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THE RADIO AMATEUR'S JOURNAL



## MEET THE NEWEST FACES IN TRANSCEIVER TECHNOLOGY

Small just got smaller. Kenwood's new TH-22AT (144MHz) and TH-42AT (440MHz) are in a category all their own, redefining "handheld communications" with a stylish palm-size format and equally impressive performance.

Besides being compact enough to slip into a shirt pocket, these two FM transceivers are light enough to carry everywhere. You'll be surprised by their output (over 5 watts with a 9.6V battery) and their stamina (long hours between charges). The secret lies in Kenwood's sophisticated power management system, featuring a MOS FET power module — a world first in this class — which enables reliable, low-voltage operation. Audio

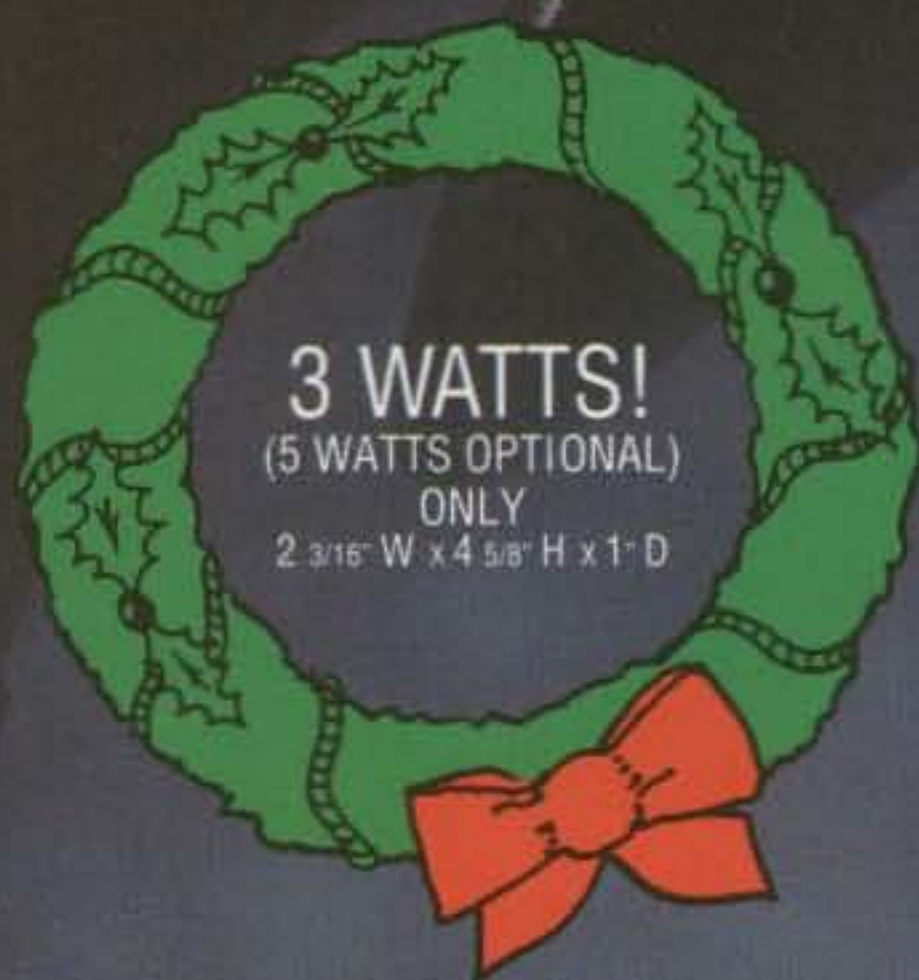
output is also great, thanks to the large built-in speaker.

Other welcome features are the built-in DTMF keypad, user-friendly menu system, multiple scan functions (VFO, call and memory) and scan stop modes (CO and TO), selectable squelch configuration, and tone alert with elapsed time indicator. In addition, there are 40 memory channels (plus 1 call channel) — all capable of storing transmit and receive frequencies, frequency step, tone (CTCSS) frequency, tone on/off status, CTCSS on/off status, DTSS code, DTSS on/off status, shift, and reverse on/off status in non-volatile E<sup>2</sup>PROM (no battery backup required). And among the desirable options are a CTCSS decoder and rapid charger.

Kenwood's TH-22AT and TH-42AT — two transceivers that are too exciting to keep under your hat.

# Hats Off!

## TH-22AT/42AT FM HANDHELD TRANSCEIVERS



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## *Life's too short for QRP!*

"When sunspots drop it's time for smoke. In the coax, I mean. Life is too short for QRP!"

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# The Radio Amateur's Journal



**ON THE COVER:** Santa Ham is at it again, this time doing a bit of pre-Christmas antenna work. For our readers of all faiths and persuasions, we wish you the most joyous and peaceful of holiday seasons. (Photo by Larry Mulvehill, WB2ZPI)

DECEMBER 1993

VOL. 49, NO. 12

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# ZERO BIAS

## EDITORIAL

I don't know about you, but I think I'm all shopped out. I've finished all my shopping, wrapped everything, and now it's just the waiting period until the holidays. This is usually the time when I reflect on the past year, compose a few resolutions I'll probably break, and try to get into the idea of the next year. This past year has turned out fairly well, although I didn't get to finish all the things I intended to accomplish. I did manage, however, to scratch a number of things off my list, but as usual, my list was quite long. I'm a compulsive list maker.

With regard to amateur radio, I certainly didn't do all the things I set out to do last January. I think in 1994 I'll start out simple and just aim to clean up the shack before I set out in new directions.

I passed the 40-year mark in amateur radio this past June. I thought I would have grown tired of it by now, but it still has much of the same fascination for me today as it had in 1953. One thing is certain, though. The toys and opportunities are a whole lot better and more fun going into 1994 than they were going into 1954. Just when you think you've seen it all and that things and gear couldn't possibly get better, a quantum leap occurs, and you're off and running in a new direction.

I guess for pure awe and wonderment, however, I would have to stick with 1953 when *everything* was new. You can substitute for 1953 whatever year you were first licensed and try to remember the feelings. Everything about amateur radio was serious, captivating, exhilarating, and consumed countless hours as though they were seconds. In fact, there simply just weren't enough hours in a day. It was a time when everything connected with amateur radio was positive—the people you met, the time spent calling CQ 187 times even though nobody came back to you, dutifully logging all 187 CQs as proscribed by law . . .

My fanciful reveries of the good old days were heightened recently when I received a letter from a reader who chided me for using the word *hobby* instead of *service* in a recent editorial. It has been a long time since anyone took me to task for using the word *hobby*. I know that technically amateur radio is defined as a *service*, but most of us tend to think of amateur radio as a hobby and something we do for our own enjoyment. It has also been a long time since I thought of amateur radio in terms of its actually *being* a service.

Coincidentally, this week I happened

on a classified ad for QSLs from the same person who sold me my first batch as a newly licensed Novice in 1953. I still remember my impassioned letter to him asking him to hurry, as my year would be running out and I expected lots of cards that simply had to be answered. I still have a few of those yellow, red, and black cards stored for posterity in my basement. Amateur radio was definitely a service then, at least for me, as it was to be taken very seriously. I had made that trip downtown to the Federal Building several times to sit before Mr. Finkelstein, only to have him glower at me as he chomped on his cigar, clearly succeeding in intimidating me. He was the full weight and measure of the U.S. Government, and apparently he and they didn't like me. After several attempts I passed this gauntlet of fear, although I felt it was much to the dismay of Mr. Finkelstein. I took KN2EEK, the U.S. Government, the Federal Building, and especially Mr. Finkelstein very seriously.

Shortly into my KN2EEK career, and armed with my new QSL cards, I took a bus ride to Queensborough Hall, the seat of government for Queens County, New York. Ostensibly, I went to see an ARRL exhibit, but I really went to see the Civil Defense amateur radio station located in the basement. I quickly saw the exhibit and went to the radio room. This was where they did important things to keep the rest of us safe. This was the true meaning of SERVICE.

I still remembered the air-raid drills from the WW II era, and later on in grade school we took shelter under our desks when alert sirens sounded. Being prepared was more than a Boy Scout motto in those days. It was a way of life. So here I was then, in the summer of 1953, at communications central for Queens County—W2NEM300. It took probably all of 30 seconds to see the whole radio room. It was kind of small, but the sight of those big, new Sonar 2 meter transceivers, the white painted helmet liners, and the arm bands made me want to sign up right away. At 15 years old I was too young for the army, but certainly I could help defend Queens County.

The Korean War (Police Action, Conflict, or whatever) was over, the Cold War was in full bloom, and everybody was watching "I Led Three Lives" on TV. I got to wear a white plastic helmet liner with the familiar CD logo and accompanying arm band, operate the big Sonar 2 meter AM rigs, and participate in several large

operational drills. During my tenure not one (verifiable) Soviet saboteur or paratrooper managed to land successfully in Queens County at Queensborough Hall. The imminent threat of mass disaster abated, I got older, and somehow it all changed—at least for me. I retired my white painted helmet liner and accompanying arm band and went on to other things. It was obvious by this time that the Soviets weren't coming. I imagine that young Soviet amateurs probably went through the same thing.

Young amateurs have zeal, tremendous enthusiasm, and an unshakable belief in almost everything. These probably are also the same traits which make them pariahs at most club meetings. Maybe it's just the young who believe in absolutes and that amateur radio is a service and not a hobby—absolutely. Maybe it's just all that enthusiasm and energy that the rest of us can only muster every so often now that sets apart the young from the "more mature." Maybe the salespeople we need to sell amateur radio to young people is other young people.

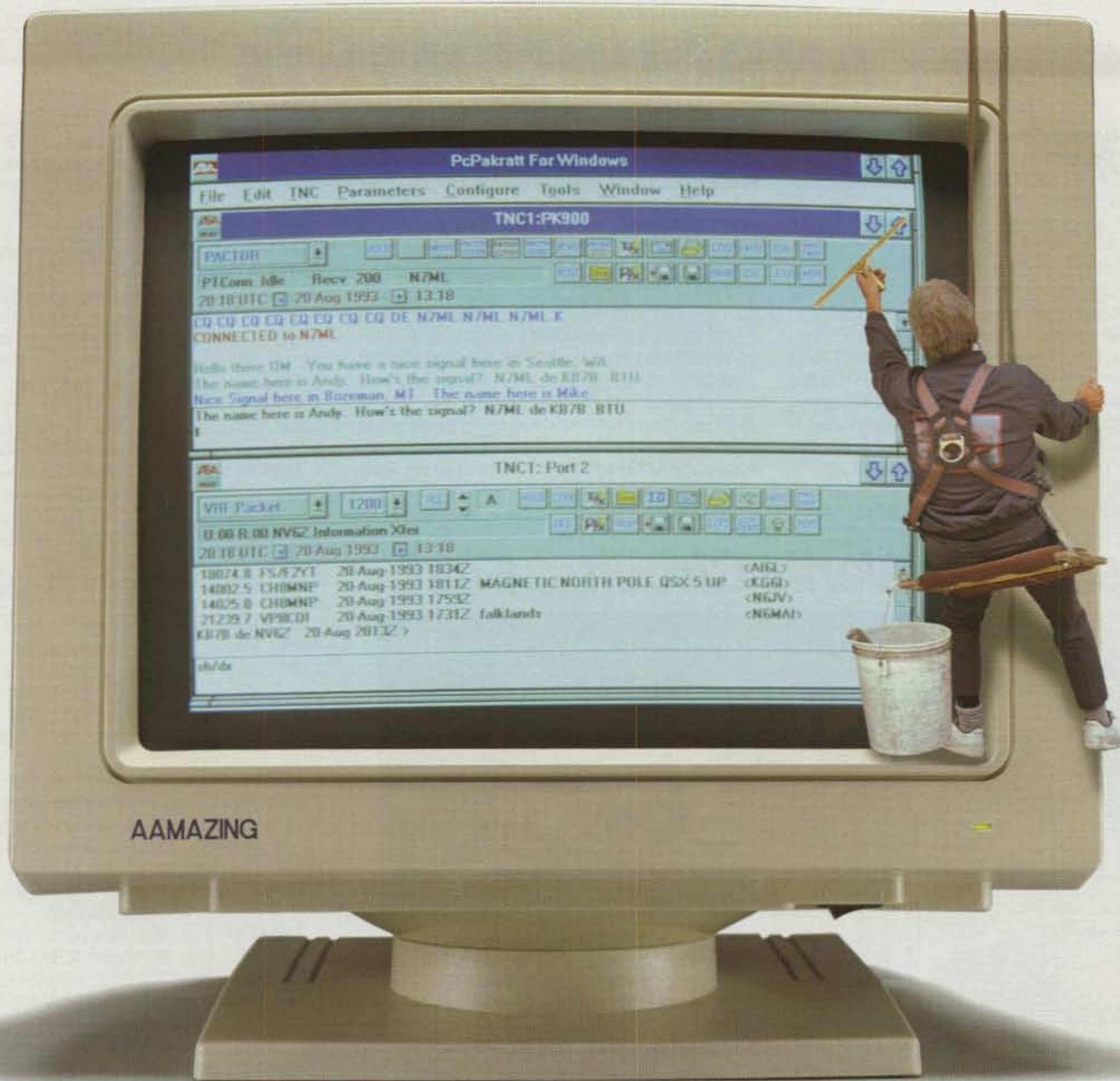
Meanwhile, it's almost time to rummage through the office and dig up my red Santa cap. Since my beard is a tad whiter than Dick's, I get to say "Ho, Ho, Ho" and hand out the grab-bag gifts at our office party. It's also time to start making plans for the 1994 hamfest season. It looks like we'll be in San Diego in early January to start off the new year. If you're going to make any resolutions at all, make one to get out of the shack once in a while and take in a hamfest or two. I can guarantee that you'll have a good time and enjoy yourself. You'll also free up some spectrum for the curmudgeons who always complain that there's too much activity on the bands for them to operate. This way everyone will have something.

Let's all try to be a bit kinder to each other in 1994, and try to keep in mind that our licenses don't entitle us to much more than the opportunity, not the right, to do something. We all can benefit from listening more and talking less. We all can also benefit in the new year by having our self-appointed amateur radio policemen retire their Sam Browne belts and hang up their RF truncheons.

All of us at CQ want to wish you the happiest of holidays and the brightest of new years. We also would like to thank you for your support and encouragement over the years and let you know that we appreciate it.

73, Alan, K2EEK





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# ANNOUNCEMENTS

•The following Special Events are scheduled for December:

**N1CC**, from "Number One Christmas Carol operation, Albany, New York; 1200Z Dec. 24 to 1800Z Dec. 25; SSB on or around 1.850, 3.950, 7.260, 14.290, 21.400, 28.480. For special QSL send SASE to N1CC, 21 High Dune Dr., Albany, NY 12203. (VE and DX will be QSLed automatically through the Bureau.)

**W1FHP**, from Christmas Special Event, Bethlehem, Connecticut; Hen House Gang ARC; month of Dec.; 10-80 meters and Novice CW 40 meters. Contacts count for Bethlehem Award; add up 4 any band, mode, etc., for special award. Send log anytime to club at 283 Hard Hill Rd. N., Bethlehem, CT 06751.

**W3OK**, from the Christmas city of Nazareth, Pennsylvania; Delaware-Lehigh ARC; 1400-

0200Z Dec. 18-19; on 3.965, 7.265, 14.265, 21.365, 28.365. For certificate send QSL and SASE to DLARC, RD4, Greystone Bldg., Nazareth, PA 18064.

**W4SVI**, from anniversary of Everglades National Park, Flamingo, Florida; Everglades ARC; Dec. 4-5; on 7.225-7.250, 14.225-14.250, 21.350-21.390, 28.300-28.500, 50.125, 144.200. For certificate send 11 x 14 SASE to Everglades ARC, c/o Dave Baskin, 18465 SW 294 Terrace, Homestead, FL 33030.

**WO4K**, from Fort Christmas, Florida; Coronado Wireless Assn.; 1400-2200Z Dec. 18, 19; 25 kHz from bottom of General phone bands, Novice 10 meter phone. For QSL send business-size SASE to WO4K, 1510 Orange Tree, Dr., Edgewater, FL 32132.

**W5QX**, from Christmas celebration, Old Fort

Concho, San Angelo, Texas; 0001Z Dec. 3 to 2000Z Dec. 5; lower General portion 40, 20, 10 meters. For certificate send QSL with contact number and 9 x 12 SASE to W5QX, P.O. Box 4002, San Angelo, TX 76902.

**WB6BNJ**, from 105th anniversary of Tournament of Roses, Pasadena, California; Relay Repeater Club; 1600-0200Z each day Dec. 30 to Jan. 1; primary frequency 28.460 MHz, secondary 21.335 and 14.260 MHz, plus 2 meters on 147.21 repeater on half hour or 220 MHz via Condor Connection on hour. For certificate send QSL with contact number and 9 x 12 SASE (58¢ postage) to Relay Repeater Club, P.O. Box 660081, Arcadia, CA 91066-0081.

**W6KA**, from commemoration of restoration of Colorado Street Bridge, Pasadena, California; Pasadena RC; 1800-2400Z Dec. 12; SSB on 21.335 or 14.260 MHz, and 147.150 MHz (+) PL 131.8. For certificate send QSL and \$1.00US to W6KA, P.O. Box 282, Altadena, CA 91003.

**KB8MBJ**, from Charles Dickens Festival, Holly, Michigan; Fenton Area ARC; 1400-2400Z Dec. 11; 28.300-28.500 MHz and general portions 20 and 40 meter phone subbands. For special QSL send QSL and #10 SASE to Bill Coale, KB8MBJ, 605 S. Broad St., Holly, MI 48442.

**W8ZQ**, from Oglebay Park's Festival of Lights, Wheeling, W. Virginia; Northern Panhandle ARC; Dec. 3-5; lower 25 kHz General 80-15 meter subbands, lower 25 kHz Novice 75-10 meter subbands, and 146.52. For photo QSL send #10 SASE to Allan Olexa, WK8T, P.O. Box 115, Neffs, OH 43940.

**W8ACW**, from 60th anniversary of Genesee County RC; Flint Michigan; 1200-2400Z Dec. 4; General 80-15 meter phone subbands, Novice 10 meter phone, 2 meters. For QSL send QSL and SASE to GCRC, P.O. Box 485, Flint, MI 48501.

**9-land**, from Special Event Week Dec. 17-24, work as many Starke County, Indiana amateurs as possible; Starke County ARC; all HF bands and possibly WARC bands, plus 2 and 440 meter operations. For certificate work at least three Starke County hams and send QSL and SASE to KA9WMW, RR1 Box 196, Knox, IN 46534 (mention serial number on your QSL).

**KH6-land**, from Kalawao County, Hawaii Special Event station; Dec. 4; all phone and CW bands, including Novice subbands, lower portion of each subband. For QSL send QSL and SASE to home QTH of op contacted.

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

Dec. 4, **Courage Center Handi-Ham Winter Hamfest**, Eagles Club, Faribault, Minnesota. Contact Don Franz, WØFIT, 1114 Frank Ave., Albert Lea, MN 56007.

Dec. 4, **North Coast ARC Fall Hamfest**, St. Clarence Church, N. Olmsted, Ohio. Contact Dan Sarama, KB8A, 216-267-5083, or NCARC packet BBS "NO8M."

Dec. 5, **Hazel Park ARC Swap and Shop**, Hazel Park High School, Hazel Park, Michigan. Contact HPARC, Box 368, Hazel Park, MI 48030.

Dec. 5, **Hancock ARC Hamfest 93**, Hancock County 4H Fairgrounds, Greenfield, IN. Contact Keith Dalrymple, N9GWK, P.O. Box 7033, Greenfield, IN 46140 (317-462-0023 or 317-328-4028).

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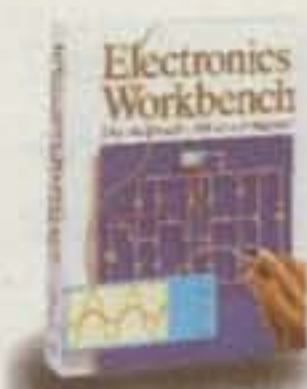
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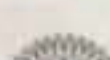
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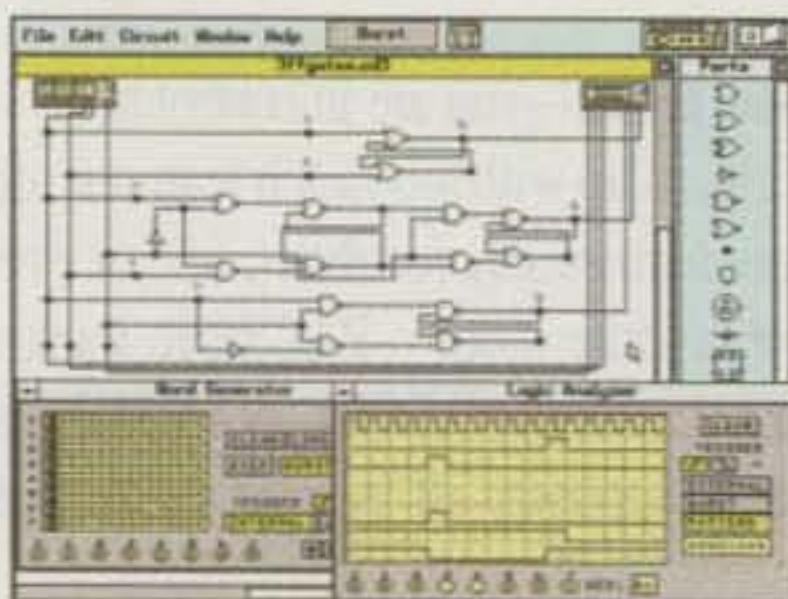
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CIRCLE 162 ON READER SERVICE CARD



# OUR READERS SAY

## Jumping The Gun?

Editor, CQ:

I was glad to see that you put in August Zero Bias the information on the USCG not monitoring 500 kHz anymore. I had known about it through the World Wireless Beacon a few months ago and from some fellow SOWP members. I am personally affected by this for nostalgic and strategic reasons.

I was an RM2 in the USCG from 1970-74 on board the *Cutter Wachusett*, NRJ, stationed in Seattle at Pier 91. The whole purpose of my watch-standing duties was operating distresses, merchies weather and position reports, AMVERS, etc. I think you see what I mean. I loved the "500" watch. On Ocean Station November, where our callsign changed to 4YN, I loved operating the merchant ships and exchanging info with them about hams as well as other pertinent info.

It is truly an end of an era, and I don't think it is such a good idea. The Coasties will stop monitoring, but hopefully the shore stations will continue their listening to the frequency. Some of those ships out there may only have MFCW for long-haul communications. FM and 2182 kHz only go so far! I just hope they didn't jump the gun with this whole thing. The GMDSS isn't fully operational yet as far as I know, and what about the International Treaty that is supposed to keep CW aboard ships until 1999?

If we hams are the last bastion of CW, then so be it. My gear is all homebrew, QRP, etc.,

and I don't even own a mike. I'm only 41 and have been called an "old fuddy-duddy" and "dinosaur" and other such terms by some of my amateur friends. Oh well, I am a died-in-the-wool continuous-wave nut and will be until I'm pushing up daisies. But in all seriousness, I hope we do not see any future oceanic disasters where if the USCG had been on 500 and heard the call, it could have been avoided.

You're the best amateur magazine out there, and keep up the good reporting.

Jeff Carter, KK6RY  
Ex-USCG RM2  
Simi Valley, CA

## So This Is What It's Like To Be Rare DX!

Editor, CQ:

Usually, DXing from near the Arctic Circle in northwest Alaska can be quite interesting. So far, only Africa has eluded my FT-101 barefoot to a Hy-Gain/Telex 18AVT/WB-5 vertical. But the fun really began when I read the article in the June CQ DX section, "Islands On The Air." Being on Sarichef Island, I wondered if it had a number, so I wrote to IOTA.

About three days later the phone rang. It was Dewitt Jones, W4BAA. "Is this Chuck, KL7OH, on Sarichef Island? You do have an IOTA number! It's North America-152, and you are on a very rare island! We immediately set up a sked on 14.260. In a half hour I added 24 QSOs to my log. Another sked at 0400 with

KH6WU, another 11 QSOs. Would I like to set up a sked for the EU's? And was I ready for some excitement?

Well, 20 meters opened up to Europe the next day. Word had gotten to the EU's of "NA-152" and they were waiting for me! "CQ Europe. This is KL7OH on NA-152, QRZed." I waited and was called by OE3WWB. Sixty-five QSOs later I sat back, staring at my rig in amazement. So this is what it's like being rare DX!

For more information on "Islands On The Air" send \$8 to Dewitt Jones, W4BAA, Box 379, Glen Arbor, MI 49636. You'll receive a detailed, 60-page booklet explaining IOTA and a listing of over 700 islands worldwide that qualify (not all do). One may be just a few hours away from you! Or monitor 14.260 for a sampling of IOTA hunting.

The pile-ups continue whenever I mention my IOTA number. In three weeks I filled up 19 pages in my logbook and received over 100 QSL cards! If you've worked KL7OH-NA-152, I am not good in the 1993 *Callbook*. Please QSL via the KL7 Bureau, or direct to KL7OH, Chuck Newberg, P.O. Box 117, Shishmaref, Alaska 99772 USA. I QSL 100 percent.

Will it end? Probably, but until then I'm going to enjoy being rare DX! From KL7OH-IOTA #NA-152, Sarichef Island, Alaska!

Chuck Newberg, KL7OH  
IOTA #NA-152  
Sarichef Island, Alaska

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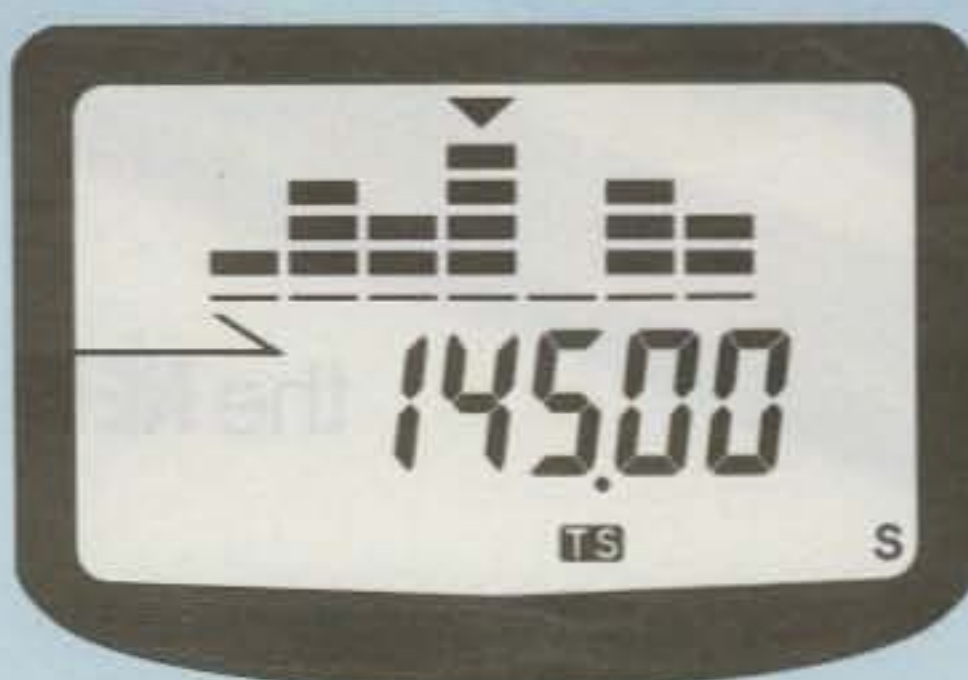
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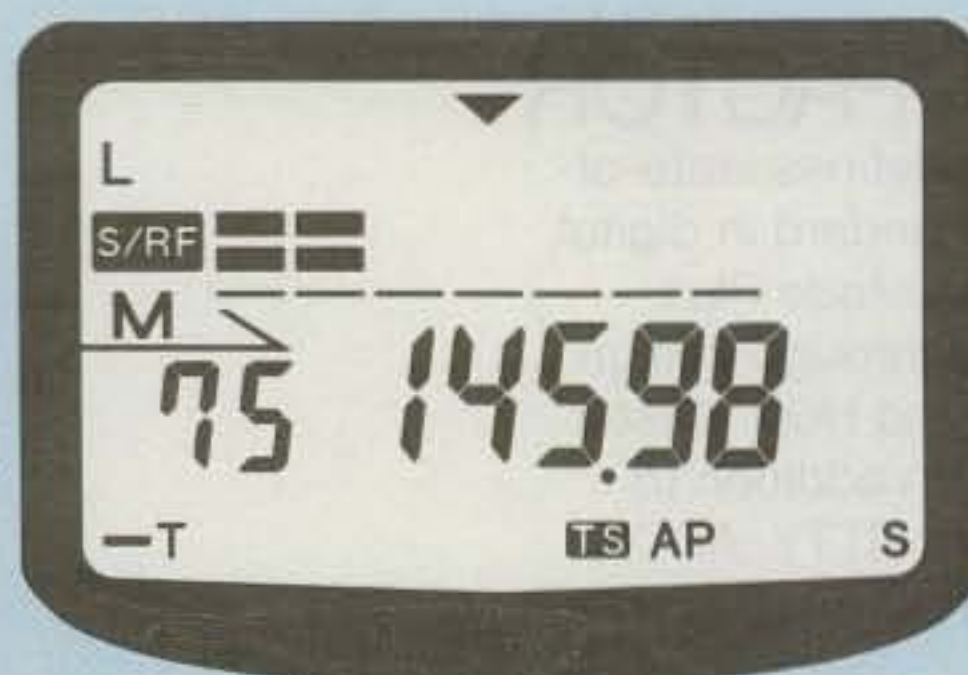
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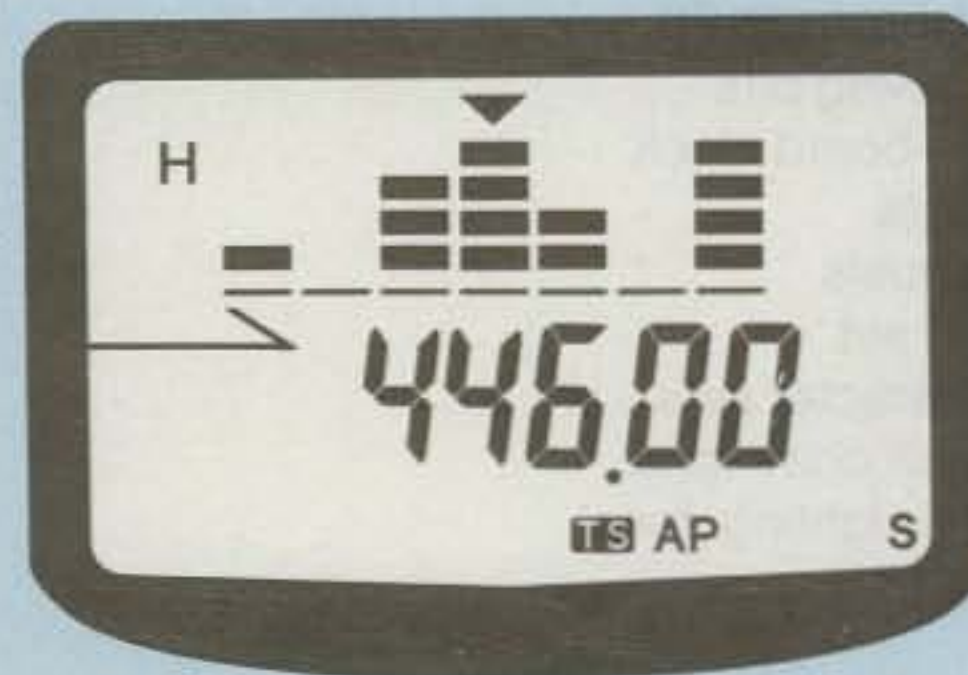
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Channel Scope (in memory mode)



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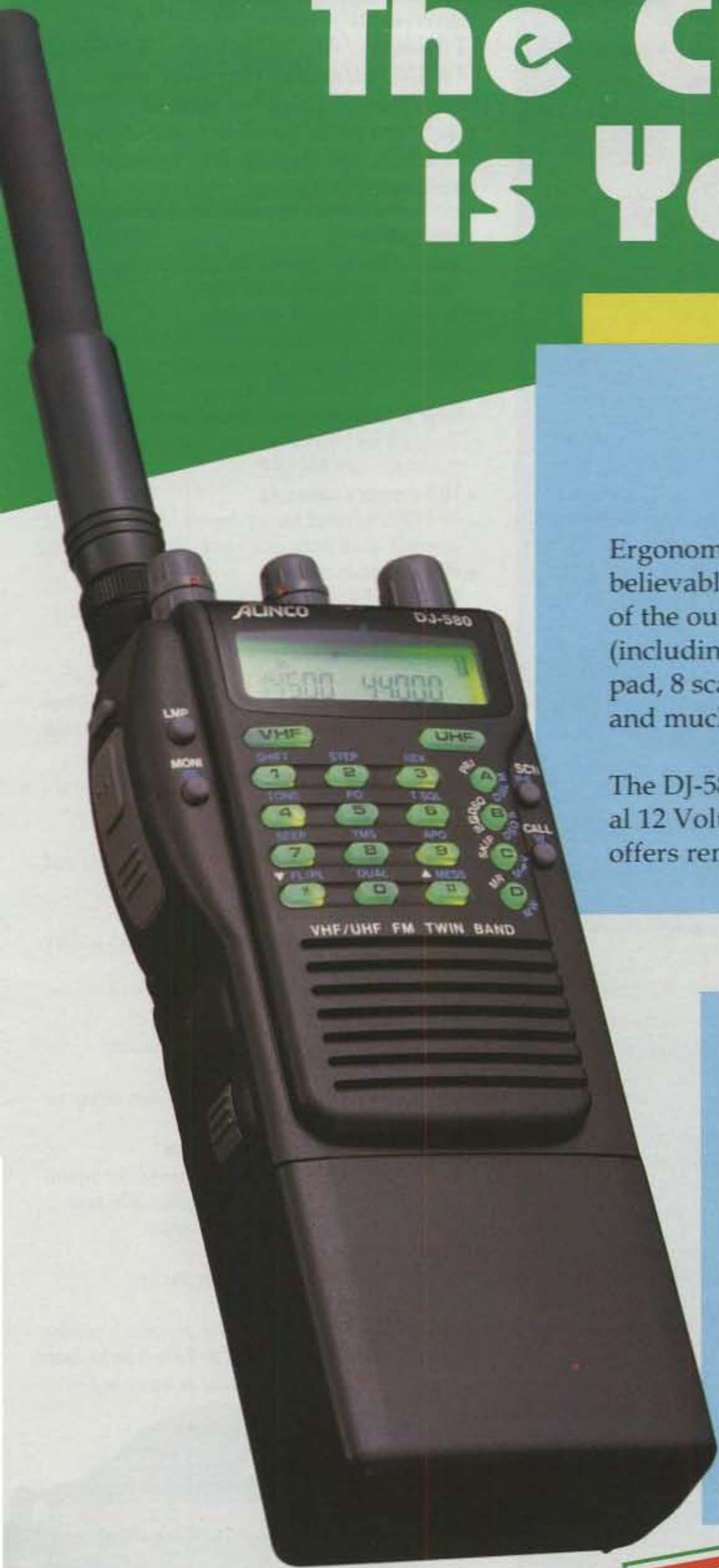
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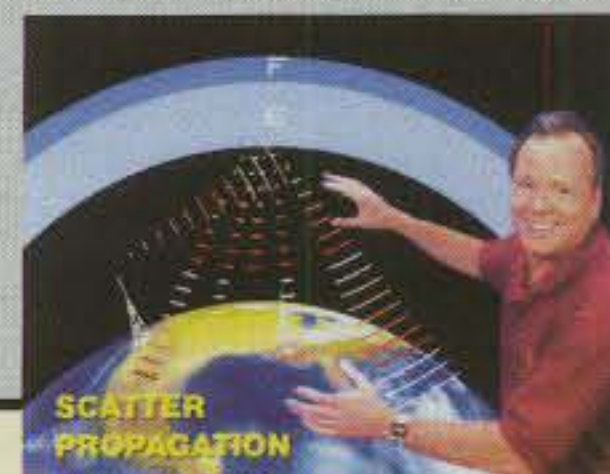


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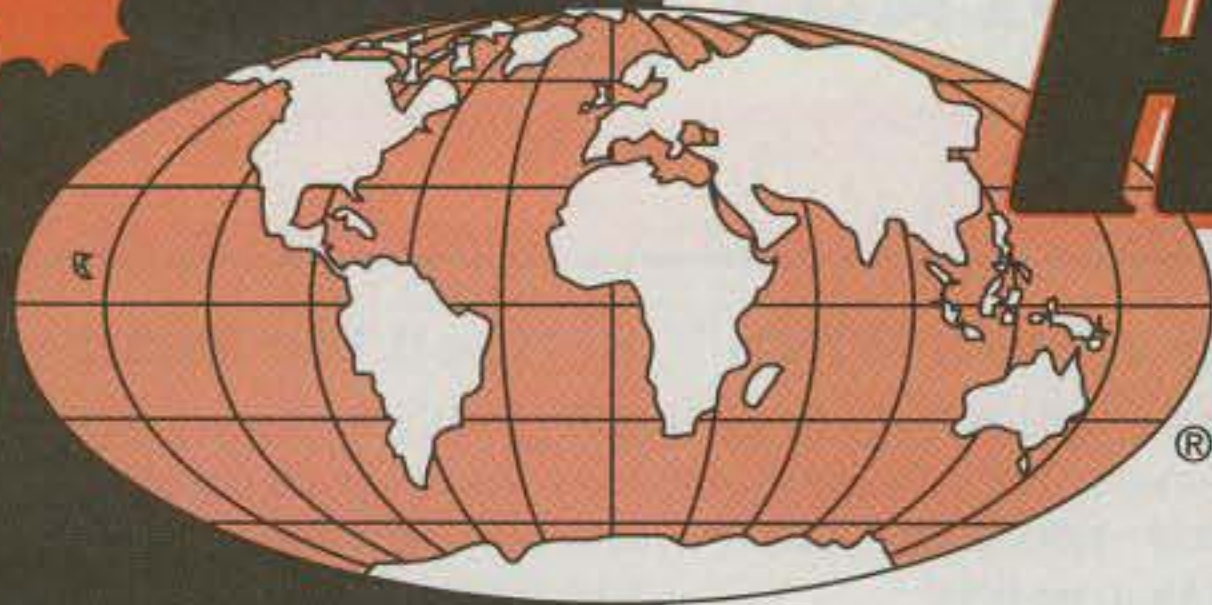
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# Results of the 1993 CQ 160 Meter DX Contests



BY DAVID L. THOMPSON\*, K4JRB

**R**emember just two years ago when only a handful of stations worked all 50 states? In 1993, 26 stations on CW and 12 on SSB worked all 50 states, while over 100 found the 48 continental states on both modes. The master log for CW increased 16% to 4027 stations, while the SSB increased by a whopping 24% to 4968. And 671 CW logs and 387 SSB logs were received, for an increase of 11%. Better conditions are expected this year, so brace yourself for more stations, more QRM, and more QSOs!

All states were active on both modes, as were all Canadian provinces except VY1 and VO2 on SSB and VO2 on CW. VO2 might be a good DXpedition target on either mode for the hearty. On CW 114 countries were logged and on SSB 103 countries were logged for an increase of 10% over 1992. Rarest DX on CW included AH1, VQ9, 5U7, UD6, UI8, UJ8, 9M2, V85, TF, HZ, JD1, UD6, A45, 9K2, KH3, and 4K2. Rare DX on SSB included VQ9, A45, UD6, UJ8, KH3, OJ0, A92, C31, FK8, VR6, CN8, and UI8.

## Conditions Were Better

The top country count increased by 7 to 69 on CW and leaped by 13 to 61 on SSB. Does this mean that working 100 countries during the contests is possible soon?

ON4UN and IR4T repeated as top country catchers, but several other stations moved up to challenge. Look for 1994 to be an interesting year that should not be missed.

Most entrants counted the WAE countries and new European multipliers correctly or made note to increase the score if they counted. The biggest problem in most logs was with the maritime mobile stations. Only a few entrants counted the points or multipliers correctly. The CQ Contest Committee decided to return maritime mobiles to a "novelty" contact with no country credit and only 5 points per QSO no matter their location. Make sure your log is correct, especially if you use a computer logger!

Last year a subtle change was made to the results, and it continues again this year. In the past the score showed the country count and the total multiplier. A better indicator was determined to be W/VE multiplier and then country multiplier. The total multiplier is easily found by adding the two columns together. Now a station can compare both the W/VE and country multiplier directly. Your comments and suggestions are always welcome as we seek to improve the contests.

Several complaints about interference to nets surfaced on SSB. Please place courtesy

\*4166 Mill Stone Court, Norcross, GA 30092



Yoshi, 5U7M, now back in Japan, was one of the most workable Africans for several years.

first and try to move if asked to do so by the net control.

## CW Contest January

The top single operator score was again P40PI with a record smashing 997,584. Mike missed one million by a few QSOs or one multiplier. His score beat the old record set by K1ZM at NP4A (1988) by 127K. KP2A came in second again with a fine score of 631,218. Stalwarts ON4UN (544K) and VE3EJ (530K) came in third and fourth, and Carlos, TI2CF, put TI1C in fifth with 515K. The top USA spot was a dog fight between K1KI and K1ZM. K1KI came out on top by less than one multiplier!

The top multi-operator score also set a new record. The gang at 4U1UN made 1243 QSOs enroute to 694,110. Their score was 147K ahead of runner-up 9A1A's 547K. WW2Y scorched the bands from stateside for third place, and 447K as USA high. W2GD made a few more contacts, but trailed WW2Y by 4 multipliers and two dozen 10 point QSOs. Their score of 395K was good enough for 4th world high, though.

K5NA closed out the top 5 with a score of 364K. Richard always places well in the CQ 160 Contests, and 1993 was no exception.

Tight races on CW in Texas, Illinois, Germany, and The Netherlands in single operator, plus Pennsylvania and Indiana in multi-operator highlighted the certificate hunt. The boxes indicate the top 10 scores for USA and DX plus

the top 5 VE scores. Placing in the boxes is a worthy goal of any contester and is a sure indicator of a competitive station.

QSO leaders (asterisk denotes multi-op throughout) were 4U1UN\* 1243, KN8Z\* 1152, W2GD\* 1148, WW2Y\* 1129, K1KI 1067, K5NA\* 1066, WB9Z\* 1059, VE3EJ 1047, AB4RU\* 1037, and K1ZM 1036. Highest DX totals outside of 4U1UN were 9A1A\* 905, KP2A 904, and P40PI 895. Several other DX stations broke into the top 50 in QSOs in a dramatic turnaround from 1992.

Top country totals included ON4UN 69; OM3TCW 66; 9A1A\* 65; G3KDB 63; UZ2FWA\*, OM3KAP\*, GW3YDX, S54CW, and DK8ZB all 62; and HA8EK, WW2Y\*, and I4EAT all tied for 61. Besides WW2Y, the top three W/VE country leaders were W2GD\* 57, K5NA\* 56, and K8PO 54. The increase in W/VE making the top 50 country list also improved greatly, reaching 14, compared to 3 in 1992. DXpeditions to AH1, 4U1UN, EA8, T32, and VR6 helped the gang to often unexpected counters.

## SSB Contest February

K1ZM found the propagation noticeably better than in 1992 with a whopping 83% increase in his final score. This was seconded by a quick peek at the USA top 10 single operators. Everyone in the top 10 scored over 100K, and there were 17 scores over 100K, compared to only 7 in 1992. 1994 promises to be even better, especially if we give the DX a chance to work in



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John, ON4UN (left), and Rudi, DK7PE, getting ready for more 160 contesting at ON4UN's QTH.

the volunteer DX window and listen up or down.

XK3EJ (VE3EJ) moves to the top overall SSB score and of course top single operator with 462,231 backed with 1236 QSOs and multiplier of 77. Watch out if John gets good, consistent DX openings to increase his country count of 20! Carlos, TI2CF, also made himself heard

on SSB with a world runner-up score of 368,431. K1ZM made the top USA score and third overall with nearly 299K. N5OLS ran single operator in 1993 and placed 2nd in the USA and 4th world high single operator. His score from 5-land proves that well-equipped stations located in the middle of the USA can make



Raimo, EA8/OH2BCI, and his contest trainer shown outside Raimo's Canary Island station. Raimo walked away with the CW African plaque in the 1993 contest.

competitive scores. IR4T lead the Europe single operators and placed 5th.

Top world high multi-operator was Ron, AB4RU. His group clicked off 1243 QSOs and found 33 countries to score 278,640. WB9Z placed 2nd in both the USA and world. Jerry always competes well with the East Coasters, and rolled up a high 1256 QSOs and a score of nearly 251K. UW2F was the special call of the UZ2FWA group. Their score placed 3rd high multi-operator and top Europe at 212K. They were one of the few Eastern Europeans to reach the USAVE. Fourth place belongs to KZ3H at 184K, and the hard-working Midwest group WR8C placed 5th with 176K. For the uninformed this was just another call used by KC8MK's group.

Tight races in Pennsylvania, Georgia, Mississippi, California, and Iowa highlighted the single operators. Pennsylvania (a three-way race) and Lithuania made things interesting for the multi-operators. As with the CW section, the boxes highlight the top 10 scores (top 5 for VE). See you in the top 10 in 1994?

QSO leaders were WB9Z\* 1256, AB4RU\* 1243, XK3EJ 1236, K1ZM 1224, N5OLS 1121, WR8C\* 1014, KZ3H\* 1013, W9UP\* 984, KD9SV 907, and N8ATR 901. Top QSO leaders outside W/VE included TI4CF 647, UW2F\* 633, and IR4T 474. The top country leaders was again an all DX affair led by IR4T 61, UW2F\* 60, OY9JD 58, OZ7YY 58, IV3PRK 57, IT9ZGY\* 56, SP5ZIM\* 55, G3NAS 55, ES5MC 54, and 9A1A\* 54. The top W/VE country leaders were K1ZM 38 and AB4RU\* 33. They at least made the top 50 in each class this time at 37th and 12th place, respectively. DXpeditions were not as evident on SSB, but OJØ, J43A, and VR6 made for exciting multipliers.

## TROPHY WINNERS

### SINGLE OPERATOR CW

**World by K5AAD (N5JJ Memorial):** Winner Mike Greenway, P40PI.

**USA by K4TEA:** Winner Tom Frenaye, K1KI.

**Canada by K5NA:** Winner John Sluymer, VE3EJ.

**Zone 3 by KM4MG:** Winner Preston T. Smith, N6SS.

**Zone 4 by K5NA:** Winner Bill Tippett, WØZV.

**Zone 5 by WA4CUG:** Winner Jeffery Briggs, K1ZM.

**Africa by K4SB:** Winner Raimo Lehto, EA8/OH2BCI.

**Asia by NE4S:** Winner Riki Kline, 4X4NJ.

**Europe by K4UEE:** Winner John Devoldere, ON4UN.

**Oceania by K4TKM/6:** Winner Jack Wheeler, KH6CC.

**South America by K4JAG:** Winner John Thompson, PJ9JT.

**Japan by WØZV:** Winner Hiro Shiozawa, 7L1GVE.

### SSB

**World by K5AAD (N5JJ Memorial):** Winner John Sluymer, XK3EJ.

**USA by K4JRB:** Winner Jeffery Briggs, K1ZM.

**Zone 3 by N4ONI:** Winner Rex Maner, K7QQ.

**Zone 4 by KC4MJ:** Winner Don E. Barclay, N5OLS.

**Zone 5 by K4ODL:** Winner Mike Greenway, K4PI.

**Africa by WB4ZNH:** Winner Ahmed Boudda, CN8GI.

**Asia by W4LVM:** Winner Igor G. Finogenov, UA9AT.

**Europe by N4NX:** Winner Ghidini Vittorio (I4YSS), IR4T.

**Oceania by K4DLI & KB4SSS:** Winner Jack Wheeler, KH6CC.

**South America by KL7JAR/W4:** Winner Celso Perdomo, YV1CR.

### MULTI-OPERATOR CW

**World by N4RJ:** Winner United Nations HQ Radio Club, 4U1UN.

**USA by WS9V:** Winner Peter D. Hutter, WW2Y.

### SSB

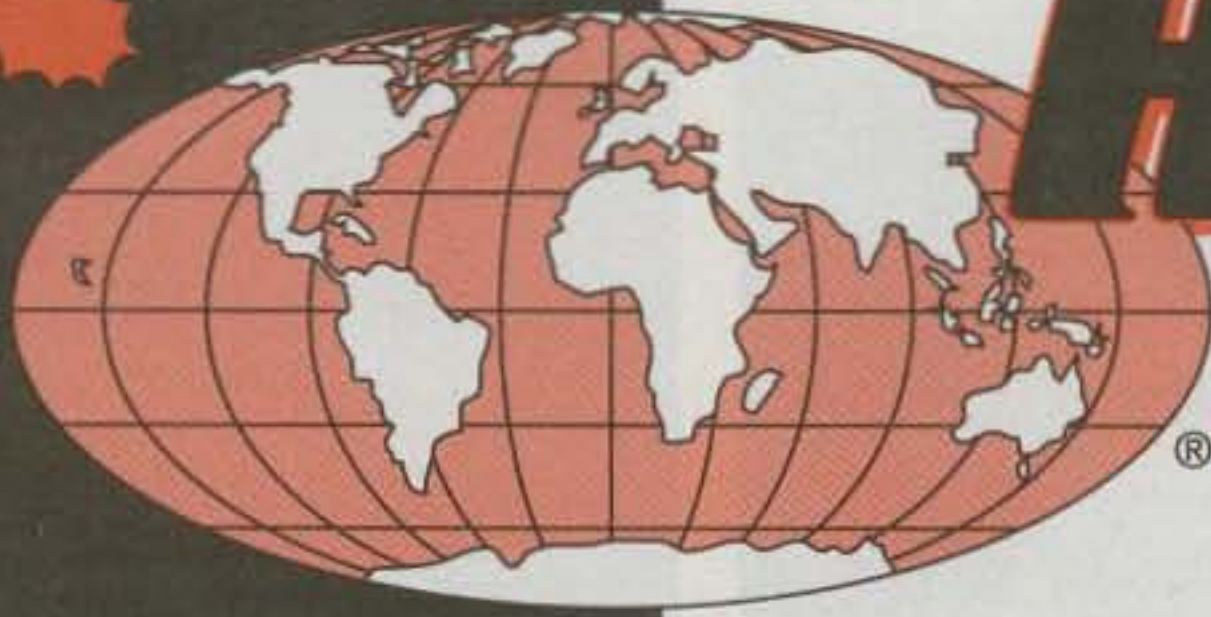
**World by Southeastern DX Club:** Winner Ron Hooper, AB4RU.

**USA by WB9Z:** Winner Jerry Rosalius, WB9Z.

## Club Competition

The Southeastern DX Club turned out the troops and the DXpeditions to a new record club score. Six other clubs scored over one million points, led by last year's winners, the Frankford Radio Club. Frankford increased their total by 43% to place second. The Yankee Clipper Club held onto 3rd place, but will need a better SSB effort to move up. Club competi-





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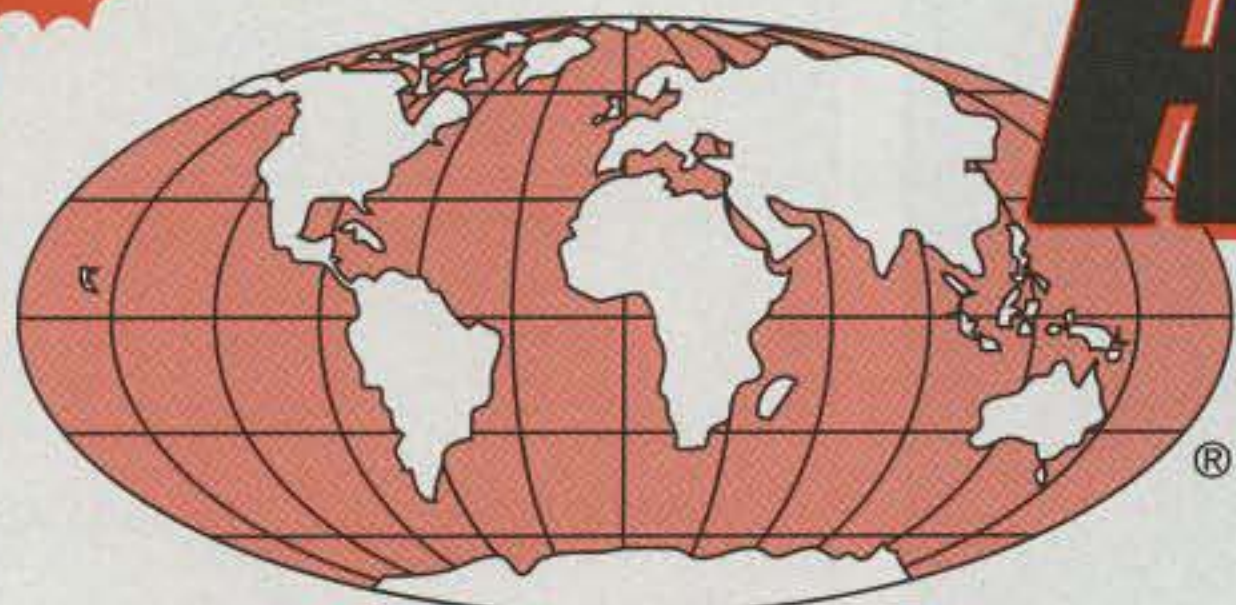
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Ivo, 5B4ADA, put Cyprus on the CW map. He plans to operate both modes in 1994.

tion is still a friendly inter-club competition. However, with increased participation, we are now going to require at least three logs for a club to appear in the listings. For a log to count towards a club participation, the club must be clearly marked on the summary sheet and you must indicate that your log is to be counted towards the club score. Logs without clear marking or that list a club only at the top of a log page will not be counted toward the club competition. If each club secretary will send me a list of participants, I will help the clubs get their due credit! For the 1993 results only clubs with at least 2 logs and a total of 10,000 points are listed.

## Thanks

Our thanks to K4PI; K4ODL; AA4GA; Helen (N4IN's XYL); my XYL, Jean; and Gail and the CQ staff for their help and assistance. Keep computer logs and hand dupe sheets coming so I can build a representative master list. The master list on the computer is the best helper!

## Logging Notes

Unfortunately, there was an increase in logging errors along with the increase in participation. Please go back through the results for the past few years and re-read the logging comments made by Don, N4IN. Follow his rules and your log will sail through the checking process!

There are 5 cardinal rules to follow:

1. Don't submit your log if you can't read all or part of it.
2. Don't send the log if the print does not line up on either a page or a line. One or two logs made us seasick to check.
3. Double check your log for logging errors. KC4 and KG4 are usually stateside, not DX. If we have to correct points or multipliers, there may be a penalty attached.
4. Remove all duplicate contacts and include a dupe or check list. A dupe list is usually just a list of stations in prefix order. There

are several good manual forms available from DX clubs or your national radio club (ARRL, RSGB, JARL).

5. Get your logs in on time.

Common logging errors include transposition of a call (K4DOL for K4ODL), mis-copying the call, and logging a call that by timing seems to have come back to you, but in reality was working someone else. Padding the log with uniques and unverifiable multipliers is very obvious in this contest and always results in drastic score reductions, warnings, and even disqualification. This also applies to duplicates not removed from the log. Thanks to the many operators who list out potential uniques. Most turn out as having worked several other participants once they get on the air, however.

Remember to always send along a hard copy of the computer logs as well as a diskette. Please send me a postcard or SAE or SASE with a stamp or IRC rather than going the registered reply route. I live in fear of a log being returned because I forget to pick it up or am out of town.

## Next Time

The 160 Meter CW Contest will be held the last full weekend in January 1994 (January 28, 29, and 30). The SSB Contest is the last full weekend of February 1994 (February 26, 27, 28). Times for both contests are 2200Z Friday start and 1600Z Sunday end. You penalize yourself if you miss the 2200Z start time, as up to 60% of the winning scores are made in the first 6 to 9 hours. The double penalty for contacts made after 1600Z eliminated that problem in 1993. Let's keep it that way! Remember to use Z Time (GMT, UTC) for all contacts.

If you need a paper log or a summary sheet, send a business-size SASE or SAE with one IRC to CQ 160 Meter Contest, CQ Magazine, 76 North Broadway, Hicksville, NY 11801 USA. Make sure your computer log program puts 40 or 50 QSOs per page and provides totals for

## TOP 10 SCORES SINGLE OPERATOR

USA CW		USA SSB	
K1KI	366,567	K1ZM	298,560
K1ZM	363,552	N5OLS	209,192
K8PO	342,768	KD9SV	153,936
W3BGN	278,615	K4PI	146,984
W0ZV	264,792	K4LTA	144,978
K2KIR	253,062	N4RJ	141,440
KZ3H	245,496	N8ATR	139,128
AA4S	237,553	K4YT	133,835
AA1K	230,398	W9ZRX	130,382
WA2SRQ	216,106	WY2X	121,897

VE CW (TOP 5)		VE SSB (TOP 5)	
VE3EJ	529,900	XK3EJ	462,231
VE1/W2XL	292,056	VE3PN	165,120
VE3ABG	261,885	VE3RM	91,312
VE5RA	191,629	VE3POS	90,882
VE3PN	153,765	VE3NXA	77,805

DX CW		DX SSB	
P40PI	997,584	TI4CF	368,431
KP2A	631,218	IR4T	187,590
ON4UN	544,104	HH2B	150,213
TI1C	514,710	ON7TK	130,845
GW3YDX	472,052	EA3KU	128,013
KH6CC	344,860	UA9AT	127,512
EA8/OH2BCI	281,424	OY9JD	127,410
8P9DX	280,476	IV3PRK	126,984
IT9ZGY	277,606	VP5JM	123,220
S54CW	261,378	CU2CE	121,806

## MULTI-OPERATOR WORLDWIDE

CW		SSB	
4U1UN	694,110	AB4RU	278,640
9A1A	546,624	WB9Z	250,826
WW2Y	446,726	UW2F	212,058
W2GD	394,516	KZ3H	184,107
K5NA	364,086	WR8C	176,325
I4EAT	321,972	AA4S	164,087
KN8Z	321,615	W1OO	151,680
OM3KAP	317,856	W9UP	148,673
PA3DWD	316,996	WW2Y	142,832
AH1A	309,339	K4JPD	136,068

QSOs, points, and multipliers on each page! Every contact should include a location, such as 599GA or 59GW. Multi-operators should either list the operator on each page or provide a summary of operator/hours. There are only two classifications—single operator and multi-operator. Using packet or a spotting net classifies an entry as multi-operator. Low power and QRP will be noted as per the complete rules (see the November issue).

CW mailing deadline is February 28, 1994 and the SSB deadline is March 31, 1994. The only exception is both logs can be sent at the same time to arrive no later than the SSB deadline. Logs with postmarks after the deadline or that arrive after May 1, 1994 are subject to being labeled "checklogs." Send all logs to 160 Meter Contest Director David L. Thompson, K4JRB, 4166 Mill Stone Court, Norcross, GA 30092 USA. Please indicate CW, SSB, or both on the envelope and send along photos.

See you in 1994, GL!

73, Dave, K4JRB

## Soapbox CW W/VE

After using a PC logging program, manual logging/check sheet duping is a thing of the past for me . . . W1OP (W1GS Op). Weather kept down our balloon until day two . . . WA1U. Will be QRV as HC1CK next time . . . KA2OIG/1.





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CIRCLE 139 ON READER SERVICE CARD

Not sure if window was a success, but the idea should continue . . . *K8HVT/1*. Kept falling asleep after 0800Z. "Qwenty" kept coming up on the screen from face on the keyboard . . . *K1ZM*. Thrilled when P40PI said "only KR2V"

. . . *KR2V/QRPp*. Used linear loaded dipole in the attic . . . *K2SWZ*. Lost the last third of my computer log; maybe the OK/MM did it . . . *W2HCA*. Still didn't get a new antenna up . . . *N2WK*. Worked all 48 states in my first CQ 160

contest . . . *WA2ASM*. All 23 dupes in my log were answers to CQ's . . . *KW2J*.  
 Congrats to the *WW2Y* team for their outstanding multi-op effort . . . *W2GD*. Still a novice at using the computer . . . *W3OV*. Worked 5

### AGGREGATE CW AND SSB CLUB SCORES

Club Name	Score	CW	SSB	Club Name	Score	CW	SSB
SOUTHEASTERN DX CLUB	6,552,237	P40PI	AB4RU	CENTRAL ARIZONA DX ASSOCIATION	196,652	N6SS	—
FRANKFORD RADIO CLUB	4,811,650	WW2Y	WW2Y	VERON (NETHERLANDS)	190,648	PA0CLN	—
YANKEE CLIPPER CONTEST CLUB	3,182,009	K1KI	K1ZM	CENTRAL VA CONTEST CLUB	181,709	WA4PGM	WB3D
MAD RIVER RADIO CLUB	1,801,996	KN8Z	WR8C	DAUBERVILLE DX ASSOCIATION	161,779	WY3T	N3FTI
POTOMAC VALLEY RADIO CLUB	1,644,889	KZ3H	KZ3H	HOOSIER CONTESTERS	154,970	KD0AV	W9ZRX
NORTH COAST CONTESTERS	1,285,208	VE3EJ	XK3EJ	SARA GROUP	153,966	OM3TKW	OM3TKW
SOC. OF MIDWEST CONTESTERS	1,186,588	WB9Z	WB9Z	CANADIAN INT'L DX CLUB	140,814	VE6JY	VE6JY
RHEIN RUHR DX ASSOCIATION	912,400	ON4UN	DJ6TK	DIXIE DXERS	133,988	N4UZ	KM4HH
CROATIA DX ASSOCIATION	671,340	9A1A	9A1A	CASPER AR SPORTING ASSOCIATION	112,802	WS7W	WS7W
LEFT COAST CONTESTERS CLUB	651,044	W7XR	K7QQ	SOUTHERN MD ARC	111,917	WK3I	—
KENTUCKY CONTEST GROUP	632,502	K4LTA	K4LTA	VE2UMS CLUB	111,234	VE2UMS	VE2UMS
NO. CALIFORNIA CONTEST CLUB	520,798	W1FEA	K6HNZ	URE (SPAIN)	109,764	EA3GCV	EA3ALD
BAVARIAN CONTEST CLUB	511,314	DK8ZB	—	NORTHERN OHIO ARS	104,857	WB8PHI	WB8PHI
NORTH TEXAS CONTEST CLUB	504,569	KC5DX	K5WXZ	UKRAINE CONTEST CLUB	101,904	UB5NBJ	—
KALININGRAD RADIO CLUB	498,312	UW2FWA	UW2F	W/K ARC GREATER MILWAUKEE	100,171	WA9TZE	WA9TZE
UPPER LAKE LIVINGSTON W. A.	472,040	AA5BL	N5OLS	ROCHESTER NY DX ASSOCIATION	98,889	WJ2W	N2WK
SO. CALIFORNIA CONTEST CLUB	426,862	N6DX	N6LL	ARI (ITALY)	90,768	I6FLD	—
UBA (BELGIUM)	374,845	ON7TK	ON7TK	CENTRAL COAST CONTEST PALS	85,104	N6RZ	—
MILE HIGH DX ASSOCIATION	367,608	W0ZV	—	SW IDAHO DX CLUB	83,901	KA7T	KA7T
BAVARIAN DX GROUP	357,700	PA3DWD	—	CENTRAL FLORIDA DX ASSOCIATION	81,218	N6AR	N6AR
KTU GROUP	349,841	LY2ZO	LY2ZO	KANSAS CITY DX CLUB	67,158	KM0L	N0BIW
SALT CITY DX ASSOCIATION	292,190	K2KIR	NA2A	RADIO CLUB ZLIN	66,083	OK2HI	—
LNDX (FRANCE)	292,044	F6EZV	F6EZV	RIVER CITY CONTESTERS	54,179	W6GO	K6SG
MINNESOTA WIRELESS ASSOC.	285,772	W0AIH	W0HW	PLATINUM COAST ARS	53,880	N4MZ	KI4TG
HAMILTON ARC	271,138	VE3DC	VE3DC	WILARC	52,228	KB9CEQ	—
TARTU RADIO CLUB	255,074	ES5RY	ES5MC	PZK (POLAND)	52,002	SP9GDB	SP9GDB
CONTEST GROUP OUDE MAAS	243,068	PI4COM	—	ARROWHEAD RAC	51,921	W0RXL	WB0SVA
TEXAS DX SOCIETY	236,902	K5DX	K5DX	ALASKA DX ASSOCIATION	41,784	WL7E	—
CAROLINA DX ASSOCIATION	218,197	AA4V	KF4HK	METRO DX CLUB	35,084	K9MDO	—
WESTERN WASHINGTON DX CLUB	205,675	WC7Q	—	HAMFESTERS RADIO CLUB	27,957	W9LNQ	—
ST. LOUIS ARC	200,854	K0LIR	K0LIR	MURPHY'S MARAUDERS	27,813	AB1U	AB1U
SNAKE RIVER RADIO CLUB	198,208	NK7U	NK7U	KMRA	25,081	K9OSH	K9OSH





OJØ/OH3AC—cold Market Reef was the exotic QTH used by operator OH3TY to provide a "rare" one on 160 SSB. Here is the entire crew that worked all bands, OH3TY on the far left.

new countries . . . K3ND. Enjoyed the QSL cards after the contest, especially the scratch and sniff card from W8AH . . . W3GH. Too many W's still in the window . . . W3BGN. Had to stand in line too long, need a better antenna than 80 ft. end-fed wire . . . W3QIR. Low noise and good DX . . . W3TS. State-of-the art receivers and low-noise antennas make for plenty of DX with-

out the window . . . AA1K. Had problem receiving due to line noise and AM broadcasting mixing problem even with beverages . . . WT3Q. Living next door to Georgia's largest electric generating plant gives new meaning to the phrase "man-made noise" . . . KX4R.

Used Isotron 160 antenna at 25 feet . . . KS4S. First contest in 20 years of operating that

I have used an amplifier . . . K4TO. Big DX signal was P40PI . . . N4UZ. Enjoyed breaking 300K, but still have much room for improvement . . . AB4RU. RF zapped PC memory for second time this contest season . . . K4BAM. Surprised what 100 watts and a windom could do . . . K4IBP. Problems with rig and antenna shot my motivation . . . N4RJ. New QTH beyond my wildest dreams, now for better antennas and power . . . K7SV/4. Will be back next year with bigger signal . . . W5WMU. Missed North Dakota . . . AA5BL. Finally got up a 160 antenna . . . W5ASP. KH6CC was the first KH6 ever heard on 160 . . . WK5K. Ran 13 JA's and worked Delaware for 160 WAS with only 100 watts and an inverted L . . . AJ6T.

Computer logging time continually kept slowing down. There was often a 2 or 3 minute error . . . N6DX. Had a good time even if we knew we would get beaten by N6DX . . . N6RZ. A lot of people were confused by my call . . . W6/S52NC. Get a big kick out of these CW contests as the operators are the best . . . W6QYO. Wish we didn't have to wait for the contests to get all the activity on 160 . . . WB6JMS. Need more DX . . . NK7U. Contest was a test drive of my new antenna . . . W7RRJ. AH1A answered my CQ after chasing the DXpedition all week . . . W7SE. Three new states, three new countries . . . W7TSQ. Was anyone else crazy enough to run 100 watts on 160 . . . WA7VNI. Seemed that I operated a zillion hours . . . K6GNX/7. Had to work both nights . . . N7LOX. Too much urban QRN . . . W7RX. I thought Nevada was rare DX but the FK8 did not agree . . . KG7D. Worked the 48 continental states by 0620Z Saturday . . . N8II. Had so much fun

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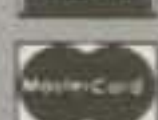
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working DX that we often neglected the QSO rate . . . *WD9INF/8*. Agreement with VCR movie addicted neighbor didn't help score much . . . *W8UCI*. The greatest single radio contest . . . *WA9TZE*. Thanks for the choice DX . . . *WB9Z*. Could not find a clear spot on the band . . . *W9LNQ*. DX window still full of US stations . . . *KØJPL/Ø*. Completed 160 WAC by working EA8 . . . *KØRW*. I live in a restricted "no outside antenna" neighborhood so operated with a balloon-supported vertical that disappeared at dawn . . . *NOØY*. Make the DX window mandatory and have the DX listen 1825 to 1830 . . . *KYØA*.

We may not have the best rigs or antennas, but we sure have a good time . . . *VE3DC*. There needs to be a senior category for those age 60 and older . . . *VE3ABG*. Had to use a torch to get antenna sections apart after the test . . . *VE1/W2XL*.

### Soapbox CW DX

With only a dipole, felt like Marconi when a VE1 was worked . . . *G4MVA*. Hope to work both days next time . . . *OH1NSJ*. Worked everyone who made the S-meter move . . . *KL7FAP*. Made 171 Q's with only 55 watts; must be the ground system . . . *W7SW/MM*. Listen for me on 1824 in 1994 . . . *HL9HH*. 6W6JX was so loud at his sunrise that I thought he was a W6 at first . . . *KP2A (K4TEA Op)*. First ever WAS in one 160 contest . . . *KH6CC*. With 240 North American stations worked I cannot complain . . . *ON4UN*. Expect better results next time . . . *YC3HCM*. Will read the rules next time so I start on time . . . *ON7TK*. OE1XJA is a special radio station where all members are scouts . . . *OE1XJA*. My summer hobby is to build 160 antennas . . . *D\_ØDA (DL1VDL Op)*.

My transceiver was horrid on RX so will change for 1994 . . . *GW3YDX*. Two new countries this year . . . *JE2LPC*. Worked my first DX on 160 . . . *OZ7AX*. Heard P40PI and many stateside signals, but did not work many due to 100 watts . . . *IT9ZGY*. Wish I had KP2A's QTH . . . *GIØKOW*. Propagation much

improved this year . . . *P40PI*. 5U7 and ET were new ones for me . . . *DL7MAE*. WX was kind and all the antennas stayed up . . . *G4BYG*. Head cold knocked me out from more participation . . . *SVØAA*. Used an 80 meter balloon, but heavy thunderstorms forced me off the air at times (it's summer in ZS) . . . *ZS6NW*. The rum here doesn't help the operating . . . *8P9DX (VE3ICR Op.)*. Second night terrible . . . *T32AF (KH6UR Op.)*.

Many good signals but still not many listening in JA band (1907.5 to 1912.5) . . . *7L1JHN*. Hope everyone enjoyed the rare DX contact . . . *AH1A*. First, but not the last time on top band . . . *5B4ADA*. Good conditions to JA . . . *DJ6TK*. Eight new ones, but condx poor to USA . . . *ES5RY*. Lost my IC-735 before end of contest . . . *OH3OJ*. Boosted score by 1500% although aurora was awful . . . *TF3DX*. My 11th CQ WW 160 contest . . . *YU7SF*. Get confused by different exchanges from the same country . . . *DL5SWB*. Surprised to do so well. Conditions had been so poor . . . *VK3IO*. No USA this time . . . *9M2AX*. Antenna only 5 meters up, will improve for next time . . . *XE1AVM*. New call, was RT5UO . . . *US1U*. First contest on top band, but missed 4U1UN and 4T4O . . . *SM6CTQ*.

Use N6TR logging program. Next year will operate at time for North America opening . . . *UA3DPX*. What happened to South America and VK? . . . *T11C (TI2CF Op.)*. Worked from "windmill" QTH . . . *PA3BAS*. Too many alligators with no ears . . . *I2UIY*. 5 kHz energy peak on 1910 kHz probably burns a hole in the band . . . *JA3BCT*. Please change exchange to RST + QSO number . . . *OK1DFF*. Greetings from rare Karelia . . . *UA1NDY*.

### Soapbox SSB W/VE

Temperature was down to -25 F Saturday night—kept warm from the RF, all of 70 watts . . . *K1JKS*. AD1G and KN1M dragged me into this foray again and it was fun . . . *W1OO*. Who ever heard of going to a mountaintop cabin for a 160 test? . . . *WF1B*. Bigger pile-ups than last



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A 45 watt 2m/70cm FM mobile radio with 100 memories per band, CTCSS encoder, and more. The radio has one open expansion slot for an optional 10m, 6m, 220MHz, or 1.2GHz band module, and an optional separation kit ..... **Call**

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 2M5WL / 2MCP22 ..... **159/199**  
 2M18XXX / 432-9WL ..... **206/135**  
 440-18 / 436CP30 ..... **99/206**

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 B1016G / A1015G ..... **289/2319**  
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## ALINCO

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 DR-130T / DR-570T ..... **309/599**  
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VS-50M	35	50	249

A=Plain M=Meters V=variable DC

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 941E / 948 / 949E ..... **99/119/139**  
 962C / 986 / 989C ..... **209/259/299**  
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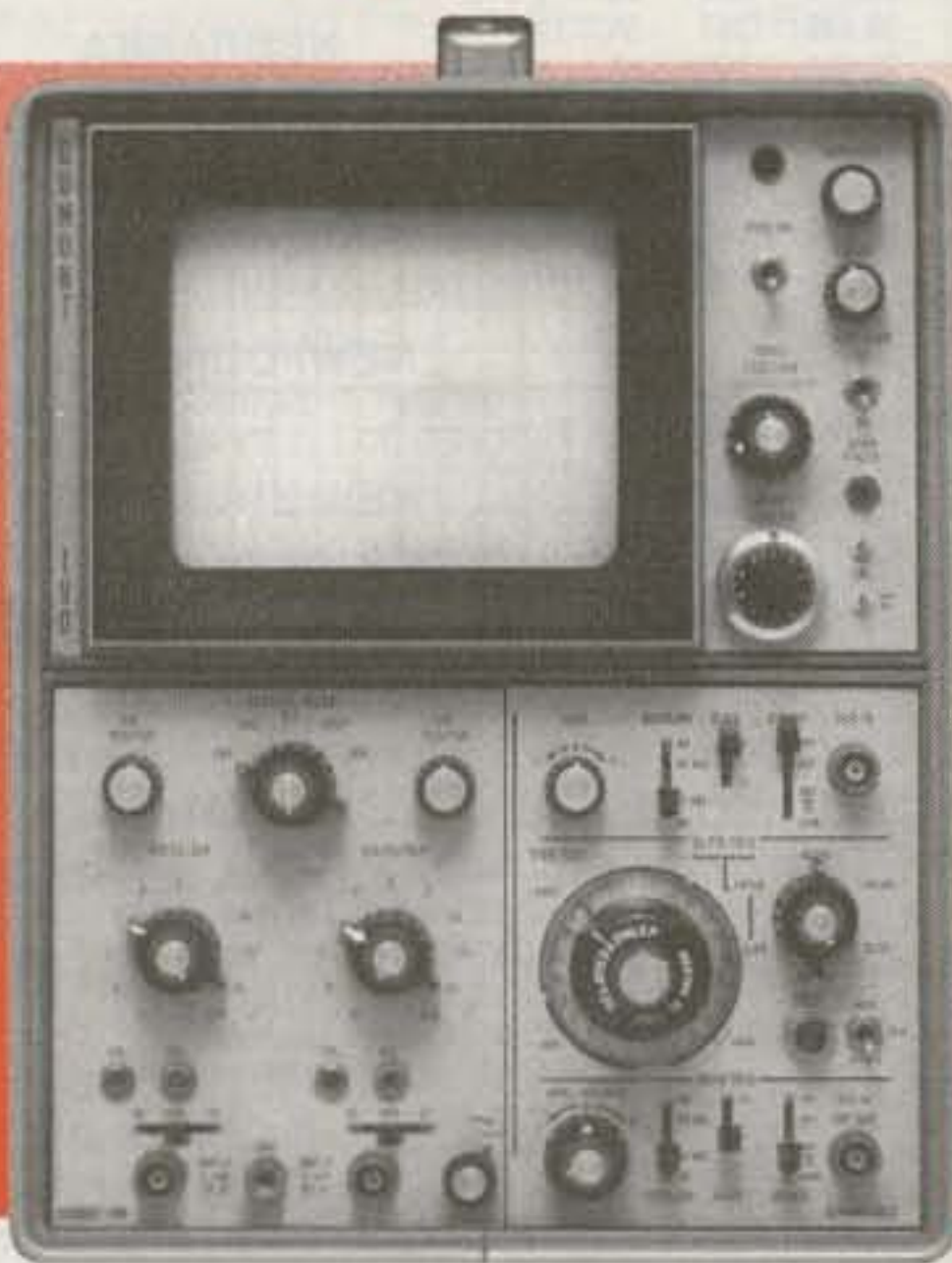
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### **Military 50 MHz Solid-State Oscilloscope**

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Remoteable VHF/UHF  
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**\$299**



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**\$117**

**Icom IC 707  
\$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. Also Available: Icom IC-77 with similar operating features, but alphanumeric display, channel tuning and cloning capability. Call for more details. Priced at only \$799.



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Band Remoteable  
Mobile \$675**

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500 Channel Scanner-  
With  
800 MHz! \$375**

Without a doubt, this is the premier scanner on the market today. It features coverage from 25 MHz to 1.3 GHz\* in 500 channels. 20 banks store these channels and your 20 most important channels can be designated as priority channels. The exclusive dot matrix-alpha numeric illuminated display allows you to program in the name of the station (Dallas Police for example) on the screen for easy identification of each channel. All of the great features of the 890 XLT are also included such as a VFO knob, weather search, turbo scan, weather alert, selectable scan delay, reception counter and step select. If you want the best, get an 8500 XLT today!  
\* Cellular Blocked-modifiable



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**NEW! Tucker  
Packet Computer  
\$749 NEW! 386  
POWER!**

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<b>TENNESSEE</b>				
K4IBP	47,424	326	53	11
<b>VIRGINIA</b>				
KX3Q	137,721	601	56	31
<b>LOUISIANA</b>				
W5WMU	109,296	705	55	14
<b>TEXAS</b>				
AA5BL	262,848	986	55	41
KC5DX	174,474	923	57	24
W5MPX	23,088	186	43	9
WB5EUC	20,142	165	49	5
<b>CALIFORNIA</b>				
N6DX	224,320	870	56	24
N6AA	107,364	518	52	17
N6RZ	78,524	367	53	14
W6/S52NC	53,352	309	46	11
WB6EGE	2,140	52	20	0
<b>NEVADA</b>				
K6GNX	54,374	318	50	12
<b>OREGON</b>				
NK7U	92,684	589	54	14
<b>UTAH</b>				
K70A	63,296	429	54	10
<b>WASHINGTON</b>				
W7XR	218,088	782	55	23
K7WA	37,675	278	47	8
<b>WYOMING</b>				
WS7W	48,256	421	50	2
<b>MICHIGAN</b>				
W0CD	161,352	802	56	27
NM8R	63,897	498	54	3
<b>OHIO</b>				
KN8Z	321,615	1152	58	47
WR8C	203,276	918	56	33
WD9INF	137,200	717	57	23
W8EDU	9,252	118	34	2
<b>ILLINOIS</b>				
WB9Z	302,616	1059	58	50
<b>INDIANA</b>				
KD9SV	169,400	748	57	31
WX9X	167,550	986	57	18
<b>WISCONSIN</b>				
W0AIH	118,152	715	55	17
WA9TZE	52,204	378	56	6
K9GS	28,350	226	48	6
<b>COLORADO</b>				
KY0A	190,086	871	56	22
N0QKY	17,145	177	41	4
<b>IOWA</b>				
NC0P	133,444	805	56	17
<b>MINNESOTA</b>				
AA0AW	10,619	116	39	2
<b>MISSOURI</b>				
K0LIR	91,927	684	56	5
<b>CANADA</b>				
<b>QUEBEC</b>				
VE20J	152,500	520	54	7
VE2UMS	65,835	248	50	5

<b>ONTARIO</b>				
VE3DC	161,138	537	54	8
VE3OSZ	136,080	444	53	10
<b>ALBERTA</b>				
VE6JY	65,460	229	50	10
VE6AO	13,356	105	28	0
<b>BRITISH COLUMBIA</b>				
VE7ZZZ	100,045	367	48	7
<b>MEXICO</b>				
XE1MD	56,600	225	43	7
<b>UNITED NATIONS</b>				
<b>NEW YORK</b>				
4U1UN	694,110	1243	57	45
<b>ASIA</b>				
<b>JAPAN</b>				
JH5ZJS	51,557	182	8	35
JA0ZRY	14,058	151	7	11
JA9YAV	72	14	1	1
<b>SAUDI ARABIA</b>				
HZ1AB	125,195	271	7	42
<b>EUROPE</b>				
<b>AUSTRIA</b>				
OE1XJA	28,224	155	0	36
<b>CROATIA</b>				
9A1A	546,624	905	31	65
<b>CZECH REPUBLIC</b>				
OK5TOP	307,272	650	22	62
OK5W	264,853	524	24	59
OK2KBA	35,919	195	0	39
<b>ENGLAND</b>				
G3VGG	84,189	304	13	44
<b>FINLAND</b>				
OH1NSJ	50,300	180	0	50
<b>GERMANY</b>				
DL3DXX	151,772	350	16	60
DL0KF	98,881	321	10	51
DK0FFO	65,692	320	3	41
DL1EFW	32,120	173	5	35
<b>ITALY</b>				
I4EAT	321,972	640	23	61
I2UIY	133,630	338	18	52
<b>KALININGRAD</b>				
UZ2FWA	286,254	625	19	62
<b>LATVIA</b>				
YL1ZR	120,232	397	6	50
<b>LITHUANIA</b>				
LY4W	153,540	465	7	53
LY2ZO	145,260	488	9	45
LY1BZB	23,392	125	0	34
<b>NETHERLANDS</b>				
PA3DWD	316,996	603	26	60
PA3FNE	292,240	604	25	55
PI4COM	241,300	545	23	53
PI4TUE	217,613	504	20	53
PI4ZLD	108,153	317	14	47
PA3BAS	94,245	268	15	46
PI4ALK	18,624	116	0	32
<b>RUSSIA</b>				
UZ10WZ	67,815	269	0	45
<b>SICILY</b>				
IT9/IK1TZO	5,540	56	0	20

<b>SLOVAKIA</b>				
OM3KAP	317,856	607	24	62
OM3KCM	207,720	484	16	56
<b>SPAIN</b>				
EA3KU	241,503	486	25	54
<b>SWEDEN</b>				
SK6EI	94,140	402	1	44
SK6NL	8,200	68	0	25
<b>UKRAINE</b>				
UB4QWW	45,144	236	0	38
<b>OCEANIA</b>				
<b>BAKER &amp; HOWLAND IS.</b>				
AH1A	309,339	477	46	21
<b>CW CHECK LOGS.</b> Thanks to the following stations for their valuable check logs: EA5URE, I6FLD, IV3PRK, LA5QC, LA8NC, OE6IMD, OH1XX, OK1DWX, OX3CS, OZ5PA, SK0RQ/5, SM4SCK, SM5BFJ, SM5JE, V85KX, W2LRJ, W8ROV, WB4RUA.				
<b>SSB</b>				
<b>SINGLE OPERATOR</b>				
<b>NORTH AMERICA</b>				
<b>UNITED STATES</b>				
<b>CONNECTICUT</b>				
W01P	44,604	364	48	6
W0MHK	9,486	141	31	0
WU1E	3,192	66	24	0
AB1U	588	23	12	0
<b>MASSACHUSETTS</b>				
W1BYH	32,542	276	49	4
<b>MAINE</b>				
NY1E	51,388	396	53	5
<b>NEW HAMPSHIRE</b>				
K1HAP	43,285	349	49	6
KT1H	3,225	57	25	0
<b>RHODE ISLAND</b>				
K2MN	5,890	86	30	1
<b>NEW JERSEY</b>				
WY2X	121,897	623	57	22
KN2T	104,121	650	54	15
KB2BF	43,407	347	43	10
N2NT	28,143	214	42	11
K2BU	11,718	109	33	9
K3GYS	9,082	102	34	4
K2FL	8,544	120	32	0
K2OWE	7,504	119	26	2
W1GD	4,672	64	32	0
WA0QQA	3,080	64	22	0
W2OAE	1,280	29	20	0
<b>NEW YORK</b>				
K12M	298,560	1224	58	38
WF2W	82,530	583	55	8
N2WK	27,783	247	43	6
NA2A	25,344	240	45	3
N2QAN	15,925	226	34	1
KF2O	4,828	51	28	6
KE2UJ	4,004	67	28	0
WB2QBO	1,911	41	21	0
K2ONP	1,501	35	17	2
WF2V	780	26	15	0
<b>DELAWARE</b>				
NY3C	7,620	115	30	0
WN3K/QRP	6,604	115	26	0
<b>MARYLAND</b>				
WZ3Q	24,012	234	43	3
KC3PZ	8,946	99	42	0
WR3L	6,528	90	29	3
W3CPB	6,412	104	28	0
W3ERT	6,328	103	28	0
WR3E	4,320	71	26	1

<b>PENNSYLVANIA</b>				
W3BGN	109,200	524	52	23
W3TS	102,186	731	54	9
NW3C	64,920	483	51	9
WT3Q	51,678	286	49	17
K2DOX	48,852	351	49	10
K4JLD	48,321	349	51	8
KU3X	37,289	346	46	3
K3ATO	22,800	263	35	5
N3GSC	18,473	172	45	4
N3CWP	14,946	141	45	2
K3CP	13,858	154	39	2
W3EHZ	9,804	126	38	0
KE3EO	3,973	61	29	0
WT3P	1,224	36	17	0
<b>ALABAMA</b>				
W4DEC	9,516	113	36	3
N4RNK	6,325	124	25	0
<b>FLORIDA</b>				
AA4MM	105,490	540	55	22
N6AR	4,526	60	28	3
KK4RV	2,850	51	22	3
<b>GEORGIA</b>				
K4PI	146,984	809	55	21
N4RJ	141,440	720	55	25
KM4HH	112,828	742	54	13
KX4R	100,640	624	55	13
WB4ZNH	88,328	667	53	8
WX4G	64,896	441	53	11
K4MZW	63,296	410	54	10
K4SB	58,200	444	52	8
AE6E	29,592	249	47	7
W4MWT	28,899	219	50	7
N4NX	26,376	207	52	4
WA4APM	23,814	200	49	5
W4GTS	20,150	185	47	3
KN4B	19,272	196	39	5
K2UFT	18,326	175	46	3
WA4IAR/QRP	17,856	183	46	2
K4NMH	15,240	180	37	3
KL7JAR/4	15,072	138	43	5
K4JEE	14,608	141	37	7
WA4ETN	11,556	95	50	4
W4DMB	8,192	122	31	1
AC4PQ	8,015	105	33	2
N4XMX	7,480	101	33	1
WB4FHF	5,481	81	25	4
K4GFH	3,120	78	20	0
N4TOL	2,052	51	18	1
K4TEA	490	23	10	0
N4ONI	24	12	1	0
<b>KENTUCKY</b>				
KC4DWT	45,100	377	51	4
KN4CG	4,092	63	31	0
ND4Y	2,760	60	23	0
<b>NORTH CAROLINA</b>				
KF4HK	106,642	652	56	15
NX9T	67,380	501	54	6
KA4TYO	21,471	191	46	5
N4IYB	3,450	66	25	0
W4HVU	108	9	6	0
<b>SOUTH CAROLINA</b>				
AC4EX	18,669	174	44	5
W4TWW	5,190	76	27	3
<b>TENNESSEE</b>				
K4LTA	144,978	852	55	18
KK4CA	65,534	470	54	8
AA4VG	20,280	182	46	6
KI4KR	16,830	172	42	3
AC4HF	6,138	99	31	0
<b>VIRGINIA</b>				
K4YT	133,835	824	53	18
W4TMN	34,224	321	44	4
W4NFR	6,090	97	29	1
<b>ARKANSAS</b>				
KG5UV	8,736	103	38	1
W5KL	637	23	13	0
<b>LOUISIANA</b>				
KB5GON	3,720	57	29	2

<b>MISSISSIPPI</b>				
KG5XA	9,972	125	33	3
N5FG	8,775	108	38	1
<b>NEW MEXICO</b>				
KN5S	22,984	211	48	4
KB5UL	10,530	108	42	3
<b>OKLAHOMA</b>				
N5VJH	1,298	28	22	0
<b>TEXAS</b>				
N50LS	209,192	1121	56	23
K5DX	58,056	437	53	6
W5ASP	38,060	325	51	4
K5WXZ	33,466	256	53	5
KI3L	18,350	154	45	5
<b>CALIFORNIA</b>				
K6HNZ	69,254	457	55	7
W1FEA	60,078	465	50	7
N6LL	58,987	415	52	9
AA6GK	39,690	325	50	4
KD6WI	26,179	229	43	4
N6AA	14,580	136	41	4
W6CN	13,110	122	42	4
WB6ITM	12,584	121	41	3
K6NY	9,720	107	37	3
K6SG	8,820	105	34	2
W6MTJ	3,799	51	27	2
AA6EE	3,744	63	24	2
KJ6HO	1,494	36	16	2
KI6PG	1,445	37	16	1
KN6DV	350	25	7	0
N6NF	245	12	6	1
<b>ARIZONA</b>				
NF7E	39,092	295	53	5
AA2U/7	12,274	144	36	2
<b>IDAHO</b>				
KA7T	35,850	307	45	5
<b>NEVADA</b>				
N7WWQ	35,392	273	52	4
N7MBX	20,445	188	43	4
K6GNX	19,056	174	45	3
<b>OREGON</b>				
AI7B	12,690	106	41	6
KI7Y	108	9	6	0
<b>UTAH</b>				
NS7K	33,436	280	47	5
W7HS	16,450	157	45	2
K6XO/7	2,829	54	22	1
<b>WASHINGTON</b>				
K7QQ	74,704	540	53	5
K9JF/7	31,017	260	43	6
W7TSQ	25,875	230	41</	



K8MR	15,093	159	43	0	<b>COSTA RICA</b>				<b>ESTONIA</b>				<b>SPAIN</b>				WU3M	95,358	542	51	18								
N8AA	10,249	125	36	1	TI4CF	368,431	647	55	48	ES5MC	87,426	299	0	54	EA3KU	128,013	306	20	51	WY3T	55,974	434	51	6					
W8FDN	9,590	128	35	0	<b>HAITI</b>				<b>FAROE ISLANDS</b>				EA3ALD	104,924	272	17	51	NN3Q	30,380	269	45	4							
KW8M	9,540	131	35	1	HH2B	150,213	413	48	21	0Y9JD	127,440	401	2	58	EA1FDI	20,085	91	8	31	K3UA	15,268	160	43	1					
KA8PTT	3,050	58	25	0	<b>MEXICO</b>				<b>FINLAND</b>				EA1EZV	16,082	81	7	27	<b>FLORIDA</b>											
<b>WEST VIRGINIA</b>					XE110	46,966	208	40	6	OH1MLB	58,880	252	0	46	EA5GRC	8,190	54	2	28	AB4XA	97,483	574	53	18					
N8II	56,127	483	50	3	XE2VOP	25,160	127	38	2	OH3OJ	6,350	51	0	25	EA1DVY	4,296	38	0	24	KI4TG	9,350	124	31	3					
<b>ILLINOIS</b>					XE1VV	9,207	66	21	6	OH2AC	1,938	20	0	19	EA1FBO	2,346	30	0	17	<b>GEORGIA</b>									
N9ITX	71,685	548	54	5	<b>PUERTO RICO</b>				<b>FRANCE</b>				SM6HRR	1,725	23	0	15	AB4RU	278,640	1243	57	33							
K9SM	23,490	188	49	5	KP4FP	9,282	68	19	7	F6EZV	95,352	316	7	51	SK6NL	1,365	20	0	13	K4JPD	136,068	877	55	14					
KD0AV	7,848	100	36	0	<b>TURKS &amp; CAICOS</b>				<b>GERMANY</b>				UT5DK	75,264	397	0	42	K4ODL	116,039	625	55	22							
W9OA	2,392	49	23	0	VP5JM	123,220	397	49	12	DL8PC	46,046	213	0	46	RB4INR	37,848	217	0	38	AC4OT	115,267	680	55	18					
KA9RTV	1,840	37	23	0	<b>AFRICA</b>				DL8HWA	22,464	123	0	39	UB0JZ	23,790	124	0	39	KD4KDH	86,856	587	54	12						
<b>INDIANA</b>					<b>MADERIA ISLANDS</b>				DL2BTU	14,553	98	0	33	RB5ELM	13,632	82	0	32	KE4TV	84,870	519	54	15						
KD9SV	153,936	907	55	17	CT3DZ	9,020	43	7	15	DL7UTA	6,725	58	0	25	UB5ZME	10,261	80	0	31	W4QD	60,780	454	52	8					
W9ZRX	130,382	860	55	12	<b>MOROCCO</b>				DJ6TK	4,992	42	0	26	UB5VND	7,000	53	0	28	W4AOL	45,050	394	49	4						
W9RE	51,156	398	53	5	CN8GI	60,690	125	13	38	DF1EQ	2,502	29	0	18	UB4EYT	4,925	38	0	25	N4HOH	714	24	13	1					
KB0C	10,840	125	38	2	<b>ASIA</b>				<b>GREECE</b>				<b>OCEANIA</b>				<b>NORTH CAROLINA</b>												
<b>WISCONSIN</b>					<b>ASIATIC RUSSIA</b>				<b>ITALY</b>				<b>GUAM</b>				<b>VIRGINIA</b>												
WA1UJU	58,104	496	53	1	UA9AT	127,512	392	0	42	IR4T	187,590	474	13	61	KN4DG/KH2	2	1	0	1	WB3D	45,540	332	51	9					
W9RZW	7,293	100	33	0	A92BE	44,396	118	1	43	IV3PRK	126,984	384	9	57	<b>HAWAII</b>				<b>LOUISIANA</b>										
<b>IOWA</b>					<b>BAHRAIN</b>				I6FLD	84,720	281	7	53	KH6CC	68,460	198	30	5	K5MS	31,111	260	48	5						
K0DXT	36,120	288	52	4	A92BE	44,396	118	1	43	IK3ORD	28,750	105	7	43	<b>PITCAIRN ISLAND</b>				<b>TEXAS</b>										
WA0ETC	31,806	248	52	5	<b>KAZAKH</b>				IV3MUC	20,040	111	0	40	VR6JJ	24	2	1	1	N5NMX	102,168	697	55	11						
K0RW	13,156	125	43	3	UL7OB	54,483	160	0	39	IK5MEQ	8,672	61	0	32	<b>SOUTH AMERICA</b>				AA5IB	57,519	401	54	9						
<b>KANSAS</b>					<b>TAJIKISTAN</b>				I2CMA	6,048	47	1	27	<b>BRAZIL</b>				<b>CALIFORNIA</b>											
N0BY	79,232	560	54	10	UJ8JMM	1,848	18	0	14	I4CSP	4,700	43	0	25	PY4BK	78	5	2	1	AJ6T	6,368	81	29	3					
W0CEM	63,224	514	52	4	<b>EUROPE</b>				I3BIP	1,215	18	0	15	<b>VENEZUELA</b>				WB6EGE	3,596	52	28	1							
N0BIW	24,480	219	49	2	<b>ANDORRA</b>				<b>KARELIA</b>				YV1CR	23,458	66	24	13	<b>OREGON</b>											
N0IZE	5,544	78	33	0	C31NA	4,950	43	0	22	RA1NA	9,240	62	0	28	YV6BFE	890	11	5	5	NK7U	105,524	750	56	6					
<b>MINNESOTA</b>					<b>AUSTRIA</b>				<b>LATVIA</b>				<b>SSB</b>				<b>WYOMING</b>												
KJ0B	51,920	398	53	6	OE2BFN	41,382	220	0	38	YL2GUP	11,620	84	0	28	<b>MULTI-OPERATOR</b>				WS7W	64,546	479	54	5						
N7AIN	36,232	292	54	2	OE1MCU	10,075	65	0	31	<b>LITHUANIA</b>				<b>NORTH AMERICA</b>				<b>MICHIGAN</b>											
KG5LD/0	15,640	158	46	0	OE1MBB	8,000	45	0	32	LY2SS	30,668	143	0	41	<b>UNITED STATES</b>				AA8U	93,390	639	56	10						
W0HW	5,600	80	31	1	<b>AZORES</b>				LY2OU	11,585	68	0	35	<b>CONNECTICUT</b>				K8LX	15,604	148	45	2							
W0RXL	4,305	51	34	1	CU2CE	121,806	221	31	36	<b>MARKET REEF</b>				<b>MASSACHUSETTS</b>				<b>OHIO</b>											
<b>MISSOURI</b>					CU2AF	23,560	77	17	23	OJ0/OH3AC	6,325	56	0	25	N1HRA	56,862	464	49	5	WR8C	176,325	1014	55	20					
WX3N/0	76,428	500	54	12	<b>BALEARIC ISLANDS</b>				<b>NORTHERN IRELAND</b>				<b>CONNETICUT</b>				<b>ILLINOIS</b>												
<b>NORTH DAKOTA</b>					EA6AAX	84,474	269	11	46	G10KOW	40,764	188	2	41	<b>MAINE</b>				WB9Z	250,826	1256	55	28						
NT0V	63,928	466	55	6	<b>BELGIUM</b>				<b>NETHERLANDS</b>				<b>VERMONT</b>				KB9CEO	50,388	404	53	4								
<b>NEBRASKA</b>					ON7TK	130,845	366	12	53	PA0IJM	15,520	96	0	32	WF1B	49,100	439	43	7	<b>INDIANA</b>									
WA0DEY	76,494	563	55	6	<b>BULGARIA</b>				PA0MIR	2,640	27	0	20	K1JKS	20,412	225	42	0	AA9AX	53,295	427	54	3						
<b>SOUTH DAKOTA</b>					LZ2JE	35,133	132	0	49	<b>POLAND</b>				<b>NEW HAMPSHIRE</b>				WM9M	9,840	111	37	3							
KD0EE	30,420	205	54	6	<b>CROATIA</b>				SP3RNZ	57,199	245	0	47	N1HFE	18,305	239	35	0	<b>WISCONSIN</b>										
<b>CANADA</b>					9A2TW	88,880	304	4	51	SP9GDB	25,872	121	0	42	<b>MASSACHUSETTS</b>				W9UP	148,673	984	56	11						
NOVA SCOTIA	24,156	106	32	12	<b>CZECH REPUBLIC</b>				SP1JXC	6,608	49	0	28	KY1H	50,120	382	49	7	WB9Z	250,826	1256	55	28						
QUEBEC	47,058	209	42	4	OK1JDX	49,984	221	1	43	SP5ENA	496	12	0	8	<b>CONNECTICUT</b>				KB9CEO	50,388	404	53	4						
VE2Q0	47,058	209	42	4	OK2HI	19,539	100	0	39	<b>PORTUGAL</b>				<b>MAINE</b>				<b>ILLINOIS</b>											
<b>ONTARIO</b>					OK1DXW	4,608	39	0	24	CT1AVR	6,925	52	0	25	W100	151,680	752	56	24	N1HRA	56,862	464	49	5	WB9Z	250,826	1256	55	28
XK3EJ	462,231	1236	57	20	<b>ROMANIA</b>				<b>RUSSIA</b>				<b>VERMONT</b>				KB9CEO	50,388	404	53	4								
VE3PN	165,120	565	52	8	Y03DCO	5,500	44	0	25	UZ4PWG	50,854	216	0	47	WF1B	49,100	439	43	7	<b>INDIANA</b>									
VE3RM	91,312	368	49	3	<b>SARDINIA</b>				RA3RCL	25,428	128	0	39	K1JKS	20,412	225	42	0	AA9AX	53,295	427	54	3						
VE3POS	90,882	351	52	2	IS0QDV	28,584	178	0	36	<b>ROMANIA</b>				<b>NEW HAMPSHIRE</b>				WM9M	9,840	111	37	3							
VE3NXA	77,805	358	44	1	<b>SLOVAKIA</b>				UA3MEV	4,598	43	0	22	N1HFE	18,305	239	35	0	<b>WISCONSIN</b>										
VE3ZTH	6,394	58	23	0	OM3TKW	69,258	266	0	51	<b>PORTUGAL</b>				<b>VERMONT</b>				W9UP	148,673	984	56	11							
VE3ST	3,043	37	17	0	<b>SLOVENIA</b>				<b>RUSSIA</b>				<b>NEW HAMPSHIRE</b>				WA9TZE	47,967	355	55	4								
<b>MANITOBA</b>					<b>ENGLAND</b>				<b>SARDINIA</b>				<b>NEW HAMPSHIRE</b>				K9OSH	7,326	102	32	1								
VE40V	21,090	117	37	1	G3NAS	98,070	241	15	55	IS0QDV	28,584	178	0	36	WW2Y	142,832	705	54	25	<b>CONNECTICUT</b>									
VE4AAU	11,152	68	34	0	G3UUV	33,699	135	10	37	<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>OHIO</b>											
<b>ALBERTA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				WR8C	176,325	1014	55	20								
VE6JAV	10,325	67	32	3	<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>ILLINOIS</b>												
<b>BRITISH COLUMBIA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				WB9Z	250,826	1256	55	28								
VE7GDM	25,826	148	35	2	<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				KB9CEO	50,388	404	53	4								
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>INDIANA</b>												
WL7E	23,480	120	36	4	<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				AA9AX	53,295	427	54	3								
AL7MX	18,304	117	28	4	<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				WM9M	9,840	111	37	3								
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>WISCONSIN</b>												
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				W9UP	148,673	984	56	11								
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				WA9TZE	47,967	355	55	4								
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				K9OSH	7,326	102	32	1								
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>COLORADO</b>												
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				KE0RO	76,850	600	54	4								
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>KANSAS</b>												
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				WBBSRP	41,006	311	53	5								
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>MINNESOTA</b>												
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				WB0SVA	14,154	149	41	1								
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>MISSOURI</b>												
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				K0LIR	108,927	795	56	7								
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>CANADA</b>												
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				<b>QUEBEC</b>												
<b>ALASKA</b>					<b>ENGLAND</b>				<b>SLOVAKIA</b>				<b>NEW HAMPSHIRE</b>				VE2UMS	45,399	258	37	0								
<b>ALASKA</b>					<b>ENGLAND</b>				<																				



# MFJ HF/VHF SWR Analyzer™

... Read your antenna SWR from 1.8 to 170 MHz continuously ... built-in 10 digit LCD frequency counter ... smooth vernier tuning ...



