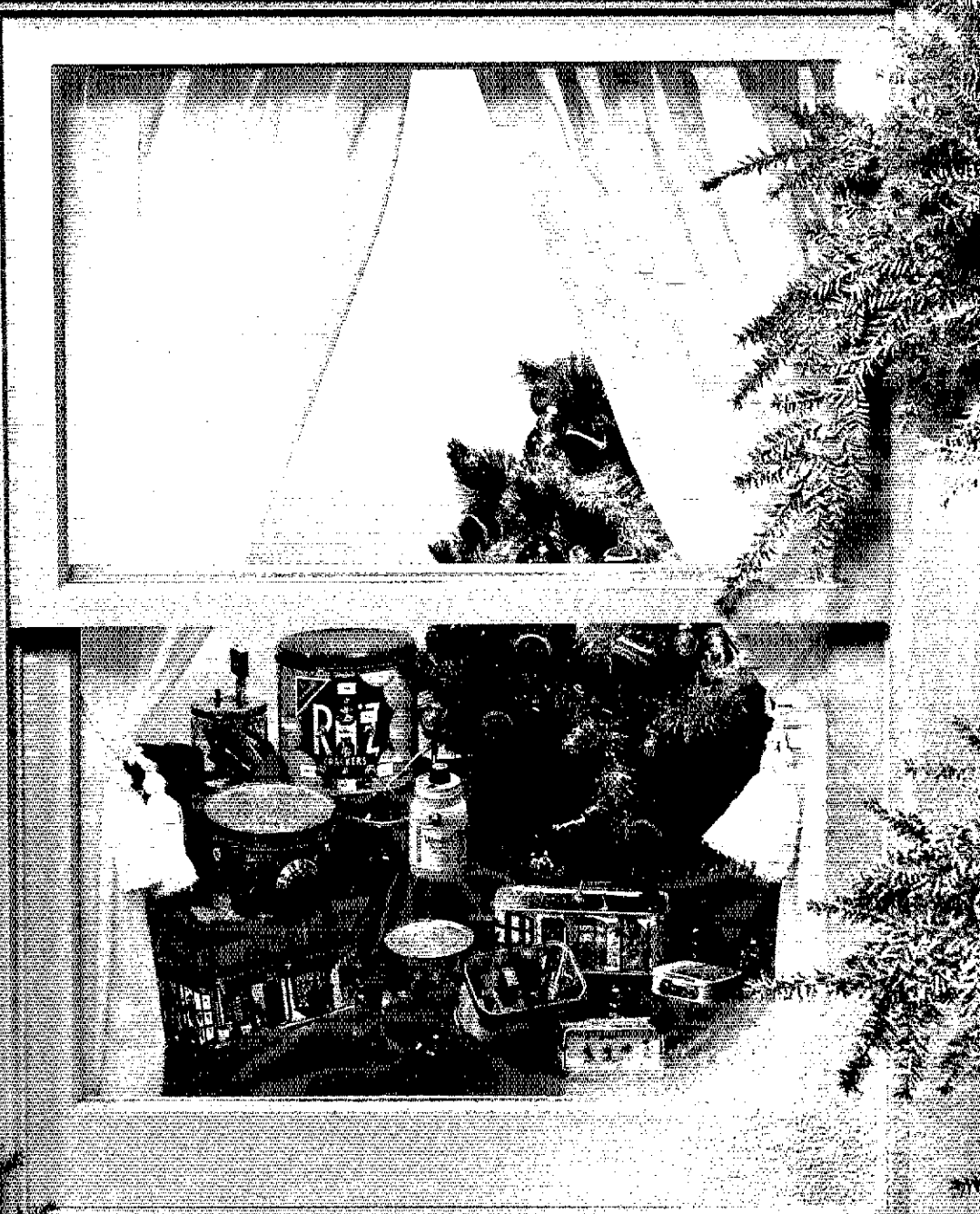


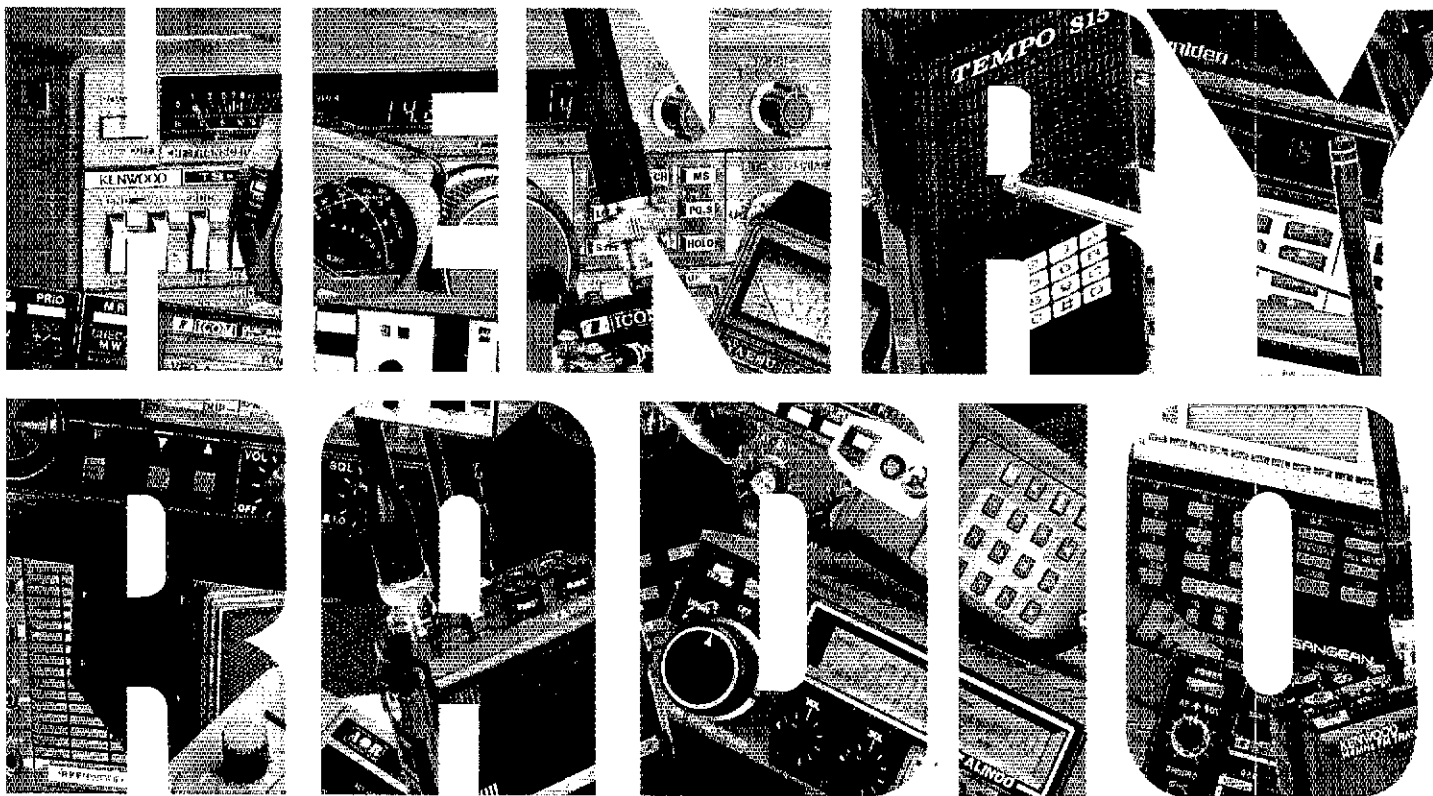
QST

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- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.



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- **31 memory channels.** Store frequency, mode and CW wide/narrow selection. Split frequencies may be stored in 10 channels for repeater operation.
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- **MC-43S UP/DOWN mic. included.**

Optional Accessories:

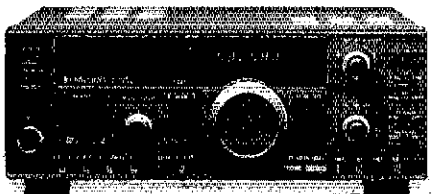
- **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface
- **MA-5/VP-1** HF mobile antenna (5 bands)
- **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic • **MC-55** (8-pin) goose neck mobile mic • **MC-60A/MC-80/MC-85** disk mics.
- **PG-2S** extra DC cable • **PS-430** power supply
- **SP-40/SP-50B** mobile speakers • **SP-430** external speaker • **SW-100A/SW-200A/SW-2000** SWR/power meters • **TL-922A** 2 kW PEP linear amplifier (not for CW QSK) • **TU-8** CTCSS tone unit
- **YG-455C-1** 500 Hz deluxe CW filter, **YK-455C-1** New 500 Hz CW filter.



TS-680S

All-mode multi-bander

- 6m (50-54 MHz) 10 W output plus all HF Amateur bands (100 W output).
- Extended 6m receiver frequency range 45 MHz to 60 MHz. Specs. guaranteed from 50 to 54 MHz
- Same functions of the TS-140S except optional VOX (VOX-4 required for VOX operation).
- Preamp for 6 and 10 meter band.



Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features and prices are subject to change without notice or obligation.

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NEW

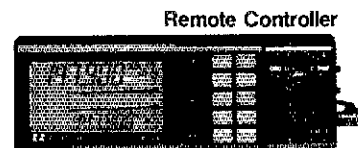
ICOM IC-900

Six Bands in One Mobile!

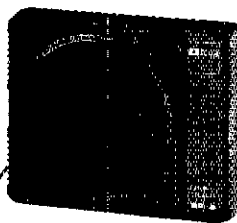
ICOM IC-900 FIBER OPTIC FM MOBILE

ICOM introduces the revolutionary IC-900 multi-band FM mobile transceiver. ICOM, first in utilizing fiber optic technology in amateur radio, enables you to create your own mobile communications system. Six band combinations... 10M FM, 6M, 2M, 220MHz, 440MHz, and 1.2GHz. It's the most advanced, versatile, compact, and easy-to-use mobile available.

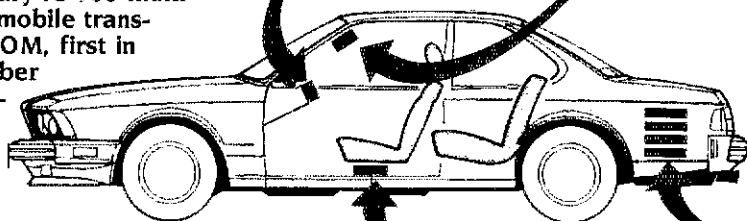
Features Galore. The IC-900 is an operator's dream... Listen on two bands simultaneously or transmit on one band and receive on a different band when using a second speaker (**true full duplex crossband operation**), 10 memories per band, independent PL tones and



Remote Controller

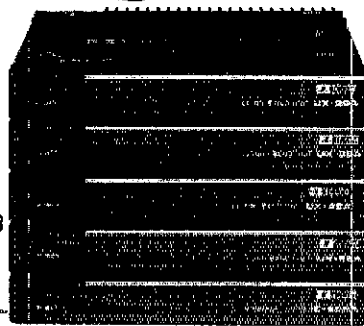


Speaker



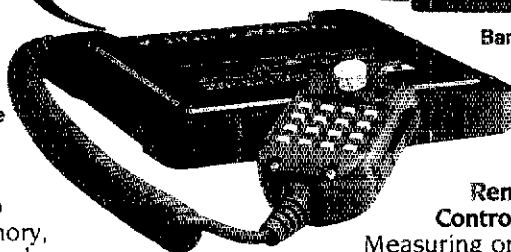
Interface Unit A is installed in a location near the driver's seat.

Interface Unit B controls the six band units and can be installed in your car's trunk. A fiber optic cable runs from Interface A to Interface B, which transports an abundance of information through a 3/16" cable and eliminates RF feedback.



Band Units/Interface Unit B

Interface Unit A



offset into each memory, memory and programmable band scan, and all subaudible tones in actual Hz readout.

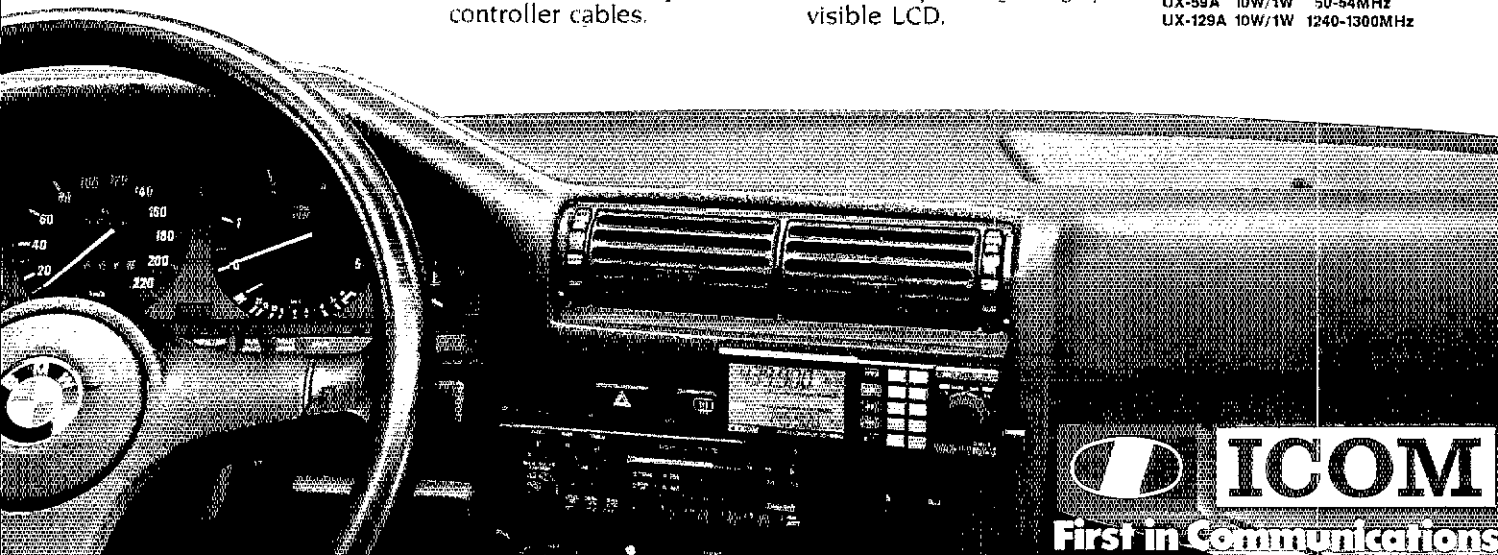
The IC-900 includes an ultra compact remote controller, an Interface A unit, Interface B unit, SP-8 speaker, HM-14 up/down DTMF mic, fiber optic and controller cables.

Remote Controller.

Measuring only 2 inches high by 5.7 inches wide by 1 inch deep, the remote controller can be installed on your car's dash or sun visor with the supplied velcro. And, if you want, take the controller with you when you leave your car. The controller features a super large, highly visible LCD.

Band Units are "stacked" onto the Interface B Unit via the supplied mounting bracket. Optional band units available are:

Band Unit	Power Output	Frequency
UX-19A	10W/1W	28-30MHz
UX-29A	25W/5W	138-174MHz Rx; 140.1-150MHz Tx
UX-29H	45W/5W	138-174MHz Rx; 140.1-150MHz Tx
UX-39A	25W/5W	216-236MHz Rx; 220-225MHz Tx
UX-49A	25W/5W	440-450MHz
UX-59A	10W/1W	50-54MHz
UX-129A	10W/1W	1240-1300MHz



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ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4

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OUR COVER



If you like constructing your own equipment, here's proof that you don't have to build it square and gray. Among the goodies under the tree this year: Crystal-controlled marker generators in hot-drink-mix, vitamin and olive containers; a 30-meter VFO in a gift tin; a tape-recorder controller in a cat-food can; a 40-meter QRP CW transceiver in a bandage box; an active audio filter in a throat-lozenge can and a really ritzy audio amplifier. If choosing a chassis has you coming up short on cash, use an enclosure that's as fun to empty as it is to fill! (cover credits: Sue Fagan, Greg Kwasowski and Meyers Studio)

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Handheld DX with the DX Handy™

The idea of handheld DX seems far-fetched, but it's actually very simple. The DX Handy is a battery powered (six penlight AA drycells included) SSB/CW transceiver with two watts output. DX Handy can also use nicad rechargeable batteries, or be powered with 9 VDC.

Two variable crystal oscillators (VXOs), each with 50 KHz range, can be selected with a top panel switch. Crystals for 28.250 to 28.300 and 28.300 to 28.350 Mhz are included, and other crystal ranges for the 10 meter band are also available at a nominal cost.

CW operation can be by either the built-in push button or with an external key or keyer. External speaker and microphone jacks are also provided, and the telescoping antenna is included. The DX Handy also has a top panel S-meter/ output power meter and an effective noise blanker circuit. DX Handy is housed in an attractive gray metal case comparing in size to popular VHF FM handhelds.

Ten meters is coming back strong. With DX Handy all amateurs, novice to extra class, can enjoy the thrill of working handheld DX.

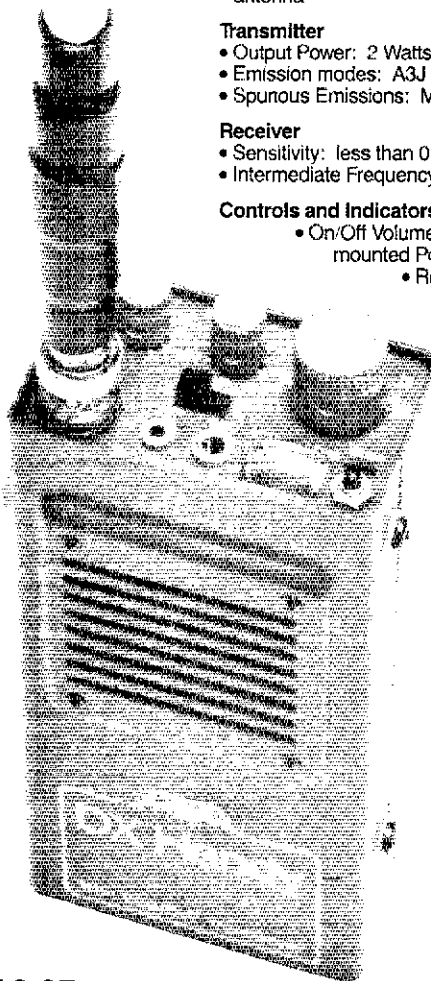
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Specifications

General

- Frequency Coverage: Any two 50 KHz segments in the 28.0–29.0 MHz Amateur Band (28.25–28.30 and 28.30–28.35 MHz supplied)
- Frequency Control: VXO provides 50 KHz of continuous tuning with a single crystal
- Frequency Stability: Within ± 500 Hz from a cold start
- Antenna: 50 Ohms Unbalanced, BNC connector
- Power Requirement: 8.4–9.0 VDC
(Included): 6-AA Dry Cells (1.5 volt/cell) = 9.0 VDC
(Optional): 7-AA NiCads (1.2 Volt/cell) = 8.4 VDC
- Current Drain: Receiving - Approx. 70 mA
Transmitting - Approx. 620 mA
- Dimensions: (W) 66mm \times (H) 39mm \times (D) 142mm
- Weight: 710 Grams (1 lb. 9 oz.) with batteries and antenna

Transmitter

- Output Power: 2 Watts at 9.0 VDC
- Emission modes: A3J (USB) and A1 (CW)
- Spurious Emissions: More than 40 dB down

Receiver

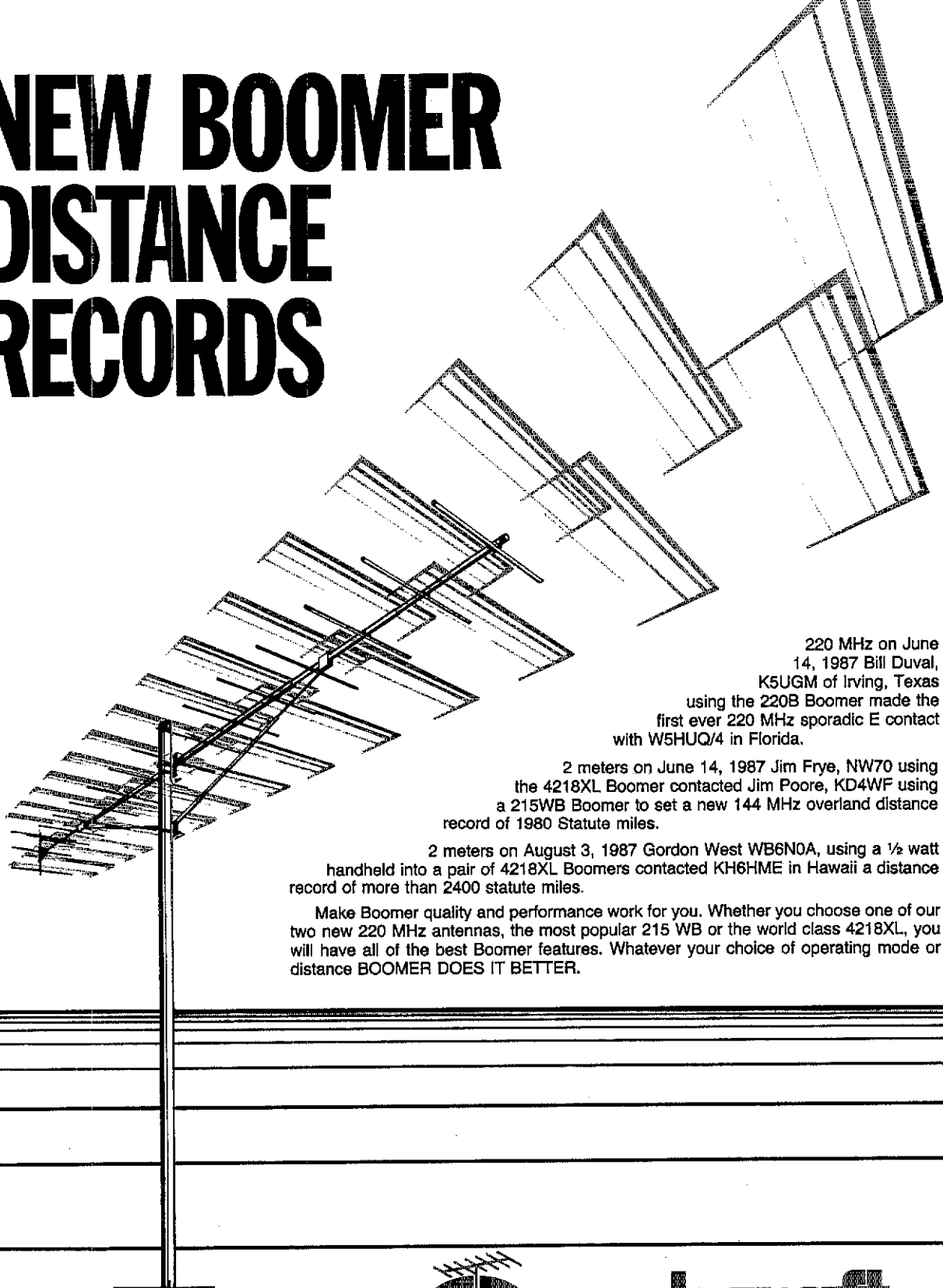
- Sensitivity: less than 0.5 μ V for 15 dB S/N
- Intermediate Frequency: 11.2735 MHz

Controls and Indicators

- On/Off Volume control Top mounted Potentiometer
- Receiver Incremental Tuning (RIT): Top mounted Potentiometer with center off detent position
- Frequency: Top mounted 50 KHz VXO
- Frequency Range: Top mounted 2-position switch
- Noise Blanker: Top mounted On/Off switch
- S/Rf meter: Top mounted S/Rf meter
- Built in CW key: Top mounted momentary switch
- External Speaker output: Top mounted $\frac{1}{8}$ " phone jack
- External Microphone input: Top mounted $\frac{1}{8}$ " phone jack
- Antenna Connector: Top mounted Female BNC
- Transmit Indicator: Top mounted Transmit LED
- Push-To-Talk: Side mounted momentary switch
- External Power: Bottom mounted 2.1 mm coaxial
- External key input: Bottom mounted $\frac{1}{8}$ " phone jack
- Mode Selector Switch: Bottom mounted 2-position switch
- Charge/External Power: Bottom mounted 2-position switch selecting 12 VDC external power function

Specifications and prices subject to change without notice or obligation.

NEW BOOMER DISTANCE RECORDS



220 MHz on June 14, 1987 Bill Duval, K5UGM of Irving, Texas using the 220B Boomer made the first ever 220 MHz sporadic E contact with W5HUQ/4 in Florida.

2 meters on June 14, 1987 Jim Frye, NW70 using the 4218XL Boomer contacted Jim Poore, KD4WF using a 215WB Boomer to set a new 144 MHz overland distance record of 1980 Statute miles.

2 meters on August 3, 1987 Gordon West WB6N0A, using a 1/2 watt handheld into a pair of 4218XL Boomers contacted KH6HME in Hawaii a distance record of more than 2400 statute miles.

Make Boomer quality and performance work for you. Whether you choose one of our two new 220 MHz antennas, the most popular 215 WB or the world class 4218XL, you will have all of the best Boomer features. Whatever your choice of operating mode or distance BOOMER DOES IT BETTER.

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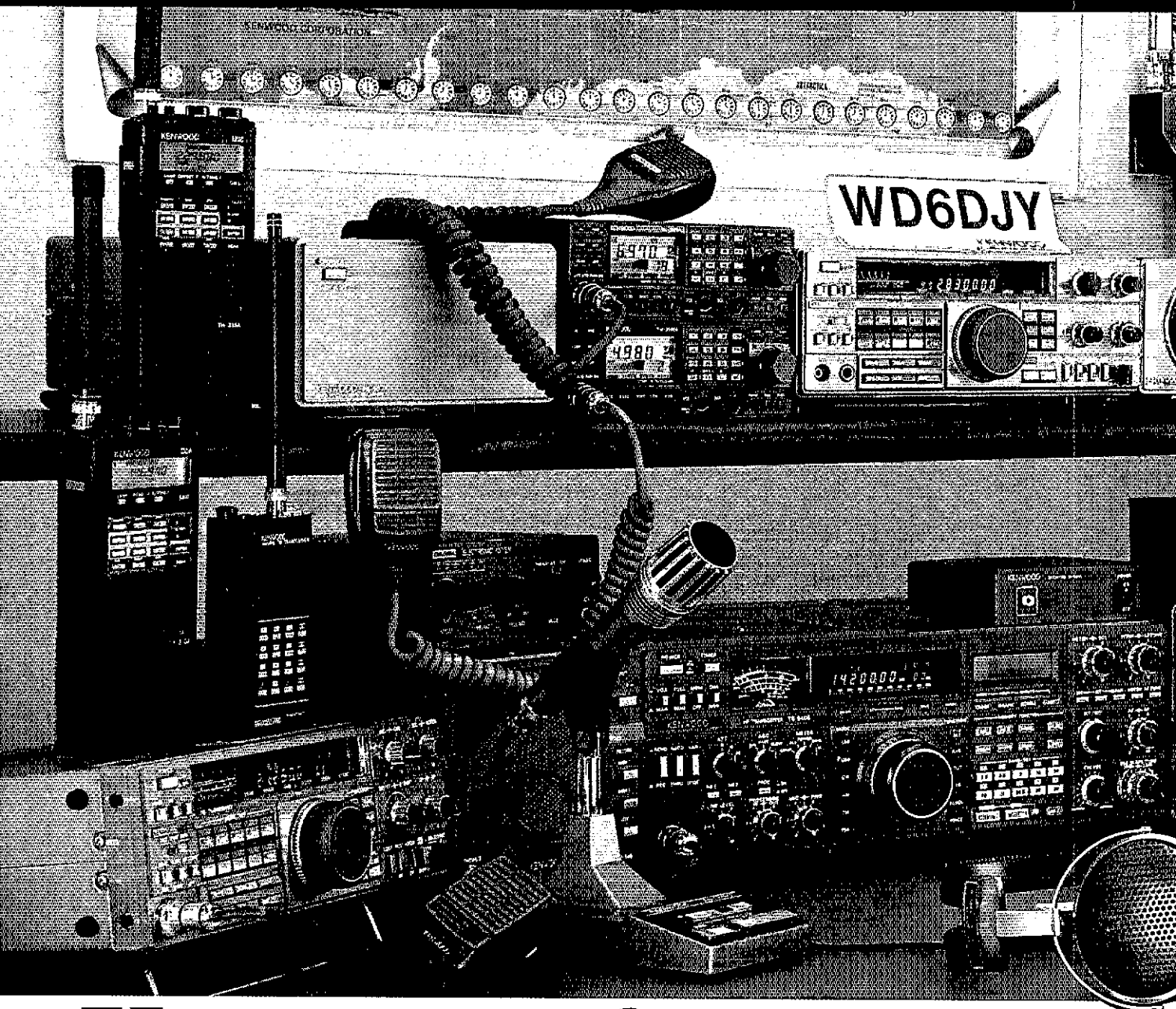
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transceivers for the enhanced Novice. The finest selection of VHF and UHF rigs. Our legendary HF line continues to earn top billing in Product Reviews, winning contest stations, and DXCC Honor Roll. All in your choice of base, mobile, or portable packages. All designed with the latest innovations in communications technology.

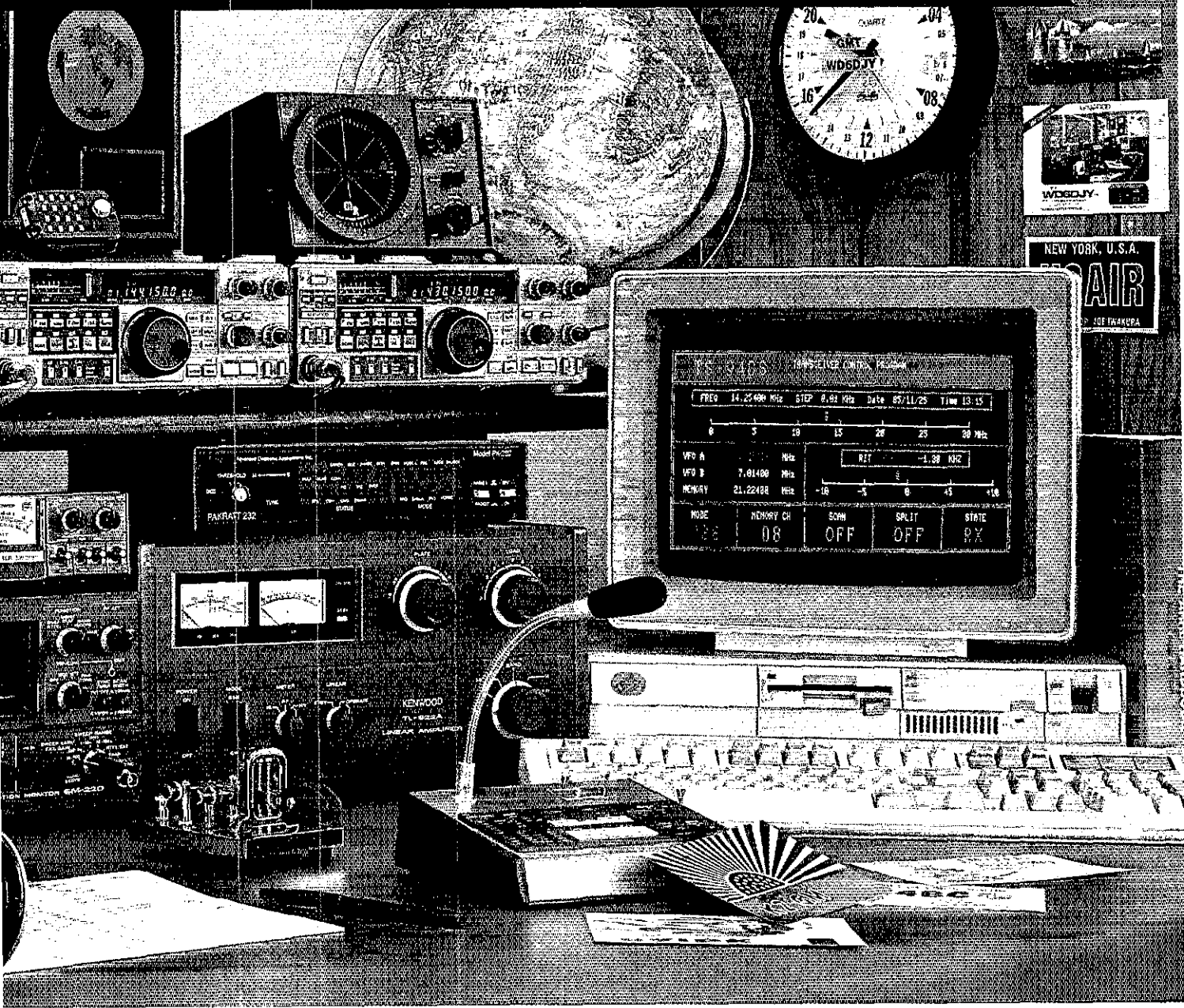
When you are on the air with a Kenwood rig, fellow Amateurs recognize that "Kenwood Sound"—it separates you from

the pack and lets everyone know that you are serious about communications, whether it's traffic handling, contesting, DX chasing, or just plain rag chewing.

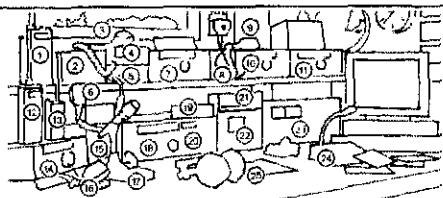
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Contact your nearest Authorized Kenwood Amateur Radio Dealer for more details on the hottest ham gear in the world!

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WD6DJY
Kenwood's Club
Station



o Amateur Extra Class!



(1) TH-315A: 220 MHz Hand-held transceiver; (2) PS-50: DC Power Supply
(3) MC-438: UP/DOWN Microphone, included with (4) TM-2530A: Deluxe
25 W, 2m E.M. Transceiver; (5) TM-3530A: Deluxe 25 W, 220 MHz Transceiver
also comes with MC-43S mic.; (6) MC-48B: 16 key DTMF Microphone;

(7) R-5000: High Performance Receiver; (8) SP-430: Matching External
Speaker for TS-430S/TS-440S; (9) MC-40B: (10) TS-711A: 2m, 25W, All
Mode Base Transceiver; (11) TS-B11A: 70cm, 25W All Mode Base Transceiver,
(12) TH-215A: 2m, Full-featured H.I. (13) TH-21BT: Pocket-sized, 7m FM
Transceiver; (14) TS-440S: HF transceiver (with AI-44B installed);
(15) SP-940: Matching External Speaker for TS-940S; (16) MC-48B;
(17) MC-60A: Base Station Microphone with UP/DOWN controls; (18) TS-940S:
Competition Class HF Transceiver with General Coverage Receiver (AI-940
installed); (19) IF-232B: Computer interface Level Translator; (20) IF-10B:
Computer Interface Module (installed inside TS-940S); (21) SW-2100B: SWR/
Power Meter; (22) SM-220: Station Monitor with pen display option BS 8
installed; (23) TL-922A: HF Linear Amplifier; (24) MC-05: Multi-function
Desk Microphone with Graphic Equalizer and three outputs; (25) HS-8:
Deluxe Headphones

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A bona fide interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US and Canada.

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*Executive Committee Member

"It Seems to Us ..."

Defending 220: The Battle Continues

In April and May, this page carried a "call to arms" for League members. The FCC had issued a Notice of Proposed Rule Making calling for the reallocation of 220-222 MHz to the land mobile service. This would deprive us of the use of 40% of one of our most valuable VHF bands.

You responded, as we knew you would. Thousands of original, well-reasoned arguments in defense of the 220-MHz amateur band flooded the FCC. These comments were not simply form letters or petitions; for the most part they were composed by individual citizens who felt the need to express their opposition to a government action that would harm them personally. By contrast, a review of the Commission's own files in this proceeding, General Docket No. 87-14, shows a singular absence of comments from land-mobile users supporting the FCC proposal.

In June, we provided some suggestions as to how you might approach your Senators and Congressmen to enlist their support. Many of you did just that, and a number of legislators have written the FCC that they think the Commission, in seeking to displace amateurs, is barking up the wrong tree.

We've made great progress since the Commission released its ill-conceived proposal. But the battle is not over, for we cannot assume that we have changed any minds in the Commission's Office of Engineering and Technology (OET), where the proposal originated. In a departure from the "Let the marketplace decide" philosophy that has been the hallmark of this administration, OET has advocated tampering with the marketplace by setting aside a slice of spectrum (at our, and therefore the public's, expense) where amplitude-compandored single-sideband (ACSSB) technology will not have to compete head-on with the well-established FM technology. Everywhere but in OET and in the tiny handful of firms interested in producing ACSSB equipment, the feeling seems to be that the marketplace has already decided—and that the decision is to stick with FM until the inevitable conversion of mobile radio from an analog to a digital environment. Promoted as a far-sighted effort to use spectrum more efficiently, the advocacy of ACSSB in its present form in fact reflects a myopic outlook that ignores the foundations already laid for a worldwide, integrated digital network through which voice, data and images will pass with equal facility.

Of course, OET doesn't have the

authority to make the final decision; the Commissioners themselves have that responsibility. ARRL President Larry E. Price, W4RA, has met personally with each of the Commissioners to emphasize the importance we attach to the 220-MHz band. Have these representations, coupled with the outpouring of rational argument from thousands of individual citizens and the support already expressed by legislators, been sufficient to persuade the Commissioners that we're right, and the OET proposal wrong? Is the OET itself preparing to recommend that the Commissioners back away from the reallocation, or have the Commissioners themselves already decided to do so? Unfortunately, there is no way of knowing for certain until it's too late, and the band is too important to take any chances. So we must maintain the pressure.

And that's exactly what your League representatives have been doing. Since last summer, we have been working with specialists in the field of congressional relations to identify and make use of every likely source of support on Capitol Hill. Many of you have been asked individually to assist in the effort to reach key legislators in both the House and the Senate. This effort will continue until we're sure of victory.

As we noted here last month, Congress has created independent agencies like the FCC because Congress itself cannot reasonably cope with the day-to-day complexities the federal government must face. In general, the agency is presumed to be the expert in its field; but through its funding of the agency and through its oversight of agency operations, Congress ensures that the will of the people (as expressed through their elected representatives) is served. On an issue of this importance to the Amateur Radio community, and in response to a threat having its roots within the Commission itself, it is entirely appropriate that Congress be requested to offer its guidance to FCC; after all, the Commission is nothing more than a creation of Congress, for its own convenience and that of the citizenry.

The next several weeks are likely to be critical in the effort to save 220-222 MHz. If you haven't already contacted your legislators, please review the June editorial and do so—even if they're not members of the listed subcommittees.

If we win, we'll probably never know whose special effort it was that put us over the top. Please make it possible that it might be yours.—David Sumner, K1ZZ

Yaesu's FT-736R. Because you never know who's listening.

Why just dream of talking beyond earth?

With Yaesu's new FT-736R VHF/UHF base station, you can discover some of the best DX happening in ham radio. Via moonbounce. Tropo. Aurora. Meteor scatter. Or satellites.

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For starters, the FT-736R comes factory-equipped for SSB, CW and FM operation on 2 meters and 70 cm (430-450 MHz!), with two additional slots for optional 50-MHz, 220-MHz, or 1.2-GHz modules.

Crossband full duplex capability is built into every FT-736R for satellite work. And the satel-



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The FT-736R delivers 25 watts RF output on 2 meters, 220 MHz, and 70 cm. And 10 watts on 6 meters and 1.2 GHz. Store frequency, mode, PL frequency, and repeater shift in each of the 100 memories.

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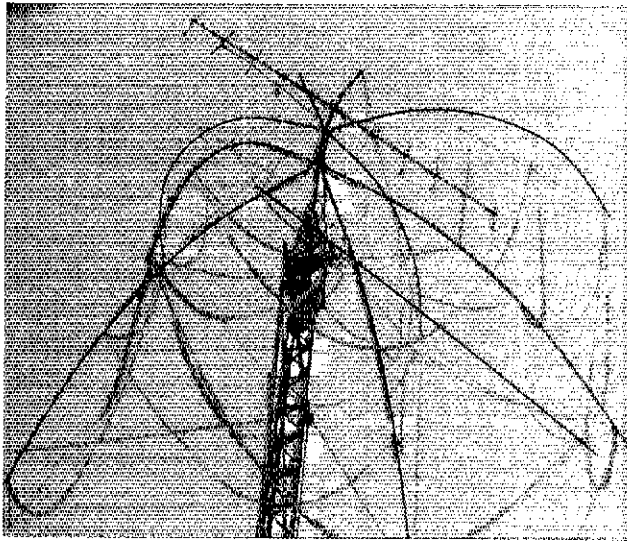
Discover the FT-736R at your Yaesu dealer today. But first make plenty of room for exotic QSL cards. Because you *never* know who's listening.

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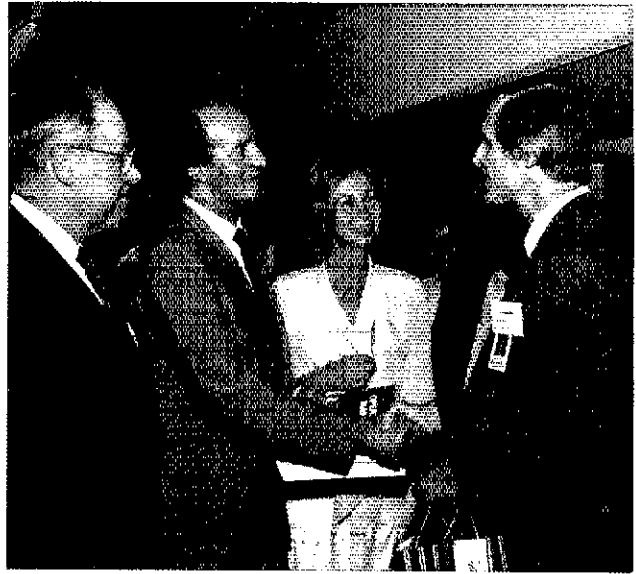


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Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc. FT-736R shown with 220 MHz option installed.



Support your local antenna. . . Old Man Winter is coming: The dangers of winter weather are painfully evident in this picture of a quad belonging to Michael DiPersio, KC2Q, of Bradley Beach, New Jersey, taken after a snow and ice storm. Michael attributes this mess to poorly maintained nylon supports. Miraculously, all but one element sprang back straight as an arrow the day after this picture was taken, but don't take chances; get ready for winter. Make sure all antenna parts are securely fastened and that the antenna is well mounted. All guy wires and antenna supports should be in good condition and properly attached. (photo courtesy KC2Q)



Royal presentation: King Juan Carlos I of Spain, known on the air as EA8JC, receives an ARRL *Operating Manual* and best wishes from US radio amateurs via ARRL First Vice President Jay Holladay, W6EJJ (right), during a recent visit to the Jet Propulsion Laboratory in Pasadena, California. Queen Sophia and JPL Deputy Laboratory Director Dr Peter T. Lyman, N6LGV, were also present. (photo courtesy W6EJJ)

Fair Warning

Amateur Radio storm spotters gave the National Weather Association, a private, nonprofit organization, a tornado warning 21 minutes before a tornado hit Saragosa on May 22 (see August QST, page 74, for details). Using the West Texas Connection, which consists of 13 repeaters covering 60,000 square miles, amateurs also provided commu-

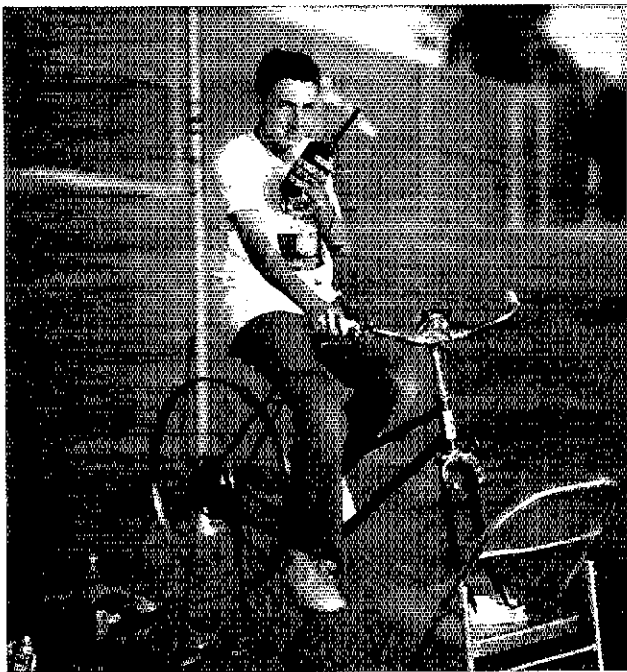
nications for 36 hours following the tornado, which disabled other communication facilities. Jim Jeffrey, WA5QM, of Odessa, Texas was honored by the Association for designing and maintaining the system. Congratulations to Jim and all the other amateurs who assisted for a job well done.



And the winner is: After being named 1987 Young Ham of the Year by the *Westlink Report*, David J. Rosenman, KA9PMK, visits with retired Senator Barry M. Goldwater, K7UGA, at the Senator's home. See this month's Happenings for more details.

Get Ready for January VHF Sweepstakes

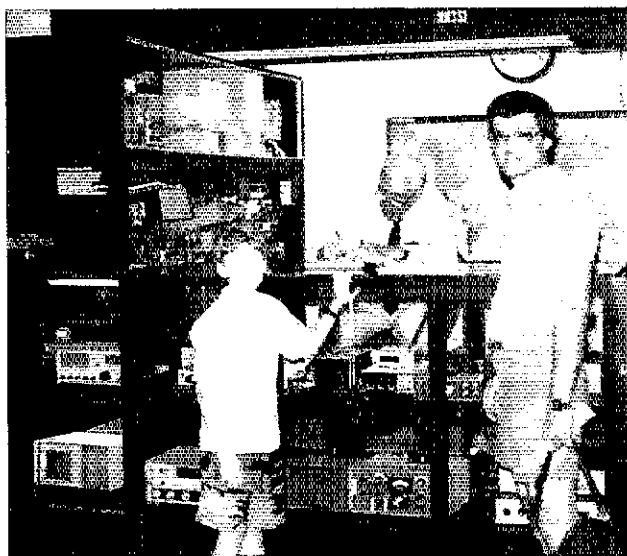
If you need a wattmeter to use in the upcoming VHF Sweepstakes, check out Doug DeMaw's article on page 15 of this issue. Odds are, you can have it built in plenty of time for Sweepstakes action.



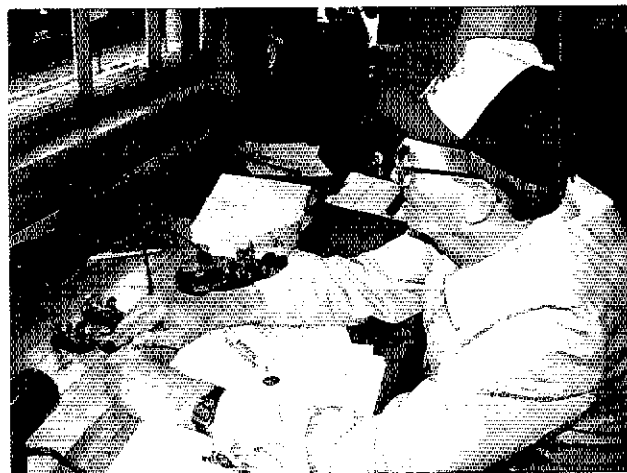
No pain, no gain: Fourteen-year-old Vince Bafetti, KB6NTW, of San Diego powered his Kenwood TH-215 *au naturel* on Field Day. The bicycle was borrowed from N6QD, the belt and pulley were donated by a friend, and the generator was found at a surplus store. 180,000 μ F of filtering and a 78H12 IC regulator rounded out his alternative energy system. Vince made the five contacts needed for 100 bonus points for the North Shores ARC. After his operation made the evening news on two local television stations and attracted many curious onlookers, Vince's intense sunburn didn't seem so bad. (photo courtesy KA6DUC)



A roaming eye: Myron Schultz, KDØYL, receives the Eyeball QSO Award from Joe Eisenberg, WAØWRI, at the 1987 ARRL Dakota Division Convention in Watertown, South Dakota in September. The award, sponsored by the Des Moines (Iowa) Amateur Radio Association, is passed among Amateur Radio clubs to help promote goodwill and to further communications among clubs. The award, an eye painted on a wood-mounted 15-pound bowling ball, has traveled extensively through Iowa and Nebraska. The award made it into South Dakota when Joe, of Lincoln, Nebraska, presented it to Myron, president of the Lake Area Radio Klub, which hosted the Dakota Division convention. If this keeps up, the eyeball may earn WAS! (photo courtesy KZ1A)



Like father, like first QSO: Justin Ashworth, KB7CRB, at the Smithsonian amateur station, NN3SI, in Washington, DC. That's station operator John O'Malley Jr., KC3UU, in the middle and Justin's father, Dennis, K7FL, on the right. Justin's first QSO was with NH6FL—same suffix as his father's call!—(photo courtesy K7FL)



"What hath God wrought?": Bob King, KA9GNY, operates land-line Morse at North Freedom, Wisconsin in commemoration of the 143rd anniversary of Samuel F. B. Morse's famous message. (Bob is connected to the Pennsylvania Railroad Museum at Strasburg.) Above Bob's right hand is a 100-year-old Bunnell Box Relay, which he restored for the Midcontinent Railway Museum. The tobacco can in the resonator (top center) is an old telegrapher's trick to increase the sounder's volume level; the very first solid-state amplifiers! (photo courtesy AD9E)



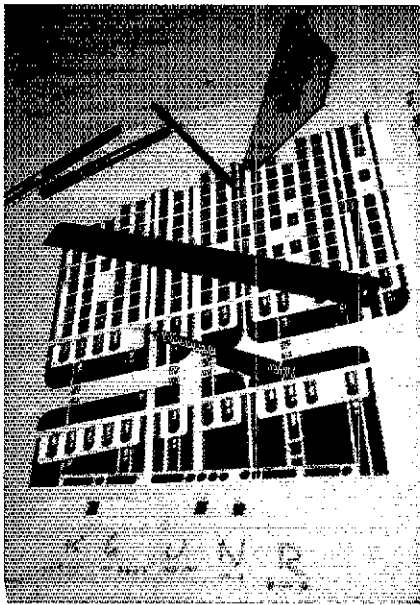
A little help from his friends: Frank Spicer, KA2ZOR, of Millville, New Jersey, receives his Advanced class upgrade from VE Team Liaison Mary Petruzzi, AE2Y. His friends feel he has earned a spot in Up Front, and we agree; Frank earned his Advanced despite being blind and deaf! Able to feel vibrations from about 700 to 1000 Hz with a bi-aural aid and to read with the aid of an Opti-Con, which converts ordinary printed material into shapes on 140 tiny pins, he listened to the questions in Morse at 18 WPM and responded verbally. Frank is a certified Braille proof-reader of books on all subjects and works with Volunteer Services of Philadelphia. A member of Tri-Cities Club, Frank is already planning to upgrade to Extra. (photo courtesy KA2KMU)



A QSO manufacturer?: While bicycling through beautiful Burbank, California, Laurent Thomin, FD1JLL/N2HMS, of Olivet, France, spotted this building. Laurent is sure there must be a few hams working here, but didn't confirm this with an eyeball QSO. (photo courtesy FD1JLL/N2HMS)

CW is alive and well in the 24th century: Bart Susman, K6UNR, Set Dresser for Paramount's new TV series, *STAR TREK: THE NEXT GENERATION*, worked with Scenic Artist Michael Okuda to give the *Enterprise's* graphic panels a new look. Morse code will be seen from time to time on wall panels

and instruments. Here is the artist's preliminary rendition of Bart's call; there was not enough space for the entire call, but stay tuned for future messages. (photo courtesy K6UNR)



HAPPY
HOLIDAYS



Tote dat float: A trailer donated by Dean Summers, KQ0C, and decorated by members of the Central Dakota Amateur Radio Club received favorable comments from judges at the Bismarck (North Dakota) Folkfest Parade in September. Power was provided by Dean's garden tractor. A little publicity for Amateur Radio never hurts, and what better setting is there than one where the crowd is already gathered and watching? With this in mind, the club is planning to enter the float in the Bismarck July 4th parade. (photo courtesy WD0ATI)

League Lines

Thinking about your 1987 income taxes? *There's still time to make your tax-deductible contribution to the ARRL Foundation.* You can specify which Foundation program you wish to support and no gift is too small. Participate in *your* Foundation by making a donation *today*. Donations and inquiries about Foundation programs should be sent to ARRL Foundation, c/o HQ.

FCC Private Radio Bureau Chief Michael Fitch has been appointed Senior Legal Advisor to FCC Chairman Dennis Patrick. Fitch joined the FCC in 1970 and was appointed Private Radio Bureau Chief in 1986. The Private Radio Bureau oversees numerous radio services, including Amateur Radio. Fitch also served as Vice Chairman of the US delegation to the 1987 World Administrative Radio Conference in Geneva, which had revised international radio regulations for various services, including aeronautical and maritime. It is not known at this time who will replace Fitch at the Private Radio Bureau.

Three representatives from the Chinese Radio Sports Association, the national Amateur Radio society of the People's Republic of China, spent two weeks in the US in late October at the invitation of ARRL. The three representatives, Wang Xun, Deputy Secretary General, Tong Xiao-Yong, station manager of BY1PK, and Liu Wen-Bin, International Secretary, visited San Francisco, Newington, New York, Washington, DC and Chicago. They studied the organizational structure and functions of ARRL and saw US amateur activities firsthand.

HQ is seeking articles concerning the National Traffic System and formal message traffic handling in general. Regardless of your traffic expertise level, well-written documents are needed for full-length *QST* articles as well as shorter items for the very popular Public Service column, and the *Field Forum* and *Section Leader* newsletters. Submissions, suggested topics and inquiries are welcomed by Luck Hurder, KY1T, at HQ.

To help you keep pace with the fast breaking news in Amateur Radio, *W1AW on-the-air bulletins* continue to keep the active amateur informed. If you receive W1AW bulletins, whether directly or via a local bulletin station, *HQ would like to hear from you on how this valuable service can be made even better.* Address your suggestions to ARRL Bulletin Survey, c/o HQ. See page 86 in November *QST* for the complete W1AW bulletin schedule.

The DXCC desk is looking for an Assistant Manager. This full-time HQ staff position processes DXCC applications. A General class or higher license is required. Interest in DXing and DX call signs is helpful. Beginning salary range is from \$12,220 to \$13,442. For further information, contact Don Search, W3AZD, at HQ.

Is your club *holding a Novice or upgrade course this winter?* Register the course with the ARRL Club Services Department now, and we'll be sure to put you in our computerized listing of classes. This will help us direct prospective hams to your club!

Does your ARES, RACES or public service communications group have photographs for possible use in ARRL publications? HQ is in particular need of photos showing such teams in action during public service events, emergency communications exercises and, of course, real emergencies. Contact Luck Hurder, KY1T, at HQ for further information.

The Egypt Amateur Radio Society has been elected to membership in the International Amateur Radio Union (IARU). The total number of member-societies is now 126.

Novices/Techs: Don't forget the ARRL 10-Meter Contest December 12-13. This contest is a great way to pick up new states and countries for your WAS and DXCC awards. See November *QST*, page 83, for rules.

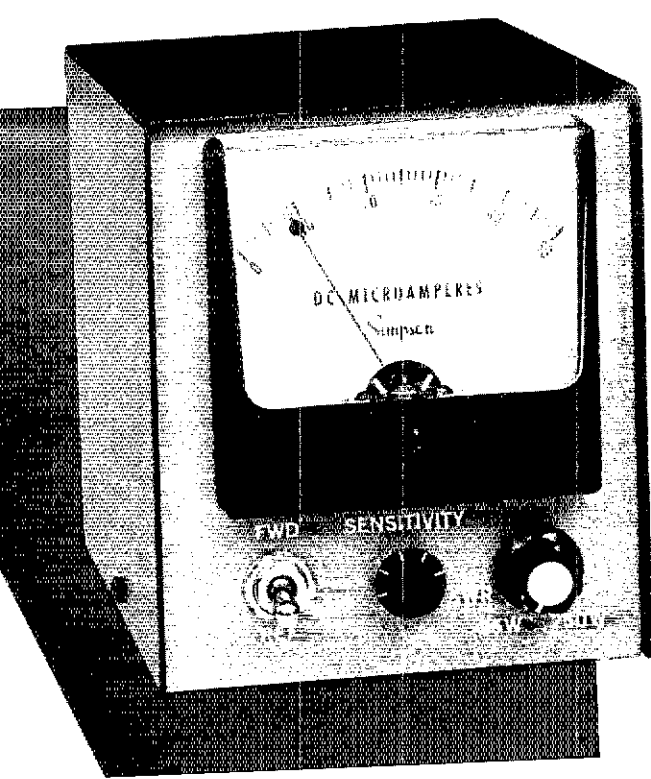
The FCC has released its licensing figures for the end of September. Because the Federal fiscal year is October 1-September 30, these are "year-end" figures as far as the FCC is concerned. These figures show Extra Class—43,214; Advanced—98,147; General—114,428; Technician—91,633; Novice—82,779. This totals 430,201, compared to 421,082 for fiscal 1986, a total gain of 2.2%. This figure does not include almost 40,000 amateurs whose licenses have expired but are still within the "grace" period and so could still be renewed.

However, the big news from the FCC statistics is the number of new amateurs. In 1987 this number was 24,338, up 40% from 17,848 in 1985, showing that Amateur Radio continues to attract newcomers while inactive licensees don't renew their license.

How to Build and Use a VHF Wattmeter

You can measure SWR and RF power at VHF with an inexpensive homemade instrument. Here's a VHF power bridge that you can build during a weekend.

By Doug DeMaw, W1FB
PO Box 250
Luther, MI 49656



I have been asked a number of times for a *QST* article that would enable someone to build a good VHF SWR/power meter. Recently, I received a letter from a ham who was disappointed to find that an instrument of this kind was not detailed in *The ARRL Handbook*. I happened to need a unit of this type in my own lab, so I developed the power bridge described here. It works nicely on 6 and 2 meters, and its performance at 10 meters is on a par with that for the other two bands. There are no exotic components in the circuit. The most expensive part is the meter, the cost of which depends on the instrument you select, and whether you acquire it by scrounging, swapping or driving a hard bargain with some friend who has one to spare! The cabinet is homemade from sections of PC-board stock, and this represents still another means of shaving the total cost of the project. By being innovative, you can keep the price of your unit down.

Types of SWR Indicators

The two most popular circuits used for measuring SWR and RF power at VHF are the *directional* and the *reflectometer* types of sampling units. These devices are inserted in a coaxial transmission line and function as part of the feed line. Because of this, they must exhibit the characteristic impedance of the transmission line in which they are used. If not, the readings will be inaccurate. Therefore, the SWR bridge should look like 50 ohms when it is inserted in a 50-ohm feed line, such as RG-8 or RG-58 coaxial cable.

Also, the sampling elements in the circuit must not absorb significant RF power, although some power (minuscule) is needed

to operate the indicating circuit. In other words, the instrument should not have a high *insertion* loss.

RF bridges and other styles of line samplers provide sensing circuits that allow you to observe *forward* and *reflected* energy on a transmission line. The better the match between the feed line and the antenna (at the antenna terminals), the lower the reflected power reading on the meter. As the reflected reading is reduced, the forward reading increases. When there is no reflected-power indication remaining (with a full-scale forward reading), the SWR is said to be 1:1 (ideal). This means that with an SWR of 1, there will be maximum RF-power transfer from the transmitter to the antenna.

Fig 1 shows a simple type of VHF SWR instrument. This directional SWR indicator was first published in a *NASA Tech Brief*, and was popularized in *QST* as the "Monimatch" during the 1960s by Lew McCoy, W1ICP. It is a simple instrument to build and use, but it is frequency sensitive. That is, as the operating frequency is increased, say, from 50 to 144 MHz, the instrument responds more readily to lower power levels. This is because the pickup lines (L1 and L2) are significantly longer electrically at the higher operating frequency, and, therefore, pick up more RF energy than at the lower frequency. For this reason, it is practical to calibrate this type of instrument for RF power only for one HF or VHF band, or for only a portion of a given band. For routine SWR testing, however, the Monimatch is entirely acceptable.

The suggested circuit and PC layout of Fig 1 follows the pattern for most VHF/UHF directional SWR indicators

that are used by amateurs. The sensing circuit is built on double-sided PC board. L2, in combination with the ground plane on the reverse side of the board, forms a strip line with a characteristic impedance of approximately 50 ohms. (This assumes that the PC board is of nominal 1/16-inch thickness and that it uses glass-epoxy insulating material.) L1 and L3 are the RF sampling lines. They, too, are arranged for a 50-ohm characteristic impedance. This circuit is suitable for use at 50, 144, 220 and 432 MHz if short leads are used throughout.

Fig 1B shows a full-scale PC-board pattern of the etched side of the board. The parts placement is indicated on the pattern. The leads from J1 and J2 to the PC board should be as short as practicable. Ideally, the terminals that protrude from the rear of the coaxial connectors should fit into the pads at the ends of L2 to allow the PC board to be mounted directly to the two coaxial jacks. If this is done, be sure to ground the PC board (there are ground conductors on both sides of the board) to the common ground of the equipment cabinet.

Generally speaking, the principle of line sampling shown in Fig 1 is the method used in the popular Bird ThruLine[®] wattmeters. Because of the frequency sensitivity of this type of instrument, we can understand why Bird has a variety of plug-in elements or slugs for various frequency ranges and power ratings. The circuit in Fig 1 is *not* a bridge type of meter.

A Bruene RF Bridge for VHF

Many years ago, Warren Bruene of Collins Radio developed a true RF-bridge circuit that set the standard for most of the

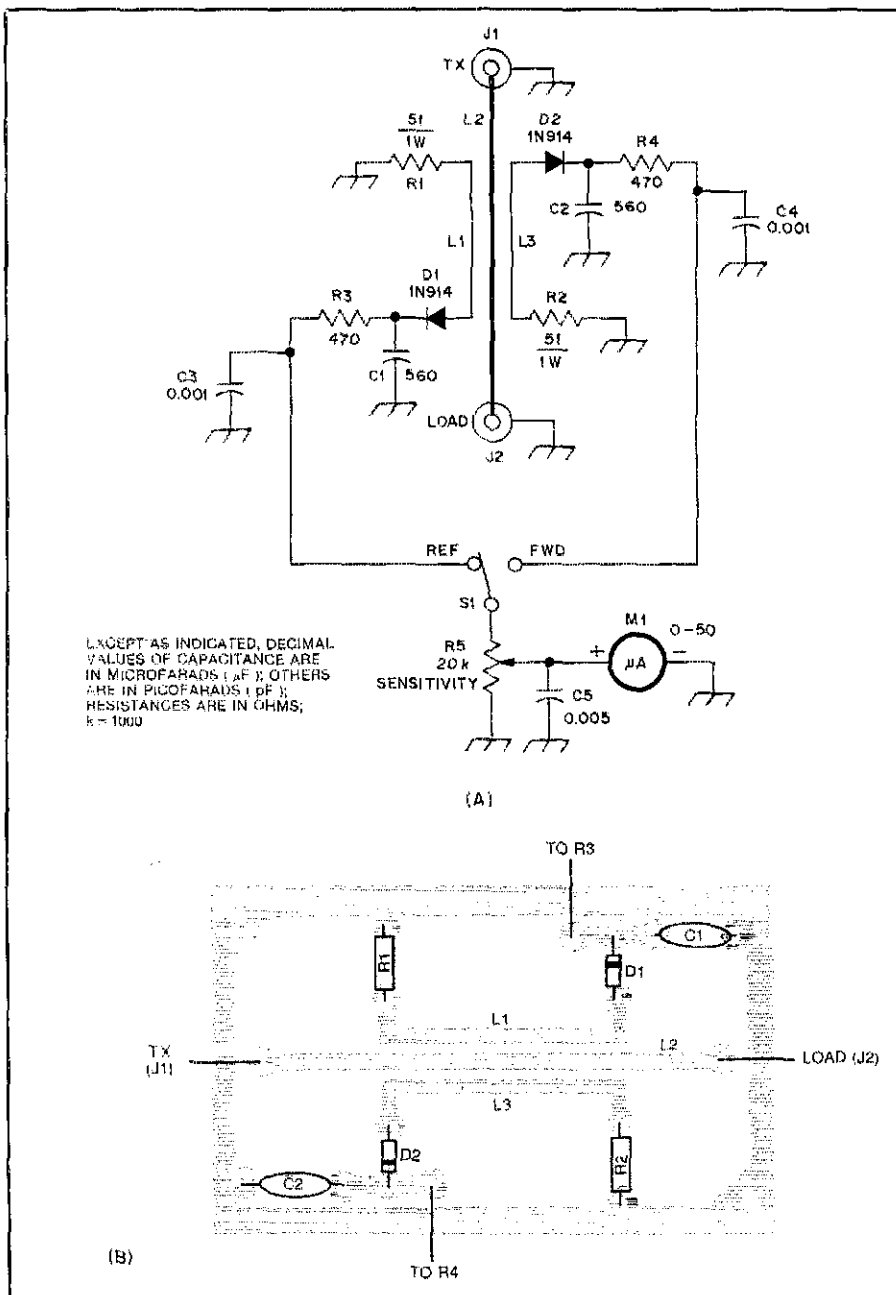


Fig 1—Schematic diagram of a suggested directional SWR meter (A). Capacitors are disc ceramic. R1 and R2 are 1/2-W, 5% carbon-composition units. R3 and R4 are 1/2-W, 10% tolerance resistors. R5 is a linear-taper carbon-composition panel control. M1 can be a 50, 100 or 200- μ A dc meter. The 50- μ A movement will provide the greatest sensitivity. At B, a full-scale template for the RF sensing circuit of the instrument. Double-sided PC board is required (see text). Parts placement is shown on the template.

HF and VHF RF power meters used by amateurs and industry.¹ The circuit has become known as the "Bruene bridge." A fairly detailed discussion of this and other similar circuits, along with diagrams that show the electrical equivalents of true bridges, is presented in *The ARRL Antenna Book*.² You may want to review this material toward a better understanding of how these circuits work.

Fig 2 shows a hybrid schematic diagram of the circuit I use for my VHF SWR/power meter. L1 and L2 are shown pictorially to emphasize how the line section and toroidal inductor are related. In effect, L1 is the primary winding (equivalent to a single turn). It is simply passed through the center of the toroid that contains the transformer secondary winding, L2. C1 through C4 form part of the bridge circuit. C2 is adjustable. It permits us to balance the bridge for a 50-ohm load at J2.

The forward and reflected RF current components that flow from J1 to J2 along L1 are rectified by D1 and D2 to provide dc for operating M1. C5 serves as a frequency-compensating capacitor to improve the bridge accuracy at the high end of the operating frequency range.

C6 through C11 are part of the decoupling circuit. They are used with R3, R4, Z1 and Z2 to prevent RF energy from reaching M1. S2 selects one of three potentiometers (R5, R6 or R7) that affect the full-scale reading of M1. R5 is adjusted to provide the low-range, full-scale RF-power reading at M1 (I chose 25 W), and R6 is used to calibrate the meter for some higher full-scale reading (250 W in my unit). R5 and R6 are PC-mount trimmer controls. R7 is panel mounted to serve as the SENSITIVITY control during SWR measurements.

L2 is bifilar wound, as indicated in the inset of Fig 2. This winding method is superior to using a single winding with a center tap. The advantage of the bifilar winding (two wires in parallel) is that the electrical center tap is more precise than it might be if L2 were wound in a conventional manner. This is an especially important consideration at VHF, where bridge balance is critical. The capacitive arm of this circuit is similar to that used in the Heath HM-2102 VHF wattmeter.

Meter Choice for M1

The mere sight of the expensive Simpson meter on the front of my VHF bridge may startle you! I hasten to say that I bought this meter for \$3 at a ham flea market in 1986. The new price for this meter would knock your socks off! I like large meters—they are an aid to tired eyes and declining eyesight. There is no need to use a 50- μ A meter, but the higher the full-scale rating in μ A, the less sensitive your RF bridge will be. A 100- or 200- μ A meter can be used with this circuit if you are willing to sacrifice low-power sensitivity. My 50- μ A meter provides a full-scale reading at 1.2 W on 2 m with S2 in the SWR position and with R7 set for maximum sensitivity. This capability is useful for checking SWR with a hand-held 2-m transceiver.

You can use a physically smaller meter for M1, such as a surplus edge-reading FM tuning meter. There seems to be a variety of these instruments in the surplus electronics catalogs these days, so shop around for a bargain. Also, be on the watch for a good-quality microammeter when you are at flea markets.

Practical Matters

Single-sided PC board (glass-epoxy material recommended) must be used for the main sensing module (shown enclosed in shaded lines in Fig 2). Double-sided board would introduce considerable stray capacitance, and this might prevent you from balancing (nulling) the bridge.

¹Notes appear on page 19.

I made my own boards using the Meadowlake Corp Tec-200 film process.³ I am not aware of any supplier of PC boards or kits for this project. I made my module on single-sided board and then soldered the module to a 2¼- × 2¼-inch piece of double-sided board that forms a mounting plate (see Fig 3). The module is perpendicular to the mounting plate, and two triangular-shaped PC-board brackets are soldered between the module and the mounting plate to ensure rigidity. The complete assembly is bolted to the rear wall of the equipment box with no. 4-40 screws. Two 1/2-inch holes, on 1-7/8-inch centers, are drilled through the back wall of the equipment box and mounting plate to accommodate J1 and J2. A full-size etching template for the sensing module and R5/R6 mounting board is shown in Fig 4, with parts placement shown in Fig 5.

L1 is a 1-7/8-inch length of RG-58 coaxial cable. Note that the shield braid is grounded at only one end of L1 (the input end). The cable braid serves as a Faraday shield to discourage harmonic currents from passing to the L2 secondary winding through capacitive coupling. I use a 0.50-inch-OD toroid core for L2, and the center hole allows ample clearance for L1.

The winding for L2 of Fig 2 is made from two 12-inch lengths of no. 26 enameled wire. Clamp one end of the wire pair in a vise, and secure the other two ends in the chuck of a hand drill. Operate the drill until the two wires are twisted about three turns per inch (not critical). Now wind eight turns of the twisted pair on the toroid core. Space the turns evenly around the toroid. Use enameled wire of two colors, or paint one wire a color of your choice to ensure correct phasing of the windings (see Fig 2 inset). Snip off the excess wire after the coil is wound, leaving about one inch of pigtail on each of the three wires.

R5 and R6 are assembled on a separate PC board, and mounted close to S2 near the front panel. This helps to minimize the lead lengths for the switching circuit.

My cabinet is 5 × 4 × 4-5/8 inches (HWD). I used steel wool to clean the copper surfaces, and after soldering, I used Kepro tin-plating solution to prevent tarnishing later on. A 100-W soldering iron or gun is required to generate enough heat to produce a smooth, rapid flow of solder when joining the cabinet walls. A 40-W pencil iron will cause rough-looking solder seams.

You can see in Fig 3 that the cabinet has a stabilizing strut soldered between the front and rear panels (top). Similarly, a strip of PC stock is soldered between the front and rear panels of the cabinet on the bottom of each side. These strips ensure added rigidity and provide anchoring points for the PC-board cabinet cover, which is fastened to the struts by means of no. 6 sheet-metal screws. Two triangular

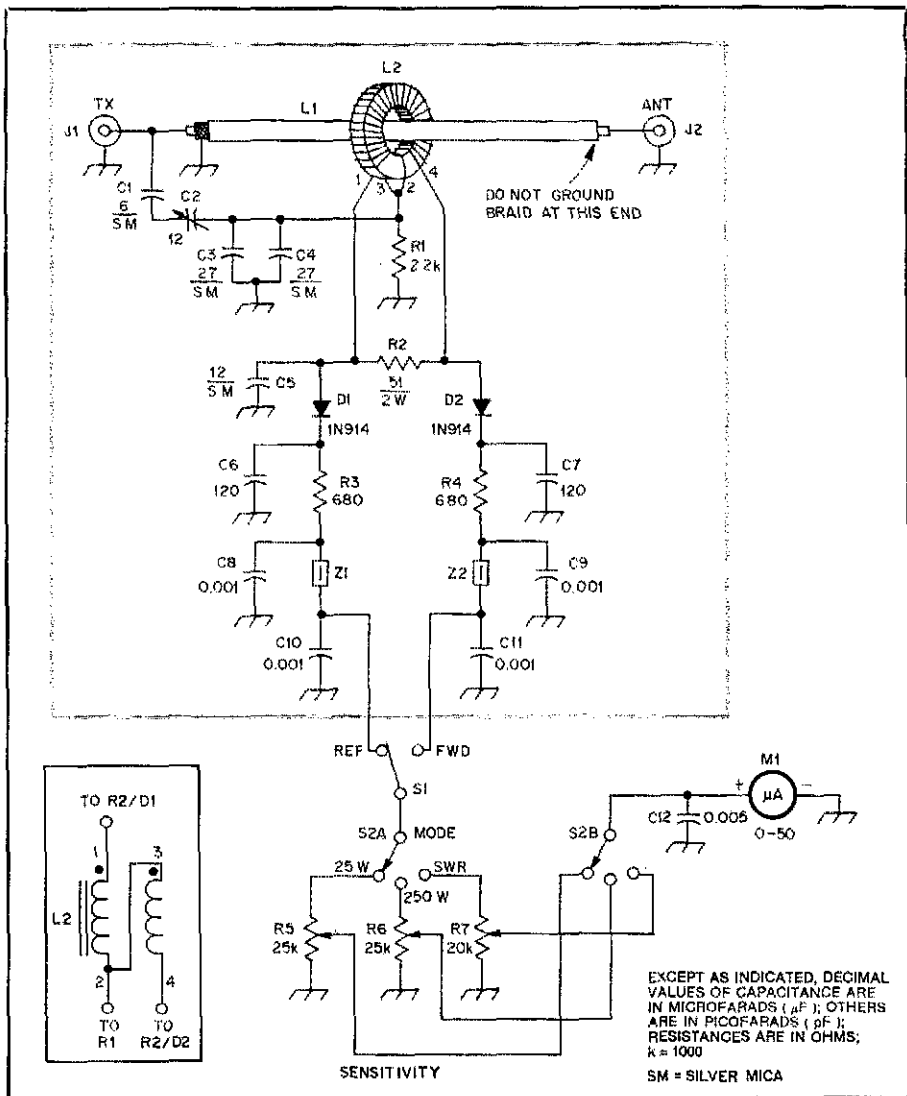


Fig 2—Schematic diagram of a practical Bruene bridge for VHF. Fixed-value capacitors are disc ceramic or silver mica. Resistors are ½-W carbon-composition types except for R2, which can be a 1- or 2-W, 5% carbon-composition type.

C2—Miniature 12- or 15-pF trimmer with a minimum capacitance not greater than 2.5 pF, E. F. Johnson T-9-5 air trimmer or equivalent.

D1, D2—1N914 or equivalent silicon switching diode, matched for forward resistance with a VOM.

L1—1-7/8-inch length of RG-58 coaxial cable

L2—8 bifilar turns of no. 26 enam wire on an Amidon FT-50-61 ferrite core (125 µj).

M1—Dc microammeter (see text).

¾- × ¾-inch Simpson (50 µA) or equivalent.

R5, R6—PC-mount 25-kΩ carbon-composition control.

R7—Panel-mount 20-kΩ linear-taper carbon-composition control; 25 kΩ acceptable.

S1—SPDT toggle.

S2—Two-pole, three-position rotary wafer switch.

Z1, Z2—Amidon miniature ferrite bead (950 µj).

EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (µF); OTHERS ARE IN PICOFARADS (pF); RESISTANCES ARE IN OHMS; k = 1000
SM = SILVER MICA

PC-board stabilizing brackets are soldered inside the cabinet cover (right and left sides, center) to keep the lid from collapsing under stress.

The completed cabinet and cover are first painted with gray automotive undercoat primer. After this coat is thoroughly dry, you may apply the labels for the panel controls. I used press-on lettering decals, then sprayed the front and rear panels with clear acrylic spray. The acrylic coating protects the decals and helps prevent finger marks on the gray panel. The top cover was given a coating of dull black spray paint after the

primer had dried for two hours. This provides a nice, attractive two-tone black-and-gray finish for the instrument.

The total cost of materials for my cabinet (excluding labor!) was roughly \$1. That sure beats paying \$7 or \$8 for a commercial box, which might not have the proper shape for this project.

Calibration

Nulling the Bridge

Balancing the bridge requires feeding 15 W, or more, of 2-m RF energy into J1. Terminate J2 with a good-quality 50-ohm

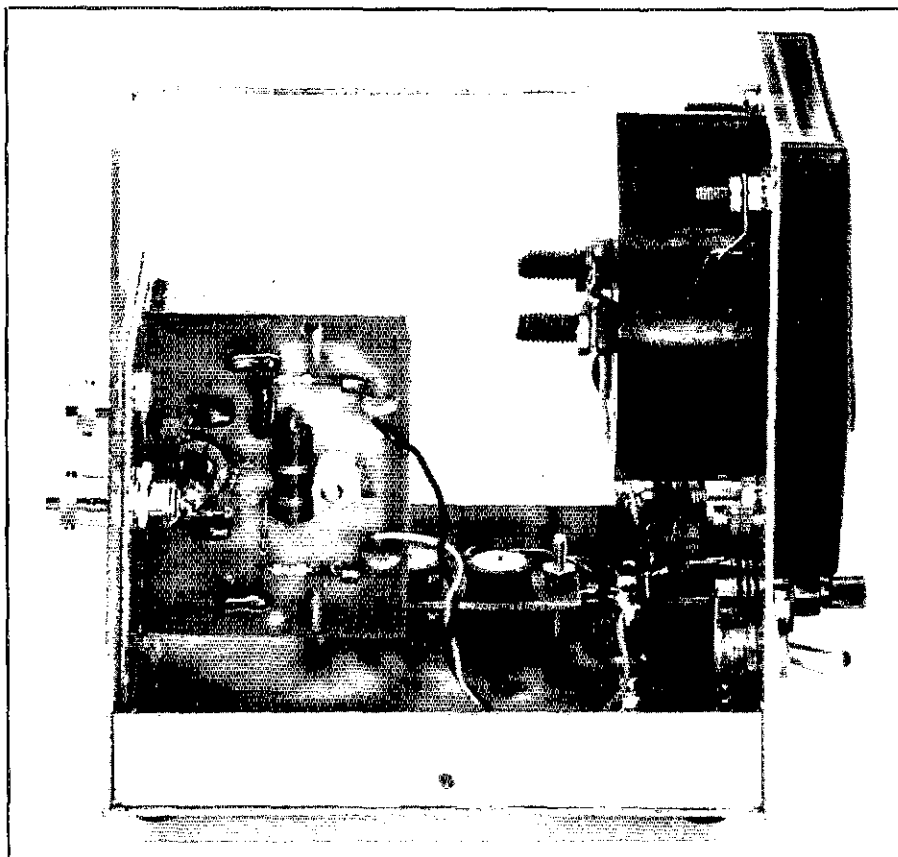


Fig 3—Photographic view of the interior of the VHF wattmeter.

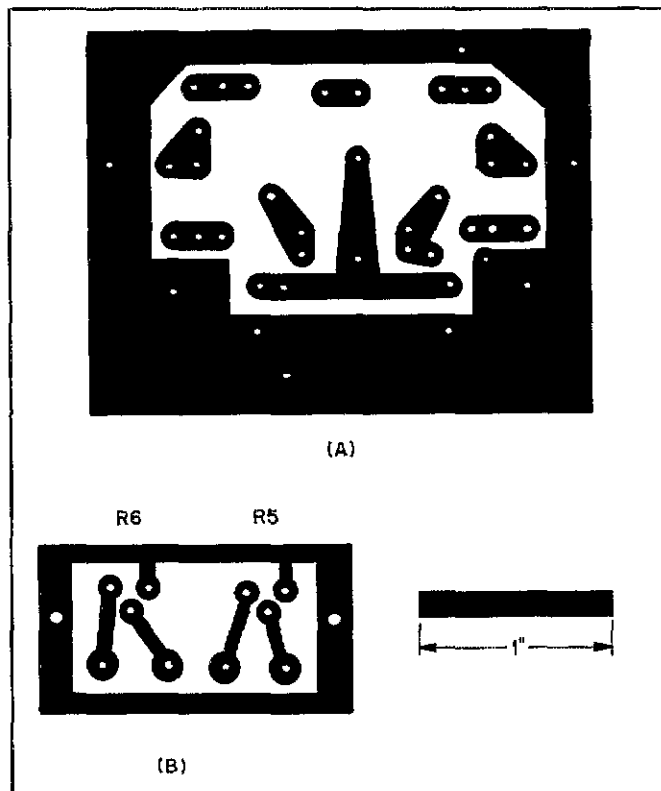


Fig 4—Circuit-board etching patterns for the VHF wattmeter. At A, the sensing module. At B, the R5/R6 mounting board. The patterns are shown full-size from the foil side of the board. Black areas represent unetched copper foil. Use single-sided board only.

dummy load, such as the Heath Antenna. Place S1 in the FWD mode, set S2 to SWR and adjust SENSITIVITY (R7) for minimum sensitivity (fully counterclockwise). Apply transmitter power and set R7 to provide a full-scale reading on M1. Next, switch S1 to REF. Ideally, the meter should read zero, but it's unlikely that it will. Use an insulated alignment tool to adjust C2 for a zero reading. The meter reading should drop to zero within the range of C2. If not, check your circuit for errors and look for bad solder joints or unwanted solder bridges between the PC-board conductors. If all is okay, and the desired null is obtained, turn off the transmitter and exchange the coaxial-cable connections at J1 and J2. Reapply power, and verify that the meter reads zero when S1 is in the FWD mode and full scale in the REF mode. If so, the bridge is properly nulled.

RF Power Calibration

You will need a variable source of RF power to calibrate the meter for the 25- and 250-W ranges. The easiest method of calibrating the instrument is to use a wattmeter of known accuracy. Place the wattmeter in series with your homemade unit. S1 must be in the FWD position for all RF power measurements. First, adjust R5 for a full-scale reading with 25-W input power. Then apply power to various power levels in the 0 to 25-W range, and record the readings. From this data, you may prepare a chart that shows the meter reading v known power in watts. Keep this chart for future reference.

Adjustments for the 250-W range are done in the same manner by setting R6 to provide a full-scale reading at 250 W. After calibrating the 250-W scale, recheck the 25-W calibration to make sure there is no interaction between the calibration circuits. There

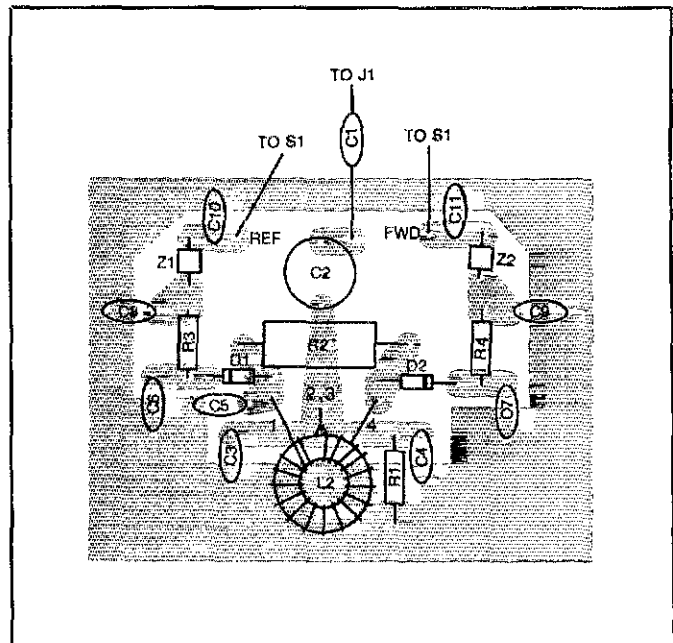


Fig 5—Parts-placement guide for the sensing module. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

should be none if your wiring is correct.

An alternative method of calibration is to use a VTVM or FET VOM with an RF probe to measure the RMS RF voltage across your 50-ohm dummy load. To determine the transmitter output power, use the standard formula:

$$P(W) = E_{(RMS)}^2 / R_{(ohms)}$$

Thus, for an RMS voltage of 50, with a 50-ohm load, the power is 50 W.

If you are unable to come up with the 2-m power needed to calibrate the high-power scale, you can use your 6- or 10-m transmitter. The bridge should be nulled at 2 m, however, before doing this. If power calibration is done at 10 m, the accuracy will be reasonably close at 2 m. I checked this by setting the meter for full scale at 25 W on 2 m (SWR mode). This resulted in a reading of 35.4 V RMS across the 50-ohm load. I then used my 10-m transmitter to

produce 35.4 V RMS across the dummy load (25 W). The needle of M1 was just slightly above full scale. This variation is close enough for most amateur applications.

Closing Remarks

If you're artistic, it is simple to make a new readout scale for your meter. The charts you plot for output power can be converted to a pair of scales on the meter face. Similarly, if you have suitable measuring equipment available, you may elect to add an SWR scale on the meter face. Because of the response of D1 and D2, the 25- and 250-W power scales will not yield linear or identical readings for the power increments. Therefore, two power scales are required.

An easy way to draw a new meter scale is to do it at two or three times scale, then reduce the artwork by means of a photo-

copy machine that can enlarge and reduce images. This makes the lettering job easier, and any imperfections will be less prominent after the reduction.

This short-term project should provide you with a few evenings of fun. You will enjoy the job even more if you can compete with the commercial boys by garnering all of the parts at bargain prices. It should be possible (depending on your bartering skills) to build this meter for less than \$10. Certainly, it should cost you no more than \$25. Good luck, and have fun!

Notes

¹W. B. Bruene, "An Inside Picture of Directional Wattmeters," *QST*, Apr 1959, pp 24-28.

²G. Hall, Ed., *The ARRL Antenna Book*, 14th Edition (Newington, ARRL, 1982), pp 15-2 to 15-10.

³D. DeMaw, "Homemade Circuit Boards—Don't Fear Them," *QST*, Sep 1987, pp 14-16 and 23.

New Products

PAC-COMM TINY TNC-2

□ The Pac-Comm Tiny TNC-2 is a totally redesigned clone of the popular TAPR TNC 2. The Tiny TNC-2—about half the size of the original TNC 2—features an IC modem and simplified circuitry for better reliability, size reduction and lower cost. This unit includes 32 kbytes RAM, 32 kbytes EPROM, EIA-232-D and TTL compatibility, watchdog timer, modem disconnect header and switch-selectable terminal baud rates. Manufacturer: Pac-Comm Packet Radio Systems, 3652 W Cypress St, Tampa, FL 33607, tel 800-223-3511. Price class: \$110 (assembled and tested).—*Mark Wilson, AA2Z*

SPI-RO MANUFACTURING MULTI-BAND ANTENNAS

□ Spi-Ro Manufacturing offers a complete line of multi-band trap dipole antennas

covering all of the 160-10 meter ham bands. The antennas feature lightweight, weather-proof traps with no-rust brass terminals. The antennas require a 50-ohm feed line and will handle 1500 W. Contact Spi-Ro Manufacturing, PO Box 1538, Hendersonville, NC 28793 for more information.—*Mark Wilson, AA2Z*

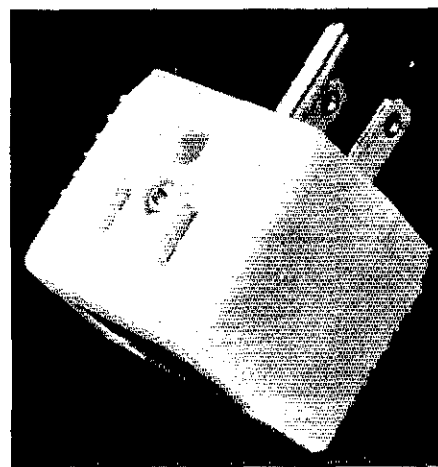
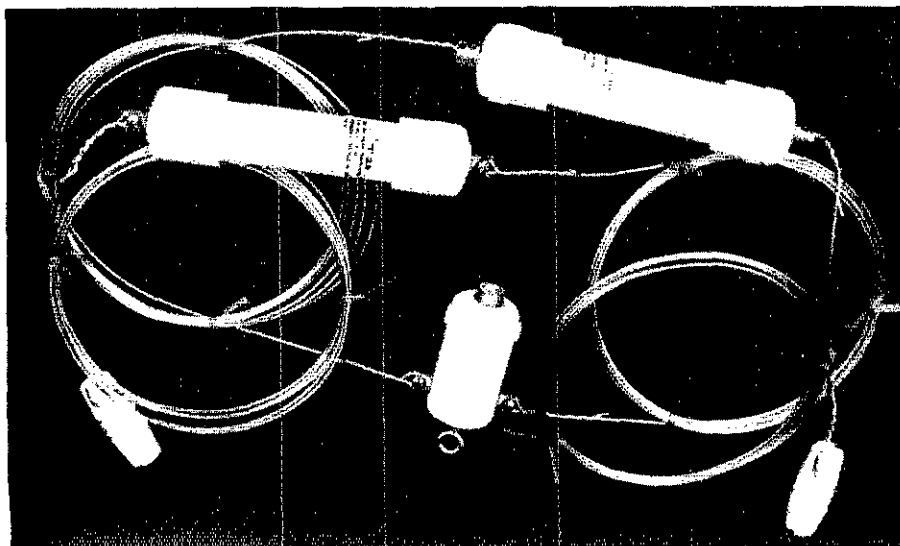
KANTRONICS KANTERM-PC TERMINAL PROGRAM

□ Kanterm-PC™, a terminal program for IBM® PCs and compatibles, is designed specifically for use with the Kantronics KPC-4 and KAM dual-port TNCs. This software features five selectable screen configurations created to enhance dual-port operation. Screen options include a number of split-screen displays. Kanterm-PC also features 37 user-loaded buffers of 254 characters each;

a pop-up menu for additional program options; real-time clock and date display; and word wrapping of received text. For information, contact Kantronics, 1202 E 23rd St, Lawrence, KS 66046, tel 913-842-7745.—*Mark Wilson, AA2Z*

TDP ELECTRONICS 10HD100 VOLTAGE SPIKE PROTECTOR

□ The TDP 10HD100 heavy duty spike protector is designed to protect electronics equipment from power line surges. The unit plugs into an ac outlet, and the equipment to be protected plugs into the 10HD100. The spike protector is built in a right-angle package, so the power cords run down the wall rather than stick out from it. A built-in neon lamp indicates that the 10HD100 is working. Rated load is 15 A. TDP Electronics, 111 Old Bee Tree Rd, Swannanoa, NC 28778, tel 704-298-6990 for more information.—*Mark Wilson, AA2Z*



An Optimum Design for 432-MHz Yagis

Part 1: What's involved in designing a high-performance antenna array? This month: Some of the parameters that must be considered in an antenna design. Part 2 will present construction information so you can build your own antenna.

By Steve Powlishe, K1FO
816 Summer Hill Rd
Madison, CT 06443

The latest rage in 432-MHz Yagi design seems to be extremely long antennas—more than 10 wavelengths. I spent nearly two years perfecting two different 10.5-wavelength designs (24-foot boom length) and presented the results of those efforts in 1986 at the major VHF/UHF conferences.¹ Frank Potts, NC1I, successfully used one of the 10.5-wavelength designs in a 16-Yagi earth-moon-earth (EME) array. Frank's success encouraged me to plan a 26.0-dBd-gain array using eight of those Yagis. The antennas would be stacked two wide by four high and located 80 feet high for tropo and EME use. After thoroughly researching this planned array, however, I came up with a different solution. This article describes my efforts.

Will It Stay Up?

An often overlooked antenna design consideration is wind load. Wind load is the force put on a structure by wind blowing against it. I live in an area where ice loading combined with moderate winds can quickly destroy a poorly engineered antenna system. With this in mind, I analyzed possible antenna configurations for gain versus wind load.

Calculations showed that the eight-Yagi array would cause the collapse of my present tower the first time winds exceeded 40 mi/h! The eight long Yagis, stacking frame and cables exhibit a total wind load area of nearly 40 sq ft. Since the Yagis were to be elevated for EME, the array had to be centered more than 14 feet above the top guy wires. I calculated the bending moment for this configuration in an 80 mi/h wind. The resultant force of almost 17,000 foot-pounds is nearly the level that would collapse an 18-inch-face commercial steel

tower and three times that which would destroy a 12-inch-face steel tower. These sobering figures encouraged me to find another way to construct a high-gain 432-MHz array.

Next, I examined a plan that used 16 moderately sized Yagis. Using low-wind load, lightweight antennas (similar in size and mechanical construction to the popular K2RIW 19-element design), a 16-Yagi array has a wind load area of 32 sq ft. The antenna booms are much shorter, so this array has to be mounted only nine feet above the top tower guys. The resultant bending moment on the tower for the array of 16 shorter Yagis is a manageable 8600 foot-pounds—half that of the array of eight long Yagis. I anticipated that the 16-Yagi array would have 27.0 dBd gain. In terms of gain versus wind load, the array of shorter antennas seemed to be a better approach. The only penalty would be a more complicated feed system.

As an interim step, I decided on a 25.7-dBd-gain array of 12 shorter Yagis. The 12-Yagi array has a wind load area of 24 sq ft and a bending moment of 6500 foot pounds. My over-guyed tower could handle this antenna.

Yagi Development

Once I decided on the array configuration, the next step was to choose an antenna design. The 19-element K2RIW Yagi (RIW 19) is enormously popular in North America because of its

- light weight
- low wind load
- clean pattern (except for rear lobe)
- self-supporting boom (no braces required)
- good wet and dry weather performance.

I had been using arrays of RIW 19s for several years with good success. I had

learned enough from working with Yagis extensively over the past few years, however, to convince me that a much better design could be had within the same approximate wind load as the RIW Yagi. In March 1986, I started work on a new moderate sized Yagi, one that I hoped would become a replacement for the RIW design. The design criteria included

- low wind load (<1 sq ft)
- light weight (<4 lbs)
- no boom support
- gain about 1 dB better than the RIW 19
- improved pattern compared to the RIW 19²:
- E-plane sidelobes -17 dB or better
- H-plane sidelobes -16 dB or better
- H-plane minor lobes substantially better
- rear lobe -20 dB or better (5 dB improvement)
- lobes surrounding the rear lobe -25 dB

Much of the design and analysis work was done using MININEC, a micro-computer-based antenna analysis program. Modeling antennas on the computer makes it possible to try many designs without drilling a single boom. I do not have sufficient computer power, or a sophisticated enough Yagi analysis program, to optimize element spacing and element lengths simultaneously. I started with a spacing pattern based upon knowledge and experience and used the computer to optimize element lengths. Several possibilities came to mind.

Modifying the RIW 19. Much computer time was spent on this approach because I had a significant investment in RIW 19 Yagis (12 of them to be exact). Although I found I could get more gain out of an RIW 19 by making a longer center boom section and using a single reflector, the RIW design was compromised by change. The target gain could not be reached with a reasonable boom length while keeping a

¹Notes appear on page 24.

clean pattern.

Using the DL6WU design. The antenna design by Gunter Hoch, DL6WU, is an excellent performer. Its flexible design (it can be made 2 to 14 wavelengths long) requires a trade-off, though: The Yagi will not be optimized for any given boom length. Using the DL6WU element spacing yielded a 20-element Yagi on a 13-ft, 8-in boom. Computer analysis indicated that this antenna would not meet my gain target. If an additional director was added, the boom would be 14 ft, 7 in long. I don't feel comfortable using a self-supporting small-diameter boom of this length. I had previously optimized the DL6WU director lengths for a 31-element, 24-ft Yagi. Reducing this antenna to a 20-element, 13-ft, 8-in Yagi did not give good results; that optimization had negated the variable-length design feature.

Starting from scratch. In this day and age, starting from scratch is almost like reinventing the wheel, and it soon became apparent that it would take a major effort to design from scratch an antenna that would outperform the modified DL6WU design. My objective was to create a better EME array; it was not merely a theoretical exercise.

The W1EJ Designs

Fortunately, I found someone who had *already* reinvented the wheel! Tom Kirby, W1EJ, had spent several years working on computer-optimized Yagi designs. Tom found that each Yagi size needs its own set of spacings to achieve the best combination of gain and pattern. He had worked out two geometries that might be suitable for my use. One was a 33-element, 10.6-wavelength (24-ft) model, and the other was a 17-element, 4.5-wavelength (10-ft) version.

I modeled two different approaches on the computer. The first cut the 33-element Yagi to a 22-element version; the second extended the 17-element model to 21 elements. Both the 21- and 22-element models (which use different element spacings) would be about 14 ft long. This is the maximum boom length I felt safe with, considering that my antenna criteria called for a lightweight, low-windload and no-boom-support design.

I built examples of Tom's 33- and 17-element Yagis, but found they performed considerably worse than expected. Careful pattern measurements and further computer analysis indicated that the antennas were tuned too low in frequency. Revised versions of the 33-element Yagi (with shorter elements) gave measured performance near what the computer predicted. This indicated that the W1EJ designs were worth pursuing. It also showed how a computer-created design must go through post-computation measurement and adjustment to verify its performance.

Examination of adjusted computer models of the 21- and 22-element Yagis showed that, as with any engineering design problem, there were trade-offs between both designs—and no clear-cut winner. The 21-element model could be computer tweaked for more gain (15.9 dBd theoretical versus 15.8 dBd for the 22-element Yagi). The pattern on the 22-element design was easier to control, and it had a significantly smaller rear lobe. When test antennas were constructed, the 22-element version won because of its better pattern (important for EME work). Note that the 21- and 22-element designs are not the ultimate in gain, as their spacings were not specifically optimized for a 14-ft boom length. Optimization of spacings for such a Yagi of this specific length could take several months and produce no more than an additional tenth of a decibel in forward gain!

Tom's computer design work provided antenna dimensions given in tenths of millimeters. I spent several weeks adjusting the Yagi's geometry on the computer to create an easy-to-build version with dimensions given in US customary units that would retain the theoretical performance of the computer model in real life. In addition, I worked on tuning the Yagi's center frequency to the desired range. It took only two tries to build a real Yagi with acceptable performance from the computer model.

The finished 22-element antenna was presented at the New England and Central States VHF conferences in 1986. On my home antenna range, I measured an antenna gain of 15.7 dBd—0.8 dB better than an RIW 19. The front-to-back ratio (F/B) measured 20 dB (5 dB better than the RIW). At the New England conference, the measured gain was 0.6 dB better than the RIW; at the Central States conference, it measured 1.0 dB better. Overall pattern measurements showed the 22-element antenna to have a better pattern than the RIW 19.

Computer modeling calculates the 22-element antenna gain to be 0.9 dB more than the RIW 19 with the pattern improvements confirmed on the test range. When you use a computer program to optimize a design, you can never be sure that the design will work as expected. This is because all models have some errors caused by calculation assumptions, algorithm errors or just plain "multiple-calculation build-up" errors. If a design is optimized with an even slightly erroneous calculation, the resultant dimensions will incorporate those errors.

Further Optimization

I still wanted to try for a better pattern and more gain before building the new EME array. Another two months were spent further optimizing the design and reworking the dimensions for metric units.

I felt that metric units were appropriate if this was to be an antenna design of the 1980s and beyond. The final design has the same gain at 432 MHz (15.7 dBd) and an improved pattern. The peak gain of this Yagi is 1 MHz higher than the previous version (437 MHz). This was done to improve the pattern, assure excellent operation in large arrays and retain that performance in wet weather.

In its final form, no element length or spacing dimensions are the same. This seems to be characteristic of Yagis with maximum all-around performance. By maximum all-around performance, I mean a combination of a very clean pattern, excellent gain bandwidth and high gain for the boom length.

Resistive Losses

You may wonder where the missing 0.1 dB is between the calculated and measured Yagi gain. Such a small difference (3%) could easily be attributed to calculation error. After several years of building and measuring Yagis and comparing them to computer models, however, I have added correction factors to account for most of the difference.

Resistive losses account for most of the gain difference. Aluminum has an electrical resistance. Because current flows in all elements of a properly designed Yagi, losses will accumulate in the elements. DL6WU has shown that resistive losses are distributed fairly evenly throughout all elements. For maximum performance, the Yagi must be built from material with good conductive characteristics that will perform well in the weather.

Rainer Bertelsmeier, DJ9BV, has analyzed the K1FO 22-element Yagi with the sophisticated NEC3 program and calculated its resistive losses to be about 0.06 dB. Changing to copper elements would reduce these losses to 0.04 dB. My antenna is among the better designs in terms of resistive loss. Although lower losses are possible (0.04 dB is the lowest calculated by DJ9BV for a Yagi with similar gain using aluminum elements), lower-loss designs require greater boom length to achieve the same gain. There is no perfect solution. Part of the design problem is determining a tolerable resistive loss versus gain per boom length. The resistive-loss problem demonstrates another trap in computer analysis: It's possible to come up with a great theoretical design that may be a poor real-world performer because of resistive losses—this has occurred!

The other 0.04 dB difference between calculated and measured gain is caused by losses in the UT-141 balun. The use of an air-dielectric quarter-wave sleeve balun could reduce these losses to about 0.02 dB.

