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Amateur Radio

CQ

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APRIL 1995

1945 CQ 1995

50th Anniversary

In This Issue

- A DX Antenna for 160, 80, 40 and 30 Meters
- Lew McCoy, W1ICP, Takes a Look at Antenna Efficiency
- Secrets of a Famous DXer Revealed
- Build Your Own Gin Pole for $12
- CQ Reviews The Antenna Mart AMQ-2-5 Two-Element 5-Band Quad

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On the cover: The Antenna Farm of Gary Dixon, K4MQG.

THE RADIO AMATEUR'S JOURNAL

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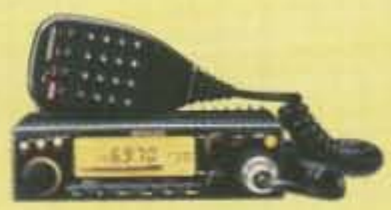

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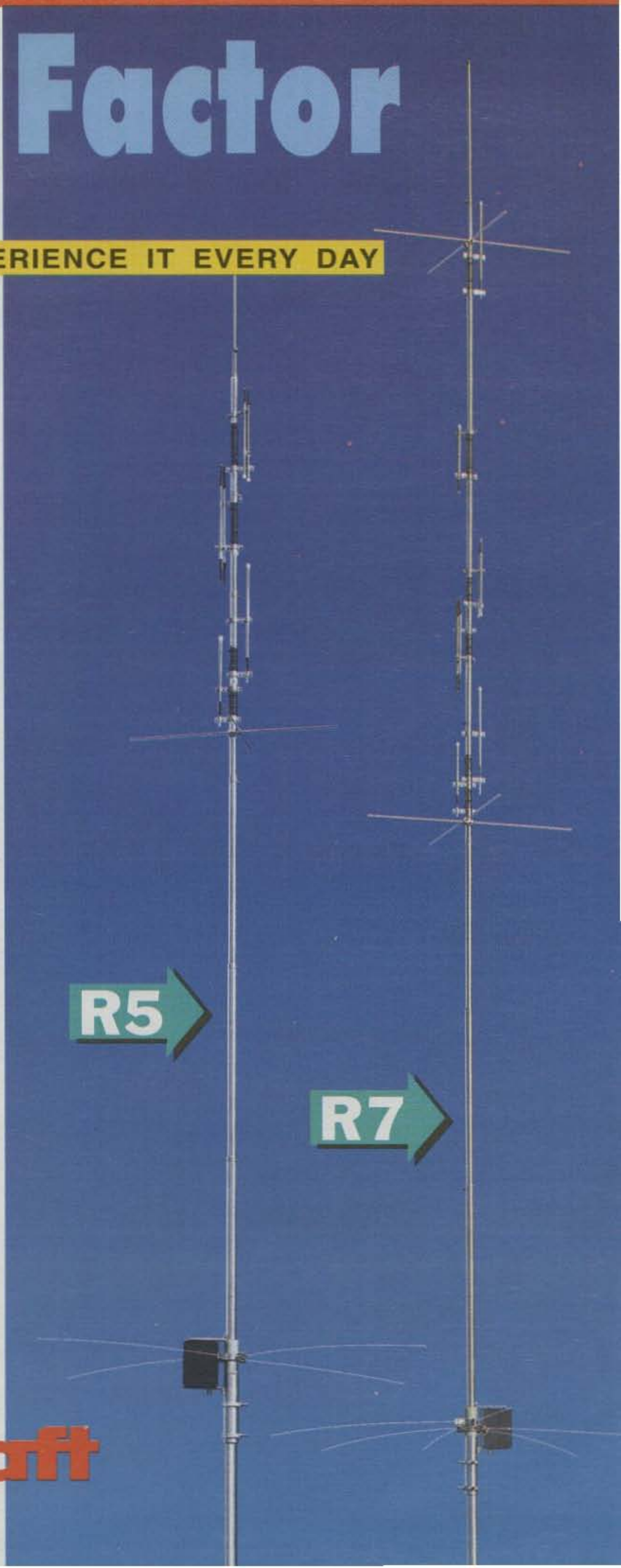
Frequency, MHz	28, 24, 21, 18, 14	28, 24, 21, 18, 14, 10, 7
Gain, dBi	3	3
Electrical Wavelength	Halfwave	Halfwave
SWR 2:1 Bandwidth	10 m-2 MHz	10 m-2 MHz
	12 m-100 KHz	12 m-100 KHz
	15 m-450 KHz	15 m-450 KHz
	17 m-100 KHz	17 m-100 KHz
	20 m-350 KHz	20 m-150 KHz
		30 m-50 KHz
		40 m-75 KHz
Power Rating, Watts PEP	1800	1800
Radiation Angle, Degrees	16	16
Frequency Selection	Automatic	Automatic
Horizontal Rad. Pattern Deg.	360	360
Height, ft (m)	17 (5.2)	22.5 (6.9)
Mast Size Range, in	1.5-1.75	1.5-1.75
(cm)	(3.8-4.4)	(3.8-4.4)
Wind Load, ft2 (m^2)	1.4 (.13)	2.25 (.21)
Weight, lb (kg)	8.7 (4)	12.3 (5.6)
49" Counterpoise Radials (Supplied)	4	7



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CQ The Radio Amateur's Journal

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ON THE COVER: The 2-element 80-meter beam of Gary Dixon, K4MQG, dominates the sky at his impressive Fort Mill, SC QTH. (Photo by Larry Mulvehill, WB2ZPI.)

FEATURES

DEPARTMENTS

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ZERO BIAS

EDITORIAL

This is the fourth month of the Gregorian calendar and mid-spring, the season of things fresh and new. What could possibly be fresher and newer than some really great stuff secured at really great prices at this year's Dayton Hamvention? If you're not excited over the prospect of being part of this annual amateur radio bacchanal, then shame on you. Even dyed-in-the-wool curmudgeons look forward to this event to find new subtle nuances to rail against as well as unique complaints of personal affrontory. Whatever you may want, from fun to misery, is always there. It just depends on what you're looking for and what turns you on.

There is a move afoot to change the date in 1996 from the end of April to mid-May so that there will be the chance for better, or at least more predictable, weather. They (the powers that be) will be testing a new date for a couple of years to check this hypothesis. This probably will mean that the big DX event in Visalia, California will also move its date to coincide. The 1996 Dayton date is the same as that of the annual Rochester, New York bash, so that too will have to move.

This year, though, it's business as usual with 20 to 30 thousand amateurs from around the world gathering in Dayton, Ohio on the last weekend of April. It's a certainty that a small percentage of attendees will be unhappy about some aspect of the show or some privation they suffer. The vast majority of us, though, will be happy to be there, trying to take in as much as possible in three days, as well as staying one step ahead of the weather. Admittedly, the old Dayton hands will bring some cold weather gear as well as a raincoat—just in case. Historically, though, the weather has been okay for most of the Hamventions, and if anything, it's been more cold than wet. Generally it's been perfect antenna weather.

Most of us have had the insight to realize that alongside some really impressive technological breakthroughs and outstanding public service, amateur radio fosters some equally big and just as impressive egos. For close to 30,000 amateurs, Dayton's operating vocabulary revolves around BIG and MORE, two very important words. While to some the meaning of BIG and MORE is obvious in relation to world-class DX stations and super contest operations, the meaning is semantically reversed with QRPers who chide each other about who can do MORE with less.

Dayton is the only place in the amateur universe where you can get in one room over 1,000 amateurs equally enthralled by the story of a bunch of guys chartering a decrepit Transylvanian trawler, loading it up with gear, and setting off on stormy seas for Mungo Island. Mungo Island, we find out, has an average temperature of –123°C in summer and approaches absolute Kelvin in winter. The operators are forced to endure unspeakable hardships and spend countless hours partially submerged in semi-volcanic pools of penguin guano just to keep warm so that we, the great unworthy, can get a postcard-sized piece of cardboard for less than a 10 second involvement. We cheer, applaud, and are awe struck at this monumental adventure (and secretly wonder if they brought the cards with them). It's great and wonderful, and I wouldn't want it any other way. By the way, no matter how remote the island or scrimpet of rock is, there'll always be two or three guys in the back sitting smugly and saying, "I've got that. Got it on all bands and all modes in '51 when whatsis name went there."

All of our heroes are there co-mingled with the ghosts of yesterday's heroes. There's nothing more exciting or enervating in amateur radio than to be part of this yearly experience. There's enough ego floating in the air to light up the Empire State Building. There's enough RF in the air to power a modern aircraft carrier, and then some. There's enough stuff there to make every possible amateur radio dream come true. There's every opportunity to listen and learn from our heroes and resident experts in just about all aspects of amateur radio, all at the same place. What's not to like?

The true Dayton devotee can burn off several hundred calories (probably the equivalent of one hotdog bun over the weekend) just walking briskly through the fleamarket. It's sort of hard to walk briskly through any of the commercial exhibit areas, so this activity cannot be construed as exercise. There is a slight upper-body benefit in lifting various things in order to get a closer look, but this effect is probably offset by the chance of lower back injury in moving some of the clunkers in the fleamarket. Some of the stuff there defies description, no matter how closely you look at it or move it around.

Dayton is way beyond the concept of fun. It's a given that you'll have fun there even if your idea of fun is misery. If you allow it, there'll be something there to tick you off. If there were some way to bottle, package, or market the overwhelming feeling of the total experience, there would be no trouble in attracting countless people to amateur radio. It's energy, excitement, and anticipation personified. It's the biggest and the best of literally everything connected with our hobby. It's the friendships, new and old, and the faces which can now be associated with callsigns, giving new meaning to that next contact. It is the immediacy of the people, sound, and movement that make amateur radio, and there's more of each at Dayton.

The immediacy of people, sound, and movement is the basis of just about every hobby and activity you might want to undertake. Hamfests both big and small are wonderful adjuncts to club meetings and other social gatherings. Simply put, it's a way of seeing what's out there to experience and learn about. It's a way of picking up the excitement of something new rather than just maintaining a narrow perspective based on limited exposure. We all know amateurs who are firmly convinced that they "know" what amateur radio is and should be. Take all the licensed amateurs in the world and add 10% to the total number and you'll still have somewhat less than the total number of definitions as to what the "real" amateur radio is and what it "should" be.

One thing is certain, though, and that is that Dayton and other hamfests point the way towards the future of amateur radio. We may kick and scream over change and the way things are going, but everything in life progresses and changes. There are very few constants in amateur radio. Technology has not kept pace with the hobby; it has led the hobby in wonderful new avenues of expression. What we do today is outwardly similar to so-called traditional amateur radio, but what the average amateur can achieve today with "simple" equipment was not possible for most of us several years ago. The only thing that stays the same is the dream that enticed all of us.

Whether we fantasize over the privations of Mungo Island or conjur up wistful thoughts of a 6-element 80 meter beam at 200 feet, the dream goes on. It goes on with a miniscule HT or a 9600 baud packet setup and everything in between. How we do things may change, and where in the spectrum we do them can also change, but most of us still see ourselves "doing" something down the line. It's the Daytons of our hobby that point the way. Some of the brightest and most far-seeing amateurs share their expertise and visions for the future, and manufacturers rush to keep pace. The only variable in this is us as individuals and how many of us want to get locked in the past and eventually swept away or overrun by things we can't fathom.

You owe it to your amateur radio psyche to attend at least one Dayton. It really is a quick boost to your enthusiasm (and mine) and a definite spark to your imagination. I am old enough to realize that I'll never have the 6-element 80 meter beam at 200 feet nor is it very likely that I'll find myself on Mungo Island cutting through the pile-ups. It's enough to know that it's all there and that someone has done it and I can enjoy and get caught up in their excitement and accomplishment. I can also broaden and raise my horizons while feeding my imagination. It's still a lot of fun after 42 years.

73, Alan, K2EEK

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ANNOUNCEMENTS

•The Southwest Ohio Chapter of the Quarter Century Wireless Association will hold its 1995 annual banquet on Friday, April 28, the first evening of the Dayton Hamvention, at Alex's Continental Restaurant. C.O.D. bar at 7:00, banquet at 7:30. Reservation deadline April 26. QCWA membership is not a requirement for attendance. For tickets ($15 each) make check payable to Robert L. Dingle, Treas. Chapter 9, and mail to 1117 Big Hill Rd., Kettering, OH 45429-1201.

•Bicycle Mobile Hams of America, Dayton Forum - BMHA will present its sixth annual forum at the Dayton Hamvention, April 28–30. Forum coordinators are Mike Nickolaus, NFØN, and Bob Pulhuj, KE8ZJ. For details see the Hamvention program booklet, or write to BMHA, P.O. Box 4009-Y, Boulder, CO 80306.

• The following Special Events are slated for April:

1-Land, from Plymouth, Connecticut; to celebrate the bicentennial of the Town of Plymouth; February 4 and June 4, 1995; general portions of 160, 80, 40, 20, 15, and 10 meters. QSL with an SASE to K1EM, P.O. Box 12, Pequabuck, CT 06781. A shipping container larger enough to hold the 9.25 × 13.75 inch certificate or a #10 business envelope for a folded certificate must be included along with sufficient return postage.

W2CWW, from 33rd Annual Invitational Boy Scout Camporee, West Point Military Academy, Lake Fredricks Site, West Point, New York; Staten Island ARA; 2200Z April 28 to 1700Z April 30; CW 7.125, 3.7; SSB 14.23, 7.227, 3.855. Send QSL and SASE to W2CWW, P.O. Box 140495, Staten Island, NY 10314.

W2CVT, from the 50th anniversary of death of Franklin D. Roosevelt, Hyde Park, New York; Poughkeepsie ARC; 1300Z April 12 to0100Z April 13 and 1300–2100Z April 15; on or near 7.045, 7.175, 14.045, 14.245, 21.045, 21.310, 146.550, and the YCCC Packet Cluster. For certificate and QSL send SASE to Herbert Sweet, 6 Covey Road, Hyde Park, NY 12538.

NJ3T, from 200th anniversary of the founding of Somerset County, Sommerset County Courthouse, Somerset, Pennsylvania; The Somerset County ARC; 10 AM to 5 PM April 17; on the lower 50 kHz of the General phone bands on 40 meters from 10 AM to 1 PM and 20 meters from 1 PM to 5 PM; also 14.105 packet. For a special QSL, send QSL and SASE to James Crowley, NJ3T, RD. 5, Somerset, PA 15501.

WB4REE, from celebration of the 130th anniversary of the last meeting of the Confederate Cabinet, Ft. Mill, South Carolina; 1500Z to 2359Z April 22; General portion of 40 and 20 meters and Novice portion of 10 meters; possibly other bands. For certificate send QSL and 9 × 12 SASE (for flat shipment) or #10 SASE (folded) to Dick Sine, KB3WN, 100 Poplar St., Fort Mill, SC 29715.

KK4VN, to commemorate the ending of the US Civil War in 1865, from Appomattox Courthouse National Historical Park, Appomattox, Virginia; the Southside ARC; 1400Z April 9 to 1400Z April 10; SSB in the General portion of 40 and 20 meters. For QSL send #10 SASE to KK4VN, Route 3, Box 221, Cumberland, VA 23040-9229.

W4UCJ, from 74th annual Rose Festival Thomasville, Georgia; Thomasville ARC; 1700–2300Z April 28 and 1100–2000Z April 29; lower portion of General 80, 40, 20, and 15 meter phone subbands and Novice 10 meter phone subband. For certificate send QSL and 9 × 12 SASE to TARC/Rose Festival Station, P.O. Box 2512, Thomasville, GA 31799.

KB5SBA, from 17th Annual Amory Railroad Festival, Amory, Mississippi; 1800Z April 21 to 2400Z April 23; operation in the General subbands for both CW and phone. For certificate send QSL and 9 × 12 SASE to Bobby Sprayberry, KB5SBA, 30037 Old Highway 6, Nettleton, MS 38858.

W5OK, from QSO party to celebrate the heritage of Route 66, Red Fork, Oklahoma (just outside of Tulsa); Tulsa ARC; 1800Z April 22 to 1800Z April 23; phone lower 50 kHz of the General 15, 20, 40, 80 meter subbands and the Novice 10 meter subband; there will also be a 2 meter SSB station; CW lower 25 kHz of the General 20, 40, 80 meter subbands and the Novice 15 meter subband. For a unique certificate send QSL and 9 × 12 SASE to Tulsa ARC, P.O. Box 4283, Tulsa, OK 74159.

6-land, to celebrate California Department of Transportation Centennial; volunteer members of Headquarters and the 12 District Caltrans Auxiliary Radio System (CARS) stations, using various callsigns; 1600–0100Z April 8–9; operations in General portion of 10, 15, 20, 75 meter bands and Novice/General of the 40 meter band, 2 meter voice contacts on 146.52 simplex, and packet on 145.05 MHz. A special commemorative QSL card, with special postal stamp cancellation, will be available for contacts made. For information, contact Carol Dulay, N6WCV, at 916-654-8884.

WB6DWY, to celebrate the history of Sonoma and the Valley of the Moon, from the Sonoma Veteran's Memorial Building, Sonoma, California; Valley of the Moon ARC; 1700 to 2200 UTC April 29; on 20 and 40 meters at 7115, 7240, and 14420–450 kHz ± during the hamfest. For certificate, send QSL and SASE to VOMARC, 358 Patten Street, Sonoma, CA 95476.

KC7MF, from the Green Valley Titan Missile Museum, Green Valley, Arizona; The Green Valley ARC; 1600Z April 22 to 2300Z April 23; SSB 3.860, 7.230, 14.250, 21.330, and 28.450 MHz; local 2M FM repeater operation on 145.29 MHz. For certificate send QSL and 8 × 12 SASE to GVARC, 601 N. La Cañada, Green Valley, AZ 85614.

W8BI/8, from Dayton Hamvention, Dayton, Ohio; April 28–30 (1300–2300Z April 28 and 1300–1700Z April 29); operation on General and Novice phone and CW bands. For QSL send business-size SASE to W8BI/8, P.O. Box 44, Dayton, OH 45401-0044 or via the bureau.

K9CAU, to commemorate the 50th anniversary of the Streator Hobby Show, Streator, Illinois; Streator ARC; 0900–2300Z April 8; 40 and 20 meter General phone band. For certificate send SASE to N9PLM, 1705 Florence Street, Streator, IL 61364-1337.

KF9SU, to commemorate the establishment and signing of the new governmental Constitution of the Ho-Chunk Nation, Black River Falls, Wisconsin; Monroe County ARC; middle of the 80–10 meter General and Novice phone subbands. For 8 × 10 certificate, send QSL and SASE to Marshall Kiel, KF9SU, P.O. Box 344, Tomah, WI 54660-0344.

NQØG, from inauguration of Kenny Rogers Showboat the "Branson Belle," Kimberling City, Missouri; Kimberling ARC; 1600–2100Z April 21 and 22; lower portions of 10, 20, and 40 meters and CW 14030–40 and 7125–50. For certificate, send SASE to KARC, P.O. Box 1171, Kimberling City, MO 65686.

WØWYV, from 35th anniversary of the founding of the Bellevue ARC, Bellevue, Nebraska; 1100– 2300Z April 22; SSB in lower phone portion of the General 40, 20, and 17 meter bands, and if propagation permits in the Novice portion of the 10 meter phone subband; CW operation will be in the Novice portion of 40 meters. For unfolded certificate, send QSL with contact number and large 9 × 12 SASE to Bellevue ARC, c/o Larry Bailey, WØPYA, 1110 Lincoln Road, Bellevue, NE 68005.

CT1TGM, DAØIMD, EI2IMD, EI4IMD, GBØIMD, GB1IMD, GB2GM, GB2IMD, GB2IMD, GB2IMD, GB2MDI, GB2MID, GB2SFL, GB4IMD, GB4MD, GB4MDI, IYØGA, IYØORP, IYØTCI, IY1TTM, IY4FGM, K1VV/IMD, KK6H/IMD, VE1IMD, VO1IMD, ZS6IMD, from 25 Special Event stations representing locations of early Marconi experiments; the Cornish RAC; 0000–2400Z April 22. Certificate for working 12. For info contact G4USB@GB4AKE.#44.GBR.EU or the Cornish RAC, Box 100, Truro TR1 1RX, Cornwall, England.

OE1M, from International Marconi Day, Broadcasting Centre, Vienna, Austria; Radio Austria International; 0000–2400Z April 22; SSB 3.770, 7.070, 14.170, 21.170, 28.470; via OSCAR 13 (approx. 0500–1220) and OSCAR 10 (approx. 1300–1500), 145.890. QSL (for shortwave broadcasts and amateur radio) to: Radio Austria International, A-1136 Vienna, Austria, or via OE Bureau.

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

Apr. 1, **Saturday Ham Radio Auction**, Waterford Senior Center, Norwich, Connecticut. For information, contact Tony, AA1JN, at 203-859-0162; or Mike, N1HFX, at 203-546-9498.

Apr. 1, **LARCFEST**, Boulder County Fairgrounds, Longmond, Colorado. For exam and table information send SASE to Randy Stevens, NØNMD, 5280 Cypress Drive, Boulder, CO 80303 (303-499-1106). (Exams.)

Apr. 1, **18th Annual Rochester Area Hamfest**, Rochester, Minnesota. For information and tickets contact the Rochester ARC, Attn: Frank Ingram, NØMXN, 1627 Fifth Avenue S.E., Rochester, MN 55904 (507-288-6569). (Exams.)

Apr. 1, **Columbus ARC Hamfest**, Bartholomew County 4-H Fair Grounds, Family Arts Building, Columbus, Indiana. For information or reservations contact Marion Winterberg, WD9HTN, 11941 W. Sawmill Road, Columbus, IN 47201 (812-342-4670).

Apr. 1, **Eastern Washington Section Hamfest & Computer Show**, Spokane Interstate Fairgrounds, Spokane, Washington. Contact: Warren Kelsey, KJ7BB, S. 1405 Crestline, Spokane, WA 99203 (509-534-8443). (Exams.)

Apr. 1, **AARG 6th Annual Hamfest & Computer Show**, Lebanon Area Fairgrounds, Lebanon, Pennsylvania. For information contact AARG, 105 Walnut Street, Pine Grove, PA 17963 (717-345-3780); or Lanny Hoffman, KD3TS, 337 N. 19th Street, Lebanon, PA 17042 (717-274-2148). (Handicapped accessible; exams.)

Apr. 2, **23rd Annual Madison Swapfest**, Dane County Exposition Center Forum Building, Madison, Wisconsin. For information, write to M.A.R.A., P.O. Box 8890, Madison, WI 53708-8890.

Apr. 2, **HAMCOMP '95 Hamfest**, Trenton State College, Trenton, New Jersey. Write to HAMCOMP '95, Delaware Valley Radio Association, P.O. Box 7024, West Trenton, NJ 08628 (609-882-2240).

Apr. 2, **Southington ARA 12th Annual Fleamarket**, DePaola Jr. High School, Southington, Connecticut. For information send an SASE to the Southington ARA, P.O. Box 873, Southington, CT 06479. (Exams by pre-registration only.)

Apr. 8, **IRAC Hamfest**, West Orange High School, West Orange, New Jersey. For information call Jim and Liz Howe, N2TDI, at 201-402-6066.

Apr. 8, **Lake Region ARC 8th Annual Hamfest**, Ottertail County Fairgrounds/Hockey Arena, Fergus Falls, Minnesota. For information contact: William Morgan, Route 6, Box 43, Fergus Falls, MN 56537. (Exams.)

Apr. 8, **Joplin ARC Hamfest '95**, John Q. Hammons Trade and Convention Center, Joplin, Missouri. For information or reservations call Larry Hendrix, WBØ0YU, at 417-782-5848. (Exams.)

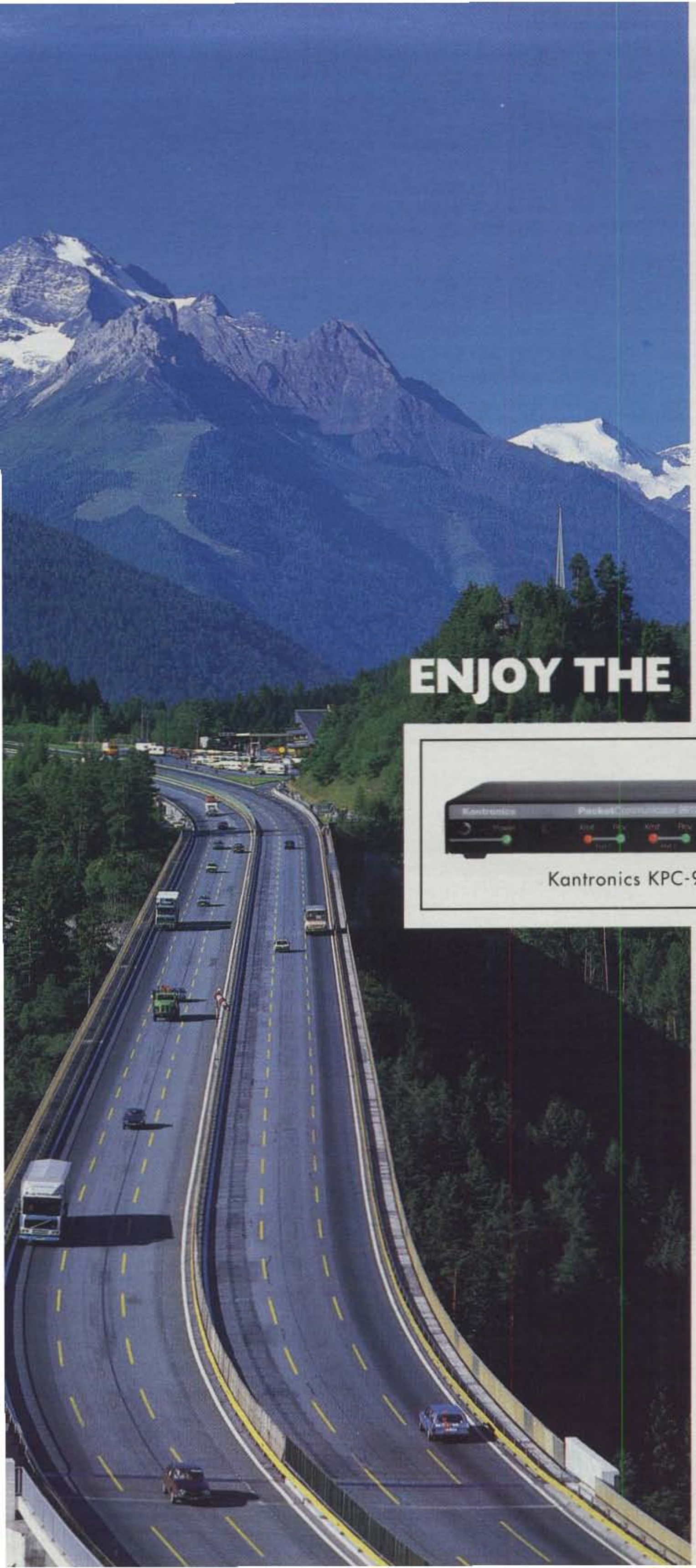
Apr. 8, **Durham Region Amateur Radio Hamfest**, Metro East Trade Center, Pickering, Ontario, Canada. Contact: David Herve, South Pickering ARC, P.O. Box 53, Pickering, ON L1V ZR2 (phone 905-837-2127; FAX 905-831-5556).

Apr. 8, **Kentucky Colonels ARC Hamboree '95**, Knights of Columbus Hall, Bowling Green, Kentucky. For more information and reservations, call: Leon Garrett at 1-502-842-5307; Don Meredith at 1-502-781-6600; or write: P.O. Box 9781, Bowling Green, KY 42102-9781.

Apr. 8, **The 49th Annual LFSARC Hamfest**, Comanche County Fairgrounds in Lawton, Oklahoma. For further information, contact Bob Morford, KA5YED, 1415 N.W. 33rd Street, Lawton, Oklahoma 73505 (405-355-6120). (Exams.)

Apr. 8, **The PAWA Electronics Flea Market and Hamfest**, University of Southern Maine, Sullivan Gymnasium, Portland, Maine. For information contact Marty Feeney, K1OYB, at 207-772-1682. (Exams.)

(Continued on page 144)



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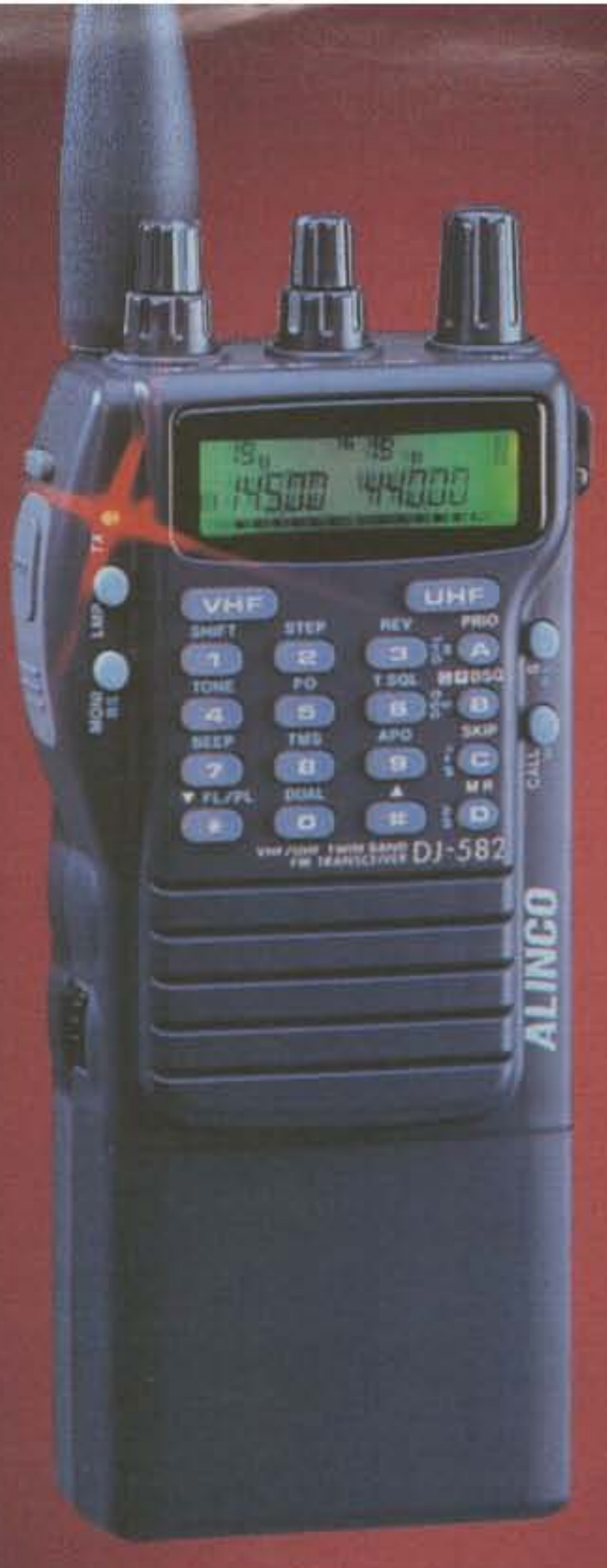

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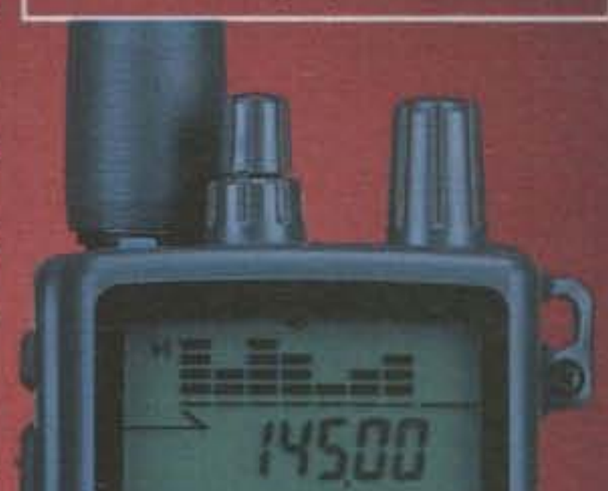

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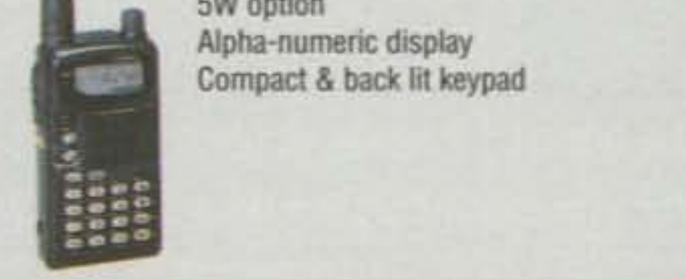

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Report to CQ by Professor Heisseluft on a problem all DXers face:

Secrets of Famous DXer Revealed

Amateurs Worldwide Stunned by Simplicity of New Scheduling Aide

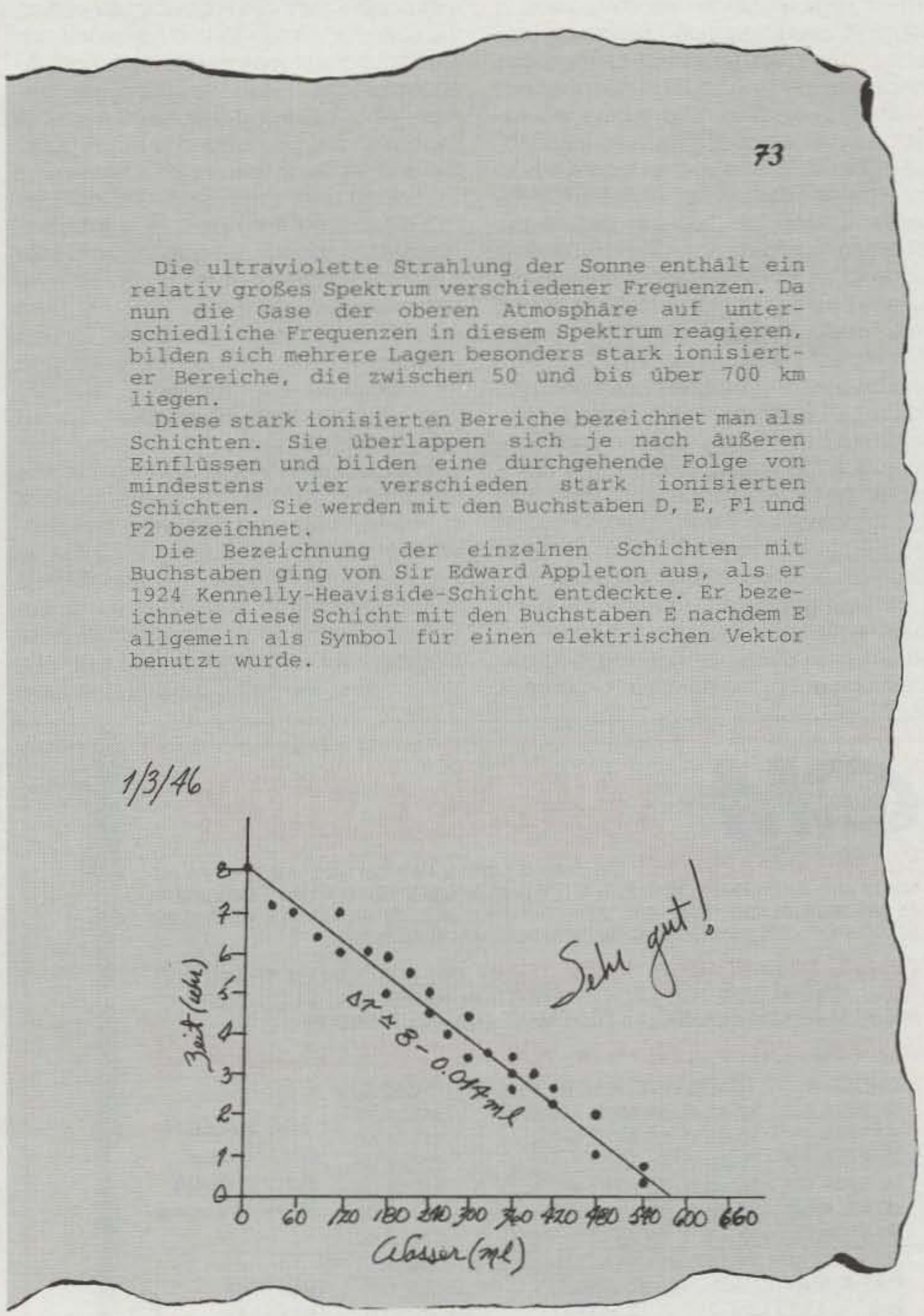
BY PROFESSOR EMIL HEISSELUFT*
LAUTON INSTITUTE
GROSSMAUL-AN DER DONAU, AUSTRIA

For many years after WW II Dr. Jerzy Ostermond-Tor, D.O.S.E. (ex-YM4XR)[1] led the world in countries and zones worked, both on phone and CW. Amateurs worldwide were in awe of the professor, who seemed to have the uncanny knack of showing up on the bands in the middle of the night, just in time to catch some rare station or another before others in the area even awoke! How did he do it? Certainly, the professor's teaching and research duties at the Lauton Institute required him to get a good night's sleep. But there he was, time and time again, working the rarest DX with abandon, and always between midnight and 5 AM local time. Now, for the first time, the professor's former student, Professor Emil Heisseluft, reveals Dr. Ostermond-Tor's secret, a secret found in the professor's scientific log, which everyone thought had been destroyed in a fire at the Institute in 1947. Used properly, the technique described here will ensure that no one will ever again have to go to bed worrying about missing a schedule in the middle of the night.

—Alan, K2EEK

Dear readers of *CQ*, what I am about to reveal to you is nothing less than astounding in its effectiveness and marvelous in its simplicity. It is a secret that everyone thought was lost to the world forever after the disastrous fire that swept the grounds of the Lauton Institute in 1947. Fortunately, in reviewing some old, damaged documents stored in the basement of the physics building, I stumbled on the fire-damaged records kept by Professor Os-

**Professor Heisseluft currently is in New Zealand, where he is consulting with Ron Wright, ZL2AMO, on documenting the status of an island in the South Pacific prior to petitioning for separate country status. Correspondence to the professor may be directed c/o CQ, 76 N. Broadway, Hicksville, NY 11801.*



This partially burned page from Tor's scientific notebook shows the data he used in developing his wake-up methodology. Also shown is what appears to be an excerpt from a German study on the ionosphere.

termond-Tor immediately after WW II. There it was—the professor's secret technique for ensuring that he met every nighttime schedule he arranged with rare DX stations around the world. More important perhaps was the fact that he never had to resort to the use of his alarm clock, a device that more often than not found its mark on the back of his head at the hands of his lovely (but volatile) wife, Gertrude.

Rude Awakening

It all started with an ill-fated schedule the professor made with His Royal Highness, Prince Namgyal of Sikkim, AC3PT. After the war the Lauton Institute maintained a meteorological station near the palace in Gangtok, and through the personnel stationed there, Tor arranged to meet the prince one morning on 20 meter phone at 3 AM Austrian time. Old timers will remember that the prince was virtually inactive at that time, and so the opportunity to work this rare station was almost unimaginable. During the evening before the schedule Gertrude could see that her husband was worried about something, but she couldn't get him to tell her what it was. Finally, Tor confessed that he was going to set the alarm clock for 2:45 AM, thereby ensuring that he would not miss the prince. Gertrude was furious! She always had been a light sleeper, and more than once the ringing of the alarm clock startled her so badly that she never was able to go back to sleep. Lately, too, she had begun to throw the alarm clock at Tor—with ever-increasing accuracy.

Tor was perplexed. On the one hand he did not want to miss the schedule. On the other his students had begun to ask questions about the stitches in the back of his partially shaved head, following early morning visits to the Institute's infirmary. So he did the only thing a DXer could do. He took his blankets, pillow, and alarm clock to the basement, and there he went to sleep.

As it turned out, Tor need not have set the alarm, for he awoke at 2:30 AM, lit up one of his big cigars, and settled in before the rig for the schedule. Unfortunately, he forgot to turn off the alarm. When its muffled sound reached Gertrude's ears, she woke with a start. Forgetting that Tor was downstairs, and smelling the acrid stench of his burning cigar, she jumped out of bed and called the fire department. Oh, dear readers, it could not have been two minutes before three fire trucks arrived on the scene, their two-tone emergency signals sounding for all the world to hear. In an instant the house was filled with firemen, who, believing that the fire was in the basement, proceeded to break down the door of Tor's shack with a fire axe.

Looking a little sheepish, Tor held up the cigar. The fire chief, less than impressed, proceeded to give the professor a lecture on false alarms. By the time he and his crew left, it was 3:10 AM, and AC3PT was nowhere to be found. Tor had failed to work the last country he needed for a clean sweep of the DXCC list.

In the days that followed Tor did not even speak of radio to Gertrude. The alarm clock was put away too, lest she find another opportunity to practice her marksmanship. But Tor was puzzled. What made him wake up at 2:30 AM on the morning of the AC3PT schedule? His so-called "internal clock" had never before worked. He wasn't one of those people who can "will" that they wake up at a certain time. Something else must have been at work here!

Then Tor had a revelation: It must have been the glass of water he drank before going to bed earlier that night that had caused him to awake. And if it had worked that night, why couldn't it be made to work at any time? Why not, indeed!

The Secret

Given his scientific background, Tor set about calibrating his wake-up time as a function of the amount of water consumed just before going to bed. Each night for the next month or so he consumed a specific amount of water and recorded the time he awoke. The results were dutifully recorded in his scientific notebook, a copy of which is shown in the accompanying figure. As seen, there is a linear relationship between the amount of water consumed and the number of hours past his bedtime that Tor awoke. For example, to ensure that he would awake three hours after his bedtime, Tor found he had to drink 360 milliliters (or about 12 ounces) of water just before going to bed. The method was so good, in fact, that Tor could time his waking to within 10 minutes! Here at last was the answer to his problem!

In the months that followed Tor not only worked AC3PT, but also virtually every other juicy piece of DX that amateurs worldwide hungered after. He had the uncanny knack of showing up—night, after night, after night—for what apparently were early morning schedules with rare DX stations around the globe. Yet he always seemed rested, and he never missed a class or laboratory experiment. Almost as surprising to his students was the fact that he no longer arrived in class with the back of his head shaved by the Institute's doctors, prior to their stitching up his wounds. Even Gertrude seemed in a better mood. Although Tor's middle-of-the-night departures from bed caused her to stir now and then, she sympathetically attributed his early morning departures from their bed to his advancing age, and to those little annoyances that life springs on everyone.

In the end Gertrude never did learn of the good professor's secret—a secret that you now can put to work in your climb to the top of the DX rolls.

Reference

1. Heisseluft, E., "D.O.S.E. Awarded to Prof. Ostermond-Tor," *CQ*, April 1979.

Readers also will want to review the following DX-related articles by Prof. Heisseluft: "Selection of Contest Operators Using Biorhythm Charts," *CQ*, April 1978; "Applications of Stealth Technology to the Design of Invisible Antennas," *CQ*, April 1981; and "All-Night Ionospheric Illumination Through the Use of Large Reflecting Satellites," *CQ*, April 1983. ■

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It's not gain, nor is it something that produces a wonderful pattern. W1ICP explains just what antenna efficiency is and why it's important.

Antenna "Efficiency"—What Is It?

BY LEW McCOY*, W1ICP

Recently, when I was writing my handbook on antennas (*Lew McCoy on Antennas,* published by *CQ*), I spent considerable time explaining antenna efficiency. My problem is that I have lived with antenna "efficiency" so long that I have become jaded and tend to disregard this important aspect of antennas. By the same token, in talking to countless amateurs these days, I have come to realize that most don't seem to comprehend antenna efficiency, or if they do, they seem to dismiss the subject out of hand. This is unfortunate, because gain is not the primary criteria for antennas, nor are patterns the primary criteria. Simply, from my point of view efficiency is.

I decided to write this article to try to make amateurs more aware of what antenna efficiency really is. Let's dig right in and see if I can make this subject clear to the reader.

I remember years ago when the two amateurs I respected the most—George Grammar, W1DF, Technical Director of *QST*, and Byron Goodman, W1DX, also a Technical Editor of *QST*—put me on the path to understanding antennas. Primarily, this was just so I could tell the good from the bad. Antenna efficiency was the one point they made sure I understood.

In amateur radio efficiency means what one gets out of a circuit in relation to what one puts into it. For years much has been written about efficiency of final amplifiers, but little has been done on how efficient an antenna may or may not be. We are accustomed to expressing gain of an antenna in decibels, and that is the way it should be. In all honesty, though, decibel gain is a long way from the final criteria of how good an antenna really is. However, what is easy to overlook is that when we feed power into an antenna, exactly how much of that power is used to achieve the decibel gain? Sound confusing? Let's take an example.

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

First, though, antenna efficiency is best shown and described as a ratio—a ratio of the power radiated to the power lost. Suppose we have a rig putting out 100 watts and we feed that power into the antenna. Also, let's assume the antenna has 3 dB gain. That 3 dB would increase our radiated signal in the antenna's best direction by twice, or 200 watts. Let's also assume that the *efficiency* of the antenna only has a ratio of 50 percent. That means we lose 50 watts, but because the antenna has 3 dB of gain, we end up with what we started at—100 watts being radiated.

Confused? Quite simply, when an antenna is resonant, there are two properties present. These two properties are radiation resistance and ohmic resistance. The latter, ohmic resistance, is the actual, real, true resistance that heats up—just like a carbon or wire-wound resistor—and similarly dissipates heat as power flows through it. As far as we are concerned, that power is lost, or wasted, power. It won't radiate as radio frequency energy and it won't go somewhere to work someone for us. It is simply lost or wasted power. The other part of our resonant antenna impedance is called the *radiation resistance*. It is listed as "ohms," but it isn't a real "ohm." This resistance is always listed in equations as R_r.

The power that is fed into our antenna, RF power from our rigs, is spent or dissipated in two ways. The power used up in the ohmic resistance is spent in heating up the wire in the antenna or the traps, bad connections, ground losses, etc. Keep in mind that some of this ohmic loss is in the ground of the antenna. The remaining power is spent in the R_r to be radiated/coupled into space (and gets us those nice 5 by 9 reports). So where does efficiency enter into this discussion?

Many years ago it was pointed out to me that the most efficient antenna was a simple half-wavelength dipole. The impedance of such a resonant dipole is on the order of 70 ohms when the antenna is at least a half wavelength above earth. On 80 meters, in a dipole made from No. 12 or 14 wire the ohmic losses will be on the order of 2 to 3 ohms (there are some ohmic losses introduced by surrounding objects and earth itself). The radiation resistance is the ohmic losses subtracted from the overall impedance, or, say, 2 ohms subtracted from 70 ohms, leaving 68 ohms. This means that our dipole is a 95 percent plus efficient antenna. If we put in 100 watts, only 3 or so watts will be lost as heat; the remainder goes to work for us. Now that's efficiency! In fact, the half-wave dipole is probably the most efficient antenna ever devised.

So what does all this mean to the average amateur? We all use beam antennas, or at least most of us *want* to use beam antennas. We argue over decibel gains of beams; which is better, trapped antennas or no traps; quads and their losses; and on and on. Mobile antennas for low frequencies are constantly discussed as to their merits. But no one discusses the efficiency of such antennas. In this discussion let's keep one important point in mind: Usually, the higher the R_r number in the antenna impedance in relation to the ohmic number, the more efficient the antenna is going to be. This is simply because the ratio of "good" power to lost power is so high.

Let's look at beams. We must first consider the impedance. Many newcomers get hung up when they assume that the impedance of all beams is on the order of 50 ohms—or very close to that figure. They do this because the antenna is fed with 50 ohm cable and produces a match or 1 to 1 SWR, or very nearly 1 to 1.

Keep this in mind, however. Nearly all Yagi-type beams have some sort of "matching" device in order to transform the actual or real impedance of the Yagi, up to 50 ohms. Let's examine this for a moment. A monoband three-element beam using close-spaced elements, say one-tenth spacing, will have a rather low overall impedance. How low? How about 4 to 5 ohms? This is very possible with close element spacing. Of course, with modern transceivers we could never feed

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such an antenna directly with coax; the mismatch and SWR would be horrific, probably 8 or 10 to 1. So of course a matching network is installed to step up that very low impedance to 50 ohms. But what about efficiency?

A beam with a 5 or 10 ohm impedance is certainly going to have ohmic losses as an important factor. We have telescoping element connections, possible boom losses, the matching network itself, and so on. Assuming that a 10 ohm impedance has 5 ohms radiation resistance and 5 ohms ohmic loss, then we are looking at 50 percent efficiency. In a beam with lots of traps, such as a three bander, there is no doubt that ohmic losses are going to increase so that the majority of power is lost as heat. The trap beam, if it is well designed and tuned properly, will probably still end up having about 6 dB gain compared to a dipole. But bear in mind that this 6 dB gain is for the useful power that gets into the beam. There is no real way of knowing what the ohmic losses are, but you can be assured that they are present. There is the old cliche that what you don't know won't hurt you, but I dislike seeing people live in a dream world.

Keep in mind that aluminum is an excellent conductor. Aluminum may be a wonderful conductor, but depending on the atmosphere, aluminum can get corroded and "scummy." If this happens, ohmic losses can skyrocket, and performance and efficiency go to pot.

Let's look at another more startling case. The following is a rule that never changes: The shorter one makes an antenna physically, the lower the impedance (and radiation resistance) goes. A startling example is that one can take a normal 80 meter, quarter wavelength antenna of, say, 60 feet length and reduce it to a very short size. This is done by adding a "loading" coil.

The idea is to shorten the antenna to a practical usable length, say about 8 feet high for mobile operation. Instead of 60 plus feet long, we coil up all but about 8 feet of the 60 feet and use the coiled up portion for a loading coil. This makes the short antenna still resonant on 80, but much shorter than the 60 foot length. The 60 foot long vertical has an impedance of 36 ohms (just half that of a half-wavelength dipole). Also, our R_r is very good, somewhere above 30 ohms, meaning good efficiency.

The ohmic losses will again depend on the resistance of the antenna wire and other objects, such as ground, but it should be a relatively small number, as in the half-wavelength dipole. *But*, the 8 foot mobile whip for 80 is going to be a very inefficient antenna. The ohmic losses will depend on the coil construction, its Q factor, the resistance present in the automobile or RV frame.

Getting back to the *but*, the radiation resistance will be only a fraction of an ohm—yes, that's correct, a fraction, about 0.1 ohm. Back in the early '50s the well-known technical writer Belrose, VE2CV, wrote an excellent article on low-band mobile antennas. He pointed out these very low radiation resistance numbers for the low bands—160, 80, and 40.

So what does all this mean and what is the answer? In the case of the short mobile whips on the low bands, our efficiency is very bad. Assuming an ohmic resistance of, say, 4 ohms (a very realistic figure with a modern automobile), we are going to lose nearly all RF power as heat. If we ran 40 watts into the antenna, only 1 watt would be radiated—sounds unreal but it simply goes to prove that QRP really works. How does one change that horrible ratio of usable power to lost power? In the case of mobile operation the object is to reduce ohmic resistance so that the ratio of lost to usable power improves. This means—

particularly with plastic parts in automobiles, even in the bodies—one should use ground strapping to get the motor, bumpers, and any frame or metal material well bonded together. This reduces the ohmic number appreciably and improves the efficiency ratio.

With beams or any other antenna, make sure that the coils are designed to have the least overall resistance. Check that all hardware and connections have the smallest resistance possible.

There are some short or relatively small antennas where the radiation resistance is increased by using different construction techniques. I did a review of the Uni-Hat vertical in the December 1994 issue of *CQ*. It described a multiband antenna that was very short on some frequencies. By using both transmission-line and folded-dipole techniques, the antenna, while only 1/16 wavelength long on 160 meters, still had a radiation resistance of nearly 50 ohms. That's efficiency!

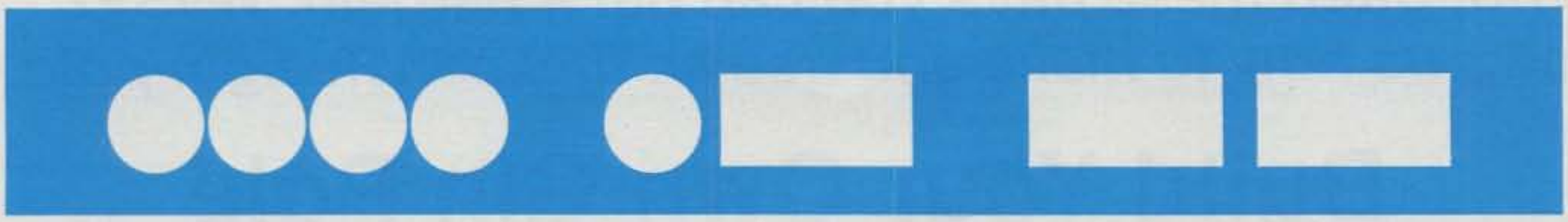
So what does one look for when buying an antenna? In a trap beam make sure the traps use the largest possible conductor wire (larger conductors means less ohmic losses). Be sure that the hardware and connections are well made. When you assemble any antenna, make sure you do an extra good job of making tight connections. If possible, on wire antennas stay with No. 12 or No. 14 wire. I haven't mentioned quads, but it is only fair to mention that quad loops in a beam have rather high impedance. This means a good ohmic to R_r ratio. (A quad beam has an impedance over 50 ohms, meaning a ratio that is well on the plus side for R_r.) Simply put, a quad is a more efficient antenna than other types, and that's a fact. More on why in a moment.

In considering mobile antennas for low bands, do everything possible to reduce the vehicle ground losses—bonding of metal frame and motor, good connections, etc.

For years I have squirreled away in the back of my mind the information for considering merits of one type of antenna versus another. Two-element quads, for example, have long been rated by some of us to be as good as a three-element Yagi. I have avoided the arguments to a great extent, but here is a simple fact to consider. Because of its low impedance, a Yagi does not have an excellent efficiency factor. As I pointed out earlier, a really short boom Yagi could be in the 50 percent or less efficiency area. A quad, however, is in the 90 percent area. Therefore, if the same gain ratings exist for both antennas—say 6.5 dB—the efficiencies of the two antennas show a 50 percent difference. This in turn means that the one antenna in a sense has a 3 dB advantage.

There is still another point to consider when discussing beam efficiencies. Time and again I have heard amateurs say that their beam performed well when it was new, but after it had been up a while performance dropped. The answer is obvious here (and has been proven many times). As a beam ages, the joints and connections corrode, causing high ohmic losses. What we have is a heating element. Earlier I mentioned that clean, new aluminum is a very excellent conductor. I recently took down a log-periodic-type antenna and found that the aluminum elements (and joints) had developed a scum covering which certainly would increase ohmic losses.

I have mentioned it before, but I live in an area that has one of the few remaining really clean atmospheres—6400 feet up in the Rockies. I still had joint corrosion. Such might be the case with your beam if it has been up a long time. Take the beam down and clean and polish all connections. It will pay off. There is no magic in antennas—just good common sense.



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Build Your Own Gin Pole For 12 Bucks

BY JACK McELWAIN*, W5SVZ

When I erected my Rohn 25G tower I did not have access to a commercial gin pole, so I made my own. It worked so well for me that I thought it might be useful to others.

The pole itself is a 10 foot length of standard electrical conduit (Electrical Metallic Tubing). TV mast is not suitable. Cut a rectangular notch in one end to fit your particular pulley (mine is 7/8 inch wide and 1 1/2 inches deep). Drill a 3/8 inch diameter hole, with the pulley in place, and mount the pulley with the bolt head inside. Prick punch the bolt and nut at their thread line to lock the nut.

Drill 1/4 inch holes in the hardwood blocks 2 inches apart for the U bolts. Run the grain perpendicular to the pole to prevent splitting. I used wood pieces cut from a milled oak flooring plank.

Mount one U bolt and block 25 inches up from the bottom end of the pole and the other 1 1/4 inches from the bottom end. Align the vertical axis of the U bolts roughly 30° from the axis of the pulley. The direction of rotation depends on which tower leg you plan to use for mounting the gin pole, but rotate the pulley away from the tower. This rotation will keep the pulley and rope from interfering with the section being erected. The completed assembly weighs about 11 pounds.

It is a good idea to fashion the U-bolt straps into a slight bow. Doing so will help stabilize the pole when mounted on the tower. This is a hammer and vice operation—nothing fancy.

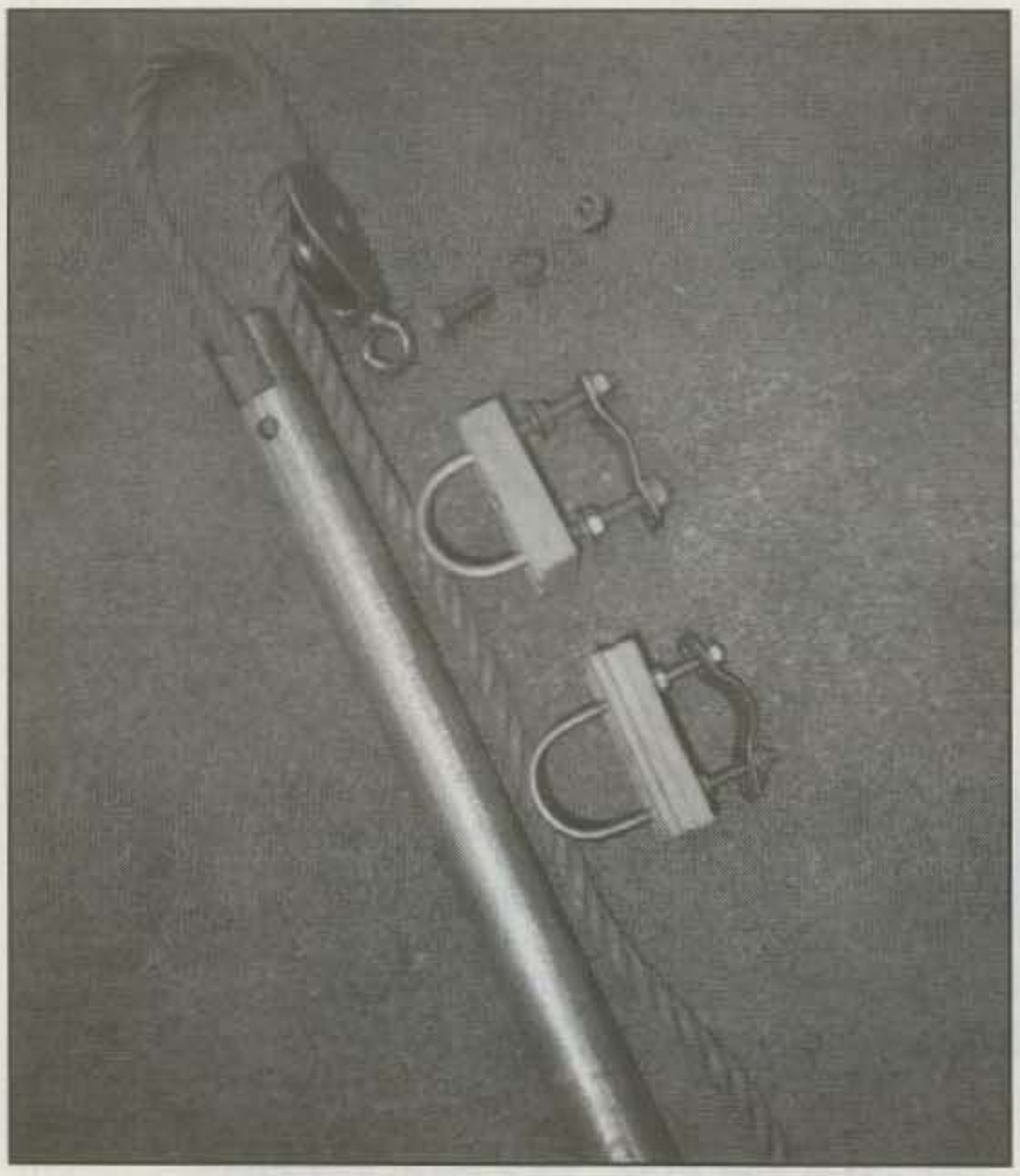
The picture shows the gin pole mounted and ready to hoist a new section. Note that the gin pole is mounted so that it will not interfere with the installation of the tower leg bolts.

Attach the hoisting rope just below the second strut bay from the top. This will provide a lift well above the center of gravity, which helps hoist the section vertically, thereby making it easier to hoist and mount.

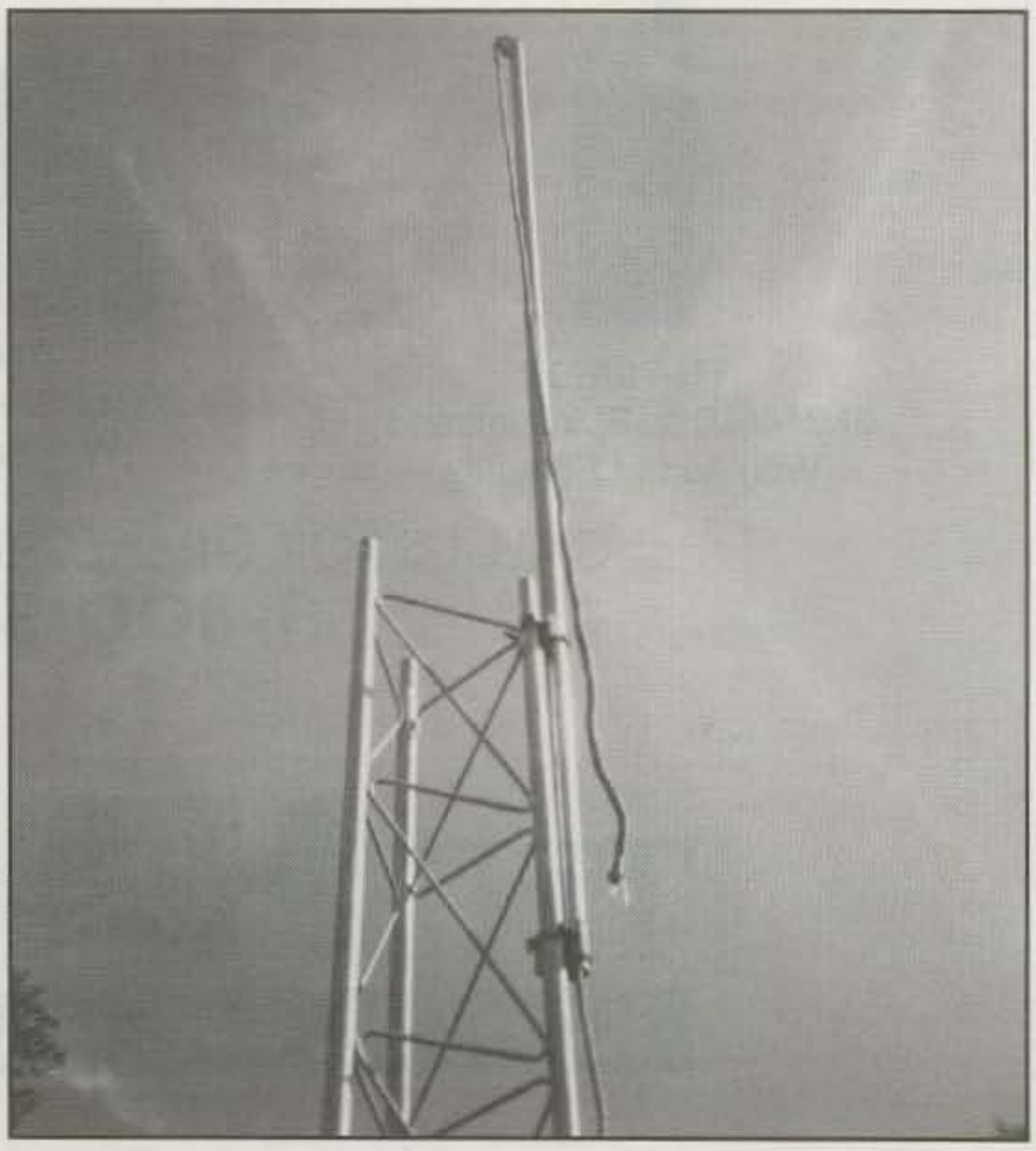
When attaching the gin pole to the tower, don't remove the upper U-bolt strap. Just loosen it, slip it over the top of the tower leg, and let it rest on the tower cross braces. Then attach the lower U-bolt strap and tighten both straps. *Hint:* Carry some extra nuts and washers with you when you go up the tower.

Could this gin pole be used for heavier sections? Maybe, but I have not tried it. I think it would be best to use 1 1/4 inch schedule 40 iron pipe and 3/8 inch U bolts—heavier, but much stronger.

*9427 Angleridge, Dallas, TX 75238



Component parts for the gin pole. Notice that the U-bolt straps have a slight bow to them so as to accommodate the conduit.



The completed gin pole is shown mounted on the tower and ready to hoist another section of tower. Proper precautionary techniques are a must.

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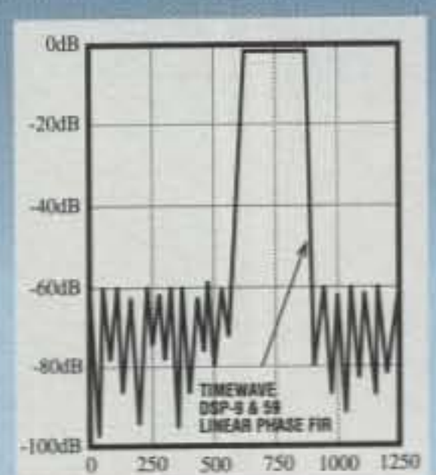

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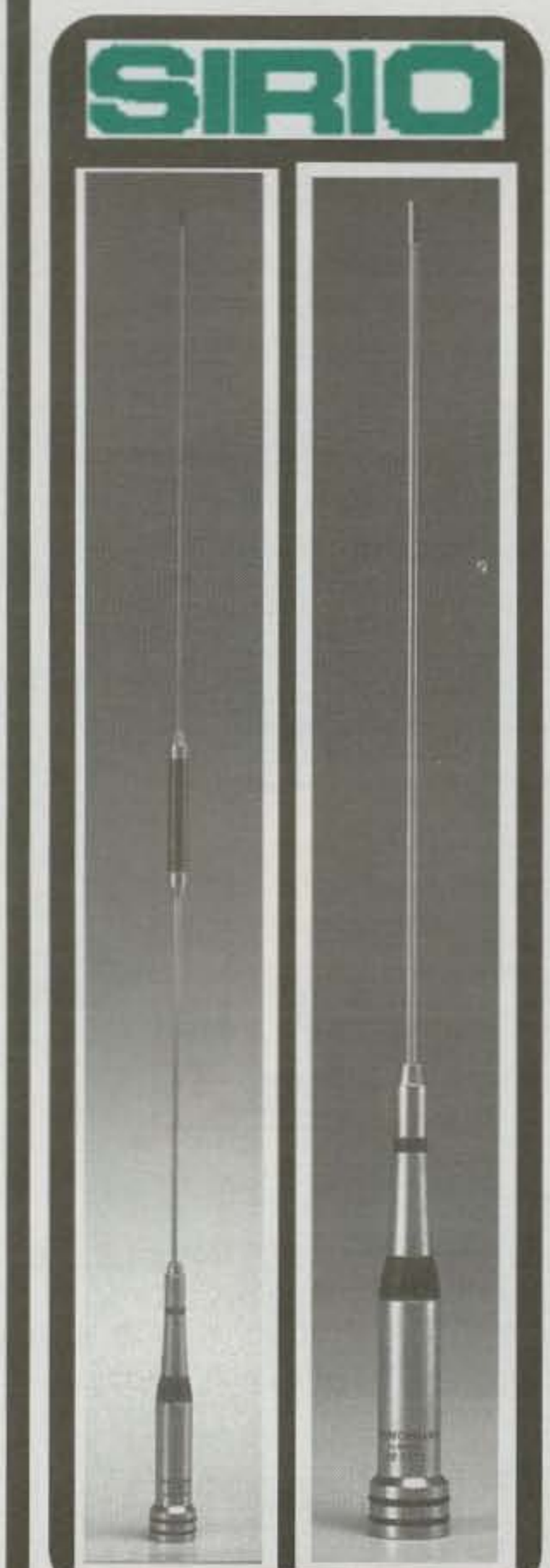

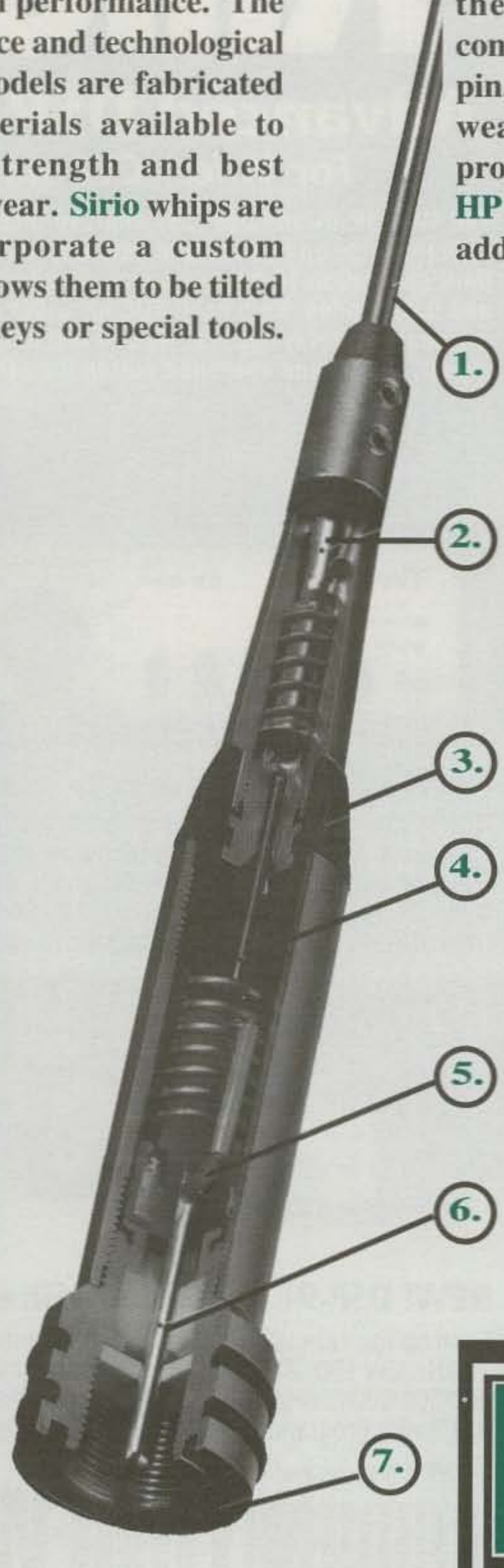

1. Hi Quality 17/7PH stainless steel whip.
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3. Dielectric low-loss "ZYTEL" insulator with brass insert soldered at the coil
4. High "Q" air wound coil for low dielectric loss
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CIRCLE 165 ON READER SERVICE CARD

Be Careful!