**MFJ-249** handheld **Universal SWR Analyzer™** lets you read your antenna SWR from 1.8 to 170 MHz quickly and easily without any other equipment! Has built-in 10 digit LCD frequency counter and smooth vernier tuning. You get *three* instruments in one ...

high accuracy frequency counter ... RF signal generator ... **SWR Analyzer™**. Measure antenna resonant frequencies and 2:1 SWR bandwidths. Adjust mobile antennas, antenna tuners and matching networks in seconds. Measure feedpoint resistance, inductance, capacitance, resonant frequency of tuned circuits,

transmission line velocity factor/impedance/loss. Test RF chokes, transformers, baluns. Use 8 AA cells or 110 VAC with MFJ-1312B, \$12.95. 4x2 1/2x6 1/8 inches. **MFJ-209**, \$109.95, same as MFJ-249 less frequency counter. See free MFJ catalog for complete line of MFJ SWR Analyzers™.

## MFJ-949E 300 W Tuner



**MFJ-949E** World's most popular antenna tuner covers 1.8-30 MHz, has lighted peak/average Cross-Needle SWR/wattmeter, 4:1 balun for balanced lines and full size 300 watt dummy load. Versatile 8 position antenna switch lets you pre-tune MFJ-949E into dummy load to minimize QRM. Custom inductor switch was carefully engineered to withstand extreme voltages and currents. Cabinet is chemically etched to MFJ's bond tough baked-on paint.

## MFJ-1278B Multi-Mode Data Controller



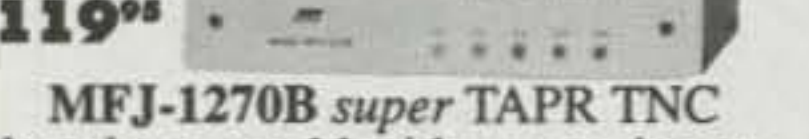
**MFJ-1278B** Use this **MFJ-1278B**, your transceiver and computer to transmit and receive digital communications! You'll discover a whole new world of ham radio and communicate in ways you never knew existed on our ham bands. The world class MFJ-1278B Multi-Mode and MultiCom™ software is packed with features no other multi-mode gives you. You get 10 digital modes ... Packet, AMTOR, PACTOR (at no extra cost), RTTY, ASCII, Navtex, Color SSTV, 16 Gray Level FAX, CW and Memory Keyer plus an enhanced 32K Mailbox. You'll have fun joining worldwide packet networks and exchanging color SSTV pictures with your buddies around the world. You'll marvel at full color FAX news photos as they come to life on your screen. You'll see weather changes on highly detailed weather maps in all 16 gray levels. You'll eavesdrop on late breaking news as it happens on RTTY. You'll enjoy error free HF QSOs on PACTOR and AMTOR and receiving packet mail in an enhanced 32K mailbox. Want to copy some CW? Just watch your screen. **MFJ-1289**, \$59.95, MultiCom™ software and cables.

## Super Hi-Q Loop Antenna

**MFJ-1786** **'249'** Tiny 36 inch diameter high efficiency loop antenna covers 10-30 MHz continuously with low SWR. Handles 150 watts. Ideal for home installations where space is limited -- apartments, condos, small lots. Take on trips. All welded construction. Remote control has Automatic Band Selection™, Cross-Needle SWR/Wattmeter. No control cable needed. Use batteries or 110 VAC. Add \$20 s/h. No ground or tuner needed. **MFJ-1782**, \$219.95, like MFJ-1786 but remote control has only slow/fast tune buttons.



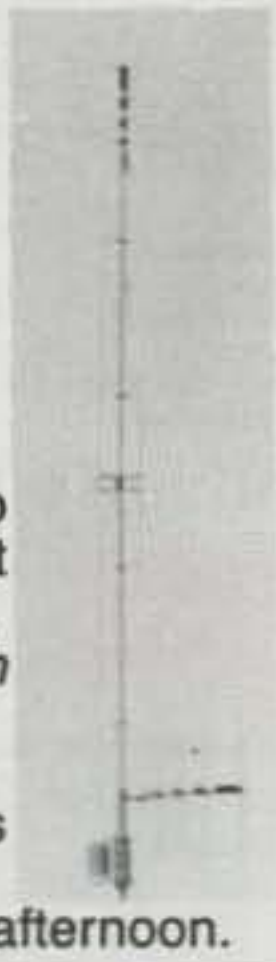
## VHF/HF Packet TNCs



**MFJ-1270B** super TAPR TNC alone has a world wide reputation as the most reliable packet TNC in the world -- many work 24 hours a day for years without a single failure! Fully TAPR TNC-2 compatible, VHF and HF operation, free AC power supply, new enhanced mailbox expandable to 512K with auto/reverse mail forwarding, WeFAX mode lets you print weather maps, optional plug-in 2400/9600 baud modems, KISS interface, MFJ Host mode.

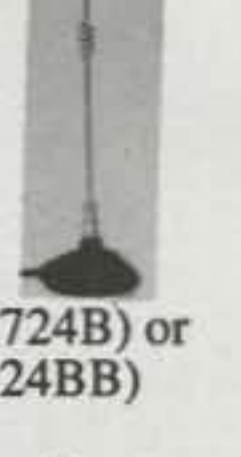
## MFJ halfwave vertical Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters ... No radials or ground needed! Operate 6 bands -- 40, 20, 15, 10, 6 and 2 Meters -- with this **MFJ-1796** ground independent halfwave vertical antenna! No radials or ground ever needed! It's only 12 feet high and has a tiny 24 inch footprint! You can mount it anywhere from ground level to the top of a tower -- on apartments, condos, small lots, even on motorhomes. Perfect for vacations, field day, DX-pedition, camping. Frequency selection is fully automatic -- all you do is transmit. Its low angle of radiation really reaches out and brings in DX. Omni-directional. 1500 watts PEP. Efficient end loading, no lossy traps. Entire length is always radiating. Full size halfwave on 2 and 6 Meters. High power air-wound choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands. Add \$20 s/h. Easy to assemble -- you'll have it on the air in an afternoon.



## Dual Band Mobile Ant.

Mobile Antenna for 144/440 MHz **MFJ-1724B/BB** dual band magnet mount mobile antenna for 144/440 MHz has 19 inch stainless steel radiator, low SWR. UHF mobile (MFJ-1724B) or BNC handie talkie (MFJ-1724BB) connector.



## MFJ TNC/Mic Switch



**MFJ-1272B** MFJ TNC/Mic Switch lets you switch between your TNC or microphone by pushing a button! Just plug pre-wired cables into your rig's mic connector and TNC. Plug-in jumpers let you use nearly any rig with 8 pin mic connector. **MFJ-1272B**, \$34.95 /MFJ/TAPR TNC2 clones; **MFJ-1272BX/PK-232**; **MFJ-1272BYV/KAM VHF/KPC3**; **MFJ-1272BYH/KAM HF Port**; **MFJ-1272BZ/PK-88**, \$39.95 each.

## MFJ's world famous 3 KW Versa Tuner V

Here's why the **MFJ-989C** is the finest 3 KW antenna tuner money can buy ... Two massive 250 pf transmitting variable capacitors can handle amps of RF current and 6000 RF volts. Logging scales. Precision ball bearing roller inductor, three digit turns counter and spinner knob give you exact inductance control for minimum SWR. Lighted peak/average Cross-Needle SWR/Wattmeter has 200/2000 watt ranges. Super heavy duty current balun has two giant 2 1/2 inch powder iron toroid cores wound with Teflon® wire. Six position ceramic antenna switch has extra large contacts. Flip stand, dummy load, one year unconditional guarantee, aluminum cabinet, tough baked-on paint, locking compound on nuts/bolts, handles 3 KW PEP, 10 1/8x4 1/2x15 in. Meter lamp needs 12 volts. Add \$13 s/h.



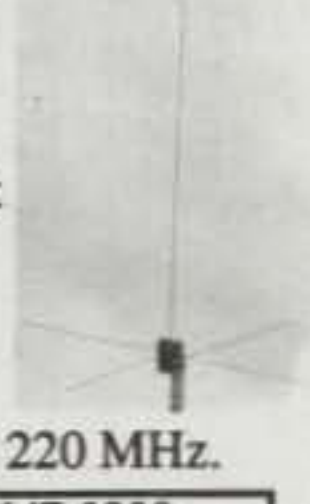
## 5/8 Wave Mobile Ant.

Maximum Gain™ 5/8 Wave 2 Meter magnet mount mobile antenna has stainless steel radiator, 12 ft coax, low SWR. UHF mobile (MFJ-1728) or BNC handie-talkie (MFJ-1728B) connector.



## 5/8 Wave Ground Plane

gets you a 2 Meter 5/8 wave ground plane home station antenna! You get the highest gain of any single element antenna, shunt fed matching, ceramic insulators. **MFJ-1752**, \$19.95, for 220 MHz.



## Regenerative RCVR Kit



**MFJ-8100K** Build this regenerative shortwave receiver kit and listen to shortwave signals from all over the world with just a 10 foot wire antenna. Has RF stage, vernier reduction drive, smooth regeneration, five bands. **MFJ-8100W**, \$79.95, assembled.

## MFJ No Matter What™ Guarantee

MFJ's famous one year No Matter What™ unconditional guarantee means we will repair or replace (at our option) your MFJ product sold in this ad no matter what for a full year.

Write or call ... 800-647-1800 **Free MFJ Catalog**

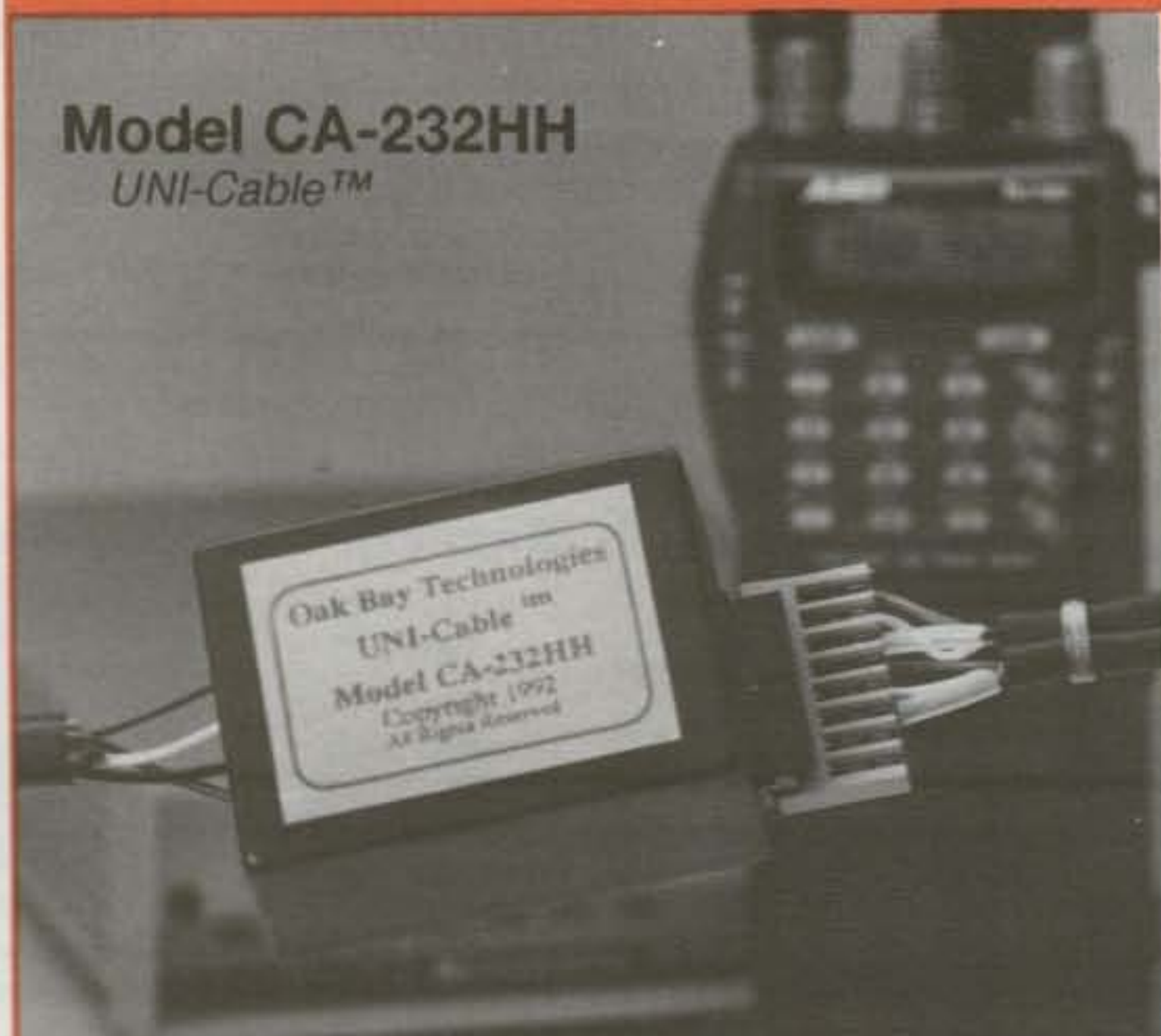
Nearest Dealer/Orders: 800-647-1800 Technical Help: 800-647-TECH (8324) • 1 year unconditional guarantee • 30 day money back guarantee (less s/h) on orders from MFJ • Free catalog

**MFJ** MFJ ENTERPRISES, INC. Box 494, Miss. State, MS 39762 (601) 323-5869; 8-4:30 CST, Mon-Fri. FAX: (601)323-6551; Add \$6 s/h MFJ... making quality affordable Prices and specifications subject to change © 1993 MFJ Enterprises, Inc.



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**Model CA-232HH**  
UNI-Cable™



Oak Bay Technologies now provides a *Universal Solution* for Packet TNC/HANDHELD interface cabling! The Model CA-232HH interfaces virtually all Handhelds to all TNC's Without Soldering! Reconfigurable for your next TNC or handheld. Make the Connection with Oak Bay Technologies today. Available from your favorite dealer.

**Oak Bay Technologies, Inc Port Ludlow, WA 98365**

## Are You In A Rotator Rut?

Most Rotators Share The Same Features:

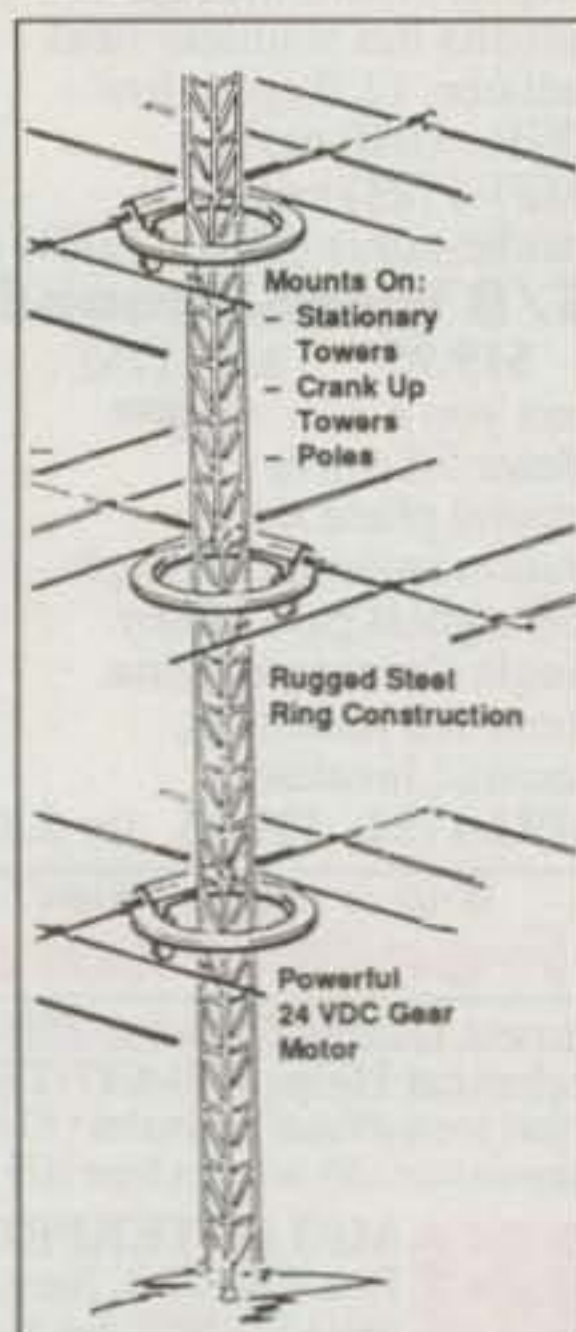
- They Aren't Rugged (built of cast aluminum & pot metal)
- They Cost Too Much and They Wear Out Too Soon
- They Have No Standard Mounting Scheme (Rotor Plates, Custom Drilling, Thrust Bearings are extra cost)
- They Freeze Up, Slow Down And Stop When They Shouldn't
- They Were Designed For "Intermittent Amateur Service"

DID YOU EVER  
WONDER WHY THERE IS  
A NEED FOR COMPANIES  
THAT SPECIALIZE IN  
RE-BUILDING ROTATORS  
???

There is an Alternative To Rotator Rut!



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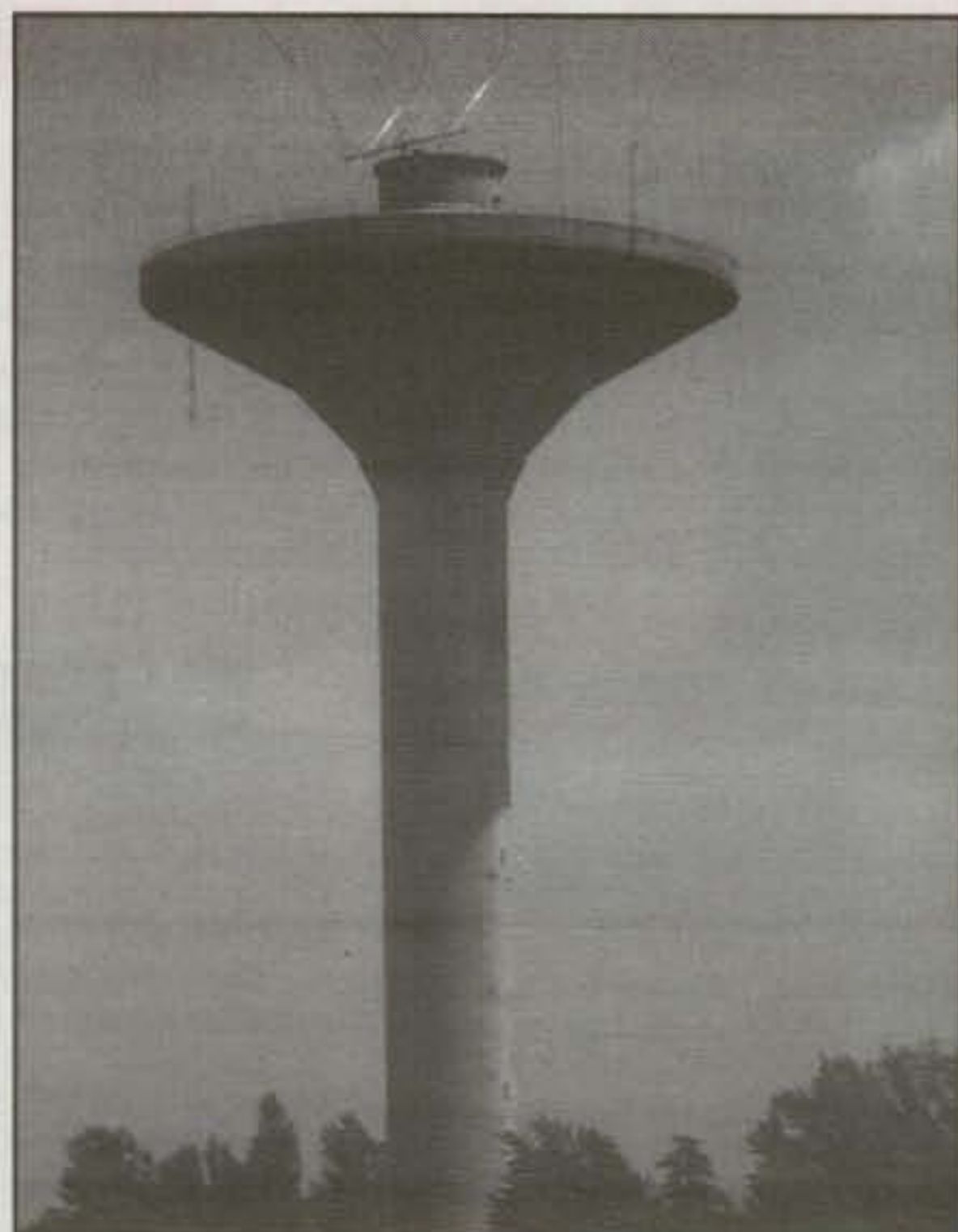


- Mounts OUTSIDE The Tower, At The Top or On The Side
- Full 360° Rotation
- Designed For HEAVY DUTY Use In Adverse Weather
- All Parts On The Outside; No Maintenance Nightmare
- No need for rotor plates, thrust bearings or side mounts
- High Accuracy Control Box With Pre-Set (Point-and-Shoot)
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LET YOUR IMAGINATION RUN WILD!

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Probably the most unusual antenna support on 160 helped operator 14YSS to gain the SSB Europe plaque.

<b>ALBERTA</b>				<b>KALININGRAD</b>			
VE6JY	75,354	285	51 6	UW2F	212,058	633	3 60
VE6XH	38,640	175	43 5	<b>LITHUANIA</b>			
<b>BRITISH COLUMBIA</b>				LY3MR	118,476	387	1 53
VE7ZZZ	58,065	257	46 3	LY2ZO	114,192	460	0 48
<b>EUROPE</b>				<b>POLAND</b>			
<b>CROATIA</b>				SP5ZIM	102,850	358	0 55
9A1A	124,716	418	3 54	<b>SCOTLAND</b>			
<b>ENGLAND</b>				GM4RIV	7,498	79	0 23
G00CE	15,159	104	0 31	<b>SICILY</b>			
<b>FINLAND</b>				IT9ZGY	89,408	253	8 56
OH1NSJ	19,950	103	0 38	<b>SWITZERLAND</b>			
<b>FRANCE</b>				H89CXZ	98,226	382	3 48
F1GTR	114,219	285	20 43	<b>YUGOSLAVIA</b>			
<b>GERMANY</b>				4N7M	34,144	149	0 44
DK0IW	32,800	186	1 39	SSB CHECK LOGS. Thanks to the following stations for their valuable check logs: EA3GBU, EA5GJW, OH1XX, SM5BFJ, VE3VID, WD6L/M.			



The operating crew of KN8Z beams over 1993 results. (Back row left to right are N8JEC and WA8YVR; front row left to right are NZ8O, KN8Z, and WX8T.)



# MFJ halfwave vertical Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed!

Operate 40, 20, 15, 10, 6, 2 Meters with this MFJ-1796 ground independent halfwave vertical antenna -- no radials or ground ever needed!

It's only 12 feet high and has a tiny 24 inch footprint! You can mount it anywhere from ground level to the top of a tower -- on apartments, condos, small lots, even on a motorhome. You can take it anywhere -- vacations, field day, DX-pedition, camping, nearly anywhere you go.

Frequency selection is fully automatic -- there are no moving parts, nothing to adjust -- all you do is transmit. It handles up to 1500 watts PEP. You'll work your share of DX because its low angle of radiation really reaches out and brings in DX.

During a contest, you'll love being able to quickly work one station after another from all directions because of its omni directional pattern.

It's so easy to put together that you can have it on the air in an afternoon.

## How does MFJ achieve maximum efficiency in such a compact multiband antenna?

The key is end loading -- the most efficient form of loading known. The entire length of the antenna is always radiating power. There are no lossy traps to reduce effective length.

End loading provides multiband and full electrical half wavelength on each HF band. An optimum combination of capacitive hat and inductive end loading delivers a close 50 ohm match without a lossy impedance matching network.

Efficient high-Q loading coils are wound on low loss fiberglass forms. Large 1-inch diameter aluminum radiators are used to keep losses to a minimum.

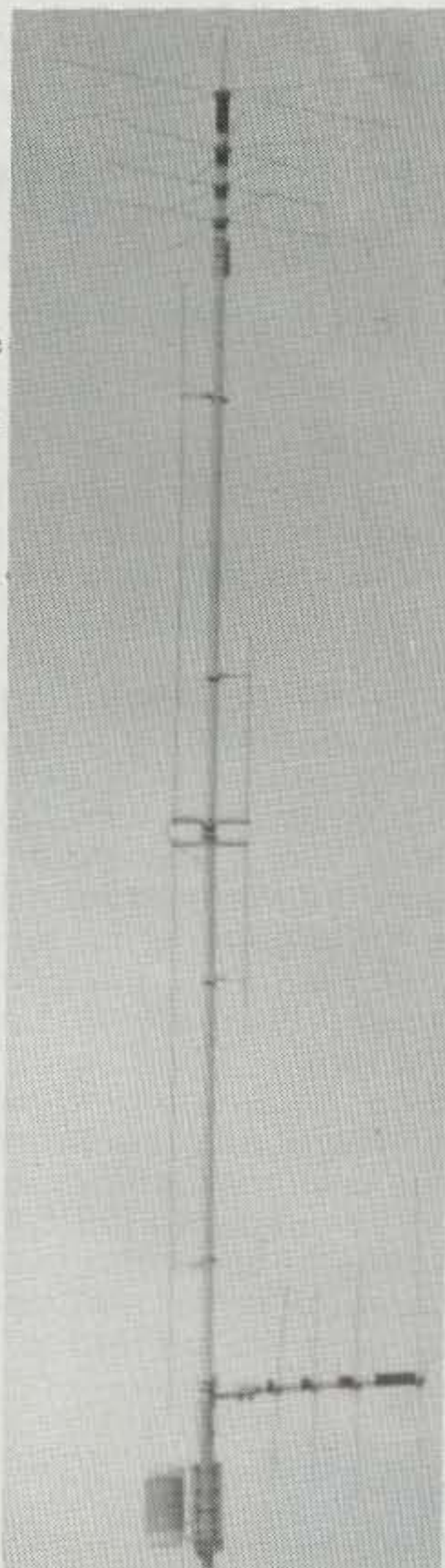
## No Radials or Ground ever Needed!

The MFJ-1796 is balanced and center fed to totally eliminate the need for radials, counterpoises or a groundplane -- you don't have the kind of ground losses that's common with a quarter wave vertical.

## No Feedline Radiation

There is no feedline radiation that causes pattern distortion and wastes power. The 50 ohm Teflon® coax feedline exits through the bottom radiator from a low impedance point -- the loading unit is mounted at right angles to decouple the feedline and to provide a low impedance point.

The feedline is further decoupled and isolated from



MFJ-1796  
\$199<sup>95</sup>

the antenna with a highly efficient air-wound choke balun. This attenuates RF on the outside of the coax and minimizes feedline radiation that waste power.

## Easy to Adjust

It's very easy to optimize the MFJ-1796 for your favorite part of the band. Frequency adjustments are nearly independent -- adjusting one band has minimum effect on the resonant frequency of the other bands -- unlike most other multiband antennas.

## Built to Last

You get an antenna built with heavy duty aluminum radiators, machined aluminum parts and stainless steel hardware.

The coils are wound on tough low loss fiberglass forms using durable Teflon® covered wire that's highly weather resistant.

## Full halfwave on 2 and 6 Meters

On 2 Meters and 6 Meters, MFJ's unique stub decoupling and efficient full size halfwave elements really get you out with low angle radiation for lots of DX.

## The most for your Money

For \$199.95, the MFJ-1796 gives you the most for your money--no other multiband, automatic band-switching, ground independent DX antenna even comes close.

## No Matter What™ Guarantee

You get MFJ's famous one year No Matter What™ unconditional guarantee. That means we will repair or replace (at our option) your MFJ-1796 halfwave vertical antenna no matter what for a full year.

## Continuing Service

MFJ Customer Service Technicians will help you keep your MFJ halfwave vertical performing flawlessly -- no matter how long you own it. Just call our toll-free help line 800-647-TECH (8324) -- an MFJ exclusive.

## Made in USA

MFJ halfwave verticals are made in the USA. Help our fellow Americans by keeping our money here -- buy Made in USA.

## Call Your Dealer for Your Best Price Today

Enjoy DXing and ragchewing on six bands from your apartment, condo or anywhere. Call your favorite dealer for your best price and order your MFJ halfwave vertical today!

## Shortwave Regenerative Receiver Kit



Remember hunching over your regenerative receiver for hours with a pair of phones pressing uncomfortably against your ears?

You could hear just about anything that

fancy superhets could hear. Sure, you had to play around with the regeneration control just right and have a steady hand to tune but you could hear'em.

Don't you wish you could relive some of this fun and excitement of your youth -- share some of it with your kids and grandkids?

Well, you can -- with the MFJ-8100 World Band Shortwave Radio Kit.

Spend a fun evening with your child or grandchild and help him put this simple kit together. When you two finish, watch him glow with excitement as he tunes the world bands--just like you did--and remember for life.

This baby performs. An RF stage really picks up the weak ones and it goes into regeneration smoothly without pops or dead spots. Stations all over the world will come in loud and clear with just a 10 foot wire antenna.

Listen to international shortwave broadcasts, hams on SSB and CW, WWV, RTTY, packet and much more. Covers all or part of 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15, 13 Meters in five bands.

It has vernier reduction drive, bandswitch, volume and RF gain controls, uses a 9 volt battery and is built into a rugged aluminum cabinet.

Two earphone jacks let you and your child or grandchild listen together with your Walkman style earphones or plug-in speakers. 7x6x2 1/2 inches.

Order one as a gift for your child or grandchild . . . or for yourself.

MFJ-8100K, \$59.95 kit; MFJ-8100W, \$79.95 wired and tested.

Teflon® is a registered trademark of Dupont.

## 300 KHz-200 MHz Active Antenna

Wish you could hear everything your expensive general coverage transceiver or receiver is capable of receiving?

Your ham band only antenna does great in the ham bands . . . but plug this new MFJ all band active

antenna into your general coverage transceiver or receiver and you'll hear strong clear signals from all over the world from 300 KHz to 200 MHz --including low, medium, shortwave and VHF bands.

You'll enjoy up-to-the minute international shortwave newscast, ship-to-shore, airline, commercial RTTY and even military traffic. Use your data controller to receive FAX news photos, weather maps, Navtex and more.

Take it on trips and use it with your mobile or QRP rig to listen.

Also improves weak noisy scanner radio reception from low band to high band VHF -- hear signals you couldn't hear before.

A J-310 FET handles strong signals and a new noiseless feedback circuit gives you excellent low

noise reception. A 4.5 GHz MRF-901 transistor lets you receive weak signals well into VHF.

Detachable 20 inch telescoping antenna.

Uses 9 volt battery or 110 VAC with MFJ-1312B, \$12.95.

3 1/2 x 1 1/4 x 4 inches.

MFJ-1022  
\$39<sup>95</sup>



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## CQ Reviews:

# The SuperSpanner 75-10 Meter Mobile Antenna

BY LEW McCOY\*, W1ICP

**A**mateur radio is experiencing a strong revival of low-band mobile operation. When FM and repeaters became popular, there was a huge rush on the part of amateurs to take part. This happened because it was an easy method to achieve local mobile communications, and FM transceivers were small and easy to fit in a car.

Now we have more and more companies entering the low-band market (80 through 10 meters) with very small transceivers. I recently reviewed a Kenwood transceiver that is only about 2 inches high, 9 inches wide, and 11 inches deep ("CQReviews: The Kenwood TS-50, June 1993 CQ). Obviously, these small rigs will fit into the smallest vehicle and mobile

operation will not be far behind. There also will be an increased market for mobile antennas, and fortunately, there are some good ones being produced.

One such antenna which impresses me very much is the SuperSpanner. This is an American-made product that is made with old-fashioned, fine machining techniques.

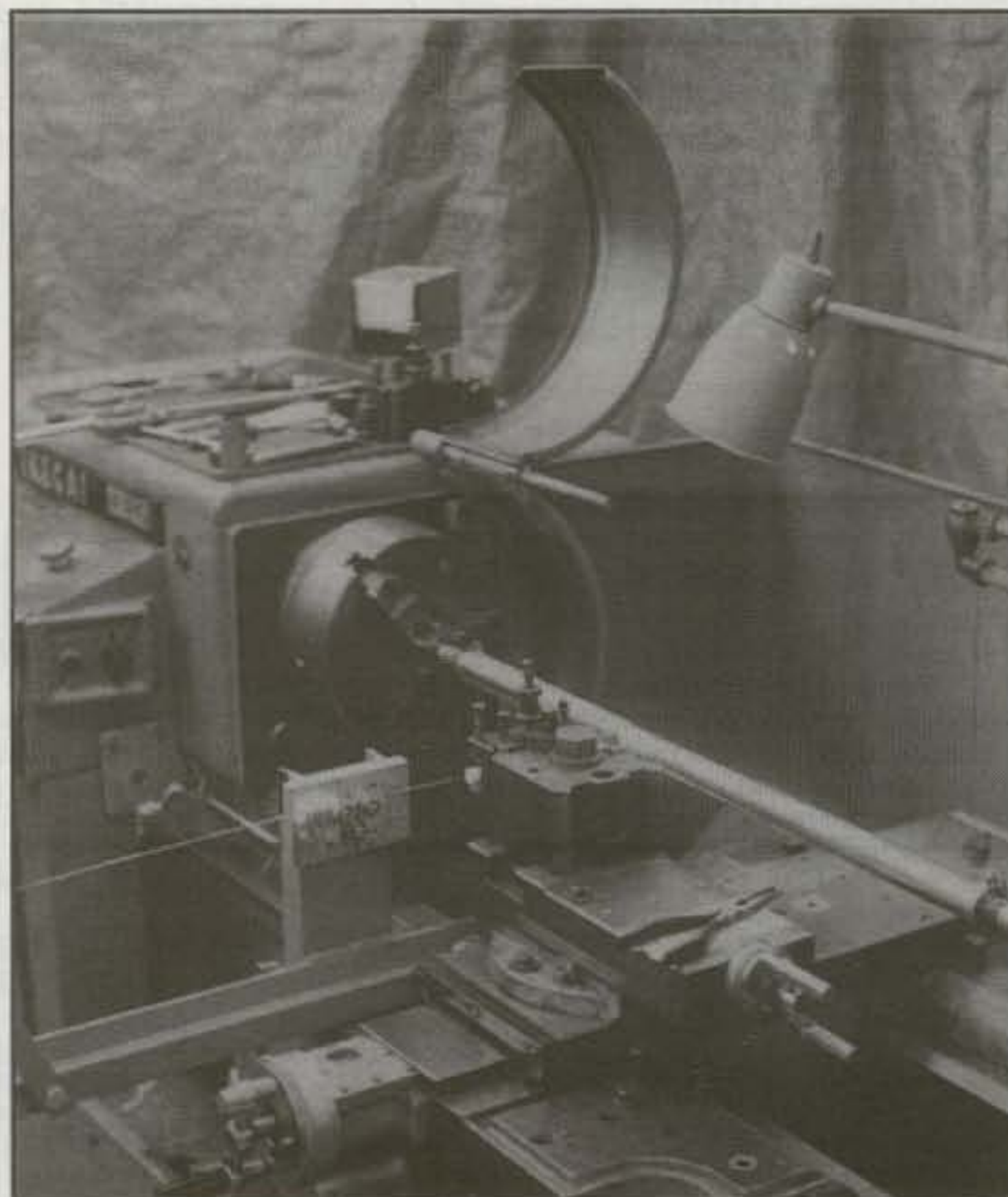
I have been using the SuperSpanner on an RV for over a year and am very impressed with it. When I saw some photos of the actual factory work, I asked if I couldn't use them in this review. I would be surprised if the reader isn't as impressed as I am.

The same people who were involved with the very famous Webster Bandspanner mobile antenna are the ones producing this newer antenna. Basically, this antenna consists of a bottom section, then a center coil, and an adjustable top whip. Sounds simple, but read on.

In construction, a 1<sup>3</sup>/<sub>8</sub> diameter, 48 inch long steel mandrel is set up in an engine lathe. The mandrel is covered with a wax paper (similar to butcher's heavy-weight wax paper), and then heated and cooled, transferring a layer of wax to the mandrel. The paper is removed. Next a 2 inch diameter steel roller is used to pressure roll size 15 gauge copper wire onto the mandrel at 10 turns per inch. The pressure forces the wax between the wire turns.

After a few more steps the mandrel with the wire winding is set up between centers, and 13 layers of .010 inch aircraft-type polyglass is applied and allowed to cure. The mandrel and polyglass coil assembly is then put in a lathe and machined down to the proper exterior diameter. After another polyglass curing process the mandrel is next placed in a power press and removed.

\*Technical Editor, CQ, 1500 W. Idaho St., Silver City, NM 88061



*Here the copper wire is wound on the mandrel.*

*Wrapping the fiberglass cloth over the coil.*





# MFJ TUNERS

## MFJ's world famous 3 KW Versa Tuner V

If you won't settle for less . . . here is the finest 3 KW tuner money can buy!

The MFJ-989C is not for everyone. However, if you make the investment, you'll get the finest 3 KW tuner money can buy. Here's why.

**Massive Transmitting Capacitors**  
You get two massive 250 pf transmitting variable capacitors with detailed logging scales. They can handle amps of RF current and withstand 6000 RF volts because the plates are smoothed and polished and have extra wide spacing.

**Precision Roller Inductor**  
A precision roller inductor lets you tune your SWR down to the absolute minimum. A 3-digit turns counter plus a spinner knob gives you exact inductance control.

**Ball bearings** on both the front and back shafts give you a velvet smooth vernier feel. Steel end plates and steel shafts give you lifetime durability.

You won't have arcing problems with this roller inductor. That's



MFJ-989C \$349<sup>95</sup>

because firm springs put considerable pressure on a plated contact wheel for excellent electrical contact.

**Wide, low inductance straps** are used for high current connections and a new core gives you excellent RF properties for minimum loss.

**Super Heavy Duty Balun**  
You get a super heavy duty current balun for balanced lines. It's made with two giant 2 1/2 inch powder iron toroid cores and wound with teflon wire connected to high voltage ceramic feedthru insulators. It lets you operate high power into balanced feedlines out core saturation or voltage breakdown.

**Ceramic Antenna Switch**  
You get a two wafer 6 position ceramic antenna switch with extra large contacts for trouble free switching.

**Plus much, much more**  
You also get a built-in 300 watt dummy load, full one year unconditional guarantee, flip stand, all aluminum cabinet, tough baked on paint, locking compound on all nuts and bolts. 3 KW PEP. Meter lamp needs 12 volts. Compact 10 3/4x4 1/2x15 inches. Made in the USA. Add \$10 s/h.

Don't settle for less--get yours today!

### Cross-Needle Meter

You get a lighted peak and average reading Cross-Needle SWR/Wattmeter with 200 and 2000 watt ranges. Its new directional coupler gives you accurate SWR and power readings over the entire 1.8 through 30 MHz range.

### MFJ's Deluxe 300 Watt Tuner



MFJ-949D **\$149<sup>95</sup>** More hams use the MFJ-949D than any other antenna tuner in the world! Why? Because the MFJ-949D gives you proven reliability, the ability to match just about anything and a one year unconditional guarantee.

You get a lighted peak and average reading Cross-Needle SWR/wattmeter, antenna switch, 4:1 balun for balanced lines, 1.8-30 MHz coverage and a full size dummy load that easily handles 300 watts of abusive tune-up power.

The inductor switch is specially designed to withstand the extreme voltages and currents that are developed in your tuner—it's not an underrated off-the-shelf switch that can put you off-the-air.

Each MFJ-949D aluminum cabinet is chemically etched to strongly bond MFJ's tough baked-on paint. You won't find a tougher, longer lasting finish anywhere.

### MFJ's New 300 Watt Tuner



MFJ-948 **\$129<sup>95</sup>** If you don't need a dummy load but want all the other features of the MFJ-949D, choose the MFJ-948 for \$129.95.

The MFJ-948 features a peak reading lighted Cross-Needle meter with a built-in lamp switch, one year unconditional guarantee and is made here in the USA.

### MFJ's smallest Versa Tuner

MFJ-901B **\$59<sup>95</sup>**  
The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP tuner -- when both your space and your budget is limited. Good for matching solid state rigs to linears.



### MFJ's Super Value Tuner



MFJ-941E **\$109<sup>95</sup>** The new MFJ-941E gives you a 300 watt PEP tuner that covers everything from 1.8-30 MHz -- plus you get a cross-needle meter, antenna switch and balun . . . for an incredible \$109.95. Lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

Antenna switch selects 2 coax lines (direct or through tuner), random wire, balanced line or external dummy load. 4:1 balun. 1000 volt capacitors. Measures 10-5/8" x 2-7/8" x 7".

### 2-Knob Differential-T™ Tuner



MFJ-986 **\$289<sup>95</sup>** The new MFJ-986 Differential-T™ 2-knob tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only one best setting. Handles 3 KW PEP.

Roller inductor makes tuning smooth and easy. Turns counter lets you quickly re-tune to frequency.

MFJ's peak and average reading cross-needle meter reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95. Current balun reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced. It covers 1.8-30 MHz. Get yours today! Add \$10 s/h.

### MFJ's Random Wire Tuner

MFJ-16010 **\$39<sup>95</sup>**  
Operate all bands anywhere with any transceiver with the MFJ-16010. It lets you turn a random wire into a transmitting antenna. 1.8-30 MHz. 200 watts PEP. Ultra small 2"x3"x4".



### MFJ's Mobile Tuner

MFJ-945D **\$89<sup>95</sup>**



Don't leave home without this mobile

tuner! Have an uninterrupted trip as the MFJ-945D extends your antenna bandwidth so you don't have to stop, go outside and adjust your mobile whip.

Small 8 x 2 x 6 inches uses little room. Lighted Cross-Needle SWR/Wattmeter makes tuning easy while in motion. Has lamp switch. 1.8-30 MHz. 300 watts PEP. Mobile mount, MFJ-20, \$4.95.

### MFJ's Versatile 1.5 KW Tuner



MFJ-962C **\$229<sup>95</sup>** MFJ-962C lets you use your bare-foot rig now and have the capacity to add a 1.5 KW PEP amplifier later. It covers 1.8-30 MHz.

You get MFJ's peak and average reading Cross-needle SWR/Wattmeter. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

Plus . . . 6-position antenna switch and teflon wound balun with ceramic feedthru insulators for balanced lines. 10 3/4 x 4 1/2 x 14-7/8 in. \$10 s/h.

### MFJ's VHF or UHF Tuners

MFJ-921 or MFJ-924

**\$69<sup>95</sup>**



MFJ-921 VHF tuner covers both 2 Meters and the 220 MHz bands. MFJ-924 covers 440 MHz. Built-in SWR/Wattmeter. 8" x 2 1/2" x 3". 2-knob tuning convenient for mobile or base.

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# GORDON WEST RADIO SCHOOL

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**08731X No Code Tech. \$49.95** \_\_\_\_\_

Includes 2 novice theory tapes, 2 technical theory tapes, 1 textbook, the latest FCC Rulebook, and frequency and band charts.

**087328 21-Day Novice \$39.95** \_\_\_\_\_

Includes 2 code tapes, 2 theory tapes, 1 sample 5 wpm Novice code test, 1 textbook, and the latest FCC Rulebook.

**087301 Novice Code \$39.95** \_\_\_\_\_

Includes 6 tapes that make it easy to learn the code from scratch. Covers FCC Element 1A.

**087336 2-Week Tech. \$34.95** \_\_\_\_\_

Includes 2 theory tapes, 1 question-and-answer textbook, and the FCC Rulebook. Covers FCC Element 3A.

**087360 Complete Gen. \$69.95** \_\_\_\_\_

Includes 6 code tapes (5 to 13 wpm), 2 theory tapes, 1 textbook, and the FCC Rulebook. Ideal for upgrade from Technician to General.

**087352 General Code \$39.95** \_\_\_\_\_

Includes 6 tapes (5 to 13 wpm). Covers FCC Element 1B.

**087344 General Theory \$34.95** \_\_\_\_\_

Includes a fully illustrated textbook with 2 theory tapes to cover FCC element 3B. Also includes the FCC Rulebook.

**087379 Adv. Theory \$44.95** \_\_\_\_\_

Includes 4 theory tapes, 1 illustrated textbook, and the FCC Rulebook. Covers FCC Element 4A.

**087409 Complete Extra \$69.95** \_\_\_\_\_

Includes 4 theory tapes, 6 code tapes (13 to 22 wpm) 1 textbook, and the FCC Rulebook. Covers FCC Elements 1C and 4B.

**087387 Extra Theory \$44.95** \_\_\_\_\_

Includes 4 theory tapes, 1 illustrated textbook, and the FCC Rulebook. Covers FCC Element 4B.

**087395 Extra Code \$44.95** \_\_\_\_\_

Includes 6 tapes (13 to 22 wpm) for the Extra code exam. Covers FCC Element 1C.

Please send me the items that I have indicated above. I have enclosed my check/money order for \$ \_\_\_\_\_ (Please add sales tax in CA, DC, IL, MA, NJ, NY, OH, PA, TN, VA & Canada, and \$3.00 for postage and handling for U.S. shipments and \$7.00 for all shipments outside the U.S.)

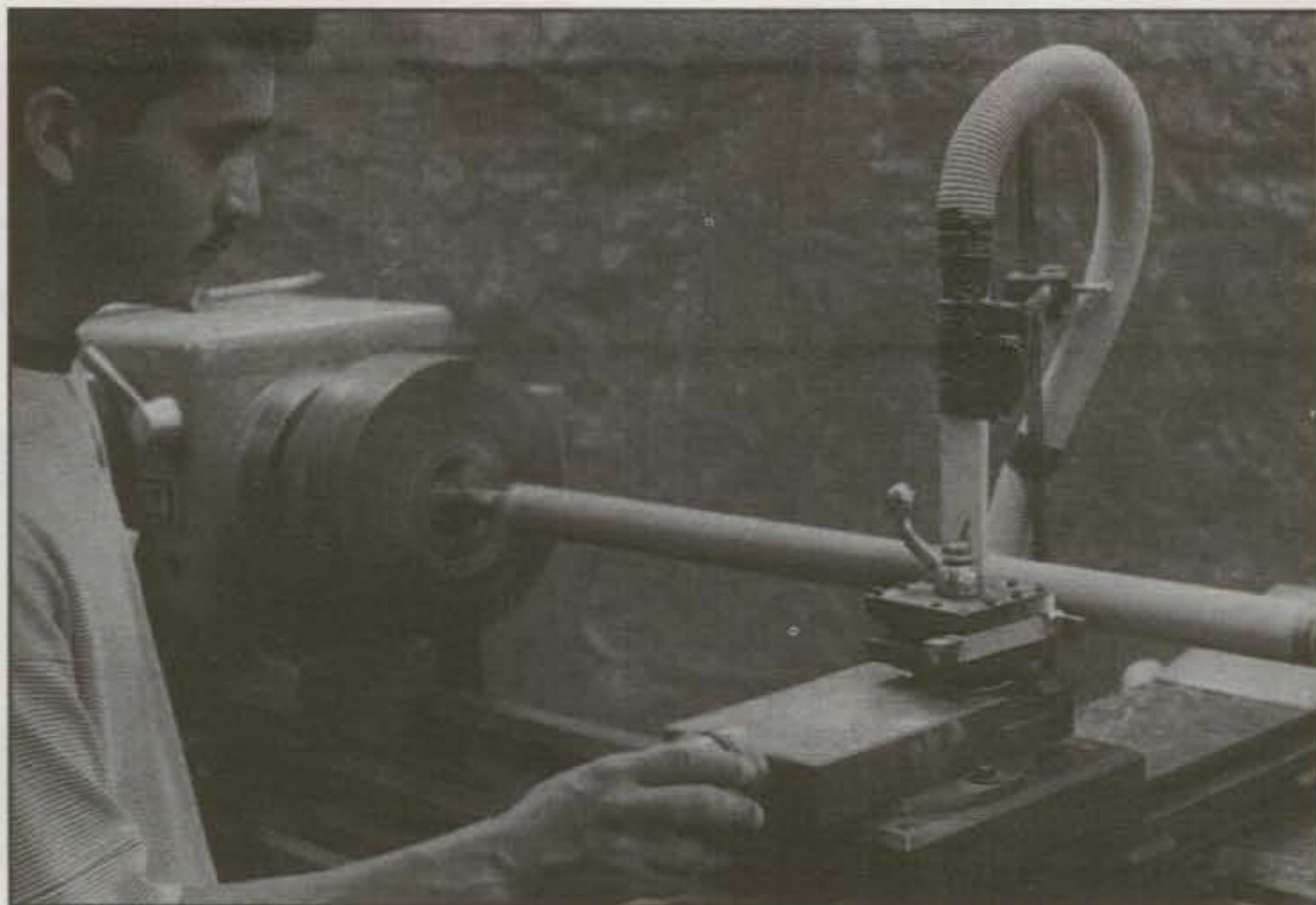
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CIRCLE 152 ON READER SERVICE CARD



*After the fiberglass has set over the wire, the coil assembly must be brought down to the correct outside diameter. This is the fiberglass being cut down.*

This leaves a polyglass tube with 270 turns of copper wire on the inside. The material used for the mounting ends of the coil is brass that has been nickel plated. The whip that slides up and down inside the coil is stainless steel. The end of the whip inside the coil has a circular stainless steel spring that makes contact with the coil, shorting out turns as required. This, with the base extension, is the basic antenna, and it is a good one.

The antenna is provided with a toroidal base matching circuit. In checking, I set up to check bandwidth using a 2 to 1 SWR calculation as a standard. On 80/75 meters the 2 to 1 bandwidth was 50 kHz. Only a slight movement of the top whip was required to move this matching point

up and down the band. Forty meters checked out at 60 kHz; 30 meters was less than 1.7 to 1 for the entire band. On 20 the coverage was 240 kHz, and on 17 meters, the entire band. Fifteen meters was the same as 20 (240 kHz), and 10 meters, the entire band.

Band changing is very simple. There is a knurled nut at the top of the coil assembly. This is tightened finger-tight. To then change bands, loosen the nut and then slide the whip up or down to the desired band. The whip has the circular shorting coil, which travels up or down the inside of the coil, shorting out the undesired portion. It is simple to mark the whip with a file nick for each desired band setting.

The antenna sells for \$187.00. Because



*The antenna ready for shipment. The completed forms are on the right and shorting whips are on the left.*



# MFJ gives you PACTOR at no extra cost

No other Multi-Mode gives you all these features -- not one!

... only the new easy-to-use MFJ-1278B Multi-Mode and MultiCom™ software gives you all these features plus 10 digital modes ... PACTOR, Color SSTV, 16 Gray Level FAX, Packet, AMTOR, RTTY, ASCII, Navtex, CW and Memory Keyer Plus an Enhanced 32K Mailbox

## New enhanced MFJ-1278B



MFJ-1278B Multi-Mode  
**\$299<sup>95</sup>**  
MFJ-1289 MultiCom™  
**\$59<sup>95</sup>**

### New features for MFJ-1278B

- New PACTOR Mode
- 32K bytes Enhanced Packet mailbox Allows separate callsign, auto forwarding and reverse mail forwarding, Remote Sysop access, Sysop paging, chat mode, mailbox C-text "Has-mail" LED indicator, Mailbox is expandable to 128K or 512K.
- New COLOR SSTV VIS tones. Allow other SSTV receiver to auto start picture
- 1 Megabit system EPROM
- 64K bytes battery backup RAM
- European RTTY tones selectable
- External reset, optional scope tuning output
- Selectable 19,200 baud terminal operation

### Transmit and Receive Color SSTV

- Robot Color: 36, 72 Seconds
- Robot B/W: 8, 12, 24, 36 Seconds
- Scotty Color: 1 and 2
- Martin Color: 1 and 2

### 16 Gray Levels FAX/SSTV Modem

- 16 Gray Levels Weather/AP Wire FAX

### Real-Time Packet Pictures

- SVGA, VGA, EGA, CGA Color Packet Pictures

### Standard Features

- Auto terminal baud rate: 300, 1200, 2400, 9600, 19,200
- Built-in 300 and 1200 baud packet modem
- Two software selectable radio ports
- Threshold control
- KISS interface for TCP/IP, MSYS compatible
- Anti-collision technology gets packets through faster, Host mode
- True DCD circuit designed for HF
- Normal or reverse FSK output
- RS-232 and TTL serial ports
- Fast-Start™ Manual

### More Exclusive Features

- Automatic Signal Analysis™ for HF packet and AMTOR as well as RTTY and ASCII
- Built-in printer port
- Built-in sidetone amplifier with volume control
- TAPR internal modem header for high speed modem—2400 or 9600 baud
- 20-LED precision tuning indicator
- Automatic Digipeater™ Routing
- QSO and transfer files simultaneously
- Dedicated MARS mode
- Individual radio port level control
- Stored parameters for each mode
- CW iambic paddle input
- 10-user programmable message memory buffers
- Call Alert Beeper™
- Built-in packet connect bell
- IC sockets used throughout
- A/C power supply included
- One year unconditional guarantee



16 Gray Levels WeFax map received on 16.410 MHz. MFJ-1278B & MultiCom™ transmit and receive 16 Gray Levels FAX.



16 Gray Levels AP Wire Photo FAX received on 20.738 MHz. See tomorrow's news today.



Full Color SSTV pictures received on 14.230 MHz. Robot 72-Second format. Transmit and receive color and B/W SSTV.



256 Color VGA Packet Picture received in real-time packet. Only MFJ-1278B and MultiCom™ has this feature.



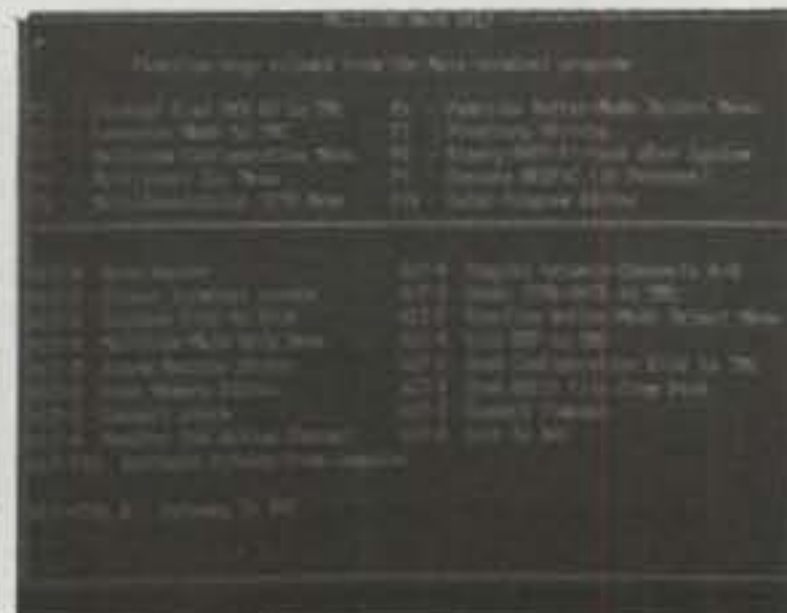
Easy and simple ... MultiCom™ Operating menu—each mode gives you 10 programmable function buffers.



Dedicated MultiCom™ FAX menu. Getting on FAX and SSTV is as simple as pressing one or two keys.



MultiCom™ lets you carry on two digital QSO's simultaneously using two multi-modes or TNC's and two comm ports.



Need help? Alt-H brings up the on-line Help Menu that makes the MFJ-1278B very easy to use.

## New MFJ-1278BT Turbo with fast 2400 baud modem



Only the MFJ-1278BT, \$369.95, gives you a built-in 2400 baud modem. Runs high speed packet without modifying your radio. Get the MFJ-1278BT and operate 300, 1200 and 2400 baud packet. The 2400 baud modem is also available separately. Order MFJ-2400, \$89.95, for any MFJ TNCs and MFJ multi-modes.

If you use the MFJ-1278B and MFJ MultiCom 3.1 and IBM compatible VGA computer you get all these features. Features may vary with other terminal program or other graphics systems.

## MFJ-1278 and MultiCom Upgrade\*

Upgrade your MFJ-1278 to include PACTOR and the enhance mailbox—MFJ-56A (32K), \$69.95; MFJ-56B (128K), \$89.95; MFJ-56C (512K), \$229.95.

New MultiCom™ upgrade Release 3.1. New features: Simultaneous dual multi-mode or TNC operation for DOS. New FAX module with auto receive, color FAX, PCX format compatible. YAPP binary file compatible. Order MFJ-49B for MultiCom™ 3.1 upgrade, \$29.95. \*Upgrade available for current MFJ-1278 and MultiCom user with proof of purchase.

## Exclusive Optional Items

- Real-time clock, MFJ-43 \$29.95
- Plug-in Scope tuning adapter, MFJ-44 \$29.95
- 2400 baud internal modem, MFJ-2400 \$89.95
- 9600 baud internal modem MFJ-9600 \$109.95

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*MFJ . . . making quality affordable*





*Each completed coil is thoroughly tested electrically.*

different base stainless-steel extensions may be desired (or required, depending on the vehicle mount), there are various sizes available. They run 24 inches for \$21.50, 30 inches for \$24.50, 36 inches for \$27.00, and 48 inches for \$31.00. The company will do special orders also. For example, Airstream trailers have a metal body that is sloped. Base support rods are available up to 6 feet long in order to get the coil above the field of the metal trailer.

While this is not a technical article on mobile operating, there are a couple of

important installation procedures that should be observed.

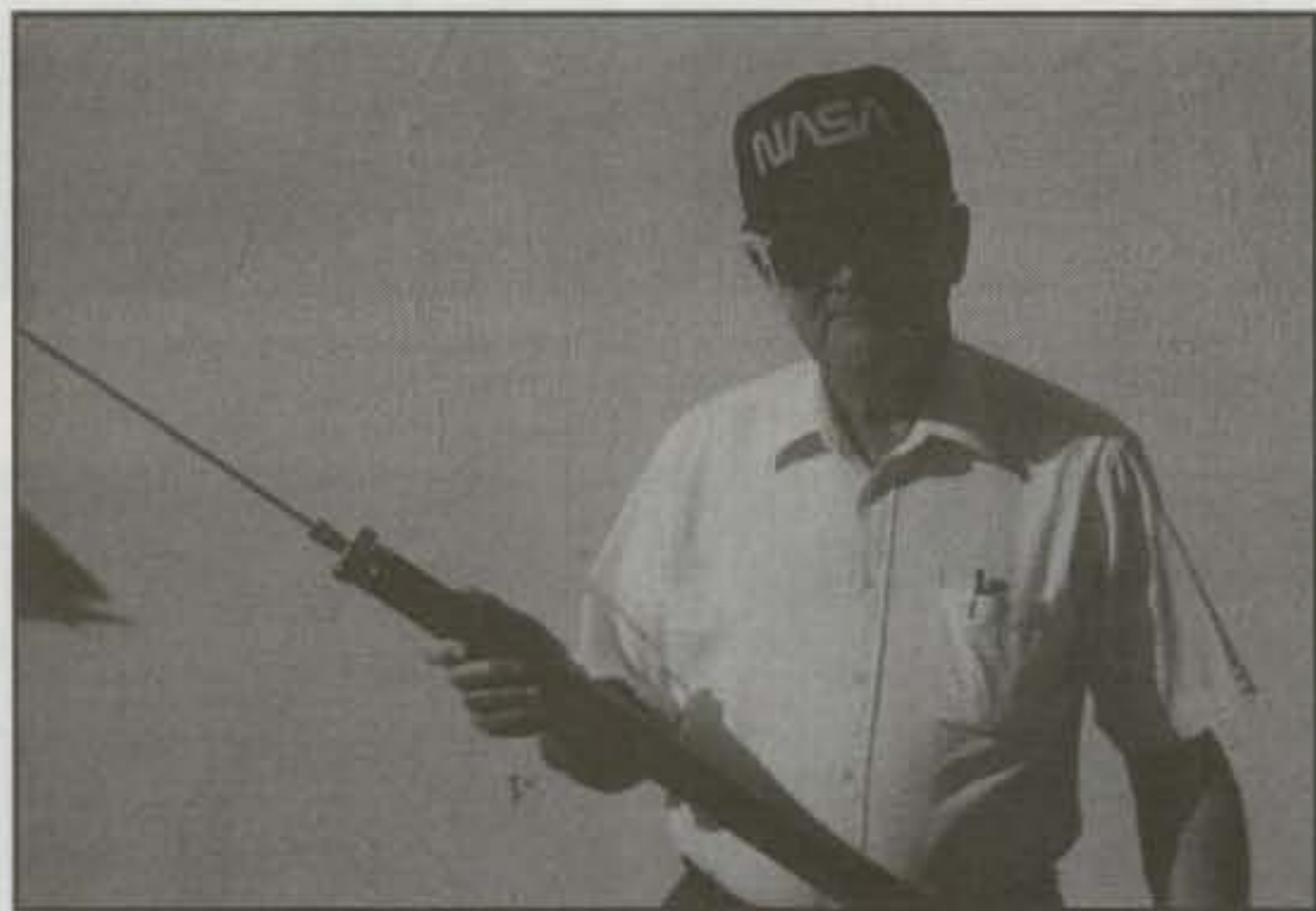
Any low-band mobile antenna, and particularly its coil, should be mounted as far as possible from metal work—or preferably, above the roof. Also, because of the very low value of radiation resistance of a mobile antenna used on 80 or 40, every effort should be made to have a good ground connection. Bonding all metal parts of modern vehicles (with all their plastic work) is very important. This is done to reduce the ohmic losses that

will be present in the base impedance.

The uninitiated 80 and 40 meter low-band mobile user should realize that the overall feed-point impedance of a whip on these bands is very low—on the order of a few ohms. Of these few ohms, only a fraction of an ohm is the radiation resistance (the useful part of your feed point). On the other hand, the ohmic resistance is a couple of ohms, and that is loss, so our loss ratio must be reduced as much as possible. In other words, let's assume a total base impedance of 5 ohms, of which 4.5 ohms are ohmic resistance and 0.5 ohm is radiation resistance. This then works out to a loss ratio of 9 to 1. Or even simpler, if one runs 100 watts to the antenna, 90 watts are lost as heat and 10 watts get radiated! Grounding and bonding of the metal work reduce this ohmic value, greatly improving efficiency.

Just so the neophyte reader doesn't get confused, that 5 ohms impedance is usually transformed up to 50 ohms to keep a low SWR. But—and this is a big "but"—the loss ratio remains the same. In RVs and trucks (pickups and vans) there is usually more metal work, providing a better ground. My bottom line here is that there is no point in having a very good antenna and then not giving it a chance to give its best performance. And the SuperSpanner is a very good antenna.

The antenna is made by ALLENTECK, 647 Arata Lane, Windsor, CA 95492 (707-838-7678). ■



*This is Roy Atkins, W7JZO, who goes all the way back to the beginning of the Webster Bandspanner. During the early days Marv Webster would bring bamboo poles to a shop (Applied Electronics on Mission Street in San Francisco), where Roy worked. The poles were covered with wire and then covered with Glyptal. Later Webster brought in the first Bandspanner design. Actually, although some may question my historical information, an amateur named Bob Harrel, W6FNC, who was a good friend of Webster, designed the famous Webster Bandspanner. Applied Electronics, later APELCO, was purchased by Raytheon, and Roy Atkins became plant manager. Under Roy's direction, literally thousands of Bandspanners were produced. Allen Beer, K6GSO, and Roy are the force behind the present SuperSpanner.*



*This is an ideal RV installation. Park your trailer, mount the SuperSpanner on the rooftop, make sure you have a good ground and the antenna in the clear, and the DX will be waiting for you.*



# MFJ ACCESSORIES

## Compact Speaker/Mics

Here's a Compact Speaker/Mic that fits comfortably in your hand and has a full size speaker for crystal clear audio.

No need to remove your handheld from your belt to talk or monitor calls. Clip it near your ears so you can easily hear every call with the volume turned down.

First-rate electret mic element and full size speaker gives superb audio on transmit and receive. Earphone jack, PTT, lightweight retractable cord. Gray. 1 1/4x2x3 in.

MFJ-284 fits Icom and Yaesu. MFJ-286 fits Kenwood.



MFJ-284 or MFJ-286  
**\$24.95**

## Mini Speaker/Mics

These tiny MFJ Speaker/Mics are so small and so lightweight you'll forget they're there -- until you get a call.

Excellent audio from electret mic element and speaker. Has swiveling lapel/pocket clip, PTT button with transmit LED, earphone jack, lightweight retractable cord. Available with L or regular connector. Tiny 2x1 1/4x1/4 in.

Order MFJ-285/MFJ-285L for ICOM, Yaesu, Alinco; MFJ-287/MFJ-287L for Kenwood; MFJ-283 for split plug Alinco; MFJ-285W for IC-W2A.



MFJ-283, MFJ-285, MFJ-285L, MFJ-285W, MFJ-287 or MFJ-287L  
**\$24.95**

L Connector also available - order L model.

## MFJ Artificial RF Ground

MFJ-931  
**\$79.95**

Creates artificial RF ground that eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding.

Greatly improves your signal if you're using a random wire or longwire antenna with an ineffective ground.

Electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

## 20 Meter CW Transceiver

MFJ-9020  
**\$179.95**

Throw this tiny MFJ 20 Meter CW Transceiver in a corner of your briefcase and enjoy DXing and ragchewing wherever you go. You get a high performance superhet receiver, crystal filter, RIT, AGC, vernier tuning, sidetone, speaker, up to 5 watts output, semi/full break-in, much more. Free manual. See free MFJ catalog for 40, 30, 17, 15 Meter versions, keyer, audio filter, power pack, tuner, antennas.

## Super Active Antenna

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy-to-operate active antenna...quiet...excellent dynamic range...good gain...low noise...broad frequency coverage... excellent choice."

Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz - 30 MHz.

Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Switch two receivers and aux. or active antenna. 6x3x5 in. Remote has 54 inch whip, 50 ft. coax. 3x2x4 in. 12 VDC or 110 VAC with MFJ-1312, \$12.95.

## Cross-Needle SWR Meter

MFJ-815B  
**\$69.95**

Peak/average Cross-Needle SWR/Wattmeter. Shows SWR, forward/reflected power in 2000/500 & 200/50 watt ranges. 1.8-60 MHz. Mechanical zero. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

"Teflon" is a registered trademark of Dupont

## MFJ Coax Antenna Switches



'34.95 MFJ-1701



'21.95 MFJ-1702B



'59.95 MFJ-1704

Select any of several antennas from your operating desk with these MFJ Coax Switches. They feature mounting holes and automatic grounding of unused terminals. One year unconditional guarantee.

MFJ-1701, \$34.95. 6 position antenna switch. SO-239 connectors. 50-75 ohm loads. 2 KW PEP, 1 KW CW. 10x3x1 1/2 in. DC-60 MHz.

MFJ-1702B, \$21.95. 2 positions plus new Center Ground. 2.5 KW PEP, 1 KW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 ohm. 3x2x2 in. MFJ-1702BN, \$31.95, N connectors, DC-1.1 GHz.

MFJ-1704, \$59.95. 4 position cavity switch with lightning/surge protection. Center ground. 2.5 KW PEP, 1 KW CW. 50 dB isolation at 500 MHz. 50 ohm. 6 1/4x4 1/4x1 1/4 in. MFJ-1704N, \$69.95, N connectors.

## Dry Dummy Loads for HF/VHF/UHF

MFJ has a full line of dummy loads to suit your needs. Use for tuning to reduce needless (and illegal) QRM and save your finals.

MFJ-260B, \$29.95. VHF/HF. Air cooled, non-inductive 50 ohm resistor. SO-239 connector. 300 Watts for 30 seconds, derating curve. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 150 MHz. 2 1/2x2 1/2x7 in. MFJ-260BN, \$34.95, N connectors.

MFJ-264, \$59.95. Versatile UHF/VHF/HF 1.5 KW load. Low SWR to 650 MHz, usable to 750 MHz. 100 watts/10 minutes, 1500 watts/10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 in. MFJ-264N, \$69.95, N connector. MFJ-5803, \$4.95, 3 ft. coax/ PL-259.



'29.95 MFJ-260B



'59.95 MFJ-264

## MFJ Low Pass Filter

Suppress TVI, RFI, telephone and other interference by reducing unwanted harmonics going to your antenna. 9 poles, MFJ's exclusive Teflon Dielectric Technology™ capacitors, hi-Q inductors, ground plane shielding, RF tight cabinet gives excellent TVI/RFI protection. Full legal power 1.8-30 MHz. Mounting tabs.

MFJ-704  
**\$39.95**



## MFJ Iambic Paddles

MFJ Deluxe Iambic Paddles feature a full range of adjustments in tension and contact spacing, self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. For all electronic CW keyers.

MFJ-564  
**\$49.95**



## Full Color FAX

Use your computer and transceiver to receive, display and transmit brilliant full color news photos and incredible WeFAX weather maps with all 16 gray levels. Also receive/transmit RTTY, ASCII and CW.

MFJ-1214PC  
**\$149.95**



## MFJ/Bencher Keyer

The best of all CW worlds -- a deluxe MFJ Keyer using a Curtis 8044ABM chip in a compact package that fits right on the Bencher iambic paddle!

MFJ-422B  
**\$134.95**



Iambic keying, speed (8-50 wpm), weight, tone, volume controls. Automatic keyer or semi-automatic ("bug")/tune mode. RF proof. 4 1/8x2 5/8x5 1/2 in.

MFJ-422BX, \$79.95, keyer only for mounting on your Bencher paddle.

## 12/24 Hour LCD Clocks



'19.95 MFJ-108B



'24.95 MFJ-112

MFJ-108B dual clock has separate UTC and local time displays. Huge 5/8 inch LCD digits are easy-to-see. Brushed aluminum frame.

MFJ-112 shows hour/minute/second, day, month, date, year at any QTH on world map. 12 or 24 hour display. Daylight saving time feature.

## VHF SWR/Wattmeter

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**With the addition of two more circuits this month we can complete our project. Those of you who have stuck with the project can now proudly say, "The rig here is homebrew."**

## The 40 Meter Fun Machine

### Part VI—From AGC To SWR To On The Air

BY PAUL CARR\*, N4PC

**W**ell, I hope you've been enjoying the superhet transceiver that was the focus of last month's effort. This month I promise that I won't work you as hard as I did last month. In this installment we will build an AGC circuit and an SWR bridge, reflect on where we've been (no pun intended), and look to the future. So let's glance at the circuits for this month.

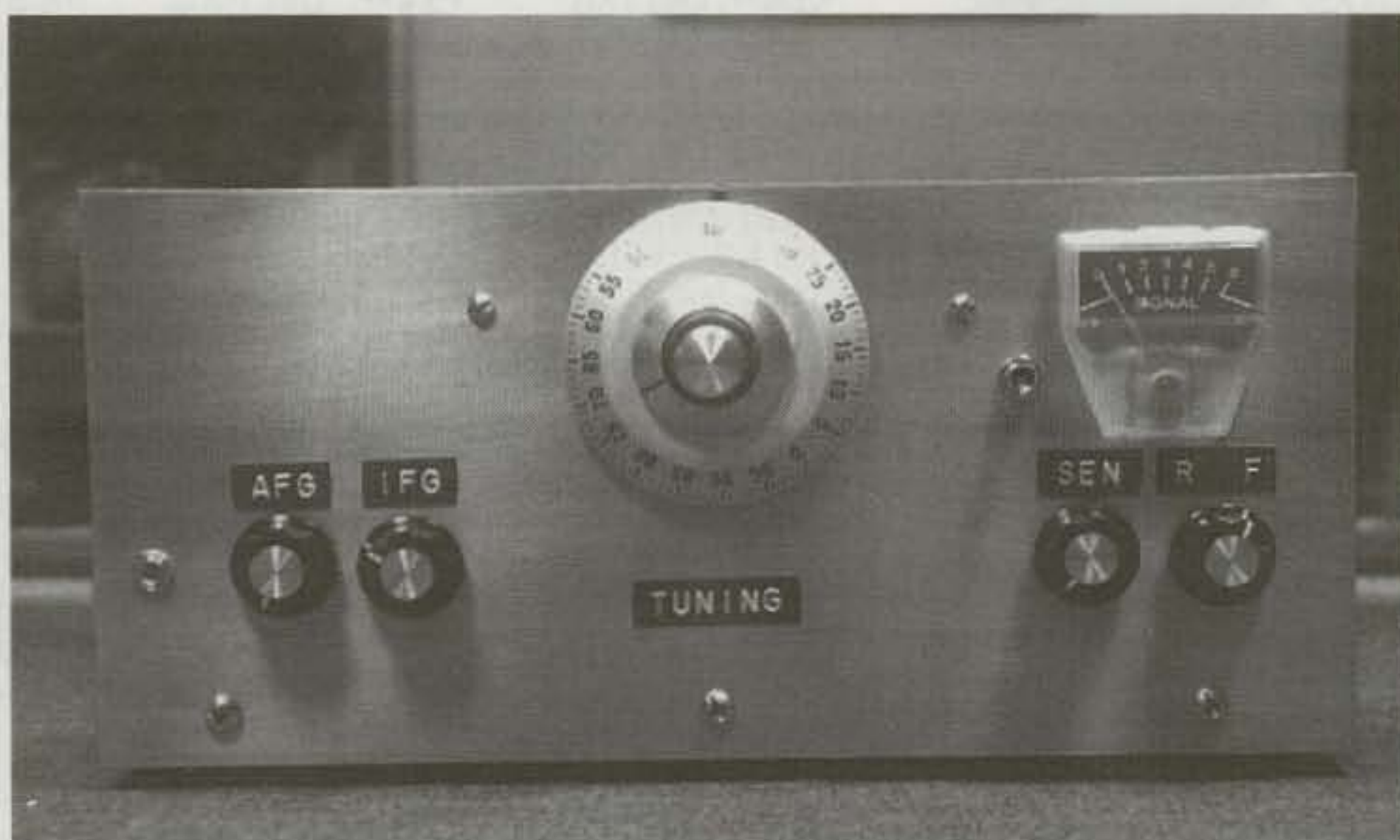
#### General Circuit Description

I chose an audio derived AGC circuit for our gain control. The primary audio voltage is obtained by sampling the audio from the preamp stage. After one section of a quad operational amplifier provides additional gain, the output is applied to a pair of operational amplifiers. Their outputs drive a full-wave rectifier to provide the control-voltage sample. The control voltage is applied to a resistor/capacitor network which drives a fourth operational amplifier. This amplifier provides the control voltage for the IF stage. If nothing else were done, the IF amplifier would take too long to return to its maximum gain condition.

The discharge time is controlled by a second network. The discharge circuit obtains its control voltage from the high end of the audio gain control. The sampled voltage is rectified by a half-wave voltage doubler and applied to a second resistor/capacitor combination which in turn controls the recovery time. With this technique you can control the attack and recovery time independently by choosing the values for the two networks. The values I have specified seem to work best for me, but feel free to experiment.

I chose a version of the time-proven Wheatstone Bridge for the SWR circuit.

\*97 West Point Road, Jacksonville, AL 36265



*And here we are—the completed project.*

This circuit is easy to build and provides all the accuracy needed for Transmatch tuning. It also provides a partial load for the transmitter during matching. Its one drawback, however, is that it needs to be switched out of the path during the operating condition. Nonetheless, it does work well, and I feel that it is a good choice for a QRP rig. Now for the specifics.

#### The AGC Circuit

The AGC circuit is built on another Radio Shack experimenter's circuit board. Prepare the board as we have done in the past by cleaning the copper pads and placing electrical tape over the holes on the opposite side of the board. Mount a 14-pin DIP socket on the copper side of the board. I built the majority of the main loop on this board and then mounted the board on the wall of the VFO compartment adjacent to the audio output stage.

After I mounted the board, I built the circuit that controls the recovery time. You should make the necessary connections through small, shielded audio cable and connect the supply voltage. The output control voltage is connected to the IF amplifier as indicated on the schematic diagram. Connect a VOM to the output voltage control line. With a strong signal, control voltage should increase, which of course, decreases the IF amplifier gain.

Is everything working properly? Great! If not, stop and find out why.

#### The SWR Bridge

Another Radio Shack experimenter's circuit board is used as the foundation for our SWR bridge. Wire the circuit as shown on the schematic. (It will probably take you less time to build the circuit than it took me to write about it.) The input and output are wired into the switch using RG-







### Parts List (fig. 1)

Resistors (1/4 watt or greater)

- 1—100 ohm
- 1—1K ohm
- 1—4.7K ohm
- 6—10K ohm
- 2—33K ohm
- 4—100K ohm
- 1—5K ohm thumbwheel pot.
- 1—10K ohm thumbwheel pot.

Capacitors (16 V or greater)

- 5—0.1 uF disc. ceramic
- 1—20 uF elec.
- 1—22 uF elec.

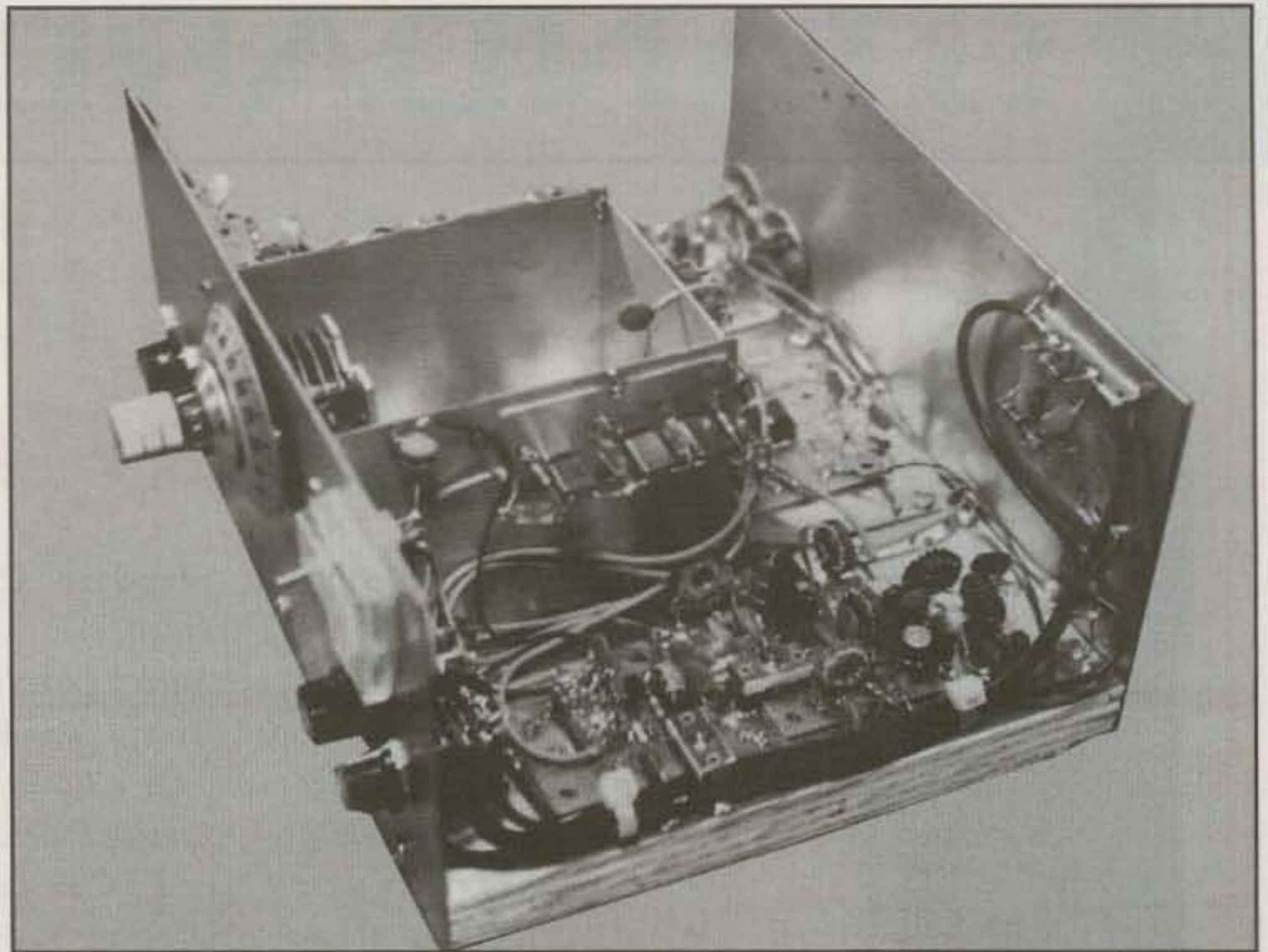
Solid-State Devices

- 1—TLO 84 quad op amp (or equiv.)
- 1—MPF 102 JFET transistor
- 5—1N914 diodes

174U miniature coaxial cable. The switch and the sensitivity control are mounted on the front panel under the meter.

Oh yes, the meter. The meter I found in my junk box was a 200 uA unit that was marked "SIGNAL," so I had no choice but to use it as an SWR indicator and an S-meter. The meter is switched between the circuits by the use of a small DPDT switch as indicated on the schematic.

Just a word about meter calibration. In the schematic you will notice a small variable resistor that is wired from +12.5 V to ground. The wiper of this control is connected through the meter switch to the negative terminal of the meter. This is the



The board containing the SWR bridge circuitry is attached to the rear panel.