As a practical matter, of course, element and balun losses are not detectable in an antenna system used for terrestrial work. Even in an EME array, it will require the

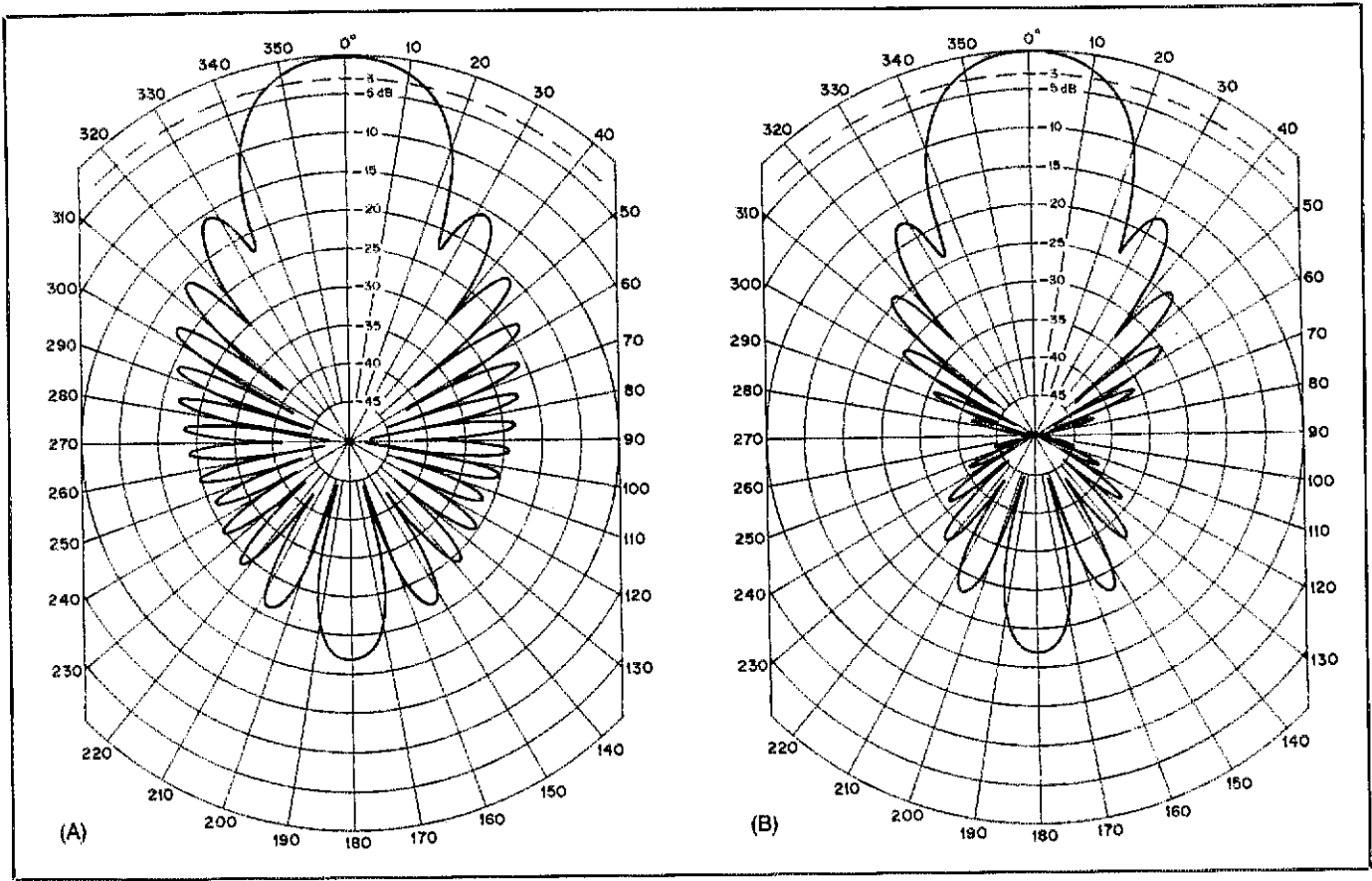
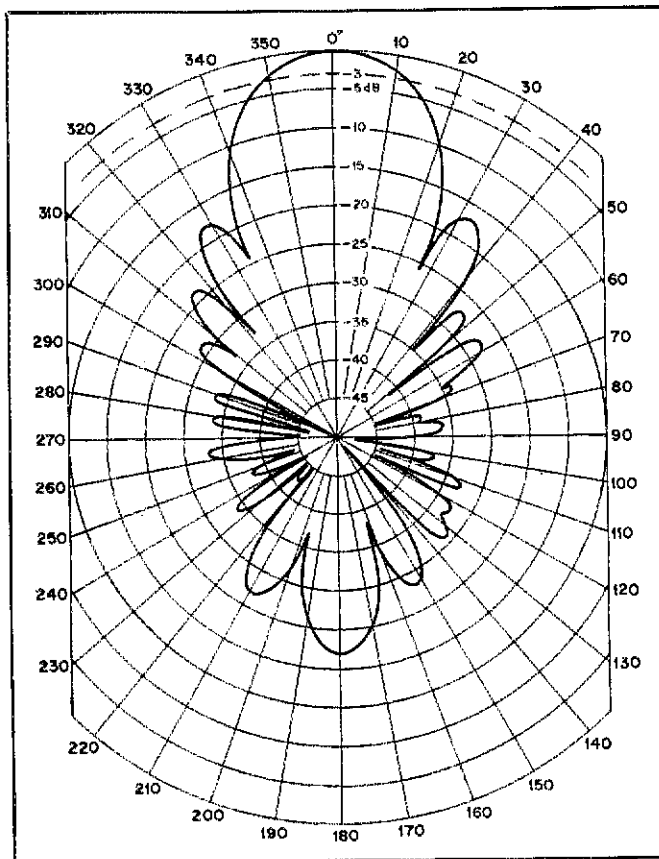


Fig 1—Computer-predicted H-plane (A) and E-plane (B) patterns for the K1FO 22-element, 432-MHz Yagi. Note: These antenna patterns are drawn on a linear dB grid, rather than the standard ARRL log-periodic grid. The linear dB grid shows sidelobes in greater detail and allows close comparison of sidelobes among different patterns. Sidelobe performance is important when stacking antennas in arrays for EME work.



← Fig 2—Measured E-plane pattern for the K1FO 22-element Yagi. Note: This antenna pattern is drawn on a linear dB grid, identical to the grids in Fig 1, rather than the standard ARRL log-periodic grid.

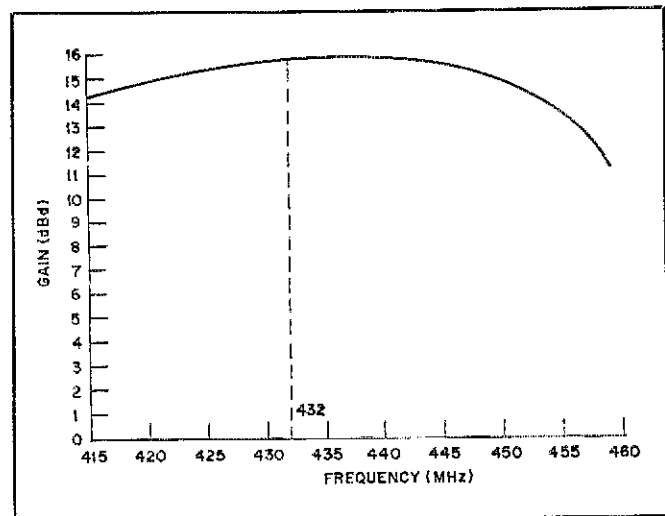


Fig 3—Gain versus frequency for the K1FO 22-element Yagi. Note that the 1-dB-gain bandwidth is 31 MHz and that the gain peak occurs at 437 MHz.

best of receiving systems to detect any improvement made from the reduction of these losses.

Pattern Measurements

Both the calculated and measured results demonstrate the value of the time spent in cleaning up the pattern. Fig 1 shows the calculated E- and H-plane patterns, and Fig 2 shows the measured E-plane pattern. The front-to-back ratio is 22 dB, and the first E-plane sidelobe is down about 17.5 dB.

Gain Bandwidth

Fig 3, a plot of calculated gain versus frequency, demonstrates the extremely wide gain bandwidth of the K1FO 22-element Yagi. Swept gain measurements of the Yagi using a network analyzer have confirmed the calculated gain bandwidth and center-frequency tuning. With an absolute gain peak at 437 MHz, the gain is less than 1.0 dB down between 420 and 450 MHz. The persistent myth that Yagis have very narrow bandwidths should be discredited forever.

Gain bandwidth (a measure of forward gain versus frequency) should not be confused with SWR bandwidth (SWR versus frequency). SWR bandwidth is a measure of the feed-point impedance and is not necessarily indicative of gain or pattern performance.

A wide gain bandwidth is important, even if operation will be on only a narrow band of frequencies. This is true for the following reasons:

1) *Construction tolerances.* The wider the bandwidth, the less critical the tolerances when building the Yagi. This makes it easier to retain excellent performance when duplicating antennas.

2) *Minimum shift of phase center.* A Yagi with smooth gain roll-off characteristics usually has less of a phase difference at the driven element as frequency changes. This is important in large arrays where the center Yagis will be operating at different points on their frequency response (this is caused by unequal mutual-impedance effects). Large phase shifts are characteristic of Yagis with many element spacings and lengths that are the same. It is also one of the major reasons why early amateur long Yagi designs were poor performers when used in large arrays.

3) *Array center frequency.* The value of wide gain bandwidth is related also to mutual-impedance effects. At 432 MHz, most of us are using arrays of Yagis (two or more antennas). Mutual-impedance effects tend to lower the center frequency of an array of Yagis relative to the center frequency of an individual Yagi. I have measured the drop in center frequency for an array of four RIW 19s to be about 400 kHz. Based on this experience, an array of 16 RIW Yagis might exhibit a center frequency drop of more than 1 MHz. An array made from wide-gain-bandwidth Yagis is a better choice than an array made from Yagis that exhibit a sharp gain drop on the high side of the peak gain frequency.

If the gain of a Yagi drops off rapidly just above the desired frequency of operation, lowering the array center frequency causes the stacking gain to be substantially lower than the theoretical 3.0 dB for doubling the array size. In addition, the pattern deteriorates rapidly above the maximum gain frequency for most Yagis (and especially for narrow bandwidth designs). For EME operation at 432 MHz, such poor Yagi pattern characteristics also create poor array patterns. This results in

inferior receive performance because of unwanted earth-noise pickup.

SWR Bandwidth

A lot of time was spent designing a driven element that would have excellent dry weather and good wet weather SWR. I decided on a T match and optimized it at 432 MHz using a Hewlett-Packard 8753A network analyzer. A sweep of SWR versus frequency is shown in Fig 4. In dry weather, the SWR measured less than 1.10:1 from 431.2 MHz to 433.1 MHz.

The good SWR bandwidth results from the wide gain bandwidth of the Yagi and from tuning the director string above the center operating frequency. For this Yagi design (as well as for other designs that were built and tested), the driven element impedance changes less with frequency on the low-frequency side of the gain peak than at or above the gain peak.

I used a garden hose to wet the Yagi for simulated heavy rain conditions. A plot of SWR versus frequency under these wet conditions (Fig 5) demonstrates how the match center frequency shifts when the Yagi is wet. The network analyzer showed that when wet, the driven element impedance becomes more inductively reactive. The SWR at 432 MHz is still an excellent 1.18:1 when the Yagi is wet. My present array of 12 22-element Yagis measures (in the shack) well under 1.2:1 when dry, and about 1.3:1 in heavy rain. Icing is a different story. As with all other 432-MHz Yagis I have tested, performance is seriously degraded under icing conditions.

I have been asked if a quad-loop driven element could be used with this Yagi. I do not favor the use of a quad-loop driven element on a long Yagi. The only advantage of a quad loop is a slightly greater

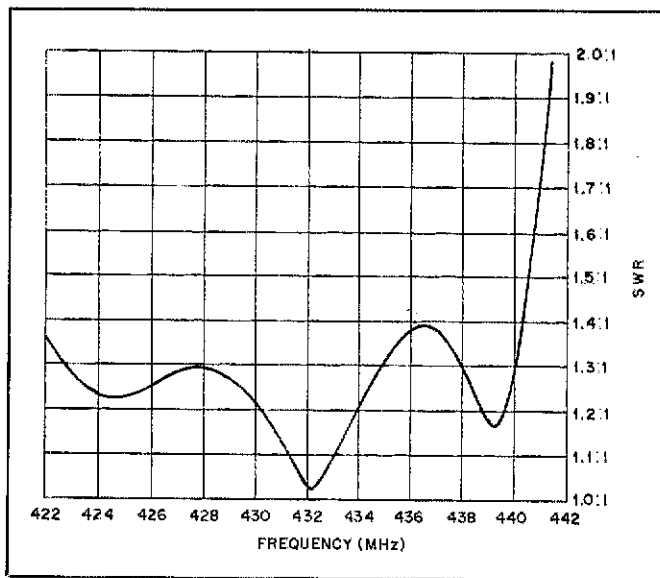


Fig 4—SWR performance of the K1FO 22-element Yagi in dry weather.

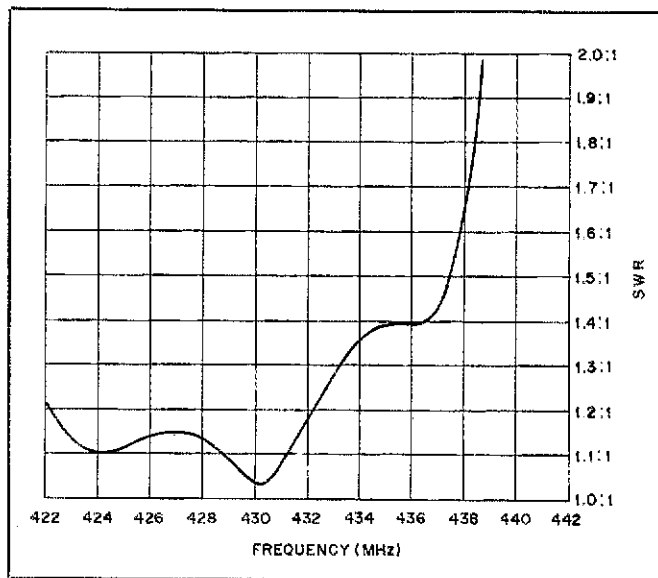


Fig 5—SWR performance of the K1FO 22-element Yagi in wet weather.

driven-element match bandwidth. All the old myths about lower noise pickup, higher gain and better pattern are exactly that: old myths. The quad-loop driven element also adds weight and windload area to the antenna without improving its gain. (I modeled this design on the computer with a quad-loop driven element and found that to make it work at all would require extensive changes to the first three or four director lengths and positions. If you want to try a quad-loop driven element or a driven-element feed system other than a T match, you have quite a job ahead of you, and you're on your own.)

Conclusions

The excellent pattern and gain of the 22-element Yagi are confirmed by the stacking spacings that give best array gain versus noise temperature. Optimum stacking distances are 65 inches in the E-plane and 62 inches in the H-plane. At those distances, stacking gain is almost

2.9 dB in both planes. (Phasing-line losses and gain loss caused by mechanical errors such as frame sag and misalignment are not included). The beamwidth of the Yagi at 432 MHz is 23 degrees in the E plane and 24 degrees in the H plane.

In examining the stacking characteristics of several popular 432-MHz commercial Yagis, I found it to be impossible to obtain more than 2.5 dB stacking gain (excluding phasing-line losses).³ This phenomenon was not a function of the physics of stacking Yagis. It was caused by the design limitations of the Yagis under test. By comparison, calculated and measured stacking gains of approximately 2.9 dB (in both the E and H planes) were obtained with the KIFO 22-element design. This figure excludes phasing-line losses.

At 15.7 dBd gain for a 6.1-wavelength boom, the gain of the KIFO 22-element Yagi approaches the theoretical maximum for its boom length. It may seem that I have done a lot of work perfecting the design

—and that a gain variation of a few tenths of a dB one way or the other isn't worth worrying about for a single 14-foot long Yagi. For an EME array of 8, 12 or 16 Yagis, however, the array gain versus wind load problem makes the effort required to tweak the antenna very worthwhile!

Coming in Part 2: Dimensions and details for duplicating the KIFO 22-element Yagi—and how to scale the KIFO design for other boom lengths.

Notes

¹Powlishe, S., "High-Performance Yagis for 432 MHz," *Ham Radio*, Jul 87, pp 8-31.

²The first E- and H-plane sidelobes are actually a single cone-shaped lobe which surrounds the main lobe when the pattern is viewed in three dimensions.

³Powlishe, S., "Stacking Yagis is a Science," *Ham Radio*, May 85, pp 18-33. □□□□

New Books

SINGLE-SIDEBAND SYSTEMS AND CIRCUITS

Edited by William E. Sabin and Edgar O. Schoenike. Published by McGraw-Hill Book Co., New York, NY. ISBN 0-07-054407-7. Hard cover, 6 x 9 inches, 594 pages, \$49.95.

In 1964, Pappenfus, Bruene and Schoenike, all members of the technical staff at Collins Radio, published *Single Sideband Principles and Circuits*. The text quickly became a standard reference for RF engineers and technically minded radio amateurs. We were quite excited to learn that this classic was to be replaced with an updated version. *Single-Sideband Systems and Circuits* was written by 22 members of the technical staff of Collins Defense Communications, a part of Rockwell International. Two of the original trio of authors are included in the present listing.

This book is a technical reference aimed at the circuit design professional. Mathematics is used liberally throughout. The resulting analytical sophistication extends to the text discussions. The reader without a formal technical background will probably be disappointed in the book.

As implied in the title, the text primarily treats SSB methods. Much of the discussion, however, is general and applies equally well to CW and data communications interests. An early chapter, System Design Considerations, presents the fundamentals of modulation theory for voice communications. These basics form background for the rest of the text. The chapter also examines many basic phenomena that limit SSB communications.

The chapters that follow examine specific aspects of SSB. The Receiver Design chapter

and a later one on receiver measurements were of special interest to this reviewer. Many interesting amplifier and mixer circuits are presented. A similar chapter on exciter and transceiver design was of equal interest. An entire chapter is devoted to speech processing, squelch and noise blanking. Other chapters are devoted to preselector and receiver IF filters, power supplies, digital controls, frequency standards and even antenna matching.

The weak element in most present-day HF ham equipment is the frequency synthesizer. The chapter covering this subject is excellent, although it left this reader looking for more detail.

Three chapters are devoted to the design of RF power amplifiers. These range from the familiar solid-state PAs in the 100-watt class to very high power vacuum tube circuits. The discussions of RF transformer design and of advanced feed-forward methods are excellent.

Perhaps the most exciting chapter in the book is that devoted to Digital Signal Processing, or DSP. An analog signal may be digitized with a circuit termed an analog-to-digital converter, or ADC. The opposite conversion is performed with a DAC. Analog functions that used to require amplifiers, mixers or filters are now realized with computer-like manipulations applied to the equivalent digital signal.

DSP is a rapidly growing segment of communications technology with many new books devoted to the subject. Unfortunately, many of these texts are written by and aimed at the digital designers. The DSP chapter in *Single-Sideband Systems and Circuits* is a refreshing departure, with fundamental concepts

presented in terms familiar to the more traditional communications engineer. There is excellent correlation between the DSP chapter and the earlier System Design chapter.

Sabin and Schoenike, the editors, have managed to maintain a uniformity of presentation style, a difficult chore with multiple authors. The resulting text is quite readable. I would recommend the book to anyone with a moderate technical background.—Wes Hayward, W7ZOI

Strays



I would like to get in touch with...

□ any faculty, alumni and students of Louisiana State University for support in reviving W5YW. Doug Hensley, WJ5J, 5054 Holloway Ave, Baton Rouge, LA 70808.

□ anyone who has 7-Band WAS. Jack Keller, WB9ETQ, R-7, Crawfordsville, IN 47933.

□ anyone who was a Navy radio operator from WW II PC Splinter fleet. James Guarino, NQ2A, 20 Nadine Dr, Cheektowaga, NY 14225.

□ anyone who speaks Greek to join a net that meets on 14,385 kHz every afternoon 1700-2200 Greece time. Dr Agis Sarakinos, SVIACS/W5WB, 4 Chiou, Chalandri, Athens, Greece.

□ anyone interested in meteor-scatter schedules as described in Nov 1986 QST. David Sarkozi, WB5N, 4278 Childress, Houston, TX 77005.

An Extended Double Zepp Antenna for 12 Meters

Got a little over 50 feet of horizontal space to spare for a 24-MHz skywire? This simple antenna will beat your half-wave dipole by about 3 dB—and you can phase two of them for even more gain and directivity.

By John J. Reh, K7KGP

510 Mt Defiance Cir SW
Issaquah, WA 98027

According to *The ARRL Antenna Book*, Zepp—short for Zeppelin—is a term long applied to just about any resonant antenna end-fed by a two-wire transmission line.¹ A bit further on in the *Antenna Book*, there's a discussion of the

extended double Zepp (EDZ) antenna.² This interested me because I have always been intrigued by "old-fashioned" wire antennas—and because the old-fashioned extended double Zepp's 3-dB gain over a half-wave dipole would provide performance quite suitable for *modern* times! The EDZ antenna consists of two collinear 0.64λ elements fed in phase. Fig 1 shows current distribution in an EDZ, and Fig 2 shows the EDZ's horizontal directivity pattern in free space.

The extended double Zepp's theoretical performance looked good to me, so I designed and built an EDZ antenna for the

12-meter band. Fig 3 shows its configuration. I decided to cut mine for 24.950 MHz. Each EDZ element is 25 feet, 3 inches long, and consists of no. 14 stranded copper wire. The antenna elements are center-fed by a short matching section made of a 5-foot, 5-inch length of 450- Ω open-wire line. Connection to 52- Ω coaxial feed line is made by means of a 1:1 balun transformer. My EDZ is strung between two trees, 35 feet above ground.

Matching Section

Perhaps I am "reinventing the wheel," but I have not seen this matching method

¹Notes appear on page 27.

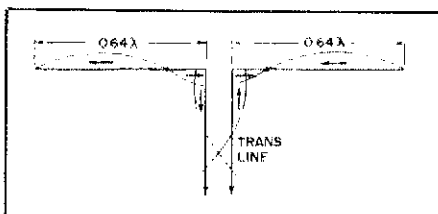


Fig 1—The extended double Zepp antenna consists of two 0.64λ elements fed in phase.

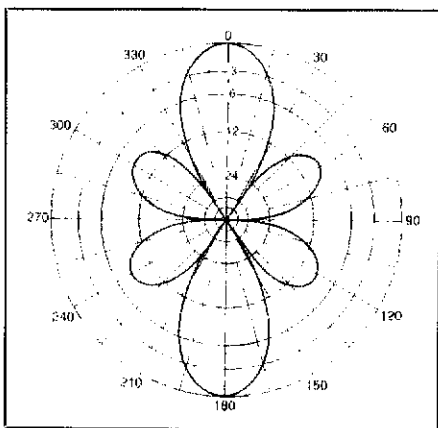


Fig 2—Horizontal directivity pattern for an extended double Zepp antenna in free space. Relative to a half-wave dipole, it exhibits a gain of approximately 3 dB. The antenna elements lie along the 90° - 270° line.

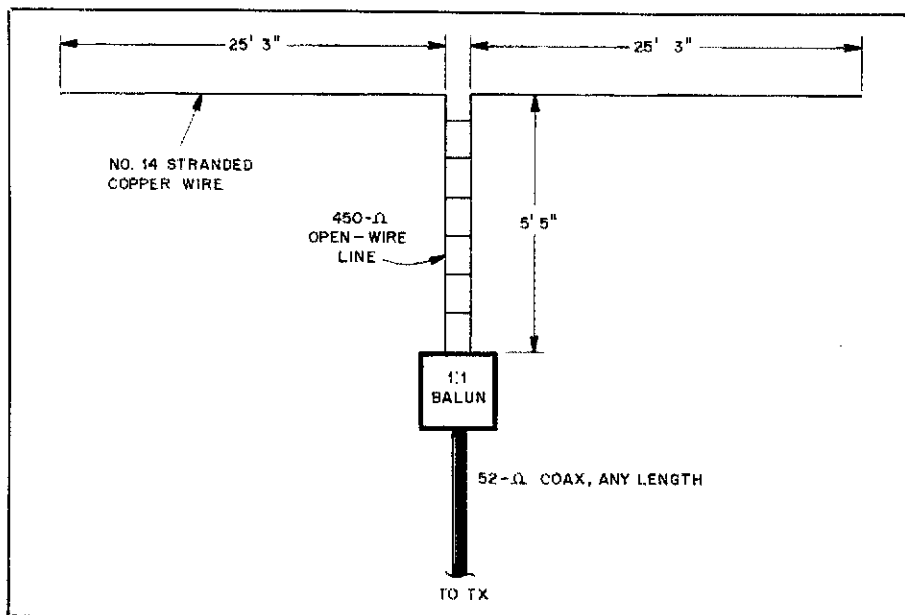


Fig 3—The extended double Zepp at K7KGP, cut for 24.950 MHz. The 450- Ω matching section transforms the EDZ's calculated input impedance ($142-j555 \Omega$) to 55 Ω (measured) for connection to 52- Ω coaxial cable by means of a 1:1 balun. The electrical length of the matching section is 52°; the linear dimension shown in the drawing assumes 450- Ω line with a velocity factor of 0.95.

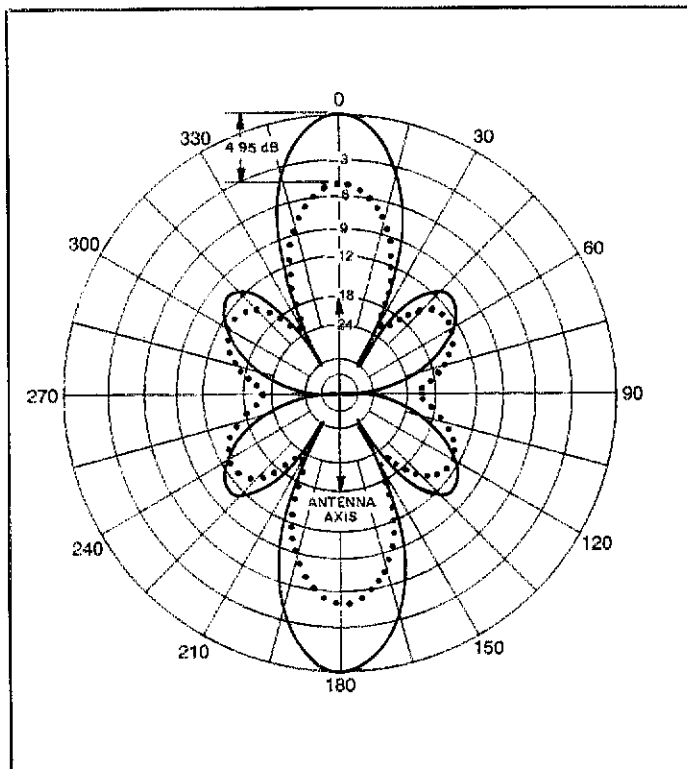


Fig 4—Comparison of calculated horizontal directivity patterns of one extended double Zepp (dotted line), and two EDZs spaced at $1/8 \lambda$ and fed 180° out of phase (solid line). The antenna axes lie along the 0° - 180° line, and the antennas are mounted 35 feet above average earth. The phased EDZs exhibit nearly 5 dB gain over a single EDZ. This is 7 to 8 dB gain over a half-wave dipole. Beamwidth of the two-EDZ array is 30° . The antenna axis is the same for the single EDZ and both EDZs in the phased array. The two-EDZ configuration characterized here is an *end-fire* array because maximum radiation occurs along its axis.

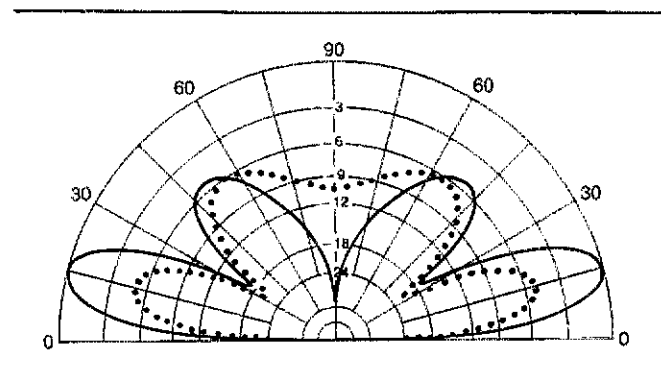


Fig 5—Comparison of the calculated vertical directivity patterns of one EDZ (dotted line), and two EDZs spaced at $1/8 \lambda$ and fed 180° out of phase (solid line). The antenna axis lies along the 0° line.

elsewhere.³ The open-wire-line matching section is 52 electrical degrees long (0.145λ). The matching section transforms the EDZ's input impedance to about 55 ohms, as measured with a noise bridge. The matching-section dimension given in Fig 3 assumes a velocity factor of 0.95 for the 450- Ω line.

Trimming the matching section to size is the only adjustment necessary with the EDZ. Make the transformer a little long to begin with, and shorten it an inch or two at a time to bring the system into resonance. (You can check resonance with a noise bridge or by monitoring the SWR.) Do *not* change the length of the elements—the EDZ's gain and directivity depend on its elements being 0.64λ long.

Phasing Two EDZs for More Gain and Directivity

Properly phased, two extended double Zepp antennas can give improved gain and directivity over a single EDZ. Fig 4 compares the calculated horizontal directivity patterns of a single EDZ and an array consisting of two EDZs spaced at $1/8 \lambda$ and fed 180° out of phase. Fig 5 compares the vertical radiation patterns of the single and phased EDZs.

Fig 6 shows the dimensions of a practical two-EDZ configuration. With proper adjustment, it exhibits an SWR of 1.3:1 across the 24-MHz band. In the array I built, lightweight broom handles serve as spreaders between the element ends; the center spreader is a wooden slat. I used

nylon rope to haul the array up between two trees. This antenna system works well, but poor propagation has precluded a thorough tryout so far. The contacts I have had with it have been entirely satisfactory.

The matching method shown in Fig 6 is

somewhat clumsy because the combined length of the phasing lines is greater than the spacing between the EDZs. The feed method shown in Fig 7 should be easier to build because the combined length of the phasing lines equals the spacing between

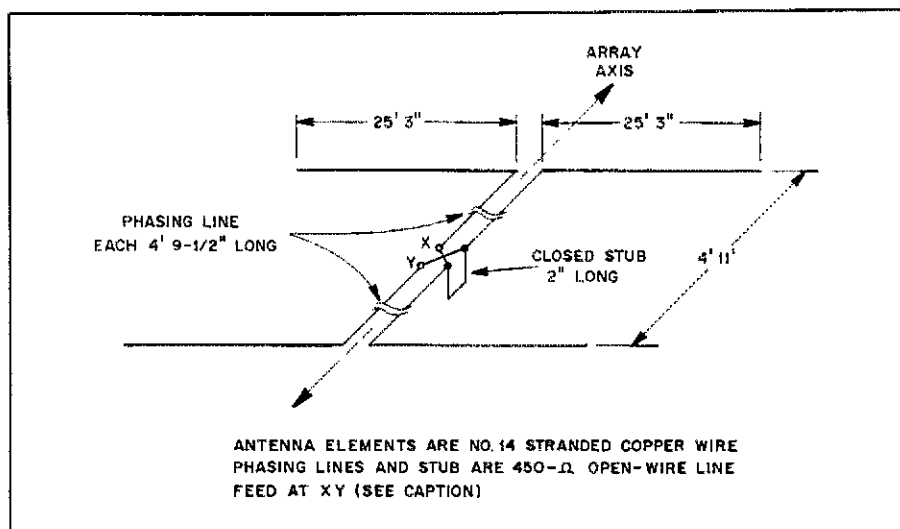


Fig 6—One method of phasing two EDZs for greater gain and directivity. The array is bidirectional, with maximum radiation occurring along the array axis. The impedance across points X and Y is 50 Ω , balanced; with a 1:1 balun at XY, the array can be fed by means of 52- Ω coaxial cable. The stub, 1.5' long, cancels a capacitive reactance of approximately 13.5 Ω at the feed point. This array works well, but its matching system is clumsy because the combined length of the phasing lines is greater than the spacing of the two EDZs. Fig 7 shows a proposed feed method that takes up less space.

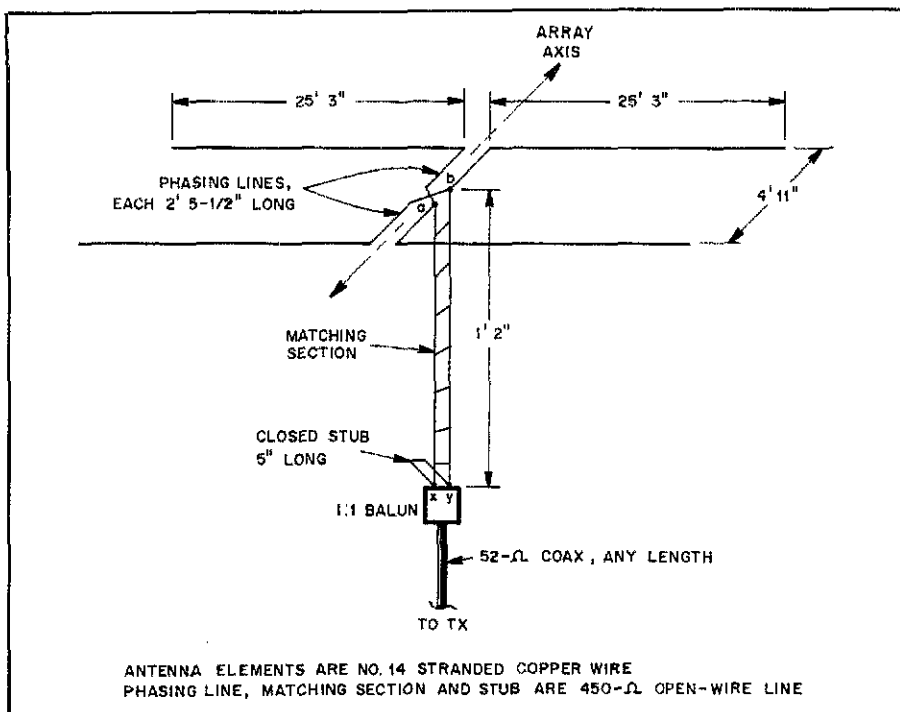


Fig 7—Proposed alternative method of phasing two EDZs. In this arrangement, the length of each phasing line is half the EDZ spacing. Calculated impedance across points a and b is $15-j112 \Omega$. The matching section—11° in length—transforms this to a calculated impedance of approximately $55-j32 \Omega$ (balanced) across points x and y. The stub, 4° long, cancels the capacitive reactance (32Ω). A 1:1 balun transformer allows the array to be fed by means of 52-Ω coaxial cable. See text.

the EDZs. I have not tried this matching method, but I'm confident that my calculated dimensions are close to what will actually be encountered.⁴

Conclusion

If the extended double Zepp has caught your attention, but 12 meters hasn't, you can scale the linear dimensions given here for other bands of interest. Once your EDZ is up and working, I think you'll agree that the performance of the "old-fashioned" extended double Zepp isn't old-fashioned at all!

Notes

- ¹The ARRL Antenna Book, J. Hall, ed. (Newington: ARRL, 1984), p 5-4.
- ²The ARRL Antenna Book, p 6-8.
- ³K7KGP's matching technique is a "re-invention of the wheel" of which he can be proud. Termed the series section transformer, it appears in *The ARRL Antenna Book* and *The ARRL Handbook*. The series-section material in these books is based on Frank A. Regier, "Series-Section Transmission-Line Impedance Matching," *QST*, Jul 1978, pp 14-16.—Ed.
- ⁴K7KGP's calculations were confirmed by Rus Healy, NJ2L, of the ARRL HQ Technical staff, using the Smith® Chart and the Mini-Numerical Electronics Code (MININEC) on an IBM® personal computer. Data for the plots in Figs 4 and 5 were also generated by means of MININEC.—Ed.

New Products

COMMUNICATIONS SPECIALISTS CHIP RESISTOR AND CAPACITOR KITS

☐ Communications Specialists provides a source of chip capacitors and resistors for experimenters. Chip resistor kit CR-1 offers 1540 pieces, including 10 each of every 5% value from 10 ohms to 10 megohms (145 values, plus 0 ohm jumpers). Also included are an additional 10 resistors in these values: 0 Ω, 10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ and 10 MΩ. Resistors are 0.1 W (0805 size) to 3.3 megohms and 0.125 W (1206 size) above that value. Each resistor is marked with a three-digit value.

Chip capacitor kit CC-1 contains 365 pieces, including 5 each of every 10% value from 1 pF to 0.33 μF (67 values). Also included are an additional 5 capacitors in these values: 1 pF, 10 pF, 100 pF, 0.01 μF and 0.1 μF. Component size is 0805 to 0.039 μF and 1206 above that value. Capacitors are NP0 ±10% to 680 pF, X7R ±10% from 680 pF to 0.1 μF and Z5U ±20% above 0.1 μF.

Contact Communications Specialists, 426 W Taft Ave, Orange, CA 92665, tel 800-854-0547, for more information. Price class: \$50 for either kit.—Mark Wilson, AA2Z

INVENTRON LABS "BANKER"— TS-940S ACCESSORY

☐ The Inventron Labs Banker is an add-on PC board for the Kenwood TS-940S that allows front-panel control of the transceiver's four memory banks. The 3.25- × 1.5-inch Banker PC board installs in the space intended for the voice synthesizer and uses the front-panel VOICE switch to select among memory banks. (Note that the Banker cannot be installed if the voice synthesizer option is installed.) No modifications to the TS-940S are required. Using only two CMOS ICs and six discrete components, the Banker requires little current and draws no power from the transceiver's backup batteries. Price class: \$50. Manufacturer: Inventron Labs, PO Box 1882, Brookline, MA 02146.—Mark Wilson, AA2Z

Strays



I would like to get in touch with...

☐ anyone with a manual/schematic for a CREI Model 255 oscilloscope. Albert Clarr, KO9N, 8116 East 20 St, Indianapolis, IN 46219.



QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

Intermodulation is a form of radio frequency interference. Distortion products caused by multiple RF signals and their harmonics mix with each other and the local oscillator to produce new output frequencies. Every transmitter and receiver has the potential of generating intermodulation distortion. Here are tips on how to pinpoint the problem, its causes and cures.

The November issue of QEX includes articles on:

- "Surviving in the Intermod Jungle," by Mark Bacon, KZ9J
- "Measurement of Antenna Impedance," by Peter Dodd, G3LDO, and Tom Lloyd, G3TML
- "A 1200-bit/s Manchester/PSK Encoder Circuit for TAPR TNC Units," by Barry McLarnon, VE3JF

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, and is published monthly. The special subscription rate for ARRL/AMSAT members is \$8 for 12 issues; for nonmembers, \$16. There are additional postage surcharges for mailing outside the US; write to Headquarters for details.

Amateur Radio and the Blind

Part 3: In this installment, we'll ready the computer to talk to the modem. Then, we'll look at modems and some terminal software, too.†

By Butch Bussen, WA0VJR
Box 142,
Wallace, KS 67761



(photo by Gary McDuffie, AG0N)

RTTY, packet radio and AMTOR are fun to operate! The latter two modes, however, are more technically sophisticated than Baudot RTTY. Blind or otherwise handicapped hams certainly can enjoy using packet and AMTOR, but the procedure isn't as simple as buying a box and plugging it in! Packet radio and AMTOR offer fun and challenges, but the long and short of it is that you'll need help—at first, anyway.

First, a Few Comments

As I mentioned way back in Part 1, it's helpful to have a radio that tells you exactly what frequency you're on. You've got to be close to the right frequency, and that doesn't mean within 1 kHz! On AMTOR and RTTY, you're working with tones 170 Hz apart, and both tones have to be in the modem filter passband.

I'll be the first to admit that I'm a bit picky, but I want my transceiver to be within 10 Hz of where the readout says I am. If it isn't, the last digit might as well be a question mark! I like my Kenwood TS-440. It's equipped with the optional speech synthesizer and automatic antenna-matching network. The '440 has keyboard frequency entry, and at the touch of a button, I know what frequency I'm on. Touching another button activates the antenna-matching network. The radio is stable and has 100 memories, many of which I've set up for phone, packet and AMTOR operation. The only feature I miss having in the '440 (that the Yaesu FT-980 I owned has) is the IF-signal monitor—it helped me set audio levels.

Many older rigs (and some modern ones) will not work on AMTOR at all, or at least need some modification to properly do so.

This is because of the fast transmit/receive (TR) switching required. If you're thinking of operating AMTOR, check out the transceiver before you spend extra money for an all-mode modem only to find your rig can't switch fast enough to use AMTOR.

Computer I/O Needs

To communicate with your modem, you'll need a serial card. Most PCs come equipped with a serial port or two either on the motherboard or on a separate expansion card. If your PC isn't so equipped, there are many inexpensive plug-in cards you can purchase that will provide you with what you need.

The Laser 128, like the Apple® //c, is equipped with the required serial port. If you intend to use an Apple //e, however, you'll have to add a serial card. I recommend the Apple Super Serial card or the Apricorn card that emulates the Super Serial card.¹⁴ (The Apricorn card setup is slightly different from the Apple card; more on that in a minute.) Plug either card into expansion slot 2; the angled corner of the card faces the front of the computer. (Slot 2 is usually used, but in an Apple //e, almost any slot is okay. The exception is slot 3: If an 80-column card is installed, slot 3 cannot be used.)

The Super Serial and Apricorn cards are supplied with a short ribbon cable equipped with a female DB-25 connector on one end. The DB-25 mounts on the back panel of the computer. The other end of the cable connects to the serial card. Apple's card requires positioning a DIP jumper plug to select printer or modem connection. Position the

plug to select modem operation; the beveled corner of the plug is positioned toward the front and bottom of the card. In lieu of the jumper plug, the Apricorn card has two on-card connectors for the jumper cable between the card and the DB-25 connector. Plug the cable into the card connector nearest the front of the computer.

Super Serial Card Setup

Two banks of switches must be set to configure the Super Serial Card for the communications mode. The switch levers are long enough to be felt and moved easily. The following switch settings are given as seen from front to rear.

Set the first switch in the front bank OFF (down). Put the next five switches in this bank in the ON (up) position. Set the last switch in this bank, switch seven, OFF. (The Talking Transend software manual shows this switch in the ON position. I have found in some cases that this switch needs to be set to OFF. No one has been able to explain to me why this is. All I know is that with the AMT-1 and KPC-2, the card works with this switch set to OFF.) At the rear of the card, the first four switches in the second bank are set to ON, and the remaining three switches are placed in the OFF position.

Apricorn Card Setup

Though the Apricorn card emulates the Apple Super Serial Card, it is different physically. You'll notice that there are eight switches in each switch bank (instead of seven as on the Apple card). The switch levers on this card are harder to move than those of the Apple card. You'll need a pencil or sharp-pointed instrument to move them. In both switch banks, switch eight is placed in the OFF, or down, position.

¹⁴Notes appear on page 31.

Talking Terminals for the Blind Amateur

ProTERM and ProTERM+ are terminal programs designed for use with the Apple® IIe, IIc and IIGS computers. (In the case of the IIe, the enhanced ROMs should be installed.) The programs perform well for sighted people using standard video displays, but are intended primarily for blind users who must rely on speech synthesizer output for reading screen information.

Many programs designed for use by sighted persons are embellished with lines of asterisks, ampersands or other "window-dressing" characters. To a blind ham relying on an audio representation of the screen, the prospect of listening to "star" (the synthesizer's word for "asterisk") 16 or more times is less than inviting! The ProTERM software eliminates this hassle. One of the keyboard-selectable options allows you to choose characters you want trapped from audio presentation. The characters can be seen on the screen and captured on disk or in memory, but are not acted on by the speech synthesizer.

Another useful feature of the ProTERM series is the ease with which parameters such as baud rate, data-word length, number of stop bits and parity can be set. For example, pressing OPEN-APPLE P enables you to set parameters. You select the desired baud rate (300 to 9,600 bps) by entering only the first digit. Any combination of parameters can be established and saved to disk as the default settings.

Incoming data can be saved to disk or read from the buffer without turning on the capture buffer. You can scroll through roughly 30 kbytes of buffer space to look at the data. This potential is extremely useful in rag-chews.

You can turn off the speech synthesizer, too. That comes in handy when you're handling high-speed transfers of large amounts of data. The program has a built-in "clicker" that serves to monitor transfer activities. When data is flowing, the clicker sounds; at 9,600 bauds,

the clicks become a continuous tone.

Among the terminal programs designed for use with Apple computers, ProTERM and ProTERM+ are by far the easiest to learn to use. There's one feature that is especially attractive to radio amateurs. Most talking software intended for use by the blind does its best to treat all letter groupings bounded by spaces or punctuation marks as words. As a consequence, it tries to pronounce them. Thus, it would try to pronounce the call letters WA1XXX as if it were a word. To circumvent this when using the program for packet-radio or RTTY operation, you simultaneously press the CLOSED-APPLE and c keys. Now, when the program sees anything that may be a call sign (an alphanumeric group), it pronounces separately each character within the group.

Using a combination of ProTERM and the appropriate Echo or Cricket speech synthesizer for the Apple computer being used, it is even possible to examine data intended to be read in columnar form. With the Screen Review feature of the Textalker, the software that drives the speech synthesizers, it is possible to define column boundaries and examine columns within these defined limits quickly and efficiently. Should there be uncertainty about the pronunciation of a given word, the word can be spelled out character by character.

ProTERM+ allows you to transfer programs and other data over the phone line using the ASCII EXPRESS™ terminal program approach. Though I have not used ProTERM with AMTOR or RTTY, I have used it on packet radio and can attest to its efficiency and operational ease.

These programs are available from Microtalk, 337 South Peterson Ave, Louisville, KY 40206, tel 502-896-1288. ProTERM is \$150; ProTERM+ is \$195.—Fred L. Gissoni, K4JLX, 310 Pleasantview Ave, Louisville, KY 40206

Otherwise, the switch positions are the same as those of the Apple card.

Software Considerations

If you are using Talking Transend, you'll need to configure the program so that it knows which serial card you're using, and in which slot it is placed. This should be slot 2 for the Laser 128 or Apple IIe. Also, tell the program that you are using a dumb modem. Be sure to perform this configuration with a copy of Talking Transend you intend to use strictly for Amateur Radio purposes! Otherwise, if you have a smart telephone-line modem and use the same copy of the program with it, the program will no longer support autodial and other features. (Talking Transend cannot be copied with Apple's standard copy program, but any bit copier should do the job.)

Next, select option D (Define Transend Parameters) from the main menu. If you're using an AMT-1, select 8 data bits, no parity and 2 stop bits. Choose a baud rate of 110, and select full duplex. I also redefined each incoming space character as a carriage return. This gives me a more even flow of data from the speech synthesizer, but consequently prints only one word to a line on the screen. For both the PK-232 and KPC-2, I set the parameters for a baud rate of 300, 8 data bits, 1 stop bit and no parity.

At the Text Transfer Protocol menu, you define the "START/STOP on buffer full"

and "STOP/START from remote" parameters. In both cases, unless you have already changed them as parameter settings, set STOP to a Control S, and START to a Control Q. Talking Transend expects decimal numbers, so use 19 for Control S and 17 for Control Q.

I can't cover all the features of Talking Transend here, but I can tell you it is a powerful and flexible program. (See the sidebar for a discussion of another pair of terminal programs.) One drawback of Talking Transend is that "the keys talk" as you type (the synthesizer voices each keystroke), so it is difficult to type ahead on AMTOR while receiving incoming data. Also, Control R is the Talking Transend line review command and Control E is a Textalker command. If your modem also has these keys defined in your parameter set, you will need to change them; otherwise, the Control R or the Control E will not be

sent. Remember: These control characters must be entered as hexadecimal numbers for both the KPC-2 and PK-232, and are thus preceded by a \$.

Textalker will not usually speak unless it sees a carriage return. Written into Talking Transend (and the program I am writing) is a time-out feature.¹⁵ After a certain length of time, Talking Transend will force the characters accumulated in Textalker's buffer to be spoken even if a carriage return is not sent. I can change this

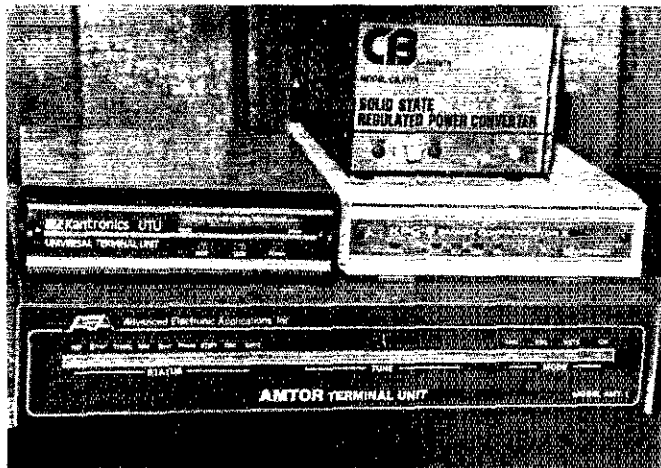


Fig 5—A mound of modems; the AMT-1 is at the bottom. (AG0N photo)

timing variable in my program, but not in Transend. In Talking Transend, this time delay is short enough that it sometimes causes problems. If, for some reason, data flow is quite slow, you will get individual characters or parts of words spoken. If you type a Control E followed by a W, Transend will wait for a carriage return. Cancel this mode by typing a Control E L.

Modems

Consider buying the same kind of modem that a friend has, so you can get assistance when setting up parameters and the like. Though most modems will talk to each other, their parameter settings and command structures can be, and usually are, quite different.

I have been on AMTOR for about three years, and enjoy that mode a lot. The first AMTOR modem I bought was the AMT-1 (see Fig 5). It's command driven (responding to immediate keyboard entry) and has a large transmit-text buffer. It's geared for AMTOR use only, however, and is no longer being manufactured by AEA. You can still find them at hamfests or dealer closeouts, though. The AMT-1 uses 110-baud input, and some computer terminals and programs won't operate below 300 bauds.

I borrowed a Kantronics UTU (Fig 5) to try on AMTOR. It works fine, but it's menu driven. This means that every time I change from mode A to mode B, I have to wait for a menu to be displayed. This leads to excessive talking by the speech synthesizer (remember, it's reading the screen). Unfortunately, I didn't get a chance to try the Kantronics UTU-XT. I understand it's command driven, so it probably works better with a speech synthesizer.

The UTU has only a 32-character transmit-text buffer that I was always overtyping. Especially on AMTOR, I like to type ahead as I'm receiving the other station. With some terminal programs, this causes problems. In some cases, the synthesizer speaks each keystroke as you type. So, if you try and type while you're listening to incoming data, things get a bit confusing! Ideally, I don't want the keys to talk as I'm typing. I usually know what I have typed, and can tell when I make a mistake.

Kantronics KPC-2

When the KPC-2 (Fig 5) arrived, I asked Gary McDuffie, AGØN, for help. He had bought a KPC-2 at Dayton, and was familiar with its operation. Gary talked me through the on-air routine. Before that, though, I had to get the modem hooked up to the computer and radio.

What drives me nuts is getting a brand new toy and not knowing how to hook it up! You may be in the same situation, so get someone to read the instruction manual to you. Here are a few things I learned—luckily, not the hard way!

The KPC-2 comes with all necessary cables and a multiple-voltage ac adapter. I didn't use the modem/computer cable provided with the KPC-2 because it has a DB-25 connector on one end only. I used a straight-through, 25-conductor, male-to-male cable of my own. (Only five wires are used in the KPC-2 cable.) The manual warns you that some of the other cable wires are used for special purposes. Pin 25, for example, has +12 V on it, and pin 18 is a processor test input used only by the factory. The only pins you're supposed to use are 1 through 8, and pin 20 (1 and 7 are common). In this regard, I was lucky—none of the computers I use has anything connected to the reserved pins—and I didn't find out about all this until later!

The power supply is a multiple-voltage-output ac adapter equipped with two switches, so be sure the switches are set correctly before you plug it in. Hold the supply with the wire coming out of it toward you, and the prongs that plug into the wall socket pointing down. Make sure the left-hand two-position switch is toward you. This switch reverses the dc output voltage polarity. Be sure the right-hand slide switch is in the second position from the left. This is the 12-V position. My power supply came from the factory set properly, but it's better to check yours and make sure.

Another cable supplied with the KPC-2 has a DB-9 connector on one end. This cable contains the transmit audio, PTT and squelch lines, and has a lead equipped with a miniature phone plug for receiver audio and ground. There's also a red lead that carries +12 V when using the Kantronics power supply. These wires all have bare ends, so clip and tape the red wire to be sure you don't accidentally short it to ground if it's not being used. (This precaution is covered in the manual.) The only wires in this cable that I use are AFSK out (white), PTT (brown) and ground (black or shield).

I won't go into a detailed description of the KPC-2 rear-panel connections as there are few of them, and no two are alike. Also, the KPC-2 has its memory backup battery already installed. The back of the KPC-2 has an on/off switch, a DB-25 connector, a coaxial power jack, a DB-9 connector and miniature phone jack.

The KPC-2 has provisions for accommodating an external speaker. Just insert the miniature phone plug into your radio, and connect an external speaker to the miniature phone jack provided on the back panel of the KPC-2.

My Kenwood TS-440 has a fixed-level audio-output phono jack (AFSK OUT) on the back.

There's enough audio there to drive the PK-232, but not enough for the KPC-2, so I had to use the transceiver's external speaker jack as the audio source. There are resistors in the KPC-2 that can be changed to decrease the audio input-level requirement, but I didn't bother with the modification.

AEA PK-232

The PK-232 (see Fig 6) I received bore serial number 51. Besides packet, the PK-232 works AMTOR, CW, ASCII and RTTY (later models include HF WEFAX reception capabilities—Ed.) The modem isn't equipped with a power supply, so you have to provide one. A two-wire power cable is supplied; it has a coaxial plug on one end that plugs into the PK-232. You don't have to worry about soldering that connector. The red wire that carries +12 V goes to the center pin, and the ground connection is made to the outside shell. If you have a multimeter, you can figure out how to get the PK-232 powered up. If no one is around to tell you the wire colors, just check for continuity. I usually tie a knot in the ground wire and put a small piece of tape on the positive wire for easy identification.

You'll also need to install the memory backup batteries so that the parameters that you have set won't "go away" when you turn off the PK-232. Remove the cabinet top by taking out two screws in the back and two on each side. (The top, back and sides of the cabinet are one piece.) Take care you don't move it too far—wires from the battery holder, which is fastened to the top of the cabinet, lead to the circuit board. Just lift the top of the cabinet up and toward the back. You'll find a battery holder that holds three AA cells. If you're looking from the front of the box toward the back, install the cells this way: With the front of the PK-232 toward you, and the top of the cabinet lifted up and toward the back, the cell to the right is inserted with the positive terminal up. In other words, the positive terminal will be toward the front of the unit when it's put back together. The middle cell is inserted with the positive terminal down or toward the back. The left-hand cell has its positive terminal up or toward the front. When you put the top back on the cabinet, be sure that the miniature phone jacks on the back line

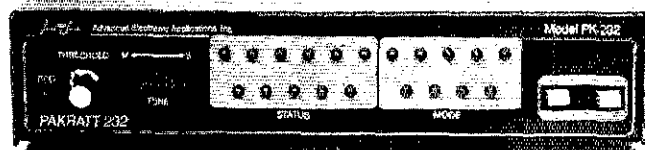


Fig 6—The AEA PK-232. In addition to CW, RTTY, AMTOR and packet-radio modes, current versions of this modem also provide for HF WEFAX reception.

up with the matching holes in the cover. Take note that there are two different types of screws used. The four screws with the pointed ends go on each side, and the two screws with the blunt ends go in the back.

Besides the power cable, the PK-232 comes with two audio cables, each with a miniature phone plug on both ends. You can use these cables to feed receiver audio to the PK-232. If you use the external speaker jack on your rig, you'll probably want to use a Y connector to hook up an external speaker as the internal speaker in your radio is usually disconnected when an external speaker is plugged in. There are also two cables with a 5-pin connector on one end for transmit audio and PTT. The green wire in this cable feeds receiver audio to the PK-232. The brown wire is tied to the shield or ground wire. The white lead feeds AFSK audio to the transmitter, red is PTT, and black is squelch inhibit. I didn't use the squelch inhibit on either the KPC-2 or the PK-232.

As with the KPC-2, use of certain wires in the cable between the modem and computer should be avoided. AEA's manual cautions that wires connected to pins 1 through 8 and pin 20 only should be used.

Because the PK-232 is designed to be used with two radios, you'll need to know which rear-panel connectors do what. The right-most push button on the front panel is the ON/OFF switch. The OUT position of the switch selects radio one, and the IN position selects radio two. Place the PK-232 so that the front panel faces you. Reach over the top of the modem and feel the back panel. Here's what you'll find: To the very right is the power jack. Just left of that is the miniature phone jack for receiver audio from radio one. Next to it is the 5-pin connector for radio one. Plug the cables into the 5-pin connectors with the wire pointing down or toward the bottom of the cabinet. The next connector to the left is the 5-pin connector for radio two, and to its immediate left is the miniature phone jack for radio two. Moving to the left, you'll find a female DIN jack used for a scope hook-up, and then another 5-pin connector that's used for an external modem. To the left of these connectors are the two CW key jacks. These are phono jacks. The one on the right is for negative keying lines, and the one to the left is for positive keying lines. I use the left-hand jack (positive-voltage keying) with my Kenwood TS-440. Next is the DB-25 connector for the serial cable to your computer. To the far left is a small hole that provides access to the transmit-audio level adjustment.

In Use

Both the KPC-2 and PK-232 have an autobaud routine that is active when the modem is first powered up. This is how it works: When you see the screen printing properly, you type an asterisk, and the modem sets itself to the baud rate for which your computer is set. This presents a

problem, however: By the time you hear the speech synthesizer, it's usually too late. I had the best luck turning on the power and immediately typing asterisk after asterisk until the modem locked on and started talking properly. I set both the KPC-2 and the PK-232 at 300 bauds. The speech synthesizer cannot talk that fast anyway, and one of the programs I was playing with on the Apple would not work at 1200 bauds.

Software

It's possible to write your own terminal program for any computer, but I found it easier to do on PCs than on the Apple. I used Microsoft® BASIC, which works great. You have commands such as ON KEY GOTO or ON COMM GOTO that you don't have in Applesoft™. Also, Applesoft can't directly, or quickly enough, handle the interrupts required by many applications. On PCs, you have function keys with which you can do some fun things.

I have used all of the programs I talk about in this series, and they work well. A simple dumb-terminal program will get you on the air, but there are additional features that are nice to have. Unless you're a real computer nut like me, you probably won't want to write your own terminal program.

If you jump back and forth from HF to VHF on packet, you'll find that there are several parameters that need changing. It's nice to have these in a disk file that you can quickly send to the modem. This feature is also nice for sending files to bulletin boards or sending and receiving programs and the like. You'll also want some kind of line review so you can check digipeated paths, call letters and other text you may not have understood the first time. Call letters are a problem as the synthesizers try and pronounce them as words, so you almost always need line review to check out a particular call. One thing I'm working on is a version of Textalker (the software used with the Echo II or Echo Plus) that will look for a number in a word and go into letters mode. Then it would pronounce the call sign properly instead of trying to make a single word out of it.

There seems to be a big push among software developers toward interruptibility. This feature silences the speech synthesizer whenever a key is pressed. It has its place, and in some cases I like it, but not while I'm on line, running packet. If you cannot turn this feature off, you cannot type at all when receiving data. If you do turn it off, output from the synthesizer is not stopped and you won't miss incoming data. As mentioned earlier, I particularly like to type ahead into the transmit buffer when on AMTOR. I can answer questions just as I receive them. When the other station turns it over to me, the transmit buffer is sent as I typed it while listening to his previous transmission. (This gives me time to grab a quick cup of coffee without missing a thing.) Doug Geoffray, a programmer I know, and I are working

on software for Apple computers that does this quite nicely. The keys and incoming data are both buffered, but completely independently. The synthesizer doesn't talk as I type, but I can type at the same time I'm listening to stuff coming in on the screen.

The "sendpak" character is usually a return, so that destroys the type-ahead thing I like to do, at least while I'm on packet. It's nice on AMTOR though, and you usually want the ECHO parameter on and the terminal program set for full duplex. With EAS on when using the PK-232 on AMTOR, the synthesizer doesn't speak the characters until they have been transmitted.¹⁶ This gives me a good idea of how fast data is actually being received. It isn't quite that easy on packet because the mode allows for so much activity on the channel. I'll be discussing a few specific parameters and why I set them the way I do.

I found that the PK-232 and KPC-2 work equally well with the computers and programs I used. Though I have not tried them, I see no reason why other modems on the market would not interface as easily and work fine. These include the TAPR TNC II, MFJ, GLB and others. Some of the command structures for these modems may be quite different, though. The PK-232 and KPC-2 are not identical, but are close in most respects. As an example, the TX DELAY parameter does the same thing on both units, but the number of milliseconds for each number set for TX DELAY is different.

Next month, I'll have a few operating tricks for you. Tune in!


In our October installment, an incorrect address was given for the Recording for the Blind, Inc. The correct address is: 20 Rozel Rd, Princeton, NJ 08540; tel 609-452-0606. (Thanks to Babette M. Richman, KA9UVF, Studio Director.)

Notes

¹Parts 1 and 2 appeared in the Oct and Nov 1987 issues of QST.

¹⁴Apricorn, 10670 Treena St, Suite 10, San Diego, CA 92131, tel 619-271-4880.

¹⁵I'm presently writing a communications program for the Apple that is done primarily in machine language and works well. You can contact me about the programs I'm writing for both the Apple and PCs.

¹⁶EAS—echo as sent. This command functions in all modes *except* packet. It permits you to choose the type of data displayed on your monitor or printer. 

Strays



I would like to get in touch with...

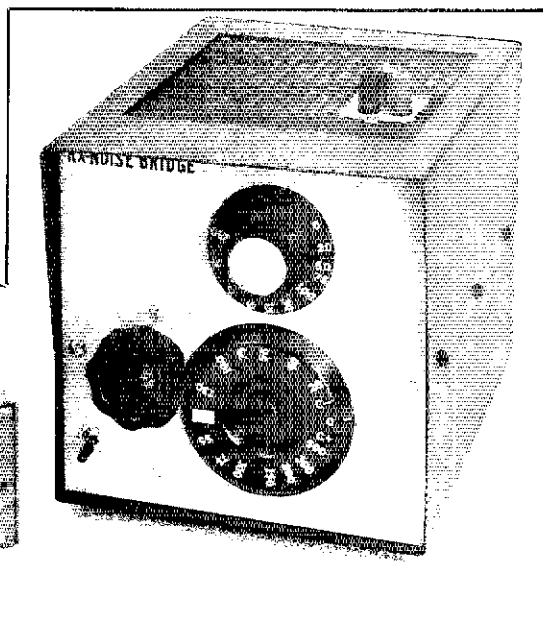
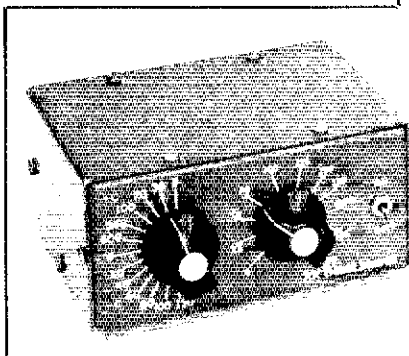
anyone with a manual/schematic for a Data Signal Cricket II electronic keyer. Robert Pinkus, WA8NYV, 5280 Gander Rd W, Dayton, OH 45424.

anyone with manuals for a Hallicrafters transceiver Model TR-20J and a Motorola Handie-Talkie Model H23-I. John Knuckles, N4QBK, Rte 2-Box 193A, White Bluff, TN 37187.

A Laboratory-Style RX Noise Bridge

Large, inflexible coaxial cable can make your small noise bridge hard to deal with on the lab bench. This project cures the problem.

By Doug DeMaw, W1FB
PO Box 250
Luther, MI 49658



Is your antenna noise bridge too small for comfortable use in your workshop or at your antenna installation? If you have one of the miniature homemade or commercial units, chances are that the connecting cables won't let your bridge stay put on the bench. Another problem with small bridges and other small test equipment is the poor dial resolution that results from the limited panel space available for calibration marking.

There is no reason you can't use a large cabinet and big dials on the noise-bridge controls. I built a lab-style instrument of this type, and it is a pleasure to use. It stays put on the lab bench and on the antenna test-site table. Large R (resistance) and C (capacitance) dials are used on the controls, and the readout is greatly improved over that of the smaller bridges. This can be of great benefit to those of us who have weak or tired eyes! Today's apparent objective of developing miniaturized equipment need not apply when we build units for home station or workshop use. The practical project shown in this article reflects my efforts to build a solid and inexpensive lab style noise bridge.

The RX Antenna Bridge Circuit

I claim no credit for designing the heart of this noise bridge. The basic circuit is taken from the measurement chapter of *The ARRL Handbook*, as is the PC-board pattern.¹ My changes include adding a NiCd battery, binding posts (in addition to

a BNC connector), a bigger cabinet and large readout dials. I also use a surplus WW-II Command receiver 3-section variable capacitor and gear train for the CAPACITANCE control. This provides nearly 330° of dial calibration space. A variable capacitor without this gear drive yields only 180° of dial calibration!

How Does it Operate?

The noise bridge circuit is shown in Fig 1. The basic bridge circuit consists of C1, C2, R1 and T1. The broadband transformer, T1, is trifilar wound (three identical windings). One winding is used to couple energy from the Zener-diode noise generator (D3) to the bridge circuit. Each of the two remaining transformer windings serves as an individual arm of the bridge. The third bridge arm consists of C1 and R1. The fourth and final bridge arm is formed by C2 and the unknown load at J2. With an unknown load connected to J2, C1 and R1 are adjusted to obtain a null in audible output noise (as monitored on a receiver that is connected to J1). The R1 and C1 control readings indicate the resistive and reactive (C or L) components of the load at J2.

1-kHz Modulation Feature

The NE555 timer IC, U1 in Fig 1, generates a 1-kHz square-wave tone with a duty cycle of roughly 50%. This energy, applied to the cathode of D3, modulates the wide-band noise generated by the Zener diode. This audio tone is not heard until the bridge is nearly at null, at which time it begins to override the noise. Nulling is continued to obtain the greatest audio-to-

noise ratio. A complete bridge null will result in a clear audio tone with no discernible wide-band noise. This effect is evident only when the bridge is used with an AM detector. Noise nulling can be done using the SSB mode of your receiver, but the 1-kHz tone feature cannot be used.

Noise-Bridge Applications

The most popular use for an RX noise bridge is antenna matching. You can couple the bridge to the antenna feed point to permit precise adjustment of the antenna-matching network. You can also use the bridge at a distance from the feed point if you use a half-wavelength section of feed line between the bridge and the feed point. In calculating the cable length, you must consider the coaxial-cable velocity factor. A half-wavelength line (or multiple thereof) repeats the feed-point impedance at the opposite end of the line. Other coaxial cable lengths will provide misleading data. The antenna-matching network (gamma, T, hairpin or other) is adjusted until a purely resistive load (zero reading at C1) is noted at the desired operating frequency.

I find this bridge helpful in testing broadband transformers. Fig 2 illustrates the setup for doing this. The test transformer is terminated with a known resistance that is within the transformation range of the transformer. The other transformer terminals are connected to the binding posts of the bridge. C1 and R1 are adjusted to obtain a bridge null, and the dial readings are noted. This procedure is repeated for each band of interest. The amount of reactance (as read on the C1 dial) indicates the quality of the transformer. An ideal

¹M. Wilson, ed, *The 1987 ARRL Handbook* (Newington: ARRL, 1986), pp 25-36 to 25-39.

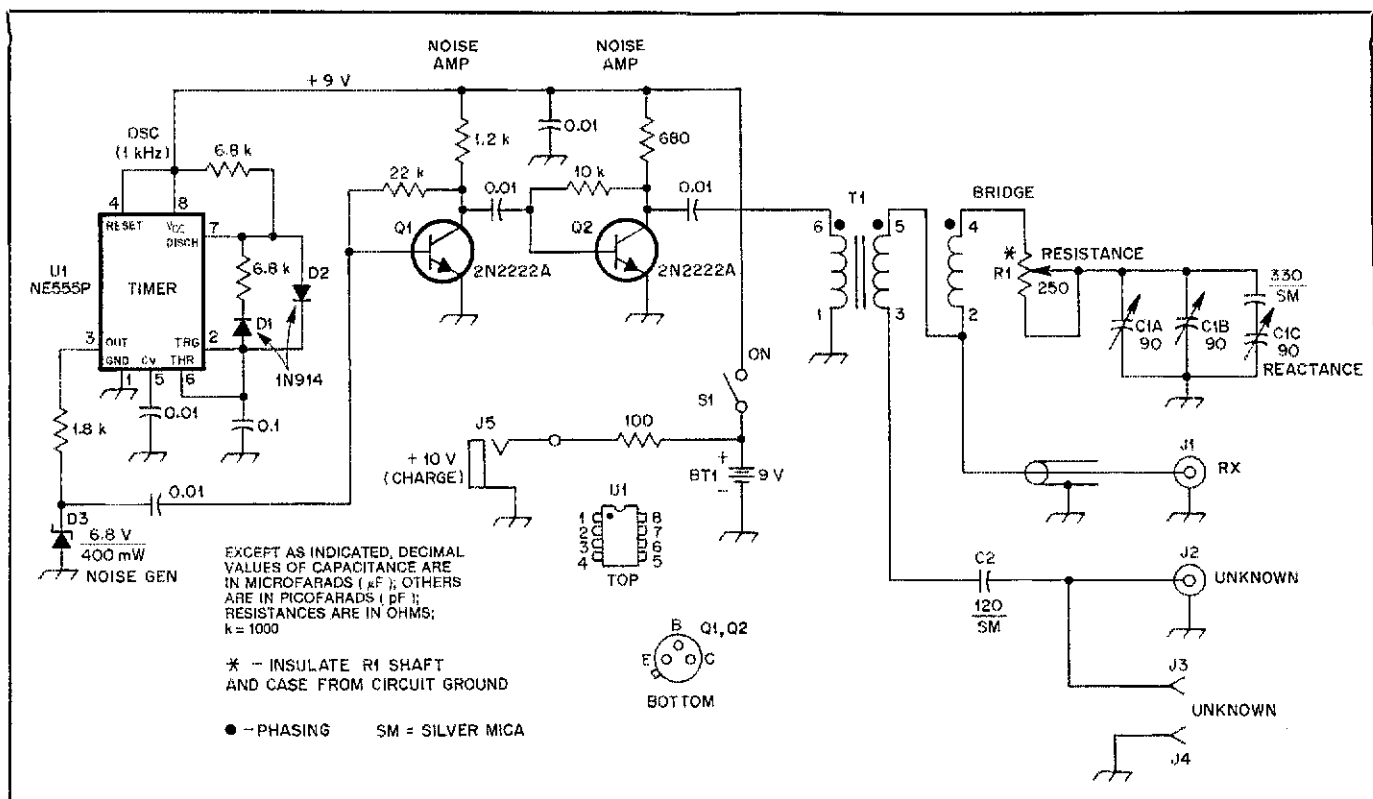


Fig 1—Schematic diagram of the RX noise bridge. Capacitors are disc ceramic unless otherwise indicated. Resistors are 1/4-W carbon-composition units.

BT1—9-V NiCd or standard transistor-radio battery.

C1—Variable capacitor, 250 pF maximum capacitance. Surplus 3-section air variable, 90 pF per section, or equivalent (see text).

C2—Fixed-value capacitor, approximately half the value of C1 (120 pF).

J1, J2—BNC coaxial connector.

J3, J4—Plastic binding-post connector.

J5—Phono jack.

D1, D2—Small-signal silicon switching diode, 1N914 or equivalent.

D3—Zener diode, 6.2 or 6.8 V, 400 mW.

R1—High quality, 250- Ω , linear taper potentiometer (Allen-Bradley or

equivalent).

S1—SPST toggle.

T1—Broadband, trifilar-wound transformer.

Use 8 trifilar turns of no. 26 enam wire on an Amidon FT-37-43 toroid core (850 μ).

U1—NE555 timer IC.

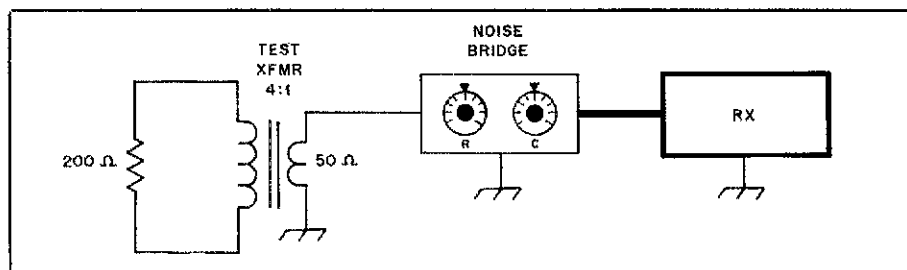


Fig 2—Setup for using a noise bridge to test broadband transformers for reactance and turns ratio.

transformer will exhibit zero reactance across the transformer frequency range. This is seldom possible to achieve, but low reactance is possible and acceptable for most amateur designs.

A noise bridge permits adjustment of a Transmatch without putting a signal on the air. This allows us to log the Transmatch settings for various frequencies with each of our antennas without causing QRM.

Construction Details

The leads of critical components are kept short by the geometry of the circuit board.

Use short signal leads to minimize unwanted stray capacitance and wide leads to minimize stray inductance. This applies to the leads that join C1, J1, J2, J3 and J4 to the PC board. I recommend strips of flashing copper, 3/16 to 1/4 inch wide.

Although I used a Command receiver variable capacitor for C1, you may use any variable capacitor with a maximum capacitance of 250 pF. The lower the minimum capacitance, the better. This yields a greater range for the reactance readings. A 365-pF broadcast-band capacitor can be used if you remove sufficient plates to reduce its maxi-

imum capacitance to 250 pF.

Check the surplus outlets and flea markets for old Command receivers. Fig 3 shows the dial, gear train and variable capacitor I used. The 330-pF silver-mica capacitor above the tuning capacitor, at the left in Fig 3, is added in series with one of the tuning-capacitor sections to reduce the total capacitance to 250 pF maximum (see Fig 1). As arranged in Fig 1, the minimum capacitance is 36 pF. Although this is a trifle high, the reactance range of the bridge is entirely adequate for my needs.

It is necessary to file or grind the frame of the variable capacitor to allow its three rotors to unmesh completely. I cut a rectangular groove in the frame where each rotor stops (visible in Fig 7). This decreases the minimum capacitance of the assembly. The capacitor must be mounted on spacers if you plan to attach it to the chassis or cabinet bottom. Without spacers, the rotors contact the chassis before they are fully unmeshed.

I drilled the end of the tuning shaft (spline) and tapped it for a no. 4-40 thread. I use a headless no. 4-40 bolt to join the



Fig 3—The surplus 3-section Command receiver tuning capacitor. Remove all padder capacitors from the assembly to reduce minimum capacitance. See text for details of adding a tuning shaft and modifying the capacitor frame. Details of the homemade U-channel assembly are covered in text.

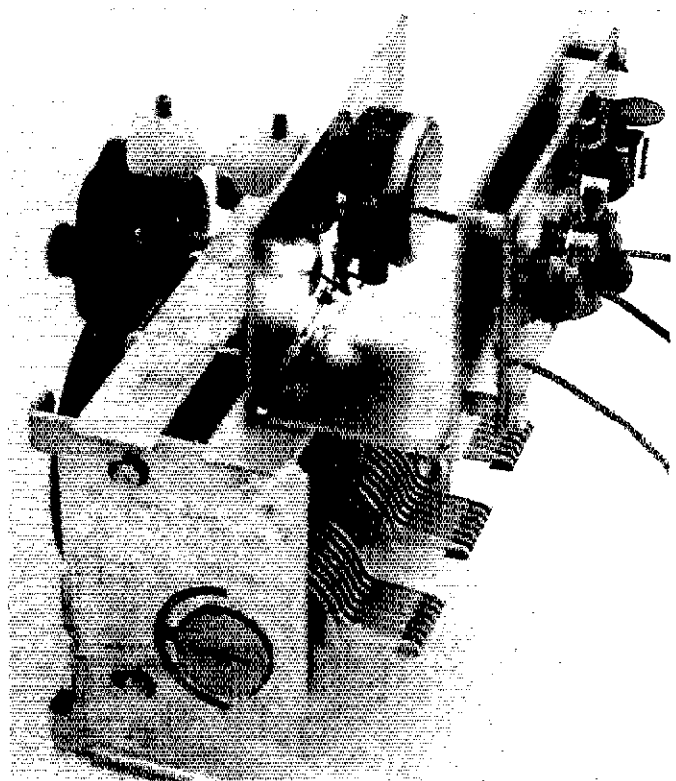


Fig 4—The piggy-back U-channel assembly. The noise bridge PC board is mounted to the rear wall of the channel. Braces are added between the front and rear walls to strengthen the channel assembly.

tuning shaft to a 1-inch-long, 1/4-inch-OD spacer that is internally tapped for a no. 4-40 screw. A drop of epoxy glue at the junction of the spacer and the capacitor shaft secures them. The shaft extension permits use of a standard knob with a 1/4-inch-diameter hole. I selected a spinner knob for my unit.

A U-channel-shaped compartment is visible on top of the variable capacitor, Fig 3. It is made from double-sided PC board sections that are soldered together. This channel holds R1. The copper is ground away from the R1 mounting hole to insulate the control from ground. Use an insulated shaft coupler, as shown. The main PC board is bolted to the rear side of the channel compartment to ensure short leads for the critical components (see Fig 4).

My cabinet measures 6 × 6 × 9 inches (hwd). I built it several years ago when I had access to a metal and welding shop. Any cabinet of similar dimensions is suitable. I painted the front panel gray, and used a matte black paint on the rest of the cabinet. A PC-board bracket is bolted to the rear of the cabinet to contain J1, the dc input jack (J5), and a ground post. J2, J3 and J4 are mounted on a piece of unclad glass-epoxy board (2 × 2 1/4 inches). This board is installed inside the cabinet top, directly above the main PC board and R1. This keeps the connecting leads short. Sheet-metal screws hold the jack board in place below the cut-out area.

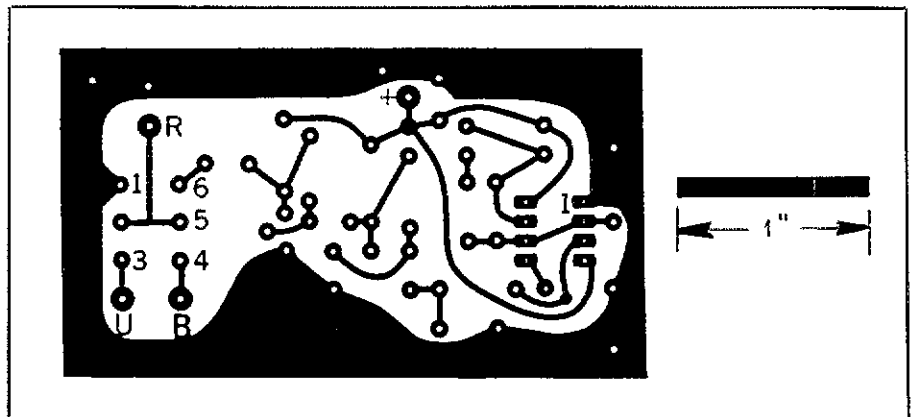


Fig 5—Circuit-board etching pattern for the RX noise bridge. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

I found a large, skirted knob for R1. White press-on decals provide calibration marks for C1 and R1. I painted the CAPACITANCE dial plate black before I applied the decals. Fig 5 is a parts-placement guide for the PC board, and Fig 6 is a full-scale etching pattern. Fig 7 shows an interior rear view of the bridge.

Calibration

Before calibration, check that the noise bridge is operating properly. Connect J1 to the receiver antenna jack. Tune your receiver to any part of the 15-meter band.

Set S1 (POWER) to ON. You should hear considerable noise from the receiver at a fairly high level.

Resistance Dial

Calibration of the RESISTANCE (R) dial is accomplished by connecting resistors of known value across J3 and J4 and nulling the bridge with the R control. You will have to adjust the C control during this procedure to get a complete null for each resistor. I used 5% resistors I had on hand, and I chose values from 20 to 250 Ω. You may use 10% resistors, with calibration

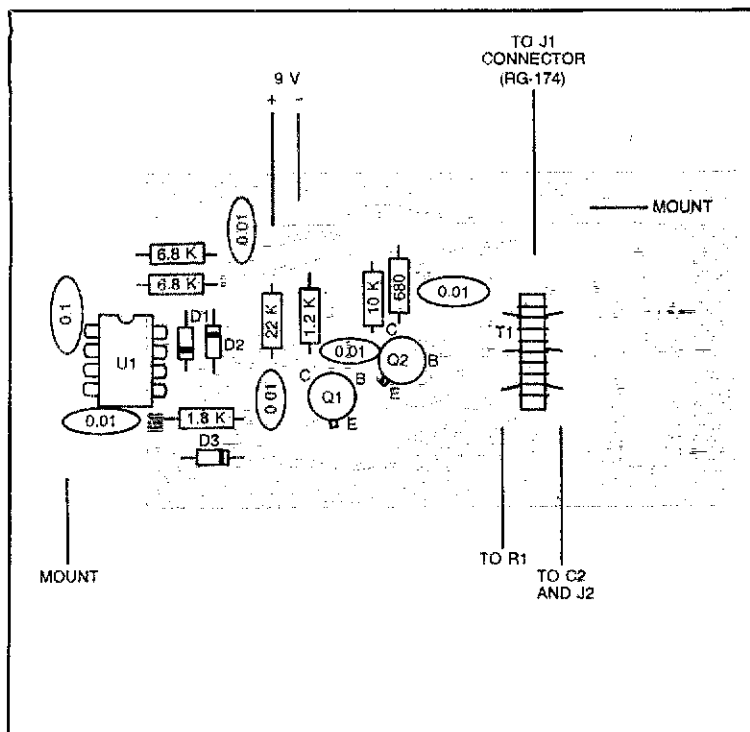


Fig 6—Parts-placement guide for the RX noise bridge. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

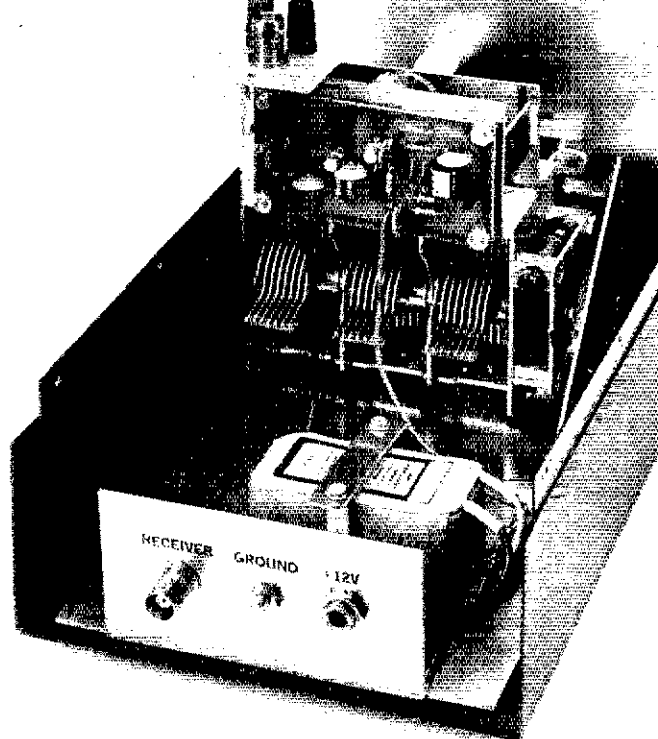


Fig 7—Interior view of the RX noise bridge. The chassis and front and rear panels are made from double-sided PC-board stock. The homemade battery clamp is fashioned from two metal standoff posts and a piece of PC board stock.

marks every 25 or 30 Ω . The more marks you include, the better the dial resolution. As each resistor is checked for a null, make a small mark on the dial skirt and keep a record of the resistance represented by each mark. The decals can be added after you complete this step.

You should get the best null when the capacitor plates are set for midrange capacitance (zero reactance). Locate this setting by placing a 51- Ω resistor across J3 and J4, then adjust R1 and C1 for the deepest noise null. Mark the CAPACITANCE dial for this setting. It will be your zero mark for the capacitance calibration. Should you be unable to get a good null with C1 at the midrange position, experiment with the value of C2 until a deep null does occur at midrange for C1. If you have difficulties, you may use a 150-pF trimmer at C2.

Capacitance Dial

Calibration of the CAPACITANCE dial is a bit trickier than for the RESISTANCE dial. Good quality fixed-value capacitors (silver mica recommended) are used as standards. The capacitors are used in parallel with a 51- Ω resistor (for negative range), and in series with a 51- Ω resistor (for positive range). To calibrate the negative range, set the CAPACITANCE dial to the zero mark (midrange as determined previously), and connect a 20- or 22-pF capacitor in parallel with the 51- Ω resistor, keeping the leads very short. Connect these parts across J3 and J4, and adjust R1 and C1 for a null. Mark the CAPACITANCE dial plate and record the capacitance value for later

application of decals. Repeat this procedure with capacitors that allow approximately 20 pF per step. I used 20 pF to 130 pF for the negative range on my dial.

Calibration of the positive range is done similarly, but with the capacitor in series with the 51- Ω resistor. I used capacitors that provide markers from 55 to 500 pF. You may use values of your choice. This part of the range on my unit is limited by the high minimum capacitance of the Command receiver capacitor. You should be able to get a null with 20 or 25 pF of capacitance at J3 and J4 if your variable capacitor has a low minimum capacitance (such as 10 or 15 pF).

Interpreting the Readings

Remember that when the bridge is nulled, minus readings on the CAPACITANCE dial indicate that the load has inductive reactance (X_L). If, for example, your antenna is too long, there will be an X_L indication. Conversely, the positive portion of the CAPACITANCE dial indicates capacitive reactance (X_C), which indicates that your antenna is too short.

The ARRL Handbook description of the noise bridge includes a graph that shows the inductance versus frequency when X_L is present. It also includes the equation for determining the X_C , in ohms, when a positive reading is obtained on the CAPACITANCE dial.

Final Comments

My purpose in writing this article is to show you how to make a laboratory style

noise bridge. I want also to mention the advantages of using a Command receiver capacitor and gear train. Other surplus equipment contains similar mechanisms that you may want to consider, such as the capacitor, dial and gear mechanism from an old BC-221 or LM frequency meter. I bought two complete units at a flea market for \$5 each.

Try to use a high quality carbon potentiometer for R1. I prefer Allen-Bradley commercial grade potentiometers for test equipment. These controls are sealed and last a long time. If you are unable to use the capacitor I used at C1, be sure the capacitor you use is a high quality type. It should have a bearing at each end of the rotor.

BT1 is a 9-V (actually 8.75-V) NiCd battery that I obtained at a flea market. I charge it from a 10 V dc supply through a 100- Ω series resistor. This results in a slow charging rate over 15-18 hours. A lower series resistance, or a temporary higher charging voltage, may be used to increase the charge rate to 50 mA, maximum. A 50-mA rate occurs with 15 V applied to a discharged battery through the 100- Ω resistor. I do not recommend charging a NiCd battery at 50 mA unless you have a charger with a circuit to control the voltage and current. Careless charging can destroy a battery quickly.

If you have never built or used an RX noise bridge, now may be the time for you to do it. You will find this instrument particularly handy if you are an antenna experimenter. It tells you much more than your ordinary SWR indicator can.

Yaesu FT-23R 2-Meter Hand-held Transceiver

Let's face it: Most hams are gadget freaks. We like to have new toys to play with, and the manufacturers accommodate us by releasing new radios periodically. The FT-23R (and FT-33R for 220 MHz and FT-73R for 450 MHz) transceivers are Yaesu's entry into the tiny-little-hand-held transceiver market.

Features

The FT-23R is rugged. The case is aluminum and zinc, but the battery packs are plastic. A tight rubber gasket seals the controls and top-panel jacks. This is the most sturdily built hand-held transceiver I've ever seen. The metal case makes it a bit heavier than some other hand-held transceivers, but it certainly can take a lot of abuse.

Operating frequency, repeater offset (+ or -), memory number, signal strength and transmitter power output are shown on an LCD on the front panel. Squelch, volume and high/low power controls, as well as earphone and microphone jacks and the tuning dial, are located on the top of the radio. Front-panel switches control priority-channel operation, tuning, repeater shift and continuous tone-coded squelch system (CTCSS) tones (with the optional CTCSS unit).

The transceiver covers 144 to 148 MHz. Power output ranges from 200-500 mW on low power to 2.5 W on high power, depending on the battery pack used. Ten memories store information on operating frequencies and repeater splits (odd splits may be stored in seven of the memories), and continuous scanning operation—including channel lockout—is possible. The FT-23R offers almost all the features I look for in a hand-held transceiver.

Frequency entry is accomplished either with a tuning knob on the top of the radio or with the up- and down-arrow switches on the front panel. Three tuning steps are provided: 5 kHz, 10 kHz and 1 MHz. The front-panel STEP control selects between 5- and 10-kHz steps. "Giant steps" (1 MHz) are entered with the F (shift) key and the up- and down-arrow keys. This tuning arrangement is not quite as convenient as direct keyboard entry or

even thumbwheels, in my opinion. Most users will enter their favorite frequencies into the memories and rarely use the tuning knob or arrow keys.

Memory entry is simple. You dial up the desired frequency and press F and the D/MR key (the D/MR key selects between dial and memory operation). A memory number flashes in the upper left-hand corner of the display. Next, crank the tuning knob or use the up- and down-arrow keys until the display shows the number corresponding to the memory you want the frequency stored in. Press the D/MR key again, and the memory is loaded.

Repeater splits are entered with the RPT key. Pressed once, the RPT key enters a plus 600-kHz split. Pressed again, the RPT key enters a minus 600-kHz split. Odd splits may be entered (and stored in the first seven memories) by first storing the receive frequency in memory and then storing the transmit frequency with the PTT switch held down. Perhaps a bit complicated, but at least it can be done.

Memory channel 0 is used for the "calling channel." This memory can be instantly recalled with the front-panel "dot" key. Memory channel 1 is the priority channel. With priority operation enabled, the radio checks memory 1 every five seconds.

Scanning operation is started by pressing and holding down the up- or down-arrow key. If the transceiver is not in the memory mode, the receiver begins to scan in increments selected by the STEP key (5 or 10 kHz). When a busy frequency is found, the receiver stops scanning until approximately two seconds after the signal goes away. If the transceiver is in the memory mode when scanning is initiated, it scans the memories. Again, when a busy frequency is found, the receiver stops scanning until two seconds after the signal goes away. This is a bit different from other scanning radios I've used (such as Yaesu's FT-109RH 220-MHz hand-held), where the scanner stops for a set period and then continues to scan even if the frequency stays busy. I'm not sure which mode I prefer; it would be nice to have both. Scanning operation can be stopped by pressing either arrow key or the PTT switch.

Memory frequencies can be locked out of a scan by using the F and D/MR keys; once a memory is locked out, however, it must be re-enabled with the keypad before it can be used at all. By comparison, the FT-109 lets you manually step through all the memories while leaving some locked out of a memory scan.

A "burst" switch is located just above the PTT button on the left side of the radio. On

the European version, this switch controls a 1750-Hz tone burst. On the American version, the switch opens the squelch to let you check the receive frequency for signals under the squelch threshold.

The 16-key, membrane-type dual-tone, multifrequency (DTMF) tone pad is an option on this radio. Without the tone pad, the radio is quite small—approximately 2.2 inches wide by 5.5 inches long with the FNB-10 battery pack (excluding the antenna). The tone pad adds another 0.8 inch to the length. Embossed bumps in the membrane over each key contribute to the good feel of the tone pad.

One aspect of the tone pad I didn't like is its mechanical construction. The front of the tone pad hangs in space when the battery pack is removed, as shown in the photographs. This may render the pad prone to damage when the battery pack is being changed.

CTCSS operation is possible on transmit and receive with the optional FTS-12 "tone squelch" unit. Any one of 37 standard tones can be selected and stored in memory. This is a handy feature if the repeaters in your area use different CTCSS tones. The Product Review radio did not have the CTCSS unit, but the instructions for installing the board did not seem too complicated.

The FT-23R has a very interesting feature not often found in amateur gear. Using a cable connected from the earphone output on one FT-23R to the microphone input of another FT-23R, it is possible to "clone" the memory information from one radio to the other. I'm not sure why you'd want to do this, and it seems to indicate that this is an amateur version of a commercial radio. In a commercial application (such as a police or fire department), the memory information in all the radios in the fleet could be transferred from one master radio. The DTMF pad must be removed to access a switch on the bottom of the radio to enable the memory-transfer feature.

Battery Power

Our Product Review radio was provided with an FNB-10 7.2-V, 600-mAh NiCd battery pack. This battery pack allows 2.5-W RF output with the FT-23R set for high power.

A 7.2-V, 200-mAh pack (model FNB-9) is available, as is a 12-V, 600-mAh pack (FNB-11). Cases for alkaline batteries, the FBA-9 for six AAA-size batteries or the FBA-10 for six AA-size units, are available as well.

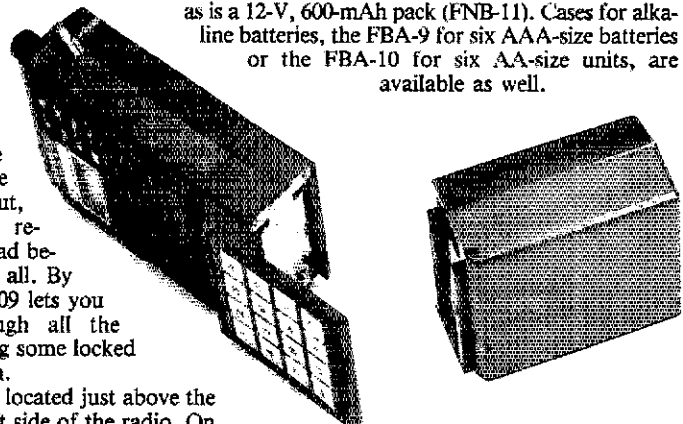
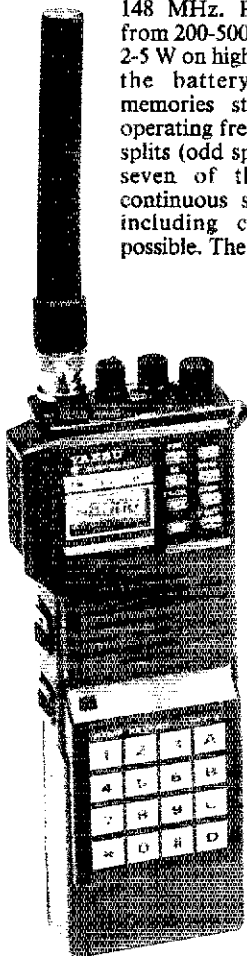


Table 1

Yaesu FT-23R 2-meter Hand-held Transceiver, Serial no. 6N073075

Manufacturer's Claimed Specifications

Frequency coverage: 144 to 147.9995 MHz.
Mode of operation: G3E (FM).
Frequency display: Not specified.
Frequency resolution: 5 kHz.

Transmitter

Power output: Low, 0.2-0.5 W; high, 2.5 W (with FNB-10 battery pack).
Spurious signal and harmonic suppression: better than -60 dB.

Receiver

Receiver sensitivity: Better than 0.25 μ V for 12-dB SINAD.
Squelch sensitivity: Not specified.
Receiver audio output at 5% total harmonic distortion: 400 mW with 12-V battery pack.
Color: Black.
Size (height, width, depth): 5.5 x 2.2 x 1.25 in with FNB-10 battery pack.
Weight: 1.2 lb with FNB-10 battery pack.

Measured in ARRL Lab

144-148 MHz.
As specified.
6-digit LCD.
As specified.

Transmitter Dynamic Testing

Low, 0.4 W; high, 2.6 W (with FNB-10 battery pack).

See Fig 1.

Receiver Dynamic Testing

0.19 μ V for 12-dB SINAD.
10-dB quieting 0.14 μ V.
0.06 μ V min, 0.19 μ V max.
260 mW with 7.2-V battery pack.
Not tested with 12-V battery.

available in a variety of configurations ranging from a "bare bones" kit to a deluxe unit similar to the 2304TRV2, but with a built-in TR sequencer.

Circuit Highlights

The 2304TRV2 is a linear transverter that converts signals in the 2304-2308 MHz range to 144-148 MHz. It works on all modes and is meant to be used with a 2-meter transceiver as a tunable IF. Weak-signal activity centers around 2304 to 2304.1 MHz, so the 2-meter rig is normally operated at about 144 MHz.

The 2304TRV2 is built in several modules. They include:

- 1) 1080-MHz local oscillator (LO)
- 2) receiver preamplifier and mixer
- 3) low-noise receiver preamplifier
- 4) 2-meter post-mixer amplifier
- 5) 2-meter IF switching circuitry, transmit mixer and low-level transmitter stages
- 6) transmitter driver and final-amplifier.

Everything except the receiver low-noise preamp is housed in a compact, attractive aluminum enclosure. The preamp, housed in a rugged die-cast aluminum box, can be connected to the receiver input jack on the back of the transverter. If you have long runs of feed line, the preamp should be mounted near the antenna for best performance. Even 7/8-inch Hardline has significant loss at this frequency.

The receiver preamp uses an NEC NE720 GaAsFET. There are two more bipolar transistor amplifier stages on the receiver mixer board, followed by a filter, followed by a diode mixer. The mixer also doubles the 1080-MHz LO signal to get the required 2160-MHz injection frequency. The IF output of the receive mixer board is routed to the 144-MHz post amplifier, a dual-gate MOSFET.

Lab measurements made with a Hewlett-Packard HP8970A automatic noise-figure meter and HP346A noise source indicate that the overall conversion gain is about 21 dB, with a 1.8-dB noise figure (see Table 2). This is good performance at 2304 MHz. Without the low-noise preamp, however, conversion gain is about 8 dB with an 8-dB noise figure. The external preamp is really necessary with this transverter.

The low-level transmit section contains a doubler for the 1080-MHz LO, a diode mixer, filtering and five stages of amplification. Power output from this lineup is approximately 300 mW. Also contained on the low-level transmit board is a TR relay and associated circuitry for the 2-meter IF, as well as attenuators to allow the transverter to work with 2-meter rigs that put out up to 10 W. The final amplifier section is built on a separate board and mounted to a heat sink. It uses a pair of Mullard BFQ68 devices to develop about 1.5-W output, as measured on a Hewlett-Packard HP435 power meter with precision attenuators.

The transverter appears to be solidly built. The receive preamp/mixer, low-noise preamp and transmitter final amplifier are all built on high-quality glass-Teflon® board. The transverter looks relatively easy to troubleshoot, although there are about 40 variable capacitors to tweak.

Connections

The low-profile front panel holds a relative power-output meter, an ON/OFF switch

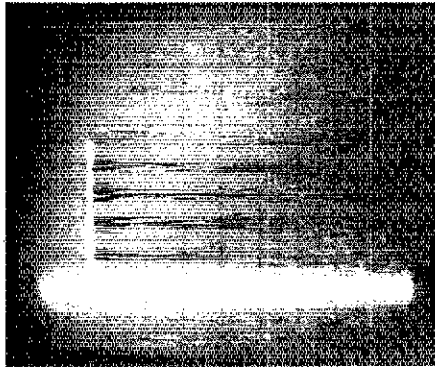


Fig 1—Spectral display of the Yaesu FT-23R operating at 146.0 MHz with approximately 2.6 W output power. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. The fundamental has been reduced in amplitude approximately 30 dB by means of a notch filter to prevent spectrum analyzer overload. All spurious emissions are at least 60 dB below peak fundamental output. The FT-23R complies with current FCC specifications for spectral purity.

The FT-23R features a "battery saver" circuit that causes the radio to "go to sleep" for 600 ms between 300-ms receiver checks. In actual use, the battery pack did last quite a while. When the battery voltage drops below 6.5 V, a tone sounds continuously to let you know it is time to change battery packs. There is no battery check feature.

Accessories

The usual range of accessories is available for the FT-23R; a 15-hour battery charger is provided with the radio, and a quick charger is available. A mobile dc adapter (model PA-6) is available, and the operating manual lists five different soft carrying cases (one for each different NiCd pack and two more for use with the DTMF pad attached to the

radio). A speaker microphone and "hanger bracket" are available for mobile use.

Operation

The review radio worked well. Several HQ staffers commented that it fits comfortably in the hand. A few minor irritations did show up, however. There is no light for the LCD; this makes night operation a bit difficult. The tuning scheme seemed a bit complicated until I loaded my favorite frequencies into the memory. (After that, tuning was still complicated, but I didn't have to *tune* the radio any more!) If I didn't absolutely need the tone pad, I wouldn't buy it; it makes the radio quite a bit larger and awkward.

Conclusion

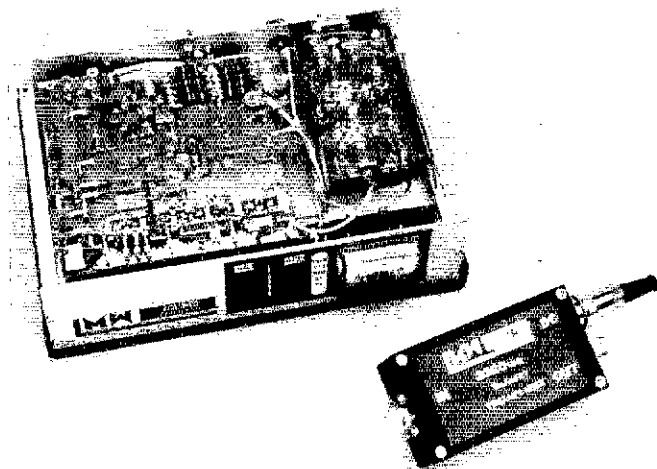
This is a well-built radio. Operation is not too difficult, and the array of controls should not be intimidating to a first-time user. There are a few things I might have done differently if I was designing this radio, but everyone has different operating requirements. I'm sure the radio will find enthusiastic users.

Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90701, tel 213-404-2700. Price class: \$300 (including DTMF pad). —Bruce Hale, KB1MW

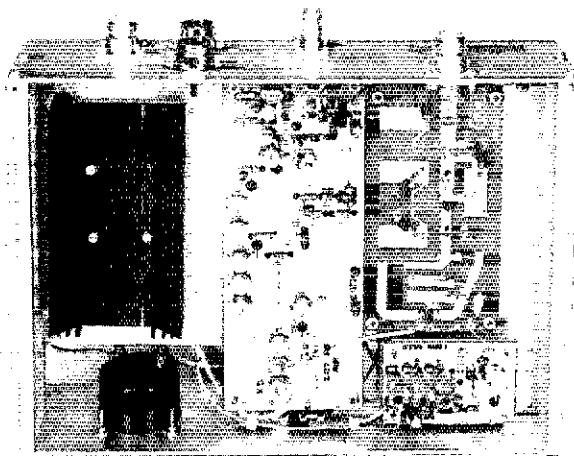
LMW ELECTRONICS 2304TRV2 2304-MHz TRANSVERTER

The 2304-MHz (13-cm) band has seen increased interest among UHF weak-signal enthusiasts, VHF/UHF contest operators and, more recently, amateur satellite types. Although there are no US-built transverters or transceivers for this band, there are several fine pieces of equipment being imported from Europe. You no longer have to be a builder to become operational on 13 cm. Although not as easy as getting on, say, 2 meters with a multimode transceiver, it is possible to get on with a minimum of technical expertise and special equipment.

The subject of this review is the 2304TRV2 transverter manufactured in England by LMW Electronics. These transverters are



LMW 2304TRV2 transverter with top cover removed. The large board on the left holds IF switching circuitry, the transmit mixer and low-level transmit stages. The shielded compartment at the right contains the transmit driver and power amplifier stages. The low-noise preamplifier is in a separate box for remote mounting.



The underside of the LMW 2304-MHz transverter holds the local oscillator, receive mixer and IF amplifier boards. At the left is a heat sink for the transmitter PA.

