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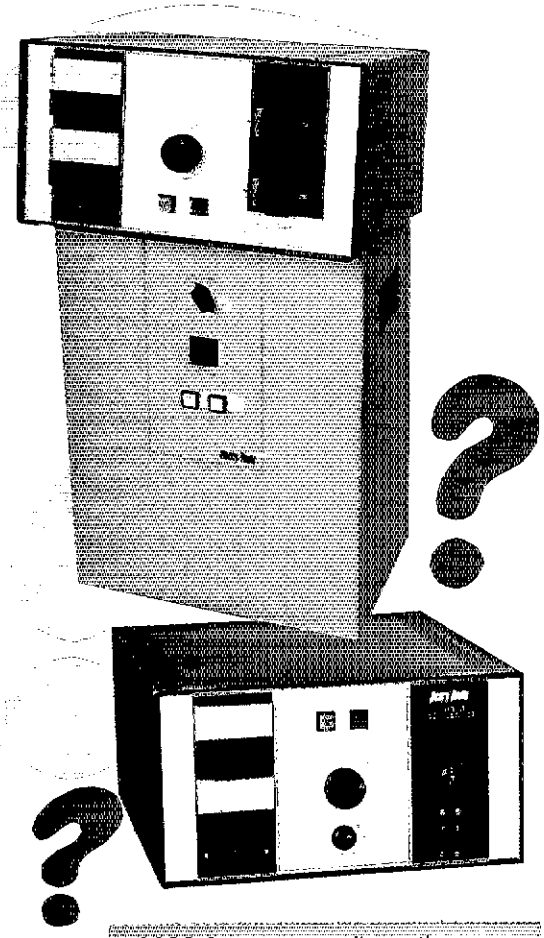

Pick a band. . .pick a power level . . .pick a price! Picking the right brand is even easier. Henry Radio is the power amplifier specialist. Every one of our 13 models offer superb value, experienced engineering (25 years!) and top quality components.

Since we offer the broadest selection of power amplifiers of any manufacturer, we feel that you should find exactly what you need on the following list:

2K CLASSIC console_____a true workhorse HF linear. Loafs along at full legal power. All amateur bands, 80 through 15 meters. 2K & 3K export models include 10 meters.

2K CLASSIC X console___we can't think of any way to make this magnificent 2000 watt HF amplifier better. Rugged and dependable. . . the last amplifier you may ever need to buy. 80 through 15 meters.

2KD CLASSIC ____a desk model designed to operate at 2000 watts input effortlessly, using two Eimac 3-500Z glass envelope triodes, Pi-L plate circuit and a rotary silver plated tank coil. 80 through 15 meters. 3.5-30 MHz.

3K CLASSIC Mk II_____uses the Eimac 3CX1200A7 tube. More than 13 db gain. We believe the 3K console to be one of the finest amateur HF linears available. 80 through 15 meters. 3.5-30 MHz.

3K PREMIER console___all of the time tested reliability of the 3K Classic Mk II plus QSK and the 160 meter band. All amateur bands, 160 through 15 meters. 1.8-30 MHz.

3KD PREMIER desk model___the same RF deck as the console, but in a smaller and lighter configuration. Full legal power plus QSK. All amateur bands, 160 through 15 meters. 1.8-30 MHz.

5K CLASSIC console ___a rugged and reliable 5,000 watt HF linear amplifier. Not available for amateur use in the U.S. 3.5-30 MHz.

2002-A desk model__a superb VHF amplifier. Operates CW, FM, SSB, AM or pulse applications. Uses an Eimac 3CX800A7 ceramic triode for smooth dependable power. Frequency range: 144 to 148 MHz. Commercial models in the 100 to 300 MHz range also available.

2002-A___the same as above, but operating in the 220 to 225 MHz frequency range. These VHF units have proven themselves in the field through thousands of hours of use.

2006-A_____offers the same specifications, the same reliability as the 2002-A, but operates in the 50 to 54 MHz. Commercial models in the 30 to 100 MHz range available.

3002-A console___full legal power provided by an Eimac 8877 ceramic triode mated to a heavy duty power supply. Rugged and reliable. Perfect for amateur, commercial, industrial and scientific operations. 144 to 148 MHz. Commercial models in the 100 to 300 MHz range available.

3006-A console__the same rugged construction and the same dependability as the 3002-A, but for operation in the 50 to 54 MHz frequency range. Commercial models in the 30 to 100 MHz range available.

2004-A desk model____a unique UHF linear amplifier for working 440 MHz frequency range. Designed for dependability. . built to last.

We realize that these descriptions are much too short. For complete descriptions, specs and prices please call or write.
If you have a requirement for a special purpose amplifier please call Ted Shannon, Meredith Henry or Ted Henry at our Los Angeles office.

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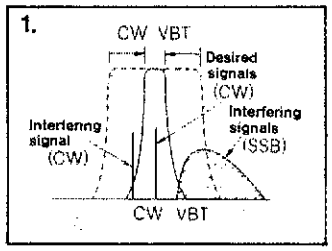
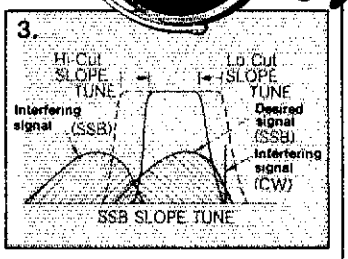
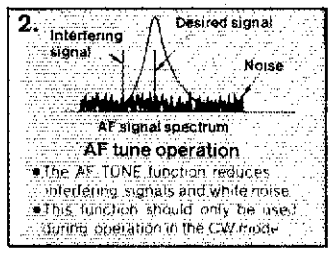
Competition class HF transceiver

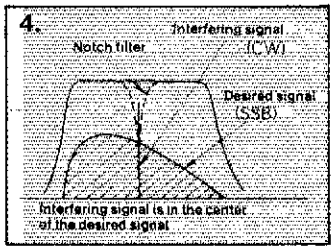
TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance 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.
- **First with a full one-year limited warranty.**
- **Extremely stable phase locked loop (PLL) VFO.** Reference frequency accuracy is measured in ***parts per million!***









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 QRM 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 QSOs, 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.

- **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 (QSK), 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.

Optional accessories:
• 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 crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • 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 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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THE OVERACHIEVERS

For exclusive 440MHz amateur action, Icom brings base, mobile and handheld operations to the discriminating amateur. Join the action on 440MHz with the local repeater gang or globe-spanning satellite enthusiasts.

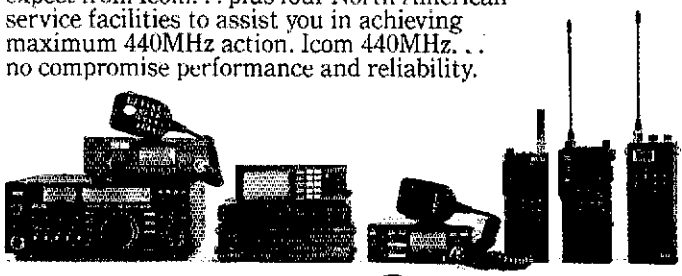
BASE STATIONS. The dream rig for UHF operators! The full-featured 75 watt IC-475H and 25 watt IC-475A pack in scanning, passband tuning and superior selectivity to cut intermodulations. The all-mode IC-475 series also incorporates DDS (Direct Digital Synthesizer), an innovative system designed by Icom to meet the demands of digital communciations. Innovative options include the CT-16 satellite interface unit which enables you to easily track the satellites and the AG-35 external mast-mounted preamp for increased gain to receive weak signals.

HANDHELDS. Icom offers a full spectrum of 440MHz handhelds and interchangeable accessories. . . the top-of-the-line IC-4GAT with six watts output and 20 memories. . . the IC-04AT full-featured, three watt handheld with ten memories. . . and the pocket-sized IC-u4AT with easy operation and great battery life.

MOBILES. Icom's new IC-448A features a multi-colored LCD readout, 20 memories, 25 watts, multi-scanning and an optional UT-40 beeper unit. Or there's the IC-48A 25 watt full-function mobile with 21 memories. First class 440MHz mobiling!

REPEATER. Start your own local repeater with Icom's RP-3010 microprocessor controlled repeater. The RP-3010 includes crystal control and 10 watts output with CTCSS/DTMF CW ID'er.

ICOM 440MHz QUALITY. Icom 440MHz units include all subaudible tones built-in and the quality you've learned to expect from Icom. . . plus four North American service facilities to assist you in achieving maximum 440MHz action. Icom 440MHz. . . no compromise performance and reliability.



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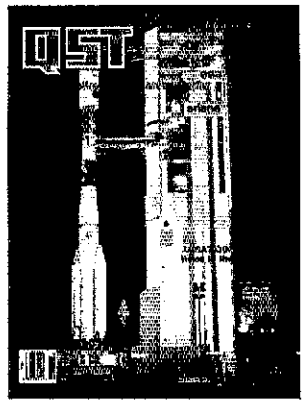

OUR COVER

The European Space Agency's Ariane-4 rocket that carried AO-13 into preliminary orbit. You can launch into the OSCAR program by checking out page 48 of this issue, as well as June *QST*, p 22, and subsequent installments of the Amateur Satellite Communications column. (*Photo courtesy CSG Kourou, W1AW photo by W2ABE*)

CONTENTS

October 1988
Volume LXXII Number 10

TECHNICAL

NEWS AND FEATURES

OPERATING

DEPARTMENTS

R4 Maximum Performance, Minimum Space

If you are like our friend on the island, living with limited space, R4 is for you.

That's right, you can forget about towers and rotators. Put away your spade, wire and insulators because you won't need a ground radial system. Cushcraft engineers have performed a miracle by developing a new half wave vertical for 10, 12, 15 and 20 meters that provides great performance using a simple counterpoise ground of four 48" stainless steel rods.

The new R4 has broadband impedance matching giving full coverage and automatic frequency selection of all four bands. All of this with an 18' high, 8 lb. vertical that will handle 1800 watts of power!

With R4 you get quick assembly, easy installation and top gun performance. Whatever your space, large or small, R4 will make ham radio more fun.

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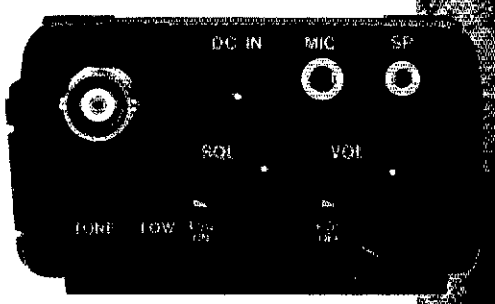
220 MHz TH-315A Here Now!

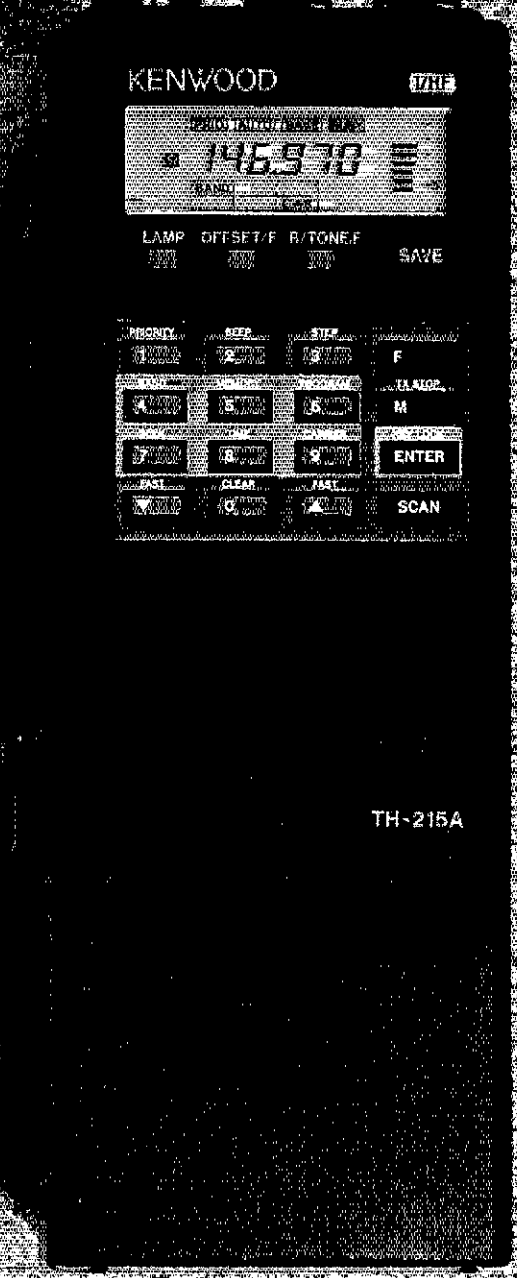
This HT Has it All!

TH-215A/315A/415A

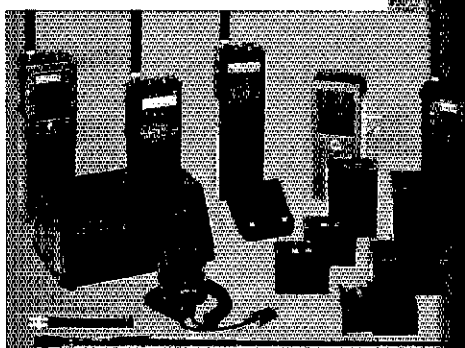
Full-featured Hand-held Transceivers

Kenwood brings you the greatest hand-held transceiver ever! More than just "big rig performance," the new TH-215A for 2 m, TH-315A for 220 MHz, and TH-415A for 70 cm pack the most features and the best performance in a handy size. And our full line of accessories will let you go from hamshack to portable to mobile with the greatest of ease!





- **Wide receiver frequency range.** Receives from 141-163 MHz. Includes the weather channels! Transmit from 144-148 MHz. Modifiable to cover 141-151 MHz (MARS or CAP permit required).
- **TH-315A covers 220-225 MHz, TH-415A covers 440-449.995 MHz.**
- **5, 2.5, or 1.5 W output, depending on the power source.** Supplied battery pack (PB-2) provides 2.5 W output. Optional NiCd packs for extended operation or higher RF output available.
- **CTCSS encoder built-in.** TSU-4 CTCSS **decoder** optional.
- **10 memory channels store any offset, in 100-kHz steps.**
- **Odd split, any fregency TX or RX, in memory channel "0."**
- **Nine types of scanning!** Including new **"seek scan" and priority alert.** Also memory channel lock-out.
- **Intelligent 2-way battery saver circuit extends battery life.** Two battery-saver modes to choose, with power saver ratio selection.
- **Easy memory recall.** Simply press the channel number!
- **12 VDC input terminal for direct mobile or base station supply operation.** When 12 volts applied, RF output is 5 W! (Cable supplied!)
- **New Twist-Lok Positive-Connect™ locking battery case.**
- **Priority alert function.**
- **Monitor switch to defeat squelch.** Used to check the frequency when CTCSS encode/decode is used or when squelch is on.
- **Large, easy-to-read multi-function LCD display with night light.**
- **Audible beeper to confirm keypad operation.** The beeper has a unique tone for each key. DTMF monitor also included.
- **Supplied accessories:** Belt hook, rubber flex antenna, PB-2 standard NiCd battery pack (for 2.5 W operation), wall charger, DC cable, dust caps.



Optional Accessories:
• PB-1: 12 V, 800 mAH NiCd pack for 5 W output • PB-2: 8.4 V, 500 mAH NiCd pack (2.5 W output) • PB-3: 7.2 V, 800 mAH NiCd pack (1.5 W output) • PB-4: 7.2 V, 1600 mAH NiCd pack (1.5 W output) • 8T-5 AA cell manganese/alkaline battery case • BC-7 rapid charger for PB-1, 2, 3, or 4 • BC-8 compact battery charger • SMC-30 speaker microphone • SC-12, 13 soft cases • RA-3, 5 telescoping antennas • RA-8B StubbyDuk antenna • TSU-4 CTCSS decode unit • VB-2530: 2m, 25 W amplifier (1-4 W input) • LH-4, 5 leather cases • MB-4 mobile bracket • BH-6 swivel mount • PG-2V extra DC cable • PG-3D cigarette lighter cord with filter

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San Francisco — Robert Odell Smith, NA6T, 320 Park St—PO Box 1425, Fort Bragg, CA 95437 (707-964-4931)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W Mesa Ave, Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Glenn Thomas, WB6W, 554 Simas Dr, Milpitas, CA 95035 (408-263-9450)

Roanoke Division
North Carolina — W. Reed Whitten, AB4W, 1208 Oxford Place, Cary 27511 (919-467-7464)
South Carolina — James G. Walker, WD4HLZ, Rte 1, Box 5395, Marion 29571 (803-423-3645)
Virginia — Mark Witt, NN4I, 113 Par Dr, Salem 24153 (703-387-3623)
West Virginia — Karl S. Thompson, K8KT, 5303 Pioneer Dr, Charleston 25313 (304-776-4352)

Rocky Mountain Division
Colorado — William "Bill" Sheffield, KQ0J, 1444 Roslyn St, Denver 80220 (303-355-2488)
New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd, NE, Albuquerque 87112 (505-299-4581
Utah — James R. Brown, NA7G, 865 Manchester Rd, Kaysville 84037 (w—801-533-5271) (h—801-544-0056)
Wyoming — James E. Raisler, N7GVV, 1102 East 9th St, Gillette 82716 (307-686-0794)

Southeastern Division
Alabama — James M. Spann, Jr, WO4W, PO Drawer X, Demopolis 36732 (205-289-1400)
Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave, Columbus 31909 (404-322-2856)
Northern Florida — Royal V. Mackey, N4ADI, 161 Shell Point W, Maitland 32751 (407-644-5905)
Southern Florida — Richard D. Hill, WA4PFK, 3800 SW 11th St, Fort Lauderdale 33312 (305-583-6932)
Puerto Rico — Jose A. "Tony" Purcell, KP4IG, Urb Tomas Carrion, Calle 2, #95, Juana Diaz, PR 006 (809-837-2975)
Virgin Islands — Ronald Hall, Sr, KP2N, PO Box 3987, St Thomas 00801

Southwestern Division
Arizona — James E. Swafford, W7FF, 5906 W Miramar Dr, Tucson 85715 (602-298-7793)
Los Angeles — Phineas J. Icenbice, Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186
Orange — Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (714-687-8394)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (619-273-1120)
Santa Barbara — Thomas I. Geiger, W2KVA, 428 E Grant St, Santa Maria, CA 93454 (805-866-1359)

West Gulf Division
North Texas — Phil Clements, K5PC, 1313 Applegate La, Lewisville 75067 (214-221-8873)
Oklahoma — Joseph Lynch, N6CL, PO Box 73, Oklahoma City 73101
South Texas — Arthur R. Ross, W5KR, 132 Sally La, Brownsville 78521 (512-831-4458)
West Texas — Amelia "Milly" Wise, W5OVH, 8516 Mt Scott, El Paso 79904 (915-751-4160)

THE AMERICAN RADIO RELAY LEAGUE, INC

The American Radio Relay League, Inc, is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communications in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"Of, by, and for the radio amateur," ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

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.

Membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA
Telephone: 203-666-1541 Telex: 650215-5052 MCI.
MCI MAIL (electronic mail system) ID: 215-5052
FAX: 203-665-7531 (24-hour direct line)

Canadian membership inquiries and correspondence should be directed to CRRL Headquarters, Box 7009, Station E, London, ON N5Y 4J9, tel 519-660-1200.

"It Seems to Us . . ."

Black Thursday

There was no joy in Newington on August 4.

We had known for more than a week that Docket 87-14 was on the FCC agenda for its meeting that Thursday morning, and had a pretty good idea that the decision was not going to be acceptable. As I sat in my office, listening to a live audio feed from the Commissioners' meeting room 300 miles away and waiting for them to get through the preliminaries, I thought about the 17-year battle we had waged in defense of the 220-MHz band—a battle that would continue, whatever the decision to be announced that day. There had been low points before, but we had always managed to turn things around before a reallocation action came to the Commissioners for a vote.

When covetous eyes were first cast on the band by commercial interests, back in 1971, amateur activity in the band was indeed very low. But two meters was filling up fast, and Amateur Radio needed a place to grow. I had helped with the first Hartford-area 220-MHz repeater in 1974, and had built one myself the following year for use by a local club. From that beginning, repeater growth in the area had continued until it reached saturation—as in much of the rest of the country. More recently, the need for packet radio links had lent increased importance to the lower 2 MHz of the band, accelerating the pace of growth already resulting from expanded auxiliary and CW/SSB operations.

Eighteen months earlier, in explaining its rationale for proposing to reallocate 220-222 MHz for land mobile use, the FCC had not acknowledged the existence of anything but repeaters in assessing the present occupancy of the band. In its NPRM it had managed to misquote the League, taking a comment we had made about activity at 28.3-28.5 MHz and applying it improperly to 220 MHz. The FCC had even misrepresented the significance of *Repeater Directory* listings, in an effort to suggest that few repeaters existed that weren't listed. Our status in the band as a primary service in the international Table of Frequency Allocations had been persistently (and conveniently) misunderstood, as was the fact that the allocation had been exclusive through the 1950s until compelling national defense requirements led to the introduction of military radar. These were clear, factual errors, not matters of opinion or "presumed expertise" of an administrative agency. Our comments and in-person representations to the Commissioners and their staff, and those of thousands of individual amateurs and local clubs, had set the record straight. Public-safety agencies served by Amateur Radio, and dozens of Congressmen, had added their own voices to the chorus in defense of the band. Was anyone on M Street listening? That morning, we would find out.

It soon became clear that the answer was no—that the decision had been made a long time ago, and the facts were being tailored to fit. For someone who believes deeply in our federal system of government, it was a bitter pill.

In its presentation of the item to the Commissioners, the staff of the Office of Engineering and Technology acknowledged none of its earlier errors and oversights. Nothing was said about the legitimate needs of the Amateur Service having been grossly understated in the Notice of Proposed Rulemaking last year. Incredibly, the interest of United Parcel Service in putting the band to commercial use was specifically mentioned. A new factual error was introduced, this being that the reallocation represented "less than 2%" of the available amateur allocations. Given our secondary status in much of the remainder, and the cavalier way we had been excluded from 420-430 MHz along the Canadian border and from 2310-2390 MHz by earlier Commission actions, this remark added insult to injury. It would be more accurate to say that lopping off 40% of the FM Broadcast band should have little impact on broadcasters, since it would represent "less than 2%" of the available broadcasting allocations.

The Commission's decision was made after *QST* went to press last month; however, we were able to insert a special two-page supplement into the wrappers with the September issue so you would get the bad news as quickly as possible. Incredibly (that word gets a lot of use these days when the subject is the FCC), it is now almost a month later and the Commission's Report and Order *still* has not been released. So, there's still no "official" explanation of why the FCC did what it did.

The battle will continue. We will ask the Commission to acknowledge its own clear errors, and to reverse its action. We will continue to ask Congress, as the higher authority on what is in the public interest, to direct the Commission to act accordingly. Probably, before it's all over we'll be in court.

The battle will continue. But amateurs' long-standing respect for the Federal Communications Commission will never be quite the same.—*David Sumner, K1ZZ*

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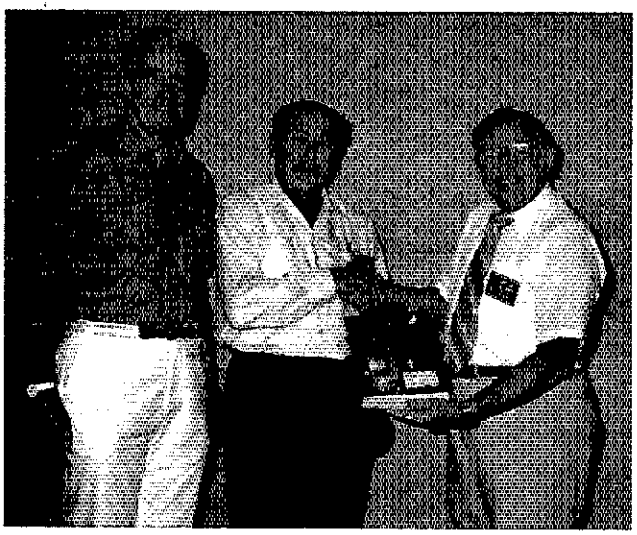
UP FRONT in QST

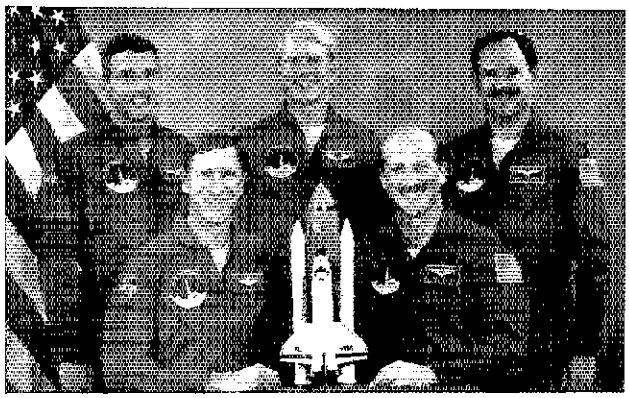
We would like to thank...

ICOM America, Inc; Kenwood USA Corporation; and Yaesu USA for their generous donation of prizes for the 1987 "Club Challenge of the '80s" competition. Upper left: ARRL Executive Vice President Dave Sumner, K1ZZ, and Wayne Yoshida, KH6WZ, of Kenwood admire the TS-680, with power supply and automatic antenna tuner. It was won by the Frontier ARS in the small club category for their 13 new ARRL members. Upper right: Chip Margelli, K7JA, of Yaesu USA, and Dave Sumner get the feel of the FT-767GX, which was donated by Yaesu. The Yaesu transceiver went to the West Coast ARC, winner in the large club category for 78 new League members. Left: Evelyn Garrison, KA7LPK, of ICOM America, Inc, and Dave display the IC-735 donated by ICOM. It was awarded to the North Seattle ARC in the medium club category for 13 new ARRL members. We would also like to thank all the clubs that participated in the competition.

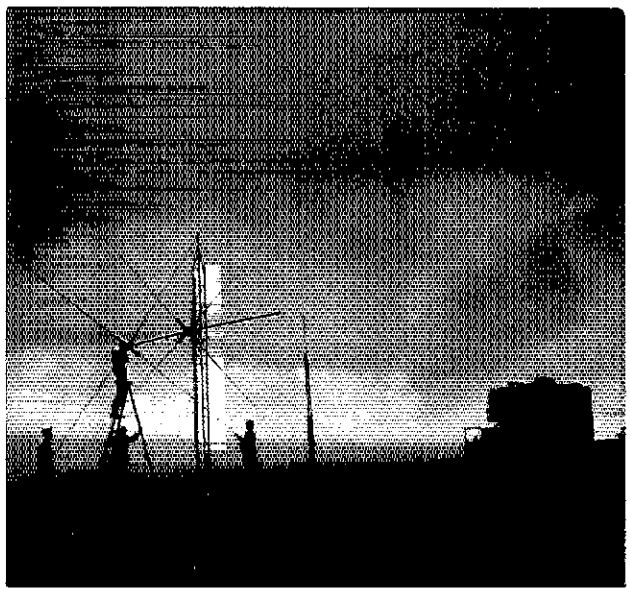


G5RV—In person: Louis Varney, G5RV (center), of West Sussex, England, the face behind the antenna which bears his call, receives a copy of the 752-page *ARRL Antenna Book* signed by the HQ staff from editor Gerald Hall, K1TD (right). Louis toured HQ in August with Bill Wiseman, KM1E (left), of Woolrich, Maine. Louis is also active from Uruguay as CX5RV. (*photo courtesy N1EOZ*)

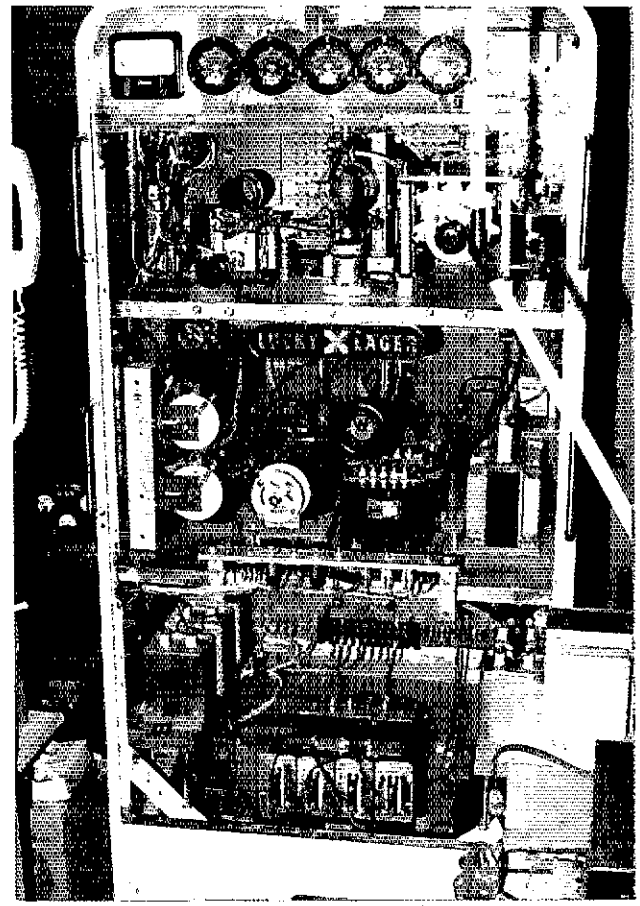
Racking them up: Mark Wilson, AA2Z, adjusts the test equipment installed in a nifty new rack donated to the ARRL recently by Fred Hammond, VE3HC. The rack is inside the RF-shielded enclosure in the Laboratory at ARRL HQ. Fred also donated a rack for use at W1AW/R. (*photo courtesy KE3Z*)



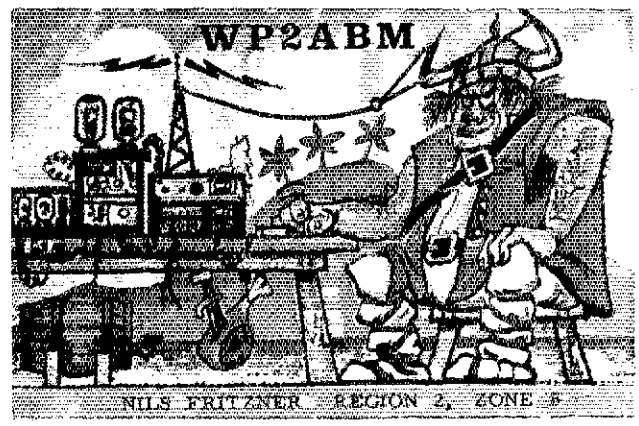
Shuttle communications: NASA will soon resume space shuttle flights and the excitement is building. The Goddard ARC (WA3NAN), located at the NASA/Goddard Space Flight Center at Greenbelt, Maryland, will retransmit air-to-ground communications from the shuttle live on amateur frequencies. The club retransmits the NASCOM feed only when the astronauts are awake; even then, there may be periods of up to 30 minutes when no on-the-air discussions can be heard. The club receives no NASCOM feed during Department of Defense missions. Seen here are the crew of the next space shuttle mission STS-26 (l-r) David C. Hilmers, Richard O. Covey, George D. (Pinky) Nelson, Frederick H. (Rick) Hauck and John M. (Mike) Lounge. The approximate operating frequencies for WA3NAN during shuttle missions are: 3860 kHz SSB (nights), 7185 kHz SSB (days), 14295 kHz SSB (whenever on the air) and 147.45 MHz FM (whenever on the air). (*NASA photo courtesy WD8LAQ*)



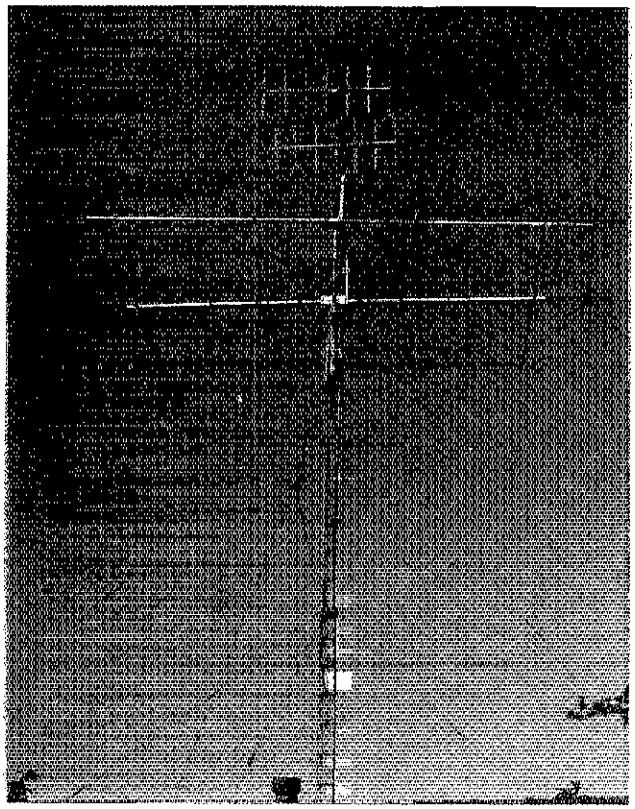
Hams in repose? Hardly. This sunset setup by the W6YL (San Jose State ARC) crew was taken just before Field Day 1988. Complete Field Day results will appear in next month's *QST*. (*photo courtesy W6YL*)



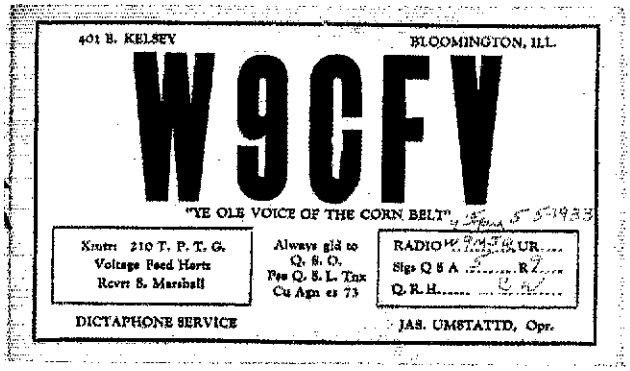
Appliance operator: Not really, but from a different angle it might look that way. Fred Huntley, W6RNC, of Nevada City, California, built this 1-kW AM transmitter in what used to be a refrigerator. The rig, which Fred built in 1987, features a pair of 250THs in push-pull, modulated by 250THs operating class B with no modulation transformer as described in an article "Single-Ended Push-Pull Modulator" in August 1956 *QST*. Fred describes it as a "real radio that glows in the dark." (*photo courtesy W6RNC*)



A displaced Viking in the tropics: Nils Fritzner, WP2ABM, of St Thomas, US Virgin Islands, doesn't seem to mind living in a warm clime; in fact, he designed a fine QSL card that fits both him and his QTH. Nils is an active member of the Virgin Islands ARC in St Thomas. (*QSL courtesy NP2AZ*)

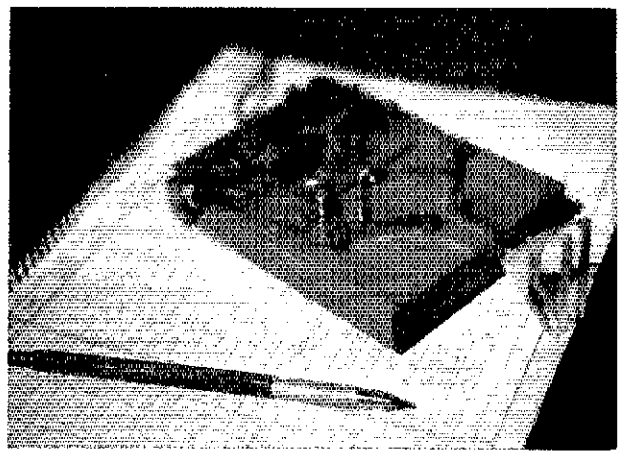


A gold-plated antenna? Well, no; it only looks that way. Chris Benner, WA6WAG, of Redding, California, took this picture during the summer when smoke from the many fires burning in northern California created the illusion. This *isn't* what they mean when they refer to California as the Golden State! (*photo courtesy WA6WAG*)



Don't give up: Myles Myers, W4OMC, of Winter Haven, Florida, recently received this QSL card from Jim Umstattd, W9CFY, of Bloomington, Illinois. Nothing unusual about that, you say? Check the date—the QSO took place 55 years ago! Jim had put the card aside because he did not have Myles' address. When the two had another QSO recently, Jim remembered the unmailed card and sent it to Myles. Never give up on getting a QSL! (*QSL courtesy W4OMC*)

DX results: Mike Gibson, KH6ND, of Honolulu, finished fifth worldwide on both CW and phone, as well as first worldwide combined, in the 1988 ARRL International DX Contest. Congratulations to Mike on his fine single-operator all-band performance at the station of KH6XX. The contest, which featured substantially higher participation than the last, is covered in detail on elsewhere in this issue. (*photo courtesy KH6XX*)



Home-brew fun: Frank King, N4RYH, of Hope Mills, North Carolina, sent along this picture of his version of the AD7Iambic Cheap Keyer (June 1988 *QST*) in the hope that it might encourage someone to build a *QST* project—he credits an Up Front picture of someone else's version of a *QST* project with prompting him to build this fine keyer. Frank made two modifications: a 47-kΩ resistor in series with the speed pot to slow the keyer down so he could learn to use it; and shorting LS1 to ground when it is not in use, to prevent irregular dash spacing. If you have built a piece of equipment featured in a *QST* article, show off your handiwork to your fellow readers. Send pictures to ARRL, 225 Main St, Newington, CT 06111, Attn: Up Front In *QST*. (*photo courtesy N4RYH*)

League Lines

At press time, the text of the FCC Report and Order in Docket 87-14 reallocating 220-222 MHz ***still had not been released*** nearly a month after the Commission's August 4 action. See the editorial and the article beginning on page 45 for more on the FCC's misstep.

Director, Vice Director elections: ***There are contested elections in all 8 ARRL Divisions up for election this year.*** Ballots will be mailed from ARRL HQ by the first of October and will be counted at HQ November 21. Here is the list of candidates by Division:

CENTRAL DIVISION
Director: Edmond A. Metzger, W9PRN (unopposed)
Vice Director: Kenneth A. Ebneter, K9EN
Howard S. Huntington, K9KM

HUDSON DIVISION
Director: Vincent J. Biancomano, WB2EZG
Stephen A. Mendelsohn, WA2DHF
Vice Director: Paul S. Vydareny, WB2VUK (unopposed)

NEW ENGLAND DIVISION
Director: Tom Frenaye, K1KI
Albert W. Hamilton, AG1F
Vice Director: William Burden, WB1BRE
Clevis O. "Cliff" Laverty, W1RWG

NORTHWESTERN DIVISION
Director: Rush S. Drake, W7RM
Mary E. Lewis, W7QGP
Vice Director: William R. Shrader, W7QMU (unopposed)

ROANOKE DIVISION
Director: Claude E. Feigley, W3ATQ
John C. Kanode, N4MM
Vice Director: James G. Walker, WD4HLZ (unopposed)

ROCKY MOUNTAIN DIVISION
Director: Laurence A. Eichel, K2NA
Marshall Quiat, AGØX
Vice Director: William M. Sheffield Jr, KQØJ
Hugh Winter, W5HD

SOUTHWESTERN DIVISION
Director: Fried Heyn, WA6WZO (unopposed)
Vice Director: Wayne E. Overbeck, N6NB
Karl V. Pagel, N6BVU

WEST GULF DIVISION
Director: Thomas W. Comstock, N5TC
Jim Haynie, WB5JBP
Vice Director: Sam C. Sitton, KV5X (unopposed)

Contest certificate winners: ***Multioperator stations that win a certificate in any contest may get individual certificates for each of their operators.*** Simply request them from the Contest Branch at HQ along with all pertinent details.

There is a temporary third-party-traffic agreement between the US and the Republic of Korea permitting traffic with 6K24SO, the special event station at the Olympic Games in Korea, until 2400 UTC October 5. The agreement began September 1.

The Technical Department at HQ is looking for a Laboratory Technician or Laboratory Engineer. We are looking for a licensed amateur who is ambitious, dedicated and creative. A BSEE or ASEE with experience in digital and/or RF is required. Starting salary is $21,000 to $25,000. For further information, contact Dennis Dzierzawski, K9EIS, or Chuck Hutchinson, K8CH, at HQ.

The 1988 ARRL Simulated Emergency Test (SET) is scheduled for October 15-16. SET is an important exercise that will give the Amateur Radio Emergency Service (ARES) a chance to practice communication skills under simulated emergency situations. For more details, see p 108.

Just at press time, FCC announced that ***it had granted the ARRL's request for a 90-day extension of time for filing comments in Docket 88-139,*** the FCC proposal to rewrite the amateur rules (Part 97). Comments are now due November 29, 1988, and reply comments are due by January 31, 1989. Copies of the FCC proposal are available from the Regulatory Information Branch at HQ upon receipt of a large SASE with 85 cents postage. The ARRL committee studying this proposal already has met twice to make a detailed comparison between the present rules and the proposed rewrite. The committee will next meet September 30, ***so there's still time—but not much—to help us with the League's response.*** Send your comments to ARRL HQ, attention Lisa Clark. For background on this important FCC proposal, see May *QST*, p 53, and July *QST*, p 61. Your ARRL Director (see p 8) will also want the benefit of your input.

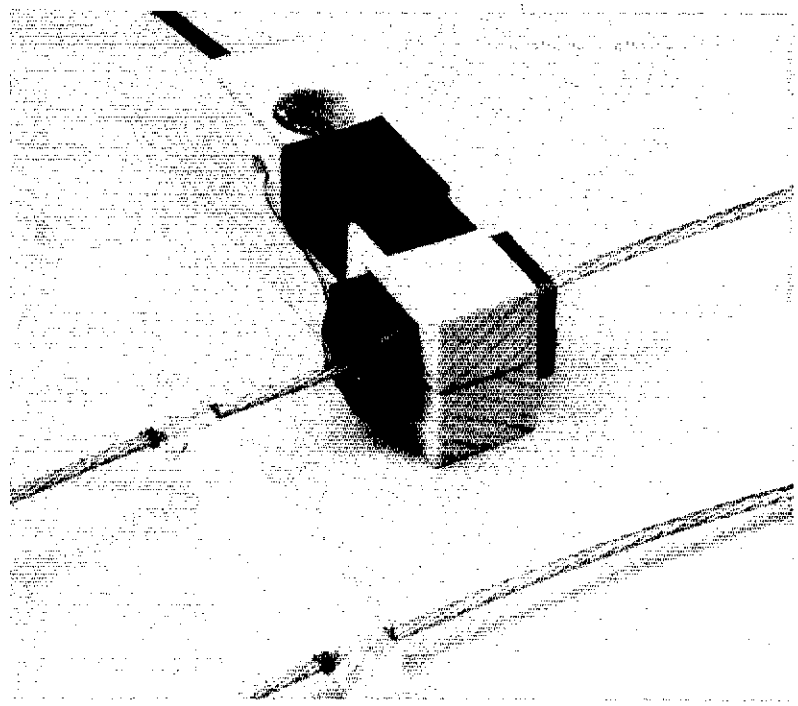
Each January issue of *QST* lists the upcoming year's ARRL-sanctioned hamfests and conventions. To be listed in the 1989 calendar, ***your event must have your Director's approval before November 5.*** For more information, contact Hamfest/Convention Coordinator Bernice Dunn, KA1KXQ, at HQ.

It seems that ***whether to have the propagation prediction curves in each issue of*** **QST** ***(see pages 68-69) is a matter of controversy.*** Please let the Editor of *QST* know whether you think we should: (a) keep them monthly, (b) make them quarterly or (c) eliminate them completely. Long-term curves appear in the *ARRL Operating Manual.* (If you notice a slight change in the format of this month's charts, we had to recreate them from scratch after the mechanicals were mistaken for part of the day's trash!)

A Relative RF Ammeter for Open-Wire Lines

How can you detect circuit imbalance in open-wire line? Just use this simple gadget to measure the RF line current—without breaking a feed-line connection!

By Zack Lau, KH6CP
ARRL Laboratory Engineer



The relative RF ammeter uses a split-core current transformer and a handful of passive components to indicate current flow on feed-line wires. This indicatorless version depends on electrician's tape to hold the movable core and its wooden carrier in place; another piece of tape holds a piece of clear plastic over a hole that contains several components. The cable leading from the back of the detector block (RG-174 miniature coax) is connected to an external voltmeter. Only a meter and a sensitivity control need to be added to make the ammeter self-contained.

In MF or HF antenna systems where minimum transmission-line power loss is important, open-wire feeder is the best transmission line going. The low loss of "open wire" is commonly exploited in balanced, multiband antenna systems, in which the line is routinely *not* matched to the antenna and operates at a high SWR. Line balance—equal current in the feeder wires—is important in a balanced antenna system if radiation from the transmission line is to be minimized. Measuring—or at least indicating—feeder imbalance involves comparing the current on both feeder wires.[1] All you need to do this is an RF ammeter—but where can you find one? If you've had as hard a time locating such an instrument as I have, take heart: You can easily build a relative RF ammeter yourself! Here's how.

The Circuit

The ammeter circuit is quite simple: In its simplest form (Fig 1A and title photo), it has only four electronic parts, not including the feeder wire and the outboard voltmeter. A self-contained version is shown in Figs 1B and 2. The secondary of current transformer T1 is wound on a split ferrite core. When the core halves are clamped around a feed-line wire, the transformer steps down the current on the antenna wire, allowing only a small portion

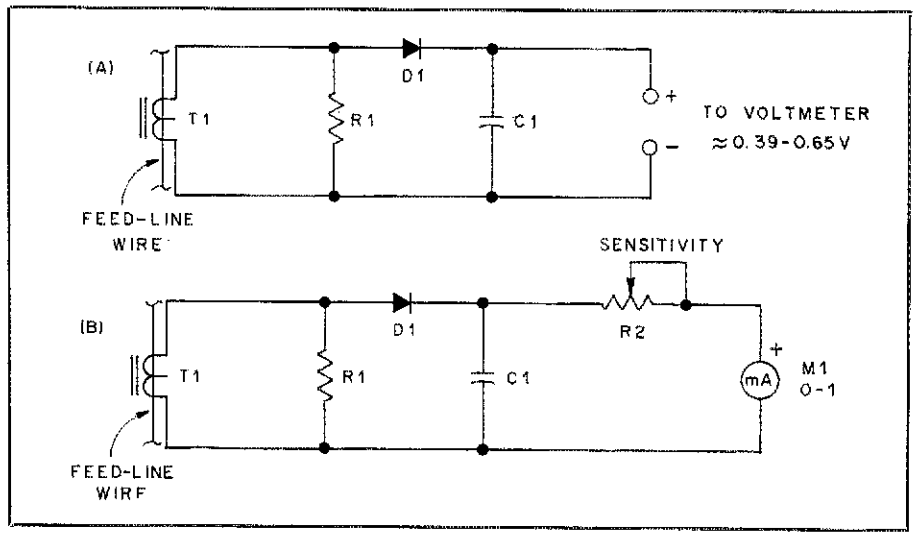


Fig 1—The relative RF ammeter can be built in indicatorless form (A) for use with an outboard voltmeter or with its own meter (B). If you don't have a voltmeter sensitive enough to work with the circuit at A and you have trouble locating a suitable meter for use in the circuit at B, build circuit B and use an inexpensive analog multimeter (set to a suitable low-current range) in place of M1. Using an external voltmeter can allow greater measurement resolution, particularly if a digital voltmeter or multimeter is available.

C1—0.001 to 0.1 μF ceramic capacitor; any value in this range is fine.
D1—1N34A, 1N270, 1N5711 or HP 5082-2835 switching diode; many Schottky or germanium small-signal and detector types are suitable. Don't use a power rectifier diode.
L1—14 turns of no. 28 enameled wire on half of an Amidon 2X-43-251 split ferrite core.[2] As necessary, cover sharp edges on the winding half of the core with electrician's, glass or masking tape to prevent scraping insulation off the wire (electrician's tape is used on the ammeter shown in the title photo; glass tape is used on the unit shown in Fig 2).
M1—Surplus miniature milliammeter. The meter shown in Fig 2 has a 1-mA, 100-Ω movement, but the meter you use need not have exactly the same characteristics.
R1—100-Ω, ¼-W resistor.
R2—1-kΩ trimmer potentiometer.

[1]Notes appear on page 20.

Why It's a *Relative* Ammeter

The RF ammeter described in this article is a *relative* measuring device because it's not calibrated in absolute units of current (amperes). (Using a calibrated voltmeter with the circuit shown at Fig 1B doesn't change this fact unless the detector/voltmeter combination has been calibrated in terms of RF amperes per volt of detector output.) A relative RF ammeter can be used to determine (1) the absence or presence of current; (2) change in the magnitude of current; or (3) whether or not two currents differ when measured under the same conditions. Respective to each of these cases, the relative RF ammeter *can't* tell you (1) how much current is flowing; (2) how much the current has changed in magnitude; or (3) how much two currents differ.
—*David Newkirk, AK7M*

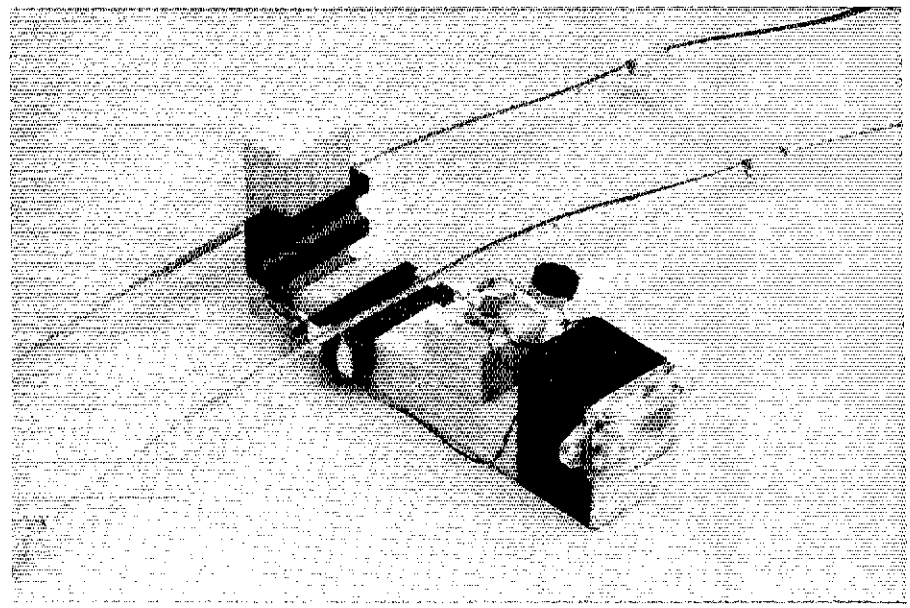


Fig 2—Even with the addition of a meter and sensitivity control, there isn't much to the RF ammeter. This self-contained version (Fig 1B shows the circuit) will be ready to go to work as soon as the core halves are closed around the feeder wire. (See Fig 3 for rough dimensions of the wooden pieces.) The hinge consists of a short length of 1/8-inch brass rod (in the ammeter body) and a length of no. 14 copper bus wire that passes through the movable core block and is bent around both ends of the rod. The small block behind the meter keeps the core halves aligned when the hinged core half is swung into place. (If this elegant hinged ammeter seems overly complicated, you can omit the hinge and "place and tape" the movable core half as shown the title photo.)

of the RF energy to be sampled by the ammeter. (The ammeter wouldn't be a useful indicator of actual feed-line conditions if it prevented much of the transmitter power from reaching the antenna!)

The number of turns specified for T1's secondary is a trade-off between circuit sensitivity and upsetting the antenna system. The fewer the turns, the greater the ammeter sensitivity and the greater the impedance "bump" presented to the open-wire line. With T1 constructed as specified, clamping the ammeter around a wire is the equivalent of connecting a resistance of 0.5 ohm in series with the wire.

Once you understand T1's function, the jobs performed by the rest of the components can be described in one sentence: D1 rectifies the sampled RF current so M1 can indicate it, and C1 acts to steady the voltage presented to the meter.