S-meter zero control, and this is the way you adjust it. With the antenna disconnected, turn the control until the needle begins to move upscale slightly. Then rotate the control the other way slightly until you are sure that you have the meter prop-

erly "zeroed." You will note that there is a resistor in series with the positive lead of the meter (through the switch, of course). This is the S-meter sensitivity control, which turned out to be 4.7K ohms in my case. You can make this a 10K ohm vari-



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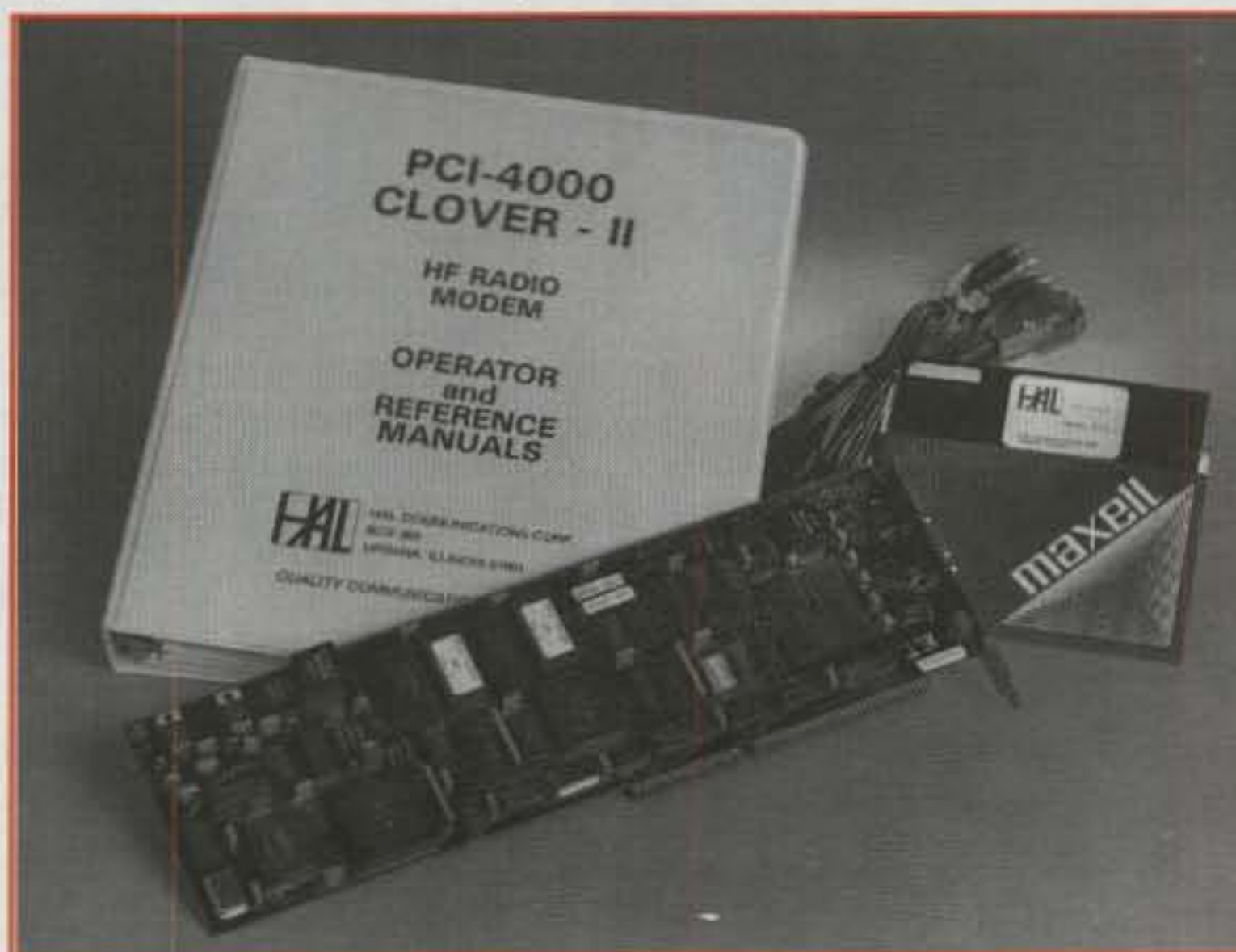
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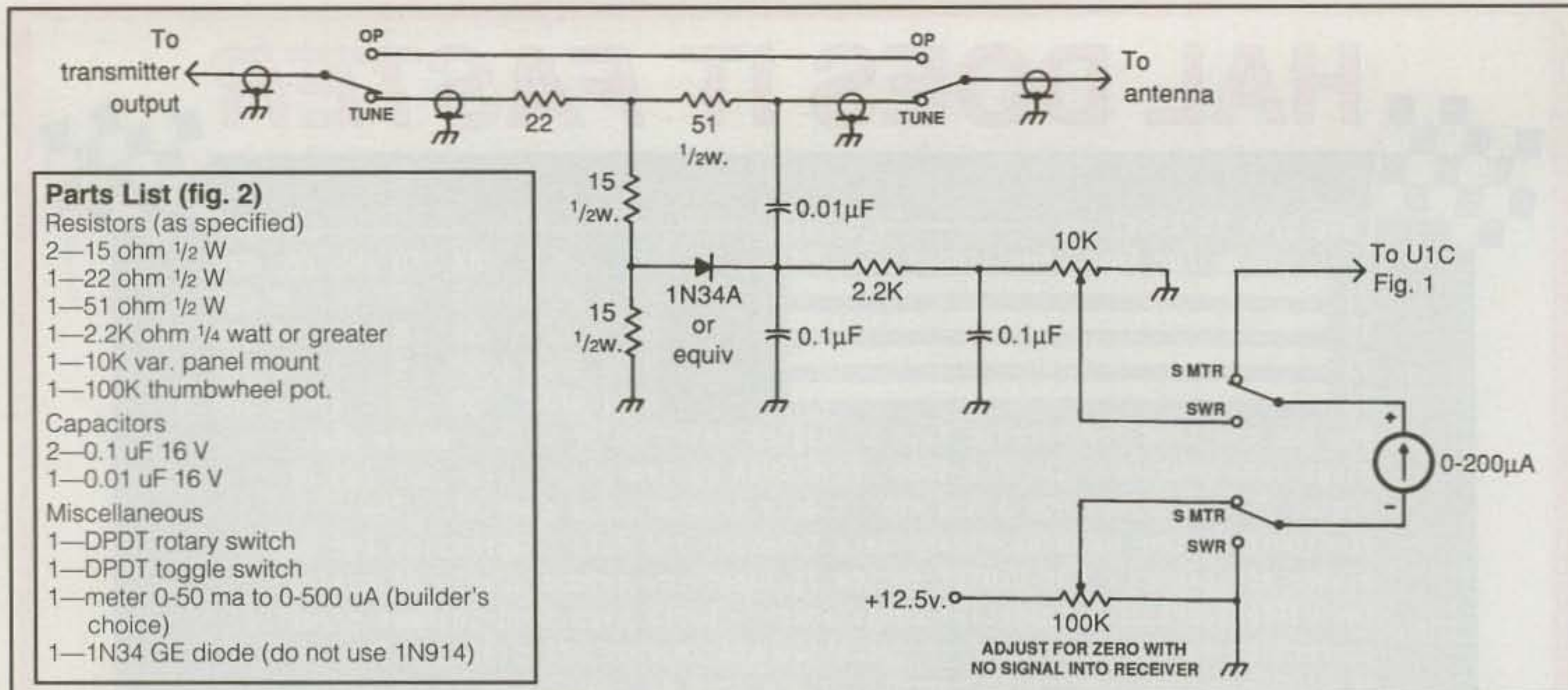


Fig. 2— Schematic diagram for the SWR bridge and metering.

able to put the sensitivity "on the money" if you like.

Well, that's it, gang. Put your creation on the air and have a ball!

### In Retrospect

Are there things I would change if I were to redesign the transceiver? Probably.

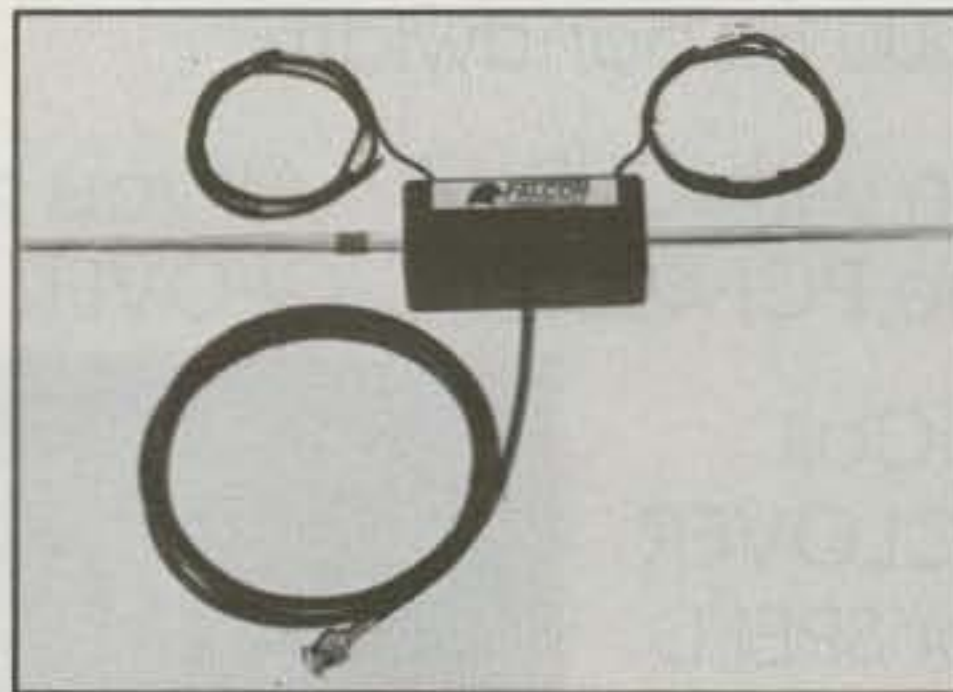
The AGC circuit has a tendency to "pop" on the first character if you are listening to a really strong signal. I will probably spend more time on this circuit in the future. The function of automatic gain control is one that still invites experimentation. The circuit is very acceptable, and I have no burning desire to redesign it. I have other circuits "calling my name."

### Acknowledgements

A project of this nature needs support from many areas. Lew McCoy, W1ICP, and Alan Dorhoffer, K2EEK, at CQ offered me encouragement every step of the way. As far as circuits are concerned, Wes Hayward, W7ZOI, Roy Lewallen, W7EL, and Doug DeMaw, W1FB all have circuits



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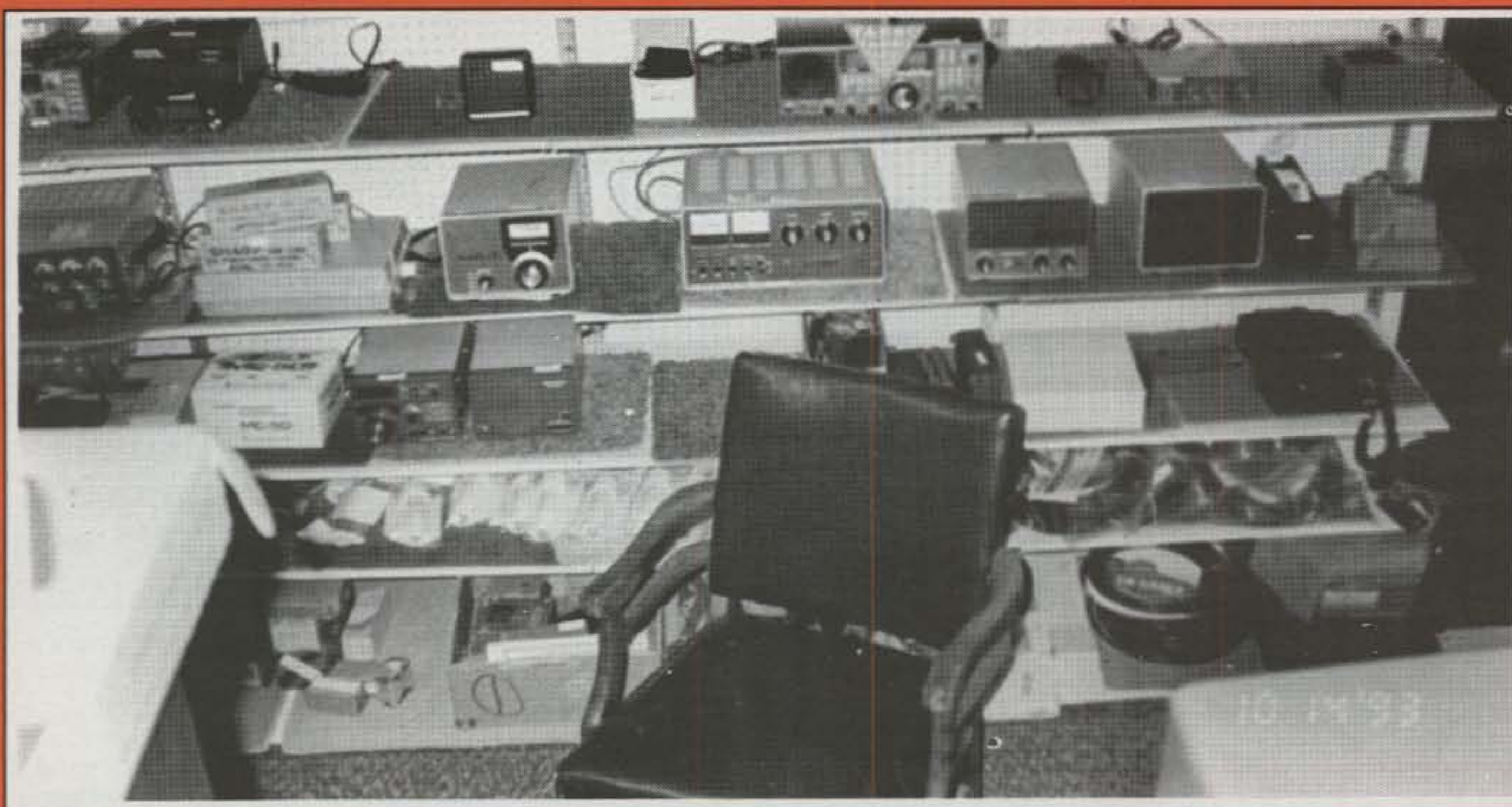
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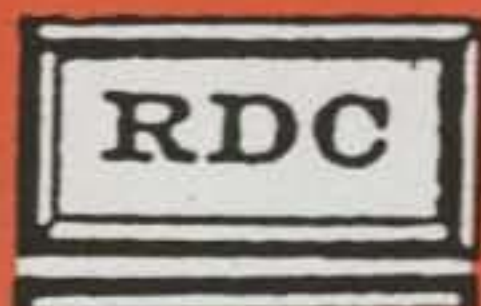
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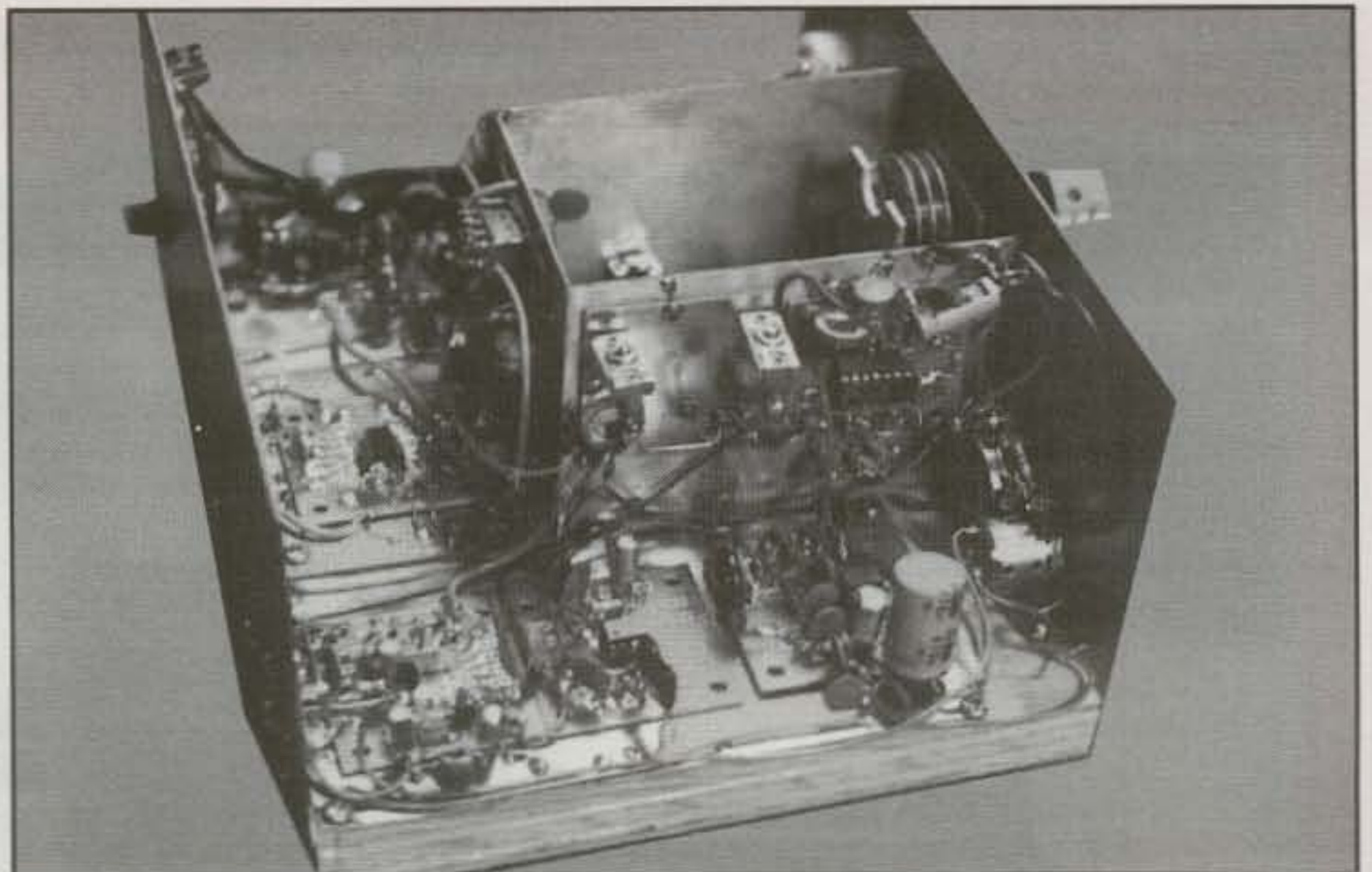
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The AGC circuit board is shown mounted to the side of the VFO compartment in this completed view.

that found their way into this project. We as a fraternity all owe a debt of gratitude to these gentlemen. My XYL has always been my biggest fan. She has words of encouragement followed by a warm smile. She also provided the typing skills. My deepest thanks to all!

I hope you have had fun in the time that

we have spent together. The name "The 40 Meter Fun Machine" was chosen because I think a project should be fun—fun to build and fun to operate.

Perhaps our journey will turn out to be a life-long trip in which you will find new learning opportunities at each step along the way. Until we meet again . . .

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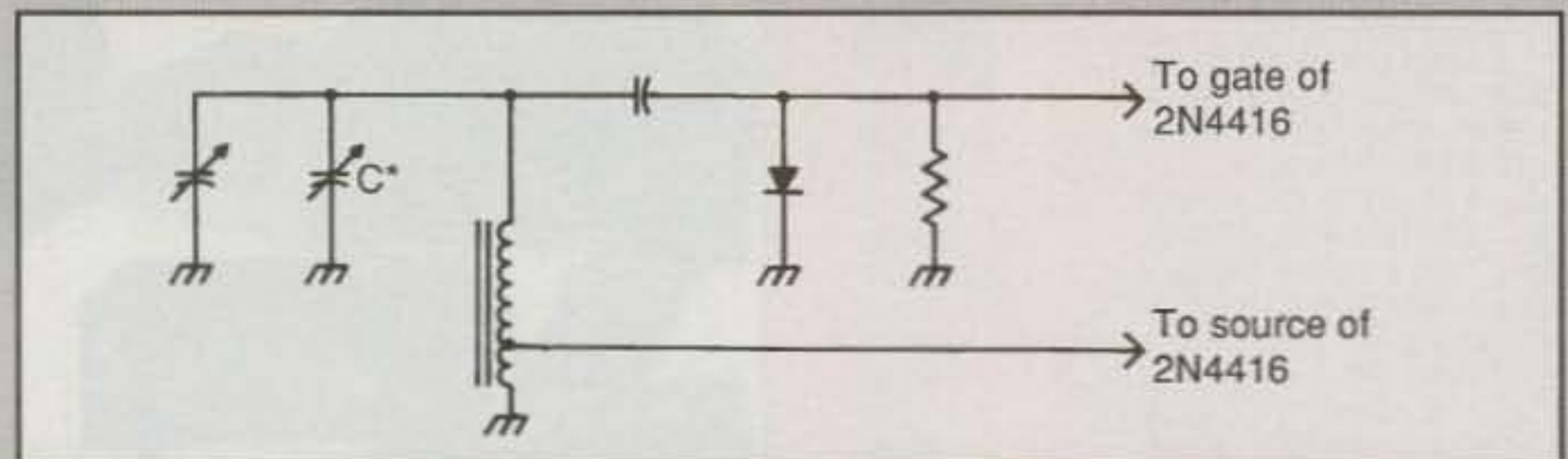
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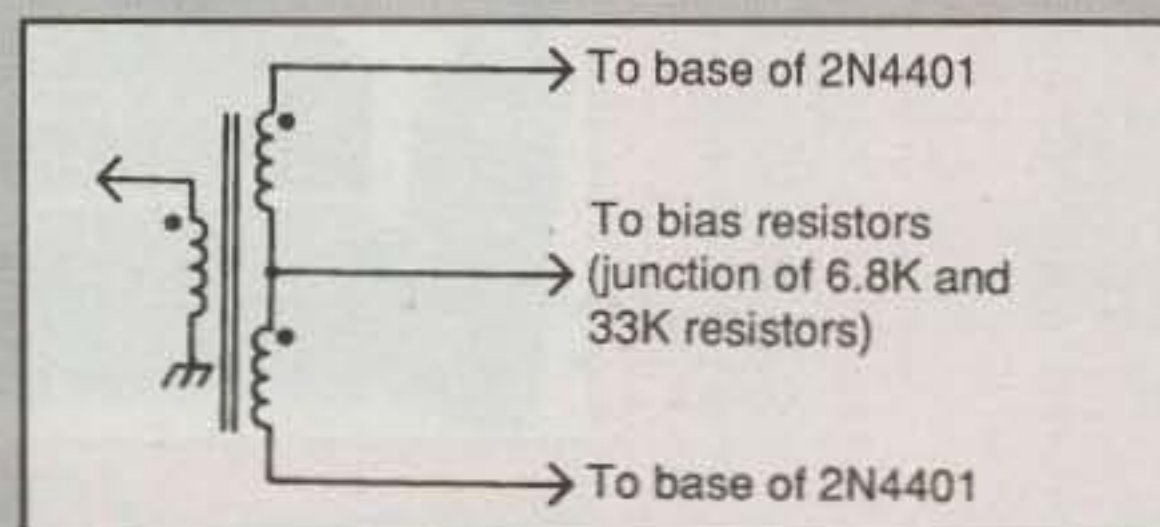
## Corrections

The following are corrections to the "40 Meter Fun Machine" series.  
**Part I** (July issue): Only one 470 uF electrolytic instead of two as specified.  
**Part II** (August): The three 0.1 uF capacitors should be disc ceramics instead of electrolytic.  
**Part III** (September): The VFO coil is drawn incorrectly. It should be as follows



48 turns #26 evenly spaced on a T68-6 (yellow core) tap 11 turns from ground end.

The trifilar between the 2N2222A and the two 2N4401 transistors in the push-pull doubler should be drawn as:



10 trifilar turns #26 on an FT 37-43 core. Observe phasing as indicated by dots.



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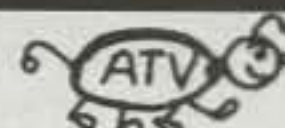
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**Most of us who get a chance to travel to different countries only get an opportunity to operate for a few days or so, if at all. N3JMM tells us what it's like to spend several months in Japan and to operate as 7J1AKO.**

## VHF/UHF Tokyo Style

BY MICHAEL J. MARCUS\*, N3JMM/7J1AKO

I guess the main reason I got an amateur license was because of a bet with my father-in-law, W2GDS. As an FCC bureaucrat I was a leading advocate of a no-code license in the early 80s. He was strongly opposed and offered to get me a transceiver if I got a license. I told him I thought it would be easier to change the rule than study code. Well, that attempt to change the rule died under a flood of opposition from the amateur establishment, *vox populi, vox dei*. I lost interest in the issue of amateur radio and eventually got interested in Japan and the study of the Japanese language. As it started filling precious brain cells, it became clear there was no room for Morse code.

In February 1991, however, no-code's day finally came, and I hoped to be among the first such licensees. But test scheduling problems delayed my license until April. The VEs were suspicious about my high test scores, but I just played dumb. I also avoided telling anyone at work I had passed until the license came, to get an independent measure of the speed of service in Gettysburg and avoid any flack about the callsign. But sure enough, the call came about three weeks later with a permutation of my initials. Then my father-in-law kept his part of the bet and gave me a Yaesu FT-411 two meter rig.

About the only air time I got that summer was on the Anne Arundel Radio Club's weekend weather net for boaters in the Annapolis area. By the fall, plans I had started two years earlier for going to Japan for a six month research trip started to come to fruition. The National Science Foundation agreed to give the FCC a grant to fund the cost of the trip, and by November 10, 1991, I was bound for the Far East!

Prior to leaving, I asked the ARRL for information about operating in Japan. The literature I received indicated that you had to apply through the Japan Ama-

teur Radio League (JARL), pay 12,000 yen (about \$100), and wait 6 weeks. In Tokyo I would be working with the FCC counterparts at the Ministry of Posts and Telecommunications (MPT); certainly I wouldn't get such bureaucratic treatment. I asked my contacts at MPT how to get a reciprocal license. They mumbled something about the JARL. I inquired at the U.S. Embassy if anyone was an active amateur, and was put in touch with Kerry Hofferth, NH2A. Yes, he said, you have to deal with the JARL and you have to pay them 12,000 yen. However, applications are processed in batches, and if I applied immediately, I would only have a three week wait. Needless to say, I changed enough money and headed over to JARL headquarters to apply in person.

In three weeks I was settled into my thirteenth floor apartment in the Osaki section of Tokyo, and the license arrived—7J1AKO. The "7J" indicated that I was a *gaijin*, or foreigner (as if there was no other way to tell). The "1" indicated the Tokyo area. MPT only started reciprocal licenses a few years ago, so even in Tokyo where most *gaijin* live this was only the 275th license given, judging from the



*At the operating position of our thirteenth floor apartment in Tokyo.*

"AKO" part. (Although there is no formal provision for vanity callsigns, the long-term *gaijin* residents of Tokyo who form the Tokyo International Amateur Radio Association [TIARA] and persuaded MPT to have reciprocal licenses did have some choice as to their callsigns.)

Kerry had given me some basic



*We had dinner one evening at the home of Makato Hoshino, 7L1CQG, and his family. From left to right: Koichi Kondo, 7K1HFX; Hoshino; my XYL, Gail; N3JMM/7J1AKO; and Hoshino's wife and daughter.*

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SL-11R	•	•	7	11	2 <sup>5</sup> / <sub>8</sub> x 7 x 9 <sup>3</sup> / <sub>4</sub>	12
SL-11S	•	•	7	11	2 <sup>5</sup> / <sub>8</sub> x 7 <sup>5</sup> / <sub>8</sub> x 9 <sup>3</sup> / <sub>4</sub>	12
SL-11R-RA	•	•	7	11	4 <sup>3</sup> / <sub>4</sub> x 7 x 9 <sup>3</sup> / <sub>4</sub>	13

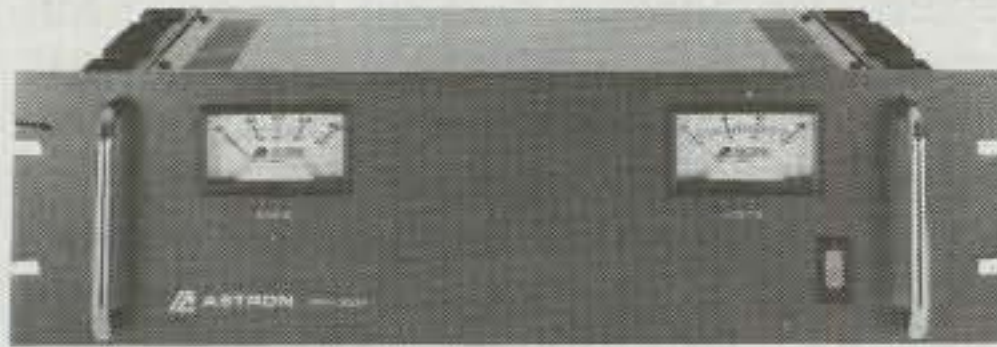
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RS-4L	3	4	3 <sup>1</sup> / <sub>2</sub> x 6 <sup>1</sup> / <sub>8</sub> x 7 <sup>1</sup> / <sub>4</sub>	6
RS-5L	4	5	3 <sup>1</sup> / <sub>2</sub> x 6 <sup>1</sup> / <sub>8</sub> x 7 <sup>1</sup> / <sub>4</sub>	7

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MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RM-12A	9	12	5 <sup>1</sup> / <sub>4</sub> x 19 x 8 <sup>1</sup> / <sub>4</sub>	16
RM-35A	25	35	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	38
RM-50A	37	50	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	50
RM-60A	50	55	7 x 19 x 12 <sup>1</sup> / <sub>2</sub>	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5 <sup>1</sup> / <sub>4</sub> x 19 x 8 <sup>1</sup> / <sub>4</sub>	16
RM-35M	25	35	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	38
RM-50M	37	50	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	50
RM-60M	50	55	7 x 19 x 12 <sup>1</sup> / <sub>2</sub>	60

### RS-A SERIES



MODEL RS-7A

MODEL	Colors		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
RS-3A	•	•	2.5	3	3 x 4 <sup>3</sup> / <sub>4</sub> x 5 <sup>3</sup> / <sub>4</sub>	4
RS-4A	•	•	3	4	3 <sup>3</sup> / <sub>4</sub> x 6 <sup>1</sup> / <sub>2</sub> x 9	5
RS-5A	•	•	4	5	3 <sup>1</sup> / <sub>2</sub> x 6 <sup>1</sup> / <sub>8</sub> x 7 <sup>1</sup> / <sub>4</sub>	7
RS-7A	•	•	5	7	3 <sup>3</sup> / <sub>4</sub> x 6 <sup>1</sup> / <sub>2</sub> x 9	9
RS-7B	•	•	5	7	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	10
RS-10A	•	•	7.5	10	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	11
RS-12A	•	•	9	12	4 <sup>1</sup> / <sub>2</sub> x 8 x 9	13
RS-12B	•	•	9	12	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	13
RS-20A	•	•	16	20	5 x 9 x 10 <sup>1</sup> / <sub>2</sub>	18
RS-35A	•	•	25	35	5 x 11 x 11	27
RS-50A	•	•	37	50	6 x 13 <sup>3</sup> / <sub>4</sub> x 11	46
RS-70A	•	•	57	70	6 x 13 <sup>3</sup> / <sub>4</sub> x 12 <sup>1</sup> / <sub>8</sub>	48

### RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-12M	9	12	4 <sup>1</sup> / <sub>2</sub> x 8 x 9	13
RS-20M	16	20	5 x 9 x 10 <sup>1</sup> / <sub>2</sub>	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13 <sup>3</sup> / <sub>4</sub> x 11	46
RS-70M	57	70	6 x 13 <sup>3</sup> / <sub>4</sub> x 12 <sup>1</sup> / <sub>8</sub>	48

### VS-M AND VRM-M SERIES



MODEL VS-35M

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MODEL	Continuous Duty (Amps)			ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt. (lbs.)
	@13.8VDC	@10VDC	@5VDC			
VS-12M	9	5	2	12	4 <sup>1</sup> / <sub>2</sub> x 8 x 9	13
VS-20M	16	9	4	20	5 x 9 x 10 <sup>1</sup> / <sub>2</sub>	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13 <sup>3</sup> / <sub>4</sub> x 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	38
VRM-50M	37	22	10	50	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	50

### RS-S SERIES



MODEL RS-12S

### • Built in speaker

MODEL	Colors		Continuous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
RS-7S	•	•	5	7	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	10
RS-10S	•	•	7.5	10	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	12
RS-12S	•	•	9	12	4 <sup>1</sup> / <sub>2</sub> x 8 x 9	13
RS-20S	•	•	16	20	5 x 9 x 10 <sup>1</sup> / <sub>2</sub>	18
SL-11S	•	•	7	11	2 <sup>3</sup> / <sub>4</sub> x 7 <sup>5</sup> / <sub>8</sub> x 9 <sup>3</sup> / <sub>4</sub>	12

\*ICS - Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)



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Yukiko Yamauchi, JI8IFD, graciously acted as tour guide for a visit to the Historical Village of Hokkaido in Sapporo. This is similar to our Colonial Williamsburg and is a wonderful museum. Behind us is a 19th century regional police station.

instructions about operating on 2 meters, but was not very optimistic about the likelihood of successful QSOs. Most of the *gaijin hamus* operate only on HF. One major change from the US is that there are no repeaters on 2. Next, the calling channel, 145.0 MHz, plays a key role in making QSOs, somewhat analogous to VHF marine channel 16. You can make a call on 145 for a specific individual or call CQ. In either call you must make it brief and announce the frequency you will be listening on—in Japanese. Kerry taught me the key words to use that aren't in elementary Japanese courses, so I started to try. I continued to try for the whole month of December with no success. Finally on New Year's Day, success with Isao, JI1VTS! Actually, Isao was the only *hamu* I ever spoke to on 2 meters in Tokyo, but he turned into a reliable contact who very much wanted to be helpful. He explained that the 2 meters in Tokyo has become somewhat CBish and is very cliquish. However, Isao was very reliable and was available most nights after 10 PM. If he didn't hear from me for a while, he would drop me a note or use the land line.

Discussions with Isao and Kerry convinced me that 2 meters was not going to be the effective way to meet people or practice speaking Japanese (or any other language). Mentioning this to W2GDS led to the offer of a temporary swap of my FT-411 for his dual-band FT-470. Through the wonders of the Military Postal Service, the swap was completed in a week, and I was now on both 2 meters and 430 MHz, which in Japan covers 430-440 MHz only. 430 does have repeaters, but their use is severely limited by local custom. They can only be used for CQs and very short QSOs, and

experience showed quickly that the 430 calling channel, 433.0 MHz, was much more effective than the local repeaters for making QSOs. My first QSO was Tadahiro, JN1SKM, who lived a few blocks away in Minami Meguro, but inexplicably sent a QSL card showing a girl and a dog in Hong Kong! After that the 430 MHz QSOs just came rolling in, a far cry from the drought on 2 meters.

So how does one make a QSO in these bands? The script I learned was:

"CQ, CQ 430. Kochira wa 7J1AKO. Jikai 3.10 nitte cado shimasu kakyokusan yuroshiku" where 3.10 stands for 433.10 and is the frequency for the QSO. The "430" has to be pronounced "fuh-tah-tee." The numbers in the callsign are pronounced in English, the letters using the usual phonetic code, although "Japan" was often favored instead of "juliet," which is hard for Japanese to pronounce. The frequency is given in Japanese decimal numbers with the word "ten" used for decimal point.

Now that I was on a band that was friendlier than 2 meters, the QSOs started to roll in. However, calling CQ still led to few contacts directly, as *hamus* obviously could recognize my accent, not to mention the 7J callsign, and were a little shy. A more reliable method was to monitor 433 MHz for CQs and then switch to the indicated frequency. At this point it was harder to deny my existence, and a QSO in Japanese often resulted. The next point normally was QSLing, as the 7J prefix was rare for VHF/UHF *hamus*. The normal QSL technique in Japan is to use the JARL bureau. This works well if you are a JARL member, but my contacts at TIARA said this wasn't economical if you couldn't read their publications and that they had never worked out a practical QSL bureau system





Here 7L1CQG and I sing along at a local Karaoke bar.

for *gaijin hamus*. The recommended approach was to reply "QSL *direto onegai shimasu*"—please QSL direct. However, this created a new problem—conveying my address in Japanese. Fortunately, my address was relatively simple and the QSLs also began rolling in. Some *hamus* made replying easy by including self-addressed, stamped envelopes. Others made it rather hard by using printed cards that only gave their address in Chinese characters. With help from friends, I replied to all.

Special thanks must be given to three of my early 430 MHz contacts: Koichi Kondo, 7K1HFX; Makoto Hoshino, 7L1CQG; and Shigeko Fukuzawa, JQ1DMO. 7K1HFX was not at all shy about speaking English and introduced me to the two others at a late-night coffee shop. He invited me to his shack and let me use his 32-element beam on top of a 14-story building to make several QSOs at a much greater range than I could with a "rubber ducky." He and 7L1CQG were concerned about my limited antenna gain and offered to lend me a high-gain antenna for my balcony, but I declined, since I would have to start packing up to leave in about a month. We compromised and they lent me a longer monopole for the HT. My XYL and I had great dinner at 7L1CQG's house along with 7K1HFX, after which we adjourned to their favorite neighborhood *karaoke* bar for more drinks and taking turns singing to videos with music and written lyrics. Finally, just before we left Japan we had a farewell dinner at JQ1DMO's house in Yokohama with homecooking and American specialties we had bought at the Navy Commissary but hadn't consumed.

I made one business trip to Osaka and tried my HT there also. In two nights of attempts from the twentieth floor of my hotel, I succeeded in making only one contact, and it was all in Japanese. I tried again the next two days in Kyoto, but was in a friend's house and could barely hear anyone, let alone make a contact. Thus, I was somewhat discouraged when we

made our last trip the first week in May for Golden Week, a string of three consecutive holidays. We chose to go to the northern island of Hokkaido. The first two nights we were in a small town in a valley and made one weak contact. Then we went to Sapporo for a three day stay.

A little monitoring showed that 430 was dead, but 2 meters was reasonably busy. I switched back to 2 and tried my old trick of waiting for someone else's CQ and then following them to another frequency. My first contact was with Motonobu Hirosaka, JG8DIX. (As you might guess, the "8" in the call is for Hokkaido.) But the excitement was the pile-up, which came as soon as we said 73s. That night and subsequent nights there was a long string of *hamus* waiting for QSOs with this rare station beginning with 7J1. JG8DIX invited me to his favorite bar the next night. Yukiko Yamauchi, JI8IFD, volunteered to spend the next day with us, and we had a great time at an open-air museum in the suburbs. Finally, Junko Sawa, JI8JUM, heard my signal but couldn't reach me from her house in the suburbs, so she drove downtown and left a note at our hotel offering to take us out to dinner the next night. We had an enjoyable time at a restaurant which served crabs, which is a regional specialty in Sapporo.

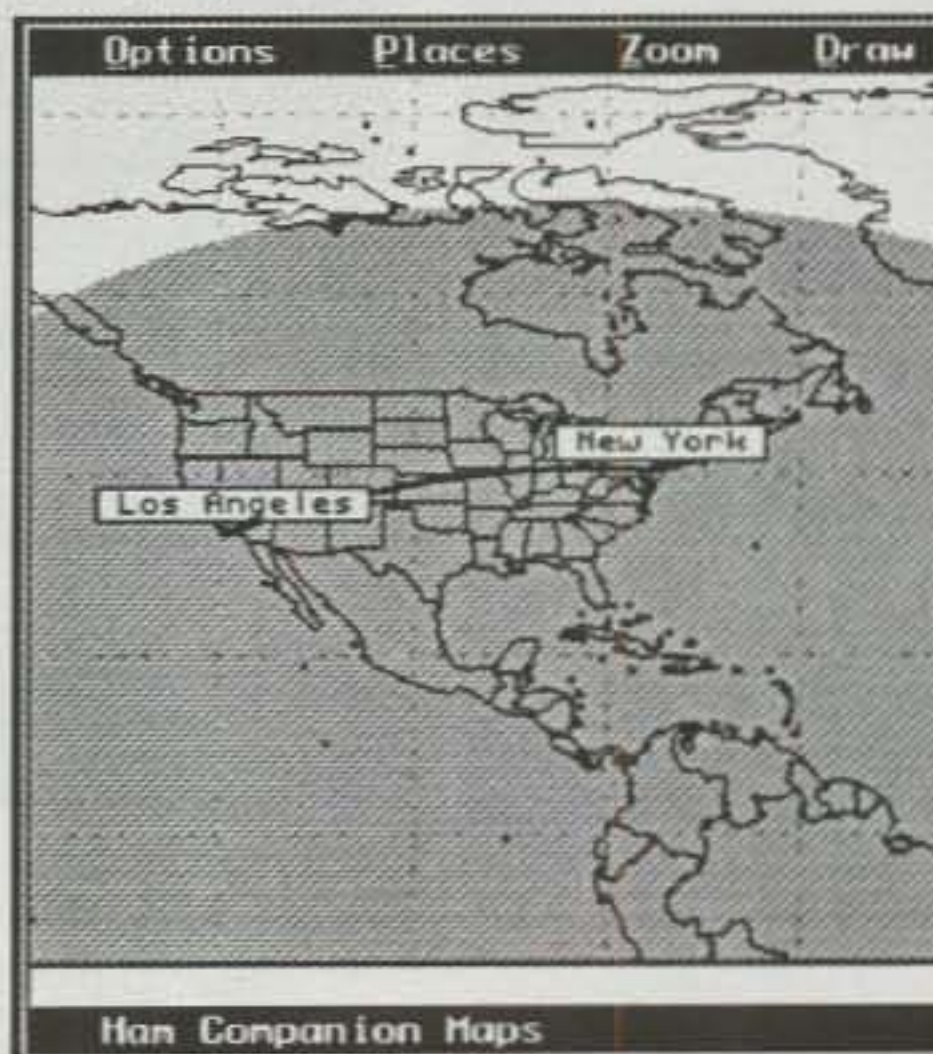
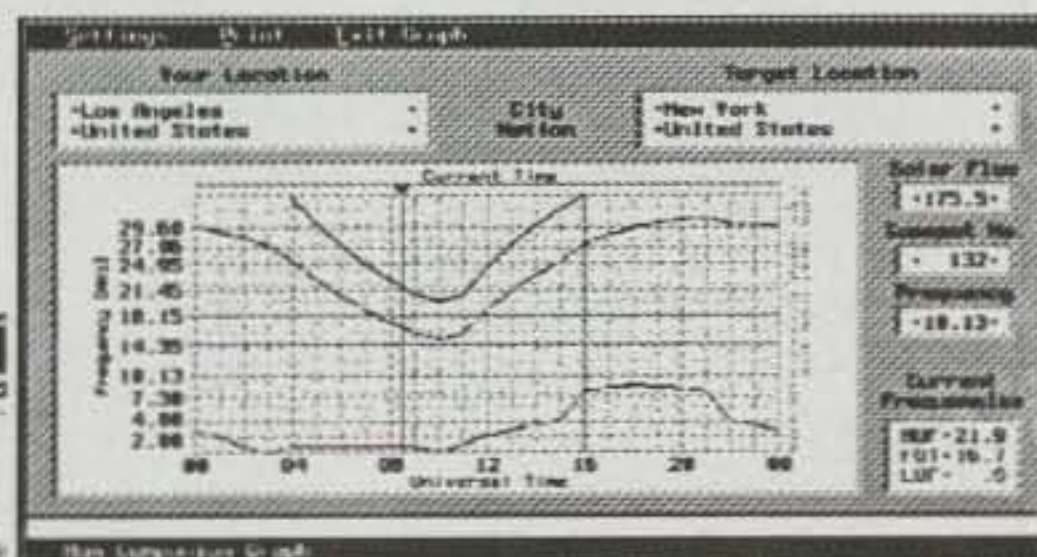
Sadly, we finally had to leave Tokyo and return to "reality" in the U.S. We had great memories of our new friends whom we

never would have met without being a *hamu*. Was the trip to Japan a success? My main goal was to study spectrum management at MPT, and I was able to learn a lot that I shared in Washington. My secondary goal was to work at MPT's Communications Research Laboratory part time on improving radio transmitter fingerprinting techniques. Shortly after my return to the FCC I was asked if I had any idea for helping in the investigation of a string of 20 meter false marine distress signals. Sure enough, with a little modification some of the techniques were used and we were able to identify the source of these signals. The technical evidence convinced this individual to plead guilty to a felony count; the final criminal sentence had not been determined at the time of this writing.

So what does this imply if you are thinking about going to Japan? First, I don't think a reciprocal license is very useful unless you have a minimal knowledge of the language such as you might get in an adult education course. Some *hamus* will speak English on VHF/UHF, but you are more likely to find them if you try to meet them halfway. If you're going to major cities, make sure you have a dual-band radio and remember how to operate it simplex. If you're staying in a hotel, ask for a high-up room, as it is the best way to get range in a repeaterless environment. Most of all, enjoy yourself! ■

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*This month W1ICP wraps up his discussion of antenna comparisons and leaves us, as usual, better informed.*

## One More Time Yagis Versus Quads, Log Periodics, and Others—Part II

BY LEW McCOY\*, W1ICP

In Part I we went over some basic information in our antenna comparisons. What do we look at next in our comparison of antenna types? We are forced to examine multibanding and performance.

Back in 1953 Buchanan, W3DZZ, described a multiband Yagi in *QST* which was really a single antenna with a single feed line. It started a revolution in Yagi design that has continued to today.

Buchanan calculated that he could take a three-element beam, insert very reactive traps in each of the three ele-

ments (driven element, director, and reflector), and make each set of three elements resonant on 20, 15, or 10 meters. This he did, and it was a very practical antenna. However, traps do contribute losses, and it was and is difficult to come up with element spacing that is optimum for each band.

One point I may have glossed over earlier is that of element spacing. In order to obtain the optimum gain and bandwidth with, say, a three-element beam, there are certain element spacings that work best. When we go multibanding, we introduce a real problem in trying to get the best gain, bandwidth, and match without

introducing losses. To compensate, manufacturers have added extra elements to attempt to solve these problems. What we end up with, and no one argues this point, is a compromise antenna. We sacrifice gain and signal pattern to obtain a multiband, single-feed antenna. Even worse, we sacrifice some performance in order to obtain a 50 ohm match. For newcomers, one of the main considerations for the impedance of a Yagi (or any beam) is element spacing. One can obtain gain, but end up with undesirable matching situations. This gain can be lost due to actual ohmic resistive trap losses (and sacrifices in

*\*Technical Editor, CQ, 1500 W. Idaho St., Silver City, NM 88061*



*I couldn't resist showing this photo. Jim Smith, VK9NS, of Norfolk Island really knows how to put up a log periodic.*



*VK9NS ready to connect the big log periodic to the rotor mast. I assume that he is using a very husky rotor, because the wind loading would be, and is, high for this type of antenna.*



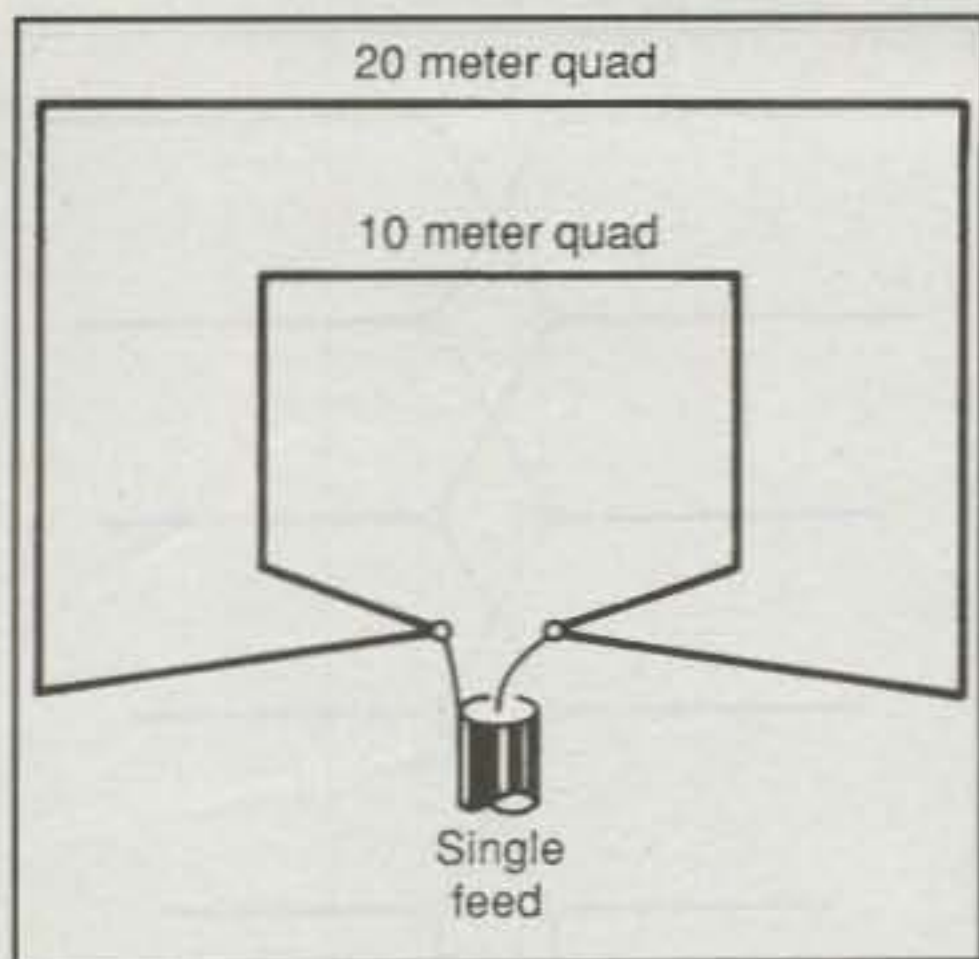


Fig. 4— Two quads elements, 20 and 10 meters, fed together may or may not cause a change in actual radiation patterns because of power division in the loops. When on 20 meters, the 10 meter loop presents a "reasonable" reactance. This tends to divorce the 10 meter loop from the 20 meter loop. On 10 meters the 20 meter loop has an impedance that is higher in value, but the 20 meter loop will still radiate 10 meter energy. And a two-wavelength loop has a pattern different from that of a single wavelength loop. There is certain to be some interaction. As pointed out in the text, however, whether this is bad or good is at present anyone's guess. The simple answer may be feed-line switching.

element spacing). Pattern loss (front to back and front to side) also comes about because of element spacing.

To be fair, I must emphasize here that the gain difference between a monoband three-element beam and a trap beam may only vary about one to two decibels, and that isn't much when considered as a fraction of an S-unit. What about multibanding a quad? Do we have the same compromise losses? If so, how much?

In this case you can find yourself in some very strange waters indeed. First we need to specify whether or not we are using a single feed line to joined quad elements (see fig. 4). There is an important point in discussing quad feed lines that should be addressed. If we feed two different antennas with a common feed line and both antennas have similar impedances, the power will divide and feed both antennas. When we do this with *directional* antennas, we will have problems with our signal being radiated in undesired directions. In other words, we are going to get pattern changes.

I think other writers have avoided talking about this when discussing quads. For example, take the case of a 10 meter quad and a 20 meter quad fed together with a single feed line. First we must keep in mind that a quad driven element is a full-wave loop with an impedance of

about 100 ohms or so. Our 10 meter quad loop (100 ohms impedance) is a more or less resonant antenna fed with 50 ohm coax. When we mount a 20 meter full-wave quad loop around the 10 meter loop, we have now added a two-wavelength loop (our 20 meter loop will have an impedance of about 250 ohms when fed with 10 meter energy) to the 10 meter loop. Assume we go on 10 meters. Is our 20 meter loop going to accept power also? Simple Ohm's law tells us while 10 meters is the lower value, 100 ohms, we still will be putting power into the 250 ohm 20 meter impedance. We have two more or less resonant antennas tied to the same feed line, so there is no doubt that our 10 meter power is going to go to both loops. How much power and how much the pattern is changed is a very good question. Frankly, I don't have the answer, and I don't think anyone does. It would take some fancy computer modeling. And, we haven't even started talking about adding a reflector or director to this quad.

Let's jump to a quad I recently reviewed in *CQ* ("CQ Reviews: The Lightning Bolt Quad," April 1993). This is a five-band job, driven elements and reflectors. It uses proportional spacing to obtain the best gain per band. However, five driven elements are connected to a common feed point. I am guessing here, but I assume that the total impedance of the array comes out to 20 to 25 ohms. (And for the benefit of any antenna engineers reading this, I am not really overlooking the various reactances that are all lumped together here.) After all, we are connecting several 100 ohm (five) impedances in parallel and Ohm's law applies.

The beam in question uses a Jerry Sevick 2:1 type transformer that works almost perfectly, so we get from 25 to 50 ohms with no problem. I very carefully checked this beam for impedance matching on all five bands, and the very worst case was only slightly more than 1.5 to 1 SWR! I would still prefer to switch the feed line for each band to provide some isolation. I would then be sure that the loops are not interacting.

But all of this still does not answer the question of patterns. What I can say from tests on this antenna and many, many other multiband quads using single feed lines is that there does not appear to be too many or too serious pattern foul-ups. From the computer programs using simply the 20/10 combination there appears to be a slight clover-leaf pattern on 10 meters. But in actual practice, it doesn't show up, at least not to a point where it can be checked on either ground wave or DX. Which means, I guess, I should not trust the MININEC computer program, or to be even more honest, maybe I'm not inputting the correct information.

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There should be an aside here. More and more amateurs are depending on computer-derived information for antenna construction. Early on I wasn't happy with what I was seeing from some of these computer programs as far as quads were concerned. I now see that others agree with me. One of the finest antenna programs is ELNEC, which was done by Lewellyn (the computer program is advertised in CQ). I would like to quote from Roy's documentation in his program.

"Experiments indicate that quads require a large number of segments (perhaps 12 or more per loop side) to give a reasonable representation of front-to-back ratio. When dealing with wires connected at an angle, MININEC (and also ELNEC) "cuts the corner" by half a segment length. This doesn't cause much error with single loops, but apparently causes enough change in the relative currents in multiple loops to quite noticeably affect indicated front-to-back ratio. The forward pattern and gain are fairly accurate [editor's note: italics are mine] with 6 segments/side or so. The segment-tapering method is an effective but rather tedious way of improving the accuracy of front-to-back indications. I am investigating methods to improve quad modeling but I haven't made any breakthroughs yet."

I'm sure if anyone can make "breakthroughs" it will be Lewellyn. The business of quad modeling—and statements you hear from amateurs who "computer model" quads—should, in my opinion, be viewed with care.

Let's get back to single feed line, multiple quad elements. Bottom line: It has to be that some power is being radiated by both antennas at the same time. I could easily pose some "cute" guesses here, and I wouldn't mind hearing from quad people as to what their "guesses" would be. For example, let's assume a single feed line to a 20/10 quad is being used on 10 meters. Would the gain be more or less than that of a 10 meter quad by itself? Keep in mind that the 20 meter part of the antenna is actually a larger antenna for 10, with a more effective aperture. I could go on, but I would prefer readers open their minds and be inquiring. Of course, one answer here is to use a single feed line and then use one of the antenna feed-line switches such as Ameritron makes. This would put the direct feed on only the desired antenna.

When discussing common feed lines, what about losses in relation to the quads that are not in play? There are bound to be some ohmic losses, but by the same token, because the loops are made from good low-loss wire, the losses cannot be great. In fact, they are almost not worth mentioning. So on the basis of losses, when comparing a multiband trap Yagi to

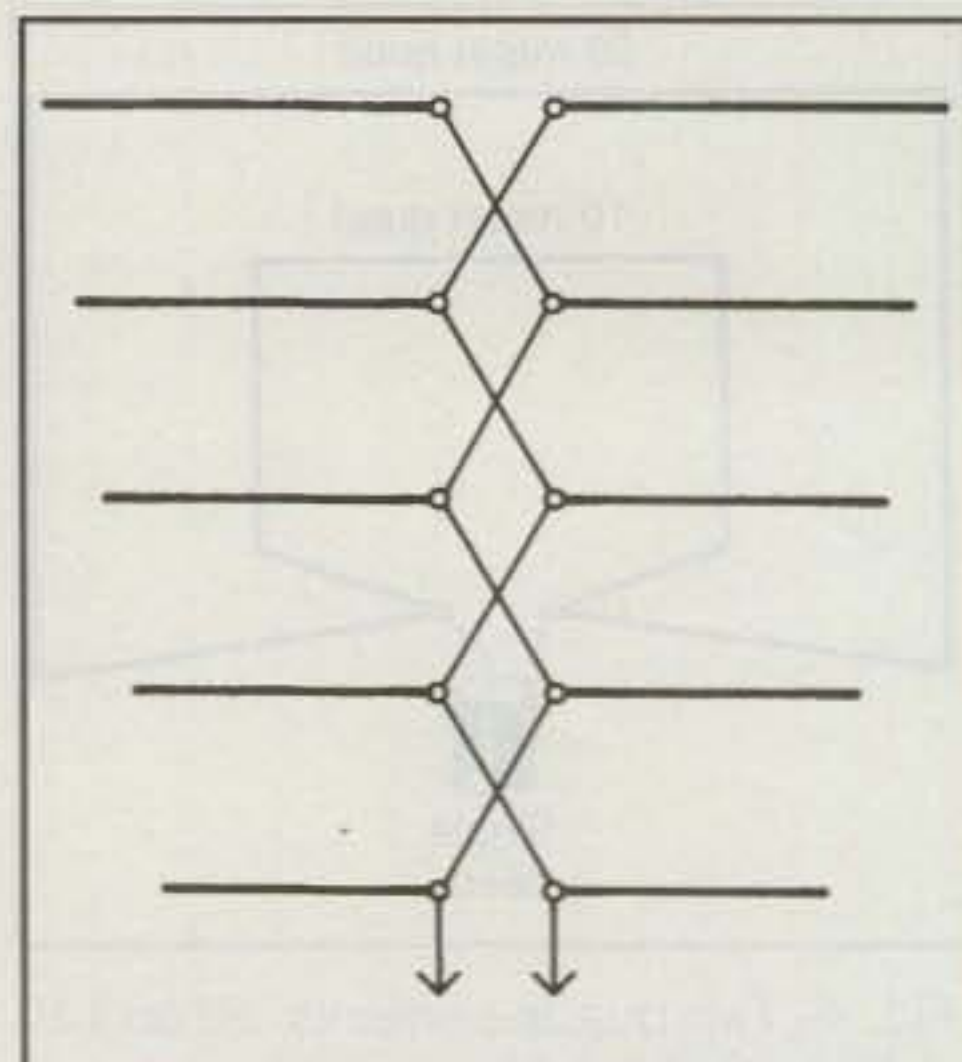


Fig. 5—The log-periodic configuration. Simply, the shortest element (front of beam) is resonant (approximately) on the highest frequency. The longest element (rear) is roughly a half-wavelength at the lowest frequency. For example, a 20 through 10 meter (2:1 range) log periodic would have the shortest element at about 16 feet (half-wave on 10). The longest element would be on the order of 33 feet. This is only one type of log periodic; there are many variations.

a quad, apparently the quad will come out the winner.

Where does this leave us overall in quads versus Yagis? From this writer's viewpoint, the quad appears to have a bit more going for it. Bear in mind that I've never mentioned price, and I probably should. Quads are usually much cheaper to build, as aluminum can be very expensive. So it leaves us with appearance.

This may sound like an attempt at humor, but unfortunately—or fortunately—it is a fact of amateur life (I've been married for 55 years!). Convincing your non-amateur wife that you should have a tower and beam can be a difficult if not impossible task. You can use the old ploy, which I did, that a radio antenna provides a zone of protection from lightning. (All wives are afraid of lightning, but then again so am I.) Frankly, I think your best approach, or at least one I would recommend, is to take your wife out to a nice dinner, and possibly really splurge and get her a nice dinner ring. Then when you are sure she is in the right mood, spring the antenna on her. But don't forget to lead off with that lightning bit, as it really works.

Once you have convinced your wife, then your next decision is more important. Does a quad look better than a Yagi? Remember that beauty is in the eye of the beholder, but neighbors make really terrible beholders!

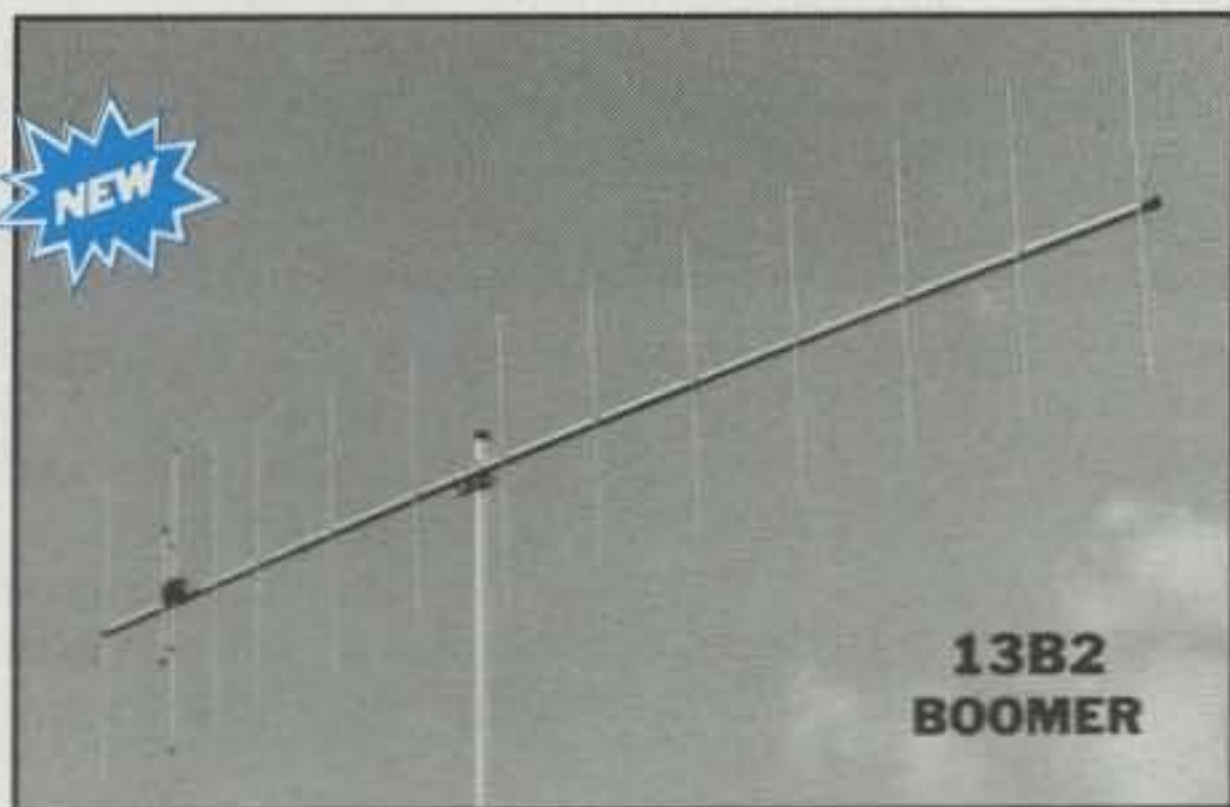
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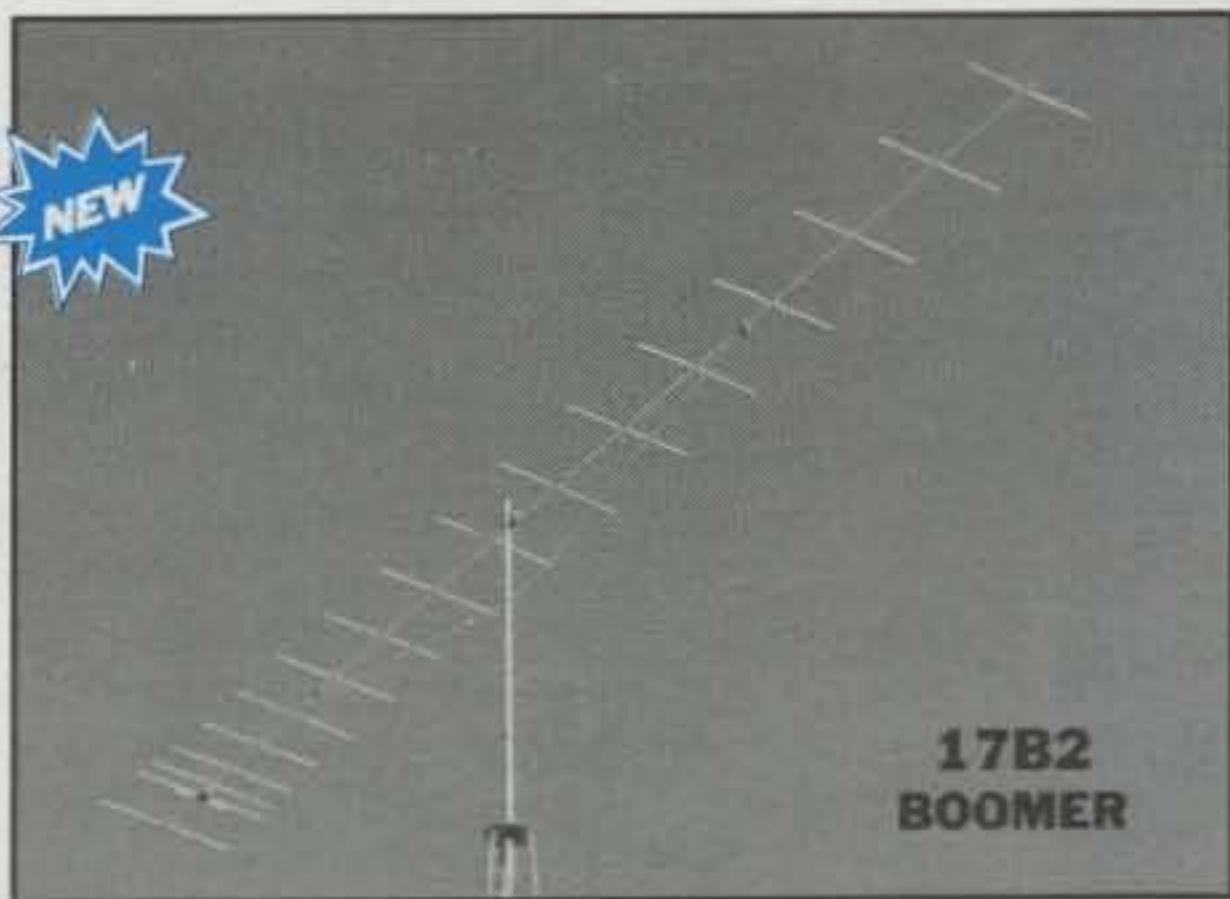
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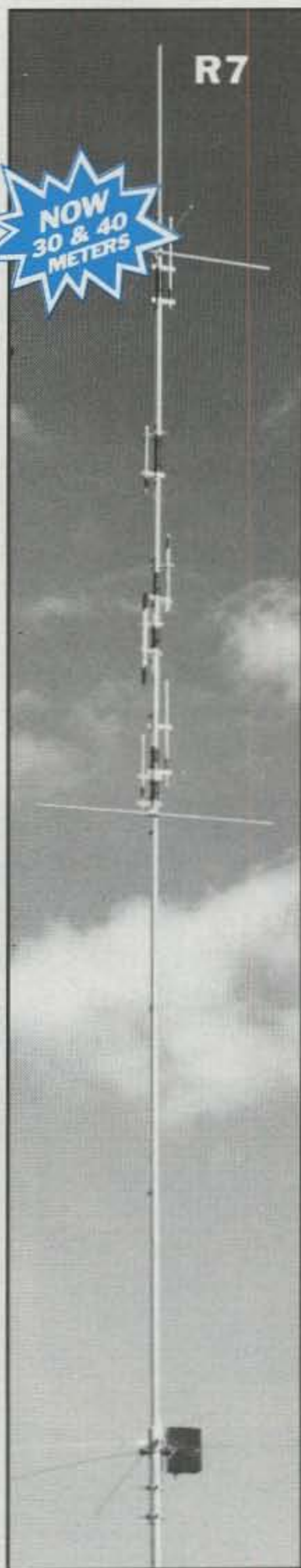
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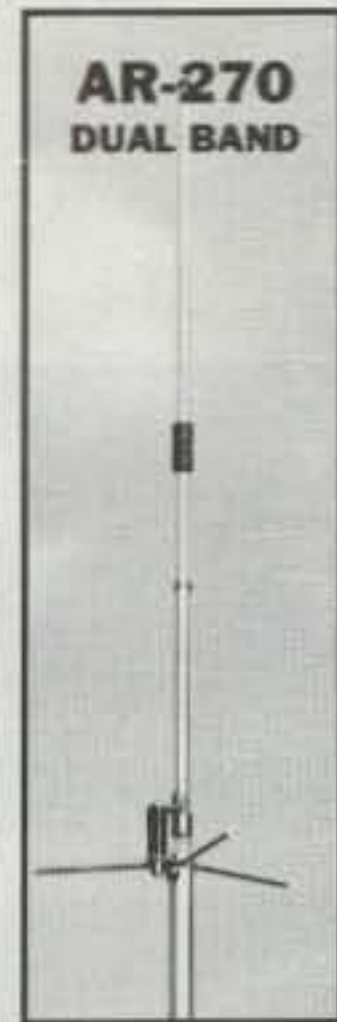
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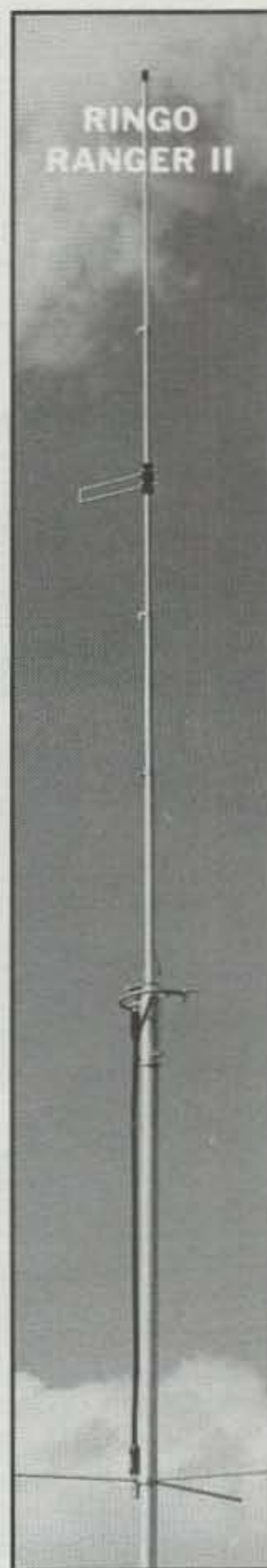
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that quads always bring more comments from other amateurs—no doubt about that. They tend to set one apart.

### Some Last Items

It is said, and often proven, that a quad is a low-noise antenna, such as for snow or rain static, when compared with a Yagi. This is absolutely true. As I mentioned earlier, at one point in my career I had both a 20 meter Yagi and a 20 meter quad. Switching between the two during a snow storm left no doubt in my mind that the quad was quieter. However, again this is a minor point unless the storm occurs during a DX contest, when it quickly becomes a major point!

Still another item that must be considered when deciding on a quad versus a Yagi is the type of person you happen to be. Are you an introvert or extrovert? This is really important simply because by definition an introvert prefers to be left alone and not be bothered by people. How does this relate to quads versus Yagis? Very simple. Neighbors have been known to ignore a Yagi simply because it looks like a large TV antenna. In fact, you sometimes can get away with convincing a neighbor that the Yagi is used for TV! On the other hand, amateurs

are accustomed to seeing Yagis, so they probably won't question you too much.

Ahhh, but a quad! Your neighbors are bound to bother and pester you about that "strange" antenna. And certainly, other amateurs will constantly be getting on your frequency to "test" your signal against theirs. It's really not deliberate QRM, but more likely could be called a search for knowledge(?). I don't endorse such action, but amateurs do like to prove they have a better—or the best—signal. So if you are an introvert, I wouldn't recommend the quad to you unless you live on a mountaintop away from people, as I do. (However, by the furthest stretch of the imagination I am not an introvert.)

Before closing, I should add a word or two about log periodic antennas. These are very good multiband antennas (see fig. 5). The ones which amateurs consider for HF usually have a 2:1 frequency range—say, from 20 meters through 10. The word "through" must be considered because actually you are really paying for something you are not going to use. Keep in mind that the antenna covers "all" the frequencies from 20 through 10. This is why the military loves them. That is really not as bad as it sounds, because in order to work the five bands—20, 15, and 10 plus the two WARC

bands—the cost becomes part of the package.

The gain of a log periodic for such coverage is usually on the order of about 5 to as much as 8 dB compared to a dipole. In simpler language, the gain will depend on the design, and there are many design factors which control log periodics. The impedance of such an antenna is on the order of 50 ohms over its frequency range, providing an SWR of less than 1.3 to 1 over the antenna's range. I have taken this information from a very excellent research paper entitled "Log Periodic Antenna Techniques" by L. G. Bullock, C. T. Elfving, and S. K. Miller (Technical Report ECOM-01829-M1016, Apr. 1967). It is not a Yagi type nor parasitic type array. In a log periodic all elements are driven. Log periodic antennas that cover 20 through 10 meters are relatively expensive compared to a quad, and maybe not as much so compared to a trap Yagi. In my humble opinion I would rate the log periodic very high as a multiband beam. My experience with the antenna is not from owning one, but rather from using one in military and other government uses, so I can't claim any "expertise." I do know they have a very good front-to-back and front-to-side performance.

Some last comparisons in rating the three types of antennas are their weight, wind load, and turning radius. The lightest in weight is the multiband quad; at least the five-band quad I mentioned earlier came in at about 30 pounds. This was a two-element reflector and driven-element type. More elements means more weight. Some of the larger trap band beams weigh in at the 75 to 100 pound range, and the log periodic for the same coverage probably weighs in at slightly over 100 pounds. The quad has the smallest turning radius because it is in a square configuration. The log periodic has the largest radius simply because of boom and longest element length.

As to wind loads, if you are interested in this type of information, I suggest writing to manufacturers. They all advertise in *CQ*, and they will be happy to give you the information. I would like to take this opportunity to thank my fellow QCWA director and a real good antenna man Arch Doty, K8CFU. Arch supplied me with the research paper on log periodics mentioned earlier and a photo of one of his big quads.

This article is meant to provide some of the many newcomers to the hobby with some "thinking" material. It may give the reader a clearer picture of how a multiband beam antenna performs. But remember what I said: Educate your wife or parents and emphasize lightning protection. I have been in amateur radio for 50 years, and knock on wood, I've never had a direct hit! ■



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BY JERRY SEVICK\*, W2FMI

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$$Z_o = 138 \times \log(4h/d) \quad (1)$$

where:  $Z_o$  = characteristic impedance of the Beverage;  $h$  = height of the wire above ground; and  $d$  = diameter of the wire.

This article presents low-power and high-power versions<sup>†</sup> of multimatch ununs designed to match 50 ohm cable to unbalanced loads from 450 ohms to 800 ohms. The low-power unit, which is capable of handling continuous power levels up to 100 watts, is specifically designed for the Beverage antenna when it is performing as a receiving antenna. The high-power unit, which is capable of handling 1 KW of continuous power, can be used with the Beverage or any other traveling-wave antenna when used as a transmitting antenna. Additionally, this article presents high-power designs capable of flat response, including the entire AM broadcast band. These multimatch ununs may be of interest to designers of high-power amplifiers for the broadcast band.

\*32 Granville Way, Basking Ridge, NJ 07920

†Kits and finished units are available from Amidon Associates, Inc., 2216 East Gladwick Street, Dominguez Hills, CA 90220.

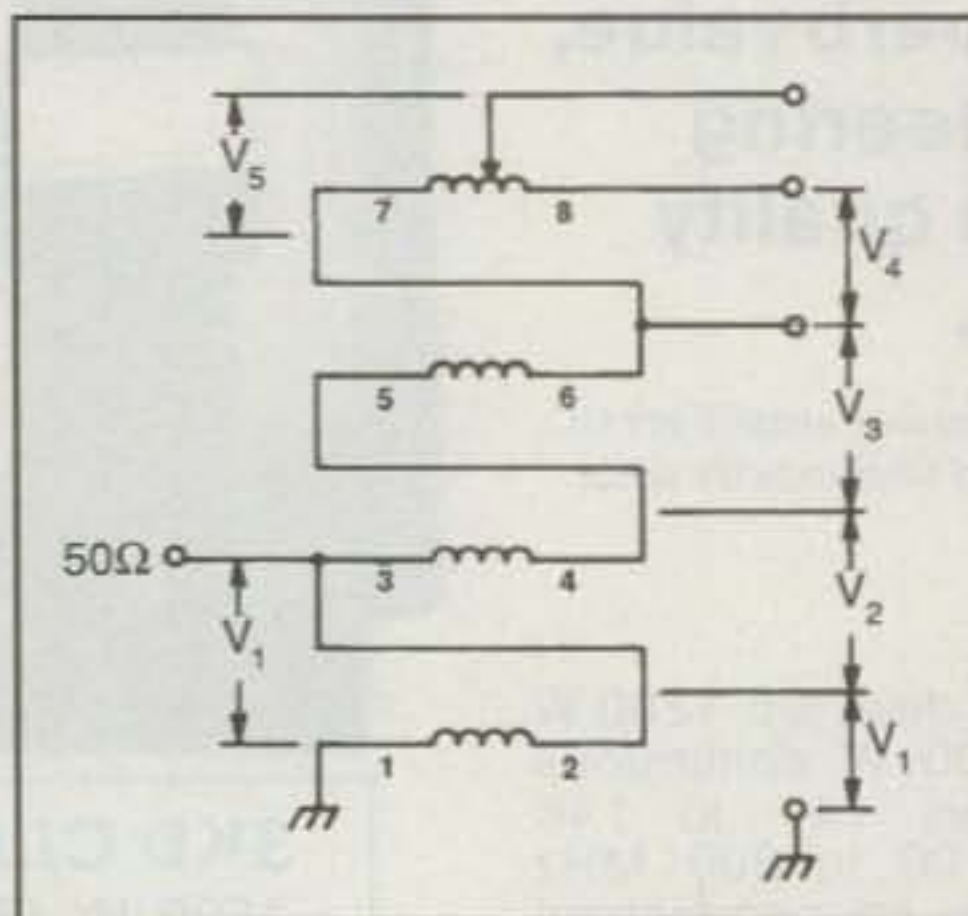


Fig. 1—Schematic diagram of the quadrifilar design using Ruthroff's approach for high-impedance, low-frequency ununs such as the Beverage antenna matching transformer.

A bit of theory on how these devices are designed is presented next.

### A Little Theory

Transmission line transformers<sup>2</sup> (the unun being a subset thereof) are known for the greater bandwidths and efficiencies over their counterparts—conventional transformers. It is also known that their design considerations are vastly different. They involve chokes and transmission lines, while conventional transformers involve flux linkages.

High-impedance ununs (and baluns) which match 50 ohms, unbalanced, to impedances as high as 800 ohms are at about the edge of capability of this technology. The reasons are (1) the windings require more turns, since higher reactances are needed for isolating the input from the output, and (2) they require higher characteristic impedances in the transmission lines, since the loads they see are greater. Therefore, one just runs out of space on toroidal cores in trying to satisfy the low-frequency and high-frequency objectives. Incidentally, beaded transmission lines are not recommended at these impedance levels because of their excessive losses.

There are two methods for obtaining broadband operation at these high-impedance levels. One uses Guanella's 9:1 and 16:1 baluns, which are converted to unun operation.<sup>2</sup> The other uses higher order windings (quadrifilar in this case) on a single core, which is an extension of Ruthroff's approach.<sup>3</sup> The Guanella approach, which uses coiled transmission line connected in series at the high-impedance side and in parallel at the low-impedance side, results in very broad bandwidths, but with difficulty in meeting low-frequency objectives. Low-frequency models<sup>2</sup> show that with ratios above 4:1, some of the coiled windings are connected in parallel, resulting in reduced reactances. However, with the Ruthroff approach all of the inductances (at the low-frequency end) end up mutually-aiding. But Ruthroff's approach suffers at the high-frequency end because a direct voltage is summed with three voltages which traverse various lengths of transmission lines. As a result, Guanella's approach of summing voltages of equal delays is preferred for the higher frequency bands, and Ruthroff's approach is preferred for the lower frequency bands. This article presents designs using Ruthroff's approach.

Fig. 1 shows the schematic diagram of a quadrifilar-wound unun. If the lengths of the transmission lines are very short compared to the wavelength (therefore, phase-delay and standing waves are negligible), then:

$$V_1 = V_2 = V_3 = V_4 \quad (2)$$

at terminal 6,

$$V_o = V_1 + V_2 + V_3 = 3V_1 \quad (3)$$

and the impedance ratio becomes

$$g = (V_o/V_1)^2 = 9 \quad (4)$$

At terminal 8, it becomes

$$g = 16 \quad (5)$$

The voltage at the tap in winding 7-8 is

$$V_o = 3V_1 + V_5 = 3V_1 + n/NV_1 = V_1(3 + n/N) \quad (6)$$



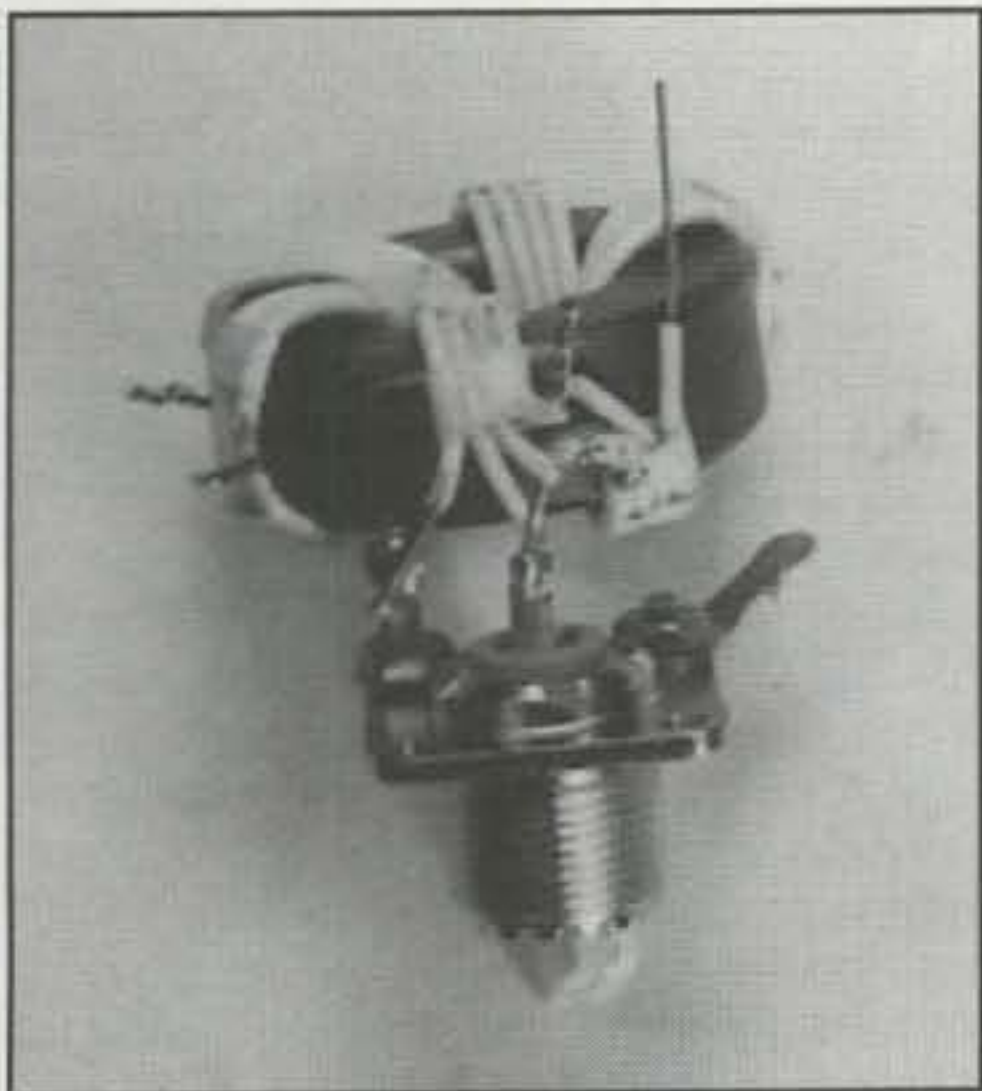


Photo A— The bottom view of the low-power Beverage antenna unun.

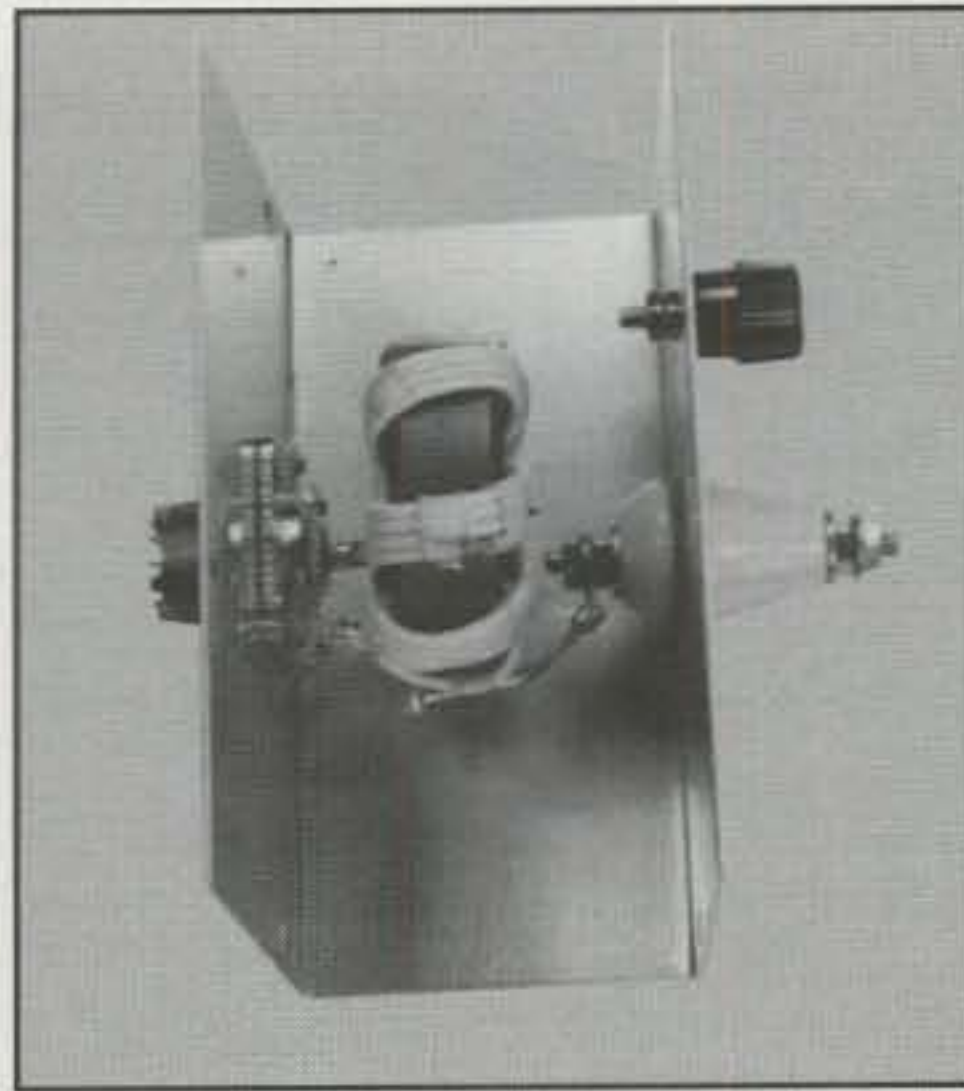


Photo B— The low-power Beverage antenna unun mounted in a 4" L x 2" W x 2.75" H minibox.

where:  $N$  = total number of turns;  $n$  = number of turns from terminal 7.

The impedance ratio, using the tapped winding, becomes

$$g = (V_o/V_1)^2 = (3 + n/N)^2 \quad (7)$$

When the lengths of the transmission lines are significant, then important phase delays can occur and reduce the high-frequency response. As can be seen in fig. 1,  $V_2$  travels one transmission line,  $V_3$  travels two transmission lines, and  $V_4$  travels three transmission lines. Additionally, the high-frequency response is further diminished if the characteristic impedances of the transmission lines are not at their optimum values (which is hard to do

at these impedances levels). Even with these major flaws, the Ruthroff approach is better for Beverage antenna use, since the greatest advantages are on the lower frequency bands (80 and 160 meters).

### A Low-Power Design

Photo A shows the bottom view of an unun designed to handle 100 watts of continuous power with constant ratios from 9:1 to 16:1 on the 80 and 160 meter bands. In fact, since its transmission lines are very short (about 12 inches long), the ratios only increase by 5 percent on the 40 meter band.

The design uses the Ruthroff approach shown in fig. 1. It has 6 quadrifilar turns on a 1.5 inch OD ferrite toroid with a per-

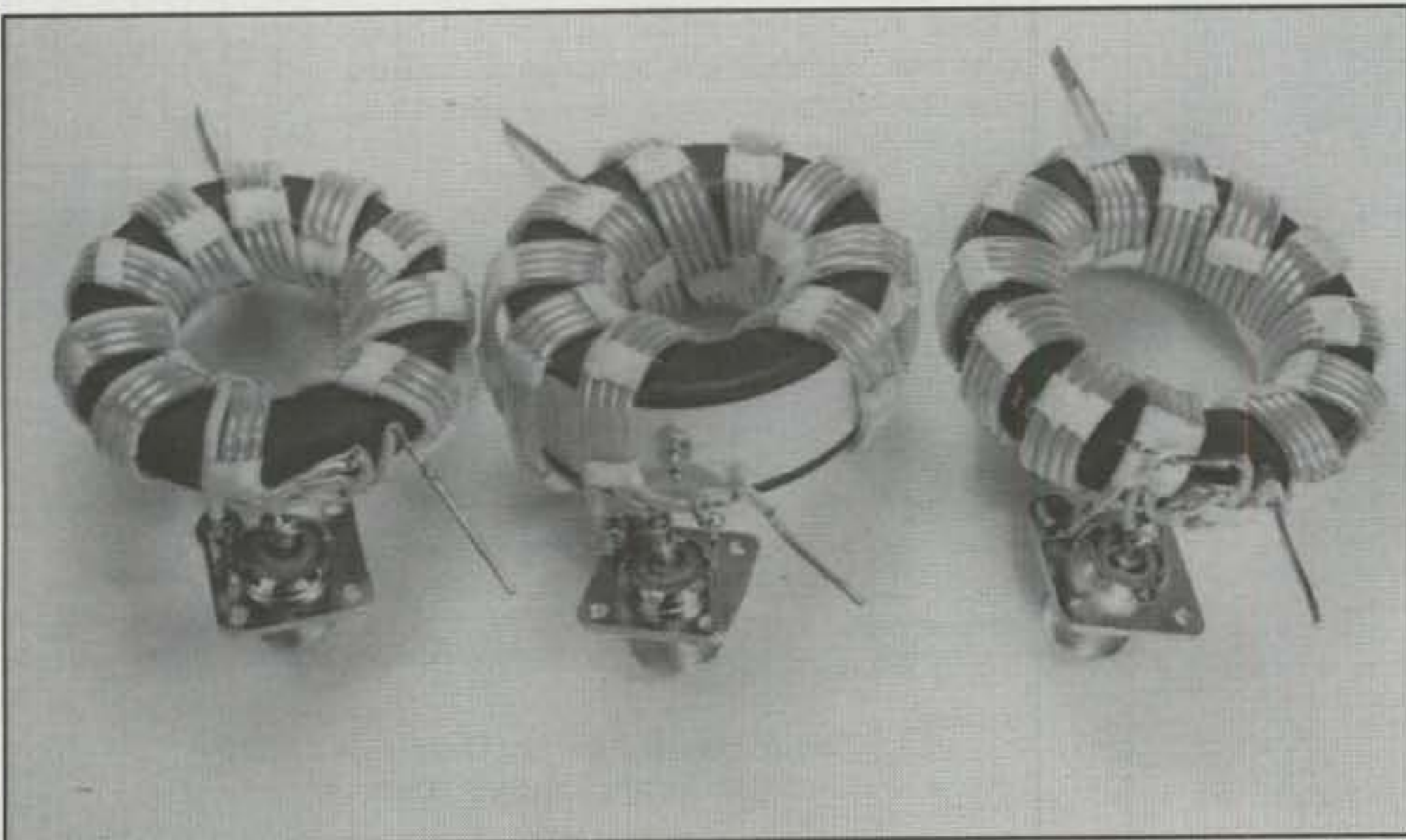


Photo C— Three high-power, low-frequency ununs using a quadrifilar design with Ruthroff's approach. One on the left is designed to cover the 80 and 160 meter bands. Other two are designed to cover the 160 meter and AM broadcast bands.

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meability of 250. The bottom winding is No. 20 hook-up wire, and the other three are No. 22 hook-up wire. Winding 7-8 is tapped at 2 turns from terminal 7 yielding a 11.11:1 ratio and at 3 turns from terminal 7 yielding a 12.25:1 ratio. Therefore, with outputs also at terminals 6 and 8, this unun matches 50 ohm cable to loads of 450, 555.6, 612.5, and 800 ohms.

Photo B shows the unit mounted in a 4"L x 2"W x 2.75"H minibox. The output (the feed-through insulator) is connected to one of the taps. A grounded binding post is also shown.