Don't stand or climb under a hoisted section.

Pull steady and evenly on the hoist rope; don't jerk it. I like ½ inch fiber rope. It is easier to grasp, and the knots are more secure than plastic rope.

Don't overtighten the U bolts. Replace if stripped or stretched.

Be sure to make a trial assembly close to the ground to satisfy yourself of mechanical soundness and check out your assembly procedures.

When climbing, use a good safety belt.

Materials

1—10 ft. length of 1¼" dia. EMT, steel, 0.068 inch wall thickness
1—½" × 2" pulley (see photo)
1—⅜" dia. × 1" long steel hex head bolt, nut and washer
2—¼" dia. 2" c to c, 4" long steel U bolts w/straps
2—3" × 1½" × ¾" hardwood blocks
4—¼ – 20 hex nuts, steel (for U bolts)
4—¼ × ⅝" dia. flat washers, steel (for U bolts)

Reference Reading

1. *The ARRL Antenna Book*, Chapter 1, section on tower safety and climbing.

2. Cook, Mike, KC8EG, "Tower Safety Tips," *QST*, August 1994, p. 40.

CQ REVIEWS:

The Antenna Mart AMQ-2-5 Two-Element, Five-Band Quad

BY LEW McCOY*, W1ICP

Those who have followed my writings know that I have always held that the quad antenna is one of the best performing beams to be found. This is particularly true of multibanding, where antenna efficiency is so important. It has long been argued—clear back to 1953, when Buchanan, W3DZZ, first invented the three-band trap Yagi—that a quad three-bander will outperform a three-band, three-element trapped Yagi.

So what about the Antenna Mart quad, or quads? Bill Wall, the chief honcho of the company, has been building and marketing quads for some years now, and he knows his business. The antenna reviewed here is his five-bander from 20 through 10, which includes the WARC bands. This antenna uses a proportional spacing to provide maximum efficiency and gain.

Let's first discuss his element support material. These are very fine quality Fiberglass poles that are mounted on a specially designed fixture (see photos 1 and 2). Each antenna has two elements—a driven element and a reflector. Spacing works out to approximately .125 wavelength on each of the bands, which is ideal for a two-element quad.

This is not an antenna that can be thrown together in a few hours. The supporting Fiberglass rods must first be mounted on one of the two supporting fixtures. Just a word about these fixtures. I could call them boom mounts, but I insist on thinking of an antenna boom as something in the shape of a long pipe. These supports have four right-angle sections welded to a base plate (see photo 1). They can be mounted so that the quad can be installed in a diamond configuration or as a square. Both of these supports mount on a fixture to mast unit, and the whole assembly is extremely rugged.

In any case, the manufacturer suggests using a cleared area and in the area installing four wood props to make the element assembly easier (see photo 2). The element supports are then mounted onto the fixture. We installed the supports and the boom fixture so that the beam

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

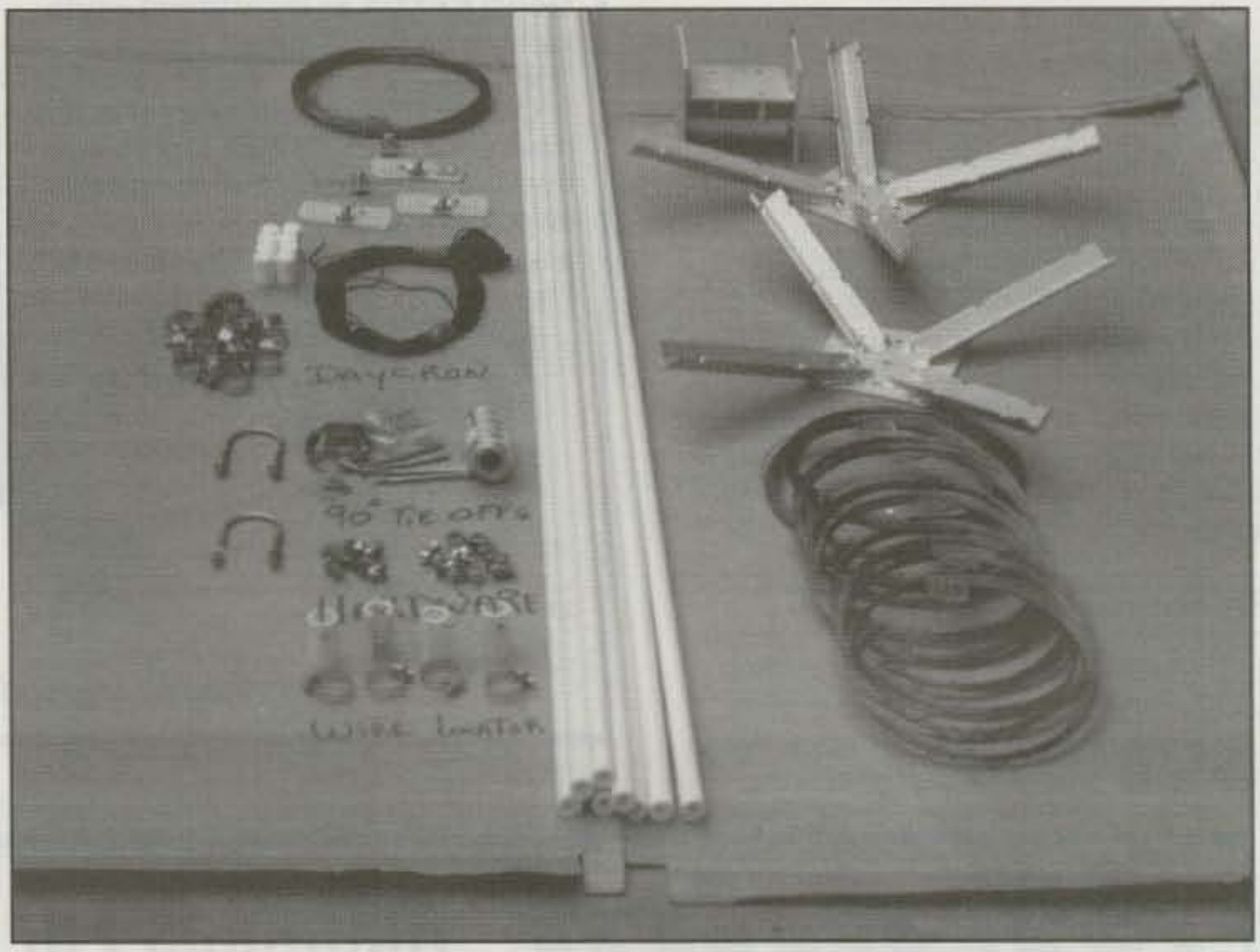

Photo 1– Here are the antenna parts as received via UPS. All you need now is a tower, a rotator, and a rig.

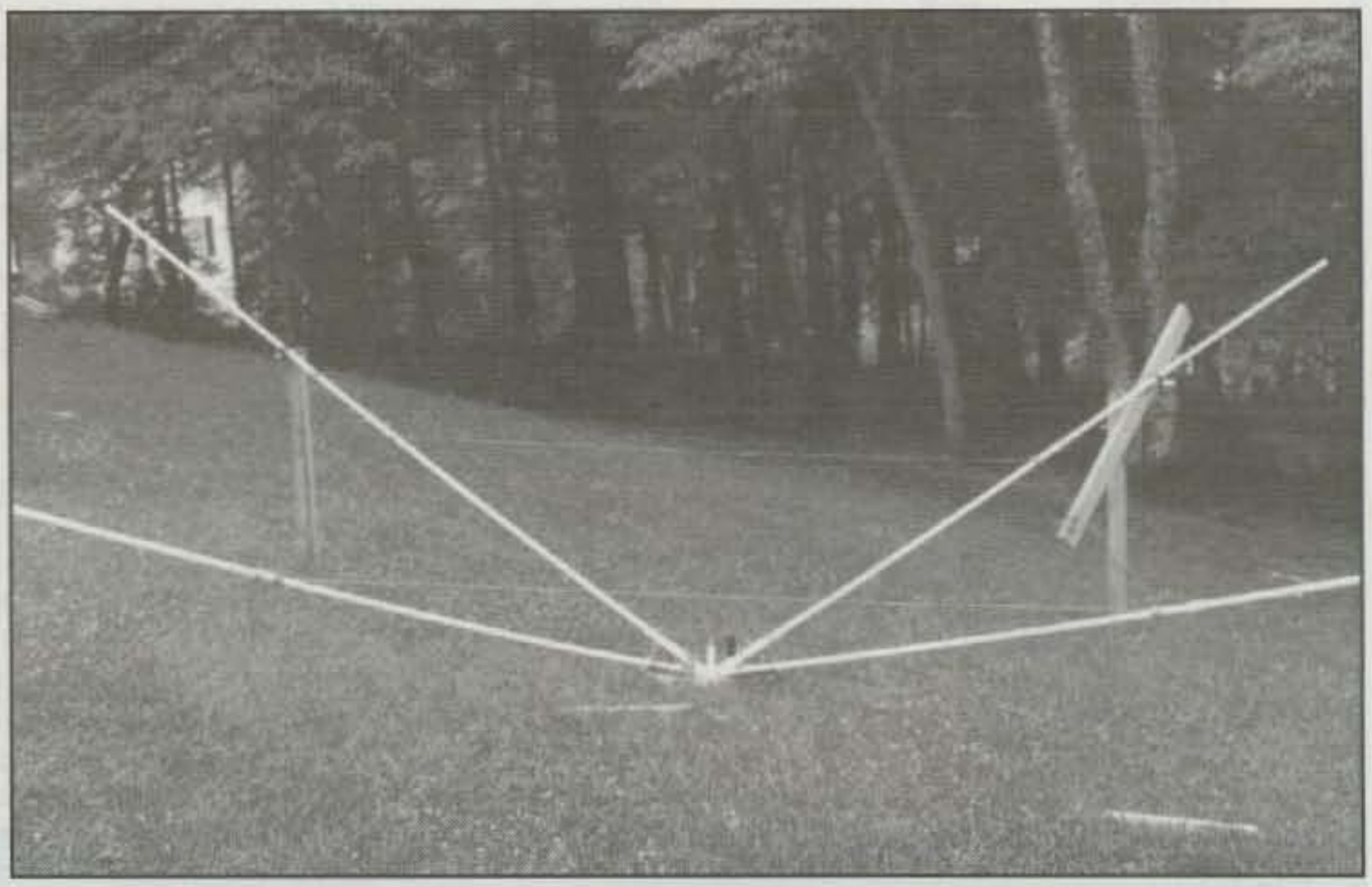

Photo 2– Here is the recommended element construction method. The wooden stakes help to support the poly rods. The angle supports provide excellent proportional spacing.

would be in a square, not diamond, configuration. As an aside, there have always been arguments as to which quad configuration, diamond or square, is best. For myself, I prefer the diamond configuration for several reasons. In an area where icing can occur, it would seem better to use the diamond simply because water tends to run downhill—or in this case, off the antenna. Also, the feed points are supported by one of the Fiberglass rods. Last, and probably most important, there is bound to be slightly more gain with the current points (top and bottom of the quad) having greater stacking distance than in the square configuration. However, this quad can be mounted either way, so use whichever arrangement you prefer.

With this antenna the manufacturer recommends separate feeding of each quad. It would be cumbersome running five feed lines to each quad. Again, Antenna Mart makes and sells a very rugged antenna switch capable of switching not five, but nine, antennas. This means that any VHF or UHF arrays on the same tower can be switched from a common, high-quality, low-loss coaxial line.

The instruction manual goes into considerable detail for installing a quad antenna on a tower. In my own case, I have a Hazer track and lift mounted on my Rohn 45 tower, so installation was a rather simple (!) project. In any case, it is recommended that tuning and adjustment be made on the quad, and both can be done at a reasonable level. In my case, when mounted, the quad support rods reach down just about 10 feet. With a reasonable-size step ladder, it was not a problem to make the feed adjustments and actually tune the reflectors.

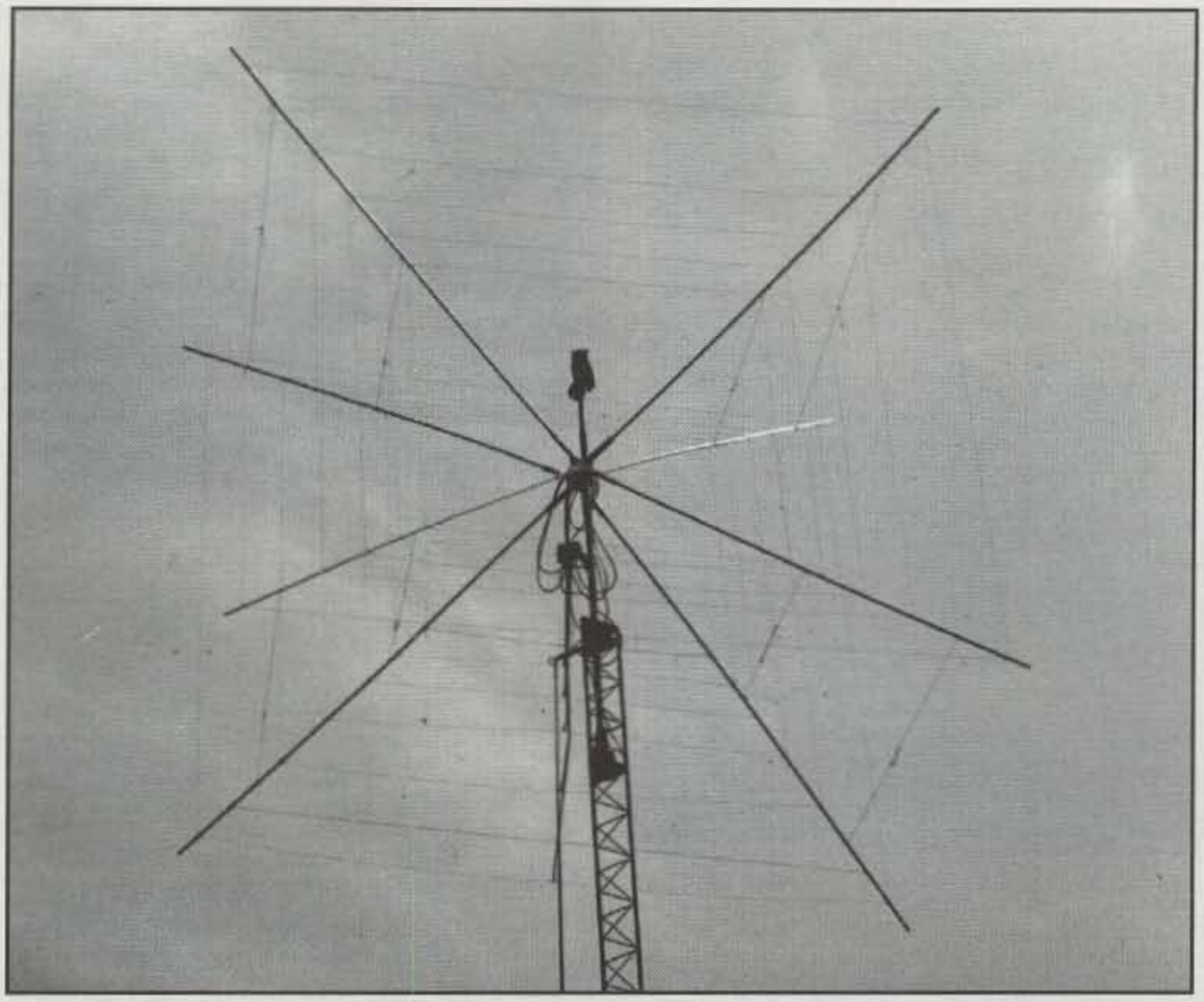

Photo 3– Here is a photo of what the five-band quad looks like on a tower.

As I pointed out, a single feed can be used, and if so, a Jerry Sevick, W2FMI,

Photo 4– At the top is the tower mounting section of the nine-terminal antenna switch. This switch is extremely rugged, handling 7000 volt peaks, with a 20 ampere current-carrying capacity. At the bottom in this view is the control unit, which is installed at the operating location. Obviously, you can label the LED indicators to suit your own needs.

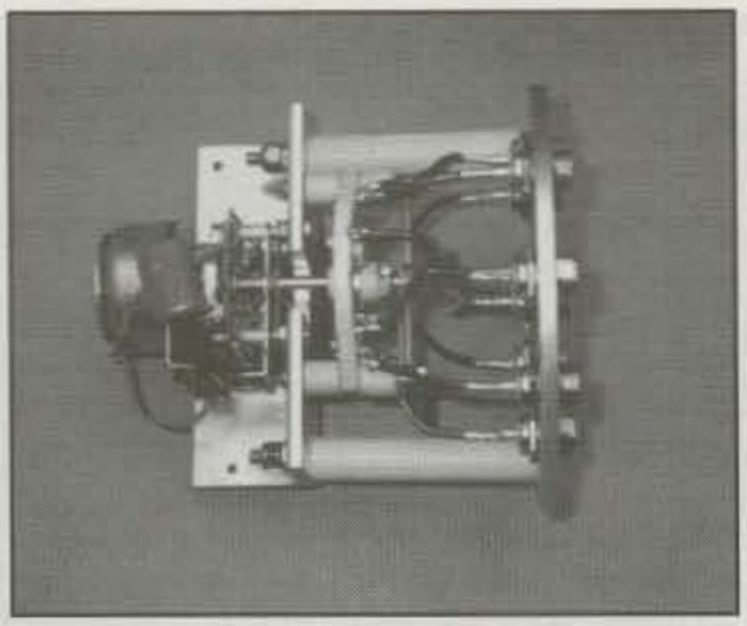

Photo 5– The switch portion removed from its weatherproof case.

type 2 to 1 ferrite transformer works exceptionally well. The common impedance of all five antennas tied together is on the order of 90 to 100 ohms, so the 2 to 1 transformer brings the impedance down to the 50 ohm region.

In this case, however, the manufacturer recommends using gamma matches on each individual beam. I carefully made SWR measurements on each band, and while I could show charts for each band, that really isn't necessary. Quads, being low-Q and broad-band antennas, usually produce a very good SWR bandwidth, and this antenna was no exception.

On 20 meters the SWR was 1.4 to 1 at 14000 kHz, dropping to a match at 14150 kHz and staying very low out to 14350, where it was back at 1.3 to 1. On 18 MHz the SWR was below 1.2 to 1 across the band. For 21 MHz again we stayed well below 1.4 to 1 across the whole band. On 12 meters the SWR was below 1.2 to 1 across the band. And for 10 meters the antenna was tuned for 28.5 MHz, which produced 1.3 to 1 at 28,000 kHz, dropping to a match of 1 to 1 at 28.5 and then rising to 1.8 to 1 at 29.7 MHz. All in all, that is very impressive for a matched antenna for five bands.

As to performance, what can I say that hasn't been said before. This is a very fine performing antenna. New Mexico is not one of the best DX locations. However, I found I had no problem breaking pile-ups or working on crowded bands.

For more details on the antenna or the antenna switch, write to the manufacturer. The five-band AMQ-2-5 quad is list priced at $299.95. In addition, Antenna Mart makes four- and five-element multiband quads (sone big monsters!), and also a low-angle, dual-driven-element quad. There are two versions of the antenna switch—one for six antennas ($289) and one for nine antennas ($389). They and the quads are manufactured by Antenna Mart, P.O. Box 699, 8 Shiloh Drive, Loganville, GA 30249 (phone 1-404-466-4352, FAX 1-404-466-3095).

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3K PREMIER console. 2000 W PEP, 160 to 15 meters, 1.8 to 30 MHz.

3KD PREMIER desk top. 2000 W PEP, 160 to 15 meters, 1.8 to 30 MHz.

2002-A desk top. 1200 W SSB, 400 W continuous operation, 144 to 148 MHz. (100 to 300 MHz available on commercial models).

2002-A desk top. 1200 W SSB, 400W continuous operation, 220 to 225 MHz.

2006-A desk top. 1200 W SSB, 400 W continuous operation, 50 to 54 MHz. (30 to 100 MHz available on commercial models).

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3004-A console. 2000 W SSB, 1000 W continuous operation, 430 to 450 MHz.

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CIRCLE 147 ON READER SERVICE CARD

What could possibly send some amateurs into a state of frenzied anxiety besides a weak signal calling CQ from a scrimpet of rock on the other side of the globe? A man in a red-checkered flannel shirt with wide suspenders and the sound of a chain saw.

Oh No! Not My Antenna!

BY TOM WAYNE*, WB8N

It was early in the morning (8 o'clock is early for me) and I was just relaxing in the shack, scanning the HF bands for anything that sounded interesting. Suddenly my dog Carmen began barking furiously! From the way she was barking, she must have thought that something dastardly was about to happen, and as it turned out, she was right!

I decided to see what was upsetting my dog to such an extent. I went to a window, and below I saw a power-company truck parked in front of my next-door neighbor's house. Two linemen were at the door talking to my neighbor. She is an old-maid retired school teacher and lives with her elderly mother. Being the summer, the window was open and I could hear bits and pieces of the conversation below. I was about to go back to my rig, passing this off as inconsequential, when I heard the words "tree" and "come down." These ominous words caused me to get more fully dressed than I was and rush outside to investigate this matter further.

The reason for my concern was that my neighbor had one huge oak tree in the rear of her yard, to which one end of my 130 foot wire antenna was attached.

When I got outside, the linemen were in the rear of my neighbor's yard, staring up into the oak tree. I hesitantly asked them what was going on, and they informed me that my neighbor was having the tree cut down due to it being badly rotted. They were there to disconnect the power lines that ran in the path of where the tree would, with luck, fall.

Clandestine Operations

Oh no! Not my antenna tree! Heaven forbid! How hard I had worked, schemed, and plotted about a year before to get the wire up in that tree, some 50 feet above ground. It had never entered my head that the big tree might someday come down.

I had wanted my wire to be as inconspicuous as possible, so it had light-blue colored insulation to blend with the sky. Not that the sky is all that blue every day, but one can hope. I had not asked my neighbor's permission to put the wire up in her tree, and had never even told her about it. I did not feel she would be very understanding of my antenna needs, so I just didn't bother. Neighbors can be kind of funny about things like that, as many of us well know.

I had waited until dusk on a fine spring evening, leaned my rickety old wooden ladder over the chain-link fence from my yard to the tree, and climbed into the branches to secure the wire. I then ran the wire across my yard and out to another fine tree on the lawn of my other next-door neighbor. This neighbor is also elderly and lives alone, so I hadn't wanted to disturb her with the boring details of what I wanted to do either. Again at dusk I climbed that tree and secured the other end of the wire—a very clandestine operation, I'm sure you will agree.

The 50 ohm coaxial feedline was attached to the wire at a point which was one-quarter wavelength of 10 meters, which just happened to be where the wire crossed the property line of the neighbor who lives alone. I had observed her on several occasions, after the installation, standing in her yard, gazing up at my wire curiously, but she never asked me about it. She did ask my father once when he stopped over to care for the dog while my wife and I were away, but he just feigned ignorance of the whole thing. Good old Dad!

What To Do?

What a predicament I now faced! I was about to lose the support for one end of my antenna. How was I going to work DX, let alone local stations? My wire had performed well for me, getting me contacts all over Europe, South America, South Africa, New Zealand and Australia, and even the Far East. It was directional, toward the southwest and northeast, but worked fairly well off the ends, toward the southeast and northwest also. I just knew that any change from what was up in the air would not perform nearly as well as this antenna had for me. It would be only mediocre at best compared to what I had become accustomed to.

The contractor who was to take down the tree arrived along with his crew. I had to let them know about my wire before the tree came down with the wire attached. I had visions of the tree falling, pulling the wire with it, and in turn causing my rig to smash violently against the inside wall of my shack. What a ghastly thought!

As the crew prepared to fell the giant oak, I got the attention of one of them. I explained the situation to him, and he graciously consented to climb the tree and unfasten the wire for me. He let it down gently, causing it to lay across my garage roof. They then proceeded to top the tree and cut it down. The felled tree was sawed up and hauled away—without my getting any firewood out of the deal, I might add!

A Time For Action

I was now without my antenna. Immediate action was called for, and it looked as though there was to be more tree climbing in store for me. Heights do not bother me. I work as a fire fighter, so they had better not. However, I'm not getting any younger, and climbing some 30 or more feet into a tree, stretching and twisting among the branches, is not one of my favorite activities. It had to be done, though, and no one else was going to do it.

This called for some planning. I went into the house and got a cold beer. I then began to study the situation. There was an old pine tree at the rear of my yard, but it leaned some 30 degrees to one side. I was afraid that during a storm it would be uprooted and fall over the rest of the way, so that option was out. That left the one remaining tree in my yard—a fair-sized oak located about in the middle of the backyard. The only problem, and the reason I hadn't put the wire up in that tree in the first place, was that it would have shortened the length of the wire by about 40 feet. My thinking was the longer the better, but now I had no choice.

Up, Up, and Away

Nothing was getting accomplished by my standing there looking up at the tree, so up I went with a lightweight rope secured to the end of my wire, an insulator, vice grips, a saw, and the hope that I wouldn't

*740 Adams Street, Bedford, OH 44146-3751

fall out of the tree and break my neck—or worse! As I climbed, I sawed off a few branches that would be in the way of the wire as I pulled it into the tree. I managed to get about 35 feet into the tree, and by reaching a few feet higher, I secured the wire and insulator with a piece of nylon rope I had stuffed into my pocket. I let approximately 30 feet of wire dangle down towards the ground, and I later secured that wire with an insulator and nylon rope tied to a stake in the ground. Hopefully, this would somewhat make up for the shortening of the antenna.

I had no idea how well this configuration was going to work. After having a couple of well-earned cold ones, I went up to the shack, my dog Carmen, almost as anxious as I, racing ahead of me.

The Test

Now to see if I could tune this new antenna arraignment. I turned on the rig with more than just some trepidation. Keying up (into a dummy load, of course), I carefully began adjusting the antenna tuner, painstakingly striving for the lowest possible SWR on each band. Remarkably, and to my pleasant surprise, all the bands tuned up pretty much as they had before. Nothing was higher than a 2 to 1 match, and average was about a 1.5 to 1 match. I couldn't tune up on 160 meters, but then I couldn't before either, so nothing lost, nothing gained there, I figured.

Of course, the real test would be what DX I would be able to work. Over the next several days, whenever I could take the time I slipped into my shack and attempted to work any and all DX I could hear. Much to my surprise and pleasure I was successful in almost all of my attempts. I have since worked pretty much the same areas of the world that I was able to work before. I haven't noticed any diminished reception, or reports on my signal. I don't know if the dangling section of the antenna has helped or not. Only more operating will tell, I guess.

When All Is Not Said, But Done

In retrospect, everything worked out rather well, considering the day had started out as a potentially disastrous one. The neighbor lady whose tree was cut down never did find out about the wire attached to her tree, and my other neighbor still does not know what in the heck is the purpose of the wire that's attached to her tree. She has not yet asked, and I am not volunteering any information. In the future, however, I will be keeping a wary eye peeled for anyone who even remotely resembles a lumberjack lurking around the immediate area of my QTH. Paul Bunyun look-alikes—beware!

- All mode operation 10-150 watts including 6 meters.
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Here's a single-shot device that's guaranteed to reach new heights. While there's no license or waiting period required, caution should be taken in its proper use.

The A1M1 Magnum Slingshot

BY HILLAR RAAMAT*, N6HR

The trusty wrist-supported slingshot with a fishing-reel spool attached has been the tool of choice for erecting many treetop wire antennas. Alternative methods of getting a wire over a tree, other than making like a monkey or hiring helicopters, have been fishing poles, rock slings, hammers, tomahawks, crossbows, and other assorted weaponry with strings attached. Having moved into the Great Northwest recently, I settled into a QTH partially surrounded by nice antenna trees, including some real beauties which were the leftover firs and spruces from clear-logging of years ago. In 50 years these saplings have grown to be 120 to 150 feet tall, straight as arrows, and are just ideal for supporting serious wire antennas.

Problem: How to get something stringy over such a tall tree.

Solution: A homemade magnum slingshot!

The materials are minimal: One 6 foot stepladder; the "Vee" or "U" part from a handtowed golf caddy; 6 feet of ½ inch heavy surgical-rubber tubing (sold in most larger hardware stores); a piece of leather; and some hose clamps. Fasten the Vee of the golf caddy to the stepladder, cut the tubing into two 3 foot pieces, and hook up the tubing to the Vee arms with the hose clamps. The leather strap between the tubing will hold the "ammo."

The "ammo" consists of a two-ounce lead sinker and a reel of 40 lb. monofilament fishline. Roll the spool of monofilament line around a highway caution cone (one of those emergency orange jobs), then spray the line with WD-40 (the fir trees have pitch, which will freeze the line!), and tie one end of the line to the sinker and the other end to the cone or the ladder. Then feed the line and sinker over the ladder and the Vee slot into the leather pocket. Now aim this contraption at the target tree so it will shoot over the treetop, pull, and watch the sinker take flight! Oh, yes—make sure it's a calm day!

In two years of "shooting" treetops here for myself and local fellow amateurs, I can vouch for the following: the 2 ounce sinker will clear the top of a 150 foot tree and go another 50 to 100 feet before descending on the other side with the line attached. *A hint:* Spray paint the sinker orange or some other bright color, or you'll have a hard time finding it in the tree branches or underbrush. If the sinker doesn't come down right away, no problem. Let nature help you with a little breeze. As long as the sinker is heavier than the line, gravity will bring it down!

Then comes phase two of the operation. Attach the monofilament line to a roll of 160 lb. light nylon cord and pull that over the tree. Then the 160 lb. cord will pull 3/32 or ⅛ inch stainless steel cable, and that cable is adequate to hold up most wire antennas. I don't use any knots or clamps, but fasten the cords or cables to each other by overlapping them a foot or more and wrapping the resultant parallel joint with glass tape. The glass tape is sticky enough and strong enough not to let go. I also dab the front part of the junction with axle grease. As I said before, that pine pitch in the trees can be sticky!

Follow the same procedure at the other tree which will support the other end of the antenna, if needed.

*P.O. Box 213, Greenbank, WA 98253

The A1M1 slingshot as described in the text. The highway cone in the front spools the monofilament line. Two of the weights can be seen on the second rung down of the ladder.

In any wind the tree and the antenna will sway vehemently when a gust hits. Therefore, only one end of the antenna should be anchored. The other end should be allowed to "give" by being fastened to a counterweight or whatever else might be suitable. I let the "loose" end go over a pulley and counterweigh it with a 10 lb. lead sinker. (A bunch of bricks will do.) Don't use any plastic water bottles; when the water leaks out, you loose your antenna! Allow the counterweight plenty of play, since a 150 foot tree can easily sway 20 feet at the top.

For antenna wire use nothing less than copper-clad steel, as plain copper will stretch, work-harden, and break. The com-

Ameritron *doubles* average SSB power . . .

NEW AL-80B kilowatt output desktop linear can double your average SSB power output with high-level RF processing . . . it also runs cooler because its Eimac 3-500Z tube completely turns off between words . . .

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The guts of the AL-80B is its heavy ***heavy*** duty power supply. A 26 pound transformer using a high silicone steel core, computer grade capacitors, heavy duty bleeders and ten 3 amp. 1000 V power rectifiers give you a stiff 2700 volts fully loaded. Many amplifiers using *two* 3-500Zs use such small power supplies they don't deliver much more power output than the AL-80B.

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You get three tough vertically mounted 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC, standby switch, transmit LED, UPS shippable and much more.

Select the 3 tube 600 watt out AL-811, $649 -- or the new 4 tube 800 watt out AL-811H, $795.

70% efficiency

The AL-80B is built on a rugged steel chassis. It has a separate RF compartment that's fully shielded to keep RF from leaking out. This keeps RFI and TVI to a minimum.

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A whisper quiet internal fan draws in cool air over power supply components and pressurizes the 3-500Z tube compartment to remove heat for longest life.

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A 50 ohm broadband Pi-Network *tuned input* is used.

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A carefully designed Pi/Pi-L output network using the optimum Q for each band gives you exceptionally smooth tuning, extremely wide matching range, full band coverage and peak performance at all power levels.

Has ball bearing vernier reduction drives with logging scales on plate and load controls.

Step-Start Inrush Protection™

Step-Start Inrush Protection™ stops damaging inrush current with a start up sequence that's *easy* on your tube and power supply components.

Multi-Voltage Power Transformer

Ameritron's exclusive *Multi-Voltage Power Transformer* lets you optimize for different line voltage. You can select from 14 different *primary* voltages from 90 to 140 VAC and 205 to 250 VAC.

Dual Illuminated Cross-Needle Meters

Ameritron's dual illuminated cross-needle meters give you *four separate meters* to monitor your operating conditions -- you can tell right away if something is wrong.

QSK Compatible

The fast *custom* T/R (transmit/receive) relay in the AL-80B switches nearly as fast as some vacuum relay QSK T/R switches.

For *lightning fast* QSK operation use the optional external Ameritron *electronic PIN diode* QSK-5 T/R switch or the internal QSK-5PC. Please contact Ameritron for details.

Plus more . . .

An *Standby* switch lets you run barefoot, but you can instantly switch to full power if you need it.

Has transmit LED; 12 VDC, 200 mA jack; 12 VDC keying relay for solid state and tube rigs; tough, nearly indestructible Lexan-over-aluminum front panel. Two year limited warranty.

AMERITRON offers the best selection of legal limit linears!

These 3 rugged linears all use a super heavy duty hypersil® power supply capable of 2500 watts!

Ameritron's most powerful amplifier

AL-1500 **$2695.00** Suggested Retail

Ameritron super power amplifier uses the herculean Eimac® 8877 ceramic tube.

It's so powerful that 65 watts drive gives you full legal output—and it's just loafing because the power supply is capable of 2500 watts PEP.

Ameritron's Dual 3-500Z linear

AL-82 **$2095.00** Suggested Retail

This linear gives you full legal output using a pair of Eimac® 3-500Zs. Some competing linears using dual 3-500Zs don't give you 1500 watts because their lightweight power supplies can't use the tubes to their full potential.

Ameritron's 3CX1200A7 linear

AL-1200 **$2195.00** Suggested Retail

Get ham radio's toughest tube with the Ameritron AL-1200—the Eimac 3CX1200A7. It has a 50 watt control grid dissipation—12 times tougher than the 4 watt rating of the 3CX800A7—yet you get the same full legal output as you get from a *pair* of 3CX800A7s.

AMERITRON brings you the finest high power accessories!

Legal limit antenna tuner

ATR-15 **$399** Suggested Retail

Ameritron — *the high power specialist* — brings you the ATR-15 antenna tuner that's designed for legal limit amplifiers. Heavy duty silver plated bandswitch virtually eliminates switch failure. High power transmitting capacitors. 1.8-30 MHz. Peak reading SWR/wattmeter. 6 position antenna switch. Selectable 1:1 or 4:1 balun. 5¼ x 13¼ x 13½ inches. Meter lamps uses 12 VDC.

Legal Limit Dummy Load

Oil cooled 50 ohm dummy load. Handle 1500 W for 5 min. SWR under 1.2 up to 30 MHz. Low SWR to 400 MHz. 7½" H x 6 5/8" D. **ADL-1500X** without oil, $39.95. **ADL-1500** with oil, $59.95

ADL-1500X **$39.50** Suggested Retail

Remote Coax Switches

RCS-8V **$149** Suggested Retail

RCS-8V, DC-UHF 5 KW Coax Switch. Replace 5 coax feedlines with one with this Remote Coax switch. Weatherproof box mounts outdoors on your tower or mast. Attractive control unit sits on your operating desk. Low SWR to 250 MHz. Usable to 450 MHz. Low loss. Rated at 5 KW to 30 MHz, 1 KW at 150 MHz. **RCS-8VN, $159.00** with "N" connectors.

RCS-4, $134.00, 4 position HF switch. Similar to RCS-8V. No control cable needed. Handles 1500 watts continuous.

RCS-4 **$134.50** Suggested Retail

QSK-5 Pin Diode T/R Switch

$349 QSK-5 Suggested Retail

Self-contained, connects externally to most HF amplifiers. Handles 2.5 KW PEP, 2 KW CW. Six time faster then vacuum relay. 6x4x9½ inches.

Step-Start Inrush Current Protector

Stops power up inrush current and absorbs momentary high voltage spikes to your amplifier. ICP-120 for 110-120V or ICP-240 for 220-240 VAC.

ICP120/240 **$79** Suggested Retail

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CIRCLE 5 ON READER SERVICE CARD

"Ready on the right." Here the author assumes the correct firing stance to launch the projectile. The hard hat is a very good idea, especially at this demonstrated firing angle.

mercially sold "flex-wire" might be okay, but the QTH here is in a saltwater environment, and the last roll of flexwire did not hold up because of corrosion. I just use stainless-steel aircraft or marine cable, and antennas made of these materials have held up. Present antennas include a halfsquare for 80/160 and a multi-element bobtail for 40/80. I don't have the right tree growth for a rhombic, but it's been thought of.

Last but not least, as with any high-energy tool, **be safe**. Use caution and protective clothing and headgear. That 2 ounce lead sinker has plenty of sock to it. It can be dangerous if mishandled! ■

MFJ TUNERS

MFJ's world famous 3 KW Antenna Tuner

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 antenna 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, 3 digit turns counter and spinner knob gives you *exact* inductance control for absolute minimum SWR.

Ball bearings on steel shafts give you a velvet smooth vernier feel and long term durability.

You won't have arcing problems with this roller inductor. Firm springs put high pressure on a plated contact wheel for excellent electrical contact.

Wide, low inductance straps are used for high currents and a new core minimizes RF loss.

$349.95 MFJ-989C

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 readings from 1.8 to 30 MHz.

Super Heavy Duty Balun

You get a super heavy duty current balun for balanced lines. It has two giant 2½ inch powder iron toroid cores and is wound with *Teflon*® wire connected to high voltage ceramic feedthru insulators. It lets you operate high power into balanced feedlines without core saturation or voltage breakdown.

Ceramic Antenna Switch

A two wafer 6 position *ceramic* antenna switch with extra large contacts gives you trouble free switching.

Plus much, much more

You also get a 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. 10¾x4½x15 in.

Don't settle for less, get yours today!

More hams use MFJ tuners than all other tuners in the world! Why settle for an imitation when you can have the real thing?

MFJ's *deluxe* 300 Watt Tuner

MFJ-949E **$139.95**

More hams use the MFJ-949E than any other antenna tuner in the world! **Why?** Because you get 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.

New 8 position antenna switch lets you pre-tune into dummy load to minimize QRM.

The inductor switch is designed for high RF voltages and currents--it's not a *plastic* switch made for small signals and wired with *tiny* gauge wire.

Each MFJ-949E cabinet is chemically treated and has a new tough scratch-proof *vinyl* cladding -- not paint that can scratch or chip off. You won't find a tougher, longer lasting finish anywhere.

MFJ's *versatile* 1.5 KW Tuner

MFJ-962C **$229.95**

Use your barefoot rig now and have the capacity to add a 1.5 KW PEP amplifier later! Lighted Cross-Needle SWR/Wattmeter. 6 position antenna switch, *Teflon*® wound balun, ceramic feedthru insulators for balanced lines. 1.8-30 MHz. 10¾x4½x14⅞ in.

MFJ's *portable/QRP* Tuner

MFJ-971 **$89.95**

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, *30/300 or 6 watt QRP* ranges. 6x6½x2½ in.

MFJ's *super value* Tuner

MFJ-941E **$109.95**

The new MFJ-941E gives you a 300 watt PEP tuner with *lighted* Cross-Needle Meter that covers everything from 1.8-30 MHz for an incredible $109.95.

Antenna switch selects 2 coax lines (direct or thru tuner), random wire, balanced line or external dummy load. 4:1 balun. 1000 volt capacitors.

2 Knob *Differential-T*™ Tuner

MFJ-986 **$289.95**

The 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. 3 KW PEP. 1.8-30 MHz.

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

Lighted Cross-Needle Meter reads SWR/forward/reflected/*peak*/average power in 2 ranges. Current balun reduces feedline radiation and forces equal currents into unbalanced antennas.

MFJ's *mobile* Tuner

MFJ-945D **$89.95**

Don't leave home without this mobile tuner! Let the MFJ-945D extend your antenna bandwidth so you don't have to stop, go outside and adjust your mobile whip.

Small 8x2x6 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 *smallest* Versa Tuner

MFJ-901B **$59.95**

The MFJ-901B is our smallest --5x2x6 inches --(and most affordable) 200 watt PEP tuner -- when both your space and your budget is limited. Great for matching solid state rigs to linear amps.

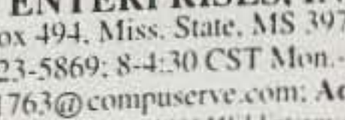
MFJ's *random* wire Tuner

MFJ-16010 **$39.95**

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 2x3x4 inches.

MFJ's VHF or UHF Tuners

MFJ-921 or MFJ-924 **$69.95**



MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 in. Simple 2-knob tuning for mobile or base.

MFJ's *artificial* RF Ground

MFJ-931 **$79.95**

Creates artificial RF ground. Eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

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MFJ . . . making quality affordable

CIRCLE 172 ON READER SERVICE CARD

Do you have a couple of big trees hanging around doing nothing? N4PY shows us how to make good use of them with his multiband antenna project.

A DX Antenna For 160, 80, 40, And 30 Meters

BY CARL J. MORESCHI*, N4PY

Most wire antenna designs center around a scheme to yield a natural 50 ohm feed point. The matching system is usually the primary goal and the radiation pattern the secondary goal. In this antenna I set out with the radiation pattern being the primary goal.

The antenna is a top-loaded electrical 3/8-wave vertical for 160 meters, a top-loaded quarter-wave vertical for 80 meters, an electrical half-wave vertical for 40 meters, and a half-wave vertical for 30 meters. The antenna is a vertical with a 45 foot vertical radiator, a special trap at the top, and a 70 foot straight-wire top hat across the top. I also have a modest ground system comprised of sixteen 80 foot radials buried about 1 to 2 inches in the ground (see fig. 1).

The trap is made up of an inductor and capacitor in series with another inductor across the series capacitor and inductor (see fig. 2).

Feeding is accomplished with a specially constructed match box or a commercially purchased automatic outdoor antenna tuner. The match box is placed outdoors at the base of the antenna.

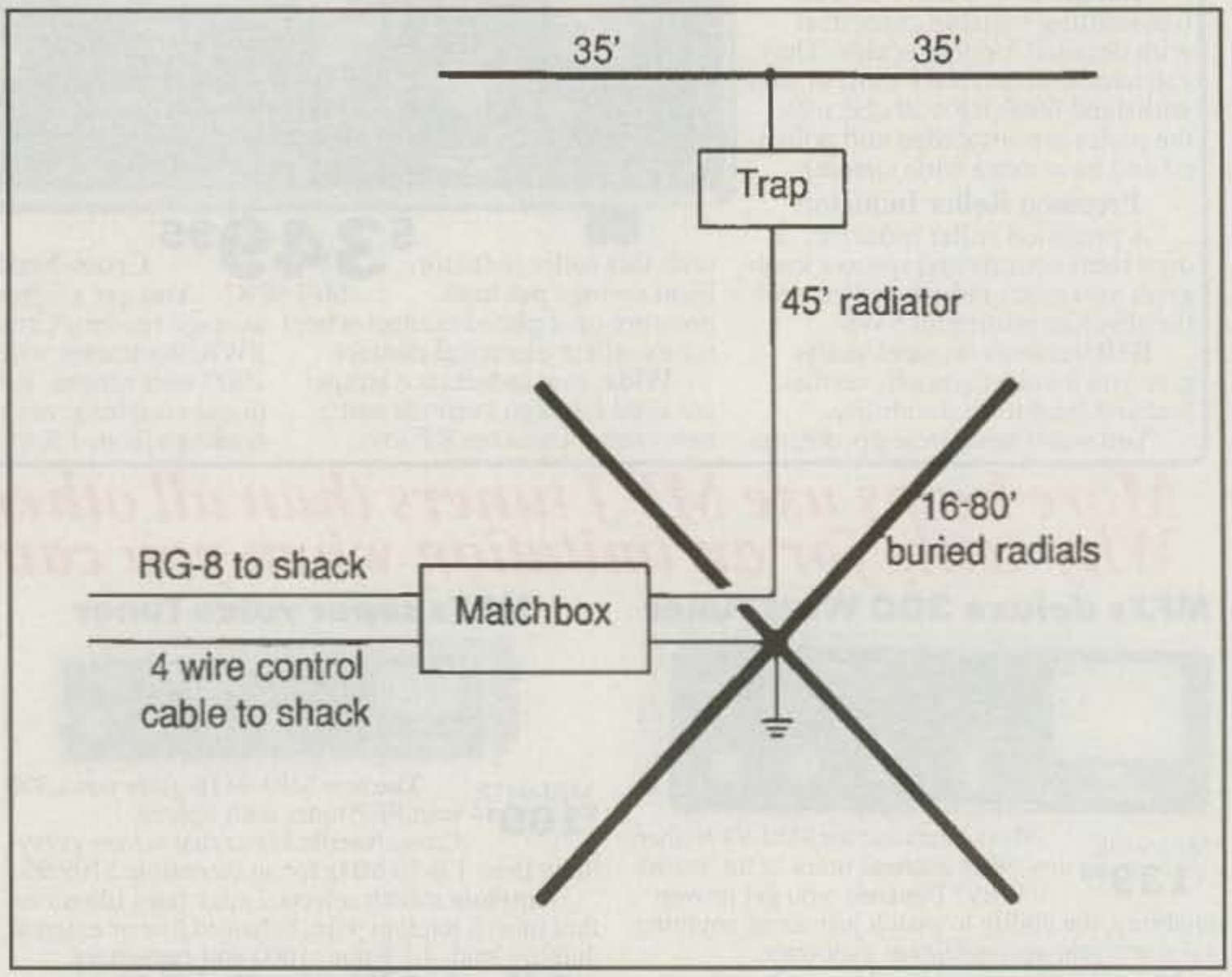


Fig. 1– The overall antenna configuration.

Theory of Operation

For 160 meters, the trap forms an equivalent loading inductor that causes the 70 foot top hat to make the overall antenna appear as a 3/8-wave vertical. The impedance of the antenna at the feed point becomes 50 ohms plus some inductive reactance. By making the antenna 3/8 wave, the typical short vertical problem of the radiation resistance being only a few ohms is solved. This means efficiency is much higher and matching is accomplished simply with a series capacitor to cancel the inductive reactance.

For 80 meters, inductor L1 and capacitor C1 in the trap are resonant, causing the top hat to be connected directly to the vertical radiator. This causes the overall antenna to be an electrical quarter-wave antenna and present approximately a 50 ohm direct match at the feed point.

For 40 meters, the trap values are such that the top hat is almost completely disconnected from the vertical radiator, leaving just enough connection to yield the equivalent of a half-wave radiator. The antenna presents a very high impedance at the feed point and is matched with a simple LC "L" network.

For 30 meters, the trap values completely disconnect the top hat from the vertical radiator. This leaves the vertical section as a half-wave vertical. Similar to 40 meters, the antenna presents a very high impedance at the feed point and is matched with a simple LC "L" network.

Construction Details

The trap is constructed on a 4.5 inch PVC pipe core cut approximately 10 inches long. On this core I wound inductors L1 and L2. Inductor L1 is 76 microhenries and is made up of 21 turns of 17-gauge enamel wire wound as closely and tightly as reasonably possible. Inductor L2 is

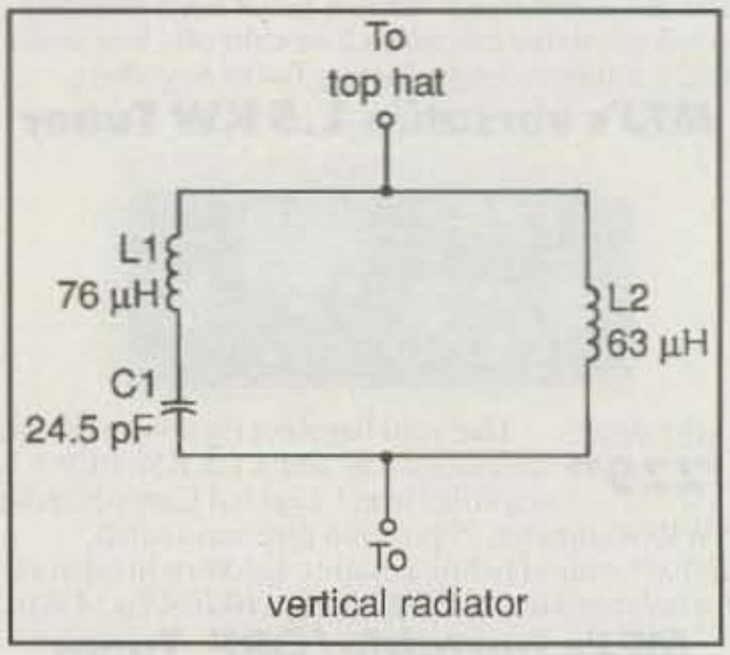


Fig. 2– Schematic diagram for the trap.

*Route 3 Box 260, Franklinton, NC 27525

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground or radials

Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters -- with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives you high efficiency for more power radiated. The result? Stronger signals and more Q-5 QSOs.

Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

Full size performance is achieved by using separate full size radiators for 2 through 20 Meters and highly efficient end loading for 30, 40 and 75 /80 Meters.

You get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR and it handles 1500 watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

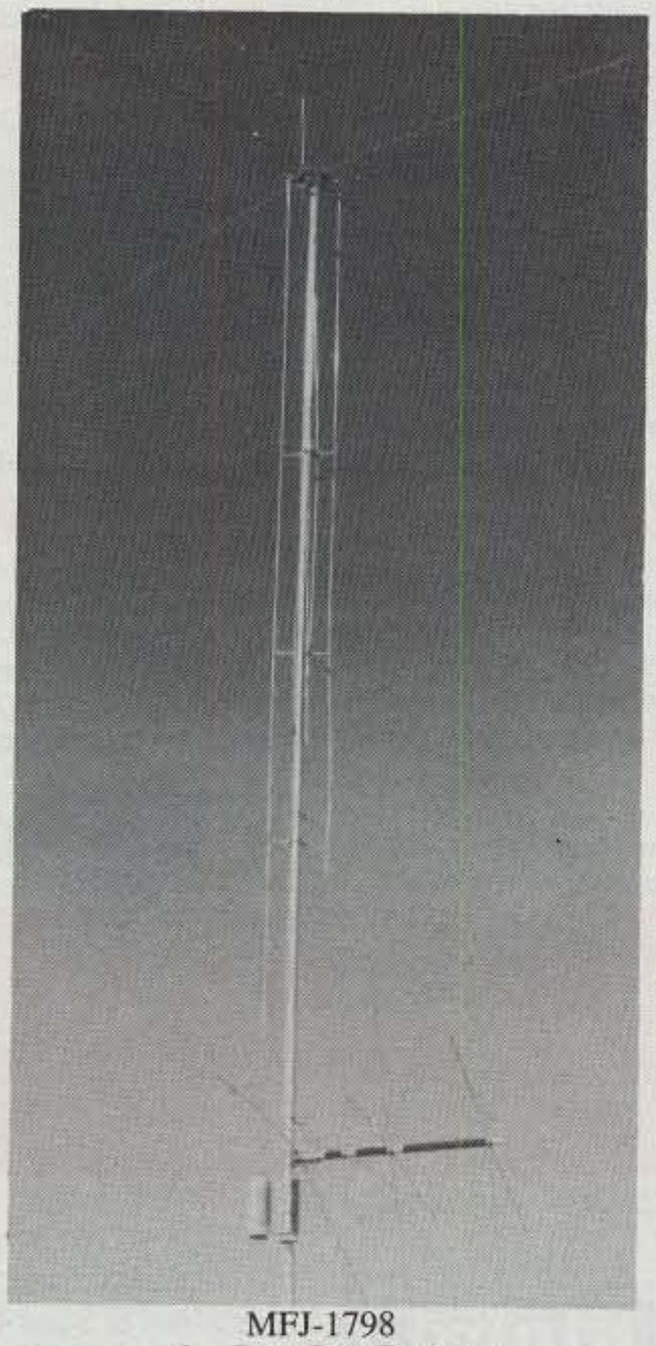
It's easy to tune because adjusting one band has minimum effect on the resonant frequency of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- on small lots, backyards, apartments, condos, roof tops, tower mounts.

Separate *Full Size* Radiators

***Separate** full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.



MFJ-1798
$269.95

This forms a very large equivalent radiator and gives you incredible bandwidths.

These radiator stubs provide automatic bandswitching -- there is absolutely *no loss* due to loading coils or traps.

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with Teflon® coax and *can't* saturate, no matter how high your power.

Built to Last

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is used in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant Teflon® covered wire.

Teflon® is registered trademark of Dupont

MFJ *Super Hi-Q Loop*™

MFJ-1786
$299.95

MFJ's *tiny* 36 inch diameter *high efficiency* loop antenna lets you operate 10 to 30 MHz *continuously* -- including the WARC bands!

It's ideal where space is limited -- apartments, small lots, mobile homes, attics, motor homes.

Enjoy both DX and local contacts when you mount it vertically. You get *both* low angle radiation for excellent DX *and* high angle radiation for local close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ-1786 *Super* Remote Control has *Auto Band Selection*™. It auto-tunes to your desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune push buttons and built-in two range *Cross-Needle* SWR/Wattmeter lets you quickly tune to your exact frequency.

All *welded* construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter *round* radiator -- not a lossy thin flat-strip -- gives you highest possible efficiency.

Each plate in MFJ's *superb* tuning capacitor is welded for low loss and *polished* to prevent high voltage arcing. It's welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches and a continuous *no-step* DC motor for *smooth precision* tuning.

A heavy duty 1/8 inch thick ABS plastic housing with ultraviolet inhibitors protects it.

MFJ-1782, $269.95. Same as MFJ-1786 but remote control has only fast/slow tune buttons.

Super 80/40M Vertical

MFJ-1792
$159.95

Designed as a *high performance* antenna for 80 and 40 Meters, the MFJ-1792 features a *full size* quarter wave radiator for 40 Meters - - that's a full 33 feet of ruthless radiating power.

End loading -- the most efficient form of loading -- is used for 80 Meters. It's accomplished by a virtually lossless 4½ foot capacitance hat and a high-Q coil wound with Teflon® wire on a *low-loss* fiberglass form.

The *entire length* radiates power.

High strength 6061-T6 aluminum tubing, super strong solid fiberglass insulator, *Frequency Adaptive L-Network*™, heavy duty *swing* mount. Handles 1500 watts PEP. Requires guying and radials, counterpoises or ground screen.

MFJ-1793, $179.95. Same as MFJ-1792 but includes *full size* 20 Meter quarter wave radiator.

Box Fan Portable Loop

MFJ-1780
$229.95

No, it's not a fan -- it's a high efficiency portable loop antenna that's about the same size and shape as a 2x2 foot box fan, complete with carrying handle.

Carry it like a suitcase, tuck it in a corner of your car or check it as baggage on a plane.

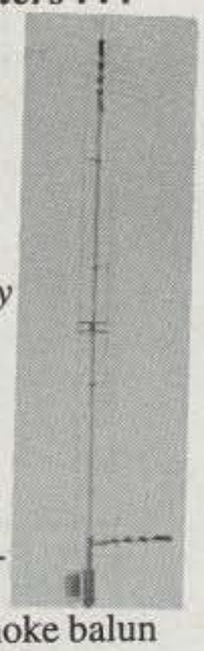
When you get there, set it on a table or desk and enjoy ragchewing or DXing.

All welded construction, covers 14-30 MHz *continuously* including WARC bands, handles 150 watts. Remote control has fast/slow tune buttons. Separate control cable not needed.

MFJ *halfwave* Vertical

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

MFJ-1796
$199.95



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! Mount it anywhere from ground level to tower top -- on apartments, condos, small lots, even motor homes. Perfect for vacations, field day, DX-pedition, camping.

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.

Automatic bandswitching, low radiation angle, omni-directional, handles 1500 watts PEP. Goes together in an afternoon.

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63 microhenries and is made up of 17 turns of 17-gauge enamel wire also wound as closely and tightly as reasonably possible. I left about an inch gap between the two inductors on the core. The capacitor is 24.5 picofarads and is simply an 11 inch piece of RG8 coax. See fig. 3 for trap construction details.

Once the trap is constructed, capacitor C1's length should be adjusted with a dip meter to provide resonance approximately 150 kHz higher than the desired 80 meter operating point. For my operation I adjusted C1 for a dip-meter resonance at 3670 kHz. This provided a 1.1 SWR at 3520 kHz. The 2 to 1 SWR bandwidth on 80 meters is about 50 kHz. It is important to note that the two inductors should **not** be adjusted, but simply left at the stated values. The entire trap should then be placed inside a water-tight container (at least water tight from the top). I used a large 2 liter, plastic soft-drink bottle. I cut the bottom off and placed the trap assembly inside the bottle. The wires enter and exit the trap through the bottom of the bottle. I bolted an 18 inch 1 × 2 piece of wood to the side of the bottle. This provides strain relief and a tie point for the trap.

The top hat is simply a 70 foot wire. The top-hat wire and vertical radiator are 14-gauge insulated wire. I used three trees that were each about 50 feet tall and separated by about 50 feet each to set up my antenna. I made halyards that go over the tops of the two end trees to support the ends of the top hat. I put another halyard over the center tree that attaches to the top of the trap for the center support of the antenna. At the bottom of the radiator I built a special relay-switched match box to select the desired band of operation.

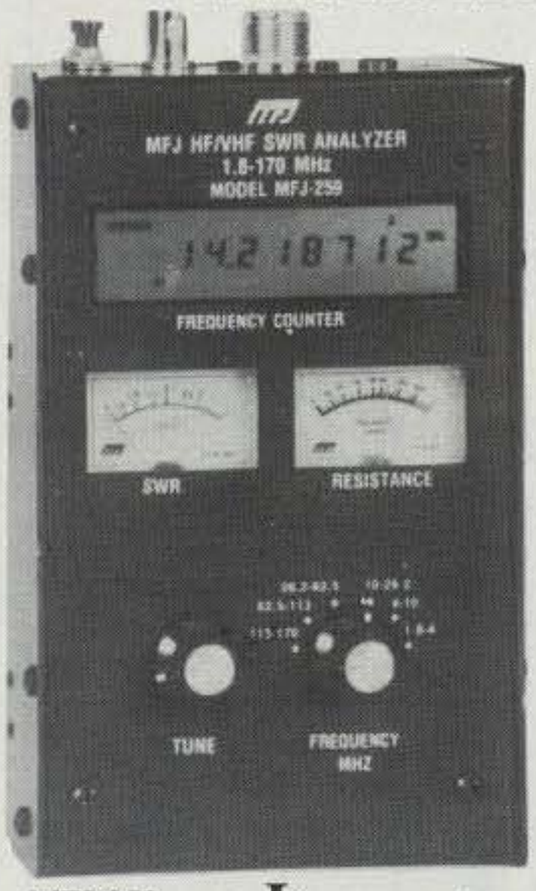
Match Box Construction Details

Feeding this antenna on the four bands requires the use of a selective match box of some type. The match box must be at the base of the antenna and therefore must be weatherproof. One very simple method (although quite costly) is simply to purchase an automatic antenna tuner and place it at the base of the antenna. I chose to build my own match box. It is built inside a metal ammunition box that provides excellent weatherproofing and RF shielding. I used four Radio Shack DPDT 12 volt relays with 10 amp contacts (Radio Shack catalog number 275-218) to select the desired band. I have a four-wire cable that runs from the match box to a rotary switch in my shack. I used a Radio Shack six-position rotary switch, catalog number 275-1386. The control cable can be any four-wire or more light-duty TV rotor control cable.

The 16 buried radials are soldered to

MFJ *HF/VHF* SWR Analyzer™ with RF Resistance Meter

Read your antenna SWR from 1.8-170 MHz . . . 10-digit LCD frequency counter . . . RF Resistance Meter™ . . . smooth reduction-drive tuning . . . simple-to-use . . .



MFJ-259 **$219.95** If you work with antennas, MFJ's revolutionary new *SWR Analyzer*™ is the best investment you'll ever make! Now you can diagnose a wide range of antenna problems instantly with one easy-to-use instrument.

What the MFJ-259 Does

The MFJ-259 gives you a complete picture of your antenna's performance anywhere between 1.8 and 170 MHz -- you can even check SWR outside the ham bands without violating FCC rules. Set the bandswitch and tune the dial--just like your transceiver. SWR is displayed instantly!

RF Resistance Meter™

Does 2:1 SWR mean 25 ohms or 100 ohms? *The new MFJ-259 tells you at a glance!*

Now you can measure RF resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's *exclusive* side-by-side RF Resistance and SWR Meters!

Take the guesswork out of building matching networks and baluns for your antennas.

Watch the effects of spacing on radiation resistance as you adjust your antenna.

Here's What You Can Do . . .

Find your antenna's true resonant frequency from the shack.

Tune the antennas on your tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss.Test RF chokes, transformers, baluns.

Adjust your tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259 is really *four* test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter, *RF Resistance Meter*™ and an *SWR Analyzer*™.

Free Manual

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand! **For** free manual write or call MFJ.

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MFJ SWR Analyzers™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Professional installer and technicians use them worldwide.

Get More by Paying Less

With the MFJ-259, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, a high accuracy frequency counter and MFJ's exclusive *RF Resistance Meter*™-- all for a low $219.95.

1.8-170 MHz *SWR Analyzers*™

MFJ-249 **$199.95** **MFJ-249** *HF/VHF SWR Analyzer*™ has all the features of MFJ-259 but less RF resistance meter. Includes 1.8-170 MHz *continuous* coverage, 10-digit LCD frequency counter and smooth vernier tuning.

MFJ-209 **$109.95** **MFJ-209** *HF/VHF SWR Analyzer*™ is same as MFJ-259 without LCD frequency counter and RF resistance meter. Has jack for external frequency counter. MFJ-249/MFJ-209 are 4x2½x6¾ inches and uses 8 AA cells or 110 VAC with MFJ-1312B, $12.95.

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MFJ-66 **$19.95** **Plug** a dip meter coupling coil into your *MFJ SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter.

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10-160M *SWR Analyzer*™

MFJ-207 **$79.95** **If** you're an HF man, this compact MFJ-207 *HF SWR Analyzer*™ will help you build 10-160 Meters antennas that'll make working DX almost routine.

Just plug in your coax to find the SWR of any HF antenna on any ham band 10-160 Meters. Has jack for external frequency counter. 7½x2½x2¼ inches.

2 Meter *SWR Analyzer*™

MFJ-208 **$79.95** **MFJ-208** 2 Meter *VHF SWR Analyzer*™ finds the SWR of any antenna from 138-156 MHz. Jack for external frequency counter. 7½x2½x2¼ inches.

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Has detachable coupling coil, dual FET oscillator, op-amp meter amplifier and jack for external frequency counter. 7½x2½x2¼ in.

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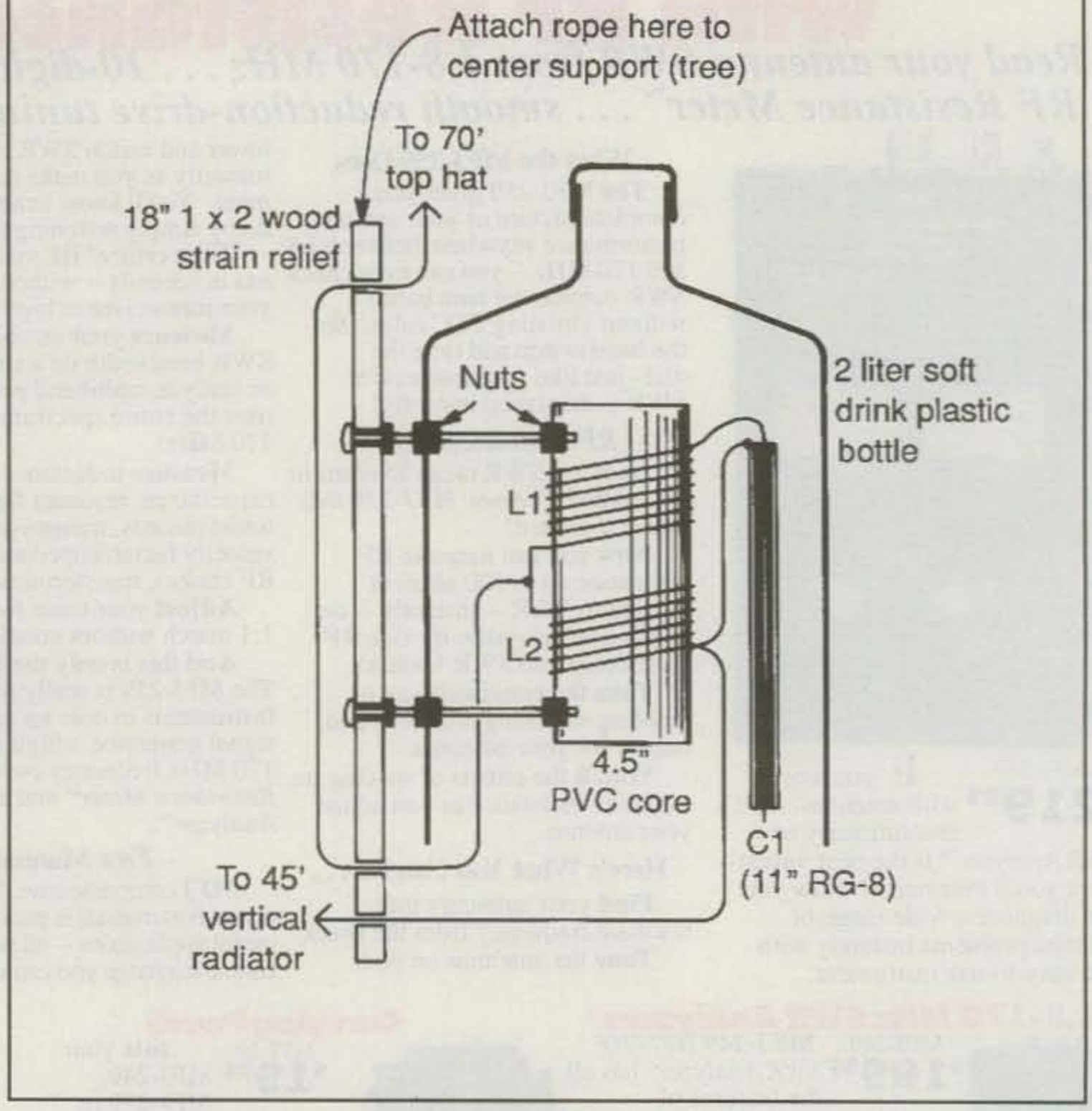

Fig. 3– Mechanical details for constructing the trap.

the outside of the match box. Idrilled a small ½ inch hole in the box and glued a piece of wood on the inside to cover the hole. I then drilled a hole in the center of the piece of wood just large enough to bring the vertical radiator wire inside the box. I coated the wood with RTV silicone to waterproof the radiator-wire entry point. On the other end of the match box I drilled two holes, one for the RG8 feedline to enter the box and the other for the four-wire control cable to enter. I used the RTV silicone liberally on the control cable and coax to waterproof their entry into the match box. At the RG8 entry point I soldered the shield of the coax to the inside of the match box.