It's important that no gap exists between the ferrite core halves when the ammeter is clamped around a feeder wire. Proper operation of the ammeter requires that the magnetic field in T1's core be fairly uniform throughout *both halves* of the core. This will be the case—in fact, the two core halves will more or less act as a single piece of ferrite—if the core pieces are in close contact with each other. (It's not necessary to take this on faith—you can easily experiment with the core halves and see for yourself.) A close fit between the core pieces allows T1's winding to be wound over half (or somewhat less) of the total core circumference. This considerably simplifies mechanical construction of the ammeter and facilitates "clampability."

Construction

Beginning home-brewers should enjoy this project—its component values are not critical. You don't even have to wind exactly the specified number of turns when making T1—the ammeter will be a little more or less sensitive, depending on whether you put on too few or too many turns, respectively. D1 must be a small-signal detector or switching diode, but should be easy to get from many sources. (Don't worry too much about the consequences of soldering the diode in backward—the meter will just deflect below zero and hit its stop if you install the diode wrong. [If this happens, reverse the meter connections and leave the diode as it is.] In fact, if you can't tell which end of your diode is the cathode, you can save time by trying the diode both ways instead of puzzling over its markings!)

Fig 3 shows the dimensions of the ammeters shown in the photographs, but you needn't duplicate either of these models exactly. (With my limited wood-

Don't Let the RF Ammeter Fool You

The simple RF ammeter described in this article can make measuring relative signal magnitudes in open-wire line easier than using a reflectometer or bridge to do the same job in a coaxial system. The ammeter's simplicity and ease of use can be deceptive, though, because measuring antenna current does not necessarily tell you how much power the antenna is radiating. (It's easy to be misled into thinking that the more antenna current you measure, the better the antenna is radiating. This misconception led many early radio experimenters to use short, top-loaded antennas that produced large feeder current readings. Some of the power measured in such a system is *reactive*, however; it represents RF that cycles back and forth between the antenna-circuit inductance and capacitance instead of being radiated. Given a choice, I would rather have a huge antenna that *doesn't* exhibit a low impedance!)

What I'm getting at is that there's a distinction between improving an antenna and improving the power transfer to that antenna. If you've modified your matching network to increase the feed-line current *to a given antenna*, it's safe to assume that the antenna *is* radiating more power because of the matching network modification. Thus, the relative RF ammeter can help you to determine which Transmatch settings are best, and to compare the relative performances of different Transmatches with a given antenna system. Used in this way, an RF ammeter can aid your efforts at improving power transfer between your transmitter and antenna by providing a relative indication of the feed-line current. Further, the ammeter can be useful in confirming balance in an open-wire feeder system: If the system is balanced, the RF current in both feeder wires will be equal in magnitude.—*Zack Lau, KH6CP*

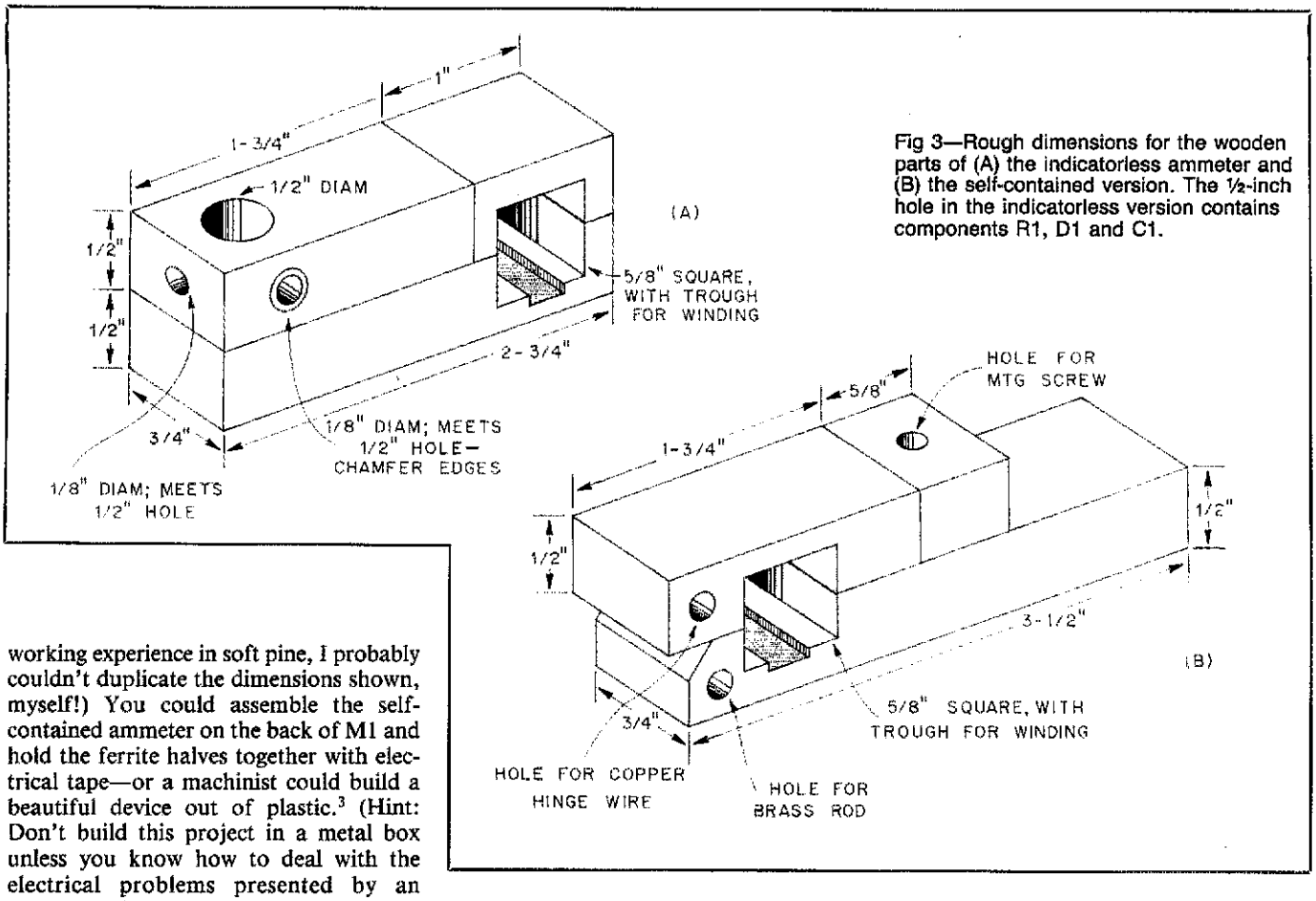


Fig 3—Rough dimensions for the wooden parts of (A) the indicatorless ammeter and (B) the self-contained version. The ½-inch hole in the indicatorless version contains components R1, D1 and C1.

working experience in soft pine, I probably couldn't duplicate the dimensions shown, myself!) You could assemble the self-contained ammeter on the back of M1 and hold the ferrite halves together with electrical tape—or a machinist could build a beautiful device out of plastic.[3] (Hint: Don't build this project in a metal box unless you know how to deal with the electrical problems presented by an ungrounded metal case in an RF field.)

In building an experimental project like this, I prefer to tack solder the components together to make part substitutions easier, but you may wish to try a "solderless" ammeter if you're in doubt of your soldering skill. If you do this, thoroughly clean all oxidation from the component leads before twisting them together.

Using It

This ammeter is designed to measure current with just a few watts of RF applied to the antenna system under test. Depending on the characteristics of your antenna system and where on the feed line you make your measurements, about ½ W can provide a useful indication; 2 to 5 W is better. If you're using the self-contained ammeter instead of the version that requires an outboard voltmeter, adjust R1 (SENSITIVITY) for a useful indication on M1. Maximum resistance at R1 corresponds to minimum ammeter sensitivity. (A more sensitive ammeter circuit would require less RF power for a useful meter deflection, thereby minimizing interference that can result from key-down antenna tests. Relatively few radio amateurs can easily reduce their transmitter power to the milliwatt range, though, so I designed the circuit to function well at output powers from about ½ W to about 5 W.) Caution: Don't make

(continued on page 20)

Why Worry About Feeder Balance, Anyway?

What's a little feeder imbalance among friends? The value of an RF transmission line lies in its ability to efficiently transfer RF power from transmitter to antenna while radiating a minimum of energy. Transmission-line radiation can upset the radiation pattern of a directional antenna ("fill in the nulls," as some hams say) and cause radio frequency interference (RFI) to electronic devices close to the feeder. (Ideally, an antenna is located far enough from such devices not to interfere with them, and the transmission line carries transmitter power to the antenna without raising an RFI ruckus along the way.)

A feed line that consists of two parallel wires radiates minimally if (1) the spacing between the wires is less than 1% of the wavelength at which the line operates and (2) if, at any point on the line, the RF currents in the feed line wires are *equal in magnitude and opposite in phase.* Commonly available open-wire or "ladder" line meets condition 1 easily in the MF and HF ham bands. Condition 2 *should* be met whenever a symmetrically installed, center-fed multiband dipole is fed with properly designed open-wire line. Sometimes, though, the feed line can't be brought away from the antenna perpendicularly for a distance of at least a half wavelength, or one side of the line must pass close to a metal object for a considerable stretch. Perhaps one leg of the antenna is much closer to the ground than the other. Or maybe you've just built a balanced antenna tuner but didn't space one band's coil taps equally from the coil center—or, even after careful measurements, you've installed your center-fed 80-meter dipole with one leg cut 6 inches longer than the other! All of these undesirable conditions—among others—can cause antenna system asymmetry and feeder imbalance. In extreme cases, current imbalance between the feed-line wires can cause the feeder to radiate as much as 10% of the RF power applied to the system. (The actual percentage of power radiated by the feeder depends on a number of factors, including the line length, height of the line above ground and degree of imbalance.†)

If you suspect that feeder imbalance is causing problems in *your* open-wire feed system, use Zack Lau's RF ammeter to measure the current in both feeder wires. If the currents are unequal at a given point on the line, it's safe to assume that your feeder is radiating more power than it should.—*David Newkirk, AK7M*

†F. E. Terman, *Radio Engineers' Handbook* (New York: McGraw-Hill, 1943), pp 193-194.

The Spiderweb Quad

Want the gain and directivity of a two-element quad, all for the price of a dipole? This is it!

By Ed Suominen, NM7T
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Scottsdale, AZ 85257

A few months ago, I became fascinated with the world "down under": New Zealand, Australia and the South Pacific. I wanted to contact hams living there, and learn about that part of the world. I was frustrated, though, listening through QRN and QRM for their signals on my inverted V at 35 feet. I needed a beam to cut through the mess on 20 meters, but my tiny bank account put the traditional aluminum "skyhook" out of my reach.

Looking at a great-circle map of the world centered on the western US, I saw that a fixed beam would easily cover the areas that I wanted to work. A decent front-to-back ratio and low-angle radiation pattern would cut out most of my noise and stateside QRM, bringing the elusive Pacific DX out of the mud.

I needed a good DX antenna that I could throw together out of wire and rope, and hang between two available supports in a fixed direction. I needed gain and a good directive pattern, but I didn't want the headaches of tuning a tricky gamma or T-match. Most importantly, I couldn't spend much money. After visions of all sorts of strange antenna designs floated through my head, I settled on the idea of a fixed, two-element quad.

The Spiderweb Quad Design

The Spiderweb Quad (shown in Fig 1) is made up of two full-wavelength rectangular loops suspended between two supports. The top corners of the loops hang from a pair of insulating spreaders that keep the elements spaced correctly with respect to each other. The loops are held tight at the bottom corners by small ropes leading to ground stakes. The entire antenna, wire elements, supporting ropes and lines, is an easily built version of a widely respected DX antenna.

A properly tuned two-element quad gives excellent gain and directivity, and a single-band version is easier to build and tune than a Yagi. The quad works well across a wide bandwidth, and has an impedance very close to 50 Ω; no matching network is required.

The two supports available to hold up my creation are a pair of two-by-fours nailed to my roof, and a galvanized pipe. Since this limited the height of the top edge of the loops to 20 feet, I decided to make the antenna vertically polarized. If the antenna was horizontally polarized, the current nodes would be on the top and

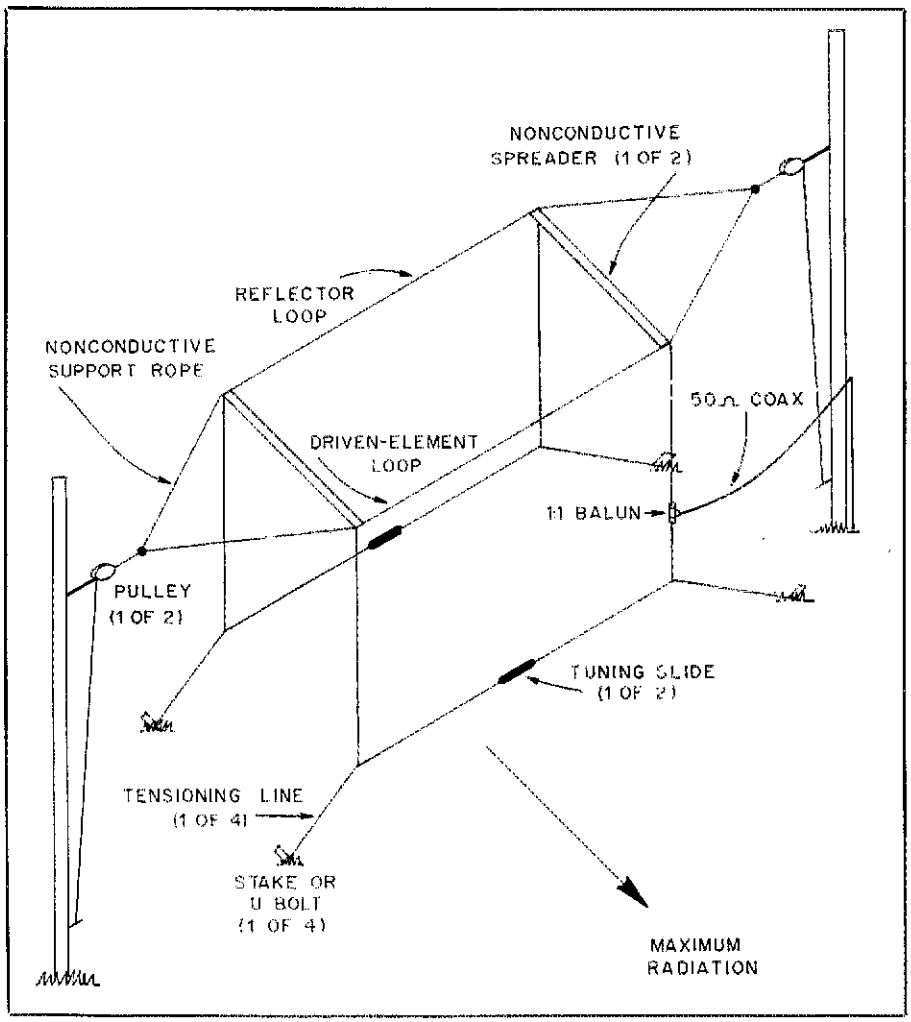

Fig 1—Pictorial diagram of the Spiderweb Quad. The spreaders can be any lightweight, insulating material—bamboo or fiberglass are best. The driven element can be tuned for resonance by adjusting the overlap at the bottom center of the loop. The overlap at the bottom of the reflector can be tuned for best front-to-back ratio or forward gain.

bottom sides of the loops, and most of my RF would go to heating up weeds. The vertical legs of a vertically polarized quad do the radiating (radiation from the horizontal legs is mostly canceled). Vertical elements radiate well at low angles even when they're close to the ground. See Figs 2 and 3.[1]

The Spiderweb Quad elements are rectangular because the low height of the supports leaves little space for the vertical sides of the loops. I wanted the bottom sides to hang at least 4 feet off the ground, but couldn't get the top sides higher than about 17 feet because of the unavoidable droop in the supporting ropes. This left me with only 13 feet for each vertical side of the loops—quite a bit less than a quarter of the total loop length for 14 MHz. Flattening the loops any farther than this wouldn't help the antenna's performance, but this shape is necessary from a constructional standpoint.

Building the Spiderweb Quad

I wasn't terribly excited about the idea of wrestling with 60-foot coils of springy Copperweld, and I wanted a conductor that was strong, light and stiff. I bought 150 feet of bare no. 14 copper wire at a local hardware store, and I cut it into two lengths for the driven element and reflector. Because I can easily tune the elements from ground level after putting up the antenna, I didn't concern myself with exact loop lengths. A few inches of extra loop length could be removed later.

The ends of both loops are connected at the midpoints of the bottom legs for easy tuning. The driven element is fed at the midpoint of one vertical side with 50-Ω coaxial cable and a 1:1 balun. The distance from the connection point of the loop to the feed point is a quarter of the total loop length. Once the loops were formed, I measured the four sides and bent the corners sharply at the guy line attachment points. Although the left, right, and bottom-side lengths aren't critical, the length of the top of the reflector and driven element loops must be the same. That's because these two lengths support the elements from between the spreaders, and a difference between them would make the antenna lopsided.

Supporting a single-loop antenna is a simple matter of hanging the loop from its top corners. Because the Spiderweb Quad has two elements, and because there are only two available supports, a spreader system is needed to lead the top corners of each side to a single rope. To do this, I used two pieces of 1- × 1-inch wood molding as insulating spreaders, and two lengths of lightweight rope, as shown in Fig 4.

The spreaders should be made of material that is light, stiff and a good electrical insulator. Although the wood molding does the job for me, there are quite a few materials that would do much better. If the pole is long enough to separate the elements by 0.15 λ, and is light and strong enough not to bend or break, it will work. My wood spreaders bend into fascinating shapes after a good rain, so I don't recommend using molding. Fiberglass or bamboo are better choices for spreaders.

Once the spreaders were hanging nicely from their ends, I began attaching the loops to the top corners of the spreaders. I wound the wire at each corner around the ends of the spreaders several times to hold it in place, as shown in Fig 5. I attached the top left corners of both elements to the left spreader, and the right corners to the right spreader. After this was finished, I attached the end of the feed line to the balun, and led the coax horizontally to one of the supports.

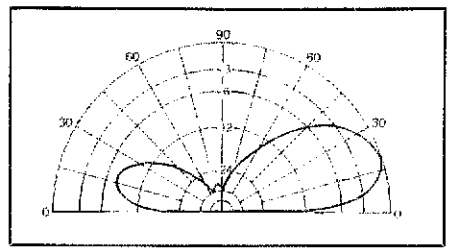

Fig 2—Elevation-plane radiation pattern of the 20-meter Spiderweb Quad shown in Fig 1.

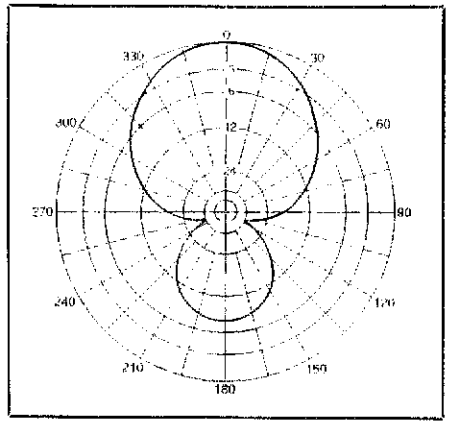

Fig 3—Azimuth-plane radiation pattern of the 20-meter Spiderweb Quad shown in Fig 1.

Table 1

Dimensions for Spiderweb Quads for the 80- through 10-meter Ham Bands

Band (MHz)	*Driven element loop length (ft)*	*Reflector loop length (ft)*	*Loop spacing (ft)*
3.5	283	290	42
3.8	258	264	38
7	143	146	21
10	100	102	15
14	72	73.5	10
21	48	49	7
24	41	42	6
28	36	37	5

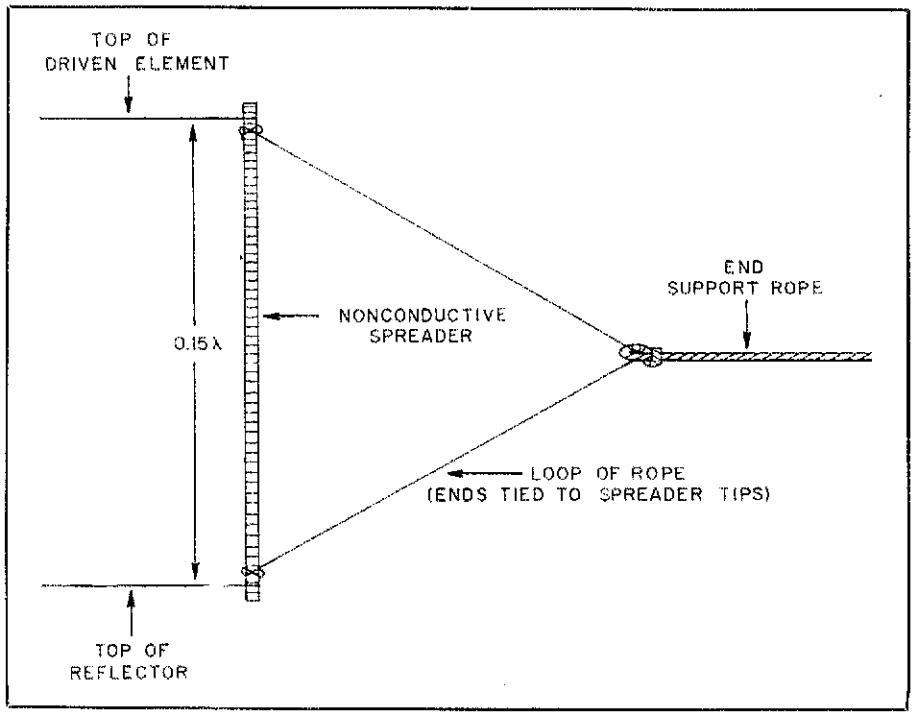

Fig 4—Top view of the spreaders and support ropes used in building the Spiderweb Quad.

[1]The radiation patterns shown in Figs 2 and 3 were produced at ARRL HQ using the MININEC antenna-modeling program (and other software developed at HQ) on an IBM® PC. Ed Suominen's 20-meter version of the Spiderweb Quad (shown in Fig 1) was modeled over average ground (conductivity: 5 mS/m; dielectric constant: 13), but the effects of obstructions (buildings, trees and so on) were not taken into account.

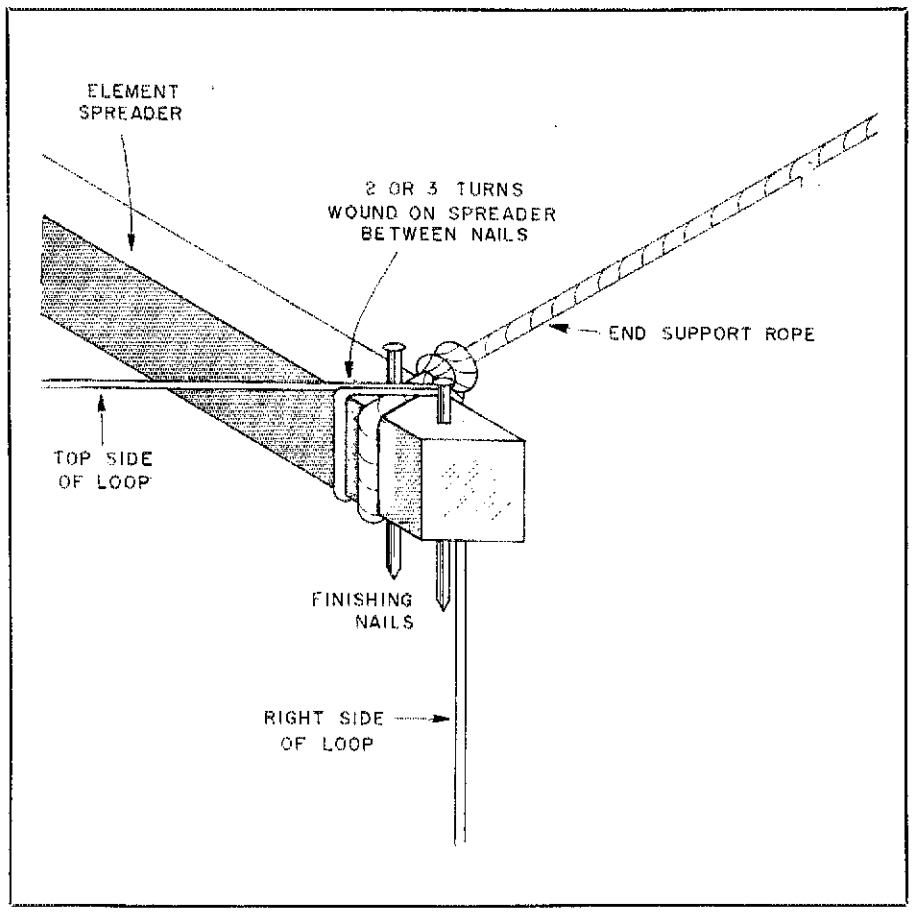

Fig 5—Detail of the spreader tips on the author's version of the Spiderweb Quad. The spreader material used is 1- × 1-inch wood molding (see text). Two finishing nails driven through the molding keep the loops and support ropes positioned correctly on the spreaders.

I used a pulley at each support to raise the antenna. I tied off the rope from one pulley, and raised the antenna with the other. Having two pulleys allowed me to position the antenna exactly where I wanted it between the supports.

Once the antenna is hanging from the spreaders, stake the bottom corners to keep the elements shaped properly. Otherwise, the loops will droop. I ran fishing line at about 45° from the bottom corners of the loops to ground stakes (I used U bolts for the ground stakes).

Summary

After operating with the Spiderweb Quad for a few months, I've found that the antenna does what I had hoped. I hear the accents of stations in Australia, New Zealand, Hawaii and other areas in the South Pacific. The old days of fighting to hear these stations through the Greater Podunk Ragchew net are over. Most signals I don't want to hear are off the main lobe of the antenna, down in the noise. The Spiderweb Quad has worked as well for me as any tribander perched on an expensive tower. DX stations no longer seem to have trouble hearing my puny 100-W signal—they actually come back to my calls and engage in enjoyable QSOs!

Ed Suominen has been a licensed ham since age 14—he earned his Novice ticket in 1983. Ed's Amateur Radio interests include antenna design, satellite operation, VHF and EME communications, digital modes and teaching licensing classes. His first love is low-band CW operation.

A Relative RF Ammeter for Open-Wire Lines

(continued from page 17)

measurements at levels higher than 5 W: Hazardous voltages may be present on the exposed feeder and ammeter wires under such conditions. Even at low power levels, don't apply RF power to the feed line while clamping or unclamping the device. (This prevents RF "bites" *and* reduces the potential for QRM by allowing test transmissions to be shorter.)

But I Want to Calibrate It...

As described so far, the RF ammeter is more of an indicator than a measuring device because it is not calibrated in electrical units. Yes, it *is* possible to calibrate the ammeter, but this usually won't be of much value in practice because open-wire line is often used under conditions of high SWR. (Although you can calculate and measure the impedance of open-wire line, the feeder current varies along the line when the SWR is not 1 to 1. This means that even if you calibrate the device to National Bureau of Standards accuracy, you'd probably end up making relative measurements anyway!)

When a high impedance voltmeter is used as an indicator in the circuit shown in Fig 1A, the ammeter's output voltage drops off linearly with frequency. (I measured this by using a Hewlett-Packard HP 8116A function generator as a signal source and a Fluke 77 digital multimeter as an indicator. The ammeter output voltage varied from 0.65 to 0.39 V over the 1.8- to 30-MHz range.)

Conclusion

This simple RF ammeter can be further refined, of course; its low parts count makes experimentation easy because there are few variables to deal with. Built as described here, though, the ammeter performs well enough to be useful and simply enough to be fun. Besides, if the RF ammeter helps you clear up a case of feeder-imbalance-related interference, you may not have to use split ferrite cores for their intended purpose: eliminating RFI!

Notes

[1]Balanced, open-wire transmission line can be built with two or four wires. Two-wire open line is assumed throughout this article because it is used much more widely by hams than the four-wire type.

[2]Available from Amidon Associates, 12033 Otsego St. N Hollywood, CA 91607, tel 818-760-4429. Palomar Engineers stocks a split core (the FSB-1/4) of the same ID, OD and ferrite material as the Amidon part; the FSB-1/4 appears to differ from the 2X-43-251 only in that it is 1/8 inch shorter than the Amidon core. The Palomar core will probably work well in the ammeter, although this has not been tried. Contact Palomar Engineers, PO Box 455, Escondido, CA 92025, tel 619-747-3343, for information.

[3]For suitable techniques, see Dennis Kennedy, "Build It Yourself—With Plastic," *QST*, Aug 1988, pp 30-34.

Build a Simple 12-Meter Beam

Will *you* be ready for the exciting DX doings in store at 24 MHz during Solar Cycle 22? If there's a rotatable gain antenna on your 12-meter-band wish list, this three-element array may provide the sock you seek!

By Donald D. Button, AJ1T
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Windham, ME 04062

With the new sunspot cycle well underway, thoughts of worldwide F_2 openings on ten meters come to mind like long-forgotten memories. This cycle, however, we'll be able to tap the DX possibilities of a new band between 10 and 15: the *12-meter* band (24.89-24.99 MHz).

Cycle 22's DX promise gave me a strong incentive for considering ways of improving upon my rarely used 12-meter half-wave dipole. A few manufacturers make antennas that cover the 10- and 24-MHz bands, but I could not locate a source for a 12-meter monoband Yagi.[1] Okay, then, how about ham ingenuity? For a given design, a 12-meter beam should be just a bit larger than its 10-meter counterpart—and a *three-element* 12-meter beam should be quite compact and easy to construct. It is! Here's how to build a 12-meter monobander capable of putting you on 24 MHz in *style*.

Element and Boom Dimensions

I arrived at boom and element lengths through the process described in the sidebar, "Design Details." Fig 1 shows the results of my calculations. With a firm antenna design in hand, the next step was to figure out how to build the antenna solidly!

Simplifying Yagi Construction

As I considered various approaches to assembling the 12-meter beam, I realized that two unsolved problems had prevented me from home-brewing a beam antenna for any of the other ham bands: the difficulty of achieving *secure* element-to-boom mountings using commonly available hardware, and procurement of the aluminum tubing necessary to construct the elements and boom.

Boom-to-Element Mounting

For years, various configurations of flat

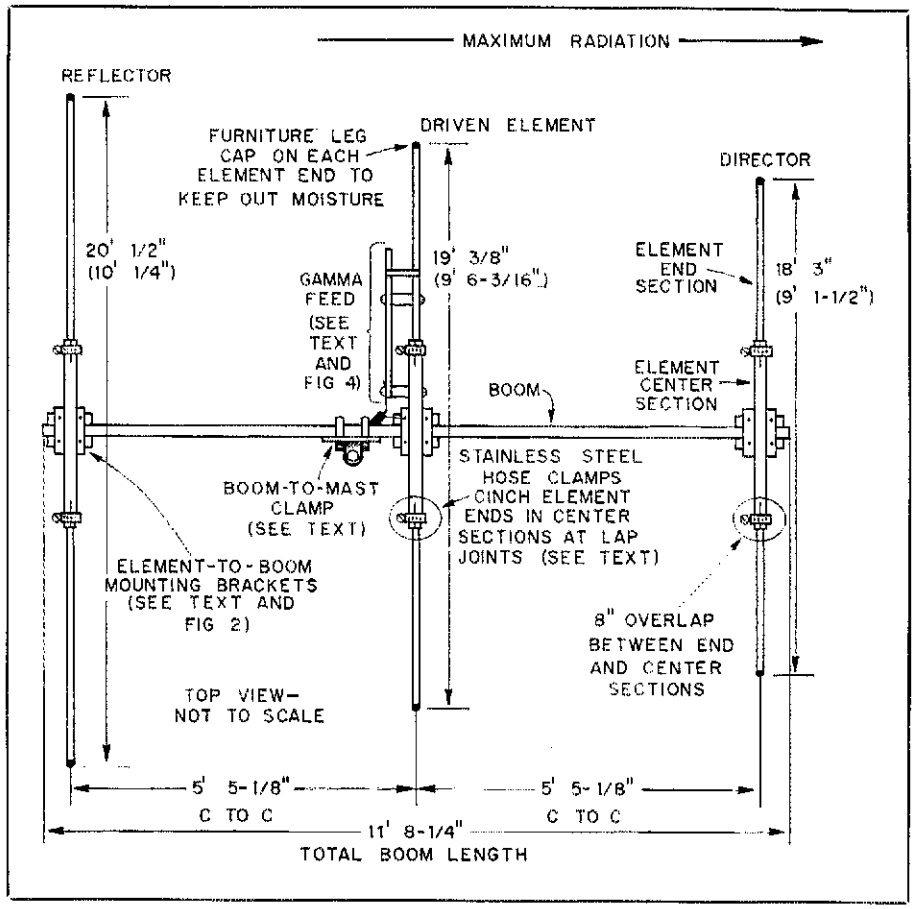


Fig 1—Design of the three-element Yagi for 12 meters. The dimensions shown correspond to a design frequency of 24.95 MHz and were arrived at through the process described in the sidebar, "Design Details." In the author's antenna, the elements and boom consist of Schedule 40 aluminum (6061-T6 material) pipe (inner diameters: boom, 2 inches; center section, 1 inch; element end, ¾ inch). Aluminum tubing (6061-T6 material) is recommended as a substitute for the pipe used by the author as follows: Boom—1/8-inch wall, 2-inch OD; element center sections, 1-inch OD; element end sections—7/8-inch OD. The gamma rod is ½-inch OD 6061-T6 tubing. See note 4 and the sidebar, "Tubing Versus Pipe: What's the Difference?" for more information.

The boom bisects each element; dimensions in parentheses give element lengths either side of the boom as an aid to construction. All element center sections are 3 feet long. Because of the 8-inch overlap between the center sections and element ends, each element end must be 8 inches longer than might seem apparent from this drawing. (For example, the director length is 18 feet, 3 inches. The director center section accounts for 3 feet of this. Each director end section must make up half of the remainder [15 feet, 3 inches] *plus the 8 inches necessary for the overlap between the element end and center sections.*) No need to get out your calculator; here are element end section dimensions that include 8 inches of overlap: director—8 feet, 3½ inches; driven element—8 feet, 8-3/16 inches; reflector—9 feet, 2¼ inches. See text for information on construction, adjustment and parts procurement.

[1]Notes appear on page 25.

metal plates and U bolts have been used to secure elements to booms in Yagi antennas. Unless made-for-application cradle blocks or saddles are used between the tubing and plates in such an installation, plate/U bolt mountings may allow the antenna elements to rotate on the boom during periods of high wind or heavy ice. Such element mounting schemes may have another drawback: Galvanized or stainless steel U bolts are often hard to locate in sizes appropriate for use with relatively slender element tubing. Further, the small parts count necessary for constructing a single antenna may hinder the builder in finding the right parts at the right price.

A second class of element-to-boom mounting methods entails the use of bolts that pass vertically through the boom and/or element. Depending on the relationship between tubing diameter and bolt-hole size, though, such bolt-through-tubing schemes can seriously degrade the mechanical strength of the tubing.

The element-to-boom mounting method I used to build the 12-meter Yagi is not necessarily new or unique; nonetheless, it has not been widely publicized. This method does not use U bolts and does not require vertical holes in any tubing member. Rather, four short pieces of aluminum angle stock are fastened to the element and boom using commonly available hardware, as shown in Fig 2. This method uses basic materials, is simple to employ and clamps the element to the boom firmly, with no danger of element movement or breakage by the mounting hardware.

Getting Aluminum Pipe or Tubing

Finding pipe or tubing for the antenna's boom and elements can require detective work. I was able to purchase Schedule 40 6061-T6 aluminum pipe of various diameters through my company. The limited range of sizes available resulted in less-than-ideal choices for boom and element material, but I was able to choose pipe sizes that produce an extremely rugged beam. (Actually, I was fortunate that the pipe sizes I chose for the Yagi elements fit together as smoothly as they did. To learn why you should proceed cautiously if you

Design Details

Standard, well-known equations were used to calculate element length and spacing. The element lengths are calculated using equations shown in *The ARRL Antenna Book*.* For the driven element,

$$\ell = \frac{475}{f} \qquad \text{(Eq 1)}$$

For the director,

$$\ell = \frac{455}{f} \qquad \text{(Eq 2)}$$

For the reflector,

$$\ell = \frac{500}{f} \qquad \text{(Eq 3)}$$

where

ℓ = length in feet
f = frequency in megahertz

As an aid to selecting element spacing and boom length, the wavelength at 24.950 MHz was calculated in inches with the equation

$$\lambda = \frac{11{,}811}{f} \qquad \text{(Eq 4)}$$

where

λ = wavelength in inches
f = frequency in megahertz

The element spacing was set at 0.14 λ for nearly optimum gain. This was also the spacing chosen by Lawson† in many of his Yagi design examples. Fig 1 of the main text shows values for element lengths and spacings at the design frequency, 24.950 MHz.

As a check of my calculations, I scaled Lawson's example of a three-element, 10-meter Yagi‡ by the ratio of the desired band-center frequencies (f1 [10 meters] and f2 [12 meters]):

$$\frac{f1}{f2} = \frac{28.400\ \text{MHz}}{24.950\ \text{MHz}} = 1.138 \qquad \text{(Eq 5)}$$

Scaling Lawson's 10-meter design to 12 meters results in element length and spacing values that agree with the values shown in Fig 1 to within 1%. The element taper schedule and boom diameter used in my 12-meter antenna also closely match those of the scaled version of Lawson's computer optimized design.—*Donald D. Button, AJ1T*

*Gerald L. Hall, ed., *The ARRL Antenna Book* (Newington: ARRL, 1988), p 11-11.
†Lawson, James L., *Yagi Antenna Design* (Newington: ARRL, 1987), Chapter 8.
‡*Yagi Antenna Design*, p 8-28.

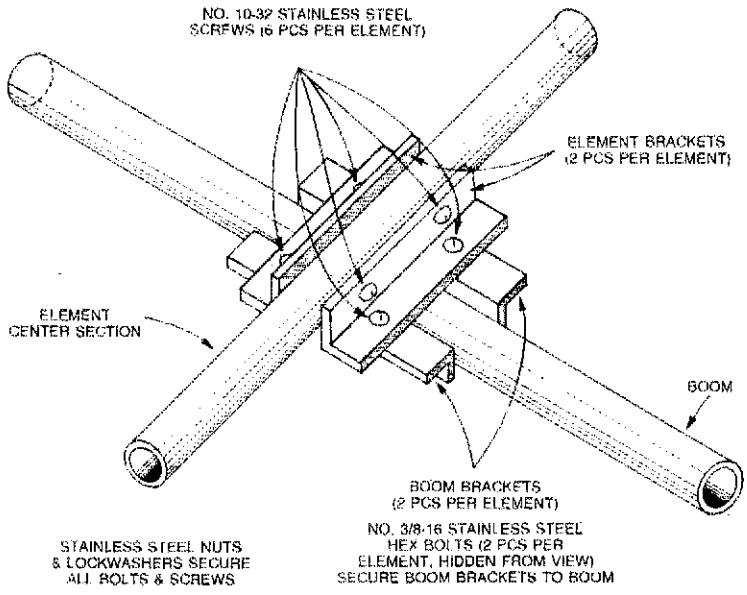


Fig 2—The elements of the 12-meter beam are mounted to the boom with 1¾ × 1¾ × 1/8-inch-thick aluminum angle brackets, and nos. 3/8-16 (boom) and 10-32 (element) stainless steel hardware. (In all cases, the mounting bolts and screws pass through the tubing diametrically.) No. 10-32 hardware fastens the element brackets to the boom brackets. This sturdy construction method does away with the U bolts, saddles and backing plates commonly used in element-to-boom mountings. See text.

Tubing Versus Pipe: What's the Difference?

Although *pipe* and *tubing* may at first seem to be used as synonyms throughout this article, they aren't: Metal pipe and metal tubing aren't the same. Most metal pipe is manufactured by extrusion and is generally intended to convey gases or liquids. Metal tubing, most of which is drawn—not extruded—is generally intended to be used for structural purposes.

Pipe sizes are generally specified—*scheduled*—in terms of *inner* diameter (ID) and wall thickness. These characteristics are important in piping systems because pipe must be able to withstand the pressure of the liquid or gas carried within it. Because pipe is generally intended to be threaded—on the outside—and connected with threaded couplings, scheduled pipe sizes don't lend themselves to the snug telescoping (lap) joints necessary in the construction of the tapered antenna elements.

Tubing, on the other hand, is specified by *outer* diameter (OD) and wall thickness in sizes *intended* to facilitate snug lap jointing. Because of this, and because tubing is generally manufactured to closer tolerances than pipe, tubing is the material of choice for constructing antennas.

I used Schedule 40 pipe to construct my 12-meter beam because it was readily available—and because I was able to find 1- and ¾-inch-ID Schedule 40 pipe that overlapped snugly without additional work. Actually, I was lucky: The design-center OD of ¾-inch Schedule 40 pipe is 1.051 inches and the design-center *ID* of *1-inch* Schedule 40 pipe is 1.049 inches! If the pipe I purchased had been smack on design center, the OD of the element end sections would have been several thousandths of an inch larger than the ID of the element centers—and I would have had to turn the element ends on a lathe to get them to fit inside the element center sections.

If you can find a good deal in pipe *that fits together snugly with minimum play*, use it by all means. If in doubt, though, go with the tubing sizes mentioned at Fig 1 and in note 4 of the main text. Stick with 6061-T6 aluminum if at all possible; it's the best for antenna construction. In any case, be sure to discuss your requirements with your aluminum supplier—he or she should be able to set you up with the right material for the job.—*Donald D. Button, AJ1T*

decide to build your beam elements out of pipe instead of tubing, see the sidebar, "Tubing Versus Pipe: What's the Difference?") The finished Yagi is certainly more rugged than most commercial beams that use thin-wall, drawn tubing. This is one antenna that will stay up for a long, long time!

You don't have to work a deal through your employer to build *your* 12-meter beam, though. Check your telephone directory's Yellow Pages for aluminum suppliers. If you can't find a local tubing source, at least one firm exists that will sell small quantities of tubing to hams.[2]

Feeding the 12-Meter Yagi

A simple gamma-rod arrangement matches the driven element to the 50-ohm coax feed line. I calculated the dimensions of the gamma matching section using the Smith chart analysis technique described in *The ARRL Antenna Book*.[3] Of course, you can use other means of matching the 12-meter Yagi to your feed line if you prefer. We'll discuss the adjustment of the matching section after we build the antenna.

Building the Beam

Each element consists of a 3-foot center section of 1-inch Schedule 40 aluminum pipe between two pieces (the element ends) of ¾-inch pipe.[4] Slit the ends of each center section with a hacksaw (four 1½-inch-deep cuts spaced at 90° around the circumference of the pipe) to allow insertion of the element end sections.[5] (Be sure to make the end sections long enough to provide at least 8 inches of overlap where the center and end sections of each element join.) Use all-stainless-steel hose clamps to secure the element end pieces in the slit center-section ends as shown in the reference cited at note 5. Before assembling the element ends to their corresponding center sections, apply conductive anti-oxidation grease (Penetrox®, No-Alox®, Oxiban® or a similar compound) to the overlapping portions of each element. Place plastic furniture-leg caps on the element and boom ends to keep out moisture and keep your antenna from singing in the wind.

Mounting the Elements to the Boom

The boom consists of an 11-foot, 8¼-inch length of 2-inch-ID Schedule 40 aluminum pipe. The outer diameter of this material is 2-3/8 inches. That's certainly very strong boom material for such a small antenna!

As shown in Fig 1, the driven element is located at the center of the boom, and the director and reflector are equally spaced from the driven element. After you have cut the boom to size, clearly mark the location of each element on the boom.

The element-to-boom mounting brackets (Fig 2) consist of 6-inch lengths of 1¾ × 1¾ × 1/8-inch aluminum angle stock. Four pieces of angle stock are used per element: two element brackets and two boom brackets. Cut the angle stock to size. Next, drill bracket-to-tubing mounting holes in each bracket that satisfy the two conditions specified at Fig 3. Don't drill the inter-bracket mounting holes yet.

Two conditions must be met in mounting the elements to the boom: (1) The elements must all lie in the same plane and (2) the elements must be exactly perpendicular to the boom. Condition 1 is the trickier of the two to satisfy; the secret to keeping all three elements in the same plane lies in proper installation of the element and boom brackets. Here's how to do this: Use a long, flat board as a reference plane. Clamp the boom to the board for stability. Use the drilled boom brackets as templates to mark the boom for drilling by placing all six brackets flush with the board *and* with the boom, the bracket-to-boom mounting holes toward the boom. Center each boom-bracket pair (director, driven element and reflector) on the location of each element. Using the brackets as templates, mark the boom for drilling. Next, drill a small pilot hole at each mark and confirm that these holes are properly aligned with the boom-bracket holes. Finally, enlarge each hole to pass the no. 3/8-16 boom-bracket

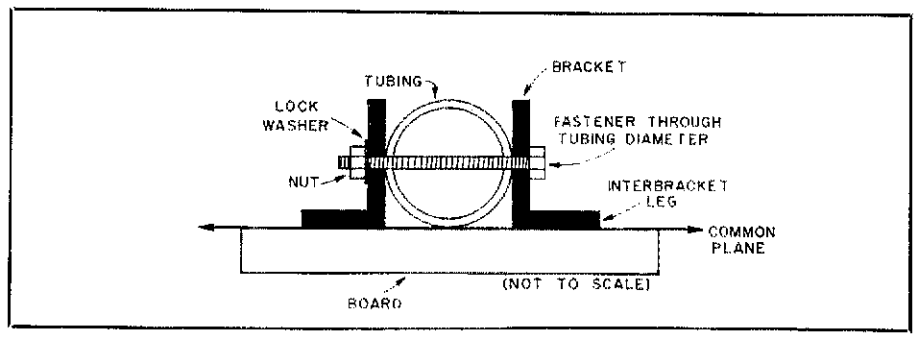


Fig 3—Each mounted bracket must satisfy two conditions: (1) Its mounting bolt or screw must pass through the tubing diametrically and (2) the plane of its interbracket leg must be tangential to the tubing along the entire length of the bracket. See the text for how to accomplish this easily with the help of a board as a reference plane.

mounting bolts. Unclamp the boom from the board and set it aside. Now, use the same technique to locate and drill the bracket-to-element mounting holes (for no. 10-32 screws) in the element center sections.

Attach the six boom brackets to the boom with no. 3/8-16 galvanized or stainless steel bolts, nuts and lock washers. Attach the six angle brackets to the element center sections with no. 10-32 stainless steel screws, nuts and lock washers.

Assembly of the elements to the boom must be done outdoors. All three elements will lie on the same plane if you've been careful installing the mounting brackets to the elements and boom; the critical part of element-to-boom assembly is ensuring that the elements are mounted *perpendicular to the boom*. Drill holes large enough for no.

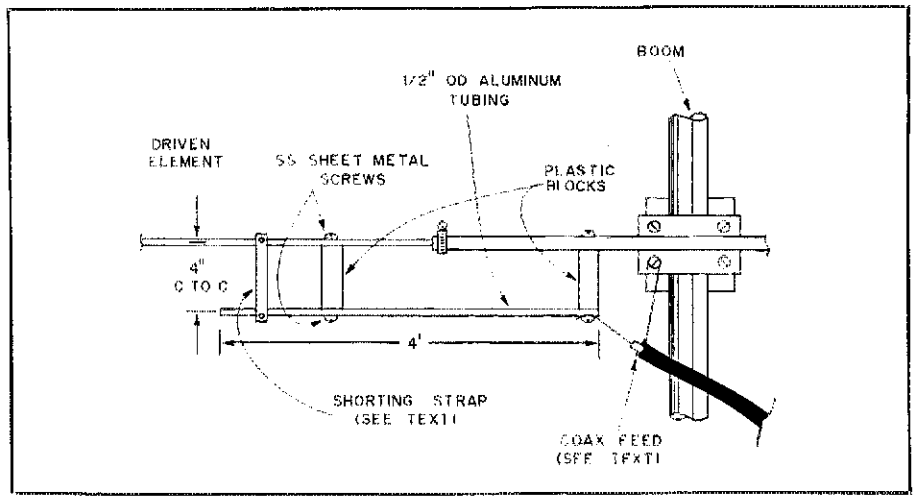


Fig 4—Detail of the gamma matching section for the 12-meter beam. The gamma rod and driven element are spaced 4 inches center to center; the separator blocks have notches cut in each end to seat the element and gamma rod tubing. See the text for details on connecting the feed line to the driven element and how to determine the position of the gamma shorting strap.

Some Comments on Parts Procurement

As mentioned in the main text and note 2, aluminum tubing is available from a number of sources. The angle stock I used for mounting the elements to the boom may be available through the same aluminum distributors that stock the tubing necessary for the boom and elements. (I've also seen *steel* angle stock for sale at lumberyards that would work fine if carefully rust proofed with rust-preventive paint or a similar product.)

One source for the boom-to-mast plate material is your local salvage yard. Steel plate is rather common and is excellent for this purpose if thoroughly rust proofed.

The U bolts used for the antenna-to-mast mounting can be made at home using zinc-plated, threaded rod stock (available at hardware stores). Using the boom and mast as forms, carefully bend the rod stock around the pipe and cut off the excess length with a hacksaw. For added leverage, slip a length of scrap water pipe over the free end of the threaded rod. If you use homemade U bolts, coat them with rust-preventive paint after they are installed.

Hardware stores often sell stainless steel hardware in popular sizes. Such sources should be able to supply you with the element-to-boom hardware, and the hose clamps necessary for cinching the element ends to the element centers. Also, check your Yellow Pages under "Fasteners" or "Screws" for a distributor who can sell at the retail level. Such firms are likely to carry the 3/8-inch bolts you need in galvanized or stainless-steel form.

Anti-oxidation grease is available from larger hardware stores and electrical supply houses.—*Donald D. Button, AJ1T*

10-32 interbracket screws in the element brackets. Set each element on the boom one by one—element brackets to boom brackets—and adjust their positions for proper perpendicularity and centering. Once you've determined the proper position for a given element, use its drilled element brackets as templates to mark the corresponding boom brackets for drilling. Drill the boom brackets to pass no. 10-32 holes and mount the elements to the boom.

The Boom-to-Mast Clamp

Unlike the element-to-boom mountings, the boom-to-mast clamp *does* rely on U bolts and a metal plate (a 6- × 8-inch piece of ¼-inch-thick aluminum).[6] The end of the plate is located two inches from the driven element mounting brackets on the reflector end of the boom, as indicated in Fig 1. This helps to balance the antenna at its mounting point. (The antenna's center of gravity lies between the driven element and reflector because the elements increase in length from director to reflector.) I used galvanized U bolts (between boom and clamp, and clamp and mast) to mount the antenna in place.

The Gamma Matching Section

The gamma-matching rod consists of a 4-foot length of ½-inch-OD aluminum tubing. I mounted mine to the driven element by means of two plastic blocks that have notches cut in each end (Fig 4). This assembly is held together, and to the driven element, by stainless steel sheet metal screws that pass through the element and the tuning rod into the blocks. (The next section, Adjustments, describes the construction of the gamma shorting strap.) The inner conductor of the coaxial feed line is connected to the boom end of the gamma rod; the coax shield is connected to a solder lug under one of the driven element bracket mounting screws.

Adjustments

Make a temporary gamma shorting strap from a scrap of stranded antenna wire to permit experimentation in finding the best match. Next, mount the beam in an accessible test position as far off the ground as feasible. (I mounted the beam to my tower about 20 feet above the ground for this step.)

Adjust the length of the driven element for the lowest SWR at 24.95 MHz. (In my case, this length was within a few inches of the calculated length shown in Fig 1.) Next, adjust the gamma match shorting wire for an acceptable SWR across the band. I obtained an SWR of about 1.8 across the band when I slid the gamma shorting wire to a point about 40 inches down the rod from the boom.

Once you've determined the optimum position for the matching short, make a permanent shorting strap out of 1/16-inch-thick aluminum sheet stock. (I used a piece 5 inches long and ¼ inch wide.) Fasten this to the element and the gamma rod with no. 10-32 stainless steel machine screws, lock washers and nuts. (As I mentioned earlier, you may prefer to use a balun-fed hairpin or T matching arrangement instead of the gamma; such may allow an even better match across the band than I achieved. The match I obtained, however, is good enough to allow my solid-state transceiver to deliver full power anywhere in the band.)