Table 2

LMW Electronics 2304TRV2 2304-MHz Transverter, Serial no. 017

Manufacturer's Claimed Specifications

Transmitting Converter

Input frequency: 144-148 MHz.
 Output frequency: 2304-2308 MHz.
 2-m drive power: 0.1-10 W.
 Output power: 1.6 W minimum, 2 W typical.

Receiving Converter

Input frequency: 2304-2308 MHz.
 Output frequency: 144-148 MHz.
 Overall noise figure: Not specified. Low-noise preamp, 1.1 dB max.
 Overall conversion gain: Not specified.
 Power supply requirements: 13.8 V dc at 2.5 A during transmit, 0.25 A during receive.
 Dimensions (height, width, depth): 2.8 x 10 x 7 in (main unit); 1.25 x 4.5 x 2.25 in (preamp).
 Color: Black and silver.

Measured in ARRL Lab

As specified.
 As specified.
 As specified.
 Maximum saturated output, 1.55 W at 2304.1 MHz.

As specified.
 As specified.
 1.8 dB at 2304 MHz. Preamp not measured separately.
 21.5 dB at 2304 MHz.
 13.8 V at 0.9 A during transmit (1.55 W output) and 0.7 A during receive.

and a switch to activate the optional TR sequencer. The rear panel has a BNC connector for the 2-meter IF transceiver and N connectors for the transmitter output and receiver input. A multipin socket marked PWR is used for ground, +13.8-V and PTT (ground to transmit) connections. A separate FACILITIES jack is used for outputs from the optional TR sequencer. The preamp has N connectors for input and output and a locking, multipin connector for power.

The 2304TRV2 contains internal switching to connect the 2-meter IF rig to the transmitter attenuator in transmit and to the output of the receiver in receive. There is, however, no internal antenna relay. It's up to you to locate an appropriate relay. Given the cost of a brand-new microwave relay and the desira-

bility of mounting the preamp and antenna relay at the antenna, this is a good move. I used a surplus Transco SMA-type relay purchased at a flea market.

It's relatively easy to get the 2304TRV2 up and running if you've used a similar transverter before. I spent about three hours making cables and lashing everything up. First, you'll need a 13.8-V, 1-A power supply. Next, you'll need to locate an antenna relay and make the appropriate dc connections. If you plan to use the preamp in the shack, you'll need to make up an appropriate cable with N connectors. Note that even RG-8 cable has appreciable losses at 2304 MHz, so try to keep all interconnections as short as possible. A single cable runs between the VHF TRANSCEIVER jack on the rear of the trans-

verter and the antenna jack on the 2-meter rig. To control the 2304TRV2 TR switching from the 2-m rig, you need to connect the PTT jack on the transverter to a line from the transceiver that is grounded in transmit and open in receive. The 2304TRV2 does not contain RF switching—you *must* ground the PTT connection to switch from receive to transmit.

When all of the interconnections are made, connect an antenna and fire it up. You'll need to remove the top cover and adjust the attenuator potentiometer for the correct 2-meter drive level. In my case, 3 W from an ICOM IC-260 in the low-power position worked just fine. Although the transverter will work with transceivers delivering up to 10-W output, it's probably a good idea to use as little power as possible. Why waste a lot of energy heating up the attenuator resistors inside the case?

The manual supplied with the unit is skimpy—a real drawback. The transverter is offered in kit form (kits account for the vast majority of its European sales), and the manual is simply a collection of assembly instructions for each module. What this transverter really needs is an organized manual with step-by-step hookup and operating instructions. The US importer is working on an improved manual, and this should be available by the time this review is published. The assembly instructions are nice, though, because they give complete schematic diagrams and board layouts, as well as tune-up information that would be very handy for troubleshooting or modifications.

Operation

The LMW transverter saw plenty of contest action during the W1XX portable operations during the June and September ARRL QSO Parties, as well as at 4U1UN in the CQ Magazine WPX VHF Contest. The transverter was used with an IC-260 as an IF transceiver and a single Down East Microwave 45-element loop Yagi. The feed line consisted of about 25 feet of Belden 9913. The results got better with experience, and the 2304-MHz tally for

the September event was 7 QSOs in 6 grid squares.

John Lindholm, W1XX, and I also used the 2304TRV2 on several grid-hopping expeditions in the northeast. Our best contact was from Mt Equinox, Vermont; we worked Rick Connor, WB2NPE, at a distance of 250 miles. Not bad for a watt and a half! The LMW transverter proved reliable, even after riding more than a thousand miles in the back of a van, and it was easy to set up and get working. These characteristics are essential for portable operation.

LMW offers a fine way to gear up for weak-signal DX on the 2304-MHz band. US distributor: Down East Microwave, RR 1, Box 2310, Troy, ME 04987, tel 207-948-3741. Price class: \$640.—*Mark Wilson, AA2Z*

HEATHKIT® HV-2000 VOICE SYNTHESIZER

I know what you're thinking: "Who needs another voice synthesizer? They're in repeater controllers, cars, soda machines and even refrigerators. Once the initial 'cuteness' of most of these applications wears off, I don't have much use for talking computers." That was my initial reaction to the Heath Voice synthesizer when I was asked to do the Product Review. Now, I'm convinced that this device has legitimate applications beyond the "gee whiz, that's neat" stage. More than just a simple synthesizer, the HV-2000 is a complete synthesizer/software package. It is built around an SSI263A voice-synthesizer chip; this chip uses allophones—or word fragments—to synthesize speech.

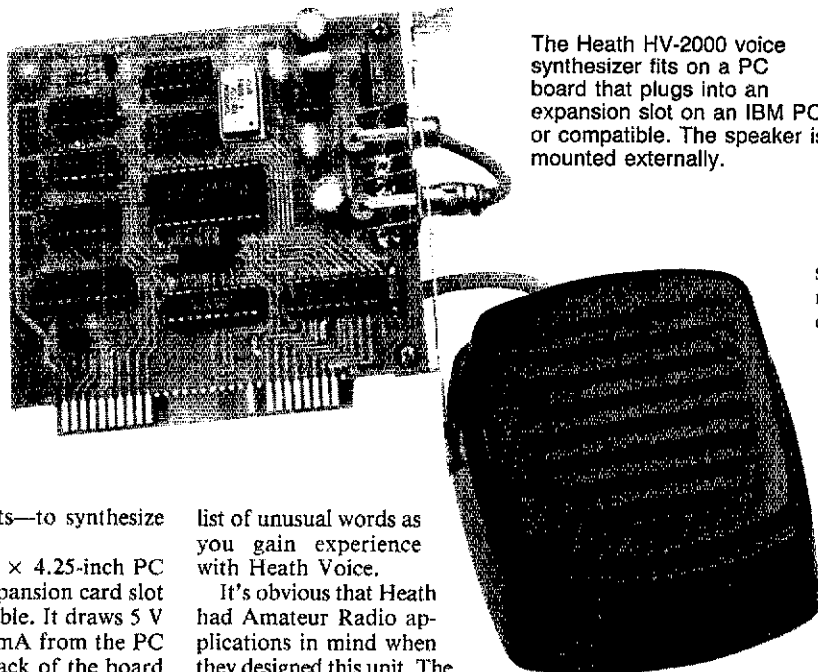
Heath Voice fits on a 5- × 4.25-inch PC board that plugs into an expansion card slot in an IBM® PC or compatible. It draws 5 V at 275 mA and 12 V at 10 mA from the PC bus. Phono jacks on the back of the board provide 500 mW audio output for driving a speaker and a 10-kΩ line-level output for connection to an external audio amplifier.

The kit is very easy to assemble, as there is no enclosure to worry about. Assembly consists of simply stuffing the PC board and soldering everything in place. All ICs are socketed, and the kit-building directions are very detailed and easy to follow (a typical Heathkit). The project took about two hours to build.

The main difference between this voice synthesizer and most of the cute "toys" I've seen is in its software. As soon as you put the cover back on your computer, you can test the voice box by typing a simple command: SPEAK SPEAKME.TXT. The unit responds by speaking "Congratulations. Your HV-2000 is up and running." The rest of the commands are almost that simple. To have the synthesizer speak a line of text, simply type the command SPEAK followed by the

text to be spoken. You can have it speak the contents of a text file by typing "SPEAK" followed by the filename. The voice unit is installed as a device in DOS (like a printer or serial port), so anything you can route to a logical device can be spoken by the voice unit.

Software is also provided to customize the way Heath Voice pronounces words and to build a custom vocabulary. This is handled by Heath's versatile NEWWORDS program. When you tell NEWWORDS what word you want to change, it responds by pronouncing the word for you and showing you what allophones the HV-2000 is using to create the word. To modify the pronunciation, you change the allophone list. The card then speaks the new pronunciation and asks if it's okay. You can repeat the process until you're satisfied. Once the word sounds right to you, the software enters the new pronunciation into an exception file, and from then on, the word is pronounced using the modified allophone list. This procedure reminds me of using a spelling-checker program. The program is initially "dumb"; you must build a



The Heath HV-2000 voice synthesizer fits on a PC board that plugs into an expansion slot on an IBM PC or compatible. The speaker is mounted externally.

list of unusual words as you gain experience with Heath Voice.

It's obvious that Heath had Amateur Radio applications in mind when they designed this unit. The unmodified software recognizes that any word with a number in the middle of it—such as a call sign—should be spelled out letter by letter, rather than pronounced as a word. Using switches in the configuration file, it is possible to have the box speak all punctuation (dash, comma, ellipsis and so on) and to have all numbers pronounced digit by digit (one-zero-zero instead of one hundred). An "auto-inflection" mode is provided, although I'm not sure if this mode is easier to understand than the monotone.

Part of the SPEAK software is a terminal program. Simply type SPEAK COM1:1200 to speak whatever is coming in on COM1 at 1200 bauds (other speeds can be set at the command line as well). The terminal program works well. It is possible to send and receive disk files and to turn the voice on and off from inside the terminal program. These features (and the other terminal functions) are

controlled by the PC function keys.

An obvious Amateur Radio application for Heath Voice and the terminal program is packet radio for a blind ham. How well does it work in this application? I'm not blind, and I had no way to evaluate the unit with a blind ham, but I think it would work well. I used a TNC, 2-meter transceiver and my PC to connect to the W1AW-4 bulletin board. I set the voice unit to speak all punctuation and to pronounce all numbers digit by digit. I also reconfigured the TNC to give each packet the shortest possible header in the monitor mode. The voice unit did very well, and the packet information was quite understandable. The voice took a little getting used to, and I could read the screen much faster than Heath Voice could speak the information, but I was really impressed with the unit. A blind amateur might need some help with the initial set up (building the exception file and other fine tuning).

Another feature of the voice unit is the ability to adjust the rate and duration of the speech. This is done using the simple configuration commands explained in the manual. Using these commands, I made the

unit speak more rapidly, but still understandably, for use with the TNC. Again, with a little fine tuning, the unit can be optimized for a particular application.

The fact that the voice unit is installed as a DOS device makes it easy to write new software to speak to the synthesizer. The manual includes information on addressing the unit in BASIC, and anyone with a good knowledge of any other computer language should be able to extend this information.

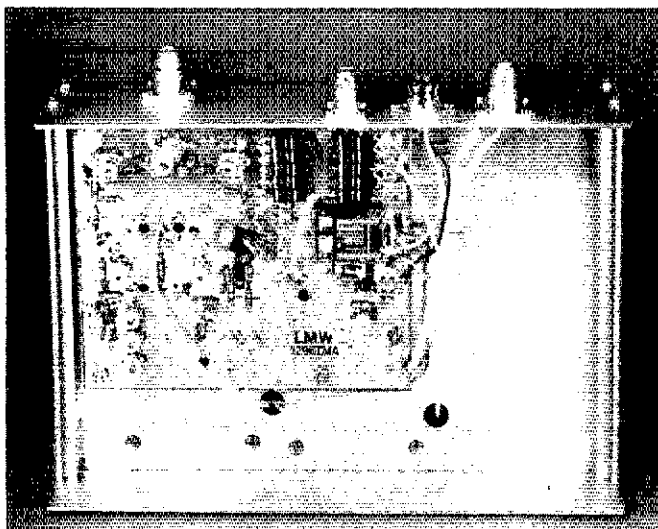
I expect that the HV-2000 will be enthusiastically received by the ham community. My initial reaction that the unit was just another toy changed when I saw what the software could do. Anyone with a little time and patience should be

able to come up with a very good voice system using this unit. I think that after the device has been around for a while, we will see people trading exception files and optimized software so that new Heath Voice users can get set up with very little work.

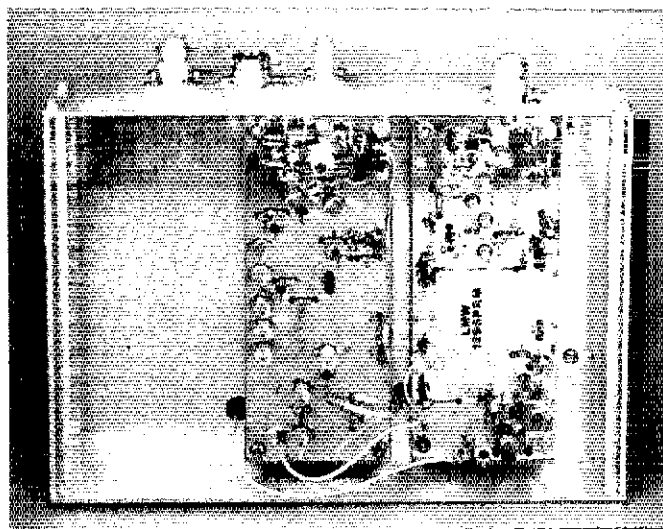
Manufacturer: Heath Company, Benton Harbor, MI 49022, tel 616-982-3411. Price class: \$90.—*Bruce Hale, KB1MW*

LMW 1296TRV1K 23-cm TRANSVERTER KIT

I was really intrigued by the reports of a 1296-MHz to 144-MHz transverter kit. After all, can you really expect to build and align a complicated piece of microwave equipment without an RF lab? Although my kit building experience is limited to a Heathkit receiver and some simple projects, I ordered one to



This PC board holds the IF switching and transmitter circuitry for the LMW 1296-MHz transverter kit.



The other side of the LMW 1296-MHz transverter chassis holds the local oscillator and receiving converter.

find out. Admittedly, I have some experience in designing and building RF equipment, as well as full access to the ARRL laboratory.

What this Kit Does

The LMW transverter is a box that converts a 1296-MHz (23-cm) signal to 144 MHz and vice-versa. It is meant to be used with a 2-meter transceiver as an IF rig. An internal relay, keyed by a PTT line, switches the 2-meter transceiver between the 23-cm receive and transmit sections.

The 23-cm input and output (to connect the transmitter and receiver to an antenna) are separate N connectors. The purchaser must supply a suitable TR relay. Since a new low-loss microwave coaxial relay can cost almost as much as the kit, I used a Dow Key BNC relay purchased at a flea market for \$10. The transverter runs from 13.8-V dc and needs 0.7 W of 2-m drive, although an attenuator allows up to 10 W of drive to be used.

Construction Details

The kit I purchased consists of kits for three separate modules, an unpunched and unlabeled aluminum case, and Teflon coax and connectors to interconnect the boards. The individual module kits are the UNVLO2 local oscillator, the 1296PRM preamp/receive mixer, and the 1296TMA transmit mixer/amplifier.

Upon unpacking my kit, I noticed several problems. Three regulator chips, a 100-ohm resistor and a piece of "tin-plate" were missing. (Upon notification, the kit's US importer, Down East Microwave, will promptly send replacement parts.) The pins on the IF TR relay were bent. The kit's static-sensitive NE41137 GaAsFET transistors were placed in an ordinary plastic bag with many of the other parts; the Schottky diodes were wrapped in aluminum foil! According to Down East Microwave, these problems have been solved on current kits. A selection of 1/4- and 1/2-W resistors is needed to set proper bias levels. The builder is expected to know when to use 1/2-W resistors. Thirteen spacers

and associated mounting hardware must be supplied by the builder to mount the boards. I used 1/4-inch spacers (no particular board-mounting height was recommended).

The documentation is minimal and written in standard British technical terms. This is definitely not a kit for beginners, although there is plenty of information for an experienced builder to follow. You must know how to follow schematics and board layout diagrams to use the documentation. You must be familiar with VHF/UHF construction techniques and component markings as well. I was glad that I had read the last 23 issues of *SPRAT*, the journal of the G-QRP club!

Figuring out how to package the transverter took a little ingenuity. I needed to look at the assembled 2304-MHz transverter reviewed elsewhere in this month's column to find out how the case went together! It turns out that square nuts that mate with the cover screws fit into slots in the extruded aluminum panels. I glued the nuts in place with non-acidic silicone sealant. A suggested layout is supplied, although no dimensions are given. I suggest using the bare circuit boards as marking templates. (Don't forget the hole for T6, the power transistor.)

It took me about 14 hours to stuff the three double-sided, tin-plated circuit boards. A hand drill is needed to enlarge some transistor mounting holes and to make a hole for a diode lead. Stuffing the boards is not difficult because component locations are clearly silk-screened on the component side and parts-placement diagrams are provided. Take care not to lose or damage any of the tiny chip capacitors; no spares are supplied.

You must read the schematic. For instance, you have to look at the transmit-mixer input-network diagram to verify that the ferrite slug in L2 must be removed.

The documentation concerning T6, the BLV91 RF power transistor, could stand improvement. Although the transistor specification sheet on the last page of the manual does mention the beryllium-oxide (BeO) hazard presented by the BLV91's insulation,

this is not mentioned in the construction section. Don't damage the BLV91's grayish-white BeO ceramic disc! BeO dust is toxic and dangerous to breathe. Fortunately, dusting is unlikely because of the hardness of ceramics.

Although the use of a heat sink for T6 is mentioned, no information is supplied on how to mount one. I ended up using two large no. 8-32 nuts to attach the transistor stud to the chassis, turning the nuts only to finger tightness to avoid cracking the transistor. This is a poor technique both mechanically and thermally, but I saw no better solution. Ideally, mechanical mounting of the transistor should be completed before soldering to minimize stresses.

Alignment and Testing

According to the instructions, the only test equipment needed is a power supply, multimeter, diode probe, 2-m transceiver and power meter capable of measuring 1 W at 1296 MHz. Unfortunately, my diode probe was never meant to work at 2 meters, much less 1.3 GHz! Instead, I used an HP435 microwattmeter.

The oscillator board almost worked on the first try. It was necessary to use 2-turn coils at L4 and L5 rather than the suggested 1-turn coils. This may be because 1-mm wire was supplied, rather than the specified 0.7-mm wire. (I cheated a bit and looked at the 192-MHz waveform with a scope to optimize the drive to the tripler.) Except for this minor modification, the board tuned up nicely using the multimeter and power meter. A look at the oscillator output on a spectrum analyzer confirmed that tune-up with these simple instruments provides good results. (It was possible to improve tuning slightly with the help of the analyzer's real-time display.) Spurs at 96, 576 and 1728 MHz were down 35, 36 and 30 dB, respectively, and spurs within 200 MHz of the carrier were down at least 62 dB. LO power to the transmitter and receiver boards is +13 and +7 dBm, respectively.

The preamp/mixer board also required minor revision. I trimmed the stripline

Table 3**LMW Electronics 1296TRV1K 1296-MHz Transverter Kit****Manufacturer's Claimed Specifications****Transmitting Converter**

Input frequency: 144-148 MHz.
 Output frequency: 1296-1300 MHz.
 2-m drive power: 0.1-10 W.
 Output power: 1 W typical.

Receiving Converter

Input frequency: 1296-1300 MHz.
 Output frequency: 144-148 MHz.
 Noise figure: Approximately 2 dB.
 Conversion gain: Not specified.

Power supply requirements: 13.8 V. Current not specified for this configuration.

Dimensions (height, width, depth): 2.8 × 10 × 7 in.

Color: Black and silver.

Measured in ARRL Lab

As specified.
 As specified.
 0.7 W minimum for full output.
 Maximum saturated output,
 530 mW at 1296.1 MHz.

As specified.
 As specified.
 6 dB at 1296 MHz.
 9 dB at 1296 MHz.

13.8 V at 0.7 A.

associated with variable capacitor VC3 by 1/16 inch on the side with the chip capacitors. This allows greater tuning range. I also added a piece of no. 16 wire to extend the ground to the chip capacitors. The missing tin-plate piece would have been used to form an inductor; I substituted a strip of 0.02-inch silver-plated copper. Changing the dimensions of this inductor slightly had little effect on the transverter's receive noise figure. The biasing of transistor T1 had a large effect on the noise figure, though. Decreasing the bias current only 0.43% resulted in the noise figure dropping from 9.1 to 6.6 dB without additional tweaking! Maximum gain seems to correspond to best noise figure.

The transmit mixer/amplifier board also required a bias current change for best performance. The bias on the BLU98 driver was increased from 15 mA to 50 mA. The bias on the BR91s was increased from 8 to 10 mA. This was done to increase the gain of the amplifier chain, increasing the power output from 150 to more than 400 milliwatts.

On-the-Air Testing

I used the transverter in the June 1987 VHF contest with an ICOM IC-251A 2-meter rig, an external 2.5-W amplifier and a 14-element loop Yagi at 18 feet. (The amplifier and the loop Yagi are versions of *ARRL Handbook* projects.) Operating from my apartment in the center of Newington, I worked W1AW and N1DPM on SSB, and W2SZ/1 and K1TR on CW. Best DX was W2SZ/1, about 90 miles away. I have since contacted other stations in the 100-mile range. Ed Hare, KA1CV, operating at nearby W1AW, did not find the transmitter's IMD products to be objectionable, even though I operated the transverter near its saturated output.

Transversion frequency error in my unit was about 22 kHz. This meant that the IF transceiver had to be set to 144.078 MHz for operation on 1296.100 MHz. An additional inductor in the oscillator circuit may eliminate the error, but degrade the transverter's frequency stability. I considered frequency stability more important than dial accuracy. Drift measurements over a period of several days (checked against the 9th harmonic of a

2-meter hand-held transceiver) indicate that the unit's frequency stability is fine.

Conclusions

Tests in the ARRL Lab (see Table 3) indicate that the LMW kit does not meet some of the manufacturer's specifications. According to Bill Olson of Down East Microwave, some of the specifications published by the manufacturer are optimistic. Experience with several units indicates that the figures I measured are typical, and Bill is revising the specification sheet to reflect this. He is also working with the manufacturer to improve the design.

This kit provides an inexpensive way to get on 23 cm, although it may be too difficult for some builders. Someone accustomed to building from scratch with appropriate test equipment will find it to be an interesting project that gives some insight into microwave techniques. On-the-air performance is fine, although an external GaAsFET preamplifier and a power amplifier would be helpful for DX work. Assembled versions are also available. US distributor: Down East Microwave, RR 1, Box 2310, Troy, ME 04987, tel 207-948-3741. Price class: \$220 with enclosure; \$170 without the enclosure. —Zachary Lau, KH6CP

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment "off-the-shelf" from Amateur Radio dealers. ARRL receives no remuneration for items presented in the Product Review or New Products columns.—Ed.]

The following ARRL-purchased Product Review equipment is for sale to the highest bidder. Prices quoted are minimum acceptable bids and reflect a discount from the purchase price.

Sealed bids must be submitted by mail and be postmarked on or before December 27, 1987. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid

bearing the earliest postmark will be declared the successful bidder.

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

Please send your bids to Kathy McGrath, Product Bids, ARRL, 225 Main St, Newington, CT 06111.

Tono 777 communications terminal (see Product Review, Apr 1987 *QST*). Minimum bid \$153.

Yaesu FT-109RH 220-MHz hand-held transceiver, s/n 6M010430 (see Product Review, Nov 1987 *QST*). Minimum bid \$207.

Trio-Kenwood TH-31BT 220-MHz hand-held transceiver, s/n 7100172 (see Product Review, Nov 1987 *QST*). Minimum bid \$160.

Kantronics KPC-2400 packet communicator, s/n 57534 (see Product Review, Nov 1987 *QST*). Minimum bid \$217. (REV)

New Books

SAILING WITH HAM RADIO

By Ian Keith, WA6DNV and Derek Van Loan, WB6VXS. Published by Paradise Cay Publications, 1001 Bridgeway #404, Sausalito, CA 94965. First edition, 1987. Soft cover, 9 × 6 inches, 152 pages, \$9.95.

This book has been written by two experienced radio amateurs for the reader who is a sailor first and an aspiring Amateur Radio aficionado second. Most of the book explains electrical principles. Amateur Radio history, techniques and operations, amateur transceivers and antenna principles in such a fashion that it all won't seem like so much mumbo jumbo to the sailor who is a rank novice in the field of shortwave communications. Although this discussion of technical subjects for the non-technical person will help many a reader, perhaps the most useful part of the book for many of us is the discussion on how to install an antenna on a sailboat, an antenna that will radiate satisfactorily on the HF bands and yet won't weaken the standing rigging.

We applaud the thought that all users of Amateur Radio aboard yachts be licensed—this book points out that achievement of that goal isn't too difficult. We recommend the book to the sailor who wants to become a radio amateur, and to anyone who wants some good information on how to install an HF antenna on board a sailing vessel. —Richard L. Baldwin, W1RU

INTERFACING THE WB2OSZ TALKING FREQUENCY DISPLAY WITH THE DIGIMAX D-500 FREQUENCY COUNTER

□ On behalf of a blind ham acquaintance, I built WB2OSZ's talking frequency display¹ from the semi-kit available from A & A Engineering.² After I got the talking display working, I discovered that the transceiver at hand (an ICOM IC-701) did not have the multiplexed display necessary for proper operation of the talking display circuit. An interface could be built to solve this problem, but the necessary interconnections would require significant disassembly of the transceiver.

As an alternative solution, I decided to apply the talking frequency display to the DigiMax D-500 frequency counter. After a number of unsuccessful trials, I arrived at the configuration shown in Fig 1.³ Briefly, I attached the appropriate leads from the "talker" to the outputs of the D-500's 4511 BCD-to-7-segment-display driver IC, and the appropriate talker strobe lines to the inputs of the D-500's digit driver (a 75492). (Do not use the outputs of the 75492. I spent considerable time trying to get this to work before I gained access to a scope and found that the 75492's output waveforms are unusable.) I used inverting hex buffers (4049s) at U9 and U10 on the talker board; no input level shifting is required (see the talking frequency display article). Loading on the counter circuitry is minimal.

A transceiver's frequency display is available continuously, but the D-500 displays only 0 until an incoming signal is detected. Thus, the talker, when used with a frequency counter, must be triggered at the beginning of a display period. This is accomplished by C1, R1 and R2 in Fig 1. These components generate a pulse when the D-500's embedded decimal point lights. This pulse is fed to inverter U9F (unused in the talker circuit) on the talker board. The output of U9F is connected to pin 12 of P1 (RESET) on the talker board. S1 enables the talker circuitry.

The values of C1, R1 and R2 were determined more by parts I had on hand than through optimization; other values may work better. With the values shown in Fig 1, useful talking frequency measurements can be made in the D-500's higher resolution setting in direct and prescaled modes. Thus, the talker/D-500 combination is useful for all frequencies up through the 70-cm ham band.

When the D-500's prescaler is in use, some mental translation of the talker output is required. This is necessary because the talker was designed with emphasis on HF readout, and because its chip set can speak numbers only up to "fifty nine." As a result, the

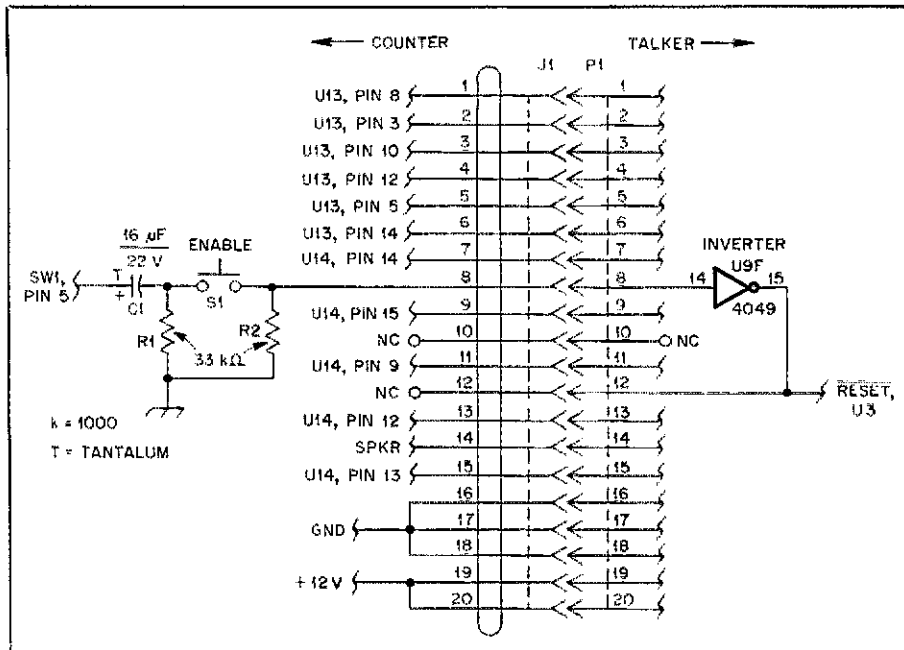


Fig 1—These interconnections and modifications allow the WB2OSZ talking frequency display to be used with the DigiMax D-500 counter. Resistors are ¼ W, carbon film; S1 is a normally-open push button. P1 is mounted on the talking display board; J1 terminates the ribbon cable that connects to P1. U9F, on the talking display board, was unused in the original display circuit; here, it serves as an inverter. U3 is the Z80[®] microprocessor on the talking display board. Part designators U13, U14 and SW1 are DigiMax nomenclature for components in the D-500 counter. See text.

D-500/talker combination speaks "Fourteen seven eight one oh" when the counter displays 147.810 MHz.

The values I chose for C1, R1 and R2 provide a characteristic I hadn't sought: Two display cycles must occur before the talker is triggered. This useful accident assures an accurate count before talking commences. After activating the transmitter, press S1, ENABLE, and hold talker and transmitter on until speech readout ends.

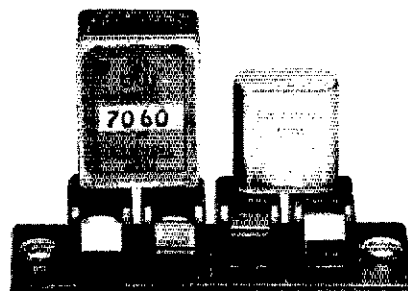


Fig 2—Yes, Radio Shack does carry crystal sockets—disguised as push-button speaker terminals! Here, a four-terminal RS 274-622 holds FT-243 and HC-6/U rocks. These crystals have 0.488-inch pin spacing; crystals with wire leads work fine, too. Terminals capable of holding four crystals are also available—see text.

I connected the 20-conductor counter-to-talker ribbon cable to the D-500 counter board by means of careful tack soldering. The stiffness of the cable makes this task tedious, but I was able to stabilize the wires sufficiently by fanning the end of the cable. I repackaged the talker, counter and speaker in a metal cabinet. The D-500's 8-digit display is visible through a slot cut in the cabinet; this makes the D-500's full precision available to a sighted helper if necessary. For routine frequency checks, I suggest feeding the transmitter into a dummy load and routing RF to the counter via an M-358 coaxial tee. To avoid overdriving the counter, couple the transmitter signal to the counter input by means of a 5-pF capacitor.

I thank Dan Burton of DigiMax, and John Langner, WB2OSZ, for their encouragement and support in this project.—John E. Runninger, WB2LCP, Rome, New York

CRYSTAL SOCKETS FROM SPEAKER TERMINALS

□ Radio Shack[®] "Button Terminals" are intended for use as spring-loaded terminals for speaker wiring, but they also work well as sockets for popular crystals with 0.486-inch pin spacing. These devices, RS nos. 274-622 (four terminals) and 274-623 (eight terminals), can be used to hold two and four crystals, respectively. Crystals in FT-243 and HC-6/U holders fit perfectly, as shown in Fig 2.—Ed.

¹John Langner, "A Talking Frequency Display," QST, Apr 1985, pp 14-17.

²A & A Engineering, 2521 W La Palma, Unit K, Anaheim, CA 92801, tel 714-952-2114.

³The similarity between the circuits of the DigiMax D-500 and -1200 counters suggests that the Fig 1 circuit should also function with the D-1200, and may fit inside the D-1200 case. This has not yet been tried, however.—Ed.

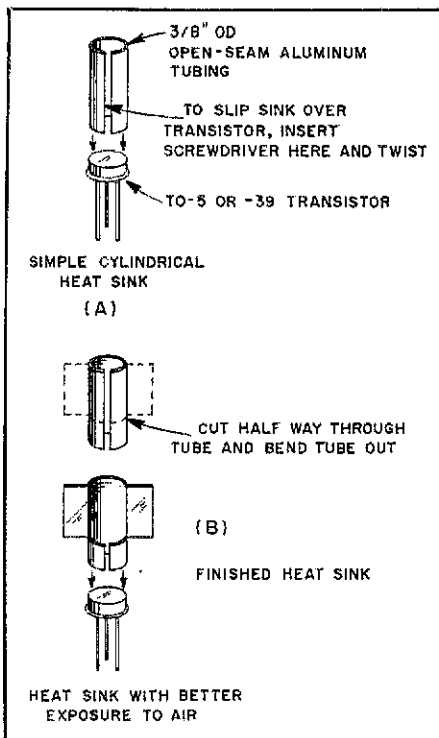


Fig 3—W6SPC's quick TO-5/TO-39 heat sinks from open-seam, 3/8-inch-OD aluminum tubing.

TRANSISTOR HEAT SINKS FROM ALUMINUM TUBING

□ Here are two alternatives to forming small heat sinks on a vise. Each makes use of open-seam, 3/8-inch-OD aluminum tubing. See Fig 3A. Cut the tubing to length, and clean the cut with reamer and file. Pry open the seam with a screwdriver and slip the sink over the transistor. The sink shown in Fig 3B uses the same technique, but is more open to the air. The 3/8-inch tubing is just right for transistors in TO-5 and TO-39 cases.—*Daniel G. Mackintosh, W6SPC, San Francisco, California*

GENERAL-COVERAGE TUNING TIP: COUNTING OUT TIME WITH Y3S

□ Time-signal station Y3S (formerly DIZ), Nauen, East Germany, is a listening target worthy of attention: The CW time pips it transmits nearly around the clock on 4525 kHz include a simple code that indicates the time of day! You can decode the pips just by listening closely and counting time. The *VHF/UHF Manual*, published by the Radio Society of Great Britain and available from ARRL, tells how:

The exact minute is indicated in the usual way by a longer than normal pip. Then follow 59 ticks at 1-s intervals, some single, some double.

To find the time, begin counting seconds from the minute mark. No. 40 is always a double, forming a useful marker which can be used to avoid counting the previous 39 once the method is known. Note the number of seconds which have elapsed as each double tick is heard until no. 55 is reached. Then refer to Table 1 and add the times equivalents to the numbers. The result refers to the minute which begins a few seconds after the last of the "doubles."

Those familiar with binary-coded decimal notation will have no difficulty in recognizing the basis of the table or in reconstructing it when necessary. Note, however, that the normal order is reversed, with the least significant digit of the minutes appearing first. Second no. 48 provides a parity bit, making an odd number of "doubles" for the minute identifiers appearing between seconds nos. 41 and 48 inclusive. No. 55 does the same for hours identifiers between seconds nos. 49 and 55. —*Ed.*

Table 1

Y3S Time Code Key

Second	Time Value	Second	Time Value
40	0000	48	(see text)
41	+0001	49	+0100
42	+0002	50	+0200
43	+0004	51	+0400
44	+0008	52	+0800
45	+0010	53	+1000
46	+0020	54	+2000
47	+0040	55	(see text)

This table shows the time values signified by double time pips on Y3S at the seconds indicated. Example: Double pips noted at the following seconds: 40, 42, 43, 45, 47, 48, 49, 51, 53. Time at the next whole minute is 0000 + 0002 + 0004 + 0010 + 0040 + 0100 + 0400 + 1000 = 1556 UTC.

A RESONANT SPEAKER FOR CW

□ Some years back, *QST* published an article on building a resonant speaker for CW.⁴ I tried it, but the results were disappointing. That speaker required a glass tumbler of a certain size, and I couldn't closely duplicate it.

I decided to build a closed-tube resonator based on a formula in my old college physics book. I felt that the frequency response of speakers more than 2 inches in diameter would be too wide, so I settled on a 2-inch replacement speaker (Radio Shack 40-245). An empty plastic caulking tube was available, so I cut it to length for 750 Hz. Then I taped the speaker to one end of the tube with electrical tape. During its first trial, the speaker exhibited a pronounced peak, but I wasn't satisfied with its output. As I picked up the speaker, however, I happened to put my thumb inside the tube. To my surprise, the output went up!

To investigate this effect, I installed a movable wooden plug in the tube. Transverse slits in the plug hold fins of thin aluminum stock; these fins can be shaped to center the plug in the pipe. Experimentation consisted of trying the speaker with the plug at various depths in the pipe. Thinking that stiffer resonator material might improve speaker efficiency, I built two more resonators from 2-inch OD PVC pipe (see Fig 4). The results are inconclusive, but each speaker produces a useful peak at 750 Hz. On the average, output at the peak is about 4 to 7 dB over the free-air response of the speaker. I can detect another peak at about 440 Hz, but this is so far down that it causes no problems.

I suggest keeping the resonant speaker in the clear by at least 2 feet. Place it on a soft pad. I use a hemostat to adjust the position

⁴J. B. and R. V. Heaton, "An Electro-Acoustic CW Filter," *QST*, Apr 1983, pp 35-36.

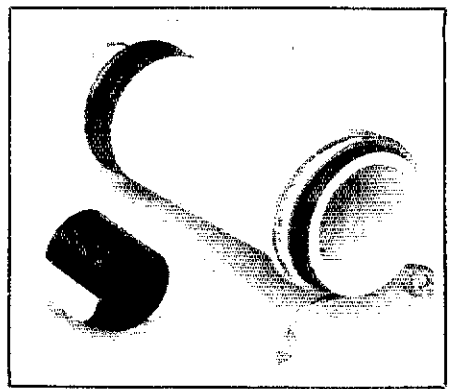


Fig 4—K4JVT's resonant speaker for CW, cut for 750 Hz. The closed-tube resonator consists of 2-inch-OD PVC pipe, 5 1/4 inches long. The 2-inch speaker (out of view at the far end of the resonator) is mounted to the pipe with electrical tape. The tuning plug is 1-1/8-inch-diameter wooden dowel, 1-1/4 inches long; its positioning fins are thin aluminum stock, press fit into transverse slits in the dowel. The short wire visible at the speaker end of the tube is one of the speaker connections. The speaker stand is heavy-gauge aluminum wire.

of the tuning plug. On some of the speakers, two positions of the slug produce a peak—one at the open end of the tube, and another about half-way down toward the speaker. From using both positions on the air, I think the inner position may be best.

I drive the speaker from my Ten-Tec Omni's rear-panel PHONE PATCH jack, turning off the regular speaker with a switch. Slow tuning is essential, because the sharpness of the speaker peak can cause you to overlook signals of weak to moderate strength if you tune too quickly.—*Wally Millard, K4JVT, Camden, North Carolina*

Editor's Note: I'm uncertain as to what formula K4JVT used to calculate the length of his resonator. According to J. E. Williams, F. E. Trinklein and H. C. Metcalf, *Modern Physics* (New York: Holt, Rinehart and Winston, 1976), p 273, the formula for resonance of a closed tube is

$$\lambda = 4(\ell + 0.4d) \quad \text{Eq 1}$$

where

λ = wavelength of the tube's fundamental resonant frequency
 ℓ = length of the tube
 d = tube diameter

Assuming that the speed of sound in 25° C air is about 13,622 in/s, this formula can be rewritten to solve for ℓ as

$$\ell = \frac{3408}{f} - 0.4d \quad \text{Eq 2}$$

where

ℓ = length of the closed tube in inches
 f = resonant frequency of the tube in hertz
 d = inner diameter of the tube in inches.

The inner diameter of the PVC pipe shown in Fig 4 is 1.56 inches. With this value for d , solving Eq 2 for $f = 750$ gives a tube length of 3.9 inches. This is considerably shorter than K4JVT's resonator. On the other hand, the graph in S. L. Seaton, "A Resonant Loud-Speaker for C.W. Reception," *QST*, May 1936, p 64, indicates that a closed-tube resonator for 750 Hz should be about 4.3 inches long. Seaton states that "A pipe diameter of two to four inches is suitable for ordinary frequencies." Clearly, there's plenty of room for cut-and-try experimentation! □

The publishers of *QST* assume no responsibility for statements made herein by correspondents.

OBTAINING VARIABLE CAPACITORS

□ One source of air variable capacitors some builders may have overlooked is an old broadcast radio. I've gone to many flea markets—not *ham* flea markets, but the regular kind—and have bought quite a few old, broken-down radios. These can be had for two or three dollars each. In fact, I even purchased one for 10 cents! Each of these radios yielded variable capacitors and other components as well: resistors, knobs and so on.—*Harry W. Neff, W3JN, 1000 Valley Forge Towers, Suite 117, King of Prussia, PA 19406*

[Don't overlook old transmitters. Transmatches and assorted military surplus gear at ham (or other) flea markets, garage or tag sales, too. Though the item itself may not be usable (or even worth repairing), the value of the components *inside* the gear may far outweigh its apparent worth. Picking apart old gear is good therapy on cold, wet or wintery days when you have nothing better to do.

You may need some muscle (or additional hands) to carry off the gear; some of that old stuff is quite heavy! Be prepared for some frowns from the sanitation engineers who'll have to haul away the discarded chassis!—Ed.]

MAKING PC BOARDS

□ I've used a type of photosensitized PC board that has more to offer than other materials on the market. These boards are manufactured by Kepro Circuit Systems, Inc.¹ These boards are sold under the trade name Keproclad, and are available in various sizes, both single- and double-sided, through electronic supply houses. The boards are coated with a photosensitive plastic that hardens under exposure to ultraviolet light to produce a surface resistant to ferric chloride etching solution.

Unlike other photoresists, the unexposed plastic is removed by use of a 1% sodium carbonate and water solution. Each board is supplied with a small packet of the powder and a tiny sponge to use in scrubbing off the unexposed plastic. Although the solution is alkaline (and precautions should be taken to prevent prolonged skin contact), this system eliminates the use of flammable, volatile organic solvents such as xylene.

The plastic resist on these boards turns color as it is exposed, resulting in a blue image on the board prior to developing. After etching and drilling are completed, the exposed plastic can be removed readily by further soaking in the developer.

I use commercial-quality, high-contrast negatives for preparation of my PC boards. For exposing the boards, I use two black light fluorescent tubes (GE F15T8-BL) mounted in my shop lamp. Two minutes' exposure at a distance of 12 inches yields excellent resolution and easy removal of the unexposed plastic in the developer. Longer exposure is not deleterious provided that the black areas of the negative are truly opaque. Prolonged exposure of the boards to the black light merely increases the resistance of the plastic

to removal once the etching process is complete. The latent image on the board changes color as exposure time increases, going from green to blue-green to blue. I find best results are obtained when the latent image appears to be blue-green. This board material is not cheap, but I can turn out a commercial-quality board every time.

Another tip: Frequently, I need to prepare a "quickie" PC board for a one-of-a-kind project. I have found an excellent means to do this. Faber-Castell manufactures "paint pens," available from office-supply stores. These pens contain a quick-drying enamel paint that flows out through a porous fiber tip. The paint resists etching solutions very well, much better than the resist pens sold in electronics stores.

The pens are available in two tip widths, and in numerous colors. I find the colors handy for color-coding locations of different hole sizes, for example. After etching and drilling the boards, the paint can be removed by scrubbing the board with a scouring pad. I find it helpful to use a solvent such as aerosol contact cleaner for final cleaning. This paint-pen method is so fast that I find it easier to paint and etch a board than to use perf board and flea clips!—*William Schrader, K2TNO, 2301 Dryden Rd, Houston, TX 77030*

ANOTHER POSSIBLE RFI SOURCE

□ I caution anyone contemplating the purchase of a First Alert model LS420 automatic light control. The one I bought caused a high level of RFI and line noise. I returned it to the manufacturer, The Pittway Corp, 780 McClure Rd, Aurora, IL 60504-2495. Your neighbor may have one that is troubling you, so check it out.—*Fred C. Wolf, N3CSL, 946 West Fairway Dr, Lancaster, PA 17603*

SQUAWKER CHECKS COAX

□ The article, "The Squawker: A Light Detector" (Jul 1987 *QST*), is interesting. I decided to put one together for a friend, Walt Hendrickson, VE7BGJ, who is a blind amateur. My version uses 100-kΩ resistors for R1 and R2, and a 500-Ω potentiometer in the speaker line.

The Squawker is a great tool for checking coaxial cables [see Feedback—Ed.]. This unit will emit a tone even when the Squawker is connected across resistances of more than 1 MΩ. The tone frequency begins to drop when the Squawker is connected across resistances above 10 kΩ. Of course, you can also practice code with it!—*J. A. "Lou" Beaubien, VE7CGE, 4813 Fairlawn Dr, Burnaby, BC V5C 3R7, Canada*

REPAIRING BROKEN TOROID CORES

□ A typical Amateur Radio Sunday night accident set me to thinking and asking some questions about powdered iron and ferrite toroid cores. I was working on a small, 30-meter transmitter when a toroid core for one of the tuned circuits rolled off the bench onto the concrete floor. The sound it made when it hit said: "busted." Sure enough, the core was split neatly into two semicircles.

Considering the composition of both powdered iron and ferrite cores, it seemed to me that carefully cementing together the core halves would result in not much more discontinuity of the material than does the manufacturing process. Engineer friends with whom I discussed this agreed.

I queried Amidon Associates, from whom I get such cores. The response I received was (in part): "Normally, iron powder and ferrite cores can be glued together with very little noticeable (adverse) effect. As you know, sometimes a core is slotted to change its inductance, which tells us that if the repair results in an extra-large 'glue gap,' there could be minor changes, but quite insignificant."

The lessons are: Don't drop cores on concrete floors. If you do, and the break is clean—and the pieces large enough to work with—you can glue them together. Sparingly use a thin, but strong, cement such as Crazy Glue[®]. Match the core fragments carefully to keep the gaps in the core as small as possible.—*Julian N. Jablin, W9IWI, 9124 N Crawford Ave, Skokie, IL 60076*

HAYES MODEM AND AMATEUR RADIO

□ I found that the Hayes[®] Smartmodem 1200™ (a computer telecommunications modem) instruction manual mentions use of the modem with Amateur Radio equipment. You can find the information in Appendix H, pp A-12 to A-14. There are even instructions on how to tell the modem to send Morse code for identification purposes; the transmission rate is 20 WPM.—*John F. Marthens, NU6A, 10446 El Braso Dr, Whittier, CA 90603-2410*

Feedback

□ In "A CW Keying Interface" (Apr 1987 *QST*), the pin numbers for the emitter and collector of the optoisolator (U3) in Fig 1 on p 52 are incorrect. Please change the labels to show the emitter connected to pin 4, and the collector to pin 5.

□ The MV2109 tuning diode specified in "Tuning Diode Applications and a VVC-Tuned 40-m VFO" (Sept 1987 *QST*, p 25-29) is no longer available from BCD Electro. Similar MV-series tuning diodes can be ordered from Circuit Specialists in capacitance values from 6.8 pF to 100 pF. Contact Circuit Specialists, PO Box 3047, Scottsdale, AZ 85257, tel 1-800-528-1417. A catalog is available. Also, the telephone number for BCD Electro has been changed to 214-343-1770.

□ An error exists in Fig 2 on p 36 in "The Squawker: A Light Detector" (Jul 1987 *QST*). In the optional circuit shown in the inset, the lead from the junction of the shell of J1 and U2 is incorrectly shown as routed to U1, pin 6. The connection should be made between U2 and the top end of R2. (Thanks to Lou Beaubien, VE7CGE, for spotting this one.)

Father Moran 1986 ARRL International Humanitarian Award Recipient



"Dedicated to those Amateurs who, through Amateur Radio, are devoted to promoting the welfare of mankind."

By Mary Schetgen, N7IAL
Volunteer Resources Assistant



The ARRL Board of Directors, at its Second Meeting in July, announced Father Marshall D. Moran, SJ, 9N1MM, of Nepal had been selected to receive the second ARRL International Humanitarian Award. This award, intended to acknowledge the extraordinary achievements and dedication to international humanitarianism by an individual or group, was first bestowed posthumously in 1986 on the late Victor C. Clark, W4KFC. Nominations for this honor were solicited from IARU member societies in July and forwarded to the ARRL Board's Volunteer Resources Committee for review and recommendation to the Board as a whole. Presentation of the engraved Humanitarian Award plaque is scheduled to take place at the September 1988 ARRL National Convention in Portland, Oregon where Father Moran is scheduled to speak.

Father Moran, as he is known to his many Amateur Radio friends worldwide, was born in 1906 in Chicago and entered a Missouri seminary at age 18. Upon ordination as a Jesuit priest, he traveled to Patna, India and a short time later was assigned to proctor college exams in Kathmandu, Nepal. By special permission of the Nepalese government, Father Moran was able to establish a small school for Nepalese boys in 1950—the first foreign educational establishment in Nepal since 1769. His excellent Jesuit education and popular teaching methods quickly gained the Father notice from several Nepalese

Nominations Being Accepted for '87 and '88 Awards

The ARRL International Humanitarian Award is dedicated to those amateurs who, through Amateur Radio, are devoted to promoting the welfare of mankind. Any licensed radio amateur worldwide, or group of amateurs who, through Amateur Radio, have provided extraordinary service for the benefit of others in times of crisis or disaster is qualified to receive the award.

Nominations for the 1987 and 1988 ARRL International Humanitarian Awards will be accepted from a licensed radio amateur, a governmental organization, or any other organization that has received the benefits of the radio amateur's extraordinary service.

Nominations must contain a summary of the actions of the nominee which qualify him or her for the award and statements from at least two references, including names and addresses for verification. All nominations should be written in English.

The deadline for nominations for the 1987 award is December 31, 1987, and for the 1988 award, December 31, 1988. Send nominations to ARRL Office of Volunteer Resources, 225 Main St, Newington, CT 06111.

monarchs and influential citizenry. As head of St Xavier's Godvari School, he was granted permission to operate the first legitimate Amateur Radio station in Nepal, and his call sign signifies this status: 9N = Nepal, 1 = first ham licensed in Nepal, MM = Marshall Moran.

Over the years, Father Moran has made 80,000 to 90,000 contacts via Amateur Radio and has assisted thousands of individuals and groups worldwide. His mission shack has issued news of climber rescues in the Himalayas, Indian border skirmishes

and visits by international dignitaries to Kathmandu. St Xavier's has provided health care and education to many Nepalese youngsters and the mission school has grown to provide dormitory facilities for girls. Although active as senior advisor to the dozen priests on staff at the school and continuing to teach on a daily basis, Father Moran still has time to operate SSB on various Asian nets, and is often the

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One Ticket Leads to the Next

Don't stop now! You've put lots of time and energy into that Novice class ticket. As your operating skills and knowledge increase, so will your awareness of what the hobby offers.

By Lee G. Hayford, AH2W
Manager, Club Services Department

Jack stretched out his hand to silence the shrill blast of his clock radio. His eyes focused on the illuminated dial. Is it really 3 AM? he thought. Confusion turned into sudden excitement as he remembered the thrill of contacting a West Coast station last Sunday morning on 40 meters while battling the interference from international broadcast stations. Kathy, in Seattle, had given Jack a 339 signal report, but it was his first West Coast contact ever! It was a whole new experience that Jack hoped to duplicate this morning.

Mark, his best friend in school and a fellow ham radio operator, told him it was possible to hear Australia and New Zealand stations on 40 meters early in the morning, but that these stations were in the General portion of the CW band. Jack dressed quickly and headed for the basement. Rubbing the sleep out of his eyes, he imagined hearing a signal from halfway around the world. He wondered if it would be possible to hear a signal from an exotic island in the South Pacific. What's it like to operate from Tahiti? he daydreamed.

Jack looked at the world map on the wall as his receiver warmed up and the tubes crackled to life. He wondered again if his dipole antenna could pick up a signal all the way from Australia. This morning I'll listen down on the General portion of the CW band, he thought. The band sounded almost dead with just a few signals. The absence of interference from international shortwave broadcast stations surprised him. Someday I'll be able to get on this part of the band, Jack promised himself. He decided to double his efforts in studying for the General class exam.

The thoughts of faraway places and new operating privileges so engrossed Jack that he didn't hear the footsteps behind him.

"What's on the band this morning?"

"Oh, hi, dad. Just thought I'd listen around a bit."

"You've been getting up pretty early in the morning. How about putting up a vertical antenna for 15 meters after breakfast?"

"Great! I don't know much about 15 meters, though."

"Believe me, you'll find it quite different."

Jack gulped down a glass of milk and exclaimed, "I'm ready to put up that antenna!"

The sun on Jack's back didn't bother him that morning as up went the vertical. Jack marveled at how quickly and easily his dad put that antenna together. He hoped that one day he'd have enough knowledge and skill to put up his own antenna. Right now he was thankful that his dad knew so much about the hobby that took so much of his time and energy.

The time had come to test the antenna. Jack had trouble containing his excitement. Jack's dad completed the final soldering on the PL-259 coaxial cable connector and plugged it into the receiver. The number of signals coming from the speaker caught Jack off guard. Strange new prefixes flooded his mind.

"What's OE, dad?"

"I think it's Austria."

"Wow, and that signal's coming in at S9!"

Soon Jack was answering CQs from stations all over Europe. He couldn't get

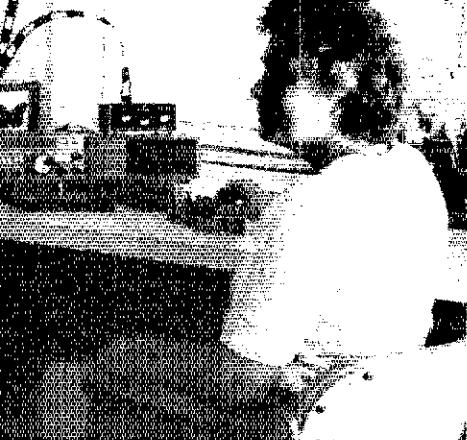
Novice Notes:

- For Techs, activities galore on V/UHF
- Generally speaking, snare DX on all HF bands
- Explore CW action on 30
- Upgrade your call sign

over the strength of the signals and the lack of interference from shortwave broadcast stations. And he could easily contact the West Coast without having to get up at 3 AM! Later that afternoon, he contacted a station in Australia on 15 meters. He started wondering what the other bands were like.

Janette LeBlanc, KB7AEZ, of Canby, Oregon, enjoys learning how to use a hand-held transceiver on 2 meters. She's upgraded to Technician since the photo was taken.





Some, like Roberta Traynor, N6PTW, of Citrus Heights, California, like it straight.

Upgraders Share Their Experiences

"It seems to me that just the fact that at the beginning of our class in February everyone knew Novice Enhancement was on the way, encouraged everyone to stay with it. I upgraded to Technician because I want to work my way up to the top and Tech was the next step."—*Glen Fisher, KB7BTH*

"I upgraded partly because of friendly competition among classmates, and to be able to use more voice frequencies. I like copying CW, but sending scares me. We had a terrific group in the Hoodview ARC VEC class. Many of the same group took Tech/Gen together. On breaks we compared notes on the confusing parts of the class. "What did he say?" usually started a jam session. They provided great moral support. You also know someone when you finally get on the air."—*Mary Lou Zehender, KB7ADT*

"I finally got the bug when my husband attended local classes to upgrade to Advanced and Extra Class. I thought if he could do this while battling cancer, I'd join him and share in this hobby with him. I found the classes (put on by the River City Amateur Radio Communications Society, Sacramento, California) to be most helpful, informative and interesting."—*Roberta Traynor, N6PTW*

"I believe, as an Amateur Radio operator, we must help other people, as well as having fun with our skills. As a General class licensee, I will be able to help others, in a wider range than just my local area, while having pleasant experiences with my hobby."—*Steve Wallace, N4PWO*

"The first thing that got me interested once again was the fact of Novice voice privileges for 10 meters. I took and passed my Novice class exam in February 1987. 2 meters was my next goal. I took my Technician class exam in April."—*Gary Weber, KB7BCS*

interesting 6-meter band, you'll have to upgrade. Many Novices say that their desire to operate on 2 meters was one of the main reasons for upgrading.

Perhaps net operations have caught your fancy. While some nets meet in the Novice portions of the bands, the majority of them meet in the General class band allocations. Nets are a good way to make lifelong friends who will always remember your call sign. You'll get a strong sense of community and belonging to a particular group of hams who share many of the same interests. Nets meet for many purposes (from traffic handling, to award seekers and medical missionaries trying to contact



Jill Dietrich, KA9VGW, of Bremen, Indiana, obviously likes getting on the air.

Novice Enhancement

Jack operated in the days when Novices couldn't use variable-frequency oscillators, but relied on crystal-controlled transmitters. He was limited to 75 watts, and had to upgrade within two years or lose his license. While transmitter power and frequency privileges have changed for Novices in the late 1980s, the unique excitement of Amateur Radio remains the same.

All hams experience the spine-tingling thrill of seeing their call signs for the first time when the license from the Federal Communications Commission (FCC) arrives in the mail. And who can forget the very first contact?

Since there's no longer a time limit on the Novice class license, Novices can choose to upgrade at their leisure. What's the hurry? Especially now that Novice Enhancement has opened up new frequencies and emission-mode privileges?

More Frequencies = More Fun

Maybe a taste of the Novice Roundup or Field Day has whetted your interest in contest operation. Most other contest operating is done in the General class or higher portions of the bands. With a General class license, you'll be able to get on 20 meters, the high frequency (HF) contesters' favorite band. Right now Novices don't have a middle band between 15 and 40 meters.

Novice Enhancement has given you a chance to sample HF single sideband (SSB) operation on 10 meters. But 10 meters is especially dependent on the sunspot cycle. Your operation on this band will decline in the same fashion as the sunspot cycle. Fortunately, however, we're into a new sunspot cycle, and propagation conditions on 10 meters should improve steadily in the months and years ahead. But what about new HF SSB vistas to explore on the other bands?

You now have the opportunity to operate on 220 MHz (1 1/4 meters). But to get on the very popular 2-meter band and the always-

the states). The range of net activities is enormous.

You can work some DX (long distance) stations on the Novice portions of the HF bands, but most DX stations operate in the General or higher class portions of the HF bands. It's a bit frustrating to hear a rare DX station operating in a portion of the band that you're not allowed to operate on.

Give Back More to the Hobby

A higher class license enables you to provide more of the community service hams are so well known for, as you'll have more of an opportunity to participate in the Amateur Radio Emergency Service (ARES). And you'll never know when your increased operating skills might even save a life. An experience I had several years ago bears this out.

While serving as a radioman in the US Navy, the ship I was on received a distress call from a Greek freighter that was on fire. I guarded the CW distress frequencies all night long as we steamed toward that freighter. Just before dawn, I copied a weak CW signal. It happened to be from a radio operator onboard the Greek freighter. One of the crewmen had abandoned ship overnight in a liferaft. Had we not received that message, who knows how long that Greek sailor would have drifted in the ocean before any rescue attempt was mounted?

Increased CW skills also helped when I had to copy weather information from a communications station on Mauritius Island, in the Southern Indian Ocean, as we frantically attempted to chart a course away from an impending tropical cyclone. I even used ham radio for a phone patch from sea to the commanding officer of the Great Lakes Naval Training Center near Chicago for additional weather information on that same tropical cyclone!

You may never be called upon to use your operating skills in an emergency situation, but don't all hams have an

obligation to be ready if the need ever arises for their services?

Another way you can give something back to the hobby from which you derive so much is by becoming a Volunteer Examiner. VEs must have an Advanced or Extra Class license, however. You might also be one of two hams to administer a Novice class exam to an excited prospective ham. To be eligible for this service, though, you must be at least 18 years old and have a General or higher class license.

As you learn more about the hobby, you'll find more ways to give of yourself. Maybe it will be something simple like sending a needed transmitter or receiver part to a fellow ham in another country, and receiving a postcard a short time later in which profuse thanks abound. Maybe your increased knowledge about antennas will come in handy when a neighbor asks for some help in putting up a new Yagi antenna. Maybe you'll have the satisfaction

Find an Experienced Ham

Some of us were lucky. We had an experienced ham in the family to offer us advice and who had the needed skills for assembling a station and putting up an antenna. This person also served as a cheerleader when the theory or code seemed to be an overwhelming obstacle.

League HQ can put you in touch with a ham radio club or instructor in your area. Clubs often provide the support you need to get a higher class license. You'll find that many clubs sponsor classes for Novices who want to earn a Technician or General class license. Let us put you in touch with a cheerleader/guide today!

of hooking up two people via a phone patch, and hear the gratitude in their voices. Ham radio offers much to those who take time to explore all the possibilities.

Take the Plunge

Hams get higher class licenses for many different reasons. Chances are that someday you'll want to work toward getting a different class of license. League HQ provides all the study materials you'll need for advancement. Our goal is to provide all the materials you'll need to gain maximum enjoyment out of the hobby. And while you're having fun, you'll also find ways to help others.

Take time to measure the cost (financially and emotionally) of going for a higher class license. A well-planned strategy and set of objectives will go far in making your bid for the next class of license a successful one.

Father Moran

(continued from page 45)

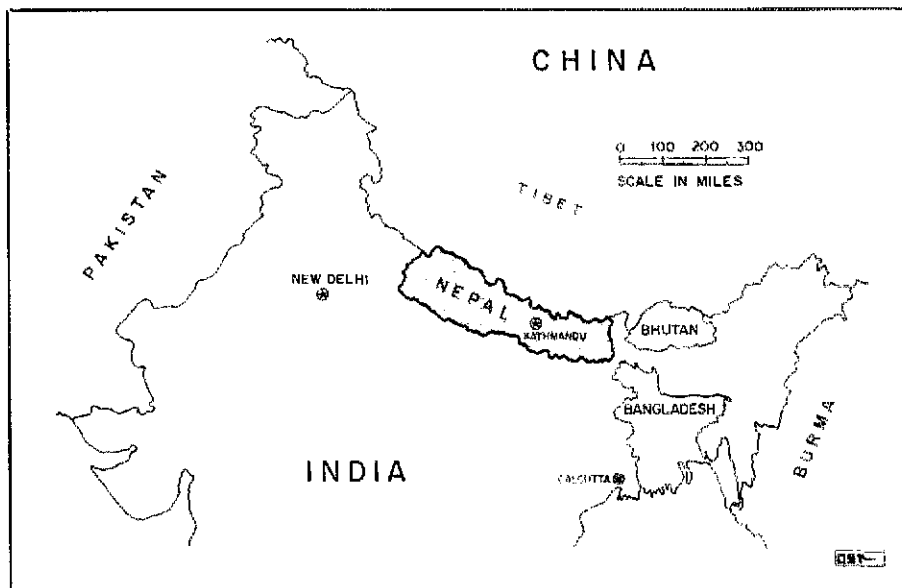
subject of pile-ups. Because the current supplying the mission fluctuates, the Father must rely on tube gear; replacement parts are regularly donated by R. L. Drake Company. His QSOs have generated such a spirit of benevolence on the part of amateurs the world over that many hams have donated unsolicited contributions to help fund mission programs.

The Father is a much-sought-after speaker when traveling and has been the guest of many Amateur Radio clubs when stateside. He presents a humorous and informative program including a slide show on Nepal and its people.

Although changes have come in the nearly four decades that Father Moran has lived and worked in Nepal, Amateur Radio activities are generally not encouraged: Only a handful of licenses for station operation have been granted. Owing to the remoteness of this Himalayan country, personal communications are still not very reliable. Father Moran's Amateur Radio station aids many foreign travelers as well as officials in Kathmandu. Many in the US have heard his jovial "Nine Nancy One Mickey Mouse" on 14.280 MHz. By his own estimate he has received more than 300,000 Christmas cards from amateurs

and shortwave listeners around the world! With an indomitable spirit to learn as well as teach, the Father has modified a personal computer and is studying its uses and applications for his staff and students.

The Officers, Directors, and members of ARRL wish to express their sincere appreciation and gratitude to Father Moran for his exemplary service to his fellow man throughout his Amateur Radio career.



The Practical Packet for the Holidays

Interested in providing a free holiday radiogram service to your community? Here are some ideas on how to advertise locally and move your traffic.

By Dave McLanahan, WA1FHB
PO Box 17, Marlow, NH 03456



Sample News Release

The original news release as received on packet:
4042 N 2373 ALL KY1T 861130 FREE RADIOGRAM NEWS RELEASES
R:861129/2252Z S:861130/0500Z 5426 FROM KY1T VIA W1ZHC
MATTAPOISETT MA.

For those of you who either have contacts with the media, or can at least come up with the addresses for local newspapers, here's a news release that can be modified for your own local use. It's the exact news release that I use several times each December to advertise the fact that we amateurs can provide free telegram service for the residents of our local communities. I send it to each and every newspaper, radio station and cable TV station in the area. Feel free to modify it and use it as you see fit.

AMATEUR RADIO SERVICE OFFERS FREE CHRISTMAS TELEGRAMS (For immediate release)

Residents of the Cape and Islands may once again send free Christmas greetings to friends, family, and loved ones by utilizing the Amateur Radio Service.

"This service is available year-round," states Luck Hurder, Section Manager for the American Radio Relay League, "but we find that most people think of using it only during the holiday season. Some Cape residents in years past have sent dozens of free telegrams instead of their usual Christmas cards."

When asked for the reasoning behind providing a free service like this, Hurder replied, "We have established our digital radio networks as a public service to our communities during times of disaster, but in day-to-day usage, we utilize the telegrams that are generated by the public to exercise and hone our equipment and operating skills."

To use the free telegram service for Christmas messages, Hurder states, "Simply call the answering machine at 255-2029 before December 21, and leave YOUR name and telephone number, the complete name, address and telephone number of the addressees, the text of your messages and a signature. The radio operators will relay the telegrams to the city of destination where they will be telephoned to the addressees."

"Be sure," says Hurder, "to avoid trying to send commercial messages, or telegrams that relate to the making of profit by any parties. This is a free personal telegram service that is made available to the community but which may not be abused by any commercial interests."—Luck Hurder, KY1T



While browsing through a neighboring packet bulletin board System (PBBS) recently, my eye was caught by a bulletin to ALL from KY1T entitled "Free Radiogram News Releases." I downloaded it and found a very nicely written press release extolling free radiogram services via the National Traffic System, NTS. At that point, I had the release in an ASCII file on disk. Just a few moments with a word processor, and the releases were personalized for my area.

I'm not a dyed-in-the-wool traffic handler, but a few calls quickly turned up a nice assortment of telephone numbers for NTS hams in various dialing areas in my immediate region. I included these names and telephone numbers in my version of the release.

Counting up "weekly shoppers," radio stations and the newspaper (there's no TV station in town), I printed six copies of the release, double-spaced on my dot-matrix printer.

It took me less than 50 minutes to hand-deliver all six copies, with a short pause for explanations and pleasantries at each stop. The result? Three of the four papers printed the release, with one of the papers using it in two different editions. One of

THE AMERICAN RADIO RELAY LEAGUE			
RADIOGRAM			
CLASSIFICATION	ORIGINATOR	DESTINATION	DATE
4	W1ZHC	ALL	DEC 20
TO: PHILIP HEDW 982 CHEYENNE ST COSTA MESA CA 92626		FROM: W1ZHC MATTAPOISETT MA	
CALLING: 714 549 8516		TO: HOLIDAYS	
SERVICE: THIS		REASON: RUCN	
RECD: []		SENT: []	



Packet Bulletin Board System Operator (SYSOP) AI, W1ZHC, of Mattapoisett, Massachusetts, automatically relays hundreds of formal NTS messages each month with his 144/220 MHz PBBS facility.

the radio stations did an on-the-air (broadcast band, not ham band!) interview of an NTS traffic handler and then called back later for one of its announcers to send a personal message, live, during a broadcast!

The proof of the pudding was a deluge of messages originated from the area. Of course, the NTS people are enthusiastic hams too, and appreciated the increase in workload. While there was no overt effort to sell Amateur Radio, I did have the opportunity to provide answers to numerous questions regarding this free service.

The bottom line has been lots of messages delivered, some for people who might not have been able to afford other means of communication. NTS traffic from

this area has certainly increased dramatically and, most important, public awareness of Amateur Radio has had a tremendous boost. The cost to me? Less than two hours of my time, 12 sheets of fan-fold paper and half a gallon of gasoline.

Interested in providing a free holiday telegram service for *your* community, but lack packet equipment? Not to worry! Any licensed amateur, Novice to Extra, regardless of mode preference or equipment capabilities, is encouraged to solicit messages from the public, and enter them into the National Traffic System for relay and delivery.

While the use of packet bulletin boards

precludes the need for understanding the fine points of when and where NTS nets meet, a quick glance through a recent *ARRL Net Directory* will guide you to the applicable times and places for your Section. Should your interests and personal capabilities lead you to decide on CW, RTTY or phone, rest assured that there are more than sufficient nets to meet your needs.

Newcomers will be pleased to find that traffic networks are staffed by experienced, helpful Net Control Stations and participants who will assist you in getting your public service communications effort off the ground and running. Don't be bashful; jump in—the water's fine, even in mid-winter!

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Season's Greetings

From the ARRL HQ/IARU HQ STAFF

Nao Akiyama, N1CIX/JH1VRQ
Chrissy Arel
Jo-Ann Arel
Vicky Armentano
Rita Sue Armour
Bob Atkins, KA1GT
Richard L. Baldwin, W1RU
Leslie Bartoloth, KA1MJP
Jeff Bauer, WA1MBK
Angela Beebe
Arlene Bender, WA1VMC
Charles Bender, W1WPR
Chip Bigelow
Jon Bloom, KE3Z
Frances Bramon
Mark Burke, KA1MIS
Laird Campbell, W1CUT
Steve Capodicasa
Joe Carcia, NJ1Q
Rose Cavanaugh
Shelly Chrisjohn, WB1ENT
Lisa Clark
Jim Clary, WB9IHH
Ferne Collin
Rose "Bud" Cyr
Sandi Damato
Doug DeMaw, W1FB
Ruth Doucette
Beth Douglass
Bernice Dunn, KA1KXQ
Steve Ewald, WA4CMS
Sue Fagan
Kathy Fay
Mark Gamble
Chetty Ganci
Scott Gee, WB9RRU
Joan Gibson, KG1F
Bruce Hale, KB1MW
Jerry Hall, K1TD
Bob Halprin, K1XA
Ed Hare, KA1CV

Penny Harts
Lee Hayford, AH2W
Rus Healy, NJ2L
John Hennessee, KJ4KB
Stan Horzepa, WA1LOU
Berta Hould
John Huntoon, W1RW
Luck Hurder, KY1T
Joan Hushin, KA1IFO
Chuck Hutchinson, K8CH
Bart Jahnke, KB9NM
Debbie Jahnke
Jeff Kilgore, N1FGB
Joel Kleinman, N1BKE
Ginny Koza
Greg Kwasowski
Sandy Laflamme
Zachary Lau, KH6CP
Patricia Lerche
Sue Liberno
Robert Lincoln
John Lindholm, W1XX
Billy Lunt, KR1R
Harry MacLean, VE3GRO
Joyce Mainelli
Kathy McGrath
Mac McGrath, KZ1A
Thomas Miller, NK1P
Jodi Morin, KA1JPA
Cori Murr
John Nelson, W1GNC
Steffie Nelson, KA11FB
David Newkirk, AK7M
Bill Olson, W3HQT
Helen Pacyna
Paul Pagel, N1FB
Rick "Bones" Palm, K1CE
Linda Pfister
David Pingree
Ann-Marie Pinto

Steve Place, WB1EYI
Sal Prado
John Proctor
Michael Riley, KX1B
Paul Rinaldo, W4RI
Vern Riportella, WA2LQQ
Phil "Pip" Sager, WB4FDT
Maria Salafia
Armando Santos
Liz Santos
Cathy Scharr
Bob Schetgen, KU7G
Mary Schetgen, N7IAL
Ellen Schoen
Don Search, W3AZD
Chris Settembri
Larry Shima, W0PAN
Nancy Slipski
Carlene Snape
Maria A. Somma
Cathy Stepina
Dave Sumner, K1ZZ
Mary Ann Taratula
Lisa Tardette
Ed Tilton, W1HDQ
Maureen Thompson, KA1DYZ
John Troster, W6ISQ
William Tynan, W3XO
Tom Vesci, WB1CRH
Bill Webb, KX1A
Maty Weinberg
Ellen White, W1YL
Rosalie White, WA1STO
Bruce Williams, WA6IVC
Perry Williams, W1UED
Vivian Williams-Beal
Jean Wilson
Mark Wilson, AA2Z
Rus Wilson, N7HWC
Larry Wolfgang, WA3VIL

PRB-1 Wins in Long Island Case

A federal judge has relied on PRB-1 to void a local height limitation as applied to an Amateur Radio antenna. Andrew Bodony, K2LE, installed footings for an 86-foot crank-up tower at his home in the Village of Sands Point, on Long Island, New York. The tower was to be located in a wooded area of tall trees which would shield the tower from view even when it was fully extended. The Village has an ordinance which limits the height of accessory buildings, a category which it claimed includes antenna towers, to 25 feet.

The Village issued Bodony a summons charging him with a violation of a village ordinance requiring a building permit for the tower. Bodony applied for the permit, which was denied. Bodony then appealed to the Zoning Board of the Village seeking a variance.

After conducting a public hearing, the Zoning Board denied the variance, saying that Bodony could still operate his station with a 25-foot-high antenna and that an 86-foot tower would depreciate property values and be detrimental to the character of the neigh-

borhood. Bodony then brought suit in the US District Court for the Eastern District of New York to overturn the denial by the Village of his application for a building permit, citing PRB-1 and violations of his constitutional rights.

In granting partial summary judgment in K2LE's favor, the District Judge found PRB-1 to be a proper exercise of FCC authority and found that the Village was precluded from applying its 25-foot height limitation on accessory buildings to K2LE's antenna. The Court said: "The fact that [the Village ordinance]... does not prohibit amateur communications is not the answer to a claim of preemption. An absolute limitation of height affects Bodony's right to the full use of his amateur Extra Class license and the license to use his property as an amateur radio station issued by the FCC.

"The Zoning Board did not consider a height above 25 feet... The FCC, [in PRB-1] placed upon the Zoning Board the duty of striking a balance between the federal interest in promoting amateur operations and the legitimate interests of local governments in

regulating local zoning matters.

"The record fails to show that the erection of the proposed antenna will endanger the health, safety and general welfare of the residents or be detrimental to the character of the neighborhood or to the residents. The Zoning Board did not determine the height above which the antenna would endanger the health, safety and general welfare of the residents... The action of the Zoning Board is devoid of any effort to make a reasonable accommodation... between the two sides."

The Court ruled that the 25-foot ordinance was invalid as it applied to Bodony. It is not known at this time whether or not the Village will appeal the ruling.

This court test of PRB-1 represents the first time a local zoning ordinance as applied to an Amateur Radio antenna has been declared invalid on the basis of PRB-1, and further strengthens the position of radio amateurs fighting unreasonable local ordinances. Copies of the ruling are available from the Regulatory Information Branch, for an 9 x 12 SASE with \$1.07 postage.

F8E ORDER AMENDED

The FCC has slightly modified its Order permitting the emission F8E. David Popkin, W2CC, had filed a petition for reconsideration in this Docket, requesting an editorial change in the rule that was amended, Section 97.61(c). Popkin was concerned that the wording of the last sentence which read: "Emission F8E may be transmitted on all amateur frequencies and above" was ambiguous as to whether "and above" means longer wavelengths or higher frequencies.

As a result, the FCC made the following editorial change in 97.61(c): The last sentence will now read "Emission F8E may be transmitted on the 0.35 meter and shorter wavelength amateur service bands." This change is effective December 7.

EASTERN AND NORTHERN REGION FOREST SERVICE FEES

The Eastern and Northern Regions of the US Forest Service have issued their fee schedules for communications sites. These are two of the four US Forest Service Regions that earlier this year proposed raising their fees for persons and businesses using certain Forest Service antenna sites. Many amateur repeaters have their sites on Forest Service property. The ARRL had filed strong comments against such fees, pointing out from a survey it took that nearly 90% of amateur groups pay no site fees.

The Eastern Region, despite its name, consists of states from the Midwest, Mid-Atlantic and Northeast, including West Virginia. This Region proposed a minimum \$200 rental fee for two-way radio users which has now been adopted.

In its analysis of public comments, the Region noted that: "All of the amateur radio

respondents expressed the opinion there should be no charge for this group. They point out that amateur radio is frequently called upon to provide communication service in times of emergencies such as floods, tornados and fires."

"The Eastern Region agrees that amateur radio operators can provide a useful public service. *The fee for two-way radios may be partially waived depending on the extent of public service provided; to be determined by the authorizing officer...*" (emphasis added). The ARRL is seeking clarification of this statement from the Forest Service.

The Northern Region, which consists of communications sites in Montana, North Dakota, and portions of South Dakota and Northern Idaho, had originally proposed charging all two-way radio users a \$500 yearly fee.

The new fee schedule specifically lists Amateur Radio rental fees at \$75 yearly. HQ hopes these fee reductions will set an important precedent for the three remaining Forest Service regions that have also proposed higher fees.

FOREST SERVICE INTERMOUNTAIN REGION PROPOSES NEW FEES

The Intermountain Region of the US Forest Service has joined four other Forest Service Regions in proposing new rental fee schedules for the various radio and television services, including amateur, that rent US Forest Service land sites.

This Region consists of over 1000 sites within the States of Nevada and Utah, and portions of California, Colorado, Idaho and Wyoming.

The proposed fee schedule varies according to the population within a 40-mile radius

served by the site. For two-way radio users the fee could vary from \$600 to \$1100. The proposal does mention that under certain qualifying circumstances, fees could be waived or reduced.

The ARRL will file comments, similar to others previously filed in other Regions, that the Amateur Service should be provided site space at little or no cost in view of its non-commercial character and valuable public service and emergency communications activities.

CITEL CONFERENCE AMATEUR RADIO AGREEMENT

The recently concluded Fifth Plenipotentiary Conference of the Inter-American Telecommunications Conference (CITEL), held in Lima, Peru, had an Amateur Radio item on its agenda.

The delegates adopted a proposal for a hemisphere-wide multilateral reciprocal operating agreement. The United States and a number of other South/Central American countries have already signed the agreement.

The agreement will have little effect on US amateurs, since the US already has reciprocal operating agreements with nearly all of the countries at the Conference. The important exception is Mexico, which, at the Conference, worked for its adoption and therefore is expected to sign it, thus establishing reciprocity with the US.

This agreement, unlike its European counterpart, still requires that amateurs requesting reciprocal privileges make a written application to the host country, which can still reject or modify the application.

The US has entered into many bilateral reciprocal agreements, but this is the first multilateral reciprocal agreement. It will

require the FCC to make some minor editorial changes to its rules to provide for multilateral amateur reciprocal agreements.

The following is a partial text of the agreement:

"The member States of . . . CITEL . . . convinced of the benefits of Radio Amateur Activities and attending the interest of different members of CITEL, in order that the citizens of a member State with authorization to operate in the Amateur Radio Service in the territory of another member State of CITEL, have agreed to enter into the following Inter-American Convention on Radio Amateur Activities:

"Article 1. The provisions . . . will be applied for issuing authorizations to allow temporary operation in the appropriate activities of the Amateur Radio Service to a citizen of one State Party in the territory of another State Party, as long as that person has the adequate authorizations to carry out the activities of the Amateur Radio Service. . .

"Article 3." The authorization referred to above in Article 1 should be applied for by the interested person directly to the competent authority of the State . . . in which he seeks temporary authorization. . ."

Canada is not a member of CITEL, so of course the agreement does not apply there.

NEW AFCEA PRESIDENT

Retired Vice Admiral Dr John Boyes has announced his plans to retire as President of the Armed Forces Communications and Electronics Association (AFCEA). The AFCEA Board of Directors has elected General John Wickham, Jr, to succeed Boyes. General Wickham recently retired as Chief of Staff of the US Army. AFCEA has more than 33,000 members worldwide.

YOUNG HAM OF THE YEAR NAMED

Westlink Report has announced that its choice of the 1987 Young Ham of the Year is David Rosenman, KA9PMK, of Muncie, Indiana. An Advanced class licensee, David is 16 and has already been licensed for five years. David's father is WD9EUT, his younger brother is KA9SWU, and his grandfather, recently licensed, is NJ2K.

David speaks Spanish, Portuguese, French and Italian, and was selected to translate for the President of the US Olympic Committee, Robert Helmick, at the recently concluded Pan American Games.

David has been active in various public service events and in finding new recruits for Amateur Radio. He received his award at the ARRL Southwestern Division Convention October 10 in Scottsdale, Arizona.

ARRL PETITIONS FOR VE RULE AMENDMENT

The ARRL has petitioned the FCC to forbid Volunteer Examiners (VEs) whose accreditation has been suspended or revoked by a Volunteer Examiner Coordinator from becoming a VE under a different VEC.

The petition states that in a few instances, some VECs have noted irregularities in certain examination sessions, and it became necessary for the VECs to discontinue the accreditation of the VEs involved. However, there is no provision in the current rules to prevent these discredited VEs from applying for accreditation with another VEC, never mentioning the previous discreditation. This undercuts the overall integrity of the VEC program.

The ARRL petition explains that a VEC is

not always in a position to determine the honesty of the VEs it accredits. Furthermore, there is no real exchange of information among VECs concerning discreditation actions, since there may be some legal liability if the VEC characterizes the discredited VE's actions in some way.

In our comments, we state it should be up to the FCC to determine whether, in its opinion, a discredited VE should be readmitted in the program: "The enactment of a rule which requires that a volunteer who has been discredited obtain FCC approval prior to applying for accreditation again would place the burden on the volunteer to seek such approval. It would at the same time obviate the need for individual VECs to exchange information about discreditation actions. . . . Most importantly, it would result in a greater degree of integrity in the volunteer examination process." The FCC has not yet assigned a rule-making number to the petition.

TRUCKING COMPANY FINED BY FCC

A Danville, Illinois, trucking company was fined \$750 by the FCC for the unauthorized use of marine channel 68. The trucking company told FCC that the gear was obtained at a hamfest and was installed by company employees. The company was using the marine channel to conduct its day-to-day business communications.

FCC investigators acted after receiving numerous complaints from marine radio users. The company claimed it was not aware that it was breaking any law.

ARRL URGES TOUGHER CABLE TV TERMINAL STANDARDS

The ARRL has found itself on the same wavelength as the National Cable Television Association (NCTA) in advocating tougher RF leakage standards than those recently adopted by the FCC in Docket 85-301. This Docket subjected external cable terminal devices to field strength emission limits of Part 15 of the Commission's rules, rather than Part 76. The upshot of this change from the amateur viewpoint is that the Part 15 emission limits are more lenient than those of Part 76, thus permitting RF leakage at higher levels than now permitted.

NCTA filed a petition for reconsideration suggesting an alternative approach—that the FCC distinguish between emissions from the "internally generated" sources of radiation (such as local oscillators) and emissions of signals that are introduced into the terminal device (such as external RF signals).

Internally generated cable leakage would be subject to the more strict Part 76 limits, whereas the externally generated signals that ingress into the cable system through cable terminal devices would be subject to Part 15 standards.

Since this view was, in part, the same as ARRL's, we filed a brief statement in support of the NCTA petition for reconsideration. The League's statement said, in part: "This counterproposal (by the NCTA) is sound from an engineering point of view and promises to minimize instances of interaction between cable systems and amateur stations. It is a far better alternative than that adopted by the Commission thus far."

FCC INTERIM POLICIES FOR GMRS

In PR Docket 87-265, the FCC proposed rules

that limit eligibility in the General Mobile Radio Service (GMRS) to individuals only. Other business, groups or organizations licensed before July 30, 1987 in the GMRS would be grandfathered; however, such grandfathered licensees would not be permitted to make substantial modifications to their systems.

The FCC has now issued a public notice clarifying its interim policies for the GMRS while the rule making is pending.

The FCC said it would continue to license entities other than individuals in the GMRS. However, if the proposal to limit to individuals only is adopted, these licenses would not be renewed. The FCC said: "Grandfathered entities will be prohibited from making modifications to their existing GMRS stations to increase the power of any transmitter, increase the number of mobile units, add any stations, increase any antenna heights, change any land station location or change any area of operation. Entities other than individuals which make such modifications to their GMRS systems during the pendency of the rule making will be considered newly licensed . . . by the FCC for the purposes of applying the prospective grandfathering provisions." In other words, if the rules proposal is adopted, the modified GMRS license will not be renewed.

A little background: The FCC seems to be quite serious about letting the GMRS completely become a personal radio service. Originally, the GMRS was the Citizens Class A Radio Service, a UHF companion to the Class D 27-MHz Service. However, due to the then high cost of UHF equipment and limited range, few individual users were interested in the band. Businesses were also allowed in GMRS, and as a consequence, about half of the licensees today are business users.

In this proposal, the FCC did not propose to change the permissibility of business use, but these new interim rules certainly make it clear that their needs could best be served in another service, the Business Radio Service.

HAM RUNNING FOR CONGRESS

Yes Jeeves, there is a ham running for Congress. Keith Jaspers, KA0TSP, a General class licensee, is running for the 7th District seat from Missouri. This district covers the Springfield area. Jaspers is running as the Democratic Party nominee against Rep Gene Taylor, the ranking Republican member of the Post Office and Civil Service Committee.

DWIGHT ALBRIGHT, W7HLF, SK

Dwight Albright, W7HLF, 74, became a Silent Key July 2. Dwight had been Section Manager of Oregon from 1976-8 and had also served as Section Emergency Coordinator. He was active in ARES and at the time of his death was Manager of the Oregon ARES Nct.

REACCREDITATION OF VEs IN CARIBBEAN

The FCC has advised the three Volunteer Examiner Coordinators (VECs) in Region 12, the Caribbean region primarily serving Puerto Rico, that the FCC will no longer accept the services of any currently accredited Volunteer Examiner (VE) in that Region.

According to the FCC, this action is taken "because of widespread irregularities occurring in the volunteer examiner system in Puerto Rico." The FCC action was taken pursuant to Section 97.515(b) of the Amateur

Amateur Radio Call Signs

The following are the call sign assignments as of October 1, 1987:

District	Group A Extra	Group B Advanced	Group C Tech/Gen	Group D Novice
0	WB0P	KE0RA	N0IOE	KB0BFX
1	NN1G	KC1GK	N1FFS	KA1RBI
2	NZ2U	KE2CR	N2HPF	KB2ELB
3	NK3P	KD3ER	N3FUB	KA3SFP
4	AB4DU	KK4RT	N4RGZ	KC4BWE
5	AA5CU	KG5DZ	N5LMX	KB5EKO
6	AA6EY	KI6ZI	N6QLO	KB6UGY
7	WF7Z	KF7DZ	N7JYC	KB7CYQ
8	NY8Q	KE8OA	N8IVJ	KB8DGH
9	NU9W	KE9GR	N9GXS	KA9ZMJ
Hawaii	**	AH6IM	NH6LY	WH6BUU
Alaska	**	AL7JG	NL7LH	WL7BPN
Virgin Is	KP2T	KP2BK	NP2CF	WP2AFS
Puerto Rico	**	KP4OK	WP4MA	WP4HOW

**All group A call signs have been assigned

rules and is effective immediately.

The FCC has further advised the three VECs—ARRL/VEC, W5YI VEC and DeVry VEC—that reaccreditation is possible for those VEs "in whose integrity you have absolute confidence."

Applications based on examination sessions already held will be processed, but future examinations in this region have been placed on temporary hold.

David Sumner, K1ZZ, ARRL Executive Vice President, has issued the following statement:

"The Volunteer Examiner Program has been serving Amateur Radio well for more than three years. The problems in Region 12, as serious as they may be, are a rare exception in a program that has earned a reputation for integrity that exceeds the expectations of even the optimists. Nor should the Commission's action be considered an indictment of all examiners in Region 12, the vast majority of whom have exhibited the highest of standards. Rather, what the Commission has done is a welcome sign that these high standards can and must be maintained by all participants in the Volunteer Examiner Program, in all regions."

DICK SMITH USA SOLD

The US interests of Dick Smith Electronics, the Australian firm which marketed low-cost amateur transceivers in the US, have been sold. The buyer is American Electronics, of Greenwood, Indiana, which will continue the business. Address and phone number: 173 East Broadway, Greenwood, IN 46142, tel 317-888-7265.

FCC DENIES PETITIONS FOR RECONSIDERATION

The FCC has acted on a number of Petitions for Reconsideration in Docket 86-161, the "Novice Enhancement" rule-making.

HQ has received only a brief news release and not the actual document, but here are the highlights. The FCC:

- denied requests for additional frequency privileges for Novices on 220 MHz, stating that the subband 222.10-223.91 MHz was chosen because it conforms to the national voluntary band plan, and Novices have access to numerous repeaters on these frequencies. The Commission concluded that if Novice licensees want additional frequencies, they should upgrade to Technician class.

- denied a request to permit Advanced class licensees to administer the written examination for the General class license, saying that there was no shortage of Volunteer Examiners. Extra Class licensees have the greatest expertise in Amateur Radio, said the FCC in the News Release, and therefore are the most qualified to administer examinations.

- denied a request to change the percentage of questions on each topic in the written Novice class examination. It reiterated that, if the percentage of questions for each topic does not result in a whole number, the administering volunteer examiners can round off the number.

The News Release also notes that the Commission has adopted certain minor editorial changes in Part 97. The *ARRL Letter* and this column will carry full details as soon as the actual text of the document is available.

NORFOLK FIELD OFFICE MOVES

Effective immediately, the new address for the FCC Norfolk, Virginia, Field Office is: 1220 Communications Circle, Virginia Beach, VA 23455. Telephone: Recording number 804-363-0900, Public number 804-441-6472.

FCC EX PARTE RULE CHANGES

The FCC has exempted members of Congress, their staffs and other Government agencies from those provisions of the FCC Ex Parte rules which prohibit contacts between FCC employees and others during the "Sunshine period." This is the period of time beginning when a matter is listed on a Commission meeting agenda and ending with the release of an Order or of a notice that the matter has been removed from the agenda or returned to the staff.

The FCC said it felt that the benefits of an uninterrupted period of deliberation were "outweighed by the greater overall public interest of flexibility in exchanging information among federal law-makers."

This change in Ex Parte rules originated from a letter written to the Commission from Congressman Edward Markey, Chairman of the House Subcommittee on Telecommunications and Finance, stating that the Ex Parte rules should not be applied to members of Congress. The Commission then issued a public notice stating that it would treat the letter as a petition for reconsideration and that the Commission was reconsidering other aspects of its Ex Parte rules as well.

Rosalie White, WA1STO, is the new Club Services Department Assistant Manager. Her name and call may seem familiar—this is Rosalie's second stint at HQ, the first being from 1973-79 ending as Manager of the Club and Training Department. She was also the editor of the *Radio Club News*, which then was distributed on a quarterly basis to all ARRL-affiliated clubs.

Rosalie, originally from Indiana, was first licensed in 1970, and currently holds an Advanced class license. She holds BS and MS degrees in Education.

As the delicious scent of Cajun cooking permeated ARRL HQ, your editor put on his detective cap to investigate the source. The aroma was strongest in the Production/Editorial Department, and eventually, after hopping over computers, cameras and artwork, the source was located—the lunchbox of Jeff Kilgore, N1FGB, the new *QST* Editorial Supervisor.

Jeff comes from gen-u-ine Cajun country, Lafayette, Louisiana, where he was N5LFW. He has a BA degree in General Studies with a concentration in English from the University of Southwestern Louisiana, and taught English there as a graduate assistant.

Jeff was first licensed as WN5EEU in 1969, presently holds a Technician license, and is working to upgrade. As Editorial Supervisor, Jeff edits *QST* general-interest articles, and is responsible for the Upfront in *QST* column and Strays. He and his wife, Majella, live in Hartford.

F. C. "Rus" Wilson, N7HWC, is the new Assistant Contest Manager. He was first licensed in Montana in 1985 and presently holds an Advanced class license. He has worked as an Industrial Electrician, and holds an Associate's degree in Electronics from the Community College of Denver.



NCJ features articles by top contesters, letters, hints, statistics, scores and much more. Big gun or small, the *NCJ* provides you with a valuable source of information on the exciting world of competitive radio.

The November/December issue includes:

- Contesting for Non-Contesters
- A Statistical Look at the 1987 CQ WW CW Contest

- NSTR/M Hits the Road Again
- NCJ Profile featuring JA5BJC
- Shunt Feed Your Tower on 160 Meters

Other features are columns on propagation, clubs and West Coast contesting.

National Contest Journal is edited by Randy Thompson, K5ZD, PO Box 11439, Pittsburgh, PA 15238, and is published by the ARRL. Subscription rate for 6 issues (one year) is \$10 first class mail, \$11 first class to Canada or Mexico and \$12 elsewhere by air mail. *NCJ* subscription orders and changes of address should be addressed to the ARRL and be marked *NCJ* Circulation. Letters, articles, club newsletters and other editorial material should be submitted directly to the Editor.

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

GOOD OPERATOR PRACTICE

□ My thanks to John A. Robertson, KA0OSC, for his letter in the Correspondence section of October 1987 *QST*.

John hit the nail on the head as to what one finds on the ham bands. He put it quite strongly and I am sure that his words will sink in to those hams who resort to sloppy operating practices. It seems to me that when the FCC discontinued the requirement of a sending test for CW, we saw a decrease in the number of good "fists." Good "fists" are indeed hard to find these days.

Also, why is it that so many operators don't know the meaning of QRL? [In this context, QRL? can be taken to mean "Is the frequency in use?"—Ed.] Do these operators realize that very often, one can hear only one side of a QSO? Why are there discourteous operators who don't care if they interfere with others?

A short while back, I heard an operator sporting an Extra Class 2 × 1 call sign ask his QSO partner to slow down to 10 WPM. If the operator had to resort to this, why did he have an Extra Class license? It is exasperating to hear CW operators in the General, Advanced and Extra Class subbands poking along at 5 WPM. Surely these operators must be able to do better. Why don't they?—James Buntain, W6VYM, Pomona, California

I WANT TO EXCLAIM!

□ Radio hams devoted to CW have not been able to "exclaim" for many a year! It was about 1938 that our exclamation point was made into a comma. I think we have been very patient in waiting for an exclamation point and it is time to do something about it.

I propose that we pay some due homage to the old-time American Morse land-line telegraphers whose clacking sounders pro-

vided all of our rapid communications for many years by adopting their exclamation point—dahdahdahdit. It may not be understood by many, but it will get attention and that's what exclamations are for!—James S. Farrior, W4FOK, Merritt Island, Florida

MORE ON ABC'S BLUNDER

□ My sincere thanks go to the League and to its Executive Vice President, Dave Sumner, K1ZZ, for the watchdog letter of clarification to ABC News.—Michael Tarant, N3FKH, Warminster, Pennsylvania

ARRL OPERATING MANUAL: A BIG HIT

□ *The ARRL Operating Manual*—What a treasure chest of information. Clearly, it is now one of the most important books in my library of Amateur Radio publications. I have 24 feet of book shelf space crammed exclusively with books dealing with our hobby. This doesn't even include my collection of every issue of *QST*.

In my 40 years as a licensed Amateur Radio operator, I have seen many publications, and, in my judgment, the 1987 *ARRL Operating Manual* is among the very best!—Kenneth M. Miller, K6IR, Rockville, Maryland

COINS AND CODE

□ This is in reference to the item in Correspondence on Amateur Radio and coins (September 1987 *QST*). In the early '30s, Canada issued a coin which was the equivalent of a US nickel. Just inside the outer rim, Morse code characters spelled out "We win when we work willingly."

I'd had this coin for a long time, but somehow it has become lost through my many

moves since the '30s. While this is not a memento of ham radio alone, it deserves recognition.—Donald L. Perry, WIEKP, Reno, Nevada

While coins depicting Amateur Radio-related subjects are few, quite a number of stamps issued by various countries display code characters and various telegraph keys. A US 3-cent stamp issued in 1944 honors telegraphy, for example.—Ed.

HAM RADIO IS FOR EVERYONE

□ It seems as if each issue of national Amateur Radio publications contains letters in the various letter-to-the-editor columns from those who are dissatisfied with one phase or another of our hobby. The interests of each of us are varied and should be respected as such.

In a recent letter in an amateur publication, one amateur was very distressed and said that the CW subbands were not being utilized. I wonder if this person has a receiver, or if he actually tunes to the CW portions of the bands. Anyone who operates CW knows that this mode is alive and well. In periods of contest activity, a clear frequency is often hard to find. Some hams complain about contests. Why don't they open their minds to the fact that thousands of amateurs enjoy this aspect of ham radio? Surely, contest exchanges are very important to these amateurs. Some hams don't like DX lists. If you don't like what you're hearing, there are plenty of other areas in which to operate.

I could go on with the petty complaints and gripes of hams concerning certain aspects of our hobby, but it all boils down to one thing—If you are dissatisfied with some aspect of operating, try to look at both points of view with an open mind and to enjoy your hobby to its fullest.—Anthony R. Truhler, W9LNQ, Chicago, Illinois

Strays



I would like to get in touch with...

□ anyone with a manual/schematic for a Knight speech compressor Model C-577. Ben Gregorowicz, W9BQS, 173 W 150 N, Valparaiso, IN 46383.

□ anyone with a manual/schematic for an R-1511/GR wideband HF receiver. Fred Huntley, W6RNC, PO Box 478, Nevada City, CA 95959.

□ anyone with manuals for an Eico signal generator Model 324 and an RCA volt-ohmmeter Model WV-77E. Henry Knoll, WA0GOZ, 10081 103 St N, Stillwater, MN 55082.

□ anyone having an RF probe schematic or miniature 9002 tube for a Precision Apparatus VTVM Model EV-10. Tom Pendarvis, WD0EMP, 215 Wildbrier, Ballwin, MO 63011.

Mini Directory

As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in *QST*.

Advisory Committee Members	Jun 1987, p 51	Major ARRL Operating Events and Conventions—1987	Jan 1987, p 57
ARRL International EME Competition	Sep 1987, p 85	Novice Enhancement Report and Order	Apr 1987, p 64
Club Contest Rules	Jan 1987, p 81	Packet-Radio Frequency Recommendations	Sep 1987, p 54
Constitution Bicentennial WAS	Sep 1987, p 14	QSL Bureaus Incoming	This issue, p 56
DX Contest Awards Program	Feb 1987, p 82	Outgoing	Sep 1987, p 63
Element 2 Question Pool, New and Revised Questions, Answers	Apr 1987, p 23	Reciprocal-Operating Agreements	Jul 1987, p 51
Frequency/Mode Allocations	Apr 1987, p 70	Tech and General Written Exams	Apr 1987, p 29
Golden Jubilee of DXCC Award	Sep 1986, p 60	Third-Party-Traffic Agreements	Jul 1987, p 51
Hamfest Calendar Rules	Sep 1986, p 84	VUCC Annual Listing	This issue, p 68
Landline BBSs	Oct 1987, p 56	What is Amateur Radio?	This issue, p 75
License-Renewal Information	Apr 1987, p 70	220-MHz Band NPRM	Apr 1987, p 16

How's DX?

Conducted By Ellen White, W1YL/4
19620 SW 234 St, Homestead, FL 33031



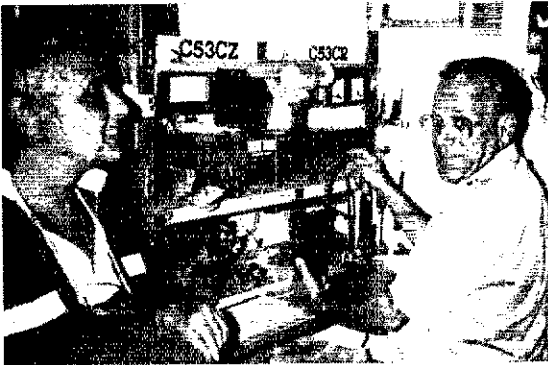
P29FG of Papua, New Guinea. Cards via WA0GUD.



A35MS, who lives in Nuku'alofa on Tongatapu Island. (Thanks DK7PE)



(L-r): HL9XX, TA2B, HL2IOO.



Banjul/The Gambia: (l-r) C53CZ with OM C53CR. (Thanks DK7PE)



A world of year-end holiday greetings to all DXers at the close of this grand celebration of DXCC's 50th Anniversary!—W1YL/4



VE7IR (rear), "Big John," visited TA2G in Ankara recently, reporting a healthy growth of ham radio in Turkey with a lot of interest in homebrewing.



Honor Roll members I1RB (l) and son I1RBJ (r) with what must be the third generation of family hams. I1RBJJ? (See Circuit)



Well-known DX scribe W8ZCQ (Columbus ARA Carascope) actually caught smiling at Dayton! (W1YL photo)



(L-r) 5T5SL (DF1VD) with 5T5XX (DL1VJ).



(L-R) HK3MRQ with dad, HK3RQ. (W1YL photo)

THE CIRCUIT

□ **VK9Y:** At just about the time domestic readers receive this December issue, F6GVD and G3AAG will be QRV from Cocos-Keeling for two weeks. Cards for VK9YH (F6GVD) and VK9YV (G3AAG) via manager VK9YC or direct to F6GVD.

□ **YJ0AA:** K5BDX and YL YJ0AYL will be operating CQWW CW and on through Dec 3. Cards via K5BDX.

□ **J6DX:** Southwest Ohio DXers are again going *en masse* to St Lucia for multi-multi during CQWW, and through Dec 6. Cards for the operation via W8UMD, Treaty City ARA, Box 91, Greenville, OH 45331.

□ **W8DMD:** Top of the Honor Roller W8DMD passed on late summer, sadly notes N8EKS.

□ **BY4WNG:** A special welcome to the new club station of the Institute of Technology in Nanjing. English-writing chief operator radio engineering student Meng Chao will answer QSLs and make schedules. Favorite frequencies 1100-1400Z: CW 3520 7001 14020 21030 28520; SSB 7088 14200 21200 28550. Amateur Radio Station BY4WNG, Nanjing Institute of Technology, PO Box 1827, Nanjing, China.

□ **4X4:** The Easter '87 in the Holy Land certificate goes to hams who worked at least 4 of the following: 4X2J, 4X3N, 4X7T, 4X8S and 4X9B. Six IRCs or \$5 with cards, go to Holon Bat-Yam Radio Club, c/o Israel ARC, Box 4099, Tel-Aviv 61040, Israel. (NICIX notes that the award is a beauty.)