### High-Power Designs

Photo C shows three high-power designs. The one on the left is specifically designed to cover the frequencies generally used with traveling-wave structures such as the Beverage antenna. It has 10 quadrifilar turns on a 2.4 inch OD ferrite toroid with a permeability of 250. Winding 1-2 is No. 14 tinned copper wire and the other three are No. 16 tinned copper wire. The wires are also covered with Teflon sleeving. Winding 7-8 is tapped at 5 turns from terminal 7, yielding a ratio of 12.25:1. When matching 50 ohm cable to loads of 450 ohms (terminal 6), 612.5 ohms (the tap), and 800 ohms (terminal 8), the variation in response is less than 5 percent from 1.5 MHz to 4 MHz. At 6.5 MHz the variation (which is an increase in the im-

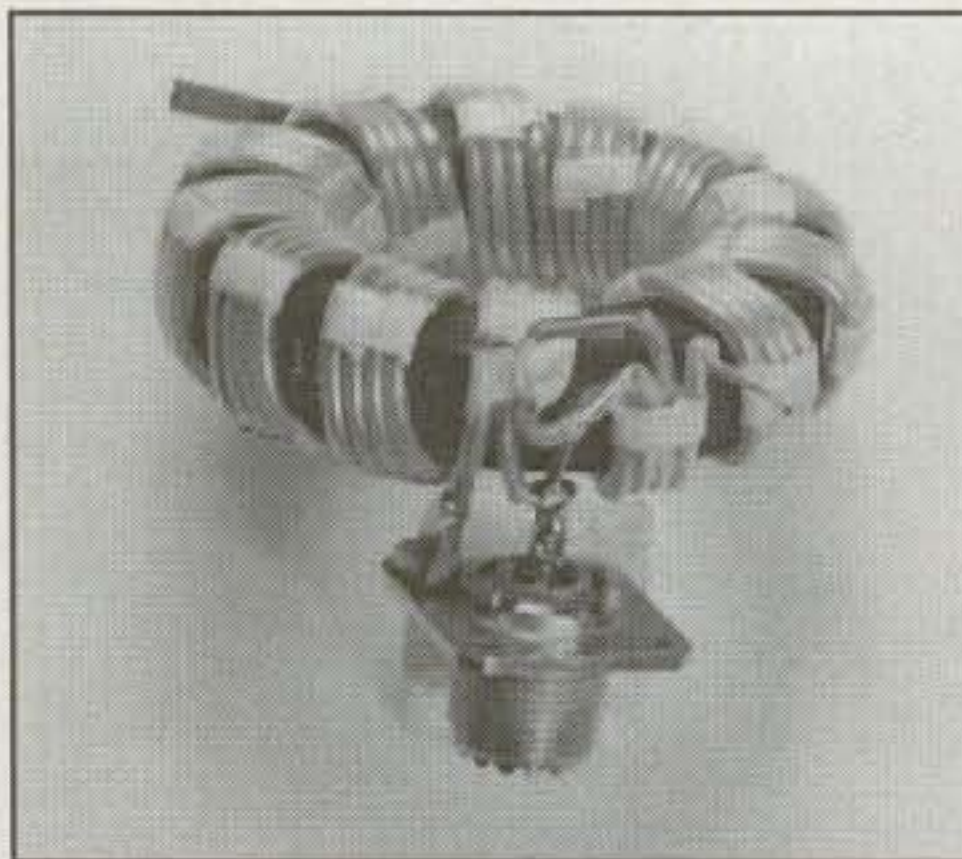


Photo D—Bottom view of the high-power Beverage antenna unun.

pedance ratio) increases to about 20 percent. Photo D attempts to give a better view of the connections.

The other two high-power ununs in photo D are specifically designed to cover the broadcast and 160 meter bands. The one in the center has 9 quadrifilar turns (of the same wires as above) on a stack of two 2.4 inch OD ferrite toroids with permeabilities of 250. The tap on winding 7-8 is now at 4 turns from terminal 7, yielding a ratio of 11.86:1. When matching 50 ohm cable to 450 ohms (terminal 6), 593 ohms (the tap), or 800 ohms (terminal 8), the response is literally flat from 0.5 MHz to 2 MHz. At 4 MHz the ratios

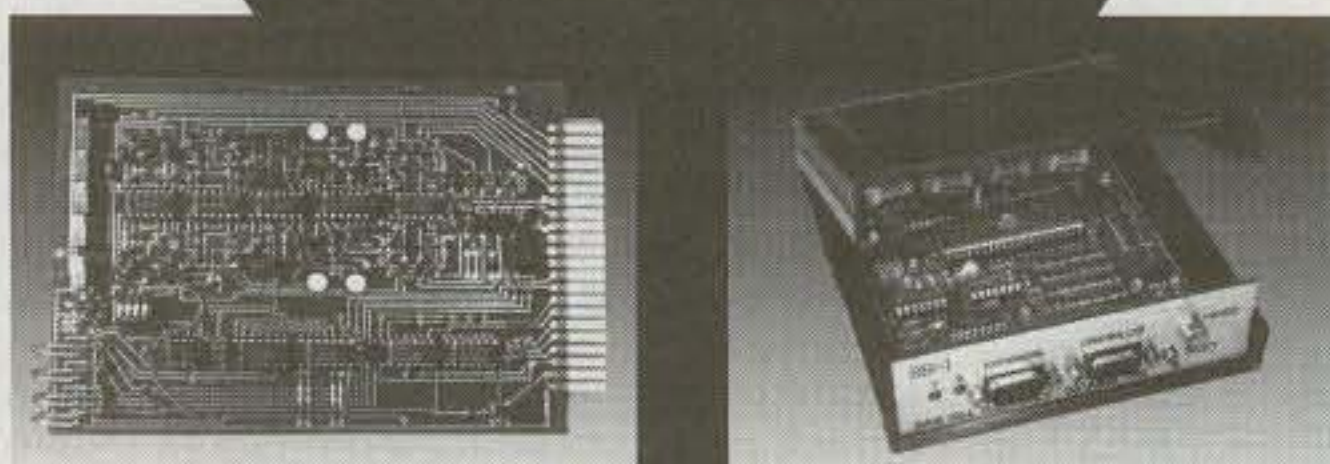
increase by about 6 percent. At 7 MHz they increase by about 20 percent.

The unun on the right in photo C shows another way of obtaining the same performance as above. In this case the design has 12 quadrifilar turns (of the same wires as above) on a 2.68 inch OD ferrite with a permeability of 290. The tap on winding 7-8 is at 6 turns from terminal 7, yielding a 12.25:1 ratio (instead of 11.86:1 as above). Although the performance of this design is practically the same as the one above (using the two 2.4 inch OD cores), it is a much more expensive design, since the 2.68 inch OD core is not nearly as popular. But if a broadband, high-power and high-impedance unun (or balun) is required to cover 1.5 MHz to 30 MHz, then these expensive 2.68 inch OD ferrite cores are very likely the only alternative!

### References

1. Gerald (Jerry) Hall, K1TD, *The ARRL Antenna Book*, 18th ed., 1991, Amateur Radio Relay League, Newington, CT, chapter 13, pp. 13-17.
2. Jerry Sevick, W2FMI, *Transmission Line Transformers*, 2nd ed., 1990, Amateur Radio Relay League, Newington, CT, chapters 1 and 8.
3. Jerry Sevick, W2FMI, "The Ultimate Multimatch Unun," *CQ*, August 1993, p. 15.

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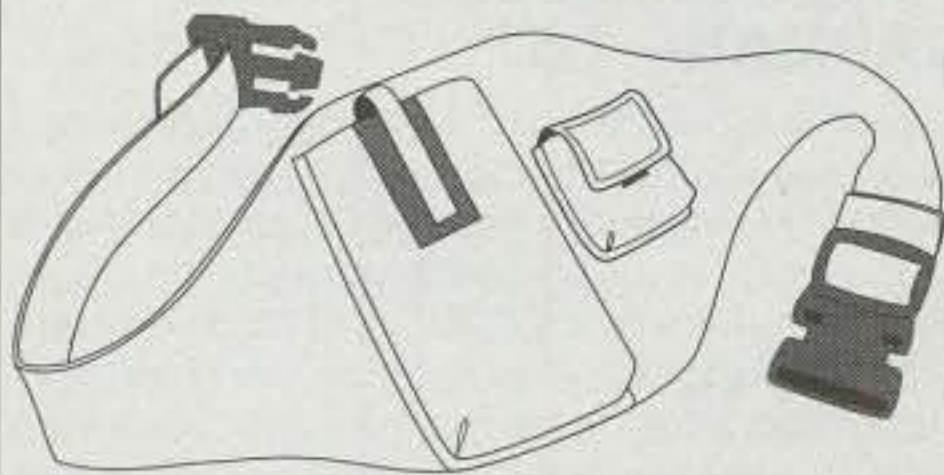


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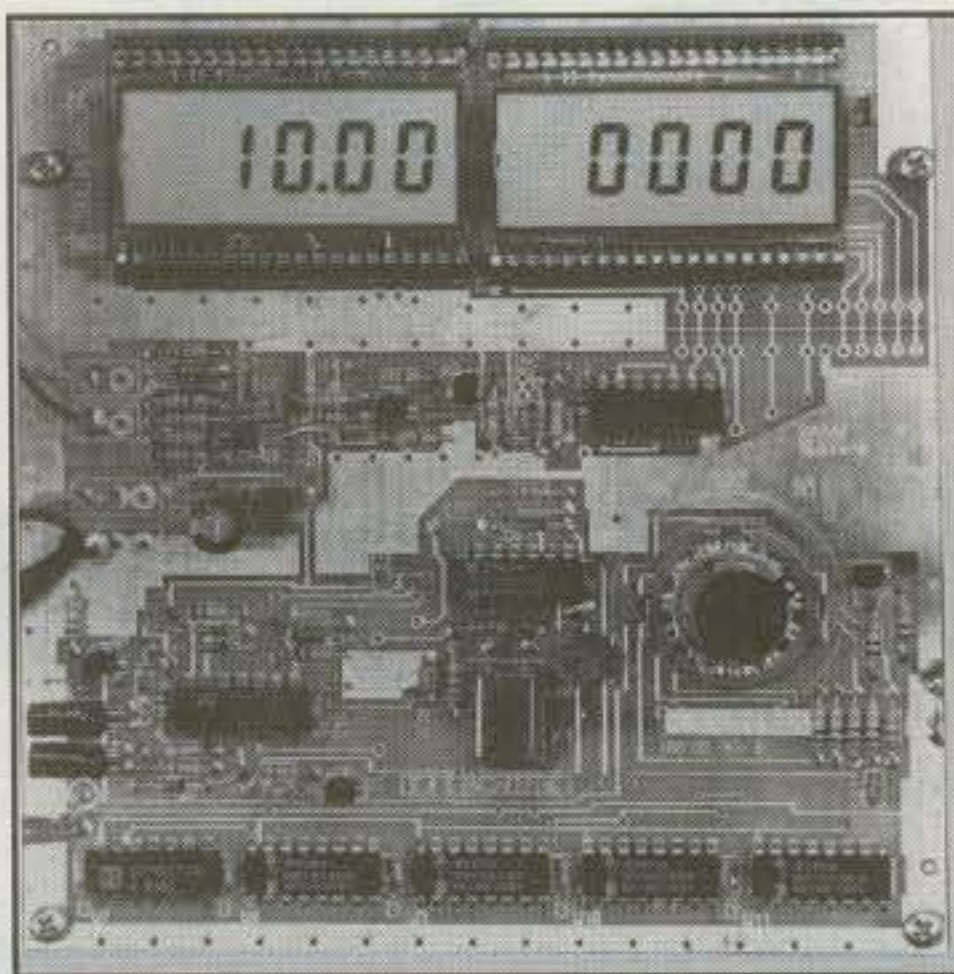
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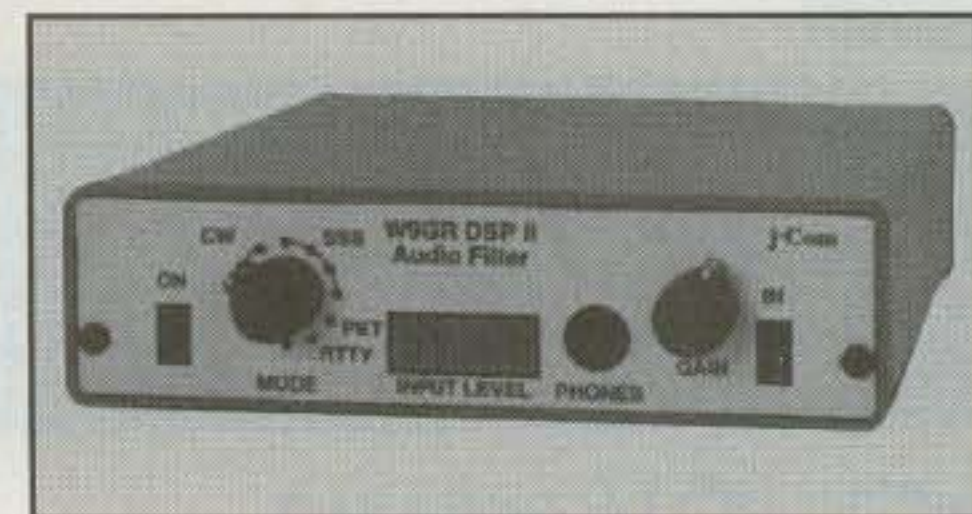
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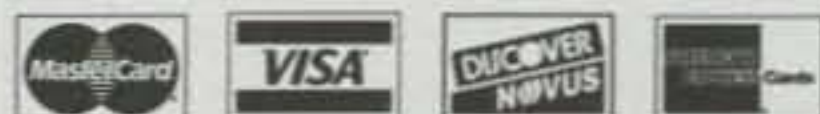
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- BD** 7-second delay unit available separately. A 2 x 2 inch circuit board fits in Ham-2,3,4, T2X AND HAM-M control units. \$25.00.
- SW** "Super Wedge" A custom steel-unbreakable wedge for HAM-3 and HAM-4 rotors capable of holding 40-foot booms. Also fits the older HAM-M and 2 with housing change. \$15.00.

Please expect a \$3.50 shipping and handling charge.

To order any of the above call C.A.T.S. at 1-800-3-ROTORS, 10-5 EDT

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# ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

## Books, Letters, and More

**T**his month we'll depart somewhat from our usual "antennas and software" format to cover some new books and catalogs and also catch up on the mail. Let's begin with the books.

### From the Radio Bookshelf

**FBenterprises.** A 10-page catalog of inexpensive but fairly unique amateur and SWL hobby items, mostly books and other paper operating aids, is available from FBenterprises, founded in 1991 by Bob Martin, N7JXN. The catalog covers products by FBenterprises as well as other sources.

Some of the items offered include QUICK-N-EASY DXCC, a 5 1/2" x 8 1/2" laminated card listing all DXCC countries; QUICK-N-EASY repeater maps; a series of four shortwave listening broadcast frequency cards; a beginner's shortwave listening guide; a "QSO Helper" card; a QSL kit with everything you need to use the ARRL Incoming QSL bureau; and several other "QUICK-N-EASY" series operating aids.

For a catalog, contact FBenterprises, 15800 N.W. 31st Ct., Vancouver, WA 98685 (206-573-0910).

**1993 World Satellite Catalog.** If your interest in earth-orbiting satellites is broader than just amateur satellites, obtain a free copy of "The 1993 World Satellite Catalog." The catalog is offered by Mark Long Enterprises, Inc.

The catalog describes the company's extensive book and videotape offerings, which collectively explain, footprint, index, and analyze all the world's communications satellites. Products include *The 1993/94 World Satellite Annual*; *The 1992/1993 World Satellite Almanac*; *The World Satellite Transponder Report*, published quarterly; "World Satellite Update," a monthly newsletter; *The World of Satellite TV*, available in Americas, European, and Asian editions; *The World of Home Video Entertainment*, a practical guide to high-tech home video devices; and various instructional videotapes, including tapes exploring the commercial Ku-band at 12 GHz and direct broadcast satellites.

For a catalog, contact Mark Long Enterprises, Inc., P.O. Box 159, Winter Beach, FL 32971 (FAX 407-589-9411).

**AMSAT Publications Update.** AMSAT, the Radio Amateur Satellite Corporation, offers in addition to a comprehensive software library a parallel library of publications for the beginning, intermediate, and advanced satellite enthusiast. These include *A Beginner's Guide to OSCAR-13*, *The Satellite Experimenter's Handbook*, *The PACSAT Beginner's Guide*, *Decoding Telemetry from the Amateur Satellites*, *Weather Satellite Handbook*; and *The RS Satellites Operating Guide*. AMSAT

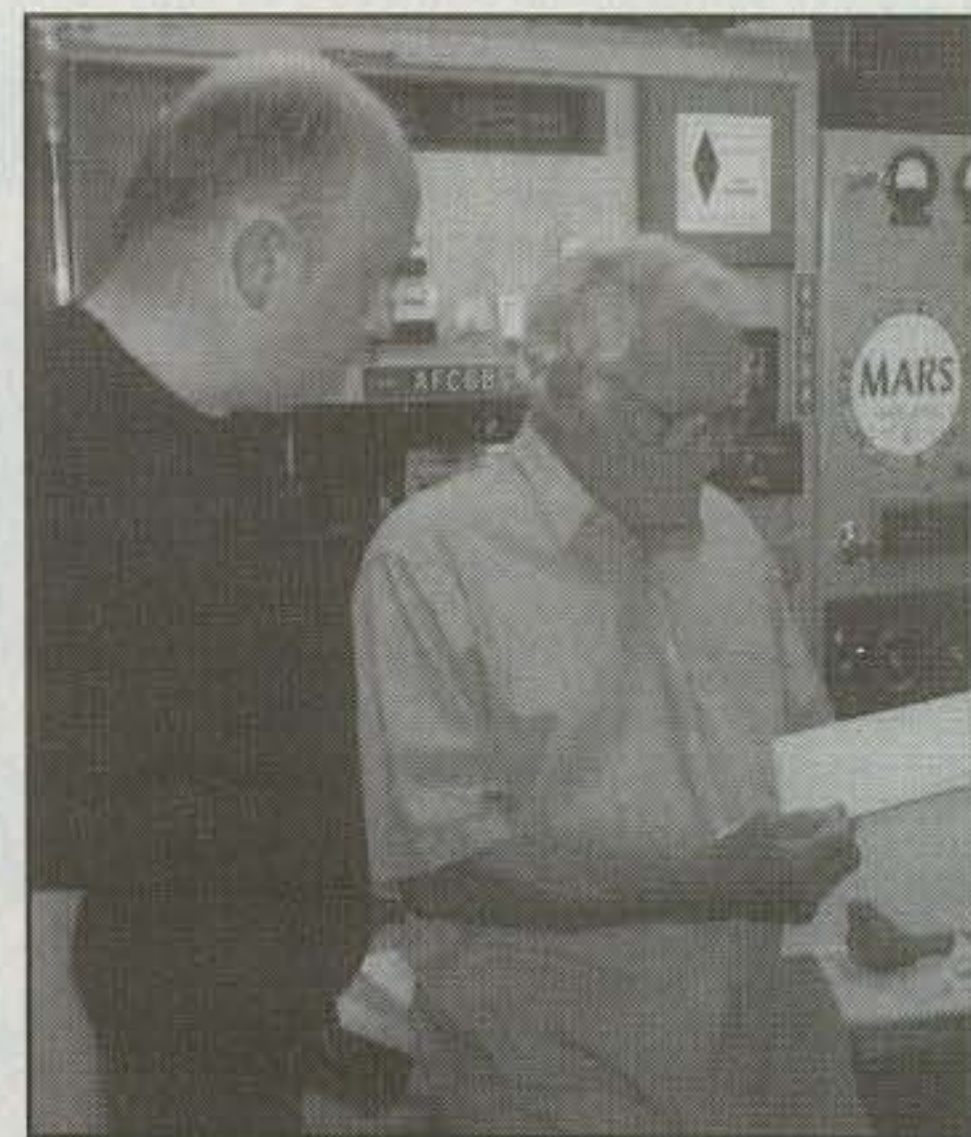
also offers the proceedings of AMSAT technical symposia and joint AMSAT/ARRL educational workshops.

AMSAT software and books are available to members and nonmembers alike, though they charge more to nonmembers for software (but not for books). Annual AMSAT domestic membership is \$30 (it's \$36 in Canada and Mexico, or \$45 foreign).

For information on membership and a current catalog of AMSAT publications and software, contact the Radio Amateur Satellite Corporation, P.O. Box 27, Washington, DC 20044 (301-589-6062).

As this issue went to press, we learned that AMSAT has a special member deal going. If you sign up for a one-year membership, you will get a copy of AMSAT's ORBITS II satellite tracking software written by Roy Welch, W0SL, and AMSAT's *How To Use The Amateur Radio Satellites*, an excellent beginner's guidebook by Keith Baker, KB1SF.

**Artsci Publications Update.** Artsci offers unique reference publications for the radio amateur, SWL, and scanner buff. These include *Amateur HamBook #2*, a \$14.95 compendium with numerous charts, tables, and construction plans; *Radio/Tech Modifications*, offered in two different 200-page books for



AMSAT is offering a membership special that includes tracking software and Keith Baker's excellent beginner's guidebook, *How To Use The Amateur Radio Satellites*. Here retired Senator and active amateur Barry Goldwater, K7UGA, peruses Keith's book while the author looks on. (Photo courtesy KB1SF)

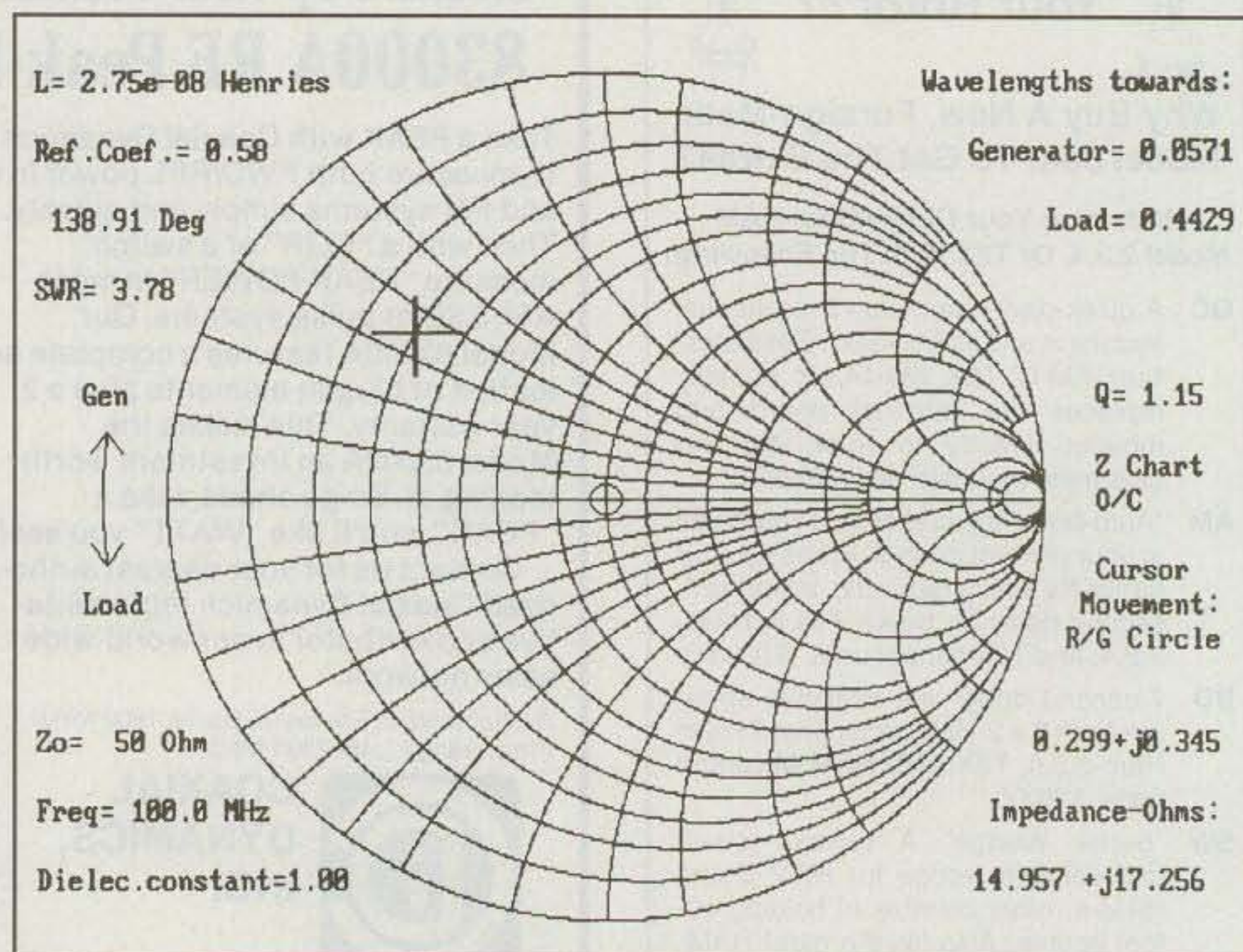
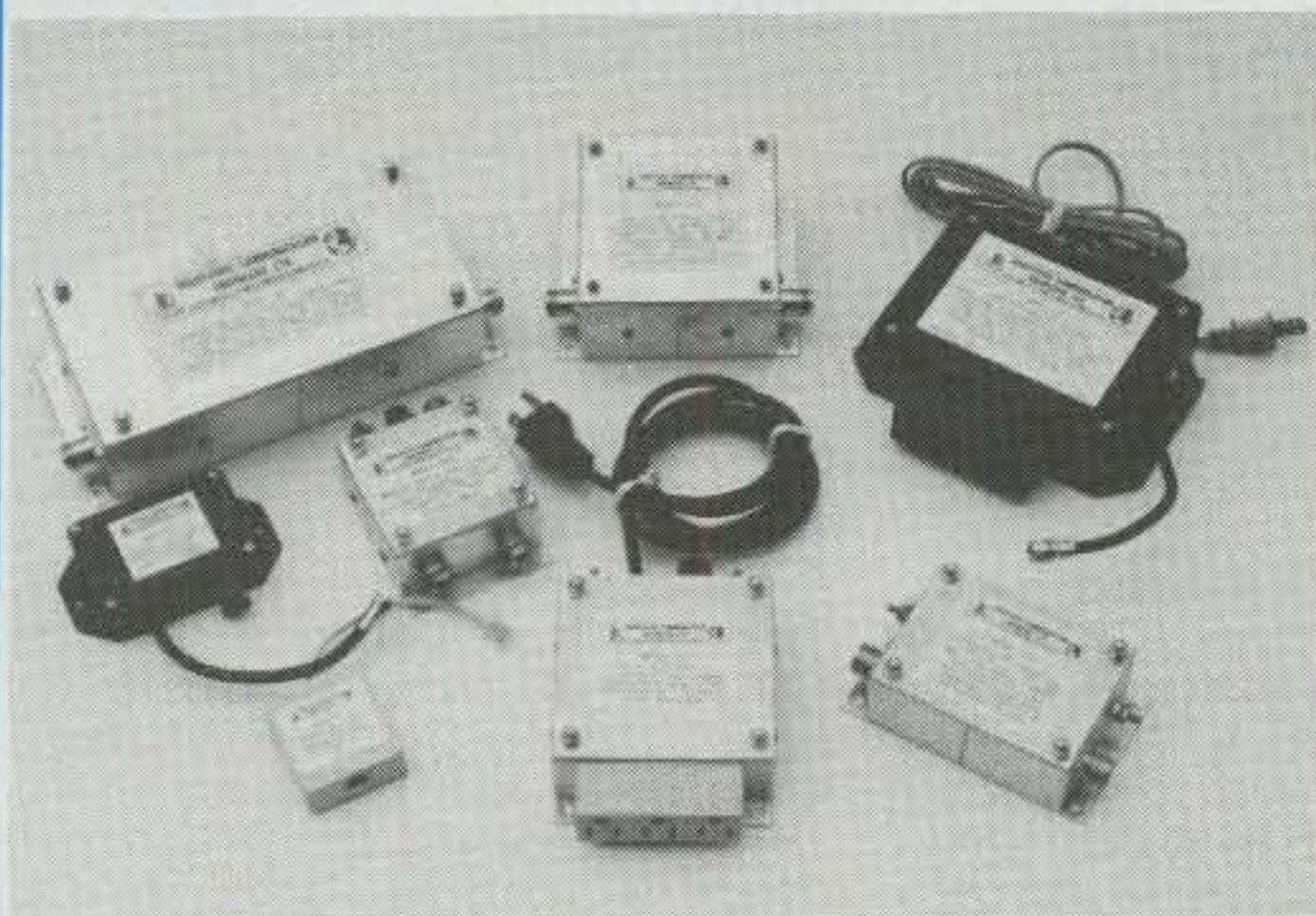


Fig. 1—Z-Match II by Number One Systems, Ltd. Z-Match II is a rather expensive but professional-quality software implementation of the paper Smith Chart developed by Philip Smith at Bell Labs in 1939. The British program retains all of the graphical advantages of the original paper chart while incorporating many advanced features to eliminate repetitive calculation and to make the chart more accessible to the casual user. (See text for details.)

289 Poplar Drive, Millbrook, AL 36054



# R.F. ODOR EATERS



At one time or another every station owner with a transmitter has had to deal with RF interference caused to other services. Whether it's with a neighbor, the family upstairs, or some of your own receiving equipment, there's one thing we can all agree on . . . IT STINKS!

Today Amateur operators and Commercial users enjoy the benefits of the best technologies ever produced to suppress harmonics, block wide-spectrum RF signals, decouple delicate consumer equipment, or maintain transmitted spectral purity. And there's no lineup in the world as broad or offering performance to the level of I.C.E.'s 1993 industrial quality passive filter selection. If you're looking to block it, ground it, restrict it, clean it, or regulate it we've got a deodorizer to fit every budget. See your local dealer or contact the factory for the whole story, and get your free Product Catalog anytime!

## LOW PASS FILTERS

A must for every HF transmitting station, lowpass filters stop spurious radiation of all frequencies above cutoff point that often interfere with other services. One of our most popular products and now sold worldwide, Model 420 LPFs offer steep cutoff points and attenuation exceeding 90db. Built in 1/8" thick aluminum chassis and available with S0239, N, or BNC connectors, these filters are a standard in Commercial and Industrial services. Packed with 4-page owner's manual and stainless steel mounting hardware.

Model 420	DC-30 Mhz.,	600WPEP/300DC	\$32.00
Model 421	DC-30 Mhz.,	6KWPEP/3KWDC	\$44.00
Model 422	DC-30 Mhz.,	12KWPEP/6KWDC	\$72.00
Model 425	DC-54 Mhz.,	600WPEP/300DC	\$32.00
Model 426	DC-54 Mhz.,	6KWPEP/3KWDC	\$44.00

## HIGH PASS FILTERS

Keep peace in the neighborhood with these seven-section comprehensive 75 ohm CATV/MATV filter assemblies. Providing over 60db of differential attenuation below 54 Mhz. and 20db of common mode (shield electrification) blocking, Model 430 Series filters are now constructed in lightweight black polycases with a 6" flexible connecting lead that attaches directly to TV set input connector. Model 430A now improved to incorporate both former wavetrap equivalents on 10 and 6 meters in a single unit. With mounting hardware and 4-page owner's manual.

Model 430A	Wide spectrum high pass filter assy.	\$21.00
Model 437A	Same as 430A but with 2M (144-148 Mhz.) wavetrap	\$22.00
Model 434A	Bandpass Style, Channel 3	\$19.00
Model 435A	Bandpass Style, Channel 4	\$19.00
Model 472	Dual unit - includes 430A and AC Line Filter	\$44.00

## AC LINE FILTERS

The ideal companion for transmitting or receiving applications, line filters provide high RF loss and decoupling of line operated equipment. Rated in a variety of voltage ranges and currents, these 4" square aluminum heavy chassis units block both differential and common mode RF interference while providing solid state overvoltage protection. Available in two or three wire arrangements (120V), each is separately fused and outfitted with 6 foot molded cord. Packed with mounting hardware, extra fuse, 4-page owner's manual.

Model 474-2 or -3,	20VAC, 15A capacity, 2 or 3 wire.	\$44.00 / \$48.00
Model 475-2 or -3.	120VAC, 25A capacity, 2 or 3 wire.	\$44.00 / \$48.00
Model 476	240VAC, 15A capacity, 3 wire.	\$48.00
Model 477	240VAC, 25A capacity, 3 wire.	\$52.00

## BANDPASS FILTERS

Creating a world standard among contesters and high performance stations, Model 400 Series bandpass tranceiving filters pass only band signals, blocking spectrum above and below. Measured attenuations in excess of 60db (full chart in 1992 Catalog), rated at 200WDC transmitter power. Ideal for close-proximity multiple station setups such as Field Day, DX contests, or wherever peak single band low noise performance is sought. Available with S0239 connectors or N style, packed with 4-page owner's manual and mounting hardware. Price \$28.00 each (S0239s) or \$30.00 (N).

Model 403	160 Meters	Model 409	15 Meters
Model 404	80/75 Meters	Model 410	12 Meters
Model 405	40 Meters	Model 411	10 Meters
Model 406	30 Meters	Model 412	6 Meters
Model 407	20 Meters	Model 413	2 Meters
Model 408	17 Meters		

## TELEPHONE FILTERS

The only telephone RFI filters in the world designed for both common mode and differential mode induced interference, Models 465 (30db loss) and 467 (50db loss) are both 4-wire (1 or two 2 line) all modular units that conveniently plug into rear of modular telephones. High permeability toroidal design.

Model 468 is a 4-wire toroid-only assembly that attaches to wall-mounted phones. Model 469 is a toroidal core form available in many colors to attach to and insert about 20db RF loss into telephone handset cords.

Each is packed with 4-page owner's manual and helpful technical hints.

Model 465	Phone filter, 4-wire, 30db loss.	\$17.00
Model 467	Phone filter, 4-wire, 50db loss.	\$28.00
Model 468	Phone filter, 4-wire, 30db loss (wall).	\$ 9.00
Model 469	Handset filter, 20db loss (specify color).	\$ 6.00

(available black, white, yellow, red, gray, light blue, brown, beige, ivory.)

## MOBILE FILTER/REGULATORS

The final word is engine noise interference for most mobile radio applications, Model 443 provides both DC line noise filtration and overvoltage control by regulation to prevent damage to 12 Volt equipment during common periods of voltage regulator switching, startup transients, or recharge cycle fluctuations. All electronic circuit, excellent for 24 to 12 VDC conversion applications. Built in standard 1/8" thick I.C.E. heavy chassis, fuse protected, packed with stainless steel mounting hardware & 4-page owner's manual.

Model 443	25 Amp capacity for 100W or less transceivers.	\$44.00
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50 MHz					
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0508G	1	170	28	15/0.6	Standard
0508R	1	170	28	+	Repeater
0510G	10	170	25	15/0.6	Standard
0510R	10	170	25	+	Repeater
0550G	5-10	375	60	15/0.6	HPA
0550RH	5-10	375	60	+	Repeater HPA
0552G	25-40	375	55	15/0.6	HPA
0552RH	25-40	375	55	+	Repeater HPA

144 MHz					
1403G	1-5	10-50	6	15/0.6	LPA
1406G	25	100	12	15/0.6	Standard
1409G	2	150	25	15/0.6	Standard
1409R	2	150	24	+	Repeater
1410G	10	160	25	15/0.6	Standard
1410R	10	160	24	+	Repeater
1412G	25-45	160	20	15/0.6	Standard
1412R	25-45	160	19	+	Repeater
1450G	5	350	56	15/0.6	HPA
1450RH	5	350	56	+	Repeater HPA
1452G	25	350	50	15/0.6	HPA
1452RH	25	350	50	+	Repeater HPA
1454G	50-100	350	40	15/0.6	HPA
1454RH	50-100	350	40	+	Repeater HPA

220 MHz					
2203G	1-5	10-40	6	14/0.7	LPA
2210G	10	130	20	14/0.7	Standard
2210R	10	130	19	+	Repeater
2212G	30	130	16	14/0.7	Standard
2212R	30	130	15	+	Repeater
2250G	5	220	40	14/0.7	HPA
2250RH	5	250	40	+	Repeater HPA
2252G	25	220	36	14/0.7	HPA
2252RH	25	250	36	+	Repeater HPA
2254G	75	220	32	14/0.7	HPA
2254RH	75	250	32	+	Repeater HPA

440 MHz					
4403G	1-5	7-25	4	12/1.1	LPA
4410G	10	100	19	12/1.1	Standard
4410R	10	100	18	+	Repeater
4412G	20-30	100	19	12/1.1	Standard
4412R	20-30	100	18	+	Repeater
4448G	5	100	22	12/1.1	HPA
4448R	5	100	22	+	Repeater HPA
4450G	5-10	175	34	12/1.1	HPA
4450RE	5-10	175	34	+	Repeater HPA
4452G	25	175	29	12/1.1	HPA
4452RE	25	175	29	+	Repeater HPA
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**Amplifier capabilities:** High-power, narrow or wideband; 100-200 MHz, 225-400 MHz, 1-2 GHz, Military (28V), Commercial, etc. - consult factory. A complete line of Rx preamps also available.

## RX Preamplifiers

Band	Model	NF (dB)	Gain (dB)	Connector
50 MHz	0520B	.5	25	BNC
50 MHz	0520N	.5	25	N
144 MHz	1420B	.5	24	BNC
144 MHz	1420N	.5	24	N
220 MHz	2220B	.5	22	BNC
220 MHz	2220N	.5	22	N
440 MHz	4420B	.5	18	GNC
440 MHz	4420N	.5	18	N
1.2 GHz	1020B	.9	14	BNC
1.2 GHz	1020N	.9	14	N



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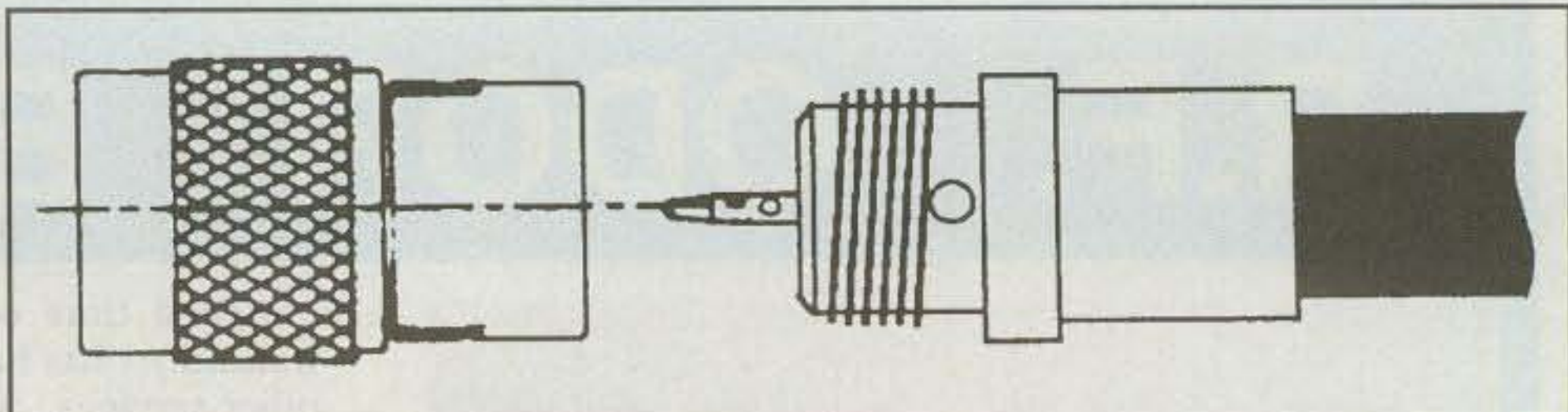


Fig. 2- Using the new Radio Works N-200 Type N connector is almost as easy as installing a common PL-259. The Teflon® dielectric, silver-plated with gold pin connector fits all "RG-8 size" coax, including 9913, 9086, RG-213, and similar coax; with some compromise in specs you can use the N-200 and a UG-176 adapter with RG-8X cable. The connector performs well from HF through about 2.5 GHz.

Alinco, Kenwood, ICOM, Standard, Yaesu, and other radios and scanners, at \$19.95 each; and *Lost Users Manuals*, a 140+ page, \$19.95 reference that contains condensed VHF/UHF mobile, handheld, and scanner radio programming and operating instructions—a lifesaver if you misplace your set's manual.

Artsci also offers *Federal Government Frequency Assignments*, a \$24.95 master frequency file; *U.S. Repeater MapBook*, which at \$9.95 has maps of all 50 states plus most of North America, showing open amateur repeater locations and frequencies; and the *North American Shortwave Frequency Guide*, for \$19.95.

For a catalog, contact Artsci, Inc., P.O. Box 1848, Burbank, CA 91507 (818-843-4080).

**Digital Digest Followup.** It's often said that one of the few things that remain constant is change. Indeed, the buzzword for the 1990s is change. Exponentially increasing electronics technology, largely digital, has seen to that—and one need only look at the "state of the art" amateur radio rigs of bygone years to be convinced. How to keep yourself updated?

Of course, you should read *CQ* and its sister high-tech oriented publication *Communications Quarterly* (subs are \$29.95). A newsletter-style publication dedicated to amateur digital communications and technology that I continue to recommend highly is "Digital Digest." Published bimonthly by Tom Arvo, WA8DXD, "Digital Digest" serves the growing interest in specialized digital techniques by providing practical information on all aspects of digital communications, software, and related technologies. Packet radio, RTTY, AMTOR, PACTOR, CW, FAX, slow- and fast-scan TV, PCs, computer interfacing, and other communications modes are covered. Most of the articles and columns, although technical, are written in a way beginners can easily understand.

Published six times a year, domestic subscriptions are \$16, or \$24 elsewhere. Contact "Digital Digest," 1908 Howell Branch Road, Winter Park, FL 32792 (407-671-0185).

## From the W8FX Mailbag

**Smith Charts on the IBM PC.** Some time ago we received an inquiry from a Canadian reader, Bruno Bouchard, who was looking for an IBM-compatible program to simulate impedance matching. He was looking for a "friendly software implementation" of the paper-based Smith Chart developed by Philip Smith at Bell Labs in 1939, which over the past 50-odd years has become a standard analysis tool for RF

engineers and many advanced amateurs.

Some antenna analysis programs include computerized Smith Chart capabilities. I suggested Bruno use the full-fledged Smith Chart utility program, SMITH.EXE, which is a part of the ON4UN Yagi Design software package offered by John Devoldere, ON4UN (215 Poelstraat, B9820 Merelbeke, Belgium). The package also includes a separate feedline analysis program, but I'm not aware if either program module is available separately.

ON4UN's SMITH.EXE program calculates the transformation of impedance, voltage, and current along transmission lines. The lines can be specified with loss and propagation velocity parameters. The length of the line can be specified in degrees, in physical length, or through electrical measurements. Feedline characteristics, such as velocity factor and attenuation data, are entered by the user.

SMITH.EXE evaluates the characteristics and performance of a transmission line under two distinct situations. The first occurs where you have measured the impedance at the end of a feedline and want to know the antenna's impedance. The second occurs when you know the impedance of the antenna and want to calculate the impedance at the end of the feedline. The results take into account the losses caused by cable attenuation.

Recently, I became aware of two standalone Smith Chart programs. One is the inexpensive Microsmith, by Wes Hayward, W7ZOI, which is optimized for impedance matching applications. Designed to take the drudgery out of hand plotting Smith Charts, it includes a tutorial to teach you the basics of L networks, transmission lines, Z-matching with transmission lines, and more. Microsmith is \$39.95 on 5.25 inch or 3.5 inch disks from HR Bookstore, P.O. Box 209, Rindge, NH 03461-0209 (1-800-457-7373).

A second package is offered by Number One Systems, Ltd. It's a professional-quality RF design and analysis Smith Chart program, Z-MATCH II (fig. 1). It's designed to provide all of the graphical advantages of the original Smith Chart while incorporating many capabilities in a menu-driven format. The program sports a number of advanced features, including wide-range frequency analysis when combined with the company's ANALYSER III linear circuit analysis program, sold separately. Functions comprise plotting impedance, admittance, constant circles for resistance, conductance and SWR, and unity resistance and conductance circles. Z-MATCH II is \$375 in U.S. funds. Contact Number One Systems, Ltd., Harding Way, Somersham Road, St. Ives,



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~ for taking the time to read our ad. If we could, we'd like to call each one of you up and wish you a Happy Hamming Year.

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~ to Stan Burghardt, our founder.

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*Minimizing SWR and reflected power is one of the most common methods of tuning antennas, matching devices, and antenna couplers for best performance. A good example of Bird's highly regarded products is the ThruLine® Model 43 RF Directional Watt Meter, a top professional-quality, insertion-type test instrument that lets you determine accurately how good the match is between your radio, transmission line, and antenna. (Photo courtesy Bird Electronic Corp.)*

Huntingdon, Cambridgeshire, PE17 4WR England.

**Computing on the Cheap.** Many letters we receive ask if we know of inexpensive sources of hamshack software for a particular computer—often an older machine. Sometimes we can help. We maintain a database of all programs previously mentioned in the column, so we often can find the answer. However, this information becomes outdated quickly: new programs are issued, old ones are dropped, popular PCs go out of vogue, and many software vendors disappear after a year or two.

Recently, Santiago Mejia, of the Dominican Republic (who by now should be on the air with a new HI8 callsign) wrote asking what shareware and public-domain hamshack software I would recommend he obtain. He wanted to handle various routine tasks including QSO logging, awards tracking, beam headings, propagation forecasting, RTTY, AMTOR, and the like.

If yours is an IBM PC, you're in clover, as there are numerous sources of inexpensive software with which you can experiment, many of which we have profiled. One source of shareware and public-domain software is commercial shareware disk distributors. Many shareware authors not only upload their programs to BBSes and online utilities, but also send copies to distributors to include in their libraries. Let's profile a few of these distributors here.

**HAM-SOFT Public Domain Software.** HAM-SOFT offers a thick catalog of amateur radio software that includes several hundred program disks for the IBM PC, plus a few for the C-64 and Macintosh. Catalogs are \$1. Contact HAM-SOFT, P.O. Box 443, Galena, TX 77547-0443.

**K-Quest.** K-Quest offers carefully selected IBM PC shareware and public-domain amateur radio programs, plus several "value packs" containing a variety of useful hamshack software. Only the most recent program versions are offered, and each program is tested for proper operation. Handily, the catalog displays typical screens of many programs. For a catalog, contact K-Quest, P.O. Box 92877, Southlake, TX 76092 (817-421-0560).

**Renaissance Software & Development.** This library offers a good selection of top-rated shareware and public-domain software for the IBM PC and compatibles. Included are numerous amateur radio program disks, including several top-notch original software programs. Contact Renaissance Development, Box 640, Killen, AL 35645 (1-800-525-7235).

**Help with Apple IIe Packet Software.** Most of what we have said about inexpensive software applies mainly to amateur radio software for the IBM PC. If you have a Macintosh, Apple II series, Amiga, Atari, C-64, C-128, or other machine, you'll find it much more difficult to find current amateur radio software for them. Ron Boyd, KO4VO, wrote that he could not find any software terminal/communications programs to let him use his Apple IIe with popular packet controllers, and that there was no local support for Apples available to him. Could we help?

I'm not Apple IIe equipped, but I do know that there are few packet implementations for that PC. Recently, however, I became aware of Apple Packet Radio (APR), Version 3, a terminal emulation program for many of the Apple II series of PCs that includes features designed for use with a packet TNC. According to the "Packet Perspective" column in July QST, you can obtain APR by sending a blank 5.25 or 3.5 inch low-density disk with a return mailer and postage to Larry East, W1HUE, 1355 S. Rimline Drive, Idaho Falls, ID 83401. There's no charge for the program to individual users who honor the author's copyright.

We'd also like to highlight some possible sources to explore for Apple II software. First is EPO Corporation (which also sells Commodore and TI programs), at 7805 NE 147th Ave., Vancouver, WA 98682. Second is Kinetic Designs Hamsoft (which also furnishes Amiga programs), at P.O. Box 1646, Orange Park, FL 32067-1646.

**Catalogs to Overseas Addresses?** Frequently we receive inquiries from overseas amateurs and SWLs requesting help in locating some American component, software, or equipment. Typical of these requests was one from SWL Muhammed Jawed, of Karachi, Pakistan, who was seeking a suitable antenna tuner for his Sony ICF-7600D radio. To find one, all that's really needed is to have access to the appropriate catalog—easy for me, hard for him. In his case, I was able to make some suggestions and have several communications catalogs sent to him.

Unfortunately, many American vendors won't send a catalog overseas for free due to high postage costs. Often the dealer requests a couple of dollars or a handful of IRCs for postage, but the fellow overseas doesn't know in advance what the extra postage charge is, and must not only obtain the vendor's correct mailing address but inquire as to the catalog's mailing costs. Sometimes there's a charge for the catalog itself, so the overseas amateur also needs to convert his currency to U.S. funds



and send a money order or check. Sort of a Catch-22.

I notice that some Central and South American amateurs and SWLs, and others, have commercial U.S. mail drops that they use for international mail (letters, package, and QSL) forwarding; some of the letters I receive come through such services. While these services may be relatively costly, they offer a great deal of convenience to the overseas amateur. So if you serve as a QSL manager for an overseas amateur, or have developed an international over-the-air friendship, you might offer to let the amateur use you as a convenient mail drop for such purposes.

**Thanks to All.** We only *sampled* the correspondence received here over the past few months. A tip of the hat for their letters also goes to those we didn't cite in the column: Pat Milne; Bud Thurston; John Wall, KD6OFF; Bob Halprin, K1XA; "Maggi" Maggiorino, IK8GJX.

### Antenna Notes

**Radio Works Dacron Rope and Type N Connector.** Jim Thompson, W4THU, The Radio Works proprietor, recently told me about two long-awaited products. Jim now carries a new Dacron® antenna support line that's made to military specs, as well as easy-to-install silver-Teflon® Type N connectors that are designed to be no harder to work with than PL-259s (fig. 2). With samples of both in hand, they seem like excellent products.

The new mil-spec Dacron® rope is popular with antenna builders because it's inexpensive and has a long service life. But Jim notes that there still are many amateurs who have not yet discovered Dacron and continue to use "hardware store quality" Nylon line. Unfortunately for them, Nylon has a relatively short useful life when exposed to sunlight.

As an antenna support line, Dacron polyester rope has far better characteristic than Nylon. For example, Dacron isn't as elastic as Nylon and thus doesn't stretch as much. Also, Dacron has far better resistance to ultraviolet degradation from sunlight. In addition to its natural characteristics, chemicals and fungus inhibitors usually are added to Dacron to further improve resistance to degradation.

Mil-spec Dacron rope has been available from several sources for several years. But according to Jim, the military's involvement in Operation Desert Storm has made desert-tan Dacron rope very popular at the expense of the olive drab rope. Radio Works has an agreement with one of the original mil-spec textile mills to continue producing the original olive drab line having the same characteristics as the mil-spec stuff. The 700 lb. test, 3/16 inch diameter solid braid rope is 8 cents per foot.

Radio Works also introduced new Type N connectors (Model N-200) that are, thankfully, no more difficult to install than a standard PL-259. The N-200 fits 9913, 9086, RG-213, RG-8, and similar coax; with some compromise you can use the N-200 and a UG-176 adapter with the smaller RG-8X cable. The \$3.25 connector, which performs well from HF through about 2.5 GHz, is silver plated with a gold-plated center pin; the insulator is Teflon.

As we noted previously, Jim has a new "Reference Catalog," which is distinct from his "General Catalog." The new catalog contains many hard-to-find products, including connectors, wire, and coaxial cables not found in

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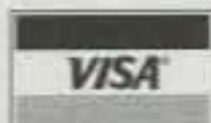
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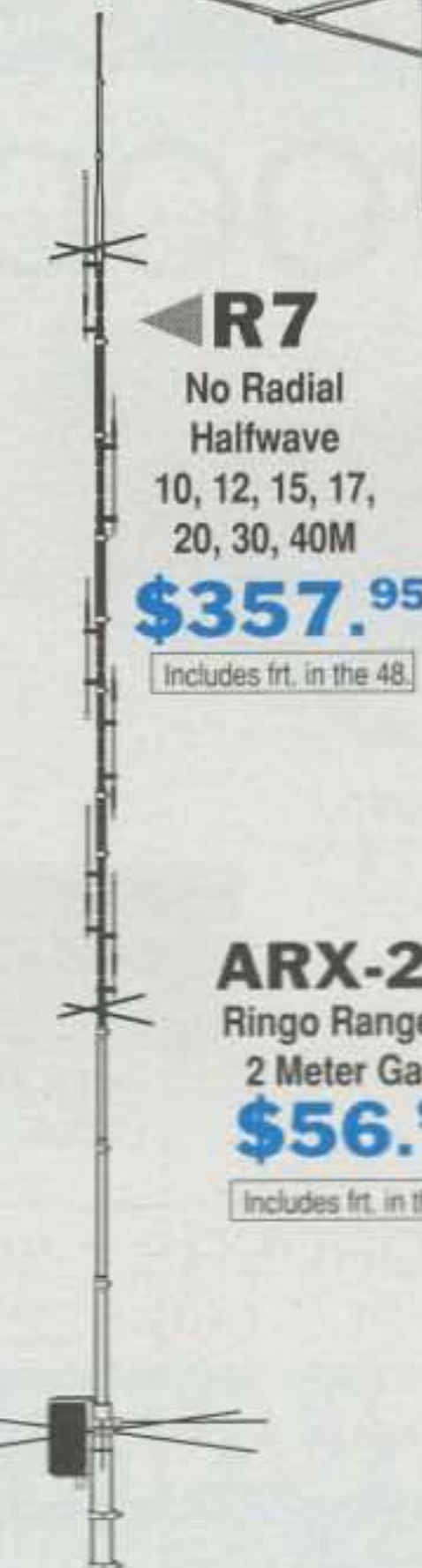
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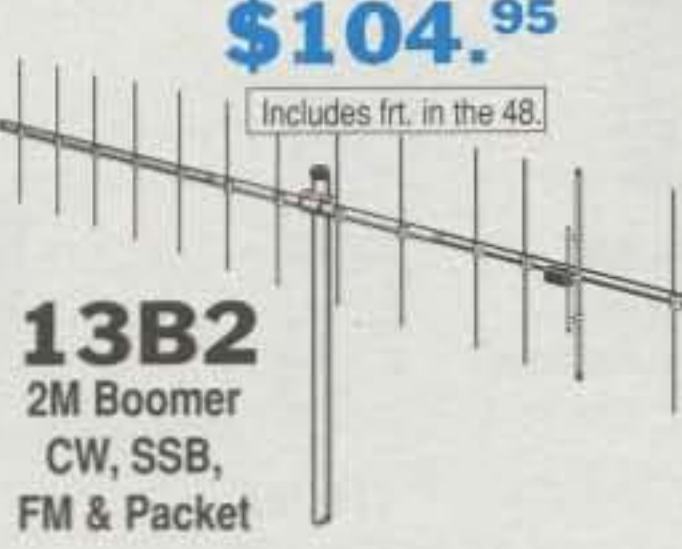
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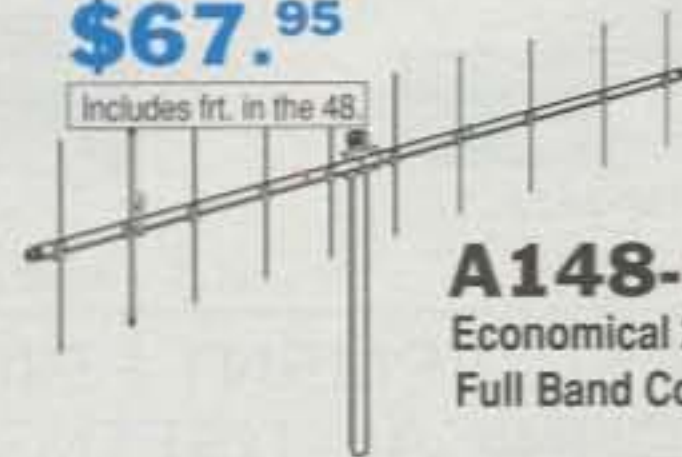
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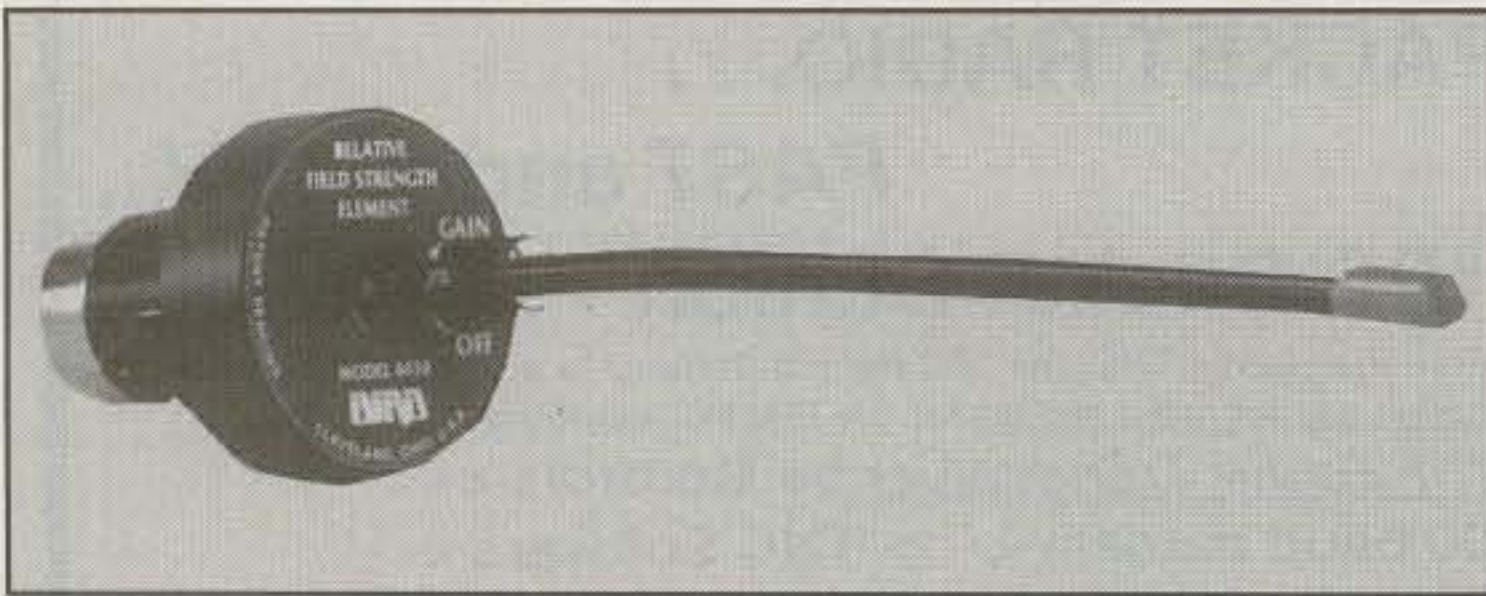
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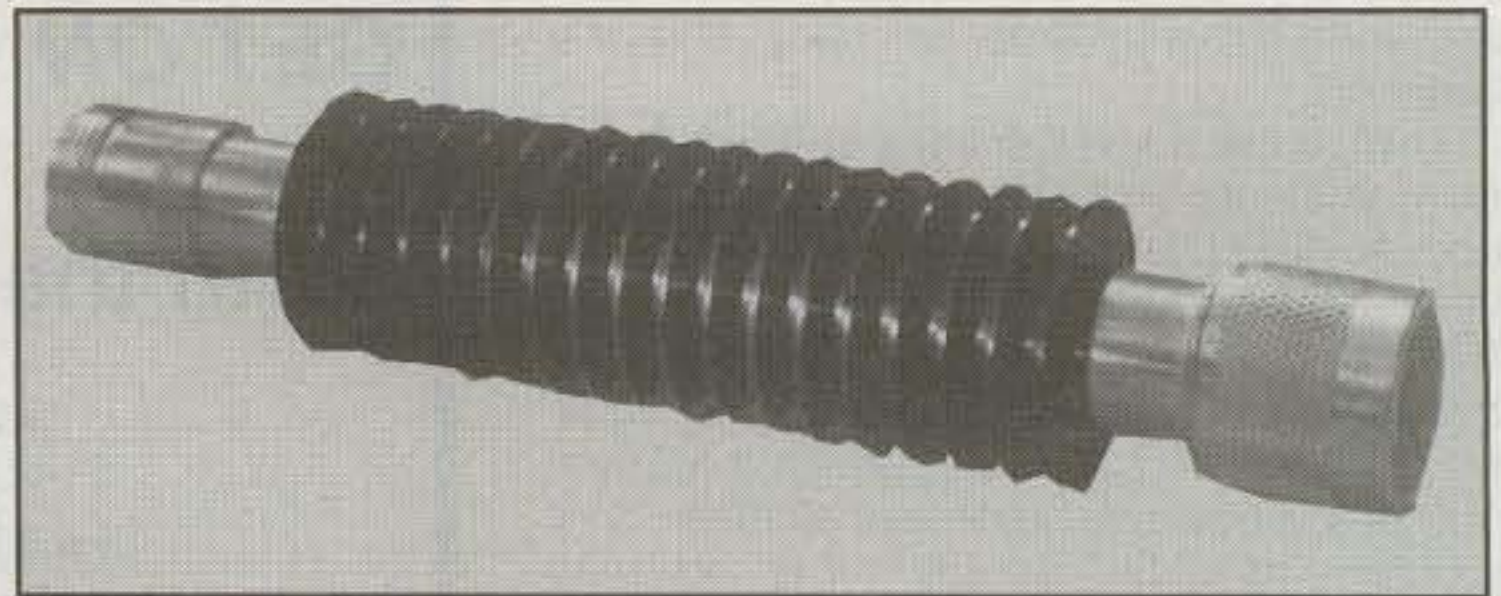
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Bird Model 4030 relative field strength element. Most field strength meters (FSMs) are built with resonant reactive networks that limit their utility. The advent of broadband RF chips allows the design of nonreactive field strength circuits within a small plug-in element for a directional wattmeter, such as the Model 43 (shown above). The Bird Model 4030 relative field strength element, shown here, plugs into any Model 43 wattmeter that was made within the last 35 years. (Photo courtesy Bird Electronic Corp.)



Included in the Bird product line of RF measuring, filtering, and termination devices is the Tenuline(R) series of coaxial RF attenuators. These are similar to dummy loads but are designed for specialized tasks such as harmonic signal analysis and component testing. Various models are available which handle average powers from 2 to 4000 watts and offer attenuation from 1 to 30 dB to as high as 4 GHz. The 25 watt Model 8306 broadband attenuator, with up to 30 dB attenuation, is shown here. (Photo courtesy Bird Electronic Corp.)

the General Catalog. The new Reference Catalog, along with a complementary copy of the General Catalog, is \$4 postpaid from The Radio Works, P.O. Box 5169, Portsmouth, VA 23703 (804-484-0140).

**Bird Instruments.** Bird Electronic Corp. is a respected, old-line RF instrument manufacturer that offers a premium quality line of devices for the measuring, filtering, and termination of RF power to 250 KW. The firm offers precision RF directional wattmeters, SWR bridges, dummy loads, and other instruments for commercial, military, and amateur applications.

Bird has available a slick 50+ page catalog that describes its comprehensive product line of power measuring equipment and other RF

instruments and accessories. Included in the catalog are descriptions of its RF wattmeters, low-pass filters, calorimeters, load resistors, attenuators, coaxial selector switches, directional couplers, and related RF products.

Although aimed largely at commercial, business, and upscale amateur markets, the catalog nevertheless is an excellent hamshack reference and contains a wealth of technical data and tutorial material that effectively explains the theory of operation of many of its products. The power measurement instruments catalog is available from Bird Electronic Corp., 30303 Aurora Rd., Cleveland, OH 44139 (216-248-1200).

**Comet Quad-Band Antenna.** NCG is the distributor for the Japanese Comet Antenna

Co., Ltd., manufacturers of VHF and UHF monoband, dual-band, and tri-band antennas. A variety of base/repeater verticals, beams, and mobile antennas are offered in various monoband and multiband combinations in the 50, 146, 220-250, 446, and 1260-1300 MHz bands.

A recent major addition to the NCG product line is its first "quad-band" antenna. The model CA-HV Quad-Band Antenna, for mobile use, allows you to choose operation on any two HF bands (40/20/15/10 meters) plus constant VHF operation on both 6 and 2 meters. The new antenna mates with PL-259 connectors and is 5 ft. 10 in. in height. It's priced at \$125.95.

For more information, contact the NCG Companies, 1275 North Grove Street, Ana-

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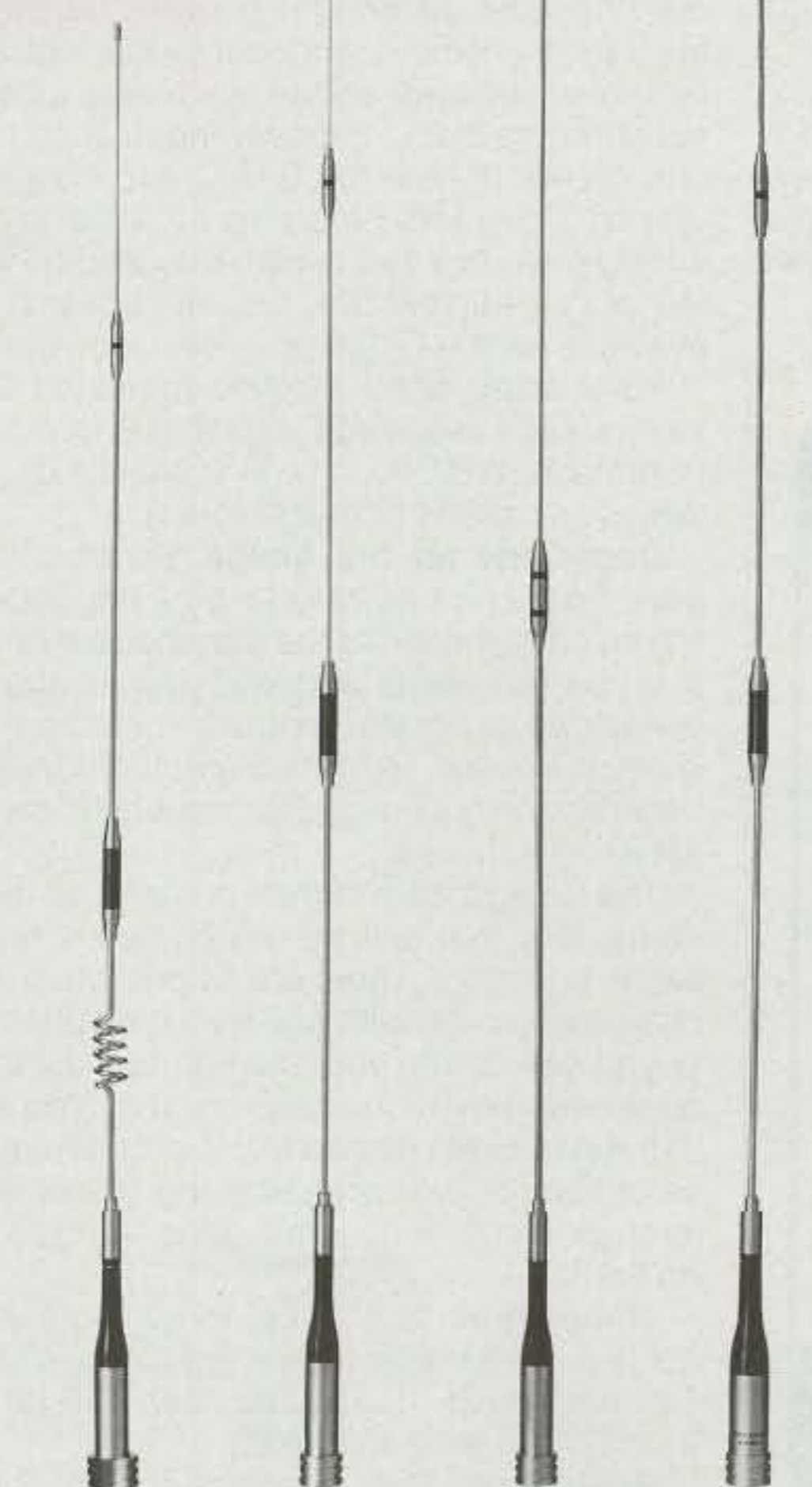
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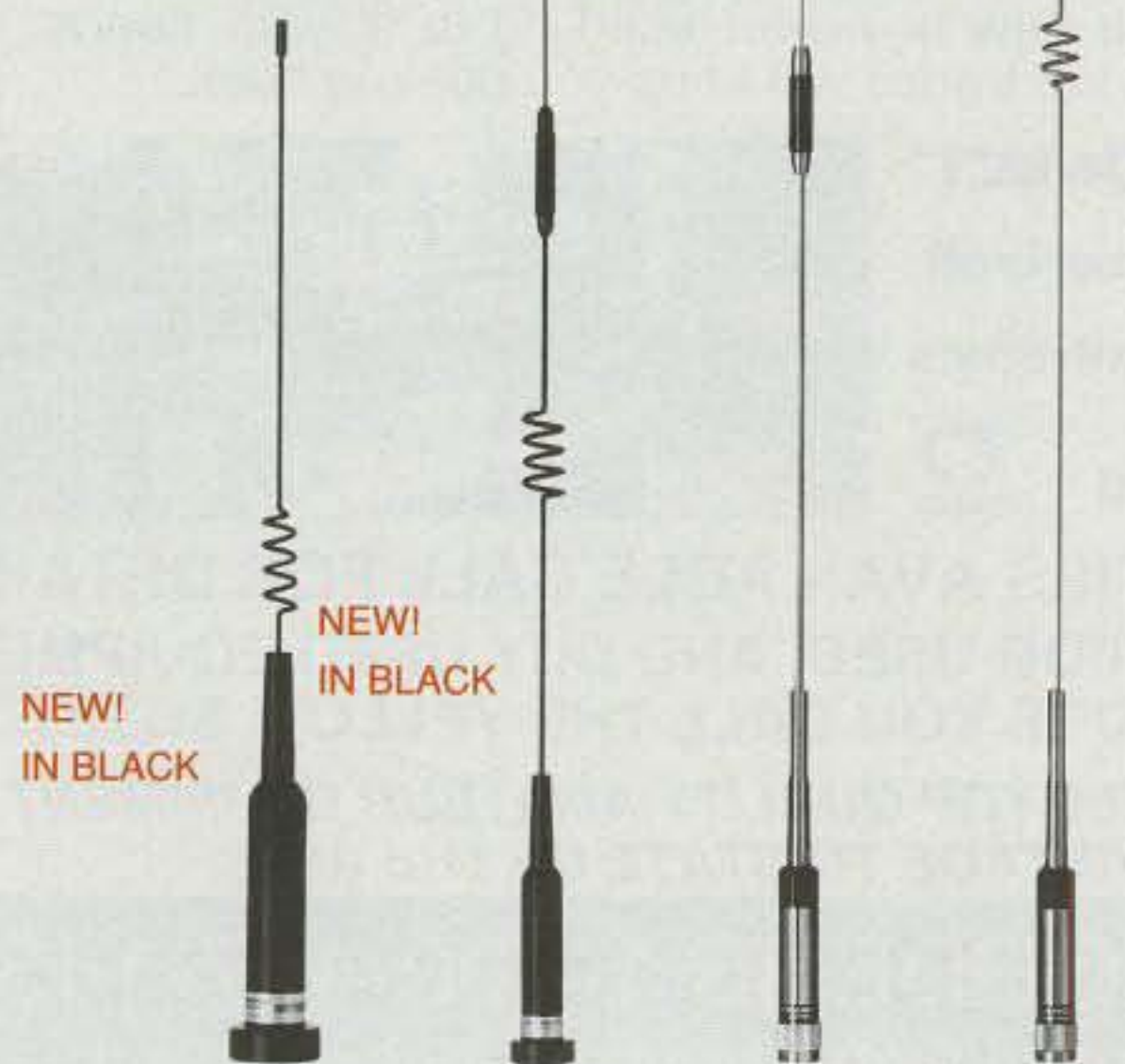
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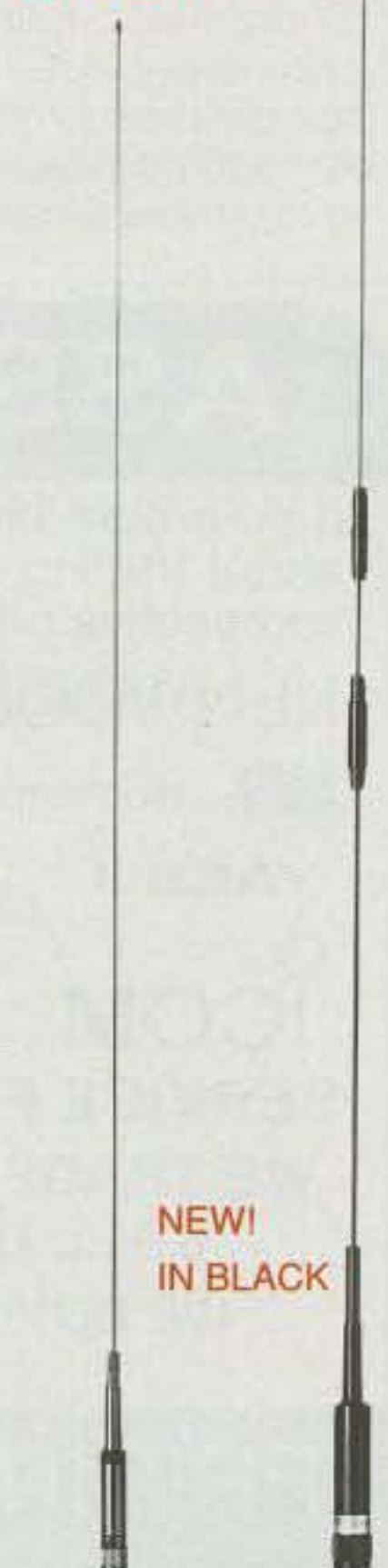
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NR72BNMO NR73BNMO NR770R NR770H

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CR214S CR320A

MODEL	BAND	GAIN(dBd)	POWER (w)	MOUNT	HT (IN)	ELEMENT PHASING
NR-72BNMO	2m/70cm	2.15	100	NMO	13.8	1/4 λ, 1/2 λ
NR-73BNMO	2m/70cm	2.15/5.3	100	NMO	33.5	1/2 λ, 2-5/8 λ
NR-770SA	2m/70cm	2.15/2.15	100	UHF	16.9	1/4 λ, 1/2 λ
NR-770HA	2m/70cm	3.0/5.5	200	UHF	40.2	1/2 λ, 2-5/8 λ
NR-770HNMO	2m/70cm	3.0/5.5	200	NMO	38.2	1/2 λ, 2-5/8 λ
NR-770RA	2m/70cm	3.0/5.5	200	UHF	38.6	1/2 λ, 2-5/8 λ
NR-790A	2m/70cm	4.5/7.2	120	UHF	57.5	6/8 λ, 3-5/8 λ
SG-7000	2m/70cm	2.15/3.8	100	UHF	18.5	1/4 λ, 6/8 λ
SG-7200NMO	2m/70cm	3.2/5.7	150	NMO	36.6	1/2 λ, 2-5/8 λ
SG-7500A	2m/70cm	3.5/6.0	150	UHF	40.6	1/2 λ, 2-5/8 λ

MODEL	BAND	GAIN(dBd)	POWER (w)	MOUNT	HT (IN)	ELEMENT PHASING
SG-7900	2m/70cm	5.0/7.6	150	UHF	62.2	7/8 λ, 3-5/8 λ
SG-2000	2m	5.2	150	UHF	62.6	7/8 λ
NR-140A	1-1/4m	3.8	100	UHF	36.2	5/8 λ
NR-124	23cm	8.4	100	N	25	4-5/8 λ
CR-214S	2m/1-1/4m	2.15/3.4	120	UHF	37	1/2 λ, 5/8 λ
CR-224A	2m/1-1/4m	5.0/6.0	150	UHF	68.5	7/8 λ, 2-5/8 λ
CR-320A	2m/1-1/4m/70cm	2.15/3.8/5.5	200/200/100	UHF	37.4	1/4 λ, 1/2 λ, 2-5/8 λ
NR-2000NA	2m/70cm/23cm	3.15/6.3/9.7	100	N	39	1/2 λ, 2-5/8 λ, 5-5/8 λ

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heim, CA 92806 (714-630-4541).

**Bilal Isotron Followup.** As we noted in 1988 and 1989 columns, The Bilal Company is a small antenna manufacturing firm, active since 1975, with a single product line—the compact Isotron antennas. The small HF antennas are designed especially for portable and restricted-space operation, and so lend themselves to emergency, Field Day, motel, maritime, and similar use where larger antennas are impractical. Construction is of tempered aluminum, PVC, cast acrylic, and stainless steel.

According to Ralph Bilal, WDØEJA, the small size and unusual shape of the Isotrons belies their good performance, which is claimed to be roughly equivalent to that of standard half-wave dipoles. Despite the small size (32" x 16"

x 15" for the 80 meter version, for example), the antennas have reasonably large areas and are made electrically resonant using large coils in series with the capacitive plates of the antennas.

Six amateur single-band versions are available which cover 160, 80, 40, 20, 15, and 10 meters. Other models cover the 11 meter CB band and MARS, CAP, and FAA frequencies in the ranges 1.8–7.3 and 14.0–30.0 MHz. Prices range from \$32.95 for the small 10 meter Isotron to \$149.95 for the 160 meter model.

For more details, contact the Bilal Company, 137 Manchester Drive, Florissant, CO 80816. Note that Ralph has available copies of five reviews that appeared in *CQ*, *73 Amateur Radio*, and *Worldradio*; include an SASE with your request.

## Software Topix

**MININEC3 for the Commodore 128.** On several occasions we have lamented the lack of Commodore 128 hamshack software. Bill Robertson, W8KHO, took our comment to heart and has rewritten the popular MININEC3 antenna design software for the C-128.

Bill says that the compiled version will handle 77 pulses. Among the features he added are files for geometry, impedance, current, and patterns. He also added an output device option to the menu. Bill is willing to send anyone copies of both the BASIC and compiled version along with programs for reading and writing geometry files (which may also be written within MININEC3). No instructions are available for the C-128 programs, however.

For a copy, send a blank, formatted 5.25 inch diskette in an SASE disk mailer to William Robertson, W8KHO, 11408 Brantford Ct., Ft. Wayne, IN 46804 (219-432-9851).

**CopyCode for the Amiga.** Sensible Software Solutions has introduced CopyCode, a Morse code trainer for the Commodore Amiga that you can use to upgrade your amateur license. All program controls, including frequency, volume, weight, character formation, transmission speed, and lesson length, can be set using a mouse.

The CopyCode program contains all of the characters that will be encountered on an exam, and more. There are 14 predetermined character groups with which you can practice, or you can create your own groups using an on-screen keyboard presentation. You also can run multiple copies of the program at the same time to practice receiving Morse code through interference. (Yes, gang, Amigas can do that!)

The program is \$23. For more information, contact Sensible Software Solutions, 4951-D Clairemont Sq., Suite 262, San Diego, CA 92117-2798 (619-452-1938).

**ScanBase.** This Windows-based shareware database program by Tony Bovee, KD6QDL, is designed to enhance scanner radio operation and convenience. The program remembers everything you need to know for up to 500 channels on your scanner; it can maintain up to eight separate databases for a grand total of 4000 frequencies. Besides keeping a description for each frequency, the program also helps determine which channels are active and keeps track of which channels you have locked out.

According to Tony, the program was first released in October 1991 and is now up to Version 3.0 or higher; it includes on-disk documentation. The program has been uploaded to CompuServe, where it's available in the HAMNET and WINADV forums as SBASE.ZIP. Program registration is \$15; for \$25 Tony will send you a disk with the latest version.

Contact Tony Bovee, KD6QDL, 330 Canal St. #2E, San Rafael, CA 94901 (415-457-0931).

**Quickyagi Update.** In 1988 and 1991 columns we mentioned Quickyagi, originally known as Yagi Antenna Designer, describing the updated Quickyagi II program in November 1991. To briefly recall, it's an automatic Yagi designer, optimizer, and analyzer for non-technical users. Its many features include manual, semiautomatic, and automatic calculation modes; fast elevation and azimuth polar plots; calculation of forward gain, F/B ratio, and

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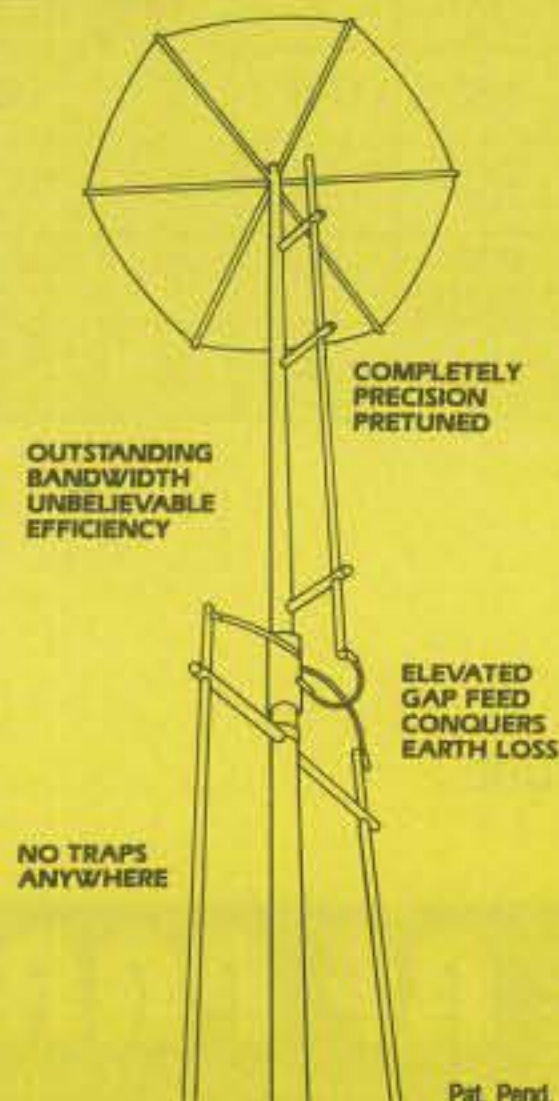
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impedances; saving and retrieving of antenna files; tapered element compensations; metric conversions; a folded dipole option; and full documentation. You can print antenna files as well as radiation pattern and impedance/SWR bandwidth charts.

A newly upgraded program (V2.5) handles 2 to 17 elements from 1.5 to 999.999 MHz with a claimed accuracy of  $\pm 5$  percent or better. The new version of Quickyagi II is available on 5.25 or 3.5 inch media and is priced at \$40.

For more information, contact Chuck Smith, WA7RAI, P.O. Box 1637, Chino Valley, AZ 86323.

**AMSOF Update.** If you have a CD-ROM drive installed on your PC, you know that a very good (and cost-effective) way to build up your software collection is to obtain CD-ROM discs of shareware and public-domain programs.

AMSOF has collected about 275 MB of amateur radio, SWL, and scanner-oriented shareware and public-domain software, placing it on its "World of Ham Radio Shareware" CD-ROM, Vol II. We described this CD-ROM by Pete DeVolpi, KC3TL, in last March's column.

As we noted then, the \$79.95 disc contains over 8000 files. The files are arranged in sub-directories in which similar programs are grouped, or which correlate to the floppy-based disk library that AMSOF also offers. According to a calculation Pete printed in a recent catalog, when compared with floppy prices, the purchaser gets "\$854 worth of software for \$79.95," a projected savings of about \$774. While one might possibly argue the real-world implications of these figures, they do attest to the significant media economies possible with CD-ROMs.

We should note that the success of the AMSOF CD-ROM doesn't completely replace Pete's extensive library of hamshack software on 5.25 and 3.5 inch diskettes. Besides individual disks, he also offers "Ham Set One Collection," a bundle of 113 carefully selected amateur-related programs on nine 3.5 inch 720K diskettes, at \$30. The AMSOF catalog also includes a cross-reference index guide that shows any program duplications across the library.

For a catalog, contact AMSOF Ham Radio Software, P.O. Box 666, New Cumberland, PA 17070-0666 (717-938-8249).

**Namlulu Communications Update.** In previous columns we briefly profiled the inexpensive hamshack, music, and other software programs for the IBM PC, offered by William F. Baylor, Jr., NN8Z, and Adelaide ("Ad") Baylor, KE8ZM, under the Namlulu Communications name. The software is programmed using Borland Turbo Pascal, Borland C++, and assembly language, combined in such a way as to increase efficiency while minimizing program size.

More than a half-dozen hamshack programs are available for logging and records management, QSL tracking and address directory maintenance, participation in the CQ WW WPX Contest, telephone and address list maintenance, electrical and other formula calculation, and QTH location and searching. Programs range in price from a modest \$7.95 to \$19.95. Namlulu Communications also offers other software, including a series of nine instructional programs that teach Turbo Pascal programming. Each of these disks comes complete with a running program and the original source code; these are \$3.95 each.

In addition, a demo disk, DEMO12, contains a cross-section sample of about a dozen hamshack, music, and Turbo Pascal programs. The 1.2MB, 5.25 inch demo is priced at \$3.95. For information, contact Namlulu Communications, 1120 Meadowview Road, Willard, OH 44890 (419-935-0270). Bill promises more programs to come in 1994 to provide, he says, "the alternative to the present ham software market."

### Short Bursts

**Another WAØKKC Suggestion.** Frequent correspondent Richard Mollentine, WAØKKC, regularly FAXes us antenna or tower-related tips, many of which we find appropriate to share with readers. This time Richard simply offers food for thought, reminding us "silent listeners" that, as the sunspot numbers sink, often a dead band is not what it seems.

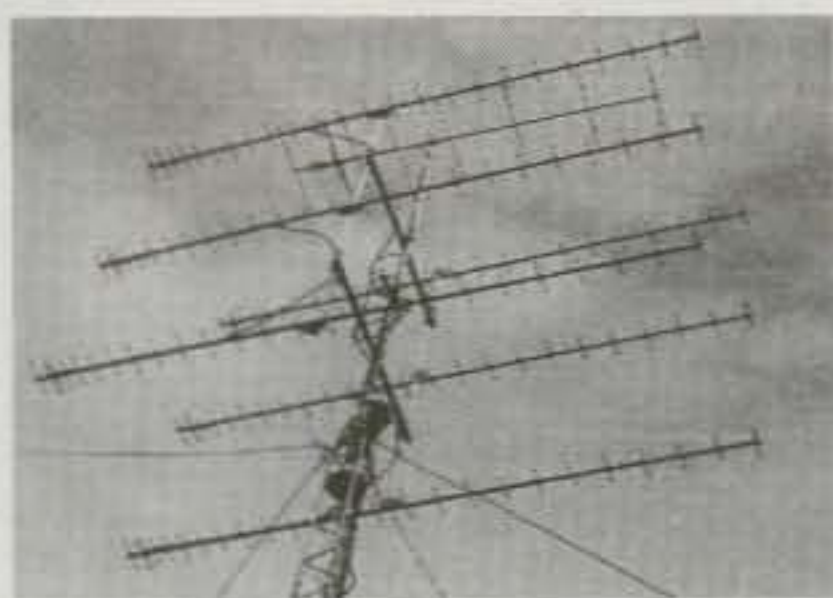
After checking 10 meters recently, he determined that the band was "dead as a mackerel," but on a lark dusted off an old 11 meter set and turned it on. What a shock: practically every one of its 40 channels was popping with "skip talkers"! The moral here is that just because you don't hear anything on a specific amateur frequency doesn't mean you should necessarily conclude that the band isn't open. The rest may all be listening.

### Wrap-Up

That's all for this month. Next time more Antennas and Accessories topics of interest. *Overheard:* Profanity? It's the one language in which all computer programmers are fluent.

73, Karl, W8FX

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RA8-2UWB	144-148MHz	8el	11.8ft	11.2	DBd	91.75
FO12-144	144-146.5MHz	12el	17.3ft	12.6	DBd	142.50
FO12-147	145-148MHz	12el	17.3ft	12.6	DBd	142.50
FO15-144	144-145MHz	15el	25.1ft	13.8	DBd	192.50
FO16-222	222-225MHz	16el	17.3ft	14	DBd	129.95
FO22-432	432-438MHz	22el	14ft	15.8	DBd	114.95
FO22-ATV	420-450MHz	22el	14ft	15.8	DBd	114.95
FO25-432	432-438MHz	25el	17.1ft	16.5	DBd	134.95
FO33-432	432-438MHz	33el	24.3ft	17.8	DBd	223.95
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**MK II's** 2 1/2"w, FM, SSB/CW portable. Requires 12V DC @ 1.1A, or opt. battery case with 9 (C) cells or nicads. DTMF mic with up-down control, dual VFOs, 10 memories with scan. Offset tuning, LCD display. 2 1/2"h x 6 1/2"w x 7 1/2"d, 2.6 lbs.

**FT-290R MK II** • 2 meters, 25W **☎**

**FT-690R MK II** • 6m, 50-54MHz, 10W **☎**

**FT-790R MK II** • 430-450MHz, 25W **☎**



**YAESU FT-5200** • 2m/440MHz FM Mobile. Covers 140-150 (tx), 140-174 (rx) & 430-450MHz. 32 memories, CTCSS encoder. (2m) 50/5W, (70cm) 35/5W. Cross band full duplex. DTMF mic., detachable front panel for remote. 5 1/2"w x 1 1/2"h x 6"d, 2 lbs. **☎**

**FT-5100** • Like 5200 w/o remote cap. **☎**

**FT-6200** • 35/10w, 440MHz/1.2GHz **☎**

**FT-2200** • 50w 2m FM xcvr w/TTP mic **☎**

**FT-7200** • 35W 440MHz FM/TTP **☎**

**FT-912RH** • 1.2GHz, 10W, 12VDC @ 4A **☎**

**YAESU FT-2400H** • Rugged 2m FM mobile. 50W/25W/5W. Receives 140-174MHz (140-150MHz tx). 31 memories, CTCSS encoder, 5 scan functions. Programmable call channel, auto. offset. Backlit DTMF mic. 6"w x 1 1/2"h x 7"d, 1 1/2 lbs. **☎**

**YAESU FT-7400H** • 35W 440MHz FM **☎**

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**YAESU FT-411E (C)** • 2m, 140-150MHz (tx), 140-174MHz (rx). 2 1/2"w FM HT. LCD, keypad and rotary-dial frequency entry. 5 1/2"h x 2 1/4"w x 1 1/2"d, .85 lb. **☎**

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**YAESU FT-470 (B)** • 2m/440MHz, 2.3w, FM HT. Similar to FT-411/811. Simult. receive, both bands, 21 memories/band. 6 1/2"h x 2 1/4"w x 1 1/2"d, .88 lbs. **☎**

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**FT-76/25** • 70cm, 2W, 430/450 MHz **☎**

**YAESU FT-23R-17 (E)** • 2m FM HT 2.5w output, rotary dial frequency entry, LCD display, 10 memories, scanning, priority. Rugged and weatherproofed. 4 1/2"h x 2 1/2" x 1 1/2"d, 1 lb. **☎**

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# PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

BY BUCK ROGERS, K4ABT

## A Description of APRS By WB4APR, And More!

**S**o much is happening in packet radio that I can't remember which period of the past eleven years of packet has been the most exciting. There's no question about it: Digital communications has made amateur radio one of the most fascinating hobbies in which anyone could become involved. Best of all, it's easy to get into packet, and it's easy to understand and enjoy it. After the initial packet station is put together (see October 1993 CQ, page 118) the rest is a piece of cake.

### Milestones

In 1983 I began passing artifact (four color) pictures via packet using a Tandy/Radio Shack Color Computer (COCO). Back then the program I used to generate the pictures was called "GRAPHICOM." Once the picture was drawn or digitized, I had to convert it from a binary format into an ASCII format (using BTOA.BIN) so that I could pass it to another station. That station then had to run the ATOB.BIN to convert the file back into a binary format. If the target station was using a COCO, he/she could run the "GRAPHICOM" program and view the picture.

In 1985 I purchased an IBM PC with a CGA monitor and became involved in a new world of packet and a program called MULTICOM.EXE. WD4MNT, Bob Slomka, put together a program that not only sends and receives binary files, it also saves them to disk as they are coming in.

In addition to binary files, MULTICOM.EXE sends and receives high-resolution pictures—that is, 256 colors and VGA. To make this packet mode even more exciting, Bob enabled the VGA color pictures to paint onto the screen as they are being received. As if the CPU was not smoking enough, Bob wrote MULTICOM.EXE so that while the picture is painting onto the screen (without errors or streaks), it is also spooling to the hard drive (saving to disk).

As exciting as we find these packet modes to be, still there comes more! In the short period of this year alone, we have seen advancements that have revolutionized packet radio.