I adjusted the length of neither the director nor reflector after I constructed them to the lengths called out in Fig 1. If you wish, you can optimize the antenna's gain and front-to-back ratio with the help of another 12-meter operator. Simply adjust

the reflector length for minimum signal off the back of the beam, and the director for maximum forward signal strength.

On the Air

I mounted the 12-meter beam eight feet above my tribander (at the 80-foot level)—but not before I thoroughly weatherproofed the antenna end of the coaxial feed line with electrician's tape to prevent moisture from entering and damaging the cable.

The antenna's performance is outstanding. With it, I've had many contacts with Europe, South America and Africa. The Yagi also enabled me to take advantage of the strong band openings to Europe that were fairly common last spring. Most stations were worked on the first call.

Although I did not adjust the element lengths to optimize any aspect of the Yagi's performance other than SWR bandwidth, the antenna seems to possess a front-to-back ratio of about five S units (as roughly measured on my transceiver's S meter). Front-to-side ratio is even better: about seven S units. The antenna's forward gain appears to be near the textbook value of about 8 dBi, based on the clearly defined pattern I perceive as I rotate the antenna while receiving.

Twelve meters stands to *really* strut its stuff during Solar Cycle 22. The simple 12-meter beam I've described here can help you take advantage of the band at its DX best. So, go to it! If you build one of these antennas, please let me know your results.

Notes

[1]A 12-meter monobander has since been announced by Cushcraft.—*Ed.*

[2]Metal and Cable Corporation, Inc, 2170 E Aurora Rd, PO Box 117, Twinsburg, OH 44067, tel 216-425-8455.

[3]Gerald L. Hall, ed., *The ARRL Antenna Book* (Newington: ARRL, 1988), pp 26-17, 26-18, 28-14 and 28-15.

[4]I encourage builders to use somewhat thinner-walled tubing for the elements, such as ¾-inch OD, 0.058-inch-wall tubing for the element ends and 7/8-inch OD, 0.058-inch-wall tubing for the element center sections. (This particular combination is attractive because the 0.009-inch difference between the element center ID [0.759 inch] and element end OD [0.75 inch] would provide a snug fit at the element lap joints.) Tubing of this size should be entirely adequate for this antenna design and is available from the supplier listed in note 2, as well as other sources. I used Schedule 40 pipe because it was readily available. If you use tubing of size and wall thickness adequate for good mechanical strength, the electrical performance of your antenna should closely duplicate that of my antenna. For more on the difference between pipe and tubing, see the sidebar, "Tubing Versus Pipe: What's the Difference?"

[5]For more on this and other aspects of constructing antennas with aluminum tubing, see Mark Wilson, ed., *The 1988 ARRL Handbook* (Newington: ARRL, 1987), pp 33-4 to 33-6.

[6]See note 5.

Don Button, born in 1957, was first licensed as WN2IMD in 1969. In 1971, he upgraded to General class and the call sign WA2IMD. From 1972 to 1973, he participated in his high school radio club in Chatham Township, New Jersey, and taught code to other students. In 1980, he upgraded to Amateur Extra Class, received the call sign AJ1T and shortly thereafter received his Bachelor of Science degree in Electrical Engineering from the University of Delaware. After his graduation, he was employed by the Raytheon Company, Wayland, Massachusetts, and Sanders Associates, Nashua, New Hampshire, as a microwave antenna design engineer. He is presently employed by Gabriel Electronics, Inc, Scarborough, Maine, where he leads several antenna design projects in the land-based communications industry.

Don is Assistant Technical Coordinator for ARRL's Maine section, as well as secretary for the Portland Amateur Wireless Association. He enjoys HF DXing and ragchewing on SSB and CW, as well as HF and VHF packet radio. His other interests include downhill skiing, digital audio, photography and church activities. He lives with his wife, Gail, who is not a ham, but who has been spotted now and again on the tower helping Don raise his latest collection of aluminum and wire!

QEX

QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

The September issue of *QEX* includes something of interest for those interested in weather-facsimile reception: the Faxboard. This plug-in card acts as the interface between the audio output of your weather-facsimile receiver and the I/O bus of an IBM® PC. You'll also see how you can modify an oscilloscope to turn it into an effective tuning indicator for packet radio, RTTY and SSTV. You can change or add shift frequencies as you desire, simply and with a minimum of components.

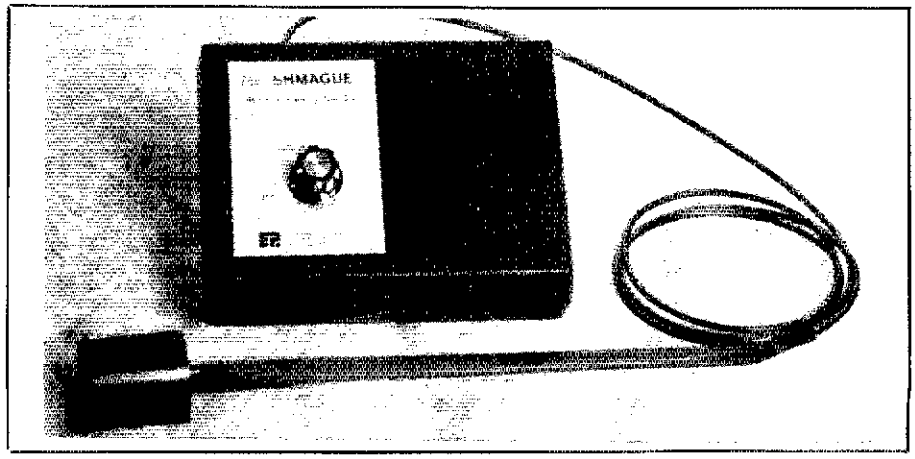
- "A Weather-Facsimile Display Board for the IBM PC", by H. Paul Shuch, N6TX
- "A Tuning Aid for Packet Radio, RTTY and SSTV", by Massimo Biolcati, I4YH
- "VHF+ Technology," by Geoff Krauss, WA2GFP
- "Components", by Mark Forbes, KC9C

QEX is edited by Paul Rinaldo, W4RI, and is published monthly. The special subscription rate for ARRL/AMSAT members is $10 for 12 issues; for nonmembers, $20. There are additional postage surcharges for mailing outside the US; write to Headquarters for details.

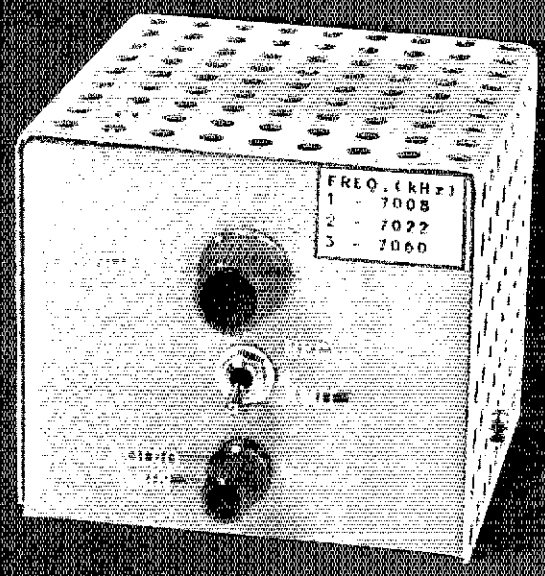
New Products

MAGNETIC-PICKUP AUDIO SIGNAL TRACER

☐ Electron Processing has introduced the SCHMAGUE, an audio-signal tracer that uses a magnetic pickup mounted on a wand with a 6-foot cord, for troubleshooting equipment. The SCHMAGUE allows audio-signal tracing without electrical or physical connection to the equipment under test; it detects the magnetic field around wires, amplifies it, and feeds it to an internal speaker. The SCHMAGUE runs on a 9-V battery, and is housed in a 5.3 × 4 × 1.5-inch enclosure. A phono jack provides signal output for a monitor scope or frequency counter. Price class: $59.95 (quantity discounts available). To order, or for more information, contact Electron Processing, Inc, PO Box 708, Medford, NY 11763, tel 516-764-9798.—*Rus Healy, NJ2L*



A Three-Channel CW Emergency Transceiver



Part 1: Ham radio hikers, boaters, campers and pilots can use this 1 W, 40-meter CW transceiver for emergency communications. QRP enthusiasts may duplicate the circuit for day-to-day fun.

By Doug DeMaw, W1FB
ARRL Contributing Editor
PO Box 250
Luther, MI 49656

Does the prospect of owning a small transceiver that measures only 3½ × 3½ × 3 inches appeal to you? How about a total weight (minus power supply, key and antenna) of only 11 ounces for the basic unit? Because of my numerous boating trips and wilderness camping, I chose to develop a small transceiver that could be carried easily among the other standard field items for these ventures. This two-part article details the circuit I developed. PC boards for this project are available.[1]

Design Philosophy

Some of you may experience a psychological hardship when you consider that this transceiver is crystal controlled for both transmit and receive. The notion that we should be able to tune about in a ham band, even though the transmitter is crystal controlled, is firmly implanted in most of our minds. This three-channel transceiver is completely crystal controlled.

I recall being urged some years ago by Armond Noble, the publisher of *Worldradio*, to develop such a device. About the same time, Wes Hayward, W7ZOI, and I discussed the pros and cons of a "rock-bound" QRP transceiver. We concluded that the concept was entirely viable for emergency and portable operation, but we didn't proceed with a design.

Crystal control offers advantages: Frequency stability is excellent under varying conditions of temperature and humidity. Also, one crystal may be used for transmit and receive if a direct-conversion receiver is used. All that is required is a 700-800 Hz frequency offset between transmit and receive (receive frequency 700 Hz higher). Moreover, large tuning capacitors and dial mechanisms are eliminated when crystals are used for both modes. Finally, a crystal-controlled transceiver should cost less than one that uses an LC type of VFO.

Fig 1 shows a block diagram of the transceiver inner workings. Q4 and Q5 form a "teeter-totter" control for the oscillator. During transmit, Q4 routes the crystals to ground when +12.5 V is applied to its base via S2. Q5 is switched on in a like manner by S2 during receive, at which time Q4 is turned off. C14 and L5 form a VXO circuit to permit shifting the crystals up in frequency by 700-800 Hz. Signal injection at this frequency is taken from the output of buffer Q2 and routed to the LO amplifier, Q11.

The PA output filter (FL1) serves as the input network for the receiver through series-resonant sampling components C17 and L4. D2 and D3 short the signal to ground during transmit, thereby protecting Q9 from damage. FL3 provides additional attenuation of the 14-MHz second harmonic of the transmit signal.

S2 also switches +12.5 V to Q9, Q10 and Q11 during reception. These stages are turned off during transmit, but U1 continues to operate so the sidetone can be heard in the phones for monitoring the CW sending. The transmitter and receiver circuits are on separate PC boards, which are the same size. In this part of the article, we will concentrate on the transmitter section of the transceiver. Part 2 deals with the receiver.

The 1-Watt Transmitter

Fig 2 shows the schematic diagram of the transmitter section of the transceiver. Eight low-cost, small-signal transistors are used to provide 1 watt of RF output. You should be able to buy the transistors for less than 25 cents each. I bought my 2N4400s for 15 cents each.

Feedback for oscillator Q1 is determined by C1. Some experimentation with the C1 value may be necessary if crystals other than those specified are used. Use only enough capacitance to ensure fast oscillator starting at the *crystal* frequency. Too much feedback will cause oscillation on other than the crystal frequency.

Q2 is used as a buffer to isolate Q1 from the keyed linear amplifier, Q3. This reduces the potential for a chirpy note. Q1 and Q2 operate at all times in order to supply LO injection for the product detector in the receiver. A simple low-pass filter (600 Ω bilateral) is located between Q2 and Q3 to remove some of the harmonic currents that are present at the output of Q2. This

[1]Drilled, solder plated glass-epoxy PC boards for this project are available from FAR Circuits (N9ATW), 18N640 Field Court, Dundee, IL 60118. The two-board set (transmitter and receiver) is $9.95 postpaid. Boards for other QST projects are also available. The ARRL and QST in no way warrant this offer.

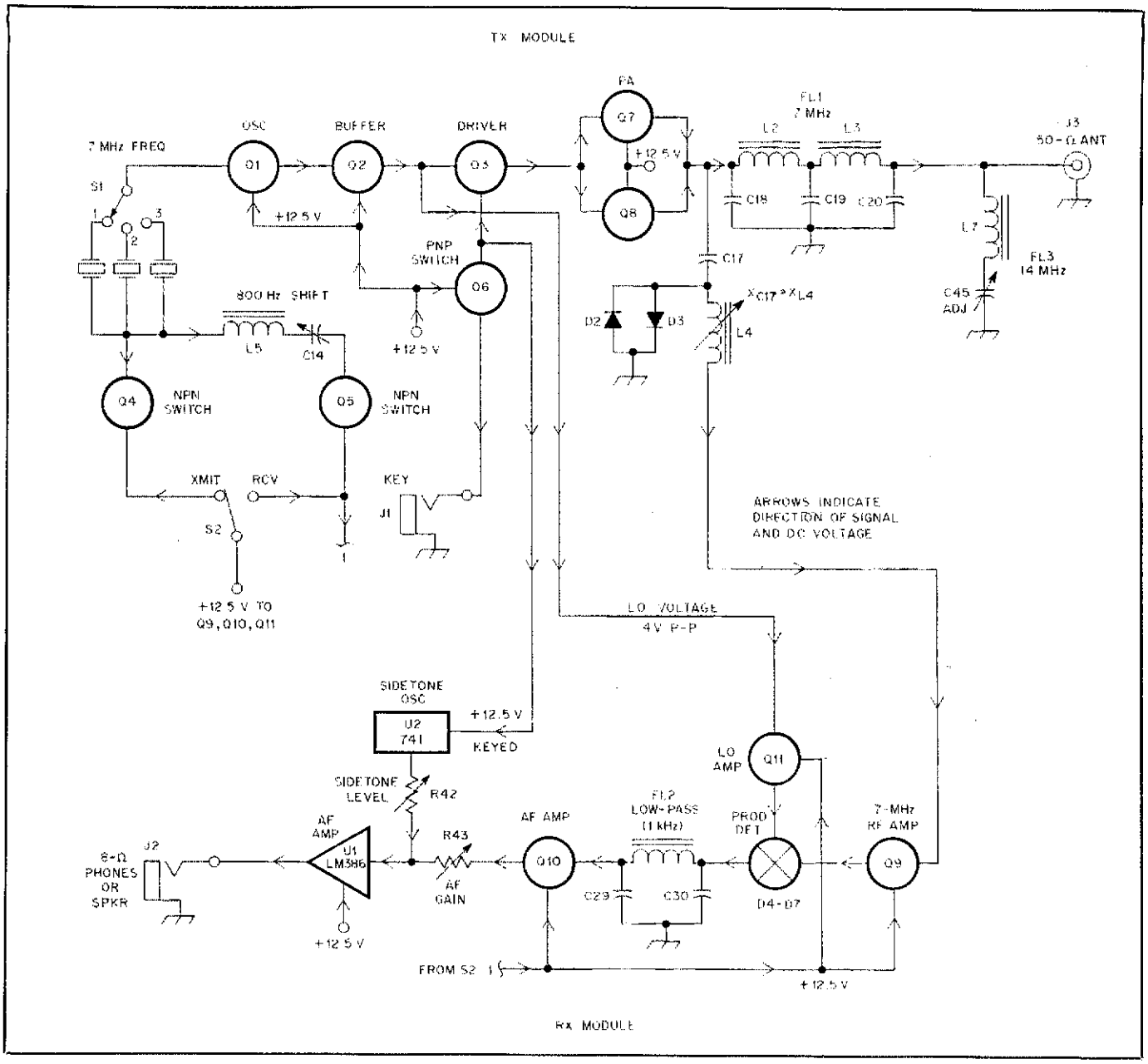


Fig 1—Hybrid block diagram of the emergency transceiver circuit. Q4 and Q5 serve as a "teeter-totter" oscillator switch to provide 700-800 Hz of frequency offset during reception. FL1 serves double duty as the transmitter output and receiver input networks. The CW sidetone is generated by U2.

ensures a cleaner LO signal for the receiver, along with a more "sanitary" sine wave for driving Q3.

Q3 is coupled and matched to the PA stage, Q7 and Q8, by means of broadband transformer T1. R17 helps to prevent self-oscillation of Q3, Q7 and Q8. Keying of Q3 is done by way of PNP switch Q6. When the base of the transistor is grounded by the key or keyer, Q6 conducts and routes dc voltage to Q3. Shaping components are used at Q6 (C11, C12, R15 and R16) to provide a click-free CW note. A positive 12.5-V output is taken from Q6 to operate the sidetone oscillator on the receiver board when the transmitter is keyed.

Q7 and Q8 operate class C, parallel mode. R23 and R24 are current-stabilizing resistors that prevent one or the other PA transistor from hogging current. The resistors also help to prevent destructive thermal runaway. Zener diode D1 protects the PA transistors from excessive collector-emitter voltage when the SWR is high, or should the PA self-oscillate. It also protects Q7 and Q8 from voltage spikes that may appear on the 12.5-V supply line.

C17 and L4 form a series resonant circuit of the type that has been used by Wes Hayward, W7ZOI, and Roy Lewallen, W7EL, in their transceivers. L4 is adjusted for maximum received signal while listening to the receiver. I chose a variable inductor in order to obtain on-the-nose matching (X_L) for the reactance of C17.

Teeter-Totter Crystal Switch

I developed the Q4-Q5 circuit especially for this rig. I have not seen it published previously. Low inductance and low capacitance are specified for L5 and C14 in order to make adjustment less critical. A 22-μH inductor and a 100-pF capacitor would allow the 7-MHz crystals to be shifted some 7 kHz (slightly above and considerably below the marked crystal frequency.) However, this would cause the 800-Hz shift adjustment to be very precarious, owing to the fast change in frequency when C14 is adjusted. In its present form, the

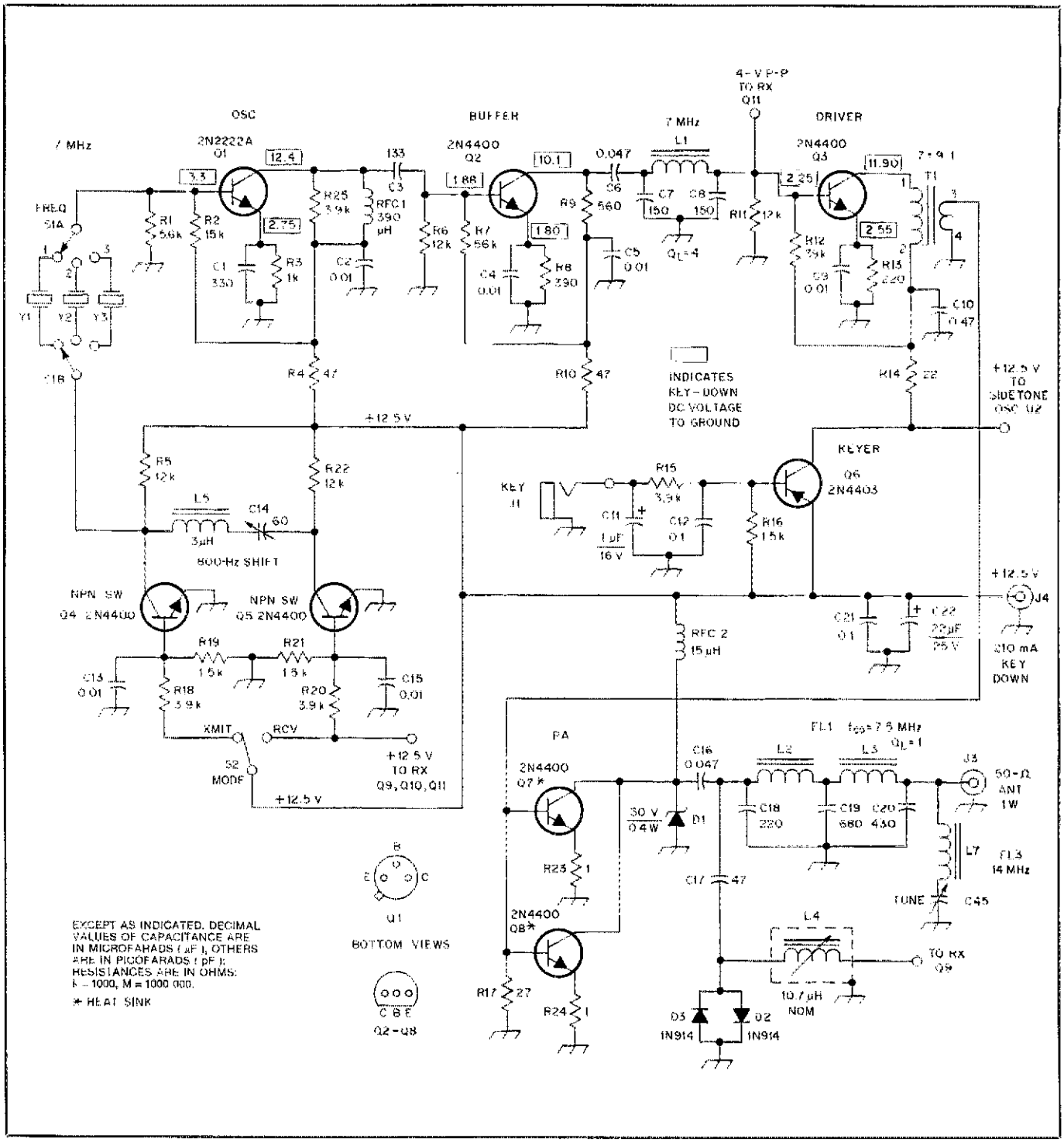


Fig 2—Schematic diagram of the 1-watt transmitter. Fixed-value capacitors are disc ceramic except for those listed below. Polarized capacitors are tantalum or electrolytic. Resistors are ¼ W, carbon composition.

C1—Disc, silver mica or polystyrene.
C6, C10, C16—Mylar® or ceramic.
C14—10-60 pF ceramic or plastic trimmer, PC mount.
C18, C19, C20—NP0 ceramic, silver mica or polystyrene.
C45—Ceramic trimmer, 10-115 pF. (May consist of 68-pF fixed capacitor (NP0 ceramic, silver mica or polystyrene) in parallel with 10-35 pF trimmer.
D1—30- or 33-V Zener, 400 mW or 1 W.
D2, D3—Small signal switching diode, type 1N914.
L1—Toroidal inductor, 5.8 µH; 20 turns of no. 26 enam wire on an Amidon Associates FT-37-63 ferrite toroid.
L2—Toroidal inductor, 20 turns of no. 26 enam wire on an Amidon T-37-6 powdered-iron toroid, 1.25 µH.
L3—Toroidal inductor, 17 turns of no. 26 enam wire on an Amidon T-37-6 powdered-iron toroid, 1.0 µH.
L4—Shielded variable inductor, 35 scramble-wound turns of no. 30 enam or small Litz wire on bobbin of an Amidon L-43-2 transformer assembly, 10.7 µH nominal.
L5—Toroidal inductor, 31 turns of no. 28 enam wire on an Amidon T-37-6 powdered-iron toroid, 3 µH. A miniature 3.3-µH RF choke may be used.
L7—Toroidal inductor, 23 turns of no. 28 enam wire on Amidon T-50-6 powdered-iron toroid, 1.5 µH.
S1—Two-pole, 3-position mini rotary switch, single wafer. See text.
S2—SPDT toggle switch.
T1—Broadband transformer, 3:1 turns ratio. Use 12 turns of no. 26 enam wire on an Amidon FT-37-43 ferrite toroid (primary). Secondary has 4 turns of no. 26 enam wire over primary winding.
Y1, Y2, Y3—Fundamental 7-MHz crystal, 30 pF load capacitance, HC-18 holder. Available from JAN Crystals, 2341 Crystal Dr, PO Box 06017, Fort Myers, FL 33906 (catalog available).

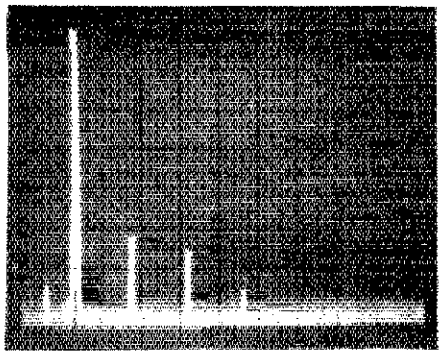


Fig 3—Spectral display of the transmitter output of the 1-watt emergency transceiver. Horizontal divisions are each 5 MHz; vertical divisions are each 10 dB. With 13.8 V from the supply, the fundamental output power (tall spike) is approximately 1.5 watts at 7 MHz. The 2nd, 3rd and 4th harmonics are down by 52, 55 and 65 dB, respectively. This nicely meets the FCC specification for spectral purity, which requires spurious output to be at least 30 dB down.

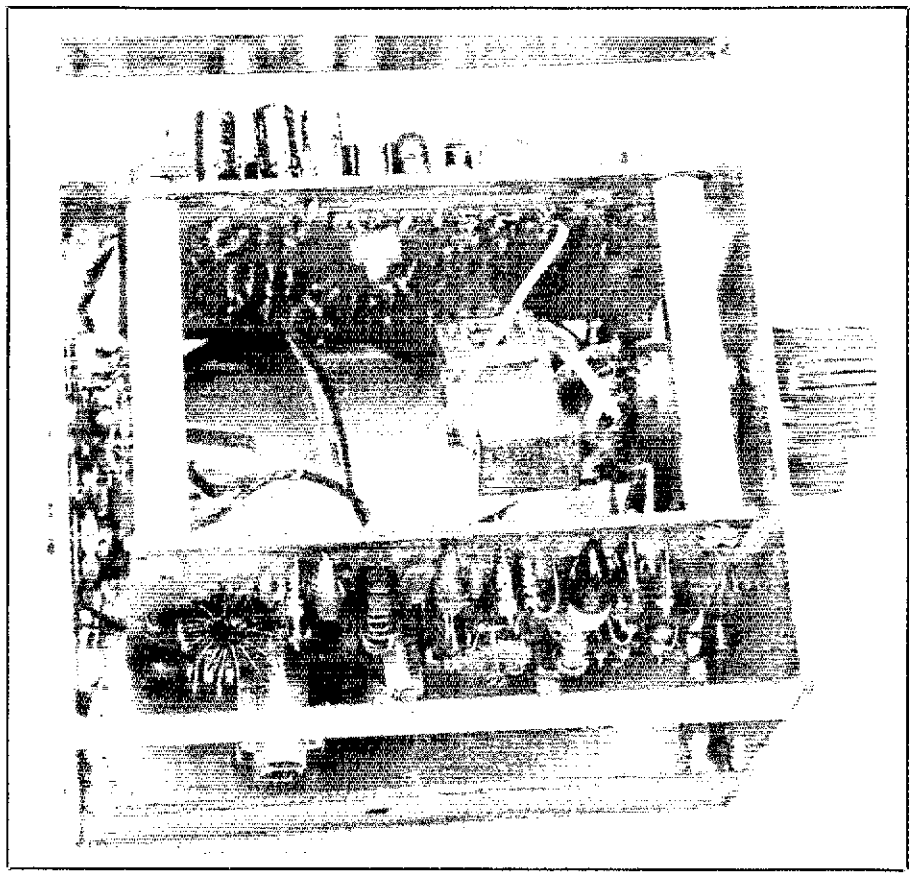


Fig 4—The interior of the transceiver. The PC boards are mounted side by side, vertically. In this photo, the receiver board is at the top and the transmitter board at the bottom. No. 6 spade bolts affix the boards to the bottom of the case. Metal spacers join the PC boards at the top. The 3½ × 3½ × 3-inch box is made from double-sided PC board. PC-board braces (two on each side, top and bottom) are soldered between the front and rear box panels to provide rigidity. RTV sealant is placed between the three crystals, visible at the center of the picture.

VXO circuit permits a shift of approximately 1.25 kHz.

A manual switch (S2 of Fig 1) is used to route operating bias to Q4 and Q5. The same switch removes operating voltage from the receiver front end during transmission. Additional solid state switches could be added for this function, but they would add to the current drain of the transceiver, and they would make it necessary to key Q1 and Q2 each time the CW key was pressed (the added solid state switches would be triggered by Q6). This would also deprive the receiver of LO injection during receive. I used a mechanical switch for the sake of simplicity. It must be operated when going from transmit to receive and vice versa.

You may use as many crystals as you wish. A miniature rotary switch (S1) with additional positions will make this possible. In any event, the switch chosen should have low capacitance between contacts and ground. If not, the VXO circuit may have a restricted tuning range.

Adjustment Notes

You may elect to lower the transmitter output power to 500 mW, or even 100 mW. This will reduce the total current drain of the transceiver (210 mA, key down, as shown in Fig 2). Reduced power is worth considering when battery operation is planned. You may increase the resistance of R13 if you decide to reduce the power. In fact, you may want to add an SPDT switch to provide a 1-W and 100-mW power choice. Two emitter resistors will be needed at Q3 if this is done.

You may find that you have too much or too little output power when you test this transmitter. The gain of the transistors you select will govern the power output. Changes in the value of R13 will permit you to set the total current drain of the transceiver (key closed) at 210 mA. This value of current will result in approximately 1 watt of output power into a 50-Ω load.

As mentioned earlier, FL3 provides additional attenuation of the transmitter second harmonic over that provided by FL2. It acts as a series resonant trap, and should be adjusted for resonance at 14 MHz. One method of tuning this filter is to key the transmitter into a dummy load while listening to the harmonic signal in a separate receiver. The receiver antenna terminals should be shorted together, and the receiver located far enough away and shielded well enough to avoid blocking. Adjust C45 for minimum received signal. Another method is to use a dip meter set to operate as a diode detector. Connect a 3-turn loop between J3 and a 51-Ω 2-W load resistor. Couple the dip meter to the loop, tune the meter to the 14-MHz harmonic, and then adjust C45 for minimum meter indication. The receiver method of adjustment is preferred, as the inductance of the pickup loop (and load resistor) connected to J3 may have a slight mistuning effect on FL3. The spectral output of the transmitter with FL3 adjusted properly is shown in Fig 3.

Construction Data

I designed the transmitter and receiver PC boards to have the same dimensions. This was done to permit stacking them with metal spacers as separators. I chose to mount my boards side by side, vertically. This results in a nearly cube-shaped package. You may place the boards side by side horizontally if you prefer a low profile package. Fig 4 shows the layout I used.

It is important that you locate crystal switch S1 as close to the related PC-board pads as practicable. Short leads for the crystal circuit are mandatory for proper performance. The same is true of the lead that feeds LO voltage from L1 to Q11 in the receiver. I used a 2-inch piece of hookup wire for this purpose, visible in the center of Fig 4.

The toroidal coils and transformers in my unit are mounted vertically. After the circuits were tested and found satisfactory, I glued the toroids to the PC boards with quick setting epoxy cement. This prevents movement from vibration and shock. That

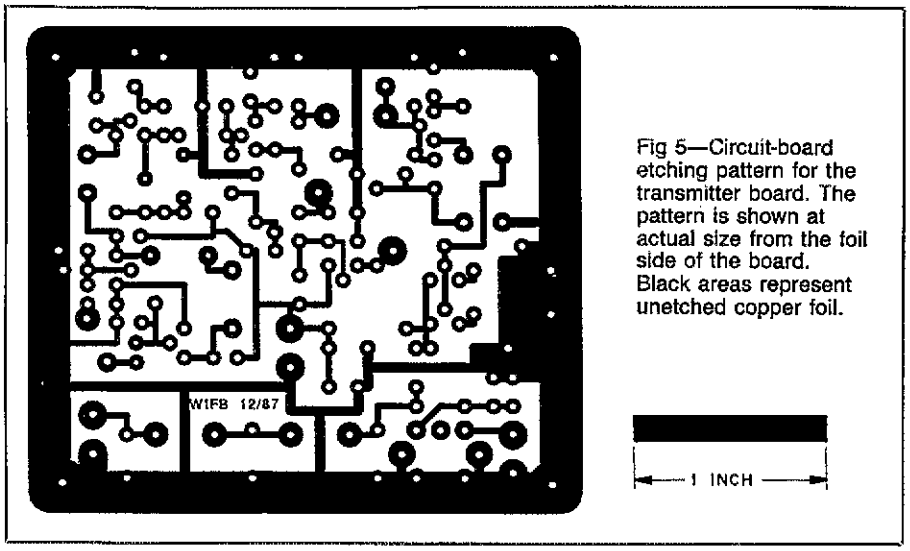


Fig 5—Circuit-board etching pattern for the transmitter board. The pattern is shown at actual size from the foil side of the board. Black areas represent unetched copper foil.

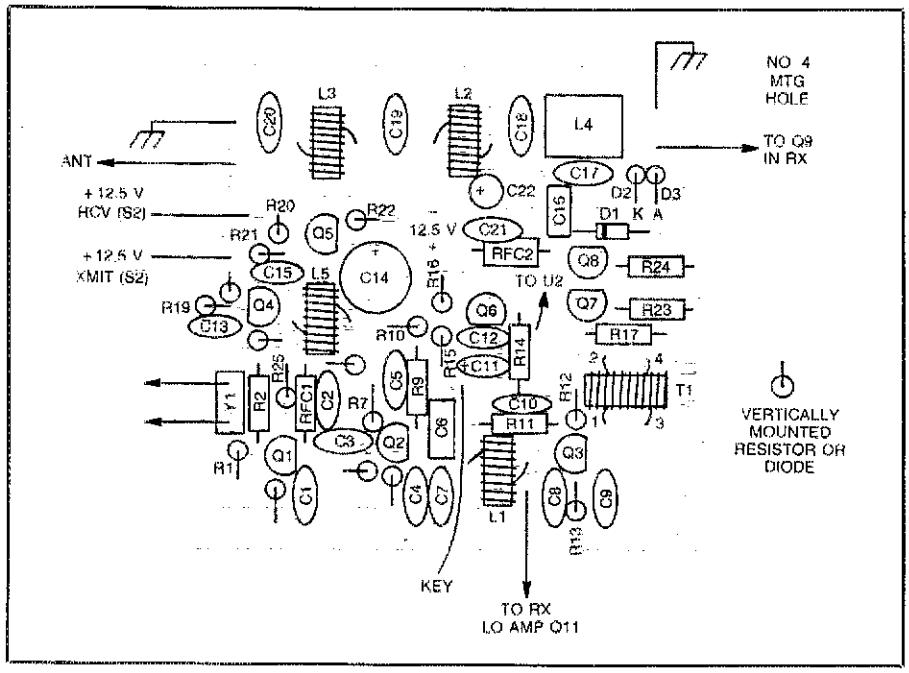


Fig 6—Parts-placement guide for the transmitter circuit. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. Not to scale. Component outlines are not necessarily representative of the shapes of the actual parts used.

type of stress can break the wire leads in time. A large dab of RTV sealant may be placed between the three crystals to add rigidity at S1, thereby reducing stress on the wire leads of the crystals.

My cabinet is homemade from pieces of double-clad PC board. The walls and bottom of the box are soldered at the seams. Reinforcing strips are soldered between the front and back panels at the top and bottom on each side. The finish on the panels is gray automotive primer. Press-on decals serve as control labels. After they are applied you may add a coating of clear lacquer spray to the panels. The cabinet lid is fashioned from perforated aluminum stock. There is no reason why solid metal or PC-board stock can't be used for the top cover. I added four adhesive-backed feet on the bottom of the box.

Fig 5 contains a foil-side etching pattern to scale. A parts-placement guide is presented in Fig 6.

Wrap-Up

You may adjust the C14 offset trimmer by sampling the signal at the junction of L1 and C8. A frequency counter can be attached at that point. Observe the transmit frequency, then place S2 in the RECEIVE position. Adjust C14 for a frequency that is 700 or 800 Hz higher than the transmit frequency. If you do not have a counter you may use your receiver during adjustment of C14. Owing to variations in crystal characteristics, the offset may be slightly different for each crystal with a given setting of C14. My rig has crystals for 7008, 7022 and 7060 kHz. The offsets are 765, 800 and 725 Hz, respectively when C14 is set for 800 Hz offset with the 7022-kHz crystal. This disparity causes no problems.

The transmitter PC board is drilled to accommodate an HC-18 crystal at the point where S1 is attached. You may install a crystal on the PC board and eliminate the crystal switch. If you choose this option, you will have a single-channel rig.

In the interest of emergency operation, you may want to install a momentary push-button switch at the center of the cabinet lid. This will serve as a CW key. It should be wired to the keying line at J1 (see Fig 1) if you include this feature.

Small, homemade, cylindrical heat sinks are used on Q7 and Q8, visible in the lower left corner of Fig 4. I formed my sinks from thin aluminum stock by means of long-nose pliers. Thin brass or copper sheeting is also suitable. The sinks are ¾ inch high, and are formed to press onto the transistors. After they are in place, allow a couple of drops of epoxy cement to flow inside them to the transistors. This helps to transfer heat and keeps the sinks in place. You will note some gain drift in the PA stage. When you first key the transmitter the total current will be on the order of 190 mA. It rises to 210 mA after a few characters are sent. This is because the gain of Q7 and Q8 increases with junction heating. This phenomenon is nothing to worry about, but it is worthy of mention.

The receiver portion of this transceiver will be described in Part 2 of this article, in a subsequent issue of *QST*. If you are interested in only the transmitter, you may eliminate Q4 and Q5. Y1 will then be returned directly to circuit ground.

Strays

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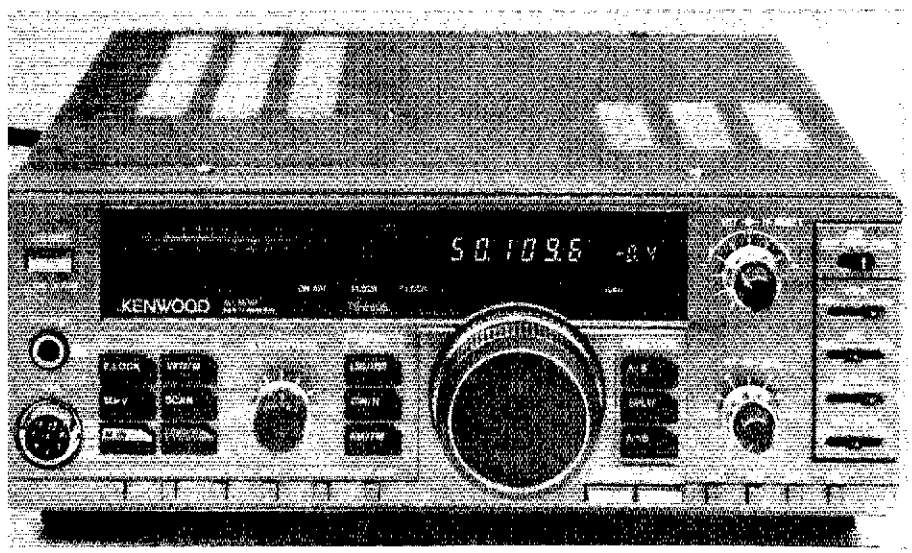
Conducted By Mark Wilson, AA2Z
Senior Assistant Technical Editor

Kenwood TS-680S 160- to 6-Meter Transceiver

Reviewed by Bart J. Jahnke, KB9NM



The Kenwood TS-680S is a full-featured, compact transceiver that covers *6 meters* as well as the usual 160- to 10-meter bands. On 160 through 10 meters, the '680S is virtually identical in features, operation and performance to the Kenwood TS-140S.[1] In this review, I'll highlight the differences between the two transceivers and talk about features found on the '680S that are not found on the '140S.

Aside from frequency coverage, there are two noticeable differences between the TS-680S and TS-140S: The '680S does not include a built-in VOX, but it does have a 10- and 6-meter preamplifier.

If you want VOX operation with your '680S, you'll need to purchase an optional Kenwood VOX-4 unit. The VOX-4 is an external accessory that is easily connected to the transceiver by placing it between the microphone and the transceiver's front-panel MIC jack. The VOX-4, which supports the regular lineup of VOX controls such as VOX GAIN, ANTI VOX and DELAY TIME, also includes a built-in audio speech processor with its own OUTPUT control. The TS-680S has an internal speech processor, though, so use of the processor in the VOX-4 is not necessary.

Part of the reason why there is no built-in VOX is the receive preamp that operates from 21.5 to 60 MHz. This preamp works on 12, 10 and 6 meters, as well as the broadcast bands in between. The RF AMP switch replaces the VOX switch found on the '140S's front panel. Lab testing indicates that this preamp improves the receiver noise floor by about 4 dB. In on-the-air tests, the preamp helped pull the weak ones out of the noise.

Receiver

The receiver in the TS-680S is essentially the same as in the '140S. The big differences are the 10- and 6-meter preamplifier, and frequency coverage. In addition to the receiver features in the TS-140S (which covers 100 kHz to 35 MHz), the TS-680S has extra receiver coverage from 45 MHz to 60 MHz. You might ask, "What can this little extra coverage do for me?" Being able to listen to much of the spectrum between the 10- and 6-meter bands is especially useful if you're interested in working 6-meter band openings. You can follow the maximum usable frequency (MUF) of F-layer propagation or E-skip openings as it climbs above 10 meters by listening to the many public service frequencies within this range. Another feature I liked is that the '680S can receive the European TV carriers around 48.240 and 48.250 MHz. Most 6-meter transceivers cannot tune below 50.0 MHz, but this transceiver can—allowing you to use European TV carriers as propagation beacons.

In general, the '680S has a good receiver. I found, however (as did the TS-140S reviewer), that stations whose signals were stronger than S9 sometimes introduced blocking problems in the receiver. Weaker stations are difficult to hear when the nearby strong station transmits. This effect is noticeable on 6 meters as well as on the other bands. Use of the internal 20-dB attenuator helped, but only if the desired signal was strong enough to remain usable after attenuation.

The review transceiver was equipped with the optional 500-Hz CW filter. Audio is harsh in the NARROW CW mode—so much so that, for signals near the noise, switching in the narrow filter may barely improve readability over that achievable in the wide CW mode (using the SSB filter). CW signals are not pleasant to listen to for extended periods with the narrow filter switched in.

Overall, general-coverage performance of the TS-680S receiver is good. AM selectivity is wide, however, and it would be nice if Kenwood offered a good 4-kHz-wide crystal filter for those wishing to use the '680S for serious AM listening. The manual specs AM selectivity as 6 kHz at −6 dB and 18 kHz at −50 dB. This is too wide for comfortable reception in crowded shortwave broadcast bands, where 5-kHz channel spacing is standard. In the AM mode, 5-kHz heterodynes are routinely audible in the shortwave broadcast bands, and the −50 dB spec is insufficient insurance against strong adjacent-channel interference, even from stations two channels (10 kHz) away. Selection of the SSB-bandwidth filter during rectification detection is not possible with the '680S. Assuming that an incoming full- or reduced-carrier AM signal is tuned as closely to carrier zero beat as allowed by the '680S's 10-Hz tuning steps, good AM reception (albeit with communications-quality demodulated audio) can be achieved when the rig is set to its USB or LSB mode.

Those wishing to tape record received-signal audio from the TS-680S can make use of the fixed-level audio output available at pins 3 (DATA OUTPUT) and 4 (GND) on the rear-panel 13-pin DIN ACC 2 jack. The 680S's AGC is so flat—with the rig's RF GAIN control fully advanced—that the associated tape recorder need not have automatic-record-level control to cope with fading.

6-Meter Transmit and Receive

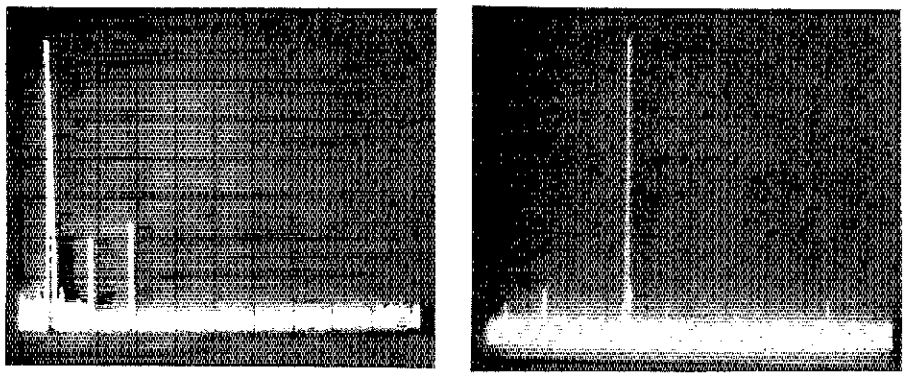
The TS-680S's transmitter section is similar to that in the TS-140S, except for 50 MHz. On 160 through 10 meters, RF from the second mixer passes through a low-pass filter, four discrete stages of amplification (to about 100 W) and another low-pass filter on its way to the antenna. On 6 meters, RF from the second mixer passes through a band-pass filter, two discrete stages of low-level amplification, and

[1] L. Wolfgang, "Kenwood TS-140S 160- to 10-Meter Transceiver," *QST*, Jun 1988, p 42.

Table 1

Kenwood TS-680S 160- to 6-Meter Transceiver, Serial no. 8111053

Manufacturer's Claimed Specifications	***Measured in the ARRL Lab***
Frequency coverage: Receiver, 500 kHz to 30 MHz and 50 to 54 MHz; transmitter, 1.8 to 2.0, 3.5 to 4.0, 7.0 to 7.3, 10.1 to 10.15, 14.0 to 14.35, 18.068 to 18.168, 21.0 to 21.45, 24.89 to 24.99, 28.0 to 29.7, 50.0 to 54.0 MHz	Receiver: 0.1 to 35 MHz and 45 to 60 MHz; transmitter 1.6 to 1.99999, 3.0 to 3.99999, 6.5 to 7.49999, 10.0 to 10.49999, 13.5 to 14.99999, 18.0 to 18.99999, 20.5 to 21.49999, 24.0 to 24.99999, 27.5 to 29.99999, 50.0 to 53.9999 MHz.
Modes of operation: USB, LSB, CW, FM, AM.	As specified.
Frequency display: 7-digit blue fluorescent.	
Frequency resolution: 100 Hz or 10 Hz, operator selectable.	As specified.
Power requirement: 12 to 16 V dc (13.8 V nominal) at 1.5 A on receive and 20 A on transmit.	13.8 V at 17.5 A at 100 W output.
Transmitter	*Transmitter Dynamic Testing*
Transmitter output power: SSB and CW: 100 W on 160 to 15 meters, 95 W on 10 meters, 10 W on 6 meters. AM: 40 W on 160 to 10 meters, 4 W on 6 meters. FM: 50 W on 10 meters, 10 W on 6 meters	SSB: 160 m, 103 W; 80 to 10 m, 108 to 112 W; 6 m, 11 W. CW: 160 m, 92 W; 80 to 12 m, 96 to 101 W; 10 m, 95 W; 6 m, 11 W. FM output power measured 47 W on 10 m and 10.5 W on 6 m. The unit will transmit FM on 160-6 meters. AM carrier power measured in excess of 100 W on 160-10 m (11.5 W on 6 m), but the power control should be used to reduce power as specified.
Spurious signal and harmonic suppression: Greater than 40 dB below peak power output on 1.9 to 30 MHz; greater than 60 dB on 50 to 54 MHz.	See Fig 1.
Third-order intermodulation distortion products: Not specified.	See Fig 2.
CW keying waveform: Not specified.	See Fig 3.
Transmit-receive turnaround time (PTT release to 90% audio output with an S9 signal): Not specified.	25 ms.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: SSB and CW—(2.2 kHz bandwidth, for 10 dB [S + N]/N) less than 3.98 μV from 0.5 to 1.62 MHz; less than 0.25 μV from 1.62 to 21.5 MHz; less than 0.18 μV from 21.5 to 30 MHz (preamp on); less than 0.16 μV from 50 to 54 MHz (preamp on).	Minimum discernible signal (noise floor), with 500-Hz filter: 1.0 MHz: –119.5 dBm 3.5 MHz: –139.5 dBm 14 MHz: –140.0 dBm Preamp off: / Preamp on: 29 MHz: –137.0 dBm / 29 MHz: –141 dBm 50 MHz: –137.5 dBm / 50 MHz: –141.5 dBm



(A) (B)

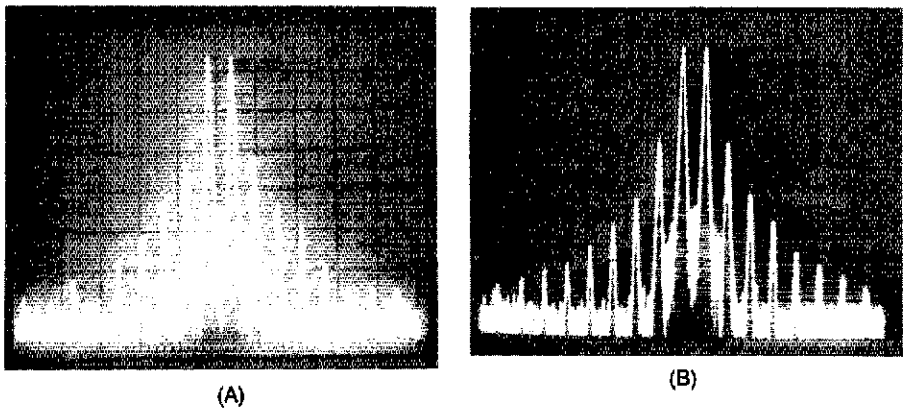
Fig 1—Worst-case spectral display of the Kenwood TS-680S. Horizontal divisions are each 10 MHz; vertical divisions are each 10 dB. In the photo at A, output power is approximately 98 W at 10.15 MHz. All harmonics and spurious emissions are at least 45 dB below peak fundamental output. In the photo at B, output power is 10 W at 50.2 MHz. All harmonics and spurious emissions are at least 64 dB below peak fundamental output. The TS-680S complies with current FCC specifications for spectral purity.

the final amplifying stage—a hybrid power module capable of producing 10 watts output. The output of the power module is low-pass-filtered before going to the antenna. On receive, the 6-meter signal passes through low-pass and high-pass filters, and then (with receive RF amp on) is amplified by a low-noise 2SK125 FET.

The sunspot cycle is on its upswing now, and more and more amateurs are getting on 6 meters and enjoying E-skip, meteor-scatter, auroral and transequatorial propagation. The '680S offers the opportunity to try 6-meter operation without having to purchase another transceiver in addition to your HF transceiver. During this past May and June, 6 meters was open almost every evening to some part of the US. There were several openings to the Caribbean islands *and* even a couple of European openings to boot! It was fun to have the ability to participate in these openings.

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
AM: (6.0 kHz bandwidth, for 10 dB [S + N]/N) less than 39.8 μV from 0.5 to 1.62 MHz; less than 2.5 μV from 1.62 to 21.5 MHz; less than 1.78 μV from 21.5 to 30 MHz (preamp on); less than 1.58 μV from 50 to 54 MHz (preamp on).	(6.0 kHz bandwidth, test signal 30% modulated with a 1-kHz tone.) 1.0 MHz: 2.4 μV 3.8 MHz: 0.25 μV 14 MHz: 0.25 μV Preamp off: 29 MHz: 0.28 μV; 50 MHz: 0.33 μV Preamp on: 50 MHz: 0.25 μV
FM: (12 kHz bandwidth) Less than 0.18 μV for 12 dB SINAD from 21.5 to 54 MHz.	0.17 μV for 12 dB SINAD at 29 MHz.
Receiver dynamic range: Not specified.	Blocking dynamic range†: 3.5 MHz: 108 dB 14 MHz: 106.5 dB 50 MHz: 106.5 dB (preamp off); 102.5 dB (preamp on). Two-tone, third-order intermodulation distortion dynamic range†: 3.5 MHz: 92 dB 14 MHz: 95 dB 50 MHz: 88.5 dB (preamp off); 87.5 dB (preamp on). Third-order input intercept†: 3.5 MHz: −1.5 dBm 14 MHz: 2.5 dBm 50 MHz: −4.75 dBm (preamp off); −10.25 dBm (preamp on).
S-meter sensitivity (μV for S9 reading): Not specified.	20 μV at 14 MHz; 23 μV at 50 MHz (preamp off).
Squelch sensitivity: FM, less than 0.32 μV.	0.15 μV min, 0.4 μV max at 29 MHz.
Receiver audio output: 1.5 W at 8 ohms with less than 10% total harmonic distortion (THD).	1.9 W at 10% THD.
Color: Gray.	
Size (height, width, depth): 4-7/32 × 11-1/16 × 12 inches.	
Weight: 13.4 lbs (not including the power supply).	