□ **Cycle 22:** W6HB notes that the beautiful 22-cent US stamp with flag and rockets obviously celebrates the arrival of Cycle 22!


□ **I1RBJ:** The day after he became one of the first to qualify for the Golden Jubilee DXCC

Award, Paul I1RBJ celebrated the arrival of a new son. Paul and his dad, I1RB, are both Honor Rollers (see photo).

□ **VO2AC:** Chris has a new manager: Bay Baybeck, KA8SOF, 512 W 8th St, Traverse City, MI 49684.

□ **Cheju Island:** This past summer, members of the Seoul International Amateur Radio Association (HL9XX TA2B HL2IOO) traveled to this subtropical Korean island and were warmly welcomed by members of the Cheju club station, HL0HAK (see photo).

□ **7X:** If you had luck working at least six different Algerian stations between July 1 and November 30 you qualify for the 25th Algerian Independence Award. Further details from ARA, 7, Square Port Said, Algeria.

□ **VU2RCK:** American Embassy staffer N4LLF is on the air from New Delhi (till spring and a QSY to Kinshasa, Zaire). Cards via Dick Kwiatkowski, New Delhi, Dept of State, Washington, DC 20520. 

Bureau System is made up of call area bureaus that act as central clearinghouses for QSLs arriving from foreign countries. These "incoming" bureaus are staffed by volunteer workers. The service is free, and ARRL membership is not required.

How It Works

Most countries have "outgoing" QSL bureaus that operate in much the same manner as the ARRL-Membership Overseas QSL Service. Members send cards to their outgoing bureau, where they are packaged and shipped to the appropriate countries.

A majority of the DX QSLs are shipped directly to the individual incoming bureaus, where volunteer workers sort the incoming QSLs by the first letter of the call-sign suffix. One individual may be assigned the responsibility of handling from one to three letters of the alphabet.

For detailed information on the operation of the bureau serving your district, please send an SASE for a prompt reply.

Claiming Your QSLs

1) Send a 5- × 7½-in SASE to the bureau serving your district.

2) Neatly print your call sign in the upper left-hand corner of the envelope.

3) A preferred way to send envelopes is to affix a First Class stamp. If you expect to receive more than 1 oz of cards, please affix postage accordingly.

4) When requesting *any information* from the bureau serving your district, always include an SASE for a prompt reply.

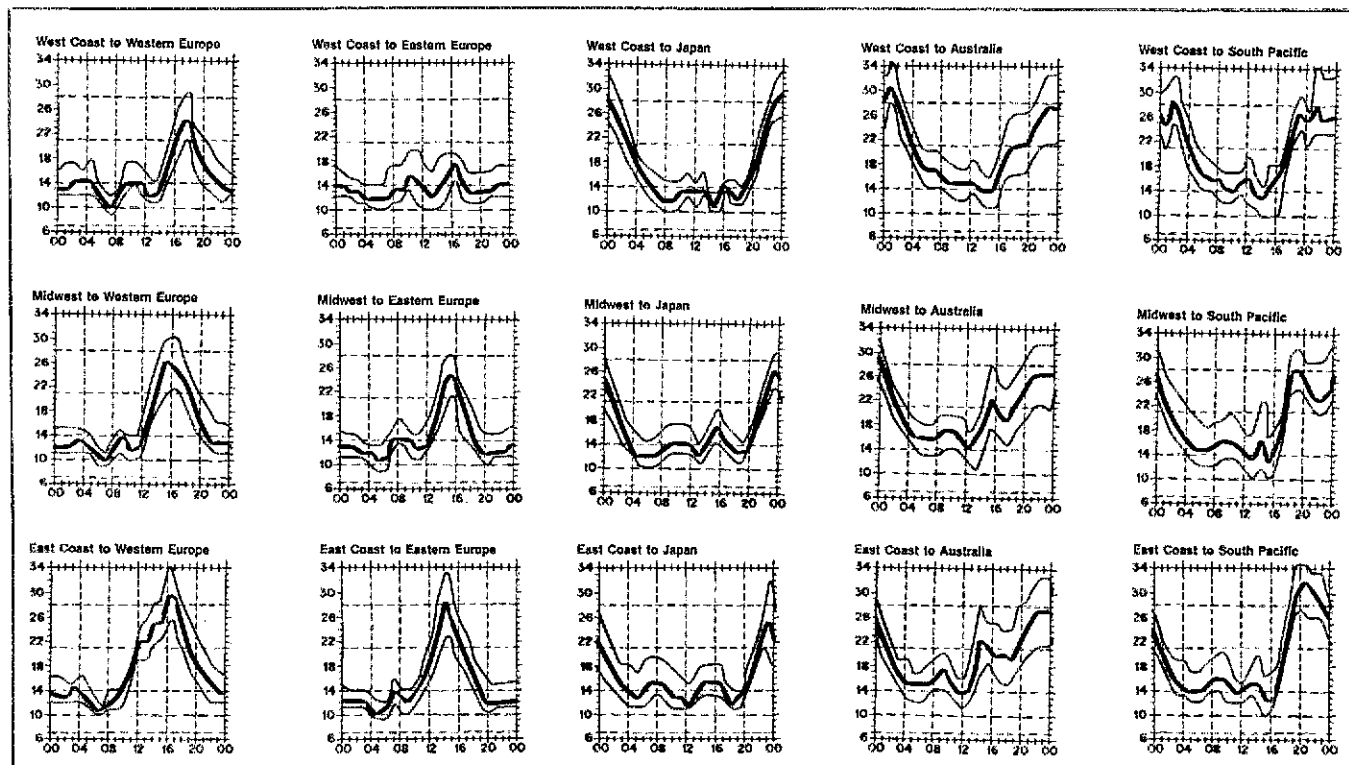
Some incoming bureaus sell envelopes or postage credits in addition to the normal handling of SASEs. They provide the proper envelope and postage upon prepayment of a

QSL Corner

Administered By Joanna Hushin, KA1IFO

The ARRL DX QSL Bureau System (Incoming)

Within the US and Canada, the ARRL DX QSL



When are the bands open? These charts predict this month's average propagation predictions for high-frequency circuits between the US and various overseas points. One chart showing East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as the lowest curve (optimum traffic frequency, or OTF). The horizontal axis shows Coordinated

certain fee. The different stages of presorting and sorting cards take time. It may be six to eight months, or longer, before you receive your cards.

Helpful Hints

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. Remember that the people who work in the area bureaus are volunteers. They are providing you a valuable service. With that thought in mind, please pay close attention to the following DOs and DON'Ts.

DOs

Do keep self-addressed 5- x 7½-in envelopes on file at your bureau, with your call in the upper-left corner, and affix at least one unit of First Class postage.

Do send the bureau enough postage to cover envelopes on file and enough to take care of possible postage-rate increases.

Do respond quickly to any bureau request for envelopes, stamps or money. Unclaimed card backlogs is the bureau's biggest problem.

Do notify the bureau of your new call as you upgrade. Please send envelopes with old call. Please put only one call on an envelope.

Do include an SASE with any information request to the bureau.

Do notify the bureau *in writing* if you *don't* want your cards.

Do be appreciative of the fine efforts of these volunteers.

DON'Ts

Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many cards coming from overseas bureaus are over a year old.

Don't send your outgoing DX cards to this bureau (see "ARRL Membership Overseas QSL Service" in this column in September 1987 QST).

Don't send envelopes to your "portable" bureau. For example, K9CH/1 sends envelopes to the W9 bureau, *not* the W1 bureau.

ARRL DX QSL BUREAU SYSTEM

First Call Area: all calls*—W1 QSL Bureau, Mt Tom Repeater Assn, Box 216, Forest Park Station, Springfield, MA 01108.

Second Call Area: all calls*—NJDXA, PO Box 599, Morris Plains, NJ 07950.

Third Call Area: all calls—C-CARS, PO Box 448, New Kingstown, PA 17072-0448.

Fourth Call Area: single-letter prefixes—Mecklenburg ARS, PO Box DX, Charlotte, NC 28220.

Fourth Call Area: two-letter prefixes—Sterling Park Amateur Radio Club, Call Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls*—ARRL W5 QSL Bureau, PO Box 44246, Oklahoma City, OK 73144.

Sixth Call Area: all calls*—ARRL Sixth (6th) District DX QSL Bureau, PO Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls—Willamette Valley DX Club, Inc, PO Box 555, Portland, OR 97207.

Eighth Call Area: all calls—Columbus Amateur Radio Assn, Radio Room, 280 E Broad St, Columbus, OH 43215.

Ninth Call Area: all calls*—Northern Illinois DX Assn, Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls*—W0 QSL Bureau, Ak-Sar-Ben Radio Club, PO Box 291, Omaha, NE 68101.

Puerto Rico: all calls*—Radio Club de Puerto Rico, PO Box 1061, San Juan, PR 00902.

US Virgin Islands: all calls—Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St Thomas, VI 00801.

Hawaiian Islands: all calls*—John H. Oka, KH6DQ, PO Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls*—Alaska QSL Bureau, 4304 Garfield St, Anchorage, AK 99503.

Guam: AH2, KH2, WH2 and KG6 calls—MARC, Box 445, Agana, GU 96910.

SWL—Mike Witkowski, WDX9JFT, 4206 Nebel St, Stevens Point, WI 54481.

CRRL DX QSL BUREAU SYSTEM

QSL Cards for Canada (VE, VO and VY) may be sent to CRRL Central Incoming QSL Bureau, Box 51, St John, NB E2L 3X1. Or, QSL cards may be sent to the individual CRRL Incoming QSL bureaus.

VE1*—A. McLellan, VE1ASJ Box 51, St John, NB E2L 3X1

VE2—A. G. Daemen, VE2IJ, 2960 Douglas Ave, Montreal, PQ H3R 2E3.

VE3—The Ontario Trilliums, PO Box 157, Downsview, ON M3M 3A3.

VE4*—Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.

VE5—B. J. Madsen, VE5FX, 739 Washington Dr, Weyburn, SK S4H 3C7.

VE6*—N. F. Waltho, VE6VW, General Delivery, 9714-94th St, Morinville, AB T0G 1P0.

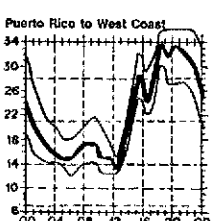
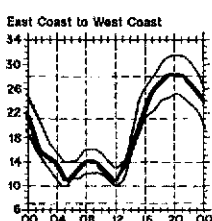
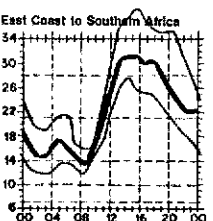
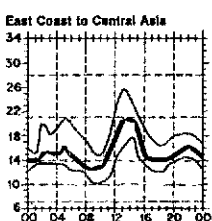
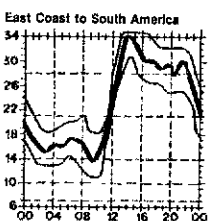
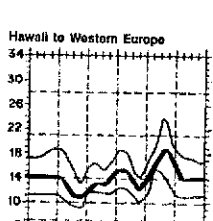
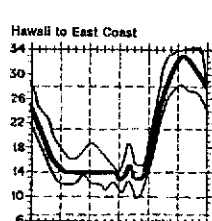
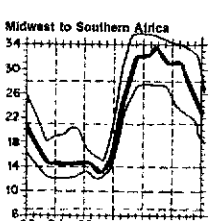
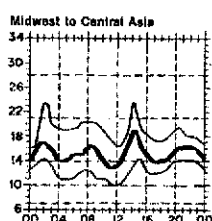
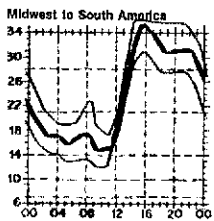
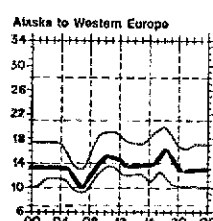
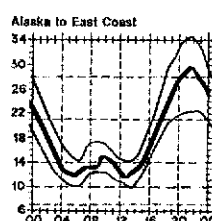
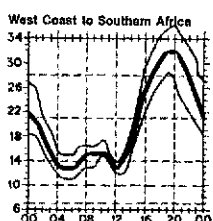
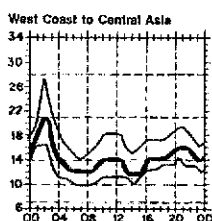
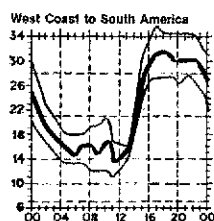
VE7*—Alex Ivsic, VE7CNE, F12 6961 Hall Ave, Burnaby, BC V5E 3A8.

VE8*—Rolf Ziemann, VE8RZ, 2888 Lanky Ct, Yellowknife, NT X1A 2G4.

VO1, VO2—Roland Peddle, VO1BD, PO Box 6, St. John's, NF A1C 5H5.

VY1—QSL Bureau, W. L. Champagne, VY1AU, PO Box 4597, Whitehorse, YT Y1A 2R8.

*These bureaus sell envelopes or postage credits. Send an SASE to the bureau for further information.



Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 QST, pp 63-64, for a more-detailed explanation. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Data provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for December 16, 1987 to January 15, 1988, assume a sunspot number of 60, which corresponds to 2800-MHz solar flux of 112.

Handwritten alphanumeric grid, likely a lottery drawing or a similar numerical table. It consists of multiple columns of numbers and letters, organized in a structured grid format. The grid is approximately 30 columns wide and 100 rows high. Each cell contains a small number or a combination of letters and numbers, such as 'W8LV', 'W6BCQ', 'JA11FP', etc. Some numbers are bolded or larger than others, possibly indicating specific results or categories. The overall appearance is that of a dense, organized list of identifiers.

Waveguide Transitions

Kent Britain, WA5VJB, reports some interesting measurements on 10-GHz waveguide transitions in issue 4/5 of *Feed Point*, the journal of the North Texas Microwave Society. Table 1 shows a number of waveguide sizes that are usable on 10 GHz.

WR90 is the waveguide normally used at 10 GHz and is the waveguide of choice if available. Unfortunately, those of us who get their waveguide surplus at flea markets can't always get WR90. It is clear, however, that all of the waveguide sizes listed in Table 1 can be used on 10 GHz. The trouble comes when mixing different waveguide sizes in a system—although different waveguide sizes may often be found at flea markets, waveguide-to-waveguide transitions are hard to find.

Kent has made a number of measurements of the loss incurred when simply bolting together sections of dissimilar size waveguide. Using an HP626 signal generator at 10.3 GHz, an HP415B power meter and a pair of isolator/circulators, he made the measurements shown in Table 2. The loss is measured after the transition from waveguide A to waveguide B and back to waveguide A, and therefore represents two transitions.

Table 1
Waveguide Sizes Usable at 10 GHz

EIA Designation	Inside Dimensions (inches)	Recommended Freq Range (GHz)	Cutoff Frequency (GHz)
WR112	1.122 × 0.497	7.05-10.00	5.259
WR90	0.900 × 0.400	8.20-12.40	6.557
WR75	0.750 × 0.375	10.00-15.00	7.868
WR62	0.622 × 0.311	12.40-18.00	9.486

Kent comments that while not claiming these are absolute loss measurements, they do indicate that there is relatively little loss incurred when simply bolting together waveguides of slightly different sizes. He also discovered that alignment was not critical.

As a thought of my own (I haven't tried this), I wonder if the loss could be decreased by the use of matching screws on either side of the transition. This would take the form of three screws spaced 1/8 or 1/4 wavelength apart on the centerline of the broad face of the waveguide.

Table 2
Losses in Waveguide Transitions

Waveguide A	Waveguide B	Loss (dB)
WR90	WR75	<0.1
WR90	WR75	0.1
WR90	WR62	0.3
WR75	WR90	0.1
WR75	WR75	<0.1
WR75	WR62	0.3

10-GHz "PENNY" FEED

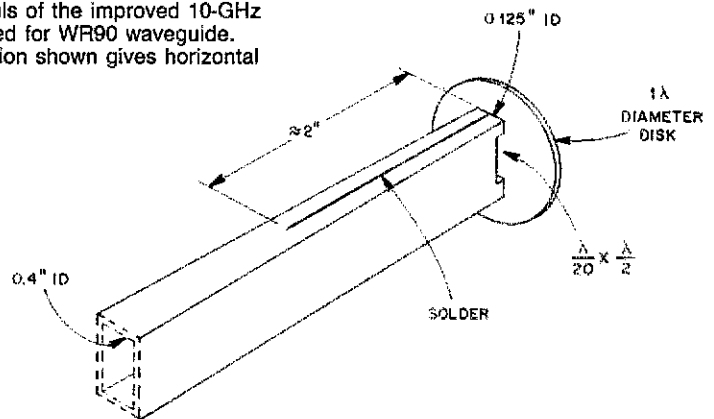
A note by G0BTA in the RSGB Microwave Newsletter (5/87) reports improvement in the "Penny" feed, described in this column in February 1981. The improvement comes from tapering the waveguide over the last two inches before the feed point. The narrow face of the waveguide was tapered from 0.4 inch ID to 0.125 inch ID. This can be accomplished by removing a V-shaped section from the narrow wall of the guide and bending the ends together. The exact improvement was not rigorously measured, but on distant beacon signals a 3 to 5 dB improvement was noted. Side-by-side comparisons with equipment of known performance also indicated increased gain. The modified feed is shown in Fig 1.

10-GHz CUMULATIVE CONTEST

Two reports of activity have been received at the time of writing (9/29). The North Texas Microwave Society seems to have been very active again. On the first day of the first weekend, seven hams participated—and six more 10-GHz stations than licensed hams were available! There was no organized activity on the second day, but WA5VJB drove around Dallas distributing equipment and making a few more contacts. The first SSB QSO occurred that day between N5MP and WA5VJB.

The second weekend saw the use of high power. WA5VJB, running 4 watts to an 18-inch dish on the roof of the Ryan building in Arlington, Texas, ran a CW schedule with WA5ICW, running 2 watts to a 10-foot dish (!) from near his home in Tulsa, Oklahoma. Unfortunately no signals were heard. KA5JPD and KD5HM then operated portable stations and worked WA5VJB over six non-line-of-sight paths.

Fig 1—Details of the improved 10-GHz "Penny" feed for WR90 waveguide.
The orientation shown gives horizontal polarization.



The last day of the contest was devoted almost entirely to SSB. WA5VJB tried again with WA5ICW, but had no luck. KF5N worked WA5VJB, and WA5DBY heard WA5VJB very well over a 65-mile path, but equipment problems prevented a two-way contact. As an example of what can be done with high power on the band, KF5N and WA5DBY (with repaired equipment) copied WA5VJB's signal in Angas at a distance of 45 miles. The signals were good copy on CW with the dish pointing vertically upwards. Signals were also received using a finger stuck in an N-connector as an antenna! Overall, KF5N made seven SSB contacts over 20- to 44-mile paths using 100 microwatts. WA5VJB ended up with a total of 51 QSOs with

19 different stations during the contest.

In California, the San Bernardino Microwave Society reports good activity for the first weekend of the contest. WA6DTA reports a score of 3348 points for the first weekend and 518 miles on his car driving between sites. WB6DNX made many contacts from Heaps Peak to both sides of the San Bernardino mountains. W6OYJ worked from sites at Mt Otay, Mt Soladad and Pt Loma. He reports more contacts in one weekend than in both weekends last year. WA6EXV reports the same situation. He worked 37 stations during the first weekend, and comments that it doesn't require much power to work hundred-mile paths when conditions are right.

Operating Tips from the Field

This month, FM/RPT features operating tips from our readers. Al Cohen, W1FXQ, addresses the situation when a mobile station on the local repeater seeks directions to some location. Whether you are the station providing directions or receiving directions, you will want to read Al's 10 tips for this scenario.

Pete Kemp, KZ1Z, a school-teacher of some note, comments about how we use (or misuse) the mother tongue (and other things) on 2-meter FM. Pete's tongue-in-cheek presentation contains a lot of truth and is food for thought for all.

Some Thoughts On Giving Directions

1. Be brief and keep transmissions short. Give only one or two instructions per transmission.
2. Instruct the station receiving directions to keep his transmissions short, too, unless he is on a long straightaway. Excess verbiage causes missed turns.
3. Be terse, for example, in highway exit instructions: "turn right/left off the ramp."
4. Avoid excessive use of landmarks on straightaways. It only adds confusion.
5. If you hear roundabout directions being given, hang loose, unless it is a gross error.
6. If you feel you must break in to correct a wrong direction, use extreme tact or you will make two enemies.
7. If you can't help, don't respond to give a long apology of why you can't help. Many an exit has been missed because of excessive gassing by an unqualified guesser/gasser.
8. If you are the station receiving directions, try to evaluate the credibility of the station giving directions.
9. In summary, be brief (long winds are for sailing) and leave the frequency open for questions.
10. Put yourself in the shoes or car of the station receiving your directions. Don't make it necessary for him to sort out usable data from excess chaff.—Al Cohen, W1FXQ

Stop, Look, and Listen On 2 Meters

Do you ever stop to think about how you sound to others on the air? Have you ever really thought about the example you are setting? Cited below are just a few examples for your consideration.

"W1*** for ID," "for ID," is, of course, redundant.

"I have destinated." There is no such word (it sounds like you just became a Silent Key).

"...anywho." This cute expression seems to be gaining acceptance. It falls in the same category as "...whatever."

"What's your QTH?" Sounds great on CW; sometimes acceptable on phone, but, in general, Q signals do not belong on voice frequencies. (QSL?)

"Back to you for the final final." I love this one; it ranks right up there with "Paris in the springtime."

Expressions such as "good buddy" and "smokey" should be banned outright.

The failure of operators to allow adequate time between transmissions for others to announce their presence on frequency, either to join in the conversation or make a call, especially during major drive times, is called "alligator" operations, ie, big mouth and small ears.

Long-winded operators who tie up a repeater pair when they are within simplex range of each other are called "repeater hogs" where I come from.

I don't appreciate hams who announce their presence on frequency and when you engage them in conversation, announce immediately that they have arrived at their first stop, "...see you later." Why start a conversation you are not prepared to finish? Did you just want to see if your voice or the repeater was still working?

"...73's." Who ever heard of pluralizing Best Wishes (Best Wishes's?) Kind of like holding a conversation in an echo chamber. Clearly and simply, it's "73." Same goes for "88" and "33."

RST reporting. I heard a guy give an RST report of 5 by 0: perfectly readable, but no signal strength (maybe his S-meter wasn't deflecting?). If he didn't have a signal, how could he hear him?

While on the subject of reports, remember it is the repeater that is doing the bulk of the work. I once heard a station ask the mobile operator where he was located so he could rotate his antenna to bring up the signal. A nice trick if you are not on simplex. Almost wonder if he was the same operator who timed-out 146.52 MHz.

As a wise person once said, "Engage brain before putting mouth in gear."—great Greek philosopher, Anonymous, as translated by Pete Kemp, KZ1Z, Connecticut Section Manager

SERA (CVRA-SERA MINUS CVRA)

The CVRA-SouthEastern Repeater Association, Inc (also known as CVRA-SERA) has dropped "CVRA" from its name and now is simply called "SouthEastern Repeater Association, Inc" or "SERA." CVRA is the abbreviation for "Carolina-Virginia Repeater Association, Inc" and since this organization is now the frequency coordinator for many states throughout the southeastern United States, its board of directors decided to drop the CVRA prefix and use the more appropriate shorter appellation.—Nita Morgan, N4DON, SERA Secretary

AMRAD 1200-MHz REPEATER HITS THE AIR

A new 1200-MHz repeater is on the air in the Washington, DC area. It is WR4S located in Tysons Corner, Virginia with a 1272.0-MHz input and 1292.0-MHz output. The antenna is 625 feet above sea level with a transmitter cranking out 4 watts. The repeater is sponsored by AMRAD (Amateur Radio Research and Development Corporation).

REPEATER LOG

According to August 1987 reports received, repeaters were involved in the following public-service events: 595 vehicle emergencies, 40 medical emergencies, 19 fires, 12 drills/alerts, 8 weather emergencies, 7 criminal activities, 5 public-safety events, 3 search and rescues and 1 power failure.

The following repeaters were involved (followed by the number of events): W2VL 57, NK2W 13, WA2ZWP 1, W4BFB 6, WA4BVW 5, WD5KBZ 4, WA6BJY 12, WD6DIH 33, KA6BEK 59, WF6NO 318, N6ME 129, K6TZ 15, K8DDG 8, KD8GL 7, WA8ULB 7, K9LSB 15, N9RM 1.

VHF/UHF Century Club Awards

(continued from page 68)

23 cm (1296 MHz)			
	25		
1	WB8BKC	55	17 N3CX
2	K8WW	50	18 WB8BKC
3	N8CA	35	19 WB8TG/8
4	WB5LUA	80	20 K0RZ
5	WB1YO	45	21 WA5TKU
6	W1JR	30	22 G3XDY
7	W2VC	30	23 KD8GT
8	W2SZ/1		24 KB8BSW
9	W5HN	30	25 VE3LNX
10	WB0DRL		
11	WA5TKU	30	3.4 GHz
12	W0RAP	50	5
13	VE3BFM		1 W2SZ/1
14	WA8TXT		2 WA5DBY
15	VE3LNX		3 WB5LUA
16	WB2NPE		4 W5UC
17	KD5RO	50	5 KD5RO
18	K3YTL		6 WA5VJB
19	G4PRJ	30	7 WB7UNU
20	WB5AFY	45	8 WA3RFX
21	WA8TKJ		9 K0RZ
22	KE5EP	35	10 W7CNK
23	WA5DBY		11 WB5AFY
24	K0NG		12 K7AUJ
25	WB9SNR		13 WB5LUA/5
26	WB4NXY	30	14 KD8GT
27	NO8Y		
28	W7CNK		5.7 GHz
29	W5RCI		5
30	W5DFU		1 W2SZ/1
31	W5NZS		2 K5PJR
32	N180	45	3 WA5ICW
33	K0SMI		4 WD5AGO
34	G4NBS	35	5 W5UGO
35	K3HZO	30	6 WB7UNU
36	N8DJB	30	7 WA3RFX
37	K2TXB		8 K7AUJ
38	W2DRZ		9 WB5LUA
39	W5ASH		10 K0RZ
40	WA5VJB		
41	KD8GT	30	10 GHz
42	W4GJO		5
43	N5WS	30	1 W2SZ/1
44	KC0QR		2 K2DNR/7
45	K0RZ		3 KC0W/7
46	WD5AGO		4 K2DNR/7
47	N0EKT		5 WA7BBM
48	K0TLM		6 WB7UNU
49	WA1QUB		7 WA3RFX
50	G3XDY	55	8 N6CA
51	WA1JOF		9 WA6EXV
			10 KB7CI/7
			11 WB2ELB
			12 KSZZ
			13 W7UDM
			14 K7AUJ
			15 WA6GYR
			16 Deleted
			17 K6UQH
			18 K0RZ
			19 W6RXQ
			20 N6XQ
			21 WB0HLC/6
			22 WB0YJ
			23 WB2ONA
			24 GHz
			5
			1 W2SZ/1
			2 WA3RFX
			3 WB7UNU

DSP-New Technique Offers Promise for Ultra Weak Signal Reception

Computers are finding their way into ham radio more and more as each year passes. At first, they were merely toys for playing games—keeping us off the air in the process. In recent years, however, they are becoming vital tools in our operating. Some early applications involved sending, and later copying, CW. Contest logging was, and still is, another favorite chore. Now, with packet operation gaining converts daily, computers are becoming necessary pieces of equipment in a great many shacks.

In the weak signal VHF realm, however, computers have yet to realize their potential as a part of the signal transmitting and receiving chain. Their use has pretty much been limited to calculating where to point the antenna to hit the moon or an amateur satellite or, perhaps, determine the best time to get on the air for the next meteor shower. However, recent developments indicate that this picture may be about to change.

The development responsible for this is one that has already seen considerable application in commercial and military fields. I am referring to DSP, or digital signal processing. It is a technique whereby signals are converted from their familiar analog form to the digital realm and then manipulated using logic processes to produce the desired results. An example might be band-pass filtering. We are all familiar with how signals are filtered in a receiver's IF amplifier. They are passed through tuned circuits which attenuate everything outside a specific band of frequencies. The same process can be accomplished in digital logic circuitry under software control. Software is the key word here. The cliché "It's only software" is a familiar one in any field which relies heavily on computers to perform a wide variety of vital tasks, be they such disparate ones as calculating where and when to fire a guided missile or keeping track of airline reservations. The computers that perform these functions may be very similar to one another in design, but the software running them is quite different. Thus, with suitable software, a single computer can perform a wide range of tasks.

The thing that has been limiting the application of DSP to functions interesting to hams has been the speed and processing capability of computers we could afford to buy. Few of us have the several million dollars needed to go down to our local computer store and pick up a Cray. But the speed and performance of machines like IBM® PCs and their clones has reached the point where, with the addition of special plug-in boards, many signal processing tasks can be performed. Such plug-in boards include now-available ultra-fast

processors along with wide-band analog-to-digital (A/D) and digital-to-analog (D/A) converters, and are loaded with suitable software. Again, the key point here is "suitable software." In the analog world, with which we are all familiar, one would never consider using an audio notch filter to generate code for keying a transmitter. The idea is completely foolish. But, like the missile fire control and airline reservation examples cited above, once in the digital domain, "It's only software" applies. Thus one can load software into a computer to perform the task of selecting a specific band of audio frequencies or another program, put into the same machine, which allows it to generate, or even read, Morse code or even act as an ACSSB generator and decoder. This versatility is one of the principal attractions of performing tasks in the digital domain rather than using separate dedicated analog boxes for each.

But, what can DSP do that might be of interest to VHFers? One exciting potential application is picking signals out of noise. We appear to have gone about as far as we can go, with current technology, in terms of weak-signal reception using analog methods. Significantly improving the noise figure of state-of-the-art preamps will not be easy. Possibly, we can build still bigger antennas, but there is a limit here too. A little more power in the transmitter? This is the expensive route and the FCC says that we can have no more than 1500 W output. Besides, all of these options—better preamps, bigger antennas or more transmitter power—are only applicable to one band at a time. Suppose we could add something to our stations that would improve performance on any band we may wish to try. A suitable computer, equipped with a special plug-in board to do the analog-to-digital conversion and high speed manipulation, and the right software, is theoretically capable of digging down into the noise and extracting a very weak signal. The computer can then print out the intelligence impressed on that signal.

Work along these lines was reported by Tom Clark, W3IWI, and Bob McGuire, N4HY, at last July's Central States VHF Conference. They liken the operation of the DSP board to a spectrum analyzer. We all know that, in a spectrum analyzer, a receiver output drives the vertical trace of an oscilloscope, while the receiver's local oscillator is repeatedly swept over a specified range of frequencies. When a signal is encountered, the scope trace is deflected and we end up with a picture of the frequency spectrum over which we are sweeping. In the digital embodiment of this, many narrow detectors (we'll call them pseudo-

detectors), each tuned to a different slice of spectrum, are operating continuously rather than a single one being swept. Since each of these pseudo-detectors is continuously dwelling on its own narrow window of spectrum, it has a greater probability of detecting a signal appearing in its passband than does the sweeping window in an analog spectrum analyzer, which may be somewhere else when the signal pops up. Even though each of the pseudo-detectors is operating continuously, processing of their outputs cannot be continuous, at least with the kind of computers hams stand a chance of acquiring any time soon. The use of parallel processing might change that picture but such computers are very expensive and are just now beginning to become available commercially. They will be well beyond our reach for some years to come.

Since we must be content with serial processing, a mathematical approach known as Fast Fourier Transform, or FFT, offers a method of analyzing the data acquired serially from our array of pseudo-detectors. The use of FFT demands that we have twice as many pseudo-detectors in our array as we would otherwise need to cover the desired spectrum. Even with the power of FFT, serial data sampling requires that a signal must be present for a specific period of time before it can be detected. This restriction limits the baud rate achievable with very weak signals such as those that might be encountered in EME. Rates of one letter every 10 seconds for moon-bounce signals a few dB weaker than those currently copied by human ear are probably attainable with hardware and software available today. Note that I said "a few dB lower than those currently copied by human ear." Being able to copy signals even a few dB lower than currently done means that lower power and smaller antennas can be used for moonbounce. In addition to EME, this technique may be useful in extending regular tropo range from a few hundred miles to perhaps double that.

The use of DSP for copying weak signals does not come without its restrictions. Receivers and transmitters with short-term stability of 50 Hz or better will be needed. However, this is state of the art with current synthesized rigs. Accurate time will be needed by both stations. This is analogous to knowing the correct time in order to properly sequence in current EME operating practice. Since detection time is relatively long, transmitters will have to be capable of running key-down for several minutes at a time.

Remember "It's only software"? While some demonstration work has been ac-

complished, there is still quite a way to go to perfect the use of DSP for weak-signal work and other applications potentially useful to VHFers. W3IWI and N4HY are looking for people who might be interested in helping in this development effort. It principally involves writing more efficient software to operate the high-speed processor on the plug-in board. Those with a bent in this direction, wishing to participate in this fascinating endeavor, may send their intentions and qualifications to me and I will see that they get to Tom and Bob.

The future holds many new and interesting developments to extend our VHF horizons. DSP appears that it may be one of the more significant of these.

ON THE BANDS

6 Meters—The October column speculated that improved ionospheric conditions would begin to be felt quite soon. Little did I realize when I wrote those lines that what appears to be F2-related conditions would be felt on 6 meters as early as this fall. I expected that 10 meters would begin to improve and it certainly has. But I did not count on the widespread afternoon 6-meter openings to South America that have been experienced across the southern tier of states over the past few weeks. These openings appear to have all the earmarks of the kind of F2-related openings frequently observed during the better years of previous solar cycles. Some refer to the propagation as TEP, mainly because it is in the north-south direction. However, TEP, which stands for trans-equatorial propagation, is usually considered an after-sundown phenomenon, with signals propagating across the geomagnetic equator. Those of us who were around for the peak of the last cycle know that there was often a rise in the maximum usable frequency, or MUF, from the US to South America, including the northern parts, during the mid to late afternoon hours, especially in the spring and fall. Since the times involved are well before sundown and the signals do not necessarily cross the geomagnetic equator, it can hardly be considered as classic TEP.

Whatever we want to call the propagation, K5ZMS reported 6-meter openings to South America as early as September 19, with reception in the San Antonio area of HC5K. Ray indicated, at the time, that the propagation appeared to be of F2 origin, rather than some form of E. However, the following day was the biggie with a number of stations in the southern part of the US working HC2FG, OA8ABT and HK1BAU. In addition, many signals from across the southern states were heard on backscatter. In his report, K5ZMS also passed along information of an upcoming trip by HC2FG to the Galapagos Islands, where Gus planned to operate as HC2FG/HC8 and establish a 10-watt beacon on 50.083 under the call HC8SLX. He must have done some effective missionary work among the few hams in the Islands, as several new calls from that usually rare spot were reported heard and worked over the next few weeks. September 25 brought contacts for several San Antonio area stations with HC8CG, one of those new HC8 calls. Signals were reportedly up to S9, permitting N5TX to make the contact with him from his mobile. October 4 brought another flurry of South

American openings with N4EJW in Florida reporting a contact with HC8GR and W5UWB South Texas noting working that station plus HC5K. John's contacts were around 2120Z. W5UWB also reports hearing the new Galapagos beacon from 2100 to 2230Z. October 11 was another big day with reports of South American contacts coming from several areas in the southern US. W5FF called to say that he worked HC8VB at 2036Z with 5-by-9 signals both ways. Other stations reporting getting in on this one were N5JHV Las Cruces, NM and W5NZS Oklahoma City who worked HC8VB and heard HC2FG and OA4ABT. Others reporting many of these openings include N4RJW and WA4BUS, both in Florida. Our thanks to all of those who alerted us to these interesting and encouraging goings-on.

Ours is not the only part of the world working north-south DX on 6 meters. The Japanese are getting a shot at it too. JA1VOK writes that he worked VK4FXX and heard VK4FXZ at 0640Z September 12. Hotsuo also notes hearing the VK8ZED beacon on 52.2 between 1130 and 1340Z September 20. He adds that JA4MBM heard the H44HIR beacon on 50.005 September 11 and 18. That station also worked VK8ZED at 1150Z and VK6UF at 1212Z September 22.

2 Meters and up—It seems odd to report on August's Perseids meteor shower in December, but there just hasn't been space for it in the past few columns. Reports on the shower were generally favorable. W2RS northern New Jersey says that he worked 10 stations on the 12th and 13th: N1BUG, for his first Maine, KC8P Michigan EN63, KA9CFD Illinois EN40, NY4T Tennessee EM55, WD9ACA Wisconsin EN53, NN9K Illinois EN41, W4ZD Florida EL97, W2GU/4 Tennessee EM75, W4FF Florida EL98 and WB4MJE Florida EL94. Ray also reports that he has worked another EME station with his non-EME set-up consisting of a 160-W solid-state amplifier and single Yagi. The latest contact was with N5BLZ, who is running 12 KLMs.

Another Perseids report comes from WD4DGF Nashville, TN. Steve used the shower to up his 1 1/4-meter total by working W5AFY Texas and AF1T New Hampshire



(At right) Leroy May, W5HN (ex-W5AJG) just after receiving the John Chambers (W6NLZ) Award from John Fox, W0LER, at the July 1987 Central States VHF Society Conference held in Arlington, Texas. The award was for W5HN's many contributions to VHF and UHF over more than 50 years. (photo by W4HHK)

for state number 33 on the band.


WD9ACA says that he has recently completed working all of the 50 states and WAC on 2 meters. So he should be in the WAS list when it appears next month, if the QSLs arrive in time. Ken's accomplishment is unique in that he did it in 220 days using only four Yagis. He pleads for more EME news in the column. I'm agreeable to that, if EMERs will submit reports.

EME ANNALS

Thanks to the 2 Meter EME Bulletin put out by KB7Q, the EME Annals will continue to appear in this column. You may remember that I stated in last May's column that I had not received enough inputs from EMERs to justify publishing the box. In an effort to generate the kind of response I need to maintain the EME Annals, Gene enclosed with one of his newsletters a post card addressed to this column's address. He asked his subscribers to fill out the card with the necessary information—number of stations worked, number of US states worked and number of DXCC countries worked on EME—and mail it. The response has been tremendous. Even a number of 70-cm EMERs have returned the cards. Many foreign stations even returned the cards, most of these in envelopes. I will publish the EME Annals next May with whatever information I have by deadline. If you submitted information on one of KB7Q's cards and your record has changed significantly since you sent the card in, you might want to update it with the needed information. If you haven't submitted a report and wish to have your accomplishments listed, please provide the necessary information to me by March 5.

Thanks again to Gene Shea, KB7Q, for providing the means to show that many people do want to keep the EME Annals in The World Above 50 MHz.

CENTRAL STATES PROCEEDINGS AVAILABLE

The papers presented at the Central States VHF Conference held in Dallas last July were published, for the Society, by the ARRL. There are still some copies of these Proceedings available for anyone who was not able to attend the Conference. Topics include 2- to 6-GHz Power-Amplifiers by Don Hillard, W0PW; Isolated Element Length Disturbances and Possible Correction Factors for Yagi VHF/UHF Antennas by Edward Pearson, KF4JU; The Thanksgiving Tropo Opening of 1986 by Jon Jones, N00Y; How to Get Started in VHF by San Hutson, K5YY; A No-Tuning Crystal Controlled Microwave Local Oscillator by Richard Campbell, KK7B; Inexpensive Microwave Frequency and Power Measurements by Joe Hudgins, K5BYS; Meteor Scatter Propagation by Michael Owen, W9IP; Radio Amateur Satellite Operation by Keith Pugh, W5IU; Use of Small TVRO Dishes for EME by Barry Malowanchuk, VE4MA; Building Equipment for 3456 and 5760 MHz by Bill McCaa, K0RZ; Microwave DXing by Emil Pocock, W3EP; GaAsFET Mixers for 5.7 GHz by Les (Lucky) Whitaker, W7CNK; A Solid State Power Amplifier for 5.7 GHz by Dick Fogle, WA5TNY; A 3456 IMFET Amplifier by Al Ward, WB5LUA and Dick Fogle, WA5TNY; and many other papers of interest to VHFers. To obtain a copy, send \$10 (plus \$2.50 for postage and handling) to ARRL HQ, attn: Publications Sales. 

Lenore Jensen, W6NAZ: Serving Amateur Radio

One of Amateur Radio's most active ambassadors is retired actress, writer and producer Lenore Jensen. She received the Special Achievement award at the 1983 Dayton HamVention® for her prodigious volunteer public relations work on behalf of Amateur Radio, and has recorded many celebrities—including Bob Hope, Dick Van Dyke, Lorne Greene and Bill Bixby—for ARRL public service announcements. Her second husband, Bob, W6VGQ, who recently became a Silent Key, also joined actively in her efforts to promote Amateur Radio.

Lenore writes "Who's Who in Amateur Radio," an interview column in Worldradio, and is working on a book tentatively titled Inside Amateur Radio, which she describes as "a labor of love in return for the wonderful experience of being a ham all these years."

Her interest in Amateur Radio began while she was a contract actress at NBC Radio in Chicago. Most of the studio engineers were hams, and she talked to them during breaks in rehearsals. She was licensed as W9CHD in 1939 and went on 40-meter CW with a Utah kit with one crystal.

When she moved to New York City in 1940, she became W2NAZ and discovered phone operation. She began her long record of volunteer service to Amateur Radio by teaching code at the American Women's Voluntary Services.

After the war, her husband Joe, W2MSC, was transferred to Hollywood, and she became W6NAZ. She became active on all bands and began doing phone patches for GIs.

Over the years, most of her operating time has been devoted to message handling and phone patching, which she calls "a thrilling experience and completely gratifying." During the Vietnam War, she ran 68,000 phone patches for Army MARS.



Through her vast amount of volunteer public relations work and her Worldradio column, "Who's Who in Amateur Radio," Lenore Jensen, W6NAZ, has made a great contribution to Amateur Radio.

Usually, when you ask the questions for one of your "Who's Who" articles, what do you want to discover about the person you are interviewing?

Because I write about amateurs who have been successful in their careers, I am curious to learn if ham radio played any part in their climb up the ladder. It's surprising how often this is true. Also, I like to find out about specific turning points in a person's career.

How did you get into this line of work?

Because I was always interested in public relations for Amateur Radio, I sent in many news stories to Worldradio and gradually started "Who's Who" as I was meeting so many impressive operators. My aim was to point out that our hobby/service has a great number of highly successful members.

Who is the most interesting ham you profiled?

It's a tie between Jay Holladay, W6EJJ, who is First Vice President of ARRL in addition to being a senior engineer at the Jet Propulsion Lab, and Roy Neal, K6DUE, semi-retired from NBC as an outstanding newsman and authority on space exploration. Roy's work for ARRL in helping produce many films and tapes has been a bonanza for all of us.

What would you like to be remembered as

your most important contribution to Amateur Radio?

I guess my efforts in public relations, such as recording and producing public service announcements for the ARRL, extolling the virtues of ham radio by celebrities. I have tried to encourage clubs to become more public-relations conscious. Also, I would hope to be remembered as a courteous operator.

I would hope to be remembered as a courteous operator.

What have you gotten from ham radio?

Oh, 48 years of great happiness! Untold benefits, especially the hundreds of good, long-time friends whom I've enjoyed meeting on the air or via clubs. Most important, two marvelous husbands, the late W6MSC and W6VGQ.

What ham activity has given you the most personal satisfaction?

The years I spent as a phone patcher for Army MARS handling traffic from Vietnam. This

was a rare privilege, of course, to share the personal needs of servicemen and their families.

Tell us about the book you're writing about ham radio, Inside Amateur Radio. Does any story stand out as the funniest? How about the most poignant?

Although there are only a couple of stories about patching, I loved the operator who told me about the tiny child saying hello to her daddy overseas: she would say "under" instead of "over"! And a YL op for Navy MARS remembers trying to convince a Marine's mother that her son was standing by to speak to her, and was not dead as an incorrect message reported in a previous communication. The other stories are about the special QSOs we sometimes experience—rescues, amazing coincidences and the like.

What conclusion have you drawn from writing your book as to why hams are the way they are?

There's no "typical ham," of course, but we all do share certain characteristics. I've found that most are anxious to use their rigs for public service when opportunities arise (and those who don't should stop to reflect why we have our privileges). Also, I like the way hams are capable of "instant friendship" when they meet another licensee.

My hope is that those who have been on the air a long time will welcome newcomers and pass on the traditions—so they won't be lost.

This QST Profile was written by Paula Place, N1DNB, former QST Editorial Assistant.—Ed.

Travels with NM7N and Fred—Part 2

My next stop was with the other Arizona Phyllis, K7SEC. We had seen Phyllis and Howard the previous summer on their way home from the Tacoma Hamfest. Although their Silke Terrier, Heather, weighs about a tenth of what Fred does, his size didn't scare her one bit. She was all over him at first sight. It took poor Fred a while to figure out what this package of energy was. During the evening, about 12 of us gathered for a potluck dinner. It gave me a chance to renew friendships I had made the year before and make some new friends.

Before leaving Arizona, we took time for some camping and hiking in Chiricahua National Monument. I had planned to be there during the East Meets West contest. I parked on the ridge rim of an old caldera and, in spite of poor band conditions, managed to work several YLs.

On our way to visit KØEPE, we visited the Gila Cliff Dwellings National Monument just north of Silver City, New Mexico. After spending the night in Truth or Consequences, New Mexico, we spent much of the next day at the Bosque del Apache National Wildlife Refuge State Park. The next night we camped at the Valley of Forest State Park followed by an evening at Ute Lake State Park. I was having trouble getting the rig to load up properly; I figured that I had a poor ground or a bad piece of coax.

The next day we arrived at Marte's, KØEPE. Fred felt right at home and went to his spot in the shack under the desk. This was true of almost every place we visited.

The next stop was with Harryette, W6QGX/5, in Mountainburg, Arkansas. A friend of hers came over and we played Scrabble. The next day I left early and drove to the home of Darleen, WD5FQX, in Hot Springs, Arkansas. I arrived in time for a luncheon with some of the YLs from Hot Springs and Little Rock. The next day, Darleen, KE5UO and NW5A took me to see the famous Hot Springs. I was grateful to Joe, WD5HIL, who checked over my coax and found the poor solder joint that had been a problem. I had always managed to get it to work, but it was a pain in the neck.

After leaving Darleen's, I set a course for Carol's, WI4K, in Marietta, Georgia and arrived in time for a luncheon with some of the local YLs. Since Carol and I didn't know if Fred would get along with the Shrader's dog, Alexander, poor Fred was relegated to the basement. Upon returning, we found Fred scared and shaking like a leaf. Apparently, he thought he had been abandoned. That evening I went with Carol and her family to hear their son Neal play in a piano recital.

After spending a week with my parents in Holmes Beach, Florida, I drove up the Atlantic coast. My first stop was at the home of Martha, WD4NKP, in Ladson, South Carolina. Unfortunately, Fred was not allowed in Martha's shack because the King's pet bird had free flight throughout the shack. While I QSOed Dot, K4AOH, the bird sat on my head.

The next stop was with Marty, NY4H in Raleigh, North Carolina. I really enjoyed the

flowering trees and gardens. Although they had a cat, we decided to let Fred in the house on a leash. Fred laid down at my feet, and the cat beat a hasty exit up the stairs. Curiosity got the best of the cat, however, and he eventually mustered up enough courage to lie down in front of Fred and tentatively reached out and touched Fred's paw. Fred and newly found friend spent the rest of the time staring at each other.

After leaving Marty's, I spent a few days with a cousin in New Jersey before driving over to the late Rose Ellen's, N2RE, in Pennsville. Karla, WA1UVJ, and Jean, WA2BGE, were staying there also. One evening we went to visit Giselle, K3WAJ, and saw her Amateur Radio store. From there, we went to the AWARE club meeting, where I showed my African trip slides. The next day, we went to the SAYLARC meeting, where I again showed the slides. After the lunch, we went to N2AKC's, which was located on a small lake, a marvelous spot for sitting and relaxing.



NM7N and Fred share their travel adventures with friends.

The next day, Karla and I took off for her QTH in Nashua, New Hampshire. We had a scary moment on the Tappan Zee Bridge in New York when the motor sputtered and almost died. The engine seemed to straighten out and I kept my fingers crossed. I could only spend one night with Karla, but did get a chance to see her OM, Jerry. From there, it was on to my aunt and uncle's place in Springfield, Massachusetts.

Upon leaving Springfield, I headed north to visit with Joan, KG1F, in Vermont. It was a great spot to walk Fred off-leash so he could run with the Gibsons' golden retriever, Sara. That afternoon, we went to Stowe and the home of Maria Von Trapp of *Sound of Music* fame. One of the big thrills there was the first Eastern bluebird I had seen since living with my grandparents in Massachusetts.

After loading up with Vermont cheddar cheese and maple syrup, I headed for Lia's,

WA2NFY, in Rochester, New York. I didn't have the foggiest idea where she lived, but did know which repeater to use. A local OM gave me directions to Lia's doorstep. Knowing ahead of time where to turn, etc, is a big help when driving an RV. Lia and I had a marvelous visit. Her stained glass work was beautiful. We had lots to talk about since we both enjoy bird watching.

From Rochester, I headed for the Dayton HamVention®. I had planned to visit Doris, WD8IKC, but she was going to the HamVention, so we agreed to meet in Dayton. Doris was going to be staying at the KOA Campground, but I heard it was filled, so I headed for the overflow RV parking area at a local junior college. I caught the shuttle bus for the convention center and got registered. I had no sooner accomplished that when I heard an announcement that the last shuttle bus was leaving. I dashed out the door, all the time wondering if I would ever find Doris among the 30,000-plus people at the HamVention. At this point, I still didn't realize that there was more than one shuttle bus route. As I climbed onto the "last bus," who should be sitting next to the door but Doris! A while after I got back, Doris returned to inform me that they had arranged with KOA for me to share their site. So Fred and I ended up at KOA after all. On Saturday night, the Buckeye Belles had a potluck supper at the campground. Many of the YLs wanted to see my Kenya slides, but no one had a screen. Fortunately, the RV parked next to us had a big, white side, so we used that for a screen.

After leaving Dayton, I headed for my final stopover in Hibbing, Minnesota at Harriet's, WBØZQZ. She is an avid bird watcher so we had lots to talk about. In the evening, we drove over to Gwen's, WDØAKS, in Chisholm, Minnesota and I showed my slides to a group of YLs and Gwen's OM, John, WDØAKT.

I was hoping to be able to say that the drive home was uneventful, but car trouble managed to delay me in Idaho. With much coaxing, I managed to limp into Coeur d' Alene, Idaho and stopped at the first service station I spotted. The mechanic knew exactly what was wrong—a clogged fuel filter. He was able to get the RV up and going quickly. This really makes one appreciate all the nice people in this world.

My final day on the road was uneventful. Going over the Cascades, Fred began to think he was getting back to familiar territory. Naturally, I received a great big welcome from the OM, including a "Welcome Home" banner erected over the gate. I also knew I was home, as it was almost time to fix dinner for him! I think the Stouffers stock must have taken a plunge on my return.

I think the thing that impresses me most about Amateur Radio is that people you meet regularly on the air soon become good friends even though you have never met face to face. As I plan this year's trip, I look forward to seeing old friends again and to meeting new ones. No longer is the trip across country a long and tedious drive. With radio friends to see along the way every day is special. ☐



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Vice President and Secretary: Harry MacLean, VE3GRO
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The End... and a New Beginning

World War I was over and Canadian amateurs were finally getting back on the air. In those days, Amateur Radio activity meant message handling and Canadian amateurs were not only few, but dispersed across the breadth of the country. Short waves had not yet been discovered and the way you covered distance was by relaying. A successful relaying organization was already in existence south

of the border. Why not share in it? In 1920, at the request of Canadian amateurs, Canadian amateurs joined ARRL.

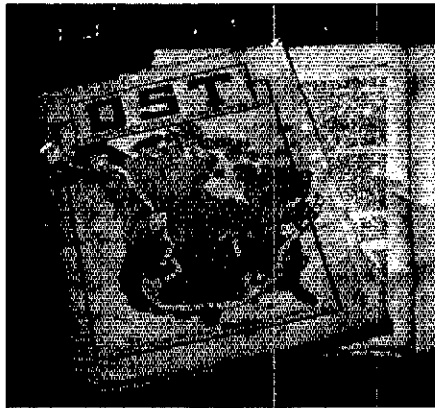
Between World Wars I and II, Canadian participation in ARRL was very different from what it would become later. Canadian affairs were the concern of a Canadian General Manager, who was also a Director on the ARRL Board. Canada was divided into five "divisions" similar to our present-day Sections: Maritimes (which also included Newfoundland, then a crown colony and not yet part of Canada), Quebec, Ontario, Winnipeg (later Prairies, consisting of Manitoba and Saskatchewan), and Vancouver (later Vanalta, consisting of Alberta and British Columbia).

The Canadian General Manager conducted Canadian Division Manager elections, represented Canadian amateurs to their licensing authority and later, when IARU was formed, represented Canadian amateurs abroad.

After World War II, ARRL was reorganized. Perhaps because of the war, Canadians and Americans felt very close, and in ARRL, Canada became a division "like the others." Well, almost. The Canadian Division Director carried on with many of the duties of the Canadian General Manager. He was the main representative of Amateur Radio to the Department of Transport, and later, the Department of Communications, and he was the representative of Canadian amateurs in IARU. ARRL budgets provided funds for the Canadian representation, just as they did for representation of amateurs in the

United States. However, Section activities in Canada were now totally integrated with Section activities in the United States and coordinated through ARRL Headquarters in Newington, Connecticut.

By 1970, Canadian Amateur Radio had grown to the point where it was becoming impossible for the Canadian Division Director to do justice to all the work that needed to be done. Many Canadian amateurs felt a need for an autonomous Canadian Amateur Radio organization, not a totally new organization but one that would carry on in the tradition of ARRL. Thus, in 1979, the Canadian Division of ARRL was incorporated in Canada as CRRL.



The cover of 1920 April QST shows "hands across the border," a symbol of friendship between amateurs of Canada and amateurs of the United States. (VE3GRO photo)



Alex Reid, VE2BE, was ARRL Canadian General Manager, and later, ARRL Canadian Division Director, from 1930 until 1960. CRRL still holds his call, and someday hopes to use it for a CRRL Headquarters station.

222 Westmont Drive,
Toronto, Ont. 1, 1925

From: Canadian General Manager,
To: Members of Ontario and Winnipeg Divisions,
Subject: Division Manager Elections,

Dear Fellows:

The nominations for the office of Division Manager have been completed. The Quebec Division re-elected Mr. J. V. Angley, by acclamation.

The Ontario and Winnipeg Divisions have nominated several men as per the names at the bottom of this letter. Please mark your choice with an 'X' and return the ballot to me at 6 Mail Bldg., Toronto. The sooner these come to me, the sooner we will get our Canadian affairs straightened. Votes received after February 20, will not be counted.

Yours sincerely,
A.H.K. Russel
Canadian General Manager

A.R.R.L. Members in the ONTARIO Division are to vote for one of the following:

Donnelly, Orton, 3EE	_____
Johnson, R.M., 4DE	_____
Harrison P., 3LP	_____
Stann W. J., 9SD	_____
Gutten W. K., ANI	_____

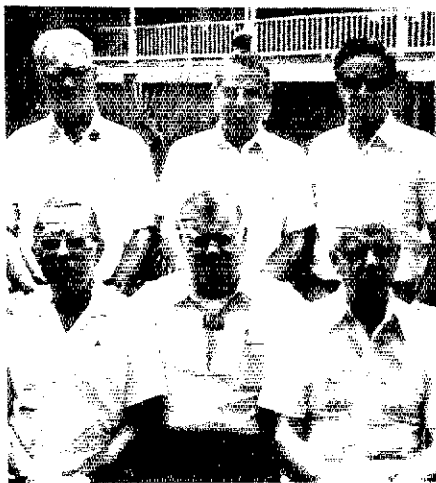
(Sign your name and call) Name _____ Call _____

A.R.R.L. Members in the WINNIPEG Division are to vote for one of the following:

Hickett J. E., 4HH	_____
Jones H. G., 4CR	_____
Jones P. R., 4HH	_____
Pottle H., 4AC	_____
Katlam F. E., 4DE	_____

(Sign your name and call) Name _____ Call _____

"The sooner these come to me, the sooner we can get our Canadian affairs straightened," Canadian General Manager A. H. K. Russel wrote on a 1925 election ballot sent to Canadian ARRL members in the Ontario and Winnipeg Divisions.



The "Fathers of Confederation," ARRL-style: (top, l-r) VE3AR, VE1SH, VE2VW, (bottom, l-r) W0BWW, W2HD and VE3CJ at the 1979 meeting that created a CRRL Board to govern Canadian League affairs. (VE1SH photo)

The rest, as they say, is history. Since incorporation, CRRL has steadily moved towards autonomy. CRRL now has a seven-man elected Board. It has its own headquarters office in London, Ontario. It sponsors and services its Section organization. It

publishes its own training materials. It represents Canadian amateurs to DOC. It is the Canadian member-organization of IARU, and the only Canadian Amateur Radio organization recognized by Amateur Radio organizations abroad.

On 1988 January 01, the Canadian Division of ARRL will disappear, leaving in its place a strong and well-supported CRRL. What changes will you, as a CRRL member, notice? Really, very few. Almost all the changes that were needed to bring CRRL to this point have been made, over the past seven years. In January, you'll still receive *QST*. This column will continue, though you should know that your CRRL Board is exploring alternatives to bring you better coverage of happenings in the Canadian Amateur Radio scene in the future. And you'll continue to enjoy a form of ARRL membership, Associate Membership, the same type of ARRL membership enjoyed by amateurs overseas. So if you're about to qualify for an ARRL 50-year plaque, that won't be in jeopardy.

The most important thing that won't change is a way of doing things. It's difficult to pin down, but there is a League way of doing things, a League way of treating fellow amateurs, a League set of standards. CRRL plans to carry these into the years ahead as it continues to work for Canadian amateurs and Canadian Amateur Radio.

Thank you, ARRL. You are the standard-bearer of Amateur Radio, not just in North



ARRL President Larry Price, W4RA (left), presents CRRL President Tom Atkins, VE3CDM, with a framed copy of a resolution, passed by the ARRL Board at its 1987 July 10 meeting in Atlanta, Georgia, pledging continuing co-operation with CRRL and wishing CRRL the best in the future. (VE3AND photo)

America but around the world. We are proud to have shared in your organization for the past 67 years. We hope you have benefited from our participation. Certainly we have benefited from being part of ARRL. Wish us well for the future.—Harry MacLean, VE3GRO, Vice President, CRRL

CRRL NOTES

□ Congratulations to Jean-Serge Labelle, VE2ED, of Laval, Quebec, who was recently named 1987 CRRL Amateur of the Year. Jean-Serge was recognized for his many years of work translating CRRL, ARRL and IARU bulletins into French and making them available on the air.

□ ARRL's latest video production, *The New World of Amateur Radio*, is ideal for introducing Amateur Radio to your licensing class or for use in the program portion of your next radio club meeting. Borrow it from CRRL Headquarters in London, Ontario, or from your nearest CRRL Director, VE1SH, VE2ZZ, VE3CDM, VE3FN, VE3GRO, VE6ABC or VE7EWI.

□ CRRL President Tom Atkins, VE3CDM, represented Amateur Radio at *Emergency Communications*, a four-day symposium held in Arnprior, Ontario, and sponsored by Emergency Preparedness Canada and DOC. The symposium focused on "defining emergency communications requirements to support various phases of emergency management in an all-hazards context."

□ CRRL has moved into a new and larger headquarters office located in Arva, Ontario, on Ontario Highway 4, two miles north of London. The address for CRRL remains the same: Box 7009, Station E, London, ON N5Y 4J9, and we'd still like you to think of CRRL as being "in London." There is a new telephone number: 519-660-1200.

DOC NOTES

□ DOC has released a new background paper, "Utilization of the Radio-Frequency Spectrum in the Range 30.01-890 MHz," for public comment. The paper is available from DOC Ottawa and DOC regional offices across the country. CRRL is concerned that the paper judges

Amateur Radio activity in the 50, 144, 220 and 430-MHz bands on the basis of the number of FM repeaters in those bands. This makes certain bands appear to be underused and could become a basis for concluding that amateurs neither use nor need these bands. CRRL is preparing an appropriate response.

□ DOC has dismissed a number of requests from manufacturers and importers to amend the Radio Regulations to permit the use of low-power wireless video transmitting devices designed to operate in the VHF-UHF television bands. After testing the devices, DOC concluded that there was a potential for interference with the reception of television broadcasts, and for mutual interference among the devices themselves.


□ The latest issue of BP-23 (Broadcast Procedures 23) allows cable television companies to radiate signals twice as strong as permitted by the previous issue of the same document. CRRL believes that the new standards, implemented without the usual opportunity for comment from those affected, will have a detrimental effect on amateur operation, particularly in the 2-metre band. CRRL has sent a strong letter of protest to DOC.

NOTES FROM ALL OVER

□ There has been very little progress in the appeal in the Jack Ravenscroft case. Jack, VE3SR, is the Ottawa-area amateur who was convicted of "interfering" with a furnace control and an electronic organ in a neighbour's home. There was a hearing in the Ontario Court of Appeals on October 26. However, this hearing only dealt with the acceptability of certain evidence in the plaintiff's *factum*. A large number of criminal cases were scheduled to be heard this fall, and criminal cases have priority over civil cases. As a result, the appeal in Jack's case will now not likely be heard until January or February of next year.

□ Amateurs everywhere will be saddened to learn of the death of Takafumi Arai, in a cycling accident outside of Portage la Prairie, Manitoba. Arai had successfully completed a 70-day voyage in June, taking his 7.3-metre sailboat from Japan to the South Pacific and then on to Victoria. He had hoped to cycle right across Canada, meeting many radio amateurs along the way.

□ At press time, six Canadian skiers, four of whom will be chosen to take part in the USSR-Canada Transpolar Skitrek expedition next February and March, had just returned from several weeks of rigorous training in the Tien Shen Mountains of Soviet Central Asia. They, along with their Soviet colleagues, planned to resume training in November, this time in the Canadian Eastern Arctic. During that training, they planned to carry out communications tests between themselves and an Amateur Radio station established for the purpose. CRRL people coordinating communications would then be able to determine the final location of the Canadian base station for the actual Skitrek expedition.

□ Can you help? Will Prentice, W3VBM, needs a set of Ontario and Northwest Territories Amateur Radio licence plates to complete a collection. If you have an old set you're about to discard, please contact Will at 2419 Chetwood Circle, Timonium, MD 21093. 

Strays



I would like to get in touch with...

□ anyone who served aboard the aircraft carrier *USS Midway* CVA-41 between 1969-1973. Lynn Winkelman, KK4DT, PO Box 12000, Gastonia, NC 28053.

Twenty-Five Eastern Massachusetts Clubs Display Amateur Radio

Almost 12,000 people saw and experienced the wide range of Amateur Radio activities during the last weekend in September at the Boston Museum of Science. The Council of Eastern Massachusetts Amateur Radio Clubs (CEMARC) sponsored the second annual Amateur Radio exhibits—one of many science and technology exhibits at the museum.

The museum staff allocated CEMARC 7500 square feet of space that was divided into nine exhibits: (1) HF, DX, (2) Novice, (3) Packet, (4) Satellite, (5) Television, (6) Message Center, (7) SWL Receiving, (8) Morse Code Training and (9) General Information. Eleven antennas were mounted on the museum roof to facilitate demonstrations of the diverse range of equipment and operating modes.

"The hams put together a class act," said Larry Bell, head of the museum exhibit department. Other museum staff commented: "The exhibit was well staffed; the personnel were warm, welcoming and knowledgeable. The vests and badges were a good idea." "The hams didn't over-explain things. They were helpful, not pushy, and introduced the visitor to the hands-on portions of the exhibits." "The

strength was in the people."

ARRL staffer Libby Karpiej, KA1DTU, reported that many young people were attracted to the SWL Receiving exhibit. Some of their comments included: "Is that really Moscow...in Russia?" "You mean they speak English there?"

Another very popular attraction was the Morse code training table headed by Ed Lajoie, K1CB. "Some of the kids learned a few letters, left for awhile, then came back to learn some more," he commented.

But not all the attention was focused on what foreign country could be heard. Jim Morris, K1UGM, head of the Satellite and Packet exhibit areas, reported: "The simple way we introduced our visitors to packet worked very well. We let them connect

from one museum station to another. This made for faster connects rather than going out through the digi and outside antenna. This method occasionally led to some interesting conversations: One young man at a keyboard on one side of the exhibit table was talking through packet to a lovely young lady on the other side of the same table. He complimented her on her nice outfit. The young lady, who thought her conversation partner was in some distant town, was very much impressed and somewhat taken aback: She thought the young man could see her on his computer! She wasn't disappointed, though, when she was finally introduced to the young man from across the table. They strolled away saying how nice Amateur Radio was for meeting people."

According to Bob Salow, WA1IDA, Coordinator of the Amateur Radio exhibits at the Boston Museum of Science, "CEMARC is working hard to make this an annual event. The museum likes the setup and has expressed interest in a permanent exhibit. It would be necessary to figure out what to do with the exhibit when

(continued on page 82)



Ed Lajoie, K1CB, shows that learning the Morse code is an enjoyable activity.



Sending a message via ham radio brings a smile.



Laurie Cote, KC1BN, demonstrates his bicycle from which he powers his 2-meter rig.



The nice weather diminished attendance a bit, but there was plenty of room to maneuver and lots to see.

New Russian Satellite Sparks Interest Surge: Part 2

Last month, we looked at the two new Russian Amateur Radio transponders, RS-10 and RS-11.¹ This month, we'll look at the telemetry suite of RS-10 and RS-11 to see what it can tell us.

Telemetry means measurement from a distance. In the present context, telemetry indicates the situation in and around a satellite. Through careful monitoring of the telemetry, one obtains an interesting and informative appreciation of the goings-on within the spacecraft. There's a lot of enjoyment and education that can be derived from simply monitoring them on their easily heard beacon frequencies.^{2,3}

The telemetry is sent in CW at 20 WPM. The information conveyed represents various status points and measurements. There are 16 status points and 16 measurements sent in a repeating cycle. The beginning and end of each cycle is indicated by the identifier "RS10" or "RS11." A complete cycle comprises the RS identifier, 16 "words" of telemetry, and the RS identifier. A complete cycle is called a *telemetry frame*.

Each of the 16 words is comprised of two parts: an *alpha* part and a *numeric* part. Both parts are two characters long. For example, take the telemetry word "IG45." "IG" is the alpha part, and "45" is the numeric part. From Table 1, we see that "IG" indicates channel 4 information is being sent.⁴ The alpha portion of channel 4 codes the status of the 15-meter uplink receiver.

The first character in the alpha portion codes the state of the binary variable being sent (refer to Table 3, next page). The "I" in the "IG45" example indicates the 15-meter receiver is off. Had the first character been an "N," we would have known the 15-meter receiver was on.

The numeric part of each telemetry word gives a value for a parameter of interest. For example, the temperature of the 10-meter transmitter is coded in channel 9. The value of the numeric portion of the telemetry word can vary from 00 to 99. To convert the numeric value to meaningful units of current, voltage or temperature, process the numeric portion of each word through the equation for that word. The equations are given in Table 3.

Here's a complete analysis of our example, "IG45." The "IG" indicates the status of channel 4: 15-meter receiver on/off. The "I" means it's off. Taking the "45" portion of our example and dropping it into the equation for channel 4, we get AGC voltage, $V = n/5 = 45/5 = 9$ V.

When a command station is accessing the system, the telemetry format is modified slightly. The modification takes the form of an extra dot or dash attached as the first Morse element of the first alpha character of each word sent (see Table 2).

Logging trends in telemetry is one of the most fascinating and edifying aspects of OSCAR work. It especially prepares young minds for the discipline, organization and record keeping essential to engineers and

Table 1
Summary Telemetry Matrix

General telemetry word form is: XY## where X is I, N, A or M (or may be modified as shown in Table 2); Y is a channel designator and can be S, R, D, G, U, W, K or O. ## is a two-digit number. Details are given in Table 3.

X	Y	Meaning of XY	Parameter "##" Indicates	
1	I/N	S	Telemetry sampling period	Power supply voltage over sample period
2	I/N	R	RX attenuation	2-m TX output power
3	I/N	D	RX attenuation	10-m TX output power
4	I/N	G	15-m RX status	15-m RX AGC voltage
5	I/N	U	2-m RX status	2-m RX AGC voltage
6	I/N	W	Command station channel	Command station AGC voltage
7	I/N	K	10-m service command	10-m beacon power output
8	I/N	O	2-m service command	2-m beacon power output
9	A/M	S	Status of 1st memory board	10-m TX temperature
10	A/M	R	Status of 2nd memory board	2-m TX temperature
11	A/M	D	Memory loading channel	20-V power supply temperature
12	A/M	G	Code Store memory status	9-V power supply temperature
13	A/M	U	Memory dump via channel	Control of backup 9-V power supply
14	A/M	W	15-m Robot RX atten.	IF voltage of 15-m Robot RX
15	A/M	K	2-m Robot RX atten.	IF voltage of 2-m Robot RX
16	A/M	O	Robot QSO counter where 00-32 QSOs logged is indicated as 00 and 33-128 QSOs is indicated by values in the range of 80-99.	Command channel 2-m power output

Table 2
Format Modification During Command Station Access

Channel Number	X with No Command Station Access	X with Command Access Via 15 Meters (Add leading dot)	X with Command Access Via 2 Meters (Add leading dash)
1-7	I or N	S or R	D or G
8-16	A or M	U or W	K or O

Explanation: The X character in the general telemetry word XY## normally indicates just a binary state, such as on or off. By substituting a different character set, the X character can indicate more. The first character is changed to indicate a command station is accessing the satellite through command channel. When X = I, N, A or M, the command station is *not* accessing the satellite. When X = S, R, U or W, the command station is accessing via the 15-m uplink. When X = D, G, K or O, the command station is accessing via the 2-m uplink. Thus, there are three character sets for use in the first, or X, slot. The first has two code elements; the other adds a leading dot or dash to make the new character sets, which use *three* code elements for each character.

scientists. Next month, I'll detail how you can try out the fascinating Robot QSO machines on RS-10 and RS-11.

Notes

¹Both transponders ride along with the primary payload (a navigation system for ground users) on a "bus" called Cosmos 1861. All were launched from the Soviet Union on June 23, 1987.

²Many secondary schools have included telemetry analysis of OSCAR satellites, together with orbital analysis/prediction, in their science curricula. *The Satellite Experimenter's Handbook* (SEH), published by ARRL and written by Dr Martin Davidoff, K2UBC, was

derived from an earlier book by Davidoff, *Using Satellites in the Classroom*. SEH is a good place to start for ideas on including telemetry analysis and tracking topics in the scholastic classroom.

³Beacons are (RS-10) 29.357, 29.403, 145.857, 145.903 MHz; (RS-11) 29.407, 29.453, 145.907, 145.953 MHz. A complete frequency list appeared in October 1987 QST.

⁴Similarly, NG would indicate channel 4 is being sent.

⁵Total receiver attenuation implemented is sum of channels 2 and 3. Attenuation can take values of 0, 10, 20 or 30 dB.

⁶AMSAT NA is the world's largest organization of Amateur Radio satellite operators. Free information is available for an SASE (or SAE with IRCs) sent to AMSAT, PO Box 27, Washington, DC 20044, tel 301-589-6062.

Table 3
Detailed RS-10/RS-11 Telemetry Analysis

Each channel is sent as a four-character word, eg, XY##, where XY is a two-character alpha indicator, ## is a two-character numeric value.

Ch No.	"X" and its meaning	"Y" Meaning of "XY" part	Ch No.	"X" and its meaning	"Y" Meaning of "XY" part
1	I = 90 minutes N = 10 minutes ## = Power supply voltage over sample period where V = n/4 volts. Example: IS80. Sample period = 90 minutes; battery voltage = 20	S Telemetry sampling period.	10	A = Off M = On ## = 2-m TX temperature, where T = n-10 in °C Example: AR23. 2nd memory board off; temp of 2-m TX = 13°C	R Status of 2nd memory board
2	I = 20-dB attenuator N = 0-dB attenuator ## = Power output of 2-m TX where W = n/10 in watts Example: NR25. 0 dB attenuation; power = 2.5 W	R RX attenuation. [See note 5]	11	A = Open M = Closed ## = 20-V power supply temperature, where T = n-10 in °C Example: AD38. Memory channel open; 20-V supply temp = 28°C	D Special memory loading channel
3	I = 10-dB attenuator N = 0-dB attenuator ## = Power output of 10-m TX where W = n/10 in watts Example: ID19. 10 dB attenuation; power = 1.9 W	D RX attenuation. [See note 5]	12	A = Open M = Closed ## = 9-V power supply temperature, where T = n-10 in °C Example: MG31. Code store memory closed; 9-V supply temp = 21°C	G Code store memory status
4	I = Off N = On ## = 15-m RX AGC voltage, where V = n/5 in volts Example: NG45. 15-m RX on; AGC voltage = 9	G 15-m RX status.	13	A = 10 m M = 2 m ## = Control parameter backup 9-V power supply, where V = n/5 volts Example: AU00. Memory dump via 10 m; backup 9-V supply control off	U Memory dump via channel
5	I = Off N = On ## = 2-m RX AGC voltage, where V = n/5 in volts Example: NU45. 2-m RX on; AGC voltage = 9	U 2-m RX status.	14	A = 10 dB M = 0 dB ## = IF voltage of 15-m Robot RX, where V = n/5 in volts Example: AW46. 15-m Robot RX attenuated 10 dB; Robot IF voltage = 9.2	W Attenuator setting of 15-m Robot RX
6	I = Off N = On ## = Special command station AGC voltage, where V = n/5 in volts Example: IW00. Command channel off; AGC voltage = 0	W Special command station channel	15	A = 10 dB M = 0 dB ## = IF voltage of 2-m Robot RX, where V = n/5 in volts Example: AK46. 2-m Robot RX attenuated 10 dB; Robot IF voltage = 9.2	K Attenuator setting of 2-m Robot RX
7	I = 1000 mW N = 300 mW ## = Service command parameter, 10-m mode Example: IK00. 10-m beacon 1000 mW out; command mode off	K 10-m beacon power output	16	A = 1000 mW M = 300 mW ## = Robot QSO counter where 00-32 QSOs logged is indicated as 00, and 33-128 QSOs is indicated by values in the range of 80-99. Example: AO89. Command channel, 1000 mW out; Robot QSOs counted, 33 < n < 128	O Special command channel 2-m power output
8	I = 1000 mW N = 300 mW ## = Service command parameter, 2-m mode Example: IO00. 2-m beacon 1000 mW out; command mode off	O 2-m beacon power output			
9	A = Off M = On ## = 10-m TX temperature, where T = n-10 in °C Example: AS35. 1st memory board off; temp of 10-m TX = 25°C	S Status of 1st memory board			

What is Amateur Radio?

Amateur Radio, also known as "ham radio," is communicating. Hams, who must be licensed by their governments, operate two-way equipment from their homes and cars. They communicate with other hams across town or across the world on special sets of radio frequencies, or bands, that are set aside for Amateur Radio use.

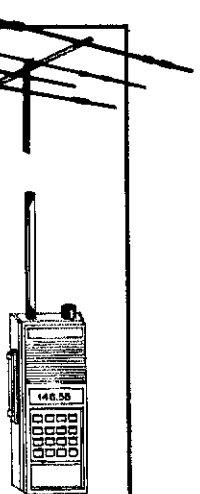
Who are hams?

Just about anyone can be a ham—there are no age limits. Many people with disabilities find a door to the world in Amateur Radio. Some famous people are hams, but most are just people from all walks of life who like making new friends around the world.

How can I become a ham?

Getting a ham radio license is easier than you may think. In the US, the Novice (beginner's) license requires only passing a 30-question written exam on basic electronic theory and FCC rules and regulations, along with copying and sending Morse code at five words per minute.

The American Radio Relay League (ARRL) offers a wide variety of information for persons interested in radio communication. We can also provide you with a list of clubs and instructors in your area. Many local Amateur Radio clubs offer licensing courses several times a year.



For a prospective ham packet, contact the ARRL, Dept Q, 225 Main St, Newington, CT 06111, tel 203-666-1541.

It is with deep regret that we record the passing of these amateurs:

W1AFN, Thomas C. Howard, Boston, MA
 W8IAPJ, Gilbert Schnare, Stoneham, MA
 W1AVA, Clarence C. Waldrip, Saugus, MA
 *W1DWW, C. Nelson Julian, Merrimack, NH
 W1IAG, Walter J. Williams, Middletown, RI
 W1KHV, George F. Augustine, New Bedford, MA
 KA1MEC, Arthur E. Tondreault, Providence, RI
 W1SMD, Sanford D. Hecht, Newton Center, MA
 W1IWWH, Vernon A. Orchard, Old Orchard Beach, ME
 W1XV, Edward Braddock, Orleans, MA
 K1ZDX, Richard W. Pease, Leominster, MA
 KA2CAN, Stanley Freeman, Madison, NJ
 W2CSN, W. Ralph Williams, Utica, NY
 N2DO, Ronald L. Miller, Lindenhurst, NY
 W2ENU, Louis R. Schreiner, Pompano Beach, FL
 W2HJK, Frederick R. Poppleston, Cape Coral, FL
 N2LA, Joyce M. Euart, Glen Rock, NJ
 W2RRG, Paul S. Hamilton, Pleasantville, NJ
 *K2SGX, Harold F. Hall, Raphine, VA
 K3BWE, Ralph G. Connors Jr, Pottsville, PA
 W3PIH, Joseph G. Thomas, Rockville, MD
 W3UEN, George J. Kalich, Washington, PA
 W3WAS, Joseph R. Chesluk, Plymouth, PA
 W3WTP, R. Harold McCann, Arnold, MD
 W3YAF, Thomas V. Winn, Philadelphia, PA
 W4ADP, Frank B. Hoselton, Miami, FL
 W4A4QL, Max E. Brantley, Thomasville, GA
 W4AZT, Wade H. Holland, Greenville, SC
 W4CSY, Leonard M. Garrriot, Nashville, TN
 N4IX, George Macatee, Jr MD, Asheville, NC
 W4LEK, Harry E. Ide, Morrisville, PA
 KF4LJ, J. Raymond Lichty, Sheffield, AL
 W4NWB, John R. Lindley, Sr, Moultrie, GA
 W4A0SE, J. Woodrow Tingle, Griffin, GA
 W4UDX, John P. Laughlin, Bedford, VA
 K4VND, Richard P. Smith, Sr, Gulf Breeze, FL
 WF4X, Phillip W. O'Dwyer, Fort Walton Beach, FL
 K5DHU, B. G. Herrin, Texarkana, TX
 N5FUO, Fred Simpson, Fairview, OK
 W5IGX, John R. Doggett, Brenham, TX
 KB5MF, Beatrice S. Harper, Redrock, NM
 W5MYQ, Dean D. Meyer, Espanola, NM

WA5TMH, Jack E. Hebert, Sulphur, LA
 W5TJT, David W. Clary, Roswell, NM
 W5YNI, Walter T. Peterson, Grand Saline, TX
 N6AZG, H. W. Jewett, Jr, Oakland, CA
 KF6BI, Clark E. Moser, Riverside, CA
 W6CZB, Frank L. Robertson, Susanville, CA
 K6DEB, Emmanuel A. Blasi, San Jose, CA
 *W6DNG, Willis Conkel, Lindsay, CA
 N6HCE, Wayne W. Richards, Covina, CA
 W6LNV, Eldon H. Donohue, San Diego, CA
 W6LVO, Benjamin E. Broyles, San Jose, CA
 W6NCT, Clare E. Potter, Lucerne Valley, CA
 WA6OYR, Harold F. Crown, Fresno, CA
 WA6SDP, Samuel Gosland, Buena Park, CA
 K6YFE, George E. McGowan, Bell, CA
 W7AZA, W. W. Eaton, Seattle, WA
 W7JCP, Joseph W. Kille, Big Lake, AK
 K7DI, James M. Martin, Sun City, AZ
 W7BDX, Willard G. Cooper, Pocatello, ID
 W7EHZ, Rudolph E. Olsen, Coeur D'Alene, ID
 W7HJR, Richard B. Knotts, Warrenton, OR
 W7JSE, Byron O. Ballou, Prescott, AZ
 WA7NZU, Charles Dowell, Florence, OR
 W7VCF, Roy L. Layman, Woodburn, OR
 W7ZUJ, Donald W. Exner, San Diego, CA
 W8FEB, J. Burton Moore, Grosse Ile, MI
 N8GJX, Lenora Kellachow, Dearborn, MI
 WB8JZ, Perry A. Towne, Munroe Falls, OH
 W8NS, Carl Bacon, Drayton Plains, MI
 KA8TLY, Irwin Matusoff, Vandalia, OH
 W8WBX, James F. Loehrke, Toledo, OH
 W9CBG, Walter Shriner, Springfield, IL
 W9DEF, David B. Rosenbaum, North Miami Beach, FL
 W9IQW, George Jesse, Port Edwards, WI
 W9JH, C. W. Sammis, Covington, IN
 *W9MAR, Melvin Barnard, Godfrey, IL
 K9UON, Don A. Goodwell, Richmond, IN
 KC9VK, John C. Grose, Osceola, IN
 WB9YNK, James L. Green, Sr, Indianapolis, IN
 N8AYA, Herbert B. Warford, Marshall, MO
 N8BUJ, Fenton W. Holdcroft, Scott City, MO

W8LMK, Phillip Thomure Farmington, MO
 WB8LRK, Clark N. Eid, Fertile, MN
 W8NSN, Lester H. Fuhrman, Cedar Rapids, IA
 WA8QPA, John Svac, Minneapolis, MN
 K8QWU, Arnold A. Berkland, Stillwater, MN
 W8RGG, Solomon Houn, Gering, NE
 K8SHO, Donald W. Swanson, Bloomington, MN
 WA8VOL, V. Ralph Renfro, Ramona, OK
 KA8ZWH, John F. Haydock, Ozark, MO
 VE3ATW, Earl Weiss, Burlington, ON
 VE3EZ, Harold W. Carson, Perth, ON
 VE3LDH, W. F. Laughlin, London, ON
 VE3LPJ, Robert Ross, Brampton, ON
 VE3NYA, Stan Carter, Burlington, ON
 VE3OEK, Douglas Lozon, Wallaceburg, ON
 VE3OJP, Norman Green, Perth, ON
 VE6BEG, Harry Goodwin, Wainwright, AB
 VE6CFS, G. Ruitenbeck, Calgary, AB
 VE6CLR, Ray E. Long, Spring Coulee, AB
 VE7AGB, George C. Benson, New Westminster, BC
 VE7CRY, Dan Dunlop, Trail, BC
 VE7DB, Bill H. Thompson, Vancouver, BC
 VE7FEW, Sydney R. Wallis, Victoria, BC
 VE7MKD, Marg Dunlop, Trail, BC
 OE1AD, Adolf R. Dominkus, Vienna, Austria

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ.

Note: All Silent Key reports sent to HQ must include the name, address and call sign of the reporter as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in QST.

50 Years Ago

December, 1937

Radio amateurs involved in television? Technical Editor Jim Lamb says there has been a hiatus since QST covered the old mechanical systems in the late 20s, but current responses to membership questionnaires show renewed interest in the cathode-ray techniques. Accordingly, he announces a new series covering modern principles.

Initially, W2KJL of the National Union (tube) Corp. educates us on the fundamentals of scanning and the make-up of the television signal, its synchronizing and blanking pulses, interlacing, etc.

A four-page RCA ad offers a "kinescope" c.r. tube for as little as \$40, to be used in building your own receiver. The price of an iconoscope (camera) is beyond our reach.

We breath a sigh of relief as the Federal Communications Commission issues its finding in the lengthy 30-300 Mc. allocation hearings. We are affirmed in 56-60, and will get two new bands 112-118 and 224-230 Mc., thus continuing the principle of harmonically-related bands.

"Copy what you hear" is the important principle for participating in the Copying Bee, 25-w.p.m. transmissions from W1AW and other prominent stations in mid-month. "Syzygy" is an example of the tricky text to test your skill.

Don't fall for the myth that any "feedback" will distort your voice signal, says George Grammer. He shows us how to apply inverse feedback to a speech amplifier to improve frequency response and increase power output.

More useful info for the 'phone enthusiast is provided by W1JZM's pentode circuit for low hum and r.f. pickup in a speech amplifier, and by R. B.

Shimer's cathode-coupled driver for Class B modulators.

In further response to increasing interest in voice operation, the League announces a new 25-cent (1) booklet, *Building an Amateur Radiotelephone Transmitter*, to tell what a new or inexperienced ham should know before attempting to modulate his rig.

With the MacGregor expedition wintering in northern Greenland, W2QY operated OX2QY for personal staff communications back to the U.S., in addition to his commercial tasks for N.B.C. program pickups.

The one-inch screen of the 913 cathode-ray tube looks lost on the panel of the complete oscilloscope with i.f. input amplifier built by W8UD, but it's been the only tube within our price range and still does a good job.

Winner of the August low-power contest (25 watts or less) is none other than W2DKJ/2—using 8 watts input on 56 Mc.!

25 Years Ago

December, 1962

W6ANU's complete transistor communication receiver so impressed QST's editors that a series of articles will detail design and construction. This month covers the tunable i.f. amplifier, with 2 to 4 Mc. coverage and 455-kc. output.

Protection from lightning strikes is a concern of most amateurs, and W1ICP answers a number of questions with known facts, at the same time dispelling old-time myths.

With more than 15,000 having participated in the June Field Day, 14 pages of QST are needed to report individual scores. W7HZ/7 with five rigs

topped the pack, outdoing setups of a dozen separate transmitters.

Many small tubes in parallel has been the only practical way to achieve high power on s.s.b. using zero-bias grounded-grid circuitry. Now the new 3-1000Z permits us a more compact rig and provides 2 kilowatts p.e.p. as described by W6UOV and W6GQK.

Don't have a 'scope? George Grammer says you can use a receiver as an analyzer of voice transmissions, provided you look at them as a collection of c.w. signals—and you begin to hear some things that aren't always evident in "normal" reception.

Seventy-two amateurs provided documentary proof of having held a license at the start in 1912, and 36 of 'em were able to attend the Hudson Division Convention in New York City and personally receive a commemorative plaque. In his address to the assembly, League President Herbert Hoover, jr., W6ZH, paid special tribute to the district radio inspectors who right from the start encouraged youngsters to get a career under way by embracing amateur radio.

And New York is added to the list of states offering call-letter license plates. Only Kentucky, Massachusetts and New Jersey are holdouts.

It isn't often you see a home-built 100-watt 6-meter transmitter in a 3 x 5 x 12-inch box, but K2IUV did it without undue crowding of components.

Ever since W2ILE's original electronic key design in a 1940 QST, a steady stream of variations on the basic idea have represented changes in features, complexity, reliability and cost. W3OFO this month adds his version, a monitored key and keyer for both cathode and blocked-grid systems.

Some 8,755 DXCC certificates have been issued (through September), and this issue contains a list of calls and totals of those active in the Club during the previous two years.

The Editor salutes the Institute of Radio Engineers on its Golden Anniversary.—W1RW

The Detroit Metro Air Disaster

On Sunday, August 16th at 8:45 PM, Northwest Airlines Flight 255 with 153 people aboard crashed just after take-off from the Detroit Metropolitan Airport as stunned witnesses watched in disbelief. A sobbing 4-year-old blonde girl, who apparently had been shielded by her mother's body, was the only survivor found by rescuers.

Earlier that evening Bill, N8GYK, had gone to the National Weather Service Station at Metro Airport to be the NCS for the Southeast Michigan Inter-County (SEMICO) Net during a severe thunderstorm warning that had been issued. At 8:45 PM, weather station officials asked him if there were any severe storm reports coming out of Oakland or Macomb Counties.

"I turned around," said Bill, "to tell them that nothing had been reported, when at that split second I saw a large fireball fly right by the building with a loud roar. It was so close that I could feel the heat through the glass. I ran outside to be sure the building had not caught on fire, and saw the black smoke billowing up from the crash a few hundred yards away. I then ran back upstairs and notified Wayne, K8BTH, on our Inter-County (SEMICO) SKYWARN Net that an airplane had crashed just off the airport."

Shanon, KA8SPW, an Assistant EC, heard the report of the air crash and quickly responded by immediately calling the homes of Captain Mark Sparks, the director of Emergency Management for the County, and Lee, KZ8V, the EC for Wayne County, to notify them about the airliner crash.

Gerde, KA8PWM, an NCS for Wayne County, also heard the report on the SEMICO Net. She also notified KZ8V, according to procedure, then immediately activated the Wayne County ARES net on the Edison 2-meter repeater and began to take check-ins. Her quick reaction got the emergency net off to a very fast start.

Upon learning of the disaster, the EC assigned the nearest available NCS operators Don, KD8UA, and Joe, WD8PSX, to report to the Wayne County Emergency Operating Center (EOC). KD8UA, and his wife Nancy, both pilots who frequently use Metro Airport, knew the best routes and arrived at the EOC first. Don activated the EOC RACES station while Nancy began taking phone calls. The crash site was just ¼ mile north of the EOC, so the traffic jams forced WD8PSX to drive on the shoulder of the road for almost a mile to get to the police roadblock where he

showed his RACES card and was quickly waved through.

Early during the emergency, we found that hand-held radios had some difficulty communicating from the crash site area via the ARES/Edison repeater in downtown Detroit, so we quickly activated a net on our nearby RACES/N8DJP repeater in Dearborn to allow for better communications.

Though this wasn't in our emergency plan, we limited communications on the second emergency net on the RACES repeater to communications between the EOC and emergency duty stations, while the ARES net on the Edison repeater remained on the air to take check-ins. Some 81 ARES members volunteered to take emergency duty assignments if needed.

Communications between nets was via "Key Stations" on the already activated SEMICO Net on the "Stu Rockafella" 220-MHz repeater. This link allowed the NCS at the RACES station at the County EOC to call the "Key Station" on the ARES net via 220 MHz. ARES volunteers were then asked to go to the emergency net on the RACES repeater for assignment to emergency duty stations.

This procedure worked out extremely well. The emergency net on the RACES repeater wasn't flooded with check-ins, allowing it to be devoted full-time to emergency communications. At the same time the ARES "Check-in" net enabled those who were willing to help to volunteer their services, if needed. This new procedure will now be written into our plans.

At the same time that the 2-meter nets were being activated, KA8SPW, Assistant EC for Packet Radio, called Ron, WA8OOH, who immediately moved his BBS to the state's emergency packet net frequency on 145.09 MHz and then offered his portable packet station if needed. WB8WKA also offered his BBS and a portable packet station with printer. KA8SPW also called DEC WA1LRL, who activated the State Packet Emergency Net with cross-over to HF on his BBS. N8FTY in Dexter readied his BBS for possible packet traffic.

We established communications to and from our RACES station at the EOC via repeaters on 2 meters, 220 MHz and 440 MHz. The Command Net on 440 MHz allowed the leadership to communicate without disturbing the emergency nets on 2 meters. Numerous other nets and repeaters in nearby counties remained on standby. We later learned that even Lucas County, 40 miles to the south in Ohio, was on standby for the disaster. Our Michigan

Section ARES and RACES organizations quickly offered their assistance, including the Michigan Section ARES and NTS nets on HF, and the State Emergency Packet net on 145.09 MHz. It was a great feeling to know that we had that kind of support behind us.

Soon after our nets were activated, the Emergency Management Director requested NCS operators at the EOC to send hams to nearby hospitals to provide communications between hospitals, the EOC, and the staging area. WD8PDG, K8IR, N8GIQ, W8JEJ, KA8HZO, WB8RQO and N8DJP were immediately dispatched to the hospitals. Soon thereafter, KA8YXB and N8FZT were dispatched to the "staging area" which had been established at a nearby fire station. As activity increased, N8HMC and W8JEJ were also sent to the staging area at Capt Sparks' request.

When the telephone system at the staging area was temporarily disrupted, ARES members provided back-up communications by relaying messages back and forth between the EOC and the staging area for various emergency-response personnel involved in the disaster. The ARES members also helped with such tasks as locating a Salvation Army portable canteen, and arranging for an escort to the crash site. When reports made it clear that no mass transfer of injured to hospitals was going to occur, packet radio terminated operations at 11:30 PM. Hams assigned to hospitals were released at midnight, and the SEMICO Net also closed down. It was 2:30 AM when emergency-response personnel at the staging area eventually completed their tasks. Only then did we close down our ARES emergency net.

Capt Sparks expressed his sincere appreciation to ARES members for the vital role we had played in providing back-up radio communications during our nation's second worst air disaster. It had been an emotionally draining event. Many of us would not sleep very well the rest of the night.

A few days later Bill, N8GYK, who witnessed the crash, commented: "It was a scary experience for me. I didn't realize it at the time, but the plane struck a light pole right next to the National Weather Service Building. If it had been 200 feet nearer I might have been killed myself. I'm thankful to the pilot for doing what he did, and I thank God that I'm still here."

On our weekly training net on Wednesday, we spent well over an hour reviewing the activities of our ARES Net operations during the disaster. In fact, a

tape recording of that net is the basis for this report. The NCS operators who worked at the EOC commended everyone for their excellent discipline during the emergency net. They were impressed with how rapidly amateurs were able to respond with assignments to emergency duty stations.

KZ8V, the ARES Emergency Coordinator and RACES Officer, was extremely pleased with the quick actions taken by our ARES leaders. The overwhelming and rapid response by our members, the effective use of our emergency plans, and the outpouring of offers of assistance from nearby counties and the state were equally impressive. The extraordinary net discipline that existed throughout the emergency helped maintain an efficient net operation. All who participated are commended for demonstrating how effective and efficient a well-trained and disciplined ARES organization can be when disaster strikes.

We all have to agree with the remark made by one of our NCS operators: "Hams acted in an exemplary manner and proved that our emergency-training sessions are bearing fruit."—*Lee Onkka, KZ8V, ARES Emergency Coordinator and RACES Officer, Wayne County, Michigan*



SPOTLIGHT ON SERVICE

Radio Amateurs Cover Hydroplane Race

Every year during the summer, for nine years running, Amateurs in the Tri-State Amateur Radio Society have provided communications for events included in Evansville's (Indiana) Freedom Festival. During one of the events, "Thunder on the Ohio" (an Unlimited Hydroplane Race), Amateur Radio efforts helped avert serious injury to one of the hydroplane drivers when his boat caught fire. Since the Unlimited Racing Commission, which governs the race, can't have an up-close view of the entire course, they depend on their support network which includes Amateur Radio operators. Amateurs are located along the race course and in the middle of the 50,000-plus crowd that shows up to view the event.

During the last half of 1987's race, a loud boom came from one of the hydroplanes. The crowd, upon hearing the loud noise, began looking for the cause and fell very quiet. Seconds later, the craft came to a halt near turn number four and began smoking. It was on fire! The rooster tails left in the wake of other boats blocked race officials from seeing that the pilot was in trouble—the race continued.

A race reporter from Evansville radio station WIKY, Lou Palmer, was about 200 feet from the boat on turn four and alerted listeners to the pilot's frantic waving for rescue crews to come to his assistance. The broadcast was monitored by KA9PCT, who relayed the information to KA9LQM, who was stationed on the judge's stand with race officials. The radio broadcast indicated the smoke coming from the troubled craft was turning from white to black and that the pilot had abandoned ship.

Upon hearing that the pilot was in the water, race officials fired the flare that stopped the race. Emergency boat rescue teams sped to the now-flaming hydroplane to put out the fire and rescue its pilot. The fire was quickly extinguished, and the pilot was taken to a waiting ambulance where he was treated for smoke inhalation and released.

Amateur Radio operators received thanks for their part in passing the information from radio reporter to race officials. Everyone involved was aware that if the fire had not been reached as quickly as it had, the accident could have been worse. Radio amateurs on hand for the race included WA9IVE, KA9PCT, KA9UIC, KA9LQM and KA9LMO.—*Martin L. Hensley, KA9PCT, Evansville, Indiana*

IN SERVICE...

□ DuPage County, IL—August 14. A record nine-inch rain fell on parts of the area, causing severe flooding and closing most of the main roads and transportation arteries in the county. DuPage County EC N9CIB put the ARES operators on standby on the Wheaton Community Radio Amateurs 2-meter repeater. ARES gathered information on road closings. That evening, ARES members were assigned to emergency shelters and community emergency operation centers to assist with communications. A total of 25 radio amateurs put in more than 190 hours over the two days following the flood.—*Ray Grundy, N9CIB, EC DuPage County, IL*

□ Leadville, CO—August 22-23. Eighteen radio amateurs, a majority of them from the Empire Radio Club of Arvada, provided support to a footrace that covered 100 miles, starting and ending at 10,150 feet above sea level. At one point, the route goes over Hope Pass at 12,500 feet above sea level. There were five checkpoint stations and medical facilities were available at each one. At least two radio amateurs were assigned to each checkpoint. Some of the checkpoints stayed open for 12 to 18 hours. Two-hundred runners braved roughly 12 hours of rain during the event. This was the third year hams supported "The Race Across the Sky."—*J. Buersmeyer, WBØSTE, Arvada, CO*

□ Franklin, WV—September 5, 1987. A Cessna 172 airplane with four persons aboard crashed into North Mountain at the Grant and Pendleton-County line during rain and fog. An initial search began in the area that the ELT signal was being received. State police supervised the search, and radio amateurs were called to provide backup communications to search crews. The wreckage was found the next morning with two surviving passengers and two fatalities. When the crash site was located, approximately 20 other radio amateurs from West Virginia and Virginia were already on their way to assist in the search effort. Amateur Radio was the primary means of communication for the search team as they brought the survivors out of the mountainous area on foot.—*Richard Gillespie, N8HON, EC, Pendleton County, WV*

□ Lehigh, PA—September 13, 1987. Carbon County emergency officials requested that RACES and ARES be activated to respond to possible flooding conditions. Once in operation at the Emergency Operations Center (EOC), radio amateurs were

dispatched to cover communications for evacuation centers and to serve as a backup to other emergency-response groups. When major flooding did not occur in the county, the net was secured.—*Klaus Rodock, WB3JYY, EC, Carbon County, PA*

□ Tyler, TX—September 23. Hans and Joan Clahsen (WB5NOG and N5KVJ, respectively) were enroute from their home on Lake Palestine to Tyler. They were in separate automobiles and in communication with each other through the Tyler Amateur Radio Club 2-meter repeater, AA5AA/R. At the intersection of Old Jacksonville Highway and Rice Road, near Tyler, Joan discovered an auto accident had just occurred with one person seriously injured. She notified Hans over her radio, stopped and began rendering emergency care to the victim, as Joan is a registered nurse. Hans used the repeater to notify the police and emergency medical service personnel.—*John B. Vittitow, N5BMO*

□ Boardman and Canfield Townships, Ohio—October 4, 1987. Radio amateurs were called to assist with communications for eight hours while an evacuation of more than 2000 people was conducted. A tank truck containing liquid oxygen had overturned on the Ohio Turnpike and officials feared an explosion. Fortunately, that did not happen and officials in charge had many compliments for the 12 participating radio amateurs.—*Keith M. Hamilton, NØ8Z, EC, Mahoning County, Ohio*

[See Field Organization Reports on next page.]

Strays



I would like to get in touch with...

□ anyone who was a member of the *Oakland Tribune* Radio Club. Seymour Snaer, KB6OCI, 42 Sea Pines, Moraga, CA 94556.

□ anyone with a schematic for a Lambda Electronics Corp oscilloscope Model MM-2. Don Miller, W2MQB, 517 Accabonac Hwy, East Hampton, NY 11937.

□ anyone interested in the writings of Ayn Rand. Harris Kenner, K1UKQ, RR 4-Box 119, North Scituate, RI 02857.

□ anyone who is interested in forming a canoeing and kayaking net. John Clark, NA3J, 7206 Rossburg Rd, Apt C, College Park, MD 20740.

□ any past members of the Oregon State University ARC. Mark Hansen, K17N, 3018 NW Lisa Pl, Corvallis, OR 97330-3216.

QST congratulates...

□ Bill Leonard, W2SKE, of Washington, DC, on the publication of his new book, *In the Storm of the Eye*.

Field Organization Reports September 1987

TCC

TCC Eastern

Cycle Four

Area Nets

EAN	30	1406	48.87	1.370	98.5
CAN	30	913	30.43	1.073	100.0
PAN	30	954	31.80	.943	97.7

Region Nets

1RN					100.0
2RN	57	232	4.07	.403	87.7
3RN	60	234	3.90	.388	98.1
4RN	60	561	9.35	.420	100.0
5RN	60	517	8.82	.580	100.0
6RN	60	526	8.76	.660	99.0
7RN	60	505	8.30	.660	82.0
8RN	55	356	6.47	.418	84.0
9RN	60	424	7.07	.522	92.9
TEN	60	380	6.00	.539	65.4
ECN	56	225	4.02	.452	78.0
TWN	54	351	6.50	.490	93.4
ARN	30	126	4.20	.101	100.0

TCC

TCC Eastern

TCC Central

TCC Pacific

	82	688
	96	1284

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, AZ, CT, DE, ENY, GA, IA, IL, KS, MDC, ME, MN, MO, NC, NH, OH, NY, NJ, NM, ND, NE, NF, NJ, NT, NV, OH, OK, OR, PA, SD, TN, TX, UT, VA, WA, WI, WMA, WNY, WPA, WTA, WTX, WY.