The matching network for 160 meters is simply a series tuning capacitor with a range of about 30 to 100 picofarads. The capacitor should be reasonably wide spaced so as not to arc over at high power.

The matching network for 80 meters is a direct connection. The antenna is naturally resonant on this band.

The matching network for 40 meters is an "L" network with a variable tuning capacitor of 30 to 100 picofarads and an inductor consisting of 10 turns of 17-gauge enamel wire on a 2.5 inch cardboard tube core.

Similarly, the matching network for 30 meters is an "L" network with a variable tuning capacitor of 30 to 100 picofarads and an inductor consisting of 6 turns of 17-gauge enamel wire on a 2.5 inch cardboard tube core.

See fig. 4 for the wiring details of the match box.

Tuning

Tuning the antenna is straightforward, and each band is quite independent of the other. The hardest band to tune is 80 meters, so I suggest tuning this band first. Once the matchbox is constructed and everything is in place, select the 80 meter position of the match box and find the resonant point on 80 meters. If the resonant point is too high in frequency, lower the antenna and lengthen capacitor C1 in the trap. Likewise, if the resonant point is too low, make capacitor C1 shorter. You will

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***Only* MFJ gives you 5 *factory* pre-set filters and 10 *programmable* pre-set filters that you can customize. Instantly remove QRM with a turn of a switch!**

You get MFJ's *automatic notch filter* that searches for and eliminates *multiple* heterodynes.

You also get MFJ's advanced *adaptive noise reduction*. It silences background noise and QRN so much that SSB signals sound like a local FM repeater.

The *automatic* notch and *adaptive* noise reduction can be used with *all* relevant tunable and pre-set filters.

***Automatic gain control* (AGC) keeps audio level constant during signal fading.**

Automatic notch filter

MFJ's *automatic* notch filter searches for and eliminates *multiple* heterodynes. It's *milli*-second fast -- interfering CW and RTTY signals are also eliminated.

Voice signals aren't degraded because the notch is *extremely* narrow.

With up to 50 dB attenuation, you'll copy stations otherwise masked by heterodynes, miss fewer calls and be less exhausted.

Leave the *automatic* notch filter on during a phone contest and you'll never hear annoying heterodynes of tuner-uppers.

You can *effectively* remove tones. Say, you're on CW and a couple of annoying CW stations appear nearby. You can use the *two* manually *tunable* notch filters in an MFJ *exclusive* way to completely knock them out.

Adaptive noise reduction

Turning on *noise reduction* silences background noise. Noisy SSB, FM, AM, CW and Data signals become readable.

Noise reduction works in all filter modes and on all random noise -- white noise, impulse noise, static, ignition noise, power line noise, hiss and atmospheric noise.

The LMS algorithm gives you up to 20 dB of noise reduction. Noise reduction is adjustable to prevent signal distortion.

Reducing random noise reduces fatigue, especially when the band is noisy.

Tunable highpass/lowpass filters

For Voice and Data, nothing beats MFJ's exclusive *tunable* highpass/lowpass FIR linear phase "brick wall" filters.

You can *tune* the lower cutoff frequency 200 to 2200 Hz and the upper cutoff frequency 1400 to 3400 Hz.

Signals *just 75 Hz* away literally disappear -- they are reduced a *thousand* times, 60 dB!

Unlike other filters, speech clarity is not reduced by envelope distortion caused by unequal time delay.

By adjusting the highpass and lowpass filters you can create *custom* filters for Voice, Data and other modes.

When signals are weak, you can improve copy by removing high and low speech frequencies. They contain little information but are full of noise that reduce readability.

On crowded HF bands, overlapping SSB signals make copying difficult. You can improve copy by slicing off some overlap with razor sharp "brick wall" responses.

You can also highpass filter out hum, pulses, rasp and other irritating low frequency noise.

Tunable bandpass filters

Narrow band signals like CW and RTTY jump out of QRM when you switch in an MFJ *tunable* FIR bandpass filters.

You can *tune* the center frequency from 300 to 3400 Hz. And *vary* the bandwidth from 30 Hz to 2100 Hz -- from super tight CW filters to wide razor-sharp Data filters.

As you narrow the bandwidth, interfering signals drop out, because, just 60 Hz away, they're down by over 50 dB.

You can use *narrower* bandwidths to fight tough QRM because these linear phase filters don't distort signals with unequal time delays.

Even with the narrowest 30 Hz bandwidth, you'll never have a problem with ringing.

One position gives you *two* tunable filters you can use together on one signal. For example, on RTTY, tune one filter to mark, the other to space and set the bandwidth tight for an incredibly sharp RTTY filter.

15 *pre-set* filters -- use factory set or program your own

You can select from *fifteen* convenient *pre-set* filters. Use them for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any mode you can think of.

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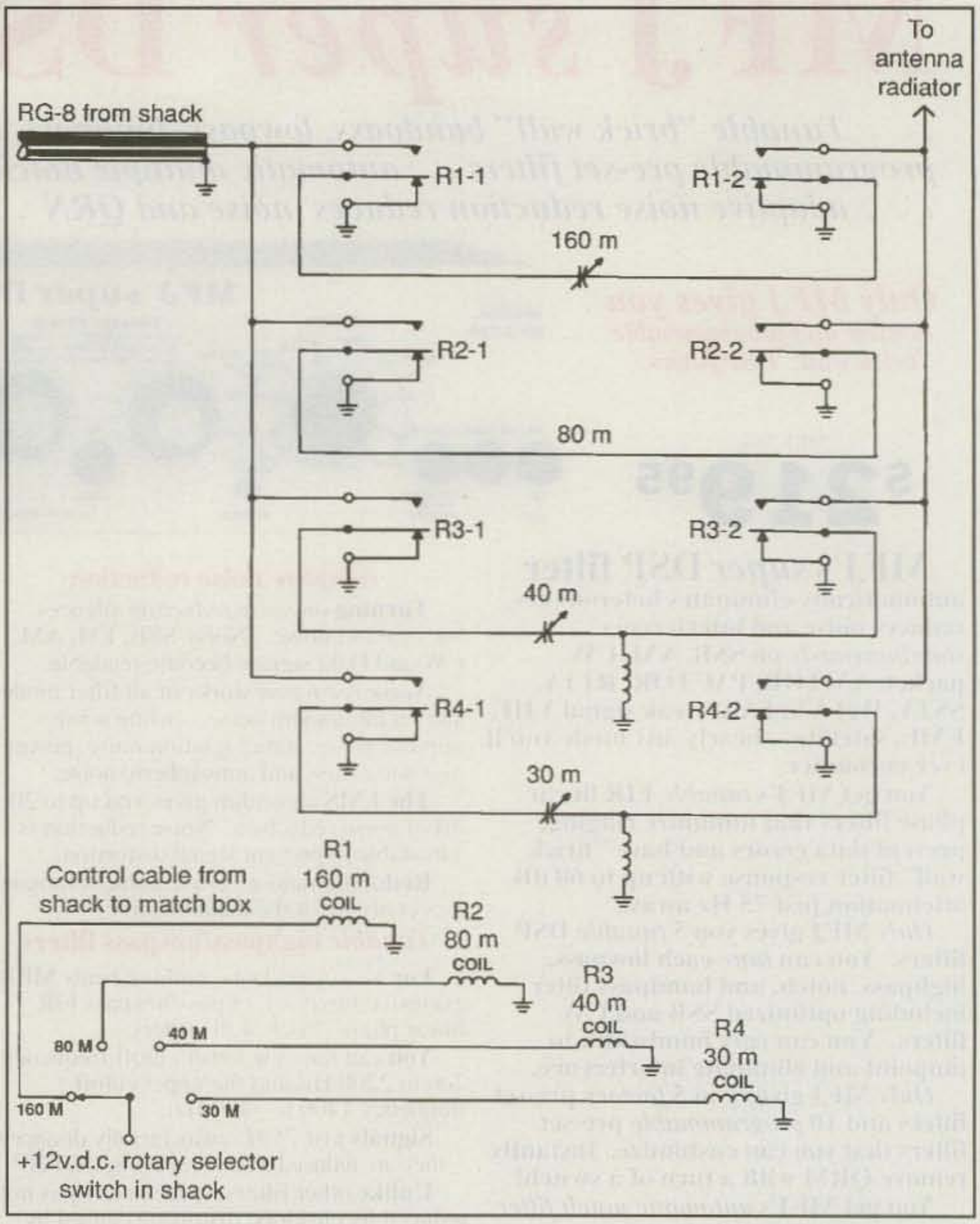

Fig. 4– Schematic diagram for the antenna match box.

find that this capacitor is very critical, and small changes in the length of C1 greatly change the 80 meter resonant point. Fortunately, C1 has very little effect on the other bands.

Once 80 meters is adjusted, select 160 meters on the match box. Simply tune the 160 meter capacitor for resonance at the desired 160 meter operating point. The 2 to 1 SWR bandwidth for this antenna is only about 25 kHz. You should be able to get an SWR of 1.2 or better at the resonant point.

Now select the 40 meter position on the match box. Tune the 40 meter capacitor for best SWR. If the best SWR is too high, the 40 meter inductor will also have to be adjusted. Some experimentation will be necessary here. Once 40 meters is adjusted, it should be possible to get the entire 40 meter band within the 2 to 1 SWR bandwidth range.

Likewise, now select the 30 meter position on the match box. Tune the 30 meter capacitor for best SWR. If the best SWR is too high, the 30 meter inductor will also have to be adjusted. Some experimentation may be necessary. Once adjusted properly, the SWR should essentially be the same everywhere on the 30 meter band and very near 1 to 1.

Operation

Operating this antenna is a dream in simplicity and results. On 160 meters I run 400 watts and have no trouble getting through pile-ups to work DX stations. On 80, 40, and 30 meters I run 100 watts and consistently get through to DX stations when others are calling. The low angle of radiation on all these bands yields a very effective signal to DX stations. If you build one of these antennas, be sure to write to me and let me know how it works out for you. ■

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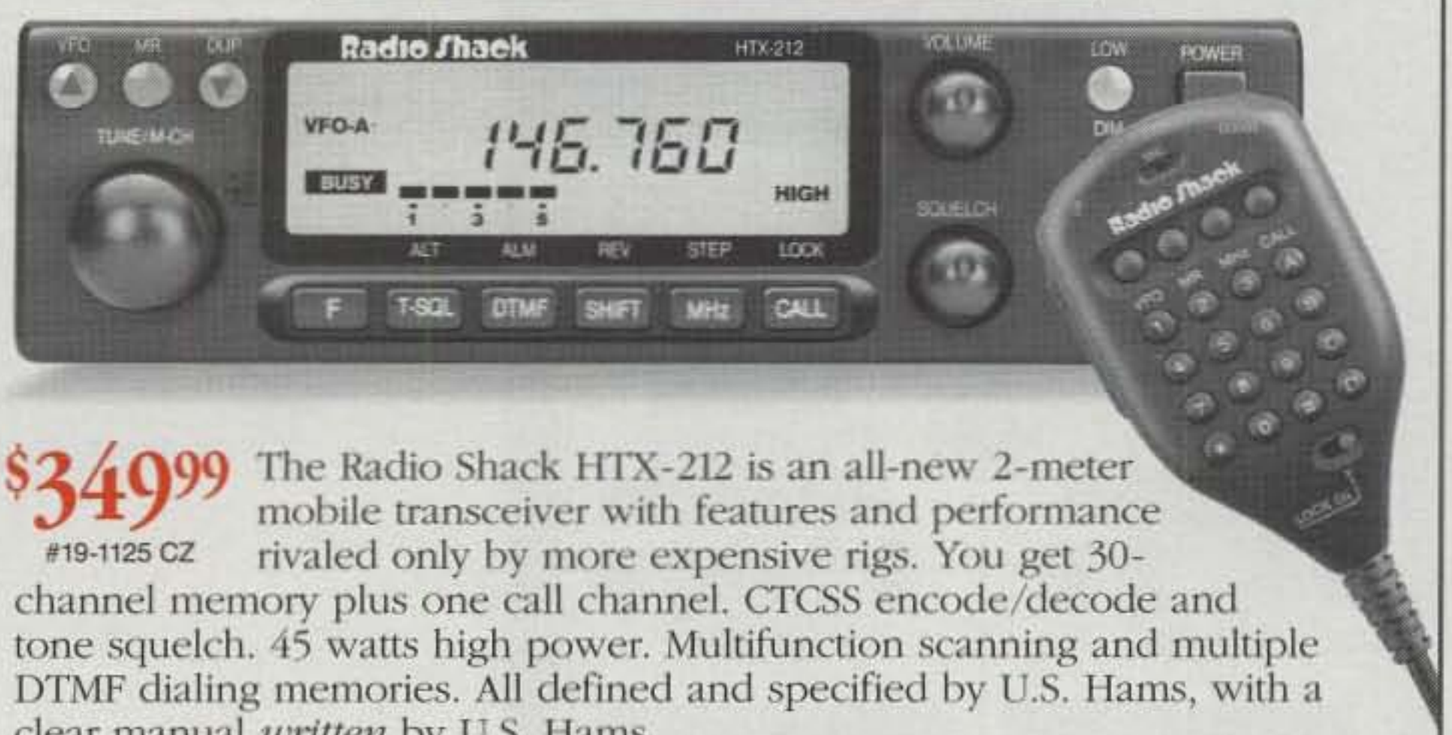

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MATH'S NOTES

BY IRWIN MATH, WA2NDM

WHAT'S NEW AND HOW TO USE IT

A New Software "Circuit Design" Program

If computer design software continues to develop along the lines of the new product I will be describing this month, we may well be approaching the end of the era of soldering and breadboarding.

The package I am referring to is the software program PROTOLAB (Release 3.0). It is manufactured by and available from Global Specialties, and it is a very inexpensive entry-level approach to designing simple AC or DC circuits on a computer. It does not require Windows and it will work on any PC-compatible computer (even a '286) equipped with a mouse, 512K of RAM, and EGA (640 × 400) video. Best of all it is practically self-explanatory, has excellent professional-quality graphics, and is so easy to use that you will be up and running in minutes.

The basic package consists of a 3¼ or 5¼ inch floppy disk and a clear, easy-to-understand instruction manual. The disk has less than 360K of data, so older drives are fully usable but you must have a mouse. When you first boot up the program, you are presented with a grid of interconnect points. You then choose up to 40 resistors, capacitors, inductors, AC or DC voltage sources, or impedances and generate a schematic of your choice with whatever values you desire. Next you choose from an assortment of test equipment that includes a voltmeter, ammeter, ohmmeter, wattmeter, sweep-signal generator, and dual-trace oscilloscope. Connect these to your circuit, turn on the power (the program will let you know if you forget), and you are ready to make all necessary measurements to check the operation of your final design. If you are not happy with the results, change values or components and try again.

Such a simple, minimum data-bit-count package has several restrictions, as you might imagine. The main ones are the limitation of only 40 components for any one circuit and the lack of any semiconductors or ICs in the basic package. This limits its designs to passive resistor and R-C networks, filters, and tuned circuits, which is a shame, since the program is so "user friendly."

To expand the usefulness of the program Global has also released three "PROTOWARE" modules which will work with the basic PROTOLAB software. These modules cover diode rectifiers, transistor amplifiers, and a simple electronic organ.

The diode module offers a choice of a half- or full-wave rectifier circuit for power-supply evaluations. While you cannot vary either basic circuit, you can change values, look at voltages and currents with the test equipment, and determine how a real-world circuit will operate. The transistor amplifier module offers a standard common emitter, common base, or emitter follower configuration. The component values can be changed and signals applied and measured, but you can only

c/o CQ magazine

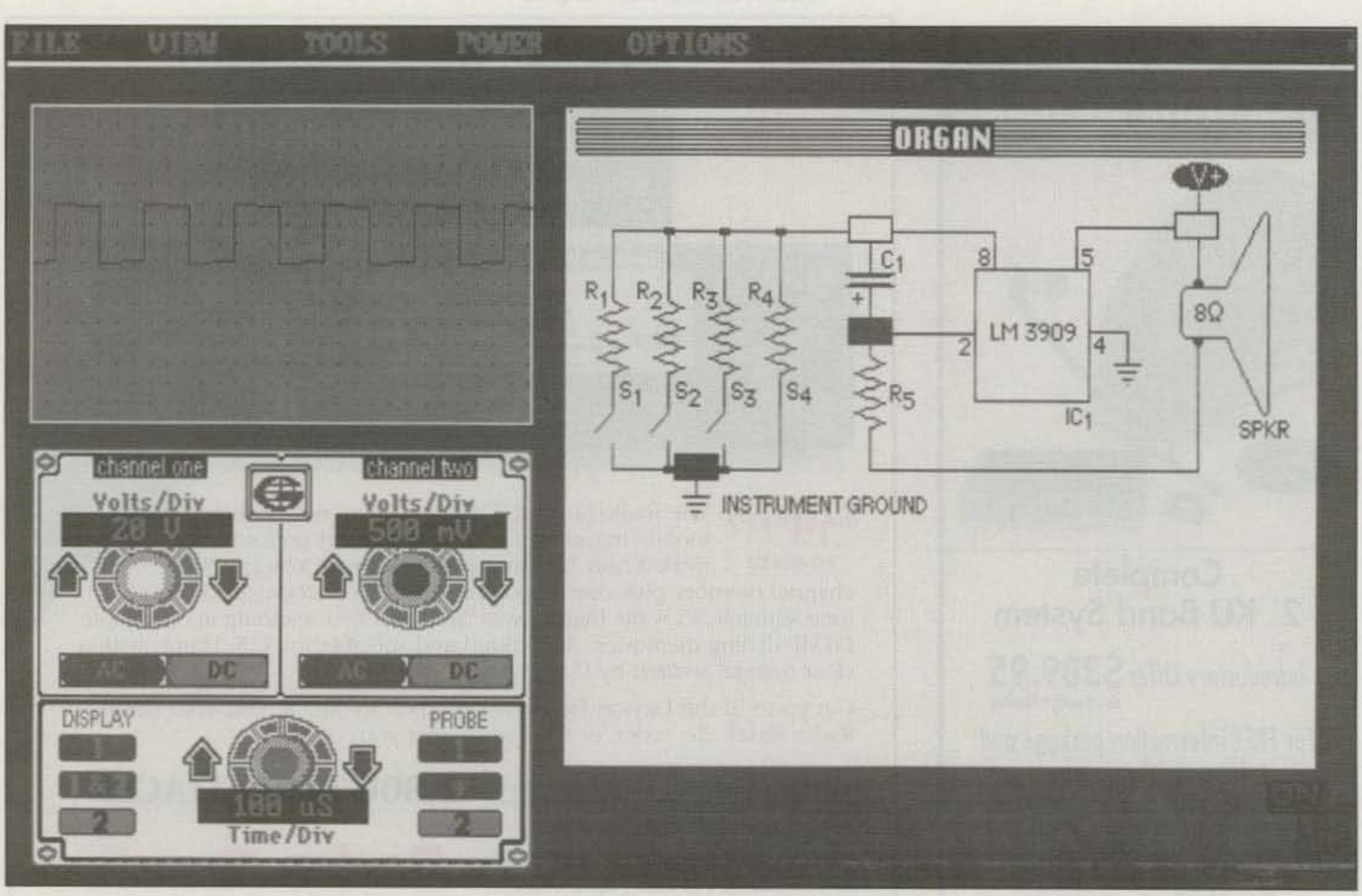

Fig. 1– The screen you will see when using the third PROTOWARE module.

work with one type of amplifier at a time. The third module presents the schematic diagram of a four-note electronic organ which you can "play" by closing any of four switches. Fig. 1 shows the screen you will get when using this module. With this circuit you can also use the oscilloscope to look at waveforms and change values to vary the frequency (tone) of the various notes. You can even choose to view this circuit in pictorial form as it might appear on a typical prototyping breadboard. This last feature would be nice to have for the basic program module also, as it would really help the newcomer visualize the physical version of his or her design.

While PROTOLAB and the PROTOWARE modules are not full-featured design packages, the $49.95 price ($19.95 extra for the three PROTOWARE modules) is quite reasonable for what you get. The software is ideal for the beginning electronic experimenter, is simple to use, and certainly enables the design of useful circuits within its capabilities. It is also ideal as a basic learning tool and as an introduction to computer circuit design. The company has also informed us that they plan to introduce additional modules in the future.

For further information contact Global Specialties at 70 Fulton Terrace, New Haven, CT 06512, or call them at 1-800-634-0762. 73, Irwin, WA2NDM

CQ SHOWCASE

Nemal Electronics Broadcast/ENG Cables

Each of Nemal's new line of cables includes multiple video and audio members as required by the customer application. Video cables are available in standard RG59, precision low-loss

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Typical constructions include part number BC213PJ (two miniature precision video cables and three jacketed audio pair) and BC152PJ (one precision video cable and two jacketed audio pair). All cables are available either in bulk reels or terminated, tested, and labeled to customer specifications. Other constructions and colors are available by special order. For more information, contact Nemal Electronics International, Inc., 12240 NE 14th Ave., North Miami, FL 33161 (305-899-0900, FAX 305-895-8178), or circle number 101 on the reader service card.

ICOM IC-2000H Wideband Mobile

The ICOM IC-2000H wideband mobile features clear, crisp reception designed specifically to deal with cross-modulation interference. It employs a tracking tuning system and

RF passband filters to improve image rejection and intermodulation characteristics. Each of the 50 memories can be programmed with a six-character name. Two scratch pad memories and six scan edge memories are also available. The unit receives 118–174 MHz and transmits 140–150 MHz. Advanced scanning features include full scan, program scan, five scan resume conditions, mode scan, and priority watch. Additional features include call channel, busy channel lockout, auto power off, programmable up switch, and separate volume/squelch knobs. Optional features include a UT-55 alpha message pager, UT-85 tone scanner, UT-101 code squelch/pager, and UT-85 tone squelch/pocket beeper.

Suggested retail price of the IC-2000H is $430. For more information, contact ICOM America, Inc., 2380 116th Avenue NE, Bellevue, WA 98004 (206-454-8155), or circle number 106 on the reader service card.

SSC PC GOES/WEFAX 4.0

Software Systems Consulting's version 4 PC GOES/WEFAX is a hardware and software system for the IBM PC and compatible computers that allows users to receive and process weather satellite pictures received directly from weather satellites on VHF and microwave or form shortwave radio. The package contains a radio facsimile modem that connects to the PC serial port and to the radio receiving equipment, image processing software, comprehensive 300-page manual, broadcast schedules, orbital prediction system, and tutorial audio cassette. Running under MS-DOS or MS Windows, PC GOES/WEFAX allows the user to receive from GOES, MeteoSat, NOAA, Meteor and Feng Yung, Okean weather satellites, C-band GOES-Tap providers, and press services.

Suggested retail for the package is $250. For more information, contact Software Systems Consulting (SSC), 615 S. El Camino Real, San Clemente, CA 92672 (714-498-5784), or circle number 108 on the reader sevice card.

Sencore Computer Monitor Signal Generator

Sencore's new CM125 "Pix Pak" Computer Monitor Signal Generator is a programmable, portable, RGB generator that satisfies com-

puter monitor testing needs. It has high resolution and full bandwidth capabilities, and is portable, lightweight, and compact. It is a fully programmable scan frequency and pixel resolution RGB generator with video bandwidth to 125 MHz and 2048 x 2048 pixel resolution. It is compatible with TTL, analog, and ECL video types and has 100 monitor setup memory locations (43 preprogrammed) for flexible testing and fast setup.

For more information, contact Sencore, Inc., 3200 Sencore Dr., Sioux Falls, SD 57107 (605-339-0100; FAX 605-339-0317), or circle number 109 on the reader service card.

Expand your Horizon

The C-4: 40-20-15-10

Plus 17 & 12

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Our customers tell us that the ***C-3***, and now the the ***C-4***, outperforms every commercially made, trapped tribander, regardless of boomlength. And, the ***C-3*** is the easiest to assemble and put up, plus coverage on 17 and 12 mtrs. The forward gain is superior to high-claimed marketing numbers from trapped antennas.

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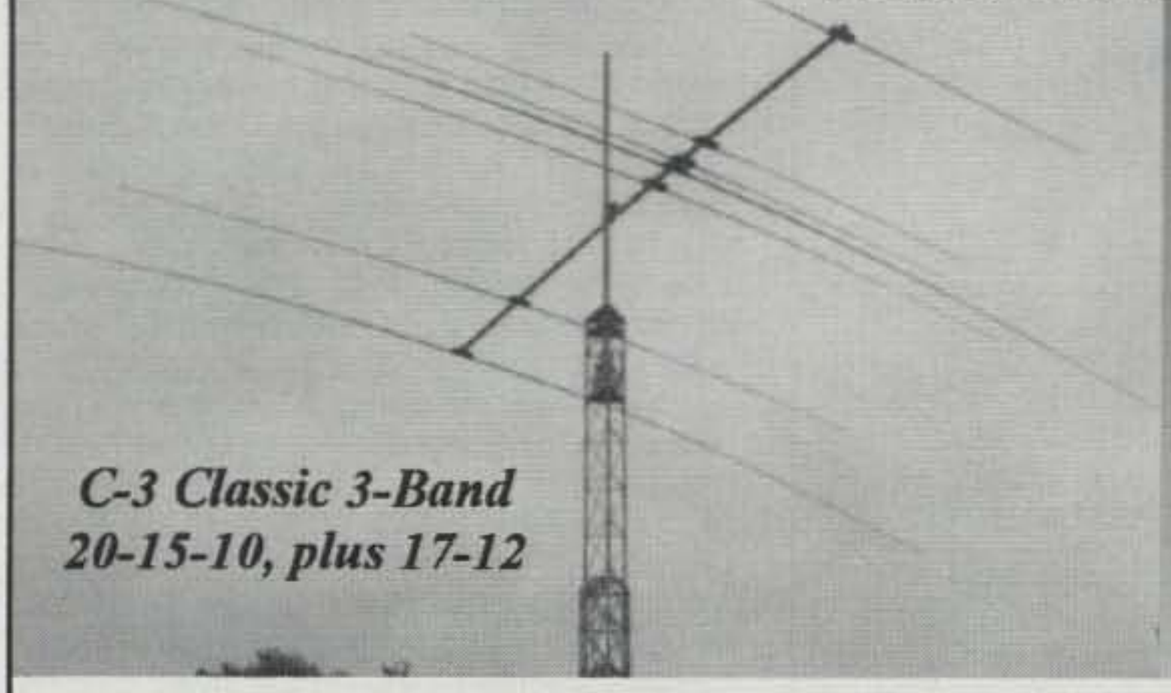
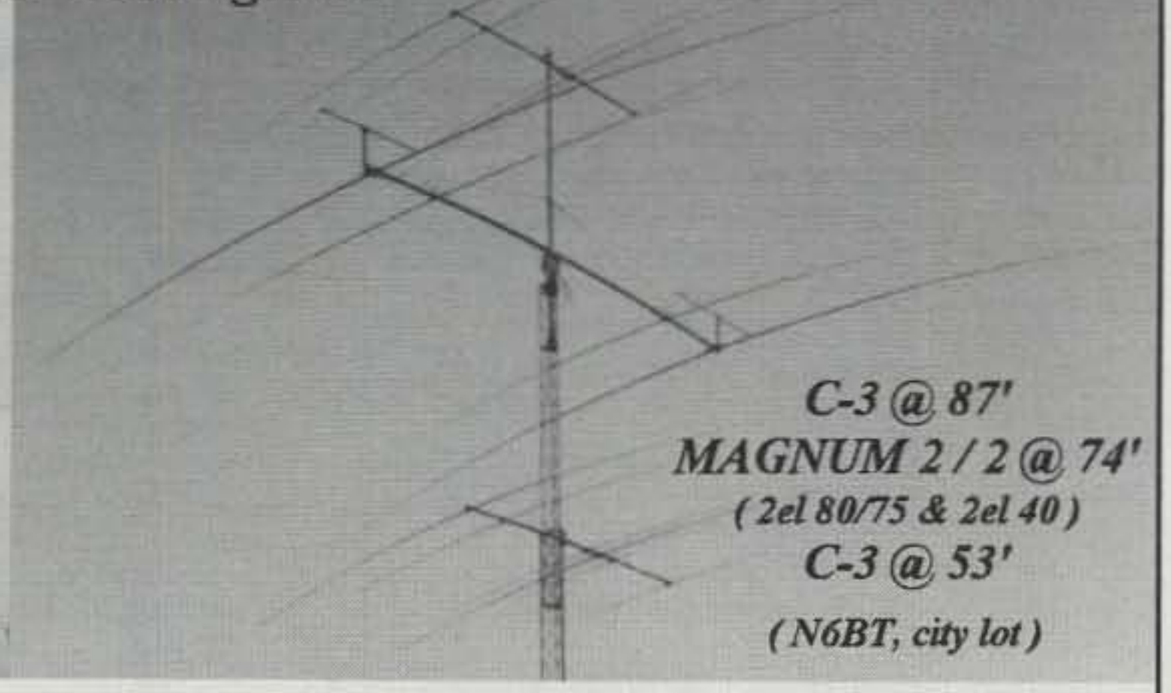


C-3 Classic 3-Band
20-15-10, plus 17-12



C-3 @ 87'
MAGNUM 2 / 2 @ 74'
(2el 80/75 & 2el 40)
C-3 @ 53'
(N6BT, city lot)

The fantastic ***C-3*** performance has been extended to 40 meters. The ***C-4*** incorporates a re-designed EF-140S 40 mtr element on the standard ***C-3*** boom for more than 100 kHz 2:1 VSWR coverage on 40 mtrs. If you are presently enjoying the great performance of a ***C-3***, you can upgrade it to a ***C-4***. To recap some ***C-3*** features, it has 7 elements that are strong and tapered, for a pleasing look. Utilizing Force 12's forward stagger and NOMAD designs, all 7 elements function on all the bands to enhance the performance. The ***C-3*** has deep side nulls and a fine pattern; F/B 14-18 dB. The ***C-3*** has an 18' boom and is fed with a single 50 ohm coax. Its light 32 pounds, 19.8' turning radius and exclusive Easy-On™ mounting make the ***C-3*** easy to put up anywhere. It can be temporarily assembled for field use and assembles with standard wrenches and a hand riveter. The element-to-boom brackets are pre-aligned on the boom, so every element is straight and will not move. Small rotators are fine. The ***C-4*** maintains the same turing radius and weighs about 40 pounds. A separate feedline for 40 mtrs is provided, so that the ***C-3*** remains intact.

◆ **Force 12** has more than 60 HF antennas from 3 el 80/75 mtr yagis to 6 mtr beams. The ***MAGNUM 2 / 2*** shown above is a 2el 80/75 and 2el 40 mtr on a single boom with two feedlines. The ***MAGNUM 2 / 2*** uses EF-180B (66.5') elements on 80/75 and EF-140 (44.5') elements on 40. At about 14 sqft, the ***MAGNUM 2 / 2*** is the answer to gain on both bands. Other 80/40 available.
◆ **Force 12** now offers **magnetic transmitting / receiving loops** for 40 and 80/75, perfect for limited space and **NVIS** use: the ***MTR-66*** (6'x6') and the ***MTR-618*** (6'x18'), both made with 2" tubing. These mount vertically on the ground, deck, balcony, etc.
◆ **Force 12** has verticals for 40, 80/75 and 160 mtrs. Add to this the several 20-40 yagis, the 40-30-20 yagi and multiple band antennas like the 5BA (20-10) and the 4BA (17-10). **Force 12** offers a pair of 50 ohm 1:1 baluns; fully tested and vacuum impregnated for reliability. The B-1 is rated at 3KW and the B-1/C commercial version with N-connector, rated at 25KW.

The C-3 is available at all 12 HAM RADIO OUTLET stores. List is $449.95. The C-4 lists at $599.95. Buy now & have fun!

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ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

Random Reflections—Part II

This time we'll reflect on and update many of the Antennas and Accessories topics we covered in earlier columns; we'll also cover new territory. Let's begin with antennas.

Antenna Notes

GAP Titan Antenna. In several previous columns we described the popular GAP multiband vertical antennas with their patented "elevated launch technology." To reiterate, GAP verticals have no traps, coils, matching transformers, baluns, or resistors. Designed by George Henf, KK4CW, the antennas are unique in that they are not fed at the base, but rather are fed at a point that is some distance up from the base. According to GAP, with this design vertical antenna resistance is no longer fixed at around 36 ohms, but can now be preselected.

The reasoning holds that since the base impedance of a vertical is normally about 36 ohms while the top is several thousand ohms, somewhere in between is 52 ohms. It's at this point where the antenna is fed, or as GAP puts it, the point where RF is launched.

The high feedpoint is said to significantly reduce earth loss, normally a major problem with verticals. The GAP verticals are largely ground independent as a result of this design, and simply use several short radials as a counterpoise. Overall GAP antenna efficiency is claimed to be in the area of around 90 percent, with a very low earth loss.

The Titan DX-VIII is the latest GAP antenna designed with an elevated feed. As in the other models, the asymmetric feed reduces earth loss, offering wide bandwidth without the need for an antenna tuner. The eight-band, no-tune antenna is 25 ft. high and weighs 25 lbs.; it uses four rigid counterpoises 80 inches long.

The Titan is designed to go practically anywhere in the amateur HF bands, and claims to be the only antenna marketed with SWR under 2:1 across 10, 12, 15, 17, 20, 30, and 40 meters, and in a 100 kHz segment of 80 meters. Guys are not necessary, as the first 8 feet of the antenna is comprised of double-wall aluminum tubing, and where it mounts to the mast, it's triple wall.

GAP also manufactures several other verticals using similar elevated launch technology. These include the Challenger DX, Voyager DX, and Eagle DX; these cover 2–160 meters in various combinations, and they range in height from 21 to 45 feet. Specs, some theoretical details, and pricing are available from GAP Antenna Products, 6010 Bldg. B, N. Old Dixie Highway, Vero Beach, FL 32967 (407-778-3728). (Besides our coverage of the GAP antennas in previous columns, our colleague Lew McCoy, W1ICP, reviewed the Challenger DX-VI vertical in March 1990 *CQ*; GAP includes a copy of this review in its spec sheet mailings.)

289 Poplar Drive, Millbrook, AL 36054-1674

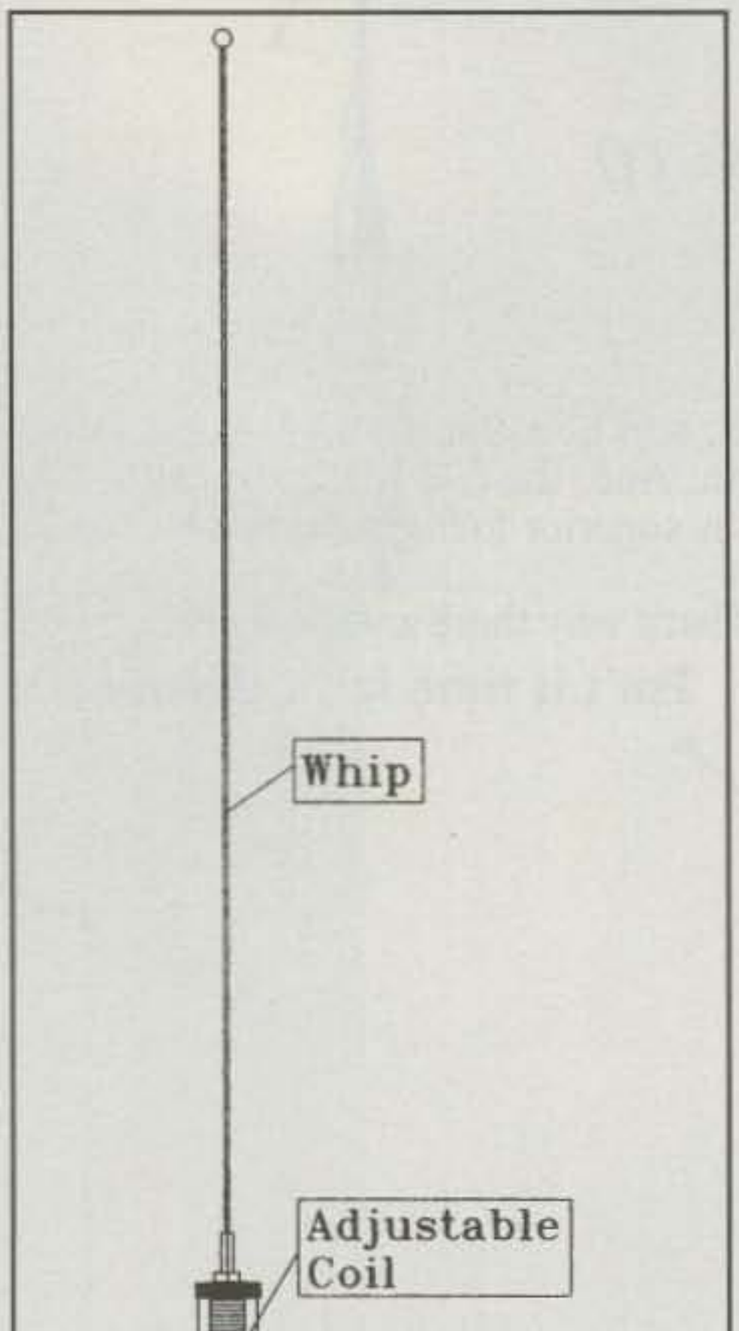

Fig. 1–GLA Systems' Texas Twister is a motor-driven HF mobile antenna that you can tune remotely over the range 3.5 to 28 MHz. It's built around a 1.8 inch diameter coil, fitted to the inside diameter of a 2 inch aluminum tube, which is driven in and out of the tube by an electric motor. The antenna gives you all-band performance with a high coil "Q."

Texas Twister. In the August 1992 and October 1993 columns we described the Texas BugCatchers—husky HF multiband mobile antennas manufactured by Henry Allen, WB5TYD. The BugCatchers, you'll recall, are center loaded, and you can custom configure them mechanically and electrically over the range 3–30 MHz. The BugCatchers are offered with several different masts, whips, matching coils, mounts, quick disconnects, coil clips, whip adapters, corona balls, and other custom components.

The new Texas Twister (see fig. 1) is a motor-driven HF mobile antenna that you can tune remotely over the range 3.5 to 28 MHz using a 60 inch whip (not included), making the full length of the Texas Twister about 9 feet. Patterned after Don Johnson, W6AAQ's classic DK3 HF mobile antenna, the Texas Twister is built around a 1.8 inch diameter coil (not PVC), fitted to the inside diameter of a 2 inch aluminum tube, which is driven in and out of the tube by an electric motor. The antenna offers all-band performance with a coil "Q" in the upper 100s to lower 200s.

Impedance matching is automatic on all bands and makes use of an optional broadband toroidal transformer at the antenna's feedpoint; it attaches to the bottom of the support tube. An optional control box uses a momentary contact switch for easy fine-tuning when you must move the coil in small increments, as when tuning on the lower frequencies. The matching unit is designed to yield an SWR of less than 1.6:1 on all amateur bands and less than 2:1 throughout the antenna's HF tuning range.

Interestingly, the coil is pushed up and down inside the support tube by an electric screwdriver, modified to run from a 12 VDC power source. An impact-resistant waterproof cover is used to protect the coil in all kinds of weather. All you need do is mount the antenna, attach the impedance matching transformer and the feedline, and run 12 VDC to it. The antenna is $299, while the matching transformer is $32 and the control box $32.

Details on the Texas Twister are available from GLA Systems, P.O. Box 425, Caddo Mills, TX 75135 (1-800-LUV-BUG-1 [1-800-588-2841]). The antenna also is available from VIS, 119 Comanche Drive, P.O. Box 17377, Hattiesburg, MS 39404-7377 (1-800-OKK-HAMS).

WXØB Stack Match by Dunestar. In the November 1993 column we profiled Dunestar Systems filters. We noted that Ron Crouse, AA7EA, introduced two transceiver RF bandpass filters for applications such as close-proximity multiple transmitter contesting, interference to and from other nearby amateur stations on adjacent bands, and TVI suppression. The filters are for 100 watt output class transceivers. Two series, the 100 series (sin-

gle-band) and the 500 series (five-band), are offered.

Ron offers the WXØB Stack Match as well. Also known as the SM-03, it's an unbalanced-to-unbalanced ("unun") transmission line transformer with relays to switch in antennas and select the transformer to match the 50 ohm input to the lower output impedances encountered when more than one antenna is selected.

Ron claims the device is highly efficient and offers very wide bandwidth; it covers 80–10 meters and is rated at 3 KW. It uses 12 VDC to control the selection relays, which are enclosed units for good reliability. The Stack Match is contained in a weather-resistant extruded aluminum enclosure.

An example of the Stack Match's use is in stacking two or three HF antennas on a single tower. The antennas can be monobanders or multibanders, but should be of the same kind for predictable patterns and stacking gain. As a simple guideline, you should stack antennas from 0.5 to one wavelength apart.

For stacking tribanders Ron suggests choosing a distance of 0.5 wavelength at the lowest operating frequency. If you do this at 20 meters, then at 10 and 15 meters the stacking distance will be 1.0 and 0.75 wavelength, respectively. (To actually determine the best distance between antennas for your beams' boom length, use antenna modeling software.)

The assembled SM-03 is $135; a kit is $89. Contact Dunestar Systems, P.O. Box 37, St. Helens, OR 97051 (503-397-2918).

Radio Astronomy Supplies. Okay, so what's so interesting about radio astronomy? Radio astronomy is used to detect celestial objects that are far too distant and dim to be seen by ordinary optical telescopes. It's also used to determine the chemical makeup of stars and gas clouds, as well as the speed and direction of moving stars. Using radio astronomy techniques, quasars were discovered early in the 1960s. Pulsars, which are thought to be rapidly rotating neutron stars, were discovered later in the same decade. With the information about the outer reaches of the universe that radio astronomy can yield, scientists can even postulate how the universe began.

If you want to get into radio astronomy pursuits, it's normally pretty expensive stuff—even more so than amateur radio. However, a small Georgia firm offers everything from radio telescopes to amplifiers, bandpass filers, feedhorns, mixers, A/D converters, noise sources, software, and "how to" publications on amateur radio astronomy.

Two popular radio telescopes are offered. One is a 1420 MHz hydrogen line radiotelescope. It consists of a cylindrical feedhorn, low-noise amplifier (LNA), converter, 70 MHz IF amplifier, detector and integrator, and DC amp, for $625. A similar system for 600 MHz, which uses a dipole instead of a feedhorn and a slightly different converter, is $600. Spectral line radiotelescopes also are available.

For a brochure, contact Jeff Lichtman, 190 Jade Cove Drive, Roswell, GA 30075 (404-992-4959).

Incidentally, if you're interested in learning more about radio astronomy and the antennas used, one of the classics is Dr. John Kraus, W8JK's classic, *Radio Astronomy*. The second edition includes material on holography, low-noise FET amplifiers, interstellar molecular clouds, comets, and pulsars. The 719-page, 1986 softcover includes numerous illustrations, worked-out examples, and references.

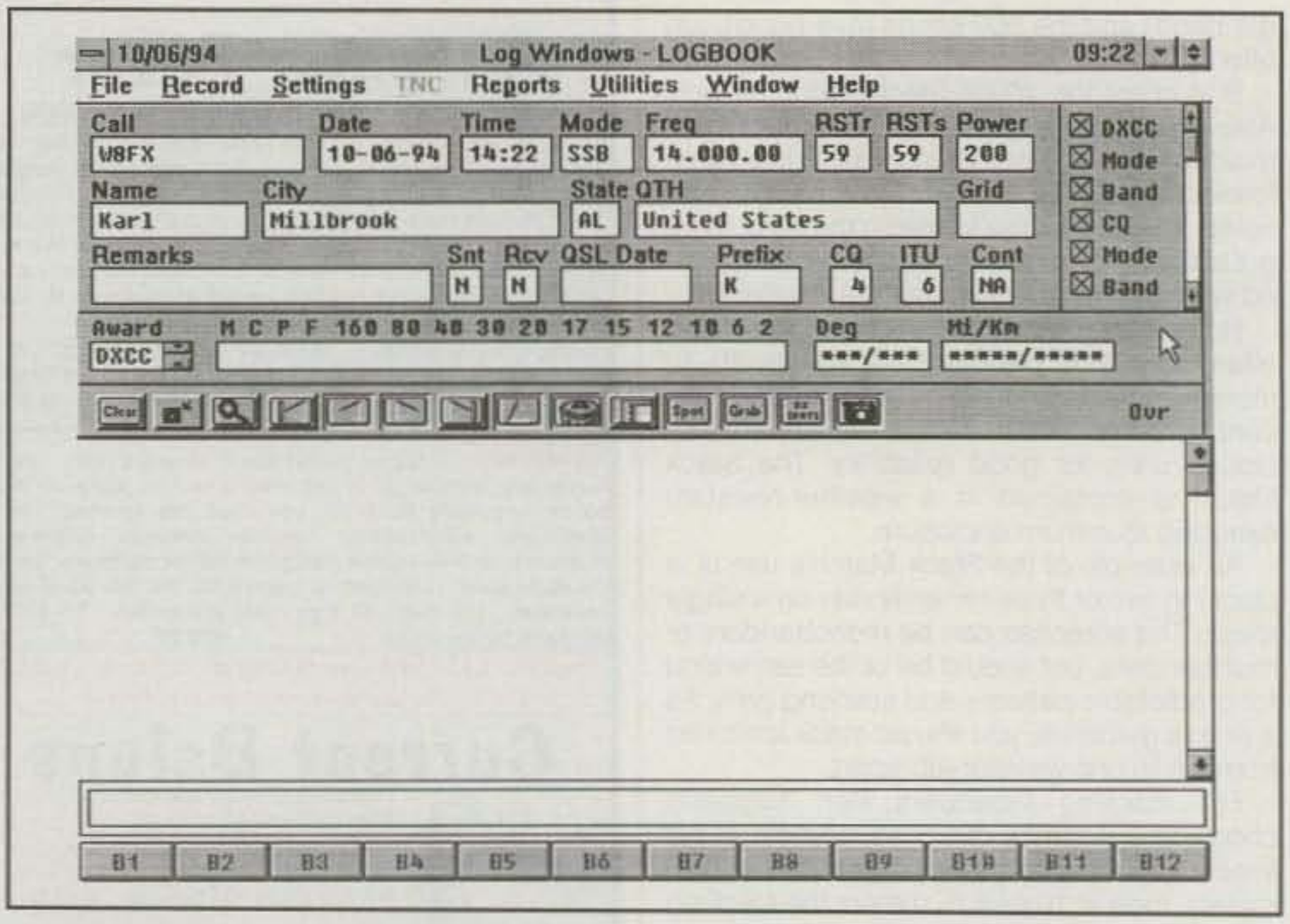

Fig. 2– AEA Log Windows main display screen. AEA's Log Windows integrates your computer with your computer-controlled radio and terminal node controller (TNC) in a single application. It allows you to perform day-to-day logging and awards tracking for various ARRL and CQ awards. Log Windows also provides a PacketCluster® interface for identifying stations that appear on your local DX cluster.

It's $39.95 plus $3 S&H from Cygnus-Quasar Books, P.O. Box 85, Powell, OH 43065 (614-548-7895). The same firm also distributes four of Dr. Kraus' other books: *Antennas, Electromagnetics, Our Cosmic Universe,* and *Big Ear.*

Alpha Delta Communications Update. Don Tyrrell, W8AD, has been doing a little traveling around, relocating Alpha Delta Communications from Centerville, Ohio, to Tempe, Arizona, and now to Manchester, Kentucky. Don is known for his line of equipment protectors, which take several forms. These include the popular Transi-Trap™ surge protectors that use gas tube Arc-Plug™ cartridges to protect electronic equipment from transients coming through coaxial cable transmission lines.

During the period of a surge voltage spike these cartridges toggle to ground, shunting the spike to ground via the ground stud and ground wire. After the spike has passed, the cartridges return to a ready state. The cartridges are said to outperform competitive

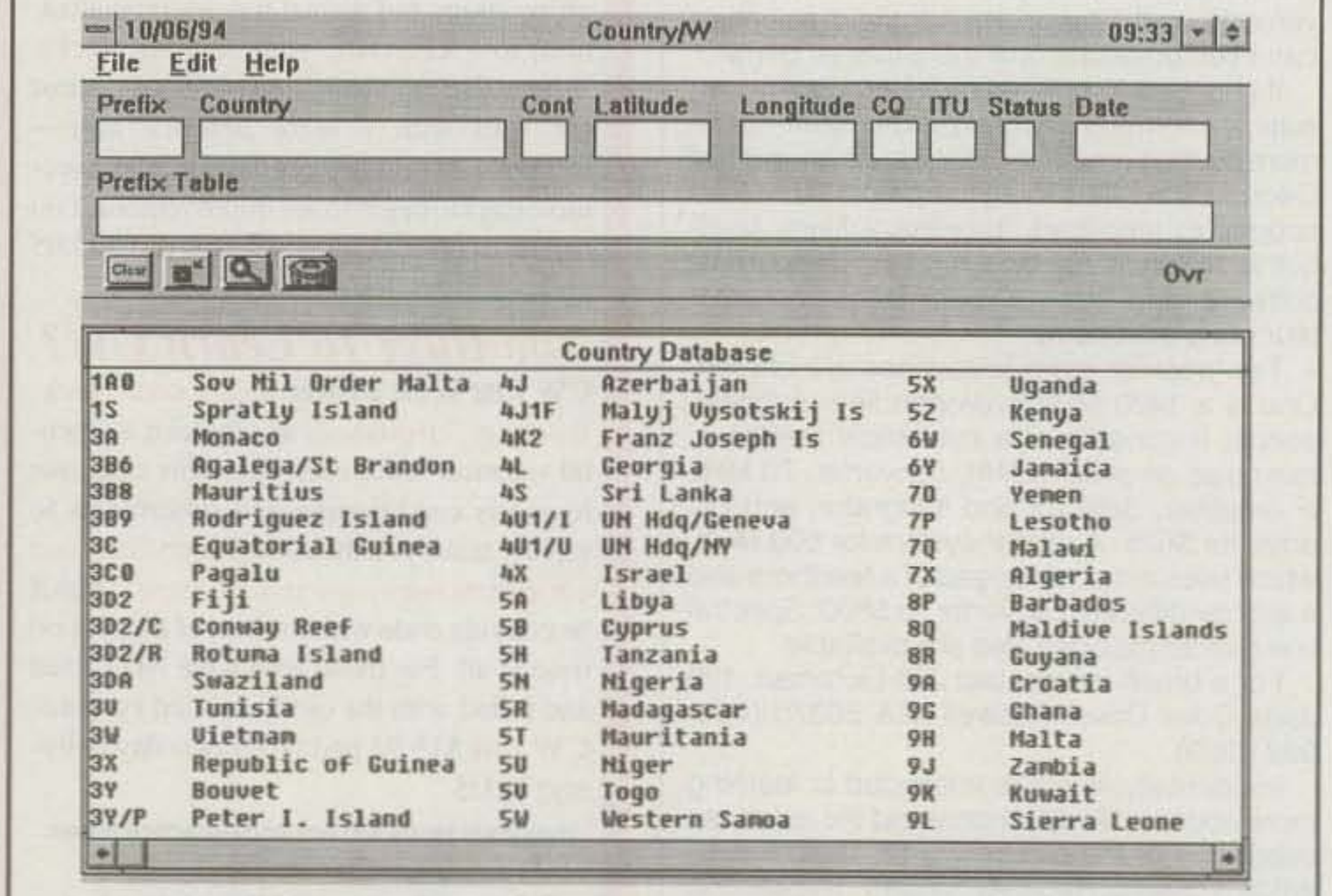

Fig. 3– Included in the AEA Log Windows package is Country/W. This is a separate country database management program that lets you maintain the database yourself. You can add a new country, prefix, DXpedition, or special event callsign, and you can even change the award status of a country.

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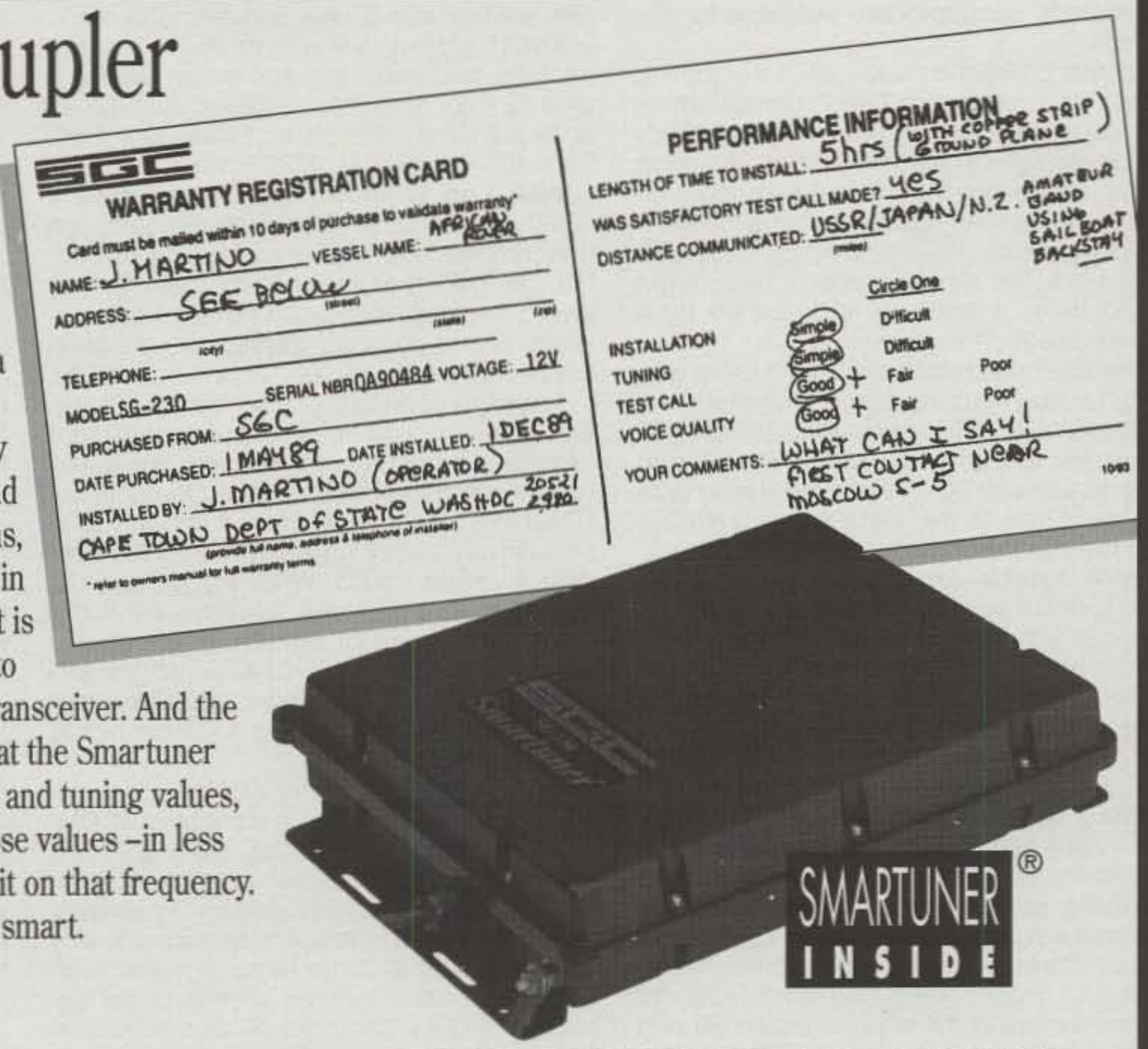

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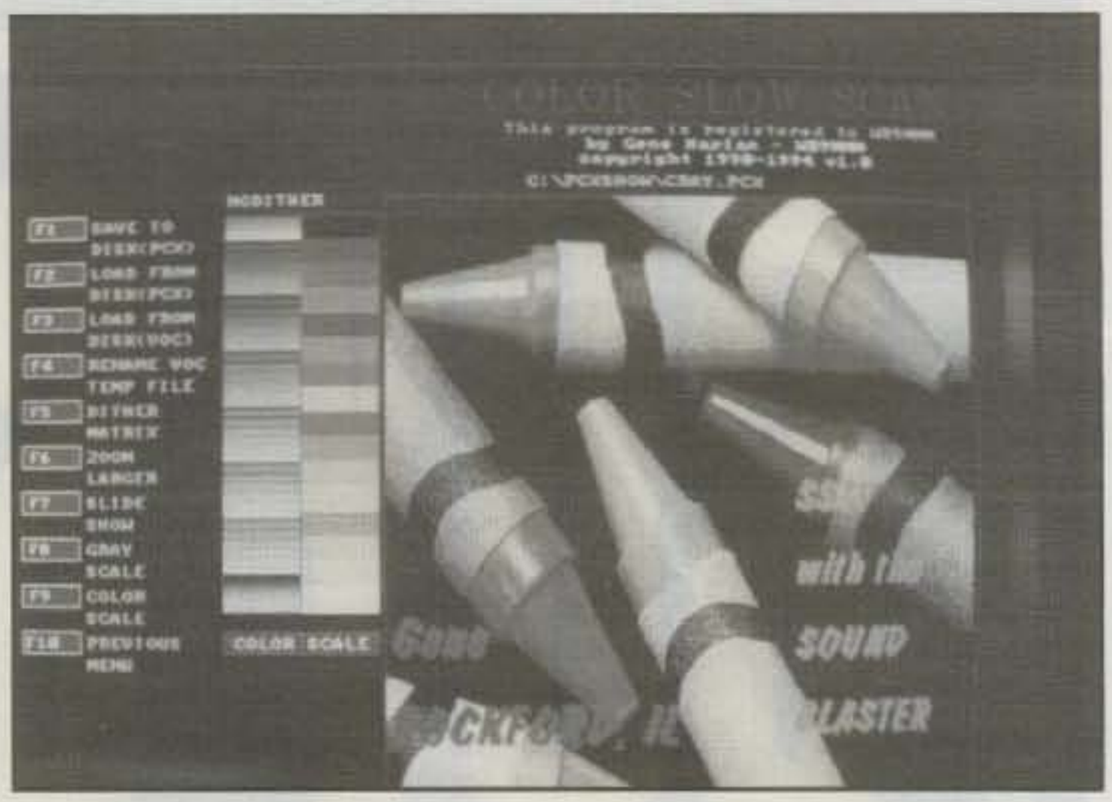
Harlan Technologies' innovative, menu- and function-key controlled program Color Slow Scan Television for the Sound Blaster offers full-color SSTV send and receive using your PC and its Sound Blaster or compatible sound card. Shown here is the initial screen display. (WB9MMM photo)



Color Slow Scan Television for the Sound Blaster's features include receive for Robot 8, 12, 24, and 36 second black-and-white, Robot 36 and 72 second color, and Scotty 1 and 2 images. The program also offers conversion of images to a "voice file" for transmitting these modes. The photo shows the save/load menu with function key assignments shown. (WB9MMM photo)

MOV based protectors. Several models protect to 500 MHz; these are $32.95 up. Field replaceable cartridges are available for the protectors.

Another product is the Model CLP Lightning Surge Protected Control Line Protector, which we discussed in the December 1990 column. It protects against surge voltages (although not for direct lightning strikes) that occur on control lines to rotor control and remote switch boxes, modems, telephone lines, and other equipment. The device protects up to eight control wires. Each wire is protected by a replaceable Arc-Plug cartridge.

Besides these protectors, Alpha Delta also offers several lightning surge protected two- and four-position RF coaxial switches ($49.95 to $89.95); these handle 1500 watts RF and are available with SO-239 or Type N coax connectors. Each of the Delta-series switches uses replaceable Arc-Plugs.

Alpha Delta has expanded its antenna offerings. It offers several HF limited-space wire antennas for amateur band operation. Most popular among these are the DX-A, a 160-80-40 meter quarterwave twin sloper with its separate 67 ft. and 55 ft. legs ($59.95); the 82 ft. DX-CC no-trap 80–10 meter dipole ($99.95); the DX-DD no-trap 80–40 meter dipole ($79.95); and the DX-EE no-trap 40–10 meter dipole ($89.95). These amateur band antennas feature 50 ohm feed, full-power-handling capability, custom inductors, and 12-gauge insulated solid copper wire.

Also offered are two SWL antennas, the 60 ft. DX-SWL sloper (medium-wave through 13 meters, including the often-forgotten 90 and 120 meter bands) and the shortened, 40 ft. DX-SWL/S Sloper, for 90 through 13 meters. The SWL antennas are priced at $69.95 and $59.95, respectively.

For specs, contact Alpha Delta Communications at its new address: P.O. Box 620, Manchester, KY 40962 (606-598-2029).

Software Notes

LOGSAT Correction. In the January column we mentioned LOGSAT, a multi-purpose, satellite-oriented software program. There is a new version and a new address to contact. LOGSAT Version 5.0 with interactive voice, tracking, and zoom features is now available ($39.95 US). Their new address is LOGSAT Software Corp., 425 South Chickasaw Trail, Suite 103, Orlando, FL 32825 (407-275-0780).

AEA Log Windows™. AEA has done it again with another Windows software package that combines the functions of logging, rig control, and PacketCluster® monitoring with award tracking and reporting. It's Log Windows, a multipurpose, easy-to-use program created by Ira Chavis, WA1W (see figs. 2 & 3).

To be more specific, Log Windows is a "general amateur radio information system" that integrates your computer with your computer-controlled radio and terminal node controller (TNC) in a single application. It allows you to perform day-to-day logging and awards tracking for various DXCC, WAS, VUCC, and *CQ* magazine awards. It also provides a PacketCluster® interface for identifying stations that appear on your local DX cluster, changing frequency and mode to the indicated station, logging the contact, or posting a DX contact to the DX cluster.

Some of the many Log Windows features include QSO logging; rig control of ICOM, Kenwood, and Yaesu radios; radio QSY and QSX via DX spots; flexible and powerful logbook search modes and reporting capabilities; a PacketCluster interface that supports any data controller in dumb terminal mode; support of numerous awards; printing of the logbook and QSO labels; ASCII data file export for use in other applications; and an interface to the SAM and HamCall™ online callbooks for automatic display of name and QTH when the callsign is entered.

Also included in the Log Windows package is Country/W. This is a separate country database management program that lets you maintain the database yourself. You can add a new country, prefix, DXpedition, or special event callsign, and you can even change the award status of a country.

Log Windows is $99 from Advanced Electronic Applications, Inc., P.O. Box 2160C, Lynnwood, WA 98036 (206-774-5554).

As this column went to press, we learned that AEA has introduced a new version of Log Windows, Version 2.0. Now you can use Log Windows with PC PakRatt for Windows 2.0 for TNC control and logging and tracking functions. Log Window users can upgrade to the new version for $35.50.

Color Slow Scan TV for the Sound Blaster. Gene Harlan, WB9MMM, has come up with a good amateur radio use for that Creative Labs Sound Blaster card you got with your new PC. He's come up with an innovative, DOS-based software package called Color Slow Scan Television for the Sound Blaster. It offers full-color SSTV send and receive capability using your PC and its Sound Blaster or compatible sound card. What could be niftier?

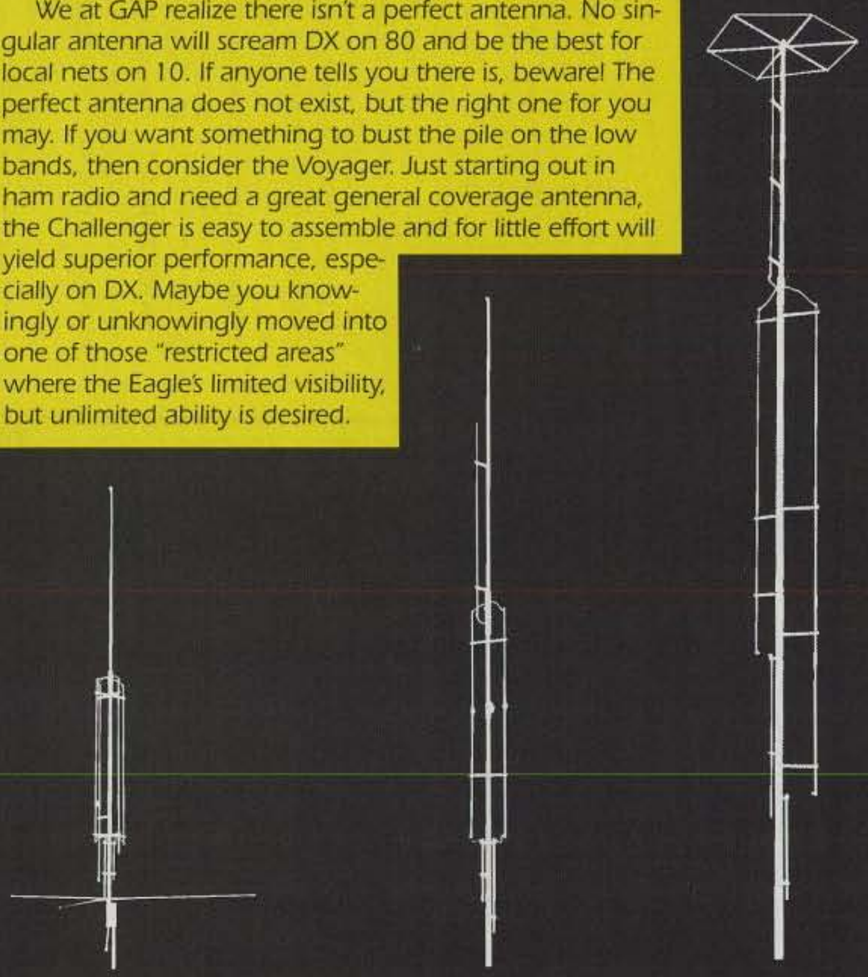
The new, menu- and function-key controlled program's features include receive for Robot 8, 12, 24, and 36 second black-and-white, Robot 36 and 72 second color, and Scotty 1 and 2 images, and conversion of images to a VOC-format "voice file" for transmit using all these modes. Other features include loading and saving of PCX format images; image dither modes for loading 24-bit color PCX images; "slide show" presentations; generation of gray-scale, color scale, and other test images; and ability to enter your callsign so it shows on the transmitted image. The program's display even tells you the frequency difference, in Hz, between your receiver and the sending station.

The new, color-capable program is $99.95. Two other programs are available: Slow Scan II, which lets you view SSTV in black and white and resend pictures ($40); and Audio Analyzer ($39.95) to visually analyze various received signals such as SSTV, RTTY, AMTOR, and packet. For more detailed information, contact Harlan Technologies, 5931 Alma Dr., Rockford, IL 61108 (815-398-2683).

XTreeGold 4.0 for Windows. One of the better "DOS shells" long has been the powerful XTreeGold® for DOS, which over the years has built up a big following among serious DOS

GAP: THE PERFECT ANTENNA

We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider the Voyager. Just starting out in ham radio and need a great general coverage antenna, the Challenger is easy to assemble and for little effort will yield superior performance, especially on DX. Maybe you knowingly or unknowingly moved into one of those "restricted areas" where the Eagle's limited visibility, but unlimited ability is desired.