†Blocking dynamic range and two-tone, third-order IMD dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.



(A) (B)

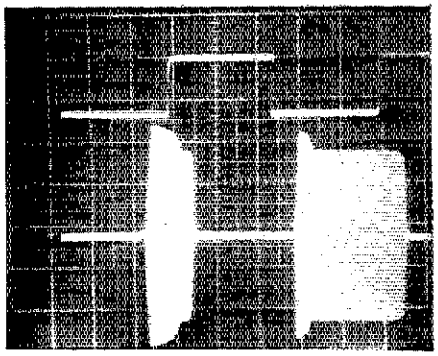
Fig 2—Spectral display of the Kenwood TS-680S during two-tone intermodulation distortion (IMD) testing. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. In the photo at A, the transceiver is being operated at 100 W PEP output on 14 MHz. Third-order products are approximately 32 dB below PEP output, and fifth-order products are approximately 43 dB down. In the photo at B, the transceiver is being operated at 10 W PEP output on 50 MHz. Third-order products are approximately 29 dB below PEP output, and fifth-order products are approximately 44 dB down.

The day I hooked my 6-meter antenna to the radio, I immediately thought that the receiver and my location were really good. I noticed some weak CW signals scattered about the band—signals that I couldn't hear on my other 6-meter transceiver. It turned out that these were not actual stations, but spurious responses generated in the receiver by strong local beacons. These responses were present only with the preamp on.

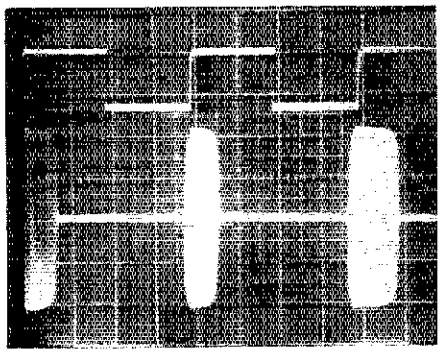
Computer Control

Another feature of the TS-140S and TS-680S is that many of the transceiver's functions can be computer controlled. There is little information on computer control in the instruction manual and the service manual, though. Here are some of the functions you can control with a computer: changing the two VFO frequencies; moving the VFO frequency up/down; choosing which memory channel (1-30) to recall; turning the RIT on/off, and changing the offset; changing the mode (SSB/CW/AM/FM); and enabling or disabling SCAN and SPLIT.

For computer control, you'll need to purchase two Kenwood accessories: the IF-10C interface kit and the IF-232C level translator. The IF-10C interface kit installs inside your transceiver and provides accessory jack ACC 1 on the rear panel. The IF-232C plugs into the IF-10C, and a cable from your computer's serial port plugs into the IF-232C. The IF-232C requires a source of 12 V dc.



(A)



(B)

Fig 3—CW keying waveform for the Kenwood TS-680S. The photo at A is with the TS-680S in the semi-break-in mode. The photo at B is with the TS-680S in the full-break-in (QSK) mode. In each photograph, the lower trace is the RF envelope; the upper trace is the actual key closure. Each horizontal division is 10 ms.

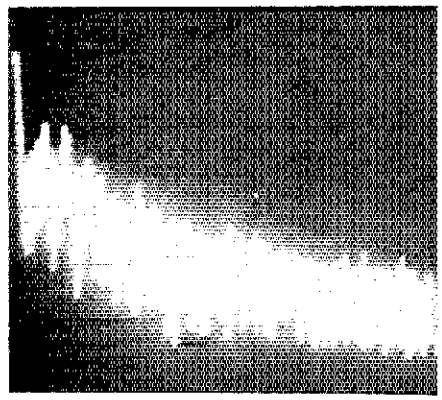


Fig 4—Spectral display of the Kenwood TS-680S transmitter output during phase-noise testing. Power output is 100 W at 14 MHz. Each vertical division is 10 dB; each horizontal division is 2 kHz. The scale on the spectrum analyzer on which this photo was taken is calibrated so that the log reference level (the top horizontal line on the scale in the photo) represents −60 dBc/Hz and the baseline is −140 dBc/Hz. Phase-noise levels between −60 and −140 dBc/Hz may be read directly from the photograph. The carrier, which would be at the left edge of the photograph, is not shown. This photograph shows phase noise at frequencies 2 to 20 kHz offset from the carrier.

You'll also need a computer and appropriate software. I used a program called HAM.COM, written by Dan Diehlman, AE6G, with my TS-680S.[2] HAM.COM runs on IBM® PCs and compatibles, and it did a great job controlling the TS-680S.

Instruction Manual

As mentioned in the TS-140S review, the manual is an essential part of learning all of the operating features of the transceiver. This is especially true in the case of this transceiver, where a number of switches have more than one function. One drawback that I recognized early on is the lack of information on the 6-meter circuitry. In fact, I found it necessary to obtain the TS-140S/TS-680S service manual from Kenwood just to get a complete schematic for the TS-680S.

Reviewer Impression

The review transceiver was equipped with a Kenwood PS-430 power supply to provide the 13.8 V dc necessary to power the transceiver. A safety note: The fuse is in the neutral side of the ac line, and the power switch is in the hot side of the line. This wiring choice can result in a personal safety hazard if a primary-to-chassis short occurs in the power transformer with the power switch on and the power-supply chassis not grounded (either through a properly grounded three-wire line cord and ac outlet or through a wire from the power-supply chassis to the station ground).

I used the '680S with external power amplifiers that are not capable of QSK operation, so I found it necessary to change the setting of an internal switch to activate the external control relay. This adjustment was easy to make and required only 10 minutes, a screwdriver to remove the covers, and a brief overview of the circuit board to locate the switch.

After initial familiarization, I found the TS-680S easy to use with little need to continually refer to the manual. I did, however, need to refer to it when I decided to begin programming memories, especially in the case of 10- and 6-meter repeaters and their offsets.

I found, as did the reviewer of the TS-140S, that the lack of provision for transverter connection to the TS-680S is an inconvenience. As an active VHF operator, I need a good HF transceiver to use with transverters that have 28-MHz IFs. Although the TS-680S is small enough to take mountaintopping for a VHF event, you may still need to bring another HF transceiver just to provide the 28-MHz IF for transverters for other bands.

Overall, I enjoyed using the TS-680S. The addition of 6 meters and the extended receiver coverage make this radio a welcome addition to my shack. HF plus 6 meters has never been more economical, and in one package to boot.

I would like to thank Dave Newkirk, AK7M, for using the review '680S and providing comments that were incorporated in this review.

Manufacturer: Kenwood USA Corporation, 2201 E Dominguez St, Long Beach, CA 90801-5745, tel 213-639-4200. Price class: TS-680S, $1100; PS-430 power supply, $195; YG-455C-1 CW filter, $135; VOX-4 VOX unit, $70; IF-10C computer interface, $95; IF-232C level translator, $95.

KENWOOD AT-250 AUTOMATIC ANTENNA TUNER

Reviewed by Bart J. Jahnke, KB9NM

The Kenwood AT-250 is an automatic antenna tuner that works with the TS-680S, TS-140S and other Kenwood transceivers. The tuner covers the 160- through 10-meter amateur bands and is capable of handling 100 W continuous input power.

It's easy to connect the AT-250 to a matching Kenwood transceiver. For the TS-680S, I simply had to place a good coaxial cable jumper between the tuner and radio and hook up the tuner control line to accessory jack number 3 on the rear of the transceiver. The last step (very important) is to connect the tuner's ground terminal to your station ground. The AT-250 can be powered from 120 V ac for home station use, or from 13.8 V dc for mobile or portable operation.

According to the instruction manual, the AT-250 is capable of matching loads from 20 to 150 ohms, or a 2.5:1 SWR (referenced to 50 ohms). Kenwood recommends that less than 50 W be used during tune-up procedures (to avoid problems caused by high voltages present when the match is not right). I ran as little as 5 W and found that the tuner worked very effectively.

The AT-250 is very easy to use. There is a front-panel BAND switch with positions for each amateur band. If you're using the tuner with an appropriate Kenwood transceiver (such as a TS-680S), though, you can set the BAND switch to AUTO and the tuner will switch automatically to the same band as the transceiver.

The tuner also has a built-in antenna switch, allowing front-panel selection of up to four antennas. In my application, I only needed to use one feed line because my HF antenna is a multi-band vertical. After you select the right antenna, tune-up is simple. Apply 50 W or less RF, wait a few seconds

[2]HAM.COM is available from Dan Diehlman, AE6G, 5478 N Bond, Fresno, CA 93710, tel 209-439-5520.

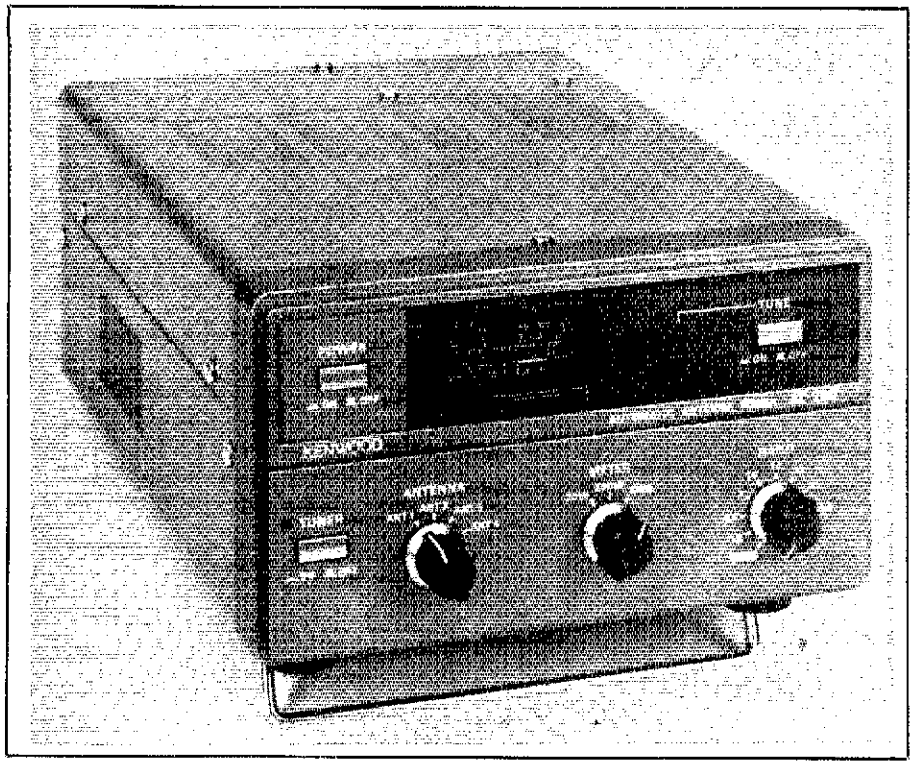


Table 2

Kenwood AT-250 Automatic Antenna Tuner, Serial no. 7100135

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency range: All amateur bands from 1.8-29.7 MHz.	As specified
Input impedance: 50 ohms unbalanced.	As specified.
Output impedance: 20-150 ohms unbalanced.	Not measured.
Insertion loss: 0.8 dB or less.	As specified.
Pass-through power: 100 W.	As specified.
Minimum power for activation: 3 W.	4 W.
Power requirements: 120, 220 or 240 V ac at 15 W; or 12 to 16 V dc (13.8 V normal) at 600 mA.	As specified.
Size (height, width, depth): 3.8 × 6.9 × 10.1 inches.	
Weight: 9.2 lbs.	
Color: Gray.	

as the capacitor motors whir while the tuner finds a match, and you're ready to go.

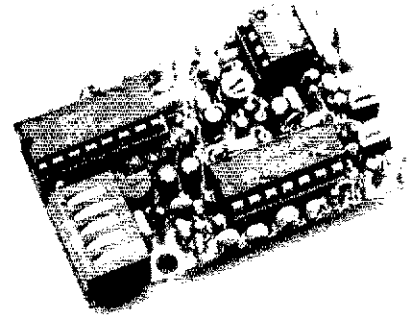
A useful feature of this antenna tuner is its ability to run on 13.8 V dc. This is an added pleasure when you want to take your radio on the road. Typically, mobile antennas have a narrow SWR bandwidth, and being able to have an automatic tuner in your car is handy when you can't take your eyes off the road.

Manufacturer: Kenwood USA Corporation, 2201 E Dominguez St, Long Beach, CA 90801-5745, tel 213-639-4200. Price class, $400.

New Products

COMMUNICATIONS SPECIALISTS CTCSS ENCODER/DECODER

☐ Com Spec has introduced their TS-32P CTCSS encoder/decoder, which is a more versatile version of their popular TS-32 encoder/decoder. The TS-32P contains a 32-bit programmable memory that allows specifying any 32 tone frequencies from 15 to 255 Hz. Up to six tones can be accessed for multi-tone use. Tone recall is controlled by the 5-position DIP switch on the TS-32P circuit board. Manufacturer-claimed frequency accuracy is ±0.01 Hz. The TS-32P can be programmed with a hand-held programmer at service shops, or it can be returned to the manufacturer for reprogramming without charge. The TS-32P is 1.25 × 2 × 0.4 inches, and operates on 6 to 25 V dc. A one-year warranty covers the product. Price class: $57.95. Available from Communications Specialists, 426 W Taft Ave, Orange, CA 92665-4296, tel 800-854-0547 or 714-998-3021.—*Rus Healy, NJ2L*



ELECTRONIC SPECIALISTS LAP-TOP TRANSIENT SUPPRESSOR

☐ Need an ultra-compact transient suppressor for your lap-top computer? Electronic Specialists has introduced two versions, the LTP-101 for ac power lines, and the LTP-102 for phone-line modems. Filtering included in the LTP-102 includes multielement spike suppression, and RF and balun noise filtering. Price class: LTP-101, $64.95; LTP-102, $45.95. Available from Electronic Specialists, Inc, 171 S Main St, Natick, MA 01760, tel 800-225-4876.—*Rus Healy, NJ2L*

Strays

CALL FOR *QST* TECHNICAL ARTICLES

☐ Surface-mount devices (SMDs) that suit Amateur Radio applications are becoming more and more common—we have already seen SMDs used in digital voice recording and other exciting areas. What are you doing with SMDs? Have you found ways to make handling and mounting them easier? Perhaps you've discovered an application for SMD technology in your station that makes conventional ICs obsolete—share your insights with *QST* readers! Other League members want to know what you're doing with SMDs. *QST* pays for feature articles. Not sure about *how* to write the article? No problem—for an author's guide, write or call the Technical Department at HQ. Send finished articles to Technical Editor, *QST*, American Radio Relay League, 225 Main St, Newington, CT 06111, tel 203-666-1541.

FATHER MORAN'S CENTRAL FLORIDA SCHEDULE CHANGED

☐ Father Moran, S.J., 9N1MM, will speak on October 2, 1988 at 3:00 PM in the Commissioners' Auditorium of the Marion County Governmental Complex on SE Fort King St, Ocala, Florida. This is a change from the date and time reported in September *QST*. Father Moran will share his experiences of living and teaching in India and Nepal. The Silver Springs Radio Club, Inc, invites all interested amateurs and the general public to attend.

Improved Anode Parasitic Suppression for Modern Amplifier Tubes

It's *not* your imagination: Today's high-power tubes *are* tougher to tame than their predecessors. Here are up-to-date parasitic-oscillation cures that succeed where traditional techniques fail.

By Richard L. Measures, AG6K
6455 La Cumbre Rd
Somis, CA 93066

Many hams think they know how to tame VHF parasitics in a vacuum-tube amplifier: Just parallel a low-inductance coil across a carbon-composition resistor of suitable resistance and wattage, install this network in the tube plate (anode) lead and cross your fingers.[1] Problem is, this parasitic-oscillation cure doesn't always work—and when it does work, it may not work *right*. The resistor may be cooked by the *desired* signal even with a network coil of barely enough inductance to tame the parasitic. If the cure fails to kill the parasitic, fuses may blow, tubes may be destroyed and band-switch contacts may arc and melt.

Approached in a hit-or-miss way, successful VHF parasitic suppression may seem to rely on black magic or luck. But VHF parasitics *can* be eliminated in modern vacuum-tube amplifiers with minimum guesswork and without destroying expensive components along the way.

Parasitic Suppression Then and Now

The traditional copper-inductor/carbon-resistor anode parasitic suppressor has been used in vacuum-tube amplifiers for at least 50 years. The success of this method lay in the understanding that there is no such thing as a zero-potential ground—especially at RF—and that wire or strap of any length always acts as an LC tuned circuit (with a bit of R) at some frequency while serving as a conductor at other frequencies. Further, an RF choke can act as a short circuit instead of a desired high reactance at certain frequencies[2]—and a resistor may choke RF better than an RF choke in some cases! A thorough understanding of these "RF secrets" allowed the commercial manufacture and sale of a transmitter that worked on all frequencies up to 14.5 MHz, was stable and could be tuned up every time with no surprises.[3]

These points of radio physics are still valid. Why is it, then, that a 1930s-style anode parasitic suppressor can fail to suppress parasitics in the 1980s? The answer is that modern power tubes differ greatly in design from their 1930s predecessors. In the 1930s, 40s and 50s, "high-μ" (pronounced *mew*) triodes had a voltage amplification factor (μ) of about 40.[4] Today, *high-μ* usually indicates an amplification factor of *100 to 240*! A parasitic suppressor capable of preventing oscillation in a tube with a μ of 40 may fail to suppress parasitics in a

Modern amplifier tubes often remain untamed by the traditional inductor/resistor (LR) VHF parasitic suppressor for another reason: Today's tubes are generally capable of operating at much higher frequencies than their predecessors. (Some ancient amplifier tubes were barely capable of amplification at 28 MHz; the 203A used in the Collins 150B transmitter was rated for full anode input power only up to 15 MHz!)

Amplifier Tubes Can Oscillate, Too

The average amplification factor of the popular 3-500Z triode varies with the manufacturer—from 130 (Eimac™) to 200 (Amperex™). The highest frequency at which the 3-500Z can be run at maximum plate in-

What's a Parasitic Oscillation?

Ideally, an amplifier just amplifies: You put a signal in and get the same signal out, only stronger. (Some distortion also occurs in the process, but this usually isn't much of a problem in a circuit of sound design.) Sometimes, though, an amplifier does more than amplify: It actually *generates signals* on its own—oscillates—on a frequency or frequencies far removed from that of its input (driving) signal. Such oscillations are known as *parasitic* oscillations or *parasitics*.

Parasitics are undesirable for several reasons. They steal power that would otherwise go into amplifying the desired signal, making the amplifier less efficient. They can interfere with radio communications and broadcast reception if they're strong enough. Worst of all, parasitic oscillations can damage or destroy amplifier components—in milliseconds!

Parasitic oscillations can occur on any frequency at which the amplifying device—tube or transistor—can provide gain. Modern vacuum-tube "linears"—the amplifiers many hams build or buy to boost the output of their MF/HF transceivers to the legal limit—are most prone to *VHF* parasitics. These parasitics occur in the VHF (very high frequency, or 30- to 300-MHz) range. (*MF* stands for medium frequency [300 kHz to 30 MHz]; *HF* stands for high frequency [3 to 30 MHz].) Because the tubes hams commonly use to amplify MF and HF signals are also capable of oscillation at VHF, careful attention must be paid to eliminating VHF parasitics in MF/HF amplifiers. If parasitic suppression isn't built in, a circuit intended to amplify MF/HF signals may simultaneously oscillate at VHF. Because the output circuitry of such an amplifier is designed to allow only MF/HF signals to pass to the station antenna, the VHF parasitic energy has nowhere to go. Instead of being sent to a proper load, the VHF signal builds up to very high voltages in the amplifier output circuitry. Result: Sparks, arcs, pops and maybe even *boom*!

Parasitic oscillations: *Nobody* wants 'em!—*David Newkirk, AK7M, Assistant Technical Editor*

[1]Notes appear on page 89.

put power in "radio frequency power amplifier or oscillator service" is 110 MHz; 3-500Zs can work well *above* 110 MHz if their power-handling capability is derated with frequency. Other modern tubes commonly used in HF amplifiers have even higher amplification factors and frequency ratings. The 8874 is a good example: It can be run at maximum input power up to 500 MHz and its amplification factor is 240!

Note the presence of the word *oscillator* in that 3-500Z specification. A tube that can amplify at a given frequency can usually be made to oscillate at that frequency. This is good news for oscillator builders and bad news for unwary builders of amplifiers. It means that a circuit built to amplify efficiently at one frequency can oscillate vigorously at another—if the amplifying device allows it.

Assuming that the tube involved has sufficient frequency capability, two additional prerequisites must be met before oscillation can occur. First, a feedback or feedthrough path must exist between the amplifier output and input. Second, high-Q tuned circuits—resonant at or near the same frequency—must exist in the input and output leads of the amplifier tube.[5] These tuned circuits are *essential* because they act like flywheels, sustaining oscillation over the portion of the input-signal cycle during which the amplifier tube is not conducting and amplifying.

The (Incomplete) Amplifier Schematic Diagram

Understanding the mechanics of parasitic oscillation would be much easier if the schematic diagram of every amplifier circuit showed the amplifier-tube input and output leads as what they really are: *inductors*. These incognito inductors, together with the interelectrode capacitances of the tube(s), and the output and input capacitances of the amplifier input and output networks, respectively, form *unavoidable* VHF tuned circuits that can support VHF oscillation. See Fig 1. Typically, these resonances occur between 90 and 160 MHz in MF/HF amplifiers capable of the legal Amateur Radio power limit.

VHF parasitic oscillation can occur if (1) the parasitic VHF circuits resonate at or near the same frequency; (2) the parasitic circuits possess sufficient Q at this frequency to sustain oscillation; (3) the amplifier tube(s) are capable of sufficient gain at the frequency at which the parasitic circuits are resonant; and (4) sufficient positive feedback exists at this frequency. VHF energy need not be present in the driving signal to get the parasitic started: If shock excitation of the VHF self-resonant circuits by switching or driving-signal transients doesn't make the amplifier "take off," the normal random variations in the tube electron stream can suffice. Once started, the oscillation builds until its amplitude is limited by tube characteristics, self-bias or—especially in high-power circuits—component failure. Because the oscillating tube operates without a load at VHF, component failure is likely to be the limiting factor. (Note: It may come as a surprise to some hams that an MF/HF grounded-grid amplifier can betray its user by oscillating as a tuned-plate, tuned-*cathode* oscillator at VHF. After all, isn't grounded-grid's "no neutralization required" characteristic the reason for the popularity of this amplifier configuration at MF and HF? See the sidebar, "Grounded-Grid Amplifiers *Can* Oscillate" to unravel this conundrum.)

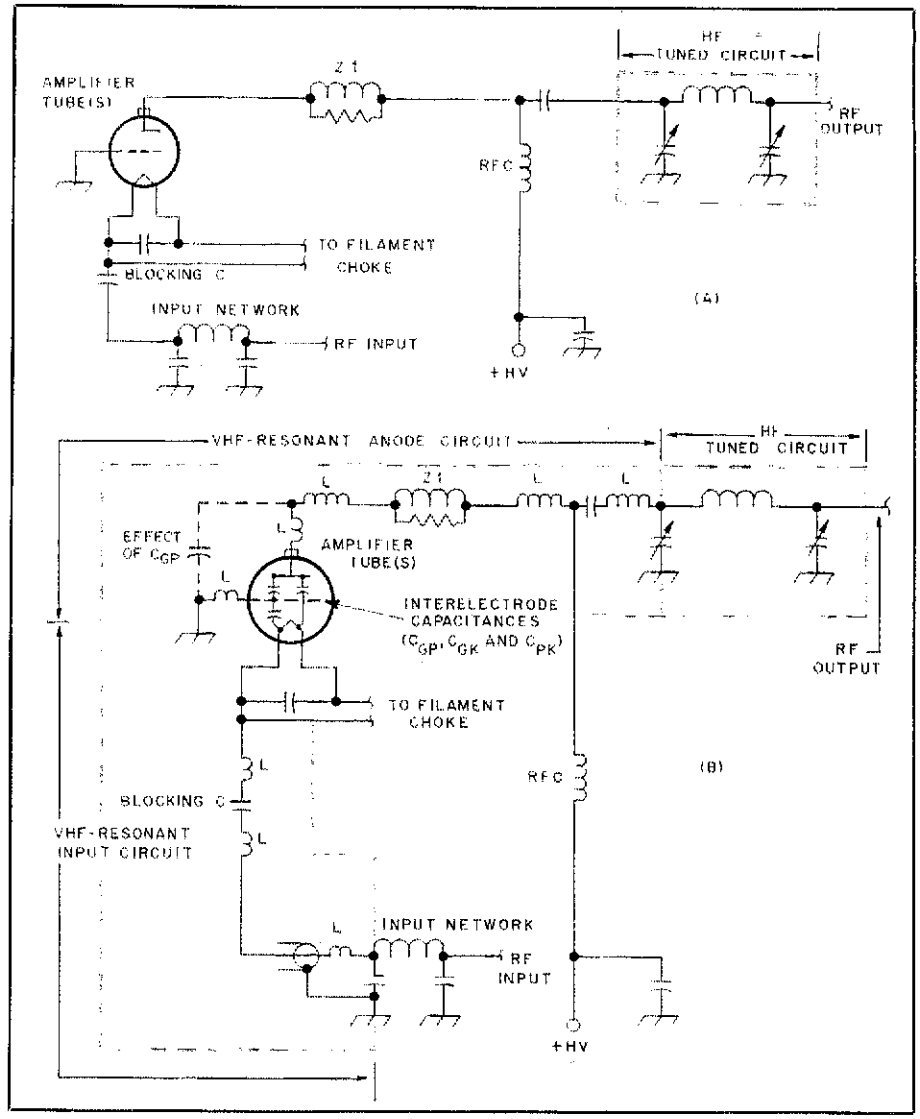


Fig 1—It's what the schematic *doesn't* show that sets the stage for parasitic oscillations in a vacuum-tube amplifier. The circuit at A—a portion of a grounded-grid HF amplifier—shows just what you'd expect: an input network, tube(s), parallel anode feed and π-network output. The circuit at B shows what you probably *wouldn't* expect: In conjunction with tube interelectrode capacitances, the inductance (L) of the leads between amplifier components results in VHF resonances in the amplifier's input and output circuitry. (Tube interelectrode capacitances include C_{GP} [grid to plate (anode)], C_{GK} [grid to cathode] and C_{PK} [plate to cathode].) Under some conditions, these resonances, in conjunction with feedback supplied by feedthrough capacitance C_{PK}, can allow the amplifier tube(s) to oscillate at VHF. Z1, a traditional parasitic-suppression network, is intended to prevent such oscillation, but may fail to do so. The text explains why.

Enter the Traditional Parasitic Suppressor

In ham folklore, the traditional LR parasitic suppressor (Z1 in Figs 1A and 1B) puts the double whammy on VHF parasitics by providing two paths for VHF current in the anode lead. The inductor usually consists of several turns of copper wire, tubing or strap, sometimes silver plated. The resistor is usually a noninductive, carbon-composition unit with a power rating of several watts. The explanation of the function of these components varies with the radio witch doctor you consult, but usually goes something like this: The inductor tunes the anode lead to a frequency different from (lower than) what it is without the coil; this helps kill the parasitic by tuning the anode circuit away from wherever it would have been. The resultant stagger tuning of the input and output parasitic-supporting circuits kills the parasitic. Any parasitic

Grounded-Grid Amplifiers *Can* Oscillate

In a grid-driven, grounded-cathode amplifier, the input and output voltages are 180° out of phase. For regeneration and oscillation to occur in such a circuit, *in-phase* plate-to-grid feedback must be applied by means of a coupling circuit that subjects the fed-back energy to a 180° phase shift. The grid-to-plate capacitance of a high-gain tube may provide sufficient coupling; tuning the plate circuit of a TPTG amplifier to a frequency higher than the grid circuit can place this fed-back energy in phase at the grid. The result is a TPTG oscillator.

By contrast, oscillation may be easier to achieve in a grounded-grid stage than a grounded-cathode stage. After all, the output (anode) and input (cathode) voltages are *already in phase* in a grounded-grid amplifier—a phase-shift circuit may not be required to achieve the correct phase relationship between the plate and cathode signals. Why doesn't a grounded-grid stage "take off" and oscillate like an unneutralized grounded-cathode stage? Many hams know the answer by heart: "Because the grounded grid acts as an effective shield between the cathode and plate, preventing regeneration and oscillation."

This presumption is true only at frequencies below the grounded grid's self-resonance frequency. Grid self-resonance is unavoidable: At *some* frequency, the inductances of the grid structure, internal and external leads, and the tube socket resonate with the capacitance of the grid structure. (For example, the grid of a 3-500Z triode, directly grounded, self resonates at about 95 MHz.) *At frequencies above grid self-resonance, the grid exhibits inductive reactance and is no longer grounded.*

Above its self-resonance frequency, the grid *cannot* serve as an effective shield between plate and cathode. To make matters worse, the reactance of the tube's plate-to-cathode (feedthrough) capacitance decreases with frequency. Result: As frequency rises above a tube's grid-self-resonance point, the grounded grid becomes progressively "less grounded" and the feedback path between anode and cathode becomes increasingly conductive to RF current—a highly undesirable condition unless the amplifier designer intends to build a VHF oscillator!

energy that remains is forced (by the choke action of the inductor) to flow through the resistor, swamping the parasitic.[6] (The resistor is also supposed to lower the Q of the inductor.) The desired amplifier output signal doesn't cook the resistor because the suppressor inductor offers a low-impedance path around the resistor in the MF/HF range.

All of this looks good on paper, but it is not 100% true. What should you do if this traditional anti-parasitic prescription fails? Here are the curative incantations: "Increase the inductance of the suppressor inductor." "Use a resistor of a different value." "Lengthen or shorten wires in the input or output circuits." "Reposition (a) the π-network tuning capacitor; (b) something; (c) anything; (d) everything." (Varying—especially shortening—lead lengths *can* improve stability *if* the new lead lengths move the cathode- and anode-circuit self-resonant frequencies farther apart. This anti-parasitic technique was mentioned on pages 116 and 117 of ARRL's 1935 *Radio Amateur's Handbook*—good advice then *and* now. Depending on the amplifier configuration [grounded cathode, grounded grid, grounded anode] in use, parasitic suppression can also be applied in the amplifier grid, screen and/or cathode circuits. See the sidebar, "Parasitic Suppression at the Grid and Cathode.")

One or more of these solutions *may* do the trick—after a frustrating struggle. Typically, success with a traditional anode parasitic suppressor boils down to increasing the inductance in the tube anode lead until the suppressor resistor *almost* burns up on 10, 12 and 15 meters. (This "solution" sometimes isn't *much* of a solution: I know of hams who've resigned themselves to replacing slow-cooked suppressor resistors every few months!) Clearly, the traditional LR parasitic suppressor is a hit-or-miss solution at best. But why?

The answer came to me as I was investigating a severe case of VHF parasitics in a two-3-500Z amplifier—a veritable Pandora's box of parasitics because its 3-500Zs had unusually high gain. (I had already installed cathode parasitic-suppression resistors in this amplifier as explained in "Parasitic Suppression at the Grid and Cathode." The resistors had improved stability, but the amplifier was not *unconditionally* stable.) Using a dip meter, I discovered that the amplifier's anode circuit exhibited a sharp dip at 130 MHz—*even though the anode lead included a traditional, supposedly Q-killing, LR parasitic suppressor!* What could be allowing this high-Q resonance to survive?

Anti-Parasitic Techniques and Q

The old adage that "more is not always better" is particularly apt where amplifier-component Q is concerned. In a well-engineered MF/HF amplifier, each part of the circuit should possess the *appropriate*, not necessarily the maximum, Q. In a practical grounded-grid MF/HF amplifier, MF/HF tuned-circuit components should have a high MF/HF Q, and anode leads—including anode parasitic-suppression networks—should have *low* VHF Q.[7]

One way to lower Q is to simply use low-Q inductors. *Copper wire, tubing or strap is the wrong material to use if you're after low Q. Silver plating is the wrong thing to add to copper if you're after low Q.* A copper, or silver-plated copper, parasitic-suppression inductor might more accurately be called a parasitic *supporter*. Yet, silver-plated copper is commonly used for anode-circuit wiring and VHF-*parasitic*-suppression inductors in vacuum-tube amplifiers—including the two-3-500Z amplifier on my bench!

I ascribed much of the inductance responsible for the 130-MHz anode-circuit resonance in the parasitic-ridden amplifier to a 2-inch-long, U-shaped piece of no. 12 copper wire connecting the amplifier's HV blocking capacitor and anode RF choke. I also suspected the silver-plated copper strap used in the amplifier's anode wiring and parasitic-suppressor inductors of contributing to the sharpness of the 130-MHz dip. Replacing these components with their low-VHF-Q counterparts was the next step.

Low-Q Conductors

Nichrome (nickel-chromium alloy) ribbon or wire has about *1/60* the VHF Q of copper and is a good choice of material for low-Q wiring and inductors. Unfortunately, though, nichrome wire—and especially flexible nichrome ribbon—is expensive and hard to find in small quantities. (As a service to fellow parasitic-tamers, nichrome ribbon and wire is available from me in small quantities. See Appendix 1.) Stainless steel has less than *1/10* the VHF Q of copper and is commonly available.

Trying Out the Low-Q Conductor Idea

With nichrome ribbon and stainless-steel wire in hand, I went to work. I replaced the 2-inch piece of no. 12 copper wire—between the HV blocking capacitor and the top of the anode RF choke—with a strip of nichrome ribbon about 1/8 inch wide and 1-3/16 inches long. Next, I wound a three-turn, ¼-inch-diameter coil of no. 18 stainless-steel wire and connected this coil in parallel with the nichrome ribbon to stagger tune the parasitic-supporting circuit. (See Fig 2.) A dip meter check revealed that

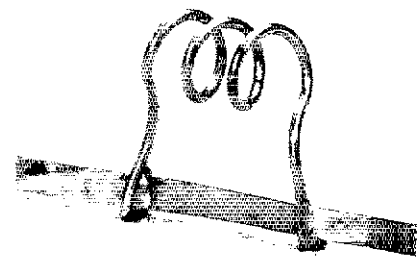


Fig 2—This low-Q parasitic-suppression network consists of 1/8-inch-wide nichrome ribbon in parallel with a three-turn coil wound from no. 18 nichrome wire. This assembly was used to replace a U-shaped piece of no. 12 copper wire in the anode circuit of a two-3-500Z amplifier. The full parasitic cure also required the installation of cathode-lead resistors and anode-lead LR suppressors. See text and the sidebar, "Parasitic Suppression at the Grid and Cathode."

(continued on page 66)

Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

CHOOSING TOROIDAL CORES FOR LESS OSCILLATOR DRIFT

☐ ARRL's *Solid State Design for the Radio Amateur* suggests the use of SF material (yellow-coded, or "Mix 6") powdered-iron toroidal cores for low-drift VFO inductors all the way down to 80 and 160 meters.[1] A few (too few) temperature-stable *ferrite* materials exist that are useful in this range. One example of this is Stackpole's Ceramag 11. The permeability v temperature curve for this material is essentially flat from about 5 to 55 °C. The high permeability of Ceramag 11 has enabled me to wind coils that exhibit much higher unloaded Qs than are possible using SF iron cores. I've also found this material, in rod form, to be quite useful for building stable permeability-tuned oscillators. *—George Hermann, N9BNH, Box 348095, Chicago, IL 60634*

Ceramag 11 looks like an interesting material, but I haven't been able to locate a source of the stuff for ham use. Anybody know of one? As a consolation prize for Hints and Kinks readers, I offer this: Instead of using a Mix 6 powdered-iron toroid in your next VFO, give a *Mix 7* toroid a try. Mix 7 material is coded white and has a slightly higher permeability—9.0—than Mix 6's 8.5. Mix 7 material is optimum for use in tuned circuits from 1 to 20 MHz; Mix 6, 2 to 30 MHz.

With a permeability stability of +35 ppm/°C, Mix 6 material was the most stable powdered-iron core commonly available to hams when *Solid State Design for the Radio Amateur* was written in the 1970s. Now, Mix 7 material is the stability winner at +30 ppm/°C. Thus, Mix 7 material appears to be a better choice than Mix 6 for use in stable tuned circuits at frequencies between 2 and 20 MHz. Palomar Engineers (Box 455, Escondido, CA 92025, tel 619-747-3343) stocks Mix 7 toroids in T-37, 44, 50 and 68 sizes; Amidon Associates (12033 Otsego St, N Hollywood, CA 91607; tel 818-760-4429) may be able to get Mix 7 cores for you, too.—*AK7M*

REDUCING KEY CLICKS

☐ Key clicks are an annoyance to other operators and may mar your neighbors' radio and television reception. As explained in *The ARRL Handbook*, clicks are most commonly caused by turning the transmitted carrier on or off too quick during the keying process. The cure for such clicks is to lengthen the transmitter turn-on and turn-off times.

One cause of key clicks is improperly adjusted ALC (automatic level control) in modern transmitters. If a transmitter's drive level is increased to the power at which its power output is limited by ALC, the driving signal may be clipped enough by ALC action to shorten its rise and fall times.

[1]W. Hayward and D. DeMaw, *Solid State Design for the Radio Amateur* (Newington: ARRL, 1986), p 33.

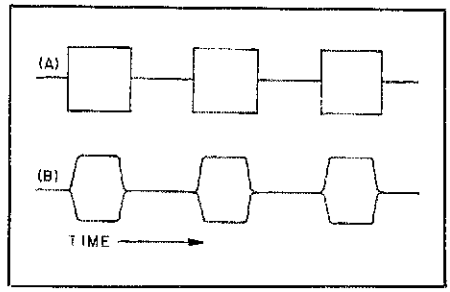


Fig 1—Stylized oscillogram of a string of dots sent with (A) ALC clipping and (B) ALC circuitry and/or DRIVE control adjusted to minimize ALC action. On the air, the signal at B sounds "softer"—has less key clicks—than the signal depicted at A.

The solution to this is simple. On a rig that has a DRIVE control *and* an ALC threshold control, adjust the ALC to limit output power to slightly more than the desired level. Then, adjust the DRIVE control to provide the desired output power. (As an example, I often adjust the ALC on my Ten-Tec Corsair transceiver for an output of 100 W and then turn down the drive until the rig's output is 80 to 90 watts. This power reduction is unnoticeable to the other operator. Fig 1 shows the stylized oscillogram of a string of dots emitted by my transceiver before and after I adjusted the rig to reduce key clicks.

Even if the ALC threshold of your rig cannot be adjusted, you can keep your keying from sharpening up too much by adjusting the transmitter drive to just below the point at which the rig's ALC meter begins to deflect.—*H. H. Hunter, W8TYX, 1106 Carolyn Ave, Columbus, OH 43224*

USING THE HEATH HR-1680 RECEIVER AS A CW MONITOR

☐ I prefer to monitor my CW signal with the station receiver rather than with a sidetone oscillator because a sidetone doesn't really tell me how my transmitter sounds. Changes in the tonal purity or frequency of the transmitted signal are immediately apparent when the receiver is used as a monitor. (Of course, this assumes that the receiver is stable enough to provide an accurate representation of transmitter stability.) Also, this technique allows me to escape from the monotony of sidetone monitoring because I can change the pitch of the monitor signal at will by tuning the receiver as I transmit.

Using my Heath® HR-1680 receiver for CW monitoring presents a problem, however, because its AGC range can't handle my transmitter's strong signal. This results in the generation of clicks, thumps and spurious signals that aren't present on the transmitted signal. To solve this problem, I installed a simple gain control circuit in the HR-1680's muting line (Fig 2). With proper adjustment of the MONITOR LEVEL control, this circuit drastically (but not completely) reduces the HR-1680's RF and IF gain when the muting line is grounded for transmission. *—Terry L. Lyon, KA3GCQ, 3 McCann St, Edgewood, MD 21040*

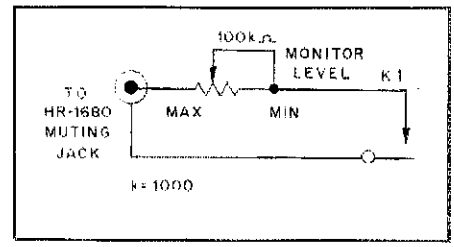


Fig 2—Used in conjunction with a spare set of closed-during-transmit relay contacts (K1) in the station transmitter or TR switch, Terry Lyon's MONITOR LEVEL control allows him to monitor his keying with his HR-1680 receiver.

SWITCH KEY MAKES RESETTING DIP SWITCHES EASY

☐ The printer I use in my ham shack computer system is a Commodore MPS-1000, which is capable of operating in two DIP-switch-selectable modes. Changing printer modes involves probing through a small back-panel window into the dark interior of the printer to reach the tiny DIP switch levers. After doing this several times with a pencil and a flashlight, I knew there had to be a better way!

I solved this problem by fabricating a switch key as shown in Fig 3. The key can be constructed of any thin, stiff, nonconductive material that's handy; plastic sheet

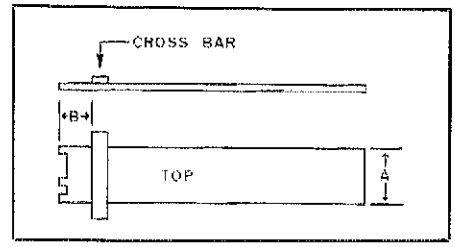


Fig 3—Ken May's switch key takes the frustration out of moving between two DIP switch configurations on his Commodore MPS-1000 printer. See the text for how to size dimensions A and B.

or perfboard is fine. (I used 0.1-inch-thick PVC stock.) Cut the key piece to any length suitable for your needs. Make dimension A equal to the width of the opening in the printer case. This keeps the switch key in lateral alignment with the DIP switch levers. To control the key's depth of penetration, cement a cross piece, B, to the appropriate point on the key body. Using a hacksaw and/or needle files, cut the appropriate DIP switch pattern into the end of the key.

Mark the appropriate key face TOP to avoid using the key upside down in future. Now, assuming that you've cut the right pattern into the end of the key, returning to the printer's proper DIP switch settings is a snap!—*Ken May, KA3LIM, 136 DeHaven Ave, Penndel, PA 19047*

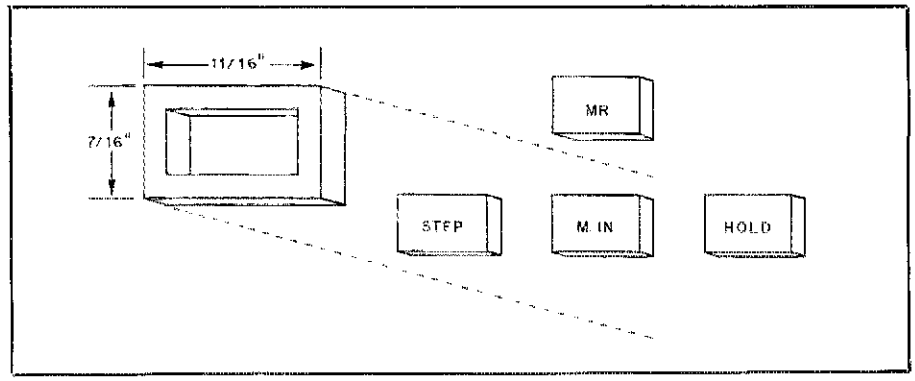


Fig 4—Dave Miller's memory button guard consists of a single piece of 5/32-inch-thick wood veneer. The dimensions shown may need to be changed to fit your situation.

CURING MECHANICALLY INDUCED FREQUENCY JUMPS IN THE TEN-TEC ARGOSY 525

☐ If you push with a finger on the top of the panel or case of an Argosy 525, the frequency of the rig's permeability-tuned oscillator (PTO) may change by 200 Hz or more, seldom returning to the original frequency. Here's how I eliminated this problem in my '525.

Remove the rig's bottom cover. Careful! The speaker leads are not very long and have no strain relief, so take care not to pull the leads out of the speaker. Check the left front foot screw for excessive length; mine was digging into the plastic portion of the '525's phone jack. Pressure on the ends of the front panel results in pressure on this screw; the resultant panel twist is coupled to the PTO. If this condition is present in your rig, snip off the end of the screw with cutters.

With the '525's cover removed, I discovered that touching the PTO cover or bringing part of the '525's bottom cover near the PTO cover can cause wide frequency changes. This suggests that the PTO shielding is inadequate. To correct this condition:

1) Remove the small bracket on the side of the PTO housing that normally receives one of the mounting screws for the transceiver bottom cover.

2) Loosen the PTO cover by backing the PTO-cover retaining screw out a few turns.

3) Remove the piece of fiber board that insulates the PTO cover from the PTO aluminum housing.

4) Cut a piece of household aluminum foil a little wider than the length of the fiber board and about 10 inches long. Wrap the fiber board with about three thicknesses of foil. Cut a hole in the foil corresponding to the hole in the fiber board to permit access to the PTO alignment coil slug.

5) Slip the foil-wrapped fiber board back into its original position and tighten the PTO-cover retaining screw to clamp the foil to the PTO housing.

6) Reinstall the bottom cover of the '525, omitting the screw that formerly engaged the PTO bracket.

This completes the modification. Note: This procedure shifts the Argosy 525's tuning calibration somewhat, so you may need to reset the tuning dial to restore proper calibration. If you find that the tuning shift is excessive or the dial tracking is off, consider realigning the PTO as described in the '525's manual.—*Charles J. Michaels, W7XC, 13431 N 24th Ave, Phoenix, AZ 85029*

A GUARD FOR THE TS-430S MEMORY BUTTON

☐ When operating my Kenwood TS-430S transceiver, I had a tendency to hit the rig's M. IN (memory input) push button instead of my intended target (MR, memory recall). This, of course, erases the selected memory channel and stores whatever frequency happens to be displayed at the moment!

I solved this problem by making a small switch guard out of thin wood veneer as shown in Fig 4. (Hobby stores carry such material; plastic is also suitable.) I used model paint to color the guard to match the '430's front panel and stuck the guard to the panel with double-stick tape. (A temporary mounting technique makes the guard removable for later resale of the rig.)

The effect of the switch guard is simple: If I want to push M. IN, I must push the button intentionally and *squarely.—David F. Miller, K9POX, 7462 Lawler Ave, Niles, IL 60648*

PUTTING THE BUTTERNUT VERTICAL ANTENNA ON 160 METERS

☐ My 160-meter antenna is a Butternut HF2V equipped with the optional 160-meter base coil. Considering that this antenna is only 32 feet long, it does a good job. Its bandwidth on 160 is 10 kHz or so without top loading. In fact, life on 160 with the HF2V is difficult for me only when I want to move around in the band: Readjusting the antenna is laborious.

My attempt to solve this problem was to put taps on the 160-meter base coil. I was satisfied with this until the weather turned bad. (Working at the antenna base in the freezing rain is unpleasant enough to get the old gray matter working on a better way!)

Butternut's optional 160-meter loading coil kit consists of a large inductor, two high-voltage 200-pF capacitors and mounting hardware. The two capacitors are used in parallel with the 160-meter coil to resonate the antenna in the 160-meter band. It occurred to me that easy remote tuning could be mine if I replaced one of the 200-pF fixed capacitors with a motor driven *variable* unit—to be controlled from the comfort of my shack, of course!

I calculated the inductance of the 160-meter coil as roughly 12.8 μH. Further calculations revealed that a coil of this value would require 550 pF to resonate at 1.9 MHz—more capacitance than that afforded by the paralleled 200-pF capacitors. Clearly, the antenna element adds enough inductance and capacitance to the circuit to bring the system down to its correct frequency. I decided to treat the antenna's effect as purely capacitive in calculating the value of my variable "QSY capacitor." I determined that placing a 150-to-250-pF variable in parallel with *one* of Butternut's 200-pF add-on capacitors would allow me to adjust the antenna's resonant frequency across the entire 160-meter band.

Finding a suitable variable capacitor was the next problem. I located a suitable capacitor in an electronics surplus store. Problem, though: Under test, the capacitor's 0.025-inch spacing could not withstand the voltage across the 160-meter tuned circuit. I increased its spacing to 0.05 inch by removing every other rotor plate and maintained the proper rotor-to-stator spacing by installing two rotor plates back-to-back wherever one was needed. To

obtain the 150-pF minimum capacitance called for in my calculations, I rotated three of the rotor plates 180° relative to the others and paralleled the variable with a 50-pF, 3000-V mica capacitor. When three plates are fully meshed with the stator, this combination unit provides 150 pF; turning the shaft 180° meshes four plates with the stator and increases the total capacitance to 250 pF. I tested the QSY capacitor by substituting it for one of Butternut's 200-pF units. It worked great!

Next, I found a 120 V ac, 1 r/min timer motor to turn the capacitor shaft. To supply power to the motor, I decided to use two 120- to 12.6-V transformers back to back—one in the shack (step down) and the other at the antenna base (step up). The motor is coupled to the capacitor by means of a 1-inch piece of vinyl tubing cut from a fish tank suction cleaner. I mounted the QSY capacitor, motor and step-up transformer in a plastic lunch box and installed the box at the base of the antenna. To protect the components from the weather, I sealed the lunch box with caulking.

The QSY capacitor allows me to tune the antenna for a 1:1 SWR anywhere in the 160-meter band. Installation of the capacitor also had a positive effect on the SWR bandwidth at 40 and 80 meters: I gained 56 kHz at 80 and 84 kHz at 40.

Operating with the modified Butternut vertical is a pleasure. QSY on 160 is accomplished as follows. First, I determine the approximate capacitor setting by applying less than 1 W to the antenna and watching the SWR meter as the capacitor is tuned. As the capacitor approaches the correct value, the SWR drops rapidly. At this point, I turn off the capacitor motor and increase power to a watt or two. (The higher power level allows finer adjustment.) Then, I start the motor again and turn it off when the SWR reaches minimum. There you have it: 160-meter QSY in less than a minute with a few flips of a switch—from the cozy comfort of the shack!—*Robert G. Pierlott, III, WE4J, 8824 Nightingale Ln, Pineville, NC 28134*

HOME-MADE COIL DOPE

☐ Tuffak® and Lexan® plastics can be used to make a superior coil dope. To do this, dissolve a quantity of one of these plastics in a polycarbonate solvent capable of bonding them chemically. (One such solvent is Weldon-35, made by Industrial Polychemical Service, 17109 S Main St, Gardena, CA 90247 and usually available at plastic sign shops.) The result is a fine, workable paste that dries quickly to a clear coating. Caution: Don't breathe the fumes of this solvent and the coil dope, use them in a well-ventilated area and don't get them into contact with your skin.—*Jack Sobel, WØSVM, 64 Burning Tree Dr, Chesterfield, MO 63017*

NAIL POLISH AS ETCH RESIST FOR CIRCUIT BOARDS

☐ Here's the quickest, simplest method I've found for making one-of-a-kind circuit boards. Once you've settled on a circuit for a particular project, draw the board layout full size on a piece of paper (discarded computer printout paper works fine!). Once you've determined the component layout and board size, cut a piece of single-sided circuit board stock to the exact size of the layout and polish the copper side with steel wool to brighten it. Then, coat it with a layer of nail polish. Once the board is fully coated, set it aside to dry until the nail polish is shiny and fairly hard.

Next, trim the layout sheet to make it fit the board and tape it over the board, taking care that the board and layout paper edges meet on all sides. Transfer the circuit to the nail polish by tracing around each conductor with a ball-point pen or soft (no. 2 or 2½) pencil, bearing down hard enough to make an impression in the nail polish coating. When you've finished transferring the pattern, remove the layout paper from the board. The impressions in the nail polish layer should be clearly visible. Next, using a scriber or sharp-pointed knife, remove the nail polish along the circuit traces—not in the traces themselves—down to the bare copper. Make sure there are no bridges between circuit elements and etch the board as usual.

Once the board has been etched and rinsed, remove the nail polish that remains on the board with lacquer thinner or nail polish remover. (As usual, don't breathe the fumes of these chemicals, use them in a well-ventilated area and don't get them into contact with your skin.) Check for short circuits with an ohmmeter; if you find any, clear them with a knife or scriber. Drilling the board comes next.