ARRL Section Emergency Coordinator Reports

Thirty nine SEC reports were received, denoting a total ARES membership of 17,638. Sections reporting were: AR, BC, CO, IA, ID, KS, MDC, MT, MI, MN, MO, MS, NE, NF, NH, NJ, NT, NV, OH, OK, OR, PA, SD, TN, TX, UT, VA, WA, WI, WMA, WNY, WPA, WTX, WY.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	649	87.00	649	1310
TCC Central	86	96.00	485	501
TCC Pacific	114	95.00	554	1066
Summary	849	92.66	1888	2877

Cycle Three

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
TCC Eastern	82	82.80	358	668
TCC Central	96	80.00	654	1284
TCC Pacific	178	81.00	1012	1952

TCC Roster

KA1AE K1EIC WA1FCD W1CE KN1K KT1Q W1QY YKW1U W2FR WA2FJ NN2H N2IC WA2SPL KA2UBD N2XJ N3EMD NJ3V KK3F AA4AT N4EXQ N4GHI WA4JDH W4JL K4MTX WB4PNY N5BT W5CTZ N5DFO W5GHP K5GM AE5I WB5J AJ5K W5KLV KD5KQ KD5RC K5MXQ ND5T W5JOV WZ5N W5QVK W5VMP NQ5W KV5K WB5YDD W8EOT W6INH N6LHE K6UYK W6VZT W6O KA7CPT NR7E W7EP W7GHT NN7H W7GIC W7LG KA7MUL K7FR K7OVK W7TGU W7VSE WB4PNY WD8LDY W8PMJ W8QHB AF8V W8BYDZ KD8WX W9CBE W9EHS KA9FEZ W9SJUJ NN9M KA9RII WB9UYU AD9A KC9D K9EZ KJ9G NX9J KD9J KA9EY W9FCR ND9A KE9NI A9O WA9OYI KS9U

National Traffic System

Net	Sess	T/c	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	30	897	29.80	.746	91.1	
CAN	30	660	22.00	.502	100.0	
PAN*	59	651	11.03	.529	97.2	
Region Nets						
1RN	60	551	9.18	.518	100.0	100.0
2RN	58	306	5.27	.372	95.2	100.0
3RN	30	166	5.53	.500	95.0	100.0
4RN	60	345	5.75	.254	82.1	100.0
5RN	60	635	10.58	.472	83.0	100.0
6RN	53	165	2.77	.295	88.3	98.3
7RN	60	527	8.78	.519	85.3	100.0
8RN	59	277	4.69	.285	90.0	100.0
9RN	60	211	3.51	.258	88.0	100.0
ECN						46.7
TEN	60	780	13.00	.456	82.0	100.0
TWN	55	230	4.28	.313	73.1	98.3
TCC						
TCC Eastern	649	1310				
TCC Central	86	501				
TCC Pacific	114	1066				

Cycle Three

Area Net	Sess	T/c	Avg	Rate	% Rep
EAN	30	358	11.93	.649	81.4
Region Net					
1RN	29	102	3.52	.296	79.3
2RN	30	138	4.60	.390	90.7
3RN	23	14	.60	.105	82.3
4RN					
5RN					
ECN					

79 N7BGW WA4LTO	72 WB8QBZ W2FR W9NXX WA6WJZ KA8WNO	67 W1TN WA3UNX VE3POJ N2AKZ KA0TTH	N1CVE WA8DHB WA4MINR N0HWD N4EXQ K44FY NN4I N8EFB
78 W3YVQ N3COY KA9RII N8GPH	71 N1AKS KB4LB WA6QCA KA1EXJ KA5QVY	66 KQ3T N8IBS WB8KWC WZSN KA2JMA	81 KK3F KA1LIH VE7ANG
77 WA3UZI NM1K W7LWK	70 N4OZB N4KRA N0BA K4IWW N2EVGT WB9PFZ N2HLZ KB0Z	65 WB1HBB KA1LMR A8C KA8TND W1RWG AJ5K WD8KBW N82D	60 KA1HPO/T WB9WJ W0YMB W4TZZ K8ND
76 WA4RUE VE3WV K1ABO VE7EJW N6CL5 KA4TMI N9JS	75 N8FXH N6MCY	64 VE3GSO K0PCK ND0N WD8RHU VE7BNI W4HON K6JDI K2TWZ	49 W1YOL/T 48 WB2NLU/T 47 WA8DYS/T 48 N8QBJ/T N8HRW/T
74 KN1K NE2W KJBJ WSKLV	74 K08NH KA7EEE KA8TNT K08WI	68 WB8SYA W0FIR VE4IX KA1MDM KA1ODT KFBJ K08KU WB5YDD N2GQS	46 N8QJ/T KA5UY/T KA2UIU/T 44 KA4FZI KB2AYD

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, upon sending notification of qualifying months to ARRL Public Service Branch, will be awarded a special PSNR certificate from HQ.

201 WA8ZUD 157 NG1A 151 KA1GWE 150 KA8TIK 144 WB2OWO 143 WB1GXZ 137 VE3ORN 136 KB4WT 135 N4GHI 131 VE4AJE KA9FFO 130 WB2ZJF 127 N9BZZ 125 W7VSE 122 W7DK KA0PKY 121 VE4LB WF8O N2EIA W2MTA	116 WA4PFK KB5ADE W9YCV 112 KT1Q 111 W1PEX WB1HHH 110 N1EDD KB1AF K4NLK KD0CL 109 K8UQY 108 KF7BX WB4KSG 107 N9CT N7ELF WD6BZQ WA4LLE WD8LDY 106 WA9VND WX4H WB2VUK W9JUU AG9G 105 K4ZK AA4MP WB1CBP K5MXQ WB4DVZ WB8JGW 104 WA4QXT WB7WOW 103 WB4WII KA0ARP WA2VJL 102 NQ2H AA4TE W9CBE WA2SPL	101 WD4KBW N3EMD KA2UBD N9BDL K8TVG 100 N3EGF NW7K WA1FCD N1EDD K14YV N8FOO 98 KA4TLC WA9VLC KF7AV 97 W7GHT W9FZW K6UYK W8INH WB2RBA WA2FJJ ND2S 96 WA2JBO AA4ZV K08HB K0SI 95 N6EQZ W9EHS K0ERM 94 W3FA N3AZW K2ZVI N7GGJ N4KSO 92 KA7AID N8FWA NV5L 91 N1CPX VE3DPO N2HIF N3JV KA1T	KA9RNY WD8QXT 90 WA2ERT 89 N2ABA/T K4JST KE0NI 88 NK1Q VE7EJU 87 AA4HT K4MTX WD5GKH 86 KA8SBY 85 K3JL WB4HRR KA1IFC K2MT 84 WA4EIC WD8KQC KT9I WB5J W5CTZ 83 W8RNL W8DM WB4PNY 82 VE3CYR W0OYH KC4VK K5UPN W4JLS KB2BKE 81 K3NNI WA1TBY WA0TFC WB0GUF AA4AT N2GPA 80 KC3Y
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Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

Call	Orig	Rcvd	Sent	Divd	Total
W3CUL	884	822	1401	69	3156
W1WP	---	---	---	---	2879
WB9YPP	0	906	83	599	1588
W3VR	315	232	297	51	895
W7VSE	73	382	344	14	813
WF6O	0	384	338	20	742
W9ZRX	0	360	363	0	723
N4GHI	51	320	302	34	707
NJ3V	66	286	329	4	685
WD8GKH	---	---	---	---	681
W1PEX	24	161	468	27	680
KY1T	---	---	---	---	680
W9JUJ	0	327	360	0	679
KW1U	0	365	289	18	672
N3AZW	9	311	281	40	641
KT1Q	56	292	281	11	640
WA2SPL	24	273	298	22	617
WB0WNJ	195	97	315	1	608
N2HIF	12	274	271	7	564
N7ELF	6	266	291	0	563
NG1A	0	262	214	56	532
N1EDD	---	---	---	---	532
WX4H	0	230	233	7	530
KA2UBD	0	253	260	0	513
KA1T	5	241	229	27	502

BPL for 100 or more originations plus deliveries:

WA3DFU	240
W80FIR	196
NQ0GQ	187
WD4IIO	148
W1FYR	142
WA8EYQ	135

Independent Nets

Net Name	Sess	T/c	Check-ins
Clearing House Net	30	605	427
Early Bird Net	30	721	298
Empire Slow Speed Net	30	52	292
Hit and Bounce Net	30	233	572
IMRA	26	848	1551
Mission Trail Net	30	112	937
New England Novice Net	26	28	53
NYSPEN	30	68	543
Southwest Traffic Net	30	191	1441
West Coast Slow Speed Net	30	52	445
20 Meter ISSBN	26	313	670
75 Meter ISSBN	30	178	1302
7290 Traffic Net	48	496	2474

Rules, 41st January VHF Sweepstakes

The dropping of the green flag at 1900 UTC Saturday, January 23, not only starts the 1988 VHF/UHF season with a bang but also marks the beginning of the 41st January VHF Sweepstakes. This year's VHF SS is the weekend of January 23-25.

Note that Novices can now play in VHF contests. Look for Novice participation especially on the 1 1/4-meter band on 223.5 MHz FM simplex and up from 222.1-MHz SSB/CW. Significant Novice efforts will be recognized with certificates.

Official entry forms are available from ARRL HQ for a business-size SASE with one unit of First Class postage. These forms will simplify the task of calculating your score and make our job of compiling the results much easier.

Don't forget the Affiliated Club Competition available to members of ARRL-affiliated clubs in the VHF SS. Check with your club secretary to see if your club is going to make an aggregate entry. If your club is not affiliated, contact the ARRL Club Services Department to find out how to join the ranks. **Club secretaries note:** There are a few changes in the rules governing affiliated-club competition that may affect your club. Now, for a club member to be eligible to submit his score toward his unlimited or medium club's aggregate score, he must attend at least two meetings a year, as opposed to the old rule of 50 per cent of the meetings. This new rule pertains to all club members as opposed to the old rule requiring only those club members residing farther than 50 miles from the club's center to attend the club meetings. If your club is planning to participate in the ARRL Affiliated Club Competition make sure you read and understand the new rules. Full details will be in the January 1988 QST. Also, don't forget that each affiliated club wishing to enter the club competition must submit a list of call signs of the club members that are eligible to submit their scores for the club. Now is the time to start planning for successful participation in the VHF SS.

Good luck!

Rules

1) **Object:** To work as many amateur stations in as many different $2^\circ \times 1^\circ$ grid squares as possible using authorized frequencies above 50 MHz. Foreign stations work W/VE amateurs only.

2) **Contest Period:** Begins 1900 UTC Saturday, Jan 23, and ends at 0400 UTC Monday, Jan 25.

3) Categories

(A) **Single Operator, Single Band:** One person performs all operating and logging functions. All QSOs for score listings in QST must be made on one band. Single-band entries may, however, submit QSOs made on other bands for credit in ARRL-affiliated club competition.

(B) **Single Operator, All Band:** One person performs all operating and logging functions.

Scoring Example

Band (MHz)	QSOs	QSO Points	Grid Squares
50	25 (x1)	25	10
144	40 (x1)	40	20
220	10 (x2)	20	5
432	15 (x2)	30	10
902	36 (x4)	144	9
1296	5 (x4)	20	3
2304	1 (x8)	8	1
5760	1 (x8)	8	1
Totals	133	295	59

Final Score = (QSO Points) x (Total no. of Grid Squares) 17,405 = 295 x 59

(C) **Multioperator:** Those obtaining any form of assistance, such as the use of relief operators, loggers or spotting nets. All equipment (including antennas) must be located within a 300-meter-diameter circle.

4) **Exchange Grid-square locator** (see Jan 1983 QST, p 49). Example: WIAW in Newington, CT would send FN31. Exchange of signal report is optional.

5) Scoring

(A) **QSO points:** Count one point for each complete two-way 50- or 144-MHz QSO. Count two points for each 220- or 432-MHz QSO. Count four points for each 902- or 1296-MHz QSO. Count eight points for each 2.3-GHz-or-higher QSO.

(B) **Multiplier:** The total number of different grid squares worked per band during the contest. Each different $2^\circ \times 1^\circ$ grid square counts as one multiplier on each band it is worked.

(C) **Final score:** Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score (see scoring example).

6) Use of FM

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted. This prohibits use of all repeater frequencies. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) Only recognized simplex frequencies may be used, such as 144.90 to 145.00; 146.49, .55 and .58, and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and

intent of the band plans as recommended in the ARRL Repeater Directory may be used for contest purposes.

7) Miscellaneous

(A) **Stations may be worked for credit only once per band from any given grid square, regardless of mode.** This does not prohibit working a station from more than one grid square with the same call sign. Such a roving station, however, must submit a separate entry for each grid square from which operation takes place. In this situation, the entrant may opt to waive rule 7(C) and use a single different call sign from each different grid square. Crossband QSOs do not count. Aeronautical mobile contacts do not count.

(B) **Partial QSOs do not count.** Both calls, the full exchange and acknowledgment must be sent and received.

(C) **A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by the FCC/DOC); one operator may not give out contest QSOs using more than one call sign from any one location.** The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(D) **Only one signal per band (6, 2, 1 1/4, etc) at any given time is permitted, regardless of mode.**

(E) **While no minimum distance is specified for contacts, equipment should be capable of real communications (ie, able to communicate over at least 1 km).**

(F) **Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz.** Even then, a complete, different station (transmitter, receiver and antenna) must exist for each QSO made under these conditions.

(G) **A station located precisely on a dividing line between grid squares must select only one as the location for exchange purposes.** A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) **Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs using coherent radiation on transmission (eg, laser) and employing at least one stage of electronic detection on receive.**

8) Reporting

(A) **Entries must be postmarked no later than 30 days after the end of the contest (Feb 25, 1988).** No late entries can be accepted. Use ARRL January VHF SS forms or a reasonable facsimile.

(B) **Logs must indicate time in UTC, bands, calls and complete exchanges.** Multipliers should be numbered clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include cross-check sheets (dupe sheets).

9) Awards

(A) **Single operator**

1) Top single operator in each ARRL Section.

(2) Top single operator on each band (50, 144, 220, 432, 902, 1296 and 2304-and-up categories) in each ARRL Section where significant effort or competition is evident. (Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers.) For example, if WBØTEM has the highest single-operator all-

band score in the Iowa Section and his 50- and 220-MHz scores are higher than any other 1A single op's, he will earn a certificate for being the single-operator Section leader and endorsement stickers for 50 and 220 MHz.


(B) Top multioperator score in each ARRL Section where significant effort or competition is evident. Multioperator entries are not eligible for single-band awards.

10) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium and local. Details are in

January *QST*.

11) Condition of Entry

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) **Disqualifications:** For excess duplicate contacts and call sign or exchange errors. See January *QST* for complete details. 

Rules, 1988 ARRL International DX Contest

To the serious DX contester and the casual country hunter alike, the third full weekend in February (20-21, for CW) and the first full weekend in March (5-6, for phone) bring the challenge and excitement of the ARRL International DX Contest. For these two weekends each year, the bands spring to life with DX aplenty. An operator can choose to go all out in the competition for a top score, or leisurely chase those last few countries needed to finish the requirements for the 5-Band DXCC award.

This is also a great opportunity for Novices/Technicians to work lots of DX. This is the first DX contest opportunity for Novices on 10-meter SSB. Novices/Technicians remember that your SSB band is from 28.300-28.500 MHz; don't inadvertently wander above 28.5. Be sure to mark your entry as Novice or Technician. We will recognize significant efforts with certificates.

There are some minor changes in the rules for the 1988 contest. For DX entrants, the Yukon (VY1) is now a separate multiplier from the Northwest Territories (VE8). For the W/VE entrants, the rules are the same except for the rules governing the eligibility of club members participating in the ARRL Affiliated Club Competition. Now, for a club member to be eligible to submit his score toward his unlimited or medium club's aggregate score, he must attend at least two meetings a year, as opposed to the old rule of 50 per cent of the meetings. This new rule pertains to *all* club members as opposed to the old rule requiring only those club members residing farther than 50 miles from the club's center to attend the club meetings. If your club is planning to participate in the ARRL Affiliated Club Competition make sure you read and understand the new rules. Full details will be in January 1988 *QST*. Don't forget that each affiliated club wishing to enter the club competition must submit a list of call signs of the club members that are eligible to submit their scores for the club. Have your club secretary send the list to HQ before the deadline and also make sure your ARRL club affiliation is current for the year. If your club is not ARRL affiliated, contact the Club Services Department at HQ for details on how to join.

Use of official entry forms makes the contest paperwork a snap for you, and makes the job of compiling the results a lot easier at our end. To receive your set of entry forms, send a self-addressed, stamped, business-size envelope with 39 cents postage (for W/VE amateurs) or a self-addressed envelope and 3 IRCs (for DX amateurs) to ARRL HQ. Mail early and avoid the last minute delay.

Complete contest rules are listed below. If you have any questions on any aspect of this contest, get in touch with us at HQ, and we will do our best to help you out. Good DX!

Rules

1) **Eligibility:** Amateurs worldwide.

2) **Object:** W/VE amateurs work as many amateur stations in as many DXCC countries of the world as possible on 1.8 to 30 MHz, *excluding* the 10, 18 and 24-MHz bands. Foreign amateurs work as many W/VE stations in as many states and provinces as possible.

3) Dates

(A) **CW**—Third full weekend in February (February 20-21, 1988).

(B) **Phone**—First full weekend in March (March 5-6, 1988).

4) **Contest Period:** 48 hours each mode (separate contests). Starts 0000 UTC Saturday; ends 2400 UTC Sunday.

5) Categories

(A) **Single Operator**—One person performs all operating and logging functions. Use of spotting nets (operating arrangements involving assistance through DX-alerting nets, etc) is not permitted. Single-operator stations are allowed only one transmitted signal at any given time. (Note: This does not permit multiple single-band entries from the same station).

(1) *All band.*

(2) *Single band* (one only). Single-band entrants who make contacts on other bands should submit logs for checking purposes.

(B) **Multioperator**—More than one person operates, checks for duplicates, keeps the log, etc.

(1) *Single Transmitter.* One transmitted signal at any given time. Once the station has begun operation on a given band, it must remain on that band for at least

10 minutes; listening time counts as operating time. Multioperator, single transmitter stations must keep a single, chronological log for the entire contest period. Violation of the 10-minute rule or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).

(2) *Two transmitter.* A maximum of two transmitted signals at any given time, on different bands. Once either station has begun operation on a given band, it must remain on that band for at least 10 minutes; listening time counts as operating time. Both transmitters may work any and all stations; the second transmitter is *not* limited to working new multipliers only. *Each of the two transmitters must keep a separate, chronological log for the entire contest period.* Violation of the 10-minute rule by either or both transmitters or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).

(3) *Unlimited.* A maximum of one transmitted signal per band at any given time. Unlimited multi-multi stations must keep a separate, chronological log for each band for the entire contest period.

(C) **QRP**—Single operator, all band only. QRP is defined as 5-W output or less.

6) Contest exchange

(A) W/VE stations (including 48 contiguous United States and does not include Canadian islands of St Paul and Sable) send signal report and state or province.

(B) DX stations send signal report and power (three-digit number indicating approximate transmitter output power).

7) Scoring

(A) **QSO Points**—W/VE stations count three points per DX QSO. DX stations count three points per W/VE QSO.

(B) **Multiplier**—W/VE stations: Sum of DXCC countries (except US and Canada) worked per band. DX stations: Sum of US states (except KH6/KL7) and District of Columbia (DC), VE1-8, VO, VY1 (Yukon is separate from VE8) worked per band. Maximum of 59 per band.

(C) **Final Score**—QSO points \times multiplier = final score.

8) Miscellaneous

(A) Call signs and exchange informa-

tion must be received and logged by each station for a complete QSO.

(B) All operators must observe the limitations of their operator licenses and station licenses at all times.

(C) Your call sign must indicate your DXCC station location (KH6XYZ/W1 in Maine, FG0AAA/FS on St Martin, etc).

(D) One operator may not use more than one call sign from any given location during the contest period.

(E) The same station may be worked only once per band—no crossmode or repeater contacts.

(F) Aeronautical and maritime mobile stations outside the US and Canada may *not* be worked for QSO or multiplier credits by W/VE stations.

(G) All transmitters and receivers must be located within a 500-meter-diameter circle, excluding directly connected antennas. This prohibits the use of remote receiving installations. Exception: Multioperator stations may use spotting nets for multiplier hunting only.

(H) The use of non-Amateur Radio means of communication (eg. telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

9) Reporting

(A) All entrants are encouraged to use official forms available from ARRL (39-cents-SASE or 3 IRCs) to report contest results.

(B) Logs must indicate times in UTC, bands, calls and complete exchanges. Multi-

pliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs total must include cross-check sheets (dupe sheets).

(C) All operators of multioperator stations must be listed.

(D) Entries must be postmarked within 30 days after the last contest weekend (April 6, 1988). Logs not postmarked by the deadline will be classified as checklogs; no extensions, no exceptions. All stations are requested to send their entries in as early as possible. Entries received after mid-July will not make QST listings.

10) Awards: Plaques will be awarded in the following categories for both the CW and phone contests.

(A) Top W/VE scorer in each entry category—single operator-all band, single operator-single band (1.8-28 MHz), QRP, multioperator-single transmitter, multioperator-two transmitter, multioperator-multi-transmitter.

(B) Top scorer in the single operator-all band category worldwide and on each continent. In addition, worldwide leaders in the single operator-single band, QRP, multioperator-single transmitter, multioperator-two transmitter and multioperator unlimited categories will receive plaques.

(C) Additional special plaques will be awarded as sponsored. See January 1987 QST for current list.

(D) Certificates will be awarded to top single operator-all band entries from each country and ARRL Section; top single-band entries in each US call area and each country;

top multioperator entries (single, two and multi-transmitter) in each country, US call area and in Canada. Additional single-band and multioperator certificates will be awarded if significant effort or competition is displayed. DX entrants making more than 500 QSOs on either mode will receive certificates.

11) Club Competition: ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium and local clubs. Details will be listed in January 1988 QST (new rules are in effect for 1988—please read!)

12) Condition of Entry

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, by regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualification: An entry may be disqualified if the overall score is reduced by more than two percent. Score reduction does not include correction of arithmetic errors. Reductions may be made of unconfirmed QSOs or multipliers, duplicate QSOs or other scoring discrepancies. An entry *will* be disqualified if more than two-percent duplicate QSOs are claimed for credit. For each duplicate or miscopied call sign removed from the log by ARRL, three additional QSOs will be deleted as a penalty. The penalty will not be considered as part of the two-percent disqualification criterion. If a participant is disqualified, that operator will be barred from entering the contest on that mode the following year. The calls of all disqualified participants will be listed in the QST contest results.

Club Spectrum

(continued from page 73)

there is no operator on duty." Hugh Turnbull, W3ABC, Director of the ARRL Atlantic Division, feels that condensing and putting "The New World of Amateur Radio" videotape on a continuous loop cassette would greatly enhance permanent museum and temporary shopping mall Amateur Radio exhibits. Any other suggestions for Bob?

These Clubs are Behind Us 100%!

Christmas is often a time of reflection and thanks. The Club Services Department staff would like to thank and acknowledge those actively-affiliated clubs in 1987 that were 100% ARRL Clubs. The following clubs have maintained 100% ARRL membership in 1987: Arkansas DX Assn (AR); Bass Hill Repeater Group (ME); Capitol Hill ARS (MDC); Central Florida DX Assn (NFL); Central Kansas ARC, Inc (KS); Cincinnati Buckeye Netters (OH); Clover Leaf ARC (NFL); Cumberland County Amateur Radio Service (EPA); Eastern Iowa DX Assn (IA); Emmettars (ID); Fist and Mouth Contest Company (LA); Frontier ARS (NV); Inland Empire VHF Radio Amateurs, Inc (WA); Long Island Contest Club (NLI); Madison DX Club (WI); Moberidge Area ARC (SD); North Augusta Belvedere RC (SC); Northern Arizona DX Assn (AZ); OBP #1 RC of St Louis (MO); Order of Boiled Owls (NLI); Packet and Repeater Klub (MT); Pennsylvania Emergency Communications Council Amateur Club (EPA); Radio Amateur Group, Inc (NC); Radio Operators Association of New Bedford (EMA); San Diego DX Club (SDG); Shelby ARC (NC); South Florida DX Assn (SFL); Sunrise RC (SNJ); Tri-County Tri-Banders (SNJ); W/K ARC of Greater Milwaukee (WI)

Welcome SSCs!

The following clubs have demonstrated their zeal for enhancing enjoyment of Amateur Radio and going the extra mile in serving their local communities. These clubs were granted Special Service Club status after demonstrating effective programs in six areas: (1) Public Relations (2) Emergency Communications (3) Training, (4) Technical Advancement (5) Operating Activities and (6) ARRL Membership Recruitment. The number in parentheses is the number of club members. Welcome aboard!

Anne Arundel RC, Davidsonville, MD (215)
Austin ARC, Inc, Austin, TX (316)
D-CAT, Hockley, TX (12)
Gabilan ARC, Gilroy, CA (45)

The following renewing Special Service Clubs have reaffirmed their commitment:

Anoka City RC & Emergency Services, Inc, Coon Rapids, MN (77)
Capital City ARC, Helena, MT (27)
Laurel ARC, Beltsville, MD (48)
Lower Columbia ARA, Longview, WA (54)
Metropolitan ARC, N Little Rock, AR (60)
Michiana ARC, Mishawaka, IN (120)
Murgas ARC, Larksville, PA (110)
North Shore Repeater Assn, Inc, Peabody, MA (305)
Ogden ARC, Inc, Ogden, UT (68)
Tri-State ARS, Evansville, IN (117)
W T Clarke HS ARC, Westbury, NY (12)

Results, 1987 UHF Contest

By Billy Lunt, KR1R
Contest Manager

It's hard to believe that 1987 marked the 10th birthday for this contest! It's had its ups and downs over the years, but the regulars always seem to make time for 24 hours of DX on the ultra-highs. In looking at results of past years, it's interesting to note the ever-increasing activity on the microwave bands. In the first event, for example, 3 QSOs and 3 multipliers were the best score on 2304 MHz. This year, W2SZ/1 worked 21 stations and 12 multipliers there! In 1978, 10 GHz was pretty exotic stuff; this year, WA3RMX and K7AUO were active on 48-GHz SSB!

Some pretty incredible scores resulted from the 1987 running of the ARRL UHF Contest. Although the number of entries is only 132, compared to 173 last year, scores are up in almost every ARRL Division. There must have been more activity in the 1987 event—there certainly were no monster tropo openings! We wish more of you would submit logs to demonstrate, for the record, that amateurs are actively using our UHF and microwave allocations. One reason that scores are up is the addition of 903 MHz to many stations. Twelve stations reported contacts on that band in 1986; the number more than doubled for 1987.

The Northeast was definitely the place to be in the single-op category. Rick, WB2NPE, ran away from the competition with an incredible 119,790 points. This is by far a new single-op record (under the grid-square scoring system), and it demon-

strates what can be done by a skilled operator at an effective station. Note that Rick's score is nearly three times that of last year's top single op. The other top single-op scores aren't too shabby either. Herb, K2LNS, operated the new, improved WA2FGK/3 station to a very respectable 85,239 points despite a number of problems inherent in getting a new station up and running. Judging by this year's results, there could be some close competition for 1988.

On the multiop front, W2SZ/1 takes top honors with 308,448 points—up by about 100k from last year. What else is new? The Mt Greylock gang has placed first in the multiop category in all 10 UHF Contests. Other top multiop scores are from outside the Northeast.

It may be a little early to be thinking about a mountaintop trip in August, but

now is the time to mark your calendar for the 1988 UHF Contest on August 6-7. While you're busy building new equipment this winter, why not order up some log sheets and plan to join in the fun!—Mark Wilson, AA2Z

Soapbox

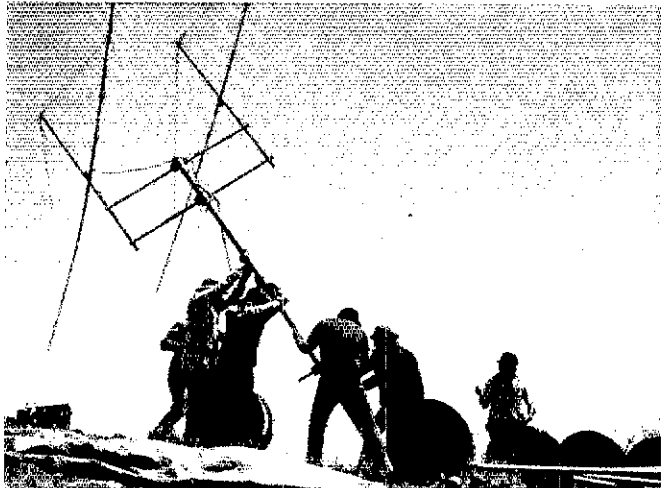
What a great time! I have never tried this one from home. I was pleasantly surprised at the dandy activity (WB2NPE). Two hours into the contest my antenna switch at the top of the tower blew up. It took two hours to get back on the air. This was a fun contest (WA2FGK/3). The usual UHF contest—poor propagation and little activity! 1296 equipment quit after 3 QSOs (K2GK). It's nice to know that almost every contact I made was a new multiplier for someone (WA3YON). Not a very active contest from this neck of the woods. Maybe a few more awards would draw more activity (N2WK). Where were all the W4s in NC and KY? Bands were open to Chicago early Sunday but very little activity was heard from that direction (W3KWH). With antenna at 35 feet, it was hard to tell if I had any propagation. Also, glad to pick up EN63 for a new one! Count me in every year. Best ham radio contest! (N9BX). 600 watts sure made a difference over 80 watts! (KA8MRI/9). First time on 432. I worked 13 grids and 6 states before the contest started! (KA9CQC). Conditions not too good here and activity was down. Had to miss most of the available time on Sunday (W9YCV). This contest is too short, another 8 hours would be about right (WA8VDP). Very impressed with the results on 1296 MHz. The extra power doubled my QSOs from previous years—1½ watts vs 20 watts (KD8SI). Activity level was very good! Wish I could have spent more time in the contest (WA8TJL). Poor conditions and low power made a slow contest (WA8DXG). Below average conditions but fun (K8DW). Lost a relay, blew up my 220 MHz receive converter and had two power connectors break. Hope next year is better (WB8TGY). My rotor went out Saturday night at 7 PM. Lost many hours of prime time. New rotor put on tower at 6:30 AM (N2BJ). Good contest! I wish had more time. Next contest I will have 7/8 Hardline (WB2CUY). Great feeling to work KH6HME (Hawaii) on 432 and 1296 SSB! (W6CPL). Conditions were fair to poor. Local grid-square expeditions were the main attraction (WD5AGO). My first UHF contest—where was

Single Operator Top Five

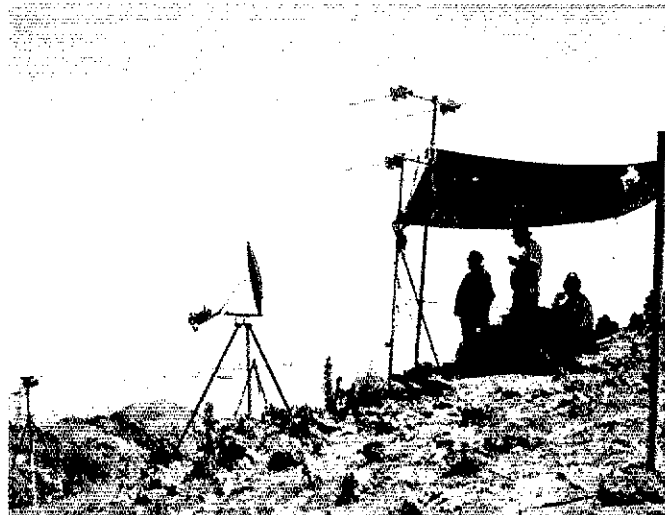
Call	Score
WB2NPE	119,790
WA2FGK/3 (K2LNS,op)	85,239
K2SMN	61,503
WB8BK	41,082
AA2Z	36,456

Multioperator Top Five

Call	Score
W2SZ/1	308,448
VE3LNX	50,424
W3KWH	36,750
KD5RO	26,892
K6TZ	24,534



The multioperator crew of K6TZ raising the 220-MHz antennas during their Island DXpedition to DM04.



The K6TZ (DM04) site for 432 MHz, 1296 MHz and 10 GHz.

everybody? (WB5ZDP). Exciting to work FN10 and FN21 on 2304! Persistence on the part of KQ3R and WA2FGK/3 made contacts possible—lots of attenuation from up there (W1RL). Low activity—the nice weather kept every one outside! (AFIT). No great propagation or DX this time. Where was everybody on 903 MHz and all the other bands?

(N1W). Hope to be on 902 next year (KH6CP/1). Everyone seemed to be at the beach (W6RXQ). Quiet contest except for K6TZ's expedition over to nearby Santa Cruz Island! (K6LMN). Had a very good time working the contest. Looking forward to the 1988 UHF Contest. Hope to be operating more of the UHF bands next year (KH6HME). Only

fair conditions and not much activity (N4HB). Very disappointed in the number of stations on the air—nothing like the June contest. It seemed like everyone was on the local 2-meter repeaters instead of working the contest (WB4CTW). Where was all the activity? We drove 5 hours to put EM97 on and for what? (WD8ISK).

Scores

Score lines indicate call sign, total score, QSOs, multipliers and bands operated (C = 220 MHz, D = 432 MHz, 9 = 902 MHz, E = 1296 MHz, F = 2.3 GHz, G = 3.4 GHz, H = 5.7 GHz, I = 10 GHz, J = 24 GHz, K = 48 GHz) and ARRL Section. Example: WB2NPE had a total score of 119,790, with 78 QSOs and 31 multipliers on 220 MHz, 111 QSOs and 41 multipliers on 432 MHz, 17 QSOs and 10 multipliers on 902 MHz, 46 QSOs and 22 multipliers on 1296 MHz, 11 QSOs and 5 multipliers on 2304 MHz and 1 QSO and 1 multiplier on 3456 MHz. He is located in the Southern New Jersey Section. Call signs of Division leaders and band indicators are printed in bold type.



Atlantic Division

WB2NPE	119,790	78-31-C-SNJ 111-41-D 17-10-9 46-22-E 11-5-F 1-1-G
WA2FGK/3 (K2LNS,op)	85,239	51-25-C-EPA 100-37-D 20-11-9 36-21-E 5-5-F
K2SMN	61,503	43-22-C-SNJ 76-28-D 15-10-9 57-19-E 6-4-F
WB3JYO	16,380	17-10-C-EPA 66-21-D 24-11-E 3-3-E
K2GK	11,985	42-24-C-WNY 37-10-D 3-3-E
WA3YON	10,032	32-15-C-EPA 22-11-D 6-5-9 11-7-E
W2EIF	9,108	23-10-C-SNJ 37-12-D 3-3-9 13-8-E 7-6-E
WA2ONK	5,600	60-20-D-SNJ
WB3FAA	3,174	10-5-C-EPA 12-7-D 5-5-9 7-6-E
WB2JHG	3,000	26-13-D-SNJ 12-7-F
WA3EOQ	2,574	13-8-C-MDC 20-11-D 3-3-E
N2WK	2,574	39-22-D-WNY
K3AKR	2,040	12-6-C-MDC 28-11-D
WB3KRW	1,385	35-13-D-EPA
WB2DNE	1,121	59-19-D-MDC
KU2A	396	3-3-C-WNY 7-7-D 1-1-9
W3KWH (KA3KSD,N3EQP,W3HH, WA3a,FYJ,TTS,VJK,ops)	38,750	39-21-C-WPA 72-29-D 28-19-E 2-1-A
WA2RQC (+W2CRS)	23,085	38-19-C-WNY 43-13-D 23-13-E 2-3-I
Canada		
VE3ASO	9,546	26-19-C-ON 20-14-D 4-3-9 4-4-E 2-2-F 1-1-I
VE3LNX (+VE3NSQ)	50,424	30-23-C-ON 91-25-D 17-16-9 20-17-E 9-7-F
Central Division		
W9UD	11,610	10-8-C-IL 54-27-D 11-10-E
N9BX	4,140	60-23-D-IL
K8MRU/9	2,765	45-20-D-IN

W8UC9	2,648	30-17-D-WI 6-4-E
WB9QBU	2,376	26-17-D-IL 5-5-E
K9GQ	2,322	43-18-D-IL
NCSF	1,530	2-2-C-IL 28-11-D 2-2-E
KA9LDS	1,350	30-15-D-IL
KA9CQC	660	20-11-D-IN
W8YCV	231	11-7-D-WI
Dakota Division		
W8VB	1,428	2-2-C-MN 18-11-D 5-4-E
W8OHU	1,215	17-11-D-MN 5-4-E
Delta Division		
K5UR	14,904	14-11-C-AR 52-31-D 13-12-E
W5RCI	7,320	9-8-C-MS 30-23-D 7-7-E
N4MW	2,880	6-6-C-TN 14-11-D 4-4-E 3-3-F
N4VC	1,035	7-6-C-TN 18-9-D
KD5RO (+KSASZ,W5UC,WA5TKU, WB5LUA,W5AACD)	26,892	12-8-C-AR 52-22-D 1-1-9 24-15-E 6-5-F 3-2-G 4-1-I
Great Lakes Division		
W88BKC	41,082	32-24-C-MI 75-37-D 6-4-9 18-14-E 3-3-F
WA8TXT	34,802	31-22-C-OH 69-32-D 19-14-E 4-4-F 1-1-G
N8BO	14,061	75-32-D-OH 17-11-E
WA8VPD	9,594	16-12-C-MI 46-22-D 2-2-9 6-5-E
KD8SI	7,308	57-19-D-OH 15-9-E
W8BEUU	5,940	16-10-C-MI 24-10-D 5-4-9 8-6-E
WA8TJL	4,620	15-14-C-OH 28-21-D
WB8PAT	4,536	12-8-C-OH 20-13-D 11-7-E
WA8DXG	4,500	60-25-D-OH
N8DGN	3,750	50-25-D-MI
K8DW	3,102	31-17-D-OH 8-5-E
KD8CJ	756	21-12-D-OH
WB8IGY	684	19-12-D-OH
K8ZOK	528	16-11-D-OH
WB8WAO/B	189	9-7-D-MI
WB8TGY (EN73)	120	1-1-C-MI 7-4-D
WB8TGY (EN72)	54	2-2-D-MI 1-1-F
Hudson Division		
N2BJ	32,604	63-16-C-ENY 92-24-D 27-12-E

WA2TEO	11,655	47-16-C-ENY 48-17-D 5-4-E
AB2I	3,240	54-20-D-ENY
K2BJG	2,961	47-21-D-NNJ
WA2EUS	1,512	20-7-D-NJ 11-5-E
WB2CUY	1,188	33-12-D-NJ
W2AWX	1,056	22-8-E-ENY
WA2RUW	693	21-11-C-ENY
K2OVS	405	14-9-D-NJ
N2WM (+NV2D)	4,284	32-17-C-NNJ 31-17-D
Midwest Division		
W8RAP	4,293	33-20-D-IA 10-7-E
W8URP	1,638	7-7-C-MO 19-14-D
W8BQM	450	1-1-C-NE 14-9-D
W8EMS	105	7-5-D-NE
New England Division		
AA2Z	38,456	54-20-C-CT 78-23-D 13-9-9 19-10-E
W1RIL	28,704	33-14-C-WMA 45-14-D 12-8-9 31-12-E 5-4-F
K1PXE	25,080	34-18-C-CT 66-23-D 26-14-E
W1JR	21,756	20-12-C-EMA 54-16-D 12-7-9 17-10-E
AB1U	18,894	28-11-C-CT 50-18-D 9-7-9 30-11-E
K1FO	10,920	104-35-D-CT
AF1T	9,324	27-12-C-NH 35-14-D 4-4-9
WB1FKF	6,723	18-8-C-EMA 23-11-D 7-3-9 4-2-F
KB1I	5,628	29-13-C-CT 36-15-D
WA1JOF	4,650	14-7-C-EMA 18-8-D 7-5-9 9-5-E
AC1J	4,140	28-11-C-NH 34-12-D
N1W	3,588	18-9-C-NH 20-9-D 1-1-9 6-4-E
K1ISW	3,276	19-8-C-WMA 29-11-D 2-2-E
W3HQT	1,785	12-6-C-ME 15-8-D 4-3-F
KH6CP/1	1,344	14-6-C-CT 12-5-D 3-3-E
K1VZI	1,122	13-5-C-EMA 11-4-D 5-2-E
WA1OUB	972	18-9-E-NH
N1W (FN42)	216	3-2-9-NH 3-2-F
K1OYB	126	3-3-C-ME 4-3-D
N1W (FN43)	36	3-2-9-NH
W11NF (K1AKB,op)	18	3-2-D-CT
W2SZ1 (KA1DZV,NC1J,WA1ZMS, KA2sFWN,WRG,KB2ZDGA,N2BNI, NF2B,W2ARQ,WA2sAAU,SCA,SPL,		

WB2sKMY,QCJ,WABUSA,ops)	308,448	111-34-C-WMA 181-43-D 24-14-9 58-26-E 21-12-F 11-8-G 9-7-H 11-8-I 2-1-J
Northwestern Division		
W7PUA	504	4-3-E-OR 2-2-F 2-2-I
W7TYR	459	5-4-C-OR 6-3-D 3-2-E
K7HSJ	240	5-2-C-OR 5-1-D 3-2-E
WB7UNU (CN85)	210	1-1-C-OR 1-1-D 1-1-F 1-1-G 1-1-I
N7DB	36	2-1-C-OR 4-1-D
WA3RMX/7	12	1-1-C-OR
K7AUO (WA3RMX,K7RUN,N7EPE, NA7T,ops)	22,983	14-8-C-OR 23-11-D 7-5-E 10-8-F 5-4-G 3-3-H 9-7-I 1-1-K
W7ADV (CN96) (+WB7KN,WA7GFP)	537	2-1-C-WA 1-1-D 2-2-F 1-1-G 1-1-H 3-3-I
WB7UNU (CN86) (+K8YUM)	648	2-1-C-OR 1-1-D 2-2-F 1-1-G 1-1-H 3-3-I
W7ADV (CN85) (+WB7KN,WA7GFP)	380	3-1-C-OR 1-1-D 1-1-F 1-1-G 1-1-H 1-1-I
W7ADV (CN85) (+WB7KN,WA7GFP)	324	1-1-C-OR 1-1-D 1-1-F 1-1-G 1-1-H 1-1-I
WB7UNU (CN76) (+K8YUM)	54	1-1-C-OR 1-1-D 1-1-F
WB7UNU (CN75) (+K8YUM)	3	1-1-D-OR
WB7UNU (CN74) (+K8YUM)	3	1-1-D-OR
WB7UNU (CN84) (+K8YUM)	3	1-1-D-OR
Pacific Division		
W6RXQ	1,575	5-5-C-SCV 16-7-D 5-2-E 1-1-F
ND7M	1,104	89-16-D-NV
K6LMN	1,092	14-5-C-SVJ 12-7-D 1-1-E
KH6HME	315	13-5-D-PAC 1-1-E

Roanoke Division		
K4QIF	13,588	71-27-D-VA 24-11-E
K4LHB	5,742	34-21-C-VA 19-8-D 7-4-E
N4RA	3,888	18-9-C-VA 38-15-D
N4HB	2,888	12-8-C-VA 34-13-D
N4MM	1,782	33-18-D-VA
WB4CTW	1,280	1-1-C-VA 29-13-D
W4DO	720	24-10-D-VA
WD8ISK (+WA8OGS)	12,818	22-16-C-WV 47-23-D 10-9-E
WB2ONA/4 (+KA2ZJI,N2CYM)	1,938	20-11-D-NC 7-5-E 3-1-I
Rocky Mountain Division		
W8KJY	3,060	3-3-C-CO 17-10-D 10-9-E 1-1-G
Southeastern Division		
WS4F	5,490	11-9-C-GA 76-13-D 1-1-9 7-5-E 2-2-F 6-5-D
WB4SLM	188	2-2-C-GA 6-5-D
Southwestern Division		
W6CPL	10,881	29-1-C-LAX 36-10-D 3-3-9 17-8-E 1-1-F 2-4-I
K8IBY	2,108	15-7-C-ORG 24-11-D
K8BXG	1,944	37-6-C-LAX 9-3-D 4-3-E
W8OYJ	378	2-2-C-SDG 11-4-D 1-1-I
WB7OHF	45	5-3-C-AZ
K6TZ (W1UQU,K6DDO,N6KTH,WA6s MRZ,VNN,WB6OBB,WB6SKMO,ops)	24,534	166-8-C-SB 2-2-9 18-6-E 5-3-I
N8KV (DM16) (+AF6O,N8DIN,WA8NKL)	1,092	2-2-C-ORG 18-7-D 1-1-9 5-4-E
N8KV (DM15) (+AF6O,N8DIN, WA8NKL)	188	5-3-D-ORG 1-1-9 3-3-E
West Gulf Division		
W5SAGO	4,958	27-17-D-OK 16-11-E
K5SW	4,860	8-9-C-OK 21-12-D 12-9-E
WB5ZDP	3,000	50-20-D-NTX
AASW	495	15-11-D-NTX
DX		
N2EA/MM2 (+KA2VAD,N2AHN)	8,670	19-11-C-DX 38-14-D 14-9-E

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in QST of prizes of any kind and games of chance such as bingo.

Indiana (Greenfield)—Dec 6. Sponsor: Hancock ARC. Time: Set-up 6 AM, 8 AM public. Place: 170 east of Indianapolis to State Rd 9, south of SR9 to US40, east of US40 to Apple Street, 1/2 mile north to 4-H Fairgrounds on the left. Talk-in: 145.33 MHz or 443.25 MHz. Admission: \$3 advance, \$3.50 door. Contact: Wayne Taylor, K9BRF, 614 N State St, Greenfield, IN 46140 tel 317-462-6759.

Indiana (South Bend)—Jan 3. Sponsor: Repeater Valley Hamfest Committee. Place: Century Center downtown, US 33, one-way north between St Joseph Bank Building and the river. Four-lane highways to door from all directions. Talk-in: 52/52 and area repeaters. Tables: \$5/5 ft round; \$15/8 x 2.5 ft rectangular; \$20/8 ft wall locations. Contact: Wayne Werts, K9IXU, 1889 Riverside Dr, South Bend, IN 46616, tel 219-233-5307.

Wisconsin (Milwaukee)—Jan 9. Sponsor: West Allis Radio Amateur Club. Time: 8 AM-3 PM. Place: Waukesha Co Expo Center Forum, I-90 to Co J,

south to FT, west to Expo. Features: Amateur exams given (write for details), food available. Admission: advance \$2, door \$3. Tables: (4 ft) \$3 advance, \$4 at door (electrical outlet \$5, as available), dealers welcome. Contact: WARAC SWAPFEST, PO Box 1072, Milwaukee, WI 53201, SASE please.

Attention Hamfest and Convention Sponsors

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your Division Director. For conventions, approval must be made by your Director and, additionally, by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541 ext. 283.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

Coming Conventions

February 6-7

Southern Florida Section, Miami

February 26-28

Ohio State, Cincinnati

ARRL NATIONAL CONVENTIONS

Sept 9-11, 1988—Portland, Oregon

June 2-4, 1989—Dallas-Ft Worth, Texas

Special Events

Conducted By Rus Wilson, N7HWC
Assistant Contest Manager

Bethlehem, Connecticut: The Hen House Gang ARC will operate Award Station W1FHP during the month of December. Operation will be all modes, 10-80 meter General bands and 40-meter Novice CW. You may also send your Santa letters to us. For a special QSL, send QSL and a first class stamp to Robert O'Neil, W1FHP, Hard Hill Rd, Bethlehem, CT 06751.

Tarboro, North Carolina: The Raleigh ARS and the Tarboro ARS will operate W4DW Dec 5 to commemorate the Bicentennial of the NC Constitutional Convention in the town of Hillsboro, NC. Suggested frequencies: lower third of General phone bands on 20, 40 and 80 meters. Novice portion of 10 meters from 1500Z to 2100Z. Send a no. 10 envelope and two units of postage for a special Bicentennial QSL and pocket copy of the Constitution to W4DW, Box 17124, Raleigh, NC 27619.

Newcastle, Delaware: The First State ARC will operate a special-event station from the Old State Capitol on Dec 5-6 for the 200th anniversary of the signing of the Declaration of Independence. Suggested frequencies: lower 25 kHz of the 80-15 General phone bands and Novice 10-meter phone. For certificate, send large SASE to FSARC, PO Box 1050, Newark, DE

Homestead, Florida: The Everglades ARC will operate W4SVI to commemorate the 40th anniversary of the Everglades National Park on Dec 5-6. Suggested frequencies: SSB—during the evening 3.93, 7.23 and during the day 14.33, 21.33, 28.33; CW—during the evening 3.53, 7.03 and during the day 14.03, 21.03; CW Novice—during the evening 3.73, 7.13 and during the day 21.13. For an unfolded certificate, send two stamps to PO Box 113, Homestead, FL 33090.

Athens, Ohio: The Athens County ARA will operate WD8OXK on Dec 12-13, 1500Z-2300Z each day, to celebrate the 200th anniversary of the Northwest Ordinance, at Ohio University, first public university in the territory. Operation will be in the lower portions of the General 80, 40, 20, 15 and 6-meter bands and Novice phone on 28.400. For certificate, send QSL and large SASE to Jeffrey White, WD8OXK, PO Box 73, Athens, OH 45701-0073.

Williamsport, Pennsylvania: The West Branch ARA will operate a special-event station the week of Dec 12-18 to commemorate the anniversary of the Constitution. Suggested frequencies: 80-10 meter General phone and CW bands and 10 meter Novice phone. For commemorative QSL, send QSL and SASE to W3AVK, PO Box 3002, Williamsport, PA 17701.

Christmas, Florida: The Coronado Wireless Association will operate K4HML Dec 19-20, 1400Z-2200Z. Operation will be in the lower 10 kHz of the 10, 15, and 20 meter General bands and the lower 25 kHz of the Novice 10 meter band. For QSL, send no. 10 SASE to K4HML, PO Box 1, Edgewater, FL 32032. If you wish to have mail post-marked Christmas, Florida, send envelopes with proper postage before Dec 15.

Bethlehem, Pennsylvania: The Delaware Lehigh ARC will operate W3OK Dec 19-20, 0400-1600Z each day, to commemorate the Christmas City. Suggested frequencies: 3.925, 7.250, 14.325, 28.425. Send QSL and SASE to W3OK, Greystone Bldg, Nazareth, PA 18064.

Christmas, Florida: W1TRB will operate Dec 23-24, 1200-2400Z each day, to celebrate the Christmas season. Suggested frequencies: 3.900, 7.213, 14.300

and 28.400. For certificate and QSL, send SASE to Lou Hoekstra, W1TRB, Box 430, Christmas, FL 32709.

Thomaston, Connecticut: The Northfield Emergency Amateur Team will operate Number One Christmas Carol (N1CC) Dec 24-25. Suggested SSB frequencies: 1.850, 3.900, 7.230, 14.250, 21.350 and 28.450. For special QSL, send SASE to N1CC, 454 High St Ext, Thomaston, CT 06787.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by Jan 1 to make the March issue. Please include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9 x 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

DECEMBER

1

West Coast Qualifying Run, 10-35 WPM, at 0500Z Dec 2 (9 PM PST, Dec 1). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3590 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

4-6

ARRL 160 Meter Contest, Nov *QST*, p 84.

6-7

TOPS Activity Contest, Nov *QST*, p 85.

12

W1AW Qualifying Run, 10-35 WPM, at 0300Z Dec 13 (10 PM EST, Dec 12). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Dec 1 listing for more details.

12-13

ARRL 10 Meter Contest, Nov *QST*, p 83.

13

ARCI QRP Homebrew CW Sprint, Nov *QST*, p 85.

27

Canada Contest, sponsored by the Canadian Amateur Radio Federation, from 0000Z to 2400Z, Dec 27. Everyone works everyone, 160-2 meters, phone and CW. Entry classes: single op, all bands, mixed mode; single op, all bands, CW; single op, all bands, phone; single op, single band, mixed mode; multiop, single transmitter, all bands; multiop, multitransmitter, all bands. Single ops must use their own stations. Work stations once per mode on each band. No crossmode QSOs allowed. Exchange name, RST, serial number starting with 001 and province/state/country. VE1 stations must also send their province. Multi-multi stations use separate serial numbers for each band. Count 10 points per VE QSO, 4 points for other countries. 20 point bonus for any CARF station using TCA or VCA suffix. Multiply by total VE provinces worked per band on each mode (VO1/VO2 VE1-PE1 VE1-NB VE1-NS VE2-8 VE0 VY1). Suggested frequencies: 1.810/1.840 3.525/3.775 7.025/7.070/7.155 14.025/14.150 21.025/21.250 28.025/28.500 50.040/50.110. Mail logs within 30 days (include SASE or SAE/IRC for results) to CARF Contest c/o Norm Waltho, VE6VW, Box 1890, Morinville, AB T0G 1P0, Canada.

29

W1AW Qualifying Run, 10-35 WPM, at 1400Z (9 AM EST) Dec 29. See Dec 1 and 12 listings for more details.

31-Jan 1

ARRL Straight Key Night, 24-hour period UTC (from 7 PM EST Dec 31 until 7 PM EST Jan 1). This is a friendly meeting on the air using straight keys. Suggested areas of operation of 80, 40 and 20 meters are 60 to 80 kHz from the lower band edges and 10 kHz from the lower Novice band edges. When participating in SKN, use SKN instead of RST preceding the three-digit report to clue in passersby. Following SKN, send a list of stations worked plus your vote for best fist heard (not necessarily one you've worked) during that period. This is not a contest; quick contest-like exchanges are discouraged. Vote also for the most interesting QSO. Mail your report by Jan 10 to ARRL HQ.

86 **DST-**

JANUARY

2-3

World SSB Championships, sponsored by 73. 10-meter contest 0000Z Jan 2 to 2400Z Jan 3, 15-meter contest 0000Z-2400Z Jan 9, 20-meter contest 0000Z-2400Z Jan 10, 160-meter contest 0000Z Jan 16 to 2400Z Jan 17, 40-meter contest 0000Z-2400Z Jan 23, 75-meter contest 0000Z-2400Z Jan 24. There are six separate contests. Work stations once in each contest. SSB only. No cross-mode QSOs. Single op, single transmitter and multiop, single transmitter classes. Exchange signal report and QTH (state, province or territory for W/VE stations; DX country name for others, including KH6 and KL7). 10-meter Novice, exchange signal report, state and serial number. There is a 5 point QSO bonus for each 10 meter Novice contact. Count 5 points per QSO with own continent, 10 points per QSO other than own continent. Multiply by number of states (48 max), VE provinces/territories (13 max) and DX countries worked (excluding US and Canada). A 100 QSO point penalty for each duplicate contact found in log. Official entry forms are available from the sponsor. Mail entries by Feb 18. 10, 15 and 160-meter entries go to Russ Blair, KE7KF, 2113 E 10095 S, Sandy, UT 84092. 20- and 75-meter entries go to Ron Johnson, WE7H, 68 S 300 W, Brigham City, UT 84302. 40-meter entries go to Dennis Younker, NE6I, 43261 6th St E, Lancaster, CA 93535.

6

West Coast Qualifying Run, 10-35 WPM, at 0500Z Jan 7 (9 PM PST, Jan 6). See Dec 1 listing for more details.

9

15-Meter World SSB Championship, see Jan 2-3 listing for more details.

9-10

Hunting Lions in the Air Contest, sponsored by Lions Clubs International, from 0000Z Jan 9 until 1200Z Jan 10. Open to all radio amateurs worldwide 80-10 meters (excluding WARC bands), phone and CW. Phone and CW count separately. Categories are single op and multiop, single transmitter. Multiop must be club or association of ham radio operators. Exchange signal report and serial number. Lion, Lioness and Leo club members will also send their club name and Lion District. Work stations once per band and mode. QSOs with stations on the same continent count 1 point; QSOs with stations on other continents count 3 points. Bonus points: 10 points for QSOs with Lion, Lioness or Leo Club from different countries; 20 points (5 points for Brazilian stations) for QSOs with Rio de Janeiro Arpoador Lions Club members. 20 points (5 points for US stations) for QSO with the Melvin Jones Memorial Radio Club of US. 25 points for QSO with Arpoador Official Station, PY1LCA (does not apply for the Rio de Janeiro Arpoador Lions Club or Melvin Jones Memorial Radio Club). No multiplier. Mail logs by Feb 15 to Rio de Janeiro Arpoador Lions Club Contest Committee, Rua Oto de Alencar 32, Apt 301, 20271 Rio de Janeiro, RJ, Brazil, South America.

10

W1AW Qualifying Run, 35-10 WPM, at 0300Z Jan 14 (10 PM EST, Jan 13). See Dec 1 and 12 listings for more details.

20-Meter World SSB Championship, see Jan 2-3 listing for more details.

ARCI QRP Winter Fireside Sprint, phone

16-17

Texas QSO-Party

AGCW-DL QRP Winter Contest, sponsored by the DL Activity Group CW, from 1500Z Jan 16 until 1500Z Jan 17. CW only, 160 through 10 meters.

Classes are: A—less than 3.5 W input (2 W out), single operator; B—less than 10 W input (5 W out), single operator; C—less than 10 W input (5 W out), multioperator; D—QRO stations, more than 10 W input (5 W out), to contact QRP stations; E—SWL. Class C stations may operate full time; classes A, B, D and E must break for 9 hours, which can be taken in 2 segments. Exchange RST, QSO-number and input, adding x if crystal controlled. QRO stations add /QRO. Operation is limited to one class per band, VFO or crystal-controlled. No more than 3 crystals may be used on one band. Contact each station once per band. Count 1 point for QSO with own country, 2 points for QSO with own continent, 3 points for QSO with DX (outside own continent) per DXCC list. JA, PY, VE, W and ZS call areas count as separate countries. Count 1 multiplier for each country and 1 for each DX QSO. Multiply points by multipliers on each band, then add band results. Crystal-controlled stations double total result. Submit a separate log for each band. Logs must be received within 6 weeks of the contest. Send logs (include 1 IRC for results) to Siegfried Hari, DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, Fed Rep of Germany.

Michigan QRP Club CW Contest, sponsored by the Michigan QRP Club, from 1500Z Jan 16 until 1500Z Jan 17. Three entry categories: 1 W or less output power; 5 W or less output power; more than 5 W. Exchange signal report, QTH (state, province or country) and MI QRP no. (power output if non-member). CW only. Work stations once per band. Suggested frequencies: 1.810 3.560 3.710 7.040 7.110 14.060 21.060 21.110 28.060 28.110. Count five points per member QSO and one point per non-member QSO. Multiply by the number of states/provinces/countries worked per band. Multiply total by 1.5 if using battery or natural power. Mail logs (include SASE for results) to be received no later than 6 weeks after the contest to Chris Hethorn, KM8X, 6818 Meese Dr, Lansing, MI 48910.

160 Meter World SSB Championship, see Jan 2-3 listing for more details.

21

W1AW Qualifying Run

23

40-Meter World SSB Championship, see Jan 2-3 listing for more details.

23-25

ARRL January VHF Sweepstakes, this issue, p 80.

24

75-Meter World SSB Championship, see Jan 2-3 listing for more details.

24-25

Winter Classic and Homebrew Radio Exchange

29-31

CQ World Wide 160 Meter CW Contest

30-31

YL-ISSB QSO Party, CW
REF French Contest

30-Feb 7

Novice Roundup

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by Jan 1 to make the March issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, Bill Gillespie, VE6ABC--A/SM: VE6AMM... SEC:2C: VE6AFO. OOC: VE6TY. STM/DEC/SM: VE6ABC. Bill, VE6ABC, returns from CHRL Board Meeting in Toronto at the end of August. (Nice to meet with joining FRP, Larry Price, WPA, again), Alberta amateurs gathering for the fall season with final checks of their antennas before winter arrives. Ham meetings and fall amateur classes getting underway. Personal traffic totals this month reflect the many messages handled by local amateurs during our tornado over the 1st of August weekend. Net Manager of ATN, GUS, VE6GUS quits. Totals for this later. Traffic: APSN QNI 1223, QTC 23, Informal 73. Personal totals: VE6NC NARC Club Call, 2200, VE6BCF 411, VE6AVP 400, VE6WQ 229, VE6ADX 202, VE6LEN 200, VE6ER 171, VE6AY 150, VE6MU 140, VE6ESE 70, VE6DA 22, VE6VK 8, VE6AG 6, VE6ON 3, VE6YV 2, VE6AVZ 1.

BRITISH COLUMBIA: SM, Ernie Savage, VE7FB--BCENet, 3650 kHz at 0300 UTC Net Manager Ferdi VE7EJU reports check-ins 737 QTC 295, British Columbia Public Service nets meet nightly at 0130 on 3729 kHz. Net Manager Jim, VE7LRO reports 4293 check-ins High 182 Low 80. Traffic for BCEN steady but would like more. Hope check-ins will pick up during fall and winter. Thanks to George, VE7DI for NCS duties this summer. Welcome back Shirley, VE7FME, as NCS also Wayne, VE7BV. Also my sincere thanks for all the work Tom, VE7BNI, does for the net. The SM for BC and family attended Hams Happening at Parksville which was a grand turn out. Of course the SM some how became the bartender both days with his son, James. We hope as the winter sets in and the clubs have their change of officers they do let us know. Traffic: VE7BNI 266, VE7EJU 190, VE7EJM 111, VE7BNI 78, VE7ANG 72, VE7FB 57, VE7XA 40, VE7CCU 39, VE7EGM 27, VE7DJ 8, VE7BZI 4. (Aug.) VE7CCJ 33.

MANITOBA: SM, Jack Adams, VE4AJE--International Hamfest Peace Gardens second weekend in July 1988. Why write about it now? Now is the time for planning to attend this event at the beautiful Peace Garden USA/Manitoba. This upcoming year will be our 25th. We want to see a flea market not seen before. So bring your odds & ends and join us as we celebrate 25 years of get together for fellowship and swag. Our September reports: MTN CW Net 3650 kHz, nightly at 2330 z. Sessions 18, QNI 114, QTC 24, MMWV net: Sessions 30, QNI 445, QTC 33, GRRL evening phone net: 3759 kHz, 0000 z. sessions 29, QNI 815, QTC 29. WRS net 2 meters, QNI 450, 9 sessions.

MARITIME-NEWFOUNDLAND: SM Leigh Hawkes, VE1GA--SEC: VE1JL. SM: VE1BO. Seasons Greetings to all. FD groups VE1ND and VE1FO placed in the top 10 for Canada. Number of VEs attending Deerfield, NH fleamarket continues to grow. Interested in having CHRL News Bulletin aired on your local net? Contact BM VE1BQO for OBS appointment. VE1 callbooks still available - contact VE1AMS. VE1CJW reps Amateur Radio at Provincial Scott Jamb. VE1ASW moved to USA. DXers, look for VO1KSYK from the Galan Heights, 39 new calls reported from VO land which is also well rep'd in contests by VO1S SA MF, QP, QJ and VO2AC. VO2CP moved to VE3. QNXA HF Group is doing a improve repeater link. Our BM and wife visited G land on vacation. Heard on CW-VE1SH. SK: VE1S DC, LO, AFN, BER, VO1KQ. Hosp: VO1S CW, QG, DB, RI and VE1BC. Pse keep your SM updated with news if you wish to see it in this column. Traffic: VE1BK 85, VE1VX 17, VE1BPM 14, VE1CK 5, VE1ALU 5, VE1BT 4, VE1DM 3, VE1WA 3, VE1WA 3, VE1ABV 3.

ONTARIO: SM, Larry Thivierge, VE3GT--A/BM: VE3GT. SEC: VE3GV. STM: VE3CYR. TC: VE3EJO. Welland County ARC held a successful amateur radio display and drive for prospective amateurs at the Port Colborne Mall. Their Club's new executive consists of VE3PSE, Pres; VE3VLT, V-Pres; K6GMU, treasurer; VE3TUR, Sec'y; VE3MX, Bulletin Editor; VE3PTZ, program chairman. VE3EAM and his xyl recently won a bridge championship. Equipment has been installed on the VE3NFH repeater tower in North Bay which will allow local amateurs to hear activity from repeater VE3MUS in Dwight, retransmitted on 147.51 MHz. VE3AZ has relocated to Peterborough from Bancroft. CHRL officials were out in full force at the Ottawa ARC: President VE3CDM spoke on the status of the upcoming Soviet/Canadian ski trek taking place in the Arctic in February 1988. The ski team, with two Soviet amateurs, will be using a 20 watt transceiver on 20 meters and communications will be conducted by amateurs on Elsemere Island; VE3FAS, ECN Net Manager was the guest speaker and spoke on the NTS and traffic handling including packet radio applications. Phil was introduced by long time NTSer VE2SD; and VE3FN Ontario Director was also in attendance. VE3NVH, daughter of VE3MHP came home from the Handicapped Olympic Games in England with several silver medals. At the Toronto Handicapped Olympic Games she swam to four gold medals and one silver. Our congratulations to Irene. VE3BLP has relocated to Ottawa from Chilliwak. VE3ZK developed and circulated via Canada Post, a survey among amateurs in the greater London area on behalf of the London ARC. Out of 387 questionnaires sent out, 181 were returned. The results were contained in a 30-page official report to the Club's Board of Directors and were most interesting. From all of your Section officials and appointees, may I wish each and everyone a Merry Christmas and best wishes for a happy and prosperous 1988. Traffic: VE3GSQ 328, VE3GUP 191, VE3QSD 167, VE3OCF 153, VE3DRN 151, VE3GMN 125, VE3CZ 102, VE3AM 92, VE3GQ 76, VE3ET 58, VE3EAM 40, VE3BUD 40, VE3J3F 33, VE3FQJ 30, VE3AJN 20, VE3BAJ 18, VE3NVJ 16, VE3FGU 15, VE3KCZ 14, VE3BDM 8.

QUEBEC: SM, Harold Moreau, VE2BP--STM: VE2EO. BM: VE2LE. QC: VE2ADN. The ARRL Executive Committee meeting was held in Montreal on Labor-Day weekend. Guests from CHRL at the Sunday lunch, VE3CDM, VE3GRO, VE2S: VW, ZJ, AX, ED and BP. Congratulations to Jean-Serge, VE2ED, who was named 1987 CHRL Amateur of the Year. Season's greetings to all. Cœur qui desirent obtenir le "NEW WORLD OF AMATEUR RADIO" on VHS or Beta, contacteur votre SM. Milliers souhaits de la saison à tous. Traffic: VE2BP 53, VE2WH 43, VE2EC 17.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WY--SEC: KC3TT. DEC: N3FDL and K3PFW. EC: KC3JM KA3LNC WA3PHT

VA3VJD. STM: KA3GRQ. PIO: WB3DJP. SGL: AF3R. PSHR: K3JL. Nanticoke ARC purchasing Ameco manuals for use in the Novice classes. A note from DARC newsletter states that it was not for the steady few, the club would fall apart. It seems this holds true for all the clubs. Please support your club. SARA has been very busy with communications for Senior day, a triathlon and Crok walk this month. Kent ARC has the 147.195 repeater back on the air. WARE has information net on Mondays & Thurs at 147.225. DIN stations 320, traffic 34 in 22 sessions: DEPNS totals 43 traffic 10 in 4 sessions. Traffic: W3QQ 111, KA3GRQ 30, WA3WY 30, WB3DUG 17, W3FEG 17, K3JL 16, K3YBW 14, W3PWO 8.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM--ASM: WA3PZO, KA3A, KQ3B, K3ZFD. SEC: KB3YS. ACC: KC3QB. OOC: W3IS. SGL: WA3IAO. STM, BM: KB3UD. PIO: WA3AQ. TC: W3FAF. Hope that whatever holidays are celebrated at your house will be happy ones! How about giving a membership in ARRL to a special ham friend this year? Penn-Ham RC is our newest Special Service Club. Our new Official Observer Coordinator is John Obradovich W3IS, and WB3DNA has qualified as an OO. After over 9 years as Section Emergency Coordinator, Bob Josuweit WA3PZO has turned that position over to Bob Stanhope KB3VS. Although WA3PZO correctly credits our DECs, ECs, OE's, and ARCS volunteers for the excellence of DEPAs ARES, let's credit him for first-rate leadership. He'll remain as an Assistant SM. Best wishes to our new SEC, even if the close male jokes about my cooking! K3DSM, PARA packet BBS sysop, is a new Official Bulletin Station. Our Official Relay Stations are ready for the usual December stationery. Net managers AA3B, WA3EHD, and WB3EPU invite you to check into Section nets: EPA 3610 kHz Daily 7 & 10 PM AA3B, Mgr. EPAEPTN 3917 kHz Daily 6 PM WA3EHD, Mgr. PTTN 3610 kHz Daily 8:30 PM WB3EPU, Mgr.

Please use the 'LT' command on your local packet BBS to find NTS holiday traffic that you might be able to deliver or QSP. W3BUR says he was appointed an ORS in 1930, so I guess he's handled a zillion ARL SIXTY ONE's by now. Warminster ARC's club call is A3DL. East Brant Peabody's League for the month of August based on over 1000 organizations from their Grande Fair demo. In ARES news, WB3IFX is now Emergency Coordinator for Bucks Co. Thanks and 73 to K3WKK, who has stepped down as Cumberland Co. EC and to WA3TFX, formerly EC for Bucks. We are happy to welcome Maple Newtown and Columbia-Montour clubs to ARRL Affiliation. League affiliation doesn't cost a club any money but brings many benefits. Write ARRL HQ for information. Time to mention the friendly reception your SM received at Holmesburg, Ephrata Area, Delaware-Lehigh, and Murgas club meetings this fall, plus the York and PaC Rats hamfests. Need a new activity for 1988? TV committees are a worthwhile project. We encourage our Assistant ICs to join or form a TV committee in their home clubs. Be sure to let FCC know you're ready to help. Happy (late) Bob birthday wishes to PIO Bill Boyer WA3MO. Nets (August QNI/QTC): MARCTN 210/48, MARCARES 105/19, DBARES 59/10, DBARES 75/12, DSESN 273/83, DBARES 77/8, EPA 396/10, EPAEPTN 449/141, PTTN 222/86. Traffic (August): N3AZW 641, WA3DFU (Warminster ARC) 420, N3CD 170, N3COY 169, N3DRM 126, K3DAA 116, K3TX 65, KA3DL 60, KB3UD 55, WK3AG 12, WK3JK 43, AA3B 40, K3WPI 95, W3ACN 29, K3VM 25, W3DP 24, WA3CKA 22, N3EFW 16, K3UR 16, W3VA 12, W3ADE 12, W3CL 12, KQ3M 12, KB3FW 11, W3FAF 7.

MARYLAND-DC: SM, John A. Barolet, KJ3E--Much good news and MDC organizational progress! W3FZV, SM-elect and I have been in continual communication working on a smooth transition from my tenure as SM to him. I imagine all of our readers will be glad to have me off the soapbox. WONT YOIU? Chevy Chase will soon be getting the bushel baskets full of ARRL and MDC mail that have been arriving at California, Maryland, for the last two and one-half years. WA3YLO has been appointed Affiliated Club Coordinator (ACC) and is now solving all the interface problems between MDC affiliated and special service clubs and ARRL HQ. We appreciate his joining the MDC ARRL leadership. N3CV, in Frostburg, is the latest Assistant Technical Coordinator (ATC) appointee, thanks to NF3X's recruiting. Speaking of ATC operations, N3CDR, Rockville ATC, is organizing the Washington suburban area ATCs and preparing an article about MDC ATCs for AUTO-CALL, KC3ZJ, in Kensington, is the latest Official Observer (OO) appointee; he is the second OO appointee in the last two months. Can you devote one hour or more a week to LISTENING to the amateur band of your choice and alerting amateur operators, by mail, of station or operating deficiencies? OOs help all of us to maintain decent ham bands. Contact KJ3E (page 8, QST) for appointment information. December is the traditional big traffic month; if you are not a regular traffic operator check into a traffic net, send several "holiday greeting" messages to relatives and friends, and get the feel of working with the largest ARRL field organization, NTS, the National Traffic System. Your traffic will move rapidly to wherever third-party (your addressee) messages are legal, which is all of North America and much of the rest of the world. I'll be happy to mail full information about the NTS to you, no cost or obligation. Write: HC: NTS: NetMGR/QND/QTC/QNI: MSN/KC3Y 30/140/366, MNNP/N3EGF 31/128/614, WRP/NO/WB3F6F 205/147/38N, BEPN/N3EGF 43/37, MDD/VW3A 60/205/516 (TOP BRASS W3QDQ/92 W3FA/B4 KC3Y73 K3NNI/70) PSHR: N3EGF 100, W3FA 94, K3NNI 81, KC3Y 80, W3YVQ 78, WA3UJZ 77, K3KF 61. Traffic: N3EGF 125, W3FA 114, N3DE 95, KC3Y 71, WA3UJZ 71, K3KF 68, K3JE 67, WB3BM 65, K3NNI 57, WA3YLO 46, NC3Z 43, W3LDD 42, W3FZE 38, W3YVQ 35, K3EBZ 27, K3TJ 26, N3P3 26, K3ORW 23, WA3WDT 23, W3DDU 16, K3XU 15, WA1QAA 10, K3AGY 4, W3BWT 3, K3DW 2, W3ZWN 1.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB--ASM: NZCER. SEC: K2QJL. STM: WB2UVR. ACC: K2JXE. TC: N2BQT. PIO: VACANT. SGL: VACANT. BM: WB2JVB. OOC: WA2HEB. VACANT: K2JF, KA2RJA and WB2MNF. Congratulations to Sam, KX2W, on finishing in FIRST PLACE in our section in the New Jersey QSO Party that was held this past August. By the time you read this, Sam should have received his trophy that was donated by the SNJ section staff. The Old Barney ARC will be conducting V tests on December 15 at the Ocean County Resort, in Ocean County, NJ. Doors open at 6:30 PM and tests begin promptly at 7. For further information, please contact Wm. Mays, WA2TKA, 82 Shelley Lane, Bayville 08721. By the way, if you

should experience a TVI/RFI problem that you cannot resolve, don't forget to contact our section's resident expert, John Fisher, K2JF. More than likely, John will be able to tell you what steps you should take. John's address is 538 Wesley Ave., Pitman 08071. I hope all of you and your families have a very safe and happy holiday season. Until next month and next year, 73. Traffic: WB2ZJF 296, WB2UVB 223, N2CER 39, KA2CQX 30, N2AEP 4, WA2HEB 3.

WESTERN NEW YORK: SM, William W. Thompson, WZ2MTA--Appointments: (ORS) K2DNN, (EC) K2ZOD Cayuga; (PIA) N2AGF KA2BO N2BJH K2DTP W2GIR K2KLV K2KWK WA2OEP WA2ODV WA2FRX K2ZYV. Presently 112 stations hold 141 appointments. Congrats: Jefferson County Ham-of-the-Year WB2ACO. Emergency Communications Commendation to NF2ZJ in Monroe County. HAMFESTS: 1988 Rookies Minifest Feb 27; Southern Tier Clubs May 7; Rochester State/Division May 21-22; Rome June 5; with more to be announced later.

Table with columns: NY NAME, MOD, FREQ, TIME, DAY, MGR, QNI-QSP-QND. Includes entries for NYSB, NYSR, NYSM, WDNM, NYPON, Empire 6W, LCARES, NYSPTEN, OCTENIE, Q Net, STAR, WDNJE, NYSIE, BLVSM, JCRACN, YHF THIN, CNYNTN, OCTENL, WONDL, NYSJL.

*NTS nets. September BPL: KA2UBD NJ3V. Public Service Honor Roll: N2ABA N2EJA N2EVG WA2JUP WFRZ NNZ WZ2MTA WB2NLU WB2WO WB2BRA N2DS KA2UBD NJ3V NE2W KA2ZNY. The Eastern Area Staff of the NTS meets in October, more in next month's column. Congratulations to WA2SPJ, new manager of Cycle 3 of ENL. Joe has one foot in NY, one in VT and one in Quebec at Alburt, VT, and plans to relocate the KD1R packet station there. State legislation (proposed) re Construction of Towers under Article thirty-nine of the Environmental Conservation Law has stalled in committee in Albany. This does not mean that the Assembly and Senate bills are kaput, but no action is expected this year. SGLs WB3CJF for WNY and KB2HY for ENY are teamed to assist the Legislature at the committee level in any way needed in the interest of Amateur Radio. If you wish to assist in this matter, get in touch with SM WZ2MTA. At this time, it is left that assistance and cooperation in Albany are needed more than letters to your state representatives. However, it is your call. Seasons Greetings and a Happy New Year! Traffic: NJ3V 685, KA2UBD 513, WZ2MTA 405, WB2WO 400, N2EJA 374, WA2FJ 252, WFRZ 232, N2ABA 196, N2DS 162, WB2QIX 144, NN2H 130, KA2QOO 117, WB2RA 109, NE2W 106, N2EVG 101, KA2ZNY 68, WB2JUH 68, KA2BDB 32, NE3B 28, AF2K 26, W2P2S 24, NY2V 21, N2FBK 16, W2GJ 16, K2UTL 16, N2DYT 14, K2QR 12, AF2A 10, WB2NLU 9, WA2OEP 8, KA2TWY 5. (Aug) K2VR 1. (Jul) K2TR 2.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB--SEC: WA3FVN. STM: K3SMB (temp). BM: KC3ET. TC: N3EFN. OOC: KX4V. ACC: AK3J. SGL: W3DWT. PIO: N3DOK.

Table with columns: NET, QNI, QTC, SESS, KHZ, TD, MGR. Includes entries for WPAACW, WPAFTN, KFN, PPN, WPA2MNT, WPA2MTN, WPARITY7.

It is with regret I must announce two Silent Keys, K3CWL and WB3JIF our condolences to their families. I also must apologize to WA3THT for misprinting his call on several reports. The new officials for 87-88 season are Pres. WA3FVS, V.P. WB3BS, Treas. KA3AVB, Checker, N3DOS, Board members W3GVJ, N3BPB, KA3LNG, KA3JMU, K3HSE and K3SGL, Historian W3QVM. The Breeze-shooters net now meets on 29495 kc to accommodate Novices and Technicians. Certificates are issued free for working ten members. The city of Pittsburgh and Allegheny County are combining forces for disaster operations due to several major spills of hazardous materials. The plan includes all emergency agencies. I am asking the various section-level appointees to report monthly so I can know if they are still interested in their appointments. The SEC, ACC, OOC and BM do, but I do not hear from the others. If you are not interested enough to report regularly and follow the duties described for the appointment, I would like to find someone else to appoint. Sept. Traffic: KC3T 32Z, N3E6M 293, W3QVM 250, W3NGO 102, N3AES 95, N3CZV 88, N3FM 83, WA3UNX 49, WB3AFL 44, K3CGO 40, WA3BWB 39, WA3QNT 26, KA3OEM 19, K3SMB 19, K3SAC 18, K3LTV 18, W3LRL 16, W3KUN 17, KA3EGE 7, W3SN 5. WANTED: AN STM!

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EQ--SEC: W9QBH. STM: K9CNP. OOC: W9TT. BM: K9EUI. SGL: W9KPT. PIO: N9EWA. ACC: W9SFT. TC: N9RF. ASM: A99D.

Table with columns: NET, FREQ, TIMES, (LOCAL ILLINOIS). Includes entries for IEN, ILN, ITN, CTN, ILARES.

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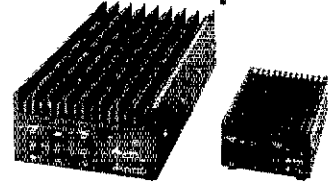
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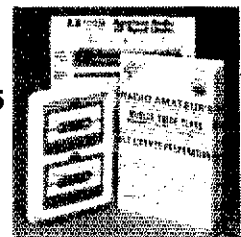
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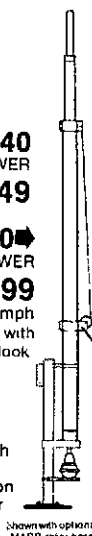


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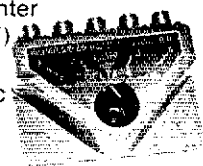
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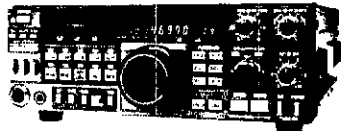
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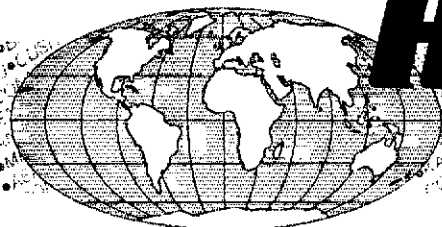
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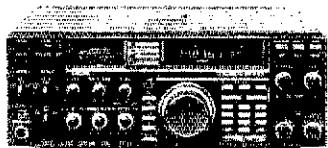
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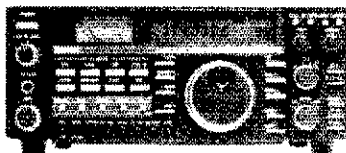
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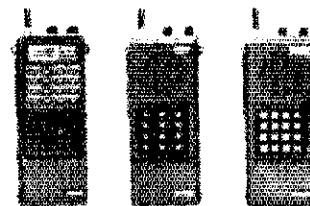
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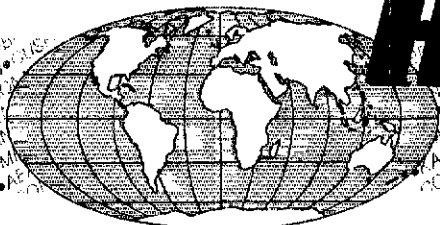
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MA-550MDP*	55'	22'11"	3	620	3"sq	6"	\$2640.00
MA-770	71'	22'10"	4	645	3"sq	8"	\$2385.00
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	MAX.	MIN.			Top	Bot.	
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TX-455	55'	22'	3	670	12 1/2"	18"	\$1395.00
TX-472	72'	22'8"	4	1040	12 1/2"	21 1/2"	\$2295.00
TX-472MDP*	72'	22'8"	4	1210	12 1/2"	21 1/2"	\$3685.00
TX-489	89'	23'4"	5	1590	12 1/2"	25 1/2"	\$3995.00
TX-489MDPL*	89'	23'4"	5	1800	12 1/2"	25 1/2"	\$5995.00

*TX-472MDP includes heavy-duty motor drive with positive pull down. TX-489MDPL comes with heavy-duty motor drive with dual level wind and positive pull down. (Both motor drive models include limit switch brackets)

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Will handle 30 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT		NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD		SUGGESTED HAM PRICE
	MAX.	MIN.			Top	Bot.	
HDX-538	38'	21'6"	2	600	15"	18"	\$1195.00
HDX-555	55'	22'	3	870	15"	21 1/2"	\$2095.00
HDX-572	72'	22'8"	4	1420	15"	25 1/2"	\$3595.00
HDX-572MDPL*	72'	22'8"	4	1600	15"	25 1/2"	\$5495.00
HDX-589MDPL*	89'	23'8"	5	2440	15"	30 1/2"	\$7195.00

*Includes heavy-duty motor drives with dual level wind and positive pull down. HDX-572MDPL includes limit switch brackets only. HDX-589MDPL includes limit wind switches and limit switch brackets.

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	MAX.	MIN.			Top	Bot.	
TMM-433SS*	33' w/o mast	11'4"	4	315	10"	18"	\$ 985.00
TMM-433HD*	33' w/o mast	11'4"	4	400	12 1/2"	20 1/2"	\$1195.00
TMM-541SR*	41' w/o mast	12'	5	430	10"	20 1/2"	\$1295.00

*Hy-Gain and some Alliance rotors when installed inside tower will restrict retracted height by approx. 24". Most Kenpro models allow full retraction.

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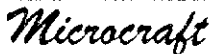
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September 13th was the day and Southeastern Illinois College west of Harrisburg was the place for the Shawnee Amateur Radio Association's SARAFEST 1987. Southeastern was a new location this year and proved to be an excellent facility. SARAFEST members and attendees enjoyed the usual good turnout of new and used equipment as well as the fine food which has become a trademark of the SARAFEST. The SARAFEST team held examinations and some happy folks left the fest with new equipment and a new license class. Special thanks to the Hamfest crew for the fine layout and location of the ARRL table. AA9D reports that four members of Kane Co. ARES and three members of the Wheaton Community Radio Amateurs provided communications for Central DuPage Hospital's "Mill Race Ride" Bike-a-Thon held on September 27th in Geneva. W9OES says that the upcoming SE1 will be combined with a 100-mile bike ride public-service event that will tie operations together in Morgan, Scott, Green and Calhoun Counties. Also, a side benefit of a Ham radio presentation he made for Scout troop 109 is that he has been invited to provide a station setup for the JOTA (Jamboree On The Air) 1987 at the Abe Lincoln Council Camporee which will have about 300 scouts in attendance. W9OES has enlisted the support of WA9UAA for the event which is a fine way to introduce young folks to our great hobby. Traffic: KA9FEZ 479, NC9T 197, W9LXL 153, WA9VLC 138, W9EHS 116, W9HWT 87, W9LWH 70, W9NBV 59, KA9BBV 21, W9RKR 19, W9LNO 16, W9B9TVD 16, W9RTD 13, K9QEW 12, W9VEY/M 7, WA9RUM 5, W9D9HQW 2.

INDIANA: SM, Ron Koczor, K9TUS--ASM: W9UHM, SEC: W9BZQE, STM: W9JUJ, KC9: K9TUS, PIO: KA9LQM, TC: K9PS, BGL: WA9VQO, Net Managers: ITN KD9DU, QIN K9J9, ICN KD9ER, VHF W9PMT, IWN KA9ERC.

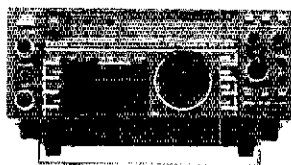
Net	Freq	Time	Day	UTC	QNI	QTC	QTR	SES
ITN	3910	1330/2130/2300			2982	327	1900	87
QIN	3656	1430/000/0300			885	382	1795	90
ICN	3705	2315						
IWN	3910	1310			2359		325	30

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Appt: K9TKE, EC Warrick Cty, KA8MRI, EC Ohio Cty, KA9MNR, EC Randolph Cty, NG9Y, EC Switzerland Cty, KC9W, EC Spencer Cty. Silent Key: W9JX, Cataract: W9JIM, Salisbury. BPL: W9JUJ Orig or; Rcvd 360; sent 372; Divd 0. W9ZRX orig or; Rcvd 363; sent 360; Divd 0. Congratulations and thanks to the new ECs noted above. I hope that they can count on your help. Being an EC is an important part of our public service. To serve the public, our ECs and DFCs need the support of all the amateurs in their counties. If you're not enrolled in ARES, find your EC and get enrolled. If your county has no EC, get with your club and find one! If you are enrolled in your county RACES group, get active with ARES too. The two groups are complimentary, and the best service to the public comes from the people who wear both hats. Good luck to Art, WA9VQO, who becomes acting-OOO, effective October 1. Art continues as SGL and will be contacting all OOs soon. Thanks to Woody, K9JG, outgoing OOC for his dedicated service to our hobby. If your group has set its hamfest and VE Testing schedule for 1988, please send me the information so I can include it in my statewide bulletins each week. The bulletins are distributed both in Indiana and in surrounding states. It's free publicity for our activity! Don't forget the Greenfield Hamfest on December 6. I hope to see you all at the South Bend Hamfest January 3, a great way to start the new year and spend some of your gift money! The IRCC elected new officers in October. They are W9UHM, Chairman; KA9RNY, Vice-Chairman; K9ET, Secretary; W9JUJ, Treasurer. Good luck to them. If your club is not a member of IRCC, you should join. Check with any of the above for information. Happy holidays to all our friends. Hoosier ham actively broke all records on 1987. On to 1988! Station reports for September: W9ZRX 793, W9JFF 679, KA9FFO 664, N9S 983, K9TKE 90, W9BZQ 86, W9OCF 83, NR9K 66, W9BPFZ 50, KA9RNY 46, K9SBV 45, KA9LGM 37, W9UEM 29, W9JHR 24, W9ZGC 22, KA9QMI 21, W9PMT 20, W9BTZ 14.

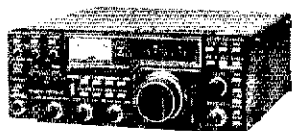
WISCONSIN: SM, Richard R. Recent, K9GDF--SEC: W9OAK, STM: K9UTO, ACC: KA9FOZ, BM: W9JISW, OOC: NC9G, PIO: K9ZZ, SGL: AG9V, TC: K9GDF. Seasons greetings. Thanks to KC9CJ for being Net Manager of Wisconsin Intrastate Net Late. Welcome to W9NGP as new NM of WINL. KA9RII, Lisa, was awarded plaque from Wisconsin Nets Association for being chosen as the top traffic handler of the year. Lisa says she has a three-toot high pile of written messages she has handled as proof of her efforts. New officers WNA: Chairman N9GJL; Sec. N9DGL; Treas. NC9G; and Training Officer K9UTQ; contact them with your questions and suggestions for traffic handling, RTTY or packet net, and net procedures both in Indiana and Wisconsin. CWVA Wisconsin Chapter 55 are Chairman: W9FCZ; Vice Chairman W9IEM; Sec. W9YVC; Treas. K9GDF; Directors W9VQD, W9VOW and N9DNM. Congratulations to W9GIL and W9HE for earning their 50-year ARRL Member Awards. Awards Manager KY9P announces awards to KD9IV VJCC 2-meters; KA9SDW 125 grids 6-meters; and K9HEH 176 grids 6-meters. Special thanks to W9UCL and N9GJL for helping deliver no-outlet Wisconsin traffic by telephone at their own expense. December 5th, exams in Stevens Point, catch N9JW. December 9th, Wednesday, 6 PM, Milwaukee Radio Amateur Club's annual Christmas Dinner Party 7 PM at Elm Grove Legion Post Hall, 1195 Legion Drive, with plenty of fun and door prizes, same for reservations to W9SNK. December 12th, Milwaukee Metro Area Netting will hold exams at East High School, info W9SNK. Badger Examiners December 19th exam, 1 PM at St. Nicholas Parish in Milwaukee, reservation with KB9G. KC9CJ and K9UTQ are leaders in Scouting. Traffic: W9B9PY 1588, KA9RII 361, W9YVC 305, K9GDF 179, W9CBE 171, W9DND 123, W9AGW 116, W9CKY 102, KA9BHL 99, N9BDL 88, W9UCL 80, W9IEM 75, AG9G 62, N9BCX 59, N9BICH 58, K9AKG 57, K9EP 54, W9B9NRK 49, KA9USV 41, K9UTQ 37, K9FH 28, K9GB 25, W9DUD 18, W9DNDQ 18, W9JID 16, N9BY 10, KA9MWT 10, W9PVD 4, W9UW 3.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KC0T--With the Fall-Winter season upon us, it's getting to be a pleasure working 80 meter Cycle 4 schedules. And I mean from Pacific Area to Eastern Area with no problems, to say nothing of the DX openings on the higher bands. Congratulations to all the "Die-Hards" who sweated out the depths of the last sun-spot cycle--looks like it's smooth sailing from here on in. At least for a few years. And, from the northern-most part of Minnesota comes our Amateur-of-the-Month for September, Congratulations to Riley Dunn, WA0CEL, of International Falls, for his fine work. Lou Guerre, K0QGI, reports on the very fine assistance from the many hams who provided radio communication for the annual two-day event, the F4W/M4 Freedom Wave around Lake Mills Lakes. Due to the efforts of Lou, KF0I, Handi Hams, and Rolf, NR0T, we seem to be clearing NTS traffic from our Section Packet Node, WA0CG/WB0GDB in Apple Valley. Hopefully we can keep

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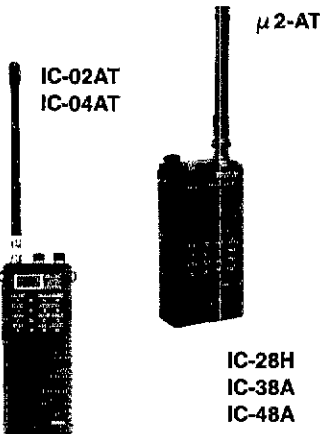
IC-735



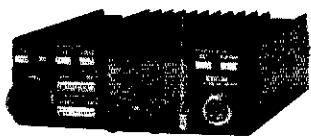
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TS-711
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TS-940S

IC-02AT
IC-04AT

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IC-28H
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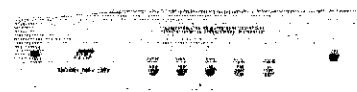
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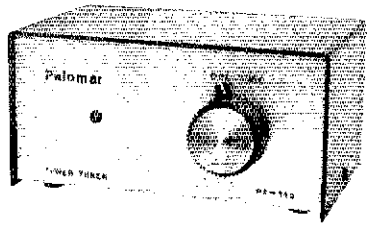
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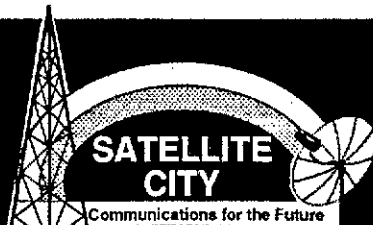
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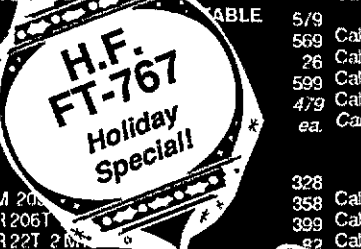
Model	Price	Call
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FC-757	359	Call
SP-757	99	Call
FT-211	1895	Call



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FT-231R-TT	25	Call
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FT-231R-TT	Call	Call



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this going so that Packet will be supplying our section with another link on a regular basis. Brian, K0DNH, did a bang-up job writing a two-part article on CW Traffic Nets in the St. Paul Ground Wave. I hope we can reproduce it for wider circulation, especially for newer members. Ray, KA6ARP, SEC of Duluth, has announced the start-up of the Minnesota SKYWARN Emergency Weather Net which will meet on a regular basis each Saturday at 4:30 PM on 3860 kHz. 73, Jim Swisher, KA6PV, 51M

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/1	3685	6:30P	408/159/30	WBUCR
MSN/2	3685	10:00P	319/53/30	K0BNH
MSSN	3710	6:00P	259/31/30	KA6SBY
MSPNN	3850	12:05P	468/178/30	WB0WJN
MSPNIE	3850	5:30P	841/185/29	K0TKD0BC1
MNAMW0NT	3850	6:00P	231/134/21	K0GOI
PICO	3925	9:00A	3250/305/123	W08BAC

MIN EMERGENCY FREQ 3860 kHz BULLETINS 3860 kHz Traffic: WB0WJN 808, KA6EY 374, WA6TPC 348, N6CIS 208, K0BCL 125, N6PCO 115, W0GRW 104, K7BH 101, KA6BP 100, KA6SBY 80, W9DM 73, K0DWH 70, W0JP 56, K0K41 48, W0BONE 46, W0BGL 42, K0BT 34, N0BIA 34, K0BYL 26, KA6PDM 15, K0BCL 12, N0HWD 11. Total Traffic: 2635.

NORTH DAKOTA: SM, Bill Kurtz, N0AEP—One July night a 3 AM, Bill, W0DEMY, was driving his 18-wheeler between Dickinson and Bismarck when he came upon an accident. A truck with a pickup following had run into a herd of buffaloes, killing 3 of them and damaging the vehicles. John, KA6SLI, in Lakota, 180 miles away heard Bill's call and reported the accident to Stale Radio. Good work Buffalo Bill and John, Also Gurney, W9NT, assisted in a car fire south of Grand Forks on Interstate 29 this summer. We will miss N0AEO who moved to Wis. Also W0BGBI and N0H0 moving to Chicago. KA6BSI now is N0KZ and N0GUU is K0BPW. Thanks to all that have sent me newsletters and other items. They are necessary to my being able to write this report and keeping up with what is going on in the state.

NET	FREQ	TIME	SESSION/QTC	MGR
Scose River	1.9 Mhz	9 AM	4/1003	W0GCO
Data	3.885 kHz	6:30 PM	25/42/731	KA6SDM
North 40	148.84 0200 Z Sat	3/370		N5H

Weather Nets to resume on Oct 20 W0GFE on 3.885 MHz 9:00 AM, 12:30 PM, 5:00 PM

SOUTH DAKOTA: R.L. Cory, W0YMB—ASM: N0AEBE, WA6FPR, SEC: KA6KPY, STM: K0BYL. The Dakota Division 1987 Convention is now History with a total of 422 registered from 18 states and two Canadian Provinces. The Lake Area Radio CLUB can be very proud of the excellent job they did with the convention. No South Dakota Club had applied for a "200" call sign, according to HQ, so M0bridge Area Amateur Radio Club did prior to the deadline so that the HQ plan for WAS Awards with "200" Centennial call signs will become reality. Black Hills 745C office had the call sign. A section of W0BFWA as President and K0BJU treasurer and new officers are WA6FPR vice president and W0Z5C sec. Dakota Chapter 102 of Q0CWA officers elected at the Watertown Convention were W0H0J president and W0LX Vice President and K0ERM Sec. Treasurer. Q0CWA net meets every Sun morning 8 Central, 7 Mountain on 3990 KHz S, Dakota. Traffic for September 1045 with 12 signs reporting. Traffic: N0DPE 254, K0ERM 176, K0ZBJ 112, K0AIE 108, KA6KPY 86, W0H0J 62, W0M21 39, WA6VRE 32, W0BOMF 32, K0BYL 29, W0YMB 15, K0ER 1.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, W0S1GF—ASM: K5UR, SEC: N5BPU, STM: W0OK, ACC: N15D, SGL: W5LCL, TC: W5FD, OOC: N5BQ, PM: W5LL, PIO: K5TML. Repeater Frequency Coord: W0B5FDP. N5BPU reports the earthquake scenario for the SET went very well with good participation from the amateur community and excellent liaison with OES. N15D reports that all affiliated clubs are 100% current with their ARRL status. Congratulations to Dora Anna and clubs. Joe, W5QPU, has assumed the duties of Net Manager for the phone net. This is no new place for Joe. He is currently the Net Manager for the Razorback net, as well as one of our avid traffic handlers. Joe is also a past NM for the phone net. On behalf of the Arkansas ARRL section team, I would like to wish each of you a very Merry Christmas and a Happy New Year. Traffic: W0K 40, W5H0T, W0S1GF 26, W0B5GWU 18, W5KL 8, KA5Z1K 3, N5BPU 2.

LOUISIANA: SM, John "Wondy" W0ndergem, K5KR—ASM: K5CXC, SEC: N5ADF, ACC: K5SDG, SGL: K055L, TC: W5RWF, OOC: K5DQK, Packet: N5DPL. During the past few years, ARRL has initiated several new programs to increase the number of licensed Amateurs and to increase League membership. In addition, ARRL recently produced their newest video titled THE NEW WORLD OF AMATEUR RADIO which was specifically designed to attract potential hams. Copies may be borrowed or purchased from the ARRL HQ Audiovisual Library for local use. Details are on page 40 of the October 87 QST. What is now needed is for each of us to share our hobby and to PUBLICIZE it. We should take every opportunity to put Amateur Radio on display at fairs, shopping centers and public events. Many clubs throughout the state are conducting classes to help the newcomer learn the technical and operating requirements of Amateur Radio. Further, we have developed an efficient process whereby everyone can take an examination at frequent intervals within a reasonable distance from his home. What is left is to put it all together at the local level by showing the latest ARRL video and by a notice at schools, scouts, shopping centers, public events, radio and television stations of local amateur activities. Contribution of your time is a rewarding experience.

MISSISSIPPI: SM, Jim Davis, K5ZJ—ASM: W5TRD, SEC: W55KD, SGL: N05Y, ACC: K5XV, PIO: W5NM, BM: W5EPW, TC: K5FDE, OOC: K5K, STM: K5B5W, VHF/UHF Coord: N5DWU. Congrats to following upgrades: To Tech: K5S0G, K5VMW, K5DPLN, K1QNH, K5ZMP, K5ZTQ, K5BJU, K5DQB; To Gen: K5ZLS, K5B5DKW, K5B5D, K5PEP, N5KJG, N5LJC; To Adv: N5JHA, N5ZLV; To Extra: A5C1 (finaly). To N5JGW as new President of Hattiesburg ARC. Best wishes to outgoing president, K5QK. ARE5 members and Co urgently needed in Calhoun, Scott, Madison, Simpson, Hinds, Yazoo, and Madison Counties; Packet ops needed for fixed, mobile and portable ops. Contact K5DZE for details. DRN5 (W55YDD) Sess—60, QTC 635; Miss Rep 100% by NSAMK, K5ZJ, W5HKW, K5B5W, and W57COC. Lauderdale County ARE5 (W5D5HL) W32 members. Sess 30, QNI-102; Magnolia Sec Net (N55M) Sess-30, QNI-163, QTC 85, ARRL Info Net (K5Z2) session 5, QNI 69; MTN (K5B5W) Sess 30, QNI 183, QTC-85; NE Miss FM Net (N55M) Sess-22, QNI-230, QTC-3; Miss/Slo/Net (W5YRX) Sess-15, QNI-55, QTC 9. Congrats to K5OS and gang at M0AFA on greatest of hamests. Hard work really paid off. Good time had by all. Great miniwesp/hamfest at Philadelphia, courtesy of W5VPP and N5DJU. Other clubs/areas should seriously consider this type get-together. Enjoyment by all. Traffic: K5B5W, Orig 1, Sent 211, Recd 141, Del 2, Total 354. W5JDF, Orig 2, Sent 25, Recd 26, Del 1, Total 54. WQSH, Q11, Sent

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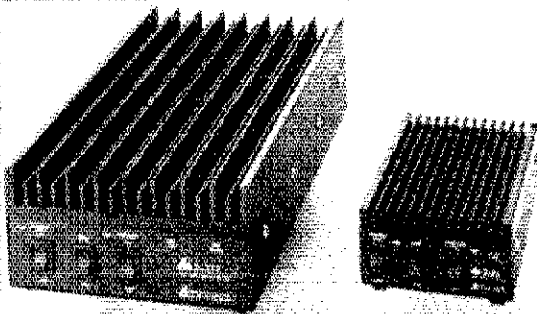
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129. Recd 131, Del 3, Total 274. NSAMK, Sent 167, Recd 120, Total 287. KTSZ, Sent 57, Recd 53, Del 2, Total 112. KK5Z, Orig 2, Sent Recd 1, Del 1, Total 5. PSHR Report: NSAMK 1/30, 2/30, 3/30, 4/12, 5/12. Total points, 96. Best wishes to KK5K for speedy and sure recovery from a lengthy stay in hospital.

TENNESSEE: SM, John C. Brown, NO4Q—ASM/ACC: WA4GLS, OOC: W9FZW, SEC: WA4GZQ, SGL: WA4GZZ, STM: NG4J, TC: W4HHK. The term of office for this Section Manager is fast drawing to a close. I am sure that your new Section Manager will be getting things all lined up with his staff. He will need the same amount of help to keep things running as I did. Make contact with him and offer your services. You just might enjoy it as I did three plus terms as the Tennessee Section Manager of the Delta Division. We moved from the section communications manager to the Section Manager concept. The services of all the section staff are much, much appreciated by me as they are just a reminder to all appointed for your term and is up with my term of office, however the incoming section manager can extend them as he sees fit. I am sure he will extend most if you will continue in the position. He will make his wishes known in due time. The packet organization is well and getting itself established and functioning as such. Traffic is being moved through this mode at a very satisfactory pace and rate. I am sure that it will improve many fold. I would like to remind those of you out there to let the Section Manager know of all and any that become Silent Keys so their names can be recorded in the appropriate section of QST. There are many nice reports of new amateurs on the way up and that can only happen when many of the clubs and individuals take the time and effort to help the struggling would-be hams along. This effort is appreciated much more than you might think. Keep up the fine work. That also goes for the VE teams. I would like to express my thanks to WA4GLS for getting the Section Activity report out last time when I made an unscheduled visit to the hospital. Thank goodness it wasn't what it was first thought. All is well with me now. The traffic summary for last time was as follows: LF: Sessions-78, QNI-2641, QTC-198; VHF: Sessions-62, QNI 701, QTC-598 and CW Sessions-38, QNI-322, QTC-149. We have N4OZB, W4LVQ, and NG4J receiving CW net Honor Roll status this period. Congrats passed to them. Individual station activity for the period is W9FZW 174, WA4FMR 119, K4WVQ 88, W4DDK 43, W4TVY 24, N4S 23, N4OZB 21, (last month), W4PPP 18, N4OZB 14, W4ADB 11, (last month), K4SKDB 8, W4PSN 8 and W4EWR 4.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thernes, WM4T—SEPTEMBER: SEC: WB4NHO, STM: KA4MTX, PIO: WA4SWF. I wish to thank Mammoth Cave ARC and the Amateur Radio Transmitting Society for their hospitality during my recent visits. If you did not attend the LID meeting in Lvl, you missed something! We are now building our strength with Ky DES. I spoke at a DES Area Coordinators conference in Frankfort and got a tour of the communications center which has a complete amateur radio station. We need Lexington or Frankfort hams to "adopt" this station and show DES we mean business. The first edition of the Kentucky Section News was mailed to all Ky appointees. If you did not get a copy, let me know.