Eagle DX | Challenger DX | Voyager DX

This chart helps you select the right GAP antenna. When comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas...and was quieter."

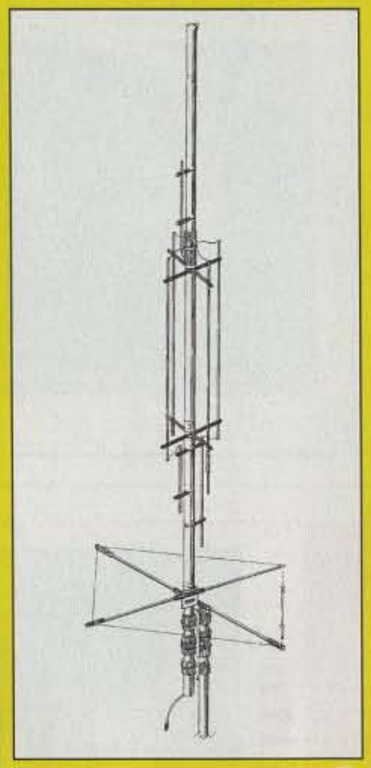
73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

New Release: TITAN DX



This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$259
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$269
Titan DX (Just Released)			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$289
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

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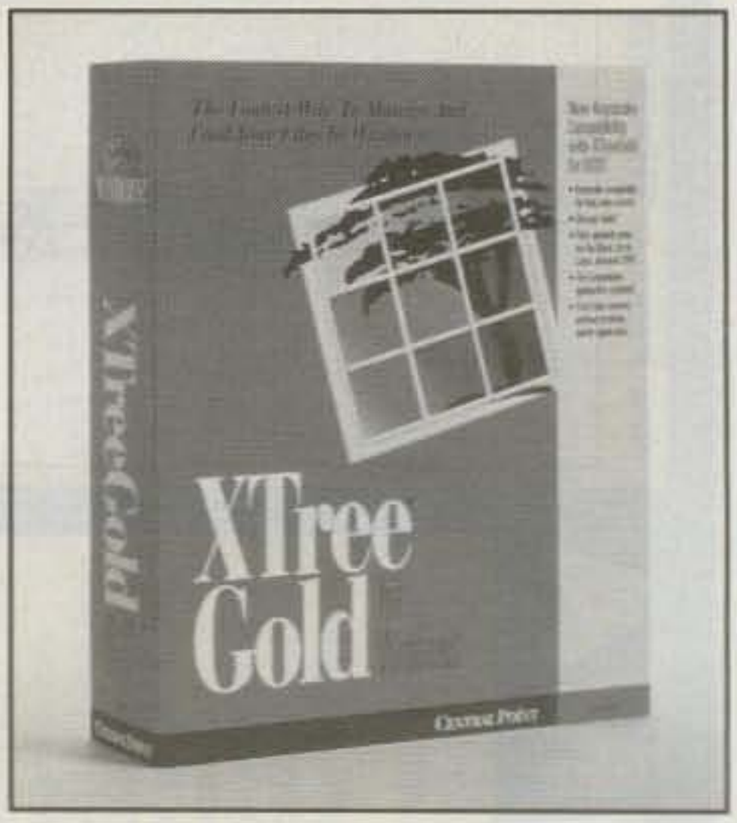


Rapidly winning favor with Windows users is XTreeGold 4.0 for Windows, by Symantec's Central Point Software. The flexible and sophisticated file and disk management program can take the place of the relatively incapable Windows File Manager, and even the much more capable file manager of a sophisticated Windows shell such as PC Tools for Windows. (Photo courtesy Central Point Software)

users. It remains one of our favorite DOS utility programs. Some time ago, a Windows version was introduced, which we highlighted in the April 1994 column.

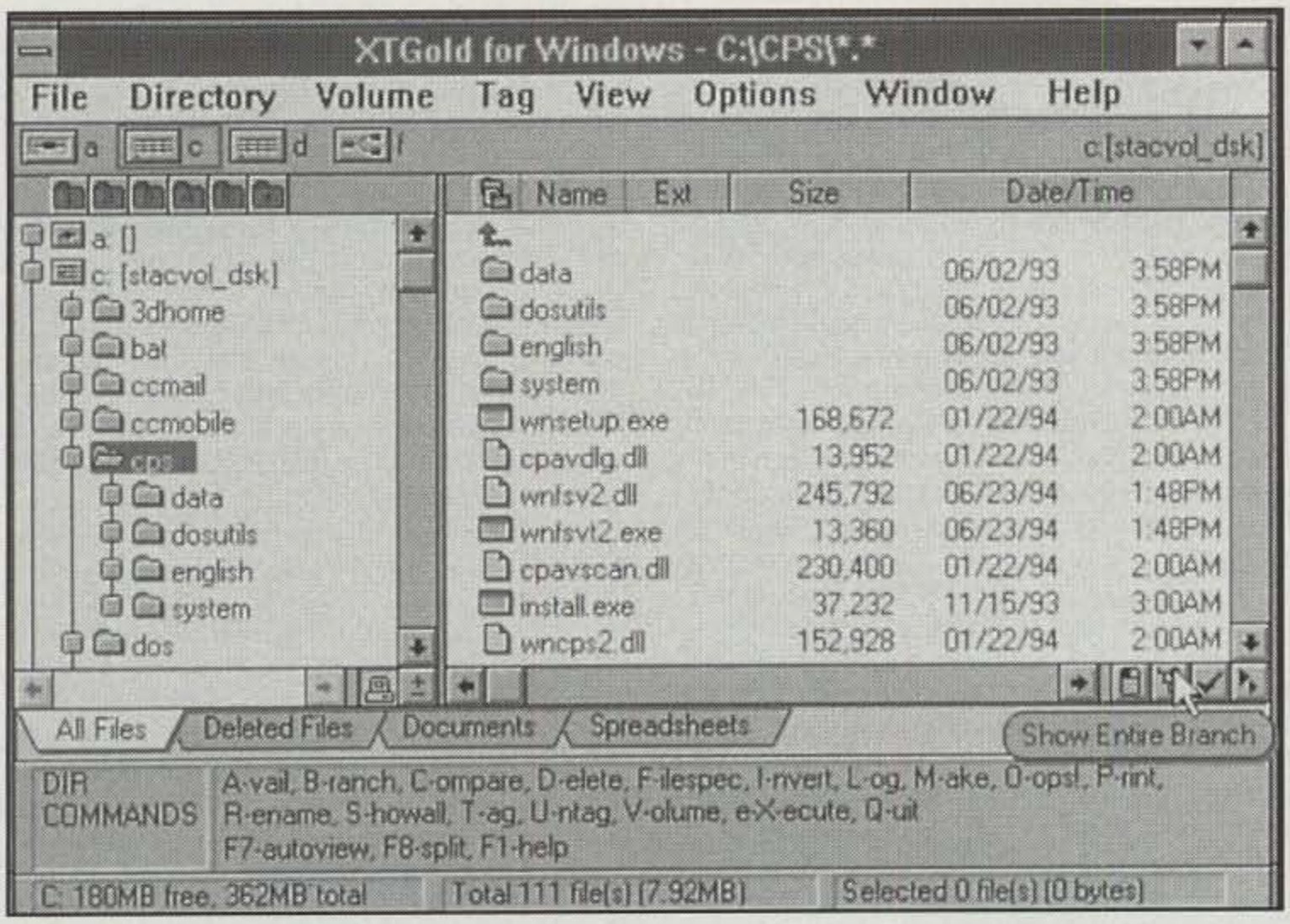
Now there's an update—XTreeGold 4.0 for Windows. The new version is keystroke- and feature-compatible with XTreeGold for DOS, for users who prefer keystrokes to menu- or mouse-based controls. Some of the new benefits include support of "long file names" as in the upcoming Windows 95; a slew of new file viewers; expanded PKZip 2.x support, including the ability to construct large ZIP files across multiple diskettes and making self-extracting ZIP files; printing directly from viewers, instead of launching their associated application; selecting files across different directories and drives; and directory synchronization, for updating and transporting files between desktops and laptops.

Central Point Software added two very nice features. One is File Companions™, which lets you access common file management tasks (copy, delete, rename, etc.) where you most need them—*inside* the Open and Save dialog boxes of Windows applications.

The second feature is SmartTabs™, which lets you create custom views of the file list, each with its own filter, sort options, and detail. This feature gives you the ability to quickly switch between different file list displays with a single click (e.g., all files sorted alphabetically, deleted files only, or data files sorted by type, to cite but three examples).

XTreeGold 4.0 for Windows is $99.95, but special upgrade deals are available for current XTree, PC Tools, and Norton users. For details, contact Central Point Software, 15220 N.W. Greenbrier Parkway, #150, Beaverton, OR 97006 (1-800-445-4208).

BOOTCON 2.1. One problem you're sure to experience if you use a variety of software is dealing with the constant barrage of software



The new XTreeGold 4.0 for Windows is keystroke- and feature- compatible with the perennial utility favorite, XTreeGold for DOS. The new Windows version is especially favored by users who prefer keystrokes to menu- or mouse-based controls. (Photo courtesy Central Point Software)

packages that have special configuration requirements. These frequently make you juggle and re-juggle your CONFIG.SYS and AUTOEXEC.BAT files. And when the juggling is done, you often need to be able to restore your original system configuration, keeping track of "what's what" in these two critical files.

We looked at various versions of BOOTCON, a solid configuration control program, twice previously—in August 1992 and October 1993. We found that the program lets you predefine many different PC configurations for various tasks. Once you have set up these configurations, you simply boot the PC and select the proper configuration from the BOOTCON menu. BOOTCON then loads the appropriate selection. If you want to change your setup, you reboot and select a new configuration.

The new version, V2.1, lets you create up to 100 different system configurations and readily choose between them at boot time. It also allows you to compare configurations to see how any two configurations differ, facilitates memory optimization when using multiple configuration, and simplifies remote computing by allowing you to have different default configurations at different times. BOOTCON also allows you to archive multiple previous configurations, and it lets you simultaneously edit the CONFIG.SYS and AUTOEXEC.BAT files for all your configurations.

BOOTCON is unique in that it not only gives you full control over these files, but also lets you manage the important Windows information files—WIN.INI and SYSTEM.INI. It automatically detects configuration changes (which often occur when you install new software) and lets you back them out if desired.

The $79 program is from Modular Software Systems, 25825 104th Avenue S.E., Suite 208, Kent, WA 98031 (1-800-438-3930). Registered users of previous versions can upgrade for $28.

Drive Rocket 1.15 Update. In last May's column we examined Drive Rocket™, a DOS utility that adds speed to the hard drive itself. It's a device driver that increases the rate at which IDE drives process data so that your drive handles data at the maximum possible performance level.

Drive Rocket is "data accelerator software" for IDE AT-interface hard drives. By boosting the rate at which the drive reads and writes data, the driver can significantly increase the effective speed at which data are processed, from just a few percentage points to more than 80 percent faster than previously with some drives. Drive Rocket is compatible with all versions of DOS and Windows, as well as most disk cache, disk compression, and disk management utilities. However, you should have an IDE drive greater than 80 MB capacity that supports what techies call "read-write multiple mode."

One problem with the original program was that if you used Windows, you couldn't also use the Windows 3.1 32-bit FastDisk driver in addition to Drive Rocket. This version lets you use the Windows FastDisk driver, and it works with all configurations supported by the original FastDisk driver. It's also compatible with Windows for WorkGroups 3.11's 32-bit file access, and so represents a major enhancement to Windows. A further enhanced "Drive Rocket for Windows" version is expected soon.

Drive Rocket is $39.95 and it comes with a 39-page, on-disk technical manual that you can view or print out. For more information, contact Ontrack Computer Systems, 6321 Bury Drive, Eden Prairie, MN 55346 (1-800-752-1333).

From the Bookshelf

Build Your Own Shortwave Antennas, Second Edition, is by Andrew Yoder. His authori

tative 1994 beginner's antenna handbook tells you how to obtain optimal performance from your shortwave radio and save money by building your own simple but effective antennas and properly matching them to your receiver. The author's easy-to-follow instructions and clear diagrams and photos illustrate how to construct a variety of inexpensive but effective antennas. These include portable antennas, a window screen antenna, a long-wire hoisted aloft with a kite. The 224-page, $16.95 book contains 150 illustrations. It's published by TAB/McGraw Hill, Inc., Customer Services, P.O. Box 5445, Blacklick, OH 43004-0545 (1-800-722-4726).

Internet Bestseller. As the Internet continues to grow at a phenomenal rate, literally millions of new users find themselves scrambling to uncover how to best use this web of information for their own benefit. Tracy LaQuey's *The Internet Companion: A Beginner's Guide to Global Networking*, Second Ed. ($12.95), updates one of the better guides for newcomers to the Internet.

The new edition contains all the latest developments in this fast-changing area, including a revised foreword by Vice-President Al Gore (you know, the "information superhighway" guy), and a new chapter on UNIX®. The updated edition is also available as *The Internet Companion Plus* ($19.95), which comes bundled with the online service Delphi's Internet access software. The two books are published by Addison-Wesley Publishing Co., 1 Jacob Way, Reading, MA 01867 (617-944-3700).

So if you haven't already heard, what is Internet? It's a loosely-spun, worldwide web linking well over 15,000 computer networks in over 50 countries, from mainframes to desktop PCs. With over 25 million users worldwide (no one knows the *real* number of users), it's the fastest growing online resource.

Designed originally for research and technical uses, it's not very user-friendly. But that's changing as more casual users seek convenient access. You may be able to hook up through work or school, online communications utility services, some BBSes, and Internet access providers that hook you up for a fee.

There's no directory of everything on the net, but some things you can access through the Internet include E-mail; government documents, library catalogs, and databases; White House press releases; weather maps and forecasts; sports schedules; ZIP codes; and much more. Many of the online communications utility services—such as Delphi, America Online, Prodigy, and CompuServe—have varying degrees of access. In fact, today anyone with a personal computer and a modem can benefit from the resources of the Internet, including communication throughout the world, tapping into robust research databases, and downloading magazine and journal articles from online archives.

Kanga US Catalog Update. In last September's column we described the imported QRP amateur radio kits manufactured by Kanga Products of England and distributed by Bill Kelsey, N8ET's Kanga US. As we said, most Kanga kits are semi-complete with all parts, including PC boards and everything mounted on them. You supply the box, knobs, connectors, and some other components, to keep costs down. The column prompted a welcome letter from Bill:

"I knew something had been written in *CQ* when I started getting catalog requests referring to *CQ*! That clip, plus the one in *Popular Electronics* ('The Word on Kits' in the July 1994 issue), have generated a lot of inquiries—many thanks."

Bill enclosed a copy of his new and expanded catalog, explaining just how much it costs to get the word out by small companies like his that operate on a very small margin: "It [the catalog] is much larger, and now costs 75 cents to mail and more to print. I am requesting $1 for the catalog, or at least a 75-cent stamp. The requests for a free catalog get a sticker inside that asks for $1 to help cover my costs."

Bill mentioned that the "hot" items now are the KK7B direct-conversion receiver kits, especially since they can be used by the QRP gang as well as in IF (intermediate frequency) applications in satellite gear. The Hands Electronics QRP kits from Wales are popular as well, particularly the new six-band SSB/CW QRP transceiver kit.

A catalog is $1 from Bill Kelsey, N8ET, Kanga US, 3521 Spring Lake Drive, Findlay, OH 45840 (419-423-4604).

Update from Universal Radio. In February 1994 we took note of a new booklet, "Understanding ACARS," by Ed Flynn, which shed some light on a very specialized form of aircraft communications. ACARS, the Aircraft Communications Addressing and Reporting System, is a form of VHF radioteletype that transmits data and messages between commercial aircraft and ground stations.

The booklet now is in its second edition and has been expanded from 53 to 79 pages. It provides all the information you need to interpret and understand the messages, which typically deal with weather, flight schedules, engine performance, fuel usage, emergency conditions, and private communications. ACARS message types and formats are defined, and there are useful tables of airline and airport identifiers. The revised booklet is $6.95 from Universal Radio, Inc.

For more information on the ACARS booklet, or a copy of Universal's catalog for amateur, shortwave, and scanner enthusiasts, contact Universal Radio, Inc., 6830 Americana Parkway, Reynoldsburg, OH 43068 (1-800-431-3939). (Their 100+ page catalog is free by fourth class mail, or for $1 by first class mail. It's also available outside North America for four IRCs.)

Looking Back Five

Five Years Ago in Antennas and Accessories. So now you know what the column looks like in April 1995. But what did it feature in April 1990? "From the Notebook—Part III" made April an interesting month.

Among the topics we covered were several book reviews, including Don Johnson, W6AAQ's *40 Years of HF Mobileering*; Robert E. Evans' *Aeronautical Communications Handbook*; *Understanding Telecommunications*, by Ronald R. Thomas, W8QYR; and *Pocket Ref*, a 480-page, pocket-size compilation of tables, maps, formulas, constants, and conversions from Sequoia Publishing.

Computer-wise, we noted the Computer/Radio Interface System (CRIS) from Electronic Equipment Bank (EEB); various antenna analysis programs from Brian Beezley, K6STI, including MN and YO; John Olapurath, KE1Z's Ham Radio 101™, a computer-based training program using the Apple Macintosh; an update on DXLOG, a DXCC award tracking and record-keeping program from Drew Smith, K3PA, of PAYL software; and more on GOfer 2.0, a text retrieval utility for the IBM PC and the Mac.

If you find a topic we covered in a previous column to be of interest, please obtain the back issue directly from *CQ*'s New York offices, rather than requesting the article from us. Most back issues are available from *CQ* for $3.50 postpaid. (*CQ* also offers various "back issues specials" to help you complete your *CQ* collection. Check their ad, or call them at 1-800-853-9797 to order back issues.)

All things considered, April 1990 was a very interesting month in the column. Were you there in *CQ* with us?

Wrap-Up

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

Overheard: Wouldn't you just know it? No matter how early you arrive to be the first to be admitted to the swapfest, someone *else* is always in line *first*.

73, Karl, W8FX

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Radio FUNdamentals

BY BILL ORR, W6SAI

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

Glass Radio

(Or, save your Confederate money, boys. The South will rise again!)

Hank, W6GXN, and I were having lunch at our favorite bistro. We weren't sitting outside. The weather was vile; a nasty wind was blowing scattered rain clouds overhead. We sat inside by the window and looked out at the dismal scene.

Hank started to reminisce about some fleamarkets he had visited earlier in the year. His story was interesting, so I will let him tell it to you.

At the local series of amateur fleamarkets I detected a new trend. I had brought a load of junk to sell to the naive and was sitting beside the old 79 Chevy pickup that I called my office. Things were just getting underway. A young fellow came by and picked up a box of ceramic transmitting tube sockets and asked, "How much?"

I replied, "Oh, about fifty cents apiece." (After all, they were for old tubes such as VT4-Cs (211), 203As, and such. To my amazement he said, "How about five dollars for the whole box?"

Fortune had smiled upon me. A quick sale was made. Then he asked if I had any old tubes, such as the 211, 845, 810, 812, 2A3, KT66, 6550, EL34, and so on. I couldn't help him out.

The next thing I noticed was that of the few small power transformers I sometimes bring to the fleamarket, the only ones I could sell were filament transformers. (I don't bring the big transformers for preservation of my back.) The 6.3 volt filament transformers with their green leads were a hot item!

The Next Flea Market And My Basement

Something was going on. At the next fleamarket the pace picked up considerably. The market opened at 5 AM (!) in pitch darkness. As soon as I arrived, I had several eager buyers (some with head-mounted miner's lamps) helping me unload my truck to get at my goodies first! I had brought more 6.3 volt and 10 volt filament transformers and even some TV power transformers and (regrettably) honored requests to let several "buyers" look over the stock of stuff in my basement at home. The net result was that every audio power triode, every linear standard output transformer, every ceramic socket, and most of my small power transformers were carried off at bargain prices. I was left with broken tubes, pawed-over components, and a messed-up stock of leftovers. On the brighter side, I was about two hundred dollars richer, but considering all the time I had put in, I'd have been better working for the local McDonalds.

48 Campbell Lane, Menlo Park, CA 94025

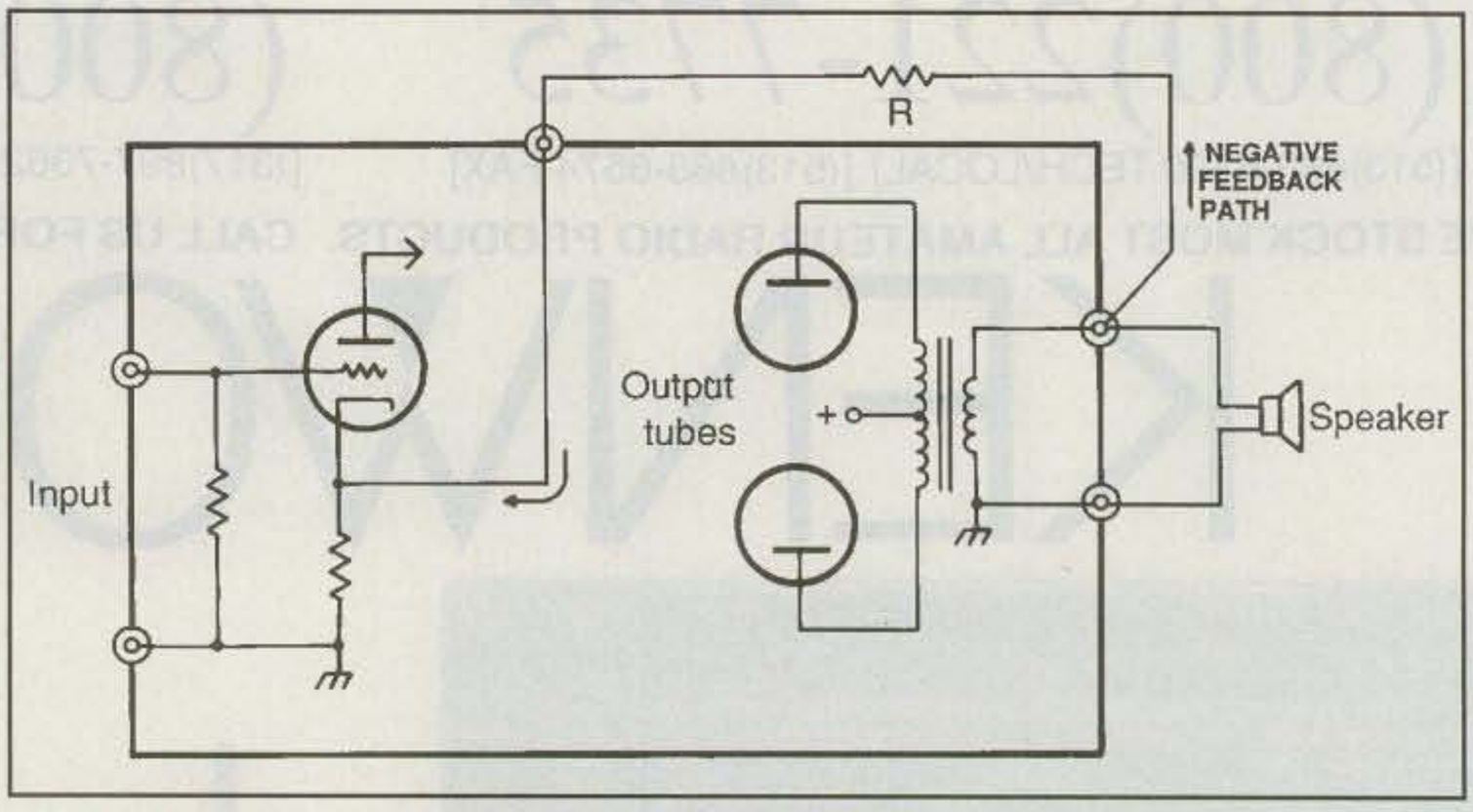


Fig. 1– Feedback loop from speaker to input stage provided "high fidelity," low distortion response in tube amplifier.

A Return to the Good Old Days

Hank paused in his story and looked over at the dessert counter. "What happened next?" I asked. Hank replied:

Well, over the next months I came to the realization that what was happening was there was a worldwide movement to return to the "good old days" of tube-type audio amplifiers. Apparently, the new emphasis of triode-tube audio started in Japan. It was no wonder then that those scroungers for parts were filling a temporary need for old-time components. Some of the fellows, I'm sure, had read the Japanese audio magazines, scooped up all the applicable components they could find, and shipped them to specialized audio dealers across the Pacific.

Glass Audio

The trend seems well established in the States. Magazines such as *Glass Audio* have emerged to satisfy the needs of the new wave of tube-type audio enthusiasts. In addition, a number of tube suppliers are selling US-equivalent audio tubes made in Russia, China, and even the Czech Republic, where the old tube-making technology never did die, mainly for reasons of social policy. (China still makes steam locomotives, as you may know.)

The trend to use tubes in audio amplifiers, often without any multi-stage feedback, has spawned a number of specialized manufacturers, and apparently even induced Western Electric Co. to start up its Kansas City tube plant again to manufacture the famous 300B audio tube. Also, a new supplier of audio tubes is scheduled to go into production in 1995 in the U.K.

This is all due to the new and growing interest in tube-type audio amplifiers, and the amazingly high prices that they command. Even the old textbooks and manuals that deal with tube-type amplifiers command exhorbitant prices. Copies of the *Big Red Book*, the Australian *Radiotron Handbook*, go for fifty dollars a copy and up these days!

The Williamson Amplifier

Right after World War II, Baxandall and others came up with what we thought at the time was the ultimate in audio amplifiers: the Williamson circuit, using push-pull KT-66s and total feedback from speaker output terminal back to the input stage (fig. 1). This, of course, necessitated putting any tone controls in a separate section, ahead of the first negatively fed-back stage.

In the U.S. the Williamson concept was copied and modified to use 6L6s, 807s, 5881s, and tubes available here similar to the British KT-66.

Heathkit took advantage of the availability of surplus 1625's (12.6 volt versions of the 807) to bring out an inexpensive Williamson kit which sold by the tens of thousands; possibly the biggest selling kit of all time. Other firms, such as Stancor, also put out kits, and most of

the audio output transformer companies, such as Thordarson, had "how-to" brochures available free with their transformers.

Hi-Fi: An Expanding Industry

As U.S. suppliers got into the Williamson act, many circuit innovations came to pass. The "Ultra-linear" circuit, with the screens of the output tubes tapped on the transformer, became fashionable. Probably the ultimate in the tube-feedback amplifiers was the MacIntosh, which, if you can find one, is worth considerable hard cash!

Hank paused in his story and looked out the window. The rain had stopped and the sun was trying to come out. Our lunch was nearly over. Finally, he said:

My own situation in the fifties was as a rather cash-strapped student, but even I could have a Williamson, even if it was home-built on a flat plate aluminum chassis with wood rails. It used surplus 1625s, 6SN7s, and bathtub capacitors for couplers. Even the output transformer was surplus, apparently having come out of some USN boat-anchor receiver. Most of my wealthier student-friends had amplifiers by Craftsman or Dynaco, but these jobs didn't sound much better than my junker. My biggest limitation was my speaker, a Lansing D216, an 8 inch type in a homemade wood cabinet. But it all sounded wonderful to me.

Introduction of Stereo

The biggest change in the audio industry came with the introduction of stereo. If one had a stereo system (even one with mediocre amplifiers), the system seemed to sound much better than a single channel that had really low distortion and good fidelity. Stereo covered up a wide range of audio fidelity inadequacies, and in the interest of compactness for a two-channel system, many of the lessons learned in the "hi-fi" era were forgotten. The "cover up" capability of stereo was relied upon to simplify and cheapen amplifiers and still provide the advantages of stereo.

In the mid-fifties the first commercial TO3 power transistors began to appear on the market, manufactured by Motorola and Delco for the output stages of auto radios. These germanium transistors were grabbed by the audio designers and put into push-pull (totem pole) output amplifiers that were totally fed-back, and that directly drove the speaker, eliminating a costly output transformer and the problems associated with it. All was happiness. A cheap and dirty system with total feedback and direct speaker drive!

Some circuit engineers felt that the direct-drive transistor circuit depended too much on its feedback to linearize the essentially nonlinear characteristics of the bipolar transistors. When Japanese manufacturers introduced their new FET output audio amplifiers, the bipolar critics were convinced that they had been right all the while. The FETs were more like tubes in their inherent linearity, and so they required less negative feedback. And besides, they sounded better, or so it was felt.

And so the argument goes, that what we really need to do is to get back to tubes in audio amplifiers, and maybe even revert to long-playing vinyl recordings instead of CDs!

What will happen next I can only guess, but I'm hanging on to my collection of old London 78 records!

Deja Vu All Over Again

I pointed out to Hank that the October 10, 1994 issue of *Business Week* magazine had a feature article entitled "Audiophiles Rediscover an Old Friend." Given up for dead in the early 1960s, the quirky tube is once again being prized for its sonic virtues. Manufacturers of tube-style audio amplifiers claim that the product's tube-like sound is more lush or romantic than the crystal-like tone of transistorized devices. An antique amplifier, such as the Marantz 9 now commands a price of up to $10,000, more than 12 times its original cost!

Modern tube amplifiers are a work of art, *Business Week* points out, with their glass bottles glowing yellowish orange in the dark.

More information on tube-style audio gear? Read *Glass Audio*, a quarterly publication devoted entirely to high-quality audio reproduction using vacuum-tube technology. For information on this fascinating publication, write to Glass Audio, 305 Union St., Box 176, Peterborough, NH 03458, or call 603-924-9464.

Aloha From W6SAI

This is my last monthly column for *CQ* magazine. From time to time, however, I hope to visit you again with interesting material. It has been a pleasure and an honor to conduct this column, and I am grateful for the fine people I have met via this medium. And my thanks and hearty best wishes to the staff of *CQ*, who have supported and encouraged me though the years: Alan Dorhoffer, K2EEK, Editor; Gail Schieber, Managing Editor; Dorothy Kehrweider, Production Manager; Liz Ryan, Art Director; Hal Keith, Illustrator; and Frank Fuzia, Controller. It has been a pleasure working with all of you. And a special 73 to Dick Ross, K2MGA, the Publisher who has guided CQ Communications through the years. To all of you, and to my faithful readers, I send a hearty thank you.

73, Bill, W6SAI

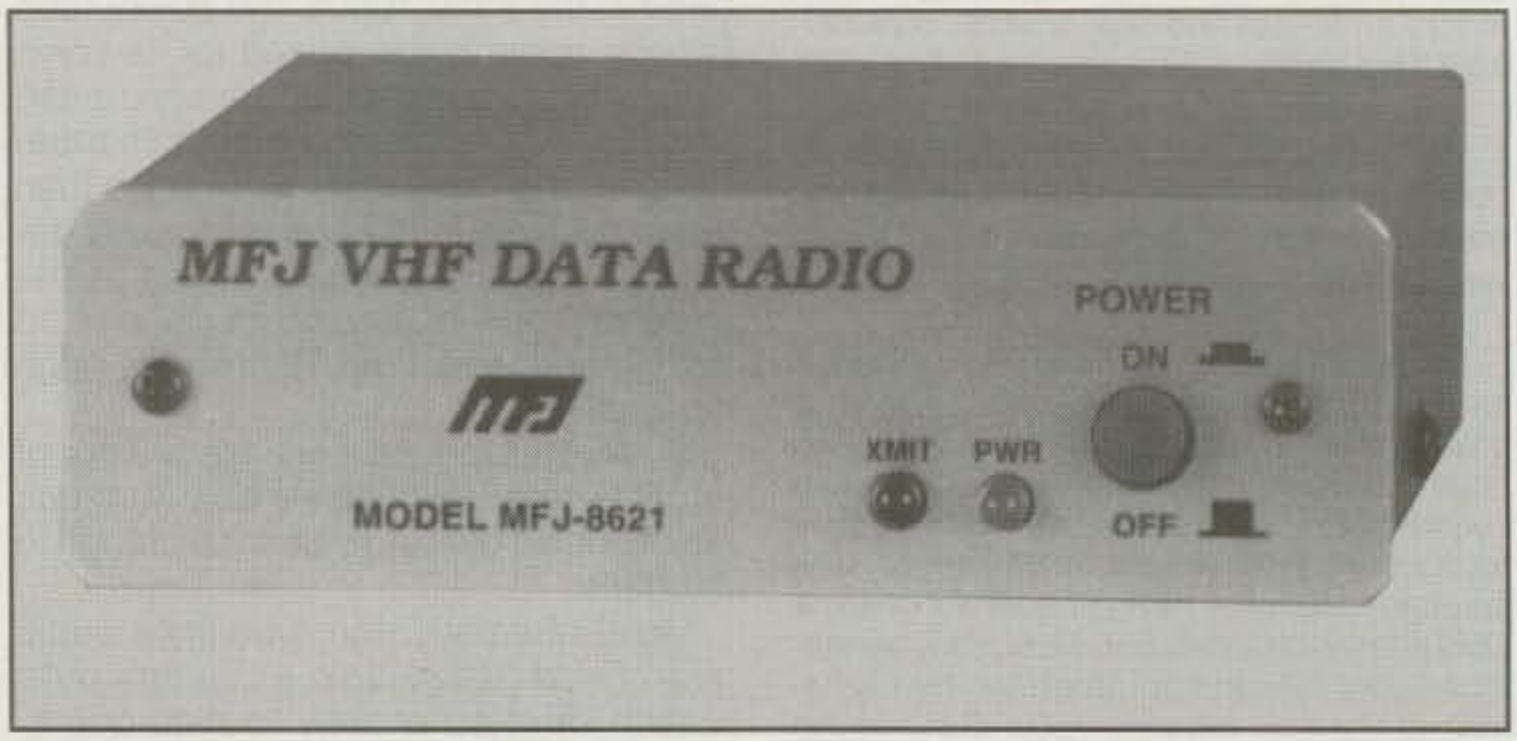
PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

BY BUCK ROGERS, K4ABT

The MFJ-8621 Packet Only™ Data Radio

This year Ham Radio 95 in Atlanta (April 7–9) and the Dayton HamVention (April 27–29) will find us moving rapidly towards the fast-paced, action-packed, and long-awaited core of packet radio. This is the moment we packeteers have been waiting for. Every manufacturer and amateur radio vendor will be exhibiting the wares of 9600 baud packet radio. Most of the hardware will be in the terminal node controllers (TNC) and multi-mode digital controllers that feature data rates for both 1200 and 9600 baud.



The MFJ-8621 VHF data radio.

Back To The Future

In the not-to-distant future 1200 baud packet will go the way that 1200 baud telephone modems went. The move to 9600 baud will be the catch-word for the packet radio user. There will still be plenty of 1200 baud around for awhile, but 9600 will be the prevailing data speed for the next five years. Although 9600 baud is below some of the data rates being talked about by a few manufacturers, it is the data rate that will suffice with the latest data radio designs.

To attempt the use of the higher speeds will require adaptation of radios with much wider bandwidths. Notwithstanding is the ever-present knowledge that when we increase data rates, we decrease the coverage for a given power level. It now becomes a power versus bandwidth problem, and the low-power (2 watt) data transceivers I've run tests on lately just don't have the range at 19,200 and 38,400 baud. When we add amplifiers to these *trick* radios, we add more TXDelay and more expense, enough said.

Back To The Present

With these thoughts in mind, we begin to consider where we can find a "happy medium." At 440 MHz 19,200 baud with 2 watts may make it across town, but what is the alternative for the long-haul networks and backbones? Simple arithmetic tells us that 9600 baud is the present answer. There is no magic elixir to enhance the cross-country networks unless we use frequencies that are contemporary and available. The other side of the picture is the data radios. Not only do we need a plentiful supply, but we also need one a data radio that is in an affordable price range for the network node SYSOP and the end user (packeteer).

211 Luenburg Drive, Evington, VA 24550

Ever Wish?

Have you ever wished you could come up with another transceiver to put on the air at home so you would no longer have to pull the YL's radio out of her car and use it for packet? It could be that you have to yank the mobile unit and use it for packet. In either case, the picture is the same. Here then is a solution.

For the network node SYSOP, for the BBS operator who has wanted to add that 9600 baud port, and for the packeteer who needs a low-cost packet-only transceiver, there is the new MFJ-8621 Packet Only™ Transceiver.

A Simplified Technical Description

The MFJ-8621 was specially designed for packet-only operation. MFJ has eliminated costly circuitry you don't need—things such as squelch, repeater offsets, PL tones, DTMF pad, PLL synthesis, memory, the speaker-amplifier, and the speaker itself. At the same time they've engineered in essential packet circuits such as true-FM direct modulation, unsquelched AFSK, PIN-diode switching, data-passband IF filtering, and a tailored 0-Vu DC-coupled line driver to ensure maximum performance. There are no user-adjustable controls to misalign, and the MFJ-8621 works with most popular TNCs.

I have four of these data radios operating at various locations on mountaintops in North Carolina and Virginia. I have two of them operating here in my lab in Evington, Virginia. They are little, but effective. All four of these units are operating in the 144.-- to 145.-- MHz region. The power output to the antenna is between 4.5 and 6 watts.

Don't let the small size of this Packet Only™ data transceiver fool you. It has a hot receiver section (0.25 uV for 12 dB SINAD) with image rejection that is better than –45 dB.

The transmitter is built around a rugged MRF237 low-power RF amplifier. One caution, though: The transmitter is not VSWR protected, so be sure to have an antenna (or 50 ohm dummy load) connected when transmitting.

The MFJ-8621 is crystal controlled and is supplied with 145.010 MHz installed. Other frequencies (crystals) are available off the shelf from MFJ at $24.95 a set (transmit and receive).

The MFJ-8621's designer, Rick Littlefield, K1BQT, created the MFJ-8621 from the git-go to be used for packet radio only. This allowed MFJ to market a true packet-only transceiver that does not compromise performance as some radios do so they may be used for both voice and packet operation. By being a packet-only transceiver, the MFJ-8621 is

built to exact packet standards while keeping the production costs low.

Sending and Receiving 9600 Baud Data

Although 9600 baud packet is almost four times faster than 1200 baud packet, it is a little less forgiving over marginal signal paths. For one thing, you'll probably need between 3 and 6 dB additional signal strength to overcome wideband noise generated by the receiver's unusually broad IF and audio passbands. Also, 9600 baud signals are extremely vulnerable to phase shift, which means multipath reflections between stations must be held to a minimum. Finally, your transmitter and receiver must be accurately adjusted to frequency, and the transmit deviation set for the correct shift.

Once you've experienced 9600 baud, you'll find it hard to return to the slow pace of 1200 baud. At 9600 baud the packets are shorter, and the ability for 9600 baud packets to go through is much better than for a comparable length packet at 1200 baud. I'm seeing 9600 baud stations operating on the same frequencies as the 1200 baud stations with little or no problem in the shared environment.

The manual for the MFJ-8621 is well written and defines many of the pitfalls that often are overlooked when making the transition to the higher baud rates. There's a section in the manual that gives the new packeteer a quick look at what to check in case of difficulty.

Think "pipeline" when setting up point-to-point 9600 baud links. A carefully aimed Yagi will deliver better quieting and less multipath than most omni-directional antennas. If you are selecting a remote site, remember the MFJ-8621 is a $120 amateur radio product and not a bullet-proof $5000 commercial unit. Avoid high-IMD sites, or be prepared to provide additional filtering to reduce the effects of intermod and desensing from nearby transmitters. Finally, make certain your transmitter is not interfering with commercial services sharing the site. Setting up a node for 9600 takes a little more care, but once you are "up and running," you can sit back and watch massive files pump through in a matter of seconds at 9600 baud rather than the ancient 1200 baud slow-boat.

The question that many are asking at this point is "What about the TXDelay?" I'm having little or no retries with the X-1J4 node set to a TXD of 7 (70 milliseconds). To make sure I have a clean link and tries are minimum, I set the TXDelay at 8 or 9. I have had good results with the

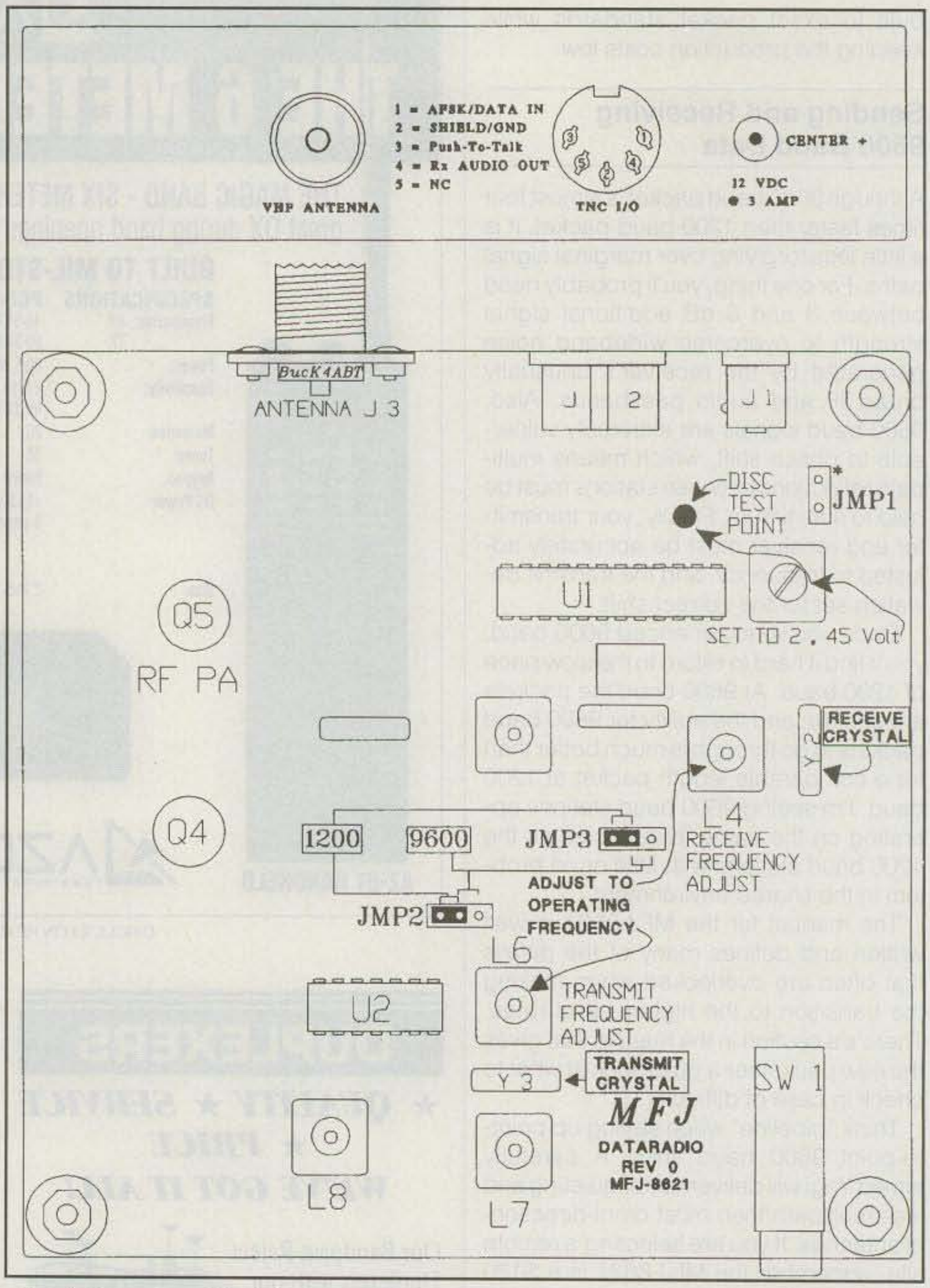


Fig. 1–Overview of the MFJ-8621 data-only transceiver. The modulator select jumpers at JMP2 and JMP3 are used to select 1200 or 9600 baud operation. The jumper at JMP1 should be installed when operating 1200 baud. When operating at 9600 baud, be sure it is removed. Crystals for other frequencies are available from MFJ. The receive crystal is Y2, and the transmit crystal is Y3. These crystals are ordered in simplex pairs.

MFJ-8621 and the node set below 50 milliseconds (TXD 5). However, this was across a short path using the MFJ-1270CQ with the Dave Roberts, G8KBB, X-1J4 TheNET node.

Baud Rate Selection

The MFJ-8621 receiver features a special noise-reduction filter to enhance 1200 baud operation. When running at 1200 baud, this filter improves weak-signal performance. To activate the 1200 baud noise-reduction filter, install a shorting plug at **JMP-1** as shown in fig. 1 (this plug must always be removed when operating at 9600-baud).

The MFJ-8621 has two FM modulators. One is a sensitive reactance modulator designed for mic-level 1200 baud AFSK signals. The other is a "true-FM" varactor modulator designed for line-level 9600 baud FSK.

For 1200 baud AFSK operation, set **JMP-2** and **JMP-3** in the reactance modulator positions (jumper plugs on the left-hand side and center pins of each header); see fig. 1.

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Now you can be your own weather reporter with the Davis Weather Monitor II. Our top-of-the-line weather station combines the most advanced weather monitoring technologies available into one incredible package. Glance at the display, and see wind direction and wind speed on the compass rose. Check the barometric trend arrow to see if the pressure is rising or falling. Push a button, and read indoor and outdoor temperature, wind chill, humidity and barometric pressure. Our package deal includes the new ultra high resolution 1/100 inch rain collector part **#7852-K**, and the external temperature/humidity sensor, part **#7859-K**. The package deal is order **#DAV1-K** for $479.95 plus $15.00 shipping. If you have a personal computer, when you order the optional Weatherlink computer software for $139.95, you'll have a powerful computerized weather station at an incredible price. For the IBM PC or equivalent order part **#7862-K**. Apple Mac Plus or higher including PowerBook, order part number **7866-K.**

The Weather Monitor II (7440-K) comes complete with anemometer with 40 feet of cable, external temperature sensor with 25 feet of cable, junction box with 8 feet of cable, AC-power adapter, detailed instruction booklet and one year limited factory warranty.

Davis Weather Monitor II 7440-K	$334.95
Davis Weather Wizard III 7425-K	$154.95
Davis Remote Display Unit 7815-K	$84.95
Davis Rain Collector II 0.01" 7852-K	$59.95
Davis Rain Collector II 0.2 mm 7852M-K	$59.95
External Temperature/Humidity Sensor 7859-K	$99.95
Davis Anemometer Mast Mount 7890-K	$15.95
Weatherlink Software for IBM PC-Version 3.0 7862-K	$139.95
Weatherlink Software for Apple-Version 3.0 7866-K	$139.95
4-Conductor 40' (12.2 m) extension cable 7876-K	$17.95
6-Conductor 40' (12.2 m) extension cable 7878-K	$21.95
8-Conductor 25' (7.6 m) junction box cable 7880-K	$14.95
8-Conductor 50' (15.2 m) junction box cable 7881-K	$24.95
8-Conductor 100' (30.5 m) junction box cable 7882-K	$44.95
Modem Adaptor 25-pin for communications port 7870-K	$9.95
Car/Boat/RV Lighter Cord 7873-K	$9.95
2400 baud modem for Weatherlink MEXT-K	$39.95
Talking weather station - Call 313-994-9000 for demo ITPRO2-K	$3,999.95
Weatherlink language disks: Française, Deutsche, Italiana, Española 7863-K	$24.95
Barometer, Indoor Hygrometer & Thermometer, Clock/Calendar BA888-K	$99.95
Indoor-Outdoor Thermometer/Barometer & Hygrometer by OSI BA213-K	$79.95
Thermometer with transparent calender & clock display by OSI TC188-K	$19.95
Thermometer with AM/FM clock radio by Oregon Scientific CR388-K	$39.95
Indoor/Outdoor Thermometer with Jumbo Display by OSI JB880EX-K	$24.95

Bearcat Scanners

Bearcat 9000XLT-K base/mobile	$399.95
Bearcat 3000XLT-K handheld	$379.95
Bearcat 2500XLT-K1 SPECIAL	$299.95
Bearcat 890XLT-K base/mobile	$228.95
Bearcat 860XLT-K1 base	$159.95
Bearcat 760XLT-K base/mobile	$198.95
Bearcat 700A-K info mobile	$148.95
Bearcat 560XLA-K base/mobile	$83.95
Bearcat 220XLT-K1 handheld/SPECIAL	$208.95
Bearcat 178XLT-K1 base/WX alert	$128.95
Sportcat 150-K handheld w/800 MHz.	$159.95
Bearcat 148XLT-K1 base/WX alert	$83.95
Bearcat 120XLT-K1 handheld	$129.95
Bearcat 80XLT-K1 handheld	$159.95
Bearcat BCT7-K info mobile	$168.95

Bearcat® 9000XLT-K Radio Scanner

Mfg. suggested list price $769.95/CE price $399.95

500 Channels · 20 banks · Alpha numeric display
Turbo Scan · VFO Control · 10 Priority channels
Auto Store · Auto Recording · Reception counter
Frequency step resolution 5, 12.5 & 25 KHz.
Size: 10-1/2" Wide x 7-1/2" Deep x 3-3/8" High

Frequency Coverage:
25.000 - 550.000 MHz., 760.000 - 824.000 MHz., 849.000 - 869.000 MHz., 894.000 - 1,300.000 MHz.

The new Bearcat 9000XLT gives you pure scanning satisfaction with amazing features like TurboSearch™ to search VHF channels at 300 steps per second.This base and moble scanner is ideal for surveillance professionals because it has a selectable attenuator to help eliminate annoying intermodulation from adjacent frequencies in highly populated areas and selectable AM, Wide FM and Narrow FM modes that allow you to change the default receiving mode of the BC9000XLT. Other features include ***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. **Hi-Cut filter** to help eliminate unwanted static noise. 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. 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 BC9000XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited warranty from Uniden.

CB/GMRS Radios

The new Maxon GMRS 210+3 transceiver is a PLL synthesized 10 channel radio on General Mobile Radio Service frequencies. Two channels are dealer programmable and one channel is set aside for emergency and safety communications. The seven remaining chanels are non-programmable for frequency--they are set on interstitial frequencies for all-purpose GMRS radio use. 2 watts of RF power for exceptional transmitting range. Up to 5 watts when used with the supplied 12 volt vehicular DC power cord. CTCSS built-in. Includes 450mAh Ni-cad rechargeable battery pack, AC/DC wall battery charger, owner's manual, FCC license application, belt clip, antenna. Order today from CEI.

Maxon GMRS210+3-K GMRS transceiver	$199.95
Cobra 29LTDWX-K CB/Weather Alert	$129.95
Cobra HH40-K CB 40 ch. Handheld	$99.95
Ranger RCI2970-K 100 watt 10 meter.	$369.95
Ranger RCI2950-K 25 watt 10 meter	$239.95
Uniden GMR100-K GMRS Handheld	$144.95
Uniden WASHINGTON-K SSB CB Base	$189.95
Uniden GRANTXL-K SSB CB Mobile	$139.95
Uniden PRO538W-K CB & Weather	$59.95

Talking Weather

Now your weather station can talk to callers. Call 313-994-9000 for a demonstration. The Talking Weather Station (TWS) from Innovative Tech Works, lets anyone phone your Davis Weather Monitor II and *hear* the weather. Here's how it works. You setup the TWS with most IBM PC 80286 or faster compatible computers with a 40 MB hard disk. Requires MS-DOS version 5.0 or later with 1 MB of RAM. Add phone lines and your own personal messages or promotional advertising. Callers are automatically greeted with your voice giving them the weather and your messages. Several times a minute, the TWS software will poll the Weatherlink and will update the voice library files to make your spoken report. A single line card, order # IT1-K is only $489.95. A two line card is order #IT2-K for $939.95. A complete turnkey system for commercial use is available, order #ITPRO2-K starting at $3,999.95.

VHF Transceiver

RELM® WHS150-K Transceiver

Mfg. suggested list price $481.67/CE price $339.95

Severe weather spotters depend on the RELM WHS150 transceiver for direct two-way communications with their police or fire department, civil defense agency or ham radio repeater. The WHS150 is our most popular programmable five watt, 16 channel handheld transceiver that has built-in CTCSS, which may be programmed for any 39 standard EIA tones. Frequency range 148.000 to 174.000 MHz. Will also work 144.000-148.000 with slightly reduced performance. The full function, DTMF compatible keypad also allows for DTMF Encode/Decode and programmable ANI. Weighing only 15.5 oz., it features dealer programmable synthesized frequencies either simplex or half duplex in both 5.0 and 6.25 KHz increments. Other features include scan list, priority channel, selectable scan delay, selectable 5 watt/1 watt power levels, liquid crystal display, time-out timer and much more. When you order the WHS150 from the Weather Bureau, you'll get a complete package deal including antenna, battery, belt clip and user operating instructions. Other accessories are available. A leather carrying case with swivel belt loop part **#LCWHS** is $49.95; rapid charge battery charger, part **#BCWHS** is $69.95; speaker/microphone, part **#SMWHS** is $54.95; extra ni-cad battery pack, part **#BP007** is $59.95. The radio technician maintaining your radio system must order programming instructions part **#PI150** for $18.00 to activate this radio. FCC license required for United States operation.

Other neat stuff

Grundig Satellit 700-K1 portable shortwave receiver with 512 memory & AC adapter	$364.95
Grundig Yacht Boy 400-K1 digital portable shortwave receiver - 40 memory presets	$189.95
Grundig Yacht Boy 230-K1 portable shortwave receiver	$109.95
Sangean ATS800-K portable 20 memory shortwave receiver	$69.95
Sangean ATS803A-K1 portable shortwave w/AC adapter – 9 memory presets	$139.95
Sangean ATS808-K portable 45 memory shortwave receiver	$159.95
Sangean ATS818CS-K portable shortwave receiver with cassette recorder	$209.95
Uniden EXP9200-K 900 MHz. 2 line cordless phone	$289.95
Uniden EXP9100-K 900 MHz. 1 line cordless phone	$269.95
Cobra CP912-K 900 MHz. spread spectrum cordless phone	$249.95
Bogen FR2000-K Digital two-line advanced voice mail system & answering machine	$279.95
Bogen FR0018-K memory expansion module, doubles recording time to 36 minutes	$79.95
FANS P161P-K 60 name/number caller ID, unwanted call blocker, automatic paging	$149.95
SNI ID200-K Bouncer name/number caller ID, call reject, forward to machine	$89.95
ICOM GP22-K1 handheld global positioning system (GPS)	$494.95
WR200-K weather radio with National Weather Service storm alert	$39.95
RELM WHS150-K VHF handheld 5 watt, 16 channel transceiver	$339.95
RELM RH256NB-K VHF 25 watt, 16 channel synthesized transceiver	$289.95
Ranger RCI2950-K 25 watt 10 meter ham radio transceiver	$239.95
Ranger RCI2970-K 100 watt 10 meter ham radio transceiver	$369.95
Uniden LRD9900SW-K Super Wideband Laser/Radar Detector	$139.95
ME2-K Map Expert CD Rom for IBM PC by DeLorme Mapping	$299.95
HCPC-K HamCall CD Rom for IBM PC by Buckmaster Publishing	$39.95
ANTK-K VHF scanner/VHF transmitting antenna PL259 connector	$29.95
ANTMMBNC-K magnet mount scanner antenna w/ BNC connector	$29.95
ANTMMMOT-K magnet mount scan antenna w/Motorola plug	$29.95
ANTMMPL-K magnet mount scan antenna with PL259 connector	$29.95
ANTSGBNC-K glass mount scanner antenna with BNC connector	$29.95
ANTSGMOT-K glass mount scanner antenna with Motorola jack	$29.95

Buy with confidence

It's easy to order from us. **Mail orders to:** Communications Electronics Inc., Emergency Operations Center, P.O. Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $15.00 per radio or telephone product for U.P.S. ground shipping and handling in the continental U.S.A unless otherwise stated. Add $10.00 shipping for all accessories and publications. Add $10.00 shipping per antenna. For Canada, Puerto Rico, Hawaii, Alaska, P.O. Box, or APO/FPO delivery, shipping charges are two times continental U.S. rates. Michigan residents add state sales tax. No COD's. No returns or exchanges after 31 days. 10% surcharge for net 10 billing to qualified accounts. All sales are subject to availability, acceptance and verification. Prices, terms and specifications are subject to change without notice. We welcome your Discover, Visa, American Express or MasterCard. Call 1-800-USA-SCAN to order toll-free. Call 313-996-8888 if outside the U.S.A. FAX anytime, dial 313-663-8888. **For technical assistance to solve your communications problem, call the Communications Electronics technical support hotline for $2.00 per minute at 1-900-555-SCAN.**

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CIRCLE 173 ON READER SERVICE CARD

TECHNICAL SPECIFICATIONS	
RECEIVER:	
Frequency Coverage	144–148 MHz
Sensitivity	0.25 uV for 12 dB SINAD
Image Rejection	–45 dB or better
1st IF	10.7 MHz
2nd IF	455 kHz
1st LO	Crystal, 3rd overtone
2nd LO	10.245 MHz
Selectivity	–6 dB at 20 kHz (data-passband filter)
AFSK Output	Unsquelched, 0 dBm @ 3.0 kHz deviation
Current Drain	25 mA
TRANSMITTER:	
Frequency Control	Crystal, 18 MHz x 8
FSK/AFSK Input level	150 mV p-p or 0.8 V (selectable)
Deviation	0–5 kHz, adjustable at TNC
RF Power Output	4.5–5.0 watts into 50 ohms
VSWR Tolerance	3:1 Max
Current Drain	*1.0 amp @ 13.8 volts*

Table I– Technical specifications of the MFJ-8621.

For 9600 baud operation, set **JMP-2** and **JMP-3** in the varactor modulator positions (jumper plugs go on the center and right-hand pins of the headers); see the notes in fig. 1.

If your TNC has a high-level output setting for 1200 baud TX-AFSK (usually set via a jumper inside the TNC), you may use the varactor modulator at both data rates.

The Fun Begins!

In the tests I've conducted on these MFJ-8621 Packet Only™ transceivers, I_ve had good results at both 1200 and 9600 baud. In 1992 I wrote about converting 2 meter transceivers (what a bore) for use at 9600 baud. In that article I discussed the difference in the sound of 1200 and 9600 baud. Since then I, along with most other users of 9600 baud, have come to take for granted that everyone is familiar with the sound of 9600 baud as compared to the sound of 1200 baud—my mistake for assuming that everyone knows the sound of 9600 baud. It is reminiscent of the time I bought a new Golden Hawk Studebaker! I had never noticed the number of Studebaker cars on the roads and highways until I had one of my own. For the benefit of Fred Roberts, Billy Stewart, and countless other packeteers, I'm about to replay the scene, but with a different cast. Here is Rick, K1BQT's method of explaining 9600 baud and the difference in sound between 1200 and 9600 baud.

9600 Baud FSK Packet Signals

The familiar "braaap" generated by 1200 baud packet signals is a combination of 1200 and 2200 Hz sine-wave tones beating together. Although the information being conveyed by these tones is digital, the transmission system itself is analog and falls within the range of normal speech. Unlike 1200 baud packet, 9600 baud signals are transmitted by binary FSK.

To understand how this works, suppose you set your radio at 145.000 MHz with the modem adjusted for 3 kHz deviation. Any time the TNC sends a 1, the transmitter should flip 1.5 kHz high in frequency to generate a carrier at 145.0015 MHz. When the TNC sends 0, the transmitter should flop 1.5 kHz low to generate a carrier at 144.9985 MHz. This is called FSK-FM (frequency-shift keyed FM), and there are no analog tones involved—only a rapid switching back and forth between binary states. In fact, 9600 baud signals sound more like white noise rather than tones when monitored on a conventional FM receiver.

Data signals of this type require significantly more bandwidth than normal speech. Extended low-frequency response is needed to sustain prolonged strings of 1s or 0s, and extended high-frequency response is needed to provide a fast rise time when the signal changes state. This is why 9600 baud receivers typically use wider IF filters and special RX-FSK output circuits, and why transmitters often use "direct-FM" modulators especially adapted for FSK.

Let's expand on Rick's 9600 baud explanation and give a quick explanation of the sound difference between 1200 and 9600 baud. A packet of 1200 baud has the familiar rasping sound, while a packet of 9600 baud has the sound of air

escaping (in short bursts) from a car tire with an audible leak.

Setting Deviation in The MFJ-8621

The MFJ-8621 has no internal deviation control. Deviation is adjusted via the AFSK output level control on your TNC (consult your TNC manual for specifics). If you don't have access to a FM deviation meter, you can set deviation by measuring the peak-to-peak AFSK signal output from your TNC as follows.

With jumpers in the reactance modulator (1200 baud) jumper positions, a 150 mV p-p sine wave should produce approximately 3 kHz deviation.

With jumpers in the varactor modulator (9600 baud) jumper positions, a 800 mV p-p sine wave should produce approximately 3 kHz deviation.

Wrap Up

To make this month's topic complete, the only other item you'll need is the interface cable between the MFJ-8621 and the TNC. In my application I am using the MFJ-1270CQ TNC (9600 baud ready "tink") with the MFJ-8621 Packet Only™ transceiver. The cable may be ordered from MFJ ready to plug and play for $9.95. If you prefer to roll your own, then refer to fig. 2. The MFJ interface cable is wired for use with most current manufacturers' TNCs which have the standard 5-pin DIN connector transmit and receive I/O. Another reason I use the MFJ interface cable is that it provides shielding of both the transmit and receive data AFSK and FSK lines.

Here are some of the features of the MFJ-8621.

Packet Only™ Performance: The MFJ-8621 is designed—from the ground up—for packet. This means you'll get uncompromising performance on both AFSK and FSK at a much further reduced price than you'd pay for a converted voice radio.

Cool Running: The MFJ-8621 draws only 25 mA on receive and less than 1 amp on transmit. Run it 24 hours a day, 365 days a year, or pack it up with your lap-top and take it on the road.

Sensitive: IC-based receiver circuitry recovers data from weak signals for better throughput and fewer collisions.

Made-For-Data Filters: Optimized (selectable), filters your receiver for wide (9600 baud FSK) signals or narrow (1200 baud) AFSK signals. Not found in other radios.

Clean, Unsquelched Data Output: The MFJ-8621 uses a wide-response DC-coupled line driver rather than a speaker

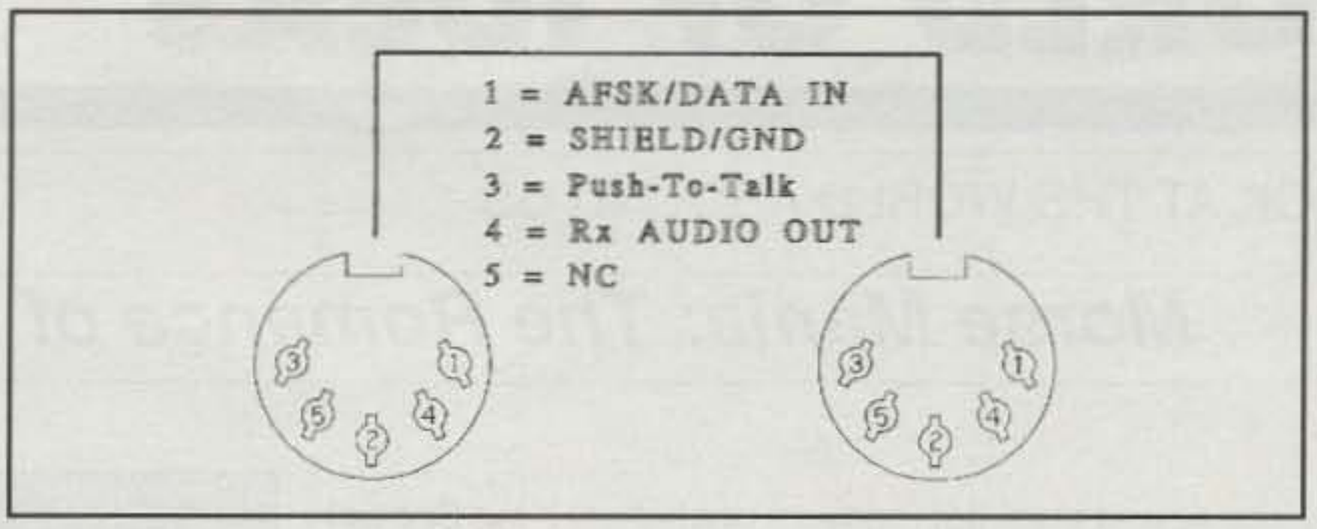

Fig. 2– The MFJ interconnecting cable pin data.

amp for clean data recovery.

Lightning-Fast TXD: Set TXD low! PIN-diode switching, a continuous-running receiver, and crystal control deliver ultra-fast switching.

Dual-Mode Modulators: Choose the varactor-modulator for true-FM FSK or the sensitive reactance modulator for mic-level AFSK at 1200 baud.

Easy To Rechannel: Use supplied 145.01 MHz crystals, or follow special easy-order procedure to purchase extra frequencies of your choice. Step-by-step instructions show you how to re-crystal using only a counter or HF receiver.

The Right Tool For The Job: Don't let the low price fool you! The MFJ-8621 is a true data radio, carefully designed and tested for accurate packet operation and nothing else. Whether you use it to work your local network, BBS, or DX spotter, you can look forward to years of hands-off service.

Summary

The price of the MFJ-8621 is $119.95. It is available at MFJ dealers. For more information, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762. The MFJ order line is 1-800-647-1800; FAX 601-323-6551.

Happy 9600 baud packeting!

de BucK4ABT @ WA4RTS.VA.USA

WORLD OF IDEAS

BY DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Morse Mania: The Romance of Keys Continues

Okay, friends and fans, get ready for our hottest Keys Special yet! Yes, and this year's two-part series includes something for everyone: brand new keys, paddles and bugs, old-time classics with fascinating histories, unusual "exotics," and much more. The new keys can be purchased right now. The "raries" are so far off the beaten path that even finding ads or photos of them is almost impossible. Ah, but just studying various types and styles of keys is almost as delightful as collecting them, plus it escalates one's interest in CW at least 200 percent.

Thanks to this column's photo contributors—Bill Holly, K1BH; Gil Schlehman, W9WDY; David Combs, W5VJW; and David Pennes, WA3LKN.

The Schurr Master and Bencher RJ

Our views begin with two new starlets, both of which are as enjoyable to study as they are to operate. The upper key in photo 1 is Schurr's Master, which is a refined version of his popular Mobil model of last year. This palm-size treat measures 4 inches long by 1.75 inches wide, is solid brass, and has a "zapperung" coating to retain its new luster indefinitely. Schurr's new "Master" key has a contoured base, rear pivot point with newly designed bearings, and handles great! It is handmade in Germany and available by mail from Klaus Gramowski, DL7NS (Kaiserin-Augusta-Allee 91, D-1000 Berlin 10, Germany).

The lower key in photo 1 is Bencher's new deluxe/all-chrome "RJ" hand key, and it is a real glamour item. Notice there are three (rather than the usual two) atop-arm adjustment screws with locknuts. The "third" adjustment (above arm's contact) can be set in conjunction with the rearmost (arm travel) adjustment to vary the knob's height above an operating desk. Neat! The key's overall appearance is low slung and quite futuristic. Considering the new Bencher key's reasonable cost and widespread availability through 800 number dealers nationwide, it may easily become "the J-38 of the '90s."