Using this method, traces can pass as close to each other as 1/64 inch. This allows successful mounting of DIP ICs if the ICs are mounted as surface-mount devices *on the foil side of the board.* I've made dozens of boards using the technique described here; most were completed in a single evening.—*John Stonitsch, W2KXG, 5 Karen Rd, Glen Cove, NY 11542*

ADHESIVE PADS MAKE QUICK PROTOTYPING EASY

☐ Have you ever noticed that the mechanical part of any construction project is always much harder and more time consuming than wiring and testing the device? In particular, I've found that a project gets even more complicated than usual if a component designed to be mounted directly onto a chassis must also be isolated from ground. This is often necessary when mounting variable capacitors in antenna tuners, noise and resistance bridges, shielded DF loops, and so on.

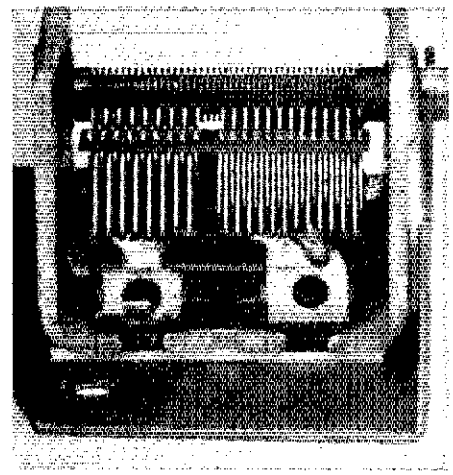


Fig 5—Glenn Yingling uses double-stick pads to mount components that must be isolated from the chassis. This photo shows pads at the front and bottom of a mounted part; pads need not be used in both places if mounting to one surface provides a strong enough bond.

My solution to this irritating problem is to mount such devices with the thick, double-stick pads normally used to mount devices such as compasses to automobile dashboards (see Fig 5). Surprisingly, controls mounted in this way don't feel spongy at all.

As near as I can determine, the dielectric constant of this tape is not a problem at frequencies up to 14 MHz or so. The capacitance between the device frame and ground can be reduced, if necessary, by using multiple pads to increase the spacing between the mounted part and chassis. The longevity of the pads is more than adequate for the intended service life (10 to 15 years) of the devices that I normally construct. The pads easily withstand the dc and RF voltage levels present in solid-state receiving and QRP transmitting equipment.—*Glenn Yingling, W2UW, 28 Lawrence Ave, Newark Valley, NY 13811*

RFI FROM A MULTI-OUTLET BOX

☐ After installing computerized RTTY gear, I experienced RFI in the form of "steel wool" on my monitor screen when my beam was aimed over the roof of the shack. One day, when the interference was especially intense, I decided to take another whack at plugging the RF leak. I unplugged cables one at a time from the RTTY modem until only the ac line remained. Keying the transmitter between each cable disconnect had so far demonstrated no reduction in the interference. Obviously, the RF was coming in on the ac line or through the modem cabinet. Because grounding the cabinet did not reduce the interference, I reckoned that the ac line was the source of the leak.

As I studied the Drake LF-6 multi-outlet

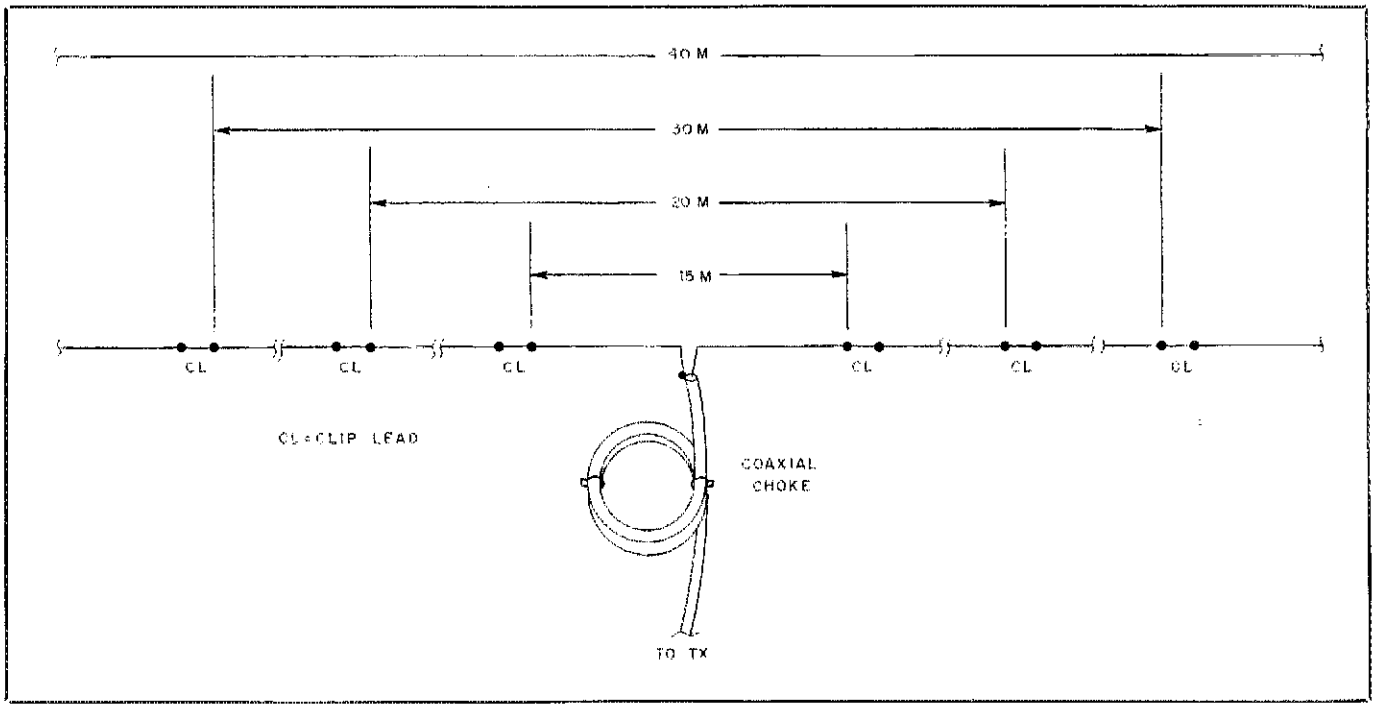


Fig 6—Larry Barry's multiband dipole makes crafty use of clip leads and thumbtacks to stuff half-wave dipoles for 15, 20, 30 and 40 meters into cramped apartment space. Changing bands entails only the connection or disconnection of clip leads. This drawing shows a straight dipole; Larry's antenna is bent into a square but works just fine. See text.

box that served as the ac connection point for the station gear, I discovered that the three-sided box cover was floating above ground—even at dc. I filed the finish off the mating surfaces of the box and reassembled the box with a star washer under each screw head. I reconnected all the gear exactly as before and presto—no RFI! Three years of frustration were over. —*Sid Kitrell, W0LYM, 926 Leisure Ln, Sevierville, TN 37862*

AN INDOOR DIPOLE ANTENNA

☐ I live in an apartment. Because of this, I'm limited in the size and type of antenna I can install for use on HF. After trying end-fed random wires, loops, mobile verticals, rain gutters and so on, I designed a multiband dipole antenna that requires no tuning after installation. It's inconspicuous, non-hazardous and efficient. I used the following materials to construct it: one PL-259 connector; 12 feet of "Mini 8" coaxial cable; two nylon cable ties; approximately 45 feet of no. 22 insulated, solid copper wire; six test leads with alligator clips; 26 thumbtacks; and an SWR bridge. The antenna was installed in less than two hours.

After attaching the PL-259 to the coaxial cable, I wound 6 feet of the coax into a tight coil and held this winding together with two nylon cable ties. The result is a shield-choke balun at the point where the antenna elements attach to the cable.[2]

[2]See Bob Schetgen, "Shield Chokes for Coaxial Cable," *QST*, Mar 1988, p 41.

Using the formula ℓ (feet) = 234 ÷ f (MHz), I calculated the length of wire necessary for each leg of a half-wave dipole at 21.1 MHz. Next, I cut two wires to this length and attached them to the feed line, one to the shield braid and the other to the center conductor. Using my transmitter and SWR meter, I pruned the dipole ends equally until I obtained the lowest possible SWR at 21 MHz. (Caution: Trim the antenna wires only when the transmitter is *off*.)

At this point, the clip leads come into play. To get the antenna up and running on 14 MHz, follow this procedure: (1) Attach a clip lead to the end of the 15-meter dipole; (2) calculate the length of the legs of a 14-MHz dipole; (3) add enough wire to each clip lead/dipole leg to bring the total length of the each 14-MHz dipole leg to the length calculated in step 2; and (4) prune the added wire for minimum SWR at the 14-MHz design frequency with the aid of the transmitter and SWR bridge. Continue this procedure to add additional clip leads and wire segments for 10 and 7 MHz. I used the thumbtacks to secure the wire pieces and test leads to the plasterboard ceiling of my apartment. Fig 6 shows the configuration of the entire antenna in linear form.

In my installation, the actual length of the dipole legs for a given band is about 14% shorter than the calculated length. This is probably due to the proximity of the antenna to the apartment ceiling—and the fact that I had to install the antenna around the perimeter of a square room, almost like a loop!

Careful pruning of the antenna for my favorite band segments paid off: An antenna tuner is unnecessary on all of the antenna's four bands. With the addition of Doug DeMaw's "AC Outlet Strip with Filtering" (December 1986 *QST*, pages 25-27), I eliminated TVI and RFI from my station.—*Larry A. Barry, NV5I, 4119 Medical Dr F-304, San Antonio, TX 78229*

An antenna similar to Larry's has been in use at AK7M for several years. I use alligator clips instead of test leads, and my antenna's wire sections are held away from the plasterboard by nylon cable ties and thumbtacks. I can't complain about its performance: I've worked plenty of DX on 30, 20 and 15 meters running just 20 W output. Moral: All's not lost if you live in an apartment: Just keep plugging away with That Old Ham Spirit!—*AK7M*

Strays

I would like to get in touch with...

☐ any hams who are interested in the study of late 15th century England. John H. McMillan, K4QOP, 7726 SW 53rd Pl, Gainesville, FL 32608.

☐ anyone who has manuals for Weinschel Engineering model 1810A RF Ratio Meter and an Electronav EN 400 HF SSB Marine Radiotelephone made by Standard Electric, Copenhagen, Denmark. Bob Murray, KA7HLB, Box 1198, Coupeville, WA 98239.

Technical Correspondence

Conducted By Paul K. Pagel, N1FB
Senior Assistant Technical Editor

TESTING FOR PCB

☐ Does the oil in that dummy load of yours contain PCB (polychlorinated biphenyl), a toxic substance? There is a relatively inexpensive way to find out: Use the CLOR-N-OL™ 50 PCB screening kit sold by the DEXSIL Corporation. DEXSIL states: "The test is intended for use only with transformer oil of petroleum origin. It may not be useful for other fluids." CAUTION: *Wear rubber gloves and safety glasses when performing the test! Used kits—and any PCB-containing oil you discover—should be treated as hazardous waste and disposed of properly.*

The screening kits are available as single kits for $7 each and $6 each in packages of 20 kits, plus shipping and handling charges. Contact DEXSIL at One Hamden Park Dr, Hamden, CT 06517, tel 203-288-3509. (Thanks to Bill Jacobs, WA8YCG, for bringing this to our attention.)—*Paul K. Pagel, N1FB, ARRL HQ*

IMPROVING RECEIVER DYNAMIC RANGE WITH A SQUARE-WAVE LOCAL OSCILLATOR

☐ Although it's common for experimenters to borrow bits and pieces of projects to build a larger project, the circuit presented here goes the other way around. It's a simplification of an already elegant circuit.

Charles Wenzel won the second annual *rf design* Awards Contest with his implementation of an odd-order frequency multiplier circuit.[1] Part of his circuit makes an excellent sine-to-square-wave converter for shaping a receiver local-oscillator (LO) signal. The revised circuit I've devised is shown in Fig 1. While using the same drive power to an SBL-1 mixer, the input intercept was raised from 11.5 dBm to 17.5 dBm by using the wave-shaping circuit. The intercepts are relative to a single tone. An HP453B equipped with an HP8482A power sensor was used to measure the drive power (11 dBm in both cases).

For those wishing to verify my results, my experimental setup used a mixer that converted a 13.77-MHz signal to 10.00 MHz. The 3.77-MHz LO (I've yet to build the 4- to 4.1-MHz VFO for my 20-m transceiver!) has a seven-element, low-pass filter at the output to remove harmonics. The wave-shaping circuit produces them!

In lieu of MMICs, you can use one of the many 2N5109 or 2N5179 broadband amplifier circuits published,[2] although MMICs are much easier to use and are available by mail order.[3] The wave-shaping circuit requires a drive level of between 5 and 10 mW, and provides a conversion gain of between 1.8 and 2.5 dB. On a wideband oscilloscope, the wave shape appears to be acceptable between frequencies of 3.5 and 6.1 MHz, but the ARRL Lab lacks a third high-quality signal generator required to make the proper measurements. A high-dynamic-range system is needed to see the improvement—at power levels near the compression point, the reduction in IMD is barely measurable.—*Zachary Lau, ARRL Lab Engineer*

[1]C. Wenzel, "New Topology Multiplier Generates Odd Harmonics," *rf design*, Jul 1987, pp 31-34.
[2]D. DeMaw and W. Hayward, *Solid State Design for the Radio Amateur* (ARRL: Newington, 1986), p 147, Fig 12.

HW-9 TIPS

☐ I read the article, "Improving the HW-9 Transceiver,"[4] with great interest. I built an HW-9 about two years ago, and the first thing I added to it was a Curtis keyer chip; the second thing was a 100-kHz crystal calibration oscillator. The keyer and calibration oscillator circuits are contained on a small perf board that's secured to the left rear corner of the rig by means of small metal angle brackets. The calibrator has proved extremely useful in light of the HW-9 reduction drive's tendency to slip.

I'd like to add a couple of suggestions concerning the addition of the keyer circuit. I like to use a straight key from time to time, so I removed the original key jack, enlarged the hole and mounted a four-pin microphone connector in its place (see Fig 2). This provides connections for both a paddle and straight key without adding another jack. I also added a small push-button switch to the rear panel and connected it to the keying line for use as a TUNE switch.

I found the HW-9's keying to be a bit on the heavy side. Although the weighting could have been altered by using a weighting control connected to the Curtis chip, I decided it was better to correct the problem at its source: This is the HW-9's keying line, which has a slow return to +12 V. I solved this by adding a 1-kΩ resistor from the transmitter keying line to +12 V. Observation of the rig's output on a scope shows almost perfect weighting. I recommend this simple modification to anyone using an external keyer as well.

I'm already planning my next project: Add the SWR meter, thump suppressor and filter modifications described in the April article. With these additions, this great little rig will be even more of a joy to operate! Now—if I could just find a way to reduce the warm-up drift of the VFO. . .—*Larry V. East, W1HUE, 119-7 Buckland St, Plantsville, CT 06479*

[3]MMICs are available from Microwave Components of Michigan, 11216 Cape Cod, Taylor, MI 48180, tel 313-941-8469 (evenings).
[4]C. Hutchinson and Z. Lau, "Improving the HW-9 Transceiver," *QST*, Apr 1988, pp 26-29.

Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you may be reached if necessary.

Feedback

☐ Please refer to "RX Noise Bridges," *QST*, May 1988, pp 34-35 and 39. On p 39,

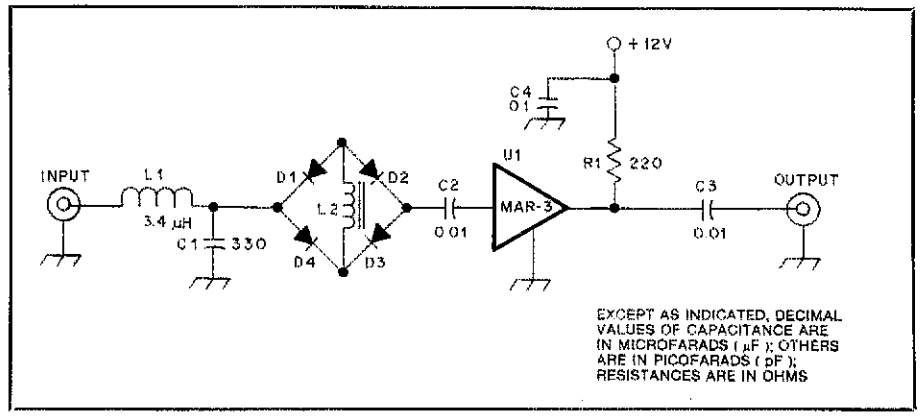


Fig 1—Schematic of the sine-to-square-wave converter.
C1—330-pF silver mica
C2-C4—Disc-ceramic capacitors
D1-D4—Schottky diodes.
L1—28 turns no. 26 enam. wire on an Amidon or Palomar Engineers T-37-2 toroidal core. (Amidon Associates, Inc, 12033 Otsego St, N Hollywood, CA 91607, tel 818-760-4429; Palomar Engineers, Box 455, Escondido, CA 92025, tel 619-747-3343.
L2—28 turns no. 26 enam. wire on an FT-37-72 toroidal core.
R1—220-Ω, ½-W.
U1—Mini-Circuits MAR-3, Avantek MSA 0304 or MSA 0385.

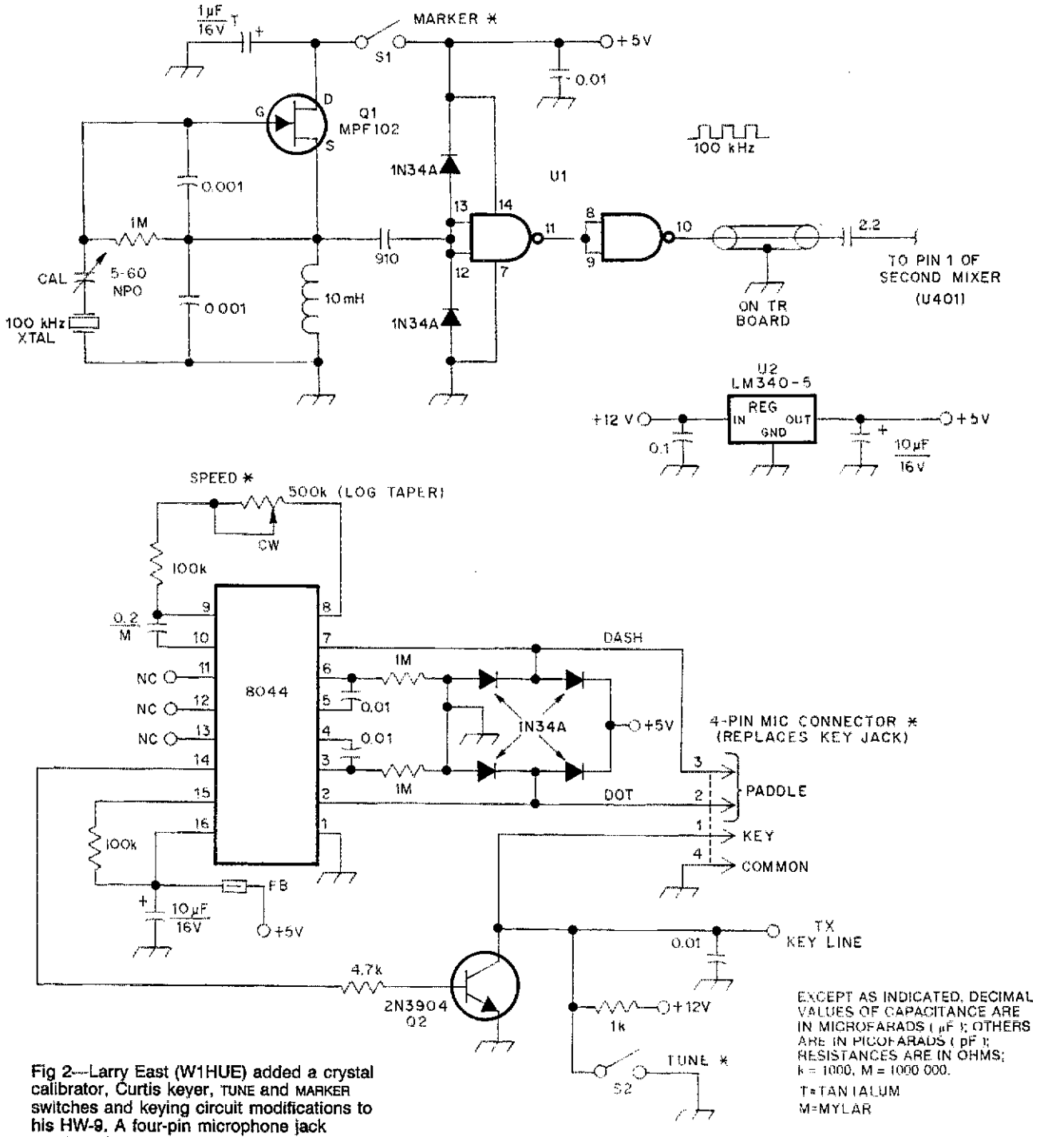


Fig 2—Larry East (W1HUE) added a crystal calibrator, Curtis keyer, TUNE and MARKER switches and keying circuit modifications to his HW-9. A four-pin microphone jack provides for straight-key and paddle connections.

EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (µF); OTHERS ARE IN PICOFARADS (pF); RESISTANCES ARE IN OHMS; k = 1000, M = 1000 000.

T=TANTALUM
M=MYLAR

* MOUNTED ON REAR PANEL OF HW-9

there is a typographical error to the left of the equals sign in equation 6. The equation should read: $Z'_{in} = 67.2 / 174.13°$.—(*tnx John Belrose, VE2CV.*)

☐ The Amidon T-44-0 core specified in the caption of Fig 1 of "Joe Ham Versus VCR RFI" (*QST*, Jul 1988, p 35) is not a powdered-iron core—it's phenolic. Although this core appears in the Amidon catalog under the powdered-iron core heading, a source at Micrometals, Inc confirms that the 0-mix cores are phenolic and have a permeability of 1 (see Jim Cox, "Iron Powder Cores for RF Power Applications," *rf design*, Feb 1987, pp 39-43.) Thanks to Michael A. Czuhajewski (WA8MCQ) for bringing this to our attention.

☐ In Doug DeMaw's "Preamplifier for 80- and 160-M Loop and Beverage Antennas," *QST*, Aug 1988, pp 22-24, there is an error in the Fig 1 parts list on p 23. L1 is wound on an FT-37-61 ferrite core, not an FT-50-61. (Although the FT-50 core yields a slightly higher inductance, it should fall within the tuning range specified.)

☐ Author Al Christman, KB8I, reported two errors in "Elevated Vertical Antenna Systems," *QST*, Aug 1988, pp 35-42. In Table 3, the input impedance of the 4-radial monopole at 15 feet should be 33.77 $+j$ 0.59 Ω, not 3.77 $+j$ 0.59 Ω. In Table 9, the antenna designations are reversed. The left-hand columns apply to a 1/8-λ monopole with a 1/4-λ radial, and the right-hand columns represent a 1/8-λ monopole with a 1/8-λ radial.

FCC Reallocates 220-222 MHz ARRL Fights On!

Ring-ring . . . ring-ring . . .

"Good morning. ARRL. May I help you?"

"Yes! I just heard we lost 2 MHz of the 220 band! I have two control links on 220 MHz. When do I have to move them? Is the ARRL going to file an appeal? Why don't we just sue FCC in Federal Court? How could three FCC Commissioners make such a decision when there's supposed to be five Commissioners . . ."

By Phil Sager, WB4FDT
ARRL Regulatory Information Branch Manager

Thursday, August 4, 1988 was truly "Black Thursday" for US amateurs. After all of our efforts, the over 6000 of you who submitted comments to the Commission, and who wrote your Congressman and Senators, the efforts of the ARRL staff, the meetings with the Commissioners and with the other policymakers within the Commission to explain the amateurs' position—after all our efforts to the contrary, to have the three FCC Commissioners vote to sustain the Docket substantially as proposed was a deep disappointment and setback to the League and Amateur Radio. It's difficult to accept that there appears to be no greater recognition of amateur requirements on the 220 band now than there was 18 months ago when the Notice of Proposed Rulemaking was first issued.

History of the 220 Band

The history of the 220 band is a long one. It was at the First Interamerican Radio Conference in 1937, held in Havana, Cuba, which recommended two new VHF amateur bands, one being at 224-240 MHz.

The FCC, in its 1938 rewrite of the amateur rules, gave amateurs 224-230 MHz. World War II intervened; when the bands were reopened, amateurs were temporarily given a band at 235-240 MHz. Finally, in 1948, the FCC moved the band to its present home, 220-225 MHz. Once some British-made wartime avionics had been phased out of use, the band was exclusively amateur in Region 2 until 1958; since then, amateurs have shared the band with the Government Radiolocation service.

Amateurs licensed in the early '70s remember the first challenge to the 220-MHz band. In 1971 the Electronic Industries Association sought 220-222 MHz for CB. In 1973 the FCC proposed taking the top 1 MHz of the 220 band for such a service. The FCC felt this allocation would relieve some of the heavy concentration of stations on the 27-MHz CB band, which in 1973 constituted nearly one-half of the radio stations licensed by the FCC.

The ARRL and thousands of amateurs filed comments against the proposal (the ARRL's filing weighed over three-quarters of a pound!) which raised issues that questioned the credibility of the idea. But in 1975 the White House Office of Telecommunications (an agency which no longer exists) weighed in with support for CB at 222-224 MHz—a classic case of "radio roulette."

In October 1977 the Commission dropped the proposal as "obsolete." A year earlier, the FCC had increased the number of CB channels from 23 to 40, and the FCC's Personal Radio Planning Group, after a study of the personal radio services, had concluded that other frequencies aside from 220 MHz should be considered. The group also thought there was a possibility of considerable television interference from the proposed service. FCC cast a shadow over future Amateur Radio use of the band, however, making vague allusions to its use by radio services other than amateur.

Amateurs celebrated the Commission's decision and continued to fill up the band, taking heed of the "use it or lose it" maxim. With the fast-growing development of the 2-meter band, we used the band heavily, especially on the East and West Coasts, saturating it with critical auxiliary and control links which supported repeater (and in the '80s, packet) stations in the 220-MHz and other amateur bands.

Yet the ink had barely dried on the Commission decision before a new challenge to the 220 band appeared. At the World Administrative Radio Conference in 1979, the US proposed a worldwide maritime allocation at 216-225 MHz, with Amateur Radio continuing as a secondary service. At the Conference, there was no support for a world maritime allocation. However, in Region 2 (US, Canada and South America) 220-225 MHz sharing with the fixed and mobile services was approved (although not a part of the US proposal) and later implemented by the FCC despite ARRL comments that there was no domestic need for these services in the band. At the time, no immediate use of the band by either service was mentioned by the FCC. The FCC said that, pending a study by a joint FCC/NTIA working group, they would maintain all three allocations, and would not implement any fixed or mobile service pending further rulemaking. These findings were never disclosed, if indeed they were ever formalized.

Thus, long before the 1987 FCC proposal to allocate the bottom 2 MHz of the 220 band to the land mobile service, a sword of Damocles has been held over the 220 band. Its threatened status has resulted in a problem that feeds upon itself: The uneasiness of the amateur allocation has stunted growth of amateur use of the band in comparison to other amateur VHF/UHF bands, and this slower growth has encouraged constant challenges to amateur occupancy,

which in turn has discouraged amateurs from purchasing equipment for the band, which in turn has discouraged manufacturers from marketing equipment for the band, and so on. Ironically, that cycle finally had been broken by the need for operation for packet-radio links and for Novice VHF operation—a development the Commission seems determined to overlook.

ARRL Options

So where does the ARRL go from here? Can we take the FCC to court? Yes, but it is best to take one step at a time. It is best to file a Petition for Reconsideration with the Commission first. Otherwise, the US Court of Appeals, in its review of the FCC decision, will be basing its review only upon the information previously brought before the Commission and the opportunity to place new, previously unavailable information into the record will be lost.

If our Petition for Reconsideration is denied, then it is likely the ARRL will ask the US Court of Appeals for the DC Circuit to review the FCC decision. However, this court is obliged to not substitute its judgment for that of the FCC because of the presumption of the Commission's expertise in the field of telecommunications. The Court, however, has greater discretion with regard to administrative procedures. If the ARRL can show the FCC decision was arbitrary, that the Commission had not considered all the alternatives, or that the Commission had predecided the issue, then the Court of Appeals could reverse the action or remand it to the Commission for further consideration.

Answers to Your Questions

"When does the Report and Order take effect? When do I have to move my control links?"

A: As of this writing, the actual Report and Order had not yet been published in the *Federal Register*. Rule changes generally take effect 30 days after publication. However, in this case the reallocation will not take effect until rules are in place permitting the FCC to make land-mobile assignments in the band. It will be several months or longer before that happens.

"Why did only three FCC Commissioners vote on the proposal? Aren't there supposed to be five Commissioners?"

A: Presently, there are two vacancies on the Commission. The Executive Branch has nominated two candidates, but the Senate has not acted on the nominations. At this point, it is virtually certain that the nominations will not be considered until Congress returns in January.

ARRL Will Fight On

The past 18 months have been marked by an all-out effort by the League to defeat the FCC proposal. This effort will continue, and rest assured that the ARRL will leave no stone unturned in its fight to have the FCC decision rescinded. As ARRL President Larry Price, W4RA, said: "The League will continue to pursue every available administrative, judicial, and legislative remedy to ensure that radio amateurs have access to the spectrum they need to serve the public." QST

Flash!

A Call to Action! ARRL Members—Help Save 220 MHz—Follow this plan now!

FCC adopted an Order on August 4, 1988, reallocating the 220-222 MHz band from the Amateur Service to the Land Mobile Service! ARRL Members have asked, "What can I do?" Three things will help save 220 MHz:

1. Ask the Senate and House Commerce Committees to add this amendment to an appropriate bill:

Radio Spectrum Allocation Sec_____

The Commission shall enforce the regulations, rules and policies in effect as of August 3, 1988 as they relate to the Amateur Radio Service in the 220-225 MHz frequency band as defined in 47 CFR Section 2.106 (Table of Frequency Allocations).

Write: Sen. Ernest F. Hollings (D-SC), Commerce, Science and Trans. Committee
Room SD-508, Attn: Ralph B. Everett
Washington, DC 20510

Sen. Daniel K. Inouye (D-HI)
Communications Subcommittee
Room SH-227, Attn: Tom Cohen
Washington, DC 20510
Rep. John D. Dingell (D-MI)
Energy and Commerce Committee,
Room 2221 RHOB Attn: John Orlando
Washington, DC 20515
and Rep. Edward J. Markey (D-MA)
Telecomms and Finance Subcommittee
Room 316 H.Annex II
Attn: Gerry Salemme
Washington, DC 20515.

2. Ask your own Senators and House Members to co-sponsor SConRes127 and HConRes 317. Already aboard in mid-August: Sen. Majority Leader Byrd WV, Sens. Adams WA, Boren OK, Bumpers AR, DeConcini AZ, Ford KY, Fowler GA, Heflin AL, Nunn GA, Pryor AR and Shelby AL; Repub. Sens. Pete Wilson CA (sponsor), Dole KS (Minority Leader), Cochran MS, D'Amato NY, Humphrey NH and McCain AZ. Dem Reps Towns NY, Hochbrueckner NY, Roe NJ, DeFazio OR, Hutto FL, Traxler MI, Robinson AR, Campbell CO, Florio NJ, Rose NC, Jacobs IN, Synar OK, McHugh NY,C. Wilson TX and Tallon SC; Repub Reps. Dornan CA (Sponsor), N. Johnson CT, John Rowland CT, Houghton NY, Latta OH, Hastert IL, Schuette MI, Horton NY, Bob Smith OR, Shaw FL, Bentley MD, Lewis CA, Roberts KS, Davis IL, Lujan NM, Coats IN, Martin IL, Clinger PA, Emerson MO, Lagomarsino CA, Weber MN, Buechner MO, Dannemeyer CA, McCollum FL and Dreier CA.

3. Get a copy of the FCC Order from ARRL (for fast service, please include a 9 × 12 inch SASE with 65 cents postage) and file with FCC, Washington DC 20554, an original and 5 copies of a request for reconsideration highlighting the effects the loss of the frequencies will have on you. ARRL officers, directors and staff will continue working right along with you!

Instructor/Teachers of the Year 1987

These educators exhibited innovative techniques and personal follow-through. If your ham radio pedagogue measures up, why not nominate him/her?

By Rosalie White, WA1STO
Education Activities Coordinator

A person has to be very special for his club to honor him by sponsoring an award in his name for nine years straight. Herb S. Brier, W9AD, *was* a very special and highly thought of person. He cared deeply about Amateur Radio instruction. Since 1978, the long-time *CQ* Novice Editor has been recognized through the Lake County (IN) Amateur Radio Club's sponsorship with the ARRL of the "ARRL Herb S. Brier Instructor of the Year Award." In his footsteps follow equally special instructors: this year's and previous years' winners of the award. The Brier award and the new ARRL Professional Teacher of the Year Award acknowledge the best of our active volunteer instructors and our professional teachers who use Amateur Radio in their curriculum.

Winners for 1987, voted on by the ARRL Board of Directors at their July meeting, are:

ARRL Herb S. Brier Instructor of the Year —Larry Odoms, K7NUL

ARRL Professional Teacher of the Year— Carole Perry, WB2MGP and Joseph Fairclough, WB2JKJ.

Other instructors honored by being nominated were: James Groover, Jr, KB4RMN, George Gruenther, WEØU, Glenn King, N5DFB, Tom Middleton, WB4CKY, Robert Ross, W1HJT and Brian Schreen, NT7R.

1987 ARRL Herb S. Brier Instructor of the Year Award Winner

This year's volunteer instructor award winner, Larry Odoms, K7NUL, achieved a 100% rate of students earning their license in his recent class. He attributes this to the constant use of demonstrations to teach basic theory. He states, "It's become easy to get students to follow a course of action toward passing the FCC examinations, but the real challenge is more in bringing the person to a position of *using their license consistently* and even upgrading their license privileges. My work here is to help the student isolate the steps to take in getting on the air, and follow through with my help in those hard areas of assembling an operating station." In a thank-you letter to Larry, one of his students, Frank Turner, wrote:

Larry Odoms, K7NUL (second from right) uses hands-on demonstrations to illustrate radio theory.

"You have certainly made Amateur Radio a fascinating subject. You have a real talent for teaching, and it is for sure that no one slept in any of your classes."

1987 ARRL Professional Teacher of the Year Award Winners

Anyone involved with Amateur Radio instruction has probably heard of Joe Fairclough, WB2JKJ, and Carole Perry, WB2MGP. Licensed since 1962, Joe became a high school English teacher in 1968. His school, G. Straubenmuller Junior High School 22 in New York City, enrolls students who have not been academically successful. After several years of using conventional English-teaching methods with little success, Joe decided it was time for a change. He devised an English curriculum around Amateur Radio as follows: Teach Morse code at the beginning of the term until students can copy spelling and vocabulary in CW. Use the *Tune in the World* text for reading assignments, learning to diagram sentences and so on. Some students go beyond this to earn their Novice license. The school's radio club equipment was purchased from Joe's and the students' fund-raising efforts. Joe says, "Above all I try to promote respect for others and oneself and courtesy to all."

Joe Fairclough, WB2JKJ, and one of the "Crew at 22," Cynthia Perez, KB2DHX, in the classroom at Junior High School 22, New York City, New York.

Joe and his students received letters from President Reagan, New York City Mayor Koch and Barry Goldwater, K7UGA, in response to publicity on their Amateur Radio projects. Joe won the Radio Club of America Grants-in-Aid award. His classroom activities have been published in *Ripley's Believe It or Not!*, and his students spoke with W5LFL on the space shuttle *Columbia*.

"Mighty Good Professor" are the phonetics used by ham radio student Justin Goldberg for his teacher, Carole Perry, WB2MGP. Another student, Stephen Martucci, KB2CSY, wrote: "Mrs Perry is a very fine teacher in the way that she makes learning fun. If there were more teachers in the world [like her] today, there wouldn't be any problems in the world." Carole is a science teacher at Rocco Laurie Intermediate School 72 on Staten Island, New York. Carole's school principal, Stanley Katzman, feels that her "Introduction to Amateur Radio" class combines learning material challenging enough for gifted children and useful in reinforcing basic concepts for reluctant learners. Over 4500 students have gone through this unique program, with a large percentage receiving their licenses.

Great interest in her classes by the community led to the formation of two evening programs at the school taught by local club members. One class helps students who already have the Novice license to upgrade; the other offers the Novice program to adults. Her daughter, Lori Perry, KA2TCC, says: "Years after children have left her class, they come to our home and seek out her help. They're always welcomed in and steered toward upgrading classes that my mom has been instrumental in setting up on

Carole Perry, WB2MGP, explains radio communications to students of Intermediate School 72 on Staten Island, New York, prior to the SSTV contact with the *Challenger* and astronaut Tony England, W0ORE.

Previous Winners of the Herb S. Brier, W9AD, Award

1978 Sam May, AD7F
1979 Dr Arthur Smith, N3DR
1980 Dan Hoover, W9VEY
1981 Eddie Miller, W5EXI
1982 Paul Woodland, W8EEY and Vera Woodland, WD5BOW
1983 Peter Kemp, KA1KD
1984 Gordon West, WB6NOA
1985-6 no award presented

Staten Island." The New York City Parks Department accepted her proposal to introduce ham radio in their recreation programs after school. Carole's class was featured in the ARRL videotape, *The New World of Amateur Radio*.

Nominate Your Deserving Instructor

If you are saying to yourself that your instructors are great people and deserve just as much recognition as any of these individuals, here is your chance to reward them. Send their names along with a brief explanation of why you are nominating them, to your Section Manager (page 8 of any *QST*) by April 1, 1989. To be eligible for the ARRL Herb S. Brier Instructor of the Year Award, a nominee must be registered as an active ARRL instructor; must use ARRL training publications; must not be personally compensated, though students may be charged a fee to offset costs; and must agree in writing that if selected he or she will not use the award in promoting any future commercial Amateur Radio teaching ventures.

To be eligible for the ARRL Professional Teacher of the Year Award, the nominee must teach or use Amateur Radio as part of the curriculum in a public or private educational institution and be compensated for the teaching activity; must use ARRL training publications as part of the curriculum material; and must agree in writing that if selected he or she will not use the award in promoting any future commercial Amateur Radio teaching ventures.

Winners are determined based on demonstrated ability and personal commitment, innovative teaching techniques employed, endorsements and testimonials; and personal follow-through in providing ham radio opportunities for students after they've earned their license. The awards proclaim instructors' efforts to promote Amateur Radio instruction, to enlist more instructors, to give teachers good role models and to identify innovative training materials and techniques.

Does this describe your instructor? Nominate that person now!

OSCAR 13 Report Card

☐ AMSAT-OSCAR 13 is beginning to make quite a name for itself. Following a successful June 15 launch, the mode B transponder was activated on July 22, followed by the transponders for modes J and L on July 24.

AMSAT President Vern Riportella, WA2LQQ, reports that the mode B and J transponders have had brisk activity, with hundreds of users; mode L has experienced light activity, but this is growing daily. A recent relay of the AMSAT 20-meter net on the mode B transponder covered four continents. According to Riportella, the mode B transmission was heard in North America, much of South America, Africa, Europe, the Middle East and much of Asia.

There are two minor problems with the satellite. The first involves the RUDAK transponder; AMSAT-DL is diagnosing this problem, which appears to be thermal in nature: A PROM (*P*rogrammable *R*ead *O*nly *M*emory) chip seems to be balking at the cold temperature. Possible solutions being investigated are turning on adjacent modules to heat up the PROM and bypassing the chip.

The second problem involves the mode L transponder. Radar energy at 1269 MHz seems to be raising the AGC voltage on the mode L receiver, impairing the receiver's sensitivity.

Riportella rates the satellite's performance to date as an "A–" to an "A." For further information on how to start using OSCAR 13, see "Introducing Phase 3C: A New, More Versatile OSCAR" (*QST*, June 1988, page 22), and recent installments of the Amateur Satellite Communications column in *QST*. The updated frequencies for AMSAT-OSCAR 13 are in Table 1.

To use Table 1, look at the second column (while referring to June 1988 *QST*, page 23). It gives the sum of the uplink and downlink frequencies. For example, for Mode B, the sum is 581.398 MHz. If you want your downlink to appear at mid-band, 145.890 MHz, subtract that value from the sum frequency to get 435.508 MHz. Conversely, if you intend to transmit on 435.508 MHz and want to know where your downlink will appear before beginning your transmission, subtract 435.508 from 581.398. In the absence of Doppler shift, your downlink will appear at 145.890 MHz. An analogous computation can be made for any of the frequencies within the passband of any of the three modes shown in this table and on page 23 of the article in June 1988 *QST*. Be sure to take Doppler shift into account. On modes B and J, Doppler shift can amount to a few (less than 5) kHz. Mode L will be up to three times higher.

The mode B uplink frequency is 3 kHz higher than previously announced, the mode J uplink frequency is 2 kHz lower than previously announced and the mode L uplink frequency is 21 kHz higher than previously announced. When using the frequency tables on page 23 of the article in June 1988 *QST*, these changes should be made to the *Uplink* side of the tables only.

Table 1

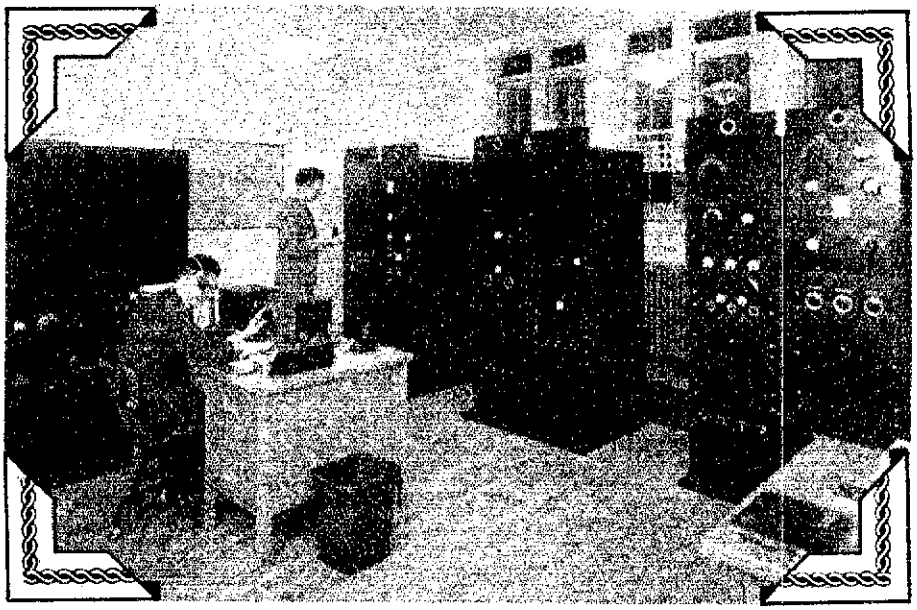
Measured AO-13 Translation Frequencies

Mode	*Sum of Up and Downlink Frequencies*	*Uplink Mid-band Frequency*	*Downlink Mid-Band Frequency*
B	581.398 MHz	435.508 MHz	145.890 MHz
J	580.413 MHz	144.448 MHz	435.965 MHz
L	1705.356 MHz	1269.496 MHz	435.860 MHz

A W1AW Vignette:

A Concise History of the ARRL Headquarters Station

By George Hart, W1NJM
Communications Manager (retired), ARRL



Circa 1938.

The history of the ARRL Headquarters Station goes back almost as far as the history of ARRL itself. It was in about 1924 that the boys at 1045 Main Street, Hartford, put the first station on the air. The call was 1MK, applied for and duly assigned to ARRL by the Federal Radio Commission. The first rig was four UV202s in parallel (five-watters, they were called), generating perhaps 20 watts of input power. The note was rough, the signal was broad, and operation was conducted by staff operators, usually during the noon period, on about 77 meters.

1MK—The First Station

That's right, 1MK. There was no prefix in those days, just a digit and two or three letters, the digit indicating the call area, as today. Operation was by CW, no phone. A CQ might have gone like this: CQ CQ CQ U 1MK 1MK 1MK K. The U stood for United States. Canadians put a C in that space, and other countries similarly used the first letter of their country name. Later, as DX started becoming popular and propagation-possible, it was decided to include the first letter of the continent; thus the U was replaced by NU, the C by NC, and so on. This was all unofficial. Not until 1929 did all prefixes denoting the country become official.

But getting back to that first station. Contacts during the noontime period were scarce, so occasionally someone would come in after hours, or in the evening, and then contacts were more readily available. The best DX was the Netherlands, not too bad a hop for the power even today!

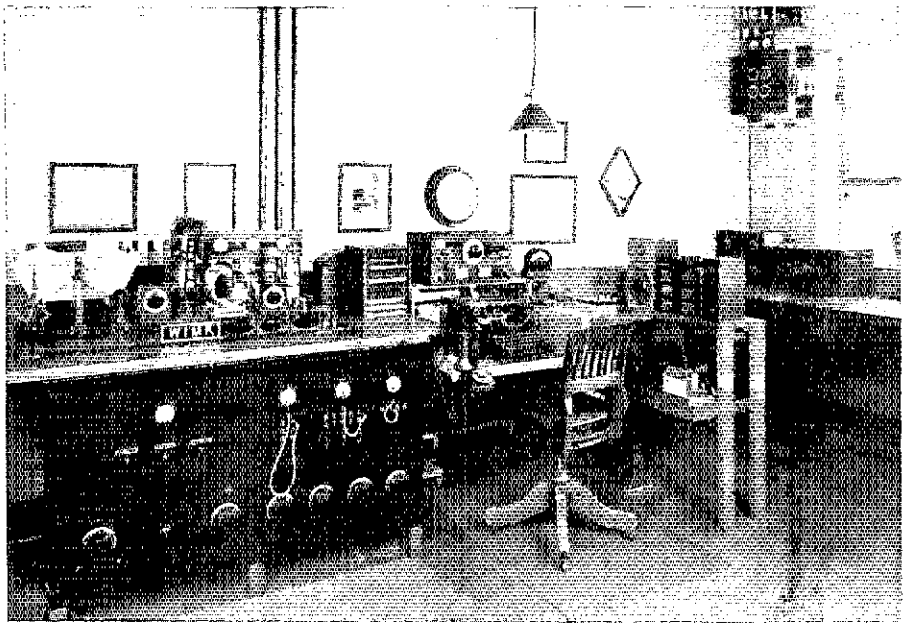
The receiver was the then-familiar Schnell detector and one-step of audio amplification, using a UV200 and UV201 respectively, entirely staff-built of course. It was a sensitive little thing, but not very selective, powered by a storage battery for filaments and "B" batteries for plate supply. Both the receiver and the transmitter were often out of commission because of staff tinkering to make them "work better."

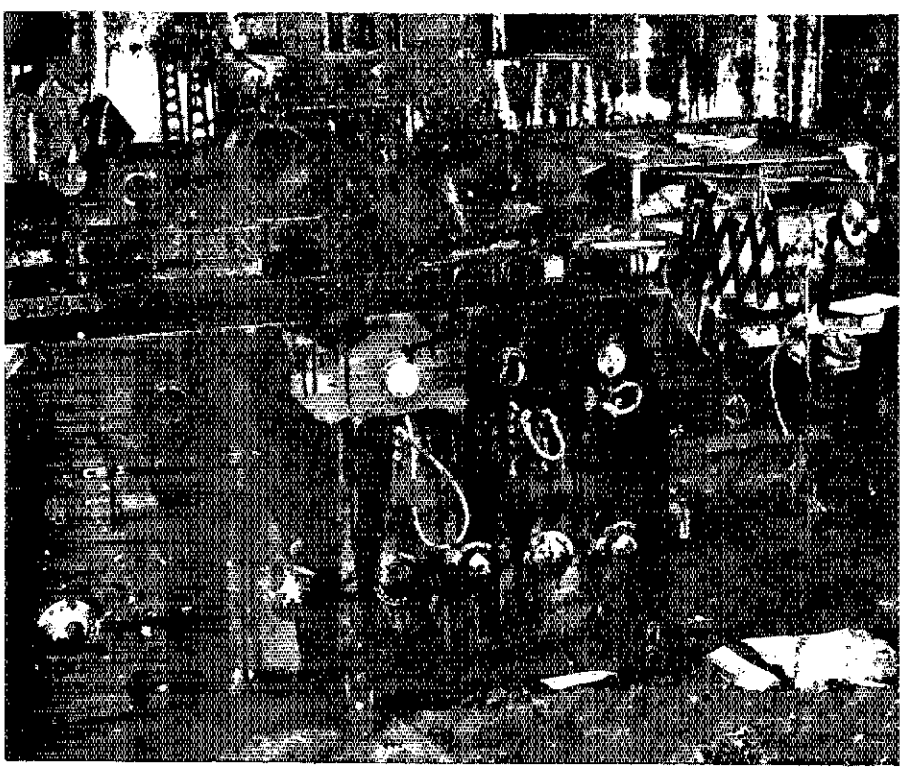
The five-watters were replaced by more modern tubes in subsequent rigs being operated from HQ, but 1MK was to be heard prominently on the air, sometimes with a quite raucous note. It was no disgrace, in those days. "Getting out" is what counted. Only rarely did stations use rectification and filtering.

An Official Station—With a National Guard Op

In 1928, responsive to membership demand, the Board of Directors authorized an official HQ station, located somewhere away from HQ (by then moved to 1711 Park Street, Hartford), and the hiring of an operator to attend it full time. After a lot of searching and negotiation, the station was installed in a National Guard building at Brainard Field in Hartford. Since the location was in a secure area, the operator who ran the station had to belong to the Guard, and this put a bit of a damper on finding a qualified man. That man was finally found, however, in the person of Bob Parmenter ("RP"), from Kentucky, where he operated under the call 9OX, 9TW and several others.

The main transmitter consisted of a pair of UV204s on 80 meters, purchased from Heintz and Kaufman. This transmitter was a workhorse for many years at W1MK. Power was furnished by a motorgenerator set which delivered dc with just a trace of ripple, giving the signal a distinctive whine. The station location, on the flood plain near the levee of the Connecticut River, provided excellent ground characteristics, and 1MK boasted a whopping signal that stood head and shoulders above everything else on the band. The station went on the air in September of 1928, "RP" at the key. Parmenter was an excellent operator and devoted a lot of time to the station, both on the air and in building maintenance. Other transmitters, for additional bands, were added under his guidance, and in 1929,





These photographs show W1MK as it looked in 1936 before and after the flood. Power was furnished by motorgenerators in an adjoining room. Our pride and joy, this station was completely destroyed by flood waters.

when the International Radiotelegraph Convention (Washington, 1927) provisions went into effect, 1MK became W1MK.

For almost eight years, this station represented ARRL HQ on the air, Parmenter doing most of the operating, supplemented at times by other staffers as necessary.

In 1933, RP returned to Louisville and a new career with radio station WHAS. Since W1MK had many schedule commitments, staff operators had to take over. The brunt of this operation was performed by Ev Battey, W1UE, F. E. (Ed) Handy, W1BDI (who was in charge as ARRL Communications Manager), and Arthur Hebert, W1ES, the League's treasurer. Other names appearing in the log during this period were Fred Pritchard, W1AQU, and one Charles Dean. Ev, however, was in effect the chief operator, a super-proficient CW man and a worthy albeit temporary successor to the popular RP.

But these staffers had other duties in the HQ office, so in April 1934, Hal Bubb, W8DES, appeared on the scene and took over the function formerly performed by RP. Hal later became W1JTD and took over full-time operation of W1MK. Then followed a period during which the station facilities were supplemented and modified to make W1MK a showpiece of high quality Amateur Radio operation of the day.

The Great Flood of 1936

But alas, when the torrential rains in March 1936 followed a winter of exceptionally heavy snowfall, the Connecticut River overflowed the levees, and W1MK was doomed in the Great Flood of 1936. Only a few items of equipment could be rescued before the inundation by six to eight feet of muddy, oily water, causing complete devastation of everything left behind. It was a sad day in the annals of the HQ station when our proud status as an Amateur Radio showpiece fell apart and W1MK became history, leaving the Headquarters station silent.