NET	QNI	QTC	SESS	MGR
MKPN	1221	162	30	WD4RWU
KTN	756	33	30	WB4LBG
KNTN	214	75	36	KB4OZ
KYN	325	208	60	K4AVX/KZ8Q
TSIMN	527	22	28	KZ8O

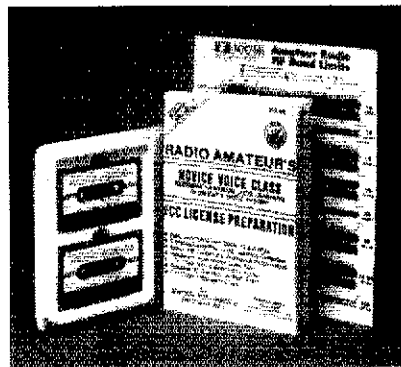
SAR (SEP) K14QH 259, K4VHF 215, WD4RWU 172, KC4WN 61, K4AVX 46, N4PEK 29, KA4MTX 29, WA4SWF 18, WD4COF 12, WB4AUN 10, WA4AVV 6, PSHR: K14QH 105, KA4MTX 85, KC4WN 61, BPL: K14QH 127.

MICHIGAN: SM, James R. Seeley, WB8MTD—ASM: Ed Galipeau, W4LRL, SEC: George Race, WB8BDG, STM: Jim Wades, WB8SIW, ACC: Stan Briggs, K8SB, TC: Dave Smith, W8YZ, SGL: Dave Wise, N8CHY, COC: Dave Race, N8BS. This month's column is being prepared by WB8BGY, your SEC. Here in MI, fall always brings about the yearly ARFSC meeting in Lansing. The meeting was a big success with over 40 in attendance. A hardy thanks and well done to all of you who put a great deal of time and effort into your group presentations. It was greatly appreciated by all in attendance. MI has a new State RACES Director, Jerry McCoy, N8HFV. In a recent meeting with State RACES Officials, we outlined a continuing ARES/RACES organization here in MI. We have their full support! I am hearing that the Novice Class enrollment is at a record high all over the state. Instructors, please let your MI League Officials know when the new calls start coming in. It would like to commend a welcome to newcomers to Amateur Radio. The new ARFSC Nat that meets every Sunday at 5 PM on 3932 MHz is doing well. MI ARRL Officials, NTS members, and ARES members are working toward a truly unified ARFSC. A renewed interest in traffic handling and emergency communications seems to be developing. On a recent session of MITN, it was interesting to note the blend of technology we have at our fingertips. Skip, WD8KQC, picked up formal traffic from a packet BBS. He passed it, using SSB, to Bill, K8SP, who was operating CW. It sure does prove and help to demonstrate the versatility of members of the MI NTS. Speaking of packet, there seems to be a fine line forming down the center of MI, RL1 BBS's on the East and MI BBS's on the West. It would like to see the merit and get the job done. There appears to be a bit of difficulty when the two systems work with each other, particularly in the area of bulletin passing. Recently, I landed in the middle of a rather heated exchange of letters between BBS operators. I apologize to anyone I may have pointed a finger at as being at fault. I would like my role in this whole situation to be a peacemaker. Gentlemen, let's work together! By combining our knowledge and talent, we can reach any goal we set. Maybe we can form kind of a statewide group for the betterment of all in packet radio. As was recently suggested, a state BBS users newsletter may also serve as a sounding board to help us each understand our individual needs and needs in general. Does anyone wish to volunteer as an editor? Let me hear your thoughts and ideas. Traffic: WA8DHB 140, W8QHB 107, W8RHH 100, W8BKQ 77, N8EGK 73, K8GXV 70, AF8V 60, N8CNY 43, K8UPE 34, N8JB 33, W8YIQ 30, K8HAP 27, K8OCQ 27, W8EOI 25, W8IHX 22, N8HWL 21, W88SYA 21, K8ZJU 20, W88BGY 19, W8MJJB 18, K8Q 13, W8MVMH 11, W8URM 8, W88WJV 7, W8YZ 5, W8CUP 4, 73 and a Happy Holiday Season to all. George, W88BGY—MI SEC.

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: N8AUH, SEC: W8BMPV, STM: KF8J, BM: W8ZM, ACC: KJ3O, TC: K88MU, OOC: AD8I, SGL: N8CVK.

NET	QNI	QTC	SESS	TIME(LOCAL)	FREQ	MGR
BNEI	272	124	30	1845	3.577	N8EVC:
BN(L)	240	115	30	>200	3.877	K8TVG
BNR	243	81	30	1800	3.905	WB8K
BSSN	264	155	65	0945,1900	3.873	K8DFW
CNN	148	45	29	1825	3.708	W8DKBV
CS	273	71	28	1810	3.727	W8DQ
OSSBN	2084	802	80	1030,1615,1830	3.8725	WB8JGV
OSSN	155	67	30	0845, M.F	3.577	K8BQJW
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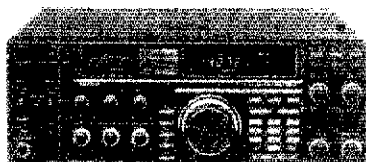


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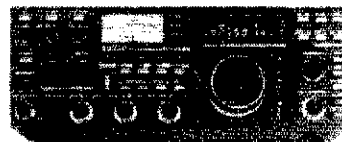
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(Note the change in time for the Ohio Section ARES Net: participants were finding 3 PM to be a busy part of their Sundays!) VE exam sessions for December and January: Columbus 12/5; Dayton 12/5; Portsmouth 12/5; Maumee 12/12; Mentor 12/12; North Olmstead 12/12; Zanesville 12/12; Elyria 12/13; Ravenna 12/26; Columbus 1/9; Maumee 1/9. Contact me for details. Happy Holidays! Another year has zipped by, and '88 lurks just around the corner. If cleaning up the shack is on your list of resolutions, WDBEQJ suggests in DARA's "RF Carrier" that your old Amateur Radio magazines might be deposited in a doctor's or dentist's office, where they can serve as "silent recruiters" for our hobby (I like to leave them on airplanes, too). I suggest writing or rubber stamping a local name and number for those who might want your information. DARA is now holding a "Swap or Sell" session before each club meeting: a good idea for your club? Sandusky Valley ARA is holding an "Old Timers' Night", where early Amateurs give the whippersnappers a taste of radio in the early days. A new VHF/UHF club for those interested in SSB and CW from 6 meters and up, gathering membership from Ohio, Kentucky, and Indiana. For information, contact W8NJR. The Delaware ARA has installed a new 220 MHz repeater with the Novice in mind. NJ8P/R will operate on 224.1 MHz. The Columbus ARA has found a new home at The DeVry Institute on the east side of town. DARA meets on the first Thursday of each month from 7:30 PM and always. Amateur Radio booth at the three day Harvest Home Fair, originating over 50 radiograms of visitors and signing up several new folks for their code and theory classes! KA2BNZ advises that the Party Time DX Net now meets Fridays 2100-2300 UTC and Saturdays 2000-2300 UTC on 28.4 MHz, covering the Americas. Trumble County ARES EC W8BBWY reports providing communications services for a horse show and two bike races in September, representing a total of over 250 person-hours of volunteered effort! The Tristate Amateur Traffic Net (N8PWA Net Manager) moved the traffic into the NTS. Hamilton County ARES (ARRES) EC W8DCC reports that they provided communications for the Sponder Bacon Invitational Band Competition on September 28, spending most of the day in the rain! Amateur Radio groups provide thousands of person-hours of volunteer service to their communities each year, and often go unrecognized for their unique abilities. Please let me know about your club's activities, and don't be shy: name a person to serve as Public Relations Chairman and bring each and every effort to the attention of the local media (newspapers, radio, cable and broadcast TV, etc.). The stations listed below have reported handling radiogram traffic during the month of September 1987: WB7EQY 295, WB7PMJ 294, W8DKF/264, KD8JK 224, W8CQ 218, K81VG 215, N8BES 214, W8ZU 124, W8GFC 123, W8BZ 119, K8BVM 118, N8BVA 149, W8AKS 144, K8BJ 143, K8ND 132, KD8HB 131, N8XK 121, KB8HD 116, W8OZK 111, W8BJW 107, K8OZ 93, W8EK 86, W8SKP 86, K8IOW 84, N9AUG 81, KV8Q 79, KD8FW 75, W8851 74, N8AEH 69, W8FFA 67, W8DKB/67, W8CXM 65, K8BCG 64, N8GPU 64, W8D0X 64, W8DBK 63, K8CNR 54, W8BBWY 53, KD8KR 52, N8EFB 51, K1JQ 48, W8JLW 47, W8BKWC 46, W8VSM 45, K8BCV 43, W8BDY 42, W8LHJ 39, KD8WJ 39, K8ES 38, W8DMPV 38, K8BYM 38, KB8TNT 37, N8WE 35, W8AHG 35, N8BX 26, K8SYV 24, KD8XL 21, K8BSOM 20, K8EF 19, W8SHD 19, K8CZU 19, K8YIP 19, KD81B 18, N8CD 17, N8CDN 16, N8HBF 16, W8JAW 16, W8BGAT 15, N8H3T 13, W8SHJ 12, N8QR 12, W8IC 10, K8R1X 10, K8BML 8, W8RC 8, W8D1M 8, K8C8 8, N8CV 8, K8ADR 8, N8FFH 8, K8JLV 8, W8BKWD 8, W8DCSP 7, K8DXZ 7, N8UJ 7, N8IJP 7, N8AJU 6, N8FB 6, N8CB 6, W8AEZ 6, W8DWP 6, W8BHL 5, N8CJS 5, K8BDAB 5, K8AOF 5, W8BWA 4, N8RC 4, W8BEKI 4, N8GOB 4, N8H14 4, W8DJYE 4, K8ALV 3, N8UH 3, N8IB 3, N8CV 3, K8VOY 3, K8LT 2, W8BTR 2, W8ZM 2, K8CBO 1, N8CDN 1, W8DKQ 1, W8BGM 1, W8GDO 1, K8VYT 1. (Aug 1987) N8BX 151, W8BYS 33.

HUDSON DIVISION
EASTERN NEW YORK: SM, Paul S. Vydareny, WB2YUK—ASM & STM; K2ZM SEC; WA2ZYM BM; WB2XR PIO; KB2TM TO & QTR/RL; K2CZC AT; KB2CZC AT; KB2HJZ KB2HJZ NEW YORK; WB2NC NE; REPORTS FOR SEPT. (ON/OFF): AESS 65/8 CDN 543/65 ESS 292/52 HVN 338/110 NYPON 585/296 NUB SE 386/198 NY6IL 414/354 NYSIM 324/208 SDN 252/135. CLIE NEWS: Albany ARA viewed the new film, The New World of Amateur Radio at their Oct. meeting. They welcome new members, N2HBG KB2PE KB2EIK. Comm. Club of New Rochelle heard a talk on AMI Mt. Beacon election results are WA2LJM-Pres. K2DPL-VP KD2AK-Rec. Secy W2DOT-Corr. Secy WB2MKY-Eng. Dir. WB2WLN-Treas. N2BZP and N2FTR-Dirs. Putnam Emerg. ARL reports that work on N2EQ/R in the 902-MHz band is proceeding now that coordination has been received. Saratoga RACES will view The New World of Amateur Radio at their Oct. meeting. Schoharie ARA had their auction in Oct. and announce new members, W8BNZX, KB2EHO, KB2DAV, KA2DLO, N2HBG, KB2JD, W2TKA, K2TR, KB2DL, W8BZF, KA2JWI, KB2DGA, KA2MCE, KA2OIM, N2ECC, KB2DFZ, WB2LKI, N2HFK. Report W2IV and WA2RT as silent keys. Welcome Westchester FMRA as a newly ARRL affiliated club. WEGA will have a tribute to K2CFX for his many years of public service. It is interesting to note that some groups are venturing into 902 and 1296. It is now time to work on equipment for 13 cm., before we lose that band to commercial interests. There will be much more pressure on our frequencies in the next WARC. It may be a bit early, but I want to wish all a very happy healthy safe and enjoyable holiday season. Don't forget to lend a hand during the holiday traffic rush. SEP. PSHR: WB2VUK NQ2H WA2JBO K2VJ N2HIF KB2AYD SEP. BPL: N2HIF SEP. Traffic: N2HIF 564, WB2VUK 268, KB2AYD 125, K2ZM 122, NQ2H 89, WA2JBO 82, K2VJ 77, W2WSS 58, WA2YBM 46, N2FTR 45, KA2TGW 32, W2CJO 26.
NEW YORK CITY-LONG ISLAND: SM, Walter Wenzel, KA2RGI-ASM; K2IZ ASM (VE); W2NL ACC; KA2WJL SEC; KA2LAD-OCC; N2BT TO/RF; WA2YNN, STM; K2MT, PIO; W2GQR. The following are traffic nets in and around the section:
NCVHF 146.745/r 1930 m-f KA2HPG mgr
SCVHF 145.370/r 2000 m-f, sun KA2JMA mgr
BAVHF 145.350/r 2000 daily K2YQK mgr
NYPON 3913 kHz 1700 daily KA2JBD mgr
NYSIM 3677 kHz 1900 daily N2JL mgr
NYSE 3677 kHz 1900 daily KU2N mgr
NYSYL 3677 kHz 2200 daily KU2N mgr
ESS* 3590 kHz 1800 daily W2WSS mgr
NLT 28450 2100 Wed. KB2BE mgr
BBS 145.010 Packet Node Station AI2Q
*Independent Net, recognized by NTS, all times are local, please note AI2Q is the Section Packet Node for all NYC/LI packet NTS messages. WB2QBP-2 is the network node for connecting to AI2Q-4 to pick up NTS messages. All clubs, please be advised that K2IZ is still writing the column, please do not purge me from your mailing lists. If you want news of your club to appear here, I need your newsletter. On behalf of KA2RGI and his family and my own family, we wish everyone a Merry Christmas and a Happy New Year. Remember the new net "NLT," short for "NYCL Ten Meter Net" and it meets every Wed at 2100 local. Notices, please note the freq. You are able to check in now. Gt. South Bay



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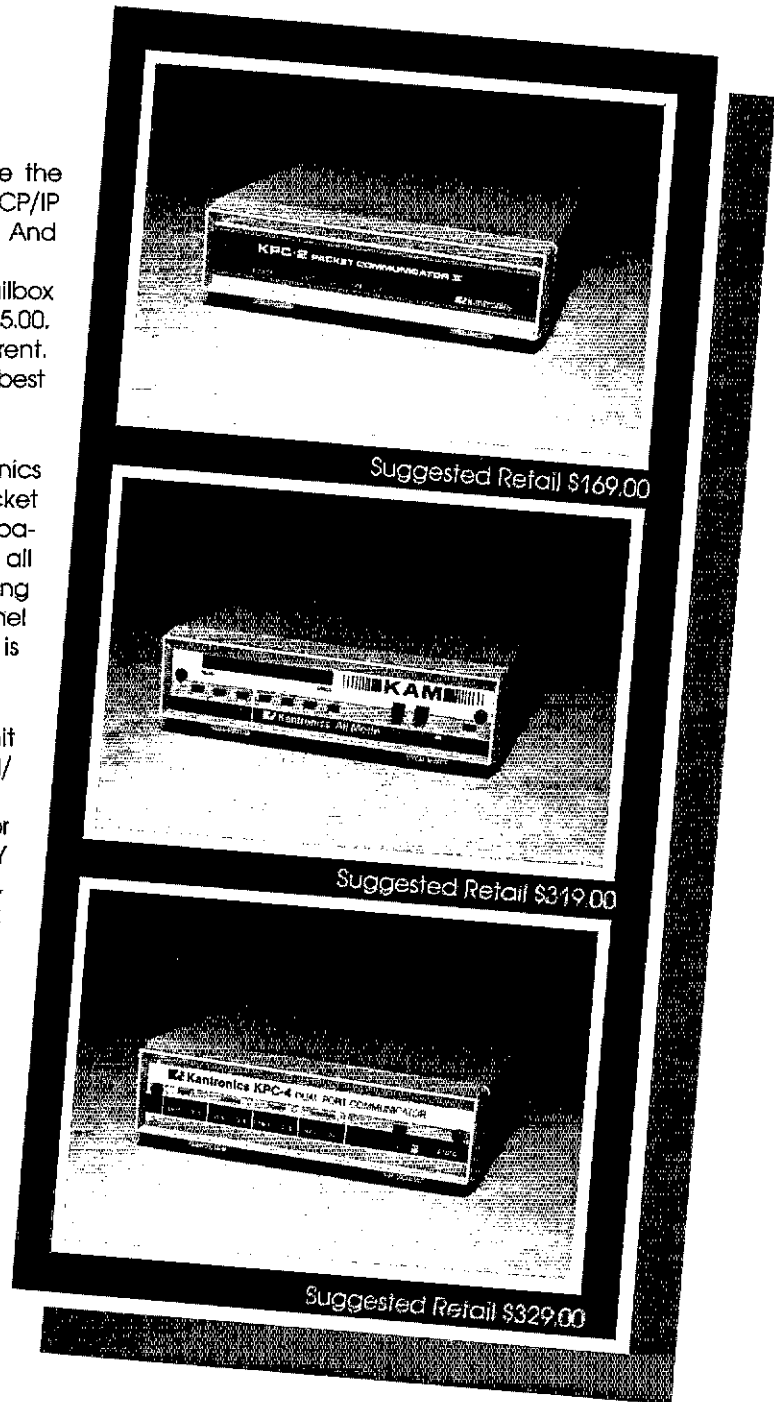
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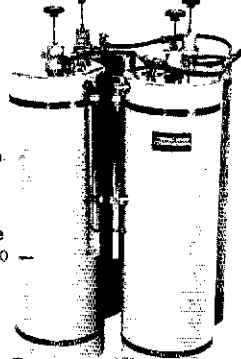
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July/August 1987

Volume 15, Number 4

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ARRL will have a test session Sun, Dec 20. For further info, contact Jim Teavary, W2DUK. Welcome to new Novice from the Kings County ARC Novice Class: KB2EFD, WB2QXM underwent heart surgery in Aug. We hope everything will be ok. LIMAFC will continue to conduct exam sessions on the 2nd Sat of the month at the NY Inst. of Technology, Rt 25A, Old Westbury, in Salten Hall, Rm 2. Applicants are reminded to bring 2 forms of ID, original and a copy of their FCC license, check for \$4.50 made payable to ARRL/VEC, pens/pencils, and a calculator for the math questions. For further info, please contact Joe Kolb, W2NL. The Suffolk County VE team is conducting exams at Suffolk Community College the 2nd Sat of the month. For further info, call George, WA2VNV, at 516-751-0894. Gruman ARC will be conducting exams on the 1st Wed. of the month. For further info, please contact Howard, W2QJLV, at 516-364-8861. Traffic: KB2BAE 232, N2AKZ 214, K2YOK 204, K2MT 150, N2BD 86, N2GPA 75, WB2EUF 60, N2GNO 57, W2GKZ 55, N2HLZ 35, N2GQS 28, KA2UJU 22, K2TWZ 18, KA2JMA 17, KB2AKY 4.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM (VE liaison); N2XJ, ASM (FO info); W2L SEC; N2BMN, STM; KA2F, OOAAC, KA2BZS, AAC; KY2S, SGL; W2KB, TC; K2BLA, BM; N2CXX, PIO: WB2QNV (PH 735-8550). Appointment endorsements for the next two-year term starting 12/87 follow: ECs KB2BHM, W2NFF, WA2CWB and WA2IEK, OESs W2BHM, W2NFF, WA2CWB, WA2IEK, and WA2UZT, OO W2DZ. New ARES appointments effective 10/87 are: From Morris County EC (Kinnelon) WB2HBZ, OESs AG2R, KB2BE, K2GDD, K2OX, KA2EAL, KA2KWS, KB2CK, KN6X, IN2ELC, W2LOP, WA2ARP, WB2FTX and WB2P.

From Union County EC (Bayonet) OESs OEA2AFPO, OO NAAR has effective 9/87 been certified as a member of the Amateur Auxiliary to the FCC's Field Operations Bureau. SGL, W2KB has reported that he is investigating a NJ Assembly Joint Resolution which requests that the FCC allocate additional frequencies for public-safety uses. Members of the Ramapo Valley Emergency Net have designated WB2IXS as the new RAVEN Chairman replacing Silent Key K2SE. TRI-COUNTY RA is now operating a daily club net on 147.255 + .6 rpt at 7:30 PM. Welcome aboard to four new NJ ARRL affiliated clubs: Major Armstrong Memorial ARC, Piscataway ARC, Radio Amateurs, Telecommunications Society, and Singer Employees ARC. Two contest location changes: Fair Lawn Arts Center for Bergen ARA and Howell Twp. Office of Emergency Mgt. for Ocean/Monmouth ARC. Congratulations to the following who were newly licensed or upgraded during September sessions conducted by NJ VE Board, and Florian Bay ARC. Novice: L. Eaves and M. McCulsion. Technician: KA2YUA, KA2YXX, KA2ZET, KA2ZWK, KB2ECP, KB2EGO, and P. Russo. General: KB2BVS, KB2BDP, and KB2DYE. Advanced: KA2RJM and WB2PEK. Extra: N2FCW, WA2FCW, and WA2MTR. SEC N2BMN has started a new ARES section net every Monday at 1930 Hrs on 9950 kHz. Traffic Net: JF—VHF Packet Liaison, August 1987

Net	Frq	Time	SES	QSP	QNI
NJ	WB2ZJF	3695	1000 Dy	31	114 189
NJPN	W2CC	3950	1800 Dy	36	79 352
NJNE	KA2F	3695	1900 Dy/P	26	90 144
NJNL	WA2EPI	3695	2200 Dy/P	25	57 107
OBTTN	K2SC	147.12	2000 Dy		Not received
TCETN	WD2AHD	146.685	2030 Dy	29	29 145
NJVNE	WB2FTX	146.895	1930 Dy/P	31	24 181
NJVNL	WB2ANK	146.49	2230 Dy/P	27	44 185
NJTNN	WA2EPJ	223.88	2100 Dy	23	41 115
NJSN	WB2PKG	3735	1830 Dy	31	30 141
NJPL	W2QNL	46.01	24 hr		WARSNA-172
SARPSHR	WB2OMP	4378	N2DXP 116/9	KA2IEE	54/71
W2FRX	124/103	N2XJ 248/104	WB2FTX 34/52	WA2EPJ	132/111
	KA2F 76/106	W2QNL 247/134	K2VX 94/33	W2XD	10/1
	WD2AHD 55/1	W2CC 25/1	Special congratulations to the following stations which qualify for ARRL Public Service Honor Roll certificates: N2XJ, W2FRX, K2VX, WB2QMP and N2DXP.		

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, W0EJ—ASM, WB0AVW, SEC: KD0BG, STM: KC0XL, ACC: NU0P, OOC: WA0QMU, BM: K0AIR, TC: K0DAS, PIO: NB0DF. I enjoyed the Midwest Convention. It was a pleasure to meet many of you and discuss Section matters. Thanks to those in Des Moines who made the convention possible. Congratulations to N0GQB who won the top door prize and also passed his Extra exam at the West Liberty Hamfest. I also enjoyed seeing many of you there. N0LKL and KB0KBS are new calls in the section. License exams are scheduled in Ames on December 12. Walk-ins are welcome. Contact KC0RX. Please let me know of upcoming scheduled exams. Congratulations to the Newton Amateur Radio Association which recently celebrated its 50th anniversary. The Northeast Iowa ARA assisted in the Waterloo Red Cross 5K-10K and Iowa Head-Injury 5K Runs. The Fort Madison ARC and the Iowa-Illinois ARC had their 6th Annual Radio Picnic while the Fort Dodge ARC enjoyed a September picnic/meeting. WB0AVW has a net on the Storm Lake while K0CY, WA4JL and K4KJU are now in Boone. Both K0VZR and K0JN are sporting new towers. The WA0RJT-1 PBBS had a traffic count of 53 this month. A Merry and Blessed Christmas to all and I look forward to serving you in 1988! Traffic: W0SS 293, K0MPT 277, W0YLS 123, KA0ADF 118, K0GP 81, WB0MCX 46, WB0AVW 39, KB0BE 34, KA0GSA 31, WA4JL 29, KC0XL 29, KA0VBA 11, WB0V 9, KA0STB 8, KC0KZ 6.

KANSAS: SM, Robert M. Summers, K0BXF—SEC: W0CHJ, STM: W0OYH. Good news first—No one reported sick during the month of August. Warm weather must agree with us all, but take care. "Old Man Winter" is just around the corner. Net activity is as follows: K5BN QNI 1063 QTC 221. KPN 418/11, KMWN 602/551, KWN 817/637, CSTN 2026/41, QK8 171/65 and QK8-SS 25/1. Many thanks again to those performing the liaison functions to Tenth Regional Nets, N0DJT, N0FNL, KX0I, K50J, N0BZ, WB0ZEN, K0MQ and K0BIF. Without these stations we would be in trouble. W0MYM manager of QK8-SS would like everyone to recruit some of those new Novices for the QTH net (30 PM local time) each Tues and Thurs. More net controls and alternates together with liaison stations are also needed for the K5BN. A one-man show isn't going to pull us out of hot water if a disaster does happen. PLEASE VOLUNTEER. Congratulations to W0FIR on another term as our MIDWEST DIVISION DIRECTOR. Have not heard from the WARC, Wichita or the Mine Creek ARC for some time now. Your SM must have got lost from your mailing list, perhaps due to an officer change. PK0AR, Leavenworth is gearing up new ARES Zone 2 with a telephone call system for contingencies. A good W0FIR is the HERO and EXPRESSES?? Traffic: W0FIR 402, W0FRC 181, N2DM 97, N0BZ 86, K0BXF 79, N0BDG 71, W0OYH 68, W0FDJ 67, W0CMT 54, K50U 47, WB0Z 43, KX0I 32, W0PB 10, W0CHJ 9, W0MYM 7, W0BFO 5, N0DUT 5.

MISSOURI: SM, Ben Smith, K0PCK—Thirty-Six amateurs from the Kansas City area provided communications for the Baptist Medical Center Triathlon. This was the 5th year Amateurs have assisted with this event, and the Amateur participation was coordinated by KM0B, K0ORB, Net Manager of the MO Side Band Net, reports the date for the Net Picnic (continued on page 104)



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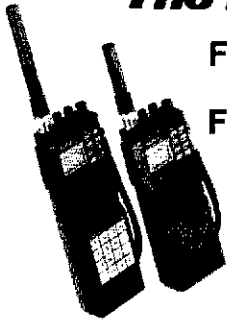
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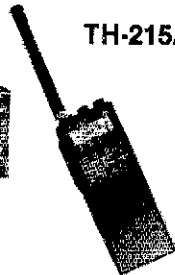


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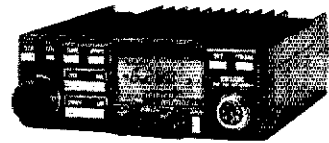


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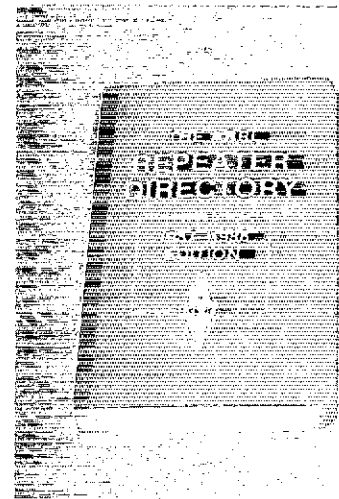
Dean has cerebral palsy and got started in Amateur Radio with help from the Courage HANDI-HAM System. The HANDI-HAM System is an international organization of able-bodied and disabled hams who help people with physical disabilities ex-

pand their world through Amateur Radio. The System matches students with one-to-one helpers, provides instruction material and support, and loans radio equipment.

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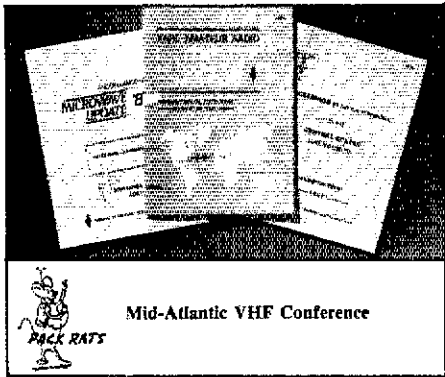


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THE AMERICAN RADIO REPEATER DIRECTORY
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Four Great Conferences



Packet Radio Enthusiasts meet in California. VHF/UHF and Microwave Enthusiasts gather in Texas, Colorado and Pennsylvania

Anyone who says that experimentation and building equipment by radio amateurs is a lost art should take a long hard look at these proceedings books! They are available from many dealers or directly from ARRL for \$10 each. Please include \$2.50 (\$3.50 for UPS) to cover shipping and handling of each order. Papers submitted are in camera-ready form, are unedited and are solely the responsibility of the authors.

The VHF Society Proceedings and Proceedings of Microwave Update '87 complement each other quite well. While still offering

a wealth of construction material, the former book contains a great deal of material on propagation and EME. The latter is devoted to interesting construction projects for 902, 1296, 2304, 3456 and 5760 MHz.

Even though you can buy a computer at the local discount store and a TNC from your ham radio dealer, packet radio is just in its infancy. There are still many things to be resolved and even more technological advances to be made. Where is digital communication headed? The ARRL Amateur Radio 6th Computer Networking Conference helps to answer these questions.

6th Computer Networking Conference

This conference was held in Redondo Beach, California on August 29, 1987 and the following papers appear in the proceedings book: Estelle: Formal Description Technique for Communication Protocols, VE2BPM; OSI: A Plan Comes Together, W2VY and N2DSY; A High Performance Packet Switch, WB6HHV, N6NKF and KA61QA; The KISS TNC: A Simple Host-to-TNC Communications Protocol, K3MC and KA9Q; Digital Signaling Processing and Amateur Radio, W3IWI and N4HY; A Duplex Packet Radio Repeater Approach to Layer One Efficiency, N6CXB and N6BGW; Packet Radio Developments over the Last Year, WB4JFI; Thoughts on the Issues of Address Resolution and Routing in Amateur Packet Radio TCP/IP Networks, N3EUA; The Design of a Mail System for the KA9Q Internet Protocol, N3EUA and PA0GRI; A Bit Error Rate Tester for Testing Digital Links, K9NG; A 56 Kilobaud RF Modem, WA4DSY; Reusable IP Addresses in a Dynamic Network, N3CVL; Software Design Issues for the PS-186 Advanced Packet Network Controller, WB6CYT; Another Look at Authentication, KA9Q; A High Performance, Collision-Free Packet Radio Network, KA9Q; The KA9Q Internet (TCP/IP) Package: A Progress Report, KA9Q; Approach for Digital Transmission of Pictures, DL2MDE; RUDAK - The Packet Radio Experiment On-Board OSCAR P3C, DK1YQ; Improving Shared Channel Access Techniques for Amateur Packet Radio, WB6RQN; The Noise Performance of Several Data Demodulators, LU4DXT; Overview of the TEXNET datagram protocol, N5EG; CSMA Multihop Networks: Throughput Analysis, N4HY; DSP Modems: It's Only Software, N4HY; HF Packet: Where do we go from here?, VE3JF; FINDER—The Family Information Database for Emergency Responses, WN6I and N6MWD and N6KL; Dial "O" for Operator: Message Routing in the Amateur Packet Network, W2VY; Packet Radio and

IP for the Unix Operating System, NIDMM; Pacgram Messaging Protocol for Packet Networks, WB8TKL; Performance Monitoring or I Wanna Fix it, Is it Broke?, WB6YMH and NK6K; ASC X12.A-1985: Draft Proposed American National Standard for Electronic Business Data Interchange Amateur Radio Message Transaction Set, NC4E; Design Abstractions for Protocol Software, VK3BLY.

Proceedings of the 21st Conference of the Central States VHF Society

On July 23 through 26 VHF/UHF and Microwave enthusiasts from across the country met in Arlington, Texas. Covered in the proceedings book are the following: Report of the 20th Central States VHF Conference, W3XO; A Brief History of the Central States VHF Society, W3XO; 2 GHz to 6 GHz Power Amplifiers, W0PW; Insulated Element Length Disturbances and Possible Correction factors for Yagi VHF/UHF Antennas, KF4JU; The Thanksgiving Tropo Opening of 1986, N00Y; How to Get Started in VHF (VHF: A New Beginning), K5YY; A No-Tuning Crystal Controlled Microwave Local Oscillator, KK7B; Inexpensive Microwave Frequency and Power Measurements, K5BYS; Meteor Scatter Propagation, W9IP/2; Amateur Radio Satellite Operation for the VHF/UHF Amateur, W5IU; Use of Small TVRO Dishes for EME, VE4MA; Building Equipment for 3456 and 5760 MHz, K0RZ; AA5C 432 MHz Transverter, AA5C; VHF Amplifier Design and Construction, KX00; Microwave DXing: An Introduction to Long-Distance UHF and Microwave Propagation, W3EP; Orbital Mechanics of the Moon, W9IP/2; Lifeline in the Wilderness, KL7WE; Smith Chart, Part 2: The Scalar Approximation, N6TX; GaAsFET Mixers for 5.7 GHz W7CNK; 3456 MHz IMFET Amplifier, WB5LUA and WA5TNY; Microwave Antenna Ranges, WA5VJB; Gunnplexer Tips, WA5VJB; Mounting MMICs, WA5VJB; Horn Gain: A Computer

tion of the DJ9HO Stacked Twin-Eight Array for the 23 cm Band, WA6KOU; More on Stacking, or Why 50 MHz is different, N7BSN. A Solid State Power Amplifier for 5.7 GHz, WA5TNY; Microwave EME Experiments, Spring 1987, KD5RO.

Microwave Update '87

Estes Park, Colorado was the location of this popular conference which was held on September 10-13, 1987. These papers are published in these conference proceedings: What's New in MMICs?, WB5LUA; 9 and 13 cm Transverters, KK7B; A 3.3 GHz Signal Source with +10 dBm Output, W0PW; Modifying the UPX-6 Cavities for 902 MHz, VE3CRU; Microstrip Bandpass Filters, WA8NLC; G Lines for 1296, 2304 and Above, W40JK; 10 GHz Noise Source, WA5VJB; Building Equipment for 3456 and 5760 MHz, K0RZ; Another 3456 MHz Transverter, K0KE; 2 GHz to 6 GHz Power Amplifiers, W0PW; Phase Lock Source Update, K0KE; A 2160 MHz Local Oscillator, WB5LUA; Tuning of Microwave Stripline Amplifiers, K0KE; 2304 MHz Amplifier Using 7289 or Similar Tube, VE4MA; Antenna Ideas for 3.5, 5.8 and 10.4 GHz, W0PW; A 6 cm Waveguide to N Connector Transition, W0PW; The "First" 3456 MHz Long Yagi?, K0KE.

Mid-Atlantic VHF Conference

Sponsored by the Pack Rats ARC, this conference was held in Warrington, PA on Oct. 10 and 11. Papers include: VHF Mountain Topping, W1XX; SHF Receivers, WA2GFP; Transceivers for the 3400 and 5600 MHz Bands, WA3JUF and WA3AXV; Two 7289s on 903 MHz, W1RIL; VHF/UHF GaAs FET Preamplifier Update, W1JR; A 404-MHz Local Oscillator, WB3JYO; The Diplexer Filter: A method for Enhancing Double Balanced Mixer Performance, WB3JYO; RF Man's 903 MHz Transverter, and 903 MHz UT-141 Filter, WA3AXV; Microwave Building Blocks, WA3JUF.



*On the Twelfth Day of Christmas
My True Love Gave to Me...*

*Twelve Folks Conversing
Eleven Geezers Griping
Ten Novices Keying
Nine Ragers Chewing
Eight Amateurs Arguing
Seven Turkeys Babbling
Six Extras Explaining
Five Garrulous Hams
Four Chatting Chicks
Three Bantering Biddies
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in 88 will be Sept. 17. In the past several months, many have received their Novice tickets, but very few seem to be taking advantage of the slow speed net. This net (MTN) meets Monday through Saturday at 8:00 PM on 7.430 kHz. It is a great place for Novices to work to get their code speed up, learn about traffic handling and meet other Amateurs around the state. If you have Novices in your club, encourage them to check in. Silent Keys reported: KA0QEY, WA0AIT, K0FFZ and WB0GGQ. Nets reporting:

NET	Sex	QNI	QTC	Day	Time(AM)	Freq (MHz)	Mgr
MOSSB	30	646	174	Dly	6:00	3.963	K00RB
MEOB	30	540	151	Dly	5:30	3.963	K00SO
MON	00	265	92	Dly	7:00/9:45	3.585	K0SI
HBN	22	251	22	M-F	12:05	3.880	K0DSQ
RRABN	29	380	11	Dly	8:00	146.19779	KABLLN
SLAN	4	234	11	Mon	8:00	146.37191	K0JFZ
ZAEI	5	70	9	Tue	8:00	147.8424	N0QE
KCBARC	4	75	5	Mon	8:00	145.41	VABSE
SWARC	5	124	3	Tue	7:00	146.04/64	K0JUD
ARES	5	54	3	Thu	9:00	147.855/255	N0FCW
TCN	4	41	3	Thu	4:00	147.09/69	N2ZF
MCFON	4	23	2	Wed	8:15	222.42/4.02	A100
CMEN	6	110	1	Wed	9:00	146.16/76	K0PCK
JCCCN	5	57	1	Wed	9:00	146.40/77.00	WB00ZX
CARL	4	18	1	Wed	9:30	146.46	WB0WLU
LOZBC	26	321	0	M-S	6:00AM	146.13/73	N0HVO
LOZFM	4	99	0	Fri	9:00	146.13/73	N0HVO
KAPES	4	59	0	Sat	9:00	146.37/97	K0JJA
SAM	4	56	0	Mon	8:00	146.42/7.03	W0ENW
CHYL	4	74	0	Mon	8:00	147.285/885	N0HVO
MMARL	4	17	0	Sun	8:00	26.235	N50B

Traffic: N0QG 465, K9OCU 165, K0SI 148, W4DYJX 124, K0PCK 111, K00RB 105, K0BAS 91, A100 82, N0DN 65, W0DELL 63, W0UD 43, W40HTN 34, K2ONP 20, KT5Y 11, K40P 10, K0DAJ 8.

NEBRASKA: SM, Vern Wirka, WB0GQM—Best wishes to everyone this holiday season. As 1987 comes to an end, thanks to all of the Field Organization volunteers that really make everything work on the section and local level. If you need assistance with some problem or project, do not hesitate to contact your Section Manager or one of the other appropriate section-level appointees. Section Traffic Manager Jerry Kohn, W0EGRK, Section Emergency Coordinator Michael Ruhnanz, N0FER, Public Information Officer Michael Bennek, K0XEV, State Government Liaison Bob Mitchell, W0BJLJ, Technical Coordinator Chuck K0N9, and Affiliated Club Coordinator Larry Lehmann, K00DA. There are several clubs in the Nebraska Section with Special Service Club status. If your club would like Special Service Club status, contact our affiliated club coordinator for information. Some clubs in the Nebraska section have been contacted by various computer clubs and computer enthusiasts for programs and information about computers in Amateur Radio. This gives an excellent opportunity to demonstrate packet radio as well as do some recruiting for the Amateur service. The Pine Ridge Club of Chadron provided communications for the annual Crop Walk between Chadron and Crawford during October. The Midway Amateur Radio Club of Kearney recently started recognizing members for Special Amateur Radio accomplishments. Eric Erickson, K40RW, was honored for the ham with the best HF accomplishment in the club. K40RW confirmed 83 countries between January and August 1987, all on CW, using a barefoot Kenwood 120 and trap dipole antenna.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, K2IZ—ASM: KB1H. STM: K1EIC. SEC: N1DCS. OOC: NA1I. ACC: NK1J. PIO: WA1CMF. TC: W1HAD. SGL: K1AH.

NET	NM	SESS	QTC	QNI
CFN	K1EIR	57	229	224
WCN	NK1J	30	57	276
CSN	WB1GKZ	22	262	137
CSN	WB1GKZ	22	35	113
NVTN	K1CE	27	132	293
CBTN	K1CE		473	
RTN	KA1JAN	30	70	234
TMRCN		4	75	

Greetings of the season to all. The ICRC has tentatively set its annual Flea Market for March 20th. With the winter season upon us remember to keep your conversations shorter and breaks longer on the repeaters. This will greatly enhance our opportunities to assist fellow operators. Tom Paradis, KA1FPA is attempting to get an amateur radio club off and running at Stafford High School. Donations of equipment, accessories or any amateur related materials would be appreciated by this and many other educational and service groups around the state. Donations to many organizations are tax deductible, a fact not to be overlooked especially around Income Tax time. Congrats to Dan, KY1F new president of RASON, K2IZ/R operating on 224.32. Tri-City ARC recently put on a demonstration at the Crystal Mall. A BIG WELCOME to the Weston ARES, the section's newest affiliated club. Congratulations to KA1JAN on her recent marriage. 32 new Novices courtesy of the Bethel Educational ARS (BEARS). All groups sponsoring amateur radio classes and VE Exams should advise NK1J-ACC. This way referrals can be made in a timely fashion to assist fellow hams and those hoping to be N1DCS-SEC is now open. Packet W1FHP and the Hen House Gang will be busy putting Bethlehem on the air during the Christmas Holidays. THE NEW WORLD OF AMATEUR RADIO video is an outstanding recruitment and public relations tool for promoting our hobby. Copies are available for loan or purchase through the APRL. Traffic: W1WP 2879, KY1T 640, N1EDD 532, W1EFW 404, KA1GWE 274, K1EIR 199, N1API 80, W1BDN 45, KY1F 48, NM1K 42, K1CE 42, WA1NLD 31, WB1ESJ 29, K1AQE 24, NN1X 20, K0BZC 20, N1BOW 7, W1CUI 7, W1QV 5.

EASTERN MASSACHUSETTS: SM, Barry Porter, KB1PA—ASM: K9HI. STM: KW1U. ACC: KA1KCU. PIO: K1HLZ. SM: KB1AF. OQJA: AG1F. SGL: K3HI. TC: KA1IU. EMass Hotline—437-0111. Westlink—449-2226.

NET	MGR	FRQ	TIME(LOC)	DY
EMRI	WB0JJ	3658	1900/2200	DY
EMRIPN	WA1FCD	3880		DY
EM2MN	NK1Q	63/23	2000	DY
NEEPN	K1BZD	3945	0830	SUN
HHTN	NG1A	04/64	2230	DY
EMRIS	N1CVE	3715	1600/2030	DY
CITN	KB1AF	745/045	1930	DY

It has been a busy month, with most of the clubs gearing up for fall and winter activities. We can all clean out our attics, rooms, and closets at the Deerfield (Oct 10) or Framingham (Oct 23) flea markets and pick up some useful goodies. I hope to see some of you there. Also the annual Boy Scout Jamboree-On-The-Air (JOTA) will be Oct 17. The only group I am aware of operating in Eastern Mass is the Norumbega Council with 8 stations at the Hale Reservation in Westwood. If you have a question on license classes or exams in this area, or want to find out how the road traffic is flowing in Eastern Massachusetts check out the "Going Home Show" Net on the 146.64 repeater hosted by net controls Kathy, KA1NYR and Dianne, KA1NQU. The State Police listen in, and the net is

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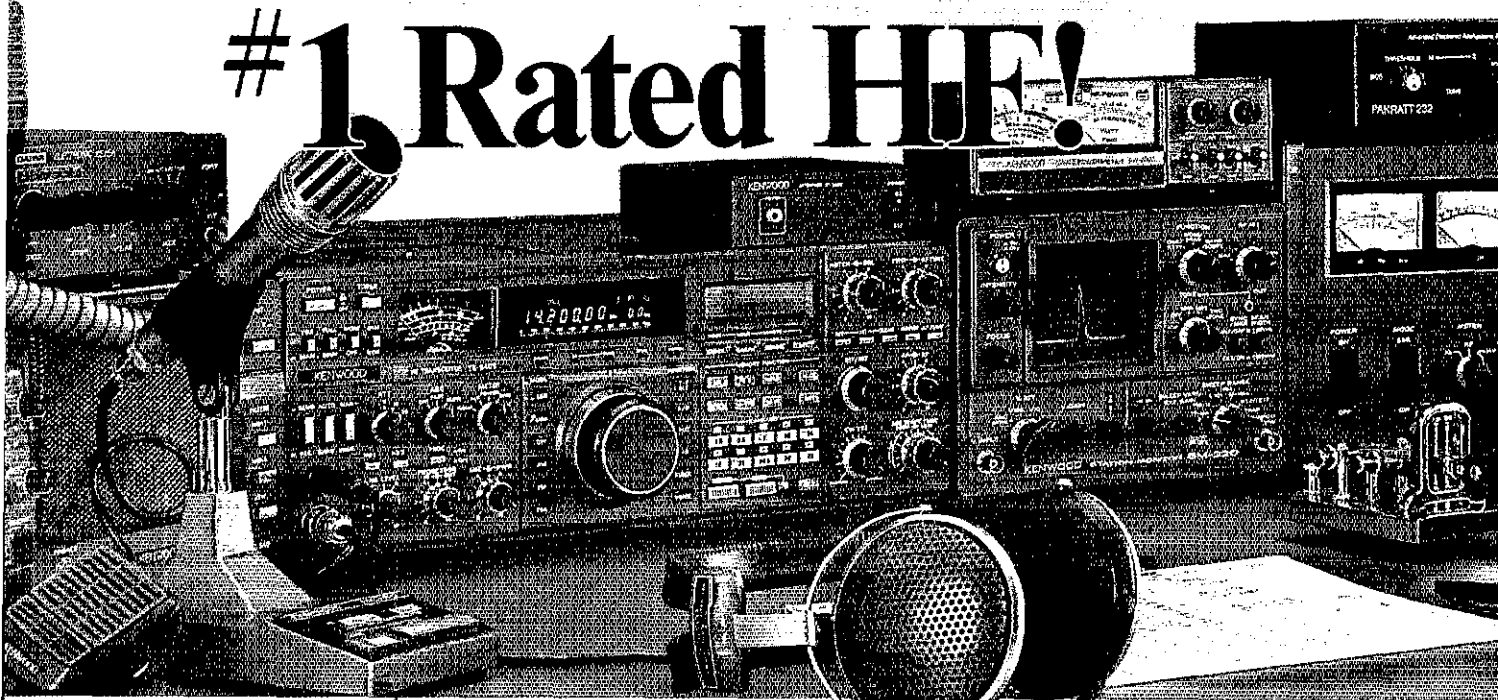
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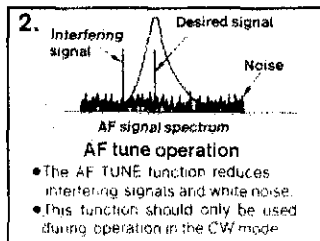
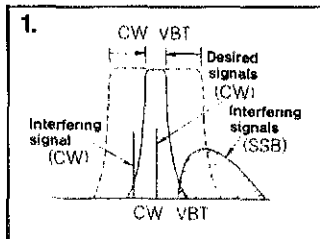
TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance shows that the TS-940S is "The Number One Rated HF Transceiver!"

- 100% duty cycle transmitter. Kenwood specifies transmit duty cycle **time**. The TS-940S is guaranteed to operate at full power output for periods **exceeding one hour**. (14,250 MHz, CW, 110 watts.) Perfect for RTTY, SSTV, and other long-duration modes.
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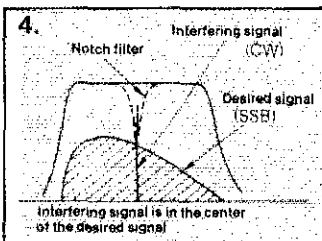
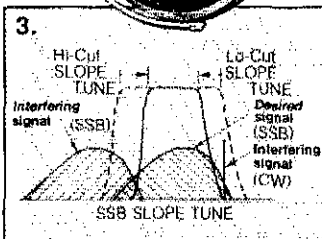
- AT-940 full range (160-10m) automatic antenna tuner
- SP-940 external speaker with audio filtering
- YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter
- VS-1 voice synthesizer
- SO-1 temperature compensated

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.



1) **CW Variable Bandwidth Tuning.** Vary the passband width continuously in the CW, FSK, and AM modes, without affecting the center frequency. This effectively minimizes DRM from nearby SSB and CW signals.

2) **AF Tune.** Enabled with the push of a button, this CW interference fighter inserts a tunable, three-pole active filter between the SSB/CW demodulator and the audio amplifier. During CW QSDs, this control can be used to reduce interfering signals and noise, and peaks audio frequency response for optimum CW performance.



3) **SSB Slope Tuning.** Operating in the LSB and USB modes, this front panel control allows independent, continuously variable adjustment of the high or low frequency slopes of the IF passband. The LCD sub display illustrates the filtering position.

4) **IF Notch Filter.** The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

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- PC-1A phone patch
- TL-922A linear amplifier
- SM-220 station monitor
- BS-8 pan display
- SW-200A and SW-2000 SWR and power meters
- IF-232C/IF-10B computer interface.

- **Complete all band, all mode transceiver with general coverage receiver.** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
- **Superb, human engineered front panel layout for the DX-minded or contesting ham.** Large fluorescent tube main display with dimmer; direct keyboard input of frequency; flywheel type main tuning knob with optical encoder mechanism all combine to make the TS-940S a joy to operate.
- **One-touch frequency check (T-F SET) during split operations.**
- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
- **Simple one step mode changing with CW announcement.**
- **Other vital operating functions.** Selectable semi or full break-in CW (OSK), RIT/XIT, all mode squelch, RF attenuator, filter select switch, selectable AGC, CW variable pitch control, speech processor, and RF power output control, programmable band scan or 40 channel memory scan.

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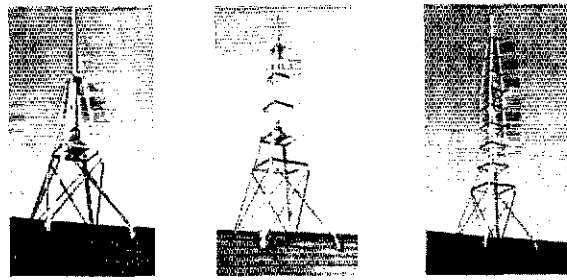
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ROOF TOWERS



CR-18

CR-30

CR-45

CREATE ROOF TOWERS CONSTRUCTED OF HIGH GRADE ALUMINUM WITH GALVANIZED STEEL BRACING FOR ADDED STABILITY AND STRENGTH WILL EASILY ACCOMMODATE YOUR ANTENNA REQUIREMENTS. THREE SIZES OF ROOF TOWERS WILL SUPPORT VHF ANTENNAS HF TRU-BANDERS AND OSCAR SYSTEMS. ROTATORS EASILY MOUNT INSIDE THE TOWER. AN OPTIONAL THRUST BEARING (#303) IS RECOMMENDED. SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.

MODEL	HEIGHT	MAXIMUM ANTENNA WIND LOAD IN FT 2	BASE WIDTH	MAX. VERT LOAD LBS.	TOWER WEIGHT LBS.
CR-18	5'10"	21 @ 90 MPH	31-1/3"	400	18
CR-30	9'10"	27 @ 90 MPH	39"	1,322	33
CR-45	14'9"	33 @ 90 MPH	39"	881	57

#303 Thrust Bearing For CR-18, CR-30, and CR-45 Maximum Acceptable Mast Diameter 2"

*Guying is required on all roof towers.

MODEL	DESCRIPTION	PRICE	CALCULATION
ROHN			
20G	10' sect	45.95	CUSHCRAFT
20AG	top sect	56.56	
25G	10' sect	57.95	A4
25AG	top sect	67.95	
45G	10' sect	137.95	A3
45AG	top sect	140.95	A5
AS29G	access shell	22.95	32-19
AS49G	access shell	56.95	215WB
TB-3	thrust bear	53.95	
M200	10' mast	19.95	
SB25G	short base	26.95	
SB45G	short base	56.95	
EP2545G	pin pole	324.95	
	AND MORE!		

MODEL	DESCRIPTION	PRICE	CALCULATION
HUSTLER			
6BTU	6 band trap vert	126.95	CUSHCRAFT
5BTU	5 band trap vert	116.95	
4BTU	4 band trap vert	99.95	A4
67-144	Fix stat 2mt		A3
	collinear	116.95	A5
MO-1/MO-2	mobile masts	21.95	32-19
RM10/RM15	10m-15m resonator	11.95	215WB
RM10S/RM15S	super resonator	16.95	
RM20/RM20S	std. & super resonator	15.95/21.95	
	10m std resonator	16.95	
	std and super	17.95/25.95	
	75 or 80 std	18.95	
	75 or 80 super	36.95	
	bumper mt.	15.95	
	starless ball mt.	17.95	
	spring	16.95	
	quick disconnect	14.95	
	2mt 5/8 mag mt.	28.95	
	trunk mt. w/swivel		
	ball	16.95	
	AND MORE!		

MODEL	DESCRIPTION	PRICE	CALCULATION
VAN GORDEN			
PB0610	80-10 dipole kit	34.95	HY-GAIN
PB0940	30-40 dipole kit	32.50	
PB4010	40-10 dipole kit	39.95	TH5MK2S
SD80	40 shortened dipole	29.36	EX-14
SD40	40 shortened dipole	25.36	IH3JRS
ALL BANDER	160-10mt	28.59	18AVT/WBS
GRV		49.95	14AVT/WBS
	AND MORE!		V2S
			V4
			HBT44MAG

MODEL	DESCRIPTION	PRICE	CALCULATION
CABLE & CONNECTORS			
Belden 9913	Low Loss	49c/ft	KR400
Columbia RG219	50 (10MHz)	35c/ft		KR500
RG7/U	Foam	30c/ft	KR600
RG8X	Mini	16c/ft	KR5400A
RG58/U	72 OHM	14 r/s	KR6500A
PL259/Silver		99/1.39	KR2000
N-Male for 8/11		4.00	
8NC(M)-UHFF		4.80	
Columbia Low Loss		29c/ft	
	AND MORE!		
KLM			
KT34A	triband 4 el		LARSER
KT34XA	triband 5 el			LM4MM
2M-14C	2mt. satellite		LM15D
2M-22C	2mt. satellite		NM0MM
435-18C	70cm satellite		NM150
435-40CX	70cm satellite		
432-30LRX	70cm satellite		
2M-13LBA	2 meter		
2M-16L BX	2 meter		

RTTY-AMTOR Packet

RTTY-AMTOR-PACKET

EEB is one of the few Amateur dealers that actually demonstrates the latest high tech equipment. We test every new item and only sell what we feel confident with. If you are considering Packet, call us and we'll sell you the best! Ask for Scott, WR45 or Ted AA4SM at 703-938-3350. If you are in the DC area, stop in and marvel at our dedicated RTTY room.

"NEW!"

PC-PakBat Terminal Program for IBM compatible and PK-232 Split Screen Xmit & Recv Buffer All commands are Simple function keys. Complete help menus for all PK-232 commands & functions. Makes use of the PK-232 Host made List Price \$29.95. Amt. Price \$25.00.

NEW PK-232 with weather fax!

- AMTOR RTTY, PACKET, CW, WEATHER FAX
- All decoding, signal processing & protocol software for all modes is on ROM in the PK-232
- Only a terminal program is required for computer interface
- VHF/HF/CW modems with 8 pole handpass filter.
- Type ahead buffer (750 characters)
- Receiver buffer (2700 characters)
- 240 page users Manual with "Quick Start" section included.

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FREE AD ADAPTOR \$30.00 VALUE



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Bird 43—elements—loads

ITEM	PRICE	MISC. ITEMS	PRICE
160 RD 40	49.95	OXA	160 RD 40
5 band beam	199.95	HFSB	5 band beam
1V rotor	19.95	ARC50XL	1V rotor
coil & whip	38.50	NM02/70	coil & whip
2m or glass	34.50	AP1B1-3G	2m or glass
Hustler adapt	14.95	X-PANDAS	Hustler adapt
1/4" O mag	19.95	UGM	1/4" O mag
2m duck	16.95	HR144B	2m duck
scanner magnet	39.95	MONR51	scanner magnet
9.1 balloon	46.95	BL1500	9.1 balloon
Onaseal	2.49		Onaseal
GFB	6.00		GFB
D130	25.1300		D130
discone	79.95		discone
5' mast	5.95		5' mast
3-way switch	26.95		3-way switch
Blitz bug	7.50		Blitz bug
4' jumper	8.95		4' jumper

ANTENNA CR2AM



MODEL	DESCRIPTION	PRICE
CR2AM	PERM MT	41.00
CR2A	2M Mag MT	41.00
CR3A	220MHz Mag MT	37.00
CR4A	140MHz Mag MT	34.00
CR2R0	Radome Cover	12.00

CABLE IS NOT INCLUDED

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provided by many of the local radio station reporters as well as the CVB Samaritan Vans. It is a great source of info and Ham Fellowship, especially in bad weather. The net provides the local authorities with timely accident and breakdown info to help keep our roads clear and Kathy keeps a list of exams and classes. The annual SET is this month, with a sectionwide drill planned for the weekend of Oct 31/Nov 1. I will have more on what went on next month. The main thrust of the drill will be improving Red Cross liaison. Peppercorn ARES will be providing communications for a soccer tournament involving 75 teams from all over New England and Canada. This event will be on Oct 10, 11 and 12. The soccer will occur on 5 fields scattered around town. The Hams will coordinate the medical response. Congratulations to the North Shore Repeater Club, who renewed their Special Service Club status. The Sturdy Memorial Hospital ARC reports the KF1C-1 Digi-repeater on 145.09 has a new transceiver, and the KA1MYG-1 Digi on 145.01 is now on a 500 foot tower. They will be providing communications for the "Health Chase", a 2 and 5 mile race held in the Attleboro area Oct 18. The Algonquin Club will be providing public service with a Halloween community watch. They sponsor a net on 28.400 +/- QRM Wednesdays at 8:00 PM local time. The Middlesex club plans to apply to use the space in the old Buell building for Massachusetts ratification of the US Constitution. For more on this event for W200HEB the week of February 6-12, 1988. The club is also working on improving the 147.36 repeater. The Cape Ann club had 21 Hams provide comms for a 15.5 mile race around Cape Ann. Colonial Wireless is looking forward to getting their cavities for their 220 MHz repeater. The Massachusetts Club reports that they meet the 3rd Tuesday of each month at the St. Thomas Parish Center, Center Street, Bridgewater. Talk in on 147.18 Repeater. On the 1st, 2nd and 4th Tuesdays they meet on the 147.18/78 Club repeater at 8:00PM. KB1AF reports 395 transmissions of Bulletin information, again mostly by packet BBS's. If you would like ARRL Section Bulletins read on your local repeater or at club meetings, contact KB1AF. If the reports that the "C's" are having more RFI problems. It's nice to know help is there when it is needed. If you want to volunteer some time, the Eastern Mass Field Organization can use you. Have you made your voice heard by letting your Division Director or Section Manager know of your opinions lately??? Traffic: KW1U 672, NG1A 532, KB1AF 407, KN1K 392, WA1FC 291, WA1TBY 282, KIABO 168, W1ZHC 166, KA1MDM 153, NK1Q 124, N1GVE 99, N1AJJ 90, WA1FNM 67, W1CE 62, KA1LJH 38, K1SEC 35, KA1EJD 33, WA2KFE 21, KB1ZD 20, KA1NOI 18, K1LCC 6, WA1SNH 6, KA1EY 4, KA1KUC 2.

MAINE: SM, Cliff Lavery, W1RWG—ASM: Bill Mann, W1KX, SEC: KABUVQ, STM: WAZERT, SM: WJ1TH, OOC: W1KX, PIC: KY1E, SGL: K1N1T, TC: KQ1L, ASMP: N1AHH. I have accepted the resignation of KA1FKS, ACC, with regret. She, however, finds that her local activities leave her very little time. Congratulations to Michael Cohen of Portland who passed his exam and received his new call, KA1OZC. Mike is only nine-years old. The Androscoggin ARC has planned a Christmas party for December 5 at Jimmie's Restaurant, and Mid-Coast ARRC has planned one for December 12 at Montsweag. The 148.73 repeater has been moved to Munjoy Hill, Portland; PAWA and Blackstrap Repeater Assoc will join to support a 220-MHz repeater. PAWA started a Novice class on October 6. Officers of the Mid-Coast ARRC include N1DXM, pres: N1CBA, vp: N1EBC, sec: W1PXE, treas: KQ1L, trustee: W1RJP, K1JHN, WA1DEQ, KB1HA, directors. Pen Bay ARC is conducting license classes at Camden-Pockport High School. The Arroostook APA participated in a countywide simulated emergency test October 12 on an exercise called "Falling Star 87". This was required by FEMA to test the emergency operation plans for Houlton, Presque Isle, Caribou, Madawaska, and County Emergency Management Agencies (EMA). The scenario was the evacuation of the Loring AFB risk area due to increased tension and fighting in Europe. A KC 135, carrying personnel and life security papers, was to crash at the north end of the N/S runway at the Presque Isle airport while attempting an emergency landing. KA1B, KA1OCS, K1CLF, KA1CNC, N1BGO, WA1YNZ, KA1KAO, KA1OXO, KA1QNG, KW1C, N1GVC, N1FCW, KASL, XP, KA1CQX, KA1EIN, KA1JHW, W1JTH, K1TFW, KA1JC, N1BUX, KA1HW, K1TFX provided comms at a variety of sites over a wide area, on ambulances and fire stations, and at other sensitive spots. The State EMA controller who had been working on the exercise for about 3 months stated the exercise was a success and that amateurs would be needed should a major disaster ever take place. MIDCOAST HAMFEST is now set for July 16, 1988, at the Union Fairgrounds. Comms for the Heart Association Race Sept 12 were provided by ARES members KS1JFE, KA1NXJ, WB1CBP.

NET SESS CHECKINS TRAFFIC MANAGER
Sea Gull Pine Tree 30 312 229 K1GUP
Arroostook Emerg 6 152 123 WAZERT
MePubSvc 4 3 0 WA1YNZ
RACES 4 55 18 W1RWG
PSHR: WAZERT 90, WR1CBP 105, KA1ODT 68, W1RWG 65, Traffic: KA1AVU 245, WB1CBP 176, WAZERT 104, W1KX 85, W1VEH 78, W1JTH 73, ND1A 63, AK1W 58, KA1JOJ 55, KA1ODT 45, W1RWG 43, WA1YNZ 32, W1BMX 25, N1BJW 19, NB2K 10, W1OTQ 5.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—ACC: K1M, STM: W1TN. The fall of the year brings many unusual activities and opportunities for the Ham community. GSARA was asked to provide comm support for the second annual air show at the Manchester Airport. This is a very large activity and an extensive comm network was needed to maintain safe operation and to coordinate events. Al Brown, W1VTP, planned and organized the event. About 35 Hams from various clubs participated over the 4 day event and comments from the airport staff indicated that our support was highly requested next year. (My apology for not listing the large team.) The experience gained here supports the concept of using public-service events as training activities for emergency communications. The fact that the Manchester club willingly supported this civic activity is definitely a plus for the Amateur Radio community. We are pleased to welcome the Interstate Repeater Society as our latest affiliated club. Pres W1HMT just received notification from the ARRL Directors of the action. Welcome to the IRSI Club members supported the annual RIVERFEST activities on the Merrimack River this year. This event includes water activities and races. Comm support was provided by W1BMA, AS1B, K1YSM, AS1B, K1YCS, K1CKS, WA1YNZ, KQ1P, N3CLZ, KB1VT, KA1ERN, KA1SK and N1IE. They report that the activities stirred interest in some people about becoming hams. On the VE scene, the Nashua club held another Vol Exam with 16 of 24 applicants upgrading. NARC Pres KA1LDF reports that the Nashua club prepared a float for the Constitution parade in Nashua. Unfortunately, rain cancelled out the floats in the parade—even the best laid plans in Ham radio occasionally fall victim to weather. CVFMA held a VE session in Claremont which resulted in 3 new Novices, 1 new Tech, 1 new General and one new Extra. Is YOUR club doing a VE session? W1TN reports that, at the recent annual tie banders picnic, Net Mgr certs were presented to K1TQY and N1ALM. N1ALM also rdg

(continued on page 110)

KENWOOD

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NEW!
45/35 Watt
Dual Bander

First Again!

TW-4100A

2 m/70 cm FM Dual Bander

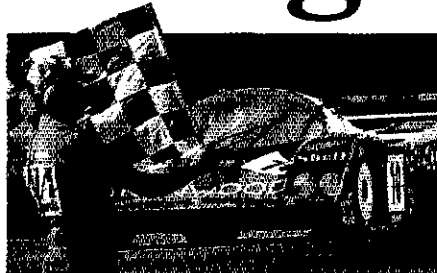
A Kenwood original just got better! Kenwood was the first to develop a 2 m/70 cm mobile radio in a single, compact package. Since then, other companies have imitated the concept, but still have not done it the "Kenwood way." The all-new TW-4100A is more compact, more powerful, and packed with more features than ever before! With many new features and accessories, and backed by Kenwood's experience, the all-new Kenwood Dual Bander is light years ahead of the rest!

• **Selectable full duplex cross band ("telephone style") operation.**

Remote base or cross band repeater function possible (a control operator is needed for remote or repeater operation).

• **45 watts on 2 m. 35 watts on 70 cm.** 5 watts (adjustable) low.

• **Frequency coverage: 144-148 MHz (allows operation on certain MARS and CAP frequencies) and 440-449.995 MHz.**

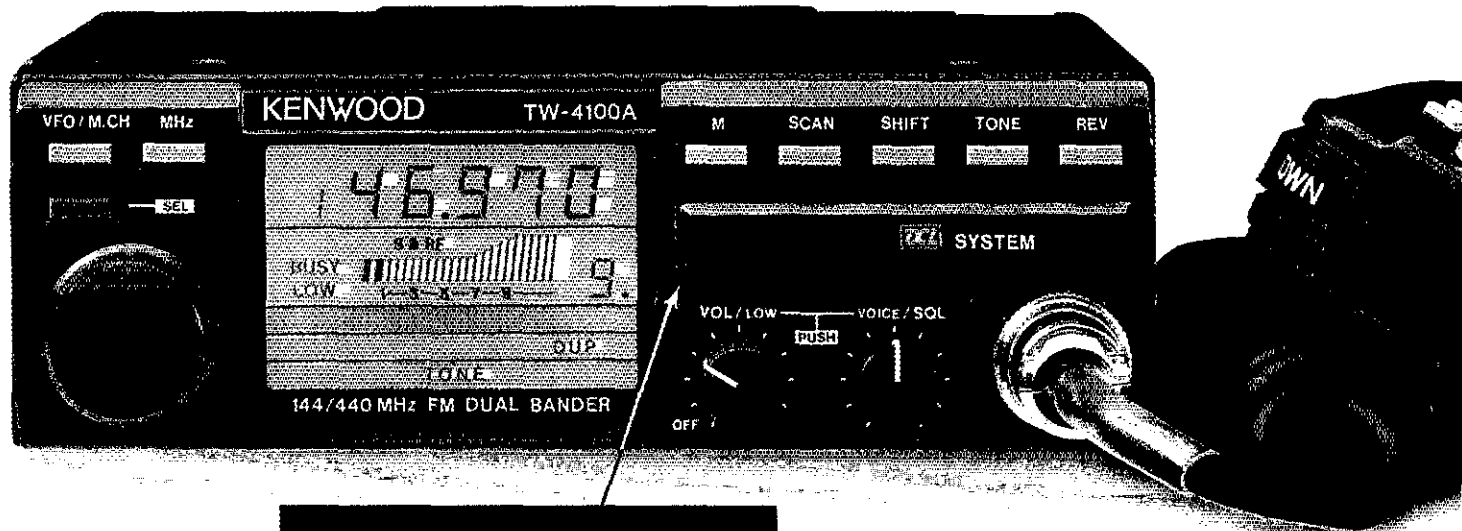


- **New compact size!** Only 5.9" W x 1.97" H x 7.87" D and weighs less than 4 pounds!
- **Proven high performance Kenwood GaAs FET front end receiver.**
- **Easy to operate!** Only 3 knobs and 8 keys on the front panel.
- **Separate antenna ports for VHF and UHF.** Minimizes loss and increases reliability and performance!
- **10 memory channels.** Lithium battery backs up memory. Store frequency, offset, subtone. Two channels store the transmit and receive frequencies independently for **odd split or cross band operation.**
- **Front panel-selectable CTCSS tone (when optional TU-7 is installed.)**

- **Non-volatile operating system.** Even after memory back up cell dies, all operating features remain intact! No re-programming or "board-swapping" necessary!
- **Programmable band scan and memory scan with memory channel lock-out.**
- **Large, illuminated LCD display and main knob.** For excellent visibility in direct sunlight or darkness.
- **Selectable frequency step for quick and easy QSY.**
- **Voice synthesizer VS-2 option.**

Optional accessories:

- **PS-50/PS-430** DC power supplies
- **MU-1** DCL modem unit
- **TU-7** CTCSS encoder
- **VS-2** Voice synthesizer
- **SW-100B** SWR/Power/Volt meter 140-450 MHz for mobile use
- **SW-200B** SWR/Power meter for base station use 140-450 MHz, 0-200 W in 2 ranges
- **SWT-1/SWT-2** 2 m and 70 cm antenna tuner
- **SP-40** Compact speaker
- **SP-50B** Mobile speaker
- **PG-2N** Extra DC cable
- **PG-3B** DC noise filter
- **MC-60A, MC-80, MC-85** Base station mics.
- **MC-55** (8-pin) Mobile microphone
- **MA-4000** Dual band mobile antenna with duplexer (shown)**
- **MB-11** Extra mobile mount



• **Digital Channel Link (DCL) option.**

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*Please check FCC regulations on repeater operation

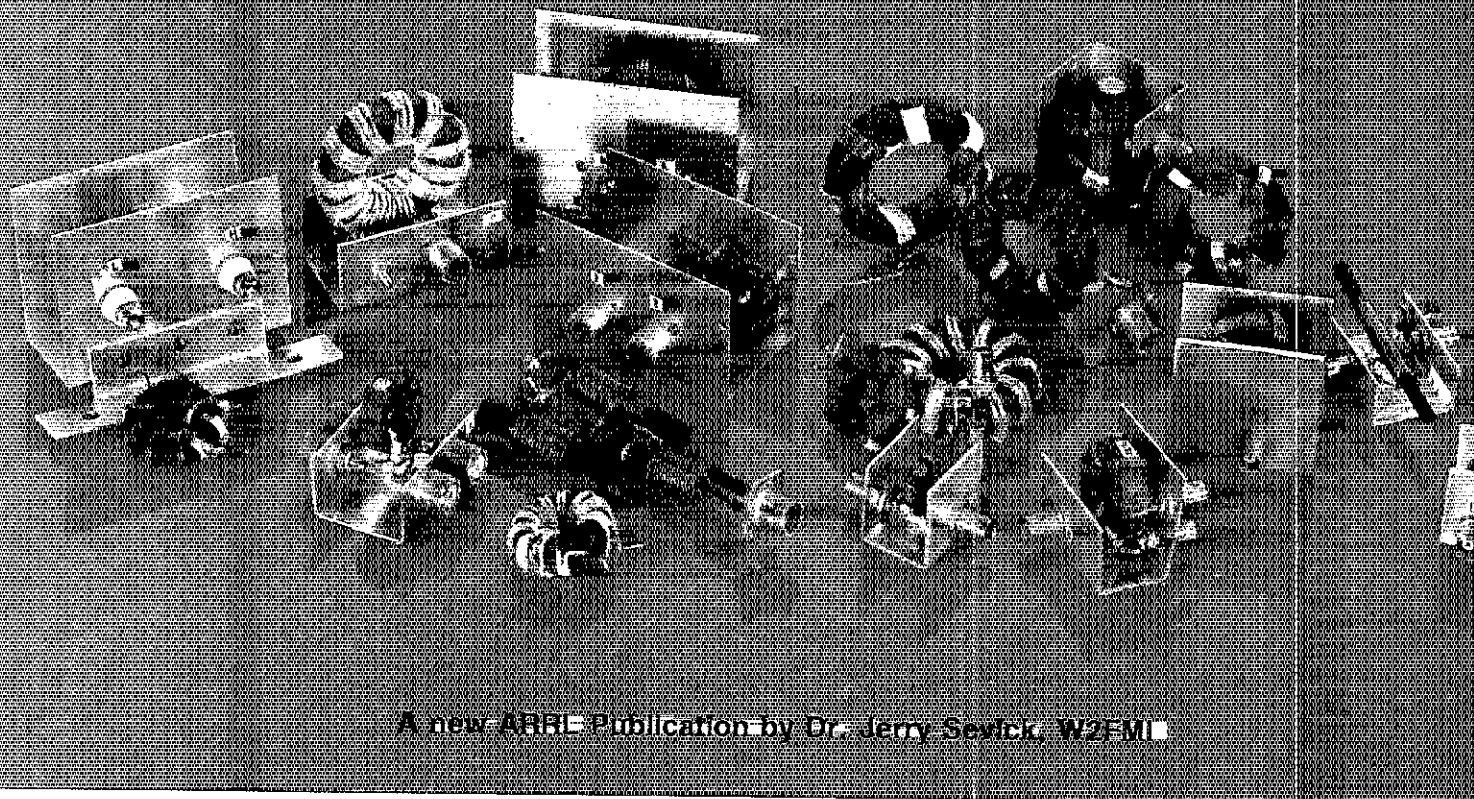
**Mag mount is not Kenwood supplied

Minor modification necessary for repeater operation

Specifications and prices subject to change without notice or obligation

Complete service manuals are available for all Kenwood transceivers and most accessories

TRANSMISSION LINE TRANSFORMERS



A new ARRL Publication by Dr. Jerry Sevick, W2FMI

Despite the popularity of transmission line transformers in both commercial and amateur applications, little practical design information has been published concerning these devices. The lack of data was made abundantly clear to Jerry Sevick, W2FMI when he began designing matching transformers for the short vertical antennas that are the subject of his classic series of articles that appeared in *QST*. In order to fill in the gaps of available knowledge, Jerry decided to study the subject of transmission line transformers in depth and the results of his findings are contained in this new ARRL publication!

Transmission Line Transformers covers types of windings, core materials, fractional-ratio windings, efficiencies, multiwinding and series transformers, baluns, and limitations at high impedance levels. There is also a chapter on practical test equipment. This book is must reading for everyone interested in antenna and transmission line theory. Copyright 1987, 128 pages \$10 hardcover only.

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The Basic Building Block
Analyses of 4:1 Impedance Transformer
A Simple Analysis
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Accessories



TL-922A 160-15 m 2 KW PEP/1 KW DC Input Linear Amplifier. Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.



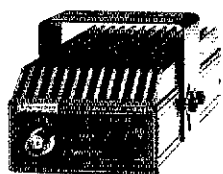
SM-220 Station monitor/10 MHz oscilloscope Pan display capability with optional BS-8 (for TS-940S, TS-830S). Monitor transmitted waveforms and/or received signal waveforms. Built-in 2-tone generator.



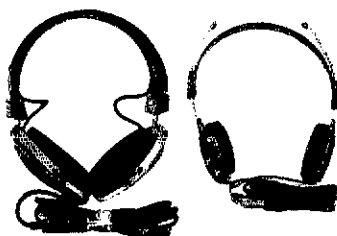
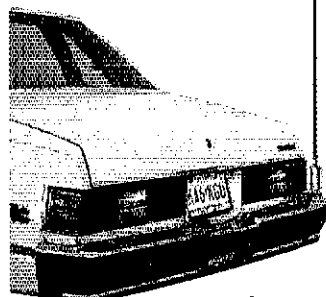
MA-5 80/40/20/15/10 meter mobile antenna. All resonators supplied. 200 W PEP max., VSWR 1.6:1 or less. Easily adjustable for center frequencies.

VP-1 Bumper mount for above.

PC-1A Phone Patch (FCC Part 68 registered)



VB-2530 25 W RF Power Amplifier (input 1-4 W). BNC-BNC cable, and mounting bracket supplied.



HS-5 Deluxe headphones.

HS-6 Lightweight headphones.



LF-30A Low pass filter. 1 kW, 50 Ω . Insertion loss: less than 0.5dB at 30 MHz.

MA-4000 2 m/70 cm dual band mobile gain antenna. Duplexer supplied. Ideal for use with the TW-4000A "Dual Bander" and TM-211A/TM-411A. (Mount not supplied.)

MJ-Series
Microphone adapters

Not Shown:

MC-50 Desk-top microphone. Hi/Lo Z. 4-pin connector.

MC-80 Desk-top microphone. 700 Ω unidirectional electret element with flexible boom. Built-in mic. pre-amp and UP/DOWN switch, with lock. (8-pin).

MC-48B Hand microphone with 16-key DTMF pad and UP/DOWN switches. (8-pin).

MC-46 As above, but with 6-pin connector.

MC-43S Hand microphone with UP/DOWN switches. (8-pin).

MC-35S Noise cancelling hand microphone, 50 k Ω (4-pin).

MC-30S As above, but 500 Ω .

PG-4A Microphone cable for MC-60A. Converts MC-60A to 4-pin connector.

PG-4B As above, but 6-pin.

PG-4C As above, but 8-pin, as supplied with MC-60A.

PG-4D Extra 4-pin cable for MC-85.

PG-4E As above, but 6-pin.

PG-4F As above, but 8-pin.

HS-7 Micro-headphones.

KPS-7A 13.8 V DC, 7.5 A intermittent DC power supply.

RA-3 2 m, $\frac{3}{4}$ λ telescoping antenna with BNC connector.

RA-5 2 m $\frac{1}{4}$ λ / 70 cm $\frac{3}{4}$ λ telescoping antenna with BNC connector.

RA-8B 2 m StubbyDuk™ with BNC connector.

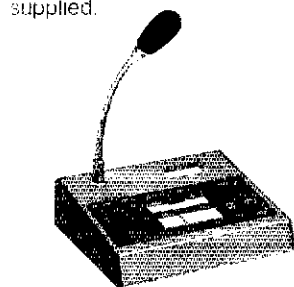
RA-9B As above, for 220 MHz.

RA-10B As above, for 440 MHz.

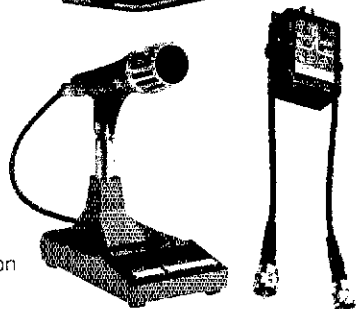
RD-20 Dummy load, 50 Ω DC-500 MHz 20 W continuous, 50 W intermittent.

PG-3B DC line filter for mobile use.

Service manuals are available for all Kenwood transceivers and most accessories.



MC-85 (8-pin) Multi-function desk-top microphone (8-pin) 700 Ω unidirectional electret condenser mic. Built-in audio level compensation with output and tone control, meter, and UP/DOWN switch. Selector switch for up to three transceivers. (Additional 4, 6, or 8-pin cables optional.)



MC-60A (8-pin) Deluxe desk-top microphone. Pre-amp built-in, PTT, LOCK and UP/DOWN switches. Hi/Lo Z selector switch.



SP-40 Compact mobile speaker.

SP-50B Mobile speaker.

Specifications and prices subject to change without notice or obligation

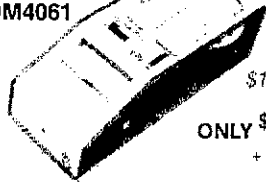
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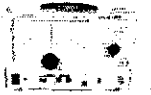
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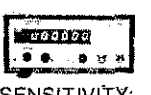
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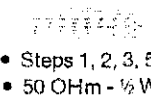
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his FRN cert. Congrats and trax for the extra effort! The Granite Chips newsletter will now be published by W1FYR and edited by W1QYY. Finally, W1LIM reports that the Lakes Region Rptr Assoc annual mtg was attended by 40 members. They had an afternoon of good food and fellowship. Traffic: MFM 187, GSPN 130, NHN 56, NHNTN 30, W1PEX 680 (BPL), N1CPX 303, WA1FHB 266, W1FYR 266 BPL, K1TQY 172, W1TN 141, KK1E 130, N1ALM 96, N1AKS 80, N1NH 68, W1ALE 87, W1UBG 58, W1HBB 57, K1LMR 43, K1IOU 35, K1IM 34, K1ACL 20, K1BI 18, K1OIQ 18, K1ATHP 13, W1APEL 12, K1ANVQ 12, K1AJOU 12, W1BGXM 6, N1DQA 5, K1KFX 3.

VERMONT: SM, Frank I. Sultor, W1CTM—ASM: KD1R, STM: AE1T. SEC: W1KRV, PIO: W1AYOY. Recognizing that the Bennington Amateur Radio Emergency Service (ARES) group was the most recent to be organized in the state, the V1 snow wizard generously donated a Simulated Emergency Test (SET) actual emergency on 10-4 by covering the county with up to 18-inches of snow. Despite this adversity, the Bennington County ARES group, led by K1ADLK (Mike) was able to provide communications from the stricken county to the rest of the state from early Sunday morning throughout the day until 2230 local Sunday night. The dedication to public service by this group of Amateur Radio operators was in the finest tradition of our service. Participating section stations were: WA1MAG (Ed), K1ACX (Wayne), K1ADLK, W1KRV (Joe), W1KQ (Jim), W1AYOY (Al), K1APTW (Bill), K1ANVZ (Tom), N1B1A (Kevin), W1BWR (Bill), & W1CTM. Due to the ARES communication efforts, Bennington Police officials were able to help over 250 stranded tourists find food and shelter. Additional supplies were requested from and provided by Burlington Red Cross to sister chapter in Bennington. Because of Bennington ARES data provided to National Wx Service (NWS), they were able to give precise wx info to other areas that were later affected by the storm. SEC W1KRV provided the governor with status info throughout the day. All in all, it was a heck of a pre-SET emergency that tested the ability of Amateur Radio to respond to an actual emergency. Needless to say, we passed with flying colors. Somehow the actual SET was a bit anti-climatic, however, the early snowstorm sure gave us a good scenario to use. Well, another bit of public service was accomplished by BARC when they supported Special Olympic Rec. Day 8-27. Participants included W1S, RTM, DOQ, EXZ, WA1S OZE, U1VV, VKW & W1CZEE. K1J says NE Novice Enhancement is working with 877 new Novices through 6-87. Club classes and Elmers are helping out. If you are an Elmer or wish to be one, contact your local club or me so I can give you some PR. The new BARC class has 13 students and VE exams will be held 12-12 (1000 local) at Burlington Red Cross—contact WB2JSJ. The 10 M contest Dec 11-13 this year should show improvement over last year due to both better band openings and Novice phone activity. BARC activity on 6 M is increasing with a Wed net on 50. 125 MHz. Don't forget Straight Key Night 12-31. Recent CVARC VE exam upgrades include Extra: J2IES, Adv K1PIF, Gen N1ECC, 1st Region: B2T, Participants: W1S, RTM, EBT, DNN, N1JZ, NK1A & WB1AJG had their hands full with 19 candidates on 9-19. A Happy Birthday party was held for W1UHI who is 100 yrs young. Best wishes Ernie on starting 2nd century. Congrats to both W1HMF (Tony) and KR6A (Clem) on having articles approved for QST publication. NTS 1st Region, Cycle 3 has new NM—WA2SPL. Joe has been consistently one of the top V1 ops for a number of years and it is right that he receive this honor—good luck. Net: VTN 30-121-113, TSEN 5-78-0, VTN30-121-113, TSEN 5-78-0, CVFNM 4-66-4, BAROSEN 4-76-2, GMM 26-430-34, W1PHN 4-71-5, CAR 26-645-6. Traffic: K1IQ 640, WA2SPL 617, AE1T 114, KD1R1 82, WA1XW 56, WA1UVJ 31, W1KRV 16.

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/DIR: N1M, PIO/ACC: K1BE, SEC/SGL: W1H1L, TC: K1JJM, STIC: K1EXJ. Novice classes are being conducted at Worcester Tech under the able direction of N1AQ. CMARA repeater W1BIMR will be sporting a new antenna and Hardline by the time you read this. MARC handled the communications for the Leonminster Constitution Celebration. Participants were: N1ERS, K1PMY, W1UD, K1ATFE, N1FCA, W1HFN, W1B1H, WA1KPO, W1BYH, K1AJL and N1DRO. It all went like clockwork. The CMARA picnic was attended by 42 members. A great turnout. Post 73, sponsored by CMARA, will participate in Jamboree on the Air. Two of the better 220 MHz repeaters are located on Mt. Wachusett in the Western Mass Section. Both of them have been used either continuously or at one time or another. The reasons for this action have been understood. Before a repeater frequency pair is assigned by the coordinating committee, a signed statement should be required from the owner or owners that in the event the repeater is restricted for any reason the frequency allocation would be forfeited. This would eliminate any small group or an individual securing and restricting anything as valuable as a frequency allocation. Irony is it may seem, both owners of these repeaters are from the birthplace of freedom and liberty, Eastern Mass. I wish they would practice their forefathers' ideologies and make these repeaters free and open at all times. In the event of an emergency, dependable operation on either of these units would be a lifesaver. No one would know if they were available or PL'd. Traffic: K1JFC 404, W1B1H 83, K1EXJ 69, W1UD 143, W1SJV 38, K1KEX 19, K1IGFV 19, WA1OPN 12, K1JHC 51, W1ZPB 11, KAT 502, W1KK 77.

NORTHWESTERN DIVISION

IDAHO: SM, Don Clower, KAT7—SEC: K7REX, STM: W7GHT, OOC: W7GVC, ACC: N7BI, PIO: W7PFQ, Dan, K7REX, has been traveling around the state meeting with different ham clubs in an attempt to put together a comprehensive ARES program. Please give some of your time and help our ARES organization. The Twin Falls ARC helped with communications during the Rock Creek fire. The Treasure Valley ARC had a booth at the county fair. The Pocatello ARC is planning their Xmas party for 12/4/87. If interested, contact N7JTE at 237-3207. Traffic: W7GHT 326, N7W7K 79. NET FREQ TIME CTS SESS NI CTS
NWNTN 145.38/98 8:30 PM D 30 528 26
CD 3.990 8:10 AM M-F 22 258 18
Farm 3.937 8 PM D 30 1862 42
IMN 3.635 9 PM D 30 328 109

General: There is a 450 repeater on Mt. Harrison, listen on 449.2 and transmit on 444.2, 73. Don.

MONTANA: SM, Ken Kopp, K0PP—Eravo for GFAARC's outstanding public service when Great Falls was without phone service for many hours. Ditto for Heligate ARC's help with gas leak in Missoula. Great publicity state-wide for all of us. Heligate also has new dipolester on Point Six providing needed E-W link. New SSB net in NW MT on 144.110 at 1930 Mondays. W7LR now has 307 countries on CW. N27W appointed Mgr of Colorado High Noon Net. If your club is not yet a Special Service Club get application form N7HKW. NET FREQ TIME CTS SESS NI CTS
IMN 30 318 119 WATGGO
MSN 4 10 1 K0PP
MTN 30 1602 111 KF7R

OREGON: Randy Stinson, KZ7T—ASM: KM7R, STM: W7VBE, SEC: W7FBP, PIO: K7YVN SGL: KATKSK, ACC:

KB7CC, RFI: AK7T, OOC: N7SG, STIC: N7ENI. As a result of the forest fires down in southwestern Oregon the hams had a chance to show what they could do and they did it. We had some 60 hams working for a period of about two weeks in several different camps and different counties. The hams did some tactical communications for the Oregon Forest Service and the BLM. The US Forest Service seemed to have trouble trying to figure out if they could cover the hams under their insurance and consequently we didn't get to do as much as we could have. I am preparing a letter to send to ARRL asking them if they could reach an agreement with the US Forest Service if they have with the Red Cross and other agencies. A few statistics on what the hams did: They furnished a total of 2675 hours drove 10,542 miles and handled over 700 pieces of health and welfare traffic. The H & W traffic was primarily for the fire fighters who came from all over the United States. All I can say is a very good job well done. A happy 50th wedding anniversary to Benjamin, K7MNB and Cleola, K7TDM. Traffic: W7VSE 813, N7ZLF 563, W7BVSN 235, N7BGW 219, KF7AV 126, KATIE 99, KF7B 74, KATZAG 46, W7FBP 43, KATZAD 33, N7DRP 12, W7DAN 6. (Aug.) N7DRP 25.

WASHINGTON: SM, Brad Wells, KR7L—STM: KD7ME, SEC: KAT7NX, ASM/ACC: KC7PH, BM: N7CAK, SGL: KD7AC, TC: W7BUN, ASM: KD7G, ASM: KAT7CSP. Two contests this month at both ends of the HF spectrum—the 160 Meter and 10 Meter contests. The 160 test is a night-time exercise where high antenna and good antennas are the deciding factor. The 10 Meter test is a daytime operation with lots of action for Novices and Technicians this year. If the band is open much can be done with low power and average antennas. Since we're on the upside of Cycle 22, there's even a chance for some F2 propagation this year. One of the more unpleasant duties for a Section Manager is the filing of Silent Key Reports. There is a real feeling of sadness and regret when these reports go to Headquarters. However, to insure accuracy, a definite procedure must be followed: If you want a Silent Key listed in QST, then I must have a copy of an obituary which I can forward to ARRL. Without this type of "hard" information, QST simply will not publish a Silent Key report. There is a 2 month delay between notification and publication. Effective September 20, 146.33 (BARS) with net is linked to the 146.90 (Mission Ridge) rpt. Sorry to report that Jerry Brunner, K7YXG, has resigned as K7IFAS EC. Congrats to NM7N (Skagit County), W7DLB (Klickitat County), and KD7CI (Pierce County) for accepting EC positions. N7CWU (Northwest) and KAT7AE (King) have been appointed DEC's. The Walla Walla Hamfest was a success with 610 people registered, VE testing, a packet demo, and "The New World of Amateur Radio" video. My apologies for being unable to attend, but I was unable to get the weekend off from work. New officers for the NWSSB Net: K7AJT, NM; WA7LVO, Sec; W7BKF, KC7PH, W7JHR, K7UVJ, KZ7TB as Directors. The Walla Walla Area has renewed as a Special Service Club. Several groups have come to the March: Walla Walla Swapfest-March; Spokane Swapfest-April; Yakima Hamfest-May; Wenatchee Hamfest-June; Tacoma Hamfest-August; ARRL Natl Convention-September; Walla Walla Hamfest-September. The Section Staff and I extend our best wishes to you and your family during the holiday season. PUBLIC SERVICE HOURS: Yakima 130, Benton 66, Franklin 66, King 36, Walla Walla 15, Astoria 13. Traffic: W7DK (multi-op) 1045, W7IGC 282, W7WOW 260, NBEQZ 194, W7LG 179, N7GGJ 174, K7XZ 171, W7BG 167, W7APN 110, K7SUX 90, WA7CBN 78, W7AQ 74, W7BK 57, KR7E 53, WA7EY 53, K7AJT 29, K7ULG 25, K7G 18, W7C 16, W7IEU 10, W7DIP 7, W7FXM 3, KN7L 2, KD7ME, KR7L.

PACIFIC DIVISION

EAST BAY: SM, Bob Walla, W6RGG—ASMs: W6ZF, N6DHN, EC: W6LKE, OOC: NYZ2, TC: N6AMG, W6BMR reports that 7 members of Tri-Cities ARES provided communications for the City of Newark's "Newark Days" Parade and 10K Run. The new editor of MDARC's "THE CARRIER" is WU6P. They have 4 RACES/ARES nets each Thursday at 7 PM: Central County: 145.68, K8BVF - NCS; East County: 146.54, WA6ZPZ - NCS; South County: 147.655, K8T1 - NCS; West County: 145.11 (J60), KB7JEC - NCS. EBARC Pres., N6IIV, recently gave Richmond County George Livingston, a tour of their station. The Richmond Red Cross LARCS meetings will be featuring a three-part series on antennas including "Impedance matching, ground effects and other perturbations." Sounds good to me! HRC has started an informal net on 28.350 at 8 PM each Wednesday. A nice way to include all licensed members in an on-the-air activity. They still hold their formal net on 145.13 (-600) at 7 PM each Wednesday. September Traffic: W6BDO 130, W6BUX 33.

NEVADA: SM, Joe Lambert, W8IXD—LVRAC adopted a new and simple constitution replacing years of patchwork and band-aids. Thanks to SCCARA for a well-done Pacificcon Convention, which was enjoyed by many Nevada hams. Congrats to LVRAC (Las Vegas Repeater Ass'n.) on becoming ARRL affiliated club. SNARS reports the 443.075 Repeater is now on Ophir Hill, resulting in greatly improved coverage, especially to the east. LVRAC has started a Novice class. Contact K7YK for info. George is also holding a public relations exhibit and station on the Meadowdale Mall to generate interest in ham radio. Congrats to W7TVF, the first Nevada to make the DXCC Honor Roll. Curly, K7HRW, continues to be busy with his emergency organization with appointments of Ass't Emergency Coordinators: W7GRM, WA7CKD and Emergency Coordinators: N7GX1, NZ7G, KC7EE, KE7FV. Many of the Nevada clubs are having elections this month. Be sure to get out and vote, or better yet, volunteer for a position.

PACIFIC: SM, Army Curtis, AH6P, Aloha and hafa adai to all of the Pacific. Kauai ARC members provided comm for a multiple running event from Kapaa. On Oahu, hams provided comm for the annual Aloha week floral parade. Participating were KH6CZ, KH6NY, NH6JL, KH6GPI, KA8NYT, WH6AXN, WH6BL, KH6NY, NH6GQ, KH6BQ, WH6BKQ, WH6AXN, KH6BQ, KH6BQ, NH6GZ, KH6BQ, K9JU, NH6JL, NH6FS, KH6A, NH6GZ, KH6BQ, KH6BQ, KH6BQ, NH6DC, NH6BY, NH6G, KH6JCA, KH6DM, KH6JUM, KH6TD, N4ESX, KH6BIO, AND WX4J. Recent upgrades include KH6PH and AH6HW to Extra, NH6FT to Advanced, NH6G and NH6GT to General, and WH6BQV to Tech. Congrats to all! On Maui, AH6AM, AH6DV, AH6GJ, AH6GQ, AH6IF, KH6H, KH6MX, KH6UO, NH6HP, NH6EW, NH6H, WH6BLW and WH6BLZ provided comm for the 11th annual Run to the Sun. No comm requirements from Guam, but they are really getting into setting up their emergency organization. Excellent Traffic: KH6S 50, KH6H 15, WX4J 6.

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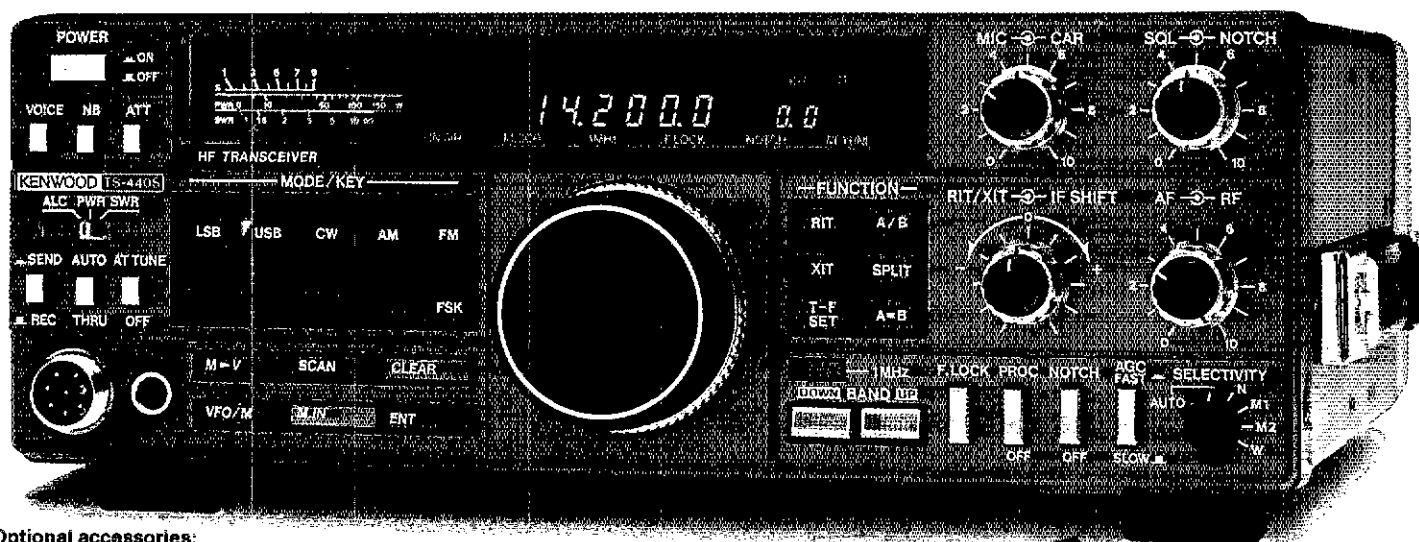
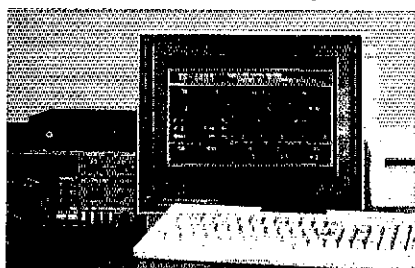
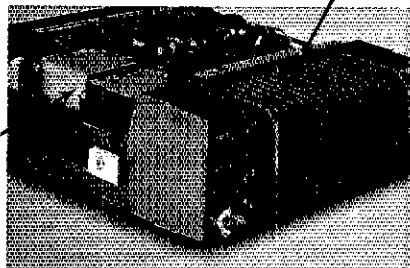
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SACRAMENTO VALLEY: SM, Bob Watson, W6WJL—Last month, I started my report: "When this is being written, the big activity as 'Add' Addison, N6GLL, EC for Trinity County, put it, is 'Lightning Struck, Fires Started, and the hams were called for help.' I will not even attempt to give a follow-on report. Many of you did a little on the fires, and many of you did a lot, and AL deserves recognition and much thanks. However, there is not room in this column to list just the CALLS of all who participated. The November Worldradio devotes about 40 column inches to the activities in just three of the twenty counties in our Section—and many other areas were also involved. I hope that the many pages of detailed reports prepared by our District ECs and sent to Headquarters by NRBA, our Section EC, will result in appropriate coverage. But all of QS7 is not large enough to give the whole story. Two years after first being invited (by AJ, WA6WJZ, Section Traffic Manager), I finally made the GEARS annual "Steak Bake" and enjoyed seeing old friends and meeting new ones. Two other club meetings were supposed to be included on the trip, but the clubs had to make last-minute changes in their plans. I hope we can get together in the future. **DON'T FORGET the SECTION NET:** First Sunday each Month, 8 PM, 146.085. Traffic: N6LUV 332, WD6BZD 218, WA6WJZ 160, K6SRF 99, WA6ZUD 67, N6CVF 64, WB6SRQ 13, KB6COH 8.

SAN FRANCISCO: SM, Bob Smith, NA8T—Pacificon 87 was a huge success this year, but where were you? Packet Radio and Emergency Communications were the high points. Look for a New 145.05 Packet Network in the Section by The End of this Year. SF to The Oregon Border, Contact NA8T for information. CDF-VIP is active in Sonoma and Humboldt Counties, with ICT, and shortly starting up in Mendocino County. FWRA now meeting at the GARDEN CAFE in Eureka Mall on Sunday at 10 AM. Del Norte ARC meeting is First Wednesday at Old High School on 9th & I at 7:30 PM. Sorry to hear that N6DSW, "Tomales George," is a Silent Key, his sense of humor will be missed on the bands. SCRA XMAS party will be at North Coast Wagon on Dec. 5, contact K6IGY for reservations and info. Are you interested in a Section Appt as OO, PIO, etc, contact NA8T for information. Ukiah ARC is organizing the ARES/RACES/VIP groups in Mendocino county. Come out to the Club Meetings on the 2nd Tuesday at the Pomolita School in Ukiah to join your LOCAL club in Emergency communications. Sec. Traffic: W6RNL 150, K6TP 70, NA8T 30, KE6LF 8.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: W6BU. STM: N6AWH. TC: WA6EXV. ACC: W6DPD. Asst SMs W6TRP and K6YK. The 1988 officers of the Lodi ARC are Pres K6PJV, VP K6BUW, Sec/Treas K6BSLE, editor K6URL. The club meets the first Wednesday in Lodi. Their 2M simplex net meets each Tuesday at 1930 hours local time on 146.535 MHz. Congratulations to the Manteca ARC on its 50-year affiliation with ARRL. The following Amateurs have joined the ranks of the Silent Keys: W6PJK, W6SMS, and K6KIS. N6LRZ is Advanced. K6DUM is General. K6BTJ and K6STOJ are Lic. Fresno Amateur Radio Club is installing a phone patch on W6TOR/146.34/94. Merry Christmas to all and a Happy New Year. Traffic: N6MXY 153, K6EQI 48, N6OCX 41, WA6YAB 30, N6MXG 6, N6DTB 2, W6DPD 1.