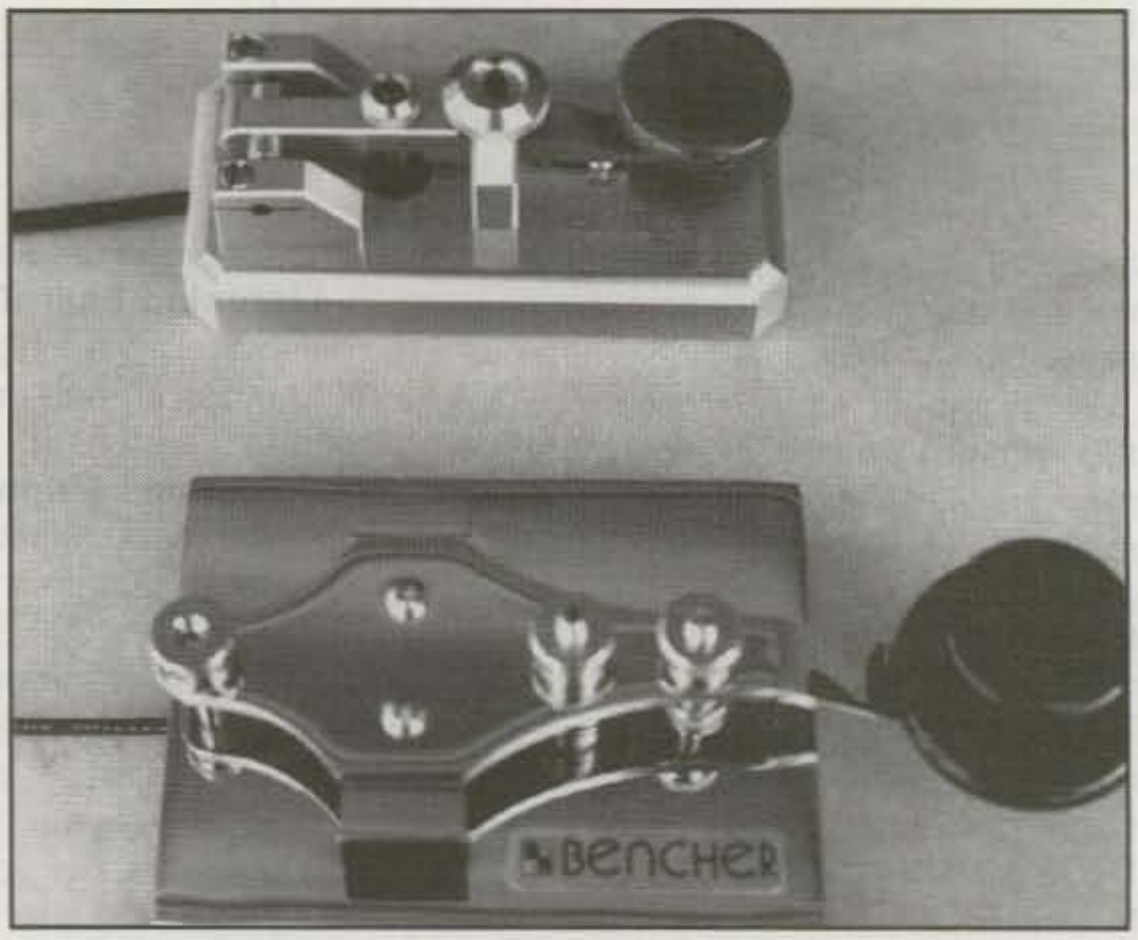

Photo 1– Two recently introduced and available-right-now hand keys destined to brighten everyone's CW life are Schurr's new "Master" mini key (top) and Bencher's dazzling "RJ" hand key (bottom). (Details in text.)

Single Lever Combo From G4ZPY

Moving into the paddle and keyer category, we have G4ZPY's new Single Lever Combo making its debut (photo 2). This new combo is a real precision-made package, and it almost feels like a "touch key" during use. It is as nimble as a sports car, a treat to use, and especially good for ex-bug operators (non-iambic) fans. The integral bottom-mounted keyer has dot/dash memory, switch-selectable inter-character spacing, keydown switch for tune-up, and operates from any 6 to 15 VDC source. If you like a mouse-quiet paddle that requires miniscule wrist action, this combo is the answer. It is available from G4ZPY, 41 Mill Dam Lane, Burscough, Ormskirk, Lancs, England L40 7TG.

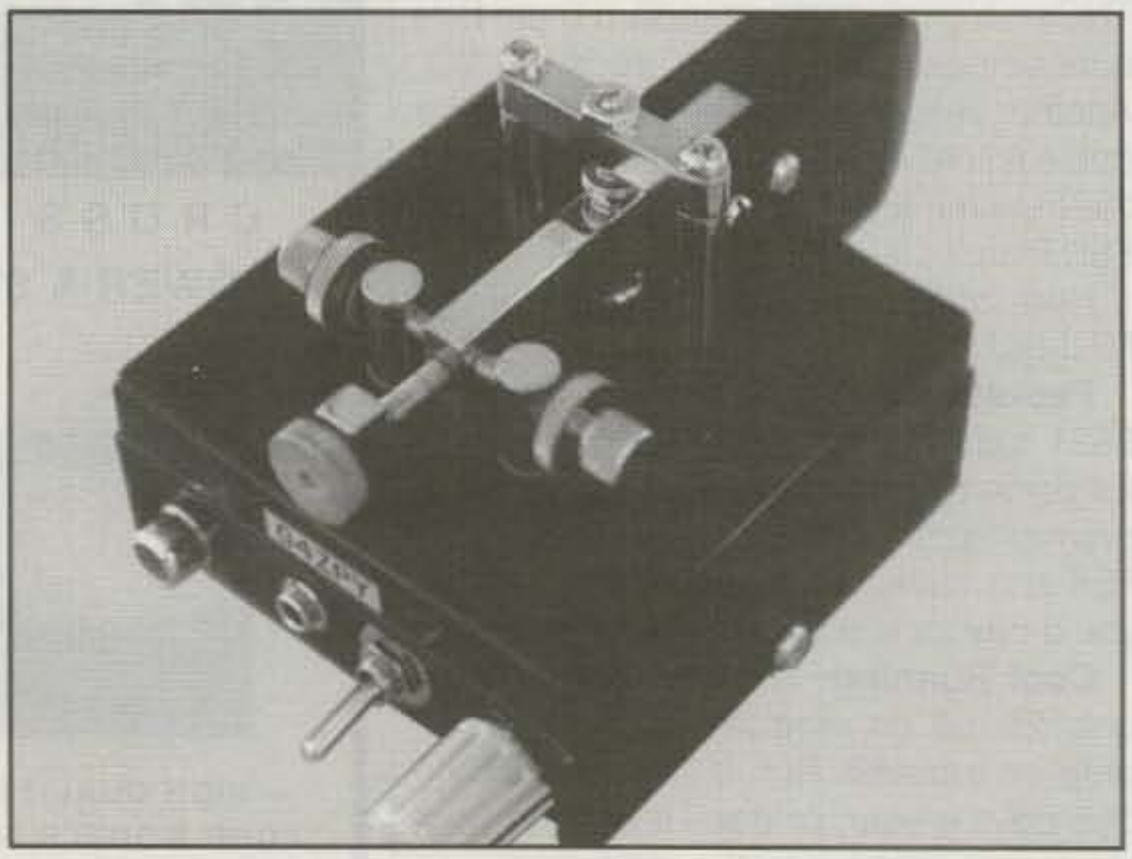

Photo 2– G4ZPY's new and also available-now Single Lever Paddle and deluxe keyer combo. Paddle feels almost like a "touch key" during use. Keyer operates from any 6 to 15 VDC source. A very nice package!

H. G. Martin Autoplex

We now shift views to highlight a special piece of history that bridged the gap between sideswipers of the late 1800s and bugs of the early 1900s: H. G. Martin's famous Autoplex. This mechanical marvel uses a pair of electromagnets powered by an external battery and a moving arm to produce dots automatically when the left fingerpiece is moved. Dashes are made manually with the right fingerpiece, just like using a bug.

Martin produced two variations of the Autoplex between approximately 1902 and 1905. First versions were handmade by Martin and looked like a highly modified pony relay. Second

4941 Scenic View Drive, Birmingham, AL 35210

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IC-736: 6 Meters and HF!

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- ☐ Newly Developed DDS Circuit for 1 Hz Fine Tuning Resolution
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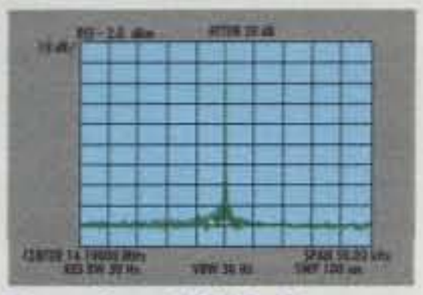
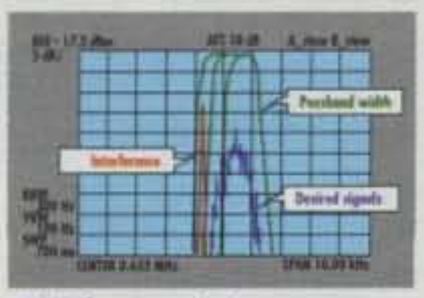
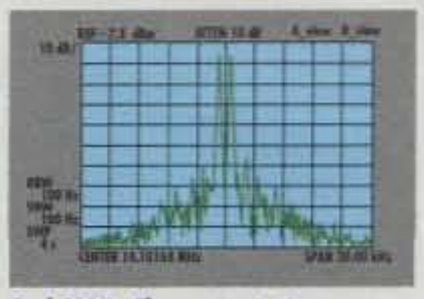
- ☐ RIT, ΔTx, ΔRx
- ☐ 10 Key Pad
- ☐ VOX
- ☐ RF Gain
- ☐ 101 Memory Channels
- ☐ Passband Tuning
- ☐ AF-type Speech Compressor
- ☐ CW Full Break-In
- ☐ Notch Filter
- ☐ Noise Blanker
- ☐ Large Display



Transmitter C/N Ratio



PBT Characteristics



3rd IMD Characteristics

Now you can work all of the HF bands AND have access to one of the most exciting amateur bands – 6 M! The IC-736 is an all band, all mode transceiver with a general coverage receiver. Only an antenna, coaxial cable and AC outlet are necessary to get up-and-running with this rig. Cutting edge features and "plug 'n play" operation make the IC-736 a "complete station in a box!"

The IC-736's compact and cleverly designed **Automatic Antenna Tuner** has preset memories for each 100 kHz step, thereby providing very high speed tuning. Tunes all ham bands plus 6 M!

Equipped with **2 Antenna Connectors,** the IC-736 includes an **Automatic Antenna Selector.** In each band, the band memory memorizes the selected antenna so you don't need to change an antenna manually each time you change the operating band.

The IC-736 employs power **MOS-FET's** in the driver and final amplifier stages, providing a clean, 100 W of output power over all of the ham bands as well as the 50 MHz band.

An **Aluminum Die-Cast Frame** and **2 Large Cooling Fans** help stabilize the IC-736's PA circuit to obtain 100% full duty cycle operation. Performance you can count on under the most demanding of conditions.

CW fans will love the IC-736. The **Full Break-In Function** (QSK) allows you to receive signals between transmitted keying pulses (semi break-in is also available). **Separately Designed CW Key Jacks** allow you to connect both a memory keyer and a paddle – great for contest operation!

The **Double Band Stacking Register** memorizes 2 frequencies along with modes in each band so it can be used like 2 VFO's in one band.

Up to 10 **Electronic "Memo Pads"** are available. This is especially useful during contests or while DX hunting. When catching a station you would like to temporarily store, simply push the memo pad-write button. The frequency and mode is automatically stored in a memo pad so you can continue band searching.

For interference rejection, the IC-736 has **Passband Tuning** and a **Notch Filter.** During crowded band conditions, these two functions can be used in combination, providing an extremely effective method of reducing most types of interference.

The **RIT** and **ΔTX** functions independently change the receive or transmit frequencies, respectively. Great for split frequency operation or for compensating for the frequency drift of another station.

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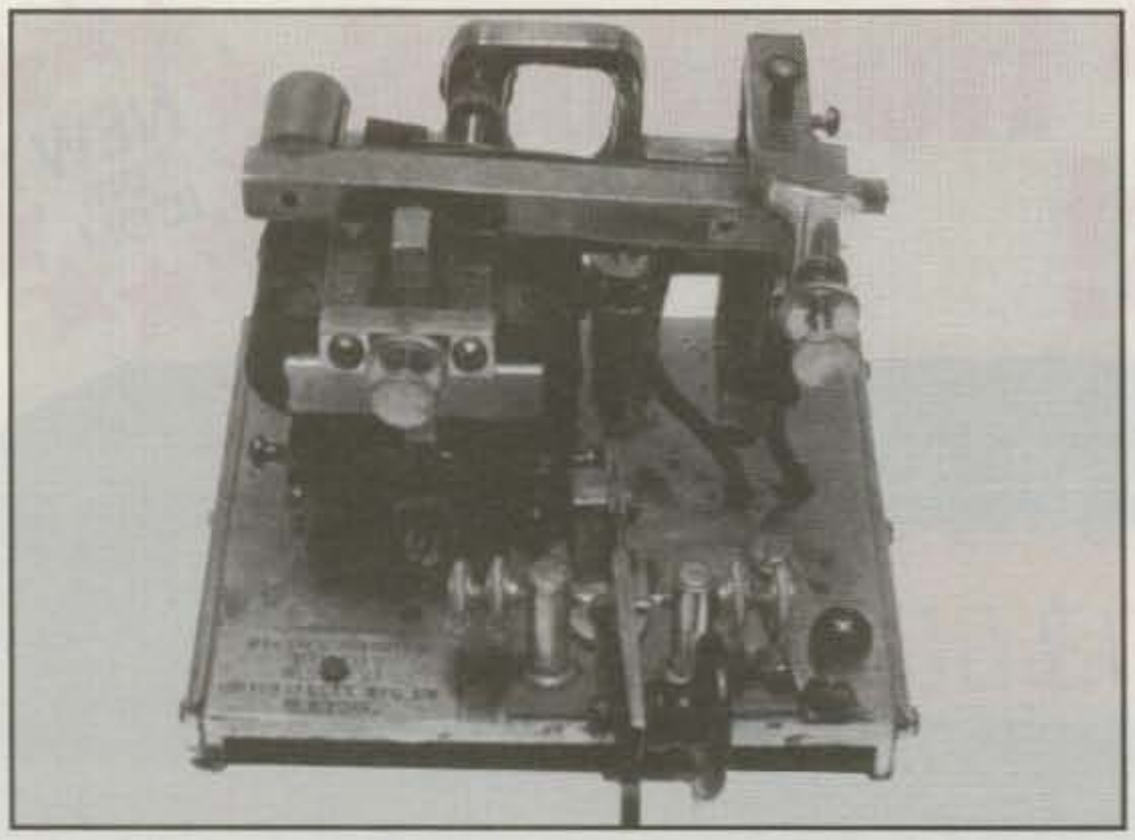

Photo 3– The rare and famous Autoplex made by Horace G. Martin before he invented the Vibroplex. Item uses electromagnets to move a modified relay arm and thus produce dots automatically (see text). (Photo courtesy master collector Gil Schlehman, W9WDY)

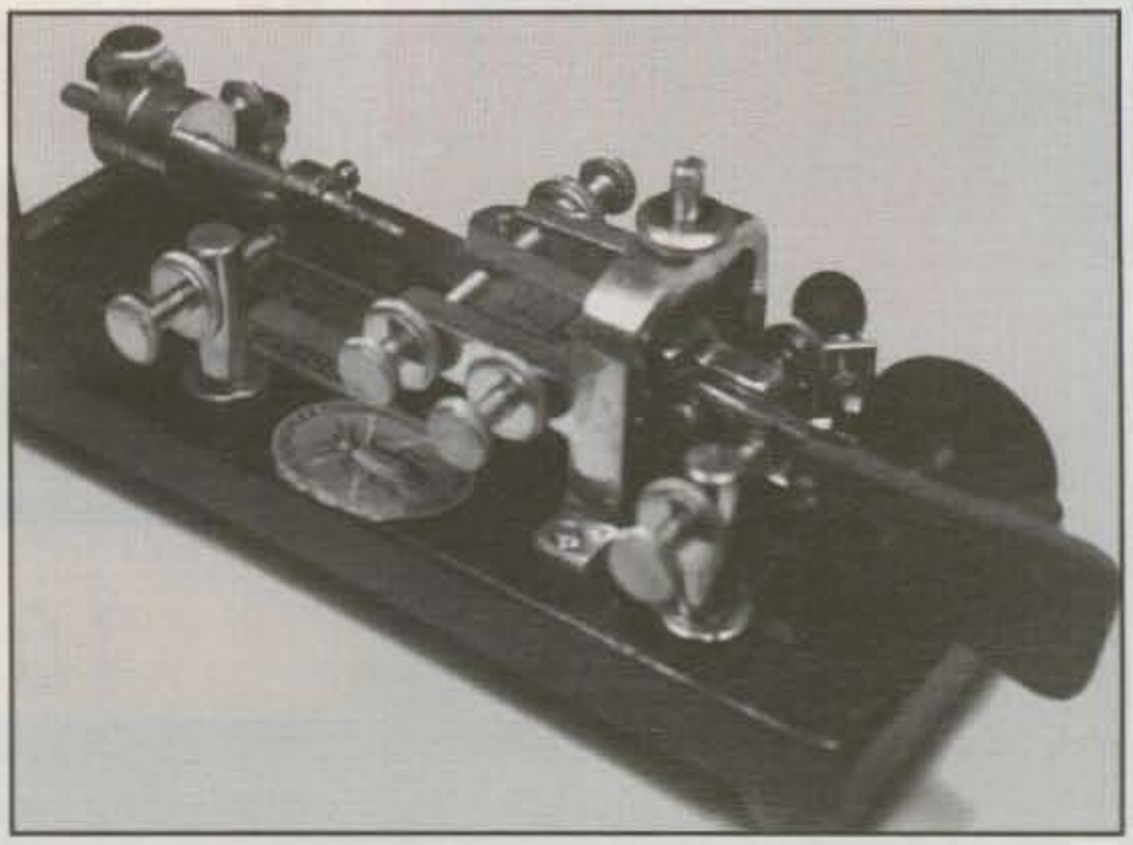

Photo 4– Notice the neat decal-type bug logos on this early Model 4 Vibroplex. Item was made during the transition period when J. E. Albright's typewriter company (Martin's sole marketing agent) changed to become "The Vibroplex Company." (Photo by owner David Pennes, WA3LKN)

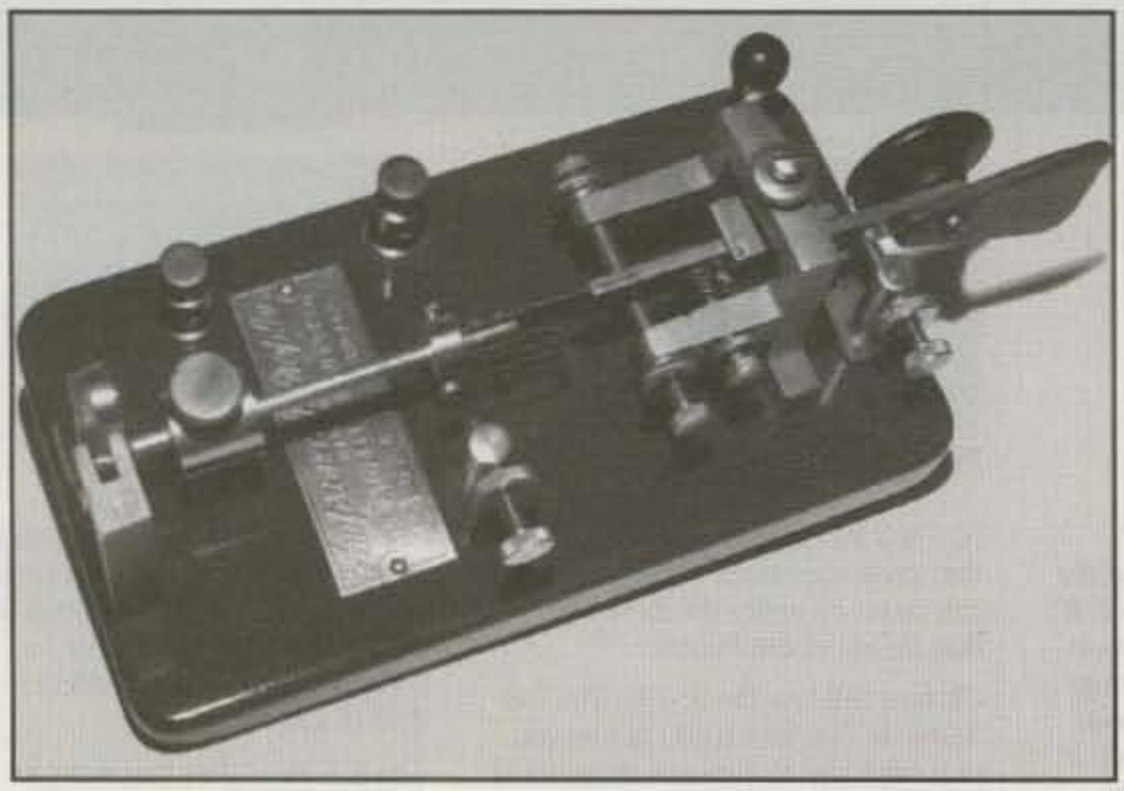

Photo 5– This "Improved Vibroplex" is an illegal and unlicensed copy of Martin's Original Vibroplex. It was made (quite briefly!) by The A to Z Novelty Company of Chicago, Illinois and is a rare item indeed. (Photo via proud owner Gil, W9WDY)

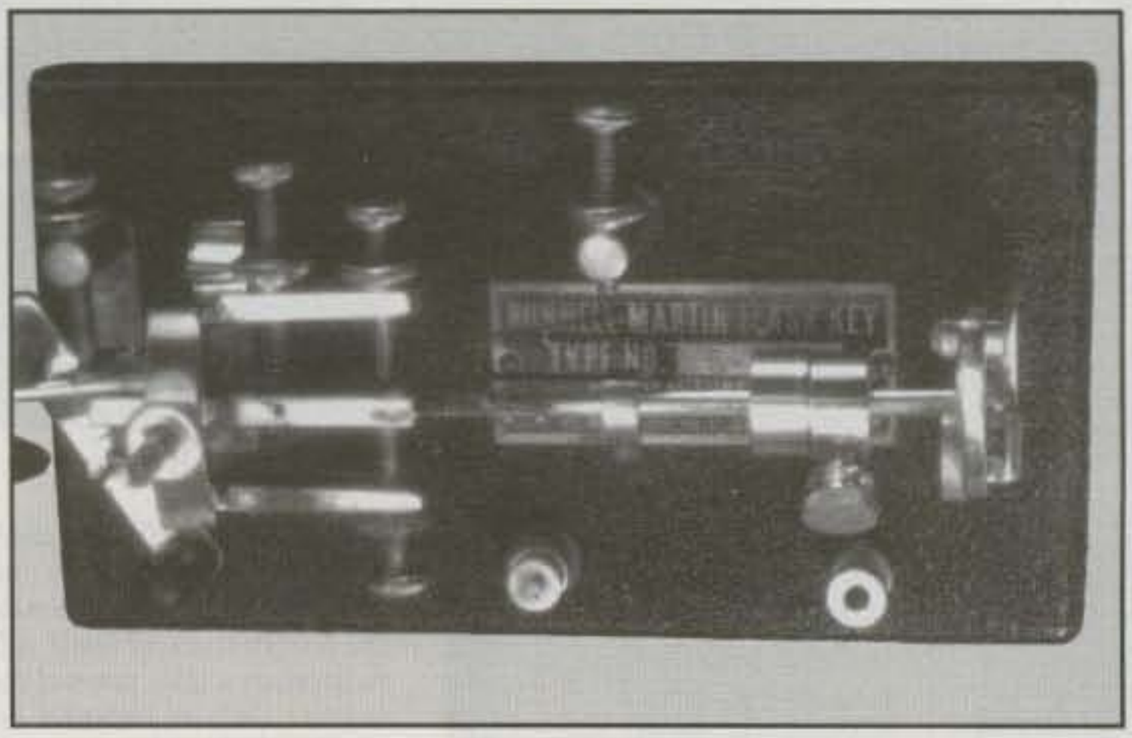

Photo 6– Famous Flash Key made after Martin left Albright and Vibroplex Company. Item is strikingly similar to "Original" model. Nameplate makes a major difference. This particular bug has a very intriguing history (see text). (Key owned by K4TWJ)

versions (as shown in photo 3) were made by The United Electrical Manufacturing Company in New York, a facility formed by Martin and several business partners when Autoplex orders overflowed production capabilities of his home workshop.

The Autoplex was bulky and cumbersome to adjust, but it was the first step leading to Martin's development of the Vibroplex bug. A limited number of Autoplexes were made, and every one still intact today is a collector's pride. Special thanks to Gil Schlehman, W9WDY, for sharing this view of his Autoplex.

Blue Racer

Some interesting points of historical significance are associated with the lightly pinstriped Blue Racer or "Number 4" shown in photo 4—namely its decaled bug logo. This semi-automatic key was made between 1914 and 1920, a time when the J. E. Albright Company (a typewriter sales and service operation, and the sole marketing agent for Martin's keys) changed directions and became "The Vibroplex Company."

The familiar bug logo evolved during that change, but it was not integrated into the metal nameplate until 1920. Stick-on logos were used during the interim period, and finding Vibroplexes with these decals still intact today is only half the challenge. Cleaning up the key without washing away its fragile logo requires patience and tender loving care. Our compliments to key owner David Pennes, WA3LKN, on exhibiting both traits!

A to Z Electric Co. Bug

During the time Martin's Vibroplex was being marketed by J. E. Albright's typewriter operation (1913 or early 1914), another company known as the A to Z Electric Novelty Company flat-out copied their product. This semi-automatic key looked exactly like Martin's original Vibroplex, and even carried the title of "The Improved Vibroplex" on its nameplate. Realizing his future was in keys more than typewriters, J. E. Albright brought court

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X series

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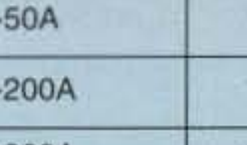
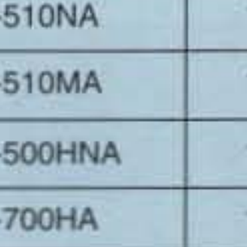
X-50A	144/440	4.5/7.2	200	UHF	5.6	135
X-200A	144/440	6.0/8.0	200	UHF	8.3	112
X-300A	144/440	6.5/9.0	200	UHF	10.2	112
X-510NA	144/440	8.3/11.7	200	N	17.2	90
X-510MA	144/440	8.3/11.7	200	UHF	17.0	90
X-500HNA	144/440	8.3/11.7	200	N	17.8	90+
X-700HA	144/440	9.3/13.0	200	UHF	24.0	90
X-2200A	144/222	6.0/7.8	150	UHF	11.5	112
X-3200A	144/222/440	6.0/7.8/8:0	100/200	N	10.5	112
X-6000A	144/440/1240	6.5/9.0/10.0	100/100/60	N	10.5	112

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



147MHz



445MHz

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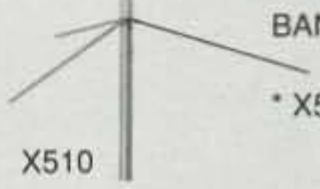
X-500HNA/X-500MA/X-510NA



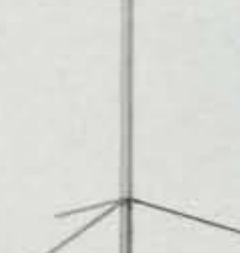
X510

GH/F/U&V series

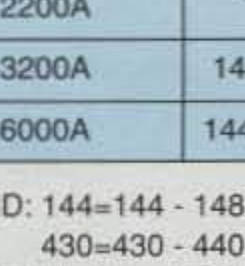
MODEL	BAND(MHz)	GAIN(dBd.)	WATTS	CONN.	HT. Ft.	RATED WIND/ MPH
DP-GH62	50	6.0	200	UHF	21.0	78
F-22A	144	6.7	200	UHF	10.5	112
F-23A	144	7.8	200	UHF	15.0	90
F-142A	222	5.5	200	UHF	6.0	110
F-718A*	440	11.5	250	N	15.0	110
F-1230A	1240	13.5	100	N	10.5	90
U-200A	440/1240	8.3/11.7	100	N	5.9	135
U-300A	440/1240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

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

U-300A 440MHz



F-22



U-300A 1200MHz

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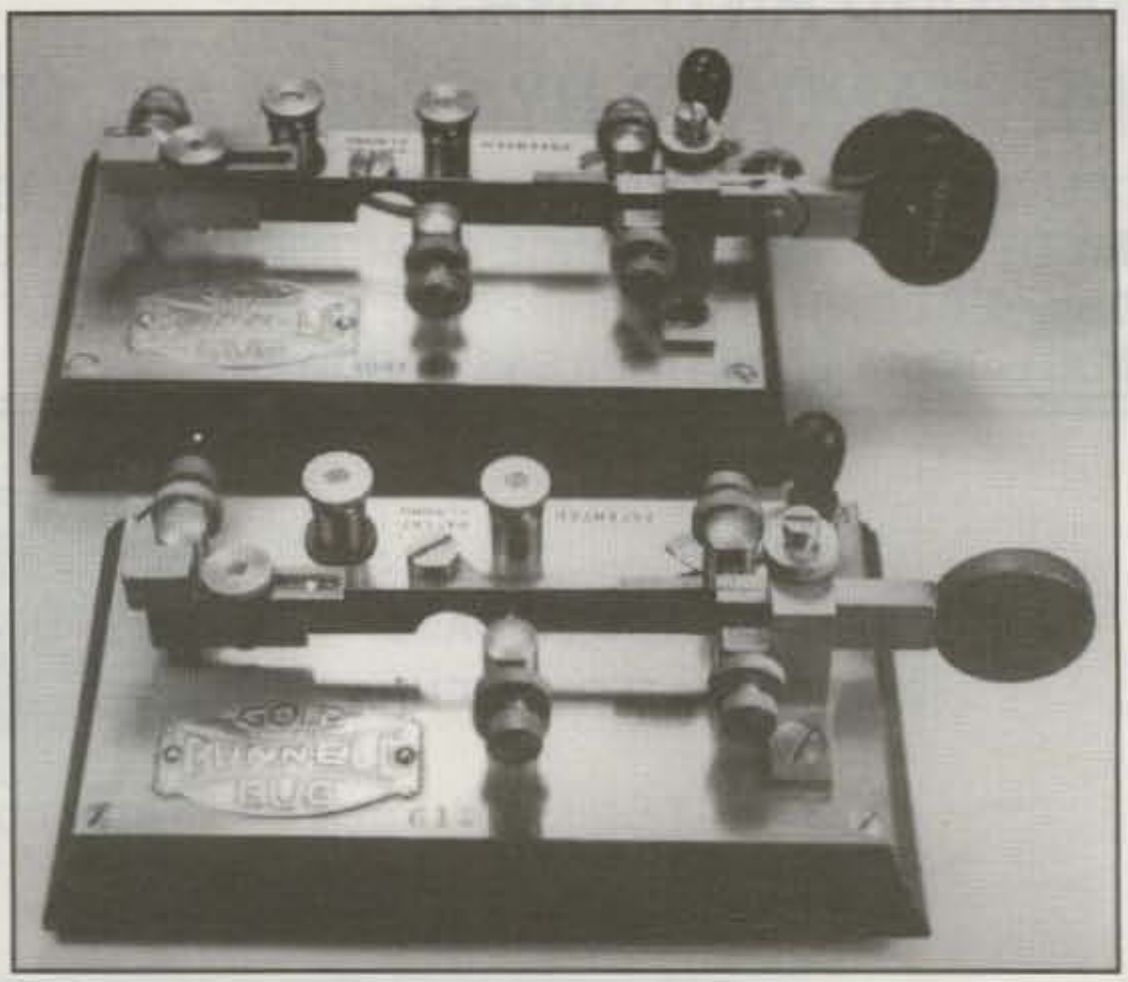

Photo 7– These bugs need to be viewed in color to be fully appreciated, but even black-and-white photos are significant. Bunnell's Gold Bugs use a single set of contacts, work great, and look terrific. (Photo courtesy owner Bill Holly, K1BH)

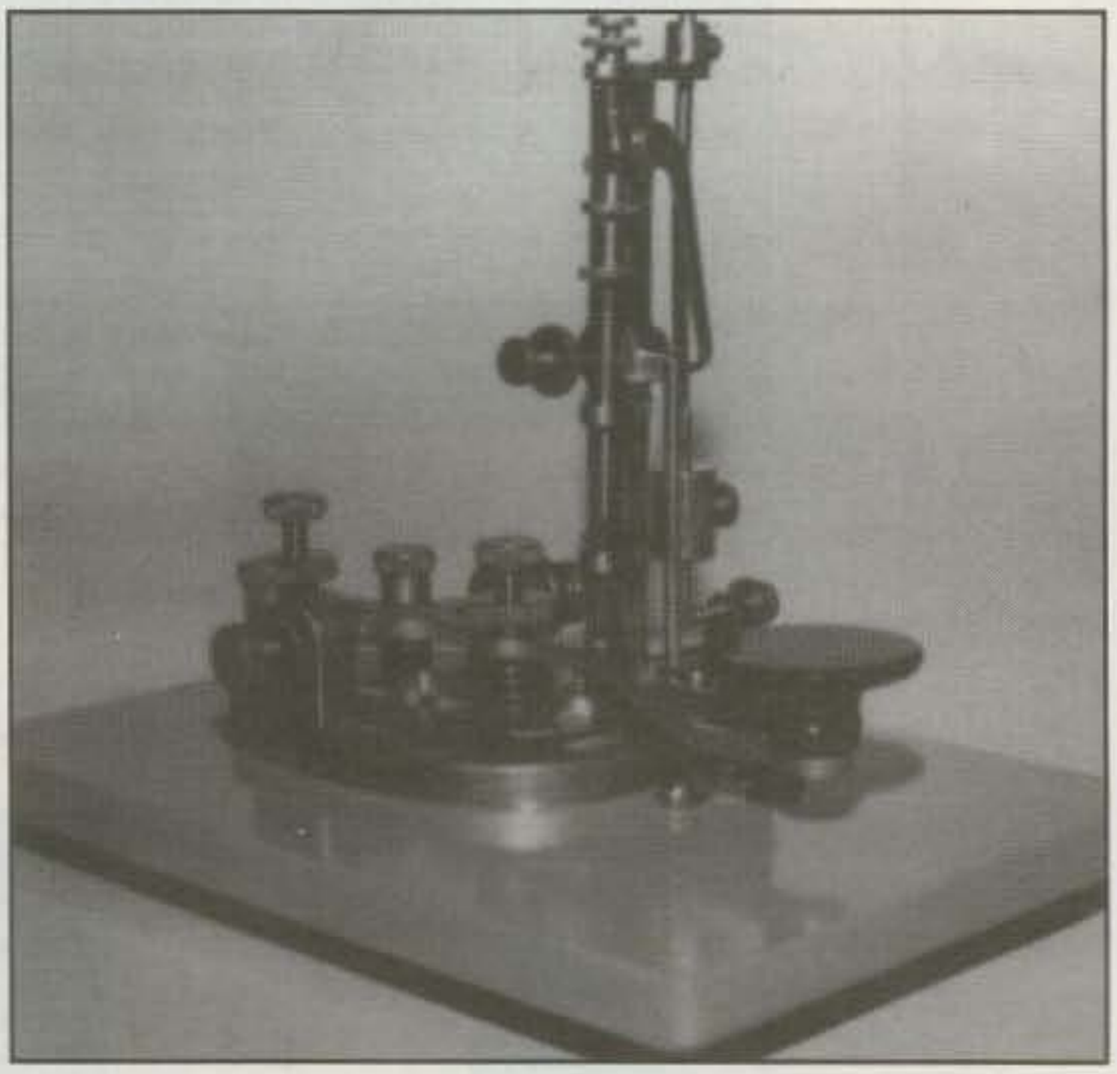

Photo 8– The stack of vertically standing rods attached to the hand key in this photo turns it into a bug. Honest! Pull up for dots; press down for dashes! Details in text. (Special photo thanks to owner Gil Schlehman, W9WDY)

action against A to Z and closed them down immediately. A to Z knew little about keys and had assumed "Vibroplex" was a generic term, just like "bugs" (tisk, tisk). Albright encored his victory by adding a warning in ads that folks using copies of Martin's Vibroplex were infringing on patent rights and were open to court action.

Studyphoto 5 of the A to Z bug, and you will see its claims of an "improved" design are quite shallow. It is basically a Vibroplex clone. Very few of these unlicensed bugs were made,

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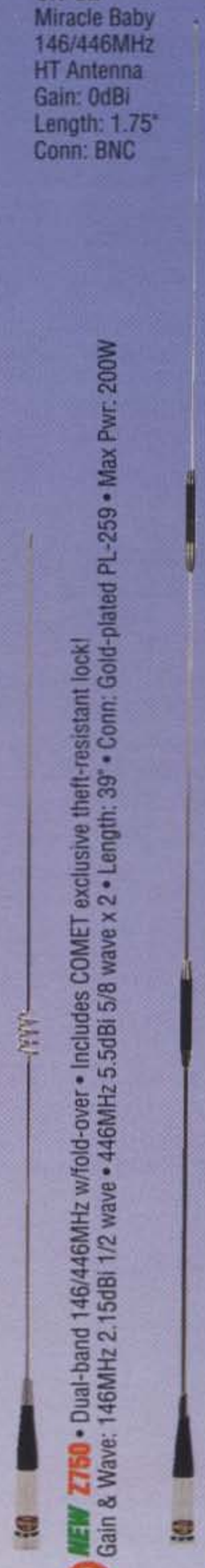
Conn: BNC



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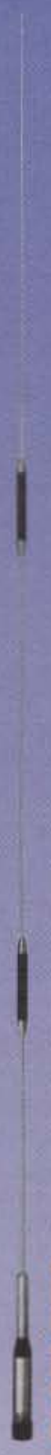
: 39" • Conn: Gold-plated PL-259 • Max Pwr: 200W

theft-resistant lock!
old-plated PL-259 • Max Pwr: 150W

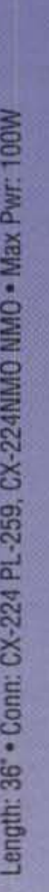
Bi 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W



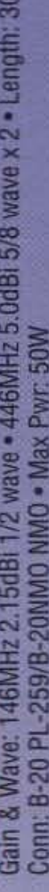
58" • Conn: SB-7 PL-259/SB-7NMO NMO • Max Pwr: 70W

39" • Conn: SB-5 PL-259/SB-5NMO NMO •

0dBi 5/8 wave x 2 •



: 30" •



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Gain & Wave: 52MHz 0dBi 1/4 wave • 146MHz 4.5 dBi 6/8 wave • 446MHz 7.2dBi 5/8 w

SB-7/SB-7NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 4.5dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" •

SB-5/SB-5NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.5dBi1/2 wave • 446MHz 5.5dBi 5/8 wave x 3 • Length: 39" • C
Max Pwr: 70W

CX-224/CX-224NMO • Tri-band 146/220/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 220MHz 3.5dBi 5/8 wave • 446MHz 6.0dBi
Length: 36" • Conn: CX-224 PL-259, CX-224NMO NMO • Max Pwr: 100W

B-20/B-20NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.0dBi 5/8 wave x 2 • Length: 30" •
Conn: B-20 PL-259/B-20NMO NMO • Max Pwr: 50W

SH-55 • Super Flexible 146/446MHz HT Antenna
Gain: 146MHz 1.5dBi • 446MHz 3.2dBi • Length: 15.5" • Conn: BNC •
Max Pwr: 10W

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Conn: B-10 PL-259/B-10NMO NMO •
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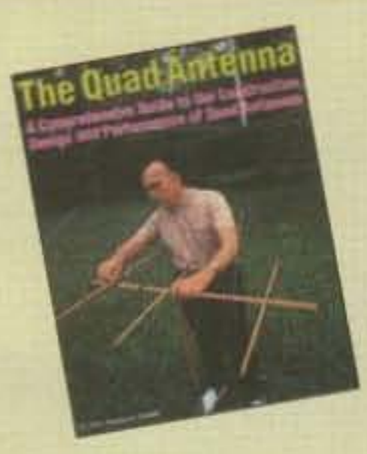

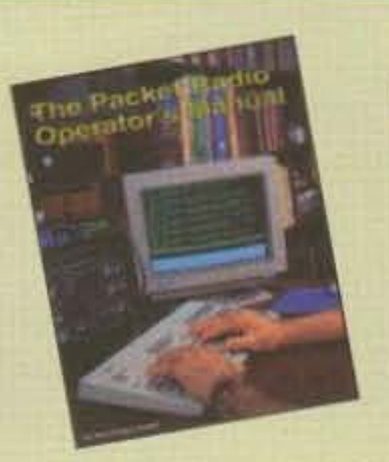

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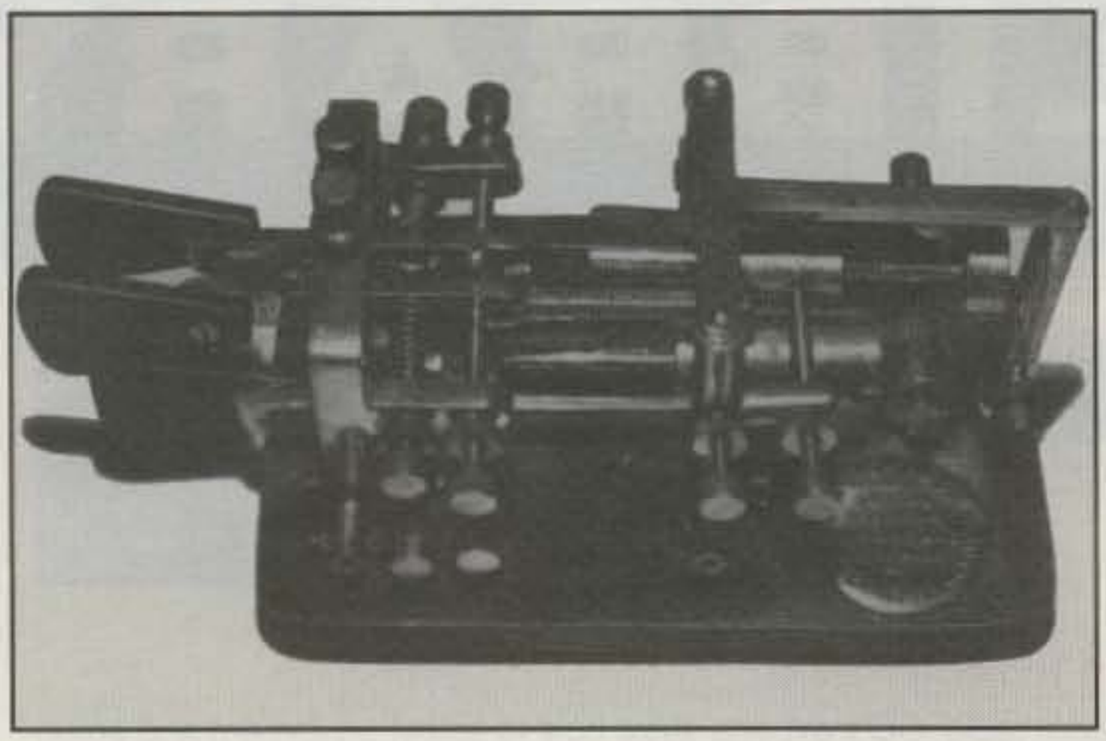

Photo 9– The amazing three-lever Automorse from Australia. Use top two levers for semi-automatic operation, or use top left and middle bottom lever for fully automatic operation. (Photo courtesy W9WDY)

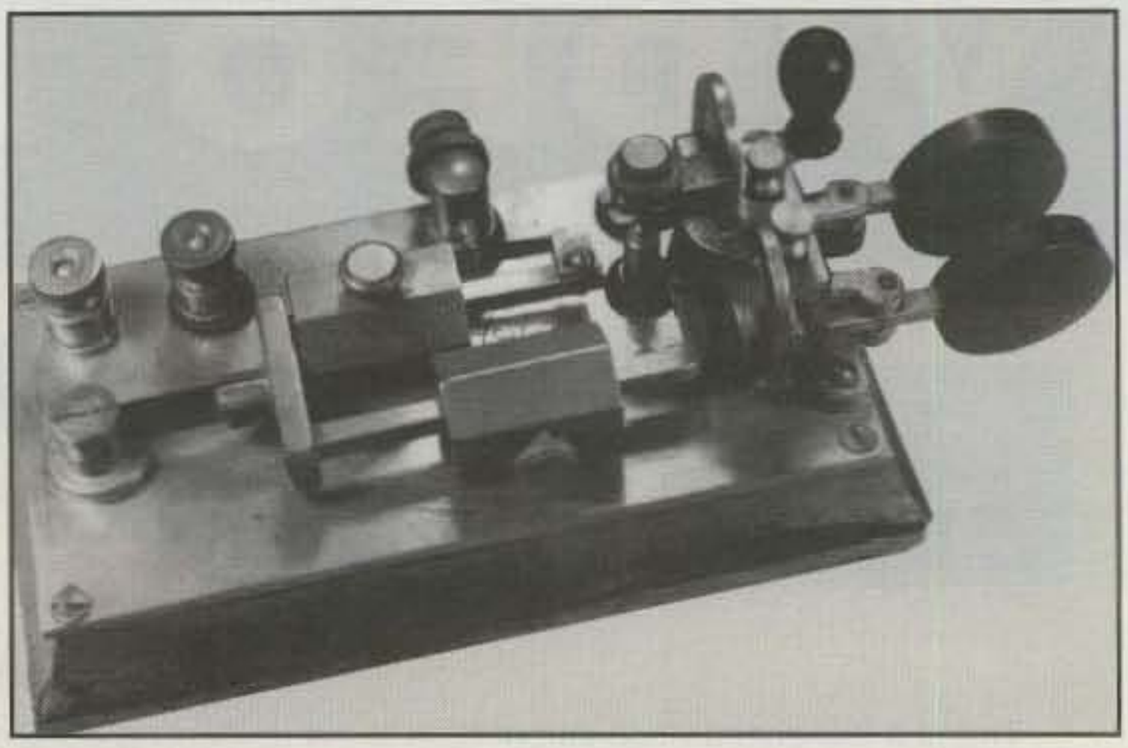

Photo 10– This fully automatic bug uses same-size weights and pendulums with a coupling bracket for making both dots and dashes. It was made by the Thomas J. Dunn Company in New York during 1909. (Photo courtesy W9WDY)

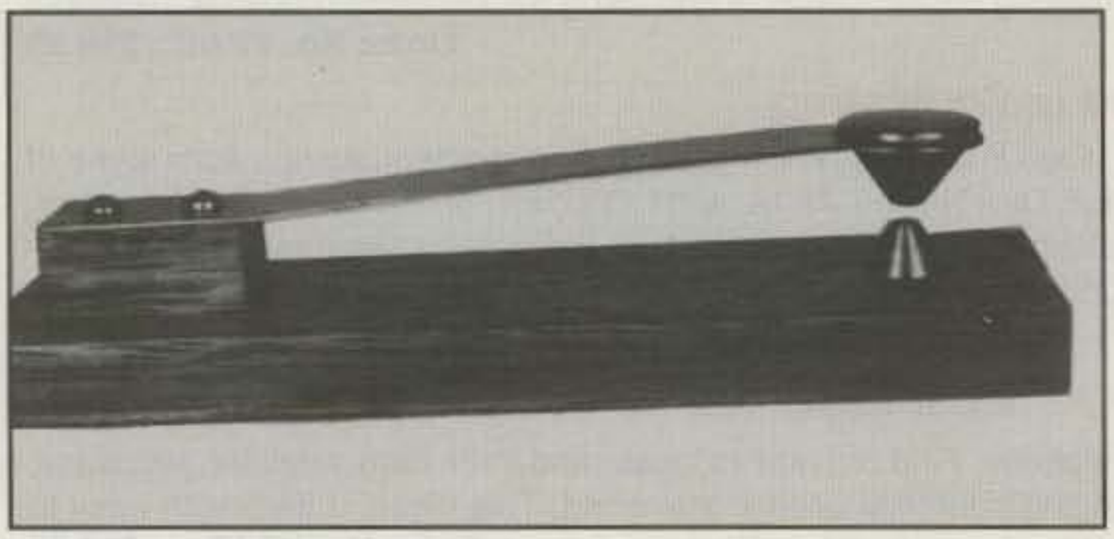

Photo 11– Perfect reproduction of telegraphy's first key—Vail's famous Correspondent. Check out that rear pivot! (Replica made by David Combs, W5VJW)

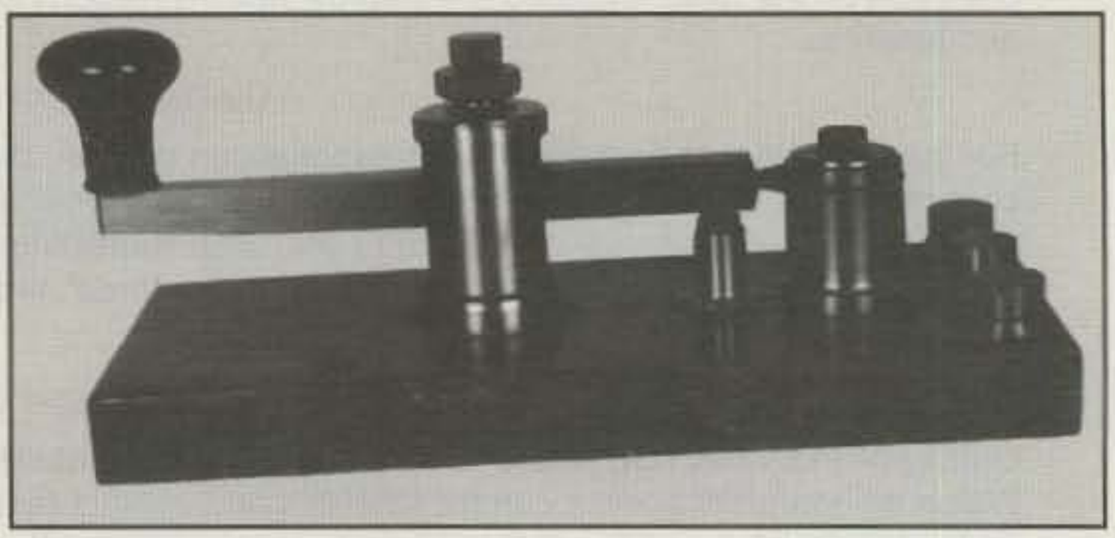

Photo 12– Exact replica of Vail's Lever Correspondent. Original is on display in the Smithsonian Institute. (Immaculate copy, and photo, from David, W5VJW)

and only a handful remain. Thanks to Gil, W9WDY, for sharing his views of this "rarie."

Bunnell-Martin Flash Keys

Martin left Vibroplex in 1938 and started up the "Martin Research and Manufacturing Company," producing a limited number of his own design bugs called "Flash Keys." A year later he sold the line and patents to J. H. Bunnell Company, and double-labeled Bunnell-Martin Flash Keys such as the one shown in photo 6 evolved. Due to resultant friction among Vibroplex, Martin, and Bunnell, only a small number of these classic gems reached the market. Two models of Flash Keys are shown in K1BH's "Vibroplex" book. One is a Lightning Bug copy and one is a Blue Racer clone on a large base. My Flash Key (photo 6), however, is similar to an "Original" and is the model 5-48—quite unusual.

This bug also has an impressive history. It was purchased in New York, used on a destroyer during World War II, and then used almost 24 hours a day on a secret 5-digit numbers station in Guadalcanal. Honest! I am not sure if more details or the previous owner's name can be revealed. In fact, I have forgotten them. However, the key is very (very!) special. Many hours of work went into its clean up and restoration.

Bunnell Gold Bugs

More interesting tidbits of history are associated with the pair of clean-cut gold bugs in photo 7. These showpieces were made by The J. H. Bunnell Company in New York during 1927 and 1928. Vibroplex challenged Bunnell's right to use the term "bug," but to no avail. By 1927 it was a generic description known around the world.

Notice the inverted "U" cutout in these keys' pendulums. It is a simple yet effective technique to reduce stiffness of the vibrating mainspring and thus slow dot speed. Look close and you will also notice the main arm is split for making dots and dashes on the top bug, but solid on the bottom bug. Our sincere thanks to owner Bill Holly, K1BH, for sharing his photo of these famous keys.

The Vailograph

This first of three far-out items is the Vailograph (photo 8), an add-on adapter that turns a regular hand key into a bug. The Vailograph attaches to an oval-base key via its right base mounting screw, a support bracket fitted in a screw hole provided by removing the key's circuit closing lever, and a stabilizing arm added on the key's base. A jumper wire from the Vailograph's dot contact parallel-connects with the hand key's existing contacts to complete the installation. The hand key's arm is then readjusted in conjunction with the Vailograph's mechanism to produce a wide-spaced gap and a (new) middle resting position. You then lift up on the key's knob to make dots automatically or press down on the knob to make dashes manually. Release the knob and it returns to its middle resting position. Everyone needs a key like this!

Operation of the Vailograph is quite interesting. A vertical rod gently presses against the top of the associated hand key's arm. When the arm is raised, the rod moves up and its attached pawl relieves pressure on the top-swung pendulum. The pendulum then swings free and taps against the dot-adjusting screw's

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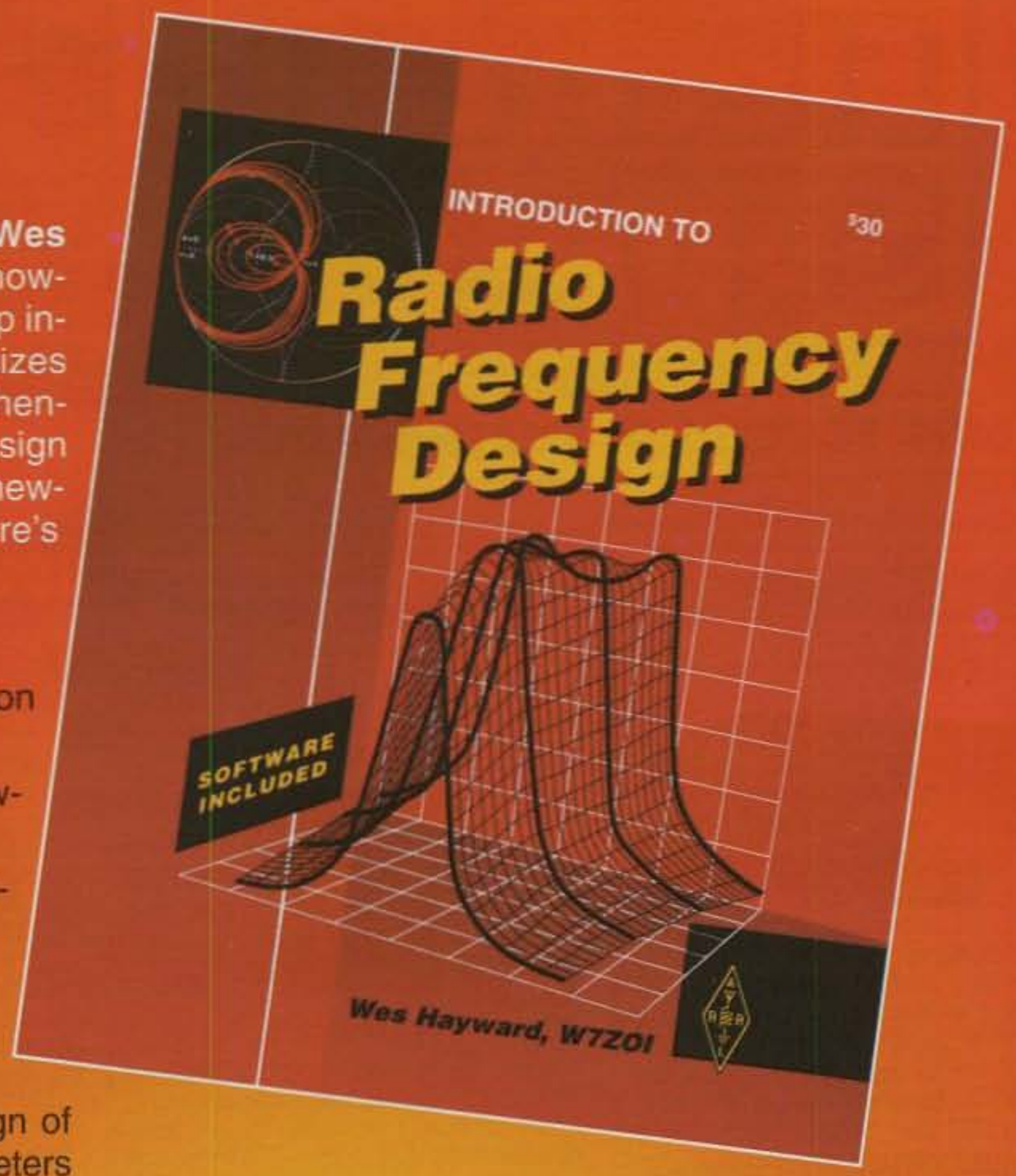

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FT-7200 • 440MHz (35w)

FT-7400H Mobile (left) • 440MHz (35w) • 31 memories • alpha display • track tuning • CTCSS encode • backlit DTMF microphone • 6¼"w x 1⅞"h x 7"d, 3.3 lbs.
FT-2500M 2m Mobile (top) • 50w • 31 memories • CTCSS encode • scan • backlit DTMF mic • 6"w x 1⅞"h x 7"d,1½ lbs.
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DJ-180TH • Same as DJ-180T, 5W standard.

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DJ-F1T 2m Mini HT • 2.5W • receives 130-174MHz and 118-136MHz • scanning • autodialer • back lit keypad, 40 memories • call channel • CTCSS • DTMF encode • DSQ paging • 4⅝"h x 2⅛"w x 1⅛"d, 14 oz.

DJ-F1T/HP • Same as DJ-1FT but 5W • 12V 600mah nicad battery standard.

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contact to automatically make dots. The dot-adjusting screw is "facing left" and "midway up the main vertical support." The pressure-relieving pawl is the black rod extending from the dot-adjusting screw toward the vertical support's top, and the pendulum is the long shiny rod with a single weight near its bottom end. Our special thanks to master collector Gil Schlehman, W9WDY, for this view of the Vailograph.

Automorse Key

Our views of telegraphic fantasy continue with the incredible three-lever Automorse key shown in photo 9. This "superkey" was made in Adelaide, Australia during the 1920s, and it functions as a semi-automatic or fully automatic key according to use of fingerpieces. When the top two fingerpieces are used, the Automorse works like a bug with dual and independently operating levers. In other words, the operator uses the left top lever to make a string of dots and the right top lever to manually make dashes. Yes, and I should also point out there is no iambic action here. Proper sending requires skill in letting go of one fingerpiece before moving the other one. Squeezing both fingerpieces simultaneously results in a solid and very long dash. This key is both challenging and fun to use. There's more. If the operator shifts fingers to use the bottom lever while continuing to use the upper left lever with a thumb, the Automorse makes both dot and dashes automatically (no iambic action is present).

If you study the Automorse mechanism, you will see a regular-size pendulum and weight on the left top (dot) side. The right lever only makes dashes, and thus does not have a weight. Now look at the bottom lever's pendulum (marked by flashbulb light reflecting off of it), and you will see the very large weight on the dash pendulum. This key is definitely in a class of its own!

Dunnduplex

If the last pair of unique items did not leave you speechless, check out the fully automatic Dunnduplex bug shown in photo 10. This little critter uses one set of contacts and two similar-size weights to make both dots and dashes—very unusual. A metal coupling bracket behind the weights and their pendulums lets the left one move independently to make dots, but combines the length and weight mass of both pendulums so dashes are three times longer. Notice the two shiny round levers atop the main yoke; they also actuate dot/dash pendulums so you can send Morse by pressing down on them with your index and middle fingers—the famous Cricket concept. There is no iambic action here, but proud owner W9WDY says the key is a blast of fun to use.

Vail's Correspondent and Lever Correspondent

These two keys (photos 11 and 12) are exact replicas of telegraphy's very first keys: Vail's famous Correspondent and Lever Correspondent. The originals of each are on display in the Smithsonian Institute. Vail, as you may know, made these keys for Samuel F. B. Morse demonstrations of the telegraph. David Combs, W5VJW, obtained photos and measurements from the Smithsonian to precisely reproduce the keys. Nice work, eh? The Correspondent is little more than a spring strap and base contact (look—the first rear-pivoting key!). The Lever Correspondent moved telegraphy into keys with a center fulcrum.

Summary

We are well out of space, and there are many more pictures to go. We will thus continue next month. In addition to featuring more "raries," I will also spotlight a cricket paddle and preview new items coming from The (new) Vibroplex Company. Stay tuned. See you on 30 meters! Remember to include an SASE with your letters of inquiry and be patient for a reply.

73, Dave, K4TWJ

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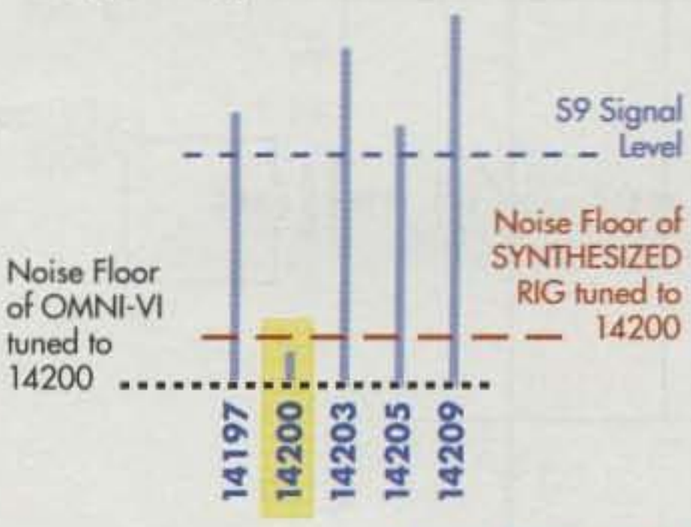

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Some Receiver Design Aids

It is not uncommon to see published amateur circuits that contain bandpass filters that are poorly designed. Some experimenters are prone to using surplus IF transformers to develop bandpass filters for receiver front ends or for use as filters after mixers. Miniature 10.7 MHz IF transformers are often used by shunting the primary windings with the required capacitance to provide resonance at some selected operating frequency. The builder has no notion as to what the insertion loss, bandwidth, or filter impedance might be. In a worst-case situation the insertion loss (in dB) can be excessive. This, plus an impedance mismatch between the source and load, can seriously degrade the receiver noise figure and overall receiver gain.

Properly designed bandpass filters are not difficult to build, nor are they costly. This article addresses methods for employing simple two-section HF bandpass filters that can be used at the front end of any homemade receiver. Table I shows the filter circuit and lists the component values for most of the HF bands.

Some Filter Facts

All passive filters exhibit IL (insertion loss in dB), and that is an accepted fact. This includes crystal, ceramic, and mechanical IF filters as well. Too great a loss can degrade the receiver noise figure and reduce the overall system gain, particularly at 14 MHz and higher, where manmade and atmospheric noise may be less than the mixer noise. It is for this reason that most quality receivers have a low-noise RF amplifier ahead of the mixer. The amplifier overcomes the losses in the tuned input circuit and has a noise figure that is lower than that of the mixer, thereby helping to establish the true receiver noise figure. Reasonable front-end loss can be tolerated at 40, 75, and 160 meters because the manmade and atmospheric noise is typically greater than the mixer noise.

It is important that the receiver input tuned circuit or filter be designed to match the antenna impedance to that of the input terminal of the first active stage (RF amplifier or mixer). This is because maximum power transfer takes place only when unlike impedances are matched (such as ensuring an SWR of 1:1 between the transmitter and the feed line). Table I shows that the IL of bandpass filters increases with the operating frequency for a given Q. The constants listed in Table I are based on a Q of 100, which can be considered average.

Since insertion loss must be taken into account, it is almost imperative that an RF amplifier follow the input filter at frequencies above 7 MHz. There is no harm in using an RF amplifier at frequencies below 7 MHz, provided the stage gain is not so high that it degrades the dynamic range of the mixer.

It could be argued that a two-section bandpass filter (Table I) is not an ideal filter for a receiver front end. Rather, a three- or four-section filter offers greater rejection of signals that appear above and below the –3 dB points on the filter response curve. This is a fundamental truth, but as the number of filter sections increases, so does the insertion loss. The two-section filters discussed here are entirely adequate for most amateur receiver circuits. A fixed-tuned filter eliminates the need for a peaking control (sometimes labeled "preselector") that has to be adjusted each time the receive frequency is changed. The cost for an air variable peaking capacitor can be greater than that for the trimmers and fixed-value capacitors in a bandpass filter. This makes the filter option desirable.

More About the Filters

Table I contains the circuit for the two-section filters under discussion. C6 and C7 are used to tweak the filters for maxi-

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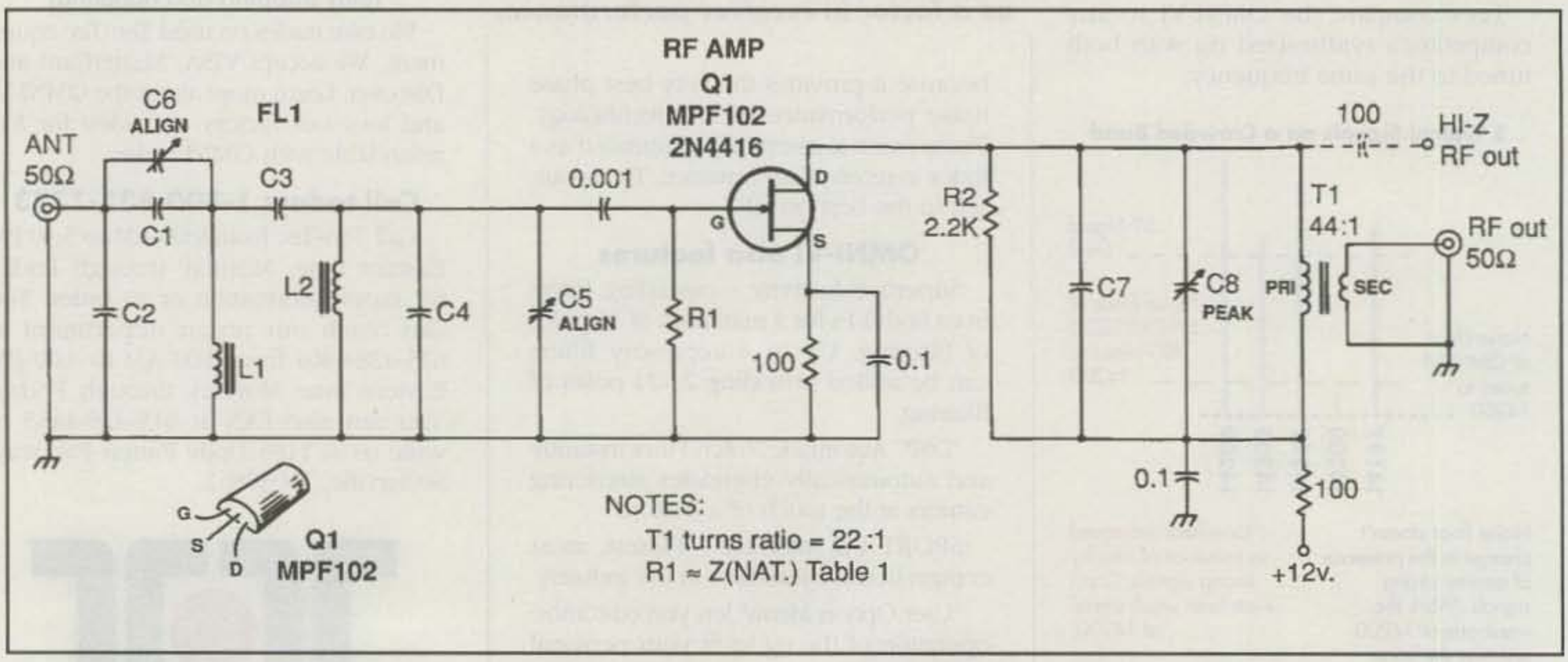

Fig. 1– Schematic diagram of a two-section bandpass filter that is configured to match the input impedance of an RF amplifier. R1 is chosen to match the characteristic impedance (Z_{NAT}) of the filter in Table I. Values for C4, C5, C7, C8, and T1 are listed in Table II.