But not for long. Ed Handy and Hal Bubb procured some equipment and facilities from the HQ lab, supplemented it with the few items rescued from W1MK before the flood and erected an antenna atop the League's 38 La Salle Road Headquarters in West Hartford. Within days this new station representing HQ was on the air, signing W1INF, the call of the ARRL Headquarters

W1INF acted as the headquarters station following the flood. This medium-powered rig was in a corner of the Communications Department at the West Hartford headquarters offices.

It was a long, cold winter, but work continued on the new building into early 1938.

Operators Club. This station, operating from a crowded corner of the Communications Department office, although limited in power and coverage, made a good account of itself in the interlude between the devastation of W1MK and the opening of the new W1AW in its present location in 1938. The chronology went something like this:

A New Station, Dedicated to HPM

In February 1936, before the flood, our beloved founder and first president, Hiram Percy Maxim, W1AW, "The Old Man" himself, became a silent key. The ARRL Board of Directors, meeting in May of that year, voted to establish a new HQ station in Maxim's memory, appropriated a sum of money for the purpose and put Ed Handy, W1BDI, in charge of the project. At about the same time, overtures were made to the Maxim heirs and then to FCC to assign W1AW to ARRL Headquarters as the call to be used by the memorial station. A search was begun for a suitable site.

The site needed to be away from heavy traffic and heavy industry, with good ground characteristics. The League finally purchased seven acres in the little town of Newington, a suburban-rural town between Hartford and New Britain. The price, would you believe it, was $2200. Of course at that time the area was rural countryside, about the only dwelling being that of the former owner, Miss Elsie Starr, from whom the property was purchased.

Then came the hiring of an architect and planning for the building of new equipment and installation of antennas. At the Board meeting of May 1937, Mr Handy was able to report that all three phases were well under way, that the architect was well along with plans and excavation had started. Hal Bubb was hard at work on construction of transmitters, assisted by League staff technicians, and five 65-foot poles of western red cedar had been purchased and shipped and were ready to be set. The plan was to use four of the poles for the rhombic antenna, 350 feet on a leg, oriented due west (270°) to enhance West Coast coverage.

The acquisition of Maxim's personal call, W1AW, was accomplished in February 1937, and W1AW started being used in place of W1INF at the little station in the Communications Department in West Hartford. Hal worked on building the new transmitters during the day while operating the temporary station for bulletins and general membership contacts at night.

The Famous Rhombic

The five antenna poles were duly installed in the fall of 1937 by a volunteer crew from the Hartford Electric Light Co, and the work of putting up the antennas commenced—Hal Bubb again, climbing poles, constructing feed lines, working on new transmitters, operating W1AW from West Hartford. Outdoor work slackened during the winter months, but in the spring of '38 it recommenced with vigor. As the building took shape, the new rhombic was completed, along with long-wire and zepp antennas for 160, 80 and 40 meters. The rhombic could be used on all bands but was to be the principal 20-meter radiator.

By early summer of 1938, Hal had finished construction of kilowatt transmitters for 80, 40 and 20 meters, plus a 500-watt rig for 160, and a common modulator generating 500 watts of audio in class B, switchable to all but the 40-meter rig (no phone band on 40 meters then). Each rig was completely self-contained, from power supply through antenna. The transmitting equipment was installed in the new building in early summer, and testing commenced. Reports of performance of the rhombic were fantastic, with especially good results in the Southern Rockies, Southern California, New Zealand and Australia, especially the latter. We also packed a powerful wallop in South Africa. The signal in Europe was respectable, as in other places around the globe, but it was very evident that the rhombic would give us the much desired Southwest US coverage.

By late summer, the station was in operation from its new location, already giving a good account of itself on the air, although there was still work to be done ironing out bugs and building a new transmitter for 10 meters. Ed Handy and Hal Bubb conferred daily at length on problems and plans, often seeking advice and assistance from George Grammer, W1DF, and his crew in the ARRL lab. Remember, only W1AW was located in Newington at that time; the HQ offices were still in West Hartford, five miles away.

The Dedication

The official dedication of the new W1AW

W1AW: America's Station

For 75 years W1AW has helped you; now W1AW needs your help!

For untold thousands of radio amateurs throughout the world, the W1AW call sign has meant code practice as they strove to better themselves in the hobby.

For others, it has meant up-to-the-minute news of the world of Amateur Radio through the W1AW bulletin service.

No one can ever forget the first time they heard or worked W1AW. The thrill of that contact with America's most historic Amateur Radio station is the subject of many fondly told tales.

Now America's station needs *you*. Fifty years of New England winters have taken their toll on the building. The equipment looks like it should be in a museum, *not* part of the station all American radio amateurs look to with pride. It's *your* turn to help.

ARRL has established a fund to put the pride back where it belongs, in this flagship station. We need to replace a floor that sags under the weight of five kW amplifiers (one per band) that line the center of the room. We need to replace the shop-worn tube-type equipment that has helped to guide generations of new hams through their code practice.

Please help put the pride back in America's Station. Send your tax-deductible donations today to the W1AW Renovation Fund, 225 Main St, Newington, CT 06111

We will acknowledge your donation with a certificate that you can proudly hang on the wall of your own shack. It tells friends and visitors alike that you cared enough to say "Thanks!" to America's Station.—*Stephen A. Mendelsohn, WA2DHF, ARRL Hudson Division Director*

W1AW Kilowatt Club Correction

The W1AW Fund Drive extends its appreciation to Dr Ted E. Palmer, D.C., WA6MUK, as a contributor to the Kilowatt Club. Ted's call sign was previously listed incorrectly.

was a great event in the annals of ARRL history (see September *QST*, p 49). Visitors from far and wide were invited, and a canvas canopy was erected for the ceremony in front of the station, facing Main Street in Newington. The formal dedication was covered by radio stations WTIC and WDRC in Hartford and CBS nationwide. ARRL Vice President George Bailey, W1KH, was master of ceremonies, introducing the dignitaries, some of whom addressed the assemblage, which included all members of the ARRL staff, town and state dignitaries, and manufacturers' representatives. The highlight of the ceremony was the unveiling of the memorial plaque in the front lobby. "Dedicated to the Memory of Hiram Percy Maxim, 1869-1936. Father of organized Amateur Radio, Beloved First President of the American Radio Relay League, Inc." Applause rippled through the audience as ARRL President Eugene C. Woodruff, W8CMP, pulled back the bunting to reveal the plaque. As the new second operator of W1AW and the latest addition to the HQ staff, I watched from far in the rear, a large lump in my throat.

That evening the Maxim Memorial Relay took place, with W1AW in full operation making contacts and handling congratulatory messages. While the on-the-air activity was taking place, WTIC conducted an on-the-scene interview with Ed Handy, W1BDI, with the keying relays tapping away in the background. As the evening progressed and the visitors dispersed, things became quiet. However, the work of making contacts and handling messages continued far into the night, until dawn the next day, with Hal and I taking turns at the key and mike.

In the weeks that followed, I couldn't get enough of operating those marvelous transmitters. Hal and I operated six-hour shifts every day, plus alternate weekends. The normal shifts were from 3 PM to 3 AM, with regularly scheduled bulletins at 8 PM and midnight, plus a few traffic schedules and general operating periods on each band, phone and CW. Since Hal was the station engineer and chief operator, he usually took the early shift and I took the "graveyard." By 3 AM, I was usually not the slightest bit interested in going home and frequently continued operating until after daylight, thence to my rented room for some sleep during the daylight hours—only to show up for my shift at 9 PM and a repeat of the same procedure. Of course this could go on only for a certain length of time, but neither Hal nor I confined our presence at W1AW to the hours we were required to be on shift.

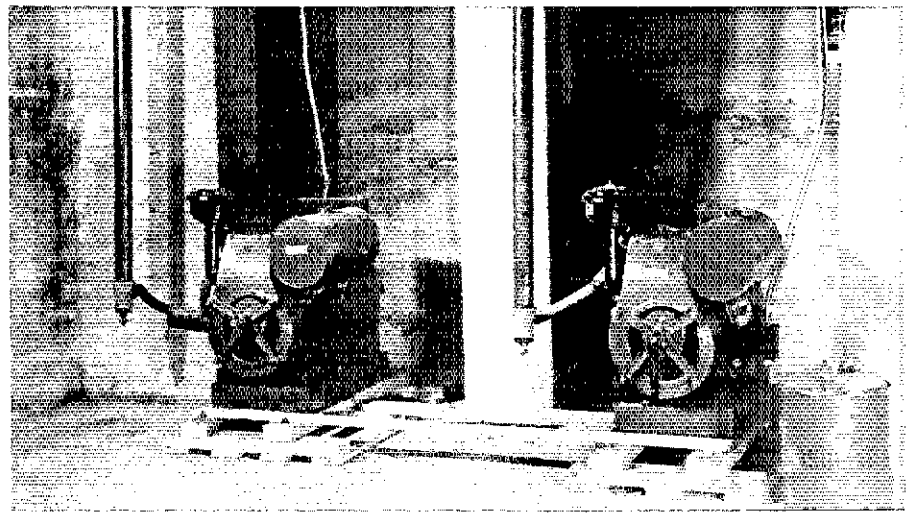
A Tropical Hurricane...And Emergency Power

Before the W1AW operation from Newington could get well under way, however, the area was visited by a tropical hurricane that devastated towns along the southern New England shoreline and blacked out electric power and telephones for several days in large portions of the northeastern US, including Newington. I happened to be at W1AW alone when the full fury of the storm struck. It was afternoon and I remember feeling the building shudder with the impact of the wind from the east. Then the electricity went off. Investigation revealed that rain water was being driven in through the cracks under and around the door in the front lobby. I mopped it up while staring out at the trees along Main Street being whipped wildly around. A large oak tree leaned drunkenly, then fell across the road, blocking traffic.

The solid little brick building withstood the forces of the wind very nicely, however. A few shingles blew off, but this was the only damage. With power off and telephone lines down throughout the area, with the attendant need for emergency communication, W1AW was helpless, for there had been no plans made yet for emergency power.

Late in the afternoon, while I checked the station for damage, Ed Handy and Hal Bubb arrived, worried about whether I had survived—but probably still more worried about the state of the building, its contents, the grounds and antennas. Ed announced that the station was officially closed until power was restored, but that power was still on at his home in West Hartford and they would need operators to help man his station. Of course, I volunteered, and three or four busy days followed with little sleep, although Mrs Handy kept us well fed.

The spectacle of a brand new superstation unable to serve in an emergency was understandably unacceptable to Station Trustee Ed Handy, and immediate plans were made to procure emergency generating equipment for W1AW. Generators capable of operating the station at full power were unthinkable. After all, we were still in the Depression, and money was tight. Eventually, a pair of 2-kW Kato generators were installed in the basement, one to operate on each side of the 220-volt line. The two generators worked well together in this configuration, since none of the gear operated on 220 volts. A maximum of 15 amps or so could be drawn from each side of the line, and this was enough to operate any one of the kilowatt transmitters at full power, plus ancillary equipment such as lights, oil burner and sump pump. Battery-powered emergency lights were also installed, so that in the event of power failure the operator had only to throw a toggle switch at the operating position to provide temporary lighting to enable him to crank up the two generators and throw the big knife switch which would put the entire building on emergency power from the commercial entrance. As luck would have it, it was many years before these generators would be needed in an actual emergency, then only to prove not optimum. This necessitated a new arrangement by means of which the full facilities of the station could be operated simultaneously—a requirement of over 15 kilowatts.



The 1938 hurricane proved the need for emergency power. These two Kato generators were capable of supplying enough power to run one of the several W1AW kilowatts at full steam.

Life at W1AW went on. Hal completed a 10-meter rig using RCA 806s in the final, new frequency-measuring gear, and general maintenance and trouble shooting. Operation continued smoothly, not without problems, but all relatively minor ones.

WW II—Amateur Radio and W1AW Closed Down

Until, that is, the gathering of war clouds, as the US was drawn closer and closer to the conflict in Europe. When the Japanese struck Pearl Harbor in December of 1941, all our lives suddenly changed. Hal Bubb came to the back door of my little house in Newington that Sunday afternoon and told me not to bother coming to the station the following day—Amateur Radio had been closed down and I was to report to the HQ office in West Hartford instead. It looked like my job was finished. No bulletins were sent from W1AW that night, but the next day I was told that W1AW operation would continue for the time being, that by special FCC request and permission, W1AW was to go on the air with bulletins announcing the closing down of Amateur Radio for the

duration, and to make contacts with amateur stations still operating to make them aware of the ban.

Some of the stations we contacted protested that they had special permission of one kind or another to continue operating and continued to do so. We did not argue with them; our job was simply to inform them that all normal amateur operation was to cease, with a minimum of discussion. W3XXX DE W1AW QRT QRT usually did the trick or, on voice, something like: W3XXX FROM W1AW, BY ORDER OF THE FCC, ALL AMATEUR OPERATION IS TO CEASE IMMEDIATELY. We sent bulletins on all bands on which we were operative, every hour, both phone and CW. This continued into January. Then FCC was consulted to find out how long they wanted us to continue. They expressed surprise that we were still operating and ordered us to cease doing so immediately. W1AW was closed up for the duration, heat turned off, water drained. Amateur Radio had gone to war.

W1AW stood idle for almost four years. Several overtures were made to the federal government to give W1AW an operating role in the war effort, but in each case they fell through, largely because the government wanted to take over completely, confiscating both building and property for the duration and for as long as needed thereafter. While the League was perfectly willing to have the building and equipment used for government purposes, military or otherwise, complete confiscation was not acceptable, and so W1AW stood idle, without heat, without water, completely abandoned. The electricity was left connected, and occasionally someone would go over and turn on the filaments, and check and report on the condition of the building and equipment. Despite the rigors of the unusually cold wartime winters, no extensive damage occurred during these years.

When the Japanese surrendered in 1945, W1AW was the first amateur station to come back on the air. It took several weeks for clearance through the military, but on October 31, 1945, W1AW took the air on spot frequencies only, by special dispensation of the Army and permission of the FCC. Permission was granted to send bulletins concerning progress being made in restoring the amateur frequencies to civilian use, from their wartime military training status back to the Amateur Radio Service.

So, when permission was finally granted, did someone just go out there, fire up the rigs and put on the first bulletin? No indeed, it wasn't *that* easy! As negotiations were proceeding, frantic preparations were made to restore the station to operating capability. The antenna farm was in disarray and the rigs were full of bugs (not literally!), mostly caused by the intense cold of winter and likewise intense heat of summer, the dampness and complete absence of use for such a long period.

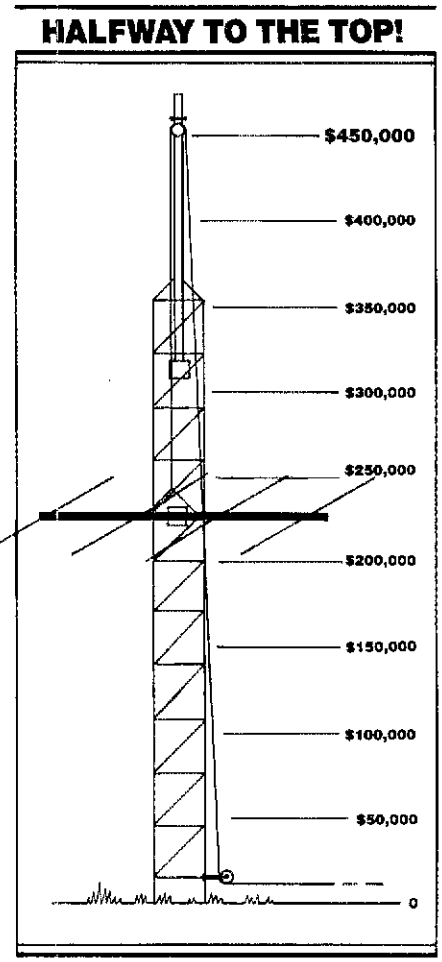
Once again it was Hal Bubb who came forward to do the dirty work. Hal spent many hours at the station getting things back into operating condition, so that when authorization was received there would be no time lost in getting the station "airborne." It was a great day for Amateur Radio and the beginning of an exciting new era when the clear, strong W1AW signal cut through the air with encouraging news to thousands of eagerly waiting hams that their League was on the job getting our frequencies back.

By early 1946, we were back on full operating schedule, with nightly bulletins and code practice, general contacts and participation in all League on-the-air activities. Hal Bubb went on to a new career, and a rapid succession of new operators took over from then until June 1950, when Murray Powell, W1QIS, became second op at W1AW. In December of that year Murray became chief operator, and in September 1952, he was joined by Chuck Bender, W3ODU (now W1WPR, and chief operator of W1AW since 1973), to form a W1AW operating team that lasted for over 20 years.

HQ Moves Next Door

While changes in the equipment were made during this period, nothing drastic occurred until the HQ offices moved to the W1AW antenna farm in 1963. Very shortly thereafter it was determined that both the inside and outside of W1AW should be renovated to match the magnificent new HQ office building. The memorial lobby was removed from the side of the building facing Main Street and relocated in an addition to the building on the opposite side, facing the new Headquarters. Most partitions inside the old building were removed, necessitating a supporting truss in the attic, making the inside mainly one big room. What had been the garage now became the new workshop, and the former waiting room was dispensed with. The "rigs that Hal built," somewhat modified and modernized, were moved to the basement to be used for spares, and new linear amplifiers were ordered, to be built under contract by Bill Orr, W6SAI, in the Eimac laboratories in California. Heavy duty power supplies were built and installed in the basement, along with a 20-kW

(continued on page 109)



You wouldn't know it was the same place! This is what the main operating room looked like after the renovation of 1964.

Emergency Communication: Is It Legal?

By Edward Mitchell, WA6AOD
4206 Suzanne Dr
Palo Alto, CA 94306

Of course, all *emergency* communications are legal. Yet, due to folk lore and secondhand anecdotes, emergency and public service communications have become a confusing topic for many amateurs. A surprising number seem to believe that much of our public service and disaster communications are illegal.

Some Examples

During August and September 1987, nearly *700 square miles* of California forest lands were destroyed by wildfire, causing the evacuation of tens of thousands of mountain residents. Hundreds of ham operators provided support communications for the US Forest Service, the California Department of Forestry, the American Red Cross and other relief agencies.

Once the fires were out, several hams were heard asking, "Were we legal? Or, were we conducting the regular business of these relief agencies?" That this question was asked at all, under the circumstances, illustrates the confusing interpretations of FCC rules within the amateur fraternity.

In some instances, the misunderstandings about emergency communications have irreparably tarnished the image of Amateur Radio. At a recent 200-mile bike ride, a "sag wagon" with Amateur Radio communications arrived on the scene of a serious accident; a volunteer paramedic had already arrived to administer first aid.

Due to the extent of injuries, the paramedic asked to confer with a physician who happened to be in the vicinity of net control. Strangely, the net control refused to allow the physician to speak directly over the radio. In spite of complicated medical terminology and the potential for mistakes, the net control operator insisted on verbally relaying each message. The control operator said he wasn't sure if it would be legal for the paramedic to speak directly with the physician.

Unfortunately this paramedic is a volunteer with a search and rescue group that *needs* Amateur Radio support. But, based on this unfortunate episode, they have chosen to avoid ham radio, because, the paramedic said, "It's unreliable."

Ham radio was the only communications system that could cover the route of 2500 bicyclists during a mountainous 100-mile bike ride. Amateur Radio assisted at 10 accidents, seven of which required paramedics or helicopter air ambulance response. Here, Rick Bradley, N6PDN, operates the net control position, copying down accident information as Roger Fluke, one of the ride directors, listens in.

At another bike tour, open to the public and sponsored by a local bike club, several hams told the ham radio coordinator that helping the bike club was not legal for ham radio—yet seven of the 2500 riders suffered major injuries requiring paramedic or helicopter air ambulance response. Ham radio proved essential to the safety of the riders.

So What Is Legal, Anyway?

For the most part, the confusion is not really in the FCC regulations, but in the amateur community and their understanding and interpretation of the FCC regulations.

Somewhere in the chain of ham radio folklore, facts about emergency communications have become distorted. At times, hams have written to the FCC asking about a hypothetical situation. Unfortunately, this may result in a hasty legal opinion, formed without consideration of all necessary factual details, when in fact, the FCC would prefer for us to be self-regulating and to resolve operational issues by ourselves (see reference 8).

When the FCC releases a *Report and Order* in a rule-making proceeding, it usually includes a discussion of why the new rule was written. Sometimes, these explanations appear at odds with, or incompletely explain, the regulations.

To help us understand what we can and cannot do, we must have a good understanding of each of the following three principles:

1) Business communications,
2) Emergency communications,
3) Public-service communications.

Business Communications

Business communications are expressly forbidden within the Amateur Radio Service. The Amateur Radio Service exists for several good reasons, including public service and technical experimentation. If routine business communication were allowed, any business could license its employees and swamp our 2-meter band with kilowatt repeaters and continuous communications in which we would not be welcome. (This has already happened in the General Mobile Radio Service, a "mixed use" service for both personal and business use.)

Because of this prohibition on business communications, the FCC has added a carefully worded exception for use during times of emergency, allowing Amateur Radio operators to conduct whatever type of communication is needed.

Public-service communication is provided for the benefit of the general public, such as when we help at running races or air shows.

The FCC regulations, Section 97.3, define *business communications* as:

> 97.3 Definitions:
> (bb) Business communications. Any transmission or communication the purpose of which is to facilitate the regular business or commercial affairs of any party.

The FCC rules, Sections 97.110 and 97.114, prohibit the use of Amateur Radio frequencies for business communications.

Note that *business* is defined as *the regular business or commercial affairs of*

Alternatives to the Amateur Radio Service

Running races and fire departments do not have "ham radio problems"—they have communications problems. To them, ham radio is just a telephone. They are asking for your help because they need your expert assistance to solve a communications problem; that you use ham radio frequencies to meet their need is only incidental to them. At times, particularly when business-like functions are requested, alternatives to the Amateur Radio Service may be more appropriate.

When a group asks for a function that we cannot perform legally under current FCC regulations, we typically say we cannot help them. We then miss out on an important training opportunity and we diminish our public-service role in the eyes of our local community.

But if we view ourselves as reliable communications problem solvers, we must do better. There is nothing in the rules prohibiting us, if properly licensed, from using another radio service for the communications that we are not authorized to perform as amateurs. Operational techniques on frequency bands allocated to other services can be just as professional and valuable as on the ham bands.

At some events you need to keep in touch with a key group of organizers, such as event directors, head of first aid, and so on. One approach has been to have a ham accompany them continuously and to provide a radio when needed. Obviously, this is people intensive and a more convenient solution would be to hand the key person a simple, nonham radio, hand-held or beeper.

Another example is that of the festival which needs to coordinate ticket sales. For these events, an alternative is to use business-radio-service transceivers.

Aside from the Citizens Band, there are three other services that could help. Low-cost, short-range, 49-MHz FM hand-held radios are available from several suppliers. These radios cover ¼ to ½ mile with a clean FM signal and are useful for short-range communications.

The General Mobile Radio Service operates on 16 FM channels at 462 MHz and 467 MHz. This service provides for both personal and business communication using relatively low cost radios.

Portable and mobile cellular radiotelephone equipment should not be overlooked; anyone who can operate a telephone can use a cellular radiophone. Disadvantages are that cellular systems often don't work outside of metropolitan areas or in mountainous terrain, and they are expensive.

These alternate radio systems and other business systems should be suggested to those who ask for functions inappropriate for the Amateur Radio Service. In some instances, these radios can be purchased at low cost, provided by the sponsor of the event, or are available for rent or loan from various sources (see the telephone book Yellow Pages).

any party. The FCC regulations make no distinction between for-profit and not-for-profit businesses. You cannot conduct the *regular business* of a charitable organization, such as providing mobile communications for a food bank in its daily collection of surplus food.

You can, however, assist at a 10k running race sponsored by the food bank (or a for-profit business) when your involvement is for the primary benefit of the general public, even if there is an incidental benefit to the sponsor (see reference 3). For example, where the communications are related to the safety of attendees and participants, the primary beneficiary is the general public, not the sponsor of the event.

Emergency Communications

Normally, all types of business communications, and certain types of third-party traffic, are prohibited. However, an important exception is made during emergencies. Section 97.3(w) defines emergencies as:

97.3 Definitions:

(w) Emergency communication. Any Amateur Radio communication directly relating to the immediate safety of life of individuals or the immediate protection of property.

The difficulty, as we will see in a moment, is the interpretation of what constitutes an immediate threat to life or property.

Both Sections 97.110 and 97.114 allow business communications during emergencies.

97.110 Business communications prohibited.

The transmission of business communications by an Amateur Radio station is prohibited except for emergency communications.

97.114 Limitations on third-party traffic.

(b) The transmission or delivery of the following third-party traffic is prohibited:

(3) Except for emergency communications as defined in this part, third-party traffic consisting of business communications on behalf of any party.

During an emergency, you may use your radio in any manner that is appropriate. Even though putting out fires or providing disaster assistance may be the *regular business* of your fire department or of the American Red Cross, in these situations an emergency affecting the immediate safety of life and property has occurred, and your Amateur Radio particpation is not only allowed, but encouraged.

When Does a Situation Become an Emergency?

The key words that define an emergency are "immediate safety of life of individuals or the immediate protection of property." Obvious examples of an emergency include natural disasters—such as tornadoes, hurricanes, blizzards, floods—and other forms of severe weather, forest fires, landslides and earthquakes, all of which typically cause immediate danger to both life and property.

Under these guidelines, assisting the Forest Service during a wildfire, allowing a physician to use your radio or performing Red Cross disaster assessment are all legitimate Amateur Radio operations.

Other situations, though, are less clear cut. For example, you spot a motorist, stranded along a suburban highway. Can you call for help on the repeater autopatch? At first this hardly seems like an emergency, but it may be a real danger to the stranded motorist.

Last year, a San Francisco Bay Area mother and daughter were killed when their disabled automobile was struck from behind. They were parked well off on the right side of the freeway, emergency flashers on, hood up, in broad daylight.

Could you have called for a tow truck?

According to the ARRL's *FCC Rule Book*, the answer is yes. Calling a towing service eliminates the need for an officer to drive to the scene and gets the vehicle removed from a dangerous situation much sooner. Of course, on many roads, stopping is not considered safe, and you would be better off driving past and autopatching the local police authority.

At the scene of an accident, can you hand your radio to an unlicensed person, such as a fire chief?

Dave Ficklin, N6BOH, "shadows" the Incident Commander for a recent multi-county disaster drill. Hams provided both on-scene communications for disaster officials, as well as coordinating delivery of victims to hospitals throughout the county. (*photo by Patty Winter, N6BIS*)

Yes. As long as you remain the control operator, this is merely standard third-party operation. This is usually the most efficient way to provide communications to an agency during an emergency. Rather than relay the message yourself, why not put the sender and the recipient on the radio? This eliminates errors and is much more efficient.

Public Service Communications

The FCC encourages public service activities within the Amateur Service. The very first rule in the FCC regulations states:

> 97.1 Basis and purpose
> The rules and regulations in this part are designed to provide an Amateur Radio service having a fundamental purpose as expressed in the following principles:
> (a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communications service, particularly with respect to providing emergency communications.

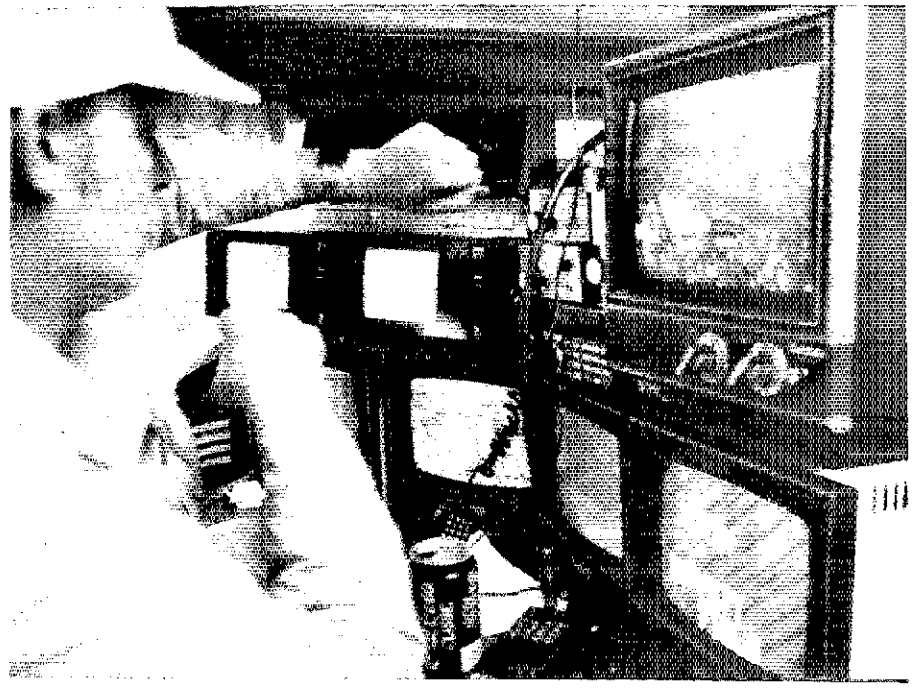
Much of the confusion over ham radio public-service communications stems both from a confusing Report and Order issued by the FCC in 1983 (see reference 10) and from a letter written to the FCC in 1984, with regard to support of the New York City Marathon. (See references 3, 6, 9 and 10.)

One of the purposes of the amateur network had been to inform the general public, and possibly the news media, of the race status via a public-address system at each mile marker. Clearly, this amounted to using Amateur Radio for purposes that are prohibited by the rules.

The letter basically asked if it was okay for the ham network to be broadcast over a public address system. Quite correctly, the FCC replied that reporting the position of lead runners via the amateur network and the public-address system ran afoul of the prohibition on broadcasting to the general public.

But contrary to widespread belief, the FCC did *not* prohibit amateurs from participating at running races nor did the FCC prohibit hams from assisting at events where there are paid participants. Acceptable activities, the FCC wrote, are not determined "by the profit objectives of the sponsor, nor by the pay status of other participants... Although some communications transmitted could incidentally benefit a sponsor, we do not view such communications as violations of the rules where their main purpose is to provide a service to the public."

Further, and again contrary to popular opinion, the FCC did *not* rule that, in general, it is illegal to transmit lead-runner position reports. At many races, the race director needs to know the locations of the lead-runners, the "pack" and the last runners so he can correctly position the first aid, ambulance and water-support crews.



The hub of the Moffett Field Air Show's ATV unit was run by Warren Terryberry, KB6HDA. Here, he sits in the ATV director's hot seat, assigning ATV crews as needed, and selecting video feeds for the monitor serving the net control positions outside.

If that is indeed the purpose of lead-runner reports, then this function is in the interest of runner and spectator safety and is a legal function for the Amateur Radio Service. Where position reports are intended for a PA broadcast, an alternate radio service must be used (see Alternatives to the Amateur Radio Service in this article).

Other examples of public service include bike races and tours, parades, air shows, a tornado and 4th of July fire watches, festivals, games and other activities that use your services to benefit the public.

However, not all public-service activities are allowed. For example, using ham radio to coordinate ticket sales at a public festival is forbidden since this is clearly a business function (see Alternatives to the Amateur

What Does the FCC Think About Public Service?

In 1983, the FCC issued a Report and Order concerning business operations and the various radio services that it regulates. The Order, unfortunately, confused many people, causing the ARRL to ask the FCC for clarification. Here's a portion of the FCC response to ARRL Counsel Chris Imlay, N3AKD.

...We want to emphasize that the Order does not prohibit amateur radio operators from participating in the routine events of traditional public service activities. For example, amateur radio operators may provide communications for municipal parades, marathons, walkathons, Eye Bank activities and the like. Although they may incidentally "benefit" the sponsor, their main purpose is to provide a service to the public which is the real beneficiary. Direct promotion to assist in the sale of a sponsor's product would, of course, be forbidden. Although it is not feasible to give you a list of every type of activity for which amateur licensees might be called on to provide communications assistance, we do want to assure that we concur in all the examples that you mention in your letter, including the permissibility of public service communications for neighborhood bike races, fireworks displays and the Olympic games. We agree that an amateur licensee's providing public service communications enhances any event which a particular organization offers as a part of its normal functions.

The Order was not intended to impose any new restrictions or to cut back on what amateur operators have legitimately been doing all along. What was intended was to alert the amateur community to the fact that the Amateur Radio Service should not be used in lieu of other radio services for the transmission of business messages. I think that we can all agree that a businessman, who also happens to be an amateur radio operator, should not use amateur radio facilities to call his office about details that surround his business transactions. On the other hand, the same businessman should feel free to use his amateur radio station if a member of his family becomes ill, if there is a safety factor in traveling on the highway, such as the need for a tow truck, etc...—*James C. McKinney, Chief, Private Radio Bureau*

Radio Service). On the other hand, using ham radio to coordinate supplies for ar open-to-the-public, 100-mile bike tour i permissible because such supplies, even i they include food, are essential to the well being, health and safety of the riders.

Can You Use Tactical Call Signs?

Tactical call signs are often used when working with other agencies during an emergency, or during large public-service activities. For example, during a running race, names like "Finish line," "Mile 1," "Mile 2," "First Aid 1" and "Water truck" quickly identify each function and eliminate confusion when working with other agencies, such as a fire department, where amateur call signs are meaningless.

The FCC does not prohibit tactical call signs, as long as the standard station identification rules are met (Section 97.84). Standard procedure is to identify at the end of each communication (the FCC's terminology) and at least every 10 minutes during a communication.

Can You Receive Payment for Your Amateur Radio Assistance?

No, the FCC regulations prohibit payments for the use of an Amateur Radio station. Specifically,

> 97.112 No remuneration for use of station.
> (a) An amateur station shall not be used to transmit or receive messages for hire, nor for communication for material compensation, direct or indirect, paid or promised.

Note that this rule does not prohibit you from being reimbursed for incidental expenses unrelated to your radio communication. If you assist at a disaster scene 100 miles from your home, you are not prohibited from receiving reimbursement for out-of-pocket travel expenses unrelated to your radio communication. For example, if as an American Red Cross Disaster Services Volunteer, you are flown to the scene of a disaster where you happen to use Amateur Radio as part of the relief effort, you are not required to pay your own airfare.

In summary, the FCC encourages activities that benefit the public. In the FCC letter regarding the NYC Marathon, FCC Private Radio Bureau Chief Robert Foosaner wrote, "Please inform your group that their licenses are not endangered by participating in the marathon. They have my support and my personal thanks for serving the public."

Public-service activities are an important, if not the primary, method of training for participation in actual disasters and emergencies. When the public needs your help, often in a life-or-death emergency, they need trained assistance. You would not want untrained paramedics at an accident—nor do you want inexperienced hams handling communications at a quake-damaged hospital.

Press Use of Amateur Radio

Both business use and *broadcasting*, which the FCC defines as "the dissemination of radio communications intended to be received by the public directly...," are prohibited within the Amateur Radio Service.

In general, the media may not directly use Amateur Radio to collect information for their broadcasts. However, there are two important exceptions.

First, *anyone* may listen to ham radio conversations. In the FCC's Report and Order in BC Docket 79-47, they wrote that it is okay for broadcasters to retransmit Amateur Radio transmissions. The broadcaster does not need permission of the FCC or of the stations involved. This means that broadcasters were legal in retransmitting live descriptions of earthquake destruction emanating from Mexico City.

Second, the FCC in Docket 79-47 wrote of a "rule of reason" that applies in interpreting the prohibition on broadcasting and news gathering.

> We note that a rule of reason applies when interpreting this emergency exception to the broadcast prohibitions in the Amateur Radio Service. Thus, conveying news information directly relating to an unforeseen event which involves the safety of human life or the immediate protection of property falls within this rule of reason, if it cannot be transmitted by any means other than Amateur Radio because of the remote location of the originating transmission or because normal communications have been disrupted by earthquake, fire, flood, tornado, hurricane, severe storm or national emergency...

In spite of this opinion, the regulations explicitly prohibit broadcast use and news gathering on the ham bands. The above quotation recognizes, however, that there may be extremely rare instances that warrant news gathering using Amateur Radio stations.

Nevertheless, what you heard during certain recent disasters may not have been legal, even under this opinion. Clearly, the communications should relate to the actual disaster, and not the coordination of media activities, such as scheduling reporters or

Mountain View Police Department, California Department of Transportation and California Highway Patrol officials monitor a developing road hazard via ATV.

"But is this Legal?"

If you are in doubt as to the legality of a particular Amateur Radio operation, the ARRL recommends contacting your local Section Manager or other ARRL official. He or she can provide an answer or pass the question to the appropriate Amateur Radio advisor. Contacting the FCC for an opinion is generally *not recommended*.

The FCC prefers for the Amateur Radio Service to be self-policing. Writing to the FCC asking for a legal opinion is generally the wrong way to approach your question and has, at times, resulted in opinions developed without a full presentation of the facts.

In one instance, a hypothetical question involving phone patches was posed to two separate FCC offices. Not surprisingly, the ham received two contradictory opinions. Depending upon who you asked, you could have created a new policy that not even the FCC would agree to!

ordering equipment or food for a TV crew. And remember, this *rule of reason* applies in extremely rare cases *only*. (See September *QST*, pp 58-59, for ARRL guidelines on interacting with the media.)

Summary

Amateur Radio serves an important role in emergency and public-service communications. The FCC regulations *encourage* public-service and emergency communications by the Amateur Radio Service.

In some situations, misunderstandings about emergency communications have reduced our effectiveness. To do our best, we must be familiar with the regulations and be ready to provide assistance when called upon.

We, as Amateur Radio operators, must continue to provide our important public service or risk losing important public recognition, and hence, frequency spectrum and even new hams. At a recent licensing class, more than two-thirds of the students said their primary reason for becoming a ham was that they wanted to help their communities through public-service and disaster assistance. Our public service also serves as a deterrent to local city councils that wish to establish restrictive antenna ordinances.

With the increasing use of cellular radiotelephones, commercial packet systems, radios for rent, and increased use of 800-MHz private trunked radio systems by public-service agencies, we must be innovative in applying Amateur Radio, and where legally necessary, nonamateur radio to communications problems. We, as licensed Amateur Radio operators, must become expert communications system designers.

The days are long past when a hand-held radio, or even a phone patch, could impress your local police and fire officials into incorporating ham radio in their disaster planning. Today, these planning officials have their own phone patches and their own cellular radiotelephones, and are building packet systems on their public-safety frequencies.

To meet today's challenges, we must work together as a skilled team, to provide creative communications solutions, inventing both new technologies and finding innovative uses for traditional systems such as HF SSB, VHF FM and ATV.

Acknowledgments

I wish to thank the following individuals for their review of this article: From the Santa Clara Valley Section: Dave Larton, N6JQJ, Section Training Coordinator and Assistant Section Manager; Sharon Moerner, N6MWD, District Emergency Coordinator; Weo Moerner, WN6I; Jim Lomasney, WA6NIL, Palo Alto Emergency Coordinator; Patty Winter, N6BIS; and Ted Harris, N6IIU, Director of Disaster Services, Palo Alto Area Chapter of the American Red Cross.

I'd also very much like to express appreciation to Craig Smith, N6ITW, District Emergency Coordinator for San Mateo County.

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Ed Mitchell was first licensed in 1973 at the age of 14 after spending hours of SWLing in front of an ancient Telefunken shortwave receiver. Over the years, his interests have included antenna building, DXing, contests, antenna building, OSCAR satellites, CW rag chewing, packet radio, public service, emergency communications and more antenna building. His wife has concluded that "the entire purpose of ham radio is to tinker and build things. Hams don't actually talk to anyone except during a contest, where the idea is to talk to the most people in the shortest amount of time without actually saying anything."

He is employed as an Engineering Project Manager at Software Publishing Corporation where he was responsible for the best-selling PFS First Choice integrated software package for the IBM® PC. In his spare time he has written many articles on both PC computing and Amateur Radio, including "When the Heat is On" (September 1985 QST) and is the author of the book, Software Construction Set for the IBM PC, *under the pseudonym Eric Anderson. He is currently writing a book on Turbo Pascal for the Howard W. Sams Book Company.*

Besides ham radio and writing, he enjoys being a new father, running and bicycling, and holds a private pilot's license.

Club Spectrum

Conducted By Rick Palm, K1CE
Field Services, Manager, ARRL

Clubs: Share Your Best Publicity/Recruiting Ideas, and Win a Computer!

Many affiliated clubs have developed sure-fire techniques for getting good publicity for Amateur Radio in their communities and for attracting newcomers into our ranks. If this describes your club, we want to hear from you! Don't hide your light under a bushel basket; garner all the fame and notoriety you're entitled to—by sending us your ideas, so we can share them with others!

The best ideas are the simple ones, so please try to keep your description down to two pages. If you want to attach some exhibits (photos, drawings, clippings, brochures, whatever), that's fine. Send to Rick Palm, K1CE, ARRL HQ. Please don't send anything you need to have returned. Deadline for receipt at HQ is December 1, 1988.

Submissions will be judged based on how readily and effectively the idea can be adapted by others to generate new hams. We're especially interested in knowing what prospective hams, especially the younger ones, tell you they find most attractive and enjoyable about Amateur Radio. We'll print the best ideas, and maybe some runners-up, in *Field Forum* or some other League publication.

And now to sweeten the pot. To say "thanks" to amateurs for their support through the years, and in the interest of promoting the growth of Amateur Radio, the Radio Shack division of Tandy Corporation will donate the latest model of Tandy 1000 computer, with monitor, as a prize for the affiliated club making the best submission!

Need any more incentive? We didn't think so!

Welcome New Special Service Club

West Branch Amateur Radio Assn, Williamsport, PA

Welcome Renewing Special Service Clubs

Silver Springs Radio Club, Inc, Ocala, FL
Vicksburg ARC, Vicksburg, MS
Peoria Area ARC, Peoria, IL
Portsmouth ARC, Portsmouth, VA
Riverland ARC, La Crosse, WI
Fox River Radio League, Aurora, IL
North Florida ARS, Jacksonville, FL
Ocean-Monmouth ARC, Inc, Neptune, NJ

ARRL Diamond Jubilee Award

By John F. Lindholm, W1XX, and Bart J. Jahnke, KB9NM—ARRL HQ

"In May 1914, a small band of radio amateurs led by the late Hiram Percy Maxim, W1AW, of silencer fame, and the late Clarence Tuska, started a national organization and named it the American Radio Relay League. Since that time, the story of Amateur Radio has been the history of the League—the chronicle of amateurs working together for the public welfare and for their common good."

So wrote John Huntoon, W1LVQ (now W1RW), ARRL General Manager 1961-1975, in the foreword to *Fifty Years of A.R.R.L.*, an ARRL publication marking 50 years of League prosperity.

In commemoration of the 75th Anniversary of the American Radio Relay League, we invite you to celebrate its Diamond Jubilee.

To mark this historic achievement, the ARRL Board of Directors has called for a year-long operating celebration open to amateurs and shortwave listeners around the world.

A handsome certificate (we've really outdone ourselves on this one!) may be earned in any of the following three categories, with each remaining category endorsable with a special ARRL Diamond:

- Work 75 ARRL/CRRL Sections on any combination of bands/modes. (There are currently 76 such entities, including VE8/VY1, which is counted as one additional section.) A complete list of Sections appears in Table 1.
- Work 75 *different* DXCC countries on a combination of the 18- and 24-MHz WARC bands. *Individual countries may be counted only once—regardless of band used.* Note: You may work all 75 countries on either 18 *or* 24 MHz, or a combination of both. The 18-MHz band is not expected to be available to US amateurs until mid-1989, so for US stations most early activity in this category will need to take place on 24 MHz. (See Table 2 for 18- and 24-MHz regional allocations.)
- Work 75 US Novice stations (or Technicians below 30 MHz) with exchanges something more than simple "hello-goodbyes." General, Advanced and Extra Class US amateurs work 75 Novice/Technicians to qualify. Novice/Technician stations work anybody for a total of 75 stations. The object of this category is to provide meaningful contacts that assist Novices in improving their operating skills and encourage them to upgrade.

Shortwave listeners are also encouraged to participate and may earn a certificate and endorsements by SWLing in any, up to all, of the three categories.

Application forms are available for an SASE with one unit of First Class postage (for US), or a self-addressed envelope from overseas, from The American Radio Relay League, Diamond Jubilee Award, 225 Main St, Newington, CT 06111 USA.

Rules

1) The Anniversary period to qualify for the "Diamond Jubilee" is from 0001 UTC January 1, 1989 through 2359 UTC December 31, 1989. All contacts must be made during this period.

2) The "Diamond Jubilee" is awarded for radio contact achievement in any of the three categories listed earlier.

3) The "Diamond Jubilee" may be endorsed in any of the remaining two categories not achieved in the initial application. Certificates with endorsements are also available to SWLs.

4) The applicant certifies on the official application the authenticity of log extract information for contacts. No QSL cards are required.

5) The "Diamond Jubilee" is available to ARRL members and nonmembers alike.

6) The official application form must be used to facilitate processing.

7) Send complete applications (within one year of the close of the Jubilee period) to ARRL HQ with: *Initial Applications* $5 US or Non-US may send 12 IRCs; *Endorsements* $1 US plus an SASE or Non-US send 2 IRCs and a self-addressed envelope.

Table 1

ARRL/CRRL Sections

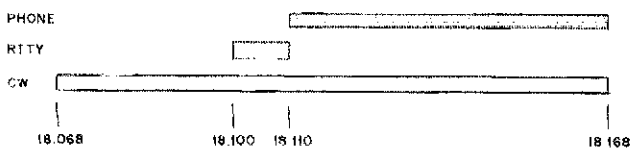
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*0*	VE
CT	ENY	DE	AL	AR	EB	AZ	MI	IL	CO	MAR
EMA	NLI	EPA	GA	LA	LAX	ID	OH	IN	IA	PQ
ME	NNJ	MDC	KY	MS	ORG	MT	WV	WI	KS	ON
NH	SNJ	WPA	NC	NM	SB	NV			MN	MB
RI	WNY		NFL	NTX	SCV	OR			MO	SK
VT			PR	OK	SDG	UT			NE	AB
WMA			SC	STX	SF	WA			ND	BC
			SFL	WTX	SJV	WY			SD	YU/NWT
			TN		SV	AK				
			VA		PAC					
			VI							

Table 2

18- and 24-MHz Band Plan for All IARU Regions

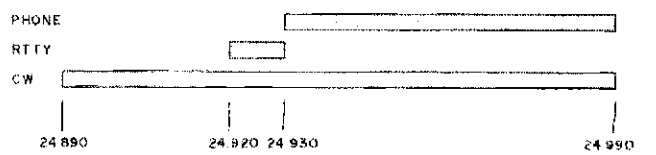
18 MHz Band Plan

All IARU Regions (US amateurs note: The 18-MHz band is expected to be available to US amateurs about mid-year 1989. US amateurs must not transmit on this band until it is released for use by the FCC. See *QST* and W1AW bulletins for updates.)



24 MHz Band Plan

All IARU Regions



• *At the Foundation*

Now, That's An Incentive!

What can a "mini-grant" do to assist a youth group interested in Amateur Radio? Plenty! Here's what your support of the Victor C. Clark Youth Incentive Program means to young hams.

By Mary Schetgen, N7IAL
Assistant Secretary
The ARRL Foundation

If you were a child when you were captivated by the wonders of ham radio, you probably had all the incentive you needed to get together with the nearest Elmer and study for your ticket. High enthusiasm is easy to find among the young (and old!) when Amateur Radio is on the scene. Schools and youth groups all over the country appreciate this fact, but are sometimes at a loss for the budget to afford even the simplest of stations for their newly founded club of prospective DXers.

The late ARRL President, Victor C. Clark, W4KFC, a lifelong and always-enthusiastic amateur, took great interest in promoting Amateur Radio involvement among the youth. Vic knew that enabling young people to experience Amateur Radio *firsthand* often opened the door to more than an excellent hobby and public service. He saw the educational and career potential that youth could derive from an ongoing ham radio interest. As a ham growing up in the heart of the Great Depression, Vic also knew the meaning of earning the funds to maintain a modest home-brew station. In Vic's day, having your own station was a dream of many hopeful hams, just as it is today. School stations were even rarer then, and fund-raising opportunities for school or community youth clubs were limited.

Victor C. Clark, W4KFC

Times have changed dramatically since the '30s. Kids hoping to set up a community Amateur Radio display or project, conduct club radio experiments, or improve or acquire station materials can raise the money needed for these projects at least in part through their own initiative. The Victor C. Clark Youth Incentive Pro-

THE ARRL FOUNDATION, INC.
"for the advancement of amateur radio"

VICTOR C. CLARK YOUTH INCENTIVE PROGRAM

At the request of the family of Vic Clark, the ARRL Foundation has established the Victor C. Clark Youth Incentive Program, with the objective of providing support for the development of Amateur Radio among high-school age youth. Funded by an endowment, the Program will make mini-grants to groups that demonstrate a serious intent to promote this objective. This will not be an award of scholarship, but rather a source of support for efforts (no doubt mostly local) to bring young people into Amateur Radio and enrich the Amateur Radio experience of amateurs under the age of 18.

Groups that may qualify for mini-grants will include, but not be limited to, high-school radio clubs, youth groups, and general-interest radio clubs that sponsor subgroups for young people or otherwise make a special effort to get them involved in club activities. Mini-grants, probably in amounts not exceeding $500 per grant, will be made for such projects as securing equipment for antennas for club stations, purchasing training material, supporting local service projects that bring favorable public exposure, and similar activities. Preference will be given to projects for which matching funds are raised locally.

Though there's no formal application form, we do ask that applicants provide as complete a proposal as they can, including such items as:

* names, call signs (if applicable), addresses and telephone numbers of sponsors
* objectives of the proposed program
* existing resources if relevant (e.g. status of school club station)
* concise, realistic, specific statement of financial need
* description of local amateur radio support
* description of local resources (e.g. matching funds, specific financial and/or equipment/material contributions)
* commitment of relevant local non-ham group (e.g. school, school science coordinator and/or principal, school board)
* any relevant supporting documentation including letters of support, letters of intent, pledges and the like
* timeframe; local evaluation process; criteria for evaluating program effectiveness/success

The ARRL Foundation is eager to assist worthy local Amateur Radio youth projects through the Victor C. Clark Youth Incentive Program. We look forward to receiving your application and proposal in the near future.

Stephen C. Place, WB1EYI
Secretary

225 Main Street Newington Connecticut 06111 (203) 666-1541 Established by the American Radio Relay League

gram exists to help youth groups meet their goals by providing matching-fund mini-grants of up to $500. If you know of a youth group that would benefit from this program, see the accompanying letter for information about applying for a Victor C. Clark Youth Incentive Program Grant. Apply to *The ARRL Foundation, Attn: VCCYIP, 225 Main St, Newington, CT 06111.*

Celestial Season-ings?

These crisp autumn nights, bringing great DX and the occasional shooting star, might have you thinking about what man-made objects you might spy in the heavens. Amateur Radio satellite watchers have for years tried to get a glimpse of the fast-moving pinpoint of light we hams call an OSCAR (*O*rbiting *S*atellite *C*arrying *A*mateur *R*adio) as it makes its rounds exchanging messages between hams, near and far.

SAREX (Shuttle Amateur Radio Experiment) missions of recent years have also generated great excitement and *visual* entertainment. Did you stand out in your backyard, clutching your hand-held, with eyes turned to the horizon hoping to catch the first glimmer of the space shuttle as it passed overhead? You knew that with the shuttle's ever-increasing signal strength those brief seconds would be your best chance at a QSO with someone in space. *Thousands* of hams joined you on the uplinks, but only a lucky few got a chance at a short exchange. On future SAREX missions there are plans to extend the ham-astronaut's operating times for conducting Amateur Radio experiments, skeds and random QSOs. We thank you for your support of the Satellite and Ham-In-Space programs through your contributions to the ARRL Foundation.