SANTA CLARA VALLEY: Glenn Thomas, WB6W—SEC: WA6OCV. TC: WA6PWW. STM: N6JLJ. PIO: WB6OML. ASM: N6JLQ & N6SN. ACC: W6MKM. BM: (vacant) OOC: (vacant) Congratulations to the Ames ARC on becoming an ARRL affiliated club. The Ames group was a leader in the Amateur Radio support to the Moffett Field Airshow this last July...the Emergency Response Institute (ERI) is in planning for March 26 & 27 1988. Like last year, it will be open to all those interested in the Amateur Radio Emergency Service (ARES) and RACES. Among other things, the Incident Command System (ICS) and Amateur Radio support of the Red Cross will be discussed. A special three hour session titled "RACES Officer Workshop" will be given by the California Office of Emergency Services. If you're interested, the registration fee is \$20 and should be sent to: SVECS-ERI, c/o Dave Larton N6JLQ, 766 El Cerrito Way D, Gilroy, CA 95020. I met many of you at the Pacific Division Convention, Pacificon '87 in San Jose. A good time was had by all. I'll never forget seeing Cindy K6BSKH hotfoot it up to the podium to collect the generator that she and OM K6BMXI won at the ARES forum! The banquet saw "The New World of Amateur Radio." Also, League Counsel Sherry Imray gave several VERY interesting talks. Chairperson Shorty A632, program chairperson Rod K6BZV and the rest of the convention committee are to be congratulated on an excellent convention... thanks to all of you who participated in the Simulated Emergency Test (SET). This is an important test, especially since we attempted to do a section-wide SET. All section EC's should send SET reports to your DEC for eventual input to Newington... FARS had their annual expedition to Mt Tom. A good time was had by all working HF, VHF SSB, and watching Star Trek in my motorhome!!! OO reports: WA3SAD. Traffic: W6YBV 322, NR7E 231, N6JLJ 24, KA6SXW 16, KB6IWG 8.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4EML. ACC: WC4T. PIO: WA4OBR. TC: K4ITL. SGL: KE4ML. This month, we celebrate the birth of JESUS. It's Christmas. The Section Staff would like to wish everyone a most enjoyable holiday and enjoy your new ham equipment. EXAM SCHEDULE: Kernersville Dec 5, Lexington Dec 19, AB4W reports that KA4WYC is new EC for Mecklenburg Co and K4LZE is new SKYWARN EC for Charlotte NOAA office. Congrats guys, KB4IVV and WD4DVS now on packet and enjoying very much. KB4IVV reports that new packet radio club is being organized in Greensboro by WD4RMQ. K4AZA reports that Greensboro NOAA office requested help from the amateurs when heavy rains caused flooding in Piedmont. The Amateurs responded with vigor Sept 12. McGuire Nuclear Exercise was held and Amateurs in affected areas were asked to participate. SEC reports much activity and several things were learned from the exercise. Mecklenburg ARES, W4BFB, will host the 1988 Roanoke Division LPM in May. Make your plans to attend NOW. RARS having special drive to get YLs and XYLs of club members involved in the club activities. W4NC club planning a hamfest in June 88. KA6PBU, OES, reports Onslow Co RC now has a 10 M net on 28.440. AK1E now QSL Mgr for several DX stations. Following is quarterly traffic report for July, August, September.

NET	FREQ	NN	QNI	QTC	TFC	QND	SESS
NCEN	3923	WB4WII	1543	568	448	1808	92
NCMN	3927	WB4HRR	1199	438	378	1808	92
CN	3573	K4IWW	2118	760	709	4097	184
CSN	3715	AA4MP	703	182	164	1857	92
CNCTN	22/82	WA4MNR	2661	406	336	1687	92
PCTN	28/88	NE4J	1055	421	315	1039	92
RARS	04/84	K4ABJ	1103	100	86	1751	92
M2MEN	63/23	KF4MZ	2035	133	118	1362	92
CFARS	31/91	W4EHP	1457	72	70	1669	92
PETN	75/35	WB4HRR	634	94	84	910	87
THEN	3923	N4LUO	810	90	79	714	90
RARS							
10MN	28364	KK4EV	234	45	54	587	31
Totals:	15520	2307	2787	18602	1128		
Traffic:	K4NLK 319, AA4TE 201, WB4HRR 154, K4IWW 151,						



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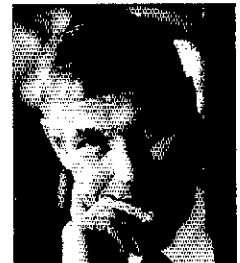
Several suggested including ETO in the name of this column. Our choice: ETO/QRO—loosely translated,

"MORE POWER FROM ETO!"

THANK YOU...

for many notes offering encouragement and expressing pleasure at our return to a more aggressive role in amateur radio. Key chains will be in the mail shortly.

73,



Dick Ehrhorn

Dick Ehrhorn, WA4ETO

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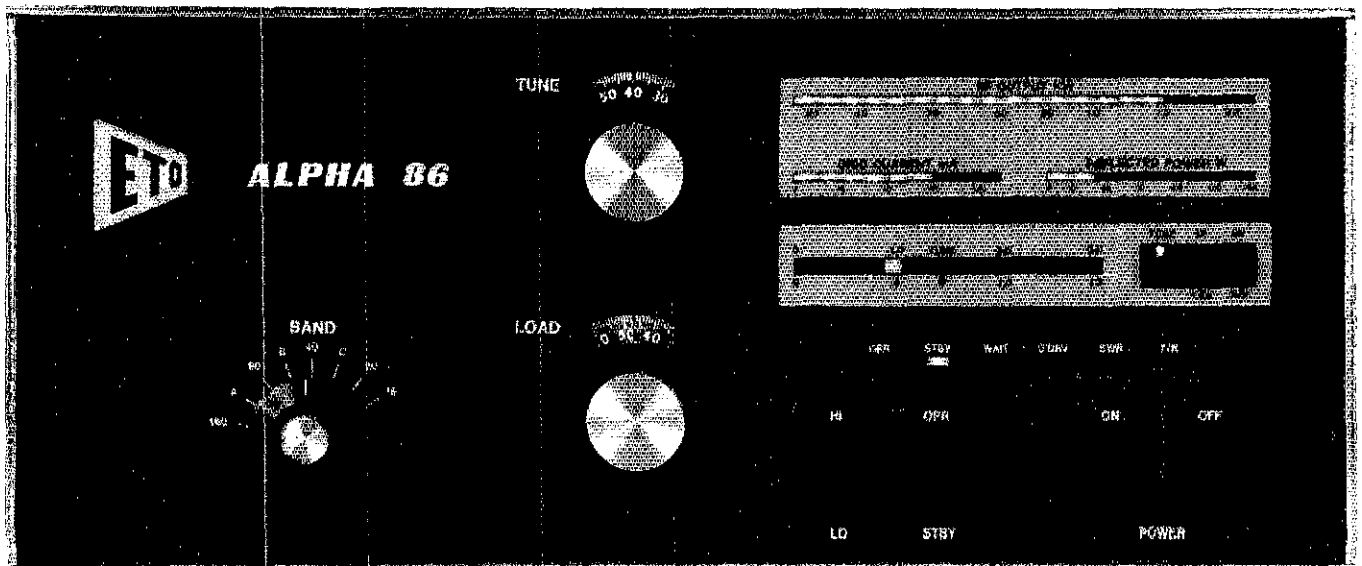
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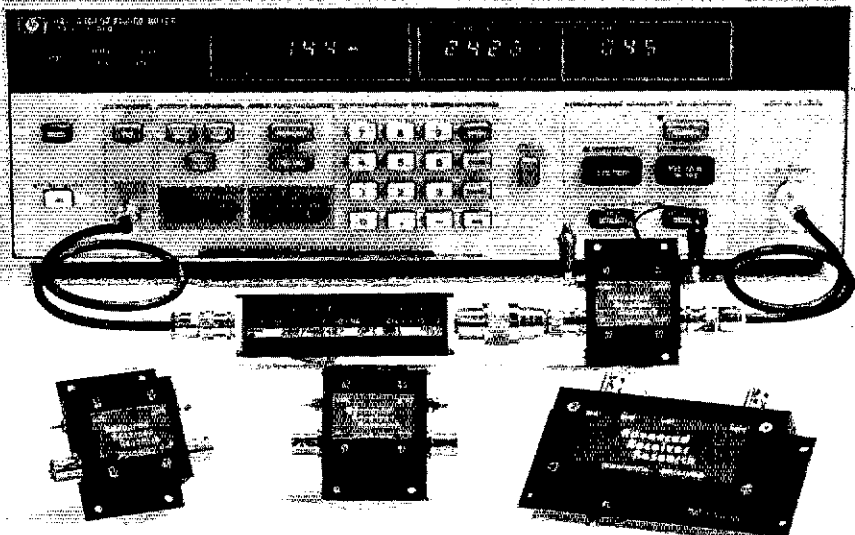
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P50VDG	50-54	<0.5	24	+12	GaAsFET	\$79.95
P144VD	144-148	<1.5	15	0	DGFET	\$29.95
P144VDA	144-148	<1.0	15	0	DGFET	\$37.95
P144VDG	144-148	<0.5	24	+12	GaAsFET	\$79.95
P220VD	220-225	<1.8	15	0	DGFET	\$29.95
P220VDA	220-225	<1.2	15	0	DGFET	\$29.95
P220VDG	220-225	<0.5	20	+12	GaAsFET	\$79.95
P432VD	420-450	<1.8	15	-20	Bipolar	\$32.95
P432VDA	420-450	<1.1	17	-20	Bipolar	\$49.95
P432VDG	420-450	<0.5	16	+12	GaAsFET	\$79.95

Inline (rf switched)						
SP28VD	28-30	<1.2	15	0	DGFET	\$59.95
SP50VD	50-54	<1.4	15	0	DGFET	\$59.95
SP50VDG	50-54	<0.55	24	+12	GaAsFET	\$109.95
SP144VD	144-148	<1.6	15	0	DGFET	\$59.95
SP144VDA	144-148	<1.1	15	0	DGFET	\$67.95
SP144VDG	144-148	<0.55	24	+12	GaAsFET	\$109.95
SP220VD	220-225	<1.9	15	0	DGFET	\$59.95
SP220VDA	220-225	<1.3	15	0	DGFET	\$67.95
SP220VDG	220-225	<0.55	20	+12	GaAsFET	\$109.95
SP432VD	420-450	<1.9	15	-20	Bipolar	\$62.95
SP432VDA	420-450	<1.2	17	-20	Bipolar	\$79.95
SP432VDG	420-450	<0.55	16	+12	GaAsFET	\$109.95

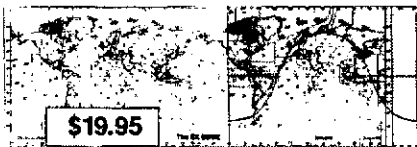
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NJ4L 146, AA4YZV 144, KA4EYF 139, KA4TLC 131, AA4MP 118, N4TN 102, WD4HTE 89, WB4WII 75, N4MMMM 61, N9CGD 50, K14YV 45, WA4MNR 35, K4SWN 35, KB4FWL 33, NE4J 33, WB4TOP 31, WB4N 29, WB4CYN 25, WA4EHF 24, AJ5F 24, WD4B 17, WD4MRD 16, K4GI 15, K4DDY 14, N4CJ 11, WD4EQK 11, KB4NWX 11, AK1E 10, WA2EDN 9 (Aug.) NJ4L 122, AJ5F 44, NE4J 31.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ—It doesn't seem possible that 1987 is nearing the end! Thanks so much to those who worked during 1987 to improve the South Carolina Section—My Senior Staff, all Field Organization appointees, net members and other volunteers—who gave your time and resources. There is no way that only a few of us can successfully run the section. It takes those who are willing to work at the local level AND take on OTHER assignments. If you're one who works only at a local level, doing VE work, some local net assignments or local club work—resolve that in 1988 you will take the plunge and make a commitment for a year or two to work on a section job assignment and give it your best shot. Section staff and appointee positions are always changed so our most qualified people are working. There are many jobs from which to select. Please make a point of contacting me on a personal basis by using my address or phone on Feb. 8 of each QST. If you each of you have a Merry Christmas and Traffic: K4ZN 164, KB4BZA 111, KA4LRM 44, WB4UDK 36, W4DRF 26, KA4YE 25.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT, SEC: N4EXQ, ACC: NT4S, OOC: W4HU, BM: AB4U, TC: WB4MAE, SGL: W4UMC, PIO: AA4VP.

VTN	1 PM	3907	KB4NGO
VSN	6 PM	3947	KI4BR
VSN	6:30 PM	3580	N4KSO
VN (EARLY)	7 PM	3680	N4GHI
VN (LATE)	10 PM	3680	WB4KSG
VLN	10:15 PM	3947	KJ4MF
SVEN	7:15 PM	146.82	NT4S
STARES	9 PM	146.97	KJ4VT

The ARES/RACES members completed another successful simulated drill in association with the SRI nuclear power station. Over 30 operators manned VHF and HF stations at the EOCs, EACs and Red Cross centers. For the first time Packet stations were utilized with stations at the New Kent, Williamsburg, James City County, Charles City County, York County, Newport News and Richmond EOCs. W4NTG acted as the NCS for the Packet net with all stations operating in the Multicenter mode. Reports are that the FEMA observers were "fascinated" with the Packet operation. WA4CCK and KB4WT were NCS for the HF net and WB4UHC and N4HSJ were NCS for the VHF net on 2 meters. Also, some 440 MHz links were operational. A good job was done by all participants with good reports from the governmental agencies served. To improve PACKET net techniques the Williamsburg area is holding net training sessions on Sundays at 9 AM and Wednesdays at 8 PM. N4EXQ, SEC, announces K4JNA as EC for Warren County and a section ARES membership of 1022. From the Lynchburg club newsletter it is reported that their employment of HAM TV coverage at the Virginia TEN MILLER race was highly successful. They report 400 to 500 people watched the TV display at the main position with others observing at the Medical tent and Star/Finish line. Stations involved were: N4NCC, WB4ONL, AA4UM, KB4MPX, KB4RJF, KB4ILD, WA4RTS, KA4YNO and KB4VON. OOC, W4HU sez his OO/AUX stations have been busy monitoring the bands with W4HU, W8IRT, K4JDU, KB4WT and K4KNN submitting reports of the discrepancies of FCC net activity. Many thanks to the members of this group for their unheralded activity in this area. To you DXers, time is coming close to an end for you to qualify for the DXCC Golden Jubilee Award; if you need to contact the SM, it was a pleasure meeting and talking to many of you at VA Beach. The forums were well attended and provided an opportunity to discuss ARES and Traffic Handling operations in the section. Another good traffic month with a total message count of 4215 with 43 stns reporting and N4GHI continues as BPL. The nominations for those who would like to run as Section Manager will close on December 4, 1987. If you are interested and have not filed a nomination form, contact the SM. Traffic: N4GHI 707, KB4WT 296, K4MTX 293, K4DOR 292, W3ATQ 262, W4BPNY 239, KB4NGO 178, W4JLS 170, AA4AT 167, N4EXQ 158, WB4KSG 138, K4JST 125, KA4TWI 111, K4IBR 97, WD4MIS 91, WB4ZNB 87, WD4OCW 82, NG2H 75, W4T2C 68, WB4EDB 59, NN41 58, N4KSO 53, WB4ZTR 53, WA4LTO 48, K4BGZ 47, K4JM 43, NT4S 30, N8ANQ 23, KB4OPR 21, K4JUM 20, K44FY 19, N4FTN 14, K4BPW 14, WA4CCK 12, K4MLC 12, K4GR 11, WB4KIT 9, K4AXF 8, K4W 8, WA4TVS 7, K4VWK 6, WA1VRL 3, W4YE 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW, STM: N8FXH, ACC: WA8OTC, SGL: K8BS, RPT, COORD: WD8OZT. Fall mtg. of State Amateur Radio Council is held on OCT. 10, at Jax Mill. New President is Dick Fowler, N8FMD. Next mtg. will be on DEC. 12. QNI WV nets listed below for time and place. All hams are urged to attend.

NET	FREQ	TIME	QNI	QTC	SESS	NM
WVFN	3665	6:00	988	140	30	88VP
WVN	3567	7:00	301	132	30	KZBP
WVRN	3640	8:30	192	21	30	K8LG
WVMD	7235	11:45	640	14	29	WB8FZP
WVNN	3730	5:15	159	30	30	WD8LDY
Hillbilly	14250	Noon Su	102	6	4	W8YP

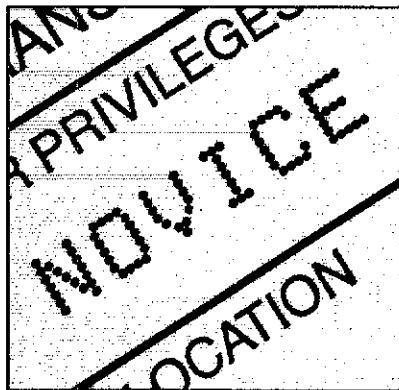
Traffic: KB4WNO 403, W8YP 245, KB8TP 196, WD8LDY 184, KB8TK 182, KE8FI 127, KB8JY 111, WD8DHC 80, WB8FZP 51, N8FXH 49, K8QEW 43, W8JWX 30, K8KT 29, KD8WX 27, NJ8J 26, NC8G 15, K8OGF 4.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, K0BJ—ASM: KADMQ, SEC: WB8TUB, STM: KBZ, ACC: WB8DUV, OOC: K0JUD, PIO: N0DZA, TC: W8LJF, SGL: WB8FQB. As I begin my new term of office, there are some changes in the Section Leadership. My thanks to N0DZE, K0KZM and N0CJF for their many services during the past two years as PIO, BM and TC. You will still be hearing from K0CZV and N0CJF as they continue with duties for SARES. Welcome as the new PIO: N0DZA and W8LJF as TC. The section is still looking for a Bulletin Manager, and I am accepting applications on this appointment. We have had many ARES districts who participated in SET, a reminder to all ECs to get your paperwork into WB8TUB, KBZ or myself by the Jan 1st deadline. The SARES linking system is complete to the Eagle/Vail area. 148,205/805 on the Front Range, 148,075/675 Kremmling, 147,015/615 in Vail-Eagle area. K0JL-1 the Net Rom digi that links the Front Range to the Western Slope now links over to Utah, Nevada, Arizona & California via numerous Netroms. From all of us here in the Section, we wish you a Merry Christmas and Happy Holiday. 73, K0BJ, NET: C0WN: QNI 87, QTC 56, QNF 355, SCTN: QNI 333, QTC 36, QNF 306, N0CTN: QNI 173, QTC 78, QNF 304, COL: QNI 980, QTC 39-104, QNF 842, QNT: QNI 1732, QTC 74-413, QNF 1185. Traffic: KE8NI 263, N0HMFZ 224, KB8Z 108, WB8BLV 82, KB8OA 86, N0DZA 79, N8JWR 65, WD8BS 46, W8NFW 38, WD8FV 33, K0MVE 16, W0DAB 4.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS, SEC: K5EYJ, DEC: W5HCB, STM: NDST, NM: WA5UNO.

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TIME OF YEAR (MONTH/DAY) = 11 / 7		YOUR SUNSET IS AT 00.44 UTC				
YOUR SUNRISE IS AT 14.59 UTC		MINIMUM TARGET DISTANCE IS 14000 KM.				
GRAY LINE WIDTH IS 66 MINUTES						
PREFIX	COUNTRY	CITY	KM.	START	END	MIN/TARG
FBEX	KERGUELEN ISL.		19138	14.26	14.41	20
FH	HAYTTK		16019	14.52	15.12	20
FR	REUNION ISL.		17113	14.26	14.41	20
FR	EUROPA ISL.		18937	15.23	15.32	20
FR	GLORIOSU		15931	14.42	15.02	20
FR	JUAN DE NOVA		18390	15.07	15.27	20
FR	TRICOMELIN		18524	14.26	14.39	20
TS	SOMALI	MOGADISHU	14416	14.34	14.54	20
YK0	HEARD ISL.		18714	14.26	14.40	23

PREFIX	COUNTRY	CITY	SUNRISE	SUNSET
EAB	BALBAIC ISL.	PALMA	04.27	19.20
EAC	CANARY ISL.	STA. CROZ	06.12	20.06
EAG	CUBA & MELLILA	MELLILA	05.02	19.30
EI	IRELAND	DUBLIN	04.03	20.56
EL	LIBERIA	MONROVIA	06.35	19.02
EP	IRAN	TEHERAN	01.23	15.54
ET	ETHIOPIA	ADDIS ABEBA	03.10	15.46
F	FRANCE	PARIS	03.53	19.57
F	FRANCE	MARSEILLE	04.03	19.22
F	FRANCE	BORDEAUX	04.21	19.52

STATION COORDINATES: 24.2 DEG NORTH, 118.1 DEG WEST

PREFIX	COUNTRY	CITY	DIR	(KM) DIST. (MILES)
AA	AND AIL		23	14289 8866
AA	ORDER OF MALTA	ROME	34	10160 6314
AB1	SPRATLEY		302	12909 8022
AA	MONACO		35	8738 5052
BB6	AGALEGA & ST. BEANDON		12	17301 10752
BB6	MAURITIUS		18	18395 11432

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ALL DIMENSIONS ARE IN INCHES

AIR WOUND COIL OR TOROIDAL CORE? (A/T) >

COMPUTE INDUCTANCE (I) OR COIL PARAMETERS (C) >

RWD. INDUCTANCE (uH) > ? 3.4
 COIL DIAMETER IN INCHES > ? 3
 COIL LENGTH IN INCHES > 4

REQUIRED NUMBER OF TURNS : 3

Low Band DXing Software

by John Devoldere, ON4UN

This inexpensive software will save you plenty of time. DXers will find these programs useful: grayline, great circle, and sunrise/sunset time listings. Of particular interest are the types of problems you can solve that have to do with antennas and transmission lines: mutual impedance, element driving impedance, voltage or impedance along with feedlines, feedline transformer, shunt or series input L network iteration and design, shunt or series impedance network, Pi or T line stretcher, feedline T junction/parallel impedances, SWR iteration and calculation, stub matching, horizontal antenna wave angle, vertical antenna design program, top loaded vertical design program, vertical array pattern calculation, element taper, coil calculation, RC/RL circuit transformation and obtaining precise resistance and capacitance values.

When ordering specify format; these versions are available for \$20: MS-DOS for IBM and IBM compatibles, DOS 3.3 for Apple 2C, 2E, or 2+, CP/M for Kaypro or Xerox, CB-128 CP/M for the Commodore C-128. The Macintosh version is \$25. Please add \$2.50, (\$3.50 for UPS) shipping and handling.

THE AMERICAN RADIO RELAY LEAGUE
 225 MAIN STREET
 NEWINGTON, CT 06111

K6LL W5QNR, TC: W8GY, ACC: KASBEM. Southwest Net (SWN) meets daily on 3583 at 0130 UTC and handled 147 msgs with 204 checkins. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 77 msgs with 1250 checkins. New Mexico Breakfast Club meets daily on 3939 and handled 177 msgs with 1052 checkins. Yucca 2-mtr Net 78/18 handled 21 msgs with 439 checkins. Caravan Club 2-mtr Net 66/06 handled 0 msgs with 145 checkins. SCAT Net 66/06 handled 5 msgs with 621 checkins. Info Net 13/73 with 104 checkins. Northern New Mexico Hamfest had beautiful weather, good prizes, lots of good fellowship, visitors came from all over the state, and a good time was had by all. Special thanks go to NSEPA and his wonderful crew. Traffic: W5DAD 102, KN5D 79.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. Our September packet emergency exercise was the first serious attempt in UT to pass emergency code traffic by packets. Contacts connected the State Emergency Operating Center (EOC) with four county EOC's and sent traffic for more than 3 hours. We learned a lot, and hope to learn more during SET, scheduled for the 3rd weekend of Nov. Trx to many packeters and MARRA who made the exercise successful. 73 de NA7G. Traffic: WA7KHE 106, WA7MEL 67, NS7K 40, NJL 26, N7ASY 31, W7OCX 23, NA7G 22.

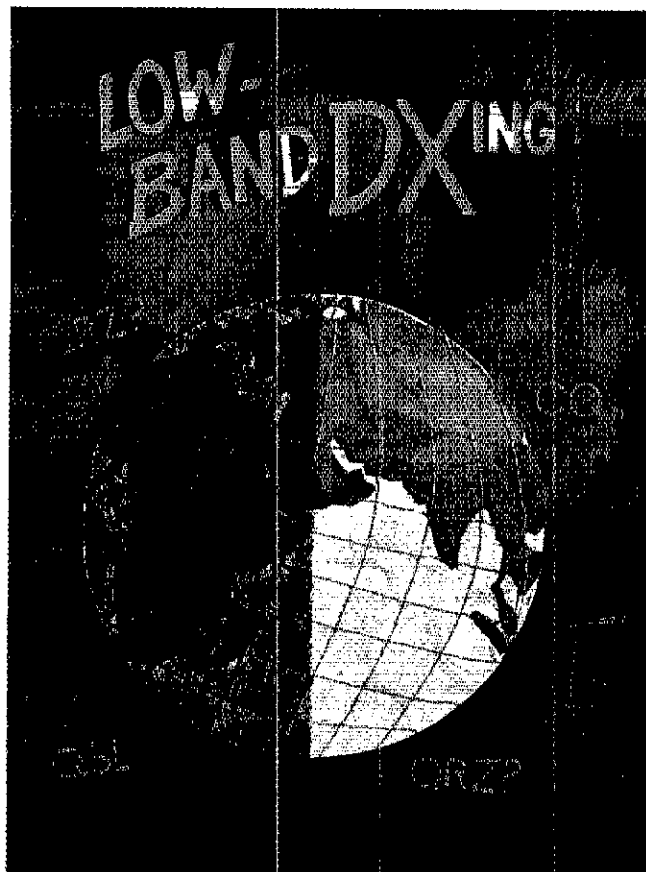
SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, WA4RNP—STM: N4JAW. SGL: KA4WVU, BM: KF4VV, COA AUX: AA4BL, TC: N4AU. ATC: WB4BYQ, ACC: WA4RNP, "act" SEC: WA4RNP. I am sorry to hear about former SCM, Jim Bonner, K4UMD, being in the Veterans Hospital for kidney surgery. But I am glad former SCM, Bert Wheeler, W4IBU, is out of surgery and sounding stronger each day. The Tuscaloosa and Birmingham Club have been renewed as an ARRL Special Service Club. I have a Silent Key report this month: N4NPF, Jim Gilbert of West Blocton. He will be missed by many as he was a good friend of Amateur Radio. Traffic: CAND reports 680 messages in 30 sessions with DRN5 rep 100% by WA4JDH, W4CK8, and NW4X. DRN5 reports 635 messages in 60 sessions with Alabama rep 88% by WA4JDH, W4CK8, NW4X, and W4IBU. RN5 reports 517 messages passed in 60 sessions with Alabama rep 94% by WX4I, W4CK8, WA4QT, WA4ZPZ, WA4LLQ, WA4JDH, WA4FAT, and W4PIM. AEND reports 25 messages passed in 30 sessions with other nets rep by WA4JDH, W4CK8, AA4YJ, and N4DCS. AENB reports 45 messages passed in 30 sessions with RN5 rep by WA4JDH, W4CK8, WX4I, WA4PIZ, WB4LLQ, WA4ZPZ, W4PIM and W4QAT. AENM reports 87 messages passed in 34 sessions. Brass Founders League: WA4JDH, SGH: WA4JDH, W4CK8, WA4PIM, and WA4RNP. Local: WA4JDH 19, W4CK8 117, NW4X 31, WA4RNP 29, WA4OZ 22, W4DGH 14, K4HJX 10, WB4TVY.

GEORGIA: SM, Eddy Kosobucki, K4JNL—The 1987 Georgia Hamfest season has finally wound down. We had another successful year. If a club or group is planning a hamfest, now is the time to contact the CONVENTION BUREAU at ARRL HQ and get the necessary forms to file the dates. Many trx to W4BTZ & W4DVZ for their service to the GA section & to Amateur Radio as a whole. I have appointed WB4UVW as SGL & WB4NTW has assumed the NM for the Georgia Net. Following are members of my staff. If you can serve in any capacity in the areas listed, please contact me or any members of the staff. Amateur Radio is growing and a lot has to be done. ASM & Affiliated Club Coordinator: WA4ABY
 Section Traffic Manager: WA4WQL
 Section Traffic Manager (Packet): W4QC
 Bulletin Manager: WB4ZQJ
 Official Observer Coordinator: NA4I
 Public Information Officer: WB4DEB
 State Government Liaison: WB4UVW
 Technical Coordinator: WD4PAH
 Section Emergency Coordinator: NC4E
 We still have time to have someone volunteer to do the annual "Santa Claus from the North Pole" as we have done in previous years. The children in the section really enjoyed this, so let one of our FB GA hams come forward. We are now approaching the Holiday season, so to all of you, the best of the Holidays 73, Eddy. Traffic: WA4LLC 82, WB4DVZ 74, KF4FG 48, K4N1M 31, K4IG 23, N4MWB 22, K4AJPN 20, K4BAI 15, K4JNL 13, WA4ON 9, N4LZ 7.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—ASM/BM: KB4LB, TC: WF4IJP, PIO: WA4POJ, SGL: KC4NH, ACC: WD4FIC, ST: AA4HF, K4JNL leaving Florida, 73. The Technical Coordinator needs some input from the field. According to the records from HQ, there is only one ATC in the NFL Section and that is nowhere near sufficient for us to do the job that we are supposed to do. Every club or area of the Section should have someone who will function as the ATC for that club or area and thereby assist our TC in getting things done. Locally, the ATC would serve as an advisor in RFI problems, help answer local technical problems and/or forward them to others who may have an answer. Be available to speak to local clubs on topics of a technical interest and let other clubs be aware of your ability. Be ready to advise local government on technical topics and be active with local industry. If any area has a hamfest, let me be involved. Help the TC in answering many of the questions that are generated in your area. If a ham writes to ARRL asking for some specific help, it's a good chance that questions will come to you for any response you or others may prepare. Last month, I neglected to congratulate the PARC for their fine newsletter and the editor Don, N4MUR. We are proud to add them to the list of fine clubs that are mailing their newsletters to me. FB 73, CUL N4ADI. Traffic: WX4H 530, WA4QX 374, WD4IO 318, N4PL 209, AA4HT 169, KB4LB 134, WA4EYU 123, N4GML 118, WD4UI 106, N4JAC 97, KC4VK 93, AA4QC 83, KA4YL 60, WC4AD 59, K4IK 56, KB4L 51, KB4RY 50, WA4EA 50, N4ADI 43, WA4SXW 41, WD4TV 40, K4CY 38, W7YWF 35, K4KAH 28, N4AOX 20, WD4BP 18, W4GJU 18, WA4PUP 18, KB4HNO 17, NQ4P 15, N4COB 15, K4FGY 14, WD4FJY 11, K14CQ 9, NS4C 8, N4IIP 8, KF4HS 7, WB4TZR 7, K3N0N 6, K4JRD 4.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS, STM: K4ZK, TC: K4AT, BM: WD4KBW, PIO: W4WYR. SGL: KC4N, OOC: W4T4H, ACC: K4EUK, WD4KBW reports 67 bulletins received and 179 sent by AA4BN 21, W4DL 45, WA4EIC 83, WT4F 10, WD4KBW 16, K4IEK 18, and WA4RLV 52. WA4NBE reports he is trying for DXCC QRP with 4 watts and having a great time. WT4F informed me in his SAR that Jim Gundry, W4JM, in Lakeland is now home from the hospital following surgery and doing okay. In some conversations recently with other operators, I realized a number of hams aren't aware of the use of IE (. . .) to ask if the frequency is in use. As I heard W1NUM say, it is so much quicker and causes less interference than QRL III. Its origin is from the American Morse Code character for C and again is IE in the International Morse Code. WV5Z, assistant manager of RN5, Cycle 4 is now living in Hollywood. He is already active on QFN and has served as liaison from the Southeast Florida Traffic Net to QFN. I had an eyeball QSO with Kevin at the Motorola Free Flea. NK80 is now living in Ft. Lauderdale and has offered



WHEN, WHERE & HOW TO WORK DX ON 160, 80 & 40 METERS

Written by John Devoldere, ON4UN, published by ARRL

It's the first really brisk day of autumn, and the trees have begun to shed their leaves. It's been crisp and clear for the past couple of days and there is not hint of rain in the forecast, so there should be no QRN. Propagation bulletins are predicting low absorption. It's going to be a great night for Low Band DXing!

This is an over-simplification. Radio amateurs know practically by instinct that 160, 80 and 40 meters "open up at night." But anyone in the Eastern U.S. who has worked Western Australia on 40-meters in the middle of the afternoon or West Coast amateurs who work into the Middle East on 80 meters just after daybreak know that, depending on the time of year, these bands have many secret hiding places for their DX-treasurers! Now, John Devoldere, ON4UN, has put together a treasure map in the form of a 210-page book published by ARRL where he completely explores the 160, 80, and 40-meter bands.

John draws on his vast knowledge and years of experience, as well as that contained in over 500 references which are listed in their own chapter. A large portion of the book is devoted to the design and building of efficient antennas for these frequencies. Receiver, transmitter and transceiver characteristics are also covered. The propagation chapter is the key to understanding when to work DX. The operating chapter tells where to find DX and gives tips on maximizing the effectiveness of your station for low band work. There is also a chapter of interesting and useful BASIC programs. But you don't have to keyboard these programs; there is inexpensive software that can be purchased separately which is available for use on many popular personal computers. (See next page.)

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his services to the section. He has been active on the section and regional nets and holds the call, VE3OCF. Some months there is a lot of info submitted, and some months not. This was a light month. 73 de WA4PFL, W3CUL, 3158, W3VR, 895, WA4PFL 273, K4SCL 239, K4ZK 228, WA4RI 208, WA4NFK 203, WA4RZ 187, WA4VW 174, WA4KIC 165, K4GNX 162, W44WY 135, K44KV 127, W44KVB 116, W4DL 115, AA4BN 115, W3TLV 104, KB4MOM 89, KA4YHS 73, N4ET 72, W4TAH 72, K4ELK 71, N4ORZ 66, N4MML 48, K5IHH 39, KA4SIH 38, K44ZV 31, K4DGYF 31, W44GCK 28, N4KB 23, K44RL 23, W45Z 23, K4AKY 21, K44WJ 20, W44CHO 19, N4QER 17, K4ORL 17, K44FO 17, AA4CH 17, K44LP 16, W44HDH 16, W3UR 15, K44EKV 15, W4SME 14, W44NXX 14, W44AD 13, W44F 11, W44PIL 10, N4PFO 10, K9ALX 9, K44YBS 9, K44YJF 9, W44VWJ 7, W4MPV 7, K44GDU 7, K4LVC 6, N4XSO 6, W4NSY 5, K44EW 4, K44GR 4, N4PSV 4, W4MFD 3, W44F 3, AA4IF 2, W4TKQ 1, W44WN 1. (Aug.) W4SME 18, N4PFO 8, AA4IF 1.

WEST INDIES: SM, Jose A. Purcell, Jr., KP4IG—ASM; NP4WI, STM: KP4JW, PIO: NP4XM, SM: KP4EW, TG: KP4ARY, SGL: WP4CSG, NM-WINS: KP4DJ, NM—WINE: VP2M. Certificate as NTS Liaison Endorsement was given for KP4IG for the Emergency Codebook. The PRARC Hamfest was held on Sept. 25th to the 27th. Several issues were covered as well as a very good time was passed by everybody. Several ARRL members are now joining the Packet fever through local digipeaters. A new one is planned to be located in the center of the island for wider coverage. 96 ARS have joined the ARES ranks so far. Join ARES and help our Country. NETS: WINS: 2300 UTC, 3710 kHz—sessions 30, QNI 90, QTC 7. WINE: 0001 UTC, 1,984 kHz—sessions 28, QNI 58, QTC 2.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP, NMs: K6LL, W67CAG, K7PO. Would like to remind all ECs/DECs to be sure and send Simulated Emergency Test reports for 1987 to the Section Emergency Coordinator. The PRARC Hamfest was held on Sept. 25th to the 27th. Several issues were covered as well as a very good time was passed by everybody. Several ARRL members are now joining the Packet fever through local digipeaters. A new one is planned to be located in the center of the island for wider coverage. 96 ARS have joined the ARES ranks so far. Join ARES and help our Country. NETS: WINS: 2300 UTC, 3710 kHz—sessions 30, QNI 90, QTC 7. WINE: 0001 UTC, 1,984 kHz—sessions 28, QNI 58, QTC 2.

NE ON 73.1M:
SWN 204 147 30 TWIN
ACN 648 81 30 TWIN
ACNVHF 271 75 30 ACN(HF)
ATEN 884 142 30 TWIN

LOS ANGELES: SM, Phineas J. Icenbice, Jr., W6BF—it is my pleasure to accept the SM position in Los Angeles. My background is Engineering and business. Ten years was spent as a Consultant & 17 yrs with Collins Radio Co./CR and Burbank. Several years were spent with Arthur Collins, W6CXX, designing and developing new products and inventions relating to SSB, filters, RFI, TVI, Spectrum Analyzers and special receivers and transmitters for data & voice communications. Other technical and business operations have resulted in 8 patents issued with 2 in process. Other professional experience includes working for Litton, TRW, Teleadyne, Rockwell & Lockheed. As a Senior member of the IEEE since 1956, it is a real pleasure to remember that Arthur Collins, W6CXX, was my sponsor and research project boss. The latest statistics show that Los Angeles is the largest populated County in the US. LA County now has nearly 4500 ARRL members. We also have earthquakes, and we need more help, so write to me with a list of what you can and will do! Numerous complaints have been received recently regarding a new code practice Beacon operating 24 hrs/day & 7 days/week on 145.55 MHz. The new "T" Hunt Schedule is out—please contact N6ML, Scott, at 818-958-3346. Chris, WA1KDL, President of the TRW ARC reports that over 200 attended the Networking Conference held at TRW. Speakers from many countries reported the SSB reports in 15 papers. The event according to Chris was a smashing success. The TRW ARC now has over 200 members according to Crosstalk, their official bulletin. An ARRL Desk (or table) will be set up during the TRW Swapmeet the last Sat of each mo. This ARRL Service desk is located next to the food and coffee. Please stop by and say hello to Phineas, Fried and Sandy. We may have a few pins and information. Twenty two more clubs were represented at the Council of Amateur Radio Clubs, Inc. if your club has not joined this fine group, please call N6KNO, the SEC/TREAS, for more information. Ted, W6HX, is very active trying to calm the high-line noise at his antenna farm. It is also rumored that the SSB reports are rockers in the San Fernando Valley, and so far the quality seems to be greatly improved. N6AHV, Tex, reports that INDEXA (14236 kHz) is active daily at 2300 UTC (except Wed.). The friendly Extra Terrestrial DX net operates on 148160 kHz daily at 2100. WORDS FROM DEPARTING SM, BOB POOLE, AJ6F: This is the final section news column from this writer. I've enjoyed the opportunity to become more involved in the ARRL Field Organization and to have learned about the way things function within a structure. We still have a lot of work ahead of us in several areas. Most importantly, the Amateur Auxiliary without AX needs coming up. This is, more important, in the effort to come forward and organize the Local Interference Committees that are the backbone of the VHF/UHF efforts here. ARES in the section is doing well, according to SEC AK6Y. All groups, however, should be represented by a section AEC or EC who in turn report to their DEC or SEC. In the past two years, I have seen packet radio gain popularity, and gain in utility. We still need more NTS facilitators to learn and use the system. For the next term, Phineas will need all the help he can get. I encourage you to contact him and find out how you can be of assistance. Many thanks to those who supported me during the past two years. I hope you will continue to support the ARRL Field Organization. 73 de AJ6F. STM News: the earthquake traffic was down for a ma, probably due to the reliable telephones which we did not have in 1971. We had good representation, however, and all systems were set to go in case a large number of messages did arrive. Thanks, gang, for the support. K6UYK and N6LHE both made BPL this month, good going. Traffic: K6UYK 639,

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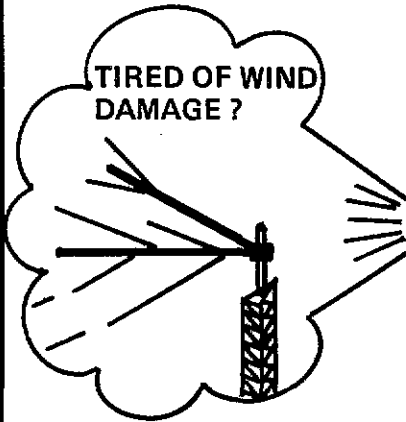
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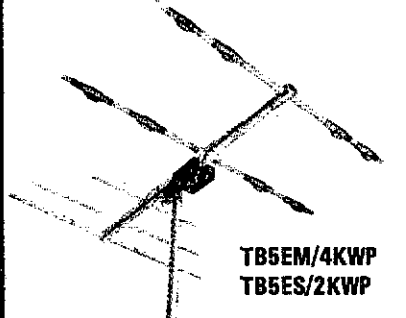
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N6LHE 591, W6INW 292, W6TTH 259, K6YBV 29, W6NKE 23.
ORANGE: SM, Joe H. Brown, W6UBQ—ASM; Bob W6LKN (714-686-3823), Ralph W6BUB (714-776-9272), Org Co, ASM; Tony W6QCH5 (714-981-1836) SB Co. Club News, fm the editor of the Bishar ARC, A BIP OP HISTOPR. As we look over the past year for the leadership of DEN (W6WYU), truly a great deal has been accomplished. In fact, many said, "It couldn't be done!" BARG now has an absolutely 1st-class mountaintop repeater located at 10,800 ft of elevation atop Silver Peak. They said it could not be constructed in one summer, but it was! It was because of good leadership and your unselfish participation in numerous work parties that this project was completed. TNX to those who so willingly gave of their time and resources. TNX guys. President's message fm Western ARA. The continuing success of your club will depend on those officers you selected to represent you. A very careful evaluation of selection for nomination is of the utmost importance. Your personal feelings should not be the criteria. Think only in terms of "THE BEST" for the club. Paul N6DWR, Fullerton RC rpt Aug 17-Hunt was the toughest and eventful ever. WB6GCT blew a valve, most hunters were beating the bushes in the Pomona area and K6OV hauled his passengers 77 miles, a personal high mileage record. N6MI drove 87 mi without finding it. (sounds like fun). The winner, WA6FAT, (34.65) ARES/RACES NEWS. Because of the actual earthquake in southern California, the State OES and some of the county agencies pulled out of Quake 87 projects. Some of the Amateur Groups also elected not to test the amateur communication system because the agencies were not participating. I would like to point out the Amateur Communications should be operated and controlled by volunteer Amateur Radio Operators. Government Agency Guide Lines are very helpful for these occasions when they are given, but we must be careful so that our flexibility and capabilities are never restricted. In order to meet our Public Service Mandate, we must constantly test our operating modes, frequencies, equipment and manpower utilization schemes. We must be a sharp tool in a constant state of readiness. PACKET RACKET: Mike, N6KZB, ASM DIGI COMM, rpts Im Inland BB System. Msg forwarding counts (Approx. now working on standardizing reporting). H/F Skipnet KD6SQ-2, 30. VHF Westnet KD7XG-1, 325. H/F 20M, WB7QGP 160. VHF Westnet KD6SQ-2, 400. VHF Westnet, KB6GVT, 25. For handling priority traffic, it appears that the dedicated BB system is the best way to go, especially when many stations are on the air. In this procedure, the individual stations can come off line for punching in data, then can connect to BB for traffic handling. Auto-forwarding the traffic would be ideal. NTS: Ernie Schultz, WA6QCA has resigned the STM position, his experience and knowledge will surely be missed. Ernie will continue as NM for SCN/V. Filling the STM slot (a tough act to follow), WF60 Dan Farrell, 534 N. Whitlier St., Anaheim, CA 92806 (714-778-4896). PSHR: WF60, WB6QBZ, WA6QCA, N6QBJT. BPL: WF60 with tic total of 742.

NET	FREQ	SEC	QNI	TFC	TIME	NM
SCN/1	3598	30	289	303	1830	WF60
SCN/2	3598	24	190	80	2015	WF60
SCN/V	147.645	30	210	314		WA6QCA

Traffic: WF60 742, KA6HJK 203, WB6QBZ 133, N6GOT 98, AD0A 98, K6VCG 84, WA6QCA 83, W6SX 39, KA6TND 25, W6CPB 24, KA6GND 22, N6QBJ 16.
SAN DIEGO: SM, Arthur R. Smith, W6INI—STM; N6GW Asst STM; NAKRA, SEC: W6INI, PIO: K6GLF, TC: N6JSE, ECs W6DGS (424-5785), K7DCC (748-9046), W6INI (273-1120), WF6Z (746-4017), W6GM (344-4158), N6NKJ (444-5465). The recent Whittier earthquakes have emphasized the need for operators to be prepared by joining and actively participating in ARES or RACES activities before the disaster. It's too late when the roof falls in! Make preparations before the quake so your family can manage without you. As an ARES or RACES member, you may be pre-assigned to a critical location so you can proceed without further ado when the disaster occurs. Contact an EC above. San Diego amateurs assisted Red Cross, Calif Dept of Forestry and Fire Control, especially during a major wildfire on Palomar Mtn in early Oct. Repeater sites were threatened and crews stood by to remove equipment if necessary. The Palomar ARC rpt, 146.73 (-) and 220 Club rpt, 224.9 (-) operated on auxiliary btry power for several days handling fire-related traffic. Red Flag patrols used SANDRA's Lyons Peak rpt, 146.265 (+). Upgrade to Extra: N6MUA, W5VGF; to Tech: N6PPD, N6PKS, N6QCT (KB6HIU), N6QJM (KB6RYF), NCTN 29 sessions, 117 msgs. ARES CW 4 sessions, 14 ck-ins. Traffic: N4KRA 79, N6GW 74, N6LWD 16.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—Three more Section appointments this month bring us up to "fighting strength." New SEC is Van Lyons, W6BIIY, who is also DEC for SLO County. Van brings with him a wealth of experience in emergency communications and management, having done both in various places. New PIO is Roger Laroche, N6FOU, looking for new challenges after a very successful term as Net Manager. Finally, the Bulletin Manager position goes to Frank Gibson, K16XG, who will be building up that area. Both Roger and Frank will be expanding their organizations so get in touch with them if you can/want to help those areas. Only the Official Observer Coordinator and Government Liaison slots remain open. The full Section leadership list is: ASM/Ventura: N6MA; ASM/SBAR: W6BIVY; ACC: K6BAH; BM: K16XG; STM: N6WP; PIO: N6FOU; TC: W6KPV; SEC: W6BIIY; DEC/Ventura: W6BRVA; DEC/SBAR: N6AJA; DEC/SLO: W6BIIY. A very productive ARES leadership meeting was held with Don Roof, District 1 & 8 State ARES Director. We are fortunate that Don is also W6BIIY, and a member of TBSMA. Attending were: W6BIIY, W6BRVA, K6KGF, W2KVA and our gracious host, N6AJA (Thanks Tony). N6FOU copied the ARRL promotional show "The New World of Amateur Radio" from the Satellite transmission, and has it available in VHS and U-Matic formats. Please contact him or me if you have an audience or can get it shown on TV. Club Activities: SARC is working on a Communications Trailer (no competition to the SBARC van), SCCC planning a CQ Worldwide expedition to Mexico. Novice classes in Santa Maria by SARC and Tech/General classes in Santa Barbara by SBARC. What is YOUR club doing? 73 for now. W2KVA. Traffic: W6NOH 182, N6FOU 31, KB6IEC 25, KB6HGB 11. (Aug.) KB6KOW 12.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—ASM; K5MXQ, SEC: W5GPO, STM: W5VMP, OOC: W5JBP, PIO: K5HGL, BM: W5QXK, TC: W5LNL, ACC: W5URI. The position of State Government Liaison is still open on our Section Staff. Please call or write for details. My address and tel number is on the bottom of page 8 of any QST. The Northeast Texas Tlc and Emergency Net (147.90/30) report for Sept.: QNI/44 QTC/11 In 9 ssn. The 7290 Tlc Net for Sept.: QNI/2474 QTC/496 in 48 ssn. K5UPN has been elected Net Mgr of the 75 Mtr. Interstate Sideband Net (3995 @ 0100Z daily) Welcome aboard to new members: ARB (W5RQ), ARB (W5EGG Co.) and WB7AXR (Hamilton Co.) W5ARV/OO has had very successful eye surgery, and is back out and about. Congrats to the Garland ARC for again qualifying as a Special Service Club. Also the Tyler ARC and the K2BSA ARA have become ARRL Affiliated Clubs. PSHR for September: K5UPN, KB5ADE, K5MXQ, W5ZN, AJ5K and KA5QYV. Traffic: N5BT 406, W5TNT 306, KD5RC 184, K5UPN 181, K5MXQ 146,

W5WMP 115, W5XQ 100, W5ZSN 94, KB5ADE 92, KA5AZK 84, AJ5K 68, W5YQZ 61, N5GVF 60, W5UW 51, K5CNG 39, N5FDL 17, W5AEZT 17, KA5QYV 16. Total: 2,037.
OKLAHOMA: SM, Bill Goswick, K5WG—ACC: WB5CDW, BM: WA5AS, OOC: K5JVG, SEC: W5ZTN, SGL: W5N2S, STM: K5VX, TC: W5GMJ. Congratulations to Ernie Buck, WB5CDW, the newly appointed Affiliated Club Coordinator. Ernie brings considerable experience and enthusiasm to this position. Any club interested in either affiliation or Special Service Club status should contact Ernie. Many thanks to Dave Cox, N5BN, for his accomplishments as the previous ACC. Congratulations to Steve Ray, N5FEM, on being appointed the Net Manager for the Sooner Traffic Net (STN). We are indebted to Don Chambers, W5JFB, for his hard work as the former manager of STN. The STN meets at 1730 hrs local on 3860 kHz. Newcomers are welcome, please check in when you can. Novice licensees are now eligible for most field appointments, so any novices (or anyone else for that matter) who is interested in a field appointment please contact me. Official Bulletin Stations W5AS, K5BJ, N5IKN, W5RE, and KA5WGS participated in 57 net sessions and transmitted 82 bulletins during August 1987. Thanks for your efforts. Happy Holidays to all. Traffic: WA5OUV 85, N5IKN 82, W5RB 50, K5GBN 50, N5FEM 42, K5VX 41, WA5OGC 27, W5VLW 25, K5FSD 24, K5CAY 22, W5VOR 21, N18W 15, W5UW 2.

SOUTH TEXAS: SM, Art Ross, W5KR—ASM; N5TC, STM: K5QEW, SEC: K5GD, ACC: W5BYDD, PIO: WA5UJZ, OOC: WA2VJL, BM: K5CVD, TC: NZ5U, SGL: K5WIK, PIA: N5IKW. Sam Houston ARC copied "The New World of Amateur Radio" direct from satellite; SHARK working on tax-exempt status with IRS. HOT HOG News, Brady, reports club station installed at police HQ near dispatch room; components donated by area Hams. NM W5GKH reports QNI 7290 Traffic Net while touring OK, CO, NM and AZ. QNI TEX CW net from south rim of Grand Canyon; says Houston dipoleaters now have 24m operation. STM K5QEW reports 7290 Net passed 496 messages in 48 Sept sessions; 274 QNI; 2 NTS liaisons per session. Region Cyc4 NM W5TNT reports 517 messages passed in 60 Sept sessions; Texas represented 100%; STX stations N5TC, W5BJ, W5CTZ, W5GKH. W5UPN reports being elected NM of Independent SB Net; Congratulations! PIA NZ5J, Seguin, reports WA5DYV copied ARRL satellite broadcast; showing for general public planned; W5FFG received ARRL Meritorious Service Award for his years in Amateur Radio and outstanding public service to the community. OBS W5KLV Sept report: 9 ARRL bulletins, 30 satellite bulletins, 4 propagation forecasts, 4 DX bulletins. ARRL bulletin given 118 readings on 9 nets. PIA WA5UJZ reports had clipped Hams W5RPA and W5FQJ sporting new antenna farm atop apartment bldg, than to entergetic D-CAT members (Houston), generosity of local Hams, and an accommodating landlord, 7290 Traffic Net picnic reported as a big success; W Gulf Vice Director N5TC received James Dunn Award for being the area's most outstanding Amateur—he certainly deserved it! CAND NM W5KLV reports 680 messages passed in 30 Sept sessions; DRN5 represented 100%; STX stations: N5DFO W5EPA W5FQJ W5KLV K5DKQ W5SHN N5XV W5BYDD KESZV. PIA KA5EEQ, Brenham ARC, sent voluminous report on packet activity; also says Amateurs will demonstrate Amateur Radio at Washington County Fair. DRN5 NM W5BYDD reports 635 messages passed in 30 Sept sessions; 274 QNI; 2 NTS liaisons per session. W5CTZ N5DFO W5KLV K5QEW N5BHQ W5EPA W5FQJ W5BYQZ KESZV WA5JZ W5B5SH W5BYDD. OOC WA2VJL reports San Benito ARC Special Event Station had 152 contacts (31 states, 5 DX) all on 15 meters. San Antonio ARC bulletin reports Central Texas Traffic Net NM K5SV also runs ARRL bulletins on 144.67, 80 wpm RTTY, 9:30 PM local. EC WA5QZI, Bexar County, sent in complete story of Amateur Radio work for papal visit; too much for here, sent to HQ. Amateur Radio performed well at the Confederate Air Force "Wings Over Houston" air show. Participants included: N5EA N5APC W5AVI N5AVY K5B5D N5EBC K5B5M2 K5BT W5BTO K5BYP W5CQY W5DNE W5WVI K5B5EJ W5EGS N5EUB W5EWM W5EZW W5SFLZ K5GK N5GKQ W5B5HML W5SHNG W5I9Q W5AJDI N5JEQ K5JIN W5AJMC N5JNN W5JLD K5AJVR N5KJP W5AKKG W5B5LI K5MIZ K5MJA W55NKZ W5B5NLM W5B5QV W5R5U K5ARXW K5C5R W5B5HU K5B5TR K5ASTAR K5T2X W5UBG W5B5UO K5AVGM W5WVR W5AY5C W5BYDD. Traffic: W5KLV 421, W5BYDD 349, W5BJ 259, W5SHN 244, W5CTZ 150, W5EPA 85, N5VL 60, W5GKH 51, WA2VJL 30, W5FQJ 29, W5BGE 22, KA5UYV 74.

WEST TEXAS: SM, A. Milly Wise, W5OVH—ASM; KA5PTG. ASM: K5OFD, ASM: W5FE, ASM: N5DPO, SEC: W5MVJ, PIO: KESZV, ACC: K5IS, OOC: KD5FL, BM: K5VRF, TC: K5CU, STM: A5E1. Prairie Dog ARC now has alert warning Tone System devised by N5OX completed and tested. On Oct 4 presented the newly affiliated Lubbock ARC with their ARRL Affiliation Cert at their Hamfest. Congratulations to a very active club, nets on both 144 and 147.3 MHz. Planning with ARES/RACES, Bike-a-thon, participation in SKYWARN alert. Big Bend Emerg. Net meets 8:30 AM Central time on 3.922, Southwest Traffic Net meets 9:30 PM Central 3.935. Abilene has a very active EC, N5DQX for Taylor Co who organized part in Boy Scout Jamboree held in Oct. DEC N5FHR advises 2-meter antenna at El Paso EOC installed and tested. At Sept meeting of W5ES West Gulf Director Jim Haynie spoke on League affairs. Panhandle ARC Cloud Chasers Net meets each Mon. 8 PM 146.07/67 PARC report. ARES in Amarillo aided Easter Seal Bike tour & Air Show. On back cover ARRL Operating Manual is Edna, K5LYC, an Amarillo Ham. Snyder ARC has a new newsletter called "The Switch". All clubs in WTX actively participated in the SET EX. Traffic: WA5ROE 8, W5BYDD & A5E1 & W5ERT & K5M2T & K5FN2 for a total of 635. W5D5KH 681, KB5ADE 49, AE51 142. 73, Milly, W5OVH.

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Removing Radio Frequency Interference (RFI)

Peaceful coexistence of electronic related pursuits in today's world involves a variety of interference-prone situations, each requiring minimization in a harmonious and effective manner. While the classic malady of TVI has been significantly reduced by sophisticated circuitry in modern transceivers, recently popularized areas of mutual radiation sensitivity, including computer systems and cable TV networks, require their own unique and challenging means of correction. High power operations with older basic design amplifiers and seldom-maintained antennas increase the complexity of that situation, especially when RF feedback or television interference through sheer "brute force" overloading enters the picture.

Although ICOM equipment's technically advanced filters and innovative circuit designs are extremely effective in minimizing interference-related signal components, external support items often introduce "after the fact" undesired radiations. Many times, those precise points of generated interference are quite difficult to locate. This Tech Talk thus investigates various causes, effects, and solutions to RFI with the objective of improving every amateur's HF and VHF station performance.

Some of the most often overlooked yet significant culprits of interference to television and computer systems include poor antenna connections, improperly installed or time-corroded connectors, and ineffective ground systems. Those same RFI-generating items also encourage RF feedback, with its sharp burns or stings vividly apparent on metallic knobs and cabinet edges (ouch!). High power linear amplifiers with low harmonic attenuation and miniscule bandpass filtering merely escalate those interference perplexions, overriding even the

best transceiver's ability to produce exceptionally pure spectral output.

An antenna's elements typically consist of sectionalized aluminum tubing with adjustable clamps and screw terminals for cables, or copper wire spliced and/or soldered to a center balun or connector. Dissimilar metals tend to corrode over a period of time, however, and connections become an antenna-mounted quasi-diode mixer anxious to generate spurious radiation when excited with RF energy. Securely joining and weatherproofing each of those items during installation minimizes undesired radiations. Periodically cleaning and resealing various pieces after seasonal winds and rains assures continued signal cleanliness.

Shield and center pin connections on antenna plugs also tend to work loose with use and time, especially when they're only partially soldered during installation. This situation also promotes undesired coax radiation and wide dispersment of spurious signals.

Resonant length and/or partially complete ground systems are notorious interference and RF feedback sources with an uncanny knack to avoid discovery. Corrective measures involve directly connecting each piece of station equipment to a large copper ground strap on the desk's rear, then connecting that strap to a good solid earth ground by a short and thick cable. Wrapping three- to four-inch diameter toroid core also breaks up or "chokes out" line radiations and minimizes their ability to act as a "phantom antenna." Toroid cores are also effective RF chokes for AC and DC power cables, hand key wires, amplifier control lines, computer, monitor, and printer cables, etc. The latter considerations also minimize computer-generated and cable-radiated "birdies" often received

throughout the HF and VHF spectrum.

Leaky cable TV systems obviously require owner repair and maintenance for full rectification; however, other options for survival are available to clever-thinking amateurs. Directional antennas, for example, can often be positioned to utilize their side or rear nulling effects for minimizing cable interference. The Passband Tuning control on ICOM transceivers can also be adjusted for an optimum bandwidth and the most beneficial signal-to-interference ratio. Additionally, combined use of ICOM's tunable IF notch can move a deep and sharp null across that optimized passband to further enhance reception and literally pull signals from amidst a proverbial sea of interference.

Power line related noises also play havoc with radio communications, and extreme cases such as arcing clamps and broken insulators or small animals across lines require power company intervention. Your mobile setup is often useful for localizing the general area of that interference before contacting company officials. Meanwhile, ICOM's multistage and continuously adjustable Noise Blanker can be teamed with its unit's Passband Tuning and IF Notch to reduce power line noises in a surprisingly effective manner.

In the same manner a chain is comprised of individual links connected end to end, an amateur radio setup is a series path to/from its transceiver and antenna. The strength of any chain depends on its weakest link, and the top-line quality of ICOM equipment is realized to its deserving full potential when complemented with similar top grade support items. Ready to join the growing chain of today's most progressive amateurs? Link up with ICOM and enjoy top-of-the-line performance with every operation!

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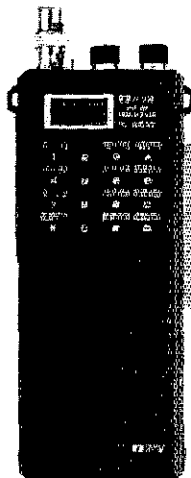
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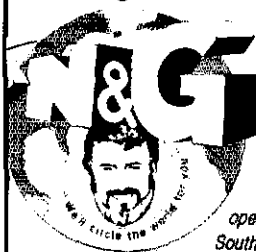
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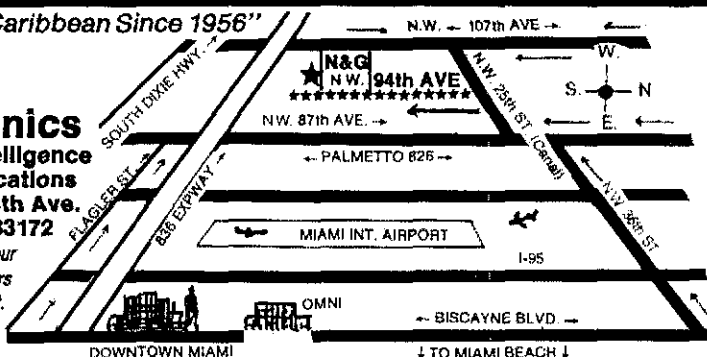
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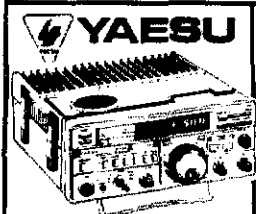
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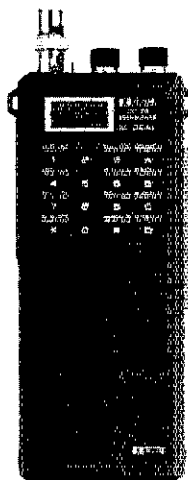
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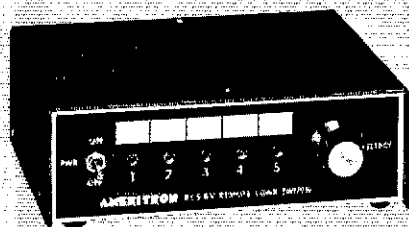
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RCS-4
FOR CONVENIENT
INSTALLATION

No control cable required
Selects one of four antennas.
VSWR: under 1.1 to 1 from 1.8 to 30 MHz.
Impedance: 50 ohms.
Power capability: 1500 watts average, 2500 watts PEP maximum.

RCS-8V
FOR SPECIAL
APPLICATIONS

Selects up to five antennas.
Loss at 150 MHz: less than .1 dB.
VSWR: under 1.2 to 1 from DC to 250 MHz.
Impedance: 50 ohms.
Power capability: 5 kW below 30 MHz, 1 kW at 150 MHz.

Available at your dealer - Send for a catalog of the complete AMERITRON line.

OTHER AMERITRON QUALITY PRODUCTS:
AL-1200 and AL-1500 AMPLIFIERS - 1500W CW
OUTPUT AL-84 AMPLIFIER - 400W CW OUTPUT

AMERITRON® DIVISION OF PRIME INSTRUMENTS, INC.
9805 WALFORD AVE • CLEVELAND, OHIO 44102 • (216) 651-1740

144MHz IC-38A
440MHz IC-48A
Now Available!



ICOM IC-28A/H

THE ONE FOR THE ROAD

- Compact Size
- Simple to Operate
- Large LCD Readout
- 25 Watt IC-28A
- 45 Watt IC-28H
- Packet Compatible
- 21 Memory Channels

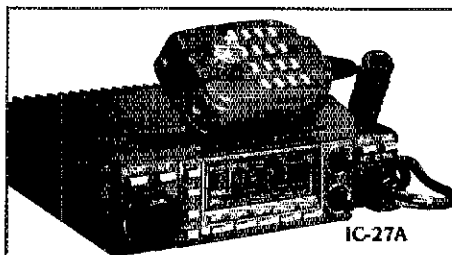
The IC-28H has all the features you need for carefree 2-meter mobile operation. The only thing it doesn't have is a big price.

45 Watts. The IC-28H provides a full 45 watts of powerful output. The IC-28A 25-watt version is also available. Both units have a selectable low power.

Large LCD readout. A wide-view LCD readout can be easily read even in bright sunlight. An automatic dimmer circuit reduces the brightness for evening operation.

Wideband Coverage. The IC-28H performs from 138-174MHz (specifications guaranteed from 144.00-148MHz) and includes weather channels. Ideal for MARS and CAP operation.

Compact Size. The IC-28H measures only 2 inches high by 5½ inches wide by 7¼ inches deep (IC-28A is 5¼



The IC-27H 45 watt and IC-27A 25 watt ultra compact 2-meter mobiles continue to be available.

inches deep). Great for mobile installations where space is limited.

21 Memory Channels. Store 21 frequencies into memory, or lock out certain memory channels. All memories are backed up with a lithium battery.

Scanning. Scan the entire band or the memory channels from the provided HM-12 mic.

Easy to Operate. With only 11 front panel controls, the IC-28H is simple to operate.

Available Options. IC-HM14 DTMF mic, PS-45 13.8V 8A power supply, UT-29 tone squelch unit, SP-10 external speaker, IC-HM16 speaker mic and HS-15/HS-15SB flexible boom mic and PTT switchbox.

 **ICOM**
First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 Customer Service Hotline (206) 454-7619

3150 Premier Drive, Suite 126, Irving, TX 75063

ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 - Canada

All stated specifications are approximate and subject to change without notice or obligation. All radios significantly exceed FCC regulations limiting spurious emissions. 28H986

BRAND NEW FROM ARRL

\$10⁰⁰

YOUR GATEWAY TO PACKET RADIO

STAN HORZEPA, WA1LOU



Packet Radio is fun—there are over 30,000 “packeters” to prove it, and that number is growing every day. Not since SSB in the early sixties or the repeater boom of the early seventies has there been so much excitement among radio amateurs!

What is packet radio good for and what uses does it have for the “average ham?” How can I be sure I have the proper equipment and how do I set everything up? What are these things called protocols? Where is packet radio headed on VHF/UHF and HF? How has the “braap” of a packet of data sent to a bulletin board replaced the clatter of a radioteletype machine in the autostart mode? Why is packet great for message handling especially in emergency situations? What uses can the computer hobbyist, contester or DX'er find using “packet.” This new 205-page ARRL publication has the answers!

Each of the following chapters is written to make understanding packet radio a breeze: The Radio Hacker, History, Theory of Operation, TNCs, Installation, Selecting TNC Parameters, Operating Procedures, VHF and UHF Communications, HF Communications, Time-Shifting Communications, Public Service Communications, Space Communications, and The Network. In addition there are these appendices: TNC 1 and 2 Commands, TNC 1 and 2 Control Characters, TNC 1 and 2 Messages, TNC Command Compatibility, ASCII Character Set, Bibliography and Sources, Glossary. Price of *Your Gateway to Packet Radio* is \$10 plus \$2.50 (\$3.50 for UPS) shipping and handling.

ARRL — 225 MAIN STREET — NEWINGTON, CT 0611 U.S.A.

ICOM MICRO
Available in 2-meter
and 440MHz versions!



ICOM MICRO THE WINNING HAND

Deal yourself a winning hand in modern technology with ICOM's new micro-size 2-meter FM transceiver. The IC-μ2AT combines maximum performance, reliability and easy operation in a thin-styled handheld that's perfectly suited for today's active lifestyles.

The IC-μ2AT. A breakthrough that ends every amateur radio operator's quest for that one true, go-anywhere 2-meter handheld.

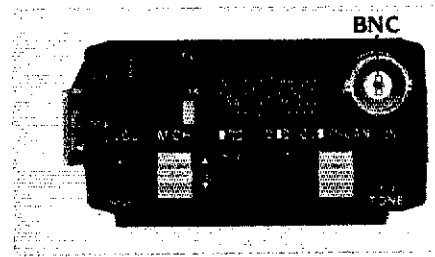
Miniaturization. The MICRO gives you all the advantages and performance of a larger handheld, in a package so small, so refined, so well-built that only ICOM could build it.

Measuring only 4.6" high by 2.3" wide by 1.1" deep, the MICRO fits in your pocket or purse as easily as a cassette tape.

This miniaturization doesn't compromise ICOM quality. It's exactly what

you'd expect from ICOM: high performance in a micro package.

Full Featured. And ICOM hasn't compromised features for size. The IC-μ2AT DTMF version includes ten



programmable memories, transmit offset capability from the back panel including odd offsets, an LCD readout on the top panel for easy readability, up to three watts of output (optional), 32 built-in subaudible tones AND wide-band receive coverage from 138 to 162.995MHz in 5kHz steps for MARS

and CAP operation plus weather broadcasts.

There's also a simple-to-use digital **TouchStep Tuning System** for fast shirt-pocket frequency adjustments. The MICRO also includes a band or memory manual scan function. An A version is also available without DTMF and PL tones.

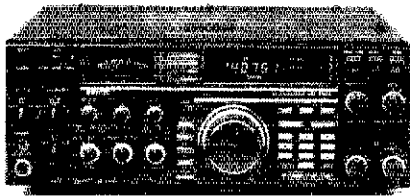
Personalize your ICOM MICRO. The MICRO utilizes most existing ICOM handheld accessories, plus it hosts a new line of versatile accessories including the BP-24 2.6 watt high-power battery pack, BP-23 long-life 1.6 watt battery pack, BC-50 desktop rapid charger, and a variety of carrying cases.

See the ICOM MICRO at your local ICOM dealer. Play your cards right with ICOM!

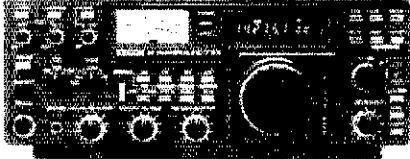


ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline (206) 454-7819**
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ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

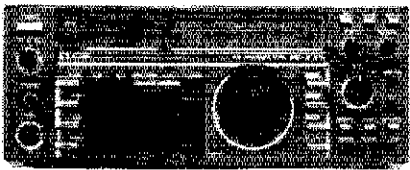
All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. μ2AT387.



HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	2149
HM-36 Scanning hand microphone	44.50	
SP-20 Ext. speaker w/audio filter	149.00	139 ⁹⁵
FL-101 250 Hz 1st IF CW filter	69.95	
FL-53A 250 Hz 2nd IF CW filter	108.00	99 ⁹⁵
FL-102 6 kHz AM filter	56.00	
EX-310 Voice synthesizer	46.00	



IC-751A 9-band xcvr/1-30 MHz rcvr	1649.00	1399
PS-35 Internal power supply	199.00	179 ⁹⁵
FL-32A 500 Hz CW filter (1st IF)	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99 ⁹⁵
FL-53A 250 Hz CW filter (2nd IF)	108.00	99 ⁹⁵
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	



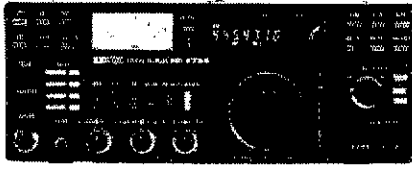
IC-735 HF transceiver/SW rcvr/mic	999.00	869 ⁹⁵
PS-55 External power supply	199.00	179 ⁹⁵
AT-150 Automatic antenna tuner	445.00	349 ⁹⁵
FL-32A 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	169.00	154 ⁹⁵
PS-30 Systems p/s w/cord, 6-pin plug	299.00	269 ⁹⁵
MB Mobile mount, 735/751A/761A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal for 751A	63.00	
PP-1 Speaker/patch	179.00	164 ⁹⁵
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan.	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	124 ⁹⁵
AT-100 100W 8-band auto. antenna tuner	445.00	389 ⁹⁵
AT-500 500W 9-band auto. antenna tuner	559.00	489 ⁹⁵
AH-2 8-band tuner w/mount & whip	625.00	549 ⁹⁵
AH-2A Antenna tuner system, only	495.00	429 ⁹⁵
GC-5 World clock	91.95	89 ⁹⁵

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	1049
IC-275H 100W 2m FM/SSB/CW	1389.00	1229
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1249



IC-475H 75W 440 FM/SSB/CW	1599.00	1429
IC-575A 25W 6/10m xcvr w/ps	1399.00	1249



IC-471A* 25W 430-450	CLOSEOUT	979.00	749 ⁹⁵
PS-25 Internal power supply		115.00	104 ⁹⁵
AG-1* Mast mounted preamplifier		99.50	
IC-471H* 75W 430-450	CLOSEOUT	1399.00	989 ⁹⁵
PS-35 Internal power supply		199.00	179 ⁹⁵
AG-35* Mast mounted preamplifier		95.00	

*Preamp \$9⁹⁵ with 471A or 471H Purchase

Accessories common to 271A/H and 471A/H	
SM-6 Desk microphone	44.95
EX-310 Voice synthesizer	46.00
TS-32 CommSpec encode/decoder	59.95
UT-15 Encoder/decoder interface	14.00
UT-15S UT-15S w/TS-32 installed	92.00

VHF/UHF mobile multi-modes	Regular	SALE	
IC-290H 25W 2m SSB/FM	CLOSEOUT	639.00	549 ⁹⁵
IC-490A 10W 430-440	CLOSEOUT	699.00	399 ⁹⁵

VHF/UHF 1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	379 ⁹⁵
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399 ⁹⁵
IC-37A Compact 25W 220 FM, TTP mic	499.00	439 ⁹⁵
IC-47A Compact 25W 440 FM, TTP mic	549.00	489 ⁹⁵
PS-45 Compact 8A power supply	139.00	129 ⁹⁵
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, TTP mic	459.00	399 ⁹⁵
IC-28H 45W 2m FM, TTP mic	489.00	429 ⁹⁵
IC-38A 25W 220 FM, TTP mic	489.00	429 ⁹⁵
IC-48A 25W 440-450 FM, TTP mic	489.00	429 ⁹⁵
HM-14 Extra TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	

IC-900 Transceiver controller	589.00	529 ⁹⁵
UX-29A 2m 25W unit	295.00	269 ⁹⁵
UX-29H 2m 45W unit	339.00	309 ⁹⁵
UX-39A 220MHz 25W unit	349.00	319 ⁹⁵
UX-49A 440MHz 25W unit	339.00	309 ⁹⁵
UX-59A 6m 10W unit	339.00	309 ⁹⁵
IC-3200A 25W 2m/440 FM w/TTP	599.00	529 ⁹⁵
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	
RP-3010 440MHz 10W FM repeater	1229.00	1089
IC-1200 10W 1.2GHz FM Mobile	699.00	629 ⁹⁵
IC-1271A 10W 1.2GHz SSB/CW Base	1229.00	1089
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	104 ⁹⁵
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	119 ⁹⁵
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1479.00	1299
RP-2210 220MHz 25W repeater	1499.00	1329



Hand-helds	Regular	SALE
IC-2A 2-meters	279.00	249 ⁹⁵
IC-2AT with TTP	299.00	259 ⁹⁵
IC-3AT 220 MHz, 1TP	339.00	299 ⁹⁵
IC-4AT 440 MHz, 1TP	339.00	299 ⁹⁵
IC-02AT 2-meters	365.00	299 ⁹⁵
IC-02AT/High Power	399.00	339 ⁹⁵
IC-03AT for 220 MHz	449.00	389 ⁹⁵
IC-04AT for 440 MHz	449.00	389 ⁹⁵
IC-u2A 2-meters	299.00	269 ⁹⁵
IC-u2AT with TTP	329.00	289 ⁹⁵
IC-u4AT 440 MHz, 1TP	369.00	329 ⁹⁵

Accessories for micros - CALL \$		
IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	399 ⁹⁵
A-2 5W PEP synth. aircraft HT	499.00	449 ⁹⁵
A-20 Synth. aircraft HI w/VOR	599.00	529 ⁹⁵

Accessories for all except micros	
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/R	20.50
LC-02AT Leather case for Dlx models w/BP-7/R	54.50

Accessories for IC and IC-O series	
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
MB-16D Mobile mtg. bkt for all HTs	24.50
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier	SALE 99.95
SS-32M CommSpec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	\$949.00	799 ⁹⁵
RC-11 Infrared remote controller	67.25	
FL-32A 500 Hz CW filter	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	159 ⁹⁵
EX-257 FM unit	42.50	
EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25MHz to 2GHz scan rcvr	1099.00	949 ⁹⁵
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
TV-R7000 ATV unit	131.95	119 ⁹⁵
AH-7000 Radiating antenna	89.95	(6)

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Introducing the next logical step.

Yaesu's Dual Band Handie.

Two affordable radios in one — that's exciting.

Yaesu's dual-band FT-727R packs our best HT know-how into one compact design. At a price that's in step with your ham budget.

Hit hard-to-reach repeaters with a powerful 5 watts on both 2 meters and 440 MHz.

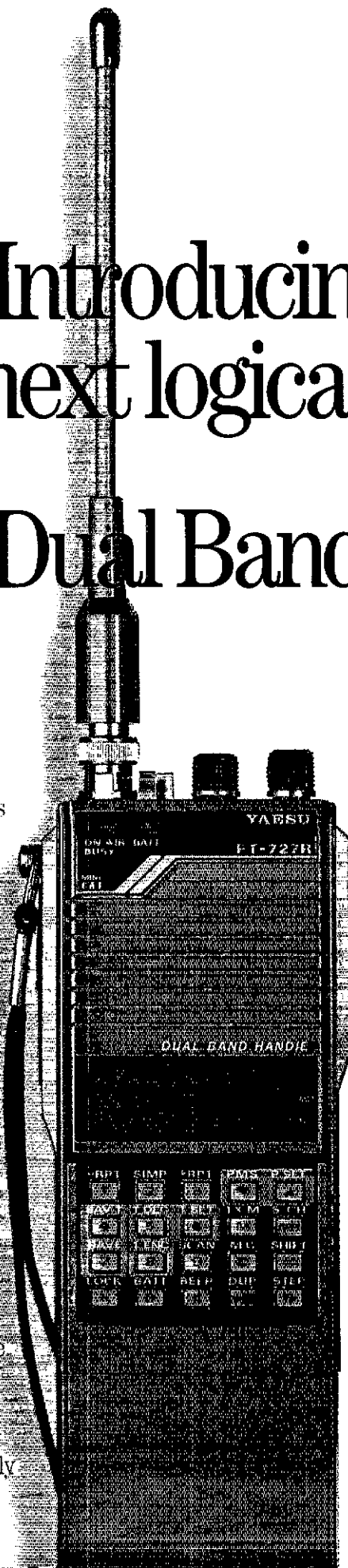
Work the bands quickly and easily with a wealth of microprocessor-controlled commands:

Jump between the separate VHF and UHF VFO registers. Program each of the ten memories for instant recall of repeater input and output frequencies, odd splits, and tone encode/decode.

Scan the memory channels, the entire band, or a band segment. And return to any special frequency with the priority feature.

Use link repeaters by programming TX on one band and RX on another.

Conserve power with the battery saver. It lets you monitor silently



while drawing negligible current. And measure your battery level with the digital battery voltmeter. There's even a "Low Battery" LED.

Finally, your operation is rounded out with features like VOX capability. A one-touch repeater reverse switch. An LCD readout with illumination lamp. A high/low power switch. Remote computer control capability. An optional CTCSS module. And Yaesu's full line of optional accessories.

So step up your operating capability now with the logical choice in HT operation.

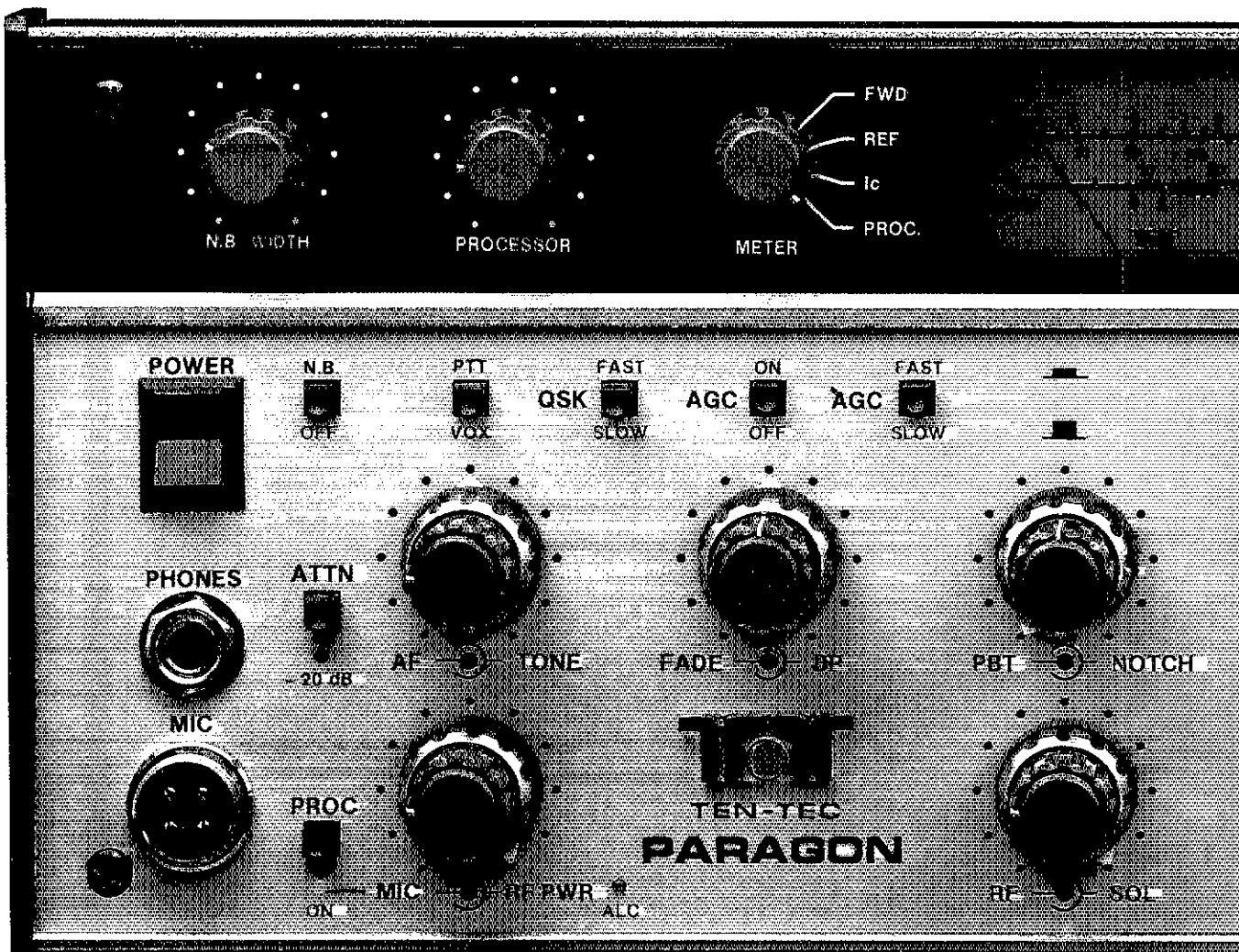
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YAESU

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Prices and specifications subject to change without notice.



You're face to face

Meet America's Newest, the Ten-Tec Paragon, Model 585

PARAGON HF TRANSCEIVER, Model 585

The Paragon Model 585 is a full featured, synthesized transceiver. General coverage all mode receiver tunes from 100 kHz to 29,999.99 MHz. Transmit at 100 watts output on all authorized frequencies from 1.8 to 29,999.99 MHz. SSB, CW, FSK and optional FM. Noise blanker and speech processor are standard equipment. Dual VFOs, RX offset, TX offset, QSK with a changeover time of less than 30 ms, five I-F filters (standard 6 kHz AM and 2.4 kHz SSB, optional 1.8 kHz, 500 Hz and 250 Hz) that are front panel selectable independent of mode, selectable tuning rates with automatic speed-up at rapid tuning knob rotation, passband tuning, audio bandpass filtering, tone control, squelch, notch filtering and more!

Sixty-two programmable memories that include frequency, mode, filter selected, channel number and a 7 character alpha-numeric tag for entering a net name, call sign or I.D. of your choice. As the memory channels are scanned, all of the information is displayed (what a light show!) and the receiver automatically sets up mode, filters, tag and frequency as stored in each channel. Channels scanned are totally controllable with global lock-out, global reset and individual lock-out and reset.

The construction is impressive too. All circuit boards are glass epoxy (G-10) and all of them can be removed without desoldering. The front panel is hinged to provide access to all sections of the chassis. All aluminum construction keeps the weight of the rig reasonable too. And of course, the front panel is a spacious arrangement which makes the critical controls easy to use.

Frequency selection can be made using the main tuning knob, keypad direct entry or up/down buttons that can shift one MHz or to the next ham band. Frequency readout is selectable to display to 100 Hz or 10 Hz. Front panel clock is in 24 hour format. Rear panel input and output provisions keep the all-mode operator in mind too. Fixed level audio out and FSK keying (170 Hz shift), auxiliary dc jack, amplifier control circuits plus all the other connections that you could possibly need, including RS-232 computer interface option.

The Paragon is the end result of a three year engineering effort. Much of that effort was invested in improving the receiver performance and controlling the phase noise inherent in a PLL oscillator. We are proud of the performance of the Paragon and we think it has set new standards of excellence in synthesized rigs. All we ask is that you take the time to check it out. We think that you will share our pride in the Paragon.

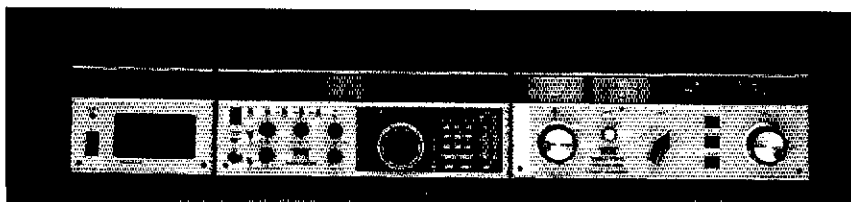
GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29,999.99 MHz. Transmit: 1.8 to 29,999.99 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer, 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C. at 29,999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Tuning Rate:

	Normal	Normal Shifted
CW/USB/LSB/FSK	10 Hz 4.8 kHz per turn	50 Hz 9.6 kHz per turn
AM/FM	50 Hz 24 kHz per turn	100 Hz 48 kHz per turn
	Fast	Fast Shifted
CW/USB/LSB/FSK	50 Hz 9.6 kHz per turn	50 Hz 24 kHz per turn
AM/FM	100 Hz 48 kHz per turn	500 Hz 240 kHz per turn

Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062" glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12-14 VDC.
Dimensions: HWD 5 1/4" x 14 1/4" x 14 1/4". 13 x 37 x 36 cm.
Net Weight: 16 lbs. 7.25 kg.

Paragon Station with Model 960 Matching Power Supply (\$229), and the Mighty Titan Amplifier (\$2685).





Shown actual size.

with the Paragon.

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Typical 200 watts.
RF Power Output: ALC stabilized, adjustable, 10 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	1-1.6 MHz	1.5-29.999 MHz	
SSB/CW/RTTY	5 μ v	15 μ v	10 dB S/N @ 2.4 kHz
AM	3.5 μ v	1.0 μ v	10 dB S/N @ 6.0 kHz
FM	1.0 μ v	.3 μ v	12 dB SINAD @ 15 kHz

Selectivity:

	-6 dB BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.25 kHz	1.875:1
Standard SSB	2.4 kHz	3.35 kHz	1.87:1
Opt. 1.8 kHz SSB (Model 285)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 285)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 282)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for 1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: +16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz, -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: +18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 μ v.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms, 5% distortion max.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

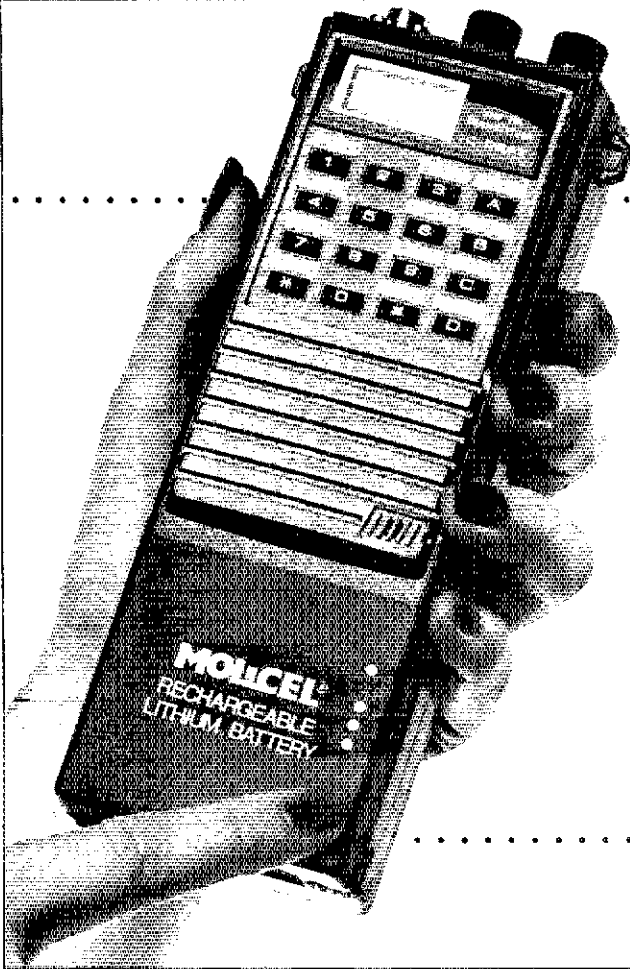
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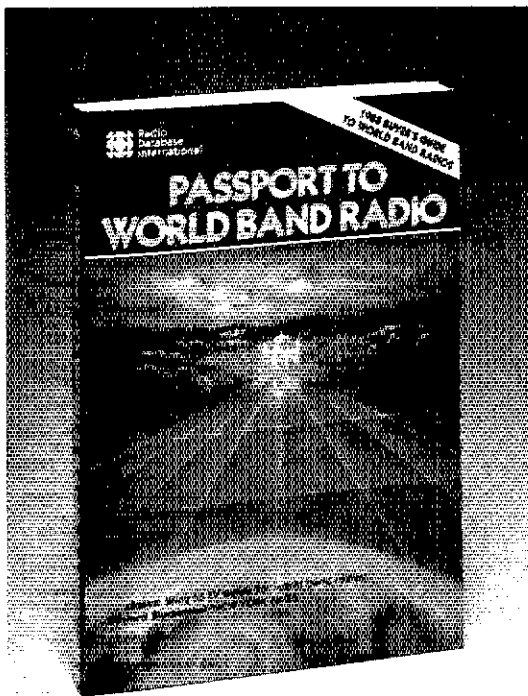
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MOLICEL® replacement battery packs (in kit form) are available with plastic cases for ICOM transceivers only. Please enquire about compatibility with other makes. The MoliKit includes a 6 cell pack, PC board, electronic components, charger and instruction book. Price, \$99, U.S. (includes shipping). Order by credit card on our toll free line. Call MoliKit 1-800-663-6658. PO Box 82460, N. Burnaby, BC, Canada V5G 5Z1 (See "The Magic of Moli," QST, June 1987, pp. 22-25).

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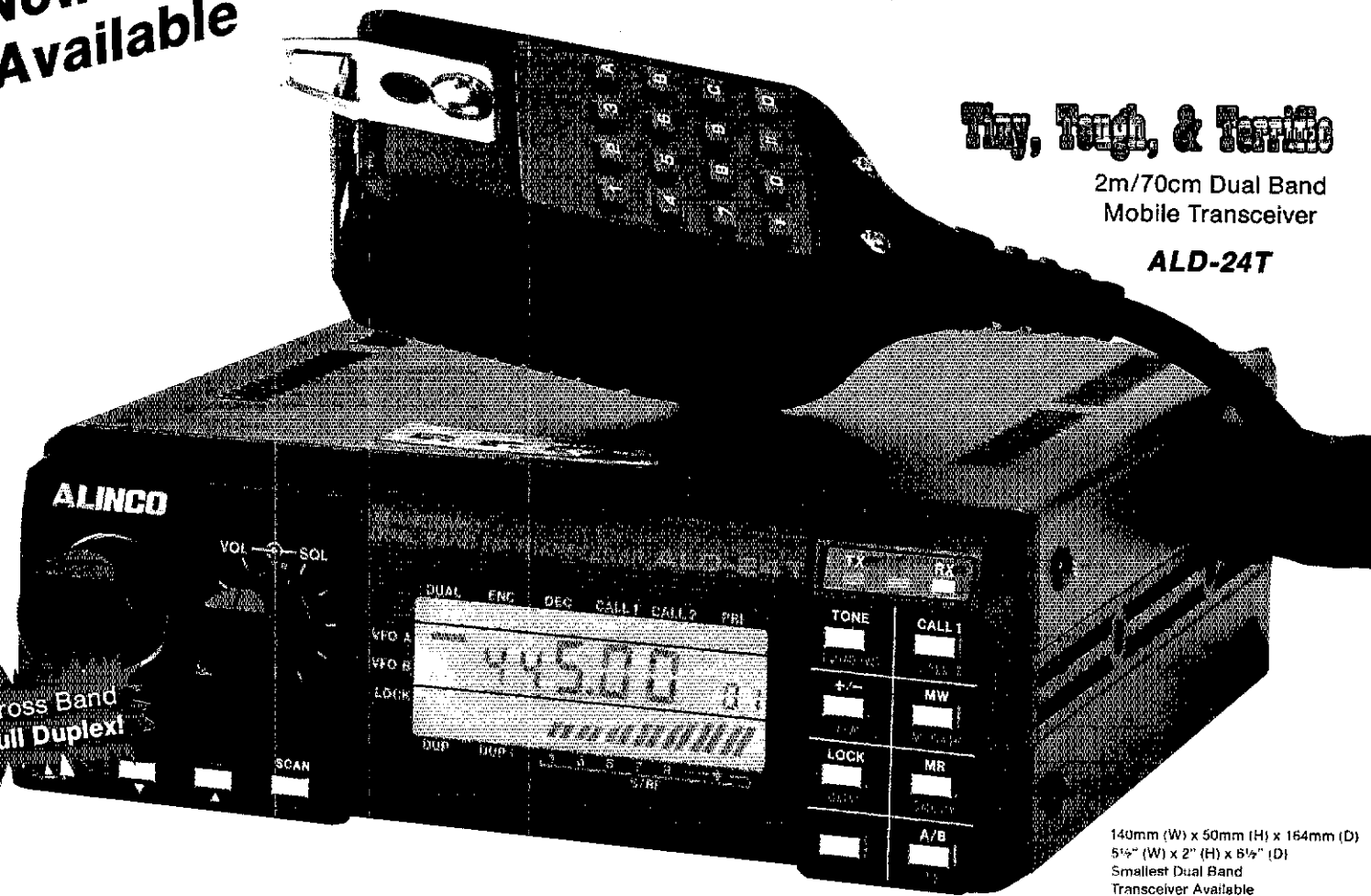
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CLP5130-2 105-1300 MHz 20 el. 500W 4'6" Boom \$119 UPS

Operate on 6m, 2m, 1 1/4 m, 70cm, 900 MHz and 1.2 GHz using only one antenna and one feedline. No tuning is required and the VSWR is 2:1 or less across the entire frequency range with excellent forward gain. The boom is made of high quality aluminum and the elements are pre-cut for easy assembly. Each model can be mounted for either vertical or horizontal polarization. Create VHF/UHF log periodics are great for the amateur bands, scanners and numerous other applications.

Unique mast centering guide

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Rugged mast clamps
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No brake! (Lower mast bracket available)
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RC5A-3

RC5-1	10 sq. ft.	\$229
RC5-3	10 sq. ft. preset	\$299
RC5A-2	25 sq. ft.	\$373
RC5A-3	25 sq. ft. preset	\$436
RC5B-3	35 sq. ft. preset	\$736

(All rotators are UPS shippable)

See Lew McCoy's Review In August 1987 Issue Of CQ.

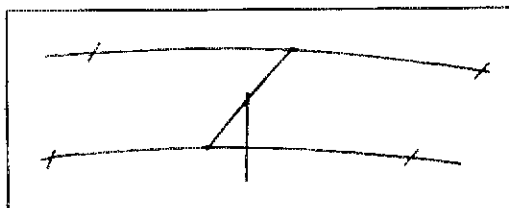


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CV-48 is a ruggedly built 40 and 75 meter vertical. Overall length of 40'8" means full size performance on 40m. Antenna comes with radial system. An optional adaptor for 80m is available. Handles 2KW PEP.

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Unique 2 element phased arrays offer excellent gain and front to back ratio compared to standard parasitic antennas.

AFA75-1 75 meters 29'6" boom \$1842
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730V-1

10 thru 40m (4 Bands)
No Radials
Easy assembly
Horizontal Polarization
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The 730V-1 is a V-dipole consisting of two 19 ft. heavy duty, self-supporting elements and bracket with an efficient balun that is ready for mounting on a standard TV mast. The V-dipole is superior to standard vertical antennas in gain, noise and efficiency. \$148 UPS



Rotatable dipole for 3.5 MHz and 3.8 MHz is 58 feet long. Tuning unit allows operation on 3.5 MHz. \$418 UPS

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"Linear here is a 230A, OM..."

When the word gets out, we expect you will be hearing this frequently. Two years in development, the 230A represents a new dimension in linear amplifier technology and operating convenience. Fully microprocessor based, the RF/power supply deck is remotely controlled via a small "microcontroller". No noisy, large enclosures at your operating position. The 230A provides maximum legal power on all amateur bands with no time limit in any mode.

Drive frequency is continuously monitored by the processor and adjustments made to ensure maximum amplifier output at all times. As you talk, the amplifier's tuning is constantly adjusted as required. Powerful gearhead motors drive the bandswitch, tuning, and loading capacitors.

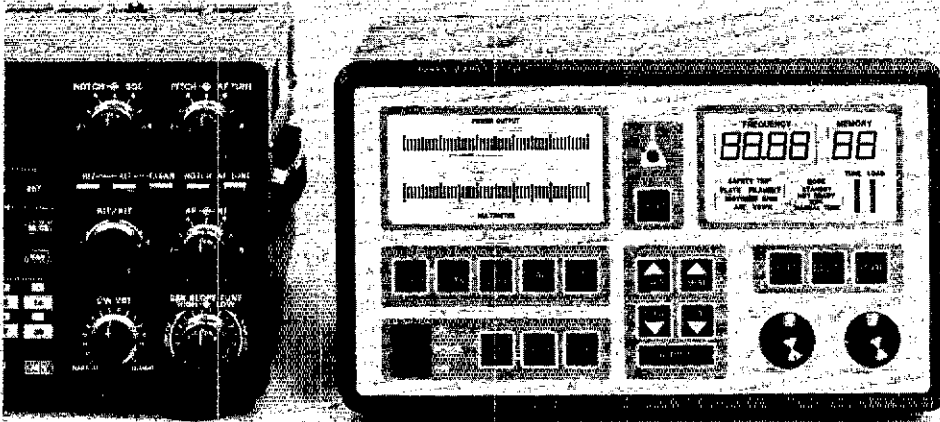
HIGH QUALITY. The 230A is manufactured to the same standards as the 230C, the commercial/military version.

VERSATILITY. The RF/power supply may be remotely located near your AC source and/or antenna cables. The small microcontroller takes little room at the operating position.

PROTECTION. The processor monitors tube parameters to ensure ratings are not exceeded. The operator is alerted if any parameter is getting close to a safety trip point.

FULL QSK. Choose QSK operation and our unique design allows "real QSK" with complete safety...no worries about burned vacuum relays, etc.

Pair of EIMAC 3CX800A7's for high efficiency, low distortion operation. Pi-L output for high harmonic suppression.



230A Microcontroller by
ADVANCED RADIO DEVICES
Remote RF/power supply
deck is not shown.

TS 940 courtesy of EEB, Vienna, Va.

FEATURES

- Two custom, easy-to-read, back-lighted LCD displays which provide all metering, alarm and status information.
- Built-in VSWR computer with readout on the LCD display.
- Accessory connectors for RS-232C control and antenna switching.
- HEAVY DUTY hypersil power transformer with full wave rectification and Radio Switch 86 series bandswitch.
- Automatic safety monitoring for VSWR, grid and plate current, airflow, filament voltage, and efficiency.
- Easy modification for 10 meters if you qualify.
- Remote control. Place RF/power supply deck up to 250 feet from the microcontroller with optional cable. (15 foot cable furnished.)
- Modular construction for ease of maintenance.

Factory direct sales for lowest cost.

Introductory prices: 230A, \$3695. 230C, \$5500.

1 year guarantee.

SPECIFICATIONS

FREQUENCY. All amateur bands from 1.8 to 21 Mhz (to 30Mhz for export)

DRIVE. 50-80 watts for full power.

INPUT VSWR. 1.5:1 or less on all amateur bands. Slightly higher for WARC.

HARMONIC SUPPRESSION. -55dB

INTERMOD PRODUCTS. -35dB down.

DUTY. Continuous on all modes including RTTY.

ALC. Full ALC with exciter to prevent exceeding power limits.

INPUT POWER. 220-250VAC, 60Hz, 20 amperes max.

DIMENSIONS.

Microcontroller: 10 wide x 6 high x 8 deep (inches).

RF/power supply deck: 14 wide x 22 high x 13 deep (inches)

All interconnect cables are furnished for ease of set up.

In addition to the above, the 230C provides continuous frequency coverage from 1.8 to 30 Mhz with a no time output rating of 2250 watts PEP. Three 3CX800A7's are utilized.

Please call or write for additional information. We love to talk about these amplifiers!

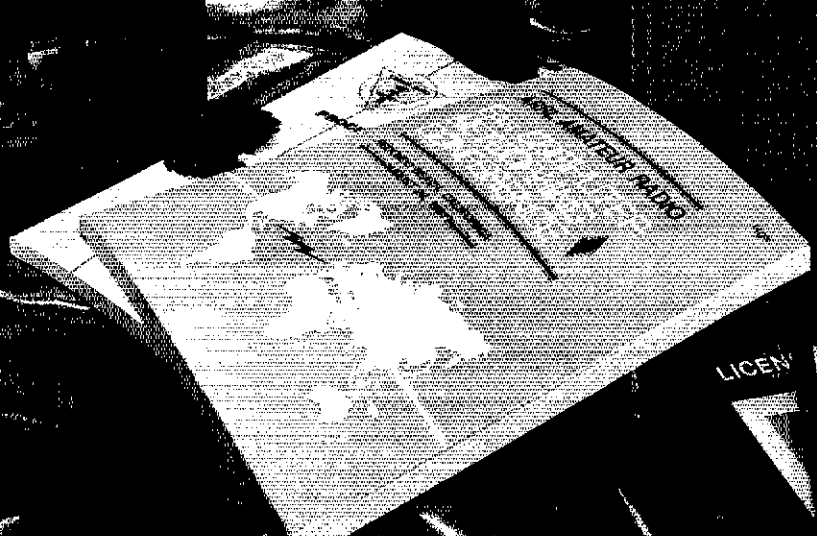
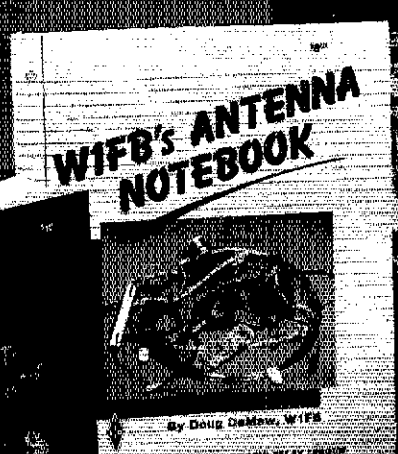
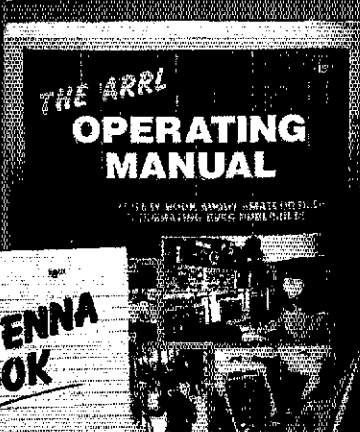
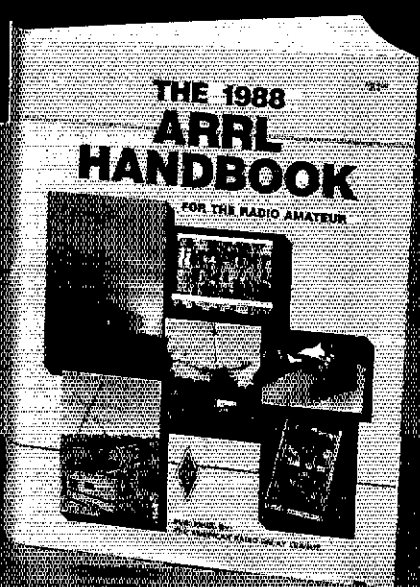
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1987: A Banner Year for League Publications

We're ending the year right with two new books, *Your Gateway to Packet Radio* by WA1LOU and *Grand Canyon QSO* the fifth in the series by K6ATX.