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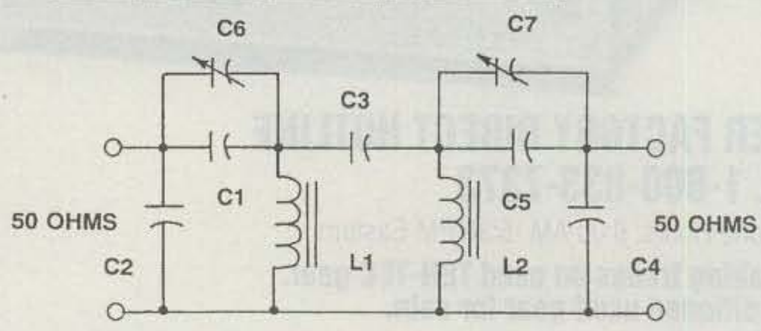
HF Bandpass Filter Constants

BAND (m)	C1,C5 pF	C2,C4 pF	C3 pF	L1,L2 uH	3 dB BW	IL dB	C6,C7 pF	Z (nat.)
15	none	470	1	2.5	400 kHz	6.6	30	25.7 K
17	180	2000	5	1.3	200 kHz	6.2	30	5.89 K
20	none	820	1	2.5	300 kHz	5.8	60	20 K
30	47	1000	1	4.8	200 kHz	6.2	30	22 K
40	68	1000	5	5.7	300 kHz	2.9	60	8.62 K
75	220	2000	15	6.8	200 kHz	2.4	60	4.59 K
80	220	2000	15	8.2	200 kHz	2.2	60	4.7 K
160	560	2700	56	12.5	200 kHz	1.2	60	2.0 K

Table I– HF bandpass filter constants. These filters are centered in each of the bands listed. C6 and C7 are ceramic or plastic trimmer capacitors for aligning the filters at their mid-frequencies: 21.5, 18.1, 14.15, 10.1, 7.15, 3.9, 3.6, and 1.9 MHz, respectively. Z_{NAT} is the characteristic end impedance of the filters when parallel resonating capacitors are used in shunt with L1 and L2 instead of the capacitive dividers. IL represents the –3 dB points on the filter response curves.



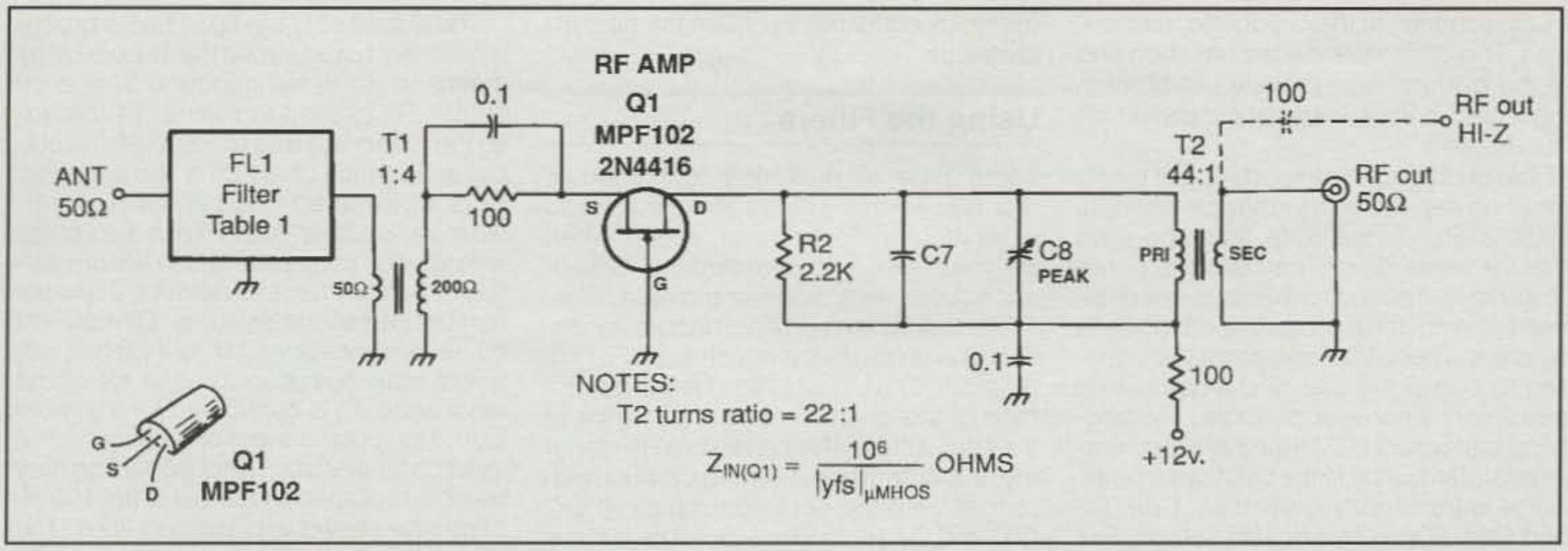


Fig. 2– Schematic diagram of a common-gate RF amplifier and a method for coupling it to a 50 ohm bandpass filter of the type shown in Table I. T1 is a 4:1 broadband transformer consisting of 16 turns of No. 26 enameled wire on an Amidon Associates FT-37-43 ferrite toroid. The primary winding has 8 turns of No. 26 enameled wire. The equation may be used to determine the exact input impedance of Q1 if the actual lyfsl (transconductance) of the FET is known.

Figure 1, Figure 2 Component Values

BAND	C4(pF)	C5(pF)	C7(pF)	C8(pF)	L1,L2 ts & CORE	T2 TURNS & CORE
15	none	30	56	30	25 ts. no. 26 on a T50-6 toroid core.	35 ts. no. 28 on a T50-0 toroid core. Use a 2 t secondary.
17	150	60	56	30	18 ts. no. 25 on a T50-6 toroid core.	41 ts. no. 30 on a T50-0 toroid core. Use a 2 t secondary.
20	none	60	100	30	25 ts. no 26 on a T50-6 toroid core.	41 ts. no. 30 on a T50-0 toroid core. Use a 2 t secondary.
30	47	30	120	30	31 ts. no. 28 on a T50-2 toroid core.	32 ts. no. 28 on a T50-12 toroid core. Use a 2 t secondary.
40	68	60	120	60	34 ts. no. 28 on a T50-2 toroid core.	30 ts. no. 28 on a T50-6 toroid core. Use a 2 t secondary.
75	180	60	220	60	37 ts. no. 28 on a T50-2 toroid core.	46 ts. no. 30 on a T50-10 toroid core. Use a 2 t secondary.
80	180	60	220	60	41 ts. no. 28 on a T50-2 toroid core.	40 ts. no. 30 on a T50-2 toroid core. Use a 2 t secondary.
160	470	60	330	60	51 ts. no. 30 on a T50-2 toroid core.	63 ts. no. 30 on a T50-2 toroid core. Use a 3 t secondary.

Table II– Shown here are coil and transformer winding data for the circuits in figs. 1 and 2. Toroid cores are available from Amidon Associates, Inc. (3122 Alpine Avenue, Santa Ana, CA 92704 [714-850-4660 for a catalog]). C5 and C8 are ceramic or plastic trimmer capacitors. Mica compression trimmers may also be used. The T1 (fig. 1) and T2 (fig. 2) toroid cores have assorted permeabilities to permit having sufficient primary turns to allow a realistic number of secondary turns.

mum response at their midband frequencies. The capacitive dividers at each end of the bilateral filter provide the 50 ohm input and output impedance shown on the diagram.

The characteristic impedance of the filter (if no capacitive dividers are used) is listed as Z_{NAT} in the table. It can be seen that the value differs from band to band. Therefore, the end capacitors must be used to transform those impedances to 50 ohms. These filter constants were chosen to permit the use of standard-value capacitors whenever possible. The coupling capacitors (C3) represent the nearest standard value to the calculated ones. Some were slightly lower than 1 pF. C2 and C4 in Table I were also selected as the nearest standard values. C6 and C7 have sufficient range to compensate for the slight departures from the calculated values of C2 and C4.

It is important that quality capacitors be used in the filters, since the capacitor Q plays a significant role in the filter performance. Therefore, dipped silver mica or polystyrene capacitors are recommended at C1, C2, C3, C4, and C5. The 1 pF capacitors at C3 can be made by twisting a few turns of insulated wire together (gimmick coupling) to obtain the desired low value.

Using the Filters

Some type of matching technique is required when the filters are used ahead of an RF amplifier or mixer, except when the mixer has a 50 ohm terminal impedance (such as a diode-ring mixer). Figs. 1 and 2 illustrate two approaches for ensuring an impedance match to a JFET RF amplifier. The circuit in fig. 1 takes advantage of the characteristic impedance of the filter without the capacitive divider at the filter output port. C4 (and C5 at its midrange) yield the net capacitance of C4, C5, and C7 (midrange) in Table I. R1 is selected to equal or closely match the value of Z_{NAT} in the table. R1 establishes the input impedance of Q1, since the gate impedance of an FET is on the order of 1 megohm or greater. In this circuit C5 and C6 are adjusted for a peak signal response at the mid-frequency of the filter. A signal generator is helpful for aligning the filters. However, acceptable peaking can be accomplished while monitoring a weak signal or listening to the atmospheric background noise.

The output of Q1 in fig. 1 has a broadly resonant tuned circuit that is peaked by means of C8 to the midband frequency of FL1. R2 is used to swamp T1 (broaden the response) and to establish the output impedance (2.2K-Ω) of the amplifier. T1 is a powdered-iron, narrow-band toroidal transformer that is wound on cores with various permeabilities to ensure sufficient primary turns to permit a workable number of secondary turns. C7 may not be necessary above 7 MHz if C8 has sufficient maximum capacitance for circuit resonance. T1 is configured for a 50 ohm load. However, if the mixer has a high-Z input characteristic, output coupling may be accomplished by means of the 100 pF capacitor shown with dashed lines. The RF amplifier in fig. 1 provides some 15 dB of gain—more than ample for compensating for the IL of the filters.

A common-gate (grounded gate) JFET may also be used as an RF amplifier. This is seen in fig. 2, where the 50 ohm filter is matched to the input of the FET via broadband transformer T1. The characteristic input impedance of a common-gate FET or source- follower FET is on the order of 200 ohms. This depends upon the |yfs| (transconductance in gm of the device), which is listed in the specification sheets. The |yfs| spread is fairly broad for most FETs, so unless the designer has instrumentation for measuring the |yfs| accurately, it is best to take an average between the minimum and maximum |yfs| figures provided by the manufacturer. Fig. 2 includes the equation for determining the FET source impedance. Generally speaking, a 4:1 broadband transformer will suffice between the 50 ohm filter and Q1.

The output tuned circuit for Q1 in fig. 2 follows the same rules that were given for the fig. 1 circuit. The gain for Q1, when operated with the gate grounded, is on the order of 10 dB. This exceeds the IL of the filters, as required.

Some Closing Comments

You may consider this article a recipe-book presentation. Space does not permit going into depth on filter design. However, detailed data about precise filter design and alignment is presented by DeMaw and Hayward in *Solid State Design for the Radio Amateur* (ARRL, Inc.). Also, various computer software is available for use in filter design.

The filters described here should appeal especially to builders of simple direct-conversion and superheterodyne receivers. The filters are suitable also for use after transmitting mixers in homemade SSB exciters.

You may want to place Table I in your design notebook for future use. Having the chart for handy reference will eliminate searching through countless manuals or articles for this type of information.

73, Doug, W1FB

CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

"QRZ, Is This Frequency In Use?"

One of the more contentious experiences we've all had while operating is about frequency ownership. Unfortunately, contesters have a relatively justified reputation of having low regard for those already on a frequency when they want to use it. Maybe you have heard the example of what a contester means by "Is this frequency in use?" In reality it is purported to mean "Watch out; I'm about to call CQ in 5 nanoseconds."

Although space restraints this month only allow me some brief comments on this topic, the debate about frequency usage over the years has yielded few conclusions. In reality, this subject is very complicated. It is intertwined with contesters jostling for frequencies positions with other contesters, DXers with DXers, rag chewers with everyone else, and so on. To add further complexity to the puzzle, there is the matter of net operations, phone patching, slow scanning, digital modes, DX windows, etc.

Let me begin with an obvious and sometimes overused statement: No amateur owns any frequency in the HF spectrum. The FCC has not issued 14226 to the W7PHO family hour, slow scanners do not exclusively retain the rights to 14235, the Maritime Mobile net is not the owner of 14300. Furthermore, K1AR does not own 14150.4, and the DXers of the world do not hold private rights to 3795. As a whole, however, we have to work together in harmony or the whole concept of frequency usage fails very quickly. And, for the most part, it does work.

So much of the conflict, in my opinion, comes from two sources: honest mistakes and selfish operating practices. One example that comes to mind, and one which really gets under my skin, is when I repeatedly ask if a frequency is in use. After getting no answer, only 5 minutes later I am told to move. Now I'm not talking about the method of checking an unused frequency earlier, measured in nanoseconds, but I am talking about a legitimate attempt at gauging the situation. Who is at fault here? I have to lean towards the "off-frequency" station who didn't have the savvy to hear the QRM and act upon it immediately. By all rights, a case can be made that you should not have to move if you have genuinely asked if a frequency is in use. However, consider the following question. Is it absolutely imperative that you stay on your newly found frequency, or are you acting out of principle? Contesting and DXing alike would provide themselves a service if we thought in those terms before lashing out at a unsuspecting rag chewer who maybe had a little less caffeine in his blood that day.

The next example I want to focus on is "standard turf" wars. Just because a contest is going on does not afford you the privilege of stealing the band edge away from a rag-chew QSO. Let's be honest with ourselves. It's just not right. The same is true for encroaching upon nets and other established QSOs. On the other side of the coin, however, is when net control operators, slow scanners, or others blindly "fire up" without regard to what is happening on a given frequency under the guise "This is where we operate, so move!" There is nothing more frustrating than not even being given the chance to discuss the point or respond politely because another operator determines it is his God-given right to be on a certain frequency and to fire up that S9+40 signal. If someone is fairly using a frequency and chooses, after some rational discussion, to stay, then that is their right to do so, and the other station should either wait or move somewhere else—not reach for the upper button on the Alpha 78D.

Finally, although this example is often an overstated excuse for what is really happening, there are situations when two people are both honest users of the same frequency. Either QRM or changing band conditions, or some other factor such as changing beam headings, etc., created the situation. While I'll be the first to defend my right to a frequency that I think I sincerely deserve, I am not so passionate that I will defend my position to the detriment of my score or goal. Unfortunately, as stated earlier, many amateurs turn frequency ownership into a matter of principle. My advice is very simple, and I'll be the first to admit I could take some of my own words to heart: Take a breath and consider how little the use of the frequency will mean to your overall score. Not only will you live a few more years, you'll probably have more fun, too!

Let me know your thoughts on this subject. I'd love especially to hear from anyone who has practical solutions to this complex problem.

Internet: p00259@psilink.com
Compuserve ID: 71301,424

Calendar of Events

Mar.	**25-26**	**CQ WW SSB WPX Contest**
Apr.	1	Poisson d'Avril Contest
Apr.	1-2	SP DX Contest
Apr.	1-2	EA RTTY Contest
Apr.	8-9	MARAC County Hunters SSB Contest
Apr.	12-14	DX-NA YLRL CW Contest
Apr.	22-23	Friendship Contest
Apr.	26-28	DX-NA YLRL SSB Contest
Apr.	28-29	Helvetia (HB9) Contest
May	6-7	ARI International DX Contest
May	6-7	Connecticut QSO Party
May	13-14	Georgia QSO Party
May	20-21	Michigan QSO Party
May	**27-28**	**CQ WW CW WPX Contest**
June	17-18	All Asian CW DX Contest
June	24-25	ARRL Field Day
July	1	RAC Canada Day Contest

April's Contest Tip

Nothing looks better on the Saturday evening of a DX contest than a good night's sleep. Here are a few ideas to make sure you don't sleep too well. Try using two alarm clocks set 5 minutes apart to ensure that you actually wake up when you want to. If you have a guest room, use that "less comfortable" bed instead of your own. Finally, learn how to set your alarm clock(s) before the contest. There's nothing worse than trying to learn how to set an alarm clock (is it AM or PM?) on 2 hours sleep!

April's Quote of the Month

Recently, as WN4KKN was thinking about his upcoming trip to operate from K1EA's station, he mentioned that "conditions would be so bad that even East Coast stations would only hear Europeans and a few watery W6s." K1EA's response: "You're right. Conditions will be terrible . . . I doubt we'll hear the 6s."

CQ Profiles: Randy Rand, AA2U

One of the most appealing aspects of our hobby is its diversity. This is true even within the context of contesting. Perhaps one of the most intense and specialized aspects of contesting is QRP operating. When you think of QRP contesting, you can't help but think of one of the best around—Randy Rand, AA2U.

Randy, at the urging of his dad, K2RF, began his amateur radio career in 1976 as WA2ICK while in high school. He was not unlike many kids of that age group—lots of energy and enthusiasm, but absolutely no money! For that reason QRP was a logical choice for Randy. It afforded him the opportunity to "get on the air" with very little investment.

Randy quickly upgraded his license to amateur Extra and received his AA2U callsign in 1978. By that time he was well on his way to a highly successful QRP operating career. In the beginning Randy used to operate contests such as the ARRL Sweepstakes as a way to quickly gather new states and work stations with modest antennas. However, he recalls being spurred on by the QRP columns in *CQ* to the point where he began to focus all his energy on QRP operating, well after other circumstances allowed him more station capability.

For Randy, QRP operating presents a unique challenge that is amazingly motivational for him. A quick look at the past few years' contest results prove that he is a master at it. Just as an example, Randy currently holds the record high USA QRP scores in the CQ WW

DAYTON hamvention® '95

April 28, 29,30, 1995

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Asst. General Chairman, Dick Miller, N8CBU

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Flea Market Tickets (valid all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. A maximum of 3 spaces per person (non-transferable). Electricity is available in a portion of the last Flea Market row for $40 additional per space. Rental tables and chairs are not available in the Flea Market. Vendors ***MUST*** order an admission ticket for each person when ordering Flea Market spaces. Please send a separate check for Flea Market space(s) and admission ticket(s). Spaces will be allocated by the Hamvention committee from orders received by February 1. Please use 1st class mail *only*.

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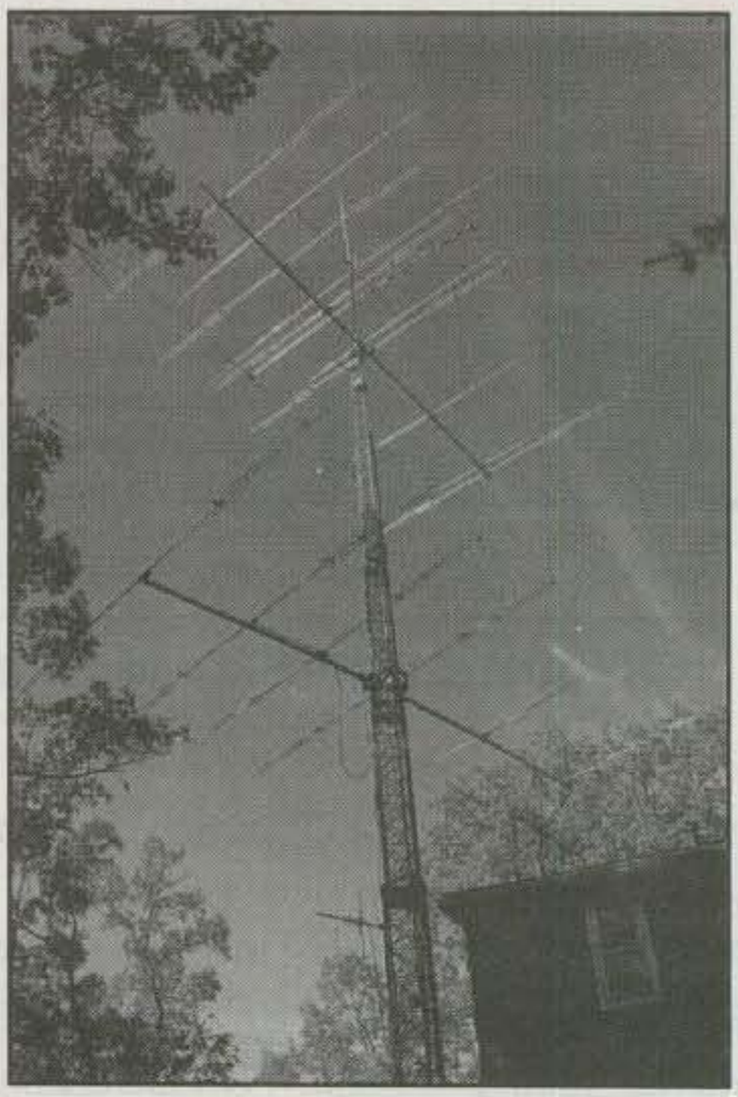
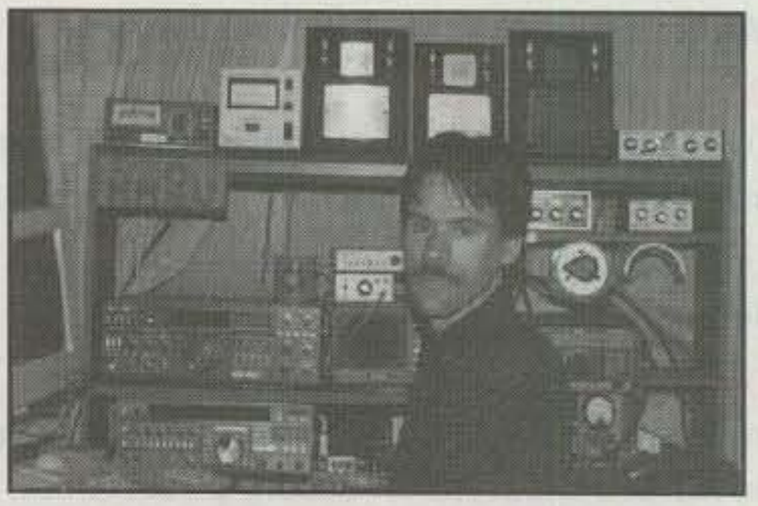


Low power doesn't mean small antennas, as we can see from AA2U's impressive tower.



Randy, AA2U, in front of his "QRP" setup.

CW and ARRL DX CW/SSB, and world high totals in the ARRL 10M and QRP ARCI QSO Party contests.

When talking to Randy recently, I was impressed with some operating statistics that he shared with me. Imagine having a 60-hour rate on 10 meter SSB during the CQ WW with only 5 watts! And how about this one: Over 600 QSOs in the recently held ARRL 10 Meter Contest! Not bad for the bottom of the sunspot cycle. To further strengthen the position that Randy is a serious operator, he tells me that he operates at least as many hours as any regular single operator effort in a DX contest. Furing one ARRL DX CW contest Randy made approximately 1050 QSOs while operating 46 hours. Now that's dedication!

In addition to QRP contesting, Randy also likes to DX and chase band countries. To date, he has worked over 300 countries with QRP and close to 2000 band countries. The race is on between Randy and N4KG, along with many others, to be the king of QRP DXing.

With so many hours logged, it should come as no surprise that Randy has a few QRP DX pile-up stories. One of his favorites is his experiences when working Bouvet Island, 3Y5X a few years back. As with any major DXpedition, QRPers have to wait their turn for the first few days while the KW stations get their QSOs in the log. After the first week, however, Randy

Final Scores—1994 Poisson d'Avril Contest

CALL	CATEGORY	SCORE
K1DG	Single-operator supremo	45,534,545
W7WHY	Single op minus transmitter	45,534,544.009
WA6SDM	Single-multi mike,op needs assistance	21,756,420
VE3VET	Single-op never won a contest but want to	$250,000 (Cdn)
VE3ZD/W6	Single-op single-freq multi tx, no rx	902.10
N3OYA	Single op completely daft	6-7/8
G4CLF	Single op landline & LDE	1-800-COLLECT
VE3VNH	Multi-op, multi-lingual, Canadian/Canadien	$20 per kg
TG9AJR	Single-op, still looking and hungry	$21.95 plus tax & 20% gratuity

decided to give it a try and quickly worked the operation three times on 15 and 10 meters (SSB/CW). Although working them easily may be overstating the fact somewhat, Randy, always looking for a new challenge, decided that he would try it on 20 meter SSB—not with 5 watts but only 1 watt! Amazingly, a 3Y5X QSO was in the log—through a 15 kHz wide pile-up—in only 5 minutes, and that with an A3 tri-bander on his roof!

As the years progress, Randy's antennas have grown bigger, with a 90 foot tower now in his backyard sporting stacked tribanders and a 402CD and A3WS for 40 meters and the WARC bands. His other antennas include a 80 meter full-wave loop and various VHF beams—all of this, I might add, on a quarter acre lot.

If you're not impressed at this point, let me leave you with more data to help you form your opinion. Most of us have had our share of Transatlantic QSOs, but can you claim QSOs with the following power levels?

80 meters—.075 watts
40 meters—.080 watts
20 meters—.00057 watts
15 meters—.00071 watts
10 meters—.00053 watts

AA2U certainly has a lot to be proud of. Professionally, Randy is a mechanical engineer and devotes some of his spare time to collecting antiques and old radio equipment. When it comes to contesting, many of the high-power stations often get most of the glory. In my book, however, AA2U is up there with the best of them. A true gentleman with impressive credentials, Randy is to be congratulated. Keep up the good work, OM!

Results of The 1994 Poisson d'Avril Contest

by Doug Grant, K1DG

Once again, here are the results of the Poisson d'Avril Contest. In a startling development K1DG again led the way with another record-setting effort. A host of other entries were received in a variety of entry categories, and the scores can be found in this year's results table.

The Contest Directors are disturbed by a growing use of excessive power in this contest. Several entrants reported big improvements in their scores simply by raising their power to 15 or 20 KW, and promising never again to run a mere 1.5 KW. This sort of operation violates the spirit and intent of the contest, and stations suspected of using excessive power will be disqualified and their tax returns audited by the IRS. There's simply no good reason for using high power in this event. Even operators with modest skills can place well in this contest by merely claiming credit for QSOs they did not make. Creative logging is much easier! But remember, it doesn't matter whether you win or lose, as long as you beat the point spread!

Soapbox Comments: "Really great contest. Key to a high score is massive QRO . . . but after the contest I noticed lots of small pieces of aluminum and many dead birds in the backyard." . . . *WA6SDM.* "Had the best of everything—the best radios, the biggest and best antennas, and way too much power. Total cost of the station was $250,000 Canadian (about $500 U.S.). Can't believe I beat K1DG!" . . . *VE3VET. (Don't worry; you didn't—ed.)* "Lack of receiver didn't seem to affect my score much". . . *VE3ZD/W6.* "Push button 'til noise come out. If no noise, push more buttons. If sparks come out, stop push button" . . . *N3OYA (apparently a distant relative of retired CQ columnist Hashafisti Scratchi—ed.).* "I told everyone I worked (every amateur on the planet, all bands and modes) not to respond to any queries about whether I worked them, so you'll just have to believe me!" . . . *G4CLF.* "John: Participation was great—first time over 45M points in one weekend. Was going to send log to K1DG, but I forgot his call." . . . *W7WHY.* "I would turn up all my wattage, turn my chili into potage, for the sweet perchance, perchance to marry thee"... *VE3VNH/VEtroisVNH.* "Is this close enough to a log? . . . *TG9AJR. (While offering a copy of the Dayton Stouffer's Room Service menu at the Dayton Hamvention; the answer, of course, was yes—ed.).*

The 3rd Annual Dayton Contest Dinner & Contest Super Suite

One of the newer traditions for contesters at the Dayton Hamvention will be available for yet another year. The North Coast Contesters and Frankford Radio Club will host the "Contest Super Suite" Thursday, Friday, and Saturday nights, April 27–29, sponsored by Kenwood Radio. The suite opens at 7:00 PM every night and will be located at the Stouffer Center Plaza Downtown Hotel, Miami Room (2nd floor). Plan on spending the evening with over 400 contesters and DXers.

The other major social activity for contesters this year will be the Third Annual Dayton Contest Dinner on Saturday night, April 29th. Hosted by the North Coast Contesters, Frankford Radio Club, Potomac Valley Radio Club, and other contest clubs, dinner will be served at 6:30 at a cost of only $26 and will be located at the Stouffers Center as well. Reservations will be first come, first served and should be sent with your check to: North Coast Contesters—Dayton Dinner, P.O. Box 59, New Bedford, PA 16140. Don't miss out on great speakers, prizes, *CQ* Contest Hall of Fame awards, and other surprises. The deadline for reserva-

tions is April 15th. Hope to see you there!

One final reminder is for the contest and antenna forums coordinated by Doug Grant, K1DG, Charlie Morrison, WZ1R, and Tim Duffy, K3LR, respectively. These events, held during the Dayton Hamvention weekend, bring out the best information and entertainment you can find on the topics of antennas and contests. If you're in Dayton this year, don't miss out!

Final Comments

That's it for this month. As always, please remember to provide any submissions for the July column to me by May 1.

73, John, K1AR

42nd Annual Poisson d'Avril Contest

1954–0000Z Saturday, April 1

This event is one of my personal favorites. Sponsored by the Longue Isle Radio Poisson Association and the Loyal Order Of Foosballers, this classic will take place on its traditional date, which actually falls on a weekend this year. Get on and make some noise!

Eligibility: All licensed and unlicensed radio amateurs may enter.

Exchange: RS(T), operator's name, QTH, serial number, and number of hours watching O.J. Simpson trial coverage in the past week. Add whatever additional information you feel would be of interest.

Scoring: A station may be contacted once per band/mode. Each QSO carries a value of one point times the serial number of the QSO. For example, the first QSO counts one point, the second two points, the third QSO is worth three points, etc. Bonus points may be earned by contacting a station again on the same band/mode, and are assigned points in the same way as normal QSOs. These bonus points are then subtracted from the normal QSO points to determine the "adjusted gross QSO points."

Multipliers: Only internationally recognized multipliers will count. This includes: U.N. (read: "Real") countries, Time (read: "Real") Zones, and States with two Republican Senators.

Frequencies: Try to stay within the amateur bands, or at least close. If your rig is capable of operating outside the amateur bands, only do so if there's really a lot of QRM inside the bands. There is no need to respect any "gentleman's agreement" on frequencies. Net frequencies, DX windows, and slow-scan calling frequencies are all fair game.

Classes: Single-operator, single-operator-is-on-strike-so-I'm-a-replacement-operator, single-operator with packet, single-operator-with-outside-spotter, single-operator-with-another-guy-in-the-shack-but-I-can't-see-him-so-he's-not-really-here-and-I'm-still-single-op-so-there, single-operator-single-radio, single-operator-two-radio, single-operator-I-bought-everything-they-had-at-HRO-last-weekend, multi-operator-single-transmitter, multi-operator-multi-transmitter, multi-operator-multi-transmitter-multi-location. There are two new experimental categories this year: Zero-operator-fully-automatic (station must be operated with no human assistance during the contest period, and software must have been written by the computer itself during the contest; and a QRPpp/ppPRQ category, where all QSOs

must be made using less transmitted energy than the received signal (for example, a station whose signal is 40 dB over S9 may be worked only if your transmitted power is one microwatt or less).

Club Competition: Any club may enter an aggregate score of all its members, past and present. A list of eligible members must be submitted to the Contest Committee. In order to be eligible, all members must sign a statement that they would never join any club that would have them as a member. Note: It is not necessary to send copies of club badges as proof of membership, since we don't need no stinkin' badges!

Awards: Awards will be issued to whomever the Committee thinks deserves them. At the very least, you'll get your call listed in *CQ* a year or so after the contest. The grand-prize winner will win a menu from the Poisson d'Avril Restaurant (there really is one!), 36 Cote de la Fabrique, Quebec City, Quebec, Canada, G1R 3V7.

Disqualifications: As noted before, anyone suspected of using excessive power will be disqualified, publicly humiliated, and possibly shot. Pretty much anything else goes, except fishy-smelling logs.

Log Deadline: April 15, same as your taxes. Make sure you don't get them mixed up, since we don't send refunds, and the IRS can't get your call in *CQ*. Last year we attempted to accept logs via Internet, but one entrant reported that our address (dash.dash@dot.dot) caused his electronic postmaster to dump 12 GB of code vs. no-code debate to his disk. So this year, we ask that you post your score to all Internet mailing lists having anything to do with amateur radio or computers. Make sure you cross-post as much as possible, since you want everyone to see how you did in the contest, and want us to be able to find your score. If you absolutely insist on sending a hard-copy or disk log, send it to P d'A Contest Committee, 144 Kendall Pond Road, Windham, NH 03087. We take all disk formats and can read the outputs of all known logging software, including CT, NA, N6TR, and the new Microsoft™ Work 'em for Windows.

EA RTTY Contest

1600Z Sat., to 1600Z Sun., Apr. 1–2

This is the 1995 edition of the Spanish RTTY Contest sponsored by U.R.E. It is open to participants worldwide on 80–10 meters.

Classes: Single operator, all bands and single band, Multi-Single, and SWL.

Exchange: Signal report and Spanish Province (for EA stations). All others use *CQ* Zone.

Scoring: For non-EA stations—on 10–20 meters, credit 1 point for contacts in your continent, 2 points for QSOs outside your continent. On 40 and 80 meters, triple your QSO points (e.g., 3 within your continent). QSOs between stations in the same country are only valid for multiplier credit and have no QSO point value.

Multipliers: Credit EA provinces (maximum 52) and *CQ* Zones worked per band.

Final Score: Multiply total QSO points times multiplier.

Awards: Various certificates and plaques are available to the winners of each operating category.

Send your entries by May 15th to: EA RTTY Contest, c/o EA1MV, Antonio Alcolado, P.O. Box 240, 09400 Aranda de Duero (Burgos), Spain.

Polish "SP" DX Contest

1500Z Apr. 1 to 1500Z Apr. 2

Sponsored by the Polski Zwiagek Krotkofalowcow (PZK), this one is held the first weekend of April and generates a good level of activity by the SPs.

Classes: Single operator, single and all band. Multi-operator, single transmitter (all band only), and SWL.

Exchange: Signal report plus a three-digit serial number. SP stations will include a two-letter province abbreviation.

Multiplier: Count the total number of Polish provinces worked (maximum of 49).

Scoring: Three points per QSO times the number of Polish provinces worked.

Bands: 160–10 meters (no WARC bands).

Awards: Certificates will be awarded to the high scores in each class per country.

Mailing deadline for logs is 30 days after the end of contest. Send your entries to: Polski Zwiazek Krotkofalowcow, Contest Committee, P.O. Box 98, 59-220, Legnica 2, Poland.

MARAC County Hunters SSB Contest

0000Z Sat. Apr. 8 to 2400Z Sun., Apr. 9

The Mobile Amateur Radio Awards Club is sponsoring the 24th running of this event. Mobile and fixed operation from every county in the United States is welcome. Mobiles and portables may be worked each time they change counties or bands.

Exchange: RS(T), U.S. county and state (province/country for others).

Scoring: 1 point for fixed stations; 15 points for mobiles; US/VE contacts with DX countries are worth 5 points. Final score is computed by the total QSO points times the total number of U.S. counties worked.

Frequencies: 3880, 7240, 14270, 21340, 28340 kHz. Fixed stations should operate above the suggested frequencies to allow more freedom for mobiles to operate on clear frequencies.

Awards: Certificates will be awarded to winning fixed stations in each state/province/country (with 1000 or more points); mobiles in each state operating in 3 or more counties with a minimum of 10 QSOs per county. MARAC plaques to the highest scoring first- and second-place mobile stations in the U.S., North American fixed station, and DX station who scores at least 50,000 points.

Completed logs, summary sheets, and check sheets must be received by May 8, 1995 and go to: Bill Nash, WØOWY, 13212 N. 37th Ave., Phoenix, AZ 85029. Enclose a #10 SASE and two units of postage with your entry for a copy of the final results.

YLRL DX to NA YL Contest

CW: Apr. 12–14 SSB: Apr. 26–28
1400Z Wednesday to 0200Z Friday

This is another popular YLRL sponsored contest open only to licensed women operators around the world.

Classes: Single operator only.

Exchange: QSO number, RS(T), and ARRL section/country. Entries in log must also show

time, band, date, and transmitter power.

Frequencies: CW—3540–3570, 7040–7070, 14040–14070, 21120–21150, 28180–28210 kHz. SSB—3940–3970, 7240–7290, 14250–14280, 21380–21410, 28280–28410 kHz.

Scoring: Phone and CW are entirely separate contests. DX YLs, including Alaska and Hawaii, may contact the North American continent. A station may be counted as one point and worked once per band for credit. Multiply the number of QSOs by your total multiplier (sections/countries) for final score. You may apply a bonus multiplier of 1.5 if less than 150 watts is used at all times during the contest.

Awards: Various cups and plaques will be awarded to the category winners. In addition, certificates will be provided to all second- and third-place winners.

Logs are due 30 days after the conclusion of each contest. Mail your logs to: Carla Watson, WO6X, 473 Palo Verde Drive, Sunnyvale, CA 94086.

Friendship Contest

1300Z Apr. 22 to 1300Z Apr. 23

This is a new one jointly sponsored by the Russian-Speaking Radio Club International (USA) and KV Zhurnal (HF Magazine) of Moscow, Russia. It is open to stations in the US and CIS/former Baltic areas.

Classes: Single Operator only.

Exchange: US stations send RS(T) and state. CIS/Baltic stations send RS(T) with *CQ* Zone number.

Frequencies: 7 and 14 MHz, SSB and CW.

Scoring: Credit one point per QSO. Stations can not work each other in their respective areas (e.g., US cannot work other US stations). Multipliers are US states and *CQ* Zones and can only be credited once regardless of band or mode. Final score is total QSO points times total multiplier.

Awards: Plaques and special diplomas will be awarded to the winners. A special prize will be awarded to the participant who submits the best commentary along with the log.

US stations must send their logs (diskette and paper) to: Friendship Contest, c/o RSRCI, P.O. Box 715, Brooklyn, NY 11230. CIS/Baltic stations should send their logs to: SRR, P.O. Box 59, Moscow, Russia. All logs are to be postmarked no later than May 15, 1995.

Swiss Helvetia Contest

1300Z Apr. 29 to 1300Z Apr. 30

This is a good chance to build up your Canton total for the Swiss Helvetia Award, which requires confirmation from all 26 Cantons.

Frequencies: Use 1.8–28 MHz (no WARC bands) on both phone and CW.

Exchange: RS(T) plus a three-digit serial number. Swiss stations will also include a two-letter abbreviation for their Canton.

Scoring: Only contacts with Swiss stations count. Each contact with an HB station is worth 3 points. You may only work a station once per band regardless of the mode.

Multiplier: The sum of the Cantons worked on each band (26 per band).

Final Score: Calculate your final score by multiplying your total QSO points by the sum of Cantons worked.

Awards: Certificates will be awarded to the top scorers in each country and each USA and VE call area.

Logging: Indicate a Canton in a separate column for each band the first time it is worked. Check your log for duplicates and include a summary sheet showing the scoring and your name and mailing address in block letters. Also include the usual signed declaration.

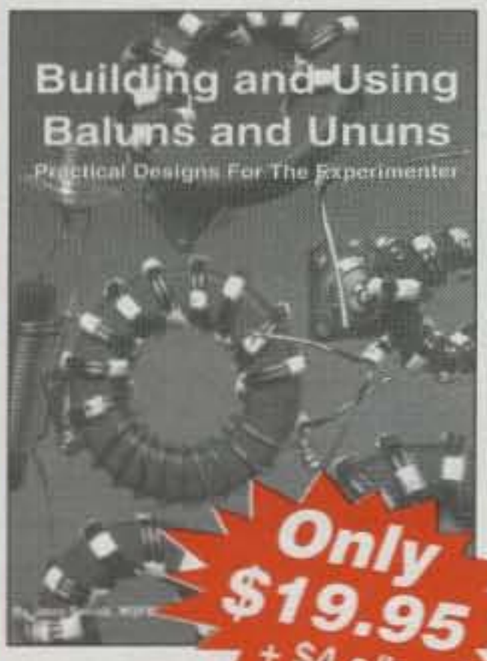
The mailing deadline for contest logs is June 14, 1995. All logs are to be sent to: Nick Zinsstag, HB9DDZ, Postfach 651, CH-4147, Aesch, Switzerland. ■

New From CQ

Here are the books you've been waiting for!

Building and Using Baluns and Ununs

Practical Designs for the Experimenter by Jerry Sevick, W2FMI



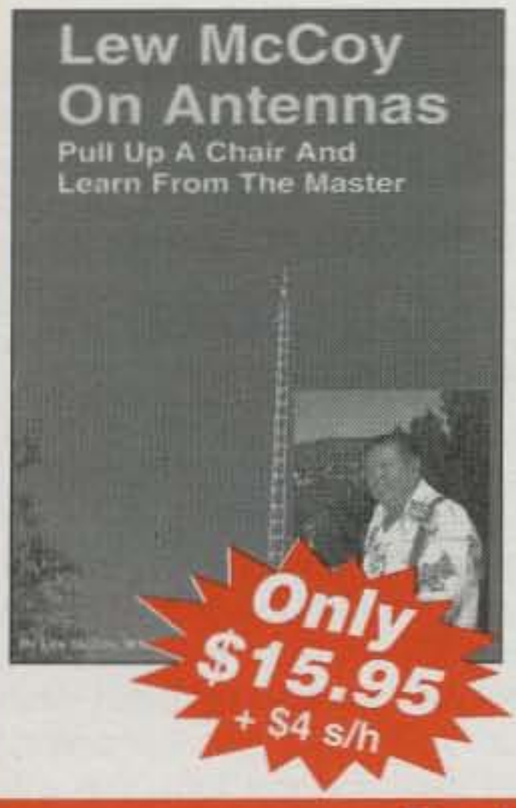
Without question, Jerry Sevick, W2FMI, is *the* authority on transmission line transformer theory. **Building and Using Baluns and Ununs** is the definitive source for the latest practical information and designs.

This book provides a unique opportunity to learn about the uses of baluns and ununs with dipoles, yagis, log periodics, beverages, antenna tuners, and countless other applications.

Much has been published about the theory of transmission line matching circuits. Jerry Sevick has unraveled the technological mysteries with designs that are simple and work. Be sure to order your copy of **Building and Using Baluns and Ununs** right away!

Lew McCoy on Antennas

by Lew McCoy, W1ICP



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BILL'S BASICS

BY BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Equipment and Accessories—Part II of III

The first part of this article provides an overall introduction to the series (see the March issue). It also covers older accessories and modern equipment.

The shack of Giuseppe (Pino) Picataggi, YV7MB, of Los Altos de Santa Fe, Venezuela, includes an ICOM IC-740 transceiver. However, Pino's favorite transmitter is a homebrew unit featuring a pair of 807 tubes in the final RF stage and a Geloso variable frequency oscillator. He uses a Hammarlund Super Pro receiver and a war surplus BC-224 receiver with his homebrew transmitter.

Accessories

Antennas. You could have poor transmitting and receiving equipment, but still experience relatively good communication results using a good antenna. On the other hand, you can have an excellent transceiver, but experience poor communication results due to using an unsuitable antenna. If you go to the expense and trouble of setting up an excellent transceiver in your shack, it makes sense to add a good antenna system to enhance your station's usefulness. Using an excellent transceiver with a poor antenna is about the same as riding a bicycle with the tires almost flat.

The dipole is the first antenna installed by most new amateurs. It is easy to construct and erect. It performs well if it is cut to the correct length and mounted at least one-half wavelength above electrical ground. If a dipole is lying on electrical ground, it radiates signals straight up, and any signal refracted by the ionosphere returns almost straight down; this results in a minimum communication range. If a dipole is erected one-half wavelength above electrical ground, its signal radiation lobe is about 30 degrees above the surface of the ground, which can provide reasonably good communication range, since the signal refracted by the ionosphere returns to earth a long distance from the transmitting antenna. If a dipole is installed one full wavelength above electrical ground, it becomes a good antenna for extremely long-distance (DX) contacts. The previous 30 degree lobe moves up to about 50 degrees, and a new lobe develops at about 15 degrees. This new low-angle lobe provides improved DX communication capability. Height is important to optimum performance of all antennas, not just dipoles. Another consideration that applies to all antennas is that antennas made with large-diameter conductors (wire or tubing) are useful over more of the band than antennas that are made with small-diameter conductors.

Various types of wire antennas are manufactured by companies which advertise their products in amateur radio magazines. Look through these magazines to get an idea of what each company offers. If you become interested in a specific model, write to the manufacturer and request a copy of their associated specification sheet. There is no standard antenna system that suits everyone. Every amateur needs an antenna system that is custom designed to meet her/his needs.

The most popular wire antennas are the dipole (including drooping, folded, sloper, bent, and trap versions), random wire, long wire (at least 2.5 wavelengths at the lowest frequency to be used), Windom, G5RV, and Zepp. There are many variations of these wire antennas.

An antenna tuner and SWR (standing wave ratio) bridge are needed to make proper use of random- and long-wire antennas. These tuners use variable capacitance and inductance to make wire antennas act as if they are correct (resonant) electrical lengths for various frequencies. Tuners make antennas electrically correct in length regardless of their actual physical lengths. Basically, a series capacitor electrically shortens an antenna, whereas a series inductor lengthens it.

The random/long wire offers all-band operation with a single antenna that is not critical as to its length. No coaxial cable (or any other) feedline is required. Consequently, they do not involve any feedline loss. The wire simply needs to be at least one-quarter wave long at the lowest frequency to be used. In other words, it should be at least 63 feet long for 80 meter Novice band use, or 33 feet long for 40 meter Novice band use. However, the lengths of the vertical (uplink) and horizontal portions are additive, making it possible to erect a useful low-frequency antenna in relatively small areas. It is advisable to avoid any reversal in the direction a random/long wire is erected. In other words, if it runs east to west, avoid a subsequent west-to-east reversal. Also, avoid kinks and other abnormalities along the length of wire. Do not loop the wire through the eye of an insulator; let it run freely through the eye a single time. If the wire must be secured to an insulator, tie it in position with nonconductive twine (string) or tape. Simply go to the farthest useful attachment point, cut off any excess wire, secure the end of the wire to an insulator (clean wire down and solder it to prevent motion, which can result in noise during windy conditions), and use a nonconductive line to secure the far end of the antenna to the attachment point through an insulator. The toughest installation problem you must overcome is preventing the long/random-wire antenna from tending to pull the antenna tuner out of the shack. It might be possible to secure the tuner in place where the pull of

45527 Third Street East, Lancaster, CA 93535-1802

the antenna causes no problem, but this has never happened in any installation I have seen. Most of us secure the long/random wire at the point where it exits the building. This is easily done by soldering an obstruction to the wire at the point where it enters the feedthrough insulator to exit the building.

The Yagi-Uda (Yagi) is the most popular directional (beam) antenna for DX operation. It is relatively easy to assemble and install. It enables you to concentrate transmission and reception in any desired direction. A properly installed Yagi seldom requires maintenance.

Serious DX operators often prefer the quad beam antenna. A two-element quad provides about the same gain as a three-element Yagi. The quad is an excellent antenna, but it does require occasional repair of damage caused by high-velocity winds.

The Delta Loop beam antenna is a rugged and larger version of the quad. Like the quad, the Delta Loop provides excellent DX opportunities at a lower height than is required for a Yagi to do the same job.

The vertical antenna requires the least amount of horizontal space. It requires a good RF ground to provide optimum performance. It is a simple antenna to assemble and erect. The vertical antenna is highly susceptible to manmade noise, such as automobile ignition interference. It is not the optimum choice for use in many locations.

The ground plane is a good choice for many stations. It provides good DX capability, and it functions relatively immune to the station's RF ground. Do not ground the radials (wires) up at the antenna; they must be off the radio frequency (RF) ground to function. The coax shield is not at RF ground at the antenna end, even though it is connected to the transceiver chassis (and RF ground, supposedly) in the shack.

The ARRL Handbook provides excellent coverage of antennas. In addition, there is a variety of specialized antenna publications. It is worthwhile to acquire a good understanding of antennas and radio-wave propagation.

Headphones and Loudspeakers

If you decide to use a loudspeaker external to your transceiver, the loudspeakers designed for use in mobile installations are satisfactory. A narrow-frequency reproduction range is preferred. Most matching AC power supplies designed for use with transceivers include the loudspeaker.

Realize that even a rare DX station is just noise to non-amateurs in your place of residence. Do not subject your family to the squeaks and squawks that we find to be thrilling. Use headphones if you operate in close proximity to other people. Headphone use also minimizes distraction to the amateur, and enables her/him to hear weak signals better than they would be heard using a loudspeaker. One has to arrive at a compromise between sensitivity and weight when selecting a pair of headphones. Extremely sensitive headphones are heavy, and they can prove to be uncomfortable when they are worn for a long time. It is best to use limited frequency range headphones instead of high-fidelity headphones.

Lighting

Subdued lighting suffices for most amateur radio operation. Avoid the glare and heat that are associated with high-wattage lighting. Simple low-wattage incandescent bulbs are preferable to fluorescent lights, since fluorescent lighting can be the source of noise to one's receiver. Use light fixtures that can be positioned to shield you from lamp glare.

Clocks

A four-digit clock is a worthwhile addition to your station. Such clocks are built into many of the new transceivers. If you use

a clock that is external to your rig, position it where it can be read easily without having to move your head. Many active amateurs use 24-hour four-digit time for all operating activities, with UTC (Universal Time Coordinated) preferred over local time. Some of these digital clocks can be set to alternately display the date and time.

Electric Power

If you can, power your amateur radio station from a dedicated house circuit; use a line that is not used to supply AC power to anything else. Multi-outlet power strips are readily available; they enable an operator to throw (set) a single switch (or circuit breaker) to apply or remove AC input power to all equipment and accessories in a station. These power strips can be purchased with built-in surge protection, which could save solid-state equipment from damage from abnormalities (spikes, etc.) coming in on the AC power line. Use an adequate-size line with conductors that can handle your total current requirement without excessive heating and unwanted voltage drop. If you have equipment that can be operated on 220 VAC, it is advisable to install an adequate 220 VAC line and to use it to power equipment that would require a much higher input current if operated at 110 VAC.

Telegraph Apparatus

Do not use a junk manual (hand) key. Such a key will be uncomfortable to use, and the resultant code is likely to be difficult to read. Get a good hand key. Top-quality hand keys are expensive if they are purchased new, but they are worth their price. The Japanese manufactured TK-11 is a good hand key at a low price. It is sold under many names by several electronic distributors. Also, surplus outfits (such as Fair Radio) usually have hand keys for sale, and many of these keys are excellent.

Some transceivers have an electronic keyer built in, and they just require an external paddle (key) to be used. In most cases, an external paddle and electronic keyer combination is required. Some companies manufacture electronic keyers with the paddle built into them. The electronic keyer and paddle are easy to master, but it is advisable to develop sending rhythm (spacing) with a handkey before changing to an electronic keyer. I know people who did not develop sending rhythm before going to a keyer. Almost without exception, such people send garbage that consists of a bewildering sequence of perfect dits and dahs, but with no separation between words. Develop good sending capability to 10 to 15 wpm with a handkey before switching to a keyer. The best electronic keyers and paddles are expensive, but they are worth the cost. I like semi-automatic keys (bugs). I use them for most of my code operation, but I do not recommend them to new amateurs. Keyers are easier to master, and many of them include memory for automatic transmission of repetitive calls, such as contest CQ calls.

Summary

This completes the second portion of this three-part article. The last part covers older gear, previous coverage, list of catalogs, plus equipment reviews and introductions.

Photographs Wanted

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

73, Bill, W6DD

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BY NORM VAN RAAY, WA3RTY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The month of April brings us April Fool's Day and the Dayton Hamvention. I'd like to report on a group that manages to celebrate both events with gusto. I met them at the County Hunter's banquet in Dayton last year and found them to be an interesting group.

The b0ZOs were conceived during the 1984 Dayton Hamvention. Nine amateurs from Wisconsin traveled as a group to the Hamvention. It all started when Dave Boede, WD9ESH, was trying to call Jeff Lichenwald, WA9PPV, a number of times on 2 meters and never got an answer. Finally, Dave looked across the aisle and there stood Jeff. Dave just gave out a yell: "Hey! b0ZO!" Jeff turned around. The rest, as they say, is history.

In order to identify themselves for the rest of the weekend, the original group took numbers: Jeff Lichenwald b0ZO/1, Robert Ronk b0ZO/2, Henry Roland b0ZO/3, Dave Boede b0ZO/4, Mark Michel b0ZO/5, Jack Bigelow b0ZO/6, Richard Loehning b0ZO/7, Wally Greene b0ZO/8, and Joan Michel b0ZO/9. That seemed to be the end of it—until the Neenah Menasha Wisconsin Amateur Radio Club had their annual banquet. Lo and behold, Dick Loehning appeared wearing a gold T-shirt with b0ZO on the front, his call on the back, and the number 7 on the left sleeve. After that they all got gold T-shirts. This started phase two of the group.

At the Grays Lake Hamfest in Mundelein, Illinois the group was all wearing gold T-shirts. People were wondering where b0ZO-land is. Some asked what DXpedition they were on. They were also picking up new members every time the gold T-shirts appeared at a hamfest. The movement also caught on with County Hunters. There are now over 200 members (or b0ZOs), some even in South Africa and Nicaragua. They come from all walks of life: bishops, dentists, business tycoons, federal and state employees, teachers, police officers, and others.

The big event for b0ZOs is the bus trip to the Dayton Hamvention. They charter a full-size motor coach that leaves Appleton, Wisconsin on Thursday and returns home on Sunday. The bus is filled and the b0ZOs have four days of fun and relaxation. It's a fun bus! Not bad for a group of amateur radio enthusiasts who have no meetings, no rules, no dues, and just meet at amateur radio conventions and hamfests.

The name b0ZO with a small "b" was chosen to avoid confusion or infringing on Bozo the Clown. There is even a b0ZO of The Year award. This award is given to the member who pulls the biggest boner of the year. The last five winners were:

1989—Rick Borre, N9HDZ, for almost cutting a finger off while using a Skill saw.

1990—Mike Ortlieb, KN9P, for buying a ham radio that spent more time in the shop than in his shack.

1991—Jack DeWolf, KA9TQC, for buying a car in which you can't install a radio.

1992—Mark Michel, W9OP, for driving to Dayton and blowing an engine while everyone else rode the bus.

1993—Patrick Bottehsek, KF9SD, for being a weather spotter, watching for tornados, and driving right into one and wrecking his vehicle.

Box 76, Pleasant Mount, PA 18453-0076

SPECIAL HONOR ROLL

J. P. Phil Bretz, KE2EA
USA-CA All Counties #850
December 22, 1994

Walt Ordway, K1DFO
USA-CA All Counties #851
December 22, 1994

Eleanor "Bunny" Cyr, N1FJR
USA-CA All Counties #852
All Mobile 20 Meters
December 23, 1994

William R. Woodle, W4XQ
USA-CA All Counties #853
December 23, 1994

Eleanor Morris, KD4NFE
USA-CA All Counties #854
January 8, 1994

Jack Crutchfield, KBØFQC
USA-CA All Counties #855
January 8, 1994

James David Garvey, WB4HIN
USA-CA All Counties #856
January 31, 1995

Sam H. Moore, Jr., NX4Z
USA-CA All Counties #857
February 1, 1995

Reynold D. McGinnis, WAØRKQ
USA-CA All Counties #858
February 6, 1995

HONOR ROLL

500

KE2EA	2800
K1DFO	2801
N1FJR	2802
W4XQ	2803
KD4NFE	2804
KBØFQC	2805
AA7VY	2806
OA4ED	2807
WB4FOT	2808
LW2DFM	2809
WAØCLR	2810
PY2OW	2811
WX7M	2812
WØULU	2813
N1OAZ	2814
G3UAS	2815
WB4HIN	2816
NX5Z	2817
LU8DY	2818
HL5AP	2819
CE5CNT	2820
LY1DC	2821
KB1JJO	2822
I1YRL	2823
WAØRKQ	2824

1000

KE2EA	1340
K1DFO	1341
N1FJR	1342
W4XQ	1343
KD4NFE	1344
KBØFQC	1345
WB4FOT	1346
WX7M	1347
WØULU	1348
N1OAZ	1349
G3UAS	1350
LBN5UNX	1351
WB4HIN	1352
NX5Z	1353
CE5CNT	1354
WAØRKQ	1355

1500

KE2EA	1122
K1DFO	1123
N1FJR	1124
W4XQ	1125
KD4NFE	1126
KBØFQC	1127
WØULU	1128
N1OAZ	1129
KJ8F	1130
KB5UNX	1131
WB4HIN	1132
NX5Z	1133
WAØRKQ	1134

2000

KE2EA	1032
K1DFO	1033
N1FJR	1034
W4XQ	1035
KD4NFE	1036
KBØFQC	1037
WØULU	1038
WB4HIN	1039
NX5Z	1040
WBØRKQ	1041

2500

KE2EA	954
K1DFO	955
N1FJR	956
WX4Q	957
KD4NFE	958
KBØFQC	959
WØULU	960
WB4HIN	961
NX5Z	962
WAØRKQ	963

3000

KE2EA	872
K1DFO	873
N1FJR	874
W4XQ	875
KD4NFE	876
KBØFQC	877
WØULU	878
WB4HIN	879
NX5Z	880
WAØRKQ	881

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.

Awards Issued

First, we apologize to Fred Schmidt, WØULU, USA-CA #840. He received his USA-CA All Counties award July 14, 1994, and we neglected to assign USA-CA 500-3000 numbers to him. We have assigned them in this issue. *Mea culpa.*

Following are only some of the award winners listed in the Honor Roll this month. Congratulations to all!

USA-CA 500: KE2A, John Bretz, #2800; K1DFO, Walt Ordway, #2801; N1FJR, Eleanor Cyr, #2802; W4XQ, William Woodle, #2803; KD4NFE, Eleanor Morris, #2804; KBØFQC, Jack Crutchfield, #2805; AA7VY, Gordon Blank, #2806; OE4ED, Augusto Morales-Zevallos, #2807; WB4FOT, John Fitzpatrick, #2808; LW2DFM, Carlos Andres Tortonese, #2809; WAØCLR, Robert Roske, #2810; PY2OW, Sandro Jose Tafarelo,

#2811; WX7M, Patrick Mulreant, #2812; WØULU, Fred Schmidt, #2813; N1OAZ, Lloyd Smith, #2814.

USA-CA 1000: KE2A, John Bretz, #1340: K1DFO, Walt Ordway, #1341; N1FJR, Eleanor Cyr, #1342; W4XQ, William Woodle, #1343; KD4NFE, Eleanor Morris, #1344; KBØFQC, Jack Crutchfield, #1345; OE4ED, Augusto Morales-Zevallos, #1346: WB4FOT, John Fitzpatrick, #1347; WX7M, Patrick Mulreant, #1348; WØULU, Fred Schmidt, #1349; N1OAZ, Lloyd Smith, #1350.

USA-CA 1500: KE2A, John Bretz, #1122: K1DFO, Walt Ordway, #1123; N1FJR, Eleanor Cyr, #1124; W4XQ, William Woodle, #1125; KD4NFE, Eleanor Morris, #1126; KBØFQC, Jack Crutchfield, #1127; WØULU, Fred Schmidt, #1128; N1OAZ, Lloyd Smith, #1129.

USA-CA 2000: KE2A, John Bretz, #1032: K1DFO, Walt Ordway, #1033; N1FJR, Eleanor Cyr, #1034; W4XQ, William Woodle, #1035; KD4NFE, Eleanor Morris, #1036; KBØFQC, Jack Crutchfield, #1037: WØULU, Fred Schmidt, #1038.

USA-CA 2500: KE2A, John Bretz, #954; K1DFO, Walt Ordway, #955; N1FJR, Eleanor Cyr, #956; W4XQ, William Woodle, #957; KD4NFE, Eleanor Morris, #958; KBØFQC, Jack Crutchfield, #959; WØULU, Fred Schmidt, #960.

USA-CA 3000: KE2A, John Bretz, #872: K1DFO, Walt Ordway, #873; N1FJR, Eleanor Cyr, #874; W4XQ, William Woodle, #875; KD4NFE, Eleanor Morris, #876; KBØFQC, Jack Crutchfield, #877; WØULU, Fred Schmidt, #878.

MARAC 1995 Convention

Plans are being finalized by Paul Scipione, AA2AV, and his group for the 1995 Mobile Amateur Radio Awards Club annual convention in Hamburg, New York on July 6–9, 1995. Hamburg is near Buffalo, but outside the Niagara Falls tourist area. The committee is working hard on plans for YLs and Harmonics (teens and preteens), so if you've been thinking about a second (or first) honeymoon or a family vacation, come and join us for a real fun time.

On A Personal Note . . .

I have been recovering from a series of flu infections. We had our first snow storm of winter '95 the first week of February. If this is all winter has for us, I'll take it!

A must have for all serious award chasers is the *K1BV DX Awards Directory* published by Ted Melinosky, K1BV. Copies may be obtained directly from him at HCR 10, Box 837A, Spofford, NH 03462 USA (603-363-8209 or CompuServe 74271,1503). Postpaid cost per copy is USA & Canada $20, DX surface $18, DX air (W. Europe, South and Central America) $25, DX air (rest of the world) $30.

73, Norm, WA3RTY

VHF PLUS

BY JOE LYNCH, N6CL

ALL ABOUT THE WORLD ABOVE HF

New 145 GHz World Record

Take a look at the band listed in the headline. It says *GHz*. Only two years ago the very first contacts were made on this band. The Danish group set out to make the first, but unknowingly were preempted by Tom Williams, WA1MBA, and Jim Mead, WB2BYW, who actually had a longer distance QSO. Undaunted, the Danes set out to beat the record. What follows is their account, written by Steen Gruby, OZ9ZI.

"It was a surprise to learn after the Danish Microwave Activity Week 1993 that what we thought was a world record on 145 GHz had been broken almost before it was set.

"The aim was to set a new record in the course of the Danish Microwave Activity Week 1994, but the weather did not permit this. Therefore, we decided to make a new attempt as soon as the weather would permit.

"We chose a test distance of 11 km over Arresø, which we previously had used for the first 10 GHz tests back in 1983. We had agreed to use 76 GHz as 'talk back,' but one of the stations decided not to work on the transmitter side. We thus had to re-saddle and use 47 GHz as 'talk back,' which cost OZ1UM's wife a drive.

"When we first had contact on 47 GHz, it was easy to establish contact on 145 GHz as well, taking into consideration, however, that the dish on this frequency is horribly sharp.

"An SSB QSO was carried out on 7 July 1994 at 1630 UTC with a 5-6/5-7 report. The stability was surprisingly great, the frequency difference was only 146 kHz in relation to the estimated difference, and the frequency drift was acceptable.

"The following equipment was used for the test: The transverter consists of DB6NT's 12 GHz injection chain, DB6NT's doubler/amplifier 12–24 GHz, and a double-balanced harmonic mixer with four diodes. The diodes used for the mixer are Russian diodes manufactured by the Salut plants. Output from the transmitters was –7 and –9 dBm, the receiver noise figure 13 dB. The aerials are 25 cm PROCOM dishes with a backfire feed system. According to OZ1UM's calculations, the stations used should have such a large surplus that we should be able to transmit 60 km with them."

VHF PLUS CALENDAR

April 2	Poor EME conditions.
April 5	Moon Apogee.
April 6	Highest moon declination.
April 7	2 Meter Sprint contest, 7–11 PM, local time. (See text for details.)
	First quarter moon.
April 8-9	European EME Contest, second weekend. (See text for details.)
April 9	Moderate EME conditions.
April 15	Full moon.
April 16	Moderate EME conditions.
April 17	Moon Perigee.
April 19	Lowest moon declination.
April 21	Last quarter moon.
April 22-23	*Lyrids* meteor shower peak days.
April 23	Moderate EME conditions.
April 25	135 cm Sprint contest, 7–11 PM, local time. (See text for details.)
April 29	New moon. Solar eclipse, Southern Hemisphere.
April 30	Poor EME conditions.

EME conditions days provided by W5LUU.

Two FCC Actions Affecting VHF Plus Frequencies

FCC Keeps Major Part of 13 cm Amateur Band for Amateurs: The following is from an AMSAT news service bulletin. It was forwarded to the Internet by Robert Brown, N7STU/YB2ARO:

"On February 7, FCC adopted a Report and Order in ET Docket 94-32, concerning the reallocation of portions of the 2.4 GHz band which had been released from government to private-sector use by the National Telecommunications and Information Agency (NTIA). Previously, Amateur Radio had secondary status at 2300–2310 and 2390–2450 MHz, with government radiolocation (mainly shipboard radar) being the primary user. NTIA, in response to a Congressional mandate that it must choose 50 MHz of spectrum below 3 GHz to reallocate from government to exclusively private-sector use, had decided to vacate 2390– 2400 and 2402–2417 MHz in 1995 and 2300– 2310 MHz in 1996.

"Companies and industry groups representing various non-amateur services had petitioned the FCC to reallocate these bands to commercial use, which would have left the amateur-satellite service with only 2400–2402 and 2417–2450 MHz. Because of interference from microwave ovens and other Industrial, Scientific, and Medical (ISM) devices nominally operating on 2450 MHz, the 2417–2450 MHz segment is not very useful for satellite downlinks and other weak-signal applications in many parts of the U.S.

"In several rounds of comments filed with NTIA and FCC, AMSAT-NA maintained that 2400–2402 MHz would not be sufficient to accommodate the future needs of the amateur-satellite service for downlink spectrum, and argued for at least a 10 MHz wide allocation (2400–2410 MHz) which could be 'paired' with the existing uplink band at 1260–1270 MHz, and preferably the entire 2400–2417 MHz range.

"The Commission's decision announced on February 7th essentially gives amateurs all that we asked for. It elevates the amateur service from secondary to primary at 2390–2400 and 2402–2417 MHz, and the amateur-satellite service from secondary to primary at 2402–2417 MHz.

"Combined with the previous decision by NTIA not to reallocate 2400–2402 and 2417–2450 MHz, this means that the international amateur-satellite service allocation of 2400–2450 MHz will remain intact in the USA.

"FCC also made available 2390–2400 MHz (a U.S. amateur band, but not allocated internationally for satellite use) for unlicensed Personal Communications Services (PCS), including wireless networking and data transfer devices, and provided for continued use of 2402–2417 MHz by unlicensed 'Part 15' devices such as wireless LANs. However, because of amateur radio's primary status in these bands, amateur stations will be entitled to protection from interference and amateurs will not have to protect any other user. Few, if any, cases of interference to or from amateurs involving these generally spread-spectrum devices have been reported to date.

"However, amateurs are not completely out of the woods. The latest FCC decision did not address the ultimate fate of 2300–2310 MHz, which must be reallocated from government to private use in January 1996. If amateurs lose their current use of this band, that could create congestion in the lower end of our amateur-satellite service allocation. The matter will be addressed in another FCC proceeding later this year; AMSAT-NA will, of course, continue to participate.

"The AMSAT News Service (ANS) would like to thank Ray Soifer, W2RS, for this item."

The following is from the "W5YI Newsletter": "**FCC Renews Spread Spectrum Special Temporary Authority**: In a letter to Robert Buaas, K6KGS, dated December 27, 1994, the FCC advised him that the special temporary authority (STA) for the use of spread spectrum emissions on frequencies of the 6 meter band and above, which was first granted May 26, 1993, was being extended indefinitely. The

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

indefinite extension is unusual because the FCC normally grants one year extensions to pre existing STAs."

According to the January 15, 1995 "W5YI Report," "Spread spectrum technology can multiplex many low-power QSOs by hopping among frequencies in a list and by combining the data to be transmitted with fast codes . . . Much of the world's commercial mobile and military communication systems are embracing spread-spectrum [technology], especially for cellular systems."

The "Report" continues, "The STA authorizes work with spreading schemes and codes, power levels, and various hardware implementations not otherwise permitted by Part 97. Much of the development has been performed with direct-sequence and frequency-hopping systems in the heavily populated 2 meter band in southern California, demonstrating robustness and lack of significant interference. K6KGS plans more experiments in the 6 meter band."

On the Microwaves

The following is from "K2UYH EME Newsletter" via "Feed Point."

"**First North American-Europe 5760 MHz EME QSO**: Barry Malowanchuk, VE4MA, reports the following: 'I have completed the 1st NA-EU EME QSO with OE9PMJ on 5760 MHz. Reports of the 1st EU 5760 QSOs in September motivated me to complete my station.

'I skeded OE9PMJ on 25 Nov. and heard him 549; however, a TWT power supply failure prevented a QSO. I hastily built a supply for a 20W solid state PA and on 11 December at 2240 UTC I QSOed OE9PMJ, 549/339. This also set a new EME distance record of 7128 km. In another sked with DL2GSG I was heard at the M level but no QSO.