With the addition of the hardware PCB to enable the NET version X-1J node to read the deviation of any connected sta-

211 Luenburg Drive, Evington, VA 24550

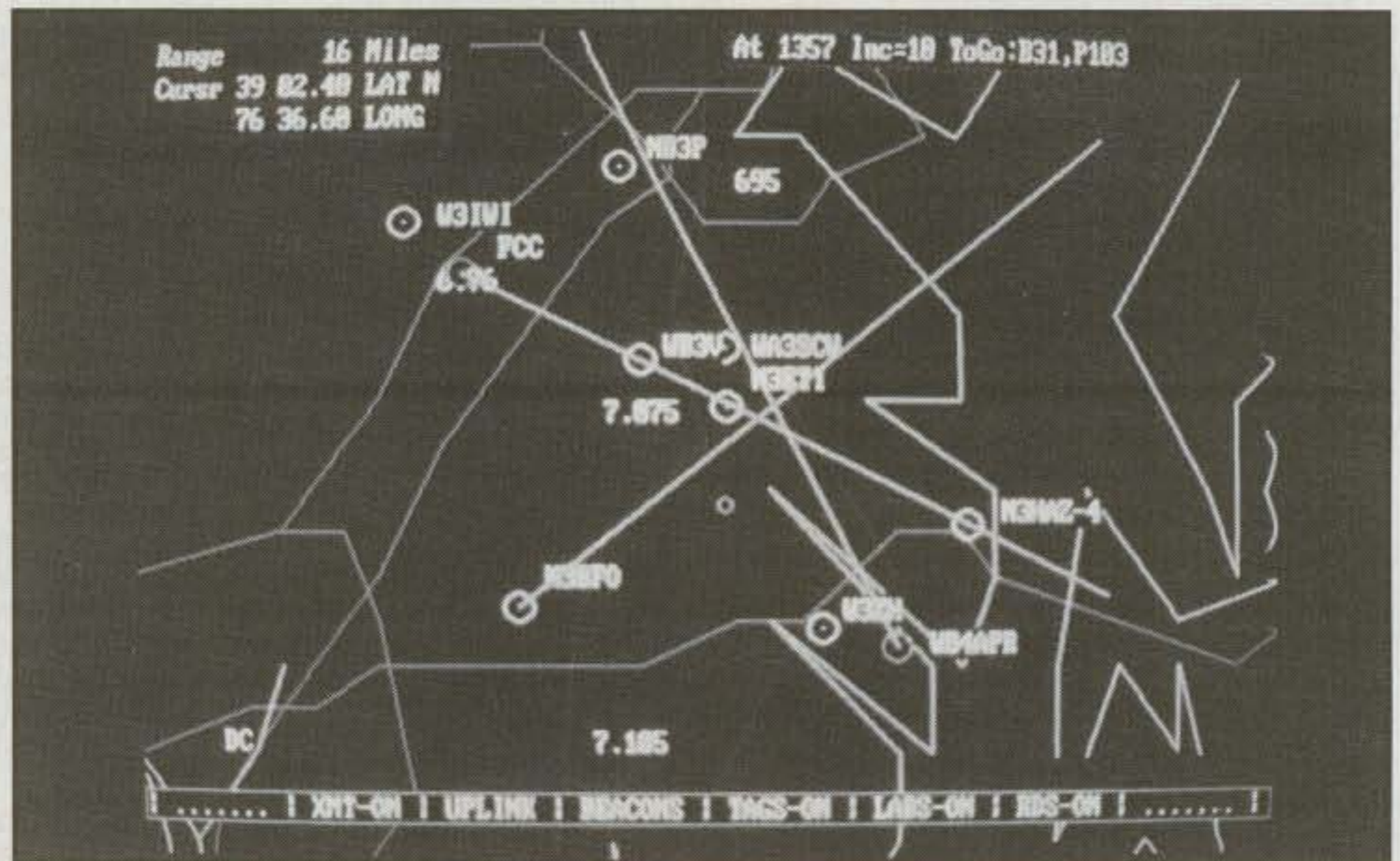


Fig. 1— This photo shows the triangulation feature of APRS being used to plot the location of an interfering signal. Any APRS station can insert a beam heading into his position report so that others can display a line of bearing from their station.

tion and soon temperature, voltage, and signal strength, we've discovered yet another fascinating facet of packet that offers an even higher level of interest.

With the exception of BBS use and DX spotting networks, packet radio has long since left the "type text and enter" stage.

The advances in packet radio digital technology have brought us to the frontier of space.

Sure, we have packet communications via satellites. Even more exciting, however, is we now have the ability to use the Global Position Satellites (GPS) with a

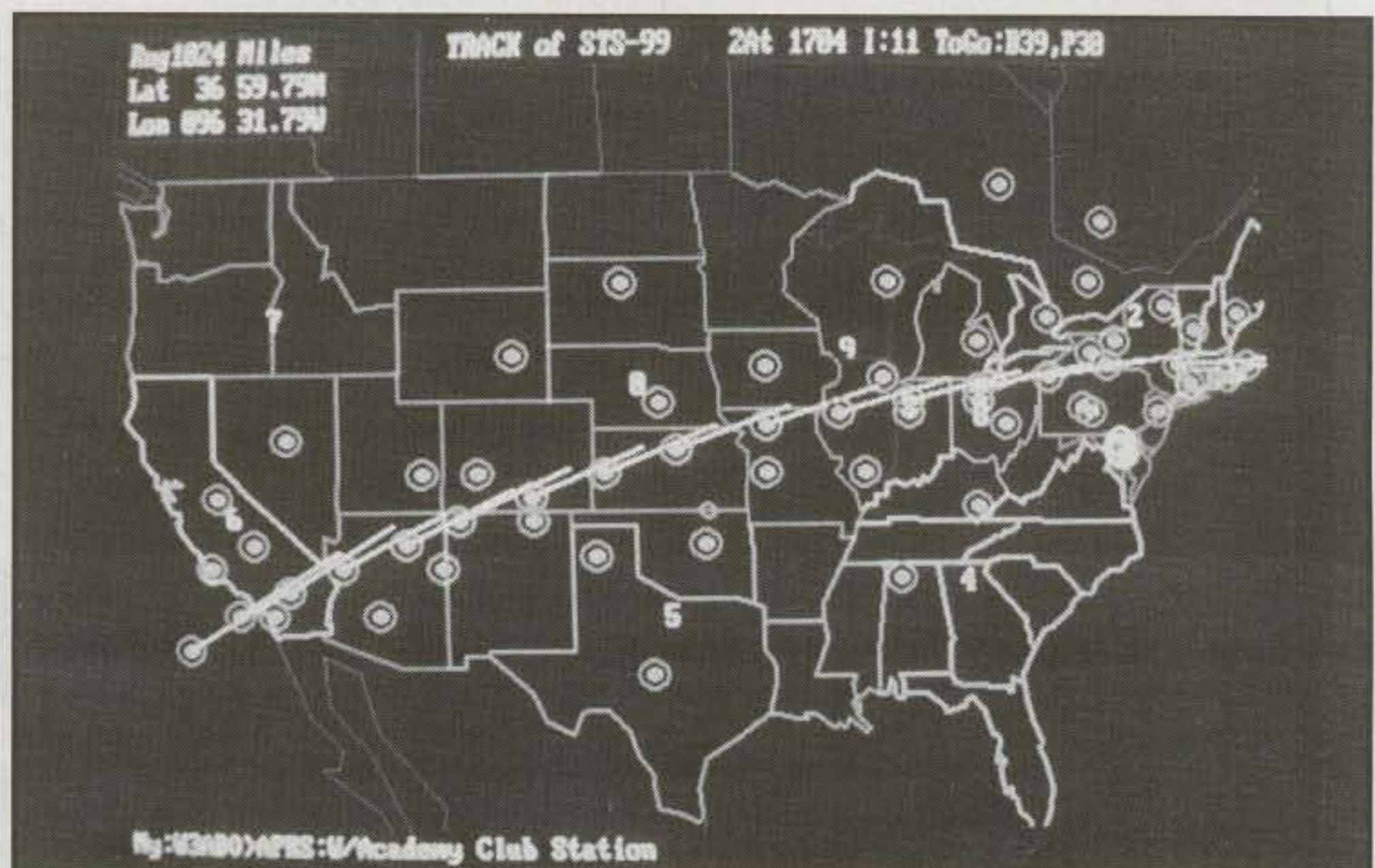


Fig. 2— This shows the APRS display of a simulated track of the Space Shuttle across the US sending its GPS position about every 2 minutes. All stations who are beaconing their LAT/LONG and were digipeated by the SAREX show up in real time. Callsigns have been suppressed to keep the picture uncluttered..





Fig. 3— Here the APRS is being used to track the running of a local marathon. Nine portable packet stations were used along the course for displaying the location of the LEAD, PACK, and TAIL bicycles. Although the bicycles were equipped with GPS interfaced to TNCs, a lot of the tracking was done by manually updating the position of objects along the course.

packet application. GPS is a fact of life, and soon it will be as much a part of our society as the cellular telephone. As a matter of interest, we may soon see this feature as an option when purchasing an automobile, just as we now have the purchase option of a CD player.

### Automatic Packet (Position) Reporting System (APRS)

We are about to discuss a shareware program that utilizes packet radio in a manner you may never have dreamed possible. What's more, the implementation of this software is so easy that I had this system operating in less than an hour on a cool Virginia Sunday afternoon.

Please don't leap to any conclusions. You don't need a GPS receiver to use this software. All the support documentation and executable files come to you on one disk. The disk is available from the author or from many telephone BBSes.

To become a registered user, you may send \$19 to the author of the software at the address shown later. If you don't already have a shareware copy of the software, include an SASE (52¢ in stamps attached) and a formatted MS/DOS disk. That way you receive the latest release of the software and become a registered user. If you don't wish to send the SASE and formatted disk, include an additional \$5 (\$24 total) to cover the added expense of addressing envelopes, furnishing and formatting disks, and postage. The registered user receives a password that allows extra features to be utilized within the APRS software. After several weeks of my using this software, the novelty of its usefulness is still there.

In addition to the APRS application, there is more fun to be had by ordering the WX add-on software to enable the use of a weather station similar to the Peet Brothers "Ultimeter II" (see page 51, October 1993 CQ). I'll have more on the implementation of the weather station into the APRSWX software in a later issue.

### The APRS Author Speaks

Who am I to keep all the fun to myself? I'm a happy user, but who better to explain the APRS shareware than the author himself. Following is his description.

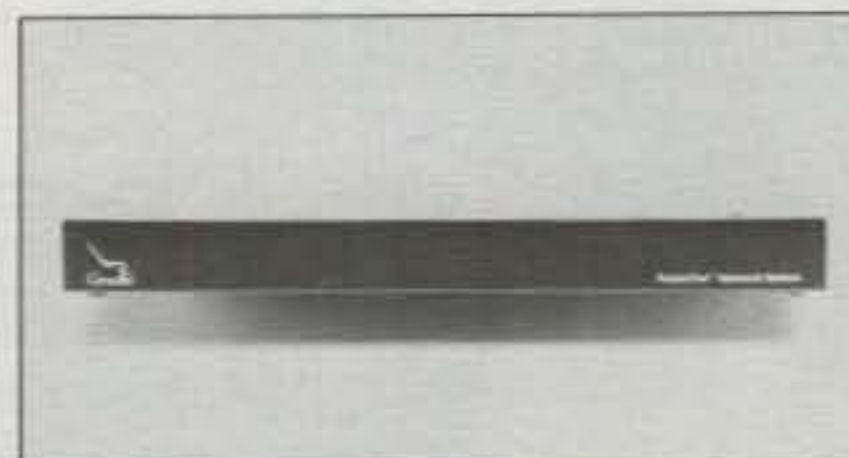
#### Automatic Packet Reporting System (APRS) A Graphical Packet Tracking and Reporting System By Bob Bruninga, WB4APR

Imagine sitting down at your packet station and instead of seeing a screen full of text scrolling by, you see a color map of your local area with all packet stations geographically positioned. The bottom few lines show conventional monitored packets, but you are alerted each time someone sends a new BTEXT or sends you a message. If you have been away from your screen for a while, with one key stroke you get a full screen display of all BEACONS monitored and the time of last receipt. Now imagine seeing one of the packet stations moving on the map!

Any station with access to GPS, LORAN, or any other low-cost navigation device can report his moving position as often as he likes! Even without automatic interfaces, any station can update his position on the map simply by moving his cursor. All other stations will see the same movement!

Imagine hitting one key and seeing a triangulation of beam headings for locating an interfering signal (see fig. 1).

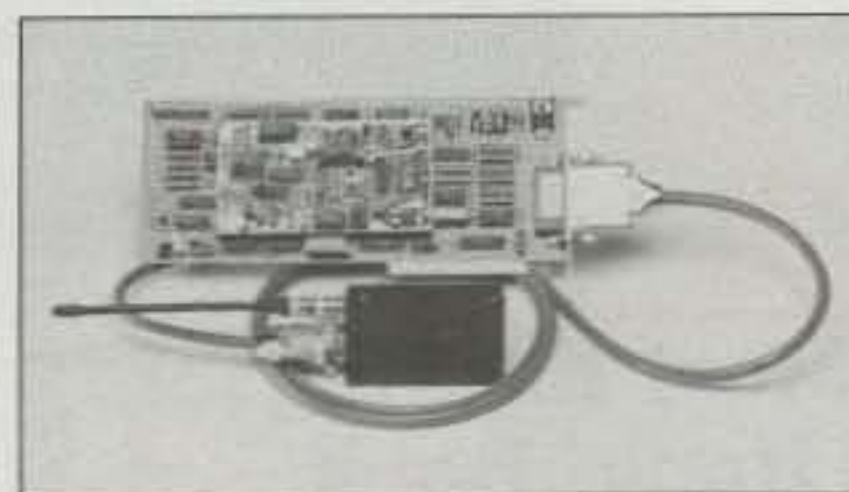
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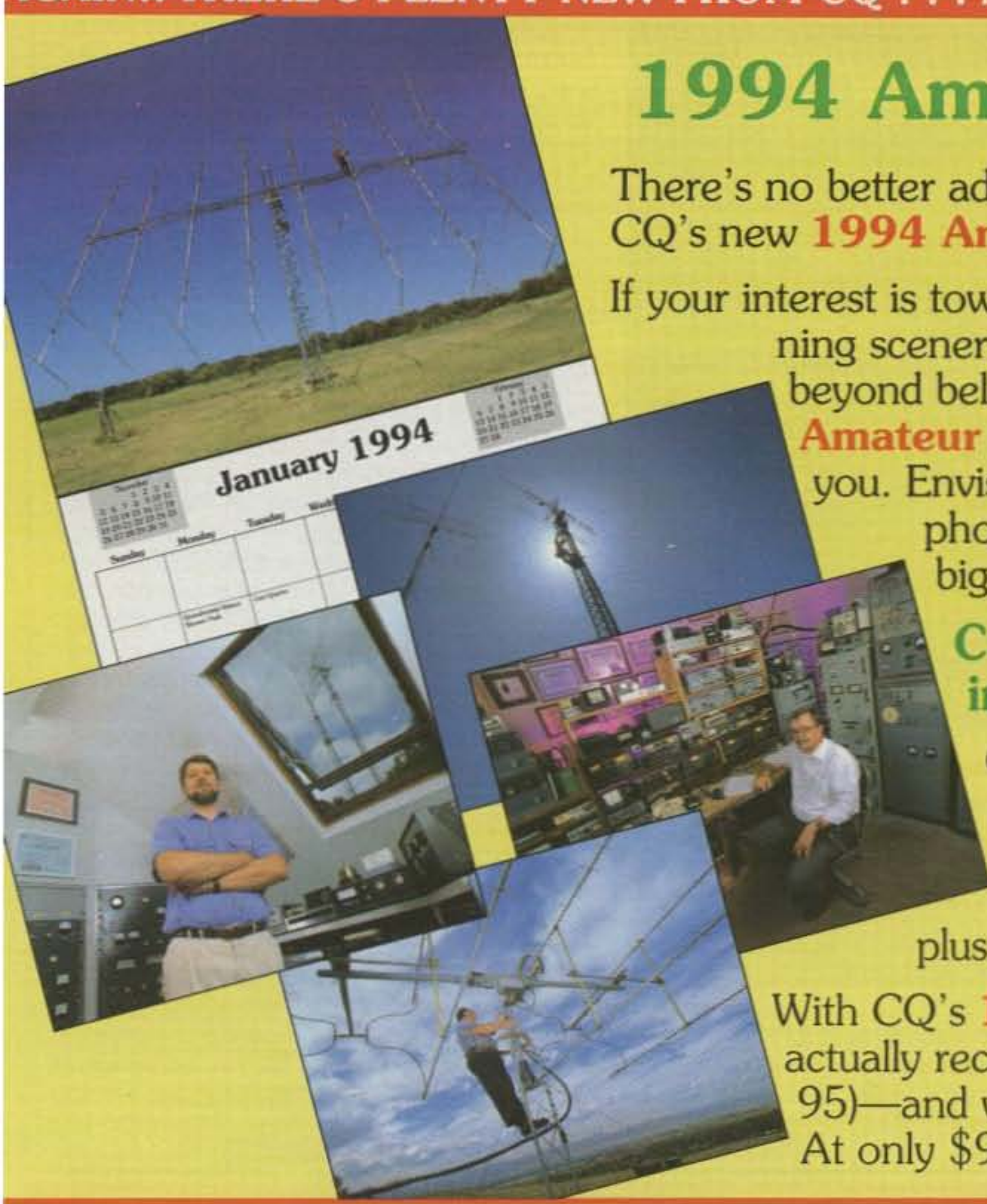
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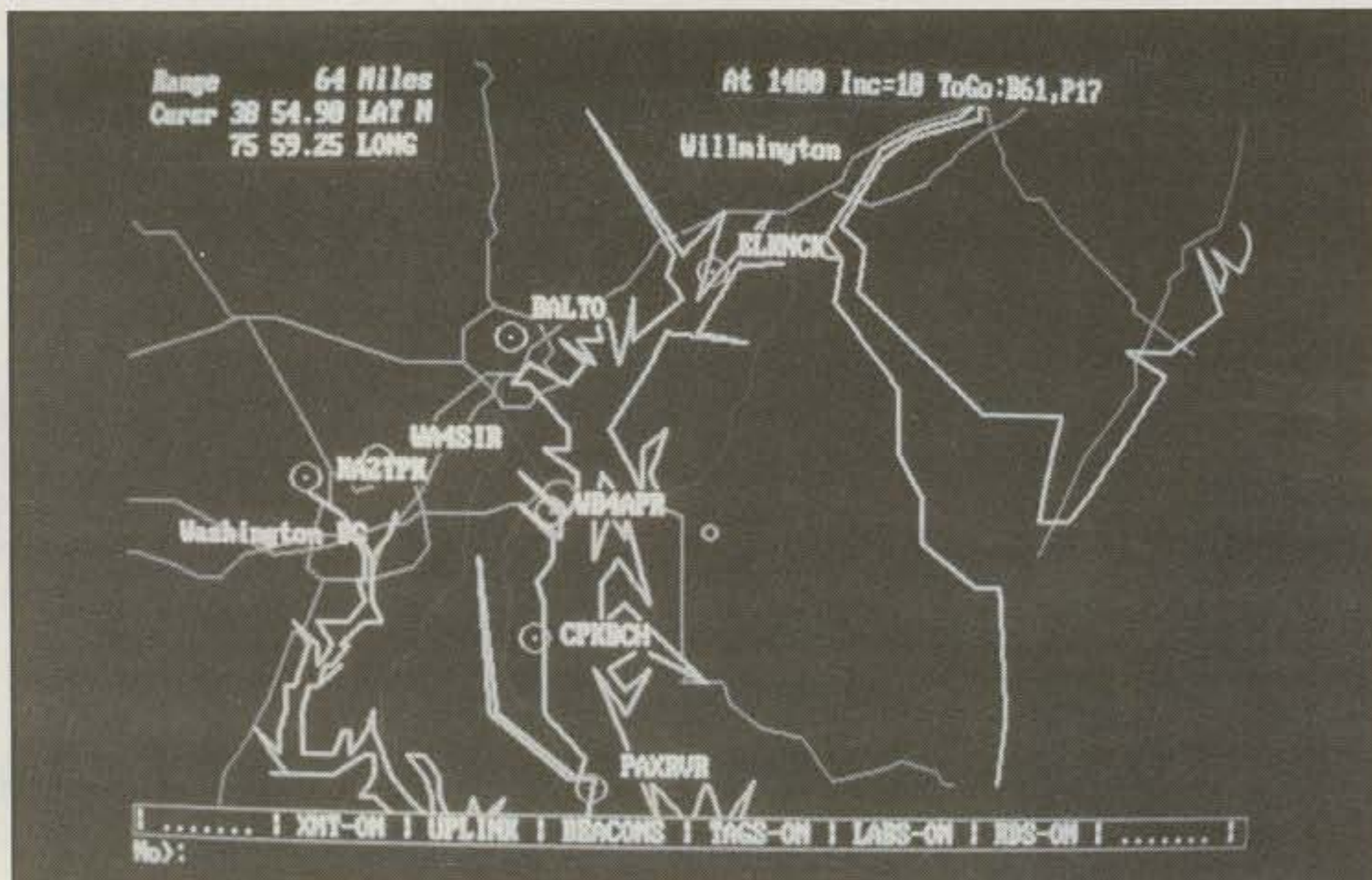


Fig. 4—The APRS network along Chesapeake Bay. The APRS nodes are used to relay the movement of boats and for reporting weather conditions along the bay via the SKYWARN system. Currently, automatic APRS weather nodes are under construction for automatically transmitting one-line weather conditions once every 15 minutes. All weather reporting stations are shown in blue with an arrow showing wind speed and direction.

Imagine sitting at your PC and overlaid on a map of the US, you see the location of all stations on your HF packet frequency. Consider tuning in the Space Shuttle or Space Station MIR packet frequency and seeing each ground station who successfully digipeats through the spacecraft show up on the map as

the spacecraft flies over. Imagine the spacecraft showing its instantaneous position as it moves (see fig. 2).

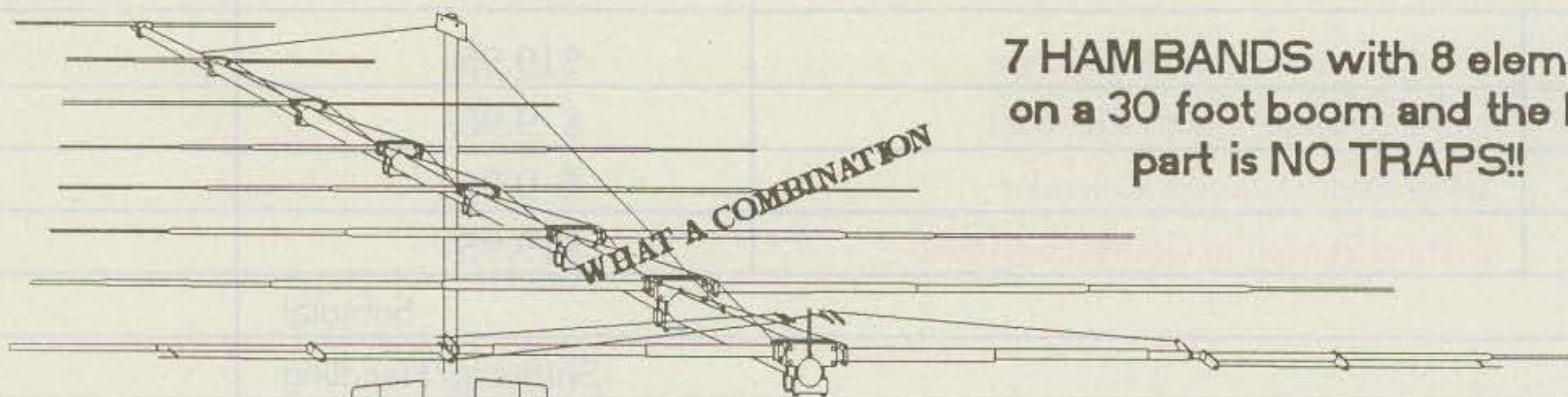
Imagine using packet radio for a public service event where all stations have a color map of the event on their screens showing the locations of all stations and key assets.

Stations can still communicate in a converse type mode via a split screen on the bottom few lines of the map without leaving the map screen. As any station moves or reports the movements of key objects or assets, everyone on the net sees the same movements. Different screens can be zoomed in or out to see different areas of interest while all sharing the same information data (see fig. 3).

Imagine conducting a severe storm reporting net, where all stations on the net show up graphically on your map. The latest weather conditions at each station are available with the touch of a single key. If any station learns of a threatening thunderstorm or tornado, he can place his cursor at that location and place a marker. All other stations on frequency instantly see the same marker on their screens, including the course and speed of the encroaching storm. All details of that report can be found on the LATEST BEACON display. While all stations can see the same map information, they can also converse with each other either with broadcast or directed one-on-one text lines. Anyone can see the latest position of the reported storm by hitting the D key to dead-reckon its current position based on the previous report (see fig. 4).

All of these scenarios and more are possible using the APRS software. The remaining article describes how we have used AX.25 packet radio for the last three years at the Naval Academy for communications with its boats during summer cruises. The packet radio system not only provides the connectivity typical in AX.25 radio networks for the exchange of messages, but the automatic beacons from the afloat units provide real-time position reporting

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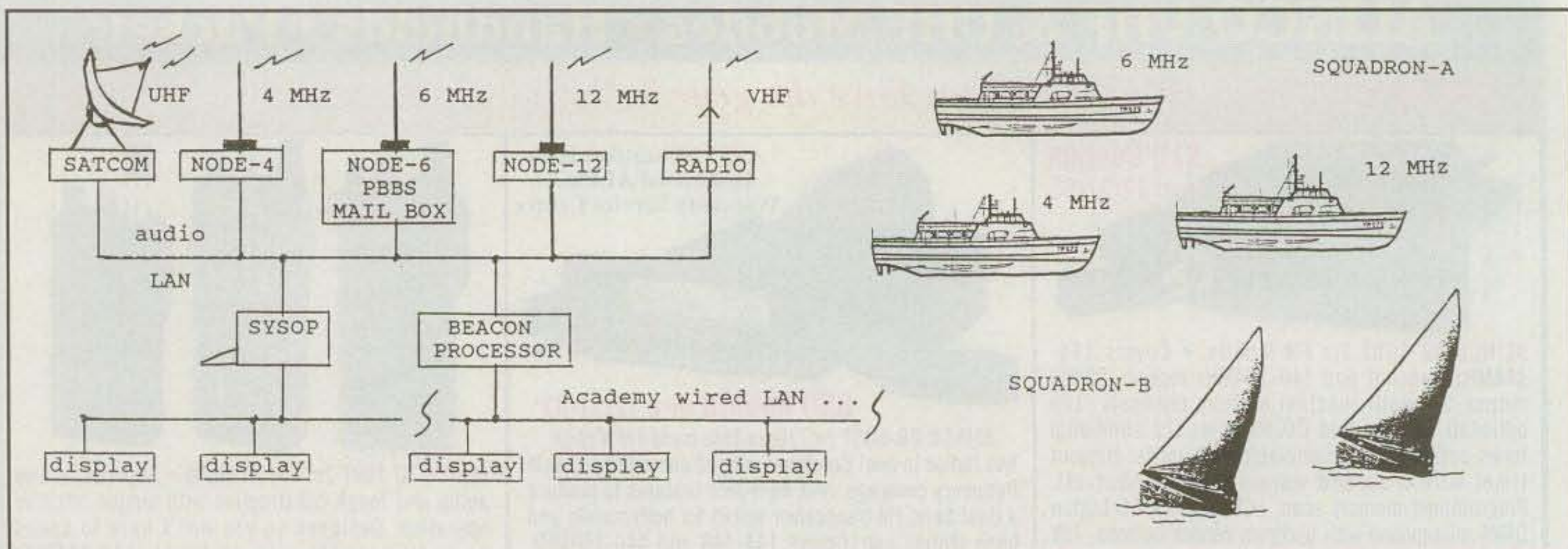


Fig. 5—The Naval Academy APRS system. Three Navy HF frequencies are used to provide frequency diversity. The three HF dual-port TNCs are all connected together on the VHF audio side to provide connectivity, and the terminal port on the center one is interfaced to the local Academy area network. In this way officers can access the central BBS for message traffic, and also display the movements of the boats on any PC in the Academy using APRS software. (Artwork via ARRL 11th Computer Networking Conference Proceedings)

of the units at sea. The purpose of this article is to describe the Academy system, particularly the use of beacons for position and status reporting, and to suggest the advantages of such a system for use in local VHF amateur packet radio and in the HF waterway net and for tracking hurricanes and other objects.

Detailed formats for automatic position and status reporting are provided. We think this is one of the most exciting things to hit packet radio in years, since in most communication

networks for any purpose, station location and status reporting are at least the second most important communication function, if not the first.

**Naval Academy APRS packet radio network.** The objective of the AX.25 network at the Naval Academy is to provide position and status reporting and to permit the exchange of record traffic between the Academy and its fleet of almost 40 Yard Patrol craft (YPs) and sailboats. The exchange of routine text mes-

sage traffic is straightforward using the internal PBBS of a single TNC, linked by dual-port TNCs to three HF channels.

The innovation in the network was the use of periodic packet beacons for position and status reporting. Central to the success of this beacon system was the use of a special amateur radio software program which monitors the packet channels and accumulates the position and status beacons and then provides a tactical color map display of the location of



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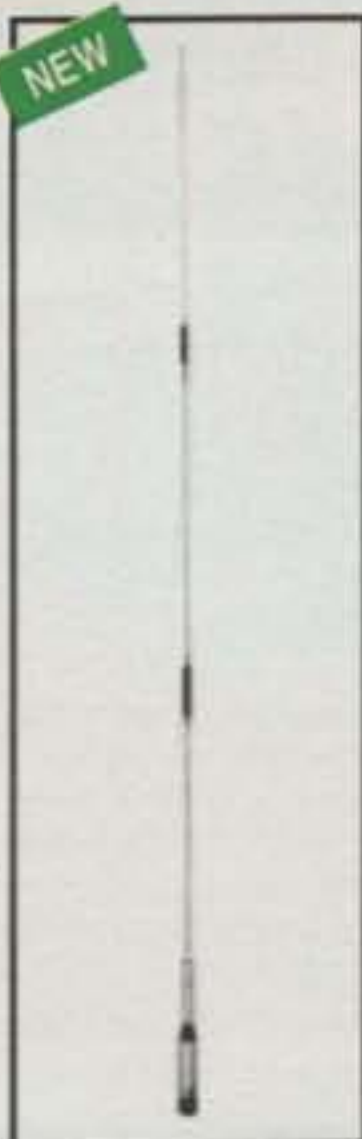
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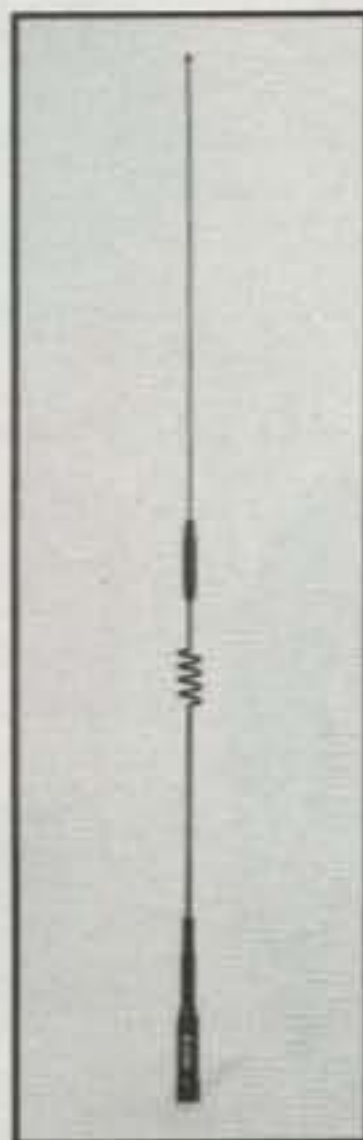
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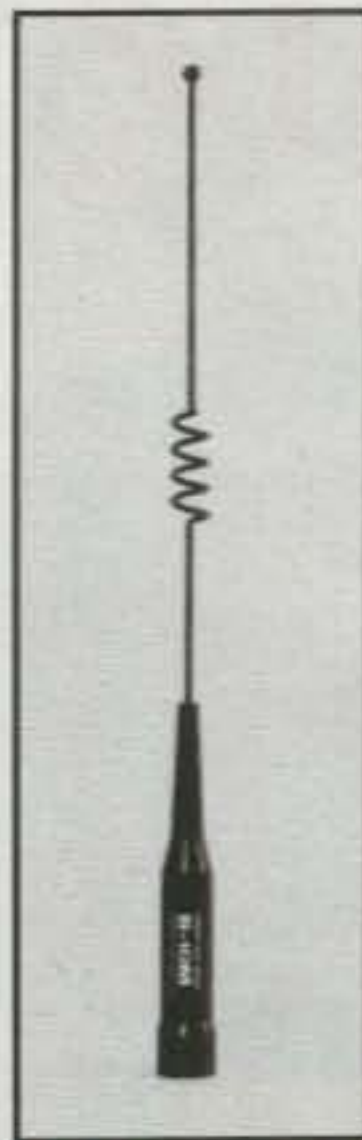
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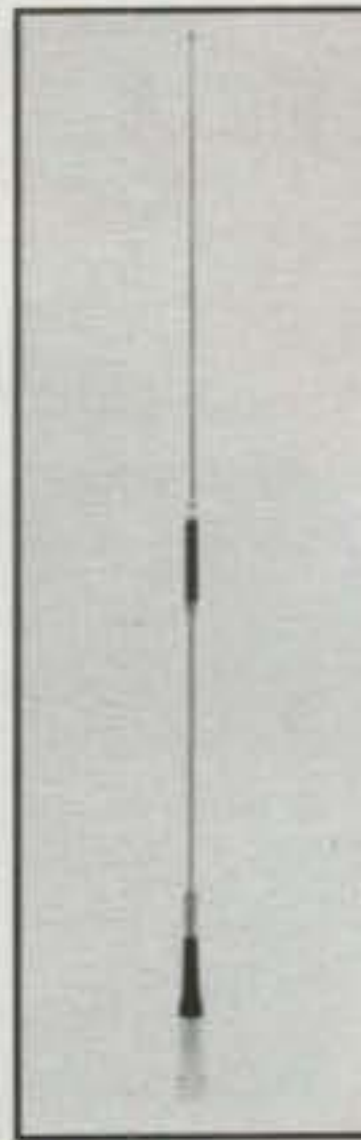
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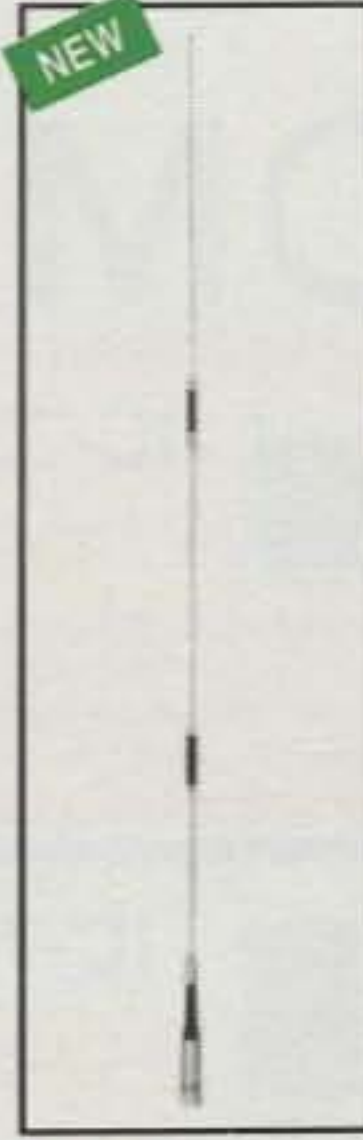
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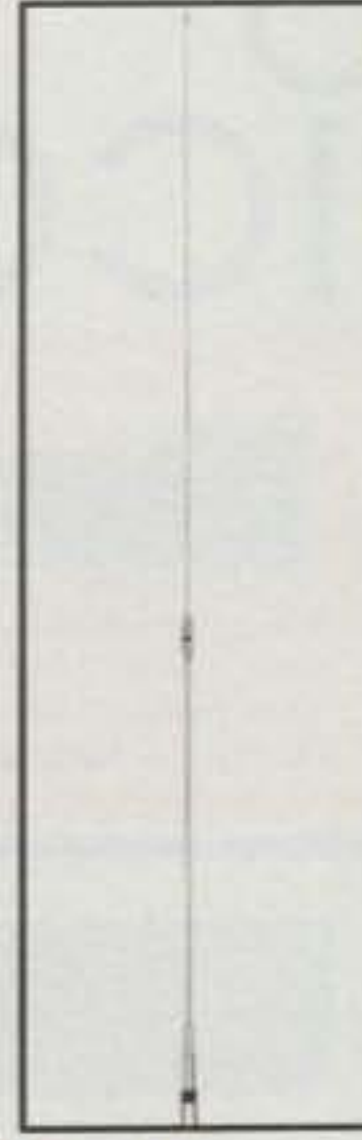
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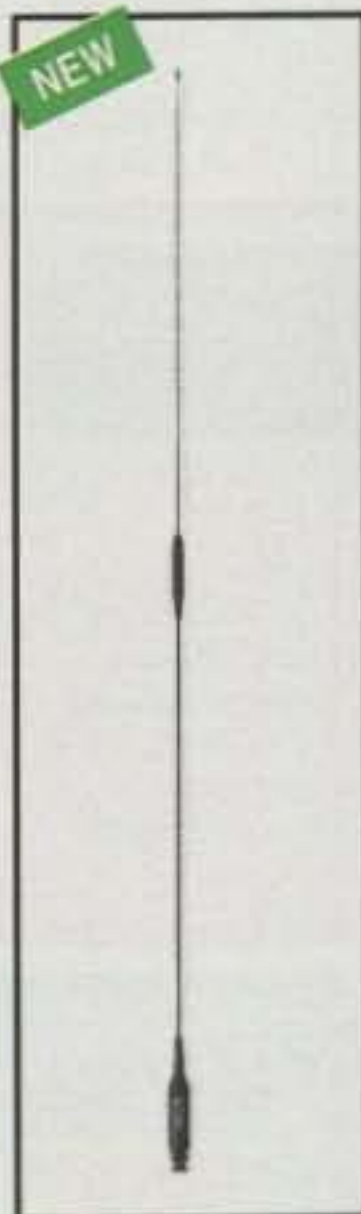
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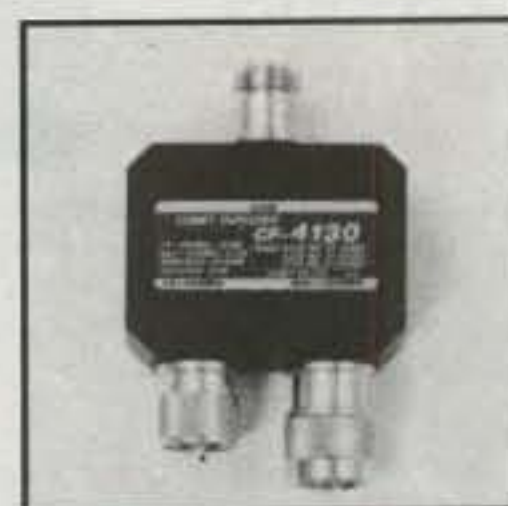
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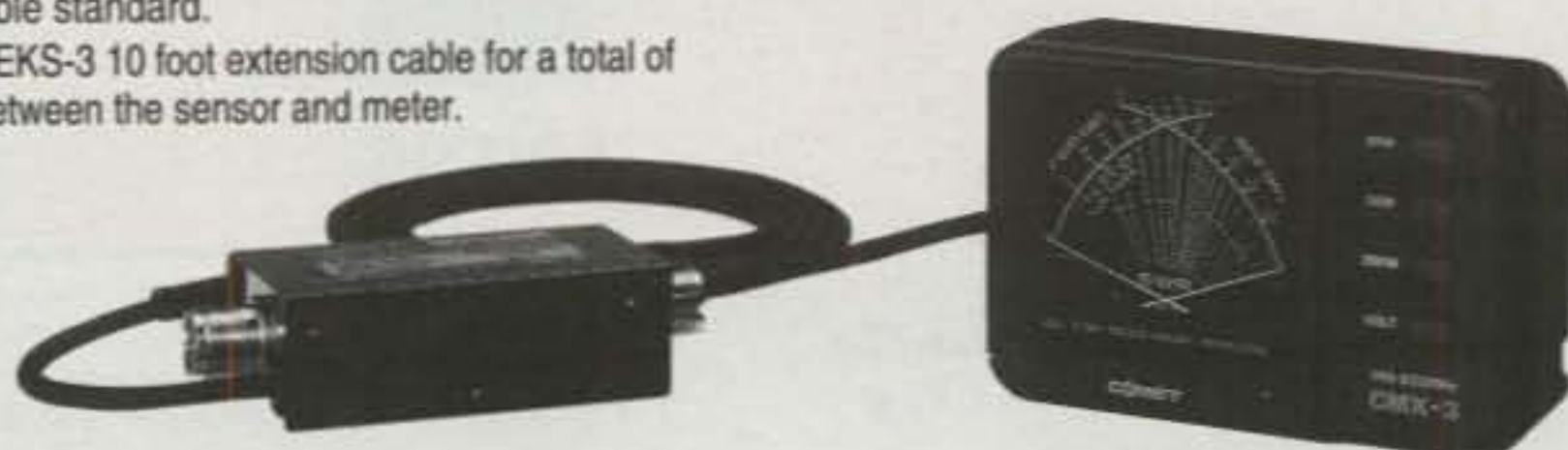
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all units on a scaleable map of the East Coast.  
**Hardware implementation.** For reliability, computers were avoided for the first two years. The master station consisted of three battery-backed-up dual-port TNCs, one on each HF frequency. The audio from the VHF ports of these three TNCs was summed together to link everything without additional hardware and node complexities.

The Kantronics KA node function built into the dual-port TNCs managed traffic between the TNCs. The message mailbox system was simply the 16K PBBS internal to the one TNC on the HF frequency. This PBBS could be accessed directly from HF on HF. On the two other HF frequencies the boats first had to connect to the KA node TNC on that frequency, and cross link to the PBBS (via the audio node) (see fig. 5).

The master station was further available to officers and staff via the Academy local area network (LAN), which provided a serial port in every office at the Academy. Again, without complexity, this was accomplished simply by connecting the TNC RS-232 serial port to the network and programming the network to recognize that address as a host. This LAN interface allowed duty officers to log into the TNC PBBS from anywhere in the Academy as well as dial-up from home to list and read message traffic. A one-transistor interface between the "CONNECTED" LED on the TNC and the LAN handles the "ready" and "busy" handshaking.

This summer we finally got around the inability of the Kantronics TNCs to do any automatic forwarding by installing PCs on all of the HF packet equipped boats. Through scrounging around the academy labs, we found enough PCs to equip 16 boats so that the network was fully automated using the APRS software for the summer of 1993. This year we also found a few laptop computers to be used on some of the sailboats during ocean cruises (see fig. 6).

**Position reporting beacons.** To take advantage of propagation openings on HF, all units in the network redundantly transmit their Position and Status BEACONS once every 10 minutes or so. The actual timing starts at 1 minute, but decays by one minute every time a beacon is transmitted so that older beacons are transmitted less and less frequently.

The boats typically beacon their position and status. The master station at the Academy typically beacons short announcements or lists of traffic pending on the PBBS. The APRS software maintains a LATEST BEACONS display so that the latest BEACON from every unit is immediately visible.

On the boats, a casual glance at the time of receipt of the last beacons on the PC screen indicates propagation conditions. If the last beacons were received in the last few minutes, conditions are probably good for message traffic via the PBBS. If good conditions do not exist, one-line messages can be queued up until conditions improve. One-line messages are transmitted repeatedly like BEACONS, but are canceled when acknowledged.

At the master station during the first summer all position report beacons from the boats were logged on a printer. The beacons were formatted so that position, course, speed, fuel, water, casualties, next port, estimated time of arrival, and intentions were all included in the single-line beacon text. By the second summer APRS was available to parse and sort all beacons and display the position and move-



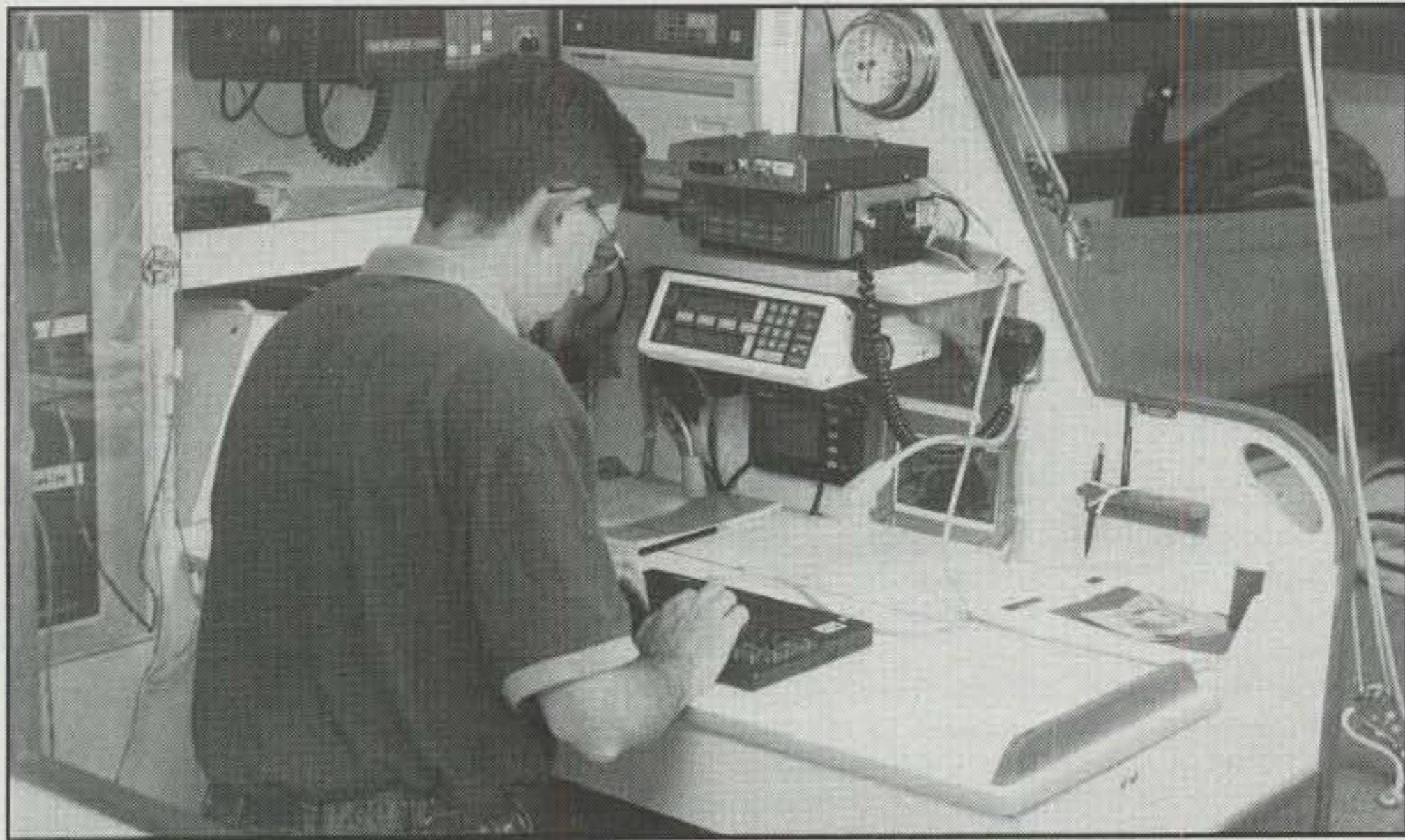


Fig. 6- The APRS installation at the chart table on one of the Academy's 44 foot sailboats. Midshipman John Roe, N2HAQ, is at the keyboard. This installation used a Magellan GPS receiver inside the MFJ 1274 TNC, requiring only an external antenna connector for the GPS antenna. Since this was only a temporary installation, the GPS antenna was simply taped to the overhead inside the boat and worked quite well through the fiberglass.

ment of the boats in full color graphics which included charts of the entire East Coast with user-selected scales of 1 to 2048 miles. This year with the PCs onboard we were able to use the COM2 serial port to interface to the boat's SATNAV equipment so that every 10 minute position report was precise and up to date.

To be sure that beacons on all frequencies are visible to all users, particular attention is paid to the setup parameters in each TNC. First, all TNCs on the boats are set to beacon via the address RELAY. Then the gateway callsign of the three dual-port TNCs at the Academy are programmed with this callsign of RELAY. This way, a beacon originating on any one HF frequency is digipeated (RELAYed) on to the master station audio node, which is then

available to all master station TNCs. Any beacon originated by any MASTER station TNC is similarly (RELAYed) out on all three HF frequencies.

A beacon can be further distributed from one HF frequency onto the local VHF node and then back out on the other two HF frequencies by simply beaconing via RELAY, RELAY.

**Position and status display software.** The key to the success of the packet reporting system is the Automatic Packet Reporting System (APRS) software, which provides everyone with fresh graphic display information on the position and status of all units. The use of computer displays in real time is far superior to the colored pins on a wall chart, which had been used for position display in the past. The tac-

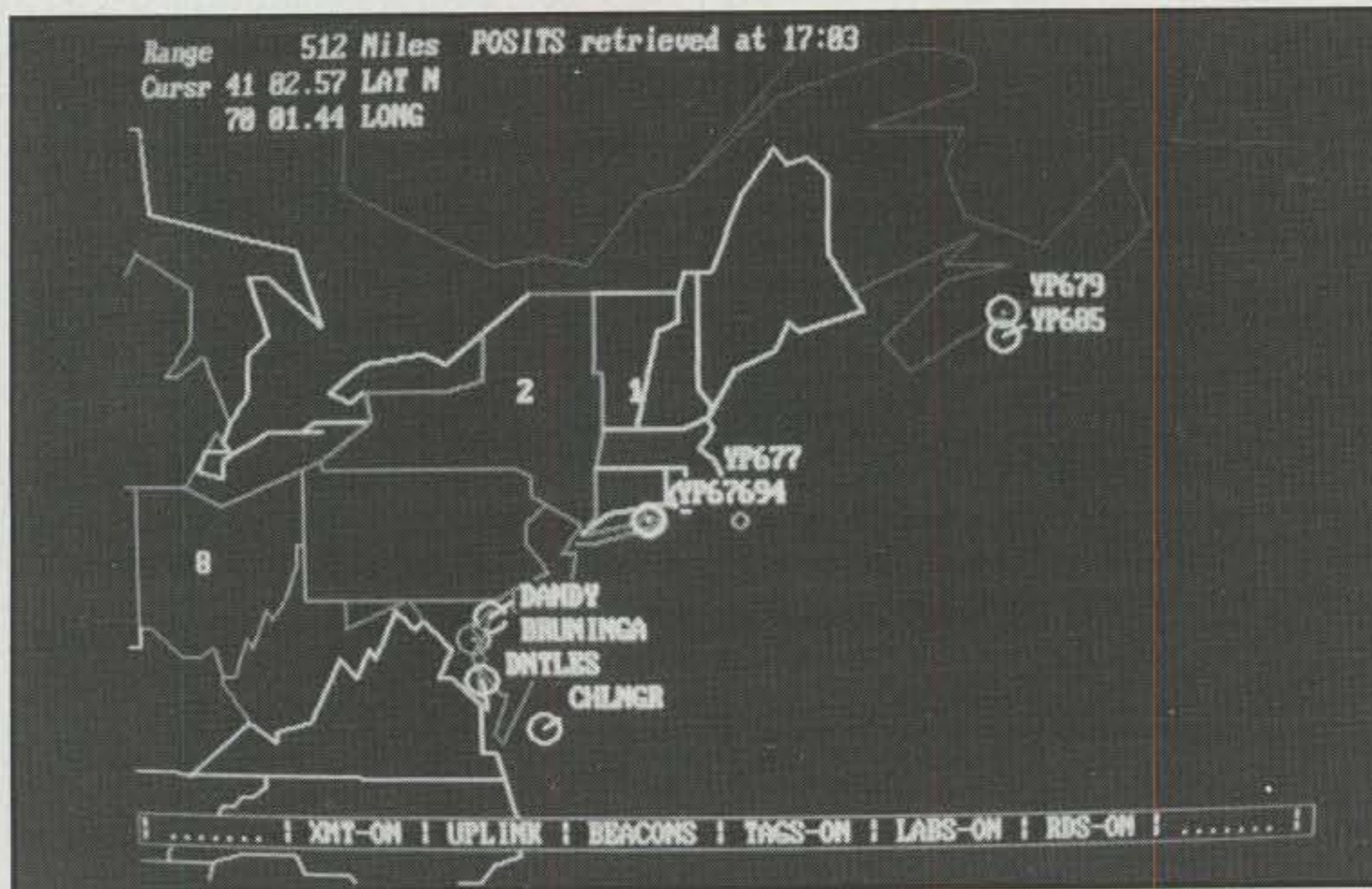


Fig. 7- The APRS screen showing the position of the Naval Academy boats at 1703 on 2 June 1993. Boats are shown in Halifax, the Long Island Sound, Newport, and Chesapeake Bay. Position reports are automatically transmitted via HF packet beacons. This display is on the 512 mile range scale.

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tical display using PC color graphics shows a map of the East Coast at any scale between a 1 to 2048 mile range centered anywhere from Nova Scotia to the Florida Keys. A picture of the display showing several units in Halifax, Long Island Sound, and the Chesapeake Bay is shown in fig. 7. Using the cursor, any unit may be selected for a detailed display of data on that unit. Further, a single key stroke will dead reckon all unit positions to their estimated current positions based on course and speed from their last reported position. It is this tactical display software which would be useful in amateur AX.25 packet radio networks for displaying the location and status of all participating stations.

**Operation.** Beacons from the deployed boats are automatic as long as the packet terminal is on and the radios are properly configured. The crews are encouraged to update their beacons once a watch, every 4 hours, or whenever significant changes occur. Similarly, the crews are encouraged to watch for beacons from the master station and to check in at least twice a day when conditions are favorable. Each squadron has 3 boats equipped with packet—one on each of the 3 HF frequencies on 6, 8, and 12 MHz to take advantage of frequency diversity. The system soft-

ware accumulates statistics on the number of beacons received from each unit per hour and makes that information available to users on the When-Heard display.

Throughout the summer on HF, 40 percent of all beacons were received within the first 10 minutes, 80 percent within the first hour, and 90 percent within 4 hours.

**Results.** Although the Naval Academy system was only experimental the first summer with three boats, more than 400 messages were exchanged over the system and 200 position reports were logged. Communication success measured by the number of successful communication events per 4 hour period with packet approached 83% compared to about 20% for the twice per day HF voice system used before.

By the second year, with ten boats configured for packet, there were always three boats per squadron able to monitor the three different HF frequencies for frequency diversity. Over 600 messages and 1700 position reports were logged. Further, the tactical display software transformed the system from an interesting experiment into a useful and productive tool in time for most of the summer of 1992. Now, a week into the 1993 summer cruises, we have 18 HF packet equipped stations each

reporting hundreds of position and status reports daily. Already, mission critical traffic is passed routinely using APRS, and one Coast Guard rescue has already been coordinated via the HF packet system.

73, Bob Bruninga, WB4APR  
115 Old Farm Court  
Glen Burnie, MD 21060

## Back To Buck

In the X-1J nodes here in Virginia we have implemented another use for APRS. Using the APRS reporting, we cause the nodes here in central Virginia to report their coordinates, and indicate their location on a map of the central Virginia region. This also keeps a current activity list of the nodes. The duration of the node beacons is set to whatever time slot you like. The local keyboard nodes are set to 1800 seconds, or half-hour broadcasts.

The format that is needed as input to the APRS program is not in the usual degrees, minutes, and seconds. Instead the format is altered slightly and the input becomes degrees, minutes, and 100th of a minute. To convert the seconds into 100th of a minute, simply divide the seconds by 60.

Thus, the coordinates 37, 18, 41 North Latitude and 79, 15, 26 West Longitude become 3718.68N/07915.43W. To input these coordinates into the beacon text of a packet station or an X-1J node, I use the following format to enter the beacon text:

**BT !3718,41/07915,43Wx**  
K4ABT-7 Automatic Position Reporting  
Node

Notice the zero in the west longitude input (07915.42W) position. This zero must be added when two digit degrees numbers are used (fill to three places). All text after the small "x" can be any text the SYSOP wishes to add.

Before we close this topic, there is one other feature that has been added to APRS versions 2.06 and above. After moving the cursor to a point within the on-screen map, look at the upper left corner where the coordinates of the cursor are displayed. While viewing the coordinates you have selected, press the "G" key. Presto! You have just defined and displayed the grid square locator for the selected coordinates.

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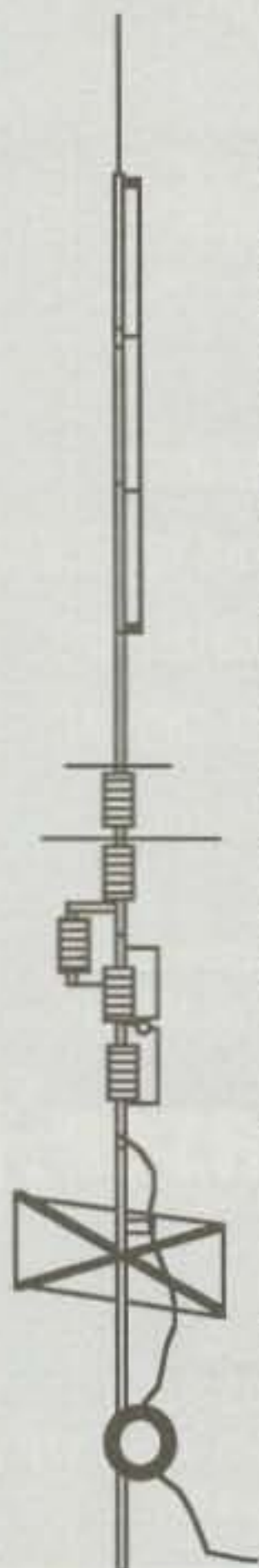


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CIRCLE 74 ON READER SERVICE CARD



## "HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

### Goodies

**T**his article contains information about amateur radio specialty items. I have included a wide variety of items which amateurs can wear and use.

Equipment and accessories directly related to signal reception and/or transmission are not included in this article. Where prices are shown, they are only included to provide some idea of cost; exact current costs should be requested from the seller before ordering any item. State sales taxes may apply, but they are not included in this article. Also, prepaid charges only apply to shipments being made to U.S.A. addresses. If you are aware of similar items which should be included in this type of an article, please send such information to my California address, as it appears on this page.

It is hoped that this article will make amateur radio a bit more interesting and pleasant for many readers. I believe in advertising amateur radio. Everyone who knows me knows that I am an amateur. I have my callsign on everything that can be marked to show my amateur radio affiliation. People frequently ask me what W6DDB means, which gives me a chance to tell them a little bit about amateur radio. Some of these brief explanations have eventually resulted in new amateurs.

### Clocks/Time Items

Benjamin Michael Industries (BMI) offers "military time" clocks. Their address is 9445 Seven Mile Road, Caledonia, WI 53108 (phone 414-835-4299; FAX 414-835-4298). The BMI Model 972A has a 14 inch diameter, shows standard 12 hour time, and is priced at \$37.95 each. Model 972D has a 14 inch diameter, shows standard 12 hour time in an outer ring of large numerals, shows the remaining 24 hour points in an inner ring of smaller numbers, and costs \$39.95 each. Model 973A has a 14 inch diameter, shows 24 hour time in a single series of numbers near its outer edge, and sells at \$59.95 each. Ten inch diameter versions of these clocks, plus 900-series analog clocks, are also marketed by BMI. David Wyatt, WA9KVE, is the president of BMI.

Geochron Enterprises offers four models of their world time indicator. Each model displays daylight and darkness, sunrise and sunset, correct time in each zone, day of the week, and date of the month. Prices range between \$1265 and \$2465, plus shipping charges and costs of any desired accessories. Each model is 34" x 22" x 5". Their address is 899 Arguello Street, Redwood City, CA 94063 (800-342-1661; FAX 415-361-1780).

Larry Abelkop, WA4LPV, is a distributor of the Seth Thomas clocks, which are popular with amateurs. His model 708 clock features a 24 hour face, quartz movement, step second

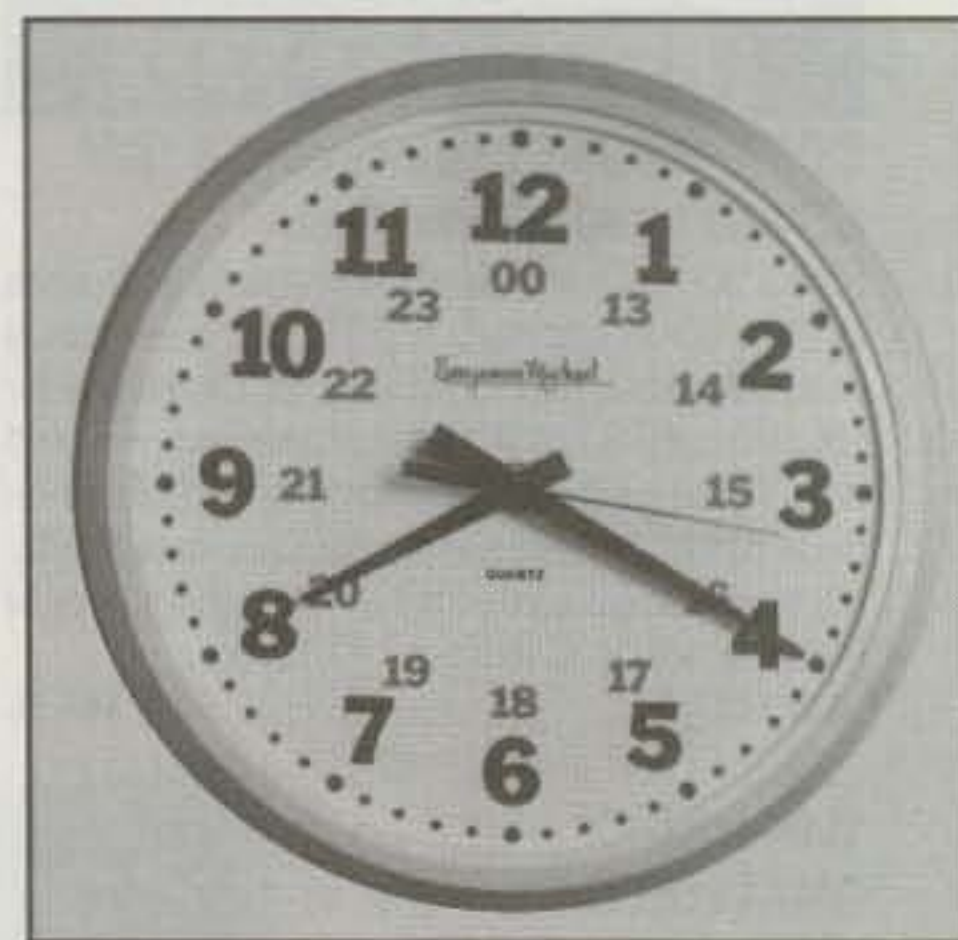
hand, and a shatter-resistant face. The model 710 clock is the same as the model 708 clock, except it has the standard 12 hour face. The 708 and 710 clocks are 2.75 inches deep and 14 inches in diameter. The 708 and 710 clocks sell at \$33.45 each, which includes s&h to domestic addresses. The model 2616 sells at the same price as the 708 and 710. The 2616 has large (1.8 inch) red LED numerals which display either 12 or 24 hour time. This clock is mounted in a woodgrain case which has a flip-out stand for desktop use. Battery backup capability, plus a battery-low backup indicator, are included in this 6.5" x 9.5" x 2.125" clock. This address is B. A. Fox, Inc., P.O. Box 6206, Spartanburg, SC 29304-6206 (803-582-6464; FAX 803-582-6744).

(Also see Azimuth Communications and MFJ coverage.)

### Clothing

CQ offers T-shirts with a choice of 13 print designs. These shirts are available in large and extra-large sizes at \$17.95, including s&h charges. Extra-extra-large T-shirts cost \$2 more apiece. The address is CQ Communications, Inc., 76 North Broadway, Hicksville, NY 11801. (See the CQ T-shirts ad in this issue.)

Caps Unlimited sells a 2" x 3" embroidered SKYWARN patch with heat-seal adhesive backing. It shows a black tornado inside a fluorescent orange eye, and it has the word SKYWATCH below the eye. This patch is also available on a black baseball-type summer cap. They sell the same kind of cap (one size fits all) with the words AMATEUR RADIO COMMUNICATIONS centered between a pair of lightning bolts in day-glo bright chartreuse. RACES decals are sold to RACES members.



An example of Benjamin Michael Industries' "military time" clocks.

They are self-adhesive on the front side for attachment inside vehicle windows and windshields. It is advisable to request a copy of their sales data sheet to obtain detailed information on their entire product line. The address is P.O. Box 460118, Garland, TX 75046-0118 (214-276-0413). They also sell identification badges and embroidered patches. As usual, send an SASE if you request data.

The Embroidery Warehouse sells summer (mesh) and winter (corduroy) caps at \$10.70 and \$12.00 each ppd., respectively. The embroidered name, callsign, and town/city can have a maximum of 14, 6, and 14 letters, including spaces, respectively. Summer caps are red or royal-blue mesh and bill, with a white foam front. Embroidery matches the cap color. Full corduroy (winter) caps are red or navy blue with gold embroidery. White or gold scrambled eggs can be added to the bill of a cap at an



Geochron Enterprises offers four models of their world time indicator.

45527 Third Street East, Lancaster, CA  
93535-1802





*Littlite is a variable-intensity desk lamp available in a variety of forms and with a variety of accessories.*

additional charge of \$1.50 per cap. The address is P.O. Box 1476, Severna Park, MD 21146.

Rod Williams offers an interesting variety of jackets, T-shirts, and caps. Each item can be customized to include name, callsign, and other information. His address is Box 7486, Toledo, OH 43615 (419-843-2014). Rod gives a ten percent discount when placing multiple-item orders. If you want details about Rod's products, request information from him.

Paul Washa, WØTOK, sells T-shirts and sweatshirts featuring an enlarged reproduction of the 1964-1965 five cent amateur radio stamp. T-shirts sell in all sizes (S, M, L, XL, and XXL) at \$10 each ppd. High-quality white sweatshirts sell at \$23 each in sizes S through XL and at \$26 each for XXL, delivered. If two (or more) of the same item are ordered, the price is one dollar less on each item. The desired size must be specified, of course. Paul also markets 58 books regarding electricity, electronics, and radio. If you are interested in books, you could request his current list, enclosing your SASE. The address is 4916 Three Points Boulevard, Mound, MN 55364-1245.

The following Yaesu items are available from Flags and Marketing Unlimited, 3783 East Desert Inn Road, Las Vegas, NV 89121. Each item shows the Yaesu emblem and/or name. Crest is embroidered on corduroy caps (\$5.95 each); jackets (\$38 each); pinnacle V-neck red, white, or navy blue sweaters (\$27.50 each); and white or navy-blue polo shirts (\$21 each). Silk screening is used on red, white, or blue sweatshirts (\$13.50 each), and red, white, or navy blue T-shirts (\$6.80 each). Jackets are silver polyester/cotton. The adjustable-size corduroy caps are navy blue or silver. Shipping charges are extra. Extra-extra-large (XXL) size items cost \$2.00 to \$4.50 more each. Allow 4 to 6 weeks delivery time. Write for a brochure if you are interested in these Yaesu-related items. Their telephone number is 702-456-3609; FAX 702-456-3611.

Ann Wright, N6BOP, sells a very good assortment of T-shirts, golf shirts, and caps. T-shirts and golf shirts are available in beige (tan), light blue, light yellow, or white. Other light colors are available upon special requests from clubs or other groups, and they can be printed front and back. A red ARRL logo

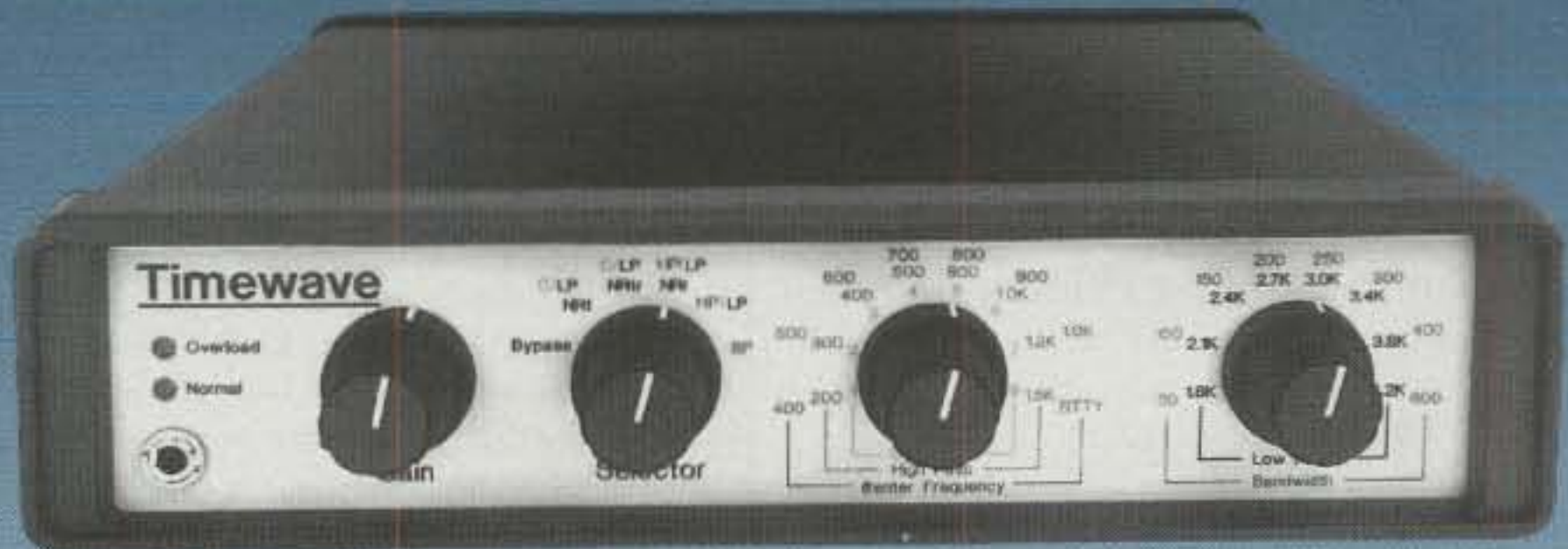
# Noise Killer!

## Advanced DSP Noise Filter -



TW DSP-9  
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**Eliminate Heterodynes, Reduce Noise & Interference, Produce Razor Sharp Audio!**



TW DSP-59 \$299.00

### TW DSP-9 CW/SSB Filter

Designed for the ham who wants CW and SSB, the easy-to-operate TW DSP-9 features selectable switching between 1.8, 2.4 and 3.1 kHz SSB filters, and between 100, 200 and 500 Hz CW filters.

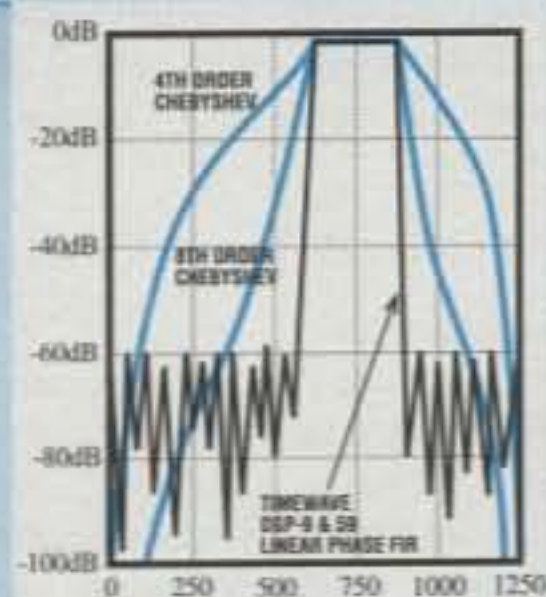
### TW DSP-59 Multi-Mode Filter

With 320 filter variations, the unique TW DSP-59 has filters for all operational modes the amateur may encounter including RTTY, SSTV, AMTOR, PACTOR, HF, Satellite, EME, SSB, CW, AM and weak signal VHF.

### Advanced Filtering Technology

Both TW DSP filters feature third generation 16-bit processors for unmatched performance. Multiple filter combinations provide simultaneous noise reduction, automatic search & elimination of heterodynes, and QRM

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Program Tracks All Satellites,  
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model 1691 -LY(N) .....\$99
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model 1691-LY-XTN.....\$85

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Shipping: FOB Concord, Mass.  
Prices subject to change without notice.  
Write for details.



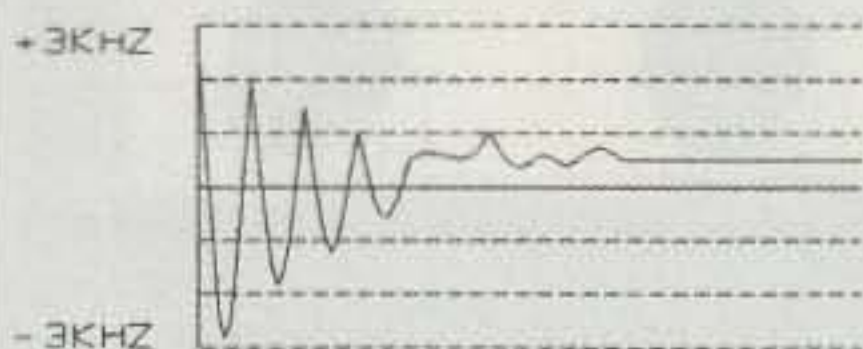
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### Transmitter Finger Printing is here!



Every radio transmitter has a unique frequency versus time characteristic. When keyed, a "finger-print" unique to each transmitter is produced that can be captured, stored and analyzed. Using patented technology--available from **MoTron Electronics**--and our advanced software, you can identify the abusers on your repeater!

The MoTron TxID includes a sophisticated circuit board that plugs into your IBM compatible computer and our exclusive software.

Additional features of the MoTron TxID include:

- ✓ Measures deviation
- ✓ Measures frequency of the received signal relative to your receiver's center frequency
- ✓ Has CI-V output for Icom receiver control
- ✓ Tape recorder output/control with digitally delayed audio
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Call or write for a brochure with full details, technical specifications, and prices.

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Info: (503) 687-2118 • Fax: (503) 687-2492

CIRCLE 87 ON READER SERVICE CARD



Whiterook Products sells RF-actuated call sign and ON THE AIR displays in various configurations and sizes.

is available in two sizes (1.375 by 3 inches and 2.25 by 5 inches). The lettering style can be ivy open or sportswear. Letter color choices are black, brown, green, maroon, orange, red, and royal blue. T-shirts cost \$14.30 ppd, printed both sides. Golf shirts cost \$19.30 each printed one side, and \$20.30 each printed both sides. Anne's caps have a foam front with a mesh back, and they are size adjustable. Caps sell at \$9.30 each ppd. Cap print styles are the same as for shirts, and the print can be in a variety of colors. Anne's address is 2272 Kellogg Park Drive, Pomona, CA 91768.

The Vibroplex Company, Inc. offers several items which may be of interest to code enthusiasts. Each item features the famous Vibroplex logo (bug) in some way. Their baseball-type light-blue hat (\$6.95) is fully adjustable. It has the Vibroplex emblem in black, red, and gold. The key chain (\$6.95) is cast solid brass, and it features the bug logo. Their black-glaze English-ironstone mug (\$8.95) shows their bug logo in 22 karat gold. An 8 by 18 inch black felt pennant (\$3.95) shows the Vibroplex name and logo in gold. Their light-blue T-shirt (\$11.95) is half cotton and half polyester. It is available in small, medium, large, and extra-large sizes. It features the bug logo. A \$5 shipping charge applies to orders being shipped to U.S.A. addresses. The Vibroplex address is 98 Elm Street, Portland, ME 04101 (toll-free 1-800-262-8387, which is also 1-800-AMATEUR; FAX 207-775-7710). Vibroplex offers several other items that are of interest to amateurs. Vibroplex has been in business since 1890, which means their centennial occurred during 1990. The history of the Vibroplex Company is covered in detail in a 91-page book that is priced at \$19.95; it includes copies of their advertisements, nameplates, and patents. I have used their bugs for 48 years, and a Vibroplex presentation bug is an essential part of my home station.

(Also see ARRL, A. T. Patch, and 7-Mike Hamstuff coverage.)

### Computer-Related Items

Buckmaster Publishing markets many highly useful items, including their Ham Call CD-ROM at \$55, including s&h charges. It provides

quick references to domestic and foreign call sign data, with almost one million listings. Their address is Route 4, Box 1630, Mineral, VA 23117 (703-894-5777).

Dave Farnsworth, WJ2O, offers a versatile software logging program, which is much more than its name implies. It features color and monochrome monitor compatibility, DXCC country identification (including CQ and ITU zones), 50-page instruction manual, 14 choices of QSO printouts, QSOs logged in a single main database, customized or standard printing of QSL cards and labels, QSL tracking, simple step-by-step menus, handnet operation format, adjustable DXCC prefix file (to accommodate changes), single keystroke pop-up utilities (such as DXCC list, international prefixes, Q-signals, state abbreviations, etc.), plus import and export files. The domestic (U.S.A. and Canada) and foreign prices for the logging program, including the manual, are \$49.95 and \$59.95, respectively. Their domestic address is WJ2O Master QSO Logging Program, P.O. Box 16, McConnellsville, NY 11301 (315-245-1010; FAX 315-245-1336). The address to be used in Europe is JONIT, Box 2063, S-831 02 Ostersund, Sweden. The National Contest Journal printed a highly complimentary review of Dave's program.

Ivanhoe Software, Inc. offers software that is simple and is very easy to use. Steven Seltzer, WF3T, developed his Blackbook Database to be so easily mastered that even brand new computer users can have it running after just a few minutes. Despite its simplicity, it has many powerful features; these include custom serial port setup, multiple lists, autodialer, and mailing labels printout. No long lists of complicated key combinations are involved with this system. Most amateurs do not use or need features which take up megabytes of disk space. Steven expects to have Cluster.Exe ready soon. It is a terminal program for the PK-232. It is intended specifically for DX packet cluster users. Additional details can be requested from Ivanhoe Software, Inc., 944 Cedars Road, Lewisberry, PA 17339.

If you like contesting, you should investigate the software being offered by K1EA Software, P.O. Box 803, Hudson, MA 01749. (508-779-5054; FAX 508-779-6902).

Engineering Systems, Inc. sells personal-



# Ameritron *no tune* Solid State FET Amplifier

*No tuning, no fuss, no worries -- just turn on and operate . . . Incredibly low \$1299 includes AC power supply, 700 Watts output, continuous 1.5-22 MHz coverage, instant bandswitching, no warm up, no tubes to baby, fully SWR protected, extremely quiet, very compact*

- Ameritron's revolutionary ALS-600 is amateur radio's only linear amplifier that uses four rugged TMOS RF power FETs -- gives unequaled *no tune* solid state performance
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- **Made in USA**
- **Enjoy 700 Watts of *no tune* solid state power.** Call your favorite dealer for your best price and order your ALS-600 with power supply today

**\$1299**

Suggested Retail  
(Includes AC  
Power Supply)



## ALS-600PS Heavy Duty Power Supply

*ALS-600PS power supply included with ALS-600 amplifier*



- **Massive choke input filter** greatly improves voltage regulation and reduces peak AC line current
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- **Extremely quiet fan**
- **Very compact** 6 x 9 1/2 x 12 inches -- can be placed conveniently out-of-way
- **Wired for 120 VAC**, supplies 50 VDC at 25 amps to ALS-600 amplifier
- **Also use on 100-130 VAC and 220-250 VAC, 50/60 Hz**
- **Draws less than 12 amps at 100 VAC and less than 6 amps at 230 VAC**
- **Includes prewired cable** to plug into ALS-600 amplifier
- **Made in USA**

# Ameritron *no tune* Solid State Amplifier

*Ideal mobile amplifier -- uses 13.8 VDC mobile electrical system, very compact 3 1/2 x 9 x 15 inches, extremely quiet, 600 Watts output, continuous 1.5-22 MHz coverage, instant bandswitching, no tuning, no warm up, SWR protected*



ALS-500M

**\$799**

Suggested Retail

- **Mobile *no tune* Solid State Amplifier** -- uses four rugged 2SC2879 high power linear RF power transistors
- **Instant bandswitching, no tuning, no warm up** -- just turn on and operate -- makes mobile QSOs safer
- **Very Compact** -- just 3 1/2 x 9 x 15 inches -- fits in nearly any mobile installation; weighs only 7 pounds, that's less than some mobile HF transceivers
- **Extremely quiet** -- quiet low speed, low volume fan stays off and silent until temperature rises
- **Output Power** -- 600 Watts PEP, 400 Watts CW
- **Continuous Coverage** -- 1.5 to 22 MHz; 10/12 Meters with easy-to-install optional kit
- **Load Fault Protection** -- disables and bypasses amplifier if antenna has excessively high reflected power or if bandswitch is set lower than exciter frequency -- virtually eliminates damage because of operating error; has Load Fault LED indicator
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amplifier if temperature is excessively high; automatically resets when temperature drops to safe level; has Thermal Overload LED indicator

- **Excellent harmonic suppression** -- multiple section output network and push-pull output circuit gives excellent harmonic suppression
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- **ON/OFF Switch** -- bypasses amplifier for "barefoot" operation without having to disconnect high current power supply cables
- **Remote ON/OFF Control** -- lets you remotely control ON/OFF function for out-of-the-way mounting of amplifier
- **Exciter Drive** -- less than 100 watts input gives full output
- **Power Supply Requirements** -- requires 13.8 VDC at 80 amperes peak current for PA transistors and separate line for 12-15 VDC at 4 amperes for control and bias circuits
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- **Call your favorite dealer** for your best price and order your ALS-500M today

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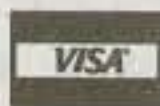
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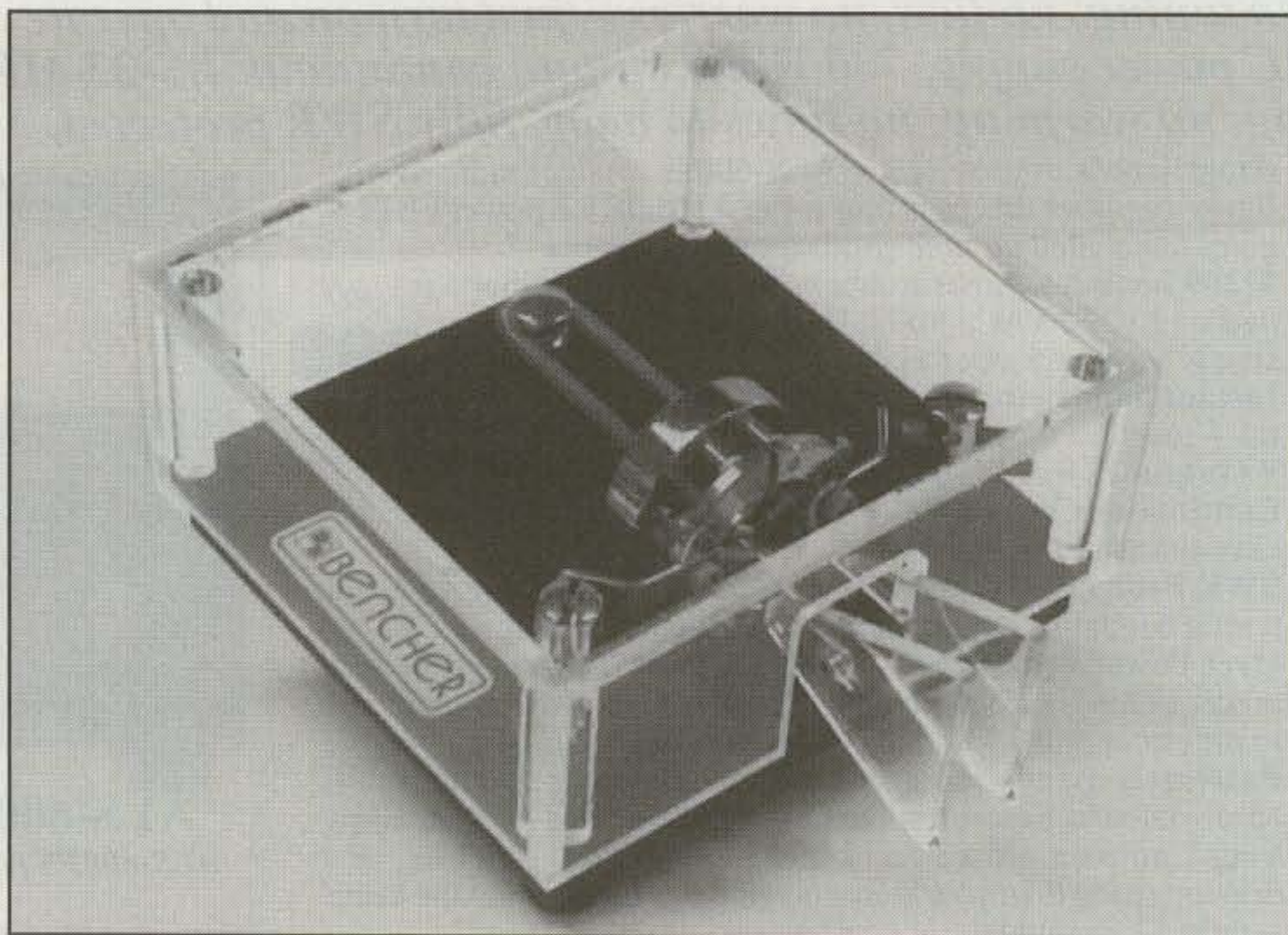


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Established in 1956, "Ham" Buerger strives to be the leader in the amateur radio business providing only the best in service and products. We have a large inventory of ICOM radios and accessories as well as our new line - AZDEN. Be sure to shop around but you'll find our new price structure to be quite competitive. Call or stop in our retail store for all of your amateur radio needs! Bob or Brian will be happy to serve you. Be sure to ask about our Hoiday Specials!



A dust cover for Bencher paddles is available from Larry Stamm, WB3EVL. It can be left on while the paddle is in use.

ized skywave propagation programs at \$29.95 each. If you want details about their products, send an SASE to P.O. Box 939, Vienna, VA 22183.

R & B Software markets an extensive variety of quality shareware for use with IBM-compatible computers. Their current catalog lists the following subject disks in the quantities indicated: Amateur (23), business (15), education (40), games (38), general (16), graphics (38), modem (4), music (3), printing (12), programming (10), scientific (10), and utilities (7). Disks are available in 3.5 and 5.25 inch sizes with prices ranging from \$1.50 to \$2.00 each, depending on the quantity ordered (3.5 inch disks cost 50¢ more apiece). Their address is P.O. Box 1428, Idaho Falls, ID 83403 (208-529-4408).

Alan Yorinks, WB2OPA, offers his LogMaster PLus/Plus all-band all-mode logging system designed for use with PC compatibles. It supports ICOM, Kenwood, Ten-Tec, and Yaesu transceivers. The price of a complete system is \$89.95. A demonstration disk is available at \$5, which can be applied towards a later purchase of the complete system. Their address is Sensible Solutions, P.O. Box 474, Middletown, NJ 07748 (800-538-0001).

**Cups/Mugs**

Walt Flesher, KK6RG, markets callsign ceramic mugs showing name and/or callsign on one side (\$17.95) or on both sides (\$20.95). These prices include s&h charges. Their address is Imagine That Graphics, P.O. Box 2700, Anaheim, CA 92814 (714-772-7484).

Jane Peake, KD4GUL, sells custom-made 11 oz. white ceramic mugs displaying her customers' designs and/or photographs. Callsigns, names, and other information can be displayed on one or both sides of the mug using any front style and any color combination. These mugs have a design area that is 3.75

inches wide by 3.0 inches high on each side. The colors are permanent. The cups are microwave and dishwasher safe. Cups customized on only one side are priced at \$15 each, whereas those which are customized on both sides are priced at \$19 each, including s&h charges plus any applicable taxes. Organizations are welcome to obtain quotes on quantity orders at reduced prices. The address is J & W Associates, 272 Farm Road, Marietta, GA 30067-4076 (404-984-9479).

Todd W. Skogen sells 13 oz. etched glass mugs and 11 oz. ceramic coffee cups at \$14.90 each ppd. First name and callsign are etched on the large glass mug. The first name and callsign are etched in white on one side of the ceramic coffee cup. The address is The Mug Factory, P.O. Box 4843, Aurora, IL 60507.

(Also see MFJ and Vibroplex coverage.)

**Desk Items**

Allen Kellogg, AA1DV, sells an assortment of modular desk and tabletop units which can be used to hold amateur radio equipment and accessories. Shelves are angled upward in front to make equipment operation easier. Their address is Kellogg Mills, 13 Ox Hill Road, Newtown, CT 06470 (203-426-8394). His selection is too varied to be detailed in this article. Readers who are interested in such units should request data sheets.

One of the best accessories I have added to my station during the past decade is Littlite, a simple, variable-intensity desk lamp. It can be operated on 12 VDC or 115 VAC. It has a weighted base and color filters available as accessories. This lamp is available in a variety of forms, and it has a useful variety of accessories. A printed flyer can be requested from Littlite/CAE, Inc., 10087 Industrial Drive, P.O. Box 430, Hamburg, MI 48139 (313-231-9373; FAX 313-231-1631). The lamp can be secured in place using the snap mount which is sup-





Azimuth's Grand 24 digital 24-hour clock features giant-size digits.

plied with it. Also, screws are provided for use in mounting the lamp directly to a surface.

Whiterook Products Company sells an RF-actuated callsign display (Model CSD-1) which lights up to display callsign while transmitting 5 watts (or more) on any HF, VHF, or UHF frequency. The price is \$49.95, plus a \$4 shipping and handling fee. A 12 VDC adapter (Model DC-1) is included. A delay is built in to eliminate flickering during transmissions. If you prefer "ON THE AIR" in large lettering, instead of having your callsign displayed in large letters with "on the air" displayed in smaller letters below your callsign, you can order their Model CSD-2 at the same price. The CSD-100 and CSD-200 are larger versions of the (5.0" x 1.5" x 5.25") CSD-1 and CSD-2, respectively. These displays are easy to mount on walls. Their size is 15.25" x 7.25" x 2.0". Each model sells at \$89.95, plus a \$4 s&h fee. Their Model CK-1 is 5" x 1.5" x 5.25"; it provides UTC time in a bright red LED display featuring 6-digit (hours, minutes, and seconds) time. The CK-1 price is \$59.95, plus \$4 s&h. The model CK-100 includes the 6-digit UTC clock with one's unlit callsign above it. The CK-100 price is \$69.95, plus \$4 s&h. The size of the CK-100 is 6.25" x 3.75" x 2.0", and it is easy to mount on a wall. Unlike the other models, the CK-1 and CK-100 operate from AC house power, eliminating the need for batteries. One week's time is required to fill each order. John Roblin, WA6KYO, suggests orders be submitted well in advance of Christmas. The address is 309 South Brookshire Avenue, Ventura, CA 93003 (phone and FAX 805-339-0702).

Elizabeth Woodbridge sells hand-cut wood desk signs at \$13.25 each, including s&h charges. Their length is 11 inches, with a maximum of six letters and/or numbers. Additional letters and numbers cost \$1.00 more each. The stand is available in black, blue, red, or white. The letters and numbers can be ordered in blue, green, orange, red, white, and yellow (you pick the combination you want). Her address is P.O. Box 261, Capitola, CA 95010-0261.

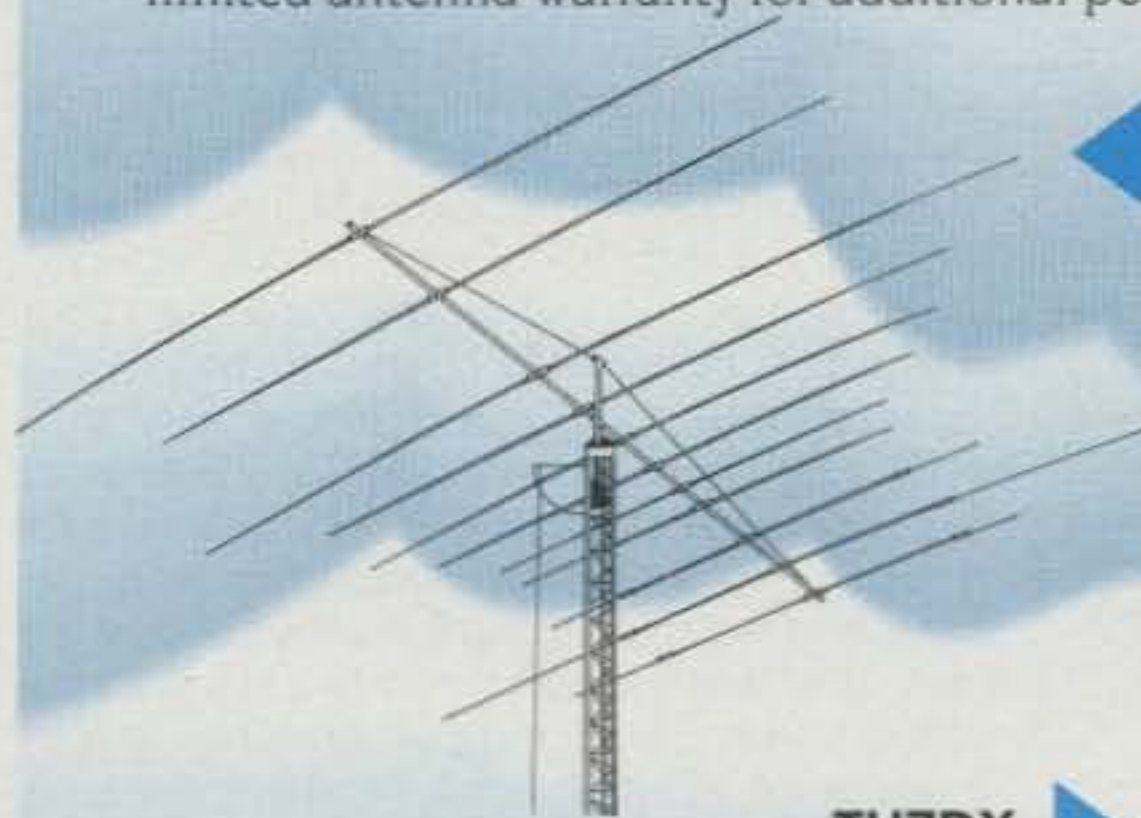
(Also see *B. A. Fox and Trophies* by Edco coverage.)