To order any of the books described below, please use the form on page 159. Shipping and handling charges per order are \$2.50, and \$3.50 for UPS. Many radio stores, dealers and some IARU societies stock ARRL publications.

Just Starting Out in Ham Radio?

Then you need a copy of *Tune in the World with Ham Radio* which tells you all you need to know in order to obtain your Novice (beginner's) class license. See page 160 of this issue.

Your Gateway to Packet Radio

This new publication is written by *QST* "On Line" contributing editor, Stan Horzepa, WA1LOU. It's filled with information on how packet radio operates, what you need in the way of equipment, and how to set things up. There's more information on page 128.

Grand Canyon QSO

After his adventures in *Death Valley QTH* you'd think that character Tommy Rockford, K6ATX would take a breather. Not true! He's back in an even more exciting story. We won't spill the beans here. Look for this publication to appear around the first of the year, its price will be \$5.00 plus postage and handling.

The 1988 ARRL Handbook for the Radio Amateur

It took 10-boxcar loads of paper to print the new *Handbook*. But this book is not just paper. It represents a huge investment in time and research on the part of both staff and outside authors to continue the tradition of updating the *Handbook* to represent the state of the art in Amateur Radio Communication. Since 1926 the *Handbook* has grown from 12 pages to over 1200. There are 40 chapters, an abbreviations list, etching patterns and a detailed index. Here is a description of what is covered in the *1988 Handbook*: The first 5 chapters serve as an introduction and cover: basics of Amateur Radio, electrical fundamentals, radio design technique and language, and solid state fundamentals. Vacuum tube principles as they pertain primarily to high power amplifier design are also presented in these introductory chapters. There are 12 chapters devoted primarily to these radio principles: power supplies, audio and video,

digital basics, modulation and demodulation RF transmitters, receivers, transceivers, repeaters, power amplifiers, transmission lines and antenna fundamentals. Another 4 chapters cover voice, digital image and special modulation techniques. The RF spectrum, propagation and space communications are covered in 2 chapters. The construction and maintenance section has 12 chapters of useful projects ranging from power supplies and antennas through digital equipment. You'll find up-to-date component data that the *Handbook* is famous for. The final 5 chapters cover how to obtain your license, station design and operation, interference, monitoring and direction finding.

The *1988 Handbook* is available in hard cover only at your dealer or directly from ARRL. The price is \$21 plus postage and handling.

The ARRL Operating Manual—Most Popular New Title in 1987

There's no doubt about it, this book is a smash hit! With almost 700 pages it rivals the size of some *Handbooks* of past years. It sells out at practically every hamfest where it is available. The full color awards chapter has received rave reviews. Traffic handlers think it's great. There have been nothing but compliments from DX'ers. Our volunteers who are into emergency communications and public service are pleased to have the additional interest this book has sparked. Like the ad on page 142 of this issue says the new *Operating Manual* is HOT... but it's also FUN! This publication is available from dealers or directly from ARRL for \$15 plus postage and handling.

W1FB's Antenna Notebook

Popular *QST* contributing editor Doug DeMaw has written another top seller that tells all about wire and vertical antennas from Doug's practical experience. For a complete description see page 140. The price is \$8 plus postage and handling.

PHDs Author Two League Publications

Yagi Antenna Design is based on the series in *Ham Radio Magazine* by the late Dr. James L. Lawson, W2PV. Jim was a highly competitive person and this carried through to his Amateur Radio hobby and work with antennas. This book has become a classic on beam antennas and covers in

over 200 pages such topics as: performance calculations, simple yagi designs, performance optimization, loop antennas, ground effects, stacking, and practical designs and construction. The book is available for \$15 plus postage and handling, hard cover only.

Transmission Line Transformers by Dr. Jerry Sevick, W2FMI has been reviewed in *RF Design Magazine* and is proving to be a very popular book among engineers, technicians and radio amateurs. See page 108 for more details. The price is \$10 plus shipping and handling.

Low Band DXing For Winter Fun!

John Devoldere, ON4UN drew on his vast knowledge and years of experience of working DX on the lower amateur bands to put together this 210 page book which completely explores the 160, 80, and 40-meter bands. A large portion of the book is devoted to the design and building of efficient antennas for these frequencies. Receiver, transmitter and transceiver characteristics are also covered. The propagation chapter tells where to find DX and gives tips on maximizing the effectiveness of your station for low band work. The price is \$10 plus shipping and handling, paper bound. Software, which is advertised in this issue, is available separately.

ARRL License Manuals—A Change in Schedule

Each of the books in our *License Manual Series* will now be updated every three years. The current edition of the *Extra Class License Manual* will be good through October 31, 1988. The *Advanced Class License Manual* will be good through October 31, 1990. The Technician portion of the *Technician/General Class License Manual* will be good through October 31, 1989 and the General class material will be good through October 31, 1990. For more information see page 42 of October, 1987 *QST*. Each of the *License Manuals* is \$5.00 plus shipping and handling.

Other New Publications

If you are interested in VHF/UHF, microwaves, or packet radio, be sure to check out our *Conference Proceedings Series* described on page 102. With over 12,000 listings, the \$4.00 (plus shipping and handling) pocket-size *ARRL Repeater Directory* comes in handy all of the time.

W1FB's Antenna Notebook

This is one of the most readable books about antennas ever published. It's not really a novel about antennas, but *W1FB's Antenna Notebook* is far from being a dry lecture on the properties of wire and vertical antennas. Instead, we can imagine ourselves being invited over to Doug DeMaw's hamshack to chew the rag about antennas. Have a seat in the easy chair in front of the fireplace while Doug grabs his *Antenna Notebook* off the shelf. Listen intently as we discuss what this new ARRL publication is about.

While the adage, "the bigger and higher the better" might be true for those with unlimited pocketbooks, lots of real estate, and plenty of technical and mechanical knowledge, most of us are constrained in some way, from putting up vast arrays of heavy metal! Wire antennas are inexpensive, can be unobtrusive, and give good performance if designed properly. Verticals don't have to be "equally weak in all directions," and we learn how to overcome this so-called "curse." That bargain coax that you picked up at the local flea market may look good, but is it? The first chapter describes a simple test to find out for sure, as well as telling us about the hidden traps of traps, what conditions cause baluns to do some very nasty things, and a brief discussion on SWR (or VSWR if you prefer.)

The second chapter is devoted to the dipole and its variations: the inverted-V, G5RV, trap dipoles, folded dipoles, multi-band dipoles, and dipole look-alikes. Chapter three covers the care and feeding of end-fed wires. Doug tells how to treat them properly so they won't bite! He will also make your day by telling you how to terminate true longwires—painlessly (so that most of the radiation will be in just one direction.)

During the time that W1FB was *QST* Technical Editor, he lived on a typical suburban lot in Newington, Connecticut. He had a tri-bander for 10, 15 and 20 meters on a 55-foot tower. Since Doug lacked the space to "go out" he decided to "go up" by optimizing his tower and beam for use on the lower amateur bands—especially 160-meters. You'll learn from his experience in one of the most

informative chapters on vertical antennas ever written.

Since Doug used to live only 2 blocks from League HQ, he had to cope with over 1 volt of RF at the receiver antenna terminals when W1AW was on the air. With code practice and bulletins being sent on 7 bands, the result was the generation of all sorts of mixing products in many receivers. (This was before the time "bullet-proof" solid-state devices had been developed for receiver front ends.) All of this noise made reception difficult at best! The chapter on Special Receiving Antennas is the result of the author's experience using receiving loops and other types of antennas to overcome this problem. Of course, the antennas described offer a solution to other forms of man-made noise as well.

Wire antennas come in two models: the basic street model, like the dipole, and high performance "off road" configurations. The latter actually provide gain over a dipole in certain directions and are described at length: loops (in almost all geometric configurations,) collinear arrays, and cloud-warmers (for effective short-range communication.)

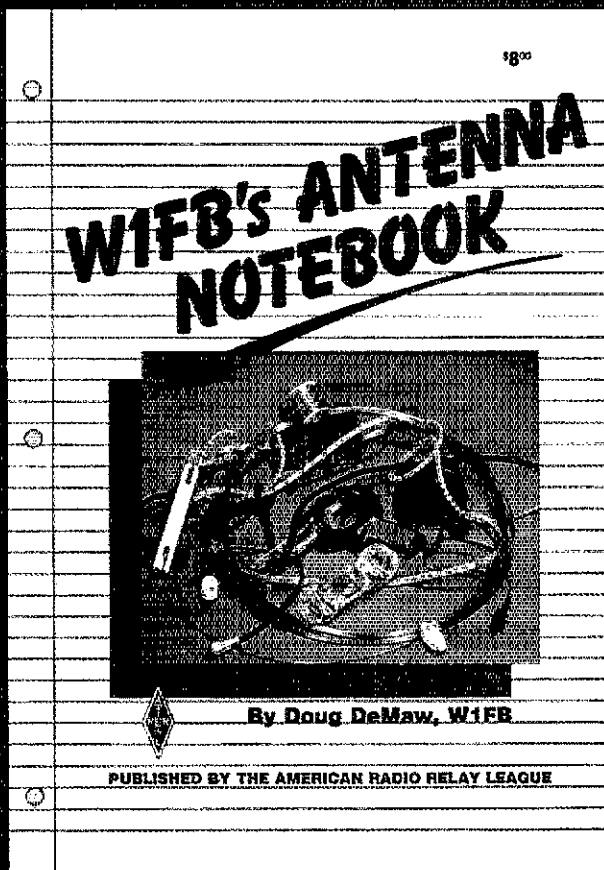
We know of a local amateur who worked 200 countries from his apartment using a 33-foot end-fed invisible antenna running from the window to a nearby tree. He used a black

plastic comb as an insulator on the far end. Chapter 6 is devoted to limited-space and invisible antennas including flag poles, TV antennas (the guy lines are the antenna) and the half sloper.

Need a match? The chapter on matching techniques has circuits ranging from simple L-networks to complete Transmatches.

The final chapter is devoted to measurements. It tells how to build and use such useful devices as field strength meters, SWR bridges, noise bridges, dip meters and a current sampling meter for verticals.

That is *W1FB's Antenna Notebook* in a nutshell. This 122 page publication is available for \$8.00 at your dealer or directly from ARRL. Please add \$2.50 (\$3.50 for UPS) for shipping and handling.



Yaesu's mini HTs. The smallest, smartest, toughest radios. Anywhere.

Whether you're a Novice or Extra class operator, you're sure to appreciate the high power, durability and size of Yaesu's FT-23R Series mini-HTs.

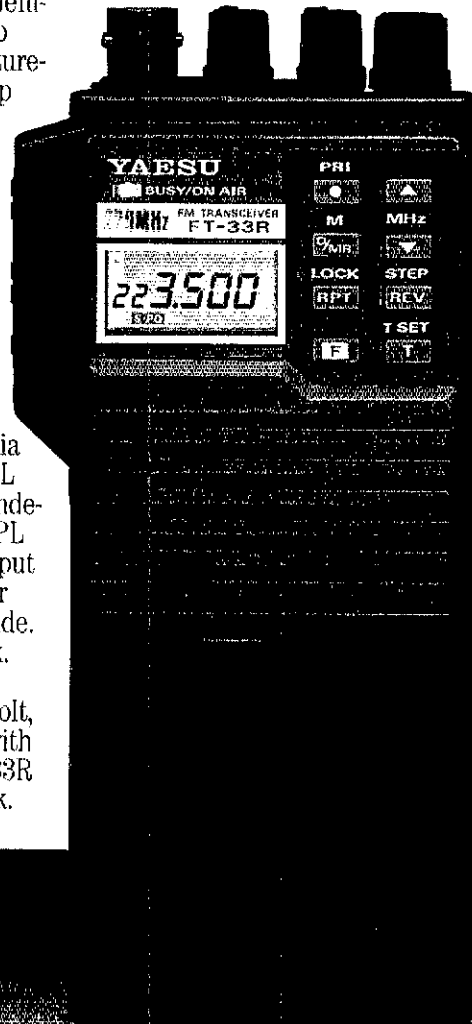
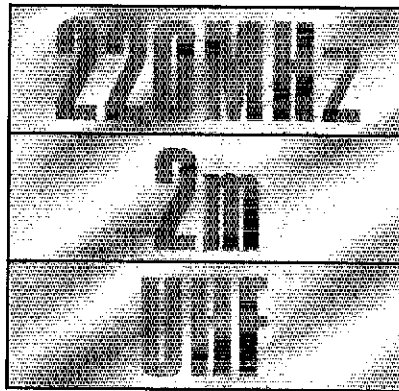
To begin with, you'll find a model that's right on your wavelength. The 2-meter FT-23R. The 220-MHz FT-33R. Or the 440-MHz FT-73R.

Whichever you choose, you benefit from incredibly small packaging. (Take a look at the actual size photo.) Aluminum-alloy cases that prove themselves reliable in a one-meter drop test onto solid concrete. And moisture-resistant seals that really help keep the rain out.

But perhaps best of all, each radio blends sophisticated, micro-processor-controlled performance with surprisingly simple operation. In fact, it takes only minutes to master all these features:

Ten memories that store frequency, offset and PL tone. Memory scan at 2 frequencies per second. Tx offset storage. Priority channel scan. Channel selection via tuning knob or up/down buttons. PL tone board (optional). PL display. Independent PL memory per channel. PL encode and decode. LCD power output and "S"-meter display. Battery-saver circuit. Push-button squelch override. Eight-key control pad. Keypad lock. High/low power switch.

The FT-23R comes with a 7.2-volt, 2.5-watt battery pack. The FT-73R with a 7.2-volt, 2-watt pack. And the FT-33R with a powerful 12-volt, 5-watt pack.



You can choose the miniature 7.2-volt, 2-watt pack shown in the photo below. And all battery packs are interchangeable, too.

And consider these options: Dry cell battery case for 6 AAA-size cells. Dry cell battery case for 6 AA-size cells. DC car adapter/charger. Programmable CTCSS (PL tone) encoder/decoder. DTMF keypad encoder. Mobile hanger bracket. External speaker/microphone. And more.

Check out the FT-23R Series at your Yaesu dealer today. Because although we can tell you about their incredible performance, toughness and small size, seeing is really believing.



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Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc. FT-33R shown with optional FNB-9 battery pack.

The New 688-page ARRL Operating Manual is **HOT...**



On July 8, 1986, a railroad tanker carrying toxic phosphorus derailed and caught fire near Miamisburg, Ohio. The success of the Monsanto Amateur Radio Association's emergency plan in helping local authorities deal with this potential disaster is documented in November 1986 *QST*. The photograph above which was taken over the scene by Mike Carter, WD8BSI, shows what could happen in your backyard! Would you be ready for such a situation? The Emergency Communications chapter by Richard Regent, K9GJF, in the new *ARRL Operating Manual* tells how to prepare for such an eventuality. Emergency Communications and efficient message handling go hand-in-hand. Maria Evans, KT5Y, tells all about this subject and how you can become a part of the National Traffic System in the expanded Traffic Handling chapter.

Over forty percent of the radio amateurs licensed today were at one time or still are shortwave listeners. With modern transceivers, it's possible to hear what is going on outside our ham-bands. David Newkirk, AK7M, adds his enthusiasm for this closely related hobby in the SWL chapter. On a related subject, Paul Rinaldo, W4RI, tells us about the characteristics of the Amateur Radio Spectrum and how our bands are assigned.

Most hams are interested in just getting on the air and talking to someone. Even so, ham radio is a lot more than talking into a microphone or pound-

ing a telegraph key. Carol Smith, AJ2I, and Bill Jennings, KIWJ, have prepared a chapter on Basic Operating. It is just what the newcomer needs in order to get started, and it's good review for some of us who have been away from ham radio for a while. Almost everyone can qualify for the Rag Chewer's Club Certificate, but do you realize that there are hundreds of Amateur Radio awards from throughout the world? Well you can see dozens of these awards in *full color* along with their requirements in the Awards chapter by Bob Halprin, K1XA.

Clarke Greene, K1JX, tells all about competitive operating. Clarke has won almost every major contest, HF, VHF, UHF, from home and away, using full power and QRP. Now he tells how it's done!

Almost everyone seems to be interested in digital communications these days. Stan Horzempa, W1LOU, covers Packet Radio in detail; while Larry Wolfgang, WA3VIL, covers RTTY and other digital modes in a separate chapter. If you find SSTV or ATV of interest, Bruce Brown, WA9GVK, has put together a fantastic chapter on Image Communications.

If you still need to work the countries represented by the QSLs below, you're not alone; but you can pick up some good tips on working DX from well-known DXer and author Bob Locher, W9KNI. DX-peditionier Carl Henson, WB4ZNH, gives advice on how to operate from the "rare ones"

without catching malaria or worse! You can find out when to work DX at anytime during the sun-spot cycle by referring to the propagation tables which were newly incorporated in this edition. You'll also find sunrise-sunset tables for working DXCC countries around the world, and there is a great chapter on Antenna Orientation by *ARRL Antenna Book* editor Jerry Hall, K1TD.

Besides "packet," W1LOU tells what is new in the area of FM and Repeater operation. This chapter is "must" reading for Novices who want to use repeaters for the first time or for those who want to upgrade their existing repeater operations. There is a lot doing these days on weak signal VHF/UHF work and Mike Owen, W9IP, shows how it's done from moonbounce to meteor scatter. Will you be ready for the OSCAR launch that may take place later this year? Dick Jansson, WD4FAB, captures us with his satellite operating techniques.

You'll also find numerous handy tables and charts in the third edition of *The ARRL Operating Manual*. It is edited by Robert J. Halprin, K1XA, Deputy Manager of Membership Communications at ARRL HQ. The new edition is available at your dealer or from ARRL for \$15. (Please add \$2.50, \$3.50 for UPS for shipping and handling.)



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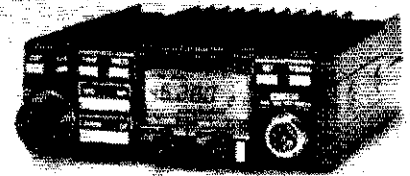
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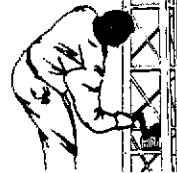


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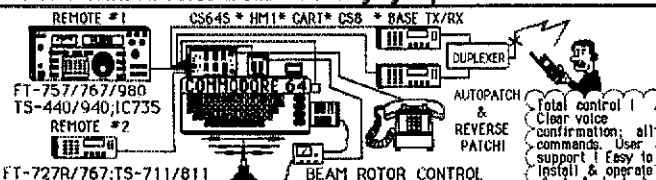
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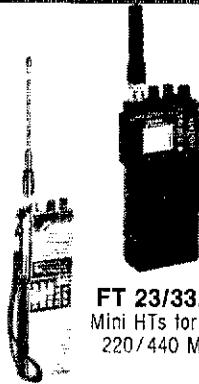
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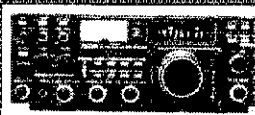
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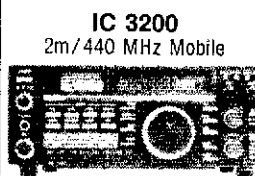
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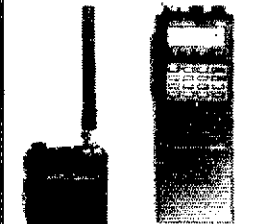
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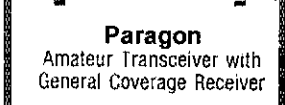
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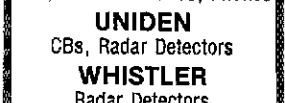
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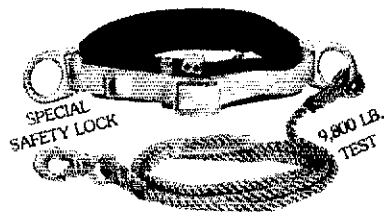
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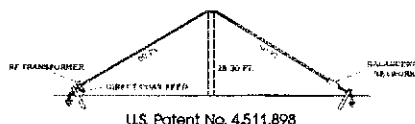
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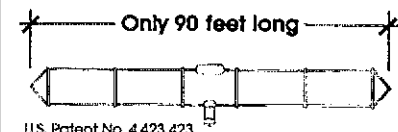


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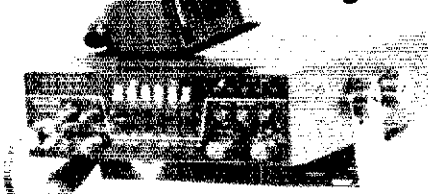
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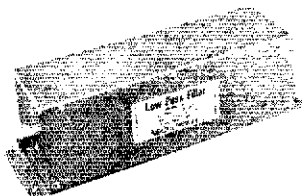
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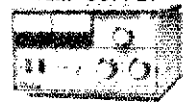
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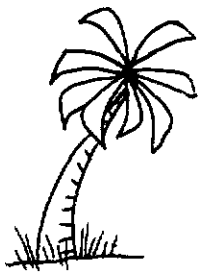
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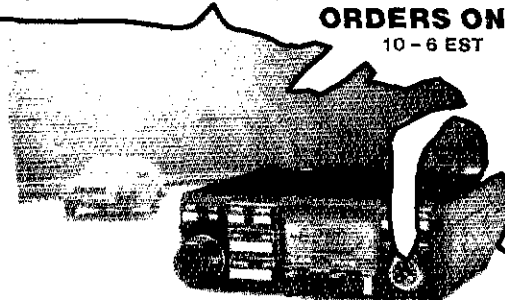
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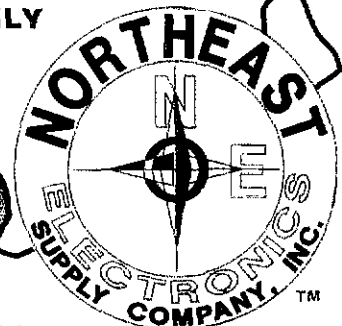


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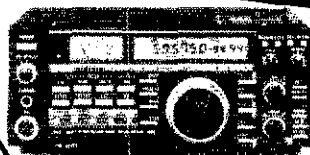
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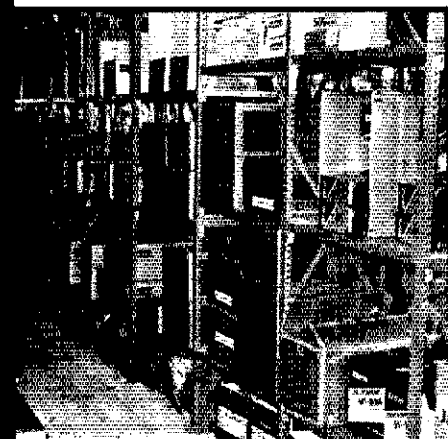
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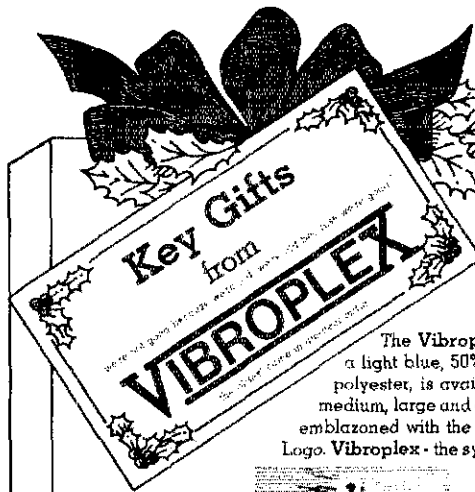
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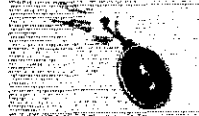
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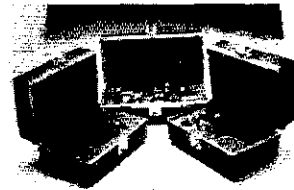
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The Vibroplex bug trademark makes an attractive key chain for car or home.



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MFJ TUNERS

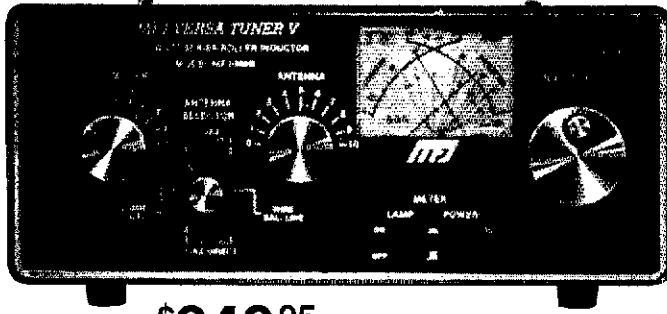
This may be the world's most popular 3 KW roller inductor tuner because it's small, compact, reliable, matches virtually everything and gives you SWR/Wattmeter, antenna switch, dummy load and balun — all at a great price!

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs—only 10 3/4" W x 4 1/2" H x 14 7/8" D.

Matches coax, balanced lines, random wires—1.8 to 30 MHz. 3 KW PEP—the power rating you won't outgrow (250pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.



MFJ989B **\$349.95**

Lighted Cross-needle Meter reads SWR, forward and reflected power all in one glance. Has 300 and 3,000 watt ranges. Meter light requires 12 VDC.

6 position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load), SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ's Fastest Selling TUNER

MFJ-941D **\$99.95**



MFJ's fastest selling tuner packs in plenty of new features. New styling! Brushed aluminum front. All metal cabinet. New SWR/Wattmeter! More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.

New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 RF power output.

Matches everything from 1.8 to 30 MHz! dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ's 1.5 KW VERSA TUNER III

MFJ-962B **\$229.95**



Run up to 1.5 kw PEP and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire.

Lighted Cross-needle Meter reads SWR, forward and reflected power in one glance. Has 300 and 3,000 watt ranges. 6 position antenna switch handles 2 coax lines, wire and balanced lines. 4:1 balun. 250 pf, 6 kv variable capacitors. 12 position ceramic inductor switch. New smaller size matches new rigs: 10 3/4" x 4 1/2" x 14 7/8" inches. Flip stand for easy viewing. Requires 12V for light.

MFJ's Best VERSA TUNER

MFJ-949C **\$149.95**



MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

2 KW COAX SWITCHES

MFJ-1702 **\$19.95**



MFJ-1702. \$19.95. 2 positions. 60 dB isolation at 450 MHz.

Less than .2 dB loss. SWR below 1:1.2.

\$29.95 MFJ-1701

MFJ-1701, \$29.95. 6 positions. White markable surface for antenna positions.



MFJ's Smallest VERSA TUNER

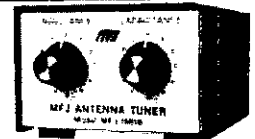
MFJ-901B **\$59.95**



MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines continuously from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier for proper matching. Efficient airwound inductor gives more watts out. 4:1 balun for balanced lines. 5 x 2 x 6 inches. Rugged black all aluminum cabinet.

MFJ's Random Wire TUNER

MFJ-1601D **\$39.95**



MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

MFJ's Mobile TUNER

MFJ-945C **\$79.95**



Designed for mobile operation! Small, compact. Takes just a tiny bit of room in your car. SWR/dual range wattmeter makes tuning fast and easy. Careful placement of controls and meter makes antenna tuning safer while in motion.

Extends your antenna bandwidth so you can operate anywhere in a band with low SWR. No need to go outside and read just your mobile whip. Low SWR also gives you maximum power out of your solid state rig—runs cooler for longer life.

Handles up to 300 watts PEP RF output. Has efficient airwound inductor, 1000 volt capacitor spacing and rugged aluminum cabinet. 8x2x6 inches. Mobile mounting bracket available for \$5.00.

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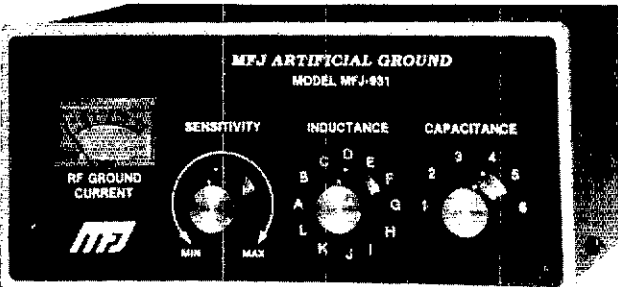
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NEW FROM MFJ

MFJ-931 creates artificial RF ground with random wire, also electrically places a far away ground directly at your rig



\$79⁹⁵ MFJ-931

Eliminate RF bites, hotspots, feedback, TVI, RFI and other problems due to an inadequate RF ground -- and at the same time -- improve your signal and radiation pattern for more DX.

Use the new MFJ-931 to create an artificial RF ground! The MFJ-931 resonates a random length of wire thrown along the floor and produces a tuned counterpoise, producing an artificial RF ground. This presents a low impedance to your rig and effectively places your rig near actual earth ground potential even if your rig is on the second floor or higher with no earth ground possible.

Also, the MFJ-931 electrically places a far away RF ground directly at your rig -- no matter how far away it is. It reduces the electrical length of the ground connection wire to virtually zero by tuning out its reactance.

It covers 1.8 to 30 MHz and has a built-in RF ammeter for indicating RF ground current. It's ruggedly built in an all aluminum cabinet with a brushed aluminum front panel and measures 7 1/2 x 3 1/2 x 7 inches.

HANDHELD SPEAKER/MIC

MFJ-284 \$24.95

Once you've tried this new MFJ-284 Speaker/Mic you'll never want to be without it. You'll conveniently carry your handheld on your belt and never have to remove it to monitor calls or talk.

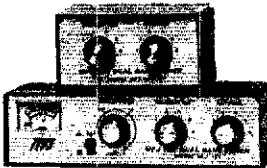
You'll never have to turn up your audio annoyingly loud because its handy lapel/pocket clip lets you place it close to your ears for easy listening.

It comes with a lightweight retractable cord that eliminates the "dangling cord problem" and fits both Icom and Yaesu handhelds. It features outstanding audio on both transmit and receive. Dark grey.

144/220 MHz VHF ANTENNA TUNERS

MFJ-920 \$49.95

MFJ-921 \$69.95



Get cool efficient operation, maximum power output and minimum SWR with these dual band VHF antenna tuners that cover both 2 meters and the new Novice 220 MHz band.

Both handle 300 watts PEP, match a wide range of impedances for coax fed antennas, and are suitable for both mobile and base operation.

MFJ-921 has SWR/Wattmeter and is 8x2 1/2 x 3 inches. MFJ-920 is 4 1/2 x 2 1/2 x 3 inches.

MFJ-701 RFI-FREE CHOKE KIT eliminates RFI easy as . . .

MFJ-701 \$14.95 Package of four (4)



Everyone has RFI problems affecting radios, TVs, computers, telephones and other electronic devices. The new MFJ-701 RFI-Free Choke Kit makes it easy



DROP-IN RAPID BATTERY CHARGER

Be prepared! Keep your handheld ready for instant use with the new MFJ-290

Drop-in Rapid Desk Charger for all ICOM rechargeable battery packs. MFJ-290 \$59.95

It's made of high quality high impact plastic with ventilation holes for cool operation and measures just 7x4x3 inches. On/Off switch, power ON and charging LEDs. Uses 110 VAC. IC-u2 series battery packs require ICOM AD-10 charger adapter.

MORSE CODE TUTOR

MFJ-1266 disk \$19.95

MFJ-1267 cartridge \$29.95

This new Morse Code Tutor for the Commodore 64/128 not only teaches code but is also a full fledged iambic keyer and Morse keyboard! Optional MFJ-76 Interface (\$19.95) lets you plug in an iambic paddle and the C-64/128 key a transmitter.

You can send all alphabet, numbers and punctuation randomly or choose certain letters, send a plain English message as given on an FCC test or received on-the-air, store a message for sending or send code directly from your keyboard. FCC-like Novice code test included.

Use ARRL's "Tune in the World" or MFJ supplied course for both individual and classroom study.



IBM Starter Pack for PACKET

MFJ-1284 \$19.95

Ready to join the PACKET fun with an MFJ TNC or TAPR clone? MFJ's newest IBM Starter Pack for PCs and compatibles with serial port gets you on packet immediately with no hassles. You get a computer interfacing cable, complete "How To" instructions and the fabulous PTP (Packet Terminal Program) on disk by N4PY -- everything you need to get on packet FAST.

PTP gives you split screen with keyboard buffer, user defined function keys, disk save, printing, file upload and download, WORLI BBS/mailbox and WDCG PBBS support, help screen, automatic command strings, automatic time set, connect alarm, full screen editor, NTS traffic generation, complete documentation plus more.

COMPACT MOBILE SPEAKER

MFJ-280 \$18.95

Enjoy crisp, clear audio and ultimate convenience with this tiny, low cost mobile speaker.

Just plug in the 3.5 mm phone plug, set the base on any magnetic surface and it's ready. Two auxiliary mounting plates with two-sided tape allow mounting on a car dash or other non-magnetic surface (screws also included). A 30 inch cord and tilt bracket give you extra versatility.

It works with all 8 and 4 ohm impedances and handles up to 3 watts of audio. Its dark grey military color matches nearly all rigs. Measures just 2 1/2 x 2 x 3 inches and weighs less than half a pound!



to eliminate common RFI problems. It's based on the highly effective technique of winding the offending cable or wire around a ferrite toroid to choke off RFI.

The problem is finding a toroid with the proper characteristics -- one that actually eliminates RFI -- and one that has a big enough hole to pass through the end of a power cord or AC adapter or microphone or telephone, etc.

The MFJ-701 RFI-Free Choke Kit gives you four square toroids that have the right properties for eliminating RFI from .5 to 200 MHz. Each toroid separates into halves and mounts in a tough snap-together plastic frame. This makes it easy to wind around the toroid nearly any kind of wire or cable -- computer ribbon cable, coax cable or a power cord with an AC adapter on its end can be wound around the toroid easily. The individual toroids also snap together into a stack. This increases effectiveness for large diameter wires where only a few turns can be used or for rigid cables where the cable is simply passed through a stack of toroids. "How to Eliminate RFI" instructions included.

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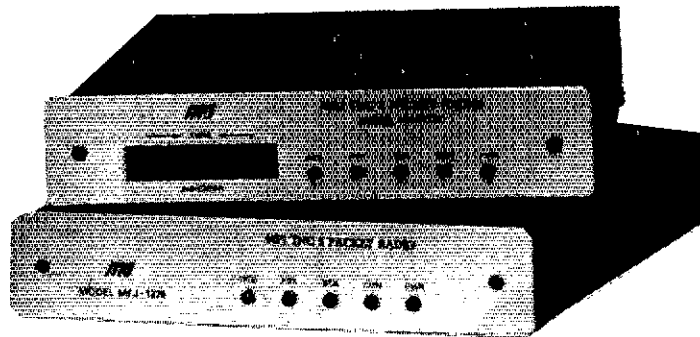


New MFJ-1274 lets you work VHF and HF packet with built-in tuning indicator for \$169.95 . . .

. . . you get MFJ's latest clone of TAPR's TNC-2, TAPR's VHF/HF modem and built-in tuning indicator that features 20 LEDs for easy precise tuning

MFJ-1274
\$169⁹⁵

MFJ-1270
\$139⁹⁵



Now you can join the exciting world of packet radio on both VHF and HF bands with a precision tuning indicator . . . for an incredible \$169.95!

You get MFJ's top quality clone of the highly acclaimed industry standard TAPR TNC-2. We've made TAPR's modem selectable for both VHF and HF operation, added their precision 20 segment LED tuning indicator, a TTL serial port, an easily replaceable lithium battery for memory back-up and put it all in a new cabinet.

If you don't need the tuning indicator or the convenience of a switchable VHF/HF modem, choose the affordable MFJ-1270 for \$139.95.

All you need to operate packet radio is a MFJ-1274 or MFJ-1270, your rig, and any home computer with a RS-232 serial port and terminal program.

If you have a Commodore 64, 128, or VIC 20 you can use MFJ's optional Starter Pack to get on the air immediately. The Starter Pack includes interfacing cable, terminal software on disk or tape and complete instructions . . . everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), \$19.95.

Unlike machine specific TNCs you never have to worry about your MFJ-1274 or MFJ-1270 becoming obsolete because you change computers or because packet radio standards change. You can use any computer with an RS-232 serial port with an appropriate terminal program. If packet radio standards change, software updates will be made available as TAPR releases them.

Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a

machine specific TNC or one without hardware HDLC as higher speeds come into widespread use.

You can also use the MFJ-1274 or MFJ-1270 as an excellent but inexpensive digipeater to link other packet stations.

Both feature AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, multiple connects, 256K EPROM, 16K RAM (expandable to 32K with optional EPROM), simple operation, socketed ICs plus much more.

You get an easy-to-read manual, a cable to connect your transceiver (you have to add a connector for your particular radio), a connector for the TTL serial port and a power supply for 110 VAC operation (you can use 12 VDC for portable, remote or mobile operation).

Help make history! Join the packet radio revolution now and help spread this exciting network throughout the world. Order the top quality and affordable MFJ-1274 or MFJ-1270 today.



MFJ-1273, \$49.95

Now you can tune in HF, OSCAR and other non-FM packet stations fast!

This MFJ clone of the TAPR tuning indicator makes tuning natural and easy - it shows you which direction to tune. All you have to do is to center a single LED and you're precisely tuned in to within 10 Hz. 20 LEDs give high resolution and wide frequency coverage.

The MFJ-1273 tuning indicator plugs into the MFJ-1270 and all TNC-1s, TNC-2s and clones that have the TAPR tuning indicator connector.

Order any product from MFJ and try it -- no obligation. If not satisfied return within 30 days for prompt refund (less shipping).

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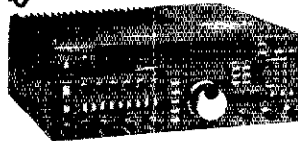
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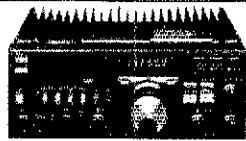
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RS20M	16	20	109
RS35A	25	35	136
RS35M	25	35	149
RS50A	37	50	196
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B1016	2M	Yes	10W	180W	\$259
B3016	2M	Yes	30W	180W	\$229
D1010N	440	No	10W	100W	\$319

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Model	Band	In-Out	List Price
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Customer feedback in 1986 insisted on system compatibility. Responding to this challenge, a special Plug and Play Harness to hook your favorite radio to the LK500 is offered as an accessory. Of course, all Amp Supply amplifiers have our famous AT-6 tuned input systems, assuring a perfect 50 ohm load to your transceiver.

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All the new LK-500ZC Series amplifiers are equipped with the ALO which stops amplifier operation when it senses an unacceptable SWR, improper tuning, or overcurrent on the tubes.

2-SPEED FANS

Most manufacturers have had to compromise on fan speed, one of the noisiest and objectionable aspects of amateur radio operation. But, our 500 Series amplifiers are different; they are the result of our perfected system of customer communication and engineer response.

THE LK-500ZC WITHOUT QSK

A version of the 500ZC is available without the Jennings vacuum antenna changeover relay and a companion sealed relay QSK system. A super buy at \$1199.00!

THE LK-500NTC NO-TUNE

Our no-tune amplifier is the same dependable amplifier as the LK-500ZC with the new ALO system and full QSK, and completes our popular 500 Series. This desirable version allows you to merely switch to your favorite amateur band and transmit at full power. We have preset internal capacitors and coils for each of the traditional six amateur bands. The LK-500NTC is also available for special MARS and commercial channelized frequencies.



SPECIFICATIONS LK-500ZC

Frequency Range: 160 Meters 1.8-2.2 MHz, 80 meters 3.5-4.5 MHz, 40 meters 7.0-7.5 MHz, 30 meters 10.1 to 10.15 MHz, 20 meters 14.0-14.9 MHz, 17 meters 18.0-19.2 MHz, 15 meters 21.0-21.5 MHz, Export models: 12 meters 24.8-24.9 MHz, 10 meters 28.0-29.7 MHz.

Drive Power: 100W Nominal for 1500 Watt SSB PEP output, 125W Nominal for 1500 Watt CW output.

RF Output SSB 1.5 KW PEP continuous, CW 1.2 KW Average continuous, RTTY, SSTV 1 KW Average 1.5 KW PEP.

Plate Voltage: RTTY/AM/SSTV/CW/SSB 3.2 KV DC

Harmonic Suppression: -50 dB minimum.

Intermodulation Distortion Products: -33 dB down minimum.

Circuit Type: Class AB₂ grounded grid. Type of Emission: SSB, CW, RTTY, AM, SSTV

Duty Cycle: Amateur continuous duty in all modes at specified output.

Output Circuit: Pi-network (silver plated tubing HF coil).

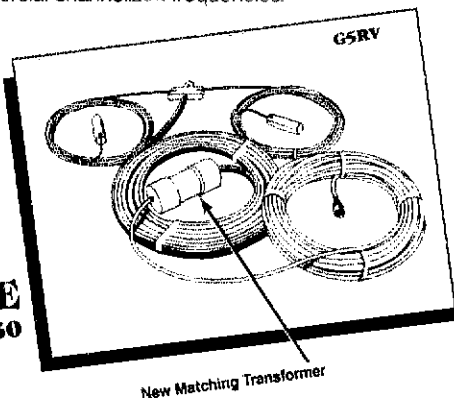
Power Requirements: 115/230 VAC, 30/15 amps (230 VAC factory wired and recommended).

Dimensions: 8" H x 14" W x 16" D (including knobs).

UPS Shippable: 59 lbs.

Warranty: Two years on amplifier.

LK-500ZC Full QSK	.....	\$1395.00 Reg. \$1295.00 SALE
LK-500ZC Without QSK	.....	\$1199.00
LK-500NTC No-Tune Version	.....	\$1695.00 Reg. \$1595. SALE
Plug & Play Harness (Specify your radio)	.....	\$9.95
AT3000 Matching 3K Tuner	.....	\$499.00
LK-550 New 3 Tube w/Power Pac	.....	\$1895.00
LK-450 New Single 3-500Z Amp	.....	\$899.50



SALE
\$49.50

THE G5RV ANTENNA

Reg. \$60.00 SALE \$49.50

The G5RV Signal Injector™ antenna is an excellent all band (3.5-30 MHz) 102 ft. dipole. On 1.8 MHz the center and shield of the coax at the transmitter end may be joined together and the antenna may be used as a Marconi with a tuner and a good earth ground. The proper combination of a 102 ft. flat-top and 31 ft. of 300 ohm transmission line achieves resonance on all the amateur bands from 80 to 10 meters with an antenna tuner. There is no loss in traps and coils.

- 2 KW PEP
- Completely assembled
- Use as horizontal or "V" configuration
- Consists of: 102 ft. copper antenna wire, 31 ft. 300 ohm transmission line, 70 ft. RG-8X coax, 2 end insulators, 1 center insulator, 1 PL-259 and sleeve, connector and the **new transformer coupler.**

Add an automatic SWR lock-out brain to your present amplifier (any brand). Self contained plug and play.

ALO-1 Accessory \$ 94.50

Trade in amps accepted. Reconditioned and guaranteed trade-in amps available. We now have a full line of wire antenna and accessories.

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For fastest delivery, send cashiers check, money order, or order by credit card. Personal checks, allow 18 days to clear. North Carolina residents, add 4% sales tax. Hours: Monday-Friday 9:00 a.m. - 5:00 p.m. E.S.T.



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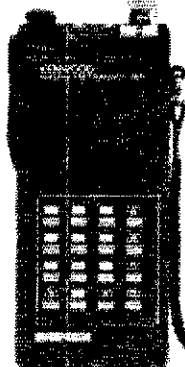
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Call for Prices

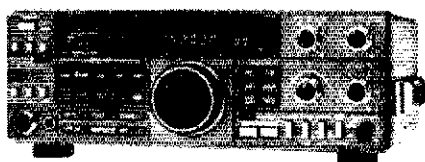
NOTE:
TH-21AT pictured.
TH-41AT is same.



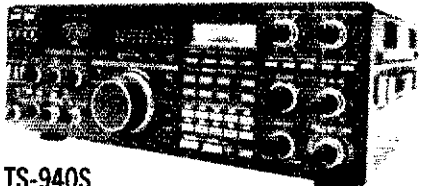
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also

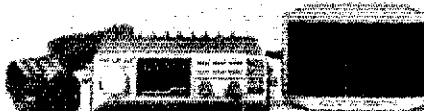
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Programmable encoder
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Special \$4⁹⁵
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In Stock: R-2000 & R-5000 Receivers
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NOVICE ENHANCEMENT

TM-3530A 25W 220MHz FM transceiver
Similar to TM-2570A pictured in upper left.

Call for Sale Prices

TH-31BT 1W 220MHz Handheld xcvr
Similar to TH-21AT left, w/built-in tone encoder

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(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" x 11" sheet of paper.

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(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in QST advertising.

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The League reserves the right to decline or discontinue advertising for any reason.

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IMRA - International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1:00-3:00 PM Eastern Time. Rev. Thomas Sable, S.J., University of Scranton, Scranton, PA 18510

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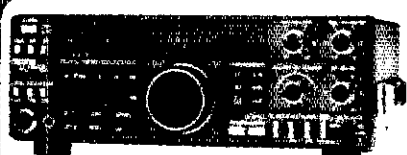
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IC-745 Gen. Cvg Xcvr	1049.00	Call \$
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IC-575A 10m/8m Xcvr	TBA	Call \$
Receivers		
IC-R7000 25-1300 + MHz Rcvr	1099.00	Call \$
IC-R71A 100 kHz-30 MHz Rcvr	949.00	Call \$
VHF		
IC-275A All Mode Base w/PS	1199.00	Call \$
IC-275H All Mode Base 100w	1389.00	Call \$
IC-27A FM Mobile 25w	429.00	Call \$
IC-27A FM Mobile 45w	459.00	Call \$
IC-28A FM Mobile 25w	429.00	Call \$
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IC-2AT FM HT	299.00	Call \$
IC-02AT FM HT	399.00	Call \$
IC-μ2AT Micro HT	329.00	Call \$
IC-900 Six Band Mobile	TBA	Call \$
UHF		
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IC-47A FM Mobile 25w	459.00	Call \$
IC-48A FM Mobile 25w	459.00	Call \$
IC-4AT FM HT	339.00	Call \$
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IC-μ4AT 440 FM HT	369.00	Call \$
IC-3200A FM 2m/70cm 25w	599.00	Call \$
220 MHz		
IC-375A All-Mode, 25w, Base Sta.	TBA	Call \$
IC-38A 25w FM Xcvr	459.00	Call \$
IC-37A FM Mobile 25w	499.00	Call \$
IC-3AT FM HT	339.00	Call \$
IC-03AT Deluxe HT	449.00	Call \$
1.2 GHz		
IC-1271A All Mode 10w	1229.00	Call \$
IC-120 1w, FM, Xcvr	579.00	Call \$
IC-12AT Deluxe 1w HT	459.00	Call \$

**TS-440S/AT**

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TS-940S Gen. Cvg Xcvr	2119.95	Call \$
TS-930S/AT Gen. Cvg Xcvr	1999.95	Call \$
TS-830S Xcvr	1199.95	Call \$
TS-430S Gen. Cvg Xcvr	899.95	Call \$
TS-440S/AT Gen. Cvg Xcvr	1299.95	Call \$
TS-440S Gen. Cvg Xcvr	1099.95	Call \$
TS-140S Compact, Gen. Cvg Xcvr	New	Call \$
TS-680S HF Plus 6m Xcvr	NEW	Call \$
TL-922A HF Amp	1599.95	Call \$
Receivers		
R-5000 100 kHz-30 MHz	949.95	Call \$
R-2000 150 kHz-30 MHz	699.95	Call \$
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TS-711A All Mode Base 25w	999.95	Call \$
TR-751A All Mode Mobile 25w	629.95	Call \$
TM-221A Compact FM 45w	419.95	Call \$
TM-2530A FM Mobile 25w	459.95	Call \$
TM-2550A FM Mobile 45w	489.95	Call \$
TM-2570A FM Mobile 70w	589.95	Call \$
TH21-BT FM, HT	279.95	Call \$
TH-205 AT, NEW 2m HT	279.95	Call \$
TH-215A, 2m HT Has It All	359.95	Call \$
UHF		
TS-811A All Mode Base 25w	1,199.95	Call \$
TR-851A 25w SSB/FM	729.95	Call \$
TM-421A Compact FM 35w	439.95	Call \$
TH-415A 2.5w 440 HT	379.95	Call \$
TH-41BT FM, HT	299.95	Call \$
TW-4100A, 2m/70cm FM	669.95	Call \$
TR-50 1w 1.2GHz FM	599.95	Call \$
220 MHz		
TM-3530A FM 220 MHz 25w	479.95	Call \$
TH-31BT FM, 220 MHz HT	299.95	Call \$
TM-321A Compact 25w Mobile	439.95	Call \$
TH-315A Full Featured 2.5w HT	379.95	Call \$

**FT 757GX**

HF Equipment	List	Juns
FT-ONE Gen. Cvg Xcvr	\$2859.00	Call \$
FT-980 9 Band Xcvr	1795.00	Call \$
FT-757 GX II Gen. Cvg Xcvr	1079.95	Call \$
FT-767 4 Band New	1895.00	Call \$
FL-7000 15m-160m Solid State Amp	1895.00	Call \$
Receivers		
FRG-8800 150 kHz - 30 MHz	699.95	Call \$
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VHF		
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FT-290R All Mode Portable	579.95	Call \$
FT-23 R/TT Mini HT	299.95	Call \$
FT-209RH FM Handheld 5w	359.95	Call \$
UHF		
FT-711RH FM Mobile 35w	479.00	Call \$
FT-770RH FM Mobile 25w	479.95	Call \$
FT-73 R/TT Mini HT	314.95	Call \$
FT-709RH FM HT 4w	359.95	Call \$
VHF/UHF Full Duplex		
FT-736R, New All Mode, 2m/70cm	TBA	Call \$
FT-726R All Mode Xcvr	1095.95	Call \$
HF/726 Module for 10, 12, 15M	289.95	Call \$
430/726 430-440 MHz	329.95	Call \$
440/726 440-450 MHz	329.95	Call \$
SU-726 Sate Duplex	129.95	Call \$
FT-690R MKII, 6m, All Mode, port.	569.95	Call \$
Dual Band		
FT-2700RH FM 2m/70 cm 25w	599.95	Call \$
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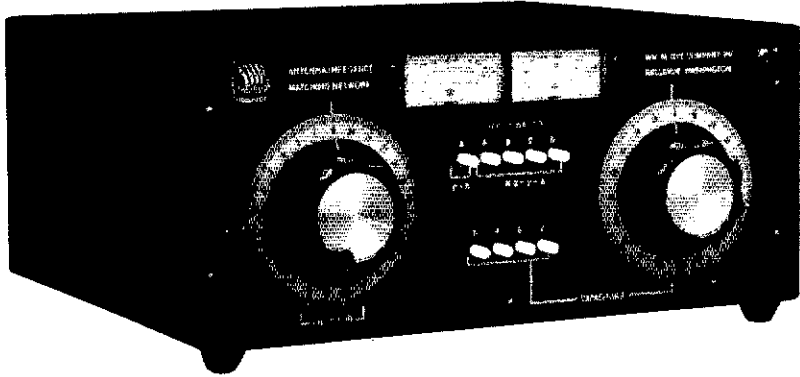
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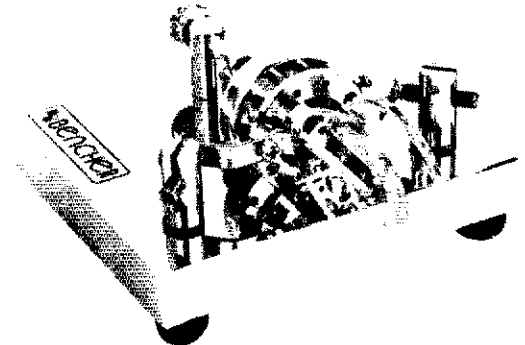
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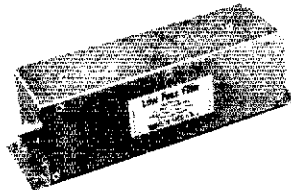
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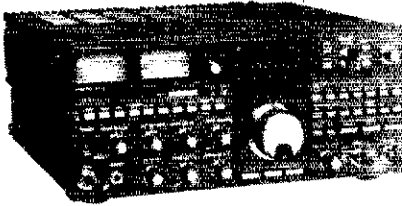
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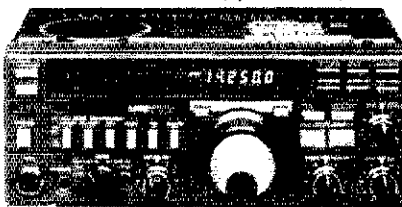
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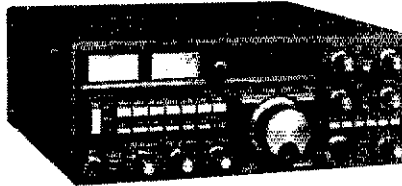


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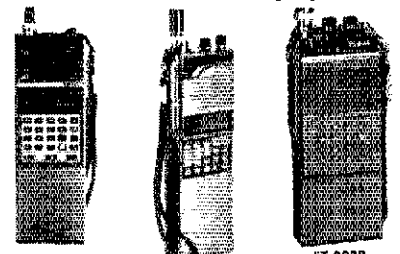
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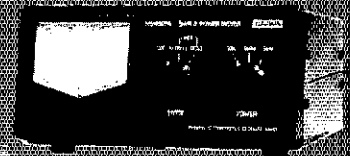
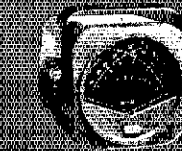
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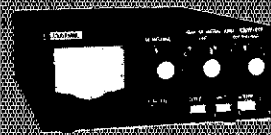
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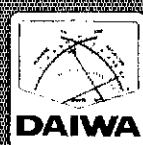
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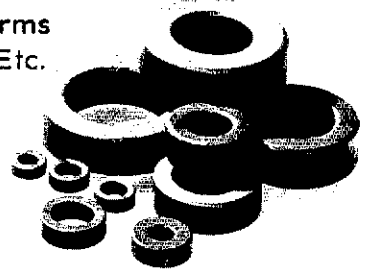
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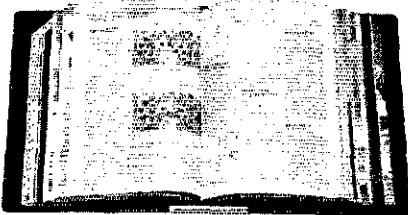
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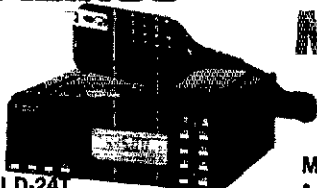
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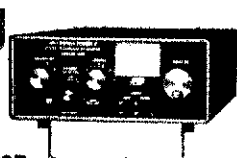
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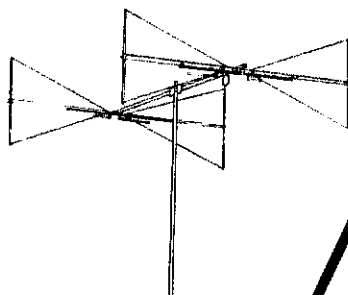
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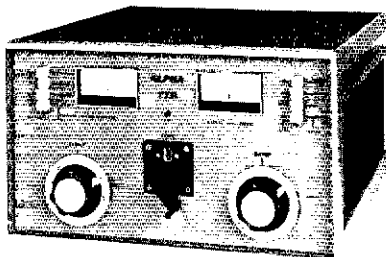


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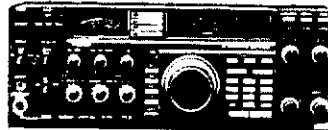
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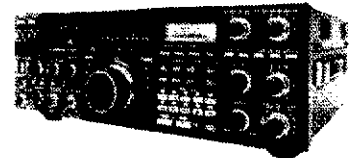
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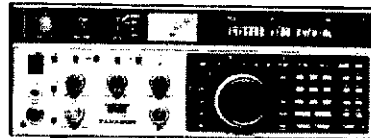
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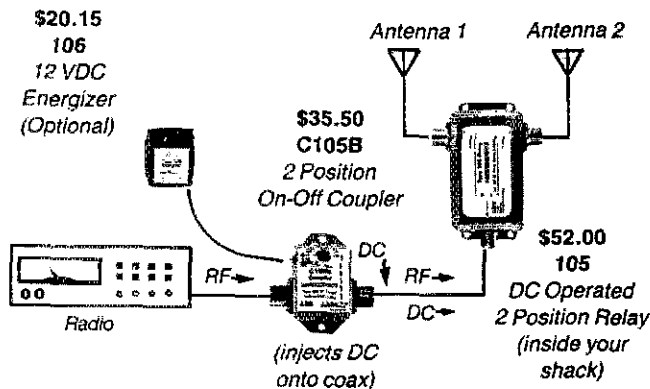
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(2-18 & 6-22)	4080 - per foot	\$0.18
(2-16 & 6-20)	4090 - per foot	\$0.35
1108	RGU Mini 8 low loss foam per foot	\$0.17
	500' roll	\$79.00
1198	RGU Columbia superflex \$29/100' or 800' for	\$125.00

Regency

FREE AC ADAPTER CHARGER & CARRY CASE HX1500 \$219.90

R1090 \$114.90
45 channel 6 band programmable, scan & search, permanent memory backup, dual level digital display, channel lockout, step control, weather scan, dual scan speed, AC only.

R1800 \$99.90
30 Channel 6 band, programmable, search or scan, weather scan, priority, permanent no battery backup, channel lockout, dual scan speed, Vacuum Fluorescent display, AC only.

MX3000 \$199.90
30 Ch 6 band, programmable, search or scan, digital display, ch 1 priority, dual scan speed, scan or search delay, brightness control, with mounting bracket, AC adaptor/charger & DC cord.

RANGER
10 meter TRANSCIVER, 25 watt, can be programmed to split transceive, SSB, CW, AM, FM, programmable scanning, fully automatic, noise blanker, 2 3/8", 7 3/4", 11D.

AR3500 \$349.00

MIDLAND

75-790 \$79.90
40 Channel 5 WATT hand held, Electronically synthesized (no crystals) adjustable squelch, instant Ch 9, ANL, LED's for transmit & receive, analogue meter, choice of power levels, jack for recharging nicads, carry case.

ASTATIC

D104 SILVER EAGLE \$69.90
Chrome plated base station amateur microphone. Factory wired to be easily converted to electronic or relay operation. Adjustable gain for optimum modulation.

ETS D104 SE \$99.90
NEW, same as above with end of transmission 'Roger Beep'.

MAXON...\$26.95
Model 495A - 49 MHz, FM 2-WAY RADIO hands free operation, voice activated transmit up to 1/2 mile. Batteries optional

model 498 \$34.95
same features as 495A except uses "AA" nicad batteries and comes with battery charger

TENNA PHASE III POWER SUPPLIES

PS3 \$15.90
Output: 13.8V DC - 3 amp constant 5 amp surge, electronic overload protection w/instant auto reset, fuse protected.

PS4 \$19.90
Fully regulated, 13.8 VDC - 4 amps constant with surge protection, overload protection w/instant auto reset.

PS7 \$24.90
Fully regulated, 7 amp constant, 10 amp surge capacity.

PS12 \$34.90
Fully regulated, 10 amp constant 13 amp surge, electronic overload protection w/instant auto reset.

PS20 \$64.90
Fully regulated, 25 amp surge capacity, 13.8 VDC, 20 amp constant, with meter.

PS25 \$79.90
Regulated 4.5-15VDC-25 Amp constant 27 amp surge, instant auto reset, dual meter for current & voltage.

PS35 \$99.90
Same as above except, 35 amp constant, 37 amp surge, adjustable from 10 to 15 volts.

uniden

BC200XLT \$279.90
200 Channel, in 10-20 Ch banks, 12 Band w/800 MHz, aircraft, weather, programmable, 10 priority Ch, lockout, scan delay, auto search, direct Ch access, track tuning, w/ battery pack & carry case.

BC800XLT \$249.90
40 channel 12 band, including aircraft & 800 MHz, instant weather, priority, programmable, track tuning, scan delay, auto search, direct channel access, auto squelch, ch lockout, AC/DC.

BC100XL \$169.90
hand held 16 Ch 9 band, aircraft, priority, keyboard lock, lighted LCD, display, track tuning, auto search, scan delay, Ch lockout, direct Ch access, W/AC adaptor/charger, ear-phone & carry case.

FREE XMAS SPECIAL
When You Purchase the BC50XL you get the BATTERY PACK CHARGER ***FREE***

BC50XL \$124.90
10 ch 10 band, hand held, 2 digit LCD, keyboard lock, Ch lockout, battery-low light, memory backup, built in delay, direct Ch access, track tuning.

BC145XL \$92.90
16 channel 10 band, programmable, 2 digit LED display, priority, review, direct channel access, track tuning, built-in delay, memory backup, channel lockout, weather search, AC/DC.

BP55C Battery pack/charger for BC50XL.....\$29.50
BC70XLT 20 chan, 10 band, HAND HELD.....\$159.90
BC175XL 16 ch, 11 band aircraft.....\$159.00
BC210XLT 40 Ch, 11 band, aircraft & weather AC/DC.....\$179.90

RADAR DETECTORS

UNIDEN

RD25 \$59.90
Compact SUPERHET, city/highway, audible & visual alarm, dash/visor.

RD7 \$114.90
Dual conversion superhet, city/hwy, LED's, audible alarm, compact.

RD9 \$149.90
2 power cords, travel case, dual conversion superhet, city/hwy, audible & LED alerts, mini size.

RD55 \$84.90
X & K band superhet, LED's, city/hwy, audio alarm, dash/visor.

BEL

880 Quantum \$179.90
Digital, photo electric dimmer, audible alert w/volume control, visual alert, 2 cord, travel case, mini size, dash/visor.

878 Quest \$159.90
Superhet w/GaAs diodes, anti falsing, audible & visual alerts, volume control, X & K band, dash/visor.

876 Vector \$119.90
Superhet, GaAs diodes, audible & LED alerts, city/hwy, dash/visor.

XKR100 \$54.90
Superhet X & K bands, audible & visual alert, volume control.

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8400 GENESIS \$239.90
THE TALKING RADAR DETECTOR, computerized, voice has 13 functions, digital, visual alert, audible alert has volume control, pocket size.

3160 MARAUDER \$89.90
Dual conversion superhet, LED & audible alerts, mute, dash/visor.

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Superhet with LED, audible alert w/volume control, city/hwy.

MAXON

RD1 \$59.90
Long range dual conversion, X & K band, LED's, audible alert w/volume control, antifalsing, city/hwy, dash/visor.

RD21 \$79.90
Mini size, audible & visual alert, omni-polarity guard, dash/visor.

RD25 \$99.90
Deluxe mini, same as above with sequential LED's.

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AEA	TR-4C Xcvr	229f
MM-2 Keyer DEMO	TR-4CW Xcvr	289f
PK-64/HFM Packet DEMO	TR-7 Xcvr	499c
PK-64A/HFM Packet DEMO	TR-7/500 Hz/NB	569w
PKT-1 Packet unit	TR-7/6 KHz filter	529w
WB-1 Woodpecker blanker	TR-7A/1.8 KHz filt	829m
AMECO	Transcv cable; R-7/TR-7	19m
PLF-2 Rcv preamp	WARC mod kit; TR-7	19m
AMERITRON	DX ENGINEERING	
ATR-10 Ant tuner	LC-1-32S Speech proc	29m
MC-8 Microphone	LC-1-KWM Speech proc	29m
AMP SUPPLY	LC-2-TR Speech proc	29m
LA-1000 Linear	ESC	
ASTATIC	Synthacoder; IC-22S	19m
10-DA/G-stand Desk mic	HAL	
D-104 Mic head	ARQ-1000 Error terminal	\$399m
T-U68-D-104 Desk mic	CRI-100 Interface	99m
ASTRON	CT-2100 Rcv terminal	219v
RM-50M 37A rack mt ps	DS-3000KSR V2 Terminal	289m
VS-20M 16A ps/meters	ST-6000 Demodulator	399m
ATLAS	HALLICRAFTERS	
MT-1 Mobile matcher	P-500 AC ps as-is	25m
B & W	HENRY	
361 Keyer	2KD-Classic Amp AIR	\$849m
FL-10/1500 Low pass tilt	S-20 220 FM amp	59m
VS-300A 300w ant tuner	ICOM	
BEARCAT	AH-2A Ant tuning system	\$329m
BC-100 Pocket scanner	AT-150 Auto ant tuner	269v
CES	AT-500 500w auto tuner	329m
510-SA Splx autopatch	HM-12 Hand mic	24m
CLEGG	HS-15SB Switchbox	12m
Thor 6 ps/modulator as-is	IC-12D 1.2 GHz FM Xcvr	369m
COLLINS	IC-211 2m Xcvr	299w
312B-5 VFO console	IC-22A 2m FM Xcvr	69m
516F-2 AC supply	IC-271A 2m Xcvr	599c
F-455-FA-05 500 Hz tilt	IC-271A/PS-25 2m Xcvr/ps	689m
F-455-FA-08 800 Hz tilt	IC-271H 2m Xcvr	769m
F-455-FA-15 1.5 KHz tilt	IC-271H/PS-35 2m Xcvr/ps	849mf
F-455-FA-16D 16 KHz tilt	IC-27A 2m FM Xcvr	289m
F-455-FA-40 4 KHz tilt	IC-27H 2m FM/voice syn	329mw
KWM-2 Xcvr	IC-2KL Amplifier	1099w
PM-2 Portable ps	IC-451A 430 Xcvr	469m
DMI	IC-471A 430 Xcvr	599mw
PA-1300 Preamp	IC-505 6m port Xcvr	349w
DAIWA	IC-720A Xcvr	529c
CN-460M 2m/430 meter	IC-720A/AM filter	549m
DENTRON	IC-730 Xcvr	489c
WVP-2A 6/2m wattmeter	IC-735 Xcvr	649m
DRAKE	IC-740 Xcvr	499wc
2NT Transmitter	IC-751 Xcvr	799m
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FS-4 Freq synthesizer	PS-55 Power supply	139m
L-75 Linear amplifier	R-7000 Scanning Rcvr	749c
MN-4 Ant tuner	R-71A SW receiver	629e
MS-4 Speaker	RM-2 Controller	69m
MS-7 Speaker	SM-5 Desk mic	25m
PS-7 Power supply	KANTRONICS	
PS-75 Power supply	Field Day Reader	59m
R-4A Ham Rcvr	Mini-Reader	89m
R-4B Ham Rcvr	KDK	
RP-700 Rcvr protector	FM 2015R 2m FM Xcvr	\$129m
SPR-4 SWL receiver	KENWOOD	
T-4X Transmitter	AT-230 Antenna tuner	\$169m
T-4XB Transmitter	AT-250 Auto ant tuner	269m
TR-4 Xcvr	BC-5 Mobile charger	24m
	CD-10 Call sign disp	69f
	HS-5 Headphones	29e

2510 Sat conv orig model	189f	FT-101 Xcvr	379m
260 Power supply	129w	FT-101B Xcvr	389mw
276 Callibrator	19we	FT-101E Xcvr	429m
280 Power supply	99m	FT-101E/CW filt Xcvr	449m
283 Remote VFO	129m	FT-101EE Xcvr	399f
444 Linear	999f	FT-101EX Xcvr	369w
525D Argosy II/nb/500 Hz	469w	FT-101F Xcvr	449w
546C Omni-D series C	499c	FT-101F/CW filter	479m
560 Corsair Xcvr	689m	FT-101ZD Xcvr	469m
560 Corsair/3 filts	749m	FT-101ZD/CW filter	499m
580 Delta Xcvr	369m	FT-102 Xcvr	599mc
700C Hand mic	19m	FT-107M/ps Xcvr	499m
979 Power supply	69m	FT-209RH 2m FM HT/tone	299v
TOKYO HIGH POWER		FT-227R 2m FM Xcvr	129w
HC-200 Ant tuner	\$ 99m	FT-301AD Xcvr	329m
USI		FT-726R/430/HF/sat	399m
1400C 14" color monitor	\$119m	FT-757GX Xcvr	699c
PI-3 12" amber monitor	69m	FT-77 Xcvr	369m
WILSON		FT-901DM Xcvr	499c
Charger for 1402-SM	\$ 19m	FT-980 Xcvr	999m
Mk IV 2m FM HT	69v	FT-ONE Xcvr	1099mw
WSE		FT-ONE Lot 10 Xcvr	1599m
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YAESU		MH-1B8 Hand mic	19w
CPU-2500RK 2m FM	\$189m	NC-24 Multi-charger	169m
FC-102 Ant tuner	169w	SP-107P Splx/patch	49m
FC-757AT Auto tuner	269v	YC-601 Dig display	99f
FL-2100B Amplifier	389f	YD-148 Desk mic	24m
FP-301 Power supply	99mw	YD-844A Desk mic	25m
FP-301D Power supply	129m	YH-77 Headphones	15m
FP-757GX Power supply	99f	YK-901 Keyboard	99f
FRB-1 Relay box	9m	YM-48 TIP mic	99m
FRB-301 Relay box	19m		
FRV-7700 VHF conv	49w		

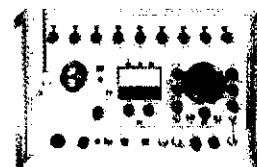
10-19-87

USED GEAR INFORMATION

(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced after we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to any New Equipment specials, Closeouts, etc.

SINGER-GERTSCH

FM-10CS signal generator with RFM-10A, FM-3 and ODM-1 options..... **\$3295**
 OAM-1 AM module FM-10C... 195
 Purchased new, and used exclusively in our service department. Good condx, operational, manual.



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BT-1	Basic Trainer	4995	ICOM	KB-2100 keyboard	14995
Isopole	220Jr base antenna	2995	ICOM	IC-290H 25w 2m SSB/FM	54995
AMPLICA			ICOM	IC-490A 10w 430-440 multi	39995
85° LNA		59	ICOM	IC-471A 25w 430-450 multi	74995
100° LNA		29	ICOM	IC-471H 75w 430-450 multi	98995
CTS	Computermate workcenter	14995	ICOM	Matching receive preamp \$995	
ENCOMM			ICOM	with IC-471A or 471H purchase.	
ST-200ET	1.5w 2m FM HT	18995	KENWOOD	TH-41AT 440 MHz HT/TTP	19995*
ST-400ET	1.5w 440 FM HT	25995	KENWOOD		
*Includes FREE Extra Battery Pack					
With ST-200 or 400ET purchase extra battery, soft case, speaker mic & mobile chgr, only \$10 extra.					
TU-6 tone board only \$495 with the purchase of a TH-41AT.					

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w	= Wickliffe, OH 44092; 28940 Euclid Ave	(216) 585-7388
f	= Orlando, FL 32803; 621 Commonwealth Ave	(305) 894-3238
c	= Clearwater, FL 34625; 1898 Drew St	(813) 461-4267
v	= Las Vegas, NV 89106; 1072 N. Rancho Dr	(702) 647-3114
e	= Chicago, IL Erickson Communications (associate)	(312) 631-5181

Local Phone

Nationwide

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1-800-321-3594	1-800-362-0290
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1 KW COUPLER

CU-714/SRA-22 (Collins 180T2) Automatic Antenna Coupler for 2-30 MHz transmitters with outputs to 1 KW PEP or 500 W average. Has UC5L-465 vacuum capacitor, variable ribbon inductor, and cooling blower in rugged aluminum enclosure. Operates from common 115/230 VAC 60 Hz power. Separate controller required. 11.5x18.9x20.46 lbs sh. Used.....\$149.50;
MANUAL, part-repro....\$12 **SCHEMATIC** only....\$4
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Prices F.O.B. Lima, O. • VISA, MASTERCARD Accepted.
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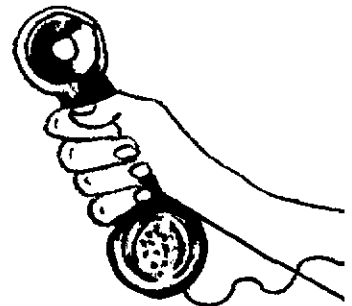
FULL 1/4th WAVE - All Bands! Automatic Selection with proven HI-Q Traps. 5 Models-ALL self supporting - Ground or vent mount. HI STRENGTH FIBERGLASS TUBING OVER - ALL - NO WOBBLING, LUMPY TRAPS - NO UN-SIGHTLY CLAMPS needed - Size 1 1/4" all the way up - Traps hidden inside. You can use it in a ft. Backyard! FOR APARTMENTS, MOBILE HOMES - CONDOS etc. where minimum space and neat appearance is MANDATORY! Instant "Drive in" ground mount (included). Use with or without radials (included). (All angle roof mount - Extra) COMPLETELY PRE-TUNED - NO ADJUSTMENTS NEEDED EVER! NO TUNER NEEDED FOR MOST TRANSCEIVERS! Use - RG8U feedline, any length! 2000 Watt PEP, input power. Shipped - PREPAID IN USA. Assemblies in 10 min. using only screwdriver. WEATHERPROOF!

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No.-AVT20-10	3 Band	11'4"	\$109.95
No.-AVT80-10 W	8 Band	24'	\$279.95
No.-AVT40-10 W	7 Band	15'9"	\$199.95

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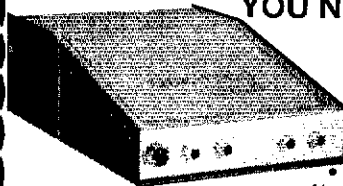
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- Small, lightweight and weatherproof
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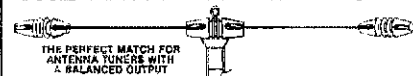
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- Small, rugged, lightweight, weatherproof
- Replaces center insulator
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- With SO 239 connector

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D-40	40/15	65'	28.95
D-20	20	33'	27.95
D-15	15	22'	26.95
D-10	10	16'	25.95
Shortened dipoles			
SD-80	80/75	80'	35.95
SD-40	40	45'	33.95
Parallel dipoles			
PD-8010	80, 40, 20, 10/15	130'	43.95
PD-4010	40, 20, 10/15	65'	37.95
PD-8040	80, 40/15	130'	39.95
PD-4020	40, 20/15	65'	33.95
Dipole shorteners — only, same as included in SD models			
S-80	80/75		\$13.95/pr.
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ICOM, Kenwood, & Yaesu separate newsletters. Just \$10 bulk U.S.A. Our newsletters keep you tuned into the latest developments! Separate Cumulative Index's, available covering the last seven years. Send SASE \$3.99 for Famous IRI Crystal Filter and High Performance Radio catalog. International Radio Inc., 751 S. Macedo Blvd., Port St. Lucie, FL 34983, 305-679-6868.

YAESU FT-727-R computer interface. For info write Gerald Hogsett Consulting, 1551 Woodland, Palo Alto, CA 94303.

WANTED: Equipment and Related Items. The Radio Club of Junior High School 22 NYC, Inc. is a non-profit organization, granted 501(c)(3) status by the IRS, incorporated under the laws of the State of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your property donation would be greatly appreciated and acknowledged with a receipt for your tax deductible donation. Please contact WB2JKJ using the callbook or telephone 516-674-4072, 24 hours, seven days a week. Thank you!

ROHN FK-25 68' foldover tower with HD-73 rotor, TET 4 element tribander. Like new. \$950 total. Dick Yeran, KE4YC, 14048 S. 36th Place, Phoenix, AZ 85044, 602-496-0663.

MERRY Christmas from "Magnolia Blossom" & Del, K4NBN. "No Bad News."

HENRY T2000 2KW Amplifier \$500. I'll ship stateside. KB8PK, 616-868-6792.

COMMODORE REPAIR. We are the largest Authorized Service Center in the country. Low prices (eg. C64-\$39.95 parts/labor). 3-4 days turnaround C-64 Power Supply \$27.95 + pp. Send for complete catalog on chips and parts Kasara Microsystems Inc, 33 Murray Hill Drive, Spring Valley, NY 10977, 800-642-7634 (outside NY) or 914-356-3131.

TEN-TEC Titan 425 amplifier for sale. Still in warranty. Will ship UPS. Immediate shipment, going big home brew. Price \$2100. Call or write Wayne Bailey, NX7K, 14930 SE 181, Renton, WA 98058. Phone days 206-575-2930, evenings 206-228-8138.

WANTED: Clean Hammarlund HQ-180 Rcvr. Larry Yamron, 351 Churchill Road, Pittsburgh, PA 15235, 412-829-0069.

FOR SALE: FT-101ZD (160M thru 10M); FC-901P (antenna tuner w/meters); SP-901P (speaker w/phone patch); YD-148 (mic); FA-9 (fan); XF8-9C (500 Hz CW filter); DC-101ZD (DC/DC converter); 4 new extra C1146's; 2 new extra 12BY7's; HF-2V Blumlein vertical; All documentation; All items absolutely mint. \$975 package. Evenings, Dana Geiger, KE2J, 516-944-6858.

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COLLINS 75S-3, \$200. Heath 5B10Z with 630 console and 650 digital readout, \$300. Frank McJannet, 700 N. 117th, Seattle, WA 98133.

AEA PK64A with HF modem \$225. Okidata model 8510A dot matrix printer \$200. WIOER, 617-891-5287.

FM EQUIPMENT Wanted. Small group of hams interested in purchasing used Motorola, GE, RCA, etc., portables, mobiles or bases. Low band needed for conversion to six meters. Also desire high band and UHF gear. Related accessories and manuals are also desired. Especially interested in some low cost, low band portables such as the HT200 or the PE. Old 6M FM amateur equipment such as Genave mobiles would be of interest. Very reasonable. Please send list and prices to WA3RSP, 469 Jayson Avenue, Pittsburgh, PA 15228—Thanks and 73s.

AZDEN Service by former factory technician. Fast turnaround. PCS-300 NiCads \$34.95. Southern Technologies Amateur Radio Inc., 10715 SW 190 Street #9, Miami, FL 33157, 305-239-3327.

KENWOOD TS180S, PS30, SP180, MC50, \$600 or best offer. All exc. cond., little used. Cliff Smith, 503-581-4575.

WANTED: Hallicratters HA-20, DX adapter, (VFO). Must be mint. Lee, KB6GQ, 201 Plover Place, Reno, NV 89502, 702-826-0140.

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DRAKE TR-7, MN2700, PS-7, MS-7, service kit, 3 element Telrex beam and Tallwister rotor \$1000. AEA CP-1 + C-64 ham + SWL software \$75. ICOM IC251A/E 2 meter allmode \$250. Clegg FM-88/800 channel scanner \$150. Dovetron MPC-1000 full house, led display \$650. All like new, will ship.

Call Dan, WARGQL, work 313-752-8675 or write

SELL: ICOM 735 \$650, AT150 automatic tuner \$275, S51D six meter \$600. All mint and original cartons. WA3IWW, phone 1-215-385-3343.

SELL: Kenwood TR-830S, VFO240, SP230, MC-50: \$750. Clipperton L \$300. Drake TR-6 w/mb, AC-4, MS-4, Turner 250, Welz SP-220 \$350. ICOM 271H, PS15, DAIWA 630: \$800. ICOM 471H, PS15, DAIWA 630N: \$825. All mint. N2BJX, 716-599-3791 after 7PM EST.

SELL: Hallicratter SR-2000 1KW transceiver with manual and extra tubes. \$550. W2NBJ, 1 Brinkman Court, Huntington, NY 11743, 516-757-0526.

FOR SALE: 40' steel crank up tower 10' sections. Good condition, stored inside. Also Tn band ant. rotor and control. Best offer will not ship. K2SST, Alt. Highlands, NJ.

TEKTRONIX 547 Oscilloscope \$150. Hewlett-Packard HP-606A Signal Generator \$100/150, HP-8708A Synchronizer \$150, HP-686C 10 GHz Signal Generator \$125. A. Emerald, 8956 Swallow, Ftn. Vly., CA 92708, 714-962-5940.

ONE 2BP1, five 3RP1, three 3AP1 tubes free, you pay shipping and ad. Fred Tucker, WBYSB, 6114 E. Pierson Road, Flint, MI 48506.

WANT: Heath HW-22A or HW-32A transceiver operable for mobile use. K9MKN, 219-658-4019 call after 2200 UTC.

SWAP: factory new automatic Xray film processors 17 x 14 (2830) and 10 x 12 (\$1799) models (info on request) for KW & CW Power Amp or clean components. 713-934-3266, WWSB, P.O. Box 460, Brookshire, TX 77423.

ALPHA 78 Amplifier \$2300. Alpha 77DX Amplifier \$3900. Signal One CX11A Transceiver \$2900. Telrex Antennas: 10M36 \$425, 16M532 \$325. Eimac 8170/4CX5000A - New, Factory Sealed Box \$975. BK-2210/SK-2216 \$90/Set. 3CX12D0A7 \$385. Bird 5,000H \$65, A. Emerald, 8956 Swallow, Ftn. Vly., CA 92708, 714-962-5940.

HENRY Classic 3MKMKI will export supply. 9KW plus out. On air 1 year I guarantee tube, \$2200. As-is, \$2000 ship from N.J. Cory, 214-340-3150, N2AQS, 203 Lkridge Vill., Suite 209, Dallas, TX 75238.

COFFEE CUPS - Your name and call. \$7.95 + \$2 shipping and handling. Bob Putman, K7ACP, 8044 North Bank Road, Roseburg, OR 97470.

WANTED: ICOM 761, Collins gear round parts dead OK, Nelson Ross Model 235 or equiv spectrum analyzer, linear, ant tuner or parts, self supporting crank up tower, exotic and spy radios German equipment. H. Kolesnik, WDSJFR, 4161 Oak Road, Tulsa, OK 74105, 918-742-1645.

SELL: Heath HW-5400 Xcvr, W/PS, SSB Filter, Keypad Entry, and Shure 444 Mike. \$500. WA2HAL, 212-877-0980.

SELL: Strikingly beautiful solid yellow brass blue racer, \$165. Wanted: Vertical Vibroplex. Dr. Hess, Box 19, Pasadena, CA 91102.

SELL North American and International 1987 callbooks. Both \$24. I ship. Lowry, 3 Darlin Drive, Heading, PA 19609.

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SELLING - Yaesu FT-208R with rubber duck & vocom ant., speaker mike, Mirage 30W amp., Larsen mag mount, PA-3 car adapter, NC-9B batt. charger and all manuals. \$300 takes all. Call Ralph, KD2UR, 201-254-7732 or 516-234-2010.

MADISON Goodies: ICOM 761, trades wanted. Lunar 2M4-40P \$109; BAW VS300A tuner \$89.95; Alnico ELH230D 2M amp \$89; AEA Isotope 144 \$44.98; Cushcraft 124WV 4el. 2M beam \$33; GSVRV dipole \$44; Diamond D130 discone \$79; Amphelion B131P P1.95 silverplate \$125; ICOM IC28H/MT \$399; GE 614B \$135; Eimac Q-500Z \$119.95; 12BY7A \$7; Kantronics KAM \$299; KPC2 3149; 30' guy cable 15 cents/ft; 1/4" 18 cents/ft; 3/16" clamp 40 cents; 50 cents; prices FOB Houston. Madison Electronics, 3921 Fannin, Houston, TX 77004, 1-800-231-3057. Texas collect 1-713-520-7300. Mastercard/Visa/COD.

MAKE OFFER, Yaesu 2m all band 225RD; Telepatch MFJ-624; Tuner MFJ-941B; TRS80 Cassette Level 11 Computer with Macrotronics Morse Code Terminal Interface. WBS5RO, Georgetown, TX, 512-859-4748.

R-390A Receiver \$115, electronically complete, repairable (Government-removed meters, operation unaffected). R-390A parts: Into SASE. Mint military-spec pull-out 12AT7, 6BA6, 6AG5, 6AL5; \$15/dozen. CPRC-26 Infantry Manpack Radio, 6 Meter FM, Heizer - Transmitter Subassemblies, controls/cabinet, antenna, crystal, handset; \$22.50, \$42.50/pair. H-251 Military/Communications Headphones: \$7.50. Add \$4.50/pcia shipping (\$9 maximum), except R-390A shipped collect. Baytronics, Box 591, Sandusky, OH 44870.

WA9GFR Communications Software. \$15 disk contains HF/VHF/JHF/L - Band propagation programs for predicting range in miles based on xmt, rcvr, and antenna height & gain. Includes impedances matching programs. Commodore-64 or IBM. Lynn Gerig, 8417 Morgan Road, Monroeville, IN 46773.

DEAD BATTERY Pack??? Ni-cads / Inserts / Rebuilding. AA \$1.60 (w/tabs \$1.75), 2/3AA 270mah \$1.95, 2/3AF 450mah \$2.45. Replacement inserts, less wires; ICOM BP2 \$17.95, BP3 (standard) \$16.95, BP5 \$23.95, Kenwood TR 2400/PB24 \$18.95, PB25 \$22.95, PB25H \$24.95, Tempo; S1/270mah \$19.95, S1, 2, 4, 5/450mah \$22.95, Azden 300 \$18.95. Others, SASE, info/rebuild quotes. In PA add 6%. Add \$2 S&H/order. Cunard Associates, RD 6, Box 104, Bedford, PA 15522.

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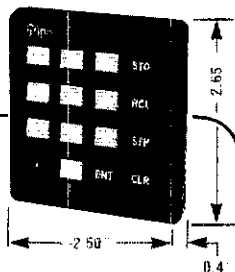
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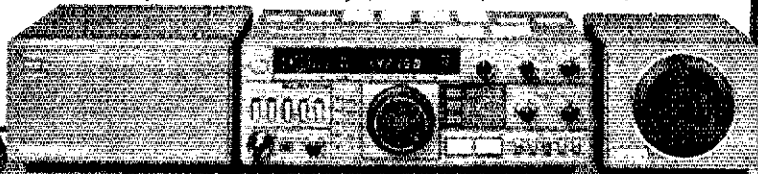
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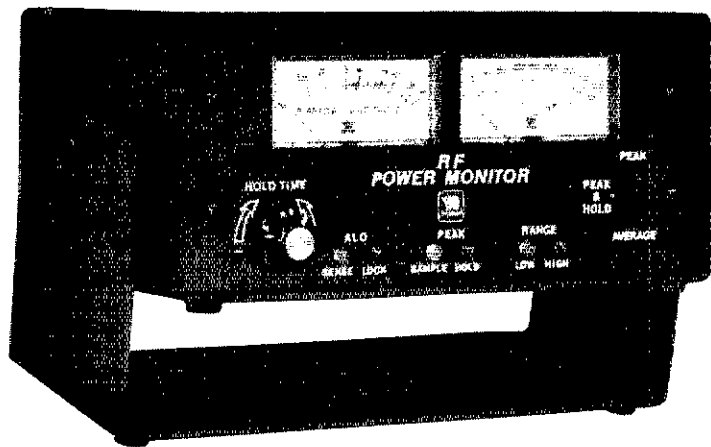
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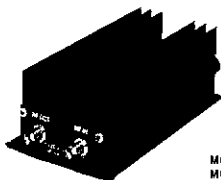
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WANTED 2-M or 70 CM all mode transceiver. Will accept either the ICOM 271 or 471 or the Kenwood 711A or 811A. Rig must be in excellent or mint condition. Pse list accessories and price on a card or letter. KD4AJ, 1968 Huntington Hall Court, Atlanta, GA 30336.

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GaAsFET's MMIC's - NE72084, \$11; Avantek 0104-0404, \$3-\$3.75. Johanson, ATC, other microwave components. SASE for list. N2CEI, RD 1, Box 341A, Franctown, NJ 08825.

KENWOOD TV-506 six meter transverter \$150; VOX-4 VOX and Processor \$30; Astron RS35-M Power Supply \$100; ICOM EX-107 VOX \$30; EX-106 FM Unit \$51/651D \$65; AH-7000 Antenna Unboxed, Unused \$50; bought too much C-84 ham radio software call or write. Siltronix/Swan FS-1000 SWR and PEP Wattmeter \$35. K6KJU, 209-564-3960.

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WANTED - Crank up tower, beam antenna, linear amplifier, rotor. Chris Bell, 3619 W. 67th Place, Chicago, IL 60629, 312-582-9045.

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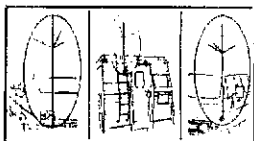
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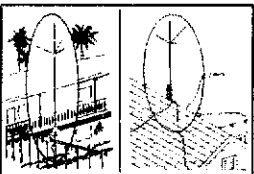


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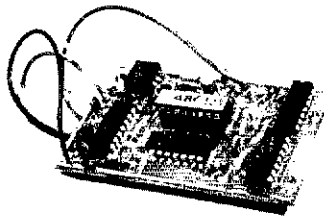
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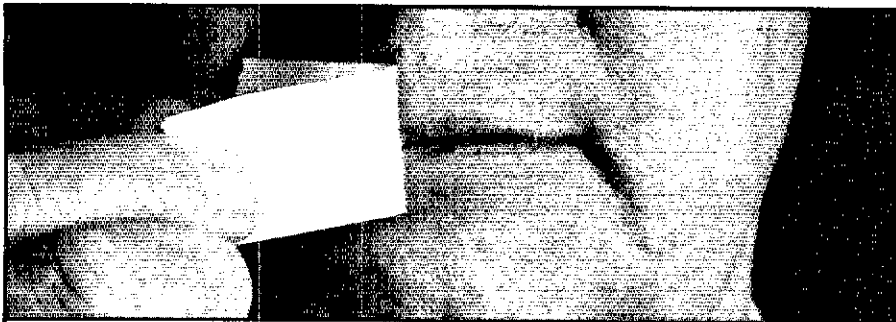
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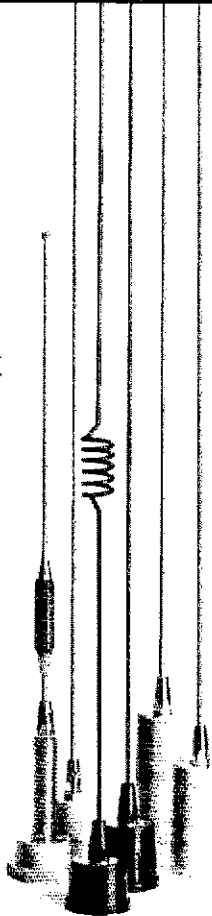


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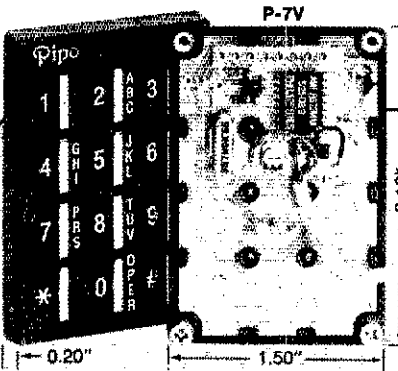
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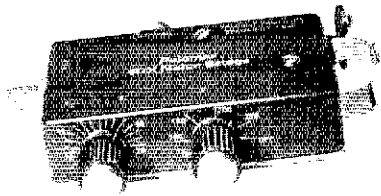


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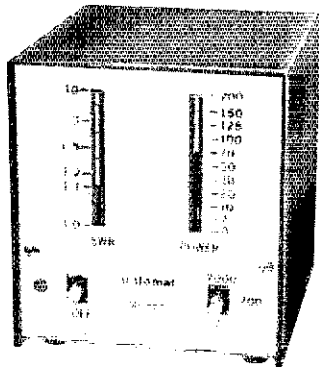


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All Models Shipped Factory Direct—
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Check these features:

- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
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HG52SS	52 ft	9 sq ft	\$CALL
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HG70HD	70 ft	16 sq ft	\$CALL

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Other Accessories Available
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In Continental U.S.A.

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Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	228	\$379
HBX48	48 ft	10 sq ft	303	\$489
HBX56	56 ft	10 sq ft	385	\$569
HDBX40	40 ft	18 sq ft	281	\$459
HDBX48	48 ft	18 sq ft	363	\$559

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

ROHN Guyed Tower Packages

- World Famous Rohn Quality and Dependability
- Rugged high wind survival provides safe installation
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Packages shown below are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

Model 25G	Model 45G	Model 55G
\$ 699	\$1239	\$1528
80'	768	1399
70'	829	1538
80'	989	1719
90'	1069	1999
100'	1149	2179
110'	1359	2329
120'	1429	2499



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Model	Min. Ht.	Max. Ht.	Ant. Load*	Sale Price
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MA50 mast	22'	50'	10 sq ft	969
TX438	22'	38'	18 sq ft	829
TX466	22'	56'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2059
HGX666	22'	66'	30 sq ft	1879
HGX872	23'	72'	30 sq ft	3299

Note - US Towers Shipped Freight Collect From Visalia, CA Factory
*Note-towers rated at 50 mph to EIA specifications

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\$.29/ft \$279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

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- RG8X—95% Bare Copper Shield • Low Loss
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- Same specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

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Lowest Loss for VHF/UHF!

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	6	9	2.3	5.8
RG8X	52	8	1.2	3.5	5.2
9086	50	4	.64	1.7	3.1
1/2" Alum	50	3	.5	1.2	2.2
3/4" Helix	50	2	.4	.9	1.6
1/2" Helix	50	1	.2	.5	.9

HARDLINE & HELIX® CONNECTORS

Cable Type	UHF	FML	UHF	MALEN	FML	N	MALE
1/2" Alum	\$19	\$19	\$19	\$19	\$25		
3/4" Helix®	\$25	\$25	\$25	\$25	\$25		
1/2" Helix®	\$49	\$49	\$49	\$49	\$49		

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A4 4-el Tribander Beam	\$299
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AP8 80-10 mtr Vertical	\$139
AV5 80-10mtr Vertical	\$109
D40 40mtr Dipole	\$159
40-2CD 2-el 40 mtr Beam	\$299
A50-5 5-el 6 mtr Beam	\$85
215 WB NEW 15-el 2 mtr Beam	\$85
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4218 XL 18-el 2 mtr Beam	\$105
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220B 17-el 220MHz Beam	\$99
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155BAS 5-el 15-mtr Beam \$129
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HUSTLER

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G6-144B 2-mtr Base	\$89		

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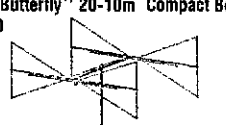
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FK2568	68 ft.	11.7 sq. ft.	1149.
FK4544	44 ft.	34.8 sq. ft.	1389.
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*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

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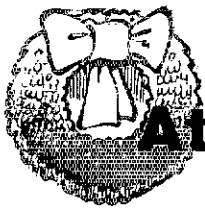
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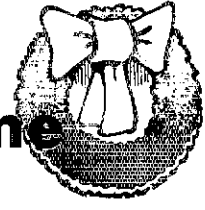
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- 25 Watts on Both Bands
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- 21 Memory Channels
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- All HF Amateur Bands
- 100 W Output
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- Optional 50 MHz, 220 MHz or 1.2 GHz
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- 10 Watts Output on 6 Meters and 1.2 GHz
- 100 Memories

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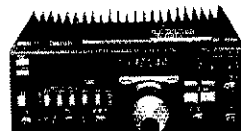
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- 14 Multi-Function Memories
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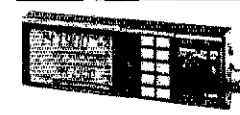


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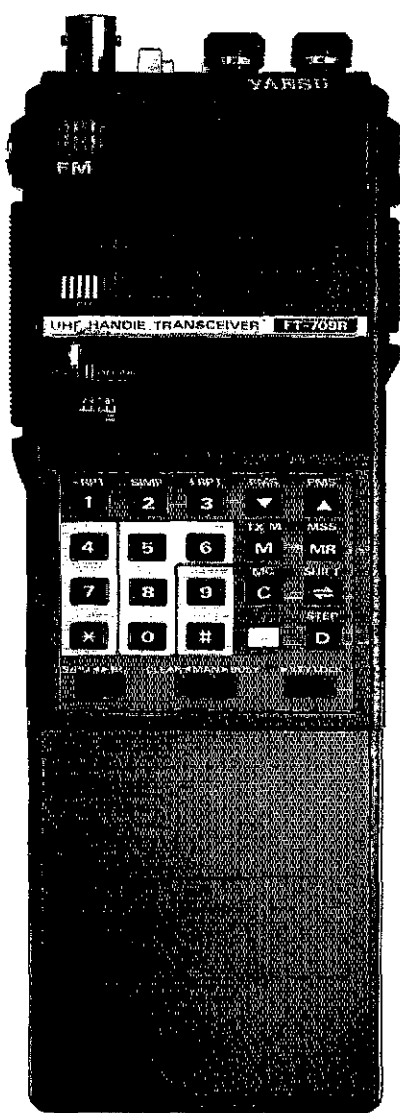
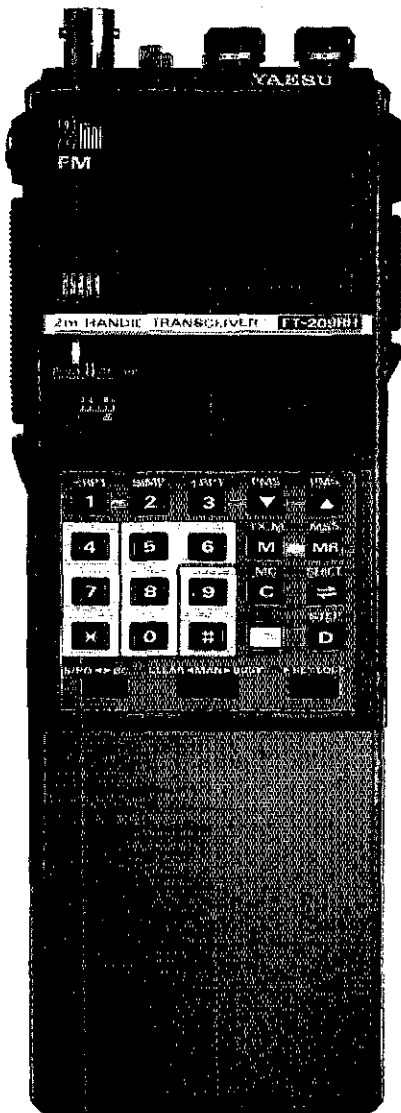
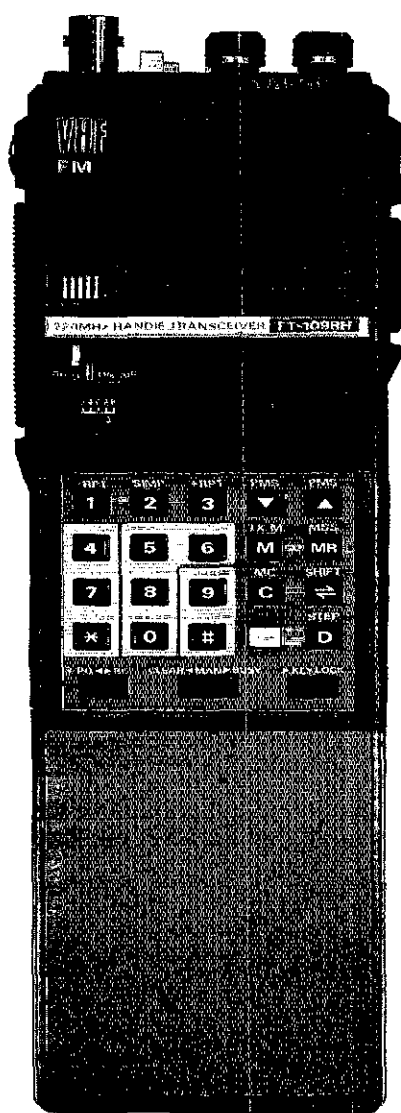
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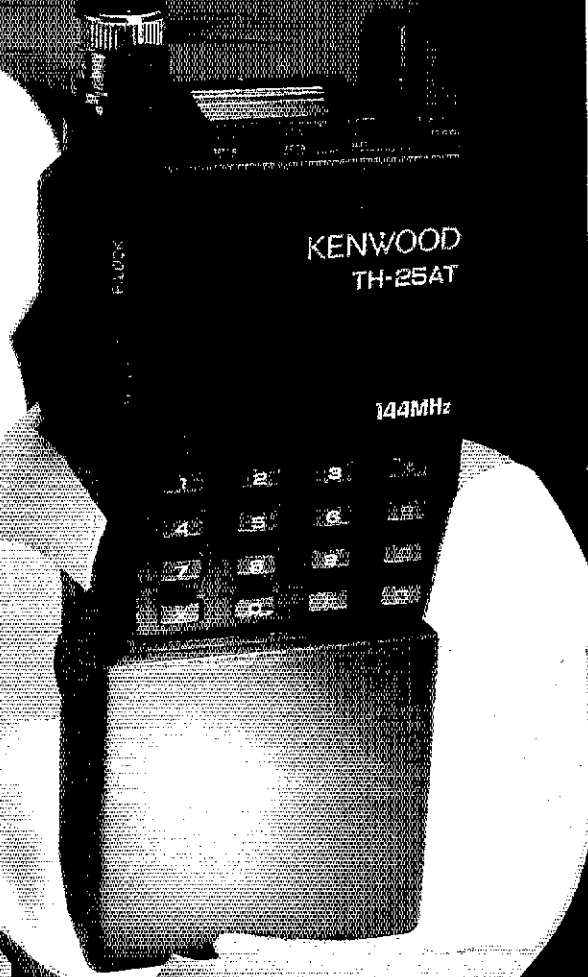


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