'My equipment included a 3.7M dish with VE4MA linear feed, approximately 1 6m of elliptical and flexible waveguide, 20 W PA and 1.5 dB NF. Since this contact I have added a new NE326 .7dB NF preamp and have a TWTA running at 25+W.

'In another sked on 17 Dec. OE9ERC was worked O/O for initial #2. A sked with OK1KIR was canceled due to equipment trouble at their end. I have begun work on modifying another TWT PS and hope to have more power in the near future. I am still waiting for an initial QSO on 3456 MHz. A try with DL9EBL was canceled in Nov., and this will now have to wait until spring. I now have two water-cooled 7289 amps combined to run 80 W.'

Again, the following is from the "K2UYH EME Newsletter."

"**DL2GSG's 10 GHz EME DXpedition:** Greg, DL2GSG, reports on the 1st 10 GHz DXpedition from EA-EA9 (Spain) 'As my roots are in 10 GHz portable tropo operation, the idea was born long ago for 10 GHz portable EME. So the 1st attempt was made in June 94 with QSOs with SM4DHN and WA7CJO.

'However, the real madness was the idea from DJ7FJ why not activate Africa on 10 GHz. So what's the easy way to put Africa on? Operate from EA9, Ceuta. The main problem was to get the rig together for a new station which had to be battery powered and powerful enough to be heard. Also the signals from DJ7FJ would have been too weak for copy on a small dish, so he needed also a bigger TWTA.

'I built 240 W TWTAs with HB power supplies capable of running off of 12 V car batteries. For the antenna, Joe had a 1.8 m al dish which he cut into three pieces for better transport. Unfortunately, this dish never reached its former gain, so I had to use my 1.8 m fiberglass dish. But now there was the problem of transportation. The solution was a rented camper van.

'In October the situation was completed, just in time for testing during the ARRL contest. This dish was mounted on a tripod and tracked by hand and moon noise. Moon noise was .9 dB. The feedhorn was just the end of circular waveguide. This system is by accident as good as an optimized VE4MA horn. The power is fed by waveguide and the TWTA reaches 55 W output.

'During tests it was possible to copy my own echoes, but they were very weak. The dish was fixed to the roof of the camper van, and on top of it was the surf gear of DL1GMG, who accompanied me on the trip. After 2500 km we arrived at EA7. We worked on 14 November as EA7/DL2GSG/p DJ7FJ O/O, SM4DHN O/M, WA7CJO O/M, and a partial with G4KGC. The next day we took the ferry to Ceuta and looked for a pleasant spot. In the evening of 15 Nov. we worked as EA9/DL2GSG/p DJ7FJ O/O, SM4DHN O/M, and WA7CJO O/M, but nil from G4KGC.

'As usual, when you do tricky things you will have some extra problems such as high wind gusts or wild dogs which are running through your station. The customs officers between Ceuta and Europe didn't take an interest in our

rig, but they sent their sniffer dog in the camper van. Our successful tests demonstrate you don't have to be a big gun to make nice QSOs on 3 cm, but you need the big guns for a QSO.'

Current Conferences

Dayton: As per usual, the Dayton Hamvention will feature a VHF-and-above forum. As of this writing details are not available, but it will probably be split, with the first two hours to be held Saturday morning and the second two hours on Sunday morning. What will be missing this year at Dayton is the antenna range. So leave your antennas home until next year, when the changed date of Dayton may improve the weather possibilities and therefore the antenna-range possibilities. The preamp measurements will probably take place on Sunday morning.

Central States VHF Society Conference: The Central States VHF Society has issued a call for papers for its annual conference to be held 27–29 July in Colorado Springs, Colorado. For more information, contact Hal Bergeson, WØMXY, Vice-President and Program Chairman, 809 E. Vermijo Ave., Colorado Springs, CO 80903, phone 719-471-0238.

Current Contests

This month begins the annual Spring Sprints. Except for the 6 meter Sprint, all contest times are between 7–11 PM local time. The 2 meter Sprint is 17 April. The 135 cm Sprint is 25 April. Exchange is your grid locator. Complete rules were in the "Contest Corral" column in March *QST* (page 123) and results are normally found in the *National Contest Journal*, a League publication.

European EME Contest: Sponsored by REF and DUBUS, this contest is intended to encourage worldwide activity on moonbounce. The rules for multipliers give equal chances for stations from North America, Europe, and Oceania. The rules encourage random QSOs for all bands below 2.3 GHz.

Contest Dates & Periods: The contest happens during two full weekends. Dates correspond to activity weekends of March and April. These are selected three months in advance for optimum performance. Each leg begins at 0000 UTC on Saturday and ends at 2400 UTC on Sunday. Dates of the European EME Contest in 1995 are 11/12th of March 1995 for the first leg (144, 1296), and 8/9th of April 1995 for the second leg (432, 2300, and above).

Bands: First leg: 144 MHz and 1296 MHz. Second leg: 432 MHz, 2300 MHz and above.

Categories: QRP: 144 MHz, <100 kW ERP; 432 MHz, <400 kW ERP; 1296 MHz, <600kW ERP; >= 2300 MHz, no specific class. *QRO:* ERP greater or equal than stated above. *PRO:* Non amateur equipment or antenna. These stations will not be ranked.

Exchange: Callsigns, TMO or RST.

Scoring: 100 points for each random QSO completed; 10 points for each sked QSO completed. The sked rule is only valid for all bands below 2.3 GHz.

Multipliers: Each DXCC country (except W/VE/VK) plus states worked in W/VK or provinces worked in VE. Multipliers count per band and only if worked by *random*. The random rule is valid for all bands below 2.3 GHz. States and provinces have to be determined by address lists in newsletters or in DUBUS.

Total per band: Sum of points multiplied by sum of multipliers.

Final score: Total sum of points multiplied by total sum of multipliers.

Classifying: Top score defines one winner total per band and one for multi-band class. No differentiation for multi-operators. *Note:* multi-band stations will also be classified on each separate band worked. Multi-operators and QRO stations will be highlighted in the general classification.

Reporting: Copy of the log for each band with details on points, multipliers, and total points. The following information must be included: Output power, transmit cable loss, antenna type and gain. Working category: QRO/QRP, mono/multi-operator, name(s) and underwriting of operators, Locator/State.

Other information is welcome: comments, conditions, grid locator, station details, photographs, etc.

Awards: A certificate will be sent to each entry. All (multi) band winners will receive a trophy.

Logs: Log entries must be postmarked no later than 30 days after the end of the second leg to the following address: DUBUS Verlag, EME Contest, P.O. Box 500368, D-22703, Hamburg, Germany. FAX: (49)404508972. E-mail: dk3uz@SYS-hh.hanse.de

Referee: Responsible for rules and general questions is Ian White, G3SEK, 52 Abingdon Rd., Drayton, Abingdon, Oxon OX14 4HP,

England. Telelephone (44)1 235-31559. E-mail:g3sek@ifwtech.demon.co.uk.

Current Meteor Showers

The *Lyrids* meteor shower is predicted to peak between 22–23 April. This is a north-south shower, producing at its peak around 10–15 meteors per hour.

Cruise-Grid Locator DXpedition

Chip Margelli, K7JA, reports that the Yaesu Cruise, which is scheduled for 18–25 June, will have a distinct VHF+ flavor. Chip plans to take EME equipment for 2 meters as well as a 6 meter rig. Also along for the ride will be a satellite station for working through OSCAR 13. More details of the grids that the operation/cruise is scheduled to traverse will appear in the June issue of this column. However, if you wish to be a part of the cruise, contact Yaesu at 310-404-2700, or write to 17210 Edwards Rd., Cerritos, CA 90701.

Notes on Publications

Harry Schools, KA3B, has recently published the *50 MHz VUCC Record Book*. Designed for the paper logger (those of us who still do our logging by hand and not the computer), this book contains over 100 pages of record sheets for keeping track of the grid locators you have worked/confirmed and applications for the VUCC award. Harry is selling the book for $20.00, which includes first-class shipping in the U.S. He will donate proceeds of the sale of the book to either SMIRK or the UKSMG.

Dave Bostedor, N8NQS, reports that the subscription price of the "Great Lakes VHF/UHF" newsletter will increase to $10.00 effective with new subscriptions and renewals after 1 April.

RS-15 Now Active

The latest Russian Satellite, RS-15, is now active. The Uplink is 145.858–145.898 MHz and the downlink is 29.354–29.394 MHz. The beacons are 29.352.5 and 29.398.7 MHz. The orbit period is 127.45 minutes.

As of 1 February the Keplerian data were: 1 23439U 94085A 95018.43232054 -.00000039 00000-0 10000-3 0 216 2 23439 64.8172 137.1826 0167589 287.8288 70.4424 11.27524601 2639. Thanks to "Feed Point" for the information which is the basis of this report.

If you are interested in an excellent satellite/lunar tracking program, then contact Michael Owen, W9IP, who has developed **Realtrak.** You may reach Michael at Northern Lights Software, Star Rt. Box 60, Canton, NY 13167.

Improving Your 2M Station

The following technical piece was submitted by Carl Smith, AA4H:

"In early 1993, I decided to give VHF a try after being on the HF bands exclusively for many years except for local 2 meter FM. I had recently reached 'top of the DXCC honor roll' and there was just nothing new on the HF bands.

"I had played around with 6 meters in the 'sixties' with 8 watts of AM and a halo antenna on the car and a copper tubing Yagi on a push-up pole. I decided to order a radio that would allow me to once again get on 6 meters, and while I was at it, maybe some of the higher bands would be worth a try. Without really knowing anything about 2 meter SSB, 222 MHz, or 432 MHz, I ordered a Yaesu FT-736R with the 6 meter, 2 meter, 222 MHz, and 432 MHz modules. At the same time I ordered small 100 watt class brick amps for each of the bands, and single boomer type Yagis for each band.

"By mid-1993 I was on four VHF/UHF bands and having a blast learning how to chase 'grid locators.' On 2 meters I was using the FT-736R transceiver, a 160 W brick amp, and a 13B2 Yagi at 70 feet fed with RG-213 feedline. The brick had a preamp in it, so I felt that I was receiving and transmitting about as good as could be done on such a very high frequency.

"However, as I began to pay more attention to what others were doing and whom they were able to work, it became apparent that I had not fully understood the potential of 2 meters and how far from ideal my setup was. Thus, I began to read everything I could find on how to improve my ability to work 2 meter 'DX.'

"Some of the things I did to help turned out wrong. I decided that in order to be heard, I needed more power. So I gave myself an early Christmas present in late 1993. I purchased a Commander (a 144 MHz kw amp) from Command Technologies. Well, sure enough, my transmitted signal was stronger. But now stations were hearing me and calling, but I couldn't hear them well enough to complete a QSO. In some cases, I had become an 'alligator'—all mouth and no ears. From earlier experiences listening on 75 meters, I quickly recognized this situation and vowed to correct it.

"In early 1994 I was working every VHF contest. When not contesting, I was looking for grid locators, but also I was asking a lot of questions. If I heard stations with very good signals or working other stations that I could not hear, I would ask them what they were using for antennas. In almost every case the answer and their advise was the same: Bigger, higher antennas and better feedline was the recommendation.

"Because the books I was reading and the advise of those with more experience were telling me the same thing, I decided to rework my antenna system. Now I'm here to tell you, there are many good antennas available. Picking one from the many is difficult at best. But after much head scratching over the decision, I finally made it.

"I selected two FO-15's (15 elements on a 25 ft. boom) as the antenna, spaced 12 ft. 6 in. vertically. I chose C1008 coax for the phasing lines, and mounted the antennas so that the top of the boom support of the top antenna is at the 102 ft. level. This higher elevation was made possible by the addition of tower sections and a special 24 foot 3/8 in. wall aluminum mast on one of my towers.

"The improvement has been dramatic! Before this system was installed, I had worked less than 65 grids, through October 1994. I am writing this in early January 1995, and I now have worked over 100 grids with 98 confirmed, unless I get lucky when the mail comes today. That's an average of three or more per week. I now regularly hear stations that I did not know were on the air before, and the signal reports

from stations worked before and after indicate a much improved signal strength.

"My point in writing this is to document the dramatic improvement at my station by upgrading my 2 meter Yagi antenna system. I would encourage anyone interested in working 2 meter 'DX' to consider the antenna and feedline as a first priority area for improvements. Maybe that old saying 'If it stays up, it ain't big enough' is actually true on the VHF/UHF and up frequencies."

Swan 250/250-C Owners Group Formed

Jack Lindauer, WA6EFM, has formed a Swan 250/250-C owners group. Jack says that the purpose of the group is to exchange information on equipment problems and circuit modifications. He states that he is interested in putting together a list of amateurs who own the Swan 250 or 250-C. Additionally, he indicates that he has copies of the Operation and Maintenance manuals and the Swan Factory Service Bulletins available to members of his group (for a fee?). If you would like to get on his list, send your name and address to Jack at 18881 Brymer Court, Northridge, CA 91326. You can also call him at 818-831-0515.

CQ 50th Anniversary Party, Tulsa, Oklahoma Style

It was not unlike any other mid-winter Friday night. The evening was cool, the stars were shining through broken clouds. But the 2 meter airwaves were being punctuated with "K5QOP this is N6CL stroke 50; thanks for the contact, Pat, and best wishes for the new year."

Thanks to the enthusiasm of the Tulsa Amateur Radio Club, your editor got talked into driving halfway across the Turner Turnpike and parking in the midway parking lot in front of the Mc Donald's restaurant. There I met with Chuck Sittler, N5FWX, who had brought a 5-element beam with him. He set it on a pole and pointed it back to Tulsa. We connected it to the TM 742 and had a ball.

Sitting inside the car, we worked 35 stations in 35 minutes, giving out special contacts with the special call "N6CL/50" to all who wished to work us. While not exactly a Rover operation, we did have all the makings of one.

The fun didn't stop at the end of the string of contacts. After we worked everyone who wanted to work us, we got off the turnpike in Stroud and had a delicious German meal at Rocks Cafe, whereupon we got much better acquainted with Chuck.

My thanks go to Vince Moore, N5RFW, who talked me into doing this pseudo mini Rover operation, to Chuck for supplying the beam and fellowship, and to the members of TARC, who are enthusiastic hams who know how to have fun with the hobby.

Banning the Limited Multi-Op Class

The following opinion appeared in February 1995 "The VHF Journal," the newsletter of the Rochester VHF Group. It represents the opinion of Tom Richmond, WB2IEY, and not necessarily the Rochester VHF Group. Nevertheless, it gives we who participate in contests something to really ponder.

"**Banning the Limited Multi-Op Class**: Over the past several operating events (spanning the last few years), I have noticed a number of stations who no longer set up on more than four bands or, should I say, do not operate 903 MHz and above in contests. This is reflected in the box scores given by band-sections and QSOs. Now this really bothers me, and it probably should bother you. There are a number of stations out there who are capable of operating unlimited multi-op, who are capable of putting on 903, 1296, or other bands, but don't.

"Now, the ARRL gives a disclaimer that limited stations are encouraged to run as many bands as possible, but to submit their best four. Hah! Get this! Look at the list of big limiteds from any recent contest. Compare it to a list of multi-ops from several years ago before the Limited category existed, Wow! The stations who are competing now as Limiteds in many cases placed between third and tenth nationwide *before* using all of their bands!

"'Well, we can't compete against N2WK and other big multi-ops,' they say. (Don't forget, comparisons to 'SZ' are now passe). Look at that sentence ' . . . can't compete against N2WK . . . ' Is competing against N2WK the point of the operating event? 'Yeah, but it's a contest, and we want to win!' might be the response. Well, here's where the editorial *could* turn to contest bashing, but I'll save it for another time.

"Yes, this is a hobby. But how can you call yourself a VHFer without an interest in the strange and the unusual, to participate in something that no one has before? What about all those lost contacts—the ones that *aren't* made because fewer people are on microwave bands? What about the envelope that *isn't* being stretched, or the station that *isn't* on during the opening because it was too much trouble for just a few contacts. That not only hurts them, but it hurts the rest of us—the ones who have the gear and want to talk to *someone*! And the contest listings in *QST* . . . you don't think that teams are the only ones reading them, do you? Why, I'm sure that the same people who were checking the *Repeater Directory* for evidence of 220 MHz use are keenly aware

of exactly what goes on above 902 MHz.

"Look, *band use is the key, here!* Why don't I have a bunch of folks foaming at the mouth to work our station in FN22 on 903 MHz? Because there's hardly anyone to work! Ditto for 1296, 2304, 3456, and 5760 MHz. There have been a dozen stations on mountaintops within 100 miles—all out for the contest. *Only* four wanted to work us on microwaves. The others will probably score 200-500 k as Limited Multi-Ops.

"Do the calculations. Ask around. We're in trouble already on 903 and 2304 and we hardly know it. Everybody is too busy reading about contesting to take notice. 'What's the payback? A bigger score?'

"Read my lips: That's not the point. Ayn Rand once said, 'A creative man is motivated by the desire to achieve, not by the desire to beat others.' Think about it!"

Further in the same issue Editor Ev Tupis, WB2ELB, echoes Tom's comments with those of his own by stating, "Here's the bottom line: The difference between Unlimited and Limited Multi-Op is the number of *bands* one can operate. This is sending the wrong message! While we are boning up on our TVI bands with KWs and H-Frames, our microwaves are being sold out from underneath us!"

Ev continues, "The intent of the Limited Multi-Op category was to allow teams with limited resources to compete, while letting the really big boys duke it out in their own ring. It's time for a rules change!"

Ev urges that limited multi-ops have access to all the bands, while *limiting* them to three operators and 200 watts output. It is your editor's opinion that perhaps the VHF contests should be structured somewhat like Field Day, where the number of transmitters on the air at any given moment is the competing category.

By competing in, say, the four transmitter or less category, for example, a bank of microwave stations could be set up to operate one at a time to as high as the operator would like to go. After all, don't we generally move stations from band to band once we get them on 2 meters? And aren't we only transmitting on one band at a time?

Speaking of "big boys," when N2WK is operating from the mountaintop, Dave Halliday, KD5RO, is generally operating the microwave bands by himself. When he is passed a contact from one of the lower frequencies, he works that station one band at a time. During that set of QSOs only one transmitter at a time is on the air on those microwave bands.

If the big boys were in their category of, say, five or more transmitters on the air at one time, they would not compete with a limited category of four or less transmitters. Nevertheless, the one category would more likely make contact with the other, thereby increasing the contacts on these little used microwave bands.

As Tom says, "Think about it!"

New Ham Club Building In Cifuentes, Cuba

During my February 1995 trip to Cifuentes, Cuba, I was once again part of a Methodist church work team. This time, however, I also got to play some amateur radio and participate in a very important local event.

Thanks to a visit from Federacion Radioaficionados de Cuba President Pedro Rodriguez, CO2RP, to Cifuentes in June, local officials became very positively impressed with the valuable resource of amateur radio—so much so that they donated a suite in a building for a club house for the Cifuentes Amateur Radio Club.

Knowing that I would be part of the church work team, the amateurs wanted me to be part of the dedication. So with great diligence, the members of the club worked all week the week before I came readying the building. On Thursday morning they set up the 2 meter rig and the 7-element Yagi, pointed it toward Santa Clara, and CO6RCV was now on the air and checking into the Santa Clara 145.41 MHz repeater. Shortly thereafter I participated in a ribbon-cutting ceremony with Cifuentes ARC President Pastor Perez, CO6PD.

In the past, because Cifuentes is in hurricane row, the townspeople often found themselves isolated because of loss of telephone communications. Now, thanks to the support of the local community and amateur radio ingenuity, a valuable link for emergency communications has been established. Additionally, the amateur radio club has a place to meet and a place to hold classes to further the growth of our hobby in that community.

I feel very special to have observed this very important development in amateur radio in this small town in Cuba.

And Finally. . .

While I was in Perryton, Texas over the Christmas holidays, I met a quiet lady, Mary Reust, N5DFQ. A Technician Class licensee, Mary limited her operating mostly to 2 meters. Even there, she mostly worked her friends in the northern Texas and Oklahoma panhandles.

However, Mary was the glue that brought together so many of the amateurs in these sparsely populated farm communities. She was always one to have the cheerful word, the encouragement to the new amateur, or just a friendly, reliable contact on the band.

When she learned that she had lupus, she put up a brave fight. All of her friends fought with her, most valiantly her husband, George, KY5C, who often drove her the 250 miles to Oklahoma City for her treatments.

I only met Mary that one time in December. Nevertheless, I was cheered by her beauty and countenance. While finishing this column I learned that Mary had become a Silent Key, succumbing to complications associated with her illness.

With a deep sadness that I share with my friends in the panhandle areas, I say farewell to a wonderful lady and a true amateur radio operator. I say a true amateur, because the true purpose of this hobby is to make friends and make your friends feel special. And Mary had many, many special friends.

Thanks to you, my many friends, for continuing to make this, your column, a success. You can continue to do so by sending your contributions to the address on the first page of the column. You can also send me materials via the Internet to 72124.2734@compuserve.com. Additionally, you can FAX me at 405-528-0746 or call me at 405-528-6625. However you get your materials to me, I will endeavor to use them to continue to make your column the best.

Until next month . . .

73 de Joe Lynch, N6CL

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

BY FREDERICK O. MAIA, W5YI

Communicating With The Astronauts By Amateur Radio! NASA's Shuttle Amateur Radio Experiment

With the help of amateur radio clubs and amateur radio operators, astronauts have been speaking over the amateur airwaves while in orbit. They are talking directly with large groups of the general public, showing teachers, students, parents, and communities how amateur radio energizes youngsters about science, technology, and learning. The program is called **SAREX**, the **S**huttle **A**mateur **R**adio **EX**periment.

NASA's intent in making astronauts available for SAREX operations is to involve the largest possible numbers of people, particularly youngsters, in technology and the US space program with the help of amateur radio. During a SAREX mission the astronauts typically will make the following types of amateur radio contacts:

•Scheduled amateur radio contacts with schools.

•Random contacts with the amateur radio community.

•Personal contacts with the astronauts' families.

A handful of schools are selected from around the world to make contact with the shuttle during most SAREX missions. These contacts are pre-arranged, giving the schools a greater chance to make a successful contact. Two or more students at each of the selected schools ask questions of the astronauts during the contact. The nature of these contacts embodies the primary goal of SAREX—to excite students' interest in learning.

Who sponsors SAREX? The American Radio Relay League (ARRL), The Radio Amateur Satellite Corporation (AMSAT), and NASA sponsor these exciting experiments. AMSAT volunteers support all technical operations for SAREX and counsel participating school groups. The ARRL provides the amateur radio community with SAREX information and educational support. The ARRL Educational Activities Department (EAD) and NASA Headquarters create and distribute SAREX lesson materials and resources for teachers. SAREX is supported by the Federal Communications Commission (FCC).

Hundreds of amateur radio operators work behind the scenes, including those from NASA's amateur radio clubs at the Johnson Space Center, Marshall Space Flight Center, and Goddard Space Flight Center. A SAREX Working Group was created to administer the program. The working group is comprised of Roy Neal, K6DUE, Chairman; Rosalie White, WA1STO, ARRL; Frank Bauer, KA3HDO, AMSAT; and Lou McFadin, W5DID, NASA Johnson Space Center.

I am a school teacher. How can I get started? Schools wanting to make a scheduled SAREX contact with the astronauts are required to submit proposals and a SAREX school application to the ARRL. While only a handful of schools get chosen for scheduled contacts, all schools can participate by eavesdropping, or by trying to make a random contact with the shuttle astronauts. SAREX lesson materials are available from the ARRL for all schools who participate. Imagine listening in on the astronauts from your classroom! If you are a school teacher, but you are unfamiliar with amateur radio, you can still become a part of SAREX in your school. A local amateur radio club can be assigned to assist you.

If you are a parent, grandparent, and/or an amateur radio operator, the League's EAD will send you materials, including ways to convince teachers and school administrators that amateur radio is an important discipline the school should take advantage of on a full-time basis. This is a tremendous opportunity for you to showcase SAREX and amateur radio to kids of all ages in a big way.

How do I submit a SAREX school application for a scheduled contact? If your school is interested in a radio contact for a future SAREX mission, you must complete a SAREX school application and write an educational proposal. The ARRL collects applications and proposals and then forwards them to the SAREX Working Group, who makes the final selection in collaboration with the astronauts. All grade levels and types of schools (rural, suburban, and particularly urban) are encouraged to apply.

SAREX school applications are available by sending a business-size SASE envelope to the ARRL, or by e-mailing your request for an electronic version of the application to ead@arrl.org. Applications may be returned to the ARRL by mail or e-mail.

A proposal must accompany all completed applications. The SAREX Working Group and NASA want to know:

1. How will you:

a) integrate this activity into the school curriculum and

b) involve as many students as you can, participating through essay contests, poster drawing, letter writing, etc.?

2. What are your capabilities for setting up all necessary amateur radio equipment and antennas? Do you have the resources of an experienced group of amateurs to assist you?

3. How will you get as much media coverage as possible?

How will I know if my school has been selected to participate? Schools that have been selected for scheduled SAREX contacts are contacted by a SAREX coordinator. NASA requires school selections to be made approximately seven months prior to launch. If a school is not chosen for the next SAREX mission, its application is recycled for future opportunities. Schools typically wait one year or longer to be selected.

I am an amateur. How can I introduce SAREX to my son or daughter's school? Establish a SAREX station at the school. Bring in a shortwave receiver and let students eavesdrop on amateur retransmissions of the NASA shuttle-to-mission control audio—from launch to landing. Then set up a 2 meter satellite ground station and attempt a random SAREX contact from the classroom. The teacher may even apply for a school contact, almost guaranteeing that the students will have an opportunity to communicate with the shuttle crew during a future SAREX mission.

Are there videos on SAREX available? The ARRL Educational Activities Department has videos available for school teachers to borrow. Use of the Audiovisual Library is free, the only cost being return shipping. *Ham Radio In Space* is a 30-minute color video chronicling the participation of schools and amateurs in SAREX. You and your class will enjoy watching students talk to the astronauts via amateur radio as they participate in this unique educational program. To borrow a copy of this video, mail

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National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (817-461-6443)

UPCOMING SAREX MISSIONS

Mission	Date	Shuttle Vehicle	Crew (name, title, amateur callsign)
STS-63	Feb. 2, 1995	Discovery (8 days)	C. Michael Foale, MS, KB5UAC Janice Voss Ford, MS, KC5BTK (tentative: Vladimir G. Titov, MS)
Configuration M			
STS-67	March 2, 1995	Endeavour (16 days)	Stephen S. Oswald, CDR, KB5YSR Wendy B. Lawrence, MS, KC5KII Ronald A. Parise, PS, WA4SIR Samuel T. Durrance, PS, N3TQA
Configuration C			
STS-71	May 24, 1995	Atlantis (10 days)	Charles Precourt, PLT, KB5YSQ Ellen S. Baker, MS, KB5SIX
Configuration B			
STS-70	June 22, 1995	Discovery (8 days)	Donald A. Thomas, MS, KC5FVF
Configuration C			
STS-74	Oct. 26, 1995	Atlantis (8 days)	Ken Cameron, CDR, KB5AWP Jerry Ross, MS, N5SCW William S. McArthur Jr., MS, KC5ACR
Configuration C			

Abbreviations: Commander = CDR, Pilot = PLT, Mission Specialist = MS
Configuration A: FM Voice (attended), Packet (attended/unattended), SSTV (attended/unattended)
Configuration B: FM Voice
Configuration C: FM Voice, Packet
Configuration M: FM Voice, using shuttle/MIR radio

Table I– Upcoming SAREX missions (updated 1/20/95). These dates are tentative. Please understand that delays in spacecraft launches are somewhat common, particularly because there are people on-board!

a postcard with your request to ARRL EAD. Borrowers, please indicate the date you will need the video. Requests should be made at least one month in advance of that date.

Can an amateur make an unscheduled SAREX contact? Yes. The astronauts have not lost sight of why SAREX has been so successful. It is the amateur radio community that has brought the astronauts' voices into classrooms all around the world. During most SAREX missions many of the crew members will make random contacts with earth-bound amateurs. They make these contacts during their breaks, before and after meal time, and during their pre-sleep time. In fact, over the past years the astronauts have contacted thousands of amateurs around the world. On many missions they have even carried a 2 meter packet radio station. Innovative computer software allows the crew to operate the packet gear in an "unattended" mode, allowing amateurs to make contacts with the ROBOT station when the astronauts are working or sleeping.

What type of equipment do I need? A typical SAREX ground station includes a 2 meter FM transceiver and 25–100 watts of output power. A circularly polarized crossed-Yagi antenna capable of being pointed in both azimuth (N-S-E-W) and elevation (degrees above the horizon) is desirable, but successful contacts have even been made with verticals and ground-plane antennas.

Commercial and public-domain computer tracking software is available to assist you in determining when the shuttle will be within range of your station and where to point your antenna.

How do I "talk" to the astronauts? You may communicate with the shuttle astronauts using a variety of modes: voice, packet (computer) radio, or television. It all depends on which equipment configuration the astronauts take into space. For example, astronauts Jay Apt and Mamoru Mohri made hundreds of random voice contacts with amateur radio operators during STS-47 in September 1992. When the astronauts were sleeping, however, a robot computer amateur radio station aboard the orbiting shuttle automatically made contact with hundreds more amateurs around the world. The robot computer transmitted an acknowledgment to each amateur whose computer successfully made contact with it.

On other missions the SAREX configuration has even included amateur radio Slow Scan Television (SSTV) and Fast Scan Television (FSTV), allowing amateurs a first-hand glimpse at life in space.

What are the SAREX radio frequencies? The following VHF frequencies are used for SAREX missions. These frequencies were chosen after much deliberation to minimize contention between SAREX operations and other 2 meter users. If you have any comments, please direct them to AMSAT via Frank Bauer, KA3HDO (at his *Callbook* address), or the ARRL EAD. It takes the cooperation of all amateurs to make the SAREX operations successful.

Most SAREX operations are split frequency (the crew uses separate receive and transmit frequencies). *Please* do not transmit on the shuttle's downlink frequency. The *downlink* is your receiving frequency. The *uplink* is your transmitting frequency. For all operations Earth stations should listen to the downlink frequency and transmit on the uplink frequency only when the shuttle is in range and the astronauts are on the air.

- FM Voice Downlink (worldwide): 145.55 MHz.
- FM Voice Uplink: 144.91, 144.93, 144.95, 144.97, and 144.99 MHz.
- FM Voice Uplink (Europe only): 144.70, 144.75, and 144.80 MHz.
- FM Packet Downlink: 145.55 MHz.
- FM Packet Uplink: 144.49 MHz.

Are all of the contacts made by the astronauts random? During each SAREX mission the astronauts' primary work schedules dictate when they can and cannot operate the radio equipment. As a result, most of the general contacts they make are random. If the astronauts are

operating their radio, however, you can be certain that many amateurs will be attempting to contact them.

What are my chances of making a random SAREX contact with the crew? The extremely busy work schedules of the astronauts may sometimes reduce your chance for an unscheduled, random contact with the shuttle. The SAREX Working Group recognizes the long-standing commitment of the amateur radio community in supporting SAREX activities and attempts to schedule as many opportunities as possible for general amateur radio contacts during flights. Keep posted to amateur radio news sources during a SAREX mission for possible announcements of scheduled general QSO opportunities.

When are the next SAREX shuttle missions? The next flights for SAREX are listed in Table I. School applications are no longer being accepted for these missions. Schools who have been selected will be contacted by a SAREX coordinator. If your school was not chosen this time, applications are recycled and you may be chosen for a future flight.

How can I use my shortwave radio to eavesdrop on the astronauts? When a shuttle mission carries the SAREX payload, SAREX news and astronaut retransmissions are carried by the Goddard Amateur Radio Club's station, WA3NAN (Greenbelt, Maryland). This station, and several VHF and UHF repeater groups, will retransmit the audio signals from the shuttle on most amateur bands so that you and the students can hear the communications. You will hear NASA mission commentary, frequent bulletins to advise listeners of astronaut-planned transmissions, and amateur two-way voice and amateur television transmissions with the shuttle. WA3NAN operates on the high-frequency (HF) bands at 3.86, 7.185, 14.295, 21.395, and 28.65 MHz and on VHF at 147.45 MHz (FM).

Can I retransmit communications between the space shuttle and mission control on the amateur frequencies? The FCC rules indicate that amateur stations are permitted to retransmit space shuttle air-to-ground communications, provided that approval has been obtained from NASA (FCC Rules, Part 97.113 (e)). In 1990 the ARRL sought permission from NASA, on behalf of radio amateurs, to retransmit shuttle communications. The response from NASA's Office of Public Affairs encouraged such retransmissions, and indicated that the audio is public domain.

If you plan to rebroadcast NASA shuttle audio, follow these guidelines:

1. In keeping with good amateur practice and the FCC rules, shuttle audio retransmissions should be limited to missions of a specific educational purpose

(non-commercial), such as those carrying the SAREX payload.

2. Retransmissions should be done manually (with a control operator present).

3. Occasionally NASA audio may contain music. Amateurs should avoid, if at all possible, retransmitting music or any other prohibited transmissions not permitted by the FCC rules (FCC Rules, Part 97.113).

How can I track the shuttle with a computer? A number of software packages are available for tracking the shuttle on a personal computer. Here are just a few options:

•**AMSAT Tracking Programs.** These easy-to-use programs are perfect for the serious amateur radio space enthusiast or beginner. Call AMSAT (The Radio Amateur Satellite Corporation) for current prices and details (301-589-6062) or write to AMSAT, P.O. Box 27, Washington, DC 20044.

•**STSPLUS (shareware for IBM).** This software was designed by David Ransom, Jr. The program allows the user to track an orbiting space shuttle or satellite. Excellent graphics and maps help to create a mock Mission Control Center. Look for STSPLUS and other tracking software posted on NASA Spacelink, bulletin board system (205-895-0028).

•**OrbiTrack (MacIntosh).** Available from BEK Developers, P.O. Box 47114, St. Petersburg, FL 33743-7114. Includes a user's manual.

•**SatTrack (MacIntosh).** Available from Mike Pflueger, WD8KPZ, 6207 West Beverly Lane, Glendale, AZ 85306.

OrbiTrack and SatTrack are also available via FTP from sumex.stanford.edu. Look in info-mac/app for the programs sat-trak-102.hqx and orbitrack-214.hqx.

What are Keplerian elements? Satellite-tracking computer software uses Keplerian elements (also known as "orbital" or "tracking" elements or "Keps") to pinpoint the location of a satellite (or shuttle) at any given time. The Keplerian elements provide the software with a snapshot of a satellite's orbital track, which the computer uses to calculate the future whereabouts of the satellite. Using such a computer tracking program allows an observer to determine when a satellite is to appear above his or her horizon.

Finding Keplerian elements for the space shuttle. During shuttle missions carrying SAREX Keplerian elements for tracking the shuttles are available from numerous sources:

AMSAT SAREX bulletins, which include daily Keplerian element postings, are forwarded by W1AW (frequencies listed on the last page) on packet radio, Keplerian teleprinter bulletin schedules, and posted to the ARRL telephone Bulletin Board System (203-666-0578).

The Goddard Amateur Radio Club, WA3NAN, maintains a Bulletin Board System (BBS), which is accessible via the Internet, modem, and packet radio. The BBS carries Keplerian orbital elements updated daily, and daily SAREX bulletins and space shuttle mission information.

•via Internet: wa3nan.gsfc.nasa.gov or 128.183.105.17

•via telephone modem: 301-286-4137

•via packet radio: WA3NAN on 145.090 MHz in the DC area

NASA maintains an electronic information system for educators called *Spacelink*. Spacelink carries SAREX information, current shuttle mission status reports, and Keplerian elements.

•via telephone modem: 205-895-0028

•via Internet: spacelink.msfc.nasa.gov or 128.158.13.250

Current shuttle mission tracking elements may be found in the following directory:

•Spacelink.Hot.Topics/Current.Shuttle.Mission/Keplerian.Elements.

The Johnson Space Center Amateur Radio Club maintains a BBS with the latest element sets available during a shuttle flight.

•via telephone modem: 713-244-5625.

The most current orbital elements for SAREX and other Amateur Radio satellites are carried on the Celestial BBS.

•via telephone modem: 205-409-9280

Keplerian elements are updated daily, when possible. Documentation and tracking software are also available on this system.

NASA Educational Resources

How do you find information on shuttle schedules, payloads, space science, and mission lesson plans? To make the most of your SAREX experience, NASA has a number of materials and resources available to educators:

Teacher Resource Center network. Teacher Resource Centers (TRC) contain a wealth of information for educators: publications, reference books, slides, audio cassettes, videocassettes, telelecture programs, computer programs, lesson plans, and activities. For more information, contact the TRC nearest you.

Teacher Resource Centers

NASA Ames Research Center, Moffett Field, California (phone 415-604-3574).

NASA Goddard Space Flight Center, Greenbelt, Maryland (phone 301-286-8570).

NASA Johnson Space Center, Houston, Texas (phone 713-483-8696).

NASA Kennedy Space Center, Kennedy Space Center, Florida (phone 407-867-4090).

NASA Langley Research Center, Hampton, Virginia (phone 804-727-0900, x757).

NASA Lewis Research Center, Cleveland, Ohio (phone 216-433-2017).

Alabama Space and Rocket Center, Huntsville, Alabama (phone 205-544-5812).

NASA John C. Stennis Space Center, Stennis Space Center, Mississippi (phone 601-688-3338).

Jet Propulsion Laboratory, Pasadena, California (phone 818-354-6916).

NASA Dryden Flight Research Facility, Edwards, California (phone 805-258-3456).

Wallops Flight Facility, Wallops Island, Virginia (phone 804-824-2297/2298).

NASA Spacelink. NASA Spacelink is a computer information service that allows individuals to receive news about current NASA programs, activities, and other space-related information, including historical and astronaut data, lesson plans, classroom activities, and even entire publications. Although primarily intended as a resource for teachers, anyone with a personal computer and a modem can access the network.

Spacelink's telephone modem line is 205-895-0028. Users need a computer, modem, communications software, and a long-distance telephone line to access Spacelink (the data word format is 8 bits, no parity, and 1 stop bit). Your software must emulate a VT-100 terminal.

The TCP/IP address is 192.149.89.61. The new system fully supports the following Internet services:

- World Wide Web—http://spacelink.msfc.nasa.gov
- Gopher—spacelink.msfc.nasa.gov
- Anonymous FTP—spacelink.msfc.nasa.gov
- Telnet—spacelink.msfc.nasa.gov

For more information, contact the Spacelink Administrator, NASA Marshall Space Flight Center, Mail Code CA21, Marshall Space Flight Center, AL 35812. For help with technical problems call the Spacelink Hot Line 205-961-1225.

NASA Television. NASA Television offers the general public a front-row seat at mission launches and activities taking place in space during a mission, as well as informational and educational programming, historical documentaries, and updates on the latest developments in aeronautics and space science. NASA TV occasionally airs live coverage of SAREX activities. Programming is received by satellite dish or may be available through your local cable television network.

Tuning-In NASA TV: Satellite—Spacenet 2, Transponder—5, Channel—9, C Band, 69 degrees west longitude, frequency 3880.0 MHz, horizontal polarization, audio on 6.8 MHz.

For more information, contact Technology and Evaluation Branch, Education Division, Code FET, NASA Headquarters, Washington, DC 20546, or call 202-358 1540.

How Do I Obtain A SAREX QSL Card?

QSL cards are similar to postcards. Amateurs exchange QSL cards to confirm their radio contacts with other stations.

Participating in the Shuttle Amateur Radio EXperiment can be an exhilarating experience. However, as many amateurs know, waiting for that coveted QSL card requires a lot of patience. Designing a card for the ultimate DXpedition can be a lengthy process. Here's a behind-the-scenes glance at producing a SAREX QSL, and some tips to help you get your card.

After a SAREX mission, ARRL and the SAREX Working Group work with the crew members to select photos from that mission, and design and lay out the QSL card. This may take a few months because of the busy schedule of the astronauts, among other things. Once the card is designed and printed, the ARRL forwards the QSL cards to whichever amateur radio club is involved with the awesome task of managing the cards.

In the past amateurs sent their contact and listener reports directly to the managing club. Now all reports should be sent to ARRL Headquarters.

In order for the managing process to run smoothly, include the following information in your QSL or report: shuttle flight number (STS-XX), date, time in UTC, frequency, and mode (FM voice, packet, SSTV, or FSTV). This documents the contact or listener report. In addition, you must also include an SASE using a large, business-size envelope if you wish to receive a card. No cards are distributed without the proper postage affixed or sufficient IRCs included.

The following clubs have graciously volunteered their service for handling QSL cards for the following missions:

- STS-67 Edison Radio Amateurs Association, Michigan
- STS-64 Nashua Area Radio Club, New Hampshire
- STS-65 Lake County Amateur Radio Club, Indiana
- STS-59 Orange Park Amateur Radio Club, Florida
- STS-60 Cowley County Amateur Radio Club, Kansas
- STS-58 Connecticut DX Association, Connecticut
- STS-57 Miami County Amateur Radio Club, Ohio
- STS-55 IBM Amateur Radio Club/1993, Florida
- STS-56 Vienna Wireless Society, Virginia

SAREX Resource List

SAREX Educational Support and Information: American Radio Relay League (ARRL), Educational Activities Department (EAD), 225 Main Street, Newington, CT 06111-1494 USA.

Telephone: 203-666-1541
FAX: 203-665-7531
MCI Mail ID: 215-5052
CompuServe ID: 70007,3373
Prodigy: PTYS2A
America Online: HQARRL1
Internet (USENET): ead@arrl.org
Internet e-mail server: info@arrl.org (valid commands include INDEX and HELP)

ARRL BBS: 203-666-0578 open to the public (14,000/9600/2400/1200/300 N-8-1)

Anonymous FTP: oak.oakland.edu in the /pub3/hamradio/arrl directory

SAREX News and Bulletins

- ARRL's (Newington, Connecticut) amateur radio station (callsign W1AW) transmits news bulletins (9:45 PM, 12:45 AM EST) on HF bands at 3.99, 7.29, 14.29, 18.16, 21.39, 28.59, and VHF at 147.555 MHz. W1AW bulletins are also forwarded on packet.
- The AMSAT International Satellite Net on Tuesdays, 3.840 MHz, 0130Z to 0300Z, and on Sundays, 14.282 MHz, 1800Z to 2100Z, +/–QRM.
- NASA Spacelink BBS phone 205-895-0028; Internet spacelink.msfc.nasa.gov
- Goddard ARC BBS phone 301-286-4137; Internet wa3nan.gsfc.nasa.gov

(Special thanks goes to Bob Inderbitzen, NQ1R, Assistant to the Manager, ARRL Educational Activities Department for providing us with the information contained in this month's column.)

73, Fred, W5YI

CIRCLE 46 ON READER SERVICE CARD

DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

Conway Reef

A multinational group of DXers plans a 10-day DXpedition to Conway Reef from March 24 to April 3. The operators include regular Pacific DXpeditioners Mats Persson, SM7PKK, and Pekka Kolehmainen, OH1RY, joined by Nils Persson, SM6CAS, and Garry Shapiro, NI6T. The team is taking three complete kilowatt stations and plans to keep at least two on the air at all times. They have beams for the higher bands, including 12 and 17 meters, and verticals on the lower bands.

At this point in the sunspot cycle they will concentrate on the low bands, the new bands, and RTTY. They also will make a special effort to work European DXers. (In *The DX Magazine*'s 1994 Most Wanted Survey Conway Reef ranked 25th overall, but was 7th on the European list.)

The preferred operating frequencies are 1823, 3503/3523, 7003/7023, 10103, 14003/14023, 18071, 21003/21023, 24893, and 28023 kHz on CW, and 1843, 3785, 7085, 10135, 14195, 18115, 21295, 24935, and 28495 kHz on SSB. On RTTY try 7030, 7082, 10120, 14082, 18100, 21082, and 28082 kHz. Note that these are the **transmit** frequencies; the operators will be listening up as announced. Take care to avoid transmitting on their frequency.

The QSLing will be split by mode. QSL SSB contacts via Philip Marsh, G4WFZ, Orcheston Road 28, Bournemouth, BH8 8SR Dorset, Great Britain. CW and RTTY contacts QSL via Mats Persson, SM7PKK, Zenithgatan 24 #5, S-212 14 Malmo, Sweden. (This is a new address for Mats; don't use any other address.)

As with all such major undertakings, donations are greatly appreciated. Send them to team coordinator Mats, SM7PKK.

Conway is named after *HMS Conway*, whose captain, Drinkwater Bethune, discovered the island in 1838. It lies about 280 miles southeast of the main group of islands that make up the country of Fiji.

Conway Reef is about 1.5 miles long, with only a small sand cay (pronounced "key") above high tide. Maximum elevation above sea level is only a few feet. The DXpeditioners will share the reef with a large bird population and multitudes of ticks. High winds sweep across the reef, complicating antenna installation and threatening tents. All in all, Conway is an inhospitable spot. In fact, its only attraction is that it is a DXCC country separate from its parent country of Fiji.

P.O. Box 50, Fulton, CA 95439

Jim Bennett, ex-TU4EI, now uses his new callsign of TU5EV from this well-appointed shack in the Ivory Coast.

Conway was added to the DXCC countries list in 1990, under country criterion point 2(b). It was one of three countries added to the DXCC list at about the same time, based on the changed wording of the "island" definitions in the DXCC rules, from the major DXCC rewrite of 1988.

That rewrite refined the criteria under which new island countries could be added to the DXCC list. The first such country added was Rotuma, another island in the Fiji group. Rotuma was not eligible for separate DXCC status under the rules prior to 1988, but clearly met the criteria of the rewritten rules. It was added to the DXCC countries list in 1989, following a unanimous vote by the DX Advisory Committee.

Some enterprising German DXers determined that Conway appeared to meet the requirements of the new rule 2(b), which concerns **additional** offshore island groups. (Rule 2(a) says that the first offshore island must be at least 225 miles from the parent country.) The new rule 2(b) says that an additional offshore island must be not only at least 225 miles from the parent country, but it must **also** be at least 500 miles away from the first such DXCC country. The point of Rule 2(b) was to eliminate the possibility of a host of new countries surrounding an island group.

While Conway lies southeast of the main islands of Fiji, Rotuma lies to the north. Conway is not only more than 225 miles from the parent country of Fiji, but it is also more than 650 miles from Rotuma, comfortably over the 500-mile requirement.

Based on this determination, five German DXers put Conway on the air for the first time in late April 1989 under the callsign **3D2CR**. This operation was on the air during the International DX Convention in Visalia, California. With hundreds of DXers trapped many hours from their home stations, and a potential New One on the air for the first time, some considerable panic ensued. Fortunately, one of the Visalia attendees had driven his radio-equipped motorhome to the convention. He fired up his station in the parking lot of the Holiday Inn, and a long line of DXers queued up to work 3D2CR. It was one of the weirder happenings at Visalia. Later that year Pekka, OH1RY, led the second DXpedition to Conway, operating as **3D2RY** in November.

Conway was not included in the 1989 Most Wanted survey, as it was not a DXCC country at the time the survey was taken. Its first appearance was on the 1990 list, where it ranked 78th, with 23% of DXers needing a Conway confirmation.

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Size(inch.)	5x4x9	5x4x9	7x6x9	11x5.5x9	6x3x9
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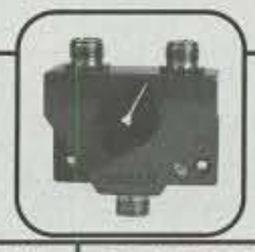

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The WPX Program

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2493.....K1BM 2495 .....JG2REG

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1697 .....IK2VUE

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SSB: 350 G4UBP, AA2TB, JG2REJ. 400 G4UBP, JG2REJ. 450 IK4SWX. 500 KJ8F, IK4SWX. 550 KJ8F. 600 KJ8F. 850 IT9JPK. 900 K9HDZ, IT9JPK. 950 IT9JPK. 1000 IT9JPK. 1150 K9BQL. 1650 KS3F, LU8DY. 1700 LU8DY. 1850 K4CKS. 1900 K4CKS. 2750 F2VX. 2800 F2VX. 3750 IT9TQH. 3800 IT9TQH. 3850 IT9TQH. 3900 IT9TQH.

CW: 350 LW2DFM. 400 LW2DFM. 450 LW2DFM. 500 LW2DFM. 550 LW2DFM. 600 K9BQL, LW2DFM. 650 LW2DFM. 700 LW2DFM, K2LUQ. 750 LW2DFM. 800 LW2DFM. 850 LW2DFM. 900 LW2DFM. 950 LW2DFM. 1000 LW2DFM, W4UW. 1050 KS3F. 1350 K9UQN. 1650 KBØG. 1900 PAØSNG. 1950 PAØSNG. 3750 IT9TQH. 3800 IT9TQH. 3850 IT9TQH. 3900 IT9TQH.

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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.

Since that time Conway has moved steadily up the Most Wanted ranks, to 55th in 1992, 37th in 1993, and 25th in 1994.

Some of this increase in ranking is due to DXers who arrived on the DX scene too late to work the first two Conway DXpeditions, but some is also due to the enormous changes to the Most Wanted list in the past few years, as many previously rare countries have seen major operations. In the 1994 survey 32% of those responding said they needed Conway. Certainly many thousands of DXers will be anxiously awaiting the 1995 Conway Reef operation.

This DXpedition provides us with an excuse to analyze how a DXer who needs a given country might plan for a contact. With the help of MiniProp Plus™, let's look at the expected propagation between Conway and a Deserving DXer on the East Coast, near Philadelphia.

Conway lies at 22 degrees south, 175 degrees east, more than 8,000 miles from Philadelphia. This distance means at least five *F*-layer hops. Our Deserving DXer should expect weak signals. Propagation is usually good near the equinoxes, so the timing appears to be in the DXer's favor. However, sunspot Cycle 22 is nearing its minimum, so solar flux, and maximum usable frequencies, will be very low. We willl pick 75 as a likely value for flux.

MiniProp Plus says there is a 50% chance of a weak opening on 15 meters around 1900–2130Z. However, signal levels are predicted to be very low. On 20 meters there is another 50% chance of an opening to Conway at around 1330Z. There's another, more likely, opening on 20 around 0030Z, but this is at least an hour after sunset in Philadelphia, and signal levels are likely to be extremely weak. The west coast will have good propagation to Conway at that time, and it will be difficult for east-coast stations to break through.

The daytime openings to Conway are during normal working hours. The DXer must decide whether to try to fight the larger weekend DX crowd, or find a way to get some time off work on a day with good propagation.

MiniProp Plus does suggest another possibility: 17 meters. There is a likely, if weak, opening forecast for 1900–2300Z. The end of this opening is just after work, before the sun sets in Pennsylvania at around 2315Z. This is probably the best shot our Deserving DXer has to work the Conway DXpedition on the higher bands.

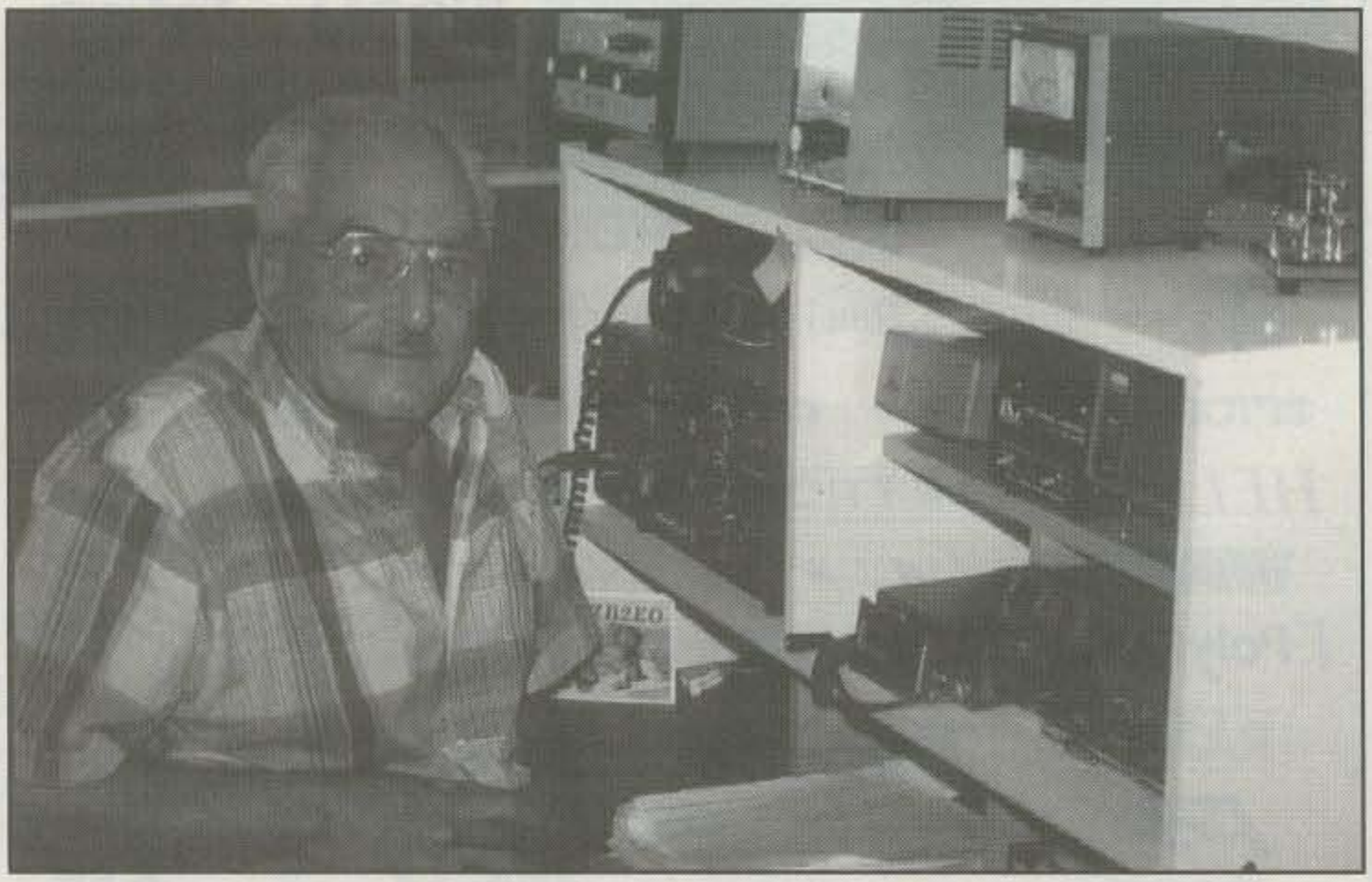
Seventeen meters offers two other advantages, in addition to the best signal

Dick Kwiatkowski, DU1KK, is ex-9Q5DX. His Philippine shack includes some interesting reading material at the right—The DX Bulletin, CQ, *and some other magazine. ((WA9INK photo)*

strength. First, there are fewer stations active on 17, reducing competition. Also, relatively few stations on 17 use large beam antennas. Many make do with far more modest antennas, such as an 80 meter dipole, many of which load very well on 17. Fewer stations with more modest antennas make the 17 meter pile-ups a tiny fraction of those on 20, and the odds of getting through the pile-up that much greater.

Our DXer should make sure than his or her 17 meter station is working well. Five hops means that the required radiation angle is very low, under 10 degrees. This means either a high beam or dipole, or a vertical. Conway is not far from Australia, so contacts with VKs might be a good way to test the effectiveness of the 17 meter station prior to late March.

Going back to the MiniProp Plus forecast, we can see that the best propagation between Conway and the US east coast will be on the lower bands. Since *D*-layer absorption eliminates long-haul contacts on the lower bands during daylight hours, the only times for such contacts are when both the east coast and Conway are in darkness. The sun sets at Conway at about 0630Z, and it rises in Philadelphia about 1100Z. This defines our DXer's best overall shot at a Conway contact. Note that it does mean getting up in the middle of the night, and staying up past local dawn. Serious DXing is not for the faint-hearted!



John, ZB2EO, is the most active station on Gibraltar. (DK7PE photo)

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4245 ..... HB9DDW

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7530 ..... HA7UW
7531 ..... KN4UI
7532 ..... OE3EPW
7533 ..... AD1E
7534 ..... DL1BDD
7535 ..... K8JJC (CW)
7536 ..... YO3YC (CW)

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.

Again, a low angle of radiation will be important. A vertical or sloper will probably perform better over this distance than a dipole at any reasonable height. Again, Australia provides a opportunity to test the station's ability to make a contact.

Before we leave MiniProp Plus, we should check for any long-path openings. In some cases, a DXer's best shot may be a long-path contact, despite the additional path losses over the longer distance. This is especially true if the long-path opening comes at a time when there are few other paths open from the DX side. However, such is not the case with Conway. While there is a good chance of a long-path opening on 20 meters around 2100Z, this is the same time as the short-path opening, where signals will definitely be stronger. Further, this is when the west coast will be booming into Conway on 20 meters, making a long-path contact even more unlikely.

Thus, our Deserving DXer had better work on both the 17 meter antenna and low-band capabilities to have a good chance to put Conway in the log.

Note that this analysis demonstrates several requirements for successful DXing at this part of the sunspot cycle. To work New Ones, a DXer must be well-informed to know who is going where when. The weekly DX newsletters are your best source of up-to-date, accurate DX news. A DXer must also be versatile, and capable of working DX on many different bands. Putting all your DX eggs into the 20 meter SSB basket is a poor strategy. Finally, the successful DXer must make sacrifices, taking time off work and losing sleep to catch a needed country.

```
MINIPROP+ SHORT-PATH PREDICTION     03-25-95     Conway Reef to Philadelphia, PA
SSN:  14.6  Flux:  75.0    Radiation Angle:  6 deg for Minimum No. of F Hops:  5
                                  K: -1
                                   MUF
          30 +---+---+---+---+---+---+---+---+---+---+---+---+ 30
          28                                                   28
          26                                                   26
       M  24                                                   24  M
       E  22                                      XXXXXXX      22  E
       G  20 X---+---+---+---+---+---+---+---+X--+---+XXXX 20  G
       A  18  XXX                                             18  A
       H  16     XX                    X       X              16  H
       E  14       XX                XX XX                    14  E
       R  12         XXX             X   X   X                12  R
       T  10 +---+---+--XXXXXXXXXXXXX+---+--XX-X-+---+---+---+ 10  T
       Z   8                             X                    8  Z
           6                                                  6
           4                                                  4
           2                                                  2
           0 +---+---+---+---+---+---+---+---+---+---+---+---+  0
             0   0   0   0   0   1   1   1   1   1   2   2   0 U
             0   2   4   6   8   0   2   4   6   8   0   2   0 T
```

Fig. 1– The forecast Maximum Usable Frequency between Philadelphia and Conway Reef.

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MOTOROLA MARINE KING KX 99

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FT411E-811-911	IC02AT/2SRA
FTH-2008/7008	IC2/4GAT/24AT
	IC-A21/U16

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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

4627 9A2AA	3144 I2UIY	2806 HA8XX	2354 WB2YQH	1994 K2OLG	1812 KA5TQF	1359 ND3A	1212 HP2CWB	889 VE3OMM
4589 F9RM	3125 I2PJA	2752 YU7BCD	2350 I2EOW	1989 KBØG	1674 PY2DBU	1359 KØIFL	1206 WA3HUP	883 WU1F
4312 K2VV	3121 N4MM	2711 HAØDU	2309 S53EO	1979 IK2ILH	1650 CT1QF	1323 W9IAL	1167 OZ1ACB	824 JR3TOE
3715 IT9TQH	3106 W1BWS	2693 K9AGB	2308 HAØIT	1965 KS4S	1611 LU8DY	1320 KSØZ	1145 HA8QC	796 OZ-2044
3645 EA2IA	3050 YU1AB	2676 K9BG	2285 K8LJG	1959 WB4RUA	1598 CT1YH	1301 I1-50156	1090 WT3W	761 EA2BNU
3437 W2FXA	3020 I1EEW	2656 SM7TV	2221 HA5NK	1928 WE2L	1555 WB3DNA	1285 WØIZV	1082 IK2DUW	743 VE6JAV
3417 VE3XN	2989 KA5W	2634 N2AC	2176 S51NU	1907 NV9S	1537 YBØTK	1280 WK3Z	1078 IT9JPK	680 EA5FV
3415 K6JG	2985 N4UU	2625 KF2O	2157 W4UW	1893 W9IL	1516 HA9PP	1277 K9BQL	1057 HB9DDZ	677 EA1AUI
3342 N4NO	2929 WA8YTM	2583 IT9QDS	2125 DK5AD	1870 SM6CST	1502 WZ1R	1251 K9XR	1018 N4PYD	655 W2EZ
3306 N6JV	2920 W9DWQ	2488 HAØHW	2078 W8UMR	1858 W3KH	1433 I2EAY	1249 I1ZQD	994 VE6BMX	
3226 N9AF	2909 PAØSNG	2463 4N7ZZ	2047 N2AIF	1853 G4OBK	1376 KC6X	1242 NH6T	977 WB2PCF	
3194 SM3EVR	2857 YU7SF	2441 I2MQP	2037 W6OUL	1848 WB2ABD	1368 JN3SAC			

SSB

4524 F9RM	2703 I2UIY	2332 I2MQP	1984 K5RPC	1650 WA6SLO	1362 K3IXD	1127 EA3KB	1008 ND3A	841 I6KYL
4026 IØZV	2675 F2VX	2298 WA8YTM	1980 EA5AT	1614 YU7SF	1339 IKØEIM	1105 KBØG	1007 IT9JPK	818 EA8BWW
3710 IT9TQH	2651 OZ5EV	2252 KF2O	1963 W4UW	1608 N6FX	1339 OE2EGL	1101 EA1KK	985 NH6T	799 EA3EQT
3633 K2VV	2644 I6ZJC	2250 EA3AQC	1957 4X6DK	1563 IK2DUU	1327 DK5WQ	1100 HP2CWB	977 K9XR	796 EA8BGY
3529 VE1YX	2623 NJØC	2243 LU8ESU	1936 CX6BZ	1560 K8LJG	1308 KBØC	1089 WB6SRK	954 KØIFL	778 JR3TOE
3512 ZL3NS	2601 N4NO	2193 WA4QMQ	1920 N4UU	1532 KA5TQF	1296 I1-21171	1086 KC6X	934 WT3W	714 KE4BM
3175 K6JG	2598 I1EEW	2183 WF4V	1916 EA2AOM	1514 KS4S	1280 HA5NK	1071 WZ1R	916 EA1AX	680 N3DRO
3137 WD8MGQ	2581 PAØSNG	2168 CT4UW	1863 IN3QCI	1492 N2AIF	1277 HP6AYV	1049 KB4HU	886 DF7HX	672 IØUVP
3116 I2PJA	2561 I4CSP	2147 W9DWQ	1860 CT1BY	1468 K2EEK	1262 I3ZSX	1045 WA2FKF	845 CT1YH	611 IK4HPU
2937 CT4NH	2524 HA8XX	2145 YU7BCD	1850 KF7RU	1459 CT1DIZ	1253 G4OBK	1030 T30JH	844 S51NU	601 HB9DDZ
2782 N4MM	2499 KA5W	2122 PY4OY	1802 WE2L	1408 CT1BWW	1234 K8MDU	1030 AA6BB	843 WU1F	
2716 EA8AKN	2472 I4ZSQ	2089 I2EOW	1689 LU8DY	1404 W6OUL	1196 IK2AEQ			
2713 EA2IA	2397 I5ZJK	2052 CT1AHU	1673 HAØIT	1385 EA5OL	1147 K9BQL			

CW

3707 IT9TQH	2627 N4UU	2109 I2UIY	1796 KF2O	1666 ZS6EZ	1386 DJ1YH	1094 EA7TG	915 KC6X	706 HB9DDZ
3690 K2VV	2560 YU7SF	2029 S51NR	1756 HAØIT	1625 N2AIF	1345 G4MVA	1081 WZ1K	836 KL7UR	699 K2LUQ
3584 WA2HZR	2343 W9DWQ	2018 W8IQ	1746 SM6CST	1612 I7PXV	1302 LU2YA	1022 HI8LC	830 PY4WS	676 HL5AP
3291 N6JV	2296 LZ1XL	1944 S51NU	1730 W1WAI	1526 W6OUL	1284 EA6BD	1011 W4UW	787 VE3OMM	658 HB9CSM
2998 VE7CNE	2227 WA8YTM	1938 KA7T	1719 K8LJG	1498 I1EEW	1226 JN3SAC	1007 W9IAL	787 NH6T	657 VE6BMX
2886 N4NO	2204 KA5W	1908 JA9CWJ	1703 N6FX	1434 G4OBK	1200 IK2ECP	967 KA5TQF	786 K9XR	640 KØIFL
2841 YU7LS	2202 YU7BCD	1861 G3VQO	1698 G4SSH	1423 IK3GER	1186 KA1CLV	966 EA2CIN	768 JA3ARM	603 I2EOW
2689 EA2IA	2155 G4UOL	1829 TI4SU	1678 OZ5UR	1418 SM5DAC	1111 EA6AA	965 4X6DK	715 EA2BNU	
2629 K6JG	2126 N4MM	1828 HA5NK	1672 KBØG	1395 KS4S	1100 9A3SM	925 ND3A		

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SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

- LOW PROFILE POWER SUPPLY

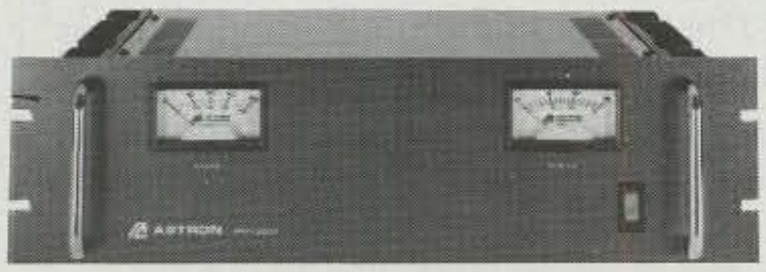
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

RS-L SERIES

- POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

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

RM SERIES



MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

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

RS-A SERIES

MODEL RS-7A

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

RS-M SERIES

MODEL RS-35M

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

VS-M AND VRM-M SERIES

MODEL VS-35M

- Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

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

RS-S SERIES

MODEL RS-12S

- Built in speaker

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

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

No one ever said it would be easy to work them all. If getting on the Honor Roll wasn't difficult, it wouldn't be an honor.

DX Gatherings

After nailing down the Conway contact, our DXer may well want to celebrate by going to one or more of the three major DX gatherings this month.

First on the list is DXPO '95, April 7–9, sponsored by the Southeastern DX Club. Location is the North Atlanta Trade Centre in Atlanta, Georgia, in conjunction with the Ham Radio '95 hamfest. Among the speakers at DXPO are Tony Deprato, WA4JQS, of Peter I Island fame and John Fung-Loy, PA3CXC, who has operated from many rare African sites such as South Sudan and Angola. For more information, see the ads in most amateur magazines, or call the Ham Radio Foundation at 404-518-7376.

Two weeks later, April 21–23, is the world's largest pure DX convention: the International DX Convention at the Holiday Inn in Visalia, California. More than 600 DXers from all across the country and from many foreign countries will converge on the Holiday Inn for three days of intense DX. Registration is $50 per person, and includes cocktail parties Friday and Saturday evenings (Friday's party is sponsored by *The DX Bulletin!*), Saturday evening banquet, Sunday morning breakfast, and access to all forums and exhibits. Make checks payable to the International DX Convention, and mail to Ted Davis, W6BJH, P.O. Box 494243, Redding, CA 96049. If the Holiday Inn (209-651-5000) is booked up, as it most likely is, try the Radisson downtown at 209-636-1111 or the nearby Lamplighter at 209-732-4511.

The next weekend is the Dayton Hamvention, the largest hamfest in the US. In addition to all the usual hamfest activities, Dayton attracts more DXers than any other such event, including a large number of visitors from overseas. The major DX activities are located at the Stouffers hotel in downtown Dayton, beginning with the DX Dinner Friday night, April 28th.

The Southwest Ohio DX Association sponsors the **Tenth Annual DX Dinner,** which will be held on Friday, April 28th, 1995, at the Stouffer Center Plaza Hotel, Dayton, Ohio. There will be a cash bar at 6:30 with dinner at 7:15. Tickets must be purchased in advance, and are available from Tom Inglin, NR8Z, 4061 Eaton Road, Hamilton, OH 45013. Tickets will be $28.00. Please make your check payable to SWODXA, and send an SASE for ticket return. Seating will be limited, so please order early. If you wish to sit as a group, it would be appreciated if you order as a group. All seats will be reserved. For more information, contact Steve Bolia, N8BJQ, at 513-429-9954 voice; 513-429-0218 Fax; Internet SDB@AG9V.AMPR.ORG.