## Key Chains

You can buy a 2.25 by 1.125 inch keychain showing your callsign on a miniature version of your state's vehicle license plate. The price is \$7.25 each, including s&h charges. The ad-

# Is your antenna under the weather?

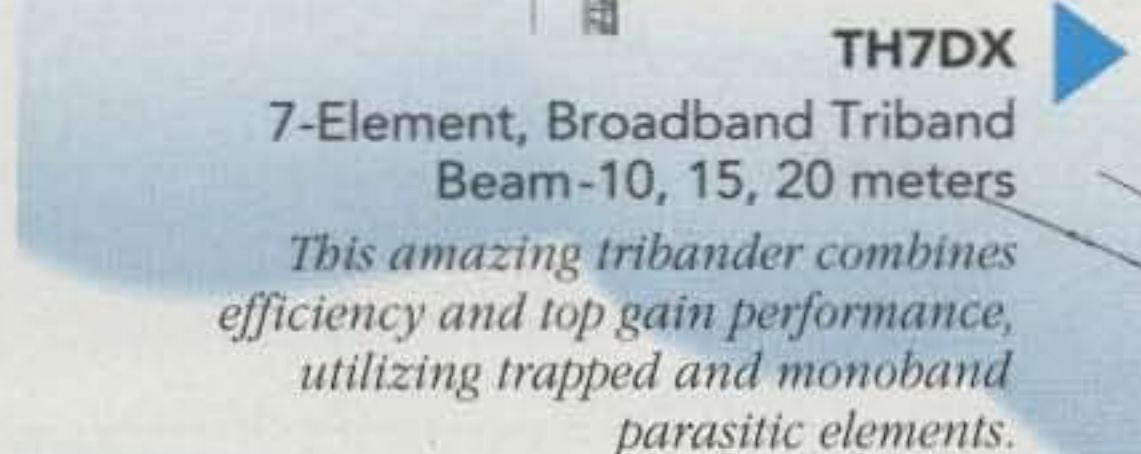
▶ Telex Hy-Gain® multiband beam antennas are built to stand up to any climate, so you can count on clear communications through wind, ice and rain. What makes Hy-Gain better? Thick wall swaged aluminum tubing and stainless steel hardware provide mechanical strength and resistance to corrosion. Machine parts, including tapered tubing, reduce wind surface for stability and reliable performance. Individually tuned traps offer outstanding tolerance, and die cast tiltable boom-to-mast brackets allow convenient maintenance. Finally, all designs undergo extensive testing under actual field conditions, and we back it all up with a two-year limited antenna warranty for additional peace of mind.



### TH11DX

11-Element Broadband 5 Band Super Thunderbird Beam-10, 12, 15, 17, 20 meters

*Designed for maximum DX performance with excellent directivity and efficiency on all five bands, the TH11DX also features the new Hy-Gain BN 4000 high power balun.*



### TH7DX

7-Element, Broadband Triband Beam-10, 15, 20 meters

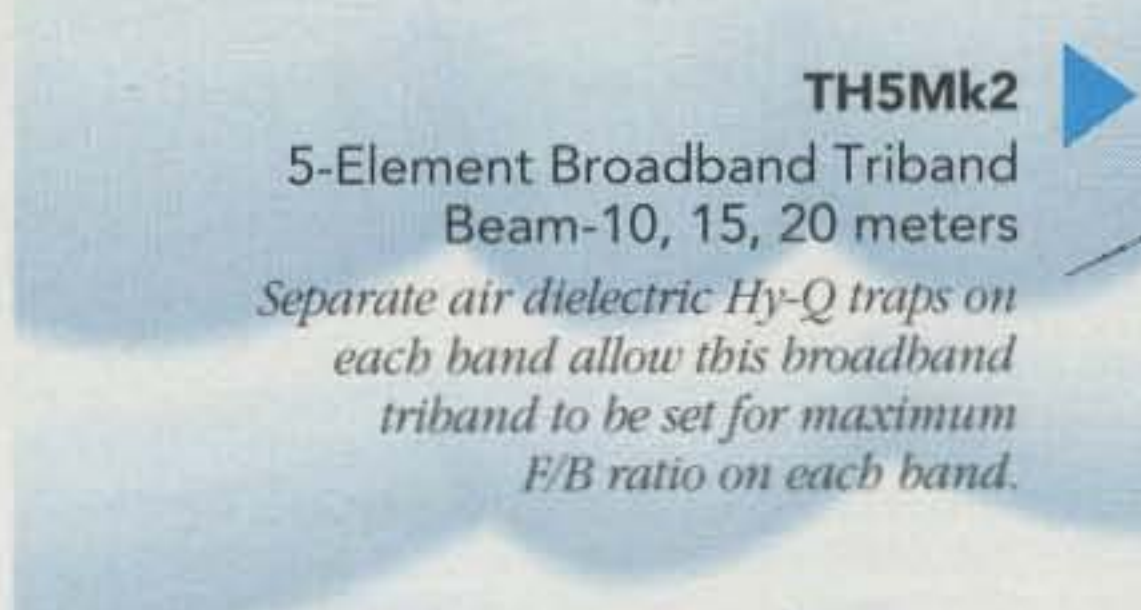
*This amazing tribander combines efficiency and top gain performance, utilizing trapped and monoband parasitic elements.*



### Explorer 14

Broadband Triband Beam with Quad-Band Option-10, 15, 20 meters

*Unique Para-Sleeve design optimizes edge-to-edge bandwidth without antenna tuner. Handles maximum continuous power within safety margins.*



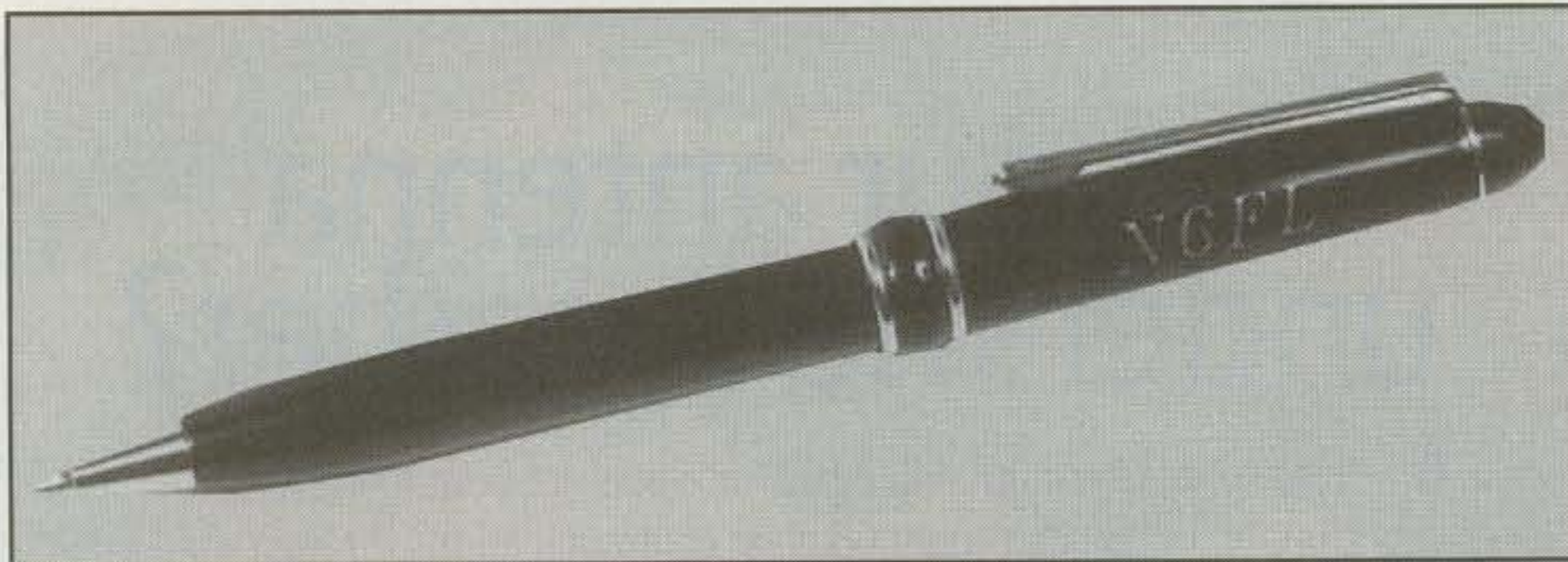
### TH5Mk2

5-Element Broadband Triband Beam-10, 15, 20 meters

*Separate air dielectric Hy-Q traps on each band allow this broadband triband to be set for maximum F/B ratio on each band.*

**Hy-Gain**  
by Telex





*Kilo-Tec offers a variety of pens which can be engraved with name and/or callsign.*

dress is Andrew Plaks (N6RKO), 3151 Fleetwood Drive, Riverside, CA 92503.

*(Also see Vibroplex.)*

## Key Covers

Larry Stamm, WB3EVL, sells a dust cover which can be left in place while the Bencher paddle is in use. The 3/16 inch plexiglas cover fits directly on the base of the keyer, with the paddles protruding through a window in the cover. The cover keeps the keying contacts and the rest of the keyer free of dust. One's callsign is engraved on the lower side of the cover's top surface to be easily read from above. The price per engraved cover is \$11, including s&h costs. Larry's address is 2516 South Lumber Street, Allentown, PA 18103-6750 (215-797-0979).

*(Also see 7-Mike Hamstuff.)*

## License Plate Items

R & J Fial Enterprises sells metal license plate frames and license plate key tags/badges. The frames are available in black matte or chrome. Up to 18 spaces can be used in the top space of the frame. A maximum of 26 spaces can be used in the space at the bottom of the frame. The face/lettering color combinations one may order are black/white, blue/white, gold/black, green/white, red/white, white/black, white/blue, white/red, and yellow/black. The face color is listed first in each pair, with the lettering color following it. License plates are priced at \$12.45 for regular mail and \$12.85, if priority mailing is desired. The plastic miniature license plates replicas are sold for all 50 states. These can be ordered for use as badges or key tags. One line of engraving is included in the \$4.95 basic price. Add 50 cents more if a second line of engraving is desired. Up to six tags/badges can be shipped at the cost of \$1.00. MasterCard and Visa orders are welcome. Their address is 5366 Camino Real, Riverside, CA 92509 (909-360-0961; FAX 909-685-8008). Shipping charges are included in the stated prices, but sales tax is additional.

## Maps

Wikle Cartographic offers 32 by 32 inch color great circle maps centered on one's location. The purchaser must provide his/her latitude and longitude. If desired and requested by the buyer, her/his call sign, name, city and/or state is shown on the map. A single map is priced

at \$30 including s&h. Additional maps cost \$20 each. Their address is P.O. Box 652, Stillwater, OK 74076 (405-743-0097).

Vector Control Systems offers a plastic-laminated, framed Great Circle Map of the Earth. The overall size is approximately 22.5 by 21.5 inches. Your stated location is shown at the center of the map with lines every 10 degrees showing true beam headings to all parts of the world. Distances are shown by 2000 mile rings centered around your station. Three versions of these full-color Great Circle Maps are available. A laminated 16 or 2 inch version is priced at \$35, including shipping and handling charges. A customized beam heading DXCC list is included at no extra charge with the preceding \$35 item. A framed 16 inch version of this map sells at \$59.95, including s&h charges. A beam indicator version of this Great circle Map sells at \$189.95, plus a \$10 s&h fee (to U.S.A. addresses). It has bright LED indicators which show 5 degree resolution. It also features an adjustable beam width and long path indicator. A simple rotor connection enables one to see the beam heading displayed on this Beam Indicator. The address is 1655 N. Mountain, Suite 104-45, Upland, CA 91784 (909-985-6250; FAX 909-985-3482).

*(Also see Geochron Enterprises.)*

## Patches

Larry Plotkin, K4JXI, sells an assortment of these items, plus ribbons and trophies. Their assortment is too extensive to cover in this article. Information can be requested by writing to Lane 4 Awards, P.O. Box 451591, Sunrise, FL 33345 (305-742-8609; FAX 305-592-5854).

Another source of custom-embroidered patches is Hein Specialties, 7960 South Glen Lake Road, Glen Arbor, MI 49636-9711 (616-334-4385; FAX 616-334-4521). Custom-embroidered key fobs are also sold by this company. They also market custom-enameled emblems (cloisonnes). It is advisable to send an SASE (#10 envelope) with your request for details of their entire product line.

A. T. Patch Company sells patches (emblems), jackets, and caps in a wide variety of styles, colors, and prices. Emblems sell in a basic range of 95 cents to \$5.20 each. Up to six colors can be used in an emblem without extra charge. Each additional color adds seven cents to the price of every emblem. If metallic thread is ordered, it adds 30% to the base price. Similarly, solid embroidery increases the price 30%, and a felt background costs 20% more. If heat-seal backing is ordered (to avoid sewing), that raises the price 15%. There is an

initial \$10 pattern setup charge, and patterns are retained for possible use in filling future orders. These emblems can be added to caps and jackets. Caps cost \$3.00 to \$4.50 (depending on quantity ordered). Obviously, these items should be purchased by groups (such as amateur radio clubs) in large quantities to obtain low prices. A special discount is available to new customers. The required form is dated and it is sent with a catalog in response to a request. The address is P.O. Box 682, Littleton, NH 03561 (603-444-3423; FAX 603-444-2371).

*(Also see Caps Unlimited.)*

## Pens

Kilo-Tec offers a variety of pens which can be engraved to show callsign and/or name. These pens feature free engraving of up to 25 letters or numbers (including spaces), gold-toned clip and accents, high-gloss black-lacquer finish, iridium point nibs, solid-brass casings, and standard refills. Ballpoint and rollerpoint pens cost \$15.75 to \$19.95 each, depending upon the quantity ordered. Fountain pens range from \$20.75 to \$24.95 each, according to quantity. A \$4.00 s&h fee applies to each order. Their address is P.O. Box 10, Oak View, CA 93022.

## Pins

Fallert's Engraving sells callsign pins of one line (1 by 3 inches) at \$1.25, two lines (1 by 3 inches) at \$1.50, and three lines (1.5 by 3 inches) at \$2 each ppd. Any desired logo (ARRL, CD, MARS, etc.) can be added at 75 cents more per pin. The address is 27 Verlynn Avenue, Hamilton, OH 45013 (513-892-9169).

The American Radio Relay League (ARRL) has a nice assortment of items. Most of the League items are only available to members. Exact details can be requested from ARRL, Publications Sales, 225 Main Street, Newington, CT 06111.

*(Also see Hein Specialties and Lane 4 Awards coverage.)*

## Publications

Jim Creevey, W4UYZ, offers the *Amateur Radio DX Blue Book* at \$9.45 each, including s&h charges. Each current amateur callsign prefix is listed with its associated capital, country, CQ/ITU zones, DXCC status, UTC/local time differences, map grids, reciprocal operating and third-party traffic allowances, plus the number of amateurs. Many other useful items of information are included. If you want complete details, write to J-C Enterprises, 4920 Mayflower Street, Cocoa, FL 32927 (407-632-6809).

George De Grazio, WFØK, is launching a magazine for homebrew enthusiasts. If you like to roll you rown (build gear), you may want to become a subscriber. The yearly rate for this quarterly publication is \$20. The address is Homebrew, P.O. Box 260083, Lakewood, CO 80226-0083 (1-800-5-HAM RIG).

Robert Halprin, K1XA, has authored a book about code operation for the benefit of new and prospective amateurs. The code subjects covered in his book include advantages, contesting, DXing, language, mastering, operating



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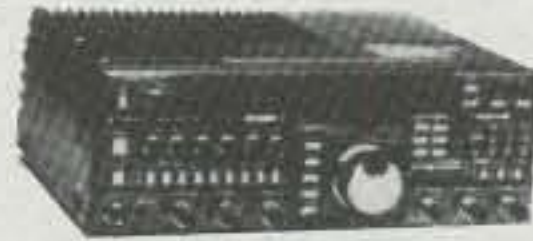
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Blacksmith Brownie (WX2Z) offers a 3.5" x 5" plaque featuring a genuine pony shoe with the purchaser's callsign hand-stamped into it.

techniques, QRP, text, tools of the trade, and traffic. The price is \$17.95 at stores and \$19.95 (domestic) if purchased from Tiare Publications, P.O. Box 493, Lake Geneva, WI 53147.

The *Amateur Radio Language Guide* provides hundreds of phrases in approximately 25 languages which are useful to amateurs. The guide is printed in five volumes which sell at \$10 each. Their address is ROSE, P.O. Box 796, Mundelein, IL 60060-0796.

Theuberger GmbH offers a 300+ page soft-cover book that is filled with tables showing

about 59,000 QSL managers, plus more than 3000 addresses of amateurs. Their address is QSL Routes, Theuberger Verlag GmbH, P.O. Box 73, O-1020 Berlin, Germany.

(Also see Vibroplex and Washa coverage.)

### QSL Items

Vaso Nagl, KD4WVK, offers a variety of eye-ball QSL cards. Prices range from \$17 to \$51 per 1000 cards, depending on card stock and inks selected. Shipping charges are included in the stated prices. There are no additional charges regarding lines, logos, and typesetting. Details can be requested from Artist, Business Cards Company, 845 Bell Road, Antioch, TN 37013 (615-731-7469).

Azimuth Communications Corporation sells the Awards QSL Library. These are customized 3-ring albums which can be used to store QSL cards, award by award. DXCC, WAS/WAC, and WAZ binders are available, plus a general file QSL binder. These binders are 19 inches high, 13 inches wide, and 2 inches deep. Each one can hold up to 240 cards. They are priced at \$22.90 each, including s&h fees. Packs of 20 extra album pages are sold at \$15.90, including s&h charges. Azimuth also markets the Grand 24 Digital 24 Hour Clock which features giant-size digits. It has a brushed black metal frame and is priced at \$32.90, including s&h fees. The GC12 is the same type of clock except that it shows 12 hour AM/PM time. Both models sell at the same price.

Joe Saunders, K3UAL, has clear-plastic QSL card holders which enable an amateur to display received cards without having to damage them with tape or thumb tacks. I have used

this type of QSL display for many years. It has the added flexibility of allowing one to quickly and easily change the cards displayed. These plastic display holders sell at \$5 for a package of 3. Each holder can be used to display up to 20 QSL cards. Joe is also a QSL card printer. His address is Club Printers, 1520 Jutewood Avenue, Hyattsville, MD 20785 (phone 301-773-9383 and 301-773-5074). If you want samples of his cards, send 50 cents (stamps or cash) with your request.

7-Mike Hamstuff sells QSL storage boxes and index dividers. The sets of dividers are for all 50 states, all DXCC countries, 1-Ø, A-Z, 10-160 meters (including the WARC bands), and a set of do-it-yourself dividers. Lee Finkel, KY7M, also sells two distinctive T-shirts and a wood cover for the Bencher paddle. His address is 7-Mike Hamstuff, P.O. Box 14455, Scottsdale, AZ 85267-4455.

### Rubber Stamps

Gary Pierce, K6CAQ, sells three-line rubber stamps at \$6 each, ppd. Send an SASE with your request if you want additional information. His address is 5521 Birkdale Way, San Diego, CA 92117.

Doug Reid, WB8MKV, sells a variety of rubber stamps for use by amateur radio operators. These stamps can be used to imprint envelopes, QSL cards, stationery, and anything else. His style M-4 stamp shows an elephant and DON'T FORGET TO QSL. Style M-8 has AMATEUR RADIO (plus your callsign) enclosed in a circle. Style M-10 appropriately shows TEN-TEN (plus your number). Style M-20 has the outline of a telegraph key. The

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Todd DeAngelis, N3KZK, of Mechanicsburg, Pennsylvania, gathered station equipment 20 years before becoming an amateur radio operator. He advises others to get on the air quicker than he did. His equipment is not "antique," but is old enough to be "classic" gear.

M-4, M-10, and M-20 stamps cost \$4.95 each. The M-8 stamp is priced at \$10.95, which also pays s&h fees. The address to use is Reid Associates, 6680 Mellow Wood Lane, West Bloomfield, MI 48322 (313-851-0260).

### Signs/Decals/Charts

Gary M. Hengstenberger, N8LVY, sells call-sign decals which are intended to be applied to the inside of vehicle windows. The height of the white vinyl characters is 1.25 inches. The price is \$4 each. The address is DCALL, 2102 Waterbury Drive, Uniontown, OH 44685-9770.

Sign On markets both magnetic and suction-mounted call-sign displays for car-window or trunk attachment. These signs are easily transferrable from one vehicle to another. The price is \$9.95 apiece and two for \$18.00, including s&h costs. The address is 1923 Edward Lane, Merrick, NY 11566 (516-546-4362). Joel Dulberg, KA3FHU, advises that your SASE and request for information will receive prompt action.

(Also see ARRL, Caps Unlimited, and Vibroplex coverage.)

### Trophies/Plaques

The Burmont Development Company etches a 5 by 7 inch replica of one's amateur license on a gold-color aluminum plate, which is then mounted on a blue or red (your choice) piece of velvet that gets mounted in an 8 by 10 inch frame. The cost is \$75.48, which includes s&h charges. Their address is 2839 Springfield Road, Broomall, PA 19008.

Trophies by Edco is an excellent source of a wide range of desk signs, wall plaques, and trophies. Rick Cordary, KN4CV, is the president of this company. Their address is 3702 Davie Boulevard, Ft. Lauderdale, FL 33312-3494 (305-587-0137; FAX 305-581-7680).

Blacksmith Brownie is Jeffry Brown, WX2Z. He sells a very nice 3.5 by 5 inch plaque which features a genuine hot-forged pony shoe that is polished before it is hand stamped (with the

purchaser's callsign) on an anvil. The pony shoe is detailed in gold prior to being mounted with authentic horseshoe nails on a 0.75 inch thick piece of finished red oak wood. The corners and edges of the plaque are milled out using a stone grinding wheel, leaving interesting looking friction burns on the milled out indents. The plaque is then finished with a natural oak stain. Last of all, two coats of a clear high-gloss polyurethane sealant is applied to protect and enhance the beauty of the wood. A routed notch on the back side makes it easy to wall mount the plaque. If preferred, this plaque can be ordered with a desk top mounting bracket. The price of a basic plaque is \$14, including s&h fees. A gold ARRL logo pin can be added (between two horseshoe nails) at the additional cost of \$4. It is interesting to note that Jeffry has been a real blacksmith for more than two decades. Each buyer must clearly list the callsign to be stamped on the pony shoe. One can order a plaque with class of license burned into the wood. The date the license was initially issued can also be burned into the wood. A popular version of this plaque has GOOD DX burned into the wood. Brass pounder, Good Luck, Member ARRL, Rag Chewer, #1 DXer, #1 Fist, #1 Ham, or 10-10 #— can also be burned into a plaque.

### VHS Tape

The Pitcairn Island story is available from Tibi Productions, P.O. Box 129, Medinah, IL 60157. This VHS tape is 72 minutes long. It was filmed and narrated on Pitcairn Island, the home of the *Bounty* mutineers. The price is \$29.96, plus s&h charges.

### Conclusion

It is hoped that you will benefit from some of the ideas and products presented here. Remember to check with the companies to get the most current prices and information before actually ordering.

73, Bill, W6DDB

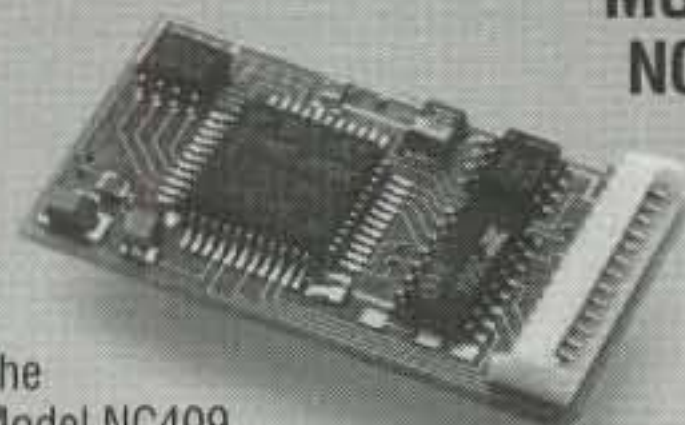
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The Model NC409 is a DTMF ANI/Alarm status encoder and companion product to the Model NC401 DTMF Decoder designed to automatically or manually generate any of the 16 DTMF characters. The NC409 features 15 memory locations of up to 30 digits each plus last number redial and multiple user-configurable functions. Programming is easily performed by means of a 12 or 16 button "X-Y" keypad with common ground or the Model NC500 Universal/P.C. programmer. The NC409 measures .85"W x 1.36"L x .165"H and comes complete with micro-miniature 14 pin header and 12" color coded cable assembly. For FREE detailed information ask for the NC409 user's manual.

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## A LOOK AT THE WORLD AROUND US

### A Holiday Special

**S**eaon's Greetings, friends, and may these holidays be better to you than ever before!

In view of those cheerful wishes, we once again digress from covering our usual variety of specialized topics to feature holiday gifts especially for amateurs. Forget those socks, ties, and the camcorder stuff you can get anytime. We are highlighting real electronic equipment and communications gear guaranteed to light up your life and expand your horizons!

A creditable amount of effort and research went into preparing this month's column, and it has truly resulted in something for everyone. Additionally, all of our featured items are in the "affordable" class, so you can reward yourself with a special gift without breaking the bank. Economic conditions may have slumped during the last year, true, but that does not mean we must short-change our enjoyment of our great hobby. Live a little! New gear is akin to a ray of sunshine on an otherwise cloudy day.

Before delving into our collection of holiday treats, I should remind you that featured items are available direct from their manufacturer or from dealers nationwide, not from me nor from *CQ*. I am simply your guide on this window-shopping tour. I also encourage you to order early to avoid "sold out" entanglements and shipping delays during this busy time of the year. In many cases a simple telephone call and a few extra dollars for Federal Express can have the item of your dreams to you in less than 48 hours.

That's enough preliminary discussion. Let's now fast-forward to our potpourri of hot items for 1993!

#### Renewing HF Fun

Gearing up with a new HF transceiver is the perfect way to start a new year in style, but many amateurs assume today's rigs are beyond their budget. Look closely at recently introduced models, however, and you may be pleasantly surprised. New "economy class" HF transceivers are priced quite attractively, built for many years of operation, and have good resale value. Over the long run such a rig is actually more enjoyable and less expensive to own than one or two used rigs.

4941 Scenic View Drive, Birmingham, AL 35210



Photo 1—The ultimate holiday gift—a new rig! ICOM's easy-to-operate IC-707 fills that bill perfectly and is affordably priced.

Consider, for example, ICOM's new IC-707 in photo 1. This compact transceiver is especially designed for carefree operation, and makes an ideal first rig for newcomers or a good mobile unit for more advanced amateurs. The IC-707 is lightweight and measures only 3.7H" x 9.4W" x 9.4D", so it can fit on the corner of a desk or in compact cars quite easily. The transceiver covers 160 through 10 meters, has an impressive receiver, and a solid 100 watt output transmitter that runs cool as a cucumber. It also features general-coverage reception from 100 kHz to 30 MHz, dual VFOs, 32 memories, RIT, noise blanker, and two scan modes. There is a front-panel-selectable receive preamp and attenuator for varying sensitivity and a power control that adjusts output down to approximately 2.5 watts for QRP operation. The IC-707's front-mounted speaker is a great idea, as it makes the transceiver a single-cabinet station that's easy to carry almost anywhere and hook up with a minimum number of connections.

I recently checked out an IC-707 and found it to be super-convenient for quick operating stints. In fact, I set it up by my den chair rather than in the shack and used it with earphones and key while watching TV, writing, and bird-sitting our parrot. During 15 minute time slots over two or three evenings I contacted over two dozen DX stations on 30 and 20 meters. The IC-707 makes HF operation as simple as working 2 meters or 70 cm—an asset definitely worth consideration with

today's busy lifestyles. Everyone needs at least 15 minutes of "ham time" to take the rough edges off daily life, and the IC-707 fills that bill perfectly. ICOM's IC-707 is available from amateur radio dealers nationwide, and more information on this basic-style transceiver is available from ICOM America, Inc., at 1-206-450-6088.

Whether your transceiver is new or old, complementing it with a custom key and/or microphone is a sure-fire way to add 10 dB in on-the-air enjoyment. Getting behind a new key or paddle is a special treat, because it is fun to use and lets you add "personality" in transmitted Morse. Fine, you say, but what's new in paddles this holiday season? Personally, I'm captivat-

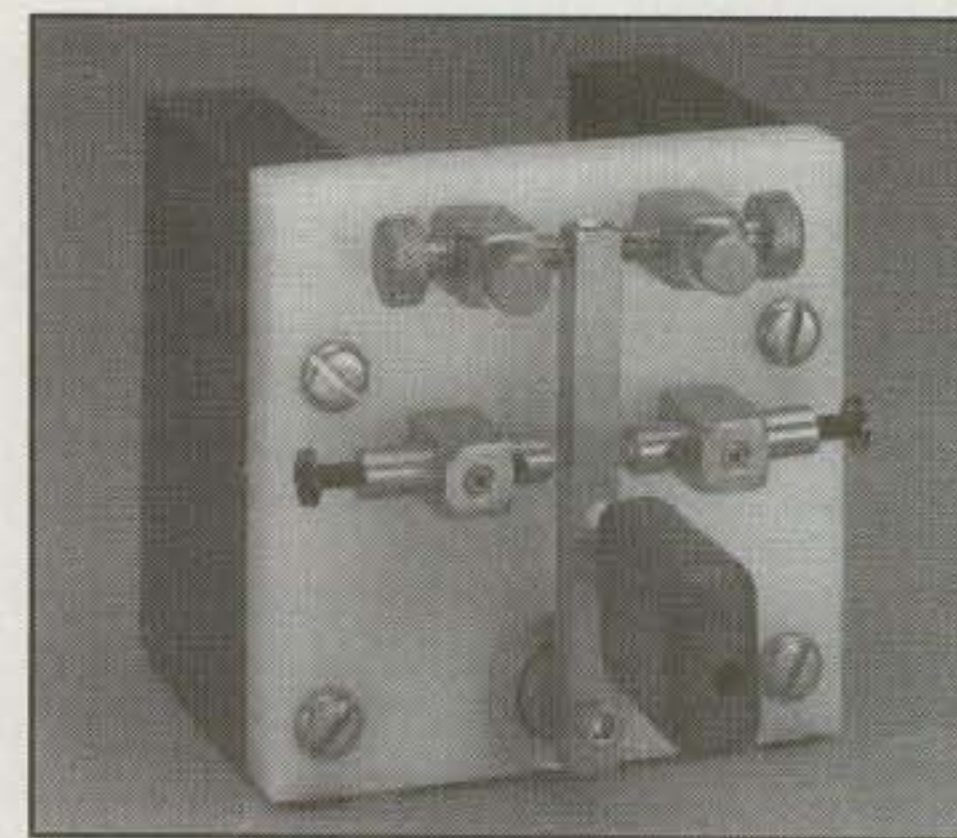


Photo 2—The new Vertical Single Lever paddle made by Stan Hails, W9WBL. This delight really makes CW operation fun.



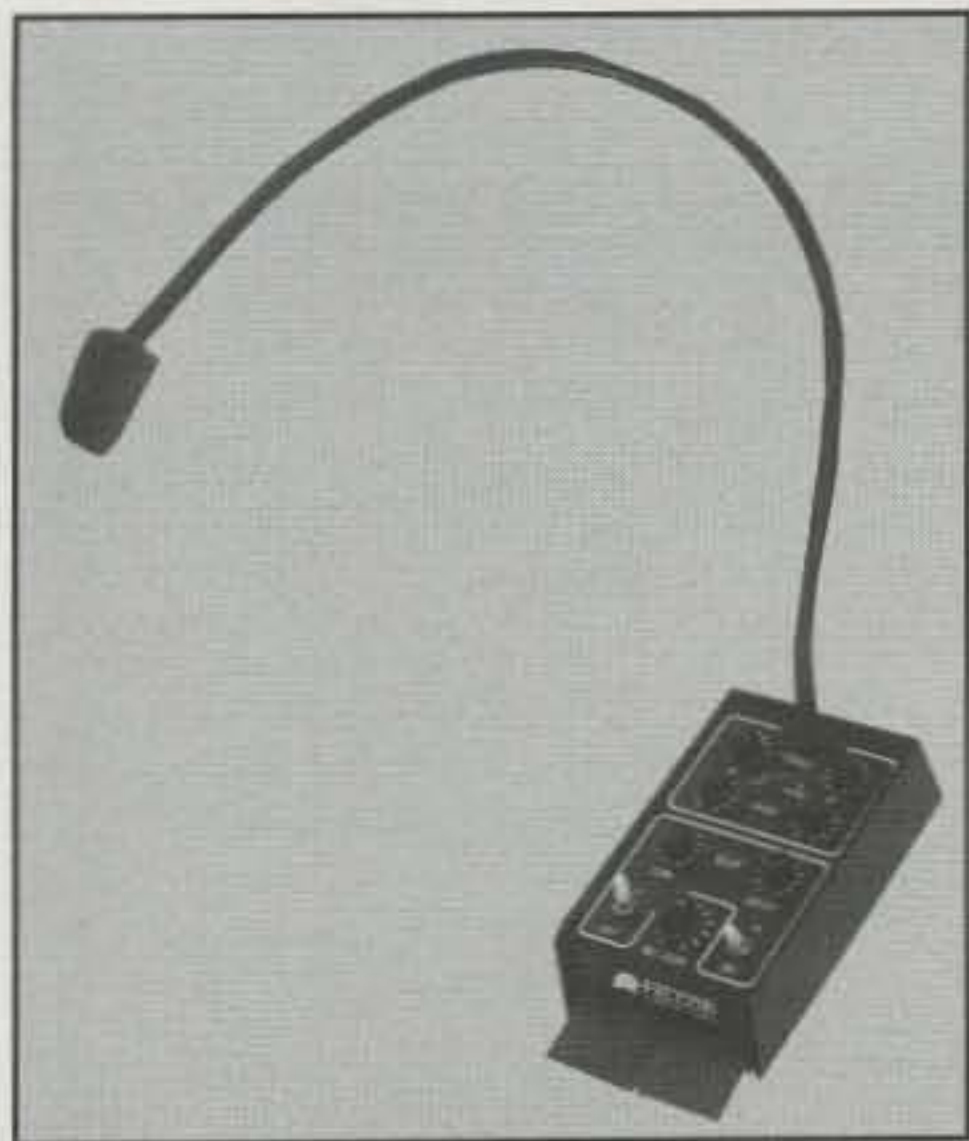


Photo 3—Falcon Communications' new super-featured desk mic has built-in VOX, bass and treble equalizers, and dual outputs for operation with two rigs. Mic is supplied complete with cable and plug to fit all popular 8-pin transceivers; wiring is field-changeable using a screwdriver.

ed by the new Vertical Single Lever made by W9WBL and shown in photo 2.

Notice that this paddle's main lever is mounted vertically rather than horizontally and pivots from the bottom. The fingerpiece is mounted above that pivot point so the main lever's movement does not "reverse directions" like a regular paddle. The left contact is thus wired for dashes and the right contact is wired for dots. Arm travel and tension are fully adjustable, and key contacts are 80 percent gold. Look closely at the main arm, and you will notice a white nylon plug in a threaded hole right above the fingerpiece. The plug and fingerpiece can be swapped in position to mate with an owner's hand. To the best of my knowledge, this is the only upright paddle made today. As Stan, W9WBL, points out, his vertical paddle is easier to handle than regular horizontally mounted paddles and thus minimizes usual errors in sending caused by changes in finger positions during use. I must agree, as the paddle feels quite smooth and is very enjoyable to operate. The VSL measures only 2.5" x 3" and weighs 2.2 pounds for solid footing on a desk. The paddle is supplied complete and ready to use with a 3 foot flexible cable and preinstalled plug (with screw terminals for easy rewiring). You can order the VSL paddle direct by writing to WBL Design, 6345 Coffman Road, Indianapolis, IN 46268-2591, or by telephoning 1-800-726-8936.

If voice operation is your preference, Falcon Communications' new desk mike shown in photo 3 is a terrific self-reward or gift idea. The mike has built-in bass and

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• N201715-1	20/17/15	3el/Dipole	<2	\$198.00
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• EF-240S	40	2el (C.I.C. 33' el), 16'		In Field Testing
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• 308 MAGNUM 810	10 Mtr	8el, 30'	5.35	\$485.00
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• 44 MAGNUM 715	15 Mtr	7el, 44'	8.85	\$875.00
• 357 MAGNUM 617	17 Mtr	6el, 35' 7"	6.30	\$625.00
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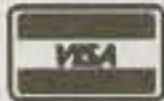
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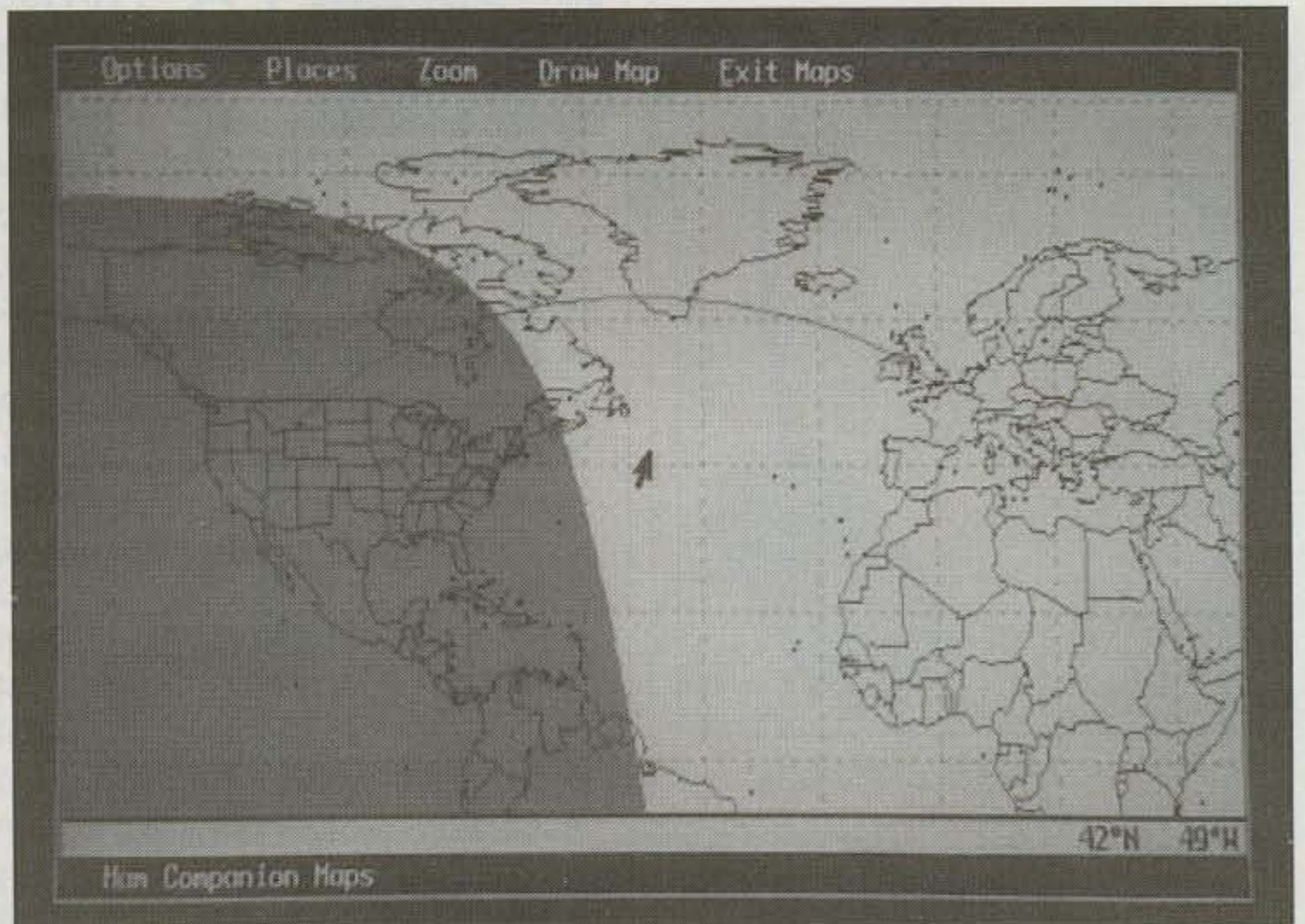


Photo 4- Off-the-screen view of The Ham Companion displaying its world maps and areas of daylight and darkness. This software package is loaded with terrific information everyone can use.

treble equalizers that can be adjusted to glamorize your voice (you will sound better on the air than you do in person!), plus dual channels and output cables for connection to two transceivers. You can thus connect one cable to your HF and the other to your VHF transceiver, and use the mic's switches to operate both rigs simultaneously. There is also a built-in VOX and adjustable mic preamp—neat extras that really enhance basic-style rigs. Falcon thought of everything when designing this microphone, as it comes complete with cable and 8-pin plug to fit all popular transceivers. Wiring is field-changeable to mate with various manufacturers' transceivers using only a screwdriver, and easy-to-understand instructions are included. This microphone promises to be a real winner year after year and rig after rig. Falcon mics are available through larger amateur radio dealers nationwide. For more information, contact Falcon Communications, P.O. Box 8979, Newport Beach, CA 96258.

Our next item is a computer program that puts an endless variety of operating aids and reference material at your fingertips: The Ham Companion. This software package runs on an IBM or compatible computer with 512K of RAM, a hard drive, and SVGA, VGA, or EGA graphics. It is available on 5 1/4 or 3 1/2 inch disk. The software does not require any rig interconnection for use (you can enjoy it with any transceiver), and it might be compared to a giant amateur radio encyclopedia. The Companion has world maps that display time zones, short- and long-path bearings, distances, gray line for DXing, and much more (see photo 4).

You can zoom in various locations, call up geographic information on pull-down menus, cross-reference prefixes and DX countries, look up CQ Zones and Q signals, and even add information to a huge database as desired. The Companion also features graphs for MUF, LUF, and optimum usable frequency that can be updated with WWV sunspot information, as shown in photo 5. During review, I noticed it even has good QSL-routing notes in its pull-down menus. Quite frankly, this is the most elaborate software package for hamming I have seen. The Ham Companion is available from Brinson Microware Corp., 114 SE Fourth Street, Mooreland, OK 73852, telephone 1-800-874-0771.

## Goodies For Portables

Want to breathe some terrific new fun into your 2 meter or dual-band handheld during the holidays? Check out Comet's new "Miracle Baby" 1.3 inch tall "tiny duckie" antenna shown attached to a portable in photo 6. This world's smallest antenna is mainly designed for close range use, and makes any handheld incredibly compact. The Comet CH-32 "Miracle Baby's" most often-cited application is line of sight and around hamfest communications with friends. I have found it delightful, however, for around town monitoring and chatting with friends through repeaters within a 5 or 6 mile range. Many of us use handhelds primarily for a quick call to nearby friends, and the Miracle Baby really shines in this respect. It can be left on a handheld even when carried in a bag, and the convenience of whipping out the



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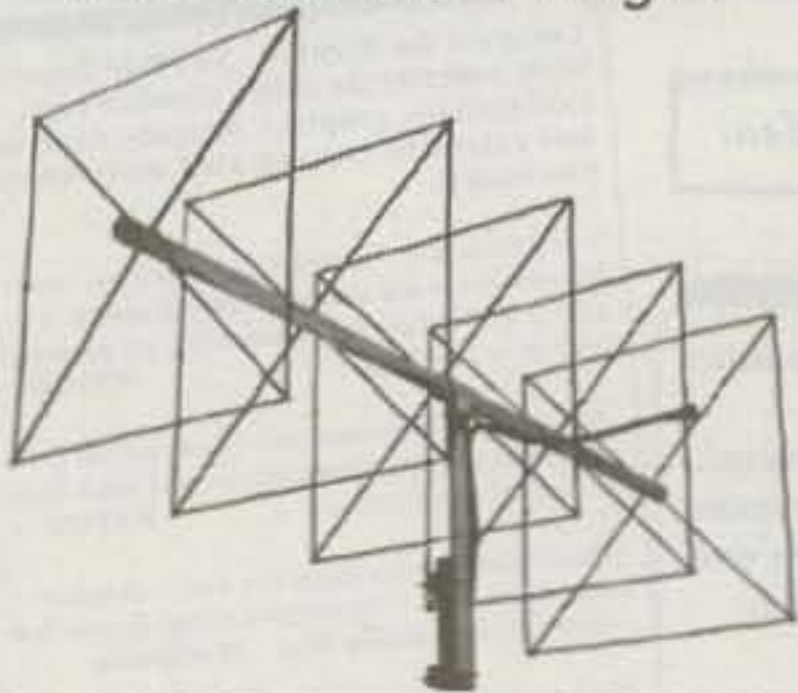
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CIRCLE 129 ON READER SERVICE CARD



Photo 6- Comet's CH-32 "Miracle Baby" 2 meter/70 cm antenna really makes a handheld compact! This micro-duckie is only 1.3 inches tall and works well for close-range communications.

rig for use on a moment's notice rather than fumbling to quickly attach a standard/supplied antenna is just great. If it sounds as if I'm hooked on this little tyke, you're right. It is the perfect size for modern times (only slightly taller than a rig's knobs!). Comet's Ch-32 Miracle Baby antenna covers 2 meters, 70 cm, and 850 MHz, and is available from amateur radio dealers nationwide. For more information, contact Comet Antennas, 1275 North Grove Street, Anaheim, CA 92806, telephone 1-714-630-4541.

Chances are good your micro-duckie-

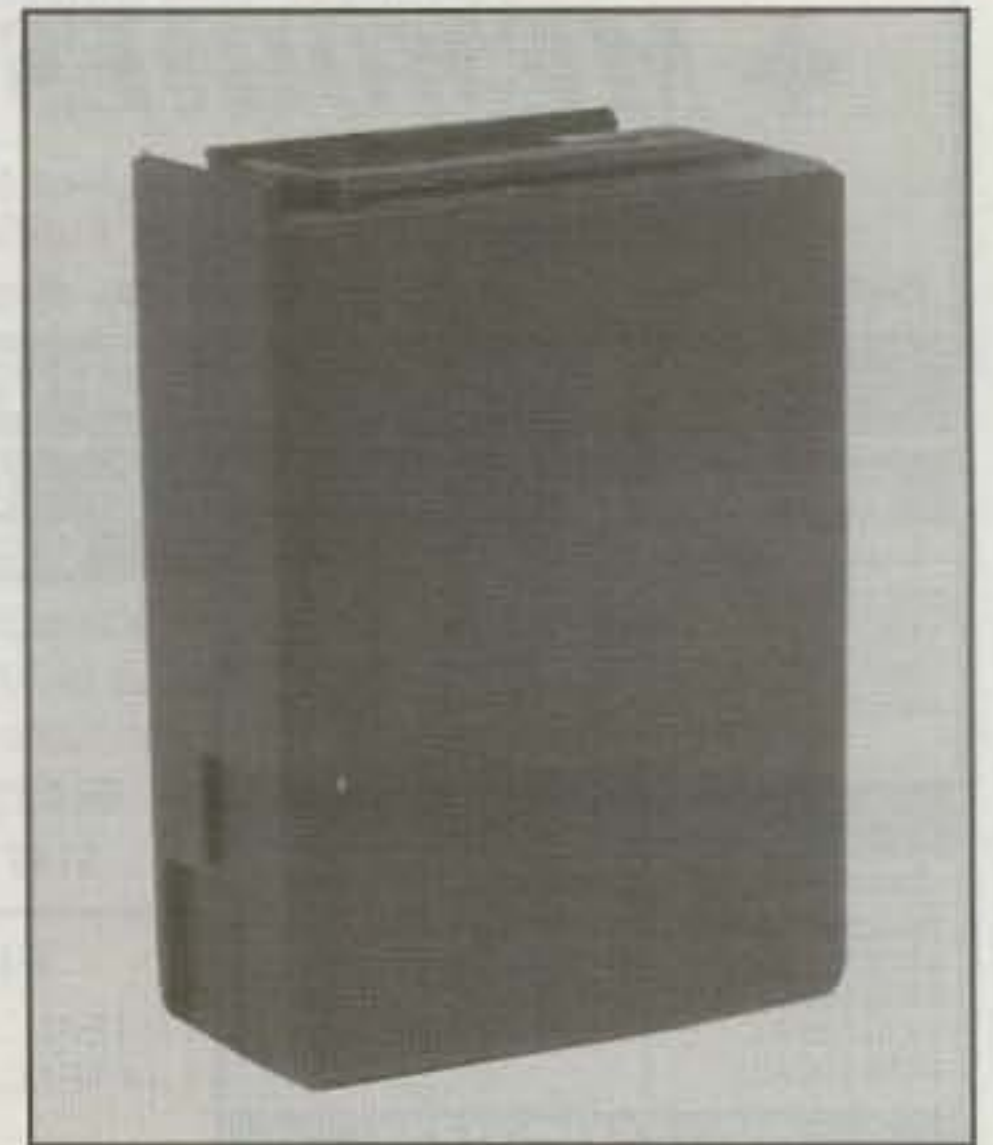


Photo 7- Long-life and high-capacity rechargeable battery packs for all popular handhelds are available from Periphex, and they work great. Everyone needs an extra battery pack to enjoy the holidays in high style!

equipped handheld will prove so much fun to use that discharged batteries will become a common occurrence. That is easily solved with an extra-long-life battery pack, and Periphex has the solution. Their new high-capacity rechargeable battery packs fit Yaesu, ICOM, Kenwood, and Alinco handhelds, and they keep you talking for two to three times longer than regular manufacturer-produced packs (see photo 7). Periphex's battery packs are made in the USA and use matched sets of Sanyo batteries for top performance. The battery packs carry a full one-

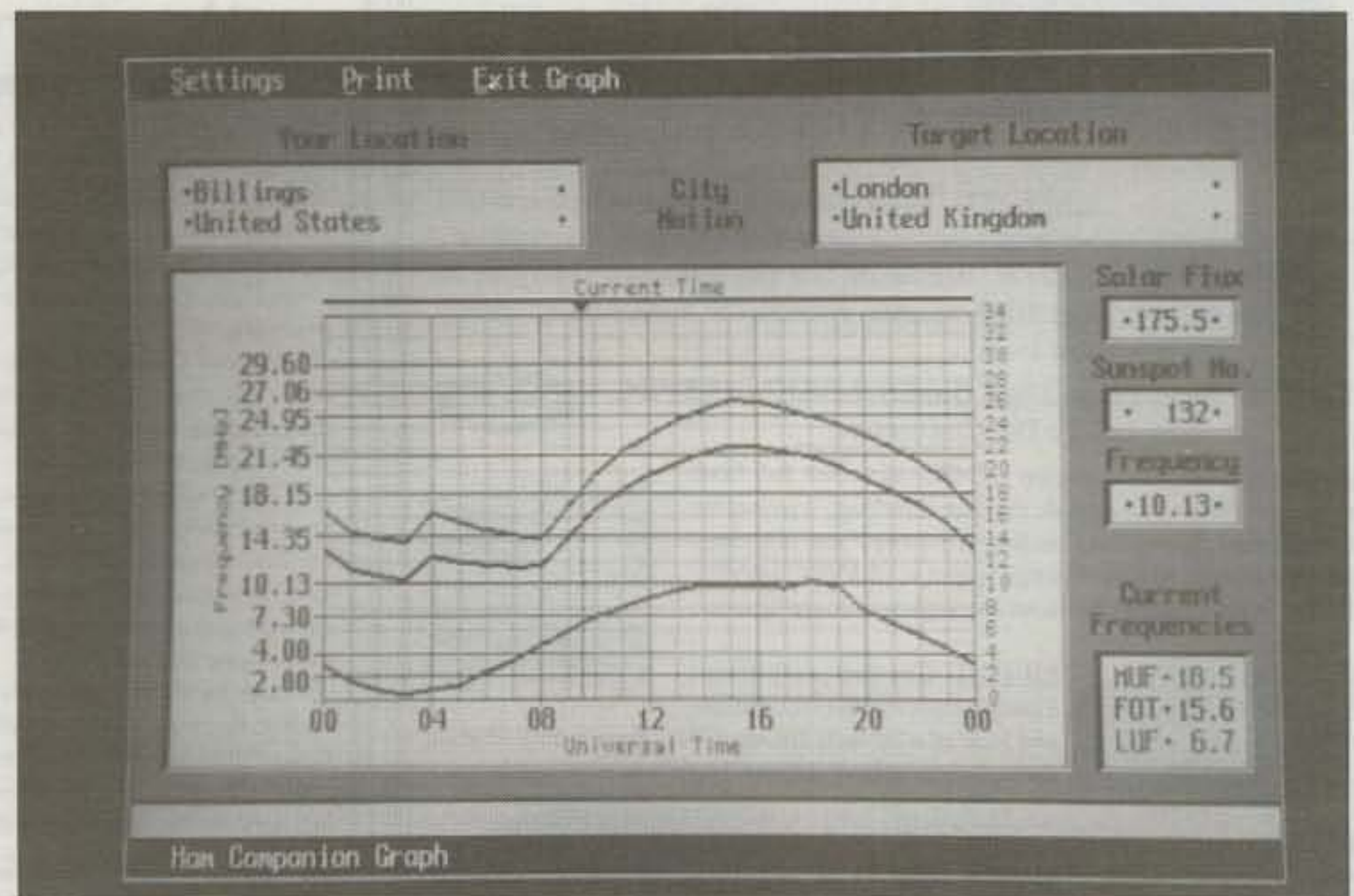


Photo 5- Another off-the-screen view showing The Ham Companion's calculations of MUF/LUF over a 24 hour period. Note the optimum band/frequency at the time this photo was taken was our own favorite—30 meters!





Photo 8— The Para Dynamics SWR and power meter shown here is actually smaller than it appears. Pocket-size item is handy for measuring mobile rigs, handhelds, and antennas.

year warranty, plus they can be field-rebuilt several years down the line, which can be a real asset (finding good battery packs after a handheld is dropped from production can be challenging). I recently tried one of the new Periphex EBP-24S/1500 ma battery packs with my Alinco DJ-580 dual-band handheld and the results were amazing. Simultaneously monitoring and operating both 2 meters and 70 cm drains most battery packs quite rapidly, but the Periphex battery pack seemed to last indefinitely between recharges. It reminded me of the classic all-day sucker we enjoyed as kids! Want to keep talking, talking, talking with few concerns for run-down batteries? Snap an FNB-12 on your Yaesu, BP-85S on your ICOM, PB-13S on your Kenwood, or EBP-24S on your Alinco FM handheld. You'll be pleasantly surprised with the results! Periphex's battery packs are available from amateur radio dealers nationwide or from Periphex, Inc., 115-1B Hurley Road, Oxford, CT 06478, phone 1-800-634-8132.

Every high-band enthusiast needs a good VHF/UHF SWR/wattmeter, but finding one small enough to fit in a coat pocket and light on the budget is a challenge. Enter the Para Dynamics PC-9 shown in photo 8. This new little tyke measures only 2.5"H x 2.5"W x 1.0"D, covers the 2 meter and 70 cm



Photo 9— H & M Jewelry's new-style call sign collar pin is a real attention grabber. Item is available in 14kt. gold or more economical gold-filled style as desired.

bands, and reads power levels of 60 watts or 15 watts full-scale. A switch on the left front selects power range, and a switch on the right front selects power or SWR measurements as desired.

The meter is solidly built to take plenty of use and abuse, and has low insertion loss so it can be left connected all the time. It is a neat gem with a thousand uses, and it also has a reasonable price tag. Finally, you can stop guessing if your mobile rig or handheld is pumping out proper power or if your antenna is improperly tuned. The Para Dynamics PC-9 is available from dealers nationwide. For more information, call Valor Enterprises, 1711 Commerce Drive, P.O. Box 601, Pique, OH 45356-0601, telephone 1-513-778-0078.

### Ham Jewelry

The holidays would not be complete without the touch of gold, and H & M Jewelry continues to be a "top banana" in this area. Their always-popular call sign collar/tie pins such as the ones shown in photo 9 have been upgraded this year with block-style letters plus a larger rear clasp, and they are real attention-grabbers. The call sign pins are available in 1/4 inch or 3/8 inch letters, and the full pin is made in impressive 14kt. gold. A small diamond can also be included on the pin for real flash. I wear one of these pins nearly every day and notice strangers pay more attention to it than me! There is no better way to proudly tell the world you are a radio amateur!

H & M Jewelry also makes amateur radio wristwatches, rings, and an impressive selection of economically priced trophies ideal for clubs. The wristwatches are personalized with your name and call, and are available in several styles. Amateur radio jewelry is truly a gift that continues giving the year round. For more information or to order, contact H & M Jewelry Co., 26 Edgecomb Road, Binghamton, NY 13905, telephone 1-800-285-8587.

In closing, I must emphasize that the views in this month's column are only a small sampling of goodies available during the holidays. You can continue the tour by browsing through advertisements on the pages of CQ. Nearly all companies are displaying their new wares, making our magazine a hamfest by printed page.

Also, friends, my recently completed book *How To Get Started In Homebrewing Projects* should make its grand debut this month. This inexpensive gift is available from NARA (phone 1-800-GOT-2-HAM). *One final note:* I am once again planning an on-the-air Christmas party the Saturday and/or Sunday before Christmas, and will be giving away various goodies to friendly contacts. Try to join us; it will be fun! I will operate around 14.200 to 14.240 MHz between 2200 and 2300 GMT. Happy Holidays!

73, Dave, K4TWJ

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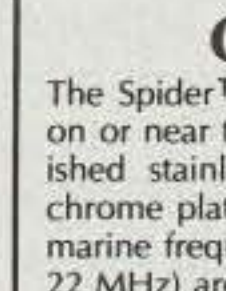
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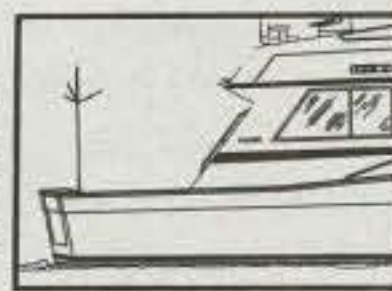
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## NEWS OF CERTIFICATE AND AWARD COLLECTING

**T**his month we salute:

**Frank C. Romano, Jr., WA6KHK**  
**USA-CA All Counties #698**  
**February 15, 1991**

Frank's dad, Frank C. Romano, Sr., introduced Frank Jr. to amateur radio in 1959. Frank Sr. was taking a Morse Code class at Pasadena, California City College. Unfortunately, his dad's arthritis prevented him from obtaining his amateur radio license. (Those were the no No-Code license days, remember?)

The seed had been planted, and Frank Jr. obtained his license and then began to "collect paper" (pursue amateur radio awards).



Frank Romano, Jr., WA6KHK, USA-CA All Counties #698.

He has held membership in the International QRP Club, the Certificate Hunters Club (CHC), the International YL SSBers, and Mobile Amateur Radio Awards Club (MARAC). He got his DXCC back in the 1960s and has worked over 140 countries.

Frank writes that county hunting has always been his love in amateur radio. He has put out many counties while traveling mobile in many states. He wishes to publicly thank Stuart Johnson, WU4S, for going out of his way to get him several counties, including Bleckley, Georgia, his last for number 3076. Frank also wants to thank his Elmer, Robert Strand, K6LCX, for administering the Novice test and being his first QSO on March 1, 1960.

Frank has another life as a Master Sergeant in the Army Reserve. He submitted his picture in his uniform to indicate support for our troops in the Persian Gulf during Operation Desert Storm.

### Awards Issued

Walter Newman, WB3HTK, submitted a complete book to receive USA-CA 500

Box 76, Pleasant Mount, PA 18453-0076

### Honor Roll

3000		1000	
WB3HTK	838	WB3HTK	1293
ND3T	839	ND3T	1294
		G14XFR	1295
2500		500	
WB3HTK	916	WB3HTK	2709
ND3T	917	ND3T	2710
		G14XFR	2711
2000		JA6PWN	2712
WB3HTK	993	N4QH	2713
ND3T	994	KCX5P (SWL)	2714
		WWØE	2715
1500			
WB3HTK	1083		
ND3T	1084		

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.

#2709, USA-CA 1000 #1293, USA-CA 1500 #1083, USA-CA 2000 #993 USA-CA 2500 #916, USA-CA 3000 #838 and USA-CA ALL #813.

Joe Foster, ND3T, also completed his quest in one submission to obtain USA-CA 500 #2710, USA-CA 1000 #1294, USA-CA 1500 #1084, USA-CA 2000 #994, USA-CA 2500 #994 USA-CA 2500 #917, USA-CA 3000 #839, and USA-CA ALL #814.

Bill Baxter, N7OTR, submitted his completed book for USA-CA ALL #815.

David Wells Beattie, G14XFR, received USA-CA 1000 #1295 and USA-CA 500 #2711 All 10 Meter SSB.

The following submitted their first books to receive USA-CA 500.

Kouichi Isimaru, JA6PWN, USA-CA 500 #2712.

Lyle Dysinger, N4QH, USA-CA 500 #2713.

Ceal Rozas, KCX5P, (SWL) USA-CA 500 #2714.

Jerry Rappel, WWØE, USA-CA 500 #2715.

### News of Awards

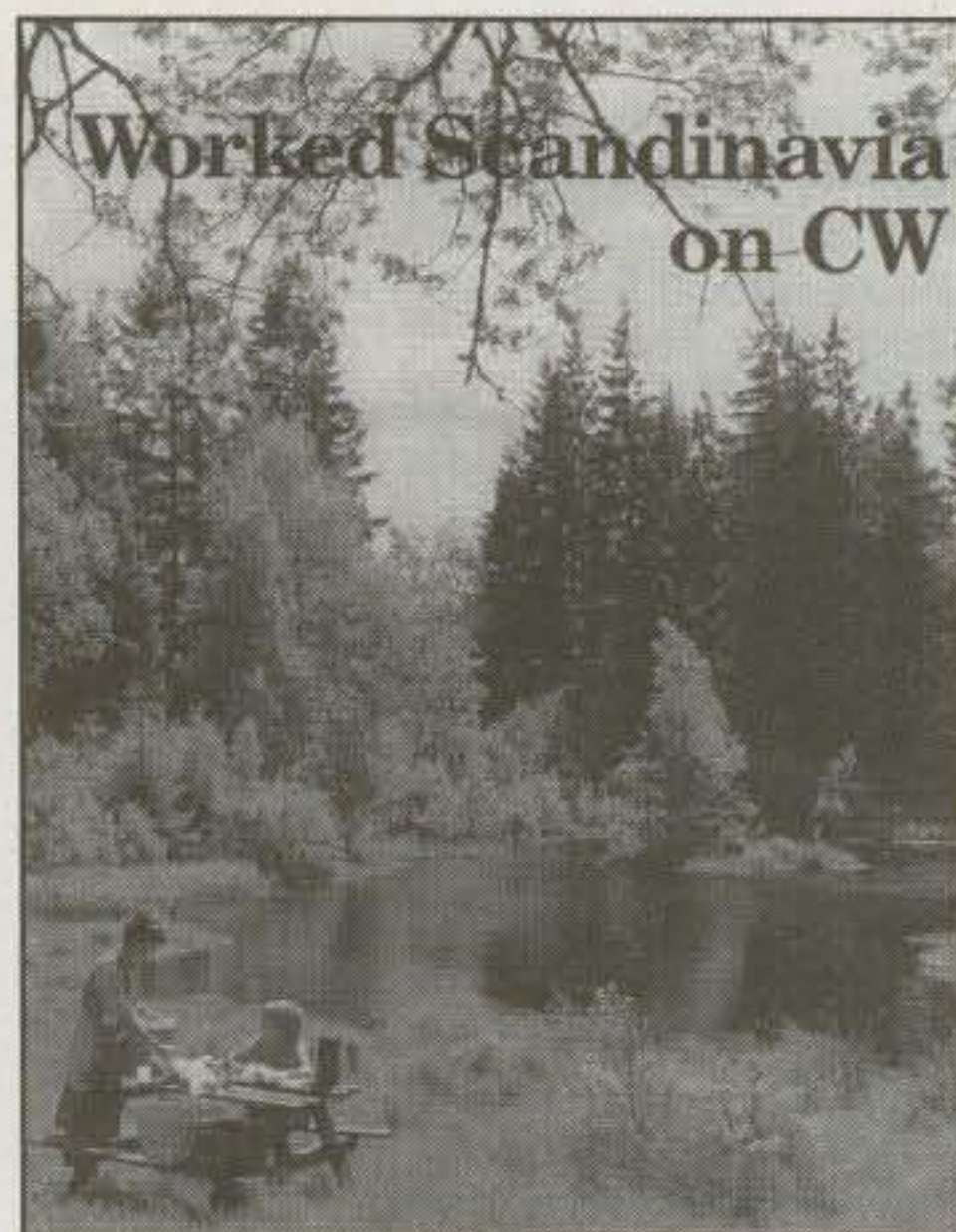
**The Scandinavian CW Activity Group Award.** The Scandinavian CW Activity Group (SCAG), founded in 1974, sponsors an award to encourage CW contacts with Scandinavian countries. A beautiful certificate with a typical Scandinavian landscape is awarded to amateurs and

### Special Honor Roll

Walter W. Newman, WB3HTK  
 USA-CA All Counties #813  
 Mixed Band & Mode, 9-16-93

Joseph Foster, ND3T  
 USA-CA All Counties #814  
 Mixed Band & Mode, 9-27-93

William Baxter, N7OTR  
 USA-CA All Counties #815  
 Mixed Band & Mode, 9-27-93



The Worked Scandinavia on CW Award is sponsored by the Scandinavian CW Activity Group (SCAG).

SWLs who meet the following requirements.

Two-way CW contact with at least 100 amateur radio stations in Scandinavia including five of the six prefixes: LA, OH, OY, OZ, SM, TF. All contacts must be after 1984. There is a special sticker for QRP (5 watts out).

Send a copy of your logbook confirmed by two licensed amateurs and US\$7 or 10 IRCs to: Award Manager Rick Meilstrup, OZ5RM, Geelskovparken 12/1, DK-2830 Virum, Denmark.

**ATV Quest Awards Program.** A completely new award program has been announced for the video modes. The program, sponsored by *ATVQ Magazine*, is called Amateur Television Quest. Amateurs and SWLs may both compete for DX awards (Quest) and number of contacts (Quantum) award certificates.

To qualify, each station must make contact in a video mode (SSTV or FSTV, AM



W9N BG

Q#1

# AMATEUR TELEVISION QUEST

KNOW ALL BY THESE PRESENTS THAT

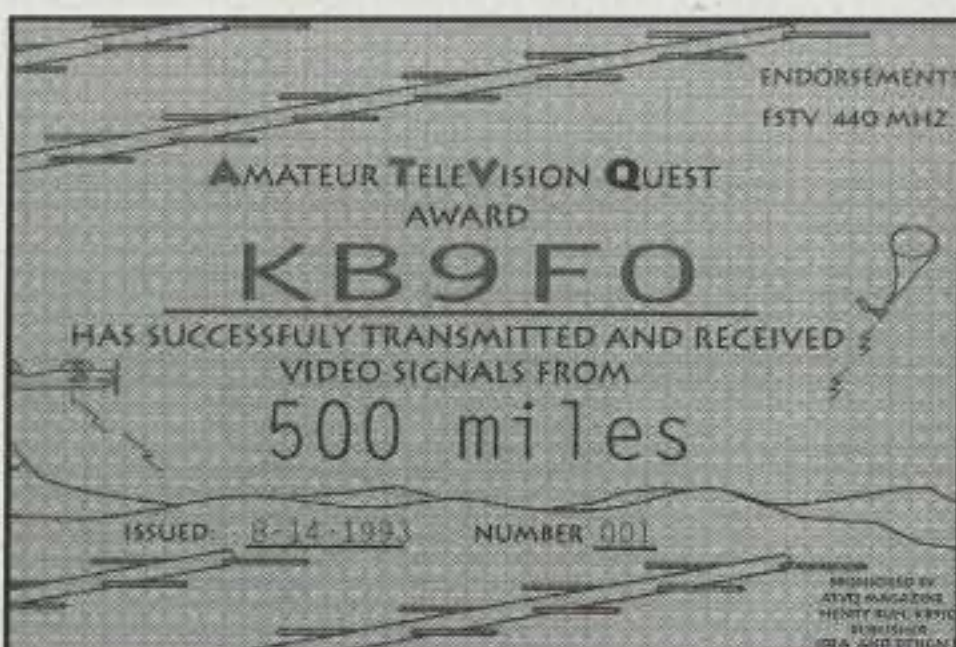
THE HOLDER OF THIS CERTIFICATE HAS DEMONSTRATED KNOWLEDGE AND DESIRE TO COMMUNICATE IN THE VIDEO ARTS, AND AS SUCH IS HEREBY ELECTED TO THE ATQ SOCIETY

TO SEEK AND QSO WITH OTHER VIDEO EQUIPPED STATIONS AND BY EXCHANGE OF THE PERSONALIZED ATQ NUMBER, QUALIFY FOR ALL BENEFITS AND AWARDS OF THE ATQ SOCIETY.

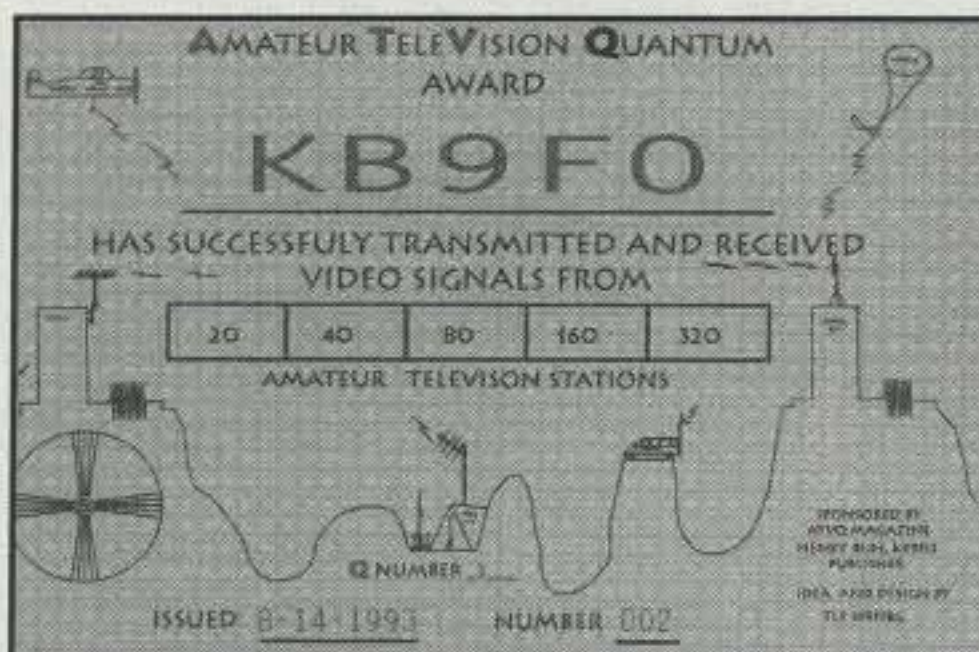
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HENRY RUH KB9FO

The Amateur Television Quest Award sponsored by ATVQ Magazine.



The ATVQ Award is issued in intervals of 100 miles or more for each level.



The ATVQ Quantum Award is issued for the number of contacts starting at 20 video QSOs and increasing to 50, 100, 250, and up.

or FM), exchange a personalized Quest number (which is issued to the operator by *ATVQ Magazine*), and exchange video, including the Quest number. A log of contacts must be submitted for each award.

The *Quest Award* is for DX contacts on 50.1 MHz and above and is awarded for contacts made in intervals of 100 miles or more for each level of the award. Multiple bands earn multiple points.

The *Quantum Award* is for numbers of contacts starting at 20 video QSOs and increasing to 50, 100, 250, and up.

To get your Quest number send \$2.50 and receive a full-color ATVQ Society Quest Membership Certificate, suitable for framing, which includes your Q number and callsign. SWLs are issued a Q



Some of the attendees at the Sept. 1993 MARAC North Central Mini Convention.

call (Q1AA, etc.). The award certificates are designed by Tom Pusateri, W9N BG, and are in full color with custom video graphics suitable for framing.

Subscription to *ATVQ Magazine* is not required to participate in the program, which is designed to stimulate activity and DX achievements.

For more information contact Henry Ruh, KB9FO, *ATVQ Magazine*, 540 Oakton St., Des Plaines, IL 60018 (708-298-2269; FAX 708-803-8994).

3. W4MBD, Robert Mc Neill, Moorehead City, NC. Total 596.

4. N4VZ, Robert Peterson, Conyers, GA. Total 860.

5. WB4DBB, Herman Cone, Goode, VA. Total 627.

6. K3UA, Phillip Koch, Coraopolis, PA. Total 728.

7. K6VX, Raymond Balch, Macdoel, CA. Total 502.

Congratulations to all!

## WARC 500 Award Winners

James E. Mackey, K3FN, has sent the first listing of the WARC 500 Award winners. These are current to 23 September 1993. (See September 1993 *CQ*, p. 66, for complete information on the award.)

1. K3FN, James Mackey, West Hartford, CT. Total 787.

2. K2FL, John Heisey, Palmyra, NJ. Total 817.

## MARAC North Central Mini Convention

MARAC members throughout the country sponsor Mini Conventions several times a year. A recent such convention sponsored by Arnie Bachman, K9DCJ, and his XYL was held September 9-12, 1993 at Mt. Horeb, Wisconsin. Forty-eight of the attendees gathered for a group picture. We understand a good time was had by all.

73, Norm, WA3RTY

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CIRCLE 127 ON READER SERVICE CARD



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

## A Simple Five-Band Antenna Tuner

Now that the sunspot cycle is dropping, interest in the 10 meter band may be declining, too. This is a mistake. Both 24 and 28 MHz have been "hot" for DX this past fall, and 21 MHz has certainly been above par. It's still too early to write off the higher frequency DX bands. They will be full of interesting contacts for the next several years! In particular, 21 MHz was a good performer in the spring and fall months of the last cycle minimum, and many operators remember the strong sporadic-E signals on 10 meters during the bottom of the last cycle. So don't ignore 10 and 15 meters yet! Keep that triband beam up in the air!

Speaking about the higher DX bands brings to mind a simple tuner useful with a multiband Yagi or quad that covers 14, 18, 21, 24, and 28 MHz. Rarely does one of these antennas present a good SWR match on all bands. Murphy's Law tells us that the particular band of interest will be the one that provides balky transmitter loading. A simple, multiband tuner solves the problem.

Many tuners have been described in the literature, and one of the interesting ones is the design shown in fig. 1, brought to my attention by Lew Stafford, W4LGK. The definitive description of it was given by E. R. Cook, ZS6BT, in *Ham Radiomagazine*.<sup>1</sup> The tuner consists of two tightly coupled, series-tuned circuits capable of resonance in each band between 14 and 30 MHz.

An SWR meter is required for tuner adjustment. It is placed between the tuner and the transceiver. The tuner is coupled to the antenna via the usual coax line.

### Tuner Construction

For power levels up to several hundred watts, receiving type variable capacitors can be used. The inductors are made from a single section of coil stock, 1<sup>3</sup>/<sub>4</sub> inch diameter, 16 turns per inch of #18 wire (Barker & Williamson 3023). It is cut to provide two closely coupled coils of 3<sup>1</sup>/<sub>2</sub> and 7<sup>1</sup>/<sub>2</sub> turns. Only enough wire is snipped out between the coils to make connection to the capacitors.

The tuner is simple enough to be built in breadboard fashion. A piece of 1/2 inch

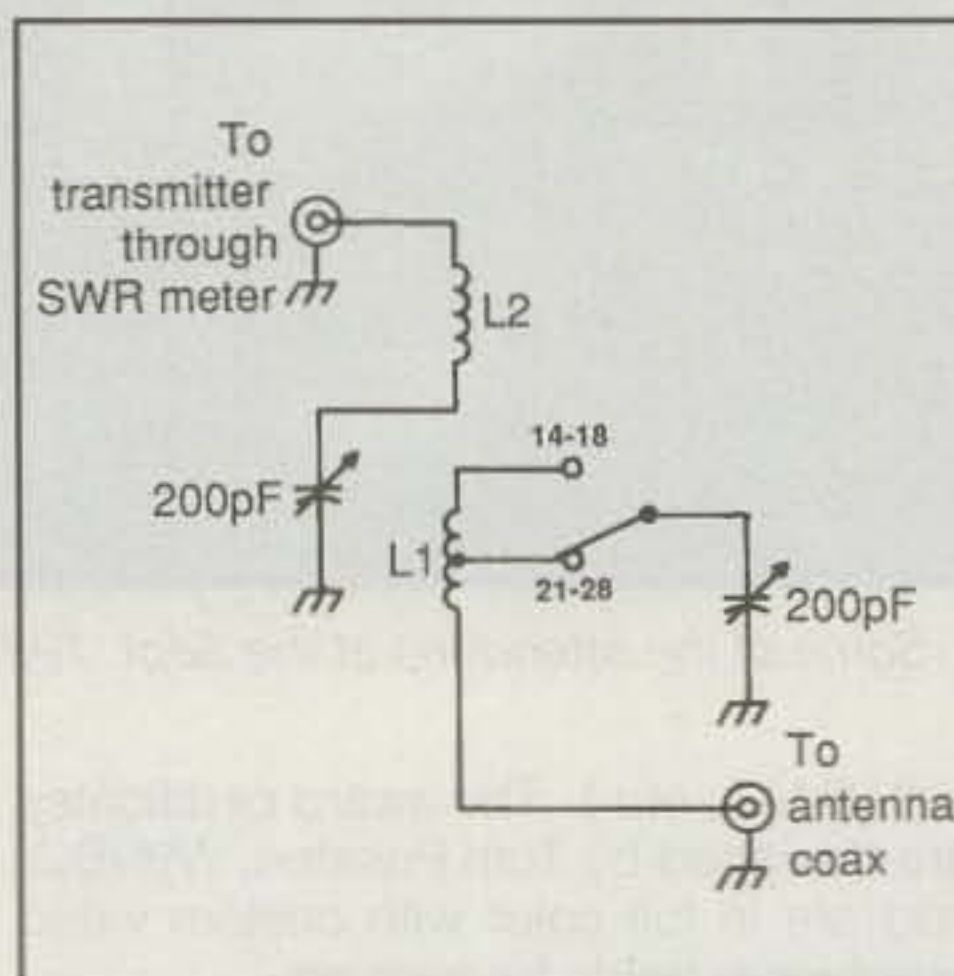


Fig. 1—The five-band antenna tuner. (See text for coil data.)

plywood serves as the base, and a sheet of 1/8 inch Masonite makes up the panel. The capacitors are mounted to the panel, and the band switch is affixed to the plywood base. Don't forget to connect all ground terminals together and to the shells of the coax receptacles, which are mounted on small pieces of angle aluminum stock.

Coil L1 (the antenna coil) is tapped for the higher bands. The tap point is determined by experiment, but is approximately 3<sup>1</sup>/<sub>2</sub> turns from the capacitor end of the coil. A Barker & Williamson Inductance Clip 3943 can be used as a tap, or the adjacent turns of the coil can be depressed inward and a soldered joint made at the proper point with a small iron.

The switch is half of a double-pole, knife-type, such as Radio Shack 275-1537. If you are lucky, you might find an old ceramic type, such as was sold years ago in the "5 and 10¢" stores.

### Using the Tuner

It is helpful to connect a dummy load to the tuner for initial tune-up. The controls are adjusted for maximum transmitter loading consistent with minimum SWR. The capacitor settings should be logged for future reference.

In the unlikely instance that low SWR cannot be obtained at a point in some band, changing the length of the line between the tuner and the antenna will help

bring the antenna input impedance in line with the matching range of the tuner.

It must be remembered that a multiband antenna can radiate harmonics of the transmitter. Thus, when on 14 MHz, for example, the antenna can radiate transmitter harmonics or spurious signals on 21 and 28 MHz. ZS6BT claims up to 30 dB harmonic rejection is provided by this little tuner.

### A Word On The Z-Match Tuner

I've written about the Z-match tuner in my last few columns. I like it. Here's a confirming note from Cornie Nouel, KG5B. He says, "I am glad to report the Z-match really works. I use a 1 inch diameter by 2 inch long ceramic form space-wound with #16 tinned wire. A total of 21 turns is used. The tap for the high-frequency range is at 11 turns and the input tap is at 15 turns.

"After considerable testing I found that a 5-turn coil of #16 solid insulated hookup wire wound right on top and in the same direction as the main coil, and at the bottom ("cold") end, gives me perfect loading on all frequencies.

"The two capacitors are receiving type. No arcing occurs with this setup. And there is very little coil warming when loading my vertical antenna with 100 watts and an SWR of 2:1, or more.

"I believe the tight coupling lowers the circuit Q and makes tuning smoother. I don't use vernier dials.

"The 10 MHz band is somewhat marginal, but usable. Using a noise bridge I was able to match resistive loads from about 10 to 300 ohms at all frequencies.

"The tuner is built in a metal box 3.5" x 8" x 5.5" in size, and there is plenty of space to put an SWR meter in the box.

"The apparent relative efficiency as measured at 14 MHz with a field strength meter compares favorably with an L-network and is slightly higher than a T-match tuner.

"Thanks for your fine column. I always enjoy it."

Nice words, Cornie, and thank you! By the way, for my readers who wish to build a Z-match and have trouble finding the capacitors, Fair Radio Sales, Box 1105, Lima, OH 45802 (phone: 419-223-2196) has them in stock. The single section capacitor (282 pF) is part No. CB-157. The



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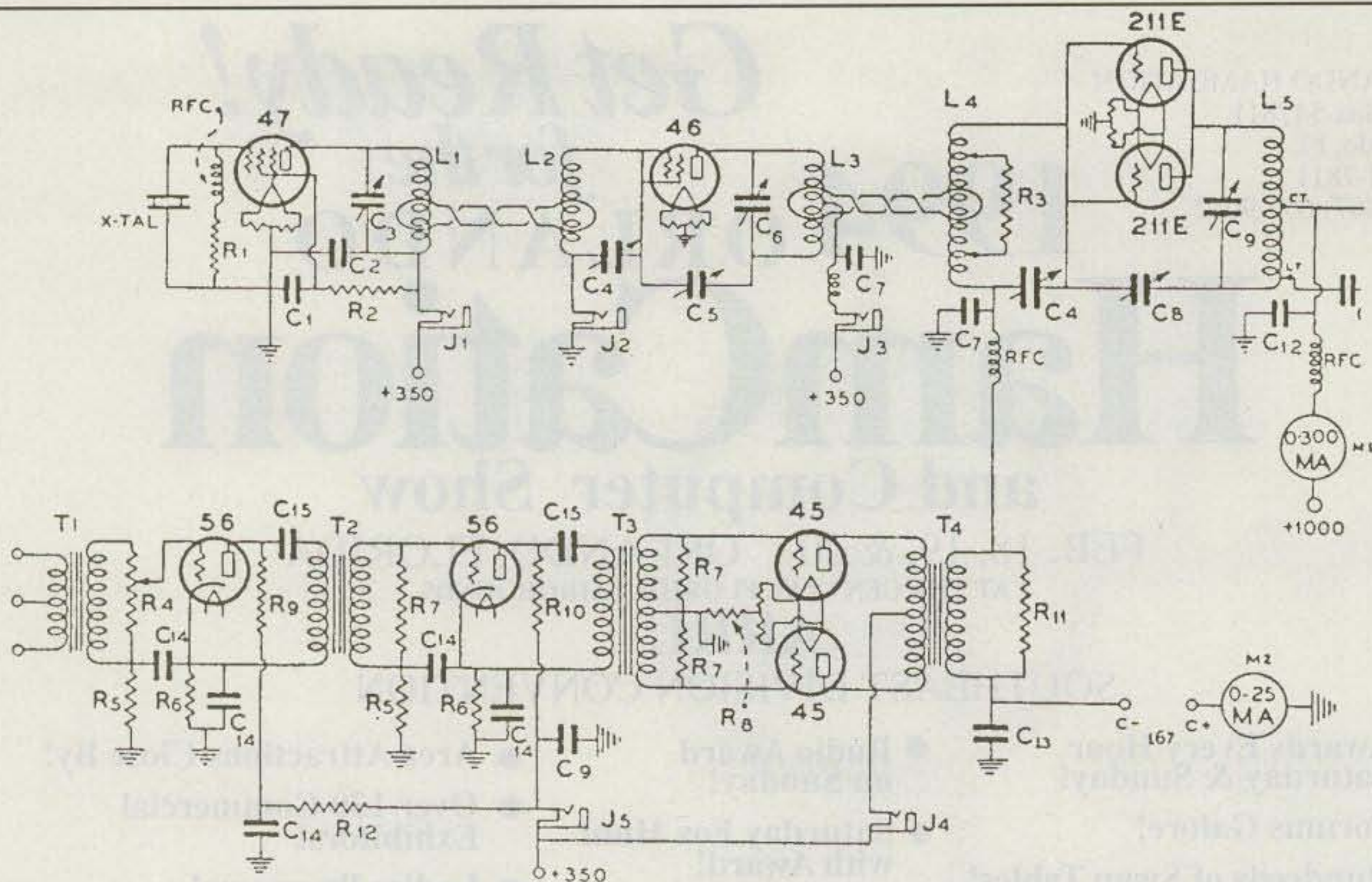


Fig. 2—The 1934 grid-modulated "junk box" phone for 160 meters.

dual-gang (also 282 pF per section) is part No. CB-156.

## The Two-Element Yagi

The two-element Yagi has all but been forgotten today, although at one time it was a very popular antenna. In the rush for more power, bigger antennas, and more DX, the belief that "bigger is better" has taken over the antenna field.

Sure, I'd like a 6-element job on a 60 foot boom, but let's be realistic! The idea is a day dream when one lives in a suburban area hemmed in by property lines, building restrictions, and suspicious neighbors who equate a big antenna with TVI and telephone interference.

There's a case to be made for the 2-element Yagi. First and foremost, it is small! It provides plenty of bang for the buck. It's light compared to a bigger array, and it's inexpensive to build. Only two elements and a very short boom are required. Best of all, it is very unassuming to the neighbor's eye.

Let's talk about gain first, because this is where the little 2-element job really shines. Before computer-aided antenna design programs were available, extravagant claims were made by aluminum benders whose Yagis were perfected in the advertising department, rather than the engineering department. The computer programs removed the hokus-pokus from antenna design and provided straight answers about operating parameters.

The NEC and MININEC analysis programs show that the maximum gain of a 2-element Yagi is very close to 5.1 dBd. Practical designs run a little less than this: about 4.8 dBd power gain.

Slightly more gain than these figures can be squeezed out of the 2-element design, but bandwidth, input impedance, and front-to-back ratio are sacrificed. One must not be too greedy about antenna gain!

The computer program quickly tells the designer that when one characteristic of a Yagi is emphasized, other attributes suffer. Thus, one cannot obtain maximum gain, maximum front-to-back ratio, high input impedance, and maximum bandwidth all at the same time. Something has to give!

Unfortunately, the 2-element design doesn't provide much front-to-back ratio. About the best that can be obtained—taking gain, bandwidth, and feedpoint impedance into consideration—is a paltry 10 dB. The only way to improve F/B ratio is to add extra elements (directors).

## Bigger Yagi Antennas

A well-designed, computer-optimized 3-element Yagi, in comparison to a 2-element Yagi, runs about 6.4 dBd gain at the design frequency. The extra 1.6 dB increase in gain, however, is achieved at the expense of a boom that is three to four times longer than that of the 2-element array.

The big improvement of the 3-element

job over a 2-element Yagi is in the front-to-back ratio. It is not difficult to obtain a ratio of over 20 dB. This is a great asset, especially if you live in the Midwest, where you get QRM from both coasts.

Adding the extra element gives the computer program another variable to play with and allows the designer extra headroom when trying to optimize an antenna for a certain band. As an example, consider the trade-offs involved in designing a beam for 10 meters that provides good gain and F/B ratio over the complete band.

The next step up in antenna prowess is the 4-element Yagi. The highest gain design in this category is the W2PV array, which sacrifices bandwidth for gain.<sup>2</sup> The gain of this Yagi is about 7.5 dBd, or about 1.1 dB over the 3-element job, and 2.7 dB over the little 2-element beam. (A narrow-band design by K6STI for 50 MHz provides 8.8 dBd gain and 20 dB F/B ratio on a 13 foot 8 inch boom. That's equivalent to a 50 foot boom on 14 MHz.)

It is my opinion that as far as gain is concerned, going from two to three elements is a waste of time, money, and space. An increase of 1.1 dB (very helpful in the VHF/UHF region) is marginal in the HF region because background atmospherics, QRM, etc., wash out the extra decibel.

Going from a 2-element design to the W2PV 4-element design, however, provides a power gain of about 2.7 dB. That's equivalent to nearly doubling your power. It may make the difference between mak-



ing a contact or losing it. The extra decibels are especially helpful in digging a signal out of the background noise, provided the atmospheric don't rise in strength as much as the signal you are looking for!

The bad news is that the W2PV design requires a 40 foot boom for a 14 MHz array. The 2-element antenna, on the other hand, can be built on a boom less than 8 feet long (one-fifth the size).

The decision the would-be antenna builder has to face regarding the 4-element 20 meter Yagi boils down to: Is the extra 2.7 dB gain worth going from an 8 foot boom to a 40 foot boom? Or to a 50 foot boom with the K6STI design?

The situation with regard to the front-to-back ratio of the proposed Yagi antenna is a different matter. A 2-element Yagi will provide only about 10 dB F/B ratio at the design frequency. A 3-element antenna, on the other hand, will provide over 20 dB F/B ratio. That's a big difference! If F/B ratio is important, the extra size of the 3-element beam is well worth the effort.

The W2PV 4-element design provides better than 20 dB F/B ratio only over a narrow frequency range, and about plus or minus 140 kHz on the 20 meter band.

The old Hy-Gain 204BA for 20 meters was an interesting compromise antenna. It sacrificed some forward gain for excellent F/B ratio, high input impedance, and good bandwidth. But the forward gain

wasn't much higher than an optimized 2-element beam! It was user-friendly, however, and that means a lot!

Some amateurs have gone to a 5-element beam, particularly on 10 and 15 meters, where boom length is more modest. A popular design is the 21 MHz Telex/Hy-Gain model 155CA. This antenna is built on a 26 foot boom and provides a power gain of 7.55 dBd at the design frequency. The F/B ratio is 25 dB.

When this beam is adjusted for the 24 MHz band, the power gain at the design frequency is 7.75 dB and the F/B ratio is 28 dB. That's a little more gain than the W2PV 4-element design, but this Yagi has a much better F/B ratio.

Brian, K6STI, has come up with an optimized 5-element beam for 50 MHz that provides 10.3 dBd gain on a 22 foot 7 inch boom (equivalent to an 81 foot boom on 14 MHz). That's an amazing design. Nifty for fifty, but a little big for 14 MHz!

Finally, K6STI quotes N6ND, who says, "If you want a REALLY good signal, you need dBs in the air and dBs on the desk!"

F/B ratio against your desire to be the big signal on the band!

Power gain can be equated to boom length. Above two elements, power gain entails long booms, with just enough elements on the boom to provide adequate gain. Adding extra elements to a given boom length doesn't buy you a thing (except possibly bandwidth), provided you have the minimum required number.

If you want good F/B ratio, better skip the 2-element beam and use a 3-element design. Adding extra elements above three helps the F/B ratio, but not as much as you might think.

Using the computer, any Yagi design can be jinked about to get a little more gain, a little more F/B, or a little more bandwidth. But Murphy's Law still works. If you increase one parameter, you lose ground in the other parameters. In other words, there's no free lunch!

### So There You Are!

Antenna gain is a powerful example of the law of diminishing returns. If you want power gain, or F/B ratio, you pay for it! You can enjoy the luxury of indecision as you juggle size, cost, antenna gain, and

### The Junkbox Phone

During the years of the Great Depression (1929-1938) the cost of putting a medium-power AM phone on the air was out of the reach of most amateurs. The cost of tubes and modulation transformers (cheap in today's dollars) was exorbitant in those "Good Old Days."

One economical approach was to use grid modulation along with surplus or second-hand power tubes. Grid modulation,

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when operated properly, was very inefficient, running about 30 percent. That is, with 100 watts input the grid-modulated power amplifier put out only a 30 watt carrier. The rest of the power was dissipated in the amplifier tube. On modulation peaks, of course, efficiency rose. But no high-power modulator was required!

Most amateurs couldn't afford \$15 for a "50-watter," so they searched about for an inexpensive power tube. About 1933 the Western Electric theater sound systems for movie houses brought in a whole new series of high-power amplifiers and the old systems were scrapped. In the debris sold to the junk shops was a quantity of obsolete Western Electric 211-E triode power tubes.