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Victor C. Clark Youth Incentive Program
Tom Frenaye, K1KI

The Satellite Fund
Tom Frenaye, K1KI

The Dr James L. Lawson Memorial Fund
Yankee Clipper Contest Club
Amalia Lawson

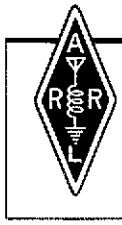
The Edmond A. Metzger Scholarship Fund
Patricia J. Levine

The Bill Bennett, W7PHO, Memorial Fund
Howard I. Sargent, K7BCX

The Paul and Helen L. Grauer Scholarship Fund
Paul, WØFIR, and Helen L. Grauer, NØBCI

The General Fund
Ralph H. Jones, KA9VAJ
Don Leland, KF7KO
Thomas H. Rockhill, WA2YRA
J. Louis Truquet, FC1DJL
Donald Piselli, KA3HMV
Stephen S. Barnes, KH6SB
Carl G. Levonius, Sr, NW6J
David T. Livingston, K5SFM
James H. Justice
Mildred M. Pace, KB4BJV
Catalpa Amateur Radio Society (Berkley, MI)
in memory of Robert Karl, W8HS
E. L. Stephenson, K4YZP
J. Branford Cole, K3XL
Julius Louloff, W2HSJ
Eldon L. Sanders, W5VDW
Dagfinn T. Larsen, WA3YOY
Gary J. Zanghi, KB2YJ
Jack F. Acker, KA8KMH
Luis G. Ortiz, Jr, NP4C
David Reith, W8HFY
Robert A. Dixon, KA1MAT
Daniel Larson
William J. McCarren, K2LV
Bradley W. Buchar, KA3EPR
Lewis L. Jones, KA7KXA
John E. Barrows, WA7JSN
M. Oliver Hulsey, KA4TKV
Dale Biermann, WNØIDF
Edgar A. Post
Sidney G. Liptz, W6VSU
in memory of Pete Machado, KH6ARM
Robert A. Boyle, KA2WGQ
in memory of John Carroll, KB2APJ

As received and acknowledged during the month of **July.**



THE ARRL FOUNDATION, INC.

"for the advancement of amateur radio"

Moved and Seconded...

(continued from page 65)

WASHINGTON—(eastern, also Idaho panhandle) Doug Rider, KC7JC
(western) Western Washington Amateur Relay Association
(Vancouver area) Oregon Region Relay Council, Inc.
WEST VIRGINIA—SouthEastern Repeater Association
(eastern panhandle) See Maryland
WISCONSIN—Wisconsin Association of Repeaters; Member, Mid-America Coordination Council
WYOMING—Wyoming Council of Amateur Radio Clubs

3. In those few geographic or political areas in which no clear determination of the desired repeater coordinator/spectrum manager exists or the existing coordination mechanism is in significant dispute, based on a Commission determination, then no coordinator is, or shall be, listed in the *ARRL Repeater Directory* until, by a settlement of differences within the area, a recognition of a single coordinator can be made by mediation, arbitration or other means.

4. The President, Executive Vice President and Counsel, together with such other persons as they deem necessary, shall solicit from the FCC a reaffirmation of the principles set forth in PR Docket 85-22 in support of frequency coordination efforts.

It was moved by Mr. Heyn, seconded by Mr. Nathanson, that the motion be amended by striking all of the text except paragraph 4, but the motion to amend was LOST. Whereupon, a roll-call vote being ordered on request, the motion was adopted, ten votes in favor to one vote opposed, with four abstentions. Those voting in favor were Messrs. Butler, Drake, Frenaye, Harrison, Haynie, Kanode, Mark, Mendelsohn, Quiat and Stafford. Mr. Heyn voted nay and Messrs. Grauer, Metzger, Nathanson and Turnbull abstained. So the motion was ADOPTED. During the course of the above, Messrs. Price and Sumner returned to the meeting.

62) It was moved by Mr. Heyn, seconded by Mr. Stafford, that the Membership Services Committee, with advice from the VHF Repeater Advisory Committee and the Legal Strategy Committee, be tasked to develop a set of recommended procedural and organizational guidelines for frequency coordinators. These guidelines shall be prepared in time for review at the 1989 Annual Meeting. A roll-call vote being ordered on request, the question was decided in the negative. Those voting in favor were Messrs. Frenaye, Heyn, Quiat and Stafford. Those voting nay were Messrs. Butler, Drake, Grauer, Harrison, Haynie, Kanode, Mark, Mendelsohn, Metzger, Nathanson and Turnbull. So the motion was LOST.

Respectfully submitted,
Perry Williams, W1UED
Secretary

Happenings

Conducted By Phillip Sager, WB4FDT
Manager, Regulatory Information Branch, ARRL

$75 Fee Proposed by Six Forest Service Regions

Six Regions of the US Forest Service have again revised their proposed rental fee schedules for the various radio and television services, including amateur, which rent US Forest Service land for communications sites. During 1987, these Regions had separately proposed fees for amateur repeaters ranging from $300 to $1200. The latest proposals, published July 26 and July 28 in the *Federal Register*, propose a $75 nonwaivable yearly fee for amateur repeaters. This fee is considerably reduced from their 1987 proposals, but is still $75 more than many amateur repeater owners were paying.

An ARRL HQ study conducted last year of fees paid by amateur repeater owners in the Rocky Mountain Region showed that 90% paid nothing to site owners for the use of their sites. Of those using Forest Service sites, half paid nothing, and the rest paid amounts ranging from $25 to $670.

Last year, the ARRL filed comments with each Region, urging little or no fees for amateur repeaters (see Happenings, July, September, October and December 1987 *QST*, for more details including the physical area of each Region).

In response, the Regions noted that they recognized the role of Amateur Radio repeater systems and that the new proposed fee schedule was based upon market studies conducted by each Region.

All fees are subject to an annual adjustment depending on the rise (or fall) of the US Department of Labor Consumer Price Index (CPI) and will be reviewed periodically by the Forest Service.

Comments on the proposal are due at the various Region headquarters by September 26.

ATTENTION SCOUTING ENTHUSIASTS!

Once again, the Jamboree-on-the-Air (JOTA), sponsored by the World Bureau of Scouting in Geneva, Switzerland, and their amateur station HB9S, will be held on October 15-16.

Calling frequencies are: CW—3.590, 7.030, 14.070, 21.140 and 28.190 MHz; Phone—3.940, 7.290, 14.290, 21.360 and 28.350 MHz.

In the 1987 effort, more than 12,000 participation certificates and 4500 patches were distributed, according to W. W. "Dan" Dansby, W5URI, trustee of K2BSA, the anchor station for the Boy Scouts of America in Fort Worth, Texas. All radio amateurs are encouraged to invite Scouts/Scout units to their shacks for the Jamboree. For further information contact Dwight Gann, K5MQA, President, K2BSA ARA, at 817-267-4266.

ATTENTION SCOUTS!

You're a registered adult Scouter or Boy Scout interested in serving on the K2BSA staff at the 1989 National Scout Jamboree? If so, pick up a copy of a Jamboree Staff application from your local BSA council office, fill it out and return it to the council office. Send a photocopy of your application to Ray Moyer, WD8JKV, c/o BSA National Headquarters, 1325 Walnut Hill Ln, SUM502, Irving, TX 75015-2079, and mark "personal/confidential" on the envelope.

BSA National Staff will be selecting the staff (probably about 40 scouts and scouters) in the next few months, so get your application in as soon as possible!

The Jamboree will be held at Fort AP Hill, Virginia, on August 2-9, 1989.

FOUNDATION FOR AMATEUR RADIO SCHOLARSHIP WINNERS

The Foundation For Amateur Radio (FAR) is pleased to announce the 1988 winners for the 28 scholarships which it administers.

John W. Gore Memorial Scholarship—$1000
Richard M. Kordick, KEØAS, Bridgewater, IA

Richard G. Chichester Memorial Scholarship—$900
William J. Hulka, NU9K, Kokomo, IN

Edwin S. Van Deusen Memorial Scholarship—$500
James D. Weldon, N1DFQ, Marlboro, MA

QCWA Memorial Scholarships—$700 each
Annette J. Barnhart, N3DKT, Mt. Pleasant, PA
Douglas M. Benish, N3CXB, Pittston, PA
John G. Eye, NØHWD, Isle, MN
David A. Hart, N7FYT, Bellingham, WA
Patrick W. Jungwirth, WG6L, Visalia, CA

QCWA Leo Meyerson Family Living Scholarship—$700
Douglas E. Swiatlowski, KA2KMT, Camillus, NY

QCWA Robert S. Cresap Memorial Scholarship—$700
Diane E. Willemin, KE8DJ, Elyria, OH

Radio Club of America Scholarships—$500 each
Gerard Hart, KC2OJ, Hampton Bays, NY
Martin J. Van Der Burgt, KA9MSR, Kaukauna, WI

Edmund B. Redington Memorial Scholarship—$500
William H. Sands, IV, KA3FXX, Pennsburg, PA

Young Ladies Radio League Scholarship—$750
Carol A. Dunlap, N1EHS, Southwick, MA

Amateur Radio News Service Scholarships—$600 each
Michael P. Krensavage, KA3CUP, Marietta, GA
Jack R. Porter, KCØVX, Lawrence, KS

Columbia Amateur Radio Association Scholarship—$750
David S. Katz, N3DKV, Bowie, MD

Baltimore Amateur Radio Association Scholarship—$750
Paul Schleck, KD3FU, Mt Rainier, MD

Dade Radio Club Tropical Hamboree Scholarships—$500 each
Stuart Rosner, WU4L, Boca Raton, FL
David P. Tancrell, KB4GIA, Palm Bay, FL

Rose Ellen Bills Memorial Scholarship—$2000
Richard Westenberger, N9DKR, Springfield, IL

Victor C. Clark Memorial Scholarship, sponsored by the Vienna (VA) Wireless Society—$500
William T. Free, KC3YO, Fairfax, VA

Frederick Amateur Radio Club Scholarship—$1000
Kurt Rupprecht, N3EOI, Salisbury, MD

Department of State ARC Scholarship—$750
Victoria L. Gruen, KA2VHR, Runnemede, NJ

10-10 International Net, Inc Scholarships—$750 each
Stephanie Ann Dougherty, N8FIT, Yale, MI
Nathan S. Willingham, KAØUFO, Bevier, MO

Emil Kumershek (W9WYF) Memorial Scholarships, sponsored by the West Allis (WI) Radio Amateur Club—$700 each
Douglas K. Kleeman, KA9LWN, Shawano, WI
Scott L. Young, N9FZS, Colby, WI

These scholarships were open to all radio amateurs meeting the qualifications and residence requirements of the various sponsors. The Foundation For Amateur Radio (FAR) (not to be confused with the ARRL Foundation, Inc) is a nonprofit organization representing 50 clubs in Maryland, the District of Columbia and Northern

Virginia. It is devoted exclusively to the scientific, literary and educational pursuits that advance the purposes of the Amateur Radio Service.

The announcement of the available awards for 1989 will appear in either April or May *QST*.

FCC WILL NOT GRANT CSCE EXTENSIONS

The FCC has notified the ARRL that it will not grant extensions of the 365-day term of Certificates of Successful Completion of Examination (CSCE). In a letter to an amateur who had requested an extension of time of his CSCE, the Commission denied the request saying: "An extension of time for a certificate would not be in keeping with the purpose of the certificate. Its purpose, in this instance, is to allow a person who fails only a portion of an examination for a particular class of amateur operator license to be given credit for the portion passed at a re-examination administered within 365 days." The letter further noted that "often re-examination is administered within weeks, or days or even hours of the failed examination" and that Section 97.23 allowed up to 365 days to allow persons with unusual circumstances, such as illness, additional time to be re-examined. So based on this letter, the Commission is not willing to allow any extension of the 365-day period.

RECIPROCAL REMINDER

This is a reminder that, in accordance with ITU rules, foreign amateurs operating using reciprocal permits must identify by giving the US prefix followed by the slant bar or "slash" and their call sign. For example, 4X1LL operating in W1-land would sign W1/4X1LL on CW or W1 SLASH (or STROKE) 4X1LL on SSB. This new rule took effect July 18.

The only exception is Canada, where, due to treaty constraints, station identification remains as it has been in the past: the Canadian call sign followed by the US prefix—VE3ABC/W1, for example.

TEMPORARY THIRD-PARTY AGREEMENT WITH SOUTH KOREA

The Republic of Korea has authorized a temporary third-party agreement between its Olympic Amateur Radio station, 6K24SO, and amateur stations in the US. The agreement will allow the exchange of third-party messages for athletes and members of the US Olympic Team with amateur stations in the United States during the period beginning 0001 UTC September 1, 1988 through 2400 UTC October 5, 1988.

US amateurs are reminded that all radio communications must be in plain language and consist only of messages of a technical or personal nature; business communications are prohibited, and at the end of an exchange of any international third-party messages, the call sign of the foreign station must be given in the station identification procedure in addition to the FCC-assigned call sign (6K24SO, THIS IS WB4FDT, for example).

United States Reciprocal Agreements

Countries with which the United States shares reciprocal licensing/operating agreements:

V2	Antigua and Barbuda	SV	Greece	YN	Nicaragua
LU	Argentina	J3	Grenada	LA	Norway
VK	Australia	TG	Guatemala	HP	Panama
OE	Austria	8R	Guyana	ZP	Paraguay
C6	Bahamas	HH	Haiti	OA	Peru
8P	Barbados	VS6	Hong Kong	DU	Philippines
ON	Belgium	HR	Honduras	CT	Portugal
V3	Belize	TF	Iceland	J6	St Lucia
CP	Bolivia	VU	India	S7	Seychelles***
A2	Botswana	YB	Indonesia	9L	Sierra Leone
PY	Brazil	EI	Ireland	H4	Solomon Islands
VE	Canada	4X	Israel	ZS	South Africa
CE	Chile	I	Italy	EA	Spain
HK	Colombia	6Y	Jamaica	PZ	Suriname
TI	Costa Rica	JA	Japan	SM	Sweden
5B	Cyprus	JY	Jordan	HB	Switzerland
OZ	Denmark	T3	Kiribati	9Y	Trinidad
J7	Comm Dominica	9K	Kuwait	T2	Tuvalu
HI	Dominican Republic	EL	Liberia	G	United Kingdom**
HC	Ecuador	LX	Luxembourg	CX	Uruguay
YS	El Salvador	3A	Monaco	YV	Venezuela
3D2	Fiji	PA	Netherlands	YU	Yugoslavia
OH	Finland	PJ	Neth Antilles		
F	France*	ZL	New Zealand		
DL	Fed Rep of Germany				

*Includes all its overseas Territories
**Includes the following territories: VP2M, VP2S (now J8), VP2V, VP5, VP8, VP9, VS6, YJ, ZB2, ZD7 and ZF.
***Cancellation claimed by Seychelles

It is possible for amateurs to obtain temporary licenses in many countries that do not have a reciprocal agreement with the US. All countries, except Canada, require US amateurs to apply for a temporary license in order to operate in them.

International Third-Party Traffic: Proceed with Caution

Occasionally, DX stations may ask you to handle a third-party message to a friend or relative in the US or its possessions. This is all right as long as the US has an official third-party traffic agreement with that particular country and the traffic is non-commercial and of a personal, unimportant nature. During an emergency, our State Department might work out a special temporary agreement with the country involved, but in normal times, never handle traffic without first making sure it is legally permitted.

US amateurs may handle third-party traffic with the following countries:

V2	Antigua	C5	The Gambia	ZP	Paraguay
LU	Argentina	9G	Ghana	OA	Peru
VK	Australia	J3	Grenada	V4	St Christopher
V3	Belize	TG	Guatemala	J6	St Lucia
CP	Bolivia	8R	Guyana	J8	St Vincent
PY	Brazil	HH	Haiti	9L	Sierra Leone
VE	Canada	HR	Honduras	3D6	Swaziland
CE	Chile	4X	Israel	9Y	Trinidad
HK	Colombia	6Y	Jamaica	GB	United Kingdom**
TI	Costa Rica	JY	Jordan	CX	Uruguay
CO	Cuba	HL9	Korea*	YV	Venezuela
HI	Dominican Rep	EL	Liberia	4U1ITU	ITU, Geneva
J7	Comm Dominica	XE	Mexico	4U1VIC	VIC, Vienna
HC	Ecuador	YN	Nicaragua		
YS	El Salvador	HP	Panama		

*Temporarily around Christmas in past years.
**Limited to special-event stations with call-sign prefix GB (GB3 excluded) and to stations on Pitcairn Island (VR6).

RICHARD MORSE, W1GR, SK

Richard Morse, W1GR, became a Silent Key July 1 at the age of 76. Morse was past Assistant Secretary of the Army for Research and Development under both the Eisenhower and Kennedy administrations, as well as founder of the Minute Maid Corporation.

Most recently, Morse was Director of the Boston Museum of Science and was partially responsible for several Amateur Radio exhibitions there. Morse was a descendant of Samuel F. B. Morse of telegraphy fame.

1989 PLENIPOTENTIARY CONFERENCE

The State Department has announced that the Chairman of the US delegation to the 1989 Plenipotentiary Conference of International Telecommunication Union (ITU) is C. Travis Marshall, W3HPS, Senior Vice-President of Motorola Inc.

The upcoming Plenipotentiary Conference will be held in Nice, France, May 23-June 29, 1989. There are four primary objectives of each of these conferences. One is to elect a Secretary General and other executive-level ITU officials, as well as other members of the Administrative Council. Other objectives: To establish ITU's programs and activities, review and establish its financial management, budget and funding; to review and modify, as necessary, ITU's purposes, principles and procedures; and to review and modify, as necessary, ITU's structure and its decision-making methods.

ARE YOU A LAWYER? ARRL NEEDS VOLUNTEER COUNSELS!

Your legal expertise is needed in the Amateur Radio community to help build and maintain the legal foundations for our service. The League's Volunteer Counsel (VC) Program is designed to help stem the tide of overly restrictive local ordinances pertaining to Amateur Radio. You can help if you have an interest in this exciting area of communications law, are a member of a state bar and the League. Please contact the Field Services Department at HQ and you will be kept informed about areas of law affecting Amateur Radio. As a Volunteer Counsel you are not expected to provide your services free of charge after an initial consultation. For further information, write to the ARRL Volunteer Counsel Program, 225 Main St, Newington, CT 06111.

If you live in one of the following states, your legal experience is especially needed: Hawaii, Kansas, Maine, Montana, Nebraska, New Jersey, New Mexico, Western New York, North Dakota, New Hampshire, Oklahoma, South Carolina, South Dakota, Texas, Wisconsin and Wyoming.

FCC DENIES PETITION

The FCC has denied a petition filed by Robert McAtee, AG5F, to amend the Amateur Service Rules regarding address changes and removal of Silent Keys from the FCC data base. In his petition, McAtee requested that a letter signed by three Extra Class licensees stating that an amateur station licensee had changed his/her address and providing the new address, would cause the Commission to change the address record of the licensee. McAtee also requested that the Commission cancel an amateur license upon request of a letter signed by three Extra Class licensees stating that an amateur operator within their ZIP code area had died.

McAtee argued in the petition that the Commission's license data base lists many people who are deceased or have moved without reporting a change of address. Consequently, he incurs unnecessary expense when using the data base for a mailing list.

The FCC, in denying McAtee's petition, stated, "The petitioner has focused on a problem that is inherent in the systematic keeping of records—inaccuracy or noncurrency of the data because of a failure by those responsible to advise the record keeper of changes." FCC went on to say the responsibility must remain in the hands of the individual licensee, or if the licensee is deceased, a close relative or executor. "To allow other persons to contact the Commission regarding mailing address changes or the licensee's death would result in numerous errors and sham notifications. Thus it is unlikely that the accuracy of the data base would be improved and it could, in fact, be made more inaccurate if the proposed amendments were adopted."

FCC-Issued Call Signs Update

The following is the list of "just issued" call signs as of August 1.

District	"A"	"B"	"C"	"D"
Ø	WMØF	KEØXC	NØJPR	KBØDBY
1	NS1Z	KC1KP	N1FXC	KA1SLU
2	WI2S	KE2II	N2ILQ	KB2GGF
3	NR3H	KD3IR	N3GKJ	KA3TMK
4	AB4JN	KM4FI	N4TLW	KC4GKX
5	AA5HI	KG5MA	N5MXU	KB5HAJ
6	AA6JU	KJ6KK	N6SVA	KB6ZOE
7	WR7G	KF7MW	N7LMM	KB7FPZ
8	WI8Z	KE8TL	N8JTR	KB8FIR
9	WA9J	KE9LX	N9HRH	KB9BIQ
Alaska	**	AL7KF	NL7OM	WL7BSB
Hawaii	**	AH6JC	NH6QG	WH6BZR
Puerto Rico	**	KP4PN	WP4QK	WP4IDY
Virgin Islands	NP2C	KP2BN	NP2CR	WP2AGA

**All 2 × 1 calls have been issued in the district.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Arizona, Arkansas, Iowa, Kentucky, Montana, Mississippi, North Texas, Orange and Wyoming Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

A petition, to be valid, must contain the signatures of five or more Full ARRL members residing in the Section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. It is advisable to have a few more than five signatures on each petition.

Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. The following wording is suggested:

(Place and date)
Field Services Manager, ARRL
225 Main St, Newington, CT 06111

We, the undersigned Full members of the...ARRL Section of the...Division, hereby nominate...as candidate for Section Manager for this Section for the next two-year term of office.
(Signature...Call...City...ZIP).

Any candidate for the office of Section Manager must be a resident of the Section, a licensed amateur of Technician class or higher, and a Full Member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination. Petitions must be received at Headquarters on or before 4:00 PM Eastern Standard Time December 9, 1988.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 2, 1989. Returns will be counted February 21, 1989. SMs elected as a result of the above procedure will take office April 1, 1989.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 1989.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in April *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by the Field Services Manager.

You are urged to take the initiative and file a nomination petition immediately.

Richard K. Palm, K1CE
Field Services Manager

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the Puerto Rico Section Manager election by the deadline of June 10, 1988, nominating petitions are herewith resolicited. See the above notice for details on how to nominate.

Moved and Seconded . . .

ERRATA TO THE MINUTES
1988 Second Meeting
The American Radio Relay League, Inc.

The following paragraphs should be substituted for the similarly numbered paragraphs of the Minutes, 1988 Second Meeting of the Board of Directors, July 21-22, 1988 appearing on pages 61-64, *QST* for September, 1988:

14) It was moved by Mr. Heyn, seconded by Mr. Harrison, that the following resolution be adopted:

WHEREAS, petitions for rule making have been received by the Federal Communications Commission looking toward expansion of the repeater segment of the 50-54 MHz band, and

WHEREAS, the Commission may well adopt a notice of proposed rulemaking in the matter in the next several months, and

WHEREAS, the Board of Directors of the American Radio Relay League agrees in principle that expansion is warranted, and

WHEREAS, Committees of the ARRL have been studying the issue since the Executive Committee request [Minute 3.3.1, December 4-5, 1987 meeting], now, therefore

BE IT RESOLVED that the Counsel is authorized to file comments, subject to review by the President and Executive Vice President, in general accordance with recommendations of the MSC on advice of VRAC and VUAC. After discussion, on motion of Mr. Nathanson, seconded by Mr. Grauer, it was voted to POSTPONE discussion of this motion indefinitely.

26) Mr. Frenaye, as Chairman, presented the report of the Education Task Force. There were extensive recommendations from each of the three Task Groups for elementary, secondary, and adult levels of education. There were also two extensive addenda to the report, one on a review of existing training materials and one on innovative ways to stimulate Amateur Radio Clubs in Elementary, Junior and Senior High Schools. The Board of Directors was in recess from 2:50 PM to 3:20 PM.

28) Mr. Stafford, as Liaison, reported briefly for the ARRL National Emergency Response Committee (ANERCOM). That group, too, will have an in person meeting in August, supplementing the work which has been accomplished by correspondence.

39) It was moved by Mr. Frenaye, seconded by Mr. Stafford, that Rule 4, Rules and Regulations Concerning Affiliated Societies, be amended to remove the restriction on the name of a local school or youth group amateur radio club; specifically, in the second sentence, "In a Category 3 Society, affiliation status may be granted if the sponsor, faculty advisor, President or Trustee of the society is a licensed amateur and a League member, and where the society's name clearly shows that it falls within this grouping", to delete the last phrase. A roll-call vote being required, the question was decided in the negative, 4 votes in favor to 11 votes opposed. Those voting for the motion were Messrs. Frenaye, Nathanson, Quiat and Stafford. Those voting against the motion were Messrs. Butler, Drake, Grauer, Harrison, Haynie, Heyn, Mark, Mendelsohn, Metzger, Milius, and Turnbull. So the motion to amend the Rule was LOST.

60) At this point Messrs. Price and Sumner left the room; Mr. Holladay assumed the chair. Mr. Milius also went out, and Mr. Kanode took his seat. The Board was in recess from 1:53 until 2:37 PM, during which time members had the opportunity, at the invitation of the Administration and Finance and Membership Services Committees, to hear a presentation on affinity credit cards.

61) It was moved by Mr. Mendelsohn, seconded by Mr. Quiat, that the following be adopted:

1. After due consideration by the ARRL, it has been determined that the authority of the following listed frequency coordinators is derived from the voluntary participation of the entire amateur community in the areas they serve.

2. The ARRL, in recognition of the specific terms of the FCC's Report and Order in PR Docket 85-22, agrees that there can be only one recognized frequency coordinator per band per geographic area.

THEREFORE, the following are acknowledged, by virtue of the recognition accorded them by the entire amateur community, as the sole frequency coordinators in their respective jurisdictions:

ALABAMA—Alabama Repeater Council, Inc.
ALASKA—Mel Bowns, KL7GG
(western interior and northern)—Jerry Curry, KL7EDK
(southeast area)—Edward Schilling, W6SJJ
ARIZONA—Ralph Turk, W7HSG
ARKANSAS—Rick Mobley, WB5FDP
CALIFORNIA—(northern) Northern Amateur Relay Council
(southern-29, 52, 450 MHz, ATV and Microwave)—Southern California Repeater and Remote Base Association
(southern-144 MHz)—Two Meter Area Spectrum Management Association
COLORADO—Colorado Council of Amateur Radio Clubs—Repeater Coordination Committee
CONNECTICUT—See New York City-Long Island
DELAWARE—See Maryland
DISTRICT OF COLUMBIA—See Maryland
FLORIDA—Florida Repeater Council, Inc.
GEORGIA—SouthEastern Repeater Association
HAWAII—Hawaii State Repeater Advisory Council
IDAHO—(south and east) Ronnie E. Moss, K7ENE
(north and west) Larry E. Smith, W7ZRQ
(panhandle and eastern Washington) Doug Rider, KC7JC
ILLINOIS—Illinois Repeater Association; Member, Mid-America Coordination Council
INDIANA—(50 MHz) David A. Epley, N9CZV
(144 MHz) Walt Breining, N9WB
(220 MHz) Paul L. Schmidt, K9PS
(440 MHz) Richard E. Shelton, N6RS
IOWA—Iowa Repeater Council; Member, Mid-America Coordination Council
KENTUCKY—(eastern) SouthEastern Repeater Association
(remaining areas) Larry Malone, KC4TX
LOUISIANA—Louisiana Council of Amateur Radio Clubs
MAINE—See Massachusetts
MARYLAND—The Middle Atlantic FM and Repeater Council
MASSACHUSETTS—New England Spectrum Management Council
MICHIGAN—(lower) Michigan Area Repeater Council
(upper Peninsula) Upper Peninsula Amateur Radio Repeater Association
MINNESOTA—Minnesota Repeater Council
MISSISSIPPI—J.S. Grantham, N5DWU
MONTANA—Repeater Advisory Committee of Montana
NEBRASKA—Member, Mid-America Coordination Council
NEVADA—(northern) CARCON
(southern) R. Scott Fowler, WA7GIV
NEW HAMPSHIRE—See Massachusetts
NEW JERSEY—(northern) See New York (NYC-LI)
(southern) See Pennsylvania (eastern)
NEW MEXICO—New Mexico Frequency Coordinating Committee
NEW YORK—(New York City-Long Island, northern New Jersey and Connecticut) Tri-State Amateur Repeater Council (TSARC)
(upstate-except: [Clinton and N. Essex Counties—see Vermont] [Franklin and St. Lawrence Counties—St. Lawrence Valley Repeater Association]) Upper New York Repeater Council
(western New York [west of Rochester]) Western New York-Southern Ontario Repeater Council
NORTH CAROLINA—SouthEastern Repeater Association
NORTH DAKOTA—William Ockert, WBØVHW
OHIO—Ohio Area Repeater Council, Inc.
OKLAHOMA—Oklahoma Repeater Society, Inc.; Member, Mid-America Coordination Council
OREGON—(also Vancouver, WA) Oregon Region Relay Council, Inc.
PENNSYLVANIA—(eastern Pennsylvania and Southern New Jersey) The Philadelphia Area Repeater Council (TPARC)
(western) Western Pennsylvania Repeater Council
PUERTO RICO—Puerto Rico ARC
RHODE ISLAND—See Massachusetts
SOUTH CAROLINA—SouthEastern Repeater Association
SOUTH DAKOTA—Member, Mid-America Coordination Council
TENNESSEE—SouthEastern Repeater Association
TEXAS—Texas VHF-FM Society, Inc.
UTAH—Utah VHF Society
VERMONT—(also Clinton and N. Essex Counties of New York) Vermont Independent Repeater Coordinating Committee
VIRGINIA—(northern) See Maryland
(southern) SouthEastern Repeater Association

(continued on page 61)

Improved Anode Parasitic Suppression for Modern Amplifier Tubes

(continued from page 38)

Parasitic Suppression at the Grid and Cathode

Efforts at parasitic suppression need not be confined to the anode circuit of a grounded-grid amplifier. Stability can also be improved by tuning out some of the inductive reactance in the grid structure with low-value capacitors (connected from grid to chassis.) This raises the grid's self-resonant frequency to a region where—hopefully—the amplifier tube does not have enough gain to oscillate.

Grid-inductance-canceling capacitors are most effective with tubes of older design (like the 811A) that have a considerable grid inductance. This technique is only mildly effective at improving stability with modern amplifier tubes that were designed to have inherently low grid inductance.

Another anti-parasitic technique I discussed in an April 1986 *ham radio* article† is the use of a resistor to lower the Q of the input (cathode) lead. (See Fig A). Input parasitic-suppression resistors also reduce intermodulation distortion at the expense of making the amplifier require a bit more driving power.

Input parasitic-suppression resistors are moderately effective at stabilizing unruly amplifiers, but they are not 100% effective. After my April 1986 article was published, about 5% of the reader letters and phone calls I received came from people who reported that their amplifiers were more stable with input parasitic-suppression resistors than without,

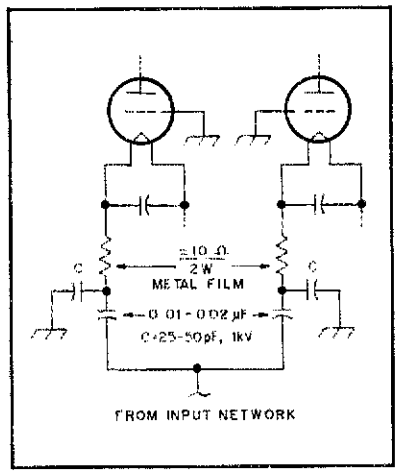


Fig A—Input parasitic-suppression resistors can help to tame VHF parasitics in a grounded-grid amplifier. They also slightly improve the amplifier's IMD performance and make the amplifier a bit harder to drive. See text.

The optional capacitors, C, may enhance the suppression effect of the resistors by providing a more direct path to ground at VHF than that afforded by the amplifier input network. If you install them, be sure to figure their capacitance into the total output capacitance of the input network.

but still not perfectly free of occasional signs of instability (minor arcing and spitting at the output-network tuning capacitor and/or band switch). I didn't know it at the time, but low-Q *anode* parasitic-suppressors would be the next—and final—step in getting rid of those parasitics for good.

†R. Measures, "Grounded-Grid Amplifier Parasitics," *ham radio*, Apr 1986, pp 31-34.

the anode self-resonance had moved from 130 to 155 MHz—a desirable change because the 3-500Zs' gain drops with frequency above 110 MHz. Also, the 155-MHz dip was shallower than the dip I'd observed at 130 MHz. So far, so good!

Next, I replaced each of the amplifier's two high-Q, LR parasitic-suppression networks with low-Q networks. Each of the low-Q suppressors consisted of two 100-Ω, 2-W metal-film resistors in parallel, shunted by a coil made of three turns of no. 18 stainless-steel wire about ½ inch long and with an inner diameter of 9/32 inch. (A 7-mm or 9/32-inch drill bit works well as a winding form. Nichrome wire or strap can be used for even lower Q; see Appendix 1.) To keep the circuit Q as low as possible, I also used no. 18 stainless-steel wire for the parasitic-suppression-network pigtails. I bent the pigtail ends into circles to allow the new suppression networks to be mounted with the same screws that held the original networks in place.

Results

The once-unruly grounded-grid amplifier shows *no* signs of instability after anode circuit modification with low-Q inductors—even with all of its cabinet screws in place![8] The power output appeared to be unchanged, although it is probably about 5 W less at 29 MHz (the worst case) with the low-Q parasitic suppressors installed.

Cathode parasitic-suppression resistors had improved the stability of the amplifier, but *eliminating* the parasitics required the removal of parasitic supporters—the traditional high-Q LR parasitic suppressors and other conductors in the amplifier anode circuit—and their replacement *with low-Q* LR suppressors.

Conclusion

High-Q inductors such as silver and copper are the best choice for anode-circuit conductors in a VHF amplifier or VHF *oscillator*. *Low-Q* conductors, such as stainless steel and nichrome, are the best materials for *all* anode-circuit conductors in an MF/HF *amplifier*. Copper is the best choice for conductors in MF/HF tuned circuits.

The high-Q LR parasitic suppressors traditionally used by hams—and by manufacturers who base their equipment designs on Amateur Radio practice—have been rendered obsolete by improvements in the gain and power bandwidth of high-power vacuum tubes since traditional parasitic-suppression techniques were developed in the 1930s. The parasitic-oscillation problems that have occurred and continue to occur in many Amateur Radio amplifiers—commercial *and* home-built—can be traced to the use of LR parasitic-suppression networks and anode-circuit conductors that actually serve as parasitic *supporters*. Replacement of these components with suitable *low-Q* conductors and LR networks can get rid of parasitic problems once and for all—or at least until the next quantum improvement in the gain and power bandwidth of high-power vacuum tubes! If you would like to discuss any part of this article or the parasitic-oscillation malady in general, please feel free to telephone me at 805-482-3034.

Danger—High Voltage!

Working with vacuum-tube amplifiers involves voltages and currents that can kill you instantly should you come into contact with them. Take proper safety precautions whenever you work on such equipment. Before working on an amplifier:

(1) Turn off the amplifier.

(2) Unplug the amplfier from the ac line.

(3) Wait until the HV meter indicates less than 100 V.

(4) Using a shorting stick *in series with a 100-Ω, 25-W resistor*, short the amplifier B+ to ground to discharge the HV-supply filter capacitors. (The resistor protects the amplifier's anode- and grid-current meters [and the meters' shunt resistors, if any] from damage as the capacitors are discharged by the shorting stick.)

Pulling the plug and following these steps is the only *safe* way to work on an amplifier. Most interlocks do not disconnect the line voltage from the amplifier when the amplifier lid is removed.

(continued on page 89)

How's DX?

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

Troster's Tips:

Handling a Pileup

A letter from Jim Rafferty, N6RJ (a DX Contest winning op from ZF2FL/ZF2JR for many years) offers something to consider. Many DX net MCs who take lists ask that callers give the suffix only, or the last letter only. This is to cut down the mass of callers into more easily handled units. For example, instead of a whole call, I would yell "Kaybec." Then the MC would ask for stations whose calls ended in the letters he heard to give their entire call, letter by letter. In a net list operation there is no particular hurry to move things along (as in a DXpedition/contest situation), not with the fervent urgency of a contest. N6RJ says the "malady" of giving only one or two letters of a call has migrated over into contest/DX calling and is "getting out of hand." He means that to complete a contact he has to go back to the station at least twice to find out just who is calling him. "QRZ ZF2JR?" "SIERRA QUEBEC." "SIERRA QUEBEC. 59 kW. YOUR CALL?" "WHISKEY 6 INDIA SIERRA QUEBEC. 59 CAL." "W6ISQ QSL. QRZ? ZF2JR."

Worse yet (and it happens). "QRZ ZF2JR?" "SIERRA QUEBEC." "SIERRA QUEBEC. 59 kW." "ROGER 59 CAL. GOOD LUCK." "OH...SORRY. WHISKEY 6 INDIA SIERRA QUEBEC. QSL?" "W6ISQ. ROGER. QRZ? ZF2JR."

Jim wants to know who is calling him up front, not as a final gesture. Compare the QSOs above with: "QRZ ZF2JR?" "W 6 INDIA SIERRA QUEBEC." "W6ISQ 59 kW." "QSL. 59 CAL." "ROGER. QRZ ZF2JR?"

This exchange is shorter. Jim can log your call and report immediately. One danger, of course, in not giving your complete call is that with the QRM, Jim may interpret a wrong prefix for your call. Now all this is not to say that ZF2JR will always receive a complete call because he cannot copy the whole thing. Indeed he may go back to "SIERRA QUEBEC 59 kW." He wants to keep things rolling, so he jumps onto the only thing he hears at the moment. Jim says, "I will always return to a weaker station giving a full call, rather than to a louder station giving only a partial call." (Next time you hear ZF2JR you better give your entire call!)

Many first-rate operators feel as Jim does. Others are not as concerned, and may even have their own particular calling preferences. We'd like to hear from you DXpedition/contest ops out there how you'd like to be called (no, not "what"—"how"!). Share your wisdom and skills on this subject of calling with W6ISQ.

(More from W6ISQ in an upcoming issue.)

CONTEST TIPS

It is indeed that season! To keep in shape for the DX rigors ahead, note the following. *The Totem Tabloid* (Western Washington DX Club) recently reprinted some interesting contest tips from the Yankee Clipper Contest Club. YCCC member Scott, KA1QXI (a doctor), on sleep deprivation strategies for contesting: sleep 4 hours of the 48 as follows: a 3-hour nap before the contest, after a reasonably good meal. Have some coffee before the contest. Eat no large meals during the contest, just snacks with high carbohydrates, low fat and reasonable protein. During the contest take a 90-180 minute nap starting about two hours before you would normally awaken (allows for a full sleep cycle) and then have another cup of coffee. Drink coffee only when you awaken from naps; otherwise you will find it harder to fall asleep, and will not awaken rested when you do sleep. Take a 30-minute nap between 12 PM and 1 PM local time, with an optional 30-minute nap during this time period on the second afternoon of the contest. Scott's other hints include avoiding alcohol and heavy physical activity (promotes deep sleep) during the contest. Keep the shack brightly lit. When you sleep, keep your room warm, 72-74° F, to promote sleep.

XU1SS, Keo Piseth, at Camp Site II on the XU/HS border (June 1988). Seth is shown with a solar electric battery charger purchased with funds from the North Jersey DX Association and W2MIG. QSL only via JA4KFA. *(Thanks, W1RAN)*

THE CIRCUIT

☐ **W1HZ:** Howie joined Silent Keys August 6. A gentleman, a fine ham, a dear kind friend.

☐ **Amsterdam:** FT5ZB leaves November 20 and may be FT4ZD or FT4ZE for 1989. As of mid-summer, he had amassed more than 23,000 two-ways with all-band activity.

☐ **Sun Clock:** This "Macintosh fan" loves this computer desk accessory that graphically displays sunlight/darkness areas. Screen dumps for selected periods can be helpful for your contest planning. Sun Clock can also be run continuously (displayed in a small window while other applications are being used). Easy to use and buy, $15 plus $2 shipping/handling, from MLT Software, Box 98041, 6325 SW Capitol Hwy, Portland, OR 97201, 503-245-7093.

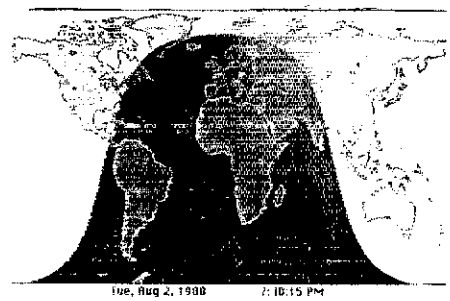


Fig 1—Screen dump from Sun Clock (see Circuit).

☐ **Sunspots:** Radio Australia gives a short but interesting breakdown on sunspot conditions twice daily on 9580 kHz at 0825/1225Z. They give the actual sunspot numbers, sunspot areas and geomagnetic conditions for both the northern and southern hemispheres, as well as other info. (Special thanks W8ZCQ!)

☐ **XX9TUE:** Cards for last May's opera-

tion by CT4UE go to him; Luiz Miguel de Sousa, Box 32, S Joao do Estorial, 2765, Portugal.

☐ **China:** KC3EK conveys the info from BY4AA that private Chinese citizens will hold calls beginning with the prefix BZ.

☐ **KC3EK:** Glenn notes that effective immediately he no longer manages nor can assist with requests for cards from: 6Y5A 6Y5HN 6Y25HN YU7XX YZ7DX 8P6OX HK1AMW 8P6RE 8P21RE.

☐ **KB5GL:** (See photo.) Sil, ex-IT9SEZ, is now a US citizen and one of those active Cajuns in the Delta DX Association. Who says Honor Roll is "too hard"? Sil wrapped it up this year with 10/314.

☐ **TL8HW:** Tracy (see photo) is a Baptist missionary (since the mid-'70s) in the village of Kembe, and has worked over a thousand US stations since January. His manager Jon, KJ4GK, notes that they meet M-F at 1900Z on 21.335 to exchange log information. Jon always takes a list immediately afterwards for at least an hour. If you need TL8 on sideband or CW, let Jon know: Jon Ferrara, 2302 Haven Crest Dr, Chattanooga, TN 37421, 615-892-6222.

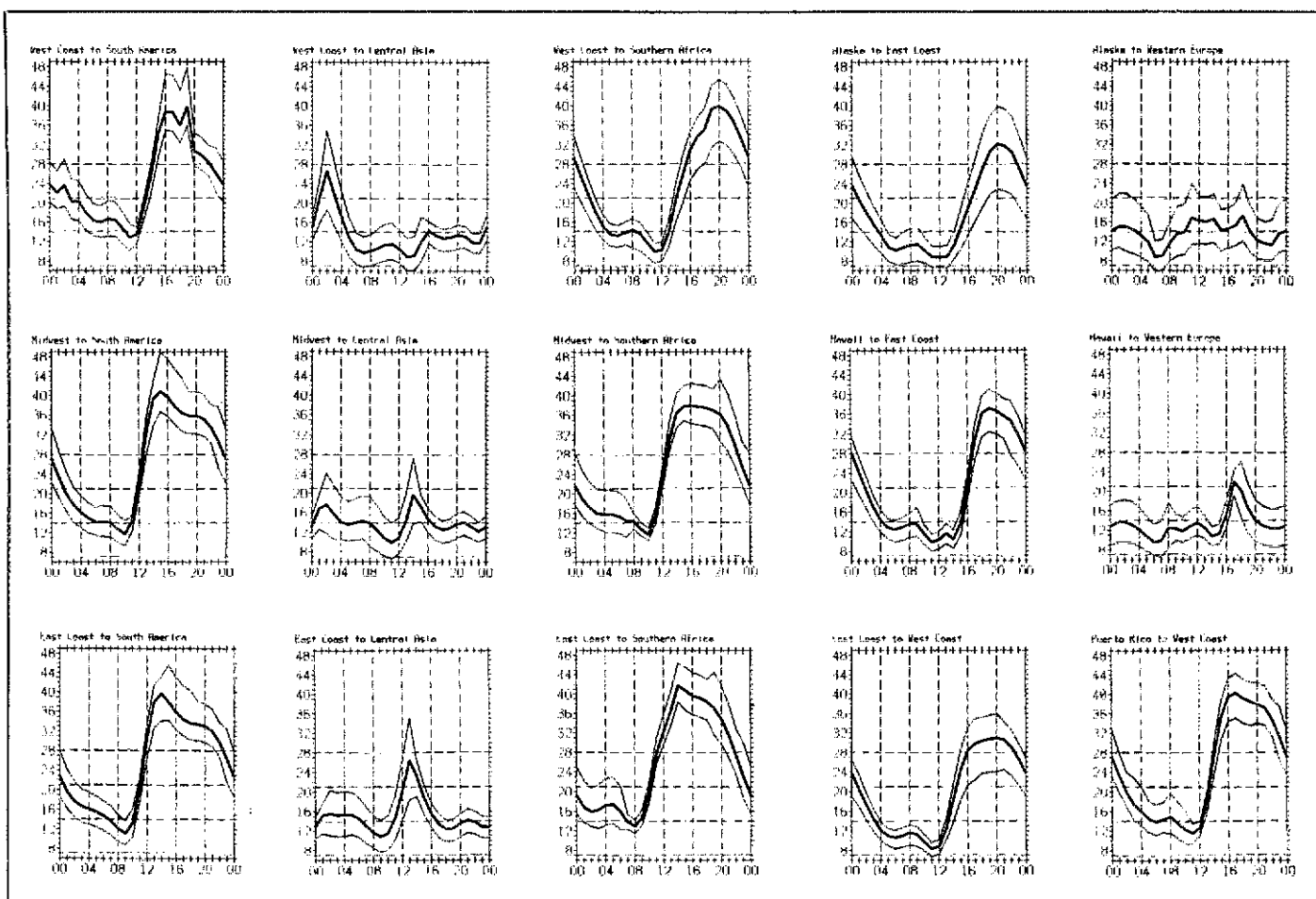
(L-R) OH2BH with Sil, KB5GL (ex-IT9SEZ) at the Visalia DX Convention. (See Circuit.)

☐ **C31IU:** W8JAQ says that K9MW now resides in The Netherlands and has not operated that call in Andorra since 1983. The pirate also says QSL via W9FSS, who has been a silent key since 1985. C31IU via W8JAQ (1975-1983) only, and W9FSS never.

☐ **EI4VFL:** Did you catch Dick, WA1KDL, the last two weeks in September? He planned mountaintopping in western and southern Ireland, QRP on 14060, 21060, 28160.

☐ **4X0V:** 4X6VV operated this call WPX CW; cards via 4X4SK.

☐ **LR1V:** This is the special contest call for



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 FOT). The horizontal axis shows Coordinated

TL8HW (see Circuit.)

the Radio Club Bariloche, Box 397, 8400 Bariloche (RN), Argentina.

☐ **Help:** 9H4G is on the track of KX6BS Nov/Dec 76, WB4ZKG/KC6 Oct '76, and PJ2FR Mar '87. Contact Eric Rogers, Sebbug Village, Gozo Island, Malta. NEØP needs info on VK9LX Jul '84, 6Y5NR/KP1 Apr '85, and 5L7T May '87.

☐ **N4RP/C6A:** Try again if you're still waiting for the card; two batches of April mail were lost.

QSL Corner

Administered By Joanna Hushin, KA1IFO

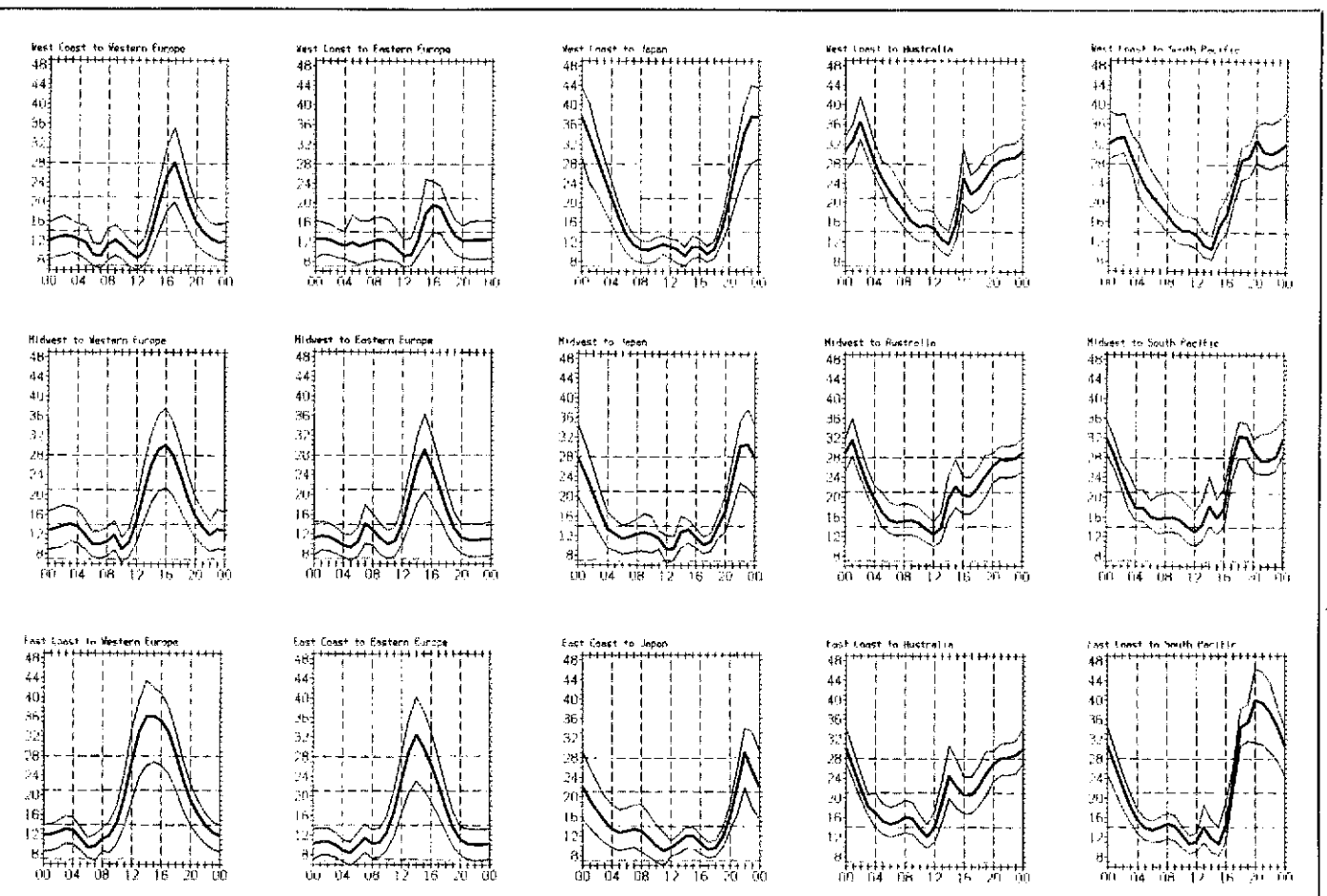
Here is some information for those of you who would like to QSL a QSL manager or direct to the station location. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.

CN8FB	(KC9V)	VP9HE	(KD8IW)
C53BU	(KC9V)	VQ9KR	(KG6DX)
EL2MS	(KD8IW)	V21WW	(NØDH)
FO5HL	(WB6GFJ)	TA2AP	(KB6LEA)
HL9OK	(KC9V)	TL8HW	(KJ4GK)
JY8KS	(VO1BD)	N4NW	(AL7EL)
OYØMR	(DL1RK)	T31JS	(VK9NS)
PYØT	(PS7KM)	XX9KA	(KC9V)
P4ØGO	(K5GO)	YB1AQC	(W4FRU)
P43WLP	(Box 2035, St Nicholas, Aruba)	YJ8AA	(JH3DPB)
		ZK1QC	(K9QVB)
VK9LS	(JH1LKH)	ZK3RVC	(VK2BCH)
		Z21BA	(N5FTR)

QSL MANAGER VOLUNTEERS

K5MK KC9V NO9G

☐ QSL Corner, June 1988 *QST*, page 72, contains information and addresses for the ARRL Incoming Bureau. QSL Corner, September 1988 *QST*, page 71, contains information on the operations of the ARRL Outgoing Service. For additional information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.



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 September 16 to October 15, 1988, assume a sunspot number of 128, which corresponds to a 2800-MHz solar flux of 172.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official ARRL DXCC Countries List. You may also submit cards to endorse your award in 25-country increments through 250, 10- country increments through 300, and 5-country increments above 300. The totals shown below are exact credits given to DXCC members from June 7 through July 11, 1988. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DF5WA/105 JJ1KXM/109 PY5AAT/105 7P8DP/147 KD2UF/181 KB4HBH/100 NZ5O/129 NX6I/108 KB8DA/103
DL7DW/299 JN1EDC/112 SM6LJP/168 KM1A/101 N2HOU/103 KK4BS/102 W5BKK/120 WB6WXS/102 NR9S/109
F1JTL/141 JR5RPP/104 VE7IU/148 KS1A/104 W2CNS/129 N4EAT/101 WB5MHA/109 WS6F/177 NX9H/100
F6HLW/112 JR8VSE/110 VU2LBW/105 W1DLP/104 KD3AO/110 N4GNL/104 WD5F/250 N7GVV/108 WD9DGE/123
G4AEM/107 JW6WDA/104 VU2NTA/108 WB1GEX/104 NE3T/122 N4NTQ/115 WT5T/123 NB7N/105 AB0G/107
G0BTY/100 OH2BOZ/316 YC5BJP/108 K2LZJ/101 WA3IJZ/192 WB4TPF/108 KI6X/106 WA7QJZ/115 KØJQL/105
IN3DEG/131 OZ1DDN/115 YO2BKL/102 KA2HTU/103 AA4TV/223 WD4KMW/120 N6NMH/105 KA8MZU/104 NØDMS/107
JG1NBD/304 PY1AFL/102 4X6RA/106 KC2P/102 AB4DC/105 AA5BT/116

Phone

CX4ABY/113 IK2GSR/110 PA3DQT/105 XE1TOA/112 7P8DP/147 WA2TZP/116 N4NTQ/115 KI6X/104 K8SUS/108
DL9HCW/107 IK7DBB/228 SM6LJP/114 YS4TE/132 KZ1D/103 WB2MNE/104 WA4UAS/100 WA6RTC/137 KB8DA/103
F1JTL/110 JR3JBA/111 SP6IXF/209 YBØCN/105 WA1JVV/102 AA4PQ/101 WB4ELX/309 KF7IK/141 NS8R/101
GM3DPL/104 JAØUMV/105 TI8ACS/101 YC5BJP/108 WB1GEX/102 K4KGU/114 WB4TPF/107 N7GVV/107 NX9H/100
HK3CNI/103 LA1IX/124 VE7IU/144 YC5ODQ/135 KE2CG/166 KD4OS/120 KD5DR/215 NB7N/102 WD9DGE/105
HK6FIM/206 LU5DIT/102 VK2WU/294 4X6RA/106 NX2H/102 KK4OK/102 NZ5O/120 WA7QJZ/102 WØBPP/105
HK7MQC/108 OH2BOZ/306

CW

DF5WA/105 FE2PC/211 JA5BEN/226 OZ1KVO/107 AA4XR/101 AA5BT/105 WD5F/213 KN8C/101 WA8LLY/103
F1JTL/101 JJ1KXM/109 OZ1HYD/104 SM6LJP/134 W4USW/125 K5GKC/120 K8OQL/162 W8IQ/139

RTTY

JH1QDB/105 JF3JIQ/101 WA3ZKZ/102 AB9O/104

160 Meters

SV1JG/103 K1JO/100 WØEJ/103

5BDXCC

YV1TO I2EOW EA1SQ UV6AY W7CMO EA5JC KE4VU WB8ZRL KA6IYE
W8QWI JA5PUL JA4VUQ WØJM DL7DW

New Honor Roll Members

Mixed

312 **311** **310**
SP5BAK/320 HK3DDD/317 JA5KT/313 W2QXA/319 K8KAE/329
K9MFY/319 K5RE/316 OH2BOZ/316 W4DXI/331 KA8T/314
N6RA/329 SM4BOI/313 WA4DAN/314 W8KKF/315
W2HBH/324 K1EM/315 WA4LOF/314 KYØA/323
W2HN/326 WB4RFZ/315

Phone

311 **310** **307** **306**
HK3DDD/317 JH1OJU/316 W5ZPA/310 SM6CST/309
K5RE/316 WB4RFZ/315 K6JG/312
W8KKF/315

CW

Endorsements

Mixed

CT4YN/291 JAØCWZ/320 YU1NR/260 WB2P/314 KF4IX/231 AK5B/306 WW5Q/291 K7ZR/331 KJ9I/299
DJ5DA/344 JAØUMV/148 YU2WM/273 WE2K/177 KF4L/301 K5ABW/300 AK6T/236 KB7QC/294 KO9Y/193
DJ7ZG/345 JAØVHI/261 YU2YM/325 KT4M/255 K5BDX/300 K6DT/343 KB7QD/252 N9CPW/291
DJ9RQ/326 LA2KD/272 YU3WZ/149 AD3Z/322 N4AH/322 K5FNQ/312 K6FS/251 N7MC/316 N9DJ/308
DK7XX/256 LA3XI/328 ZL1ARY/343 AF3E/329 K5FNR/249 K6JAD/326 NN7T/200 N9OK/310
DK9FB/330 LA8PF/280 ZS6LW/357 K3GYD/321 K3IE/308 K5GH/330 K6PZ/331 W7IYW/328 W9AG/335
DL1RB/322 LU5DO/358 4X4FQ/351 K3SKE/203 N4CIS/284 K5JG/321 K6UFT/326 W7KSG/331 W9DY/356
DL1SBF/222 OE2KGM/277 4X4NJ/337 K3YGU/212 N4DRC/301 K5JII/205 KB6DSX/125 W7OEV/334 W9FR/327
F3AT/355 OE2YGM/211 5H3RB/226 KT3H/224 N4DSS/253 K5JM/326 KG6AM/263 W7OM/338 W9NGA/327
F6EYS/300 OH2LA/356 K1DRN/342 KX3I/312 N4HH/319 K5KR/323 KI6GI/202 WA7GQA/259 W9NTU/259
F6HJR/293 OH3KN/265 K1KOB/301 N3AM/304 N4HOH/281 K5PG/201 N6CR/320 K8EJ/342 W9OKL/312
FD6ITD/282 OH4NS/345 K1MEM/325 N3WH/284 N4IA/322 K5PP/316 N6EA/353 K8PYD/331 W9SC/316
FY7AN/320 OK1MP/349 KA1EKR/187 NI3P/250 N4IR/301 K5PZ/174 N6HL/313 KD8KY/245 W9TY/318
G3BKG/200 OK2RU/299 KB1NS/174 W3CV/353 N4MM/339 KA5W/314 N6IV/KL7/227 KE8CQ/200 W9WY/334
G3FKH/260 OK3MM/358 KM1D/316 W3EV/315 N4QAJ/175 KC5P/258 N6VF/320 KE8M/151 WA9EKA/313
G3JEC/339 OZ1TL/259 KR1U/290 W3EYF/347 N4SU/365 KD5RO/304 NB6L/310 N8AA/337 WA9MAG/311
G3RCA/320 OZ7OP/331 N1CPC/226 W3HCW/276 N4TX/314 KE5OD/150 W6BA/362 N8BLZ/276 WA9USE/314
G4MZF/W4/205 PP5UG/338 N1DCM/285 W3TVB/320 W4DR/360 N5AR/346 W6ERS/347 N8DE/323 WB9EEE/271
HA5DA/241 PT7AA/295 W1FZ/362 W3UJ/315 W4FGX/305 N5OK/324 W6GO/324 NA8G/200 WB9YXY/318
HB9TL/360 PY4KB/282 W1GME/349 WA3LJP/317 W4GTS/339 NA5S/280 W6GR/341 NM8K/304 WB9ZHS/203
I1BRB/203 PY5EG/316 W1IKB/327 WB3DNA/311 W4IF/355 NA5Z/181 W6HJ/250 NM8O/308 WD9GQV/299
I1RB/336 SM4CTT/322 W1JZ/336 AA4KA/315 W4JKC/242 ND5R/309 W6KG/355 NX8J/295 ABØX/319
IN3RZY/305 SM6CKS/338 W1NG/335 AA4SY/224 W4JVN/285 NJ5L/148 W6KPC/341 NY8I/253 KØALL/327
IN3XAI/300 SM6CST/332 W1NU/358 AA4V/325 W4LVM/322 NJ5X/296 W6KTE/346 W8BE/337 KØCVD/308
I5FLN/333 SM6CTQ/327 W1OT/335 AB4AE/249 W4MGN/352 W5AC/270 W6LC/218 W8BF/364 KØEOU/310
IK7CJV/279 SM7BIP/332 AA2X/214 AG4L/301 W4OMQ/338 W5EC/293 W6MUM/339 W8CBA/301 KØIEA/332
JA1CZI/280 SM7PRF/179 K2JF/301 K4BBF/336 W4RIM/331 W5EFA/317 W6NLG/313 W8GIO/315 KØRW/151
JA1QOP/309 SMØKV/353 K2JLA/315 K4BVQ/349 W4ZD/354 W5EW/224 W6OKX/325 W8GKM/335 KØVZR/290
JH1FDP/300 SV1DO/320 K2POF/230 K4BYK/308 WA4JZS/275 W5IZ/340 W6ONZ/355 W8ILC/338 KAØBKR/208
JH1OJU/319 UP1BZZ/320 KA2AOT/227 K4DLI/302 WA4SSI/251 W5KFN/325 W6QL/341 W8IQ/318 KAØCDN/291
JA2BL/335 VE1AL/325 KB2RZ/308 K4IQJ/200 WA4VDE/316 W5KGX/359 W6RT/361 W8MEP/280 KBØWM/265
JA2XW/343 VE3CPU/312 KD2SY/302 K4LNA/225 WB4CVH/125 W5ONL/226 W6SN/355 W8RV/304 KSØT/152
JA3ANW/290 VE3LGQ/344 KY2Q/341 K4LRX/313 WB4GNT/313 W5ZF/324 W6UZ/280 W8XD/150 NIØG/261
JA3BG/340 VE3OEE/152 KZ2I/325 K4MEF/208 WB4QNP/327 W5ZPA/318 W6WKE/157 WA8LLY/155 NJØM/286
JA3CSZ/319 VE6OU/313 N2AC/310 K4MZU/340 WB4SYP/268 WA5IPS/281 W6YO/340 WA8YTM/281 WØHZ/343
JA3EMU/328 VE6WQ/319 N2EDF/260 K4PR/302 WB4TDH/321 WA5JDU/268 W6ZZ/320 WB8Y/151 WØIZ/331
JA4IYL/164 VE7BD/330 ND2A/201 K4PVZ/324 WC4B/286 WB5BIR/293 WA6AIL/270 K9ACQ/149 WØKZV/322
JA4VAD/313 VO1CA/297 NK2W/200 K4RIG/311 WD4FWE/301 WB5LBJ/DU/312 WA6CSO/144 K9BIU/312 WØLYI/333
JA5BEN/293 XE3ABC/251 W2FXA/356 K4TEA/332 WD4IKI/255 WB5MTV/227 WA6DHA/128 K9CJK/343 WØMD/253
JA5IU/324 YI1BGD/221 W2MT/320 K4TXJ/310 WJ4S/175 WB5ZKR/303 WJ6O/279 K9GPN/300 WØULU/306
JA7QFU/228 YS1GMV/319 W2MUM/339 K4XR/316 WN4M/204 WC5P/215 AL7EL/323 K9LA/262 WØVX/319
JA7ZP/312 YU1AB/324 W2PN/344 KC4QT/275 WW4Q/240 WD5COV/236 K7NO/320 K9RJ/341 WØYVA/274
JA8MS/333 YU1GTU/311 W2SY/333 KE4RX/315 AA5BK/200 WI5A/302 K7OX/274 K9UWA/323 WA0CGS/315
JE8CIS/225 YU1HA/344 WA2UDT/203 KF4CI/168 AD5F/149 WK5I/268 K7WF/289 KA9OTD/176

Phone

CO2HQ/264
CT1CDL/225
CT1FL/335
CT1TM/264
CX2AAL/265
DF2XE/199
DF8NM/212
DJ5DA/317
DJ7ZG/344
DJ9RQ/326
EA1TE/150
EA3CZM/250
EA5AN/226
F6DLM/316
F6HJR/292
FD6ITD/282
F9ER/304
F9MD/342
G3JEC/339
G3RCA/319
G4ZYQ/208
GW4KGR/280
HB9CZW/174
HB9TL/359
HK3JJH/203
HK6BDX/279
HK6BER/230
I1RBJ/336
I2JSB/300
I2PEI/308
IK2DUU/251
IK2ECN/212
IN3ANE/309
I4USC/314
I5FLN/333
IK5EEG/168
IK7CJV/275
I8ACB/321
I8IYW/225
I8KNT/318
I8XTX/307
JA2XW/333
JI2KAR/176
JA3BG/296
JA3CSZ/310
JA4VAD/293
JA5BEN/285
JA5IU/319
JA5KT/257
JA7ZP/306
JAØCWZ/315
KP4GY/125
LA3XI/328
LU8DPM/274
LU8DWN/205
OE1PC/315
OE2KGM/266
OE2YGM/180
OK1MP/342
OZ1LRT/155
OZ7OP/331
PAØ2HBO/357
PY4KB/280
PY5EG/316
SM4BOI/312
SM6CKS/338
SM6CST/306
SM6CTQ/315
VE3OEE/151
VE6OU/304
VE6WQ/311
VK5MS/362
VK5QW/254
YB3CEV/255
YS1GMV/319
YU2WM/248
YV1KZ/335
ZL1ARY/336
ZS6LW/356
5B4ES/198
5B4MF/265
K1EM/270
K1MEM/319
KA1EKR/187
KA1YK/200
KB1CQ/125
KM1D/306
N1CPC/128
N1DCM/260
W1EED/286
W1FZ/356
W1KID/307
W1NG/327
W1SEB/335
W1VKQ/317
W1WAI/200
K2EWB/250
K2JLA/315
KB2RZ/308
KD2SY/302
KD2UF/181
KZ2P/311
NN2Q/125
W2ACC/134
W2FGD/344
W2FXA/337
W2HTW/217
W2QWS/346
W2SY/327
WB2P/312
WB2TKU/253
WE2K/176
K3RX/320
K3SKE/200
K3YGU/158
N3FBN/200
NK3U/176
W3DHM/358
W3EYF/304
W3HCW/275
W3HEQ/188
W3JK/341
W3NB/224
WB3BGI/311
AA4KA/301
AA4TV/219
AB4AE/249
AG4L/293
AK4E/284
K4BBF/336
K4BYK/304
K4DLI/300
K4JDJ/286
K4JRB/347
K4ODL/169
K4PR/287
K4RIG/311
KB4IT/312
KC4MJ/200
KI4FW/225
KK4HD/204
KN4H/303
KT4M/255
N4AXR/314
N4DRC/301
N4MM/335
N4RFN/151
NU4D/292
W4DR/356
W4EX/366
W4JVN/277
W4LVM/311
W4MGN/342
W4RNZ/305
W4UWC/345
W4WMQ/316
W4ZCB/317
WA4DAN/310
WA4LOF/312
WA4PPS/280
WA4TJW/171
WA4VDE/315
WA4ZBC/228
WB4FOT/202
WB4FQP/303
WB4GNT/312
WB4QNP/322
WB4SWI/306
WB4SYP/265
WC4B/255
WD4CRG/253
WD4IKI/252
AE5E/290
K5GH/329
K5KR/321
KA5W/310
KC5P/252
KE5PA/267
KV5E/298
N5AJW/315
N5JPC/219
ND5R/309
NI5D/225
NY5L/309
W5DLQ/205
W5EFA/316
W5EU/315
W5JJA/342
W5KGX/355
W5NYN/259
WB5LBJ/DU/312
WB5ZKR/284
WD5FHG/207
WK5I/253
WW5Q/186
AK6T/185
K6DT/326
K6EID/317
K6JAD/326
K6PZ/324
KE6KT/127
KI6GI/202
N6AHV/311
N6CR/320
N6HL/308
W6BAF/353
W6GO/323
W6GR/340
W6KON/331
W6KPC/340
W6KTE/345
W6SN/313
W6ZZ/316
WA6AIL/269
WB6PSY/305
WB6VIN/292
AL7EL/294
K7DS/311
K7NO/277
KD7CL/272
KX7J/261
KY7M/260
N7GMT/255
W7OEV/326
W7OM/330
W7TE/310
K8LZ/321
K8PYD/328
K8REG/281
KB8XT/202
KC8CY/315
KC8MK/225
KC8YM/303
KD8KY/209
KE8CQ/198
N8DE/297
NG8T/229
NM8K/300
NX8J/278
W8BE/319
W8BF/364
W8CBA/299
W8CUO/345
W8GIO/314
W8GKM/334
W8ILC/333
W8IQ/152
W8JRW/263
W8NXF/335
W8QHG/295
W8WVM/230
WA8LLY/131
WA8YTM/274
WA8ZDL/276
K9BIL/308
K9FYZ/320
K9MFY/312
KA9TNZ/271
KC9YX/260
KD9NA/211
KO9Y/188
N9CPW/283
N9DJ/265
NJ9X/176
W9AG/290
W9BEK/345
W9HHS/179
W9ITT/294
W9OKL/312
WA9EKA/310
WB9ZHS/200
WD9GQV/295
KØALL/323
KØGT/312
KØJRG/280
KØVZR/286
KAØCDN/278
KBØSY/296
KUØY/260
NØEUQ/200
WØJIN/306
WØLYI/331
WØMD/250
WØULU/305
WØVX/277

CW

DJ5DA/263
DK2DE/157
DK7XX/252
DL8AN/316
DL8ZAJ/180
F3AT/315
G4SSH/177
HB9BIF/175
HK3DDD/270
JA1CZI/260
JH1OJU/280
JA3BG/292
JA3CSZ/307
JA4VAD/161
JAØCWZ/279
KL7UR/152
LA2KD/228
LA3XI/308
OE2KGM/202
OK1MP/307
OK2RU/264
OZ2UN/133
OZ4OC/223
OZ7OP/300
PT7AA/253
PT7AC/259
PY3CJI/152
PY5AKW/175
SM5DAC/224
SM6CTQ/299
SM6CVX/306
VE3BX/305
VE3CKF/312
VE6OU/252
VE6WQ/276
YU2WM/222
K1MEM/315
K1XA/250
KM1D/227
N1CIX/128
W1FZ/311
W1NG/316
W1WA/227
K2JLA/221
KB2FS/202
W2FXA/279
WB2P/266
WE2P/166
K3IE/296
K3UA/306
W3EVW/308
W3EYF/289
W3NB/174
W3TVB/295
AA4KA/277
AA4V/271
K4CEB/310
K4MEF/135
K4PR/234
K4TEA/285
N4BPP/300
N4IR/293
N4MM/311
W4LVM/293
W4OMQ/124
WA4DAN/290
WB4CSK/280
AK5B/264
K5BDX/280
K5FNQ/271
K5JII/180
K5KR/307
K5TSQ/289
KA5W/297
KC5M/277
NR5Q/131
WB5ZKR/260
AK6T/185
K6DT/302
W6GO/307
W6OKX/285
W6SN/269
W6TVP/225
WG6P/225
K7NO/271
K7WF/225
K7ZR/302
N7MC/274
NZ7Q/217
W7TE/285
WA7HCE/177
K8PYD/308
KD8KY/154
N8DE/283
NX8J/207
W8AH/320
W8GKM/275
WA8YTM/250
K9BIL/279
K9LA/206
N9DJ/235
NJ9X/145
W9AG/265
W9FF/201
W9TY/309
WA9BXB/125
WA9EKA/303
WB9EEE/228
KØCVD/299
KAØCDN/271
NIØG/225
NSØB/130
WØIZ/309
WØULU/174
WØVX/268

RTTY

JA2NNF/131
OK1MP/177
K5KR/162
NJØM/181

160 Meters

UT5AB/152
4X4NJ/171
K1MEM/191
K1ZM/200
W1NG/140
W2PN/140
W3CV/137
AA4V/151
K4TEA/139
W4DR/215
W4FX/155
W4MGN/166
W4OO/151
WA4VDE/115
KA5W/113
WA8TXT/151

DXCC Notes

Reminder: Those wanting to update their totals for the December 1988 QST DXCC Listing must submit confirmations during the month of September. They must reach HQ on or before September 30, 1988 to be listed. You must comply with DXCC Rule 5, including the once-a-year exception, to update the listing.

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is given to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in *italics* for each band listing. Initial qualifiers are shown first, followed by those with endorsements, for June 11, 1988 through August 10, 1988. An SASE will bring you the rules and application forms.

6 m (50 MHz)

100

301 KC7IJ
302 WA3YON
303 KA9LLF
304 KB8BSW
305 W2CNS
306 K7NN
307 KE9I
308 N5DGQ
309 N7GXS
310 K7VAY
311 NKØP
312 WB5NAA
313 KB5QA
314 N5JWD
315 KB8JI
316 WBØCQO
317 WA5OLT
318 AB5T

KA1MVB 200
KU2A 125
KA2GOJ 225
W2HRW 275
K2OVS 200
N2WK 225
WA3DMF 350
AC3T 225
W3ZZ 300
KB4CSE 125
NA4I 200
N4LTA 200
N5DGQ 125
W5FF 450
WA5OLT 125
W5OZI 275
WD6BCN 150
WA6BYA 375
K6EID 200
KB6OK 175
W7ABX 225
W7HAH 325
KC7IJ 150
WB7OHF 325
WB8KRY 175
WD8OXK 150
WB8PAT 150
K8TGC 300
WB8TGY 150
WB8YFE 275
KE9I 175
KA9LLF 125
KA9SOW 150
KMØA 225
WBØCQO 125
WAØDYU 225
NØFFO 175
WØGN 150
KØIFL 175
KAØJGH 325
NØLL 400
WBØWAO/8 175
VE3LNX 150
VE4CW 125

2m (144 MHz)

100

241 YU7CV
242 WB8CCL
243 WD4FAB
244 K9MK
245 KAØJGH
246 KE9I
247 WA4MJD
248 W1AJR

W3CWG 200
W3ZZ 125
W4ZD 250
WB8CCL 150
KMØA 225
KFØM 225
YU7CV 200

1¼ m (220MHz)

50

29 KCØQR
30 K4LHB

70 cm (432 MHz)

50

121 WB5ROR
122 WD4FAB
123 WB8PAT
124 WD4AHZ
125 WA4VCC
126 WB4OOJ
127 KDØGT
128 KØRZ
129 G4FRE

W1JR 170
W2GU 70
W3ZZ 60
W8YIO 110
KR9G 60
KMØA 60
KFØM 80
WØRAP 190
WAØTKJ 80
WØVD 70
G4FRE 100

33 cm (902 MHz)

25

VE3LNX 35

23 cm (1296 MHz)

25

57 W2GU
58 WØOHU
59 N2WK
60 KØFQA

WA1OUB 30
W2VC 35
WD5AGO 45
KØRZ 30
NOØY 45
G4PRJ 35

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to PO Box 117, Burtonsville, MD 20866,
or call 301-384-6736 to record late-breaking information.

The 6 Meter DX Window—The First Three Months

In the May column, it was proposed that we initiate a one-year trial of a 25-kHz DX window for 6 meters. Specifically, it was proposed that 50.100 to 50.125 be used only for working, or attempting to work, stations outside of the contiguous 48 US states or lower-tier Canadian provinces (VE1 through VE7). Implementation of such an arrangement carried with it the use of 50.125 as the general calling frequency in place of 50.110 long used for that purpose.

This proposal came after a number of letters, received over several years from various 6-meter operators, that some kind of a "DX" window be established. A group in south Florida specifically suggested the 25 kHz from 50.100 to 50.125. In addition, many comments arrived vehemently protesting the monopolization by contest stations of the low end of the band, particularly during the ARRL June VHF QSO Party. These people complained that it is difficult, if not impossible, to work some of the foreign DX stations which often put in an appearance during this popular event, due to the heavy QRM from contest operations.

Indeed, there have been several reported instances of US stations being heard in Europe during the June contest, but those on this end were unaware of it due to heavy contest activity. The trial of a DX window was, then, to determine if a significant change in our operating habits could be brought about and, if so, whether that change would enhance everyone's opportunity to make 6-meter foreign DX contacts.

It is emphasized that the proposed use of 50.100 to 50.125 in working, or attempting to work, foreign DX stations is entirely voluntary and represents merely a gentlemen's agreement. There is no FCC rule and the League, or any other organization, is not trying to shove anything down the throats of 6-meter operators. If some few choose not to go along, there is no recourse other than peer pressure to urge them to do so.

With that disclaimer out of the way, how has it been going? Now that the first quarter of the proposed one-year trial period is complete, and we have come to the end of the summer sporadic-E season, it seems to be an appropriate time to assess that question and explore the continued implementation of the DX window during the next few months. Normally, the months to follow would be a dead period for 50-MHz propagation, and very few can work up much enthusiasm for adhering to a reservation of frequencies for DX when there has not been as much as single-hop E_s in months. But this year may well be different. Many believe that we have an excellent chance of witnessing the first substantial F2 openings of solar cycle 22 beginning only a few days after this issue of *QST* arrives in mail boxes.

As might be expected, agreement and compliance with the DX-window proposal has been less than 100 percent. It has been better in some parts of the country than others, with the East tending to greater acceptance than the West or Midwest. Like most generalizations, however, this one has exceptions. There are quite a few people in all areas of the country very much in favor of the plan who are conducting their operating accordingly. And there are those in all areas who are bitterly opposed, and operate in a manner reflecting their opinion. There is a third group who, while favoring the idea and generally operating in accordance with it, nevertheless frequently venture into the window to exchange greetings with an old friend or to work a new grid square. All too often, they fail to even mention to the other station that both of them are operating in the DX window and that perhaps they should QSY to some frequency above 50.125. This practice has had the predictable effect of providing those who consciously select a frequency between 50.100 and 50.125 for their routine operating a relatively clear frequency and a fairly steady stream of callers—although they might do even better above 125. If continued, this can only lead to the eventual disintegration of the DX window.

One thing that has come out clearly both in discussions about the plan and in mail received is that those of us who are adhering to the proposed use of 50.100 to 50.125 can use considerably more politeness and tact when telling others of it. Please, let's take the time to inform people in a courteous manner. I know that this is tough if we are hearing DX at the time, but it should pay off in better observation of the window later on. Getting someone mad at you generally doesn't cause him or her to go away. The reverse is quite often the result.

Whether adherence to the 50.100-to-50.125 MHz DX window has been total or not is not the major question. How well it has improved the overcrowding around 50.110 and led to greater spreading out of stations generally are what really count. The answer is that there has been a noticeable reduction in domestic rag chewing-type QSOs between 50.100 and about 50.120 during the season just passed, and it has been easier to read the weak DX stations when they did appear. Why so many have chosen 50.120 on which to park is somewhat of a mystery, but I have observed quite a few operating in that vicinity. Maybe their vote will lead to 120 being declared the top of the window but it is not what was proposed for the trial period.

One of the often-heard comments opposing the establishment of a DX window generally comes from Midwesterners and West Coasters who say that the idea is merely a ploy by the East Coast to clear a spot where they can work the DX which the West and Midwest are not privy to. Even if that were the basis for the proposal, which I contend it was not, why should that be a reason for opposition? If, by some freak of geography, one part of the country happens to be more fortunate in terms of propagation than others, is that any reason to operate deliberately in a manner that prevents the favored area from taking advantage of its good fortune? This kind of attitude seems like sour grapes to me and I don't believe it belongs in our VHF operating. Remember, the shoe can easily be on the other foot during the next E_s opening or with the F2 propagation coming up.

This leads me to a suggestion as to how, I think, the DX window should be used over the coming months in order to maximize its value to those who need it most. Whatever section of the country has had the best of things in a particular part of the world, let's not have the gang in that area monopolize the window with CQ DX calls and attempts at working every station heard—even if it is the umpteenth time that station or country has been worked. If there is any possibility that another area has a chance to make some, to them, rare contacts let's move out of the window and give them a chance. This goes particularly for the big guns. There are certain to be many small stations, even in the favored sections of the country, which have not yet been successful with the DX. They should be given an opportunity to partake of the riches that many of the rest of us already have salted away.

This credo means that those Easterners with big stations should make way when Europe is in and not see how many log pages of Gs we can fill in. Give the small stations and those in the rest of the country a break. The same comment goes also for the big West Coast stations when it comes to Japan. I am sure they will find it difficult to believe, but there are many of us, even those quite well up the 6-meter DXCC ladder, who have not yet worked a JA. Another related suggestion which was passed on to me and seems apropos is that we not engage in crossband operation in the DX window. A good idea would be to move above 50.150 for such work.

In summary, while observance of the DX window has not been 100 percent, it has been great enough to bring about a noticeable improvement in spreading out and a quieter place to hear the weak DX stations. On this basis, it appears worthwhile to

Mirowave Standings

Listings are call, state, US states worked, call areas worked, grids worked and best terrestrial DX worked in miles. Call areas are the 10 US call areas plus KH6 and KL7 plus each VE and XE call area plus DXCC countries not located within the continental limits of the US, Canada or Mexico. To ensure that the stations listed possess a true capability to work meaningful distances, a minimum showing of 5 grids or the minimum DX listed for each band is required. In order to make the standings a true reflection of stations currently active on the bands above 902 MHz, those not reporting activity within the past two years are subject to being dropped. They will be reinstated upon written presentation of continuing activity. It is not necessary to have worked additional states or grids in order to remain in the standings or be reinstated, merely an indication of continued activity and interest. Compiled August 10, 1988. Deadline for next update is February 5, 1989.

902 MHz (33 cm)

Minimum best DX 150 miles

W1JR	MA	10	5	25	378
W1RIL	MA	9	4	19	230
AF1T	NH	9	3	—	320
W1EJ	NH	6	2	—	—
WB2NPE	NJ	9	5	19	396
W2PGC	NY	6	6	12	478
N2WK	NY	6	5	—	328
KD5RO/2	NY	4	3	8	300
KU2A	NY	3	3	4	200
WA3AXV	PA	9	6	18	326
N3CX	PA	8	5	14	400
WS4F	GA	3	1	3	165
WB5LUA	TX	6	3	13	627
W6CPL		1	1	10	178
N6XQ		1	1	1	185
NI8O	OH	6	5	8	293
VE3LNX		9	6	36	498

1240 MHz (23 cm)

Minimum best DX 150 miles

W2SZ/1	MA	17	8	34	—
K1FO	CT	15	7	21	468
W1JR*	MA	13	9	34	655
K1PXE	CT	13	5	—	448
WA1OUB	NH	12	7	30	496
W1RIL	MA	12	6	23	450
AF1T	NH	10	4	—	350
K1LPS	VT	8	5	15	288
W1EJ	NH	8	4	—	—
W1QXX	MA	6	3	—	260
K2UYH*	NJ	25	32	—	770
WB2NPE	NJ	17	8	42	756
WA2LTM*	NJ	17	6	—	770
W2VC	NJ	16	7	26	537
W2PGC	NY	13	9	25	960
N2BJ	NY	13	5	22	—
K2YCO	NY	11	8	—	—
K2EVJ	NY	10	6	—	426
N2WK	NY	10	6	—	584
KD5RO/2	NY	6	6	13	360
KU2A	NY	3	3	6	200
K2LME	NJ	3	—	4	—
WA3AXV	PA	16	7	33	698
WA3JUF	PA	14	5	20	300
W3IP	MD	13	7	22	369
K3HZO	MD	13	6	25	—
WA3NZL	MD	11	7	—	780
KB3QM	DE	7	—	7	—
W3RUE	PA	6	3	11	—

*Some stations worked via EME.
—Information not supplied.

K4QIF*	VA	22	25	—	790
WB4NXY	KY	17	7	29	730
WS4F	GA	9	3	13	625
W3IY/4	VA	7	5	—	481
WA4OFS	FL	7	2	17	1042
K4NTD	FL	4	2	—	847
WB5LUA*	TX	29	28	112	1280
W5HN	TX	14	5	50	1155
W5DFU	OK	13	6	38	1031
W5RCI	MS	13	4	29	—
K5UR	AR	12	4	36	654
WB5AFY	TX	12	3	50	685
WA5ASH	TX	10	6	33	1425
K5SW	OK	10	5	30	984
WA5VJB	TX	9	5	—	1140
WD5AGO	OK	8	2	35	—
WA5TKU	TX	5	3	18	1112
WA5HNK	TX	5	2	15	740
W0RRY/5	OK	5	2	11	285
W5NZS	OK	5	—	20	—
W5HPT	TX	4	1	—	571
N5AMA	LA	3	2	11	675
WB5LBT	LA	3	2	—	—
W5UC	TX	3	1	12	163
N5BBO	OK	2	2	3	1042
WA5DBY	TX	2	1	—	—
K5PJR	OK	1	1	1	271
WA5TBE	TX	1	1	—	571
W5GVE	TX	1	1	—	366
N6CA*		8	10	30	2472
K6ZMW		4	3	—	402
W6CPL		3	4	19	2476
N6XQ		3	3	19	2519
W6KGS		3	2	—	382
K6QXY		2	2	—	2358
WB0HLC		1	1	2	479
K6LMN/6		1	1	1	230
N6NB/7	UT	4	2	—	295
WB5TCO/7	AZ	2	2	2	403
W7YOZ	WA	2	1	7	230
W8YIO	MI	20	12	45	950
WA8TXT	OH	18	9	25	820
NI8O	OH	18	8	48	982
K8WW	OH	16	7	32	448
WB8BKC	MI	15	7	33	650
WB8PAT	OH	10	5	16	836
W9ZIH	IL	24	9	—	790
WB9SNR	IL	14	8	27	760
WA9FWD	WI	8	3	8	—
W9UD	IL	5	4	—	760
W0UC/9	WI	3	2	6	290
WB0DRL*	KS	27	18	115	1100
W0RAP	IA	14	5	52	678
WA0TKJ	KS	13	5	40	1100
W0OHU	MN	12	5	25	814
K0TLM	MO	12	4	28	—
K0IFL	MO	11	5	18	426
KC0OR	NE	10	3	38	430
K0RZ	CO	7	3	31	407
K0ALL	ND	6	2	—	283
KX0O	CO	5	2	16	653
W0YZS	MO	4	2	—	425
W0ZJY	KS	3	1	—	170
NO0Y	KS	2	2	4	170
W0MDL	MN	2	2	—	340
W0VB	MN	2	2	—	340
KH6HME		2	2	—	2472
VE3LNX		12	7	39	498
VE4MA*		8	14	22	800

2300 MHz (13 cm)

Minimum best DX 100 miles

W1RIL	MA	7	3	11	230
W1JR	MA	7	3	7	257
W2SZ/1	MA	6	3	10	—
N2WK	NY	4	5	—	584
W2PGC	NY	4	4	7	315
KD5RO/2	NY	2	3	5	250
WA3AXV	PA	11	6	19	671
N3CX	PA	6	4	9	250
WA3JUF	PA	5	3	10	—
W4HHK*	TN	10	7	12	582
WB4NXY	KY	4	4	6	360
WS4F	GA	2	1	2	147
WB5LUA*	TX	12	5	32	933
WB5AFY*	TX	7	3	18	285
W5DFU	OK	4	2	11	235
W5HN	TX	4	2	11	623
WA5VJB	TX	3	1	13	185
W5UC	TX	3	1	12	163
W5ASH	TX	2	1	11	225
K5PJR	OK	1	1	1	271
W6CPL		1	1	5	105
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	115
W8YIO	MI	10	8	22	940
WA8TXT	OH	4	4	5	291
WB8TGY/8	MI	2	3	11	152
NI8O	OH	2	1	3	127
W9ZIH	IL	9	4	—	470
WB9SNR	IL	6	4	7	—
KX0O	CO	3	2	10	450
K0RZ	CO	2	2	11	143
K0JJA	IA	1	1	2	208
VE3LNX		5	5	11	296

3300 MHz (9 cm)

Minimum best DX 100 miles

W7CNK/5*	OK	4	2	6	187
WB5LUA	TX	3	1	11	165
WB5AFY	TX	3	1	10	285
WB5LUA/5	AR	3	1	6	288
W6OYJ		1	1	2	214
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	115
NI8O	OH	2	1	3	127
K0RZ	CO	2	2	5	70

5600 MHz (5 cm)

Minimum best DX 100 miles

K5PJR	OK	7	2	35	332
WA5ICW/5	OK	6	2	29	287
W5UGO	OK	6	2	24	377
WD5AGO	OK	3	2	5	94
N5JJZ/5	OK	3	1	4	404
WB5LUA	TX	2	1	10	215
WD5AGO/5	TX	1	1	1	224
W6OYJ		1	1	2	214
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	115
K0RZ	CO	2	2	5	75
W5UGO/0	NE	1	1	1	331

10 GHz (3 cm)

Minimum best DX 100 miles

WB5LUA	TX	1	1	5	82
W6CPL		1	2	8	281
N6XQ		1	2	7	358
WA6QYR		1	1	7	103
W6OYJ/6		1	1	5	404
K6HLH		1	1	5	125
W6SFH/6		1	1	4	414
K6KKO		1	1	4	208
WA6MHZ		1	1	4	104
WB6BKR		1	1	4	168
N6GN/6		1	1	3	414
WB6HLC/6		1	1	7	479
WB7ABP/6		1	1	1	479
WD6FWE		1	1	1	174
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	115
K0RZ	CO	2	2	6	78
KX0O	CO	1	1	2	165

24 GHz (1.25 cm)

Minimum best DX 50 miles

N6XQ		1	1	4	68
WA3RMX/7	OR	1	1	5	115
WB7UNU/7	OR	1	1	—	115
KX0O	CO	1	1	1	74

47 GHz (0.6 cm)

Minimum best DX 10 miles

WA3RMX/7	OR	1	1	2	14
WB7UNU/7	OR	1	1	—	14

continue the trial, especially with the onset of F2 propagation probably imminent. The trial will be helped by greater compliance. This can be aided by all of us deciding to use 125 in place of 110. At least make the first call there and monitor that frequency when in the shack doing other things. In the East, much of the activity has already shifted there. All it takes is an agreement among the locals in each area that 125 is where they are going to be listening from now on.

It seems clear that, by working together, we can make 6 meters more productive for everyone, not just the high-power East Coast stations.

ON THE BANDS

6 Meters—The results are in. The 1988 summer E_s season was mixed. May began with great hope. That hope was fulfilled in June with major widespread transatlantic openings on the 6th and 25th and transpacific openings on the 5th and 27th. But by almost all accounts, July was somewhat of a bust. WA5IYX, who makes a study of such things, says that from his FM broadcast data, July E_s was about 25 percent of that for June and about 33 percent of that for July 1987. That should make it official. WA1OUB agrees that July was a poor shadow of June, but Bob still managed to find six days during the month that showed some signs of European signals.

Whatever anyone else or the statistics say, WA2QCE thinks that this was a wonderful season. Leta writes that she added a total of 14 new countries, two in May, seven in June and five in July. She notes that some of these were DXpeditions and thanks those who went to the time and expense of putting them on. She also comments that the DX window is working somewhat, but she ran into one frustration when trying to catch an XE, only to have an S9 local come on 110 and call CQ without taking the trouble to listen first.

2 Meters—Some interesting news comes from Europe via the RSGB's VHF/UHF Newsletter, edited by G4ASR. It says that on July 15 at about 2100Z, GI4KIS in Northern Ireland heard several EIs rather excitedly calling some station. Further listening revealed that it was EA8BEX in the Canary Islands. He was unable to break in at the time, but two hours of persistent calling finally brought a response at 2405Z for the first GI to EA8 contact and a new IARU Region-1 2-meter tropo record of some 3065 km, or 1905 miles. Later, EA8BML joined in to work EIs 5FK, 8GQ and 9FD. GI6KIS also worked EA8BML. Signals generally ran between S3 and S9. GI6KIS runs an FT-290 into a Microwave Modules 100-W amplifier and four 9-element Yagis at 50 feet. EA8BML's installation consists of an FT-480R and 60 W to a 17-element F9FT Yagi.

The Canadian Radio Relay League has instituted a series of Fall VHF Sprints. Rules are similar to the League-sponsored Spring Sprints. See page 107 for details.

1¼ Meters—We should put a black band around The World Above 50 MHz this month. I am sure that everyone must know by now that the FCC has decided in favor of taking away the lower 2 MHz of this very interesting and valuable band. As this is being written, only a few days after the August 4 announcement, it is not yet known what steps the League will take to overturn this very unfavorable decision. If the decision does stand, we must consider what we VHFers must do to preserve a portion of the band left to the Amateur Service for weak-signal work. The FCC action transforms the 220-MHz band from one that was available for a variety of modes, from weak signal through FM repeaters and wideband intercity packet links, to the narrowest and most crowded band we have above 50 MHz. Stay tuned.

Conducted By Bob Atkins, KA1GT
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West Coast 10-GHz Activity

Jack, N6XQ, has been taking X-Band equipment along on a San Diego group's contest outings in Baja California. On July 16, a North American DX record for wideband FM was established when XE2GDK (Terry, N6CW, op) near San Quintin, Mexico (grid square DM20) worked Gary, NN6W/6 (about 10 miles southwest of Santa Barbara, in DM04), at a distance of 358 miles. XE2GDK was using a 10-mW Gunnplexer and a 4-foot dish, and NN6W ran 15 mW to a 19-inch dish for the QSO. Signals were weak, but Q5 on peaks. A few minutes earlier, XE2GDK worked Chip, N6CA/6, who was 3 miles west of NN6W, at a distance of 356 miles. These contacts are particularly interesting, because they were made using relatively simple, low-power equipment. The current US DX record on 10 GHz is 414 miles, but this was made using high-power narrowband systems (see the November 1987 New Frontier column for details).

Operating sites used for previous expeditions in Baja were Punta Banda (DM11), and a second site near San Quintin (DM10). Stations worked from these locations were Gordon, WB6NOA (176 miles), Loren, W6KGS (216 miles), Allan, W6CPL (280 miles) and Bob, W6OYJ (80 miles). Some of the contacts were exceptional—N6CA (256 miles away) had a 40-dB signal margin and WB6NOA, operating at sea level with a horn antenna, also had strong signals. Full-duplex QSOs lasting more than an hour were made with N6CA, W6CPL and WB6NOA.

An interesting observation was made on the long contacts. The peaks and valleys of the fading cycles *did not occur at the same times* for stations on opposite ends of the paths. N6XQ comments that this may be a result of frequency-selective fading (Gunnplexer systems operate with a 30-MHz difference in transmit and receive frequencies).

Operators participating in the Baja expeditions were Terry, N6CW/XE2GDK, Fred, K9VV/XE1FUX, Dennis, WA5LIG/XE2GBO, Bob, K6JYO and Jack, N6XQ. N6XQ says that he is running out of suitable locations to try overwater DX paths. Maybe a California-to-Hawaii contact will be made next!

5.7-GHz Activity in Oklahoma

On July 7, Jim, WA5ICW traveled to the Oklahoma panhandle for an attempt to contact stations in the Tulsa area on 5.7 GHz. In the past few years, contacts have been made using 4-foot dishes, but this time WA5ICW and Larry, W5UGO, decided that they wanted to do it using 10-foot dishes. At about 7 PM CDT, contact was established between WA5ICW/5 near Boise City (DM86—Fig 1) and W5UGO near Sand Springs (EM16). The two made contact, setting a new North American DX record of 350.4 miles. Using 5-W transmitters (Jim's rig is shown in Fig 2), signals were a *very* strong 30 dB over S9, with little fading or distortion. There were thunderstorms between the two stations at the time of the contact. Signals were steady with the antennas pointed at the horizon, and no signal-strength improvement occurred as they were elevated.

Because signals were so strong, WA5ICW moved farther west, across the border to a site near Moses, New Mexico. By the time Jim reached the site, darkness had fallen. That and heavy thunderstorms prevented operation until 7 AM on July 10. The first contact was with W5UGO on SSB, again with S9+30 dB signals. This extended the DX record to 377.4 miles. Propagation on this contact probably resulted from some kind of enhancement, as deep fading occurred (all the way down to S9!). When W5UGO used a 4-foot dish, signals dropped to about 10 dB over S9, and even a small horn antenna gave S9 signals!

Just before 8 AM, Scott, N5JJZ/5 in Broken Arrow, Oklahoma, was able to make contact with WA5ICW at a distance of 403.6 miles using 5 W to a 4-foot dish. Signals were S9, with fading. All the stations involved used similar home-brew equipment built from commercial surplus components.

WA5ICW comments that he is surprised how well the 10-foot dishes worked. Contending with the narrow beamwidth (about 1.3 degrees) is a potential problem, but using a reduction-geared motor to aim the dish, Jim has had no aiming problems so far. Contacts on 5.7 GHz have been made into the Dallas and Denver areas. Anyone in Jim's area interested in trying a 5.7-GHz contact, give him a call at 918-251-9019.

Other Microwave News

The San Bernardino Microwave Society (SBMS) *Newsletter* reports that a new 10.280-GHz beacon (W6NWG/B) is operational on Mt Palomar, California, running 100 mW to a vertically polarized antenna with azimuth coverage of 130 to 260°. Please send reception reports of the FM CW message to Bob, W6OYJ, via his *callbook* address.

The SBMS *Newsletter* also contains news from the West Coast VHF Conference. Of particular interest is the report of a presentation by Chuck, WA6EXV, on a 1-kW, 2.3-GHz injection-locked magnetron transceiver. I look forward to hearing more about this, and will pass on information in The New Frontier as I receive it.

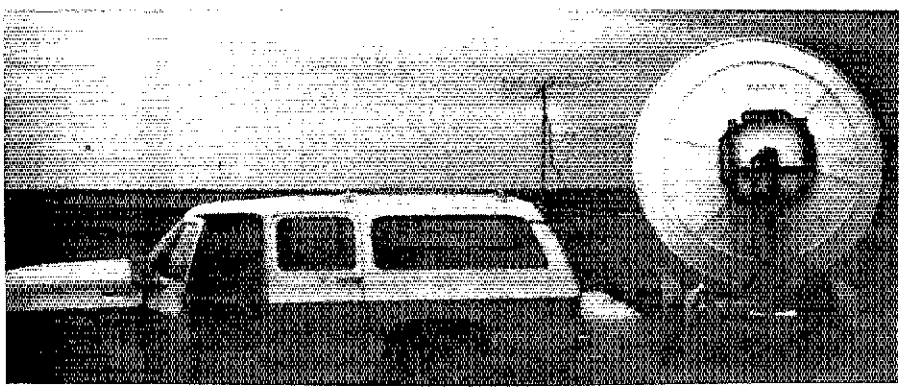

Fig 1—Jim, WA5ICW, set up this station about 3 miles northeast of Boise City, Oklahoma, and made a 5.7-GHz contact with Larry, W5UGO, in Sand Springs, Oklahoma, on July 9, 1988 at about 7 PM local time. That contact established a North American 5.7-GHz distance record of 350.4 miles. The next morning, the two set *another* 5.7-GHz record: 377.4 miles. A bit later, WA5ICW/5 and N5JJZ/5 broke the record *again*, completing a 403.6-mile QSO!

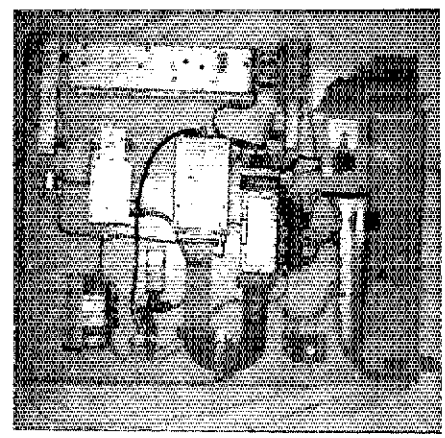

Fig 2—WA5ICW, W5UGO and N5JJZ used similar 5-W transverters in making record-setting 5.7-GHz contacts in July 1988. This unit was used at WA5ICW/5.

On Line

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Survey Results

Here are the results of the On Line Mini-Survey (presented in the May installment of this column). The responses (164 in all) to some of the questions were predictable, but there were some surprises that made things interesting.

Each question is listed below along with the percentage of respondents that selected each possible answer. I've added some comments following the results of each question.

Packet Radio Boom Continues

Question 1: Are you active on packet radio?

Yes:	45.3%
No:	24.6%
Soon to be:	30.2%

With 45% of the respondents already active on packet radio and another 30% planning to become active soon, I guess you can say that packet is still booming. Perhaps there is some connection between the FM-repeater boom of the '70s and the packet-radio boom of the '80s. Many hams have purchased VHF/UHF FM transceivers in the past 15 years or so. I imagine that quite a few people got tired of FM voice operating and had the transceiver just sitting on a shelf looking lonely. Packet gives these operators something to do with that lonely transceiver, and it doesn't even cost a lot of money (hams are notoriously cheap). Quite a few people have computers these days too, so for the price of a TNC you can give your computer *and* your lonely FM transceiver something to do!

Question 2: Would you like to see On Line devoted exclusively to packet radio?

Yes:	14.5%
No:	82.7%
Don't know:	2.2%

The response to question 2 doesn't take much explanation, especially since some of the respondents who said they would like to see On Line devoted exclusively to packet radio would only agree if a new column that provided general computer coverage (like this one) was added to the *QST* line-up. It is obvious that most of you want to see On Line continue to provide general coverage of the Amateur Radio computer world.

PX To Continue

Question 3: Have you ever requested a program listing from the On Line Program Exchange (PX)?

Yes:	62.0%
No:	38.0%

Question 4: Do you favor dropping or retaining the On Line Program Exchange (PX)?

Drop PX:	1.7%
Retain PX:	89.4%
Don't know:	8.9%

The On Line Program Exchange is still popular. While 62% confess to actually using PX, 89% proclaim that the program should continue. A number of the supporters of PX added that they would like to be able to obtain electronic listings, either by some sort of diskette exchange or a land-line bulletin board system. I am investigating some possible alternatives to the hard-copy listing system PX uses now, so stay tuned.

Question 5: Would you like to see On Line published more or less often (the column is now published eight times per year)?

More often:	84.5%
Less often:	0%
Stay the same:	12.8%
Don't know:	2.8%

I guess the response to this question indicates that On Line is popular with the people who read it. This information needs to be integrated with the results of a poll of all *QST* readers before we'll really be able to tell what it means.

Commodore and IBM: Number One and Two

Question 6: What kind of computer (manufacturer and model) do you use most often for ham radio applications?

Commodore 64/128™	43.6%
IBM® PC family and clones	30.7%
Apple® II family and clones	7.8%
Tandy®/Radio Shack® Color Computer	5.6%
Radio Shack Model 100	2.2%
Apple Macintosh	1.7%
Kaypro® family	1.7%
Texas Instruments TI-99/4A®	1.7%
Radio Shack TRS-80® Model III	1.1%
All others (less than 1% each)	3.9%

Before I conducted this survey, I guessed (correctly, I see now) that the first and second most popular computers for ham radio applications would be the Commodore 64 and IBM PC. I never imagined that the two would be used by nearly three-quarters (74.3%) of the survey respondents. In comparison, when the last On Line survey was conducted in January 1986, the Commodore 64 was the most popular computer (used by only 20.1% of the respondents), while the IBM PC was tied for fourth place with a 5.2% score.

Interestingly enough, the Apple II and Tandy/Radio Shack Color Computer families have maintained their popularity between the first and second surveys. In 1986, Apple IIs were used by 6.2% of the respondents (7.8% today) and Color Computers were used by 5.5% of the 1986 respondents (a nearly identical 5.6% today).

Question 7: What topic(s) would you like to see covered in On Line?

I received a number of good suggestions for future On Line columns and you will see the responses to this question in future installments of this column.

I would like to thank you for your thoughts and your willingness to respond to the survey. Hopefully, the end result will be a better On Line.

DX HELPER

As its name implies, W7HR's latest software offering for the Apple Macintosh computer provides assistance to the Amateur Radio DXer. DX HELPER opens with a world map that indicates the current location of the sun and the gray line (the display is updated automatically every 10 minutes). The operator can use the mouse to point to a location on the map to obtain its latitude and longitude, beam heading and distance, sunrise and sunset times and the current estimated maximum usable frequency (MUF). Alternately, a country can be selected from the scrolling DXCC list to obtain its latitude and longitude, sunrise and sunset times, CQ zone, UTC offset time, third-party traffic status and the current estimated MUF. A double click of the mouse accesses a 24-hour MUF chart for the selected location.

DX HELPER lets you select a range of frequencies and display a map indicating the areas of the world likely open to you now. The rectangular world map may be replaced by a great-circle map centered on your QTH, and the program can print DXCC country beam headings and distance charts to hang on the wall of your ham shack.

Other features include international call sign prefix and Russian oblasts locators, an alarm that may be set to remind you to tune to WWV to obtain solar flux and propagation data and a code practice function to help you get your speed up to pile-up snuff.

DX HELPER is available from Randy Stegemeyer