Following the dinner, DXers will head upstairs to the hospitality suites. Look for activity on the 3rd, 5th, and 12th floors. DXers shouldn't miss the special DX exhibitors' suite on the top floor of the Stouffers, in the Judith Resnick room, between the restaurant and the bar. Your much-travelled DX editor will be there with *The DX Magazine* and *The DX Bulletin,* as will the new owners of the GOLIST of QSL managers, Bencher of CW paddle fame, and the operators of the **VP8SGP** South Georgia DXpedition. The DX Suite is open after the DX dinner on Friday night and again Saturday evening. Stop by for a taste of fine California wine and an eyeball QSO.

Finally, for your advance planning, the New Orleans International DX Convention

5 Band WAZ

As of December 30, 1994, 403 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

I4IKW

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
K6YRA, 199 (34)
AA4KT, 199 (26)
K7UR, 199 (34)
NAØY, 199 (26)
WØPGI, 199 (26)
W2YY, 199 (26)
W9WAQ, 199 (26)
W1JR, 199 (23)
VE7AHA, 199 (34)
W1FZ, 199 (26)
IK2GNW, 199 (1)
W9CH, 199 (26)
ACØM, 199 (34)
IK8BQE, 199 (31)
JA2IVK,199(34,40m)
KM5W, 199 (26)
K1ST, 199 (26)
I1POR, 199 (1)
ABØP, 199 (23)
VE1AST, 199 (18)
SP3IOE, 199 (23)
SM6AHS, 198 (12, 31)
UA3AGW, 198 (1, 12)
KL7Y, 198 (34, 36)
VO1FB, 198 (19, 27)
EA5BCK, 198 (27, 39)
KZ4V, 198 (22, 26)
K4PI, 198 (23, 26)
G3KDB, 198 (1, 12)
DK2GZ, 198 (1, 24)
UY5XE, 198 (24, 27)
N5FG,198 (22,34 on 40)
KG9N, 198 (18, 22)
W2UE/7,198 (18,18on40)
K2ENT, 198 (28,40 on20)

The following have qualifiedfor the basic 5 Band WAZ Award:

OE3EPW, 183 Zones
AA2SZ, 178 Zones
I4IKW, 200 Zones
HI8LC, 161 Zones

Endorsements:

HA6NF, 191 Zones
K6FG, 179 Zones
SP3IOE, 199 Zones

938 Stations have attained the 150 Zone level as of December 30, 1994.

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.

is August 25–26, in New Orleans, of course. More details in a later issue.

April DXpeditions

Vance LePierre, W5IJU, is planning a trip to Navassa with KB4VLO and KØIYF. They plan to concentrate on the low bands and satellites, with a late April, early May time frame. See the DX newsletters for more details.

Gene Sochor, N9SW, will operate **FJ/** from St. Barthelemy (St. Barts) March 25 to April 1. QSL to his home address: P.O. Box 413, Wayne, IL 60184.

Al Brown, WA3FYZ, and his son Jared will operate as **ZF2AB** from Grand Cayman March 23-30, SSB on the traditional bands. QSL to Page Pyne, WA3EOP, 230 N. Potomac St., Hagerstown, MD 21740.

More of an operating event than a DXpedition is Marconi Day, April 22. More than 25 stations in Canada, England,

QSL INFORMATION

3Z0CON to SP2TQW
4K8F to UA9AB
4L0JA to JP1BJR
4N6F to YU6FPQ
4N70AT to DC3SZ
4U49UN to W8CZN
5H3JA to AA0OB
5N0GC to F2YT
5N1DMA to W4DVJ
5R8DP to JA1OEM
5R8ED to LA1SEA
5T5JC to F6FNU
5V7DB to DJ6SI
5W0BL to JH2ABL
5W1MW to VK2BEX
5X1XT to WF5T
7Q7JL to G0IAS
7Q7RM to G0IAS
7Q7SB to AB4IQ
7Z5OO to W1AF
8P9CT to K9JJR
8P9CU to K9JJR
9G5MT to WY7K
9G5RM to NZ7E
9G5VT to K5VT
9J2SZ to SP8DIP
9K2ZC to KC4ELO
9Q5AGD to SM0AGD
9Q5BB to EA4BB
9Q5IY to LA1K
9Q5RP/9X to F5DN
9U/F5FHI to F1FHI
9V1YC to AA5BT
9X5EE to PA3DLM
9X5HG to DK2SC
9Y4SF to WA4JTK
A22EX to N4CID
A22MN to WA8JOC
A35SS to AA6BB
AA5DX/KP4 to N2AU
BZ1QL to BY1QH
C53HG to W3HCW
C91AI to CT1DGZ
CO9OTA to CT1ZW
CP4BT to DL9OT
CR9WAG to DL8KWS
CU9CNE to CU1AC
D2RU to GM0FET
D2XX to PA3CXC
D3X to CT1EGH
D68TA to JA1IDY
EA8BYR to WA1ECA
EA9AU to EA9IB
EO5OJS to LY1DS
ER1AM to SP9HWN
EU7SA to RC2SA
EW1MM to W3HCW
EX0V to DF8WS
FG5FZ to F6FNU
FK/7K1WLE to 7K1WLE
FK/JM1WBB to 7K1WLE
FK/JN1BSH to 7K1WLE
FK/JO1SIT to 7K1WLE
FK/JP1IHT to 7K1WLE
FK8FU to NA5U
FY5GJ to F2YT
HC7SK to SM6DYK
HC8A to WV7Y
HH2LQ to KM6ON
HI8ROX to HI8OMA
HK/G0SHN to F6AJA
HK0HEU to HK0FBF
HL9DC to N7RO
HP1XBH to W4YC
HS0ZAA to KM1R
HZ1AB to K8PYD
I1A/1P0 to I1RBJ
IC8/N2TGK to IC8WIC
IQ0J to IK0REH
IU0YL to IK0PXD
J28BS to FD1PHW
J28DE to F2WS
J68AC to WA2USA
J68AH to AC0S
J68AK to W8QID
J68AS to N9AG
J68BT to W8KTQ
J68ER to W9UI
J68WX to WX9E
J79YL to KQ1F
J88CW to WA6AHL
KC6OK to N5OK
KC6SS to WV5S
KC6WP to JA1WPX
KG4JO to WI2T
KG4ML to WB6VGI
KH2DD/KH0 to JA1SGU
KS2V/TI2 to KB5IPQ
LX9DX to SP5SS
LY40MR to LY1BZB
OA5/IK1EDC to I1ZL
OQ50USA to ON4RAT
OS4ANT to ON4ANT
OS5CD to ON5CD
OS5GK to ON5GK
P40J to WX4G
PA3EVJ to VE3MR
PJ9U to OH1VR
PP0F to PP1CZ
PY0FF to W9VA
R1FJL to JA3AFR
RK0QXY to UA0KCL
RK9XWH to UZ9XWH
S0RASD to EA2JG
SP5GRM to SP5ES
T30RT to VK4CRR
T32A to JA5EXW
T77BL to T70A
T91DNO to DL1DAZ
TF4/DL2SCQ to DL6DK
TF4/SM6CAS to G4WFZ
TJ1AG to F5RUQ
TJ1PD to N5DRV
TK5EL to F6FNU
TL8NG to WA1ECA
TM0P to F6BFH
TM5IPA to F5LGQ
TM5T to F6KCE
TO0P to F6BFH
TU5EV to W3HCW
UA0QJG/0 to UA1AGC
UK7R to UA9AB
UK8AX to UA9AB
V26E to AB2E
V26R to KA2AEV
V26Y to W2KKZ
V31ND to OH6ZS
V31YK to W5JYK
V47NF to WB8GEW
V47WZ to WZ8D
V5/N0AFW to WA2FIJ
V5/N9NS to WA2FIJ
V63MN to JR1TNE
V73GT to WF5T
V73Y to WA4WTG
VE3MJQ/9X5 to VE2PR
VP2MEJ to W5ASP
VP8CQS to DL1EHH
VP8CRB to W4FRU
VP8GAV to GM0LVI
VQ9ZX to K7ZX
XE1/JA1QXY to JA1HGY
XF4M to AA6BB
XN9JA to VY1JA
XX9TSX to G3SXW
YJ0AAY to W6YA
YQ0FR to YO8FR
ZA1AJ to OK2PSZ
ZA1B to HB9BGN
ZD8KJ to G0FXQ
ZD8OK to N8ABW
ZF1CQ to W8BLA
ZF1DX to W8BLA
ZF2LS to KJ6HO
ZF2RV/ZF8 to WJ7R
ZF2SY to K2UFT
ZK2ZE to LA9GY
ZL4TT to ZL1HS
ZZ5AVM to PP5LL
5N3OBRC to Box 13904, Kano, Nigeria
CE0DFL to Marco, Box 7, Easter Island, Chile
CE0LJI to Richardo, Hospital, Easter Island, Chile
CN15AMV to Box 299, Rabat, Morocco
ZD7JAM to P.O. Box 54, St. Helena Island

CQ DX Awards Program

SSB

2122	IK2JYT	2125	KF7RU
2123	LU8HMP	2126	I1EEW
2124	YU1XW		

CW

917	9A3SM	918	I1EEW

SSB Endorsements

320	K7EHI/327	300	I4CSP/308
320	K9HDZ/326	300	KF7RU/306
320	I1EEW/326	300	WA2FKF/305
320	N5FW/326	300	CT1AHU/302
320	IK1GPG/325	275	NC3C/275
320	NJ0C/324	200	LU8HMP/225
320	L1POR/324	200	KA5OER/219
320	LU7HJM/321	200	IK2JYT/213
310	KX5V/315	3.5/7	N5ORT

CW Endorsements

320	W0JLC/325	300	I1EEW/307
320	N5FW/325	275	K7EHI/280
320	4N7ZZ/310	250	9A3SM/253

Total number of active countries is 327. 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.

Italy, the United States, and elsewhere will commemorate Marconi's birthday the full UTC day. Look for stations with MD in the suffix or extension. The sponsoring Cornish Radio Amateur Club offers a certificate for working 12 or more of the special-event stations. Contact the club at Box 100, Truro TR1 1RX, Corwall, England for more details.

QSL Notes

QSL the 1994 CQWW SSB contest operation of **V47Z** via Ray Smith AB4JI, 5515 Panorama Dr., Huntsville, AL 35801. This is also the route for **V47WK**. (QSL the 1987–90 V47Z operations via N4FD.)

QSL **ZF2RF** via Bob Dorsey, K4UVT, P.O. Box 231240, Montgomery, AL 36123-1240. (The 1994 and earlier *Callbook* addresses are incorrect and forwarding time has expired.)

Larry Flegle, N4TMW, is QSL manager for **HS0ZAK** and **HS0ZAL**. His address is 210 Wylie Lane, Woodstock, GA 30188.

QSL **V31MF** and **V31MY** to K5AZ, P.O. Box 1350, Ingram, TX 78025; **V31MX** to K0BCN, P.O. Box 2051, Bandera, TX 78003.

Bob Keenan, KD8IW, handles QSLs for **KP4RV, KP4SB,** and **KP4VP**. Bob's address is 3083 Sixth St. DB, Monroe, MI 48161.

73, Chod, VP2ML

PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Solar Cycle Progress

Sunspot Cycle 22 continues its slow decline towards a minimum. The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot level of 27 for December 1994. A daily high value of 57 was reported on December 11th, while the lowest number recorded was 0, which occurred on December 3rd.

December's mean sunspot count results in a 12-month running smoothed sunspot number of 31 centered on June 1994. This is a drop of two numbers since the previous month's level.

According to daily observations made at Penticton, British Columbia by the Dominion Radio Astrophysical Observatory of Canada, the reported mean level of 10.7 cm solar flux for December 1994 was 84. This results in a smoothed value of 86 centered on June 1994.

While solar flux levels andsunspot numbers are very closely interrelated, the solar flux measurement is less subjectively determined than is the sunspot count, and more accurately represents levels of solar energy.

A smoothed sunspot number of just under 20 is forecast for April 1995. A corresponding 10.7 cm solar flux level of approximately 75 is expected for April 1995. The present sunspot cycle is expected to decline steadily until mid-1996 or early 1997, when it is expected to end with a minimum sunspot count of less than 10.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for April 1995

	Expected Signal Quality			
Propagation Index.....	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 14-15, 18, 29	**A**	**A**	**B**	**C**
High Normal: 2-3, 10, 16-17, 24-25, 30	**A**	**B**	**C**	**C-D**
Low Normal: 1, 4, 6, 9, 12-13 22-23, 26-28	**B**	**C**	**D**	**D-E**
Below Normal: 5, 7-8, 11, 19 21	**C**	**C-D**	**D-E**	**E**
Disturbed: 20	**C**	**D**	**E**	**E**

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S9 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. With the *propagation index,* use the above table to find the expected signal quality associated with the band opening for any date of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair (C) on April 1st; good (B) on April 2nd and 3rd; fair (C) on the 4th; fair-to-poor (C-D) on the 5th, etc.

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. A ** indicates the best time to listen for 10 meter openings. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

April DX Propagation

During April, 17 and 20 meters should be the optimum bands for DX propagation conditions during most of the daylight hours, and into the early evening hours as well. Somewhat fewer openings are expected on 15 and 17 meters compared to the winter months, but some fairly good DX still should be possible towards southern and tropical areas, especially during the afternoon hours when conditions are High Normal or better. Few 12 or 10 meter DX openings are expected this month, but an occasional one should be possible from all USA time zones towards South America, and from the western states towards the South Pacific. Be sure to check these bands during the afternoon hours and when conditions are High Normal or better.

11307 Clara Street, Silver Spring, MD 20902

For a few hours *after* sunset, optimum DX propagation conditions should be shared among 20, 30, and 40 meters. Good openings to many parts of the world are forecast for these bands between sunset and midnight, and on 40 meters from midnight to sunrise. Some good DX openings should also be possible on 80 meters during the hours of darkness and at sunrise. There is also a good chance for some 160 meter DX openings during this same time period.

Seasonably favorable propagation conditions over long paths between the northern and southern hemispheres—for example, to Australasia, South America, southern Africa, etc.—should continue during April on all HF bands.

Thunderstorm activity increases during April in the northern hemisphere, and this should result in increased levels of static on all HF bands, especially 30, 40, 80, and 160 meters.

Ionospheric absorption should continue to increase in the northern hemisphere during April as the sun rises higher in the northern sky. This should result in somewhat weaker DX signal levels during daytime openings, compared to the winter months.

Short-Skip Propagation

For openings between 50 and 250 miles, use 80 meters during the day and 160 meters at night. Between 250 and 750 miles, use 30 and 40 meters during the day, 80 meters at sunrise and sunset, and 160 meters during the hours of darkness. For openings between 750 and the short-skip limit of 2300 miles, use 17 and 20 meters during the day, 30 and 40 meters at sunset and sunrise, and 80 meters during the night. Expect an increase in short-skip openings on 15, 12, and 10 meters between distances of about 500 and 1300 miles during the daylight hours, but these will occur sporadically. There is also the possibility for openings on 15 and 17 meters during the afternoon hours between distances of approximately 1300 and

April 15 - June 15, 1995
Time Zone: EDT (24-HourTime)
EASTERN USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Central Europe & North Africa	12-17 (1)	05-07 (1) 07-10 (2) 10-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	18-19 (1) 19-21 (2) 21-01 (3) 01-03 (2) 03-04 (1)	20-22 (1) 22-01 (3) 01-02 (2) 02-03 (1) 22-00 (1)* 00-02 (2)* 02-03 (1)*
Northern Europe & Euro-pean USSR	11-16 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-16 (2) 16-18 (1)	19-20 (1) 20-23 (2) 23-01 (1)	20-00 (1)
Eastern Mediter-ranean & Middle East	14-16 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-19 (1) 22-00 (1)	19-21 (1) 21-23 (2) 23-00 (1)	21-23 (1)
Western Africa	12-14 (1)** 10-12 (1) 12-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	20-22 (1) 22-02 (2) 02-03 (1)	00-02 (1)
Eastern & Central Africa	10-13 (1) 13-14 (2) 14-15 (1)	07-09 (1) 13-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	21-01 (1)	22-00 (1)
South-ern Africa	12-14 (2) 14-15 (1)	16-17 (2) 17-18 (3) 18-20 (1) 23-01 (1)	22-00 (2) 00-02 (1)	
Central & South Asia	17-19 (1)	07-10 (1) 14-16 (1) 19-21 (1)	05-07 (1) 19-21 (1)	*Nil*
South-east Asia	*Nil*	08-10 (1) 18-20 (1)	*Nil*	*Nil*
Far East	17-19 (1)	08-10 (1) 18-19 (1) 19-21 (2) 21-23 (1)	04-06 (1)	*Nil*
South Pacific & New Zealand	15-18 (1)** 09-11 (1) 15-17 (1) 17-19 (2) 19-20 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-20 (1) 20-23 (2) 23-02 (1)	02-03 (1) 03-04 (2) 04-06 (3) 06-07 (1)	02-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
Austral-asia	17-20 (1)	07-08 (1) 08-10 (2) 10-11 (1) 15-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (1)	03-05 (1) 05-07 (2) 07-08 (1)	04-07 (1) 04-06 (1)*
Carib-bean, Central America & North-ern Countries of South America	11-14 (1)** 14-16 (2)** 16-17 (1)** 10-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	04-06 (1) 06-07 (2) 07-08 (3) 08-10 (4) 10-11 (3) 11-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	19-20 (1) 20-21 (2) 21-04 (3) 04-06 (2) 06-07 (1)	21-02 (1) 02-05 (2) 05-07 (1) 03-06 (1)*
Peru, Boliva, Para-guay, Brazil, Chile, Argen-tina & Uruguay	12-15 (1)** 15-16 (2)** 16-17 (1)** 08-09 (1) 09-11 (2) 11-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-18 (3) 18-19 (4) 19-20 (3) 20-22 (2) 22-00 (3) 00-01 (2) 01-03 (1)	20-21 (1) 21-04 (2) 04-06 (1)	23-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
McMurdo Sound, Antarc-tica	*Nil*	07-08 (1) 08-09 (2) 09-10 (1) 16-20 (1) 20-23 (2) 23-00 (1)	01-05 (1)	*Nil*

April 15 - June 15, 1995
Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Southern Europe & North Africa	14-16 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-19 (1)	19-21 (1) 21-23 (2) 23-01 (1)	21-00 (1)
Northern Europe & Euro-pean USSR	*Nil*	07-08 (1) 08-10 (2) 10-14 (1) 14-16 (2) 16-18 (1) 20-22 (1)	20-20 (1)	21-22 (1)
Eastern Mediter-ranean & Middle East	*Nil*	07-09 (1) 13-15 (1) 15-17 (2) 17-18 (1) 22-00 (1)	20-00 (1)	*Nil*
Western Africa	12-14 (1) 14-15 (2) 15-16 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	20-01 (1)	*Nil*
Eastern & Central Africa	13-15 (1)	07-09 (1) 13-16 (1) 16-19 (2) 18-19 (1)	21-00 (1)	*Nil*
South-ern Africa	09-11 (1) 11-13 (2) 13-14 (1)	14-16 (1) 16-18 (2) 18-21 (1)	20-22 (1) 22-00 (2) 00-01 (1)	22-00 (1)
Central & South Asia	17-19 (1)	08-10 (1) 17-19 (1) 19-21 (2) 21-22 (1)	05-07 (1) 19-21 (1)	*Nil*
South-east Asia	*Nil*	08-10 (1) 19-22 (1)	05-07 (1)	*Nil*

Far East	18-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1) 20-22 (2) 22-23 (1)	03-05 (1) 05-06 (2) 06-07 (1)	05-06 (1)
South Pacific & New Zealand	15-17 (1)** 11-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	16-19 (1) 19-21 (2) 21-23 (3) 23-03 (2) 03-07 (1) 07-08 (2)	00-02 (1) 02-04 (2) 04-05 (3) 05-06 (2) 06-07 (1)	02-04 (1) 04-05 (2) 05-06 (1) 04-05 (1)*
		08-10 (3) 10-11 (2) 11-13 (1)		
Australasia	16-18 (1) 18-20 (2) 20-21 (1)	06-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-16 (1) 16-18 (2) 18-21 (1) 21-00 (2) 00-02 (1)	02-04 (1) 04-06 (2) 06-07 (1)	04-06 (1)
Caribbean, Central America & Northern Countries of South America	11-13 (1)** 13-16 (2)** 16-17 (1)** 09-11 (1) 11-12 (2) 12-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	00-07 (1) 07-08 (2) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	19-21 (1) 21-22 (2) 22-03 (3) 03-05 (2) 05-07 (1)	21-23 (1) 23-04 (2) 04-06 (1) 00-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	12-15 (1)** 15-16 (2)** 16-17 (1)** 08-10 (1) 10-12 (2) 12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-08 (1) 08-09 (2) 09-10 (3) 10-16 (1) 16-18 (2) 18-19 (3) 19-20 (4) 20-21 (3) 21-23 (2) 23-01 (3) 01-02 (2) 02-04 (1)	21-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-05 (1)	00-04 (1) 01-03 (1)*
McMurdo Sound, Antarctica	15-17 (1)	08-10 (1) 16-18 (1) 18-22 (2) 22-00 (1)	00-06 (1)	*Nil*

April 15 - June 15, 1995
Time Zone: PDT (24-Hour Time)
WESTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Southern Europe & North Africa	*Nil*	07-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-18 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-00 (1)	21-23 (1)
Central & Northern Europe & European USSR	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 22-00 (1)	20-23 (1)	21-22 (1)
Eastern Mediterranean & Middle East	*Nil*	07-10 (1) 10-12 (2) 12-13 (1) 22-00 (1)	20-23 (1)	*Nil*
Western Africa	10-14 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-19 (1)	20-23 (1)	*Nil*
Eastern & Central Africa	10-12 (1)	07-09 (1) 12-14 (1) 14-15 (2) 15-17 (1)	20-22 (1)	*Nil*
Southern Africa	10-13 (1)	07-09 (1) 13-14 (1) 14-16 (2) 16-17 (1) 22-00 (1)	19-22 (1)	20-22 (1)
Central & South Asia	19-21 (1)	08-09 (1) 09-11 (2) 11-12 (1) 17-19 (1) 19-21 (2) 21-23 (1)	04-07 (1)	*Nil*
Southeast Asia	19-21 (1)	07-08 (1) 08-10 (2) 10-11 (1) 21-22 (1) 22-23 (2) 23-01 (1)	04-07 (1)	05-06 (1)
Far East	19-21 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 18-21 (1) 21-23 (2) 23-01 (1)	02-03 (1) 03-06 (2) 06-08 (1)	03-07 (1)
South Pacific & New Zealand	15-18 (1)** 11-13 (1) 13-16 (2) 16-19 (3) 19-20 (2) 20-22 (1)	06-08 (1) 08-11 (2) 11-17 (1) 17-20 (2) 20-21 (3) 21-23 (4) 23-00 (3) 00-02 (2) 02-04 (1)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1)	01-02 (1) 02-05 (2) 05-06 (1) 02-05 (1)*
Australasia	16-18 (1)** 13-16 (1) 16-17 (2) 17-19 (3)	06-08 (1) 08-10 (2) 10-12 (1) 18-20 (1)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2)	02-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
	19-20 (2) 20-22 (1)	20-22 (2) 22-02 (3) 02-03 (2) 03-04 (1)	07-08 (1)	
Caribbean, Central America & Northern Countries of South America	11-14 (1)** 14-16 (2)** 16-17 (1)** 09-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	00-06 (1) 06-08 (2) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-00 (2)	19-20 (1) 20-21 (2) 21-02 (3) 02-04 (2) 04-06 (1)	21-00 (1) 00-03 (2) 03-05 (1)* 01-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	13-16 (1)** 09-10 (1) 10-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (1) 08-10 (2) 10-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-23 (2) 23-01 (1)	20-22 (1) 22-02 (2) 02-04 (1)	21-03 (1) 00-03 (1)*
McMurdo Sound, Antarctica	16-19 (1)	07-09 (1) 16-18 (1) 16-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-00 (1)	03-06 (1)	*Nil*

*Indicates best time for 160 meter opening.
**Indicates best time for 10 meter opening.
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.

2300 miles. Check the *CQ* Short-Skip Propagation Chart which appeared in last month's column for more details.

DX propagation predictions for each amateur band between 10 and 160 meters for the period April 15 through June 15, 1995 appear in the DX Charts with the column. Beginning this month and continuing through the summer and fall, the times shown in the Propagation Charts will be local *daylight* time (EDT, CDT, MDT, and PDT).

Check the day-by-day *general* propagation forecast for April, which appears in the Last Minute Forecast at the beginning of this column.

VHF Ionospheric Openings

Chances for some unusual VHF ionospheric openings during April look pretty good.

Some auroral-type openings should be possible during periods of radio storminess. Check the Last Minute Forecast at the beginning of this column for those days during April that are expected to be Below Normal or Disturbed.

Lyrids, a major meteor shower, is due April 22–24. It will probably peak late April 22 or early on the 23rd, with an average of about 15 good-size meteors entering the earth's atmosphere every hour. This should considerably increase chances for VHF meteor-scatter-type openings.

Sporadic-*E* propagation usually begins to increase during April, and it should continue to do so through the spring and summer months. Look for an increase in short-skip openings on both the 10 and 6 meter bands during the month. Most openings on 10 meters should fall between approximately 750 and 1300 miles. Sporadic-*E* openings, as the name infers, may occur at any time of the day or night, but there is a tendency for them to peak between 8 AM and noon and again between 5 and 9 PM local time.

73, George, W3ASK

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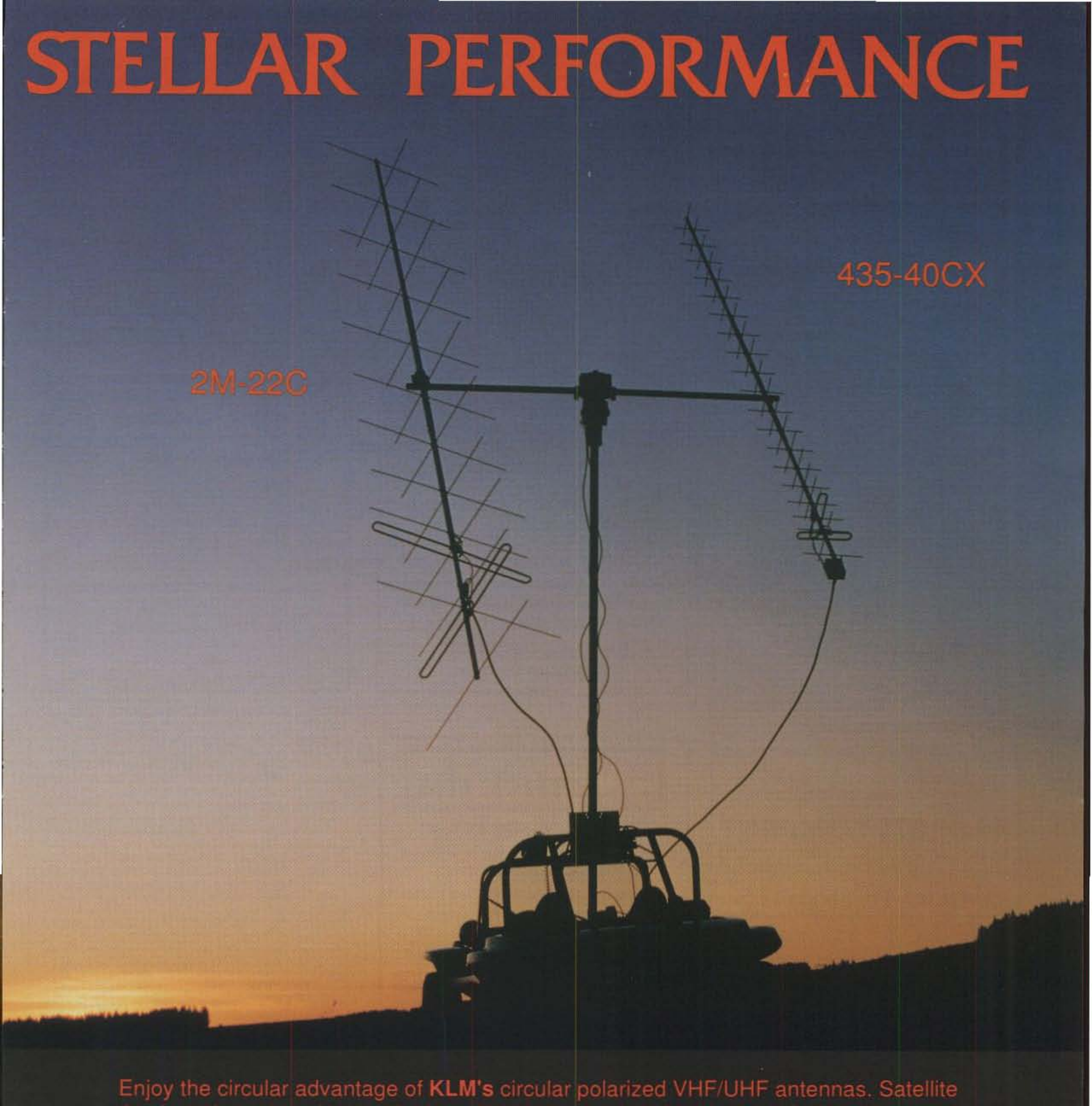

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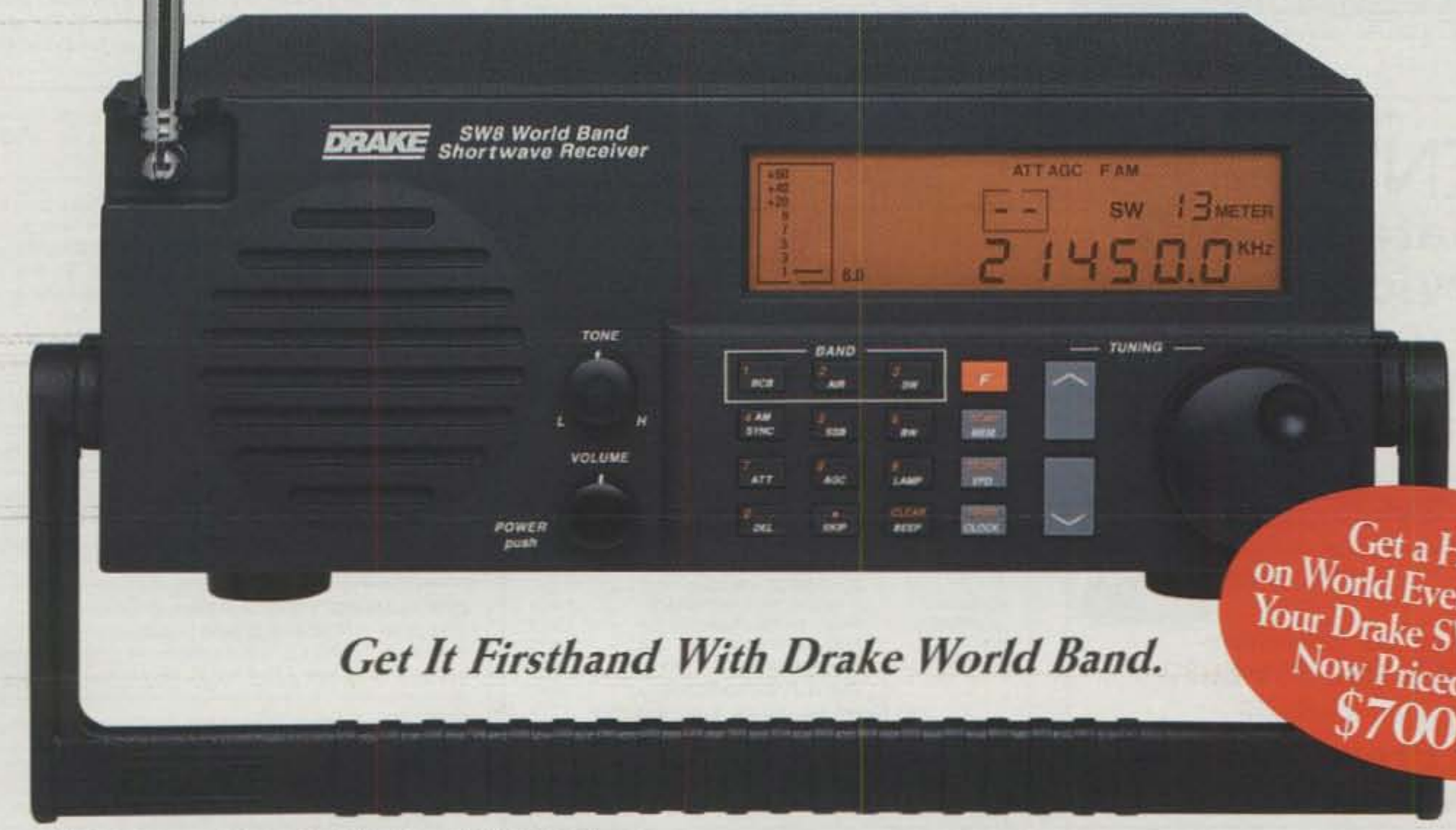

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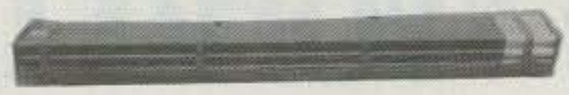

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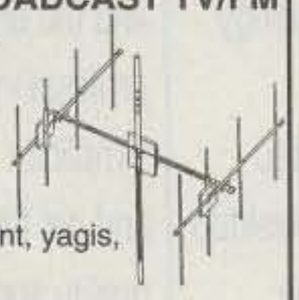

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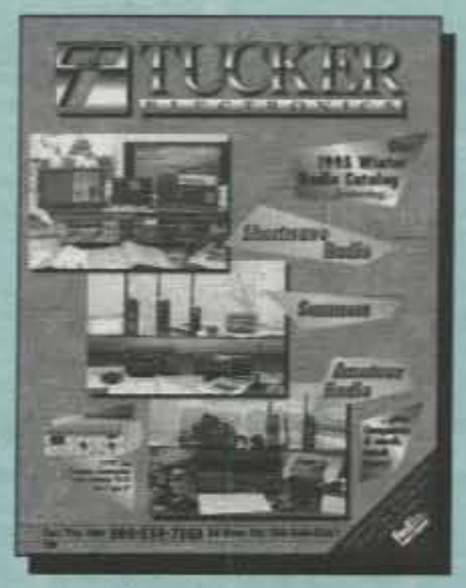

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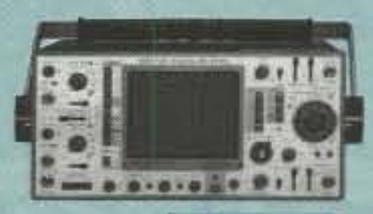

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ANNOUNCEMENTS *(from page 6)*

Apr. 8, **AHSTC/Brown County ARES Swapfest**, Ashwaubenon High School, Green Bay, Wisconsin. For more information, contact Chad Stiles, N9PAY, 2171 Barberry Lane, Green Bay, WI 54304 (414-494-2936); or Lisa Kolbusz, N9VJL, 520A Columbia Ave., Green Bay, WI 54303 (414-497-1807). (Exams.)

April 9, **Raleigh NC ARS 23rd Hamfest and Computer Fair**, NCS Fairgrounds, Jim Graham Bldg., Raleigh, North Carolina. For information contact Rollin Ransom, NF4P, 1421 Parks Village Road, Zebulon, NC 27597 (919-269-4406). (Wheelchair accessible; exams pre-registration only 919-847-8512.)

Apr. 9, **Electronics Expo & Hamfest**, Rockford Metro Centre, Rockford, Illinois. For information, write to RARA, P.O. Box 8465, Rockford, IL 61126-8465, or 815-397-6027. (Handicapped accessible; exams.)

Apr. 15, **Muskegon County ARES and RACES Hamfest**, Pulaski Lodge, Muskegon, Michigan. For tickets and information contact Greg Hoffman, N8RXB, P.O. Box 5313, North Muskegon, MI 49445 (616-759-8786). (Exams.)

Apr. 15, **Oak Ridge Hamfest '95**, National Guard Armory, Clinton, Tennessee. Contact Gene Muncy, KB4UMM, Suite 165, 1345 Oak Ridge Tpk., Oak Ridge, TN 37830. (Exams, preregister by April 14 to Doug Campbell, P.O.B. 6272, Oak Ridge,TN 37831.)

Apr. 15, **Chesapeake ARS SpringFest '95,** The Pavillion at Virginia Beach, Virginia Beach, Virginia. Contact Donald Price, 4105 Indian River Road, Virginia Beach, VA 23456.

Apr. 15, **S.M.A.R.T. Swapfest '95**, Goochland County Fairgrounds, Goochland, Virginia. Contact Buddy Travis, KA4NNN, 703-894-0406. (Exams; handicapped acessible.)

Apr. 16, **MIT ERS, MIT Radio Society & Harvard Wireless Club Flea Market**, Albany and Main Street, Cambridge, Massachusetts. For reservations or further information, call 617-253-3776.

Apr. 21–22, **Old Natchez ARC Hamfest**, Natchez Convention Center, Natchez, Mississippi. Contact ONARC, P.O. Box 2008, Natchez, MS 39120; or call Bill Berry, KI5WP at 601-446-8572; or Eric Smith, KJ5OZ at 601-442-8812.

Apr. 21–23, **1995 International DX Convention**, Holiday Inn, Visalia, California. To register, or for information, send SASE to Ted Davis, W6BJH, P.O. Box 494243, Redding, CA 96049.

Apr. 22, **TRACFEST**, National Guard Armory, Talladega, Alabama. Reservations/info: JT Martin, 4181 Allison Mill Rd., Talladega, AL 35160 (205-362-0478); or call Linda Pettis, 205-362-5212. (Exams.)

Apr. 22, **Flowertown IV Summer Hamfest & Computer Expo**, Charleston Exchange Club Fairgrounds, Summerville (Charleston), South Carolina. Contact Flowertown Hamfest, c/o TARC, P.O. Box 73, Summerville, SC 29484.

Apr. 22, **5th Annual Lewis-Clark Hamfest and Computer Fair**, Walla Walla Community College, Clarkston Center Campus, Clarkston, Washington. Contact Ken Anderson, KB7IAW, 840 Grelle Dr., Lewiston, ID 83501 (208-743-9569 days; or 208-743-1074 eves.). (Exams.)

Apr. 23, **NoBARC Hamfest/Flea Market**, Taconic High School, Pittsfield, Massachusetts. Contact Chuck Lowery, NZ1Z, at 413-447-8377. (Exams.)

Apr. 23, **Moultrie Amateur Radio Klub 33rd Annual Hamfest**, Moultrie/Douglas County Fairgrounds, Arthur, Illinois. Contact Ralph Zancha, WC9V, at 217-873-5287 (eves.). (Exams by pre-registration only.)

Apr. 23, **The PENN-DEL ARC Annual Hamfest**, at the Nur Temple, New Castle, Delaware. For information contact Hal Frantz at 302-798-7270. (Exams.)

Apr. 23, **Blossomland ARA 36th Annual Swap-n-Shop**, St. Joe Kicker Sport Club, St. Joseph, Michigan. For information send SASE to Blossomland ARA, 1051 Main Street, St. Joseph, MI 49085; or call 616-982-0404.

Apr. 29, **Gastonia Area ARC Hamfest**, Karyae Park, Gastonia, North Carolina. Contact: GAARC, P.O. Box 85, Iron Station, NC 28080-0085, Attn: Bill, WB4TSW (phone 704-732-1005; FAX 704-434-5832). (Exams.)

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(continued on page 147)

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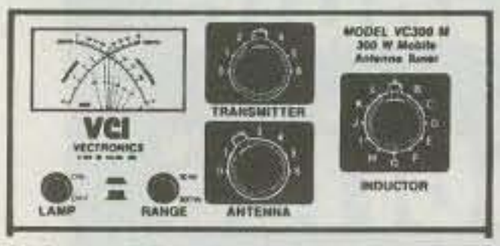
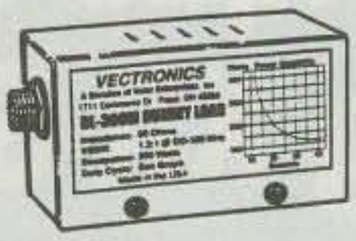
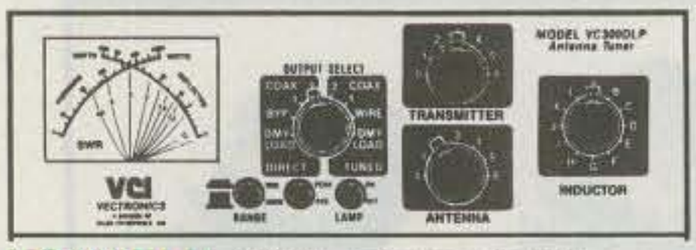


VC300M 300W Mobile Tuner

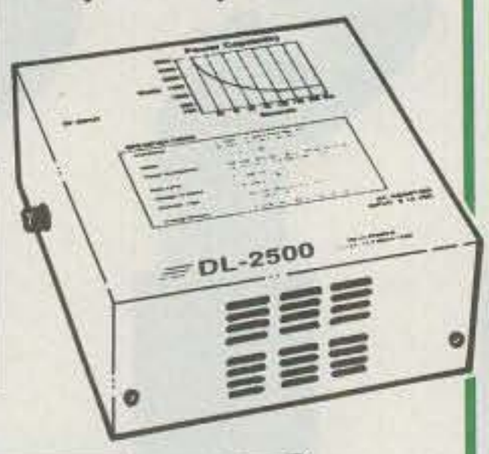


DL300M
300 Watt, 150 MHz, Dry Dummy Load



VC300DLP 300W Antenna Tuner

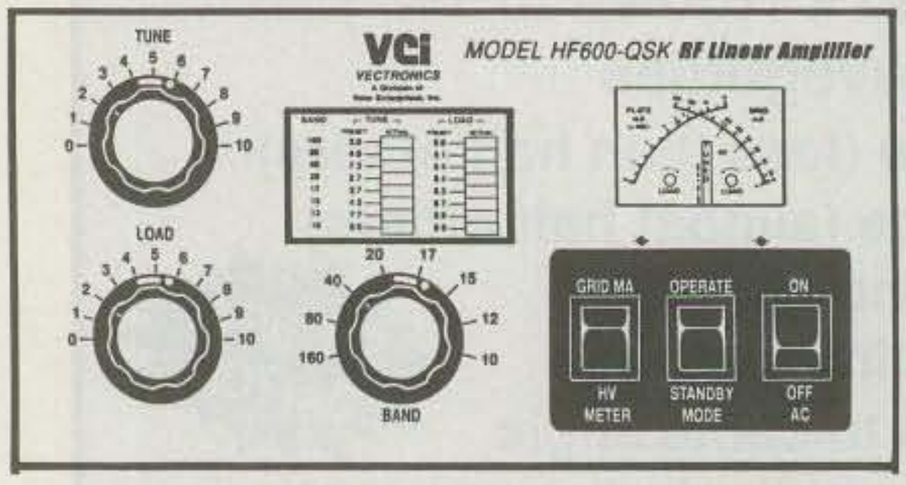
DL2500
2500 Watt, 150 MHz, Dry Dummy Load



VC300D 300W Digital Antenna Tuner

HFT1500 1500W Antenna Tuner

DL650M
1500 Watt, 650 MHz, Dry Dummy Load



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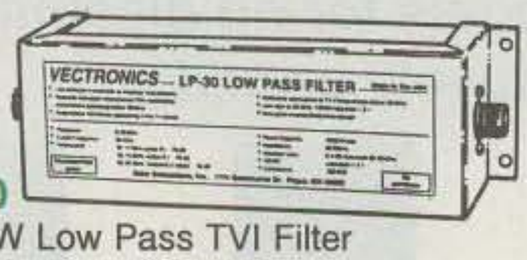

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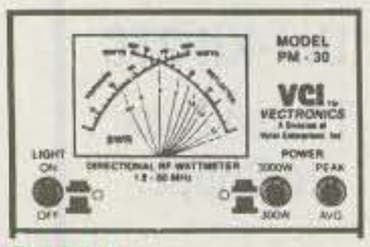
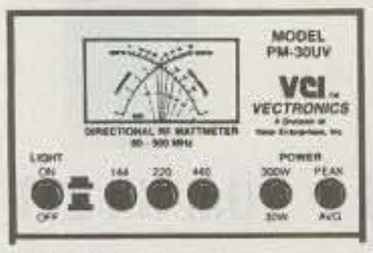
HPF1
High Pass TV Filter



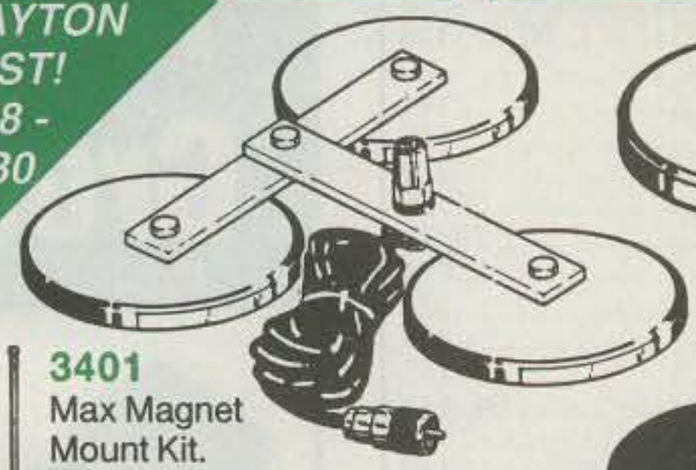
PM30
300W/3kW Wattmeter



PM30UV
30W/300W Wattmeter

AT100
Mobile Active Antenna/Tuner

We also have 13.8Vdc Power Supplies



3401
Max Magnet Mount Kit.
(Black: **3401B**)

401
5" Chrome Magnet Mount Kit. (Black: **401B**)

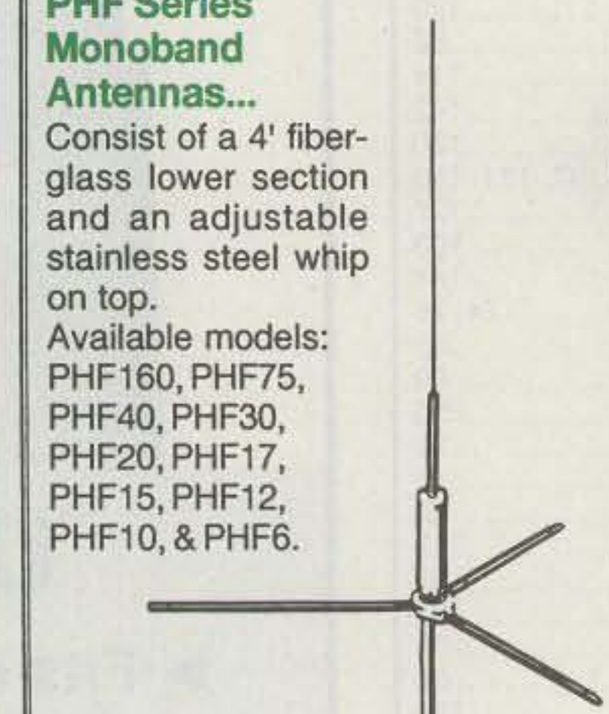
401BSO
SO-239 Black 5" Magnet Mount Kit.

PHF Series Monoband Antennas...
Consist of a 4' fiberglass lower section and an adjustable stainless steel whip on top.
Available models: PHF160, PHF75, PHF40, PHF30, PHF20, PHF17, PHF15, PHF12, PHF10, & PHF6.

PAM
3-3/4" Chrome Magnet Mount Kit. (Black: **PAMB**)

PAM2
3-1/4" Chrome Magnet Mount Kit. (Black: **PAM2B**)

PAM4
5" Chrome Magnet Mount Kit. (Black: **PAM4B**)



MM450B
MICRO-MAG® Mobile Antenna. 440-450 MHz.

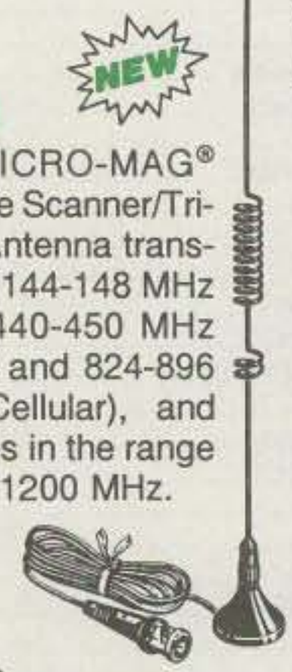
AB5
Complete 5 band HF Mobile Antenna System w/ resonators for 10, 15, 20, 40, and 75 meters.

MM144B
MICRO-MAG® 2 Meter Mobile Antenna. 144-148 MHz.

GM144
Glasmaster™ Glass Mount Antenna; 144-148 MHz.

GM270
Dual Band Glasmaster™ Glass Mount Antenna. 144-148 and 440-450 MHz.

MM3B
The MICRO-MAG® Portable Scanner/Tri-Band Antenna transmits at 144-148 MHz (2m), 440-450 MHz (UHF), and 824-896 MHz (Cellular), and receives in the range of 100-1200 MHz.



MM270B
MICRO-MAG® Dual Band Antenna. 144-148 and 440-450 MHz.

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FT-2500M
Heavy Duty, 2 Meter Mobile 50 Watts, Large LCD Display

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FT-5100
Compact 2M/70cm Mobile. Built-In Antenna Duplexer

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FT-51R
Dualband Handheld Easy-To-Use Scrolling Instruction Menu-Cloning Memories

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100 Watt HF Transceiver w/General Cov. Receiver

FT-736R
Multi-Mode VHF/UHF Full Duplex Base, Optional Modules For Extra Bands

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2 Meter Mobile. Compact Size With 3 Power Levels

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Dual Band Mobile With Snap-Off Front Panel

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FT-900
New Compact HF Transceiver

- Snap-Off Front Remote Control Panel
- 100 Watts
- Built-In Antenna Tuner

FT-290MKII
True Field Operation For Fun Or Emergency. All Mode, 2 Meter, 25 Watts

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G-500
G-800S
G-800SDX
G-1000SDX
G-5400B

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50kHz-30MHz Receiver With 50 Memories and New Broadcast Band Mode

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FT-11R
2 Meter, FM Handheld. World's Smallest Size HT With Full Sized Keyboard

STANDARD

C558A
VHF/UHF FM HT Super Compact Size, Cross-Band Operation, Twin Band Scanning, Receive AM

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C188A
Ultra Thin 2 Meter FM HT, 200 Memory Channels, Keyboard Under A Slide-Cover Plus Wakeup Feature

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AR270B	$ 84.95
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RS20A	$ 89
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RS50A	$215
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RS20M	$109
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VS50M	$244

MFJ

MFJ-989C

MFJ-493

MFJ-1270C

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1702B	$ 19	493	$119
1704	$ 54	498	$159
1763	$ 37	784	$198
1768	$ 45	815B	$ 59
1786	$249	817	$ 69
1796	$165	8621	$108
1798	$229	9020	$144
209	$ 94	9420	$179
249	$165	934	$144
259	$188	949E	$119
283, 284, 285, 286	$ 22	962C	$195
346	$169	986	$242
407	$ 63	989C	$292

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9600 Baud Packet Ready From The Box. 50W On 2M, 40W On 440MHz

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Don't let your contest results depend on "previous generation" technology. Get the Dxer's advantage with the "Next Generation" IC-738.

FEATURES

- ☐ New DDS Technology
- ☐ 100W (SSB, CW, FM) 40W AM Standard
- ☐ AT-170 High Speed Automatic Antenna Tuner (160-10 Meters)
- ☐ Two Antenna Connectors (Front Panel Switchable)
- ☐ 4 Function Meter (SWR/ALC/PO/S)
- ☐ VOX
- ☐ RF Gain
- ☐ Pass Band Tuning
- ☐ Notch Filter
- ☐ 10 Electronic Scratch Pad Memories
- ☐ 101 Memory Channels (10 split, 2 scan edge)
- ☐ RIT/ΔTx Functions
- ☐ Quick Split w/Simultaneous Display
- ☐ Speech Compressor
- ☐ Attenuator (20 db)
- ☐ Pre Amplifier (20 db)
- ☐ Double Band Stacking Registers
- ☐ Set Mode Menu to Customize Operation
- ☐ Menu Selectable CW Filters
- ☐ Noise Blanker
- ☐ Fast/Slow AGC
- ☐ High Dynamic Range/Low Distortion
- ☐ Built-in Electronic Keyer
- ☐ Direct Keyboard Entry
- ☐ Hand Microphone Included (HM-36)
- ☐ Computer Control Port (CI-V)

NEXT GENERATION TECHNOLOGY

Next Generation Circuitry	**DDS (Direct Digital Synthesis)** ICOM's unique DDS IC is used for the LPL Circuit. High tech and compact, the PLL unit improves frequency resolution to 1 Hz step. You'll experience an analog feeling of the tuning, faster PLL lockup times, improved phase noise blocking and high dynamic range.
Next Generation Tuner	**AT-170 Advanced Tuner** Preset memories, in 100kHz steps, provide very high speed tuning. "Automatic re-tune" turns the AT-170 on, and tunes, when SWR exceeds 1.5:1 "Through inhibit" permits tuning at SWR conditions up to 3:1 (when your antenna can't be tuned to 1.5:1). "Sensitive/Normal" gives you the choice of minimum possible SWR or 1.5:1. This eliminates tuning each time you transmit, unless desired.
Next Generation Duty Cycle	**100% Full Duty** The final power amplifier outputs a stable 100 W in SSB, CW and FM modes. The aluminum die cast frame, large heatsink and innovative twin cooling fan system stabilize the PA circuit to ensure 100% duty cycle operation.
Next Generation Frequency Management	**Quick Split Operation** Pre-programmable offsets, simultaneous display of Tx and Rx frequencies and XFC (Transmit Frequency Change) give you a competitive edge when calling Dx stations operating split frequencies. "Split Lock" permits changes in your transmit frequency while protecting your receive freqeuency against accidental changes.
Next Generation CW Operation	**CW Contest Package** Our built-in electronic keyer with separate key jack, full break-in (QSK) and separate jacks for an extended CW key or memory keyer, make a competitive package for CW contesting. For example, use a memory keyer (or TNC with CW capability) to make contacts easily, then use your paddle for normal operation.

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NEW HF

Compact HF Transceiver **FT-900AT**

Introducing an HF that's going places.

"With the small snap-off remote front panel design, it's an HF mobile."

"It's a great base, too. Direct keypad entry, built-in antenna tuner, CW keyer with adjustable speed, 100 Watts, Omni-Glow display... Wow!"

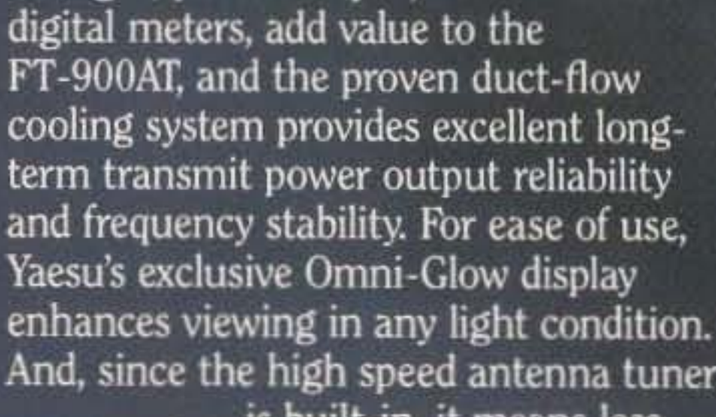
"Yaesu did it again!"

DX-CARIBE CRUISE '95
for details call or write Yaesu USA Today!
1995

Uncompromising HF quality that will change your lifestyle. It's the first transceiver with true HF technology to go mobile in any vehicle or stay at home as a compact base station.

With its revolutionary, small, snap-off remote panel, the controls of the FT-900AT can install almost anyplace in your car, truck or camper. Since the 100 Watt RF deck can be installed under a seat or in your car trunk, it's away from critical automotive electronic wizardry. And, for ultimate convenience, the built-in antenna tuner simplifies in-car operation.

As a base station, the compact full function FT-900AT includes direct keypad entry for pinpoint accuracy during quick band/frequency changes. Other features you'll like include CW keyer with front panel speed adjustment, speech processor, twin stacking VFOs, and IF Shift and Notch. No competitor offers this! Bonuses, such as signal strength, power output, SWR and ALC digital meters, add value to the FT-900AT, and the proven duct-flow cooling system provides excellent long-term transmit power output reliability and frequency stability. For ease of use, Yaesu's exclusive Omni-Glow display enhances viewing in any light condition. And, since the high speed antenna tuner is built-in, it means less clutter in your shack.



The FT-900AT controls mount almost anywhere in your car, truck or camper. 100 Watt RF deck can mount in trunk, or under seat.

Remote front panel control head measures only 2-1/4"H x 9-1/8"W x 1-1/4" D.

For sheer high-performance, anywhere, the incomparable FT-900AT ranks with the FT-1000 to further establish Yaesu as the choice of the world's top DX'ers.

Trust Yaesu to know what you want. True HF you can take with you or leave at home! Available now at your Yaesu dealer.

Specifications

- Remote Front Panel Design
- Built-In Auto Antenna Tuner
- Direct Keypad Entry when used as a Base Station
- Large, Bright Omni-Glow™ LCD Display
- 100W on SSB, CW, FM modes; 25W on AM
- IF Shift and 30db Notch Filter
- Digital S/RF, SWR & ALC Meters
- Programmable CTCSS Encode w/Repeater Offset
- Direct Digital Synthesis (DDS)
- 100 Memory Channels
- Frequency Range
  RX: 100 kHz-30 MHz
  TX: 160-10 meters
- CW Full Break-in Keying w/ Adjustable Speed
- Fast/Slow AGC Circuit
- Intercept Point Optimization
- Duct Flow Cooling System
- Twin Band Stacking VFOs
- Built-in Noise Blanker
- Built-in Adjustable Speech Processor

ACCESSORIES:
YSK-900 Remote Mount Kit
MMB-62 Controller Bracket
MMB-20 Mobile Mtg. Bracket
SP-7 Mobile External Spkr.
SP-6 Base Station External Spkr.
DVS-2 Digital Voice Recorder
FP-800 20A HD Power Supply
YH-77ST Headphone

YAESU

Choice of the World's top DX'ers

Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

2m/70cm Mobiles **FT-2500M/FT-7400H**

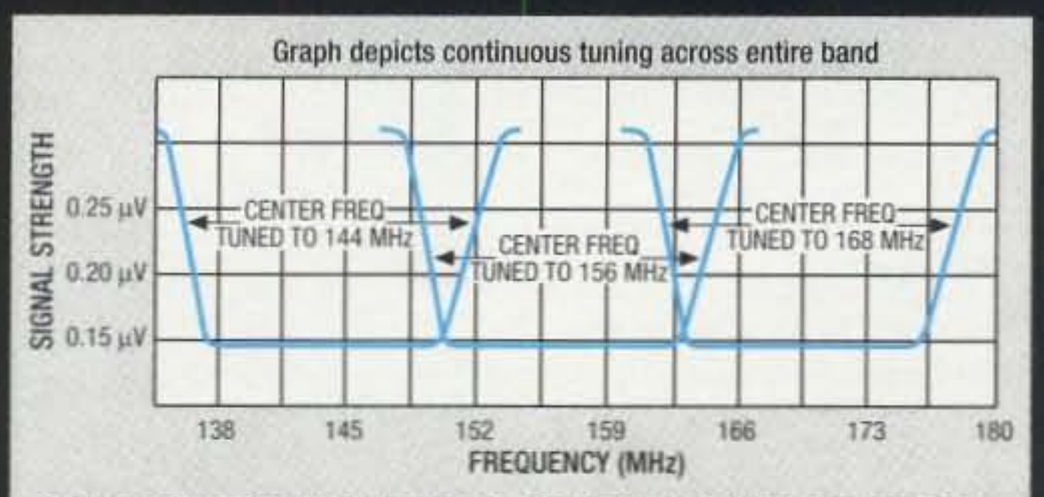
Advanced Track Tuning, Mil Spec, true FM. All in one radio!

Outside, you can easily see why the FT-2500M stands up to the shock and vibration like no other. We engineered the first mobile radio to meet the rigid standards set by the U.S. Military back in the '80s, and that same critical design is in the FT-2500M. From the simplified front panel, rubber coated knobs, durable pebbled finish coating, and huge Omni-Glow™ display to the one-piece die-cast chassis, the FT-2500M can take whatever you throw at it!

Inside, the electrical circuitry meets standards so uncompromising the FT-2500M can respond like no other radio. Built-in 3-Stage Advance Track Tuning (ATT), automatically retunes from 140 to 174 MHz permitting consistent receiver sensitivity across the entire band.

But there's more. Like alpha-numeric display capability! Lets you program a frequency or a 4-character name on any of the 31 memories. With three selectable power output levels and up to 50 watt power output, the FT-2500M extra large heat sink means forced air cooling is not necessary. And, as a bonus, Yaesu's exclusive backlit DTMF mic comes with every FT-2500M.

Experts say the FT-2500M is the only commercial-grade amateur radio available. So, for tough manufacturing standards, inside and out, with true FM clarity, and outstanding performance, the FT-2500M is your mobile.



3-Stage Advance Track Tuning (ATT) – The exclusive 3-Stage Advance Track tuning front end automatically adjusts band width sensitivity across the entire receiver range, while maintaining selectivity specifications. ATT significantly reduces interference from inter-modulation and front end overload.

Specifications

- **Frequency Coverage:**
  FT-2500M
  RX: 140-174 MHz
  TX: 144-148 MHz
  FT-7400H
  RX/TX: 430-450 MHz
- Rugged Military Spec Design
- Advanced Track Tuning (ATT)
- Selectable Alpha-Numeric Display
- Omni-Glow™ Display, largest available
- Power Output:
  FT-2500M 50/20/5 Watts
  FT-7400H 35/15/5 Watts
- Flip Up Front Control Panel hides seldom used buttons
- Backlit DTMF Mic
- 31 Memory Channels
- CTCSS Encode Built-in
- Automatic Power Off (APO)*
- Time-Out Timer (TOT)*
- Manual* or Automatic Backlighting Adjustment
- **Accessories:**

FP-800	20 Amp HD Power Supply w/ Front Mounted Speaker
FRC-6	DTMF Paging Unit
FTS-17A	CTCSS Decode Unit
SP-4	External Mobile Speaker w/ Audio Filters

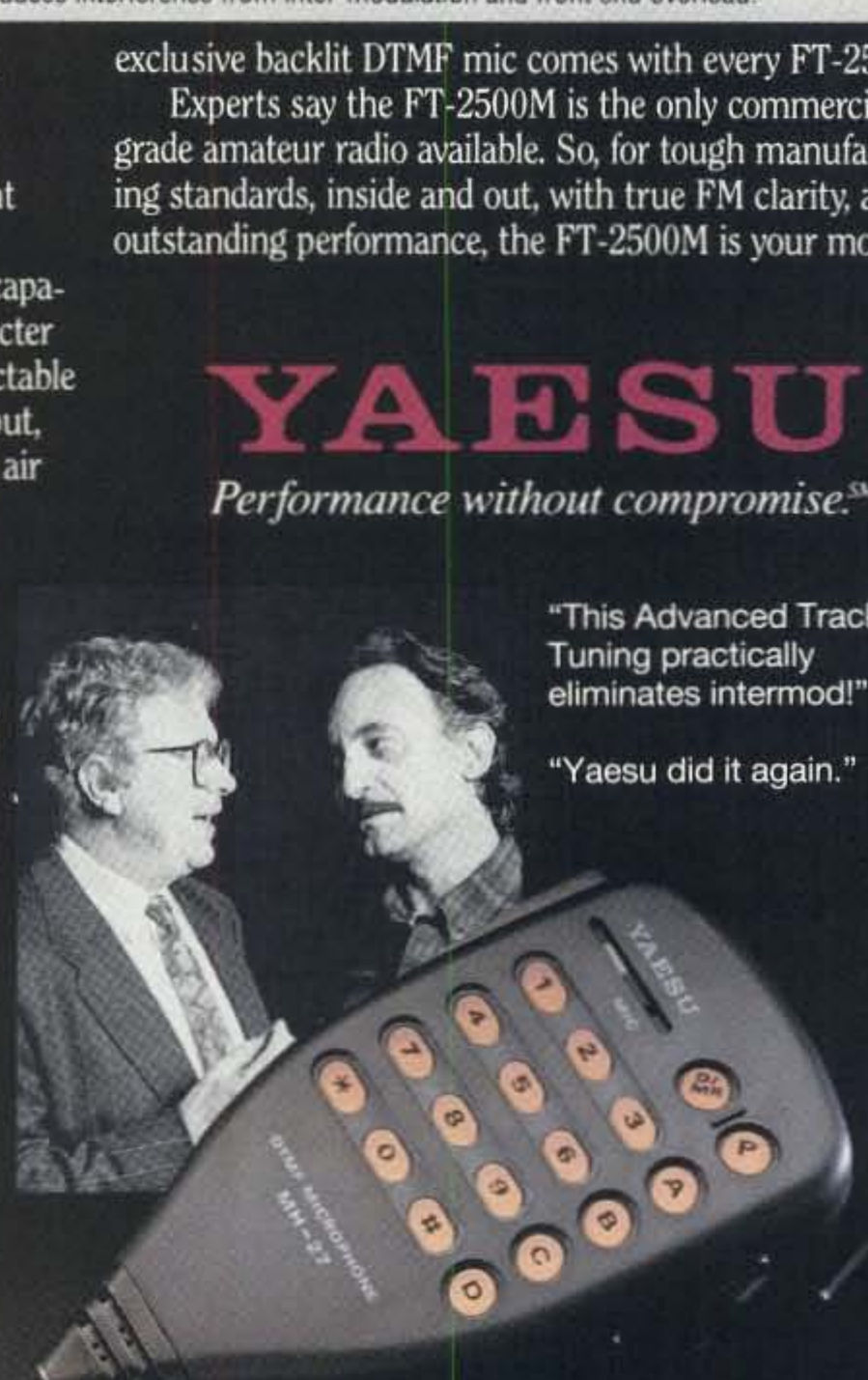
*FT-2500M

YAESU

Performance without compromise.℠

"Just look inside. Military spec really means something to Yaesu!"

"A QST review says 'the FT-2500M exhibited superior 10 MHz offset IMD dynamic range of 103 db!' "



"This Advanced Track Tuning practically eliminates intermod!"

"Yaesu did it again."

US MILITARY APPROVED MIL-SPEC 810

FT-2200/7200

Just 5.5"W x 1.6"H x 6.5"D, the FT-2200/7200 radios are designed to fit into today's more compact cars with ease.

SPECIFICATIONS • Frequency Coverage: FT-2200 RX: 110-180 MHz, TX: 144-148 MHz. FT-7200 RX/TX: 430-450 MHz. • Wide Receiver Coverage: 110-180 MHz • AM "Aircraft" Receive: 110-139 MHz • Built-in DTMF Paging/Coded Squelch • Selectable Channel Only Display • 10 Memory DTMF Auto Dialer • Backlit DTMF Mic • Power Output 50/20/5 Watts (FT-7200 35/15/5 Watts) • 50 Memory Channels • Remote Operation w/ Optional MW-2 • CTCSS Encode Built-in • Optional Digital Voice Storage System. Accessories: See your authorized Yaesu dealer.

Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

"Built-in VOX? Right!"

"Dual Decode. Now that's a first!"

"Wow, a real Battery Voltage Readout!"

"Yaesu did it again!"

DX-CARIBE CRUISE '95
for details call or write
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1995

FEATURES	Yaesu FT-530	Kenwood TH-	Alinco	Icom AT
Memory Channels	82			
Slide-out Lithium Battery	YES			
Dual CTCSS Decoder	YES			
Battery Voltage Readout	YES			
Automatic CTCSS Tone Search	YES	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

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SEE YOUR DEALER FOR DETAILS
LIMITED TIME OFFER.

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.℠