These maverick 50 watt tubes were intended only for audio use. In fact, in the bottom of the glass envelope were small choke coils wound of resistance wire, placed in series with the plate and grid leads! They were used because in some sound systems HF parasitics developed when long speaker leads were attached to the amplifiers. It was easier to build a special tube that would suppress parasites than it was to modify thousands of theater sound systems scattered around the world!

Although the 211-E was designed for audio service, that didn't stop amateurs who grabbed at a chance to get a big power tube for a dollar or less!

When the 211-E was used for RF, the

little chokes often ran red-hot due to the current flowing through them, and at 40 meters, for instance, the chokes would pop like fuses, ruining the tube!

Some smart amateurs, however, found that the 211-E would function on 160 meters, with the chokes running cold. The combination of the cheap tubes, plus grid-modulation circuitry, led to the design of a grid-modulated phone, having a carrier power of about 60 watts, for a power input of 200 watts.

Shown in fig. 2 is the "Junk Box Special" described in *Radiomagazine*, June 1934. It uses two 211-E tubes as a grid-modulated amplifier. Audio quality was acceptable, but grid loading (controlled by resistor R3) was critical, as was drive power. It was most important to monitor grid current, and the article gave explicit instructions concerning the proper modulation. Reading the article, it sounded to me like a tricky transmitter to tune up, especially since very, very few amateurs in those days owned an oscilloscope, or even rudimentary test equipment!

No matter. The lure of "high power" and the low tube cost put plenty of 211-E tubes on the air. (A friend of mine boasted that he ran a 211-E on 40 meters and it didn't blow up! Curious!)

I suspect the circuit sounded pretty raunchy on the air, but what could you expect for a few dollars? NBC?

The 211-E is a great collector's tube, and it will amaze your friends when they squint through the glass and see the little RF chokes in the base structure of the tube. The idea may sound crazy, but it did solve a difficult problem, at little expense.

#### Footnotes

1. Cook, E. R., "An Antenna Coupler for the Three-Band Beam," *Ham Radio*, May 1972, pp. 42-45.

2. *ARRL Antenna Book*, 16th edition, pp. 11-17 to 11-19.

#### The Mail Bag and Dead Band Quiz

Thanks to the following who wrote personal letters. Sorry I can't reply individually, but I really appreciate your input: WU2J, WD0DAN, W4EHU, W4LGK, W4LLF, W6JJZ, VE1JET, VE7BCX, W2OQI, and W2DU.

And congrats to the following who solved the lamp bulb quiz: N8MOT, KB5YSS, W0FQV, KH6GI, N0KWA, K3TW, W2LCV, KB7WJQ, W6OK, and WN2SQC. And the following knew that the question to the reply "9,W", is "Do you spell your name with a "V", Herr Wagner?": K0CJ, VE7IIT, and W2LCV.

See you on the low end!

73, Bill, W6SAI

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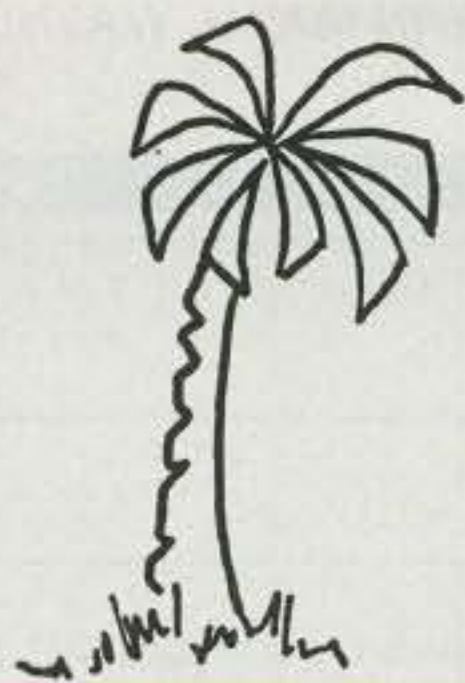
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To give you an idea of what is in store, we will describe a simple chip now being produced for use as a low-power FM receiver for the cordless telephone and paging market. This chip, the SL6655, is manufactured by GEC Plessey, Sequoia Research Park, 1500 Green Hills Road, Scotts Valley, CA 95066 (408-433-2900).

The SL6655 is supplied in a 28-pin sur-

c/o CQ magazine

face-mount package that is only 0.4 inch wide and 0.7 inch long and requires only a few low-cost parts to produce a complete, ultra-low-power, VHF FM receiver with rather interesting specifications.

First of all, the unit is guaranteed to operate up to 100 MHz. However, it is specified to 500 MHz. I'm certain 10, 6, and 2 meter operation will be no problem. Second, at 50 MHz the unit is rated at a sensitivity of 0.25 microvolt (12 dB sinad) with a noise figure of 6 dB. Finally, the entire chip draws only 1 ma—that's right, one milliampere—from a battery supply that can be as low as 0.95 volt! One AAA cell or a watch battery will suffice! Imagine the miniaturization you can achieve with this device.

To further help you along, fig. 1 is a schematic of a complete 6 meter FM receiver. This circuit uses 455 kHz ceramic filters in the IF and requires a crystal at 455 kHz below the desired receive frequency. A 49.545 MHz crystal, therefore, will put you at 50 MHz. You might also ex-

periment with a series LC tank instead of the crystal for a tunable receiver.

With 3 kHz of deviation, the audio output (50K balanced) produces 12 millivolts RMS, so you will need an amplifier in order to drive a speaker. With an emitter follower, however, you may be able to drive a headphone. Of course, with wider deviation the audio output will be higher.

The SL6655 is truly an experimenter's dream. It will be interesting to see what the readers of this column come up with, and I will be glad to publish the most interesting application. For those who are interested in pursuing this device further, upon receipt of a self-addressed, stamped envelope I will be glad to forward a copy of a detailed application note and PC layout for the SL6655.

Unfortunately, I do not have prices at this time. However, the chip is designed for mass-produced products, and I am sure it is reasonably priced.

Best wishes for a happy holiday season.

73, Irwin, WA2NDM

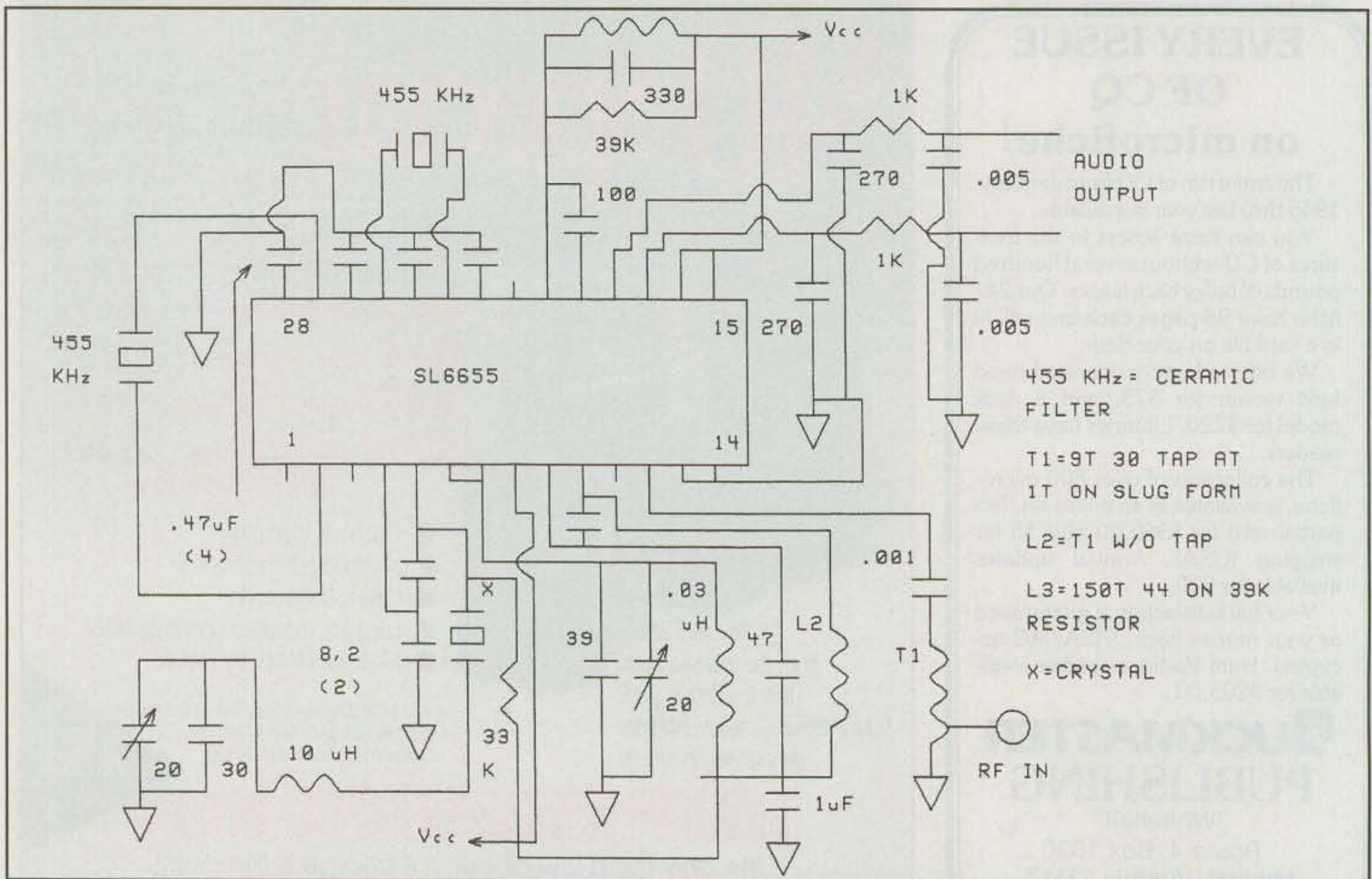


Fig. 1—Schematic diagram of micropower FM receiver.





Rob, WA3QLS



Gail, KA3ITN



Paul, WA3QPX

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## HF

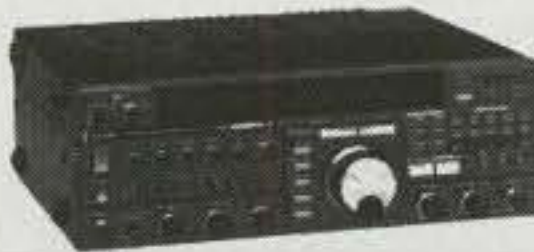
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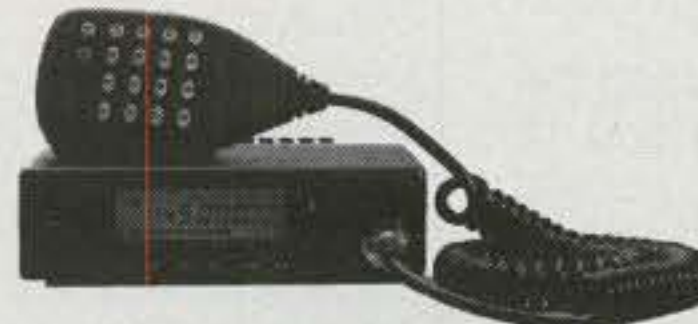
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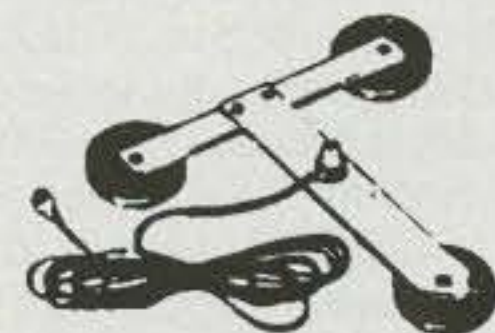
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### More New VHF-Plus Records Set

I began last month's column headlining the new overland 10 GHz record. I begin this month's column headlining more new records, both in the U.S. and in Europe. I will cover Europe first.

**New Overland GHz Records:** During the GHz Activity week (between 6 June and 12 June this year) Danish operators set several regional and at least one world record for communications on the amateur bands above 24 GHz. On 76 GHz OZ1UM and OZ/DB6NT made contact on 11 June over a distance of 8.8 km, which was an improvement over the old Danish record of 3.7 km. The equipment used was as follows: For OZ/DB6NT, he used a transverter with about 10  $\mu$ W output, with a receiver noise figure of an unknown value. The antenna was a 25 cm PROCOM dish with a Cassegrain feed designed by DB6NT. For OZ1UM, he used a transverter with about -40 dBm output, also with a receiver with an unknown noise figure. His antenna was also a 25 cm PROCOM, but with an open waveguide feed that he designed.

On 10 June OZ/DB6NT and OZ/DF9LN worked OZ9ZI and OZ/DJ5HN on 145 GHz over a distance of 3.1 km, which is a regional record, but just shy of the 2 May contact between Tom Williams, WA1MBA, and Jim Mead, WB2BYW, that one taking place over a path of 3.5 km. The equipment used for this contact is built on the same principle as the old Gunn oscillators, but with an X-value controlled oscillator. The power output is 5  $\mu$ W into 25 cm PROCOM dishes, both being fed with Cassegrain feeds. They reported that direction is found by using a rifle telescopic sight mounted on the edge of the dish.

Also on 10 June OZ/DB6NT and OZ/DF9LN made contact over a 0.5 km path on 241 GHz. This is believed to be the first ever amateur radio contact over free space on this band. The equipment used is very similar to the equipment for the 145 GHz stations.

It is interesting to note that these Danish and German amateurs are very active on the micro microwave frequencies. They report that at least 16 stations are now active on 24 GHz and that interest is spreading to Belgium, France, Sweden, Norway, Finland, and even Chile, with the visit of CE5SPR. Thanks to Steen Gruby, OZ9ZI, for these reports.

**New 2304 MHz Overland Record Set:** A stalled high-pressure area over the upper Midwest that extended down into Oklahoma, parts of Texas, and most of the southeast resulted in very favorable conditions during the days of 16 September through 20 September. Al Ward, WB5LUA (EM13), was alerted to the conditions when he noticed very good signals on TV channels 14 and 16 on the morning of the 16th. His observations were confirmed when he re-

#### VHF PLUS CALENDAR

December 5	Very good EME conditions.
December 6	Last quarter moon.
December 11	Perigee.
December 12	Moderate EME conditions.
December 13	New moon. <i>Geminids</i> meteor shower predicted peak 1841 UTC.
December 17	Noisy EME conditions.
December 19	Good EME conditions.
December 20	First quarter moon.
December 22	<i>Ursids</i> meteor shower predicted peak 1108 UTC.
December 23	Apogee.
December 26	Moderate EME conditions.
December 28	Full moon.

ceived a phone call from Ron, W9ZIH, alerting him of the conditions. (Ron, along with Garry, K3SIW/9, had previously worked into Oklahoma, making 432 MHz contacts with Larry Hazelwood, W5NZZ, and your editor, on SSB. In addition, Ron had also made a couple of 436 MHz ATV contacts, both in Oklahoma.)

Following the phone call, Al got on the air and immediately worked both Ron and Garry on 432 MHz. Following that Al made 2 meter contacts with W9NLP in Wisconsin, as well as Ron and Garry.

Al made no further contacts until that evening when he worked WB9OJR in EN50 on 432, 902, and 2304 MHz. Al's son, Bryan, N5QGH, also worked WB9OJR on 2304 MHz. At about the same time AA5C worked WB9OJR on 3456 MHz. Al went on to work W9ZIH, K3SIW, N9IYV (EN52), and W9UD (EN41), all on 1296 MHz. Then he worked K3SIW on 902 MHz.

After midnight the bands were still cooking for Al. This time W8s were coming in. Al worked WB8TGY (EN72), Tom, WA8WZG (EN81), N8ERM (EN72), and N8DJB (EN81) all on 432 MHz. Then he worked WB8TGY, N8ERM, and WA8WZG, this time all on 1296 MHz.

All the while he was working these stations, he kept asking if anyone had 2304 MHz capability. Finally, Tom, WA8WZG, volunteered that he had 1 watt into a pair of loop Yagis mounted at a height of 100 feet. Al told Tom that he would send him a signal from his 300 watt Klystron and his 5 foot dish that is mounted at 65 feet. Tom reported that he immediately heard Al with a very loud signal. Very quickly they completed a contact, thereby extending the tropo, overland distance to 952 miles. Later Al completed a contact with WB8TGY over a path of 922 miles. Al went on to work WA8WZG and N8DJB on 902 MHz.

While his record setting was over, the propagation was not. He went on to work VE3DSQ in FN03 (approximately 1190 miles distance) on 432 MHz. The next morning he worked Hal, KC4YO, on 144 MHz. That evening he worked WA8R (EM79), WB9OJR (EN50), WA8MSF (EM79), KB9FZQ (EM68), and WA8WZG again, all on 432 MHz. On Saturday morning

he worked WS4F (EM84) on 432 and 222 MHz. In addition he worked WA8R on 222 MHz. He wrapped things up by working W3ANX (FN00), K8UC (EM99), WB4CTW (EM76), and KC4QWZ (EM66), all on 144 MHz, plus K8UC on 432 MHz.

Al's elation was overshadowed by not being able to get on 3456 MHz because of a relay problem. He finally got it fixed, after climbing the tower at 3 AM on Friday morning!

#### Algonquin Dish On Air For First EME Test Weekend

The 150 foot Algonquin Radio Telescope, operating under the callsign of VE3ONT, provided 403 contacts to operators of EME communications over the first weekend of the ARRL EME test. Operated by VE2DFO, VE3s ASO, BFM, CRU, DSS, EMS, KDH, VD, and W9IP, the station was on 432 MHz the first night, where they made 167 contacts in 37 multipliers and on 144 MHz the second night, where they made 236 contacts in 44 multipliers.

(By way of comparison, some of the big-gun scores are as follows: W5UN, 191 contacts; N2IQU, 82 contacts; K1FO, 104 contacts; and all of these taking place over the total weekend, whereas the VE3ONT contacts were made over only one day for each band.)

In total they made 129 contacts with stations in the U.S., 73 contacts with Germany, 43 contacts with Japan, 18 contacts with Great Britain, 15 contacts with Italy, and 13 contacts with Canada. The rest of the contacts were spread among several other countries, including one with Reunion Island (FR5) and one with Sarawak (9M8).

Conditions on the first night were fair to good and on the second night were fair to poor because of an aurora.

**Dennis, VE3ASO**, reports that with only a minor problem with a hum on the 432 MHz pre-amp, the operation was a total success, exceeding everyone's greatest expectations. (Dennis indicated that the pre-amp problem would be corrected in time for the next contest weekend.) He said all operators were amazed

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The son of OZ1UM (left) and CE5SPR (right) look over the OZ1UM 10, 24, and 47 GHz stations set up at Spodsbjerg (grid square JO55wx). Note the solar panel: all stations are fully powered by the sun. (Photo via OZ9ZI)

at the strength of echoed signal, reaching S9 at times.

Dennis reported that the auto tracking worked perfectly; they had to make no adjustments whatsoever. The only drawback was that because of its design, the dish could not be lowered to less than 9° off the horizon.

**Peter, VE3VD**, reported that they were working stations at a steady rate of one every 2–3 minutes. **Kevin, VE3KDH**, said that they expressed satisfaction with having gone to an HF style of QSOing over sequencing because of the sheer number of station trying to work them. Their only regret, with regard to 144 MHz, was that their listening window was too narrow. Anyone working an HF pileup can appreciate the problem of tuning in one station through such a mess.

**Michael Owen, W9IP**, says that nearly half of the stations worked were not in any EME data base, indicating that in all likelihood these stations were making their first EME contact. Michael also observed that those who had HF contest or pileup experience that taught them to listen for the station being worked fared much better than those who did not.

They found that the HF liaison station was of no use to them because the QTH is in a hole. Because of this, as of this writing they were deciding not to take the HF station for the second weekend of the contest.

Your editor sincerely appreciates the tremendous efforts put forth by the Canadian amateurs in order to bring about this successful operation. I am sure that I speak for so many of the VHF+ community. Congratulations on a job very well done, guys. If you need a card, QSLs will go to VE3ASO, via his *Callbook* address.

Among stations reported working VE3ONT were: **Larry Hazelwood, W5NZS**, who reported that because of Faraday rotation it took him several hours to complete. Nevertheless, he heard the station consistently all day long. **Doug Allen, W2CRS**, worked them on SSB for his first-ever contact using that mode off the moon. **Hal Perry, KC4YO**, was able to snag

them during their last eight minutes of operation on Sunday afternoon.

There were disappointments, though. **Randy Galloway, KN4QS**, reported that he was frustrated in not being able to work VE3ONT or any of the other stations that he heard during the contest either at home or the club station. Using the NASA Marshall Space Flight Center ARC equipment (four 20-turn RHCP Helixes) on 432 MHz, the club members were able to hear VE3ONT consistently above the noise. However, no two-way contacts were made.

Randy observed that a few people from his area were able to work VE3ONT. They included KB4WM and K4YYL (on 432 MHz). He noted that K4YYL was able to work them using satellite antennas and 100 watts, so the link budgets advertised did indeed work out. Randy comments that maybe next month will be better. We hope so too, Randy.

### Jicamarca Observatory Test Reports

Owing to the lack of advanced publicity, not much was known about the test of the Jicamarca Observatory in Peru. This observatory is set up for ionospheric sounding and consists of a 1 megawatt transmitter and 20,000 dipoles. It transmit an 800 Hz signal essentially straight up on a frequency of 49.92 MHz. The test was conducted between 0050 and 0100 UTC on 25 September. Because the antenna is fixed, there is only the short window, and it is common only with locations in the western hemisphere. The operators—Jorge Heraud, OA4LS, and Alfonso, OA4PQ—transmitted an 800 Hz pulsed signal in a modified CW mode by keying the transmitter on and off during the test.

For the test, the stations that are currently active on 6 meters EME were notified by FAX and E-mail principally by Michael Owen, W9IP. Approximately five or six operators listened, and the reports ranged from hearing nothing (K6QXY) to taping the transmissions (W3EP).



Jimmy Sutton, WM7A, displays his 1296 MHz cavity. It was packaged by Bill Clemow, KE7CX, to match Jimmy's IC-1275A. (Photo courtesy KE7CX)

After the test Michael observed that the reason some did not hear the signal was that the noise blanker may have interpreted the 800 Hz signal as noise and blanked it out. One observer, Mike Staal, K6MYC, did leave his noise blanker off and copied a very good signal.

The most complete report came from **Ron Neyens, N8CIH**, and **Rod Blocksome, K0DAS**, located in Robins, Iowa (grid square EN42eb). Here are the particulars of their observations: Equipment used was a KWM-2 and 62S-1 tTransverter with approximately 3 dB noise figure. The antenna was a 5-element Yagi (12 foot boom) mounted 12 feet above ground and connected with 18 feet of RG-213 coax. They manually pointed the antenna directly at the moon (visually) and could also rotate antenna polarization.

*Signal Report:* They first detected a signal at 00:53:16 UTC. The signal build to maximum at 00:54:01 UTC. The signal was at maximum until 00:54:56 UTC. The signal went back into noise at 00:55:23 UTC. During period of maximum signal Ron and Rob observed the following: They copied "CQ" and several long "dashes." They found signal to be essentially horizontally polarized and the signal was approximately 6 dB out of the noise (however, they did not have a meter on the receiver to verify this).

Rod passes along that they are operational on 6 meters with a solid 1500 watts output and working on building an EME-capable antenna by the end of this year.

Based on the initial success of the September tests, future tests were being planned, the next time possibly using an amateur transmitter within the amateur bands. We will report on the success of these future tests.

### 1993 Microwave Update

Fifty of the cream of the crop of the VHF+ community gathered at the North Atlanta Hilton 23–25 September to share their ideas and their projects on the microwave bands.

The sessions began Friday morning with a



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John, 8P6 Johnny Walker, and his wife, Elsa, 8P6 Lovely Lady, were guests of Jimmy, W6JKV, and Drew Treybig at the barbecue.



Dave, ZF1DC, was a guest of Jimmy, W6JKV, and Drew Treybig at the annual barbecue.

presentation by Al Ward, WB5LUA, and Kent Britain, WA5VJB, outlining simple approaches to getting on 24 GHz. Al and Kent were followed by Charles Osborne, WD4MBK, who talked about unconventional transverter frequency plans. The morning session was concluded with a talk by Reed Fisher, W2CQH, on Evanescent Mode Waveguide Filters.

After lunch Tom Williams, WA1MBA, discussed tri-band feed protection. Tom was followed by Rick Campbell, KK7B, who talked about his work in progress on a single-board 1296 MHz transceiver. Al Ward was again on stage, this time to present an APPCAD tutorial and to pass out free software. Al was followed by a talk by Jim Davey, WA8NLC, on microwave engineering techniques. The afternoon session concluded with a talk by Randy Rhea, N4HI, on his excellent circuit-modeling software.

The evening was consumed with each of us trading our "useless junk" for someone else's "prized possession" at the swapfest. I think that we all broke even. It usually works out that way.

Saturday morning began with a talk by Dave Kunkee, KØDI, on radiometric measurements at 92 GHz. Dave was followed by Kent, who presented his now classic "Microwaves are

Simple" talk. The morning session concluded with Tom Williams, WA1MBA, discussing his record-setting 145 GHz contact with Jim Mead, WB2BYW, and their plans for communicating on the 80 GHz band.

The afternoon session was headed off by a thought-provoking talk by Bill McCaa, KØRZ, on the exposure of RF radiation to us in the hobby. Bill was followed by Zack Lau, KH6CP /1, who discussed how to get microwave transverters on the air. The afternoon sessions were concluded with a talk by Charles Osborne, WD4MBK, on the use of your EME array for radio astronomy.

The banquet speaker was Rick Campbell, KK7B, who fascinated us with his demonstration of a home-built spark-gap transmitter. Some of the old timers in the audience almost had tears in their eyes as we reminisced about the old times of experimentation in our hobby.

Special appreciation goes to Rick Campbell, KK7B, and Jim Davey, WA8NLC, for all the hard work they did organizing this year's Microwave Update.

What about next year? As usual, someone's arm had to be twisted, and this time it turned out to be Bill McCaa, KØRZ, who agreed to host it at its founding location of Estes Park, Colorado. The tentative date is set for the third full weekend in September. So make your plans to be among those who are on the cutting edge of experimentation at next year's Microwave Update conference.

## Meteor Reports

Fred Deziel, WØHP, reports that he completed his 2 meter WAS with a contact with **Chip Taylor, W1AIM** during the *Perseids* meteor shower. **Paul Kelley, N1BUG**, reported that he observed two peaks during the *Perseids*, one at 0100–0130 UTC and another 0330–0500 UTC on the 12th. He stated that most of the bursts were of an extremely short duration. **ON4ANT/ON4GG** report that they observed a peak at around 0130 and between 0300–0400, with somewhat higher counts than normal. **GM4IPK** reports the same peaks, but with more bursts than average years. **S57TW** also reported the same peaks. **Mike, VE1MQ**, reported a peak between 0400–0530 UTC. **Ray Bohmer, N1GDP**, in Maine did not observe the 0100–0130 spike, but noticed several others. Among his best DX was a contact with Charlie, WØRRY, at a distance of 1500 miles, that taking place on 12 August between 1600–1700 UTC. Ray comments that he observed few long burns, most lasting only 5 seconds or less. He observed that operators should be encouraged to use phonetics for their call letters and grid squares. He felt that there was too much advanced publicity. He also noted that random operation should be encouraged between 144.190 and 144.210 MHz. **Shelby Ennis, W8WN**, noticed a very good peak between 1200–1500 UTC on the 11th, but no spike around 0100 UTC. He also noted a few double or flurry bursts that he had observed in past years.

**Larry Jones, WB5KYK**, called to report that he worked the following stations during the *Gamma Piscids* shower: On 6 meters he made the following contacts: W9QOX (EM69), WZ8D (EM79), KB9FZQ (EM68), and K8GQB. On 2 meters he made the following contacts: WD9BTM (EM68) and AA9D (EN52).

Thanks to Shelby Ennis, W8WN, and the



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VHF/UHF BBS for information on most of these reports.

## Current Meteor Showers

Two showers occur this month. The first, the *Geminids*, is predicted to peak around 1841 UTC, 13 December. It is a good north-south shower, producing an average of 50-60 rocks per hour at its peak.

The second, the *Ursids*, is predicted to peak around 1108 UTC, 22 December. It is an east-west shower, producing an average of only 10 rocks per hour at its peak. However, in 1945 Zenith hourly rates of 169 were observed. You never know what to expect unless you try to make contacts during these showers.

## On The Air

**Larry Lambert, NØLL**, reported that he had a very good tropo opening around 1245 UTC the Sunday afternoon of the September ARRL contest. He says that it extended from DM82, through his QTH in EM09, to EN35, EN44, and EN54. He worked WØUC (EN44 on 4 bands, N9IGN in EN44 on 2 meters, KBØZQ/R (EN33) on 3 bands, NN9K (EN42) on 3 bands, KØGJX (EN35) on 2 meters, WA9HCZ (EN43) on 2 meters, WA9LWJ (EN54) on 2 meters, a number of stations in EN34, including WA2HFI/Ø on three bands, WAØNTT (EN35) on three bands, WAØBWE (EN34) on 5 bands, WØKRX, NØVCB, WDFØGNK, KAØPQW, WBØGGM, all on 5 bands, and KBØZQ/R (EN23) on 4 bands, including 1296 MHz. Larry also reported hearing weak aurora toward the late afternoon and evening of the contest.

Tom, NL7OW, phoned me to report that after the September contest was over **Dan, KL7Y**, made contact with **Mike, VE1MQ**, and **VE1PZ** on 6 meters via what appears to be auroral E.

As noted above, the southeast and upper Midwest experienced quite a tropo opening during the days 16 September through 20 September. The conditions seemed to have developed Thursday morning. **Larry Hazelwood, W5NZS**, observed his squelch on his 432 MHz radio breaking and turned it up to hear what was going on. He copied **Ron, W9ZIH**, and **Garry, K3SIW/9**, on 432.100 MHz. He quickly made contact with both of them and then called me on the phone (notice how often the contact is made and then the phone call is made!). Larry told me that their signals were consistently loud. I advised him to tell them that I was going to try to find a place to go and set up with the van.

I drove about 5 miles from my home QTH to a clearing on the side of a road. After making sure that everything was hooked up for the 432 MHz station, I unloaded the 15-element NBS antenna and stuck it on an 8 foot pole. By waving it back and forth I was able to get a fix on the guys in the Chicago area. I then informed Larry that I was set up. He in turn notified the guys that they should try to listen for me. After a few more jockeying around movements with the antenna I was finally able to work both of them. I know now that I am ready to rove on that band during the next contest.

That Thursday morning opening appeared to be the beginning and the end of propagation for us in western and central Oklahoma, because although the guys in Tulsa were being heard working the DX the next couple of days, we could not hear it ourselves.

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CIRCLE 51 ON READER SERVICE CARD





Host Jim Davey, WA8NLC, welcomes us to the banquet of the Microwave Update conference.



Rick Campbell, KK7B, demonstrates how one tunes a home-built spark-gap transmitter at the banquet of the Microwave Update conference. Rick says that this is his next project—a one-board, non-tube HF transmitter that will work all the TVs in the neighborhood.

**Randy Galloway, KN4QS**, reports the following highlights: On 144 MHz, 18 September, WZ9D (EN51, 1340), K5YY (EM36, 1425—Randy stated that he waited a long time for this grid), KB0EEB (EM29, 1439). On 19 September K2UOP/8 (FM09, 0213), W3ZZ (FM19), KB3PD (FM29, 0231—his first Delaware!), WB0JQQ (EM39, 0347), WA8WZG (EN81, 1223), N8PEK (EN98, 1253); on 432 MHz WZ9D (EN51, 1340), KE8FD (EM89, 1322). On 19 September N8TLZ (FM09, 0139), K2UOP/8 (FM09, 0213), K8UC (EM99, 0215), WA8MSF (EM79, 0312), W0DFK (EM47, 1427), and AB4CR (EM78, 1448).

Randy reported that the 432 MHz contact with Jack, AB4CR, was representative of the way the opening behaved; they tried for 10 minutes on CW with only parts of calls being heard and rapid QSB being observed. So they went back to 144 MHz and talked for perhaps 1 minute. Then they decided to go back to 432 MHz on SSB for one last try. Jack called him. Randy heard him quite well and completed the QSO very quickly. It was an amazing swing in the propagation over a 2 minute period. Randy states that this was typical of reports from the other ops.

**Hal Perry, KC4YO**, reports the following new stations worked: On 432 MHz W0ZZQ (EM36). On 902 MHz WB9OJR (EN50), W0GR (EM38), K9MRI (EN70), W8IDU (EN83), W8AC (EN91), K2UOP (FM09), WB0JQQ (EM39), and WB4DBB (FM07). On 1296 MHz WD5BKV (EM26), WD5AGO (EM28), WA8TJL (EN91), W8AC (EN91), VE3DIR (FN03), WB0JQQ (EM39), WB4LRA (EM74), and K9OYD (FM18).

**Tony Everhardt, N8WAC**, reports that on 17 September starting at 0206 UTC he worked K5YY (EM36), WD5GVP (EM25), and N5RSS (EM14). The next day, beginning at 0124 he again worked K5YY, then K5SM (EM26), K5UR (EM35), WB4AEG (EM74), KA2DRH (EM64), and WB4AXQ (EM64). Tony reports that he is now up to 60 grids and 18 states running just a TR 751, barefoot, with no pre-amp into a 17B2. He states that this was his first summer on 2 meters SSB and he loved it! We love having you, Tony.

**Bob Striegl, KA2DRH**, who seemed to be

in the middle of the action, FAXed this excerpt from his log: On 144 MHz, 18 September he worked the following: AA0DN (EN21), K0RDF (EM29), WB9MSV (EN50), W0JRP (EM27), WD5AGL (EM26), K5SM (EM26), KC0EH (EM27), WD5GVP (EM25), N5VLL (EM26), W0ZZQ (EM36), K5YY (EM36), WA5NFC (EM45), KD4NOQ (EM55), N5RSS (EM14), K5TF (EM73), N4AVB (EM64), W0EKZ (EM17), KM4GY (EM55), K4QAH (EM73), K9RK (EM28), N0SDZ (EM29), W0GR (EM38), N0EOQ (EM24), N0IGZ (EM27), N0JRN (EM37), N0AMR (EM29), W9JVC (EN51), N9PEZ (EN50), WB9W/mobile (EN50), WB9HDD (EN61), N9JFP (EN52), N8WAC (EN81), WD9AQL (EN51), N9GHU (EM89), KA3SDP (FN00), N3AJX (EN71), WF9M (EM79), KI8G (EN82), W9ZR (EN80), KB8LPZ (EM79), W1AJR (EN91), W3ANX (FN00), KD4GNM (EM78), KD4YGK (EM78), N8TLZ (FM09), K0FF (EM49), KB0CJ (EM48), K0TLM (EM29), KB0EEB (EM29), AB4CR (EM78), N9EMW (EM59), NZ9D (EN51), K0DAS (EN42), W0DFK (EM47), W0JRP (EM27), KA9CFD (EN40), KB5SFV (EM55), KF3Y (FN11), N9IVV (EN52), WD8RPZ (EN90), and K3BFA (FN10).

On 222 MHz he worked the following: WB9MSV (EN50), W0JRP (EM27), W0EKZ (EM17), K5UR (EM35), KE8FD (EM89), N8TLZ (FM09), AA4H (EM86), WD4MOB (EM74), K0TLM (EM29), AB4CR (EM78), and KB5SFV (EM55).

On 432 MHz he worked the following: W0JRP (EM27), W0ZZQ (EM36), W0EKZ (EM17), W0GR (EM38), N9JSM (EN52), KI8G (EN82), K0TLM (EM29), AB4CR (EM78), WZ9D (EN51), KA9CFD (EN40), and KB5SFV (EM55).

After taking 4 hours to climb the tower and fix a T/R relay he worked the following on 1296 MHz: KB5SFV (EM55).

The next day on 144 MHz he worked the following: KA3SDP (FN00), WA8MSF (EM79), K2PQI (FM09), N8PEK (EM98), N3JNP (EN91), K4QIF (FM07), W4DR (FM17), NI8T (EM79), KA3RWP (FN00), K9OYD (FM18), W3ZZ (FM19), K1HTV (FM18), KO4VD (EM84), K8UC (EM99), KB3PD (FM29), KA8SPH (EM79),

WB3F (FM19), WB0JQQ (EM39), K1RZ (FM19), WA8CXI (EM99), WB4DBB (FM07), WB4CTW (EM76), N9OYZ (EN70), KD4EPI (EM85), N4HWL (EM65), N4KWX (FM08), K4HJF (FM18), and N4AVV (FM04).

On 222 MHz he worked the following: WB4DBB (FM07), NS4W (EM76), and WA4III (EM64).

On 432 MHz he worked the following: K0FF (EM49), K4QIF (FM07), K8UC (EM99), WB0JQQ (EM39), K1RZ (FM19), N8PEK (EM98), WB4DBB (FM07), and N4AVV (FM04).

On 1296 MHz he worked the following: N8TLZ (FM09), WB0JQQ (EM39), and AB4CR (EM78).

Another tropo event affected the southeast and idwest about three weeks later. **Brian Snyder, WA8MZQ**, reports that on Thursday and Friday evenings, 7 and 8 October, he had openings to the northeast. Among the contacts made were with **Charles Hummel, K3BFA**, and **Ron, WZ1V**. **Hal Perry, KC4YO**, reported that he was called by **Tom Legget, N5KWB**, and asked to pursue a contact on 903 MHz. The resultant QSO represented Tom's first contact and Hal's 25th grid square. **Randy Galloway, KN4QS**, reported that on Sunday evening 10 October (11 October, UTC) he was involved in a nice tropo opening that lasted past 0400 UTC. He stated that it was a most unusual opening in terms of its lower level atmospheric qualities—i.e., it was quite cold (50 degrees for a high that day) with periodic 20–30 mile per hour wind gusts. A cold front passed through about 36 hours earlier and good enhancement was noted the previous night from his QTH out to about 200 miles on repeater frequencies.

Randy stated that was not totally unexpected because he had observed that condition before when a strong front moves into a very warm, moist atmosphere; these conditions usually last only a few hours (he calls them "rain openings"). However, Randy reported that this one lasted much longer, built up steadily, and appeared to have been basically NE/SW in scope, but with some due north and south-eastern stations also being heard or worked.

Randy reported that he worked three new grids on 2 meters and one on 70 cm. They were: On 2 meters, N4DXC (0246 UTC, EM70), WA8CXI (0314, EM99), N8TLZ (0315, FM09—Randy heard him work several other stations, especially in Louisiana and Mississippi), KF5IU (0320, EM31), N5KDA (0352, EM41), and KJ5QO (0353, EM31). On 70 cm he worked N5TQB (0327, EM31). EM70, EM99, and EM41 were new ones on 2 meters for Randy and EM31 was new on 70 cm for him.

Randy reports **Joe Crawford, WA4AUX**, in Prospect, Tennessee (EM65), also worked N4DXC, WA8CXI, N8TLZ, and N5KDA at approximately the same times that Randy worked them. Randy gives credit to Joe for being responsible for getting him away from the Braves game long enough to get those new ones that have stymied him for three years.

On Sunday evening 10 October **Larry Hazelwood, W5NZZ**, reported a sporadic-E opening between Oklahoma City and W2-VE3 that lasted about an hour. Very unusual for this time of year.

The 6 meter EME gang turned in the following report for the first weekend of the contest: W6JKV worked OH2BC, W5FF, OZ5IQ, and WA4NJP. K6QXY worked OH2BC, W5FF, I5MXX, OZ5IQ, and WA4NJP. K6MYC worked



OH2BC, W5FF, I5MXX, WA4NJP, and SM7BAE. WA4NJP worked OH2BC, K6QXY, K6MYC, W6JKV, and W5FF. Worked after the contest on 12 October were SM7BAE and OZ5IQ. Mike Staal, K6MYC, sent me the FAX with this information. He indicates that they did extremely well considering the size of the antennas of some of the stations. He continues to wonder why more people are not getting on 6 meters EME considering that it is, in his words "... not that hard." With the collapse of the F2 propagation this is the only way that long-haul DX will continue to be worked on this band.

## FM26 Activated From Chesapeake Light Tower

**Steve Harrison, KOØU/4**, who works for a company that is under contract with the U. S. Government to use the facilities of the Chesapeake Light Tower (in the middle of the mouth of the Chesapeake Bay, near Norfolk, Virginia), took advantage of the opportunity to set up operations from there, in the relatively rare grid square FM26.

His operation was from 26 July through 15 August. For the trip he took the following equipment: FT-620B, TS-700, Radio Shack HTX 100, and Microwave Modules MM432-28S transverter. The antennas consisted of a homebrew 3-element beam on 6 meters, the back half of an old Cushcraft 19L boomer, and an 8-element quagi for 70 cm.

During his stay he experienced tropo, sporadic-E (on 6 meters only), and meteor scatter propagation. His first contact, which was on 2 meters, was with **W4FSO**, whom he subsequently worked several more times.

During the next three weeks he made contacts on the following bands: 50 MHz, 62 QSOs in 38 grids; 144 MHz, 122 QSOs in 25 grids; and 432 MHz, 44 QSOs in 17 grids.

On 1 August he almost made it to the west coast on 6 meters. He had completed a contact with Rick, K5UR, when Charles Pettit, K6UIY, called Rick. Charles tried to alert Rick to the fact that he was copying Steve. However, Rick did not get the message. Later that day Steve was copying stations in the Dallas area but could not get them to hear him.

During the *Perseids* meteor shower Steve found the 2 meter band to be open on tropo. He had such a pileup that he was forced to break down the callsigns into specific prefixes. Steve reported that he did not have much success working random meteors because of the tremendous amount of activity in the form of several stations calling CQ all at the same time.

Steve reported that on the tower there are several dishes, and on a few occasions he would hook up the 432 MHz radio to one of them. This did help his signal in the direction that the dish would point. However, it had a limited azimuth range, thus restricting its usage for that purpose.

His last contact was on 14 August and was with **KD4BFJ** on 6 meters, which represented a new grid square for the both of them.

Steve feels that the operation was a success despite the equipment limitations. Certainly, having the amateur radio equipment available relieved the boredom that comes from these kinds of trips. In addition to making many people happy with the new grid on the three bands, Steve was able to learn more about propaga-

tion, especially tropo, when it is going to develop and how it will affect the VHF+ operator during a given time frame.

## WB5LUA and W5UC Grid Expedition To Louisiana

On Friday, 23 July, Al Ward, WB5LUA, and Mike Watson, W5UC, set up operations from Bossier City, Louisiana (EM32) for microwave communications back to the DFW area. They had stations on 902 MHz through 10 GHz, plus 144 MHz, for liaison.

Arriving just before midnight, they begin setting up immediately. Around 2 AM they were on 902 MHz with an AA5C transverter, running 20 watts into a loop Yagi. Later they set up the 1296 MHz rig, which consisted of a N5QGH transverter running 7 watts into a 6 foot loop Yagi.

Additional equipment was set up later. It included Mike's IC-271A and a 150 watt brick into a homebrew 7-element Yagi on 144 MHz, a 4 watt transverter and a WA5VJB amplifier to a 2.5 foot dish on 2304 MHz, a transverter and

a WA5TKU Avantek amplifier into the same dish on 3456 MHz, and a transverter running 13 watts into the same dish for 5760 MHz. On 10 GHz they ran an AA5C transverter running 2 watts into an 18 inch dish, fed with WR90 waveguide. All antennas were mounted on a 25 foot mast attached to the rear end of Al's travel trailer.

On Saturday morning Al's son Bryan, N5QGH, reported back to the group on 144.3 MHz that he was hearing TV channel 14 from Monroe full scale on the FRG-9600. Encouraged with that news, operations began immediately. Bryan and Al hooked up on 3456 MHz and immediately made the first-ever Texas to Louisiana contact on that band. Al then worked AA5C (EM13), WQ5S, and WA5DBY (EM12), at 223 miles, their best DX on that band.

Switching to 5760 MHz, their first contact was with Kent, WA5VJB (EM12), for a distance of 204 miles and the first Louisiana to Texas contact on that band. Contacts were attempted between them and N5QGH, as well as AA5C on 5760 MHz and 10 GHz, but were unsuccessful because of tree blockage at both

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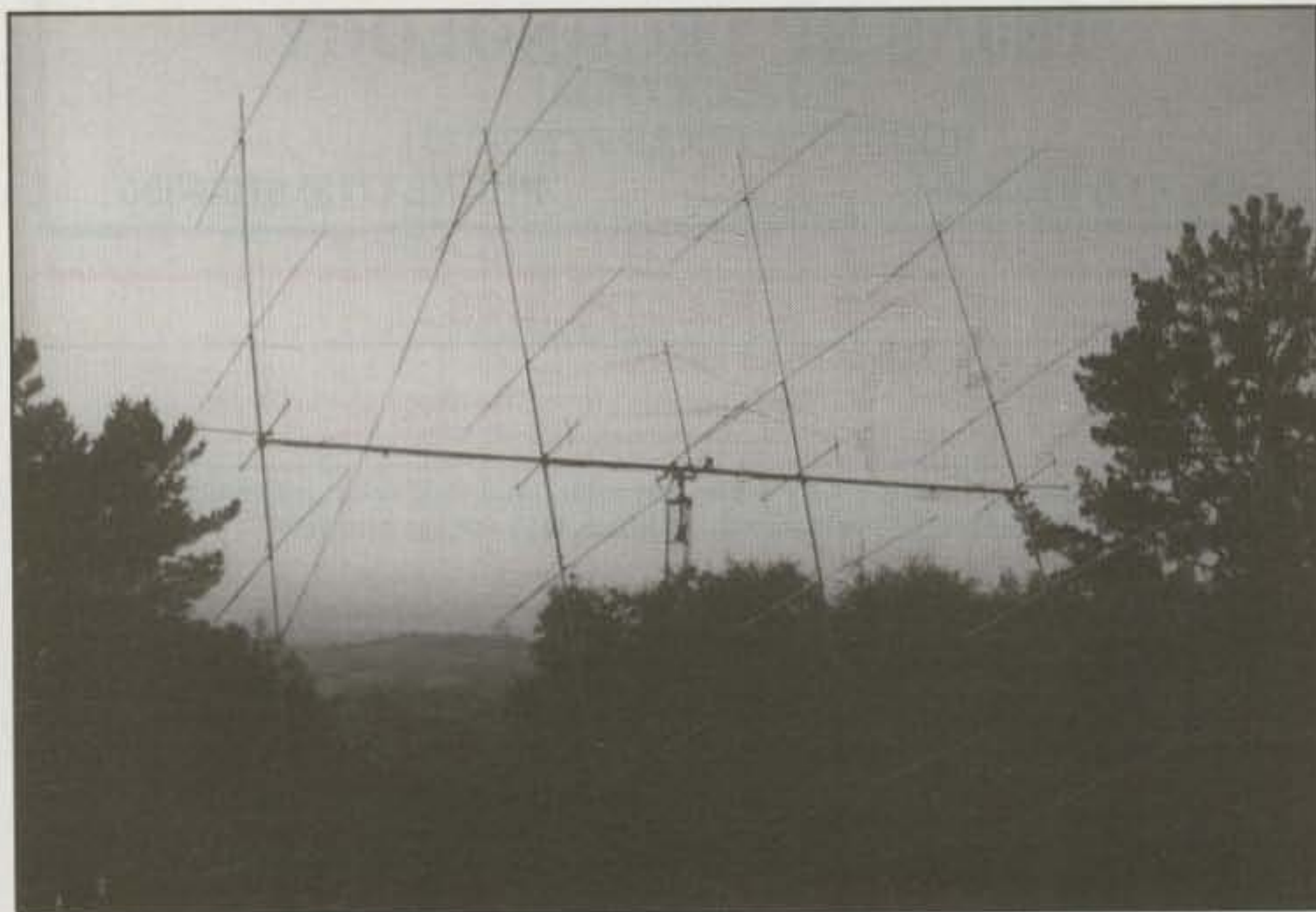
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*This picture of the W6JKV 6 meter array was shot just after sundown using a one second exposure. Shown are each of the 16 seven-element Yagis. In the lower left corner of the picture is Jimmy's shack, a converted barn.*

QTHs. (Al reports that they have a solution for the problem for the next trip, possibly something that George Washington would think of.)

Later in the morning they made contacts with numerous stations on 144 MHz, N4MW (EM55) and WA5DBY (EM12) on 902 MHz, AA5C (EM13), KB5IUA (EL29), and N5QGH

(EM13) on 1296 MHz. Finally, after receiving permission from his dad, Bryan fired up the Klystron on 2304 MHz and made contact with the group, beaming the 300 watts at them. Al was quite impressed to hear his station from the "other end" for a change.

After finding a better location for the trailer

on Saturday afternoon, contact was completed between them and N5QGH on 10 GHz the next morning. A contact with WA5VJB quickly followed. Later still they worked WA5DBY for their longest DX (223 miles) on that band. Unfortunately, contact was never established with AA5C.

Additional contacts were made on Sunday on most of the bands. They included a 3456 MHz contact with WA5VJB (the only one on all the bands); contacts with WA5VJB, WA5DBY, and W5RCI (EM44) on 2304 MHz; contacts with WA5VJB, WQ5S, N4MW, W5RCI, WA5DBY, and KC4YO on 1296 MHz; and contacts with N5WS, WQ5S, WA5VJB, and W5RCI on 902 MHz. Highlights of DX on 144 MHz include WA8R/9 in EM79, KA2DRH (EM64), N5XYO (DM90), and N5RZ (DM81).

Al reports that he really appreciated Mike's company and good cooking. Additionally, the visit from Ernie, W5FYZ, and other Louisiana amateurs provided excellent hospitality during the operation. A trip over the weekend of 16-17 October was planned. We will report on the highlights of that trip in a future column.

## Microwave Activity Growing In The Northwest

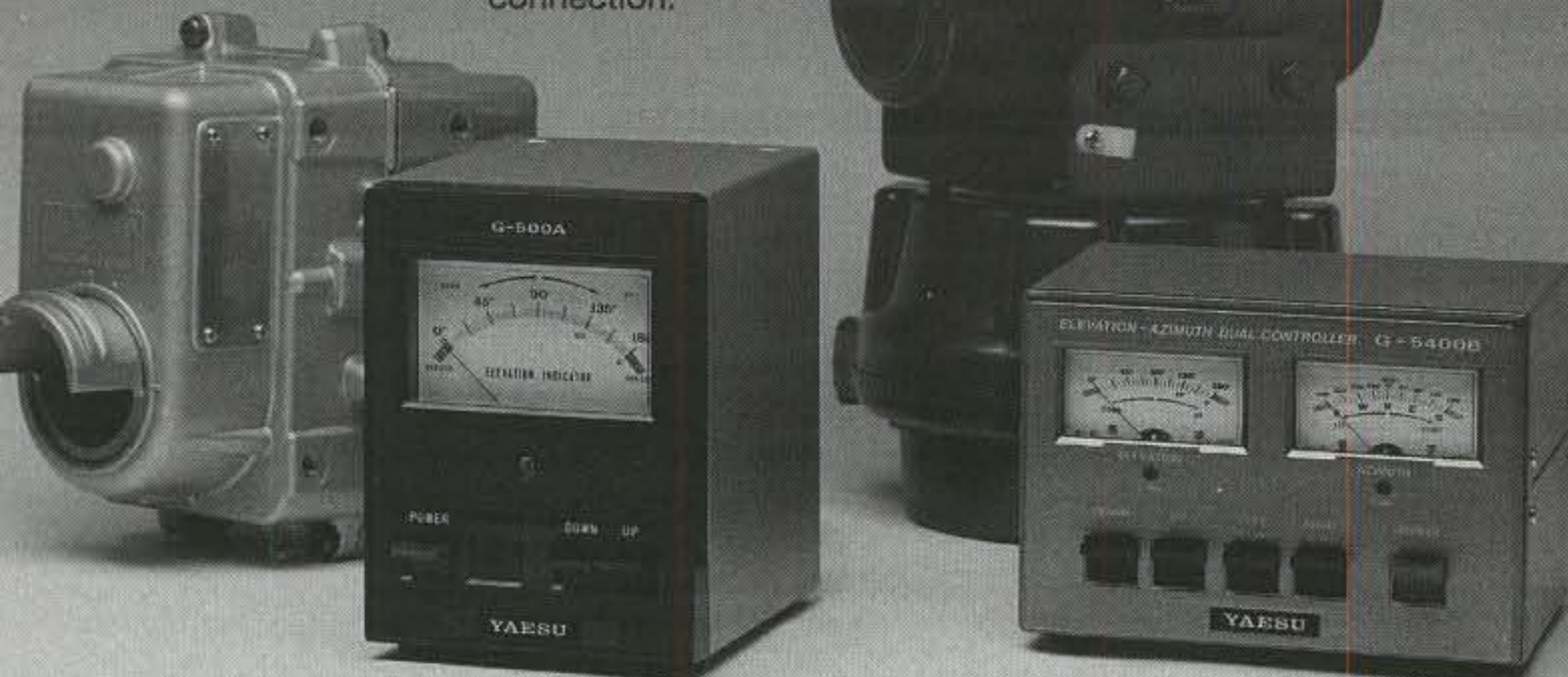
Bill Clemow, KE7CX, reports that there are now 20+ stations active on 1296 MHz in the northwest. Activity extends across Idaho, Oregon, Washington, and British Columbia. He states that this number is double that of a year ago. In addition, Bill says, there are numerous individuals pursuing 2304, 3456, and 5760 MHz and 10 GHz.



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Bill also states that because of the unusual terrain there, interesting propagation often takes place. He reports that almost every other weekend over this past summer found someone on some mountaintop. Most active of these mountain toppers are NU7Z, W7LHL, W7PUA, KD7TS, and WA7OEU.

A serious incident in which Ernie, W7LHL, set up on a mountaintop and suffered a heart attack points out the necessity of having a buddy along for these mountaintop trips. Bill relates that after getting set up for the UHF weekend and going to bed, Ernie suffered the heart attack. Knowing that there was nothing that could be done until morning, Ernie waited until then to fire up the generator and make contact with someone.

He made contact with W7YOZ and N7MWW via 2 meters that morning. They immediately went to his aid, coordinating an ambulance and retrieving his equipment.

Fortunately, Ernie will be alright. However, his situation could have been much worse and would have been much better had he had a partner along with him.

Remember what I said a couple of years ago in this column? It is worth repeating. "Play it safe; don't let amateur radio be the death of you."

## Jimmy Treybig, W6JKV's Barbecue Tenth Anniversary

The tenth anniversary of the barbecue at the Treybig's took place the last weekend of August. Drew Treybig, the excellent hostess, made sure that we were all accommodated with plenty of food. Among the guests were cit-

izens of at least six countries and approximately fifteen states. Altogether, there were in excess of fifty for dinner.

Next year we are once again are looking forward to the barbecue with Drew, Jimmy, and their new child. Thanks for the great time, Drew and Jimmy!

## And Finally

### Harry Schools, KA3B, Temporarily QRT:

After making my request for copies of Harry School, KA3B's monograph on 6 meters I received responses from three people (Bob Gorardi, N9LAG, Clem Clement, K1GPJ, and Pete Varounis, NL7XM/2—thanks, guys). Then I received a box from Harry, along with a letter. In the box were all of his important papers concerning his activities on 6 meters. In the letter was the sad news that because of pressing family and work-related responsibilities, Harry was having to temporarily QRT from amateur radio. He will still keep informed of what is happening by reading this and Emil's column in *QST*. But for the time being, he is going to have to sit on the sidelines.

We will miss him, but Harry deserves a well-earned break. He has spent hundreds of hours pursuing his specialty, the 6 meter band. His authorship of the newsletter "The 50 MHz DX Bulletin" (which is being carried on by Victor Frank, K6FV) has provided many of us with fascinating reading about "the Magic Band." His trips to remote locations have provided us with new countries (and, in your editor's case, my 49th state—Delaware). His care and concern have come through time and again in his writing. In addition, he has been one of those quiet

people who has done so much "behind the scenes" work through his correspondence, telephone calls, and personal conversations to promote his specialty, and thus the whole hobby of amateur radio.

So, Harry, take a well-deserved break. When you are ready to come back, rest assured that there will always be a place for you in the hobby. And when you are ready for me to send back your papers, let me know. In the meantime, I will do as you have instructed—guard them with my life!

My appreciation, as always, goes to the newsletter writers for your efforts in performing the unrequited job of providing the news to your fellow amateurs, and to you, the active operator, for sending me your reports of the fun you are having pursuing your interests in the VHF+ frequencies. When you have something to tell me about, you can reach me through the usual routes. My phone number remains the same: 405-528-6625. My FAX number is 405-528-0746. You can also do as Randy Galloway, KN4QS, and Rod Blocksom, KØDAS, did and send me E-mail via Compuserve.

I hope that this has been a fun-filled year for you and that you have been able to accomplish some of your goals in pursuit of your hobby. Remember, though, that this is just a hobby and that the most important people in your life remain your family. Treat them with the love that they deserve this holiday season.

The best of the holiday season to you, the best of the members of this hobby. I look forward to hearing from you next year as you continue to achieve your successes on the VHF+ frequencies. Until next year . . .

73, Joe, N6CL



## NEWS/VIEWS OF ON-THE-AIR COMPETITION

### Contesting's Bandwidth

#### December's Contest Tip

Here's one for the multi-ops! Have you tried every filter technology known to man and still have interference between stations? Try looking outside for the source of your troubles. A long-standing inter-station QRM problem was recently fixed at K1EA's station by tightening the backstay hardware on one of Ken's 20 meter Yagis. The S-8 interference it had previously generated on 15 meters went completely away!

**F**ew topics are more contentious than the issues that come from the way we utilize our precious frequencies—and for good reason. Perhaps now, more than any other time in the history of our hobby, the amateur spectrum is being threatened by the encroachment of commercial interests and others. The problem is further compounded by the way we sometimes trivialize examples such as the recent loss of a portion of the 220 MHz band. After all, many of us have never seen a transceiver display a frequency above 28.900 MHz, right?

I strongly believe that the amateur spectrum is being watched by predatory interests. Having said that, let's take a few minutes to examine amateur spectrum use from a contesting perspective.

Let's be honest with ourselves and call a spade a spade. There are many contest weekends where the operating event dominates the majority of our HF amateur bands—albeit usually only on one mode. Obvious examples include the CQ WW, CQ WPX, ARRL DX, and ARRL SS contests. In contrast, it's also fair to say even with contests on nearly every weekend of the year, the vast majority are not disruptive to "non-contest" operating. Is this acceptable to amateurs? This is a topic worthy of discussion this month.

Before I go on, I think it's important to point out that contests are not the only area of our hobby that amateurs find disruptive. There are very few active amateurs who can forget the chaos that has originated from some of the major DX-peditions in recent years. Operating practices such as listening on 20 meter SSB from 14200-300 come to mind. And while I'm not here to judge the value of

c/o CQ magazine  
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Compuserve ID: 71301,424

#### Calendar of Events

Nov.	20-22	ARRL SSB Sweepstakes
<b>Nov.</b>	<b>27-28</b>	<b>CQ WW DX CW Contest</b>
Dec.	3-5	ARRL 160 Meter Contest
Dec.	11-12	ARRL 10 Meter Contest
Dec.	31	ARRL Straight Key Night
Jan.	1-2	ARRL RTTY Roundup
Jan.	1-2	Michigan QRP CW Contest
Jan.	8-9	North American CW QSO Party
Jan.	15	Winter NW QRP Sprint
Jan.	15-16	North American SSB QSO Party
Jan.	15-16	HA DX Contest
Jan.	22-23	ARRL VHF Sweepstakes
<b>Jan.</b>	<b>28-30</b>	<b>CQ WW 160M CW Contest</b>
Feb.	6-7	1994 Classic Radio Exchange
Feb.	19-20	ARRL CW DX Contest
<b>Feb.</b>	<b>26-27</b>	<b>CQ WW 160M SSB Contest</b>
Mar.	5-6	ARRL SSB DX Contest

that approach, it most certainly has an impact on our use of the bands. There are still others who feel the growing propagation of DX nets is poor use of our bands. And haven't you heard some folks complain about the inefficient emergency/traffic nets operating above 14300 (an opinion with which I strongly disagree)? The point is that everyone has a view on frequency spectrum usage. DXers and contesters are not going to go away, so the operative strategy better be coexistence for all of us.

Probably the most commonly proposed suggestion on contest frequency spectrum use coming from my contest surveys and scores of telephone calls/personal conversations is the idea of a "contest free operating zone." While in theory this idea may have some merit, it really doesn't address the fundamental issue—the growing size of contest participation. From my experience, although contest activity does extend itself all the way to the upper edge of certain bands (e.g., 15 and 20 meters), it dramatically tails off well before that point. For example, I am so confident about the availability of a clear channel in upper parts of most bands that I use them myself as a safe haven for passing multipliers. Rarely has there been a time when I could not have a normal QSO with a new multiplier (and casual contest) on any band and at any given time. Sure, I wasn't running a phone patch, but the techniques for getting someone to move off my frequency were no different than any other mid-week type operating scenario.

As I've said, contesters' use of frequen-

cy spectrum is directly related to the amount of participation. In the 1970s and 80s it was a rare occurrence to witness someone calling "CQ Contest" on 21405. However, the broadening of spectrum use in recent times is not because contesters are inherently inconsiderate. Rather, it has happened because the amount of operating interest and activity has grown, warranting its use.

The beauty of amateur radio is that our use of spectrum is not pre-programmed. We are not like a radio or television network with strict guidelines for what we say and when we can say it. Amateur operating activity is defined by what the majority wants at any point in time. When Peter I (3Y) comes on the air in a few months, you can bet that the majority at that time will want to call and try to work them. And you can count on the fact that during the next CQ WW Contest, the bands will be filled again with great DX, fine operators, and more participants than ever before.

However, let's close with one final consideration. Setting aside the debate on whether or not the majority vote is spoken for during contest weekends, contesters have an obligation to show courtesy and consideration to their fellow amateurs. While it's easy to get caught up in the heat of competition, we should view our operating practices by asking two key questions: (1) Would my operating practices be acceptable if I were on the other end (especially the non-contester) and (2) Do my operating methods mirror the way I am on the air outside of contests? If you can honestly answer "yes" to these two questions, then by my definition you have passed the operating fairness test. What do you think?

#### New Addition To CQ's Video Library

CQ is introducing a number of new products this month (see the ads in this issue), but one of note to contesters is our new video entitled "Getting Started in Contesting." This video has been produced by CQ under the expert direction of Rich Moseson, NW2L, and is an ideal way to introduce contesting to the newcomer as well as convey excitement to the experienced operator. Approximately 50 minutes in length, it can also serve as an excellent club investment.

If you're trying to learn more about con-



testing, improve your score, or are interested in seeing some of the best stations in action, then you'll want to get this one by calling CQ's new order line at 800-853-9797.

## Who Says CW Is Dead?

This morning I had the pleasure of chatting with contesteer extraordinaire, Roger Western, G3SXW, who was operating from ZD9SXW. He commented that he had already worked 21,000 QSOs. Not only did he do it all by himself, but all on CW! Not bad, I'd say.

## Final Comments

Although hard to believe, the holiday season is already upon us. My family (Barbara, Timothy, Katelyn, and Kendra) and I wish you a safe and joyous time with friends and family. And as always, please remember that the deadline for the April issue is February 1st.

73, John, K1AR

## ARRL 10 Meter Contest

0000Z Sat. to 2400Z Sun., Dec. 11-12

This is the 21st annual 10 Meter Contest organized by the ARRL. It's an extremely active competition in which stations can work each other within their own country as well as around the world.

A maximum of 36 hours operating time is permitted out of the 48-hour contest period for all stations. The same station can be worked on SSB and again on CW for QSO points.

**Categories:** Single operator, mixed mode, SSB only and CW only. Multi-operator, single transmitter, mixed mode only.

**Exchange:** W/VE stations (including KH6 and KL7) send RS(T) and state or province. DX stations (including KH2, KP4, etc.) send RS(T) and QSO number starting with 001. Maritime or aeronautical mobile stations use RS(T) and ITU region. Novice/Tech stations must identify themselves with a /N or /T designator.

**Scoring:** SSB QSOs are worth 2 points, CW 4 points, Novice/Tech CW QSOs 8 points.

**Multiplier:** U.S. states (50 plus District of Columbia), Canadian provinces (NB, PEI, NS, VE2-8, VY1, VO1, VO2), DXCC countries, and ITU regions (1, 2, 3).

**Final Score:** Total QSO points times the sum of U.S. states, Canadian provinces, DX countries, and ITU regions, per mode.

**Awards:** Certificates will be awarded to the top-scoring single operator station in each category (including /N and /T) for each ARRL section and DXCC country. Additionally, the top-scoring multi-operator station in each ARRL division and each continent will also receive certificates.

Indicate a new multiplier only the first time it is worked. Dupe sheets are required for logs with 500 or more QSOs. The usual disqualification criteria will be enforced. A large SASE will get you log and instruction forms. The standard ARRL policy for electronic logs applies to this contest (contact the ARRL Contest Branch if you have any questions).

Mailing deadline for all entries is January 12th to: ARRL 10 Meter Contest, 225 Main Street, Newington, CT 06111.

## 1994 Michigan QRP Club CW Contest

1200Z Sat. to 2359Z Sun., Jan. 1-2

Take part in the 14th running of this popular QRP event sponsored by the Michigan QRP Club. The contest is open to all amateurs around the world (single-operator only).

**Classes:** (a) 250 milliwatts or less output, (b) 250 milliwatts to 1 watt output, (c) 1 to 5 watts output, (d) over 5 watts output.

**Exchange:** RST, QTH (state/province/country), and MI-QRP membership number (non-members replace with power output).

**Frequencies:** 1810, 3560, 7040, 14060, 21060, 28060, and 50060 kHz. Novices use 10 kHz from bottom of their sub-band.

**Scoring:** Stations may be worked once per band for QSO credit. Member contacts are worth 5 QSO points each, non-member contacts are 1 point. Final score is total QSO points times the number of multipliers worked on all bands. Bonus: Multiply total points by 1.25 for homebrew RX or TX. Multiply total points by 1.5 for homebrew XCVR or TX/RX combination. Commercially available kits are not eligible.

**Awards:** Certificates will be issued to the highest scoring score in each state/province/country. A separate log is required for each band, as well as your name, address, equipment description, and power output.

Logs must be received by February 5, 1994. Include an SASE for final results. Send your entry to: L. T. Switzer, N8CQA, 654 Georgia, Marysville, MI 48040.

## ARRL Straight Key Night

0000Z to 2359Z, Jan. 1  
(7 PM Fri. to 7 PM Sat., EST)

This is a friendly meeting on the air using a straight key only. Suggested frequencies on 80, 40, and 20 meters are 60 to 80 kHz up from lower band edges, 10 kHz from lower edge of Novice bands.

Use SKN instead of RST in the exchange to clue-in other stations. Include a list of stations worked plus your vote for the best fist heard during that period (not necessarily one you've worked).

This is not a contest, so any additional chatter is encouraged.

Send your report and vote for "best fist" and "most interesting QSO" to ARRL SKN, 225 Main Street, Newington, CT 06111 by January 10th.

## CQ WW 1992 Contest Errata

The following SSB entries should have been listed as certificate winners: JA7JI, VD2MRP/3, W4WJJ, N8CQA (QRP), and KA1CZF (QRP).

Paul Blumhardt, KS1G should have been listed as the operator of the winning 28 MHz USA CW single band effort at KA5W in the trophy listings. Also credit KS1G with accomplishments referenced in the write-up.

KQ8M should have been listed as the operator from K8AZ throughout the CW results.

VE6SH should have been listed as a CW QRP entry, placing him as #1 Canada.

W2KHQ was erroneously left out of the CW results. His final score was 317,151 with 419 QSOs, 78 Zones, and 191 Countries in the Single Operator, All Band/Low Power category.

K7SP should have been listed in the CW low-power "Unassisted" category, placing his score as #5 USA.

The following were left out of the CW results: RA3XA (single op. 21 MHz, score 38,394, QSOs 217) and SP3KEY (single op. 21 MHz, score 357,840, QSOs 1032).

VU2MTT was also omitted from the CW results: multi-single, score 721,329, QSOs 843; ops VU2PTT, VU2MTT, VU2HJA).

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## NEWS OF COMMUNICATION AROUND THE WORLD

### Getting The Most Out of 10 Meters

Over the past year DXers have seen a dramatic change for the worse on 10 meters. One year ago 10 meters was humming with choice DX, often to well above 2,8500 kHz. An active DXer could count on working all continents in a single day, and contest totals of more than 100 countries on a weekend were commonplace.

In December 1993 ten meters sounds strikingly different. Instead of good DX, we hear only some illegal SSB chatter encroaching into the bottom of the CW band. A careful tune across the wide SSB subband yields nothing. Is 10 meters dead? Will DXers be forced to live without their largest high-frequency band until Sunspot Cycle 23 begins to build in 1998? In a word, no!

Ten meters is not the same band it has been for the past five years, with wall-to-wall, loud signals from all around the world. But neither is it a completely dead band. DXers who ignore 10 meters over the next four to five years are missing out on one of the most interesting and rewarding aspects of DX. There is a unique thrill to being the only station on the band, to being the first one to hear and work good DX on 10 meters. And there is a significant challenge to those DXers who have run out of other goals in DX. Let's look more closely at 10 meters and how DXers can get more out of the band at the bottom of the sunspot cycle than they believed possible.

We'll begin with a review of propagation and the progress (if we can call it that) of Sunspot Cycle 22. Cycle 22 began back in September 1986, when the solar flux averaged about 70 for the month. (A solar flux value of about 66 is equivalent to a sunspot count of zero—i.e., that's as low as solar flux can get.) Cycle 22 picked up steam quickly, with the average solar flux rising to about 100 within a year of the minimum. A solar flux of 100 is generally considered to be the minimum necessary to "open" 10 meters. The average flux continued to rise, hovering near 200 for more than three years (1989-1991), and then dropping gradually over the past two years, to a monthly average below 100 this past fall. Ten meters was no longer "open" on a daily basis for most DXers. But just because 10 meters is not "open" doesn't mean that the knowledgeable DXer can't work DX on the band. To un-



Miran Voncina, S59VM (ex-YU3VM), recently qualified for the very difficult CQ 5 Band Worked All Zones award.

derstand why, we have to look at what we mean by a band being "open," and alternatives to such openings.

DXers usually call a band "open" when the maximum usable frequency (MUF) is higher than that band in the given direction. Thus, 20 meters is "open" to Europe from the East Coast when the MUF between Europe and the East Coast is above 14 MHz. For the MUF to be this high, the level of ionization in the upper atmosphere must be sufficient to refract (bend) radio signals of that frequency

back to the earth. The higher the level of ionization, the higher the frequency that will be refracted back to earth, and the higher the MUF.

For the purposes of DX, most such refraction occurs in the F-layers of the ionosphere, about 200-400 kilometers up (125-250 miles). The F-layers of the ionosphere are relatively stable. Although there is considerable vertical movement from day to night and back again, the overall degree of ionization, and thus MUF, varies more slowly. It takes a few days of

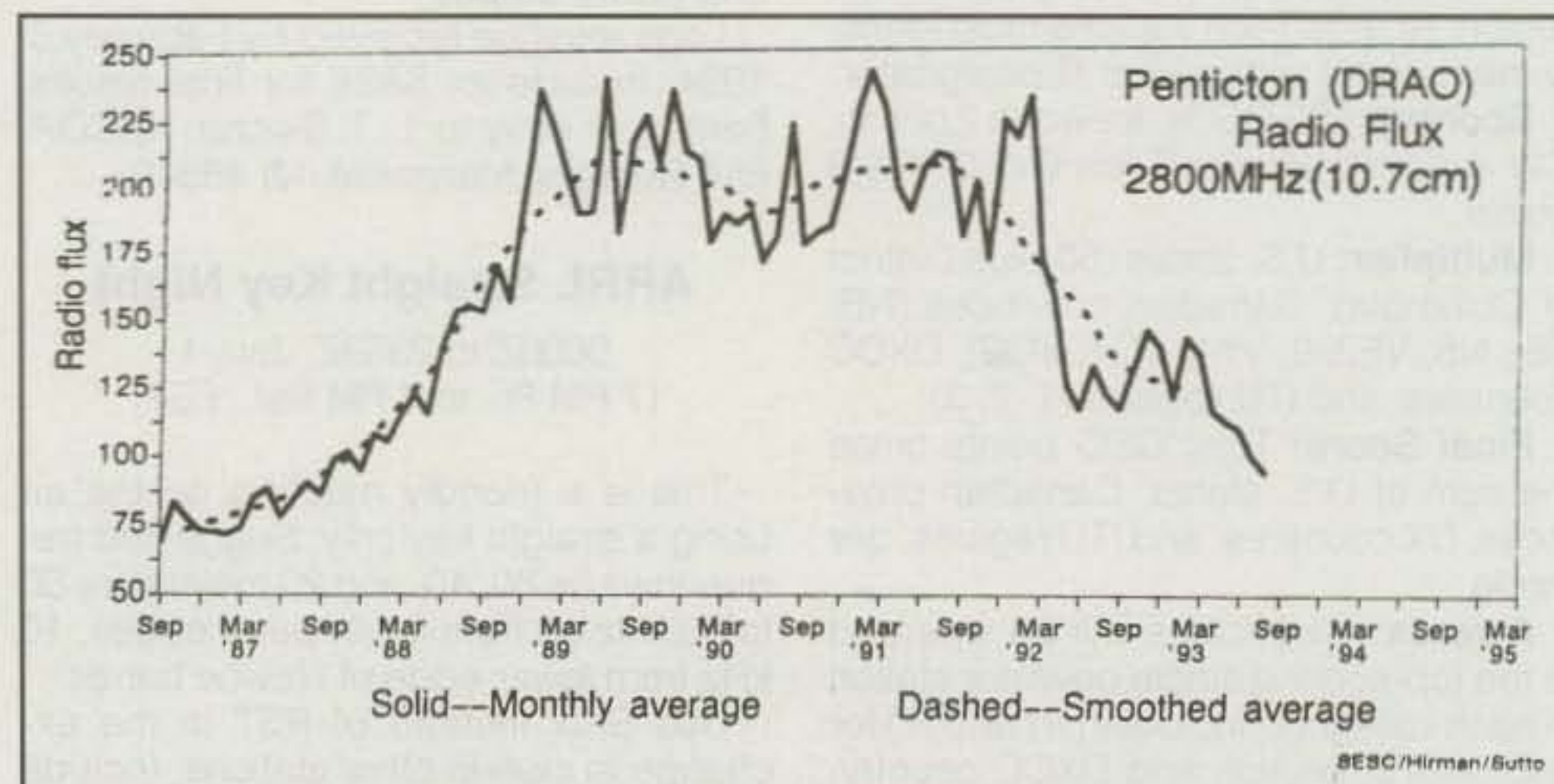


Fig. 1—Sunspot Cycle 22 has faded significantly in 1993, as this Space Environment Services Center graph shows.

P.O. Box 50, Fulton, CA 95439



increased solar activity to raise the MUF significantly, for example. Likewise, the bands don't fold immediately when solar flux levels fall. The highest level of ionization occurs in the F2-layer of the ionosphere, the highest layer. This is the layer most important for long-range refraction, and thus for DXing. When DXers say a band is "open," they usually mean there is refraction of radio signals via the F2-layer of the ionosphere in that direction.

Because the F2-layer is relatively predictable and stable, band openings occur on schedule, based on the level of solar activity. DXers can use computer models such as MiniProp to make remarkably accurate predictions about possible band openings, as we discussed with Mellish Reef VK9MM in September. On 10 meters F2-layer band openings occur when the solar flux is above 100, and the sun is (more or less) directly overhead of the midpoint of the path between the two stations. For example, 10 meters is open between the East Coast and Europe in the morning when the sun is over the Atlantic Ocean, and between the West Coast and Australia in the late afternoon, when the sun is out over the Pacific. One reason 10 meters sounds so dead these days is because the level of solar activity is too low to ionize the F-layers of the atmosphere sufficiently to refract 28 MHz signals back to earth.

Note the discussion about MUFs. We have always talked about the MUF on a given path. MUFs vary in different directions. The MUF on paths crossing the equator is often much higher than on paths passing through polar latitudes. Thus, even though the MUF is not high enough for contacts between the US and Europe on 10 meters, the ionosphere may well support 10 meter contacts between the US and South Africa, South America, or the South Pacific. Since there are far fewer amateurs in the Southern Hemisphere, we don't notice that 10 meters is open in that direction as readily as we

## The WPX Program

### SSB

2402.....HB9AUT	2408.....KB2NEK
2403.....EA8BGY	2409.....DU1CHD
2404.....EA1AYN	2410.....I3SIV
2405.....EA3CWS	2411.....DJ8WQ
2406.....EA6ZS	2412.....N3LBC
2407.....KF7IO	

### CW

2790.....HB9AUT	2792.....IK0NOF
2791.....W9IL	2793.....IK2MMF

### MIXED

1615.....HB9AUT	1616.....KB8NTY
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Mixed: 450 HB9AUT, 500 HB9AUT, JA3WFQ, 550 HB9AUT, 600 HB9AUT, KD1CJ, 650 HB9AUT, 700 HB9AUT, 750 HB9AUT, EA3CWK, W3KWH, 800 HB9AUT, EA3CWK, WA3KWH, 850 HB9AUT, EA3CWK, JE1RRK, W3KWH, 900 HB9AUT, EA3CWK, JE1RRK, W3KWH, 950 HB9AUT, EA3CWK, 1000 HB9AUT, EA3CWK, 1050 HB9AUT, EA3CWK, TF5BW, 1100 HB9AUT, TF5BW, 1150 HB9AUT, TF5BW, 1200 HB9AUT, TF5BW, 1250 HB9AUT, JA7FFN, 1300 HB9AUT, 1350 HB9AUT, 1800 W9IL, 1850 HA5NK, KS4S, 1900 HA5NK, 1950 IK2ILH, 2000 W8UMR, IK2ILH, 2050 N6JM, W8UMR, 2100 W8UMR, 2150 W4UW, 2850 ZP5JCY, W1BWS, 2900 ZP5JCY, W1BWS, 2950 ZP5JCY, W1BWS, 3000 ZP5JCY, W1BWS, 3050 W1BWS.

SSB: 350 HB9AUT, EA6ZS, EA8BGY, EA1AYN, DU3CHD, I3SIV, 400 HB9AUT, WB4UMQ, EA6ZS, EA8BGY, EA1AYN, DU1CHD, I3SIV, 450 HB9AUT, EA6ZS, EA8BGY, EA1AYN, DU1CHD, I3SIV, 500 HB9AUT, EA6ZS, EA8BGY, I3SIV, 550 HB9AUT, EA6ZS, EA8BGY, I3SIV, W4ZYQ, 600 HB9AUT, EA8BGY, I3SIV, W4ZYQ, 650 HB9AUT, I3SIV, W4ZYQ, 700 HB9AUT, I3SIV, W4ZYQ, 750 HB9AUT, W4ZYQ, DF7HX, 800 HB9AUT, W4ZYQ, 850 HB9AUT, W4ZYQ, 900 HB9AUT, 950 HB9AUT, 1000 HB9AUT, KC6X, 1050 HB9AUT, TF5BW, 1100 I3UBL, W0ULU, HB9AUT, TF5BW, 1200 I3UBL, HB9AUT, TF5BW, 1350 KS4S, 1400 KC9DX, 1900 N7TT, 2700 ZP5JCY, 2750 ZP5JCY, 2800 ZP5JCY, 2850 ZP5JCY.

CW: 350 HB9AUT, AG0A, 400 HB9AUT, 450 HB9AUT, 500 HB9AUT, 550 HB9AUT, 600 HB9AUT, 800 KC6X, 850 KC6X, 900 KC6X, 950 3A2LF, 1000 3A2LF, EA6AAK, 1050 3A2LF, 1100 3A2LF, 1150 3A2LF, KS4S, 1200 3A2LF, ZP5JCY, 1250 3A2LF, W4ZYQ, ZP5JCY, 1300 3A2LF, W4ZYQ, 1600 N7TT, 1650 N7TT, 1900 W8UMR, 1950 W8UMR, 2000 W3TVB, W8UMR, 2200 G3OCA, 3300 N6JV.

10 Meters: HB9AUT, WB4UMQ, W9IL, IK2MMF  
 15 Meters: HB9AUT, W9IL, DU1CHD  
 20 Meters: HB9AUT, W9IL  
 40 Meters: HB9AUT  
 80 Meters: HB9AUT, KC6X, W8IQ

Asia: HB9AUT, W9IL, DU1CHD  
 Africa: HB9AUT, W9IL  
 No. Amer.: HB9AUT, WB4UMQ, W9IL, KL7FAP, N3LBC  
 So. Amer.: HB9AUT, W9IL  
 Europe: HB9AUT, W9IL, DU1CHD  
 Oceania: HB9AUT, W9IL

**Award of Excellence:** HB9AUT, KC6X

**Award of Excellence Plaque Holders:** I8YRK, W4CRW, SM8AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, W8YIM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DE0DXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, W4BQY, I0JX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, H18LC, KA5W, K0JN, 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, KB0G, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YLW4, NN4Q, KA3A, YB0TK, VE7WJ, VE7IG, K9QRF, YU2NA, N2AC, W4UW, NX0I, W9NUF, N4NX, SM0DJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG, I1EEW, I8RFD, I3CRW, VEFXR, N4MM, KC7EM, ZS6BCR, CT1YH, IV3PVD, KA5RNH, ZP5JCY, F1HFW, KC8PG, NE4F, VE3MS, K9LJN.

**Award of Excellence Plaque Holders with 160 Meter Endorsement:** FM5WD, SM0DJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, W3ARK, H18LC, KA5W, UR2QD, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SM8AJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, W1JR, W6OUL, W5AWT, KB0G, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YB0TK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, K9QFR, NX0I, G4BUE, LU3YLW4, I4EAT, WB4RUA, VE7WJ, N4NX, DE0DXM, 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.

detect openings in other directions.

This means that the best way to check for possible DX on 10 meters at this time is to point your antenna south; if 10 is open at all, it is probably open to the south. A quick tune across the 10 meter beacon subband (28,200-28,300 kHz) confirms this. Even when 10 meters is so dead that only a handful of the near-100 active 10 meter beacons can be copied, the ones

from South America are loud and clear.

Besides low MUF in most directions, however, there is another reason why 10 meters is so quiet: lots of listeners and no transmitters. Many DXers assume that because they don't hear many signals during a quick tune across the 10 meter band, the band won't yield any DX. This is one of the few examples in DX when merely listening is not enough. To deter-



Mike, UW0MF, operates from Vladivostok in Zone 19. Mike was one of the operators in the P5RS7 North Korea operation. (RC2AR photo)



Andy, UX3D, Larry, UA6HZ, and Jim, GM0FET, discuss formation of an alternate group to the Central Radio Club in Russia. (K7FL photo)



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RG 8/U FOAM 95%	.30/ft	.28/ft
RG MINI 8X BLK or CLR UV JACKET	.16/ft	.14/ft
RG 11U FOAM MIL-SPEC	.42/ft	.40/ft
RG 214/U—MIL-SPEC	1.50/ft	1.30/ft
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C4090 HVY DUTY 2/18-6/20 UV JACKET	.34/ft	.32/ft
18GA 4/C GRAY JACKET	.15/ft	.13/ft
18GA 7/C GRAY JACKET	.18/ft	.16/ft

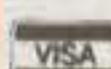
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14GA SOLID "COPPERWELD" UNINSULATED	.07/ft	.06/ft
12GA 19 STR FLEXIBLE BC UNINSULATED	.11/ft	.10/ft

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## The WAZ Program Single Band WAZ

### 10 Meter SSB

466 ..... EA2KL

### 12 Meter SSB

7 ..... OZ1ING

### 15 Meter SSB

449 ..... WB2NOT 451 ..... EA2KL  
450 ..... 7L1WII

### 20 Meter SSB

932 ..... OH3OJ

### 40 Meter SSB

79 ..... EA2KL

### 10 Meter CW

138 ..... WA3CGE

### 12 Meter CW

9 ..... N4MM

### 15 Meter CW

251 ..... WA3CGE

### 20 Meter CW

437 ..... W8IQ 438 ..... K5FUV

### 40 Meter CW

168 ..... NQ1W 170 ..... WA3CGE  
169 ..... K5FUV

### 12 Meter Mixed

11 ..... OH3MEP 12 ..... I2EOW

### All Band WAZ SSB

4105 ..... W9AGH 4110 ..... VU2JJO  
4106 ..... EA1AYN 4111 ..... K2ZFW  
4107 ..... DL1ZBB 4112 ..... ON6TP  
4108 ..... KB5MRT 4113 ..... ON4SW  
4109 ..... K6UV

### CW/Phone

7370 (CW) ..... N3RW 7375 ..... WB7NKY  
7371 ..... K4PY 7376 ..... F5OZK  
7372 ..... SP8HKT 7377 ..... S52TU  
7373 ..... GM4AGS 7378 (CW) ..... ON4SW  
7374 (CW) ..... WB6MBF

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4 1/2 x 9 1/2 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 checkpoint 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).

mine if 10 meters can support DX contacts, a DXer should try a few CQs in a likely direction: southeast in the morning; southwest in the afternoon.

Chris Burger, ZS6EZ, notes that he seldom hears any signals on 10 meters when he first turns on his rig in the early evening. However, he turns on a CQ tape, and starts working stations every few minutes. By the time he signs off a few hours later,

## 5 Band WAZ

As of August 31, 1993, 367 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:  
XE1VIC

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)	W1FZ, 199 (26)
K6YRA, 199 (34)	IK2GNW, 199 (1)
PY7ZZ, 199 (34)	W9CH, 199 (26)
K8CS, 199 (34, 40m)	AC8M, 199 (34)
AA4KT, 199 (26)	G3MXJ, 199 (12)
K7UR, 199 (34)	IK8BQE, 199 (31)
NA8Y, 199 (26)	SM6AHS, 198 (12, 31)
VE7DX, 199 (34)	K1ST, 198 (19, 26)
W8PGI, 199 (26)	4X6DK, 198 (4, 6)
W2YY, 199 (26)	AB0P, 198 (23, 34)
W9WAQ, 199 (26)	UA3AGW, 198 (1, 12)
K6EID, 199 (34)	KL7Y, 198 (34, 36)
IK8CNT, 199 (12)	VO1FB, 198 (19, 27)
W1JR, 199 (23)	W6TC, 198 (34, 37)
W8SEY, 199 (26)	EA5BCX, 198 (27, 39)
N7RT, 199 (34)	KZ4V, 198 (22, 26)
VE7AHA, 199 (34)	

The following have qualified for the basic 5 Band WAZ Award:

WB2NOT, 179 Zones	AA7FL, 155 Zones
K5FUV, 194 Zones	OE3EMN, 169 Zones

Endorsements:

WN4KKN, 193 Zones	XE1VIC, 200 Zones
KBBL, 181 Zones	

850 Stations have attained the 150 Zone level as of August 31, 1993.

Rules and applications for the WAZ program may be obtained by sending a large SAE 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 band is filled with stations! In another example, Bill Eckels, W8ZNH, reports on a sked he had been keeping with ZL1ASC since 1979. Bill called on 28,666 kHz without even bothering to turn on his amplifier, since the solar flux was about 85, and 10 meters had sounded completely dead for several weeks. However, ZL1ASC came right back with an S7 report! They continued their sked for more than 20 minutes before signals faded out. These experiences illustrate one of the most important characteristics of 10 meters: it is open far more often than most DXers realize.

The ARRL 10 Meter Contest in mid-December provides a dramatic illustration of this phenomenon. Before and after the contest 10 meters will appear to be dead. However, during the contest hundreds of stations will make thousands of contacts on this same "dead" band.

The 10 Meter Contest also provides a good opportunity to make contacts via propagation modes other than the straight-forward, direct F2 openings. For

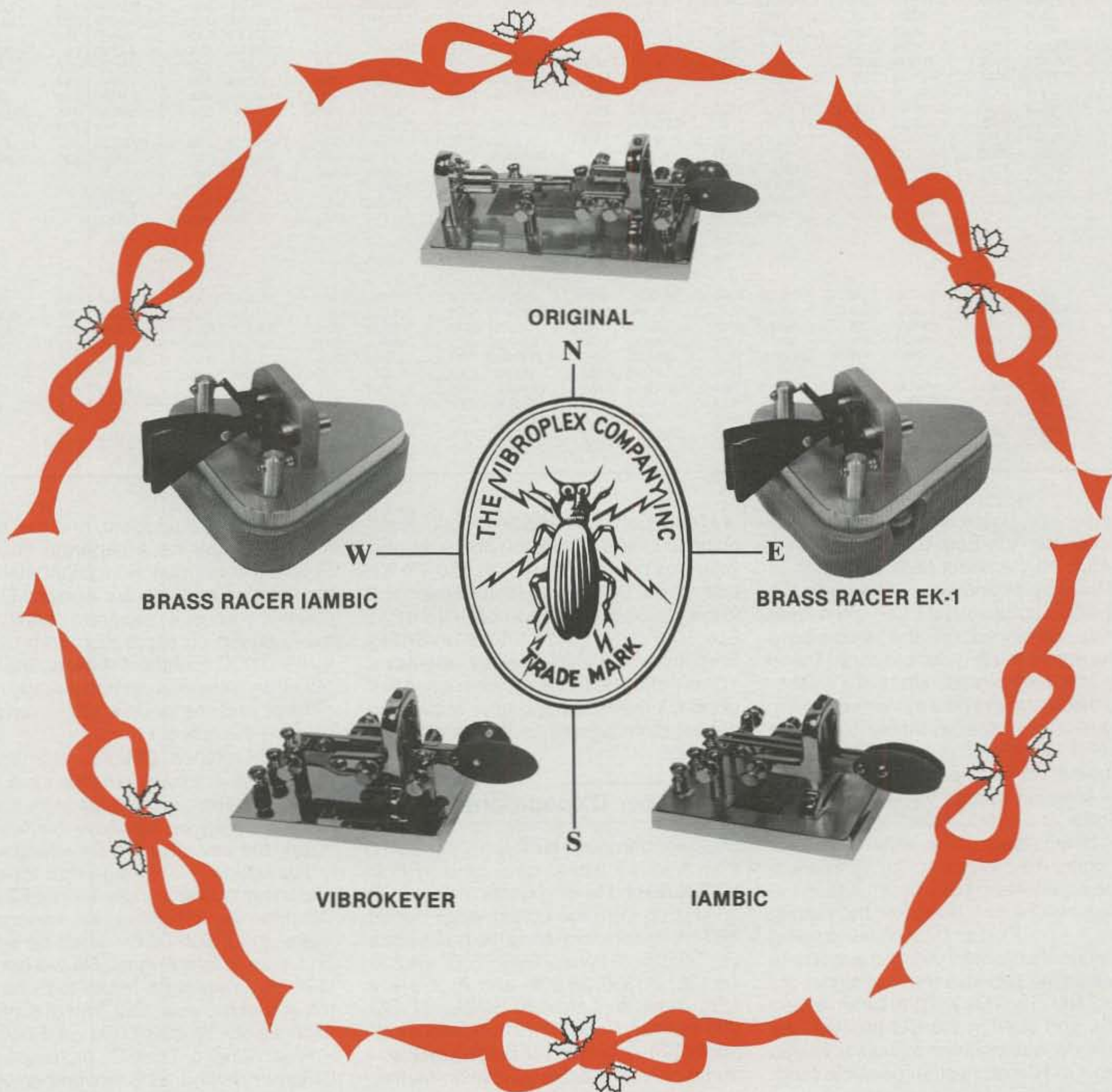


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## The WPX Honor Roll

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

4512	9A2AA	2973	ZP5JCY	2722	PA0SNG	2203	HA0IT	1897	W6OUL	1701	NV9S	1462	S58MU	1189	I1-50156	945	W4USW
4434	F9RM	2972	K0BLT	2682	YU7BCD	2147	K5UR	1893	HA5NK	1694	IK2ILH	1452	I0AOF	1178	K7LAY	937	WB2PCF
4148	K2VV	2964	W1BWS	2652	I6SF	2142	I1WXY	1880	WE2L	1688	WB2ABD	1430	LU8DY	1164	CT3CU	920	AA7TF
3498	EA2IA	2954	N4MM	2639	N4UU	2118	3A2LF	1868	N2AIF	1674	S51NU	1364	HA9PP	1160	K0IFL	902	JN3SAC
3365	K6JG	2924	I2UIY	2609	YT7DX	2097	S53EO	1811	KB0G	1638	VE1RJ	1325	KC7V	1125	W0ULU	854	VE6BMX
3322	VE3XN	2905	WA8YTM	2604	SM7TV	2095	WB2YQH	1785	DF6EX	1631	W8CNL	1324	I2EAY	1122	K7KBN	851	VE7CBH
3234	N4NO	2904	YU1AB	2557	K9BG	2091	W4UW	1782	SM6CST	1628	WB8ZRL	1318	NJ1T	1119	NH6T	840	VE3OMM
3210	K6XP	2898	KA5W	2556	HA8XX	2091	I2DMK	1780	G4OBK	1560	CT1QF	1298	K13L	1118	G4SDJ	770	N3KR
3174	N6JV	2855	PY4OD	2549	N2AC	2052	KL7AF	1767	W9IL	1546	EA1JO	1271	KC6X	1104	HP2CWB	753	OZ-2044
3127	IT9TQH	2852	W9DWQ	2449	IT9QDS	2049	K8LJG	1762	WB4RUA	1532	CT1YH	1248	NE6I	1074	WK3Z	738	JA4DUD
3037	W2FXA	2840	IN3ANE	2435	K9AGB	2041	DK5AD	1745	KS4S	1531	KA5TQF	1224	K9BQL	1072	EA3CWK	671	WB9IHH
3025	I2PJA	2817	I1EEW	2332	K9QFR	2016	N6JM	1740	WA1JMP	1487	DK7NP	1213	W9IAL	1061	HB9DDZ		
3008	SM3EVR	2814	9A2NA	2318	HA0HW	1993	W8UMR	1724	W3KH	1484	K5IID	1211	W0ZV	1032	ITZQD		
3003	W4BQY	2725	YU7SF	2255	I2EOW	1902	K29LG	1714	K5DB	1470	WB3DNA	1194	N6IBP	956	JH1IED		

### SSB

4320	F9RM	2539	N4NO	2129	PY4OD	1841	4X6DK	1534	YU7SF	1305	WN5MBS	1123	NG9L	919	N4CSF	739	CE5FSB
3895	I0ZV	2533	NJ0C	2105	WA4QMQ	1840	K5UR	1510	CT1UE	1289	DK5WQ	1117	FE6FNA	917	NE6I	710	JA4DUD
3522	K2VV	2525	I2UIY	2098	W9DWQ	1779	IN3QCI	1493	KA0ZFX	1272	KB0C	1112	WA2FKF	910	NH6T	700	WU1F
3420	ZL3NS	2483	F2VX	2087	YU7BCD	1757	CT1BY	1490	LU8DY	1258	W6OUL	1101	K9BQL	892	AA7TF	687	SM6CST
3338	VE1YX	2458	I1EEW	2067	I8KCI	1742	WE2L	1476	IK2DUU	1254	KA5TQF	1098	IK2AEQ	859	EA1JO	681	AA4UF
3104	IT9TQH	2437	W0YDB	2065	WF4V	1714	N4UU	1442	I8LEL	1226	IK0EIM	1096	HA5NK	849	KF7IO	644	EA8BGY
3080	K6JG	2416	KA5W	2046	CT4UW	1711	KC8YM	1403	K8LJG	1199	K3IXD	1073	WB6SRK	844	CP1FF	643	JR3TOE
3018	WD8MGQ	2398	I4CSP	2041	LU8ESU	1708	CX6BZ	1392	IT9JKY	1193	G4OBK	1063	CT4RH	836	KA9MOM	611	EA8BWW
3015	I2PJA	2395	PA0SNG	2022	I2EOW	1700	EA2AOM	1392	K2EEK	1187	CT1BWW	1019	KC7V	821	EA1AX	606	KE4BM
2893	ZP5JCY	2319	HA8XX	2004	EA3AQC	1659	I2TZK	1341	LU7HJM	1180	EA9LZ	1017	KC6X	818	SV3AQR	603	HB9DDZ
2833	K6XP	2296	W4BQY	1985	PY4OY	1600	KL7AF	1339	W5AWT	1174	I3ZSX	1010	KB4HU	809	K0IFL	600	JA2OCU
2797	CT4NH	2291	WA8YTM	1930	EA3FHT	1593	KF7RU	1337	I2DMK	1156	KB2DE	998	HP2CWB	806	I6KYL		
2635	N4MM	2286	I5ZJK	1925	K5RPC	1586	HA0IT	1327	CT1DIZ	1154	K8MDU	991	YB3OSE	797	EA3EQT		
2576	EA2IA	2175	9A2NA	1917	W4UW	1583	N6FX	1317	N2AIF	1153	K5IID	956	JH1IED	781	G0FWG		
2558	OZ5EV	2171	K9QFR	1902	CT1AHU	1535	I6NOA	1312	KS4S	1130	I1-21171	944	EA3KB	762	EA5DCL		

### CW

3578	K2VV	2460	YU7SF	2146	YU7BCD	1790	EA7AZA	1599	KL7AF	1504	I7PXV	1307	S58MU	1004	AH6JF	789	KL7UR
3383	WA2HZR	2401	I6SF	2054	KA5W	1770	JA9CWJ	1598	W9PWW	1503	KB0G	1297	3A2LF	1002	EA6AAK	749	VE3OMM
3385	W8RSW	2400	K6XP	1996	N4MM	1737	I2DMK	1596	HA8XX	1443	VR2UW	1280	ZP5JCY	952	W9IAL	710	HB9DDZ
3156	N6JV	2354	W4BQY	1940	I2UIY	1721	IT9VDQ	1576	S51NU	1402	W6OUL	1277	EA1JO	944	FE1JUD	688	N5GFX
3124	IT9TQH	2320	N2AC	1918	G4UOL	1719	G3VQO	1569	W1WAI	1397	I2EEW	1244	NJ1T	916	W4UW	669	NH6T
2910	VE7CNE	2311	W9DWQ	1861	9A2NA	1700	K5UR	1567	VE1RJ	1364	IK3GER	1195	I2EAY	908	KC7V	637	I2MQP
2787	N4NO	2302	N4UU	1856	IK0ADY	1681	SM6DHU	1555	W5AWT	1363	G4OBK	1179	LU2YA	907	K5IID	630	AA6WJ
2605	YU7LS	2284	JH3CXL	1818	KA7T	1673	G4SSH	1539	HA5NK	1354	DJ1YH	1177	KS4S	860	NE6I	611	KI4UZ
2577	PY4OD	2209	LZ1XL	1812	W8IQ	1668	HA0IT	1534	ZS6EZ	1324	SM5DAC	1131	K9QFR	852	KA5TQF		
2557	K6JG	2206	WA8YTM	1808	TI4SU	1668	SM6CST	1519	K8LJG	1317	G4MVA	1110	KA1CLV	827	WB5MTV		
2554	EA2IA	2165	VE7DP	1790	N4YB	1646	N6FX	1506	N2AIF	1312	DL2HBX	1102	IK2ECP	821	KC6X		

example, it is possible to work European stations from the East Coast even when the MUF on the direct path is lower than 28 MHz. By aiming your antenna to the east and southeast you can often hear signals scattered off the ionosphere rather than refracted back to earth. These side-scattered signals are much weaker than those arriving on a more direct path, but are often copiable, thanks to the low noise of 10 meters.

Another possible propagation mode is back scatter. Because the MUF is typically higher due south, if both stations point their beams due south, some portion of the signal may reflect off the earth south of the equator and back north. Again, the signals will be much weaker than direct signals. Also, if either station tries to swing his or her beam antenna on the direct path between the two stations, the signal will disappear. Try CQs with the beam aimed south, and state in the CQ that you are looking for back-scatter signals from due south. On 10 meters other possible propagation modes include some more common to VHF, such as meteor scatter and E-skip.

In any case, don't write off 10 meters

until sunspot Cycle 23 rolls around. In addition to tuning across the SSB subband, listen for beacons in the 28,200-28,300 kHz range. (A list of 10 meter beacons is in the *Callbook* and is available from P.O. Box 50, Fulton, CA 95439 for an SASE). Then try some CQs in likely directions. You will often be pleasantly surprised with good DX contacts, and your activity will stir yet more signals on the band. Good hunting!

### December DXpeditions

Scott Richardson, N7TNL, is operating from Midway Island until January 6 as **N7TNL/KH4**. He will concentrate on CW 36 kHz up from the bottom of all bands, 160-10 meters, including the new bands. On SSB he'll favor 7096/7236, 14,236, 18,136, 21,336, 24,936, and 28,336 kHz. QSL direct to Landean Bailey, W1OO, 224 Holmes Road, RFD 3, Scarborough ME 04074, or via the W7 bureau to Scott's home call. (The military base on Midway Island is slated to be closed in the next few years, and the island returned to the State of Hawaii. When that happens, the basis for separate DXCC country status

of Midway will disappear, and the island may no longer be a separate country. Should that happen, Kure Island KH7 will also likely drop off the current DXCC countries list, as its separate country status is based on separation from Hawaii by the DXCC country of Midway. The radiolocation base on Kure has already been closed, and the gooney birds have reclaimed the island.)

Pertti Kantanen, OH2VZ, returns to Sri Lanka 4S7 in mid-November for a four-week operation, around his work schedule. He is plagued by heavy interference during the day, plus in the evening widely fluctuating line voltage that trips the switching power supply on his FT-890. Despite these difficulties, he managed to make about 600 QSOs when he was in Sri Lanka in late August. He will print up QSL cards upon his return to Finland at the end of the year; QSL him at Kattilala-aksontie 8B, SF-02320 Espoo, Finland.

Alex Wilhelm, DK8FD, plans a trip to Chatham island ZL7 November 24 to December 4. He has requested either **ZL7FD** or **ZL7DX**. He'll operate on 80-10 meters, including the new bands, on CW and SSB. He'll also be on in the CQ WW



## QSL Information

3D2ZG to JH9XZG  
 4J4GAT to DL1VJ  
 4J4JJ to UG6JJ  
 4K3/RA3YM to RA3YG  
 4K3BB to RB5CB  
 4K4BVI to UY5XE  
 4K4LC to UA6LC  
 4L0FWW to UF6FWW  
 4L24A to K1M2B  
 4Z4UT to WB2FTK  
 5H3NU to ITHAG  
 5J129P to HK6LRP  
 5N4S8G to WB5KYF  
 5R8GW to F6FNU  
 5W1KH to I4ALU  
 5W1VJ to G4ZVJ  
 7Q7JL to G0IAS  
 7Q7LA to G0IAS  
 7Q7XX to JH3RRA  
 7X4AN to DJ2BW  
 7Z1AB to WB2QMP  
 9A1CRU to YT2IX  
 9A2PM to KA9WON  
 9A4AA to 4N2AA  
 9H1AZ to 9H5AZ  
 9H1EL to LA2TO  
 9H3PB to DF4EK  
 9J2SZ to SP8DIP  
 9K2GS to WB6JMS  
 9K2SH to WB6JMS  
 9M2NA to VE3CHZ  
 9M6NA to JE1JKL  
 9M8DB to AA5AZ  
 A22MN to WA8JOC  
 A35NP to DK6NP  
 AM7CEZ to EA7CEZ  
 AM92GZH to EA7GZH  
 AP/WA2WYR to KK6TX  
 BZ5HAN to BY5HZ  
 C9RJJ to WB6IO  
 CJ8PW to VE8PW  
 CP6RP to I0WDX  
 D2EL to EA7EL  
 D2FGC to OK1AJN  
 EA9UK to EA9LZ

EF8VBV to IC8AWP  
 EH0JEB to EA3MM  
 EU10 to F6AML  
 F6BLQ/D2 to F6ELE  
 FK8CR to F6EWK  
 FK8GJ to F6CXJ  
 FM5FE to F1NCZ  
 F05BI/P to F6HSI  
 FP/VE1KM to K1RH  
 FS4PL to FG4BG  
 FY5FP to ON4ZD  
 FY5YE to W5JLU  
 H44GC to K2PF  
 HC8K to KT1N  
 HF0POL to SP9DWT  
 HP2CWA to N4YWY  
 HZ1AB to K8PYD  
 J5UAI to NW8F  
 J73FTC to N9DTP  
 J8/N2HNO to JH4IFF  
 J80X to JH4IFF  
 JW1CCA to LA1CCA  
 JW2IJ to LA2IJ  
 KH8/DF6MS to DJ3QC  
 OD5SK to KB5RA  
 P29DK to N4COF  
 P29JA to JH7MSB  
 P29KH to WD4DZV  
 PY0TUP to PY1RO  
 PY1NAP to PY1RO  
 R19A to K1M2B  
 RD40A to SP9HWN  
 S21A to W4FRU  
 S79KMB to KN2N  
 S92IJ to DJ5IO  
 S03JE to SP3GVX  
 SU1AY to OE6EEG  
 T32LN to VK4CRR  
 T32MV to AA6MV  
 TM3IF to FD10ZF  
 TM9WPX to FF1N2H  
 TR8YA to F6FUN  
 TU2PA to KEBLS  
 TV9CEE to F1MXH  
 U5WF to DJ0XC  
 UB9X/UB2KA to UB5KDD  
 UC2AAA to F6AML

UF7FWW to UF6FFF  
 UL4I/UZ9AWO to UA9AQN  
 UL7TX to UW6HS  
 US768L to UB588N  
 UY7U to SM2DYS  
 UZ9MYL to W0BIU  
 V2/AA4BQ to AA4BQ  
 V73CT to OKDXA  
 VE1ST to VE1ANJ  
 VE8CWI to VE2SEI  
 VI4FOW to VK4CHB  
 VK2CWG to W6FGD  
 VP2MLD to KC4DWM  
 VP8CGK to VK4MZ  
 VP9MN to WB2YQH  
 VQ9QM to W4QM  
 VQ9RB to WA4DPU  
 VQ9WM to K7100  
 VS6WV to K0TLM  
 VY6QST to K1ZZ  
 XT2DK to OE3DKS  
 YB47RI to Y88VM  
 YJ0AFU to NA5U  
 YN/SM00IG to SM0KCR  
 ZA1J to HB9BGN  
 ZD8VDC to WB5VDC  
 ZF2NE to W5ASP  
 ZF2SO to WA0JTB  
 ZK1AL to I4ALU  
 ZK1AR to WB6HGH  
 ZK1XR to N7NKG  
 ZK2VJ to G4VZJ  
 5B4AAL to P.O. Box 1642, Nicosia, Cyprus  
 9A2PA to P.O. Box 60, Krizevci, Croatia  
 9A3GW to P.O. Box 5151, 41040, Zagreb, Croatia  
 9D8RR to P.O. Box 766, Brooklyn NY 11230-0766  
 A71BV to Khalid, P.O. Box 2260, Doha, Qatar  
 CB8NS to P.O. Box 6577 Rabat, Morocco  
 EP2PP to P.O. Box 2274, Monrovia, Liberia  
 HH2PK to P.O. Box 1095, Port au Prince, Haiti  
 VR6BX to P.O. Box 21, Pitcairn Island  
 X0BYAF to P.O. Box 4, Easter Island, Chile  
 Y11BGD to Deya, P.O. Box 7361, Baghdad, Iraq  
 ZA1BM to P.O. Box 5, Elbasan, Albania  
 ZA1FD to P.O. Box 1, Elbasan, Albania

CW test November 27-28. QSL via the German DARC bureau, or direct to Alex at Feldstrasse 19, 64859 Eppertshausen, Germany. Remember that German postal rates have increased dramatically this year, and US\$1 is not enough for return postage to the US. Send two IRCs with your self-addressed envelope, or expect an answer via the bureau.

Paul Mauro, IV3UHL, begins a five-month, multi-nation Pacific DXpedition in Late November. He'll be in Fiji 3D2 November 15 to December 1, and again February 1-15. In December and January he'll operate from Tonga A3, including several counters for Islands On The Air. In mid-February he travels to the South Cook Islands ZK1 until early March. He'll spend most of March in French Polynesia FO before returning to Italy. Paul will operate SSB on 3760, 7095, 14,260, and 21,260 kHz, and CW on 3050, 7005, 14,005, and 21,005. He'll also be on the new bands. Paul says he will concentrate on 40 and 80 meter CW, and also watch the US Novice subbands. QSL to his Italy address: P.O. Box 21, 33038 S. Daniele.

Finally, The Scottish Expedition Group will commemorate St. Andrew's Day by operating three stations November 27 to December 5. Look for **GB0SEG** from Dunnet Head, **GB2SEG** from Central Scotland, and **GB4SEG** from Fife County. They offer a certificate for anyone work-

ing and confirming all three stations: US\$4 from George Leishman, GM2TW, Woodside, Redding, Falkirk, Stirlingshire FK2 9UQ, Scotland.

## DXCC News

Bill Kenamer, K5FUV, DXCC Specialist to ARRL Headquarters, has announced that the following operations are now accredited for DXCC: 5R8DC from 13 October 1992; 5R8DD from 14 October 1992; 5R8DE from 4 September 1992; 5R8DF from 4 September 1992; 5R8DH from 4 November 1992; 5R8DI from 4 November 1992; 5R8DL from 9 November 1992; 5R8DM from 5 November 1992; KP1/W5IJU *et al* from 23 March 1993; T5/KJ6QO from 11 March 1993; T5/DL8YR from 20 April 1993; T5/DL1VJ from 1 March 1993; T5/DF5UX from 1 March 1993; T5THW from 1 March 1993; TT8AKX from 16 January 1993; 6Y5/DF5UL from 25 April 1993; 6Y5/DL2FAI from 25 April 1993; 6Y5/DL4ZBI from 25 April 1993; 7Q7CE from 20 July 1993; D68CA from 9 August 1993; FH/I4ALU from 21 August 1993; FJ/I4UFH from 9 August 1993; and TY8OBO from 14 August 1993. Cards for these operations may be submitted for DXCC credit.

In late September the ARRL Awards Committee voted unanimously to accept the DX Advisory Committee's (DXAC)

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NEC/Wires 1.0 is \$100 for amateur use only. Visa, MasterCard, U.S. check, cash, or money order. Add \$5 overseas. NEC/Wires requires a 386+ 387 or 486DX, a hard disk, and VGA.

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## CQ DX Awards Program

### SSB

2038	KA5OER	2043	EA8BGY
2039	EA1ET	2044	EA1AX
2040	EA5GJM	2045	KB5MRT
2041	EA3CWS	2046	Y33VL
2042	EA5ZR	2047	HH2B

### CW

886	KB4HU	888	Y33VL
887	KB5OHT	889	W7BU

### SSB Endorsements

320	KB4HU/328	300	KX5V/307
320	W6EUF/328	300	K1VHS/307
320	ZL1AGO/328	275	Y33VL/299
320	OE3WWB/328	275	KB5MRT/281
320	YV1AJ/328	275	EA5GKE/276
320	YV1KZ/328	275	K2EEK/283
320	K9IW/328	250	WZ3E/256
320	EA4DO/327	200	EA5ZR/219
320	KM2P/327	200	WB6SOF/200
320	N4KEL/M/324	150	EA3CWS/173
310	OE7SEL/317	150	HH2B/154
310	LU7HJM/317	3.5/7 MHz	Y33VL
310	N6PTI/314	28 MHz	Y33VL

### RTTY Endorsements

16	K1KOB
----	-------

### CW Endorsements

320	K2OWE/328	300	KB4HU/308
320	K4CEB/327	300	AA2X/308
320	K9IW/326	300	G3KMQ/301
320	K4IQJ/320	275	N5FW/279
310	Y33VL/316	200	W4TYU/205
310	N4AH/315	150	KK4XL/160

Total number of active countries is 328. 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.

recommendation to reinstate **Eritrea E3** as a separate DXCC country. The DXCC desk will accept QSL cards for Eritrea contacts starting January 1, 1994. Eritrean cards sent to ARRL Headquarters before January 1 will be returned without action. Since this is a reinstatement of a previously deleted country, any DXer with Eritrea ET2 credit prior to its deletion in 1962 need not resubmit cards.

While the unanimous vote to reinstate Eritrea was not a surprise, the vote on the effective date of this action was. The Awards Committee voted four to three to make this reinstatement May 24, 1991, rather than the May 24, 1993 date the DXAC recommended. (See November's DX column for more details.) Despite the Eritreans' own statements that they did not seek international recognition of their independent status until after results of their worldwide referendum, the Awards Committee "felt that sufficient evidence of sovereignty existed to justify the 1991 reinstatement date."

Since the Awards Committee cannot unilaterally overrule DXAC decisions, the

chairman of the Awards Committee, Chuck Hutchinson, K8CH, conferred with DXAC chairman Bob Beatty, W4VQ, on the different start dates. In view of the split vote within the DXAC on the effective date (nine to six in favor of the 1993 date), the DXAC agreed to accept the Awards Committee action.

This action appears to loosen the definition of a separate DXCC country. In the recent past either some measure of official international recognition, or the use of ITU-assigned prefixes in the callsigns, have been required for a country to count as a separate entity for DXCC. Several so-called countries that failed to meet either of these requirements were turned down for separate country status. However, in the case of its vote on the effective date of Eritrea, the Awards Committee, with the concurrence of the DXAC, has chosen an essentially arbitrary date for the "start" of a DXCC country.

While the Eritreans celebrate May 24 as their "independence day," in fact, the only real significance of that date is that opposing soldiers stopped shooting at the Eritreans. The Ethiopian military didn't "surrender" until May 27, the EPLF didn't proclaim its provisional government until May 28, and the then-government of Ethiopia didn't officially accept the concept of a separate Eritrea until July 3, 1991. Eritreans worldwide didn't vote to separate from Ethiopia until April 1993, and the provisional government of Eritrea didn't seek international recognition as an entity separate from Ethiopia until May 24, 1993. The only amateur radio operations between 1991 and May 1993 were under callsign blocks assigned to Ethiopia.

There are numerous examples around the world of effectively conquered territories that are held by self-proclaimed "independent" governments, situations not significantly different from Eritrea between 1991 and 1993. While the ARRL Awards Committee chairman, K8CH, cautioned against reading too much into this decision, it is a safe bet that DXpeditioners will be carefully reviewing such cases in hopes of using the Eritrea vote as a precedent for more potential new DXCC countries.

## QSL Notes

**J8/N2HNQ, J85A, and J80X** are all St. Vincent calls of JH4IFF during August. QSL any of JH4IFF's calls via his home call.

QSL the special-event station of **JU830C** via the Mongolian Radio Sport Federation's club call JT1KAA. JT1T and JU1T are also MRSF club calls; QSL via JT1KAA, Box 639, Ulan Baton 13, Mongolia.

**Azores** Island DXers have formed the Sao Miguel DX team, and will QSL any of



their members' operations via P.O. Box 1414, 9500-Ponta Delgada, Azores Islands, via Portugal. The members are CU2AA, CU2AE, CU2AF, CU2AP, CU2AV, CU2CE, CU2CR, and CU2DX.

QSL **5V7DP** via the new manager—N6MMF.

**HC1EA** has not provided logs to W2KF, and W2KF can no longer serve as QSL manager for HC1EA. Try direct to Carlos Calderon C., P.O. Box 2761, Quito, Ecuador, South America.

**5U7M** reports that he will QSL 100% via the bureau for his Niger contacts. He asks that you *don't* send cards, SASE, IRCs, etc., direct; QSL via the JARL bureau.

QSL contacts with **UB3JX** since April 1, 1992 via new manager W2FXA.

QSL **ZA/G3MHV** and **ZA/KA6ZYF** via their home bureaus, or direct to them at P.O. Box 1489, Santa Monica, CA 90406-1489.

**Bermuda** VP9 cards from VP9MP, VP9MN, VP9OM, VP9CB, and VP9YL are available from Bob, WB2YQH. Bob also handles cards for **XT2BW**.

QSL **HP1XFG**, **HP1XFJ**, **HS0JUA**, **HS0IYY**, **HS0C**, **JH8YDY/JD1**, **5H1YK**, **7Q7JA**, **7Q7JA/HI8**, **V51/7Q7JA**, **9J2HN**, and **9N88C** via JH8BKL.

For QSLs from **YI1BGD** try LA5NM, who is currently in Svalbard; he may have logs.

To QSL contacts with stations in what was Yugoslavia, the USPS asks that DX-ers use the newly recognized international names of the countries: Bosnia-Herzegovina, Croatia, Slovenia, and the former Yugoslav republic of Macedonia. Only contacts with stations in Serbia and Montenegro should use the word "Yugoslavia" in the address.

### Pirates, Bootleggers, Etc.

**EP/WA1HFF** in August was by a bootlegger, according to WA1HFF. Don't QSL, please.

Likewise, **9G1PP** from June 1988 is not a legitimate operation, according to purported QSL manager G0CAD.

The **EP2MM** contacts since 1970 have been by a Slim, says Clyde Stottlemire, W5TQG, who held that call in 1968-69. Unfortunately, he no longer has logs for his Iranian operation.

### QSL Manager Volunteers

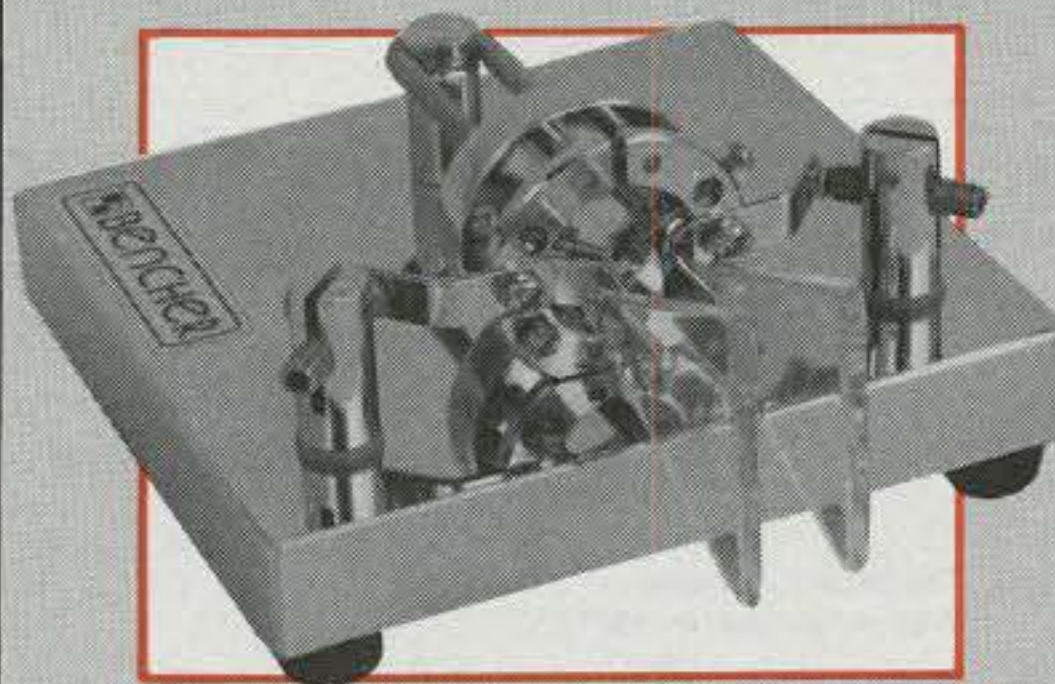
Everett LaPorte, KC1OC, is willing to serve as a QSL manager for a DX station; contact him at 42 Mathews Avenue, Waterville ME 04901-5233.

Duncan Kremer, W1GAY, is not only willing to serve as a QSL manager, but will even pay for the cards and additional postage; contact him at P.O. Box 637, Vineyard Haven, MA 02568.

73, Chod, VP2ML

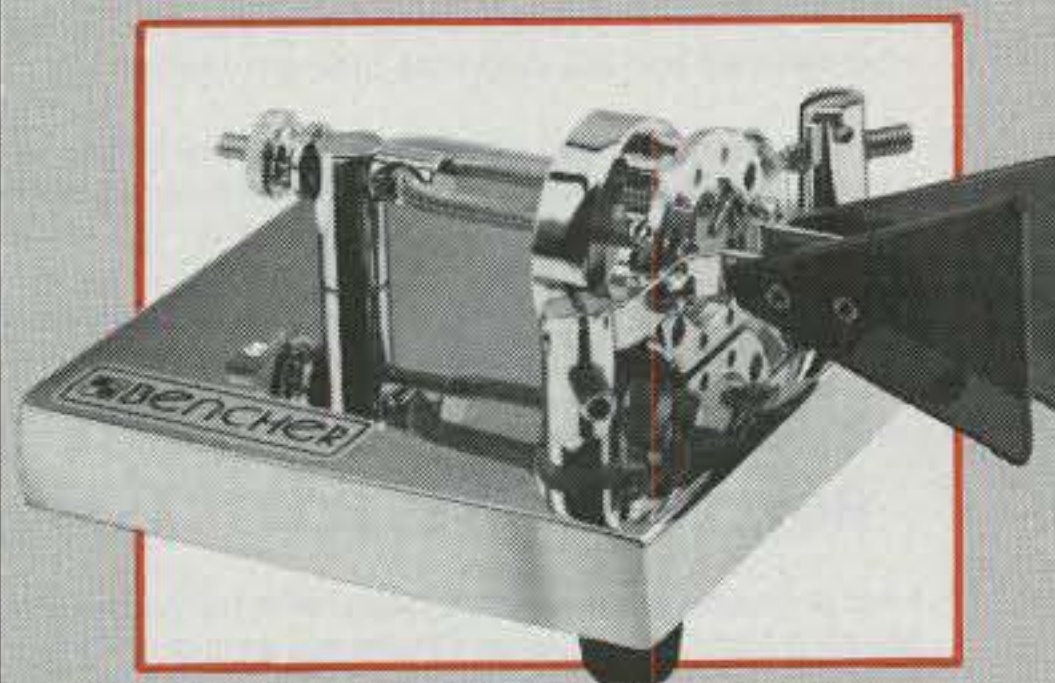
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## THE SCIENCE OF PREDICTING RADIO CONDITIONS

### 1993: A Relatively Good Year

**A**lthough sunspot Cycle 22 continued to decline slowly but steadily during 1993, the solar count was still high enough to produce another relatively good year for the users of the HF spectrum. The year began with a smoothed sunspot number of 71, and it is estimated to have dropped to a count of 51 by the end of the year. Solar activity therefore was moderate during 1993, and this was reflected in the generally good conditions that were observed on all of the HF bands.

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a mean sunspot number of 42 for August 1993. This was the lowest monthly mean value recorded since February 1988. The mean level for August results in a 12-month smoothed sunspot number of 69 centered on February 1993. The sunspot cycle is measured by the value of smoothed sunspot number. February's level is a drop of two points from the previous month's count. A smoothed sunspot number of 51 is forecast for December 1993, as the 22nd sunspot cycle is expected to continue its steady decline.

A corresponding 10.7 cm mean solar flux level of 94 was reported for August 1993 by the Dominion Radio Astrophysical Observatory, Penticton, B.C. This results in a smoothed solar flux value of 123 centered on February 1993. A smoothed 10.7 cm flux level of approximately 121 is expected during December 1993.

The sunspot cycle is expected to continue its slow but steady decline through the New Year. Next month's column will feature a forecast of solar activity expected during 1994, as well as a prediction for the remainder of Cycle 22 and the expected beginning of Cycle 23. It is very likely that 1993 was the last of the relatively good years for HF propagation conditions for at least the next four to five years!

#### December Band Openings

During December the density of ionization in the northern hemisphere is expected to increase more rapidly after sunrise than during other seasons. Atmospheric noise and static levels should be at seasonally low values during the month, and signal levels are expected to be excep-

11307 Clara St., Silver Spring, MD 20902

#### LAST MINUTE FORECAST

Day-to-Day Conditions Expected for December 1993

Propagation Index.....	Expected Signal Quality			
	(4)	(3)	(2)	(1)
Above Normal: 8, 12, 17, 26-27	A	A	B	C
High Normal: 1, 6-7, 16, 24-25, 28	A	B	C	C-D
Low Normal: 4-5, 9, 11, 13-15, 18, 21-23, 31	A-B	B-C	D	D-E
Below Normal: 2, 10, 19, 29-30	C	C-D	D-E	E
Disturbed: 3, 20	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 S3 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 good (B) on Dec. 1, fair-to-poor (C-D) on the 2nd, poor (D) on the 3rd, fair (C) on the 4th and 5th, etc. Mother Nature should give radio amateurs a present of good (B) conditions over Christmas!

tionally strong during many band openings.

Solar activity has now declined to a point where daytime DX conditions on 10, 12, and 15 meters will be noticeably poorer than they were during the winter seasons of high solar activity. This probably will be the last year for fairly widespread DX openings on 10 meters until well into the new solar cycle.

Some 10 and 12 meter DX openings, mainly to southern and tropical areas, should be possible during much of the daylight period. Fairly good 17 and 15 meter DX openings are expected to most areas of the world sometime during the daylight hours, and the bands occasionally may remain open towards the west during the early evening. Twenty meters should open for DX in almost all directions for an hour or two after sunrise, and remain open to one area of the world or another through the daylight hours and into the early evening. When conditions are

#### Bulletin

As this is being written, world-wide solar and geomagnetic data is in hand for October 2, 3, and 4. This data is for one 27-day cycle prior to the CQ WW DX SSB Contest weekend of October 30 and 31, and two cycles before the WW DX CW Contest weekend of November 27-28. There is a high probability that conditions observed on October 2, 3 and 4 will repeat during both contest weekends. Of course, by the time this issue of CQ reaches readers, the SSB weekend will be history. For the record, however, conditions look somewhat improved from those I discussed previously. There is now a very good change that High Normal conditions will take place during the SSB weekend, with a fairly good possibility that they may be Above Normal at times.

This issue of CQ, however, should reach most readers in time for the CW weekend of the CQ World-Wide DX Contest, November 27 and 28. Here is an updated day-to-day propagation forecast for the weekend made at press time. It looks like good news. Based on a two-cycle repeat of October 3 and 4 conditions, expect at least High Normal most of the weekend, with the possibility of some Above Normal periods on the 27th.

If this forecast for the contest weekends should hold up, it looks like the 1993 contest can still be a good one, despite the decline in solar activity!

above normal, 20 meters is likely to remain open towards the south and west during the hours of darkness to about midnight, and perhaps beyond.

With static levels at seasonally low values in the northern hemisphere, and the hours of darkness at a maximum, a considerable improvement is expected in DX conditions on the 30, 40, 80, and 160 meter bands during December. Thirty and 40 meters should open for DX during the late afternoon hours, with the first signals coming from Europe and other areas in a northeasterly direction from the USA. During the hours of darkness DX should be possible to many areas of the world. The bands should peak shortly before sunrise to Oceania and other areas in a generally southerly and westerly direction.

Fairly good DX conditions are also expected on 80 meters. Openings with relatively strong signal levels should be possible to many areas of the world during the hours of darkness, with conditions expected to peak as the sun rises at the



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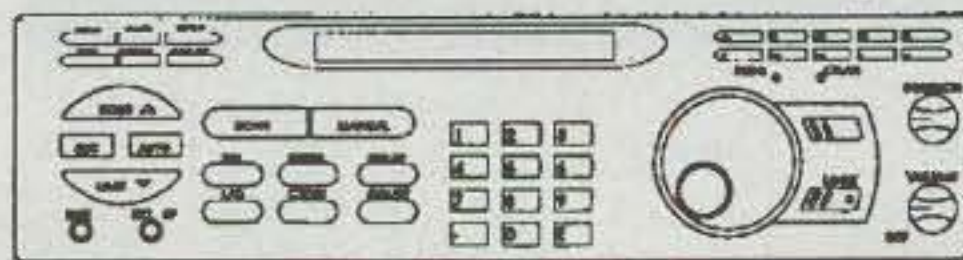
On April 19, 1993, the FCC amended Parts 2 and 15 of its rules to prohibit the manufacture and importation of scanning radios capable of intercepting the 800 MHz. cellular telephone service. Supplies of full coverage 800 MHz. scanners are in *very* short supply. If you need technical assistance or recommendations to locate a special scanner or solve a communications problem, call the Communications Electronics Inc. technical support hotline for \$2.00 per minute at 1-900-555-SCAN.

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137.000 - 173.995 MHz. (NFM), 174.000 - 215.995 MHz. (WFM),  
216.000 - 224.995 MHz. (NFM), 225.000 - 399.995 MHz. (AM)  
400.000 - 511.995 MHz. (NFM), 512.000 - 549.995 MHz. (WFM)  
760.000 - 823.9875 MHz. (NFM), 849.0125 - 868.9875 MHz. (NFM)  
894.0125 - 1,300.000 MHz. (NFM).

The new Bearcat 8500XLT gives you pure scanning satisfaction with amazing features like Turbo Scan. This lightning-fast technology featuring a triple conversion RF system, enables Uniden's best scanner to scan and search up to 100 channels per second. Because the frequency coverage is so large, a very fast scanning system is essential to keep up with the action. Other features include *VFO Control* - (Variable Frequency Oscillator) which allows you to adjust the large rotary tuner to select the desired frequency or channel. *Counter Display* - Lets you count and record each channel while scanning. *Auto Store* - Automatically stores all active frequencies within the specified bank(s). *Auto Recording* - This feature lets you record channel activity from the scanner onto a tape recorder. You can even get an optional *CTCSS Tone Board* (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. *20 banks* - Each bank contains 25 channels, useful for storing similar frequencies in order to maintain faster scanning cycles. For maximum scanning enjoyment, order the following optional accessories: PS001 Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter \$14.95; PS002 DC power cord - enables permanent operation from your vehicle's fuse box \$14.95; MB001 Mobile mounting bracket \$14.95; BC005 CTCSS Tone Board \$54.95; EX711 External speaker with mounting bracket & 10 feet of cable with plug attached \$19.95. The BC8500XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited warranty from Uniden. Order your BC8500XLT from Communications Electronics Inc. today.



## CB/GMRS Radios

The Uniden GMR100 is a handheld GMRS UHF 2-way radio transceiver that has these eight frequencies installed: 462.550, 462.725, 462.5875, 462.6125, 462.6375, 462.675, 462.6625 and 462.6875 MHz. This one watt radio comes with flexible rubber antenna, rechargeable ni-cad battery, AC adapter/charger, belt clip, F.C.C. license application and more.

Uniden GMR100-G GMRS Handheld ....	\$169.95
Uniden GRANTXL-G SSB CB Mobile ....	\$149.95
Uniden PC66XL-G CB Mobile .....	\$78.95
Uniden PC76XL-G CB Mobile .....	\$99.95
Uniden PC122XL-G SSB CB Mobile ....	\$107.95
Uniden PRO330E-G CB Remote .....	\$99.95
Uniden PRO510XL-G CB Mobile .....	\$36.95
Uniden PRO520XL-G CB Mobile .....	\$49.95
Uniden PRO538W-G CB & Weather .....	\$69.95

## Shortwave

ICOM R1-G ultra compact handheld .....	\$469.95
ICOM R100-G mobile .....	\$649.95
ICOM R71A-G base (add \$39.00 shipping) .....	\$1,029.95
ICOM R72A-G base (add \$39.00 shipping) .....	\$954.95
ICOM R7000-G base (add \$49.00 shipping) .....	\$1,249.95
ICOM R7100-G base (add \$49.00 shipping) .....	\$1,289.95
ICOM R9000-G base (add \$149.00 shipping) .....	\$4,999.95
ICOM AH7000-G super wideband discone type antenna .....	\$109.95
Grundig Satellit 700-G portable with AC adapter .....	\$449.95
Grundig Satellit 500-G portable with AC adapter .....	\$349.95
Grundig Cosmopolit-G with cassette recorder .....	\$179.95
Grundig Yacht Boy 230-G portable .....	\$139.95
Grundig Traveller 2-G portable .....	\$79.95
Sangean ATS606-G ultra compact .....	\$149.95
Sangean ATS606P-G radio with antenna & AC adapter .....	\$169.95
Sangean ATS800-G portable .....	\$79.95
Sangean ATS803A-G portable with AC adapter .....	\$159.95
Sangean ATS808-G portable .....	\$159.95
Sangean ATS818-G portable without cassette recorder .....	\$189.95
Sangean ATS818CS-G with cassette recorder .....	\$209.95
Sangean ANT60-G portable shortwave antenna .....	\$9.95

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Cobra CP910-G 900 MHz. spread spectrum cordless phone ...	\$299.95
ICOM GP22-F handheld global positioning system .....	\$699.95
WR200-G weather radio with storm alert .....	\$39.95
RELM WHS150-G VHF handheld 5 watt, 16 ch. transceiver ...	\$319.95
RELM RH256NB-G VHF 25 watt synthesized transceiver .....	\$289.95
Ranger RC12950-G 25 watt 10 meter ham radio .....	\$244.95
Ranger RC12970-G 100 watt 10 meter ham radio .....	\$369.95
Uniden LRD9000W-G Laser/Radar Detector .....	\$169.95
PWB-G Passport to Worldband Radio by IBS .....	\$10.95
POL1-G Police Call for CT, ME, MA, NH, NY, RI, VT .....	\$5.95
POL2-G Police Call for DE, MD, NJ, PA .....	\$5.95
POL3-G Police Call for Michigan & Ohio .....	\$5.95
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POL5-G Police Call for IA, KS, MN, MO, NE, ND, SD .....	\$5.95
POL6-G Police Call for DC, FL, GA, NC, PR, SC, VA, WV .....	\$5.95
POL7-G Police Call for AL, AR, LA, MS, OK, TN, TX .....	\$5.95
POL8-G Police Call for AZ, CO, ID, MT, NM, NV, UT, WY .....	\$5.95
POL9-G Police Call for California, Oregon & Washington .....	\$5.95
USAMBNB-G magnet mount scanner antenna with BNC .....	\$29.95
USAK-G VHF scanner/VHF transmitting antenna with PL259 ...	\$29.95
USASGMBNC-G glass mount scanner ant with BNC connector ..	\$29.95
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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 80 and 160 meter openings.

3. The propagation index is the number that appears in parentheses ( ) 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 AM; 13 is 1 PM, 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, DC is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based on 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.

### December 1993 to February 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	09-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-14 (1)	06-07 (1) 07-09 (4) 09-11 (3) 11-13 (4) 13-14 (3) 14-15 (2) 15-17 (1)	15-16 (1) 16-17 (2) 17-19 (3) 19-00 (4) 00-02 (2) 02-03 (3) 03-05 (1) 17-19 (1)* 19-20 (2)* 20-02 (3)* 02-03 (2)* 03-04 (1)*
Northern Europe & European USSR	08-10 (1)	07-08 (1) 08-10 (2) 10-12 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-14 (1)	16-19 (1) 19-23 (2) 23-03 (1) 19-02 (1)*
Eastern Mediterranean & Middle East	08-10 (1)	08-09 (1) 09-10 (3) 10-11 (2) 11-12 (1)	06-09 (1) 09-10 (2) 10-13 (3) 13-15 (2) 15-17 (1)	18-20 (1) 20-22 (2) 22-00 (1) 20-23 (1)*
West Africa	09-11 (1) 11-13 (2) 13-15 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	18-22 (1) 22-00 (2) 00-03 (1) 03-04 (2) 00-02 (1)*
East & Central Africa	10-13 (1)	08-10 (1) 10-12 (2) 12-13 (3) 13-15 (2) 15-16 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	18-00 (1)
Southern Africa	09-10 (1) 10-12 (2) 12-13 (1)	07-09 (1) 09-12 (2) 12-14 (3) 14-15 (1)	07-09 (1) 12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	18-19 (1) 19-21 (2) 21-00 (1) 19-22 (1)*

Central & South Asia	Nil	08-10 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-21 (1)	06-08 (1) 20-22 (1)
Southeast Asia	Nil	08-11 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 19-21 (1)	06-08 (1) 20-22 (1)
Far East	Nil	16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 05-07 (1)*
South Pacific & New Zealand	13-17 (1)	11-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	03-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-07 (2)* 07-08 (1)*
Australasia	16-18 (1)	09-12 (1) 15-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-18 (1) 18-20 (2) 20-22 (1)	03-05 (1) 05-07 (2) 07-09 (1) 05-08 (1)*
Caribbean, Central America & Northern Countries of South America	09-10 (1) 10-12 (2) 12-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-11 (3) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (2) 07-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	17-18 (1) 18-19 (2) 19-21 (3) 21-04 (4) 04-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)* 20-22 (2)* 22-02 (3)* 02-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-12 (1) 12-15 (2) 15-16 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (1)	13-14 (1) 14-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-03 (1) 05-06 (1) 06-08 (2) 08-09 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-03 (1)*
McMurdo Sound, Antarctica	Nil	07-10 (1) 16-18 (1)	07-09 (1) 17-18 (1) 18-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	00-05 (1)

\*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2) or better.

### December 1993 to February 1994 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	09-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-13 (1)	06-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-15 (1) 22-00 (1)	16-18 (1) 18-20 (2) 20-00 (1) 00-02 (2) 02-03 (1) 17-20 (1)* 20-01 (2)* 01-02 (1)*
Northern & Central Europe & European U S S R	Nil	07-08 (1) 08-10 (2) 10-12 (1)	07-08 (1) 08-11 (2) 11-13 (1) 23-01 (1)	17-19 (1) 19-22 (2) 22-01 (1) 19-00 (1)*
Eastern Mediterranean & Middle East	Nil	08-11 (1)	06-09 (1) 09-12 (2) 12-14 (1) 22-00 (1)	18-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
West & Central Africa	08-10 (1) 10-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-19 (1) 22-02 (1)	18-21 (1) 21-23 (2) 23-01 (1) 19-22 (1)*

East Africa	10-12 (1)	07-11 (1) 11-13 (2) 13-14 (1)	06-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	19-23 (1)
Southern Africa	08-09 (1) 09-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (2) 15-16 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-20 (1) 23-01 (1)	18-19 (1) 19-21 (2) 21-23 (1)
Central & South Asia	Nil	08-10 (1) 19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-22 (1)	06-08 (1) 19-21 (1)
Southeast Asia	Nil	08-11 (1) 17-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 16-17 (1) 17-19 (2) 19-20 (1)	04-07 (1)
Far East	Nil	07-09 (1) 16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-21 (1)	02-04 (1) 04-06 (2) 06-07 (1) 04-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-18 (1)	10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-20 (3) 20-21 (2) 21-22 (1) 02-04 (1)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 03-07 (1)*
Australasia	14-15 (1) 15-17 (2) 17-18 (1)	09-11 (1) 13-15 (1) 15-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-18 (1) 18-21 (2) 21-22 (1)	02-04 (1) 04-07 (2) 07-09 (1) 03-06 (1)*
Caribbean, Central America & Northern Countries of South America	08-10 (1) 10-14 (2) 14-16 (1)	07-08 (1) 08-09 (2) 09-13 (3) 13-16 (4) 16-17 (2) 17-19 (1)	06-07 (2) 07-11 (3) 11-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	18-20 (1) 20-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 19-21 (1)* 21-01 (2) 01-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-15 (2) 15-17 (1)	07-08 (1) 08-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	05-06 (1) 06-08 (2) 08-10 (1) 12-14 (1) 14-15 (2) 15-17 (3) 17-19 (4) 19-20 (2) 20-22 (1) 22-00 (2) 00-03 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-04 (1)*
McMurdo Sound, Antarctica	Nil	07-09 (1) 16-18 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	22-05 (1)

### December 1993 to February 1994 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	07-09 (1)	07-08 (1) 08-10 (2) 10-11 (1)	05-07 (1) 07-10 (2) 10-12 (1) 23-01 (1)	18-20 (1) 20-23 (2) 23-01 (1) 19-23 (1)*
Central & Northern Europe & European USSR	Nil	07-09 (1)	06-07 (1) 07-10 (2) 10-13 (1) 23-01 (1)	17-00 (1) 19-23 (1)*
Eastern Mediterranean & Middle East	Nil	07-09 (1)	06-07 (1) 07-09 (2) 09-11 (1) 21-23 (1)	18-21 (1)



West & Central Africa	09-12 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	06-10 (1) 10-13 (2) 13-16 (3) 16-18 (2) 18-19 (1)	18-22 (1)
East Africa	Nil	08-11 (1)	08-10 (1) 13-16 (1) 21-23 (1)	18-20 (1)
Southern Africa	08-11 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	07-11 (1) 11-13 (2) 13-16 (3) 16-18 (2) 18-19 (1) 00-02 (1)	18-20 (1)
Central & South Asia	Nil	09-11 (1) 17-19 (1)	08-10 (1) 17-19 (1) 19-20 (2) 20-21 (1)	05-07 (1) 18-20 (1)
Southeast Asia	15-18 (1)	09-11 (1) 15-16 (1) 16-18 (2) 18-19 (1)	07-09 (1) 09-11 (2) 11-16 (1) 16-19 (2) 19-20 (1)	03-08 (1)
Far East	15-17 (1)	14-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	08-10 (1) 13-14 (1) 14-15 (2) 15-18 (3) 18-19 (2) 19-21 (1)	00-01 (1) 01-03 (2) 03-06 (3) 06-08 (2) 08-10 (1) 02-08 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-17 (1)	09-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	07-08 (1) 08-10 (2) 10-15 (1) 15-16 (2) 16-18 (4) 17-18 (2) 18-19 (3) 19-20 (2) 20-22 (1) 03-05 (1)	22-00 (1) 00-03 (2) 03-06 (3) 06-07 (2) 07-08 (1) 00-03 (1)* 03-06 (2)* 06-07 (1)*
Australasia	13-15 (1) 15-17 (2) 17-18 (1)	08-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	01-03 (1) 03-06 (2) 06-08 (1) 01-03 (1)* 03-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-14 (2) 14-16 (1)	06-07 (1) 07-08 (2) 08-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (2) 07-09 (3) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	18-20 (1) 20-22 (2) 22-02 (3) 02-04 (2) 04-05 (1) 19-21 (1)* 21-01 (2)* 01-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	10-12 (1) 12-14 (2) 14-15 (1)	07-10 (1) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (2) 16-18 (1)	08-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-23 (1) 23-01 (2) 01-06 (1) 06-08 (2)	20-22 (1) 22-01 (2) 01-04 (1) 22-02 (1)*
McMurdo Sound, Antarctica	Nil	07-09 (1) 12-15 (1) 15-17 (2) 17-18 (1)	16-18 (1) 18-19 (2) 19-22 (3) 22-01 (2) 01-03 (1) 07-09 (1)	23-05 (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.

easternmost terminal of a DX path. Even the 160 meter band is expected to have its share of DX during December. Some openings are likely to take place when the transmission path is entirely in darkness, or when part of the path is in darkness

and the other in either twilight or dawn.

For optimum DX openings on 30, 40, 80, and 160 meters remember that signals peak just as the sun begins to rise at the easternmost terminal of a path.

Short-skip conditions during December favor the 40 and 80 meter bands for daytime openings less than 250 miles in length. Try 80 and 160 meters for this same distance at night. For openings between 250 and 750 miles, 40 meters should be optimum during the day and both 80 and 160 meters at night. Try 20 meters during the day for openings between 750 and 1300 miles; 30, 40, or 80 meters from sunset to midnight; and 80 meters from midnight through the sunrise period. Try 30 and 40 meters again for an hour or so after sunrise. For openings between 1300 miles and the maximum one-hop distance of 2300 miles, 17, 15, or 20 meters should be optimum during the day; 20, 30, and 40 meters from sundown to midnight; and 40 and 80 meters from midnight to sunrise. Ten and 12 meters should also provide some fairly good short-skip openings between 1300 and 2300 miles during the daylight period, particularly when conditions are High Normal or better.

This month's column contains DX Propagation Charts valid through mid-February 1994. Short-Skip Propagation Charts for December appeared in last month's column.

### VHF Ionospheric Openings

Quite a bit of meteor activity is expected during the month. *Geminids*, classified as a major meteor shower, should begin on December 12 and last for about three

days. Maximum intensity is expected on December 13, with a meteor rate of about one a minute. This should permit fairly good meteor-type openings on both 6 and 2 meters. A second, but somewhat less intense, shower period is expected later in the month. Called *Ursids*, it should last from December 22-23, peaking on the 22nd. A meteor rate of about 15 per hour is expected during this shower.

Trans-equatorial scatter or TE openings on 6 meters should fall off quite a bit during December. An occasional opening may still be possible, however, between the southern half of the USA and South America during the hours of 8 and 11 PM.

A secondary seasonal peak in sporadic-E propagation generally takes place during December (the major peak occurs during the summer months). This should result in a few fairly good short-skip-type openings on 6 meters between distances of approximately 800 and 1400 miles. Conditions should peak during the early evening hours, but some openings may occur at other times as well.

Some auroral-type VHF ionospheric openings are also likely to occur during December, and especially during periods when ionospheric conditions on the HF bands are Below Normal or Disturbed. Check the Last Minute Forecast at the beginning of this column for the days that are most likely to be in those categories during the month.

I would like to take this opportunity to extend my warmest wishes for the Holiday Season, and best wishes for good propagation during 1994, despite declining sunspot activity.

73, George, W3ASK

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# WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

BY FREDERICK O. MAIA, W5YI

## Letters From The Mailbag

**W**e have been saving up letters of general interest from readers of this column. This month let's cover a few. Possibly you have been wondering about some of these items also!

**Q.** I am new to ham radio. Just what is "packet radio," how does it work and what is it good for? . . . *B.C., Eugene, OR*

**A.** In a nutshell, packet radio allows personal computers to talk error-free to one another. The PCs are connected by toll-free radio waves rather than the phone lines. While "radio" is subject to all sorts of interference and other adverse atmospheric and ionospheric conditions, packet data is almost always received correctly. This is due to its self-correcting protocol. A radio modem (called a terminal node controller) basically converts a computer's digital signals into audio tones which are transmitted (and received) by a radio transceiver. You can do anything by packet radio that you can over the phone lines, and much more! A packet radio bulletin board system allows time shifting. The amateur packet-radio network protocol allows messages not intended for a specific station to be automatically stored and forwarded on down the line to the next packet station within radio range. This is called "digipeating" (for digital repeating) and is how messages get from one station to another. The message automatically stops at the station for which it is intended. There are even orbiting digipeaters aboard amateur satellites! The future of packet radio boggles the mind.

**Q.** I am confused by the FCC's conflict of interest rules which prohibit a volunteer examiner from teaching an amateur radio class. . . . *A.D., Fargo, ND*

Amateurs in the ham equipment business can't be VEs. Just what equipment is the FCC talking about? . . . *R.M., Cherry Hill, NJ*

I passed out study material to a ham class I taught in the past. Does this mean I can never be a VE again? . . . *M.L., Auburn, ME*

I am an accredited VE. Is it OK to distribute study guides to an amateur radio class as long as I do not participate in the examination of those specific students? . . . *T.G., Waterloo, IA*

*National Radio Examiner Coordinator,  
P.O. Box 565101, Dallas, TX 75356-5101  
(817-461-6443)*

I work for Radio Shack, but in the administrative office. Can I be a volunteer examiner? . . . *L.A., Utica, NY*

**A.** We seem to get a lot of questions on this subject—many from long-time amateurs. All of the above questions have been lumped together, since they all involve who can and cannot be a VE. There is indeed much controversy and confusion on the subject!

Section §97.515(b) of the FCC Rules covers conflicts of interest by volunteer examiners. As written, the law prohibits VEs from being involved in the manufacture or distribution of equipment used in connection with amateur station transmissions, and the preparation and distribution of amateur license preparation material.

According to the FCC, the terms in this rule are used in their broadest sense. For example, the word "distribute" is interpreted as passing out, giving away without cost, and selling publications at profit or no profit. Does giving someone a copy of the Part 97 Amateur Service Rules preclude them from being a VE? Apparently it does, since many examination questions are on regulations. This certainly seems odd to us.

The rule also states that amateurs who work in other departments of an amateur radio equipment firm or study material publisher/distributor may be VEs if they do not normally communicate with those who are statutorily prohibited from being an examiner. Thus, an office employee who is not normally part of the selling function could be an examiner.

There is no prohibition against a VE teaching an amateur radio class, providing the teacher does not distribute license preparation materials to his/her students. An examiner/instructor must have someone else (other than him/herself) pass out the study material. In both cases, the instructor may also act as the VE.

The conflict of interest rule does not apply "forever." When the offending situation changes, then the amateur is once again eligible to be a VE. For example, an instructor who passes out study material must not examine his or her students, but may do so when he/she does not pass out study materials.

What constitutes "equipment used in connection with amateur station transmissions" is an especially vague point. We checked four unabridged dictionar-

ies (*Funk & Wagnals, American Heritage, Random House and Webster's*) for the meaning of "equipment." We found that it includes ". . . any apparatus, paraphernalia, article or implement used in an operation or activity." That is broad! Certainly a personal computer or any amateur accessory would be considered as ham "equipment." But what about a pencil?

Perhaps the best advice is not to ask and to use your best judgment. We follow Commission proceedings very closely, and there never has been a citation issued for a violation of the conflict of interest rule.

Our personal opinion is that §97.515(b) needs to be revisited by the Commission. We believe the rule should only preclude amateurs from being VEs if they are in the amateur radio equipment or license preparation business . . . with "business" being defined as "commercial" or for "profit" or personal gain. To us, a VE who "Elmer's" a class of newcomers and provides them with a study manual certainly does not seem to be much of a threat to the hobby. Why does it make it all right if an outsider provides the same study material to the same instructor's/examiner's students?

**Q.** When are the various question pools changed and how are the questions determined? . . . *C.H., Alton, IL*

**A.** There are five question pools in the Amateur Radio Service, each consisting of nine topics. Each question pool is revised on a four-year cycle. The Novice and Technician question pools are revised together, since they are the sole requirement for the entry-level Codeless Technician license—the most popular. A new question pool is released into the public domain each December, with the questions being used in examinations the following July. Here is the schedule.

Element	Class	Exams Changed
Element 2	Novice	July 1, 1993
Element 3(A)	Technician	July 1, 1993
Element 3(B)	General	July 1, 1994
Element 4(A)	Advanced	July 1, 1995
Element 4(B)	Extra	July 1, 1996

The VECS (volunteer-examiner coordinators) Question Pool Committee revises all of the questions with the assistance of the public. The amateur community is asked to submit their views on revisions to the syllabus (outline) and the actual



questions. It takes more than a year to go through the question pool revision process for each license class.

By the way, the FCC has now adopted the question pool system for all of its Commercial Radio Operator licenses. The General Radiotelephone Operator License (GROL) now requires written multiple-choice examinations on the same nine sub-elements that are required in the Amateur Service. In fact, more than half the questions in the 900-question GAOL pool are exactly the same as in the Amateur Advanced and Extra Class exams!

The Commission turned over the testing of all Commercial Radio Operators to the private sector last September. So far, only the Element 1 (Radio law) and Element 3 (Electronic fundamentals and techniques) question pools have been released by the FCC. The Element 5 and 6 (Basic and Advanced Radiotelegraph) question pools are scheduled for release this month (December). Shortly thereafter the First, Second, and Third Class Radiotelegraph examinations will be available in the private sector.

The question pools covering the Radar Endorsement and new Global Maritime Distress and Safety System (GMDSS) will follow early next year. GMDSS is the satellite-based alerting system due to replace manual telegraphy in the Maritime Service. There will be two GMDSS licenses, the GMDSS Maintainer and GMDSS Operator.

The Second Class Radiotelegraph Operator Certificate should prove very popular among Amateur Extra Class licensees, since they will automatically receive credit for the Morse code portion of the license without examination! For more information on Commercial Radio Operator testing, write National Radio Examiners, P.O. Box 565206, Dallas, TX 75356 (817-461-6443). (National Radio Examiners is a division of The W5YI Group, Inc.)

**Q.** I have heard that amateurs will soon be able to select their own call signs. When will this happen? . . . S.A., Canton, OH

**A.** At the insistence (and persistence) of amateurs, this past year Congress enacted two pieces of legislation which looked toward special station call signs for amateur radio operators. Without congressional approval, the FCC is powerless to issue special call signs, since the Rules require strict systematic issuance of amateur calls. One bill authorizes call signs for Club and Military Recreation stations to be issued by private sector Call Sign Administrators (CA) at no cost to the club. A newer (and unexpected) bill, however, gives the FCC authority to charge user fees in connection with a custom or "vanity" call sign program which would be available to any amateur radio operator willing to pay for it.

According to the bill, the special call sign will cost the amateur station \$7.00 annually. While the club call sign was to be assigned in sequential order from

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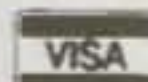


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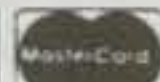
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Date	Extra	Advanced	General	Technician	Novice	Total
March 1, 1991	54,246	105,628	120,241	129,386	94,859	504,360
Sept. 1, 1993	63,977	111,890	126,666	217,049	101,017	620,599

Table I—As can be seen here, the largest growth in amateur radio licensees between March 1991 and September 1993 has been in the Technician class.

blocks issued to each CA, the "vanity" callsign may be selected by the amateur radio operator from any available unassigned callsign. The newer legislation was part of the Clinton Budget Deficit Reduction Plan signed into law last August. Since most amateurs would like to have distinctive call letters, it seems assured that "vanity" callsign will be by far the most popular of the two programs.

As a result, it now appears that the FCC may not implement the Club and Military Recreation Call Sign Program at all. Instead everyone—clubs included—will be able to select any available callsign as provided by the broader "vanity" callsign program. We also hear rumors that Congress may change the \$7.00 annual fee to a lump sum amount for a specified number of years that the special call letters are to remain in force. The FCC's computer at their Gettysburg, Pennsylvania licensing facility has already been programmed to issue special callsigns.

Another new wrinkle to be added shortly is electronic application filing. VETS will be able to file upgraded FCC Form 610 license applications over the phone lines starting next year. This will greatly reduce the time between license examinations and license receipt. Stay tuned!

**Q.** All of the written multiple-choice amateur license examinations are standardized. Why not the telegraphy exams? . . . T.R., Pittsfield, MA

**A.** The Morse code tests are not standardized, because they are not required to be by the Part 97 Amateur Service Rules. Section §97.503(a) requires that "A telegraphy examination must be sufficient to prove that the examinee has the ability to send correctly by hand and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed, using all letters of the alphabet, numerals 0-9, period, comma, question mark, slant mark and prosigns AR, BT, and SK." The prescribed speeds are 5, 13, and 20 words per minute (wpm). Section §97.509(d) says that "Passing a telegraphy receiving examination is adequate proof of an examinee's ability to both send and receive telegraphy." That means that the sending test is not required, although it may be if the VE team believes it important. Few do.

The FCC leaves it to the VEC System to determine the appropriate code exam answer format. At the 1993 VEC Conference the VE coordinators agreed that only three answer formats should be used by VEs in telegraphy examinations. These are: (1) one minute solid copy, (2) answer

seven out of ten questions, and (3) multiple-choice format with a minimum of four possible answers.

As far as the transmission speed goes, every VEC transmits their 5 and 13 wpm code tests using a faster character speed with longer spaces in between the characters. This exaggerated transmission is known as the Farnsworth method of Morse code spacing.

It is a matter of opinion as to which Farnsworth spacing is best. Many instructors believe the faster the character speed, the quicker an applicant is able to attain higher code speed proficiency. Most VECs and their volunteer examiners prepare their 5 and 13 wpm telegraphy code tapes at a character speed of 15 to 18 wpm. The overall yield is still 5 and 13 wpm, however. The 20 wpm code test is usually sent at 20 without longer spacing between the characters.

The FCC (in a June 22, 1982 Public Notice) recommends an audio frequency on code tests of between 700 and 1000 Hertz. You might want to check with your local VE team to determine what they use, especially if you have a computer program which allows you to duplicate their Farnsworth spacing and tone. This gives computer-aided instruction a big advantage over cassette tape learning.

**Q.** What has happened to amateur radio growth since the no-code Technician went into effect three years ago? . . . D.W., Norfolk, NE

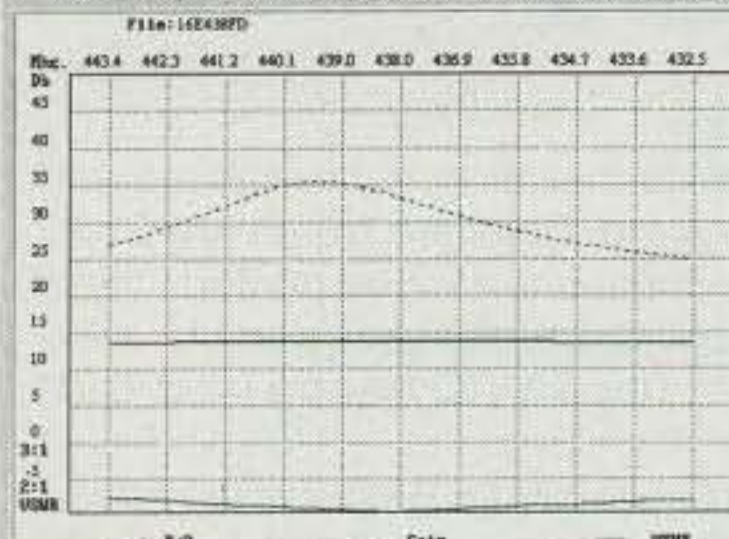
**A.** The Codeless Technician Class, adopted on February 14, 1991, has been unbelievably successful! On March 1, 1991 the Amateur Service stood at 504,360 licensees. This has expanded to 620,599 as of September 1, 1993—a gain of slightly more than 23% overall (see Table I). This is a gain of 4008 a month. What is interesting, however, is where that gain is coming from. There are now 217,049 Technician Class licensees versus 129,386 on March 1, 1991—a whopping gain of 68%! More than 3000 of the 4000 monthly gain is at the Technician level! By contrast, since 1991 the Novice Class has increased by a paltry total of 6.5%, General Class by 5.3%, Advanced Class by 5.9%, and Amateur Extra Class by 17.9%. Thirty-five percent of all amateurs are now Technicians. On March 1, 1991 it was 25%. The Technician Class is growing at a rate of 28% annually, Extra class at 7.5%, and all other license classes at around 2.5%.

That's it for this month. Happy Holidays to all!

73, Fred, W5YI



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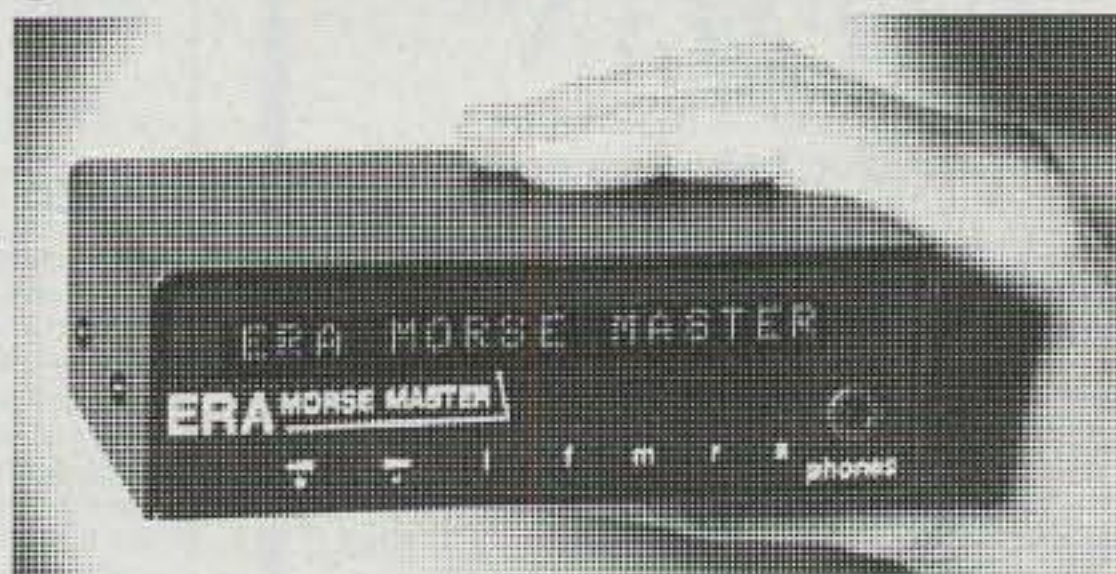
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MMDDYY	DATE/UTC	Award Type	Mode	168	08	40	20	29	17	35	12	10	6
02/24/93	Call	HQ	My	Freq	Mode	Pwr	QSL	Manager					
	02:24:59	HJ0VQJ	598	598	7.0030	CW	750	HJ0VQJ					

Name: [ ] Q [ ] Sent [ ] Recv [ ] Insert [ ] Change [ ] Delete [ ] Clear [ ]

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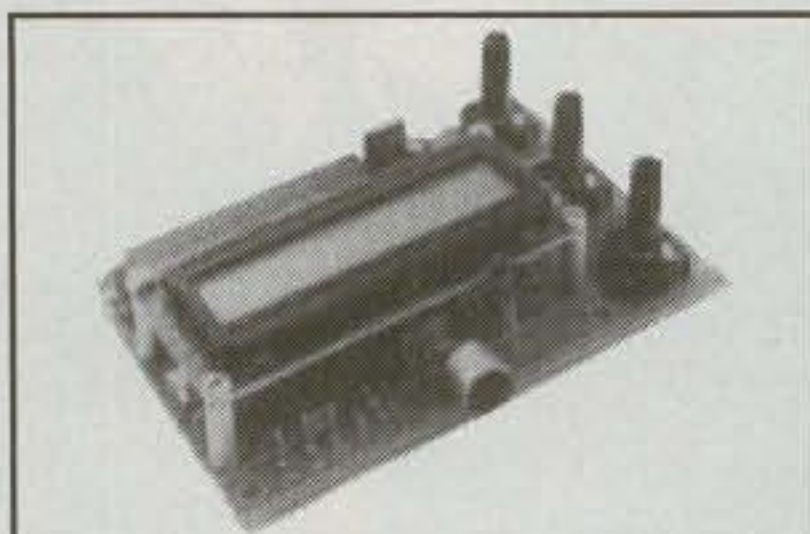


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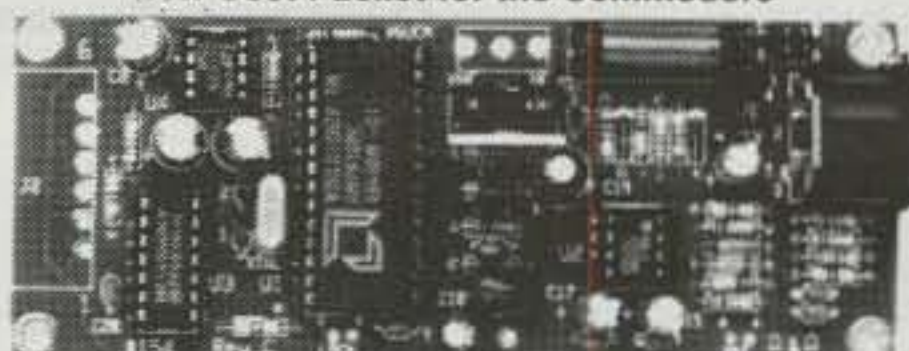
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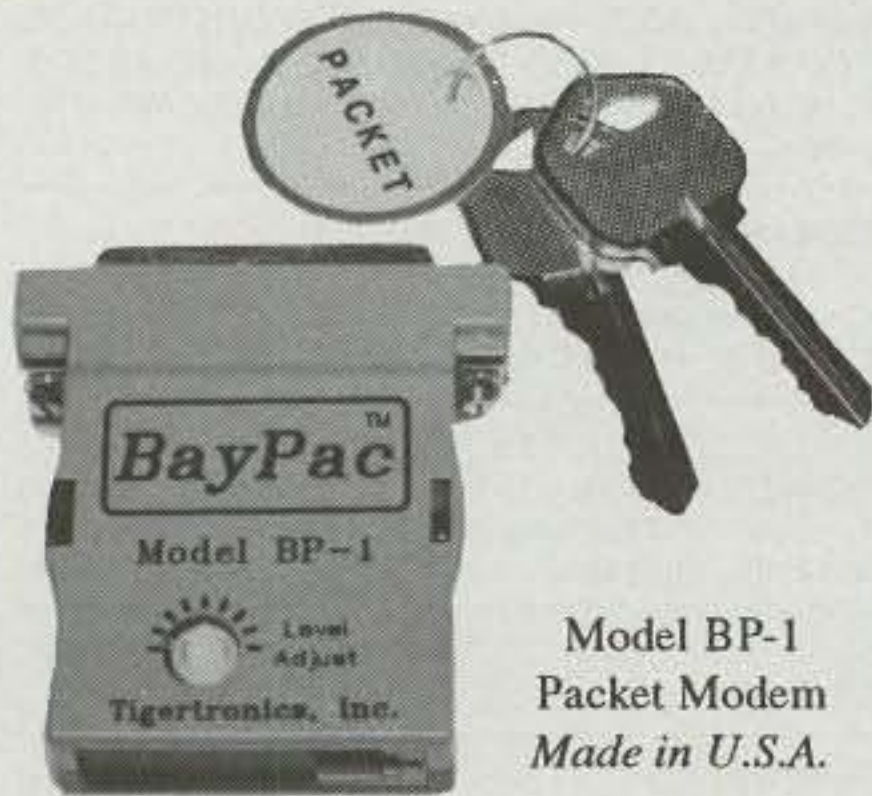
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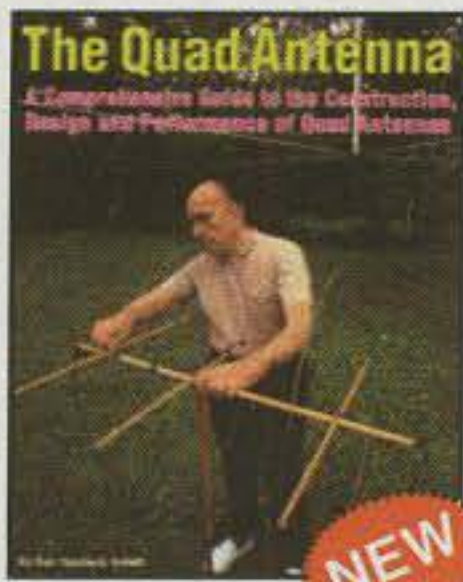
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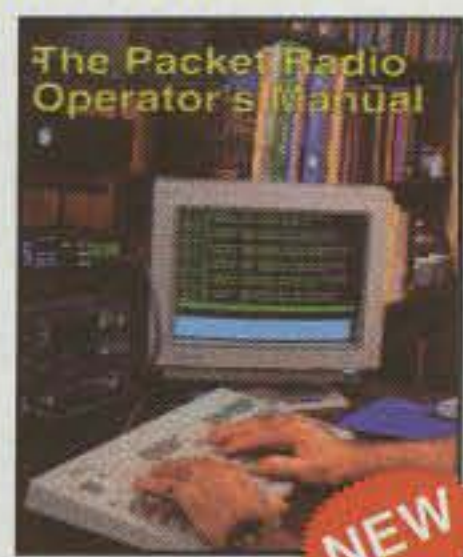
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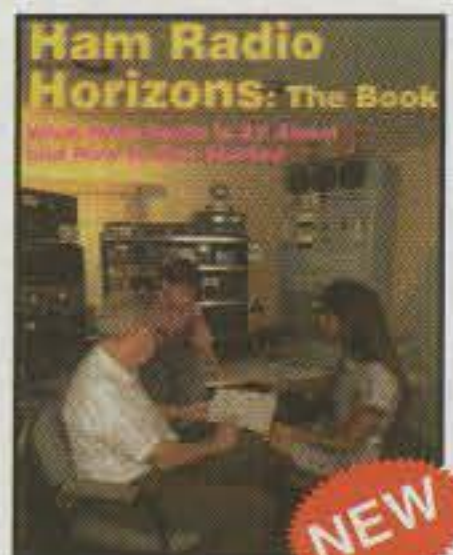
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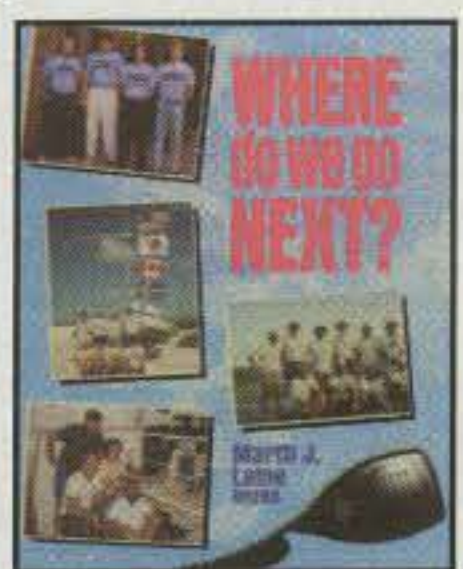
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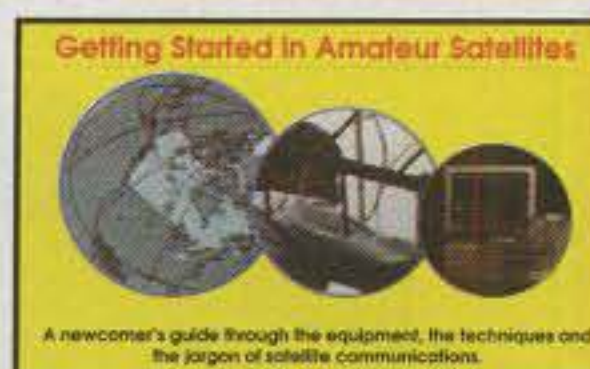


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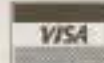
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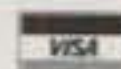
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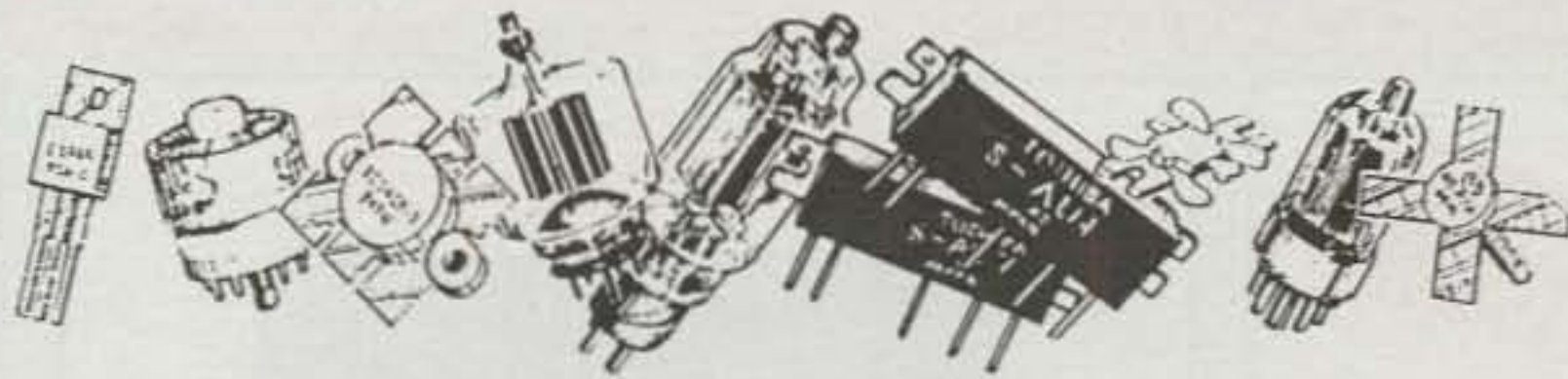


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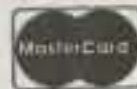
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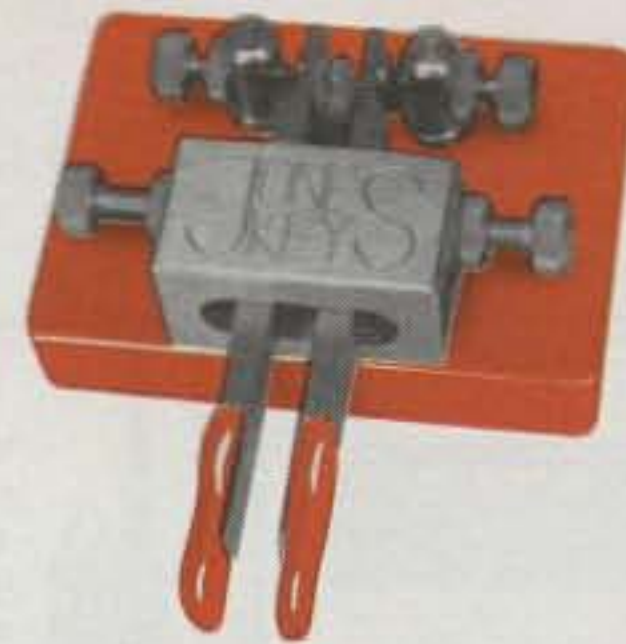
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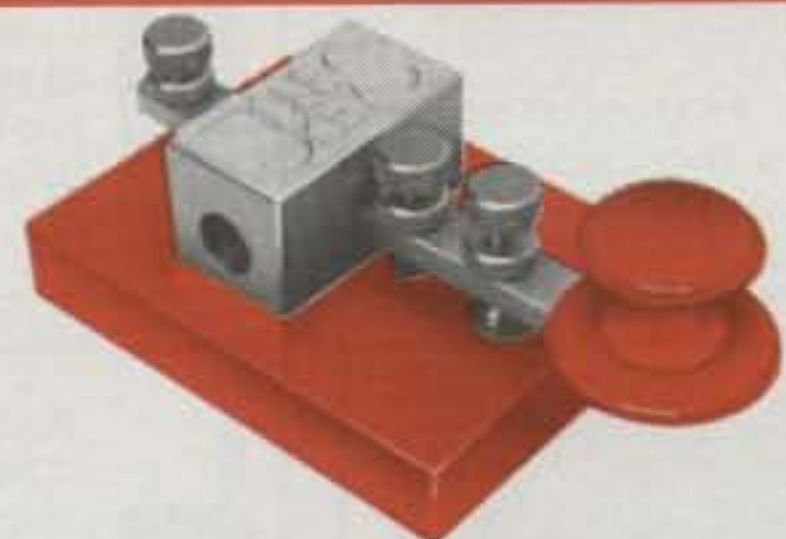
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 Military Spec'd 2 Meter **\$15.00 OFF**

**FT-890AT**  
  
 Dual VFO's 100W, HF **\$35.00 OFF**

**IC-229H**  
  
 2 Meter Mobile With 50 Watts And 20 Memories

**IC-2GAT**  
  
 2 Meter Handheld With 7 Watts Output **SALE \$299.95**

**IC-Δ1A**  
  
 2M,440MHz And 1200 MHz In One Compact Handheld Receive All 3 Bands Simultaneously.

**FT-2200**  
  
 2 Meter, 50W Mobile **\$15.00 OFF**

**FT-840**  
  
 New Compact HF **\$35.00 OFF**

**IC-3230H**  
  
 2m/440MHz Mobile With 45W on 2/M and 35W On 440MHz

**IC-R1**  
  
 Compact Handheld Receiver Covers 100kHz - 1300MHz AM,FM, Wide FM, 100 Memories

**IC-R7100A**  
  
 All Mode Receiver. 25 To 2000 MHz, 900 Memories Analog S-Meter

**FT-530**  
  
 New 2 Meter 440MHz Handheld **\$25.00 OFF**

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1278B .....	\$259
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1796 .....	\$159
209 .....	\$ 94
250X .....	\$ 27
284, 5, 6, 7 .....	\$ 22
249 .....	\$169
9015, 20, 40 .....	\$149
949E .....	\$129
986 .....	\$239
989C .....	\$288

**Large Stock, Call For Other Items**

**ALINCO**  
 ELECTRONICS INC.  
  
**DJ-580T**  
 2 Meter/440MHz Handheld **\$20.00 OFF**

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 New Digital Controller Featuring PACTOR Along With CW, RTTY, ASCII, AMTOR and Packet

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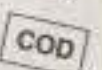
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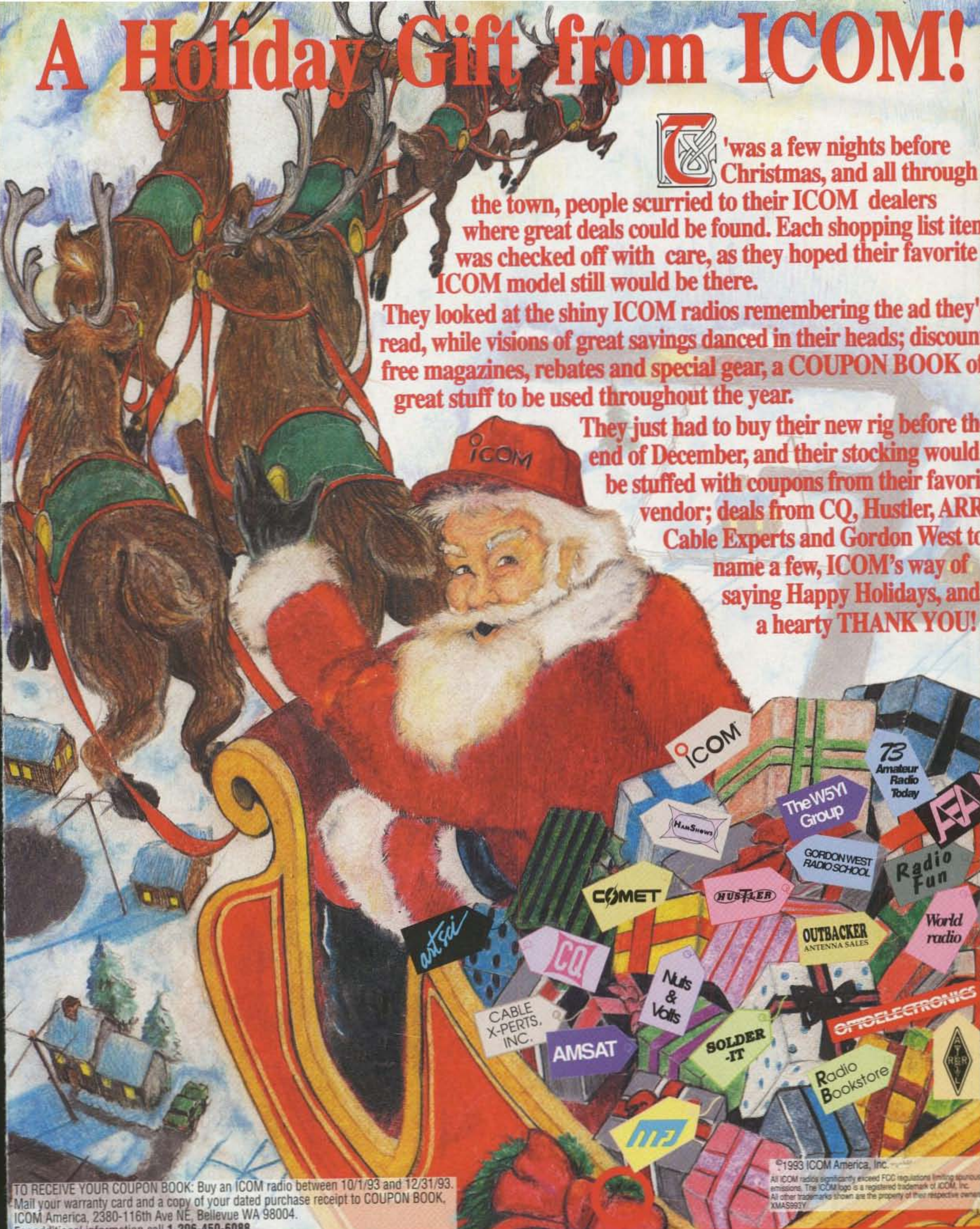
# A Holiday Gift from ICOM!



'was a few nights before Christmas, and all through the town, people scurried to their ICOM dealers where great deals could be found. Each shopping list item was checked off with care, as they hoped their favorite ICOM model still would be there.

They looked at the shiny ICOM radios remembering the ad they'd read, while visions of great savings danced in their heads; discounts, free magazines, rebates and special gear, a COUPON BOOK of great stuff to be used throughout the year.

They just had to buy their new rig before the end of December, and their stocking would be stuffed with coupons from their favorite vendor; deals from CQ, Hustler, ARRL, Cable Experts and Gordon West to name a few, ICOM's way of saying Happy Holidays, and a hearty THANK YOU!



TO RECEIVE YOUR COUPON BOOK: Buy an ICOM radio between 10/1/93 and 12/31/93. Mail your warranty card and a copy of your dated purchase receipt to COUPON BOOK, ICOM America, 2380-116th Ave NE, Bellevue WA 98004. For additional information call 1-206-450-6088

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CIRCLE 164 ON READER SERVICE CARD

*Experience the Quality*®

# ICOM®



## FT-11R/41R 2m/70cm Handhelds

- **Frequency Coverage:**  
Wide Receiver Coverage:  
FT-11: 110-180 MHz RX,  
144-148 MHz TX  
FT-41: 430-450 MHz RX/TX
- Selectable Alpha Numeric Display
- New Compact Battery Design  
4.8V produces 1.5 Watts  
9.6V produces Full 5 Watts
- 150 Memory Channels  
(75 when Alpha Numeric)
- AM "Aircraft" Receive  
(110-136 MHz)
- Small Compact Size w/ Easy  
Operation (measures only:  
4"H x 2 1/4"W x 1"D)
- Rx/Tx Battery Savers
- High-efficiency MOS FET Power  
Module
- Large Back-Lit Keypad and  
Display
- Up/Down Volume/Squelch  
Controls
- Built-in DTMF Paging/Coded  
Squelch
- Automatic Power Off (APO)
- **Accessories:**  
FNB-31 4.8V, 600 mAh Battery  
FNB-33 4.8V, 1200 mAh Battery  
FNB-38 9.6V, 600 mAh Battery  
FBA-14 6 AA Size Battery Case  
FTS-26 CTCSS Decode Unit  
NC-50 Dual Slot 1-Hour Desk  
Charger  
CA-10 Charge Adapter  
(required w/ NC-50)  
Contact your Dealer  
for full details.

"Look, alphanumeric  
display and a 4.8V  
battery. Terrific!"

"Small and thin –  
with a full sized keypad!  
How'd they do that?"

"Yaesu did it again!"



### NEW Alphanumeric Display

First time for Yaesu HT  
Full function LCD  
combines letters and  
numbers.

**NEW Up/Down  
Thumb Control**  
with Volume and  
Squelch Bar Graph.  
No other radio has  
this. Back lit, too!

**NEW Compact  
Battery Design**  
4.8V gets you  
1.5 Watts. A first  
for amateur radio.

# Get a grip on this!

World's smallest size HT with a full sized keypad  
Measures only: 4"H x 2 1/4"W x 1"D

"Small" is relative, isn't it? It could mean size – which in this case it does. And, it could mean "reduced", which it doesn't! Nothing missing from the hot new FT-11R HT from Yaesu except bulk! You're going to wonder just how all the features of this full-function radio fit in. Until you remember Yaesu pioneered 2-way radio micro technology.

To see what this really means to you,

check out all the new features. Like the alphanumeric display. This Yaesu HT first, lets you tag your favorite frequency by name, call sign or number. Or, the new "voltage stingy" battery. It's an industry first for amateur radio. Smaller and compact, the 4.8V battery gives you 1.5 watts on TX. And, if that's not enough, there's an optional drop in, dash mount battery charger.

You see it's not a small time performer. Just small sized. The FT-11R. Another small example of Yaesu superiority. See your dealer today!

**YAESU**  
*Performance without compromise.<sup>SM</sup>*



"Built-in VOX? Right!"



"Dual Decode. Now that's a first!"

"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.<sup>SM</sup>



# YAESU

## HOLIDAY SPECIALS

**\$100.00 off**



FT-1000D/FT-1000



Plus  
Special Bonus  
Limited Edition  
Embroidered  
Jacket  
(\$169.00 Value)

GOOD  
OCT. 15  
1993  
THROUGH  
JAN. 10  
1994



FT-990/FT-990DC

**\$50.00 off**

**\$35.00 off**



FT-890AT/FT-890



FT-767GX,  
FT-736R



FT-840



FT-747GX

FT-5100



FT-5200/6200



FT-530 FT-470



G-2700SDX  
G-1000SDX  
G-800SDX

**\$25.00 off**

**\$15.00 off**

FT-2400H



FT-416/816

FT-2200



FT-411E

CUSTOMER: Surrender this coupon at time of purchase to your authorized Yaesu dealer for discount. Limit one coupon per purchase. Coupon is non-transferable and can be only used for products as advertised in this ad and for the discounts as stated. Offers only good at authorized U.S. and Canadian Yaesu dealers. DEALER: Send this coupon along with a copy of sales receipt to YAESU U.S.A., Sales Dept., 17210 Edwards Rd., Cerritos, CA 90701.

**CHECK BOX**

- \$100 OFF FT-1000D/FT-1000  
FREE also with purchase of FT-1000D or FT-1000, Limited Edition Embroidered Yaesu Jacket. Dealer will provide redemption coupon for jacket.
- \$ 50 OFF FT-990DC/FT-990
- \$ 35 OFF FT-890AT/FT-890, FT-840, FT-767GX, FT-736R, FT-747GX
- \$ 25 OFF FT-5100, FT-5200/6200, FT-530, FT-470, G-2700SDX, G-1000SDX, G-800SDX
- \$ 15 OFF FT-2400H, FT-2200, FT-416/816, FT-411E

MODEL PURCHASED \_\_\_\_\_ SERIAL NUMBER \_\_\_\_\_

DATE OF PURCHASE: \_\_\_\_\_

YOUR NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

PHONE: \_\_\_\_\_ CALL SIGN: \_\_\_\_\_

DEALER NAME/STATE: \_\_\_\_\_

Coupon offer valid in USA and Canada only. Offer void where prohibited by law. Coupon has no cash value. Limit one coupon per purchase. Not valid with any other Yaesu offers or discounts. Offers not applicable to purchases made prior to October 15, 1993 or after January 10, 1994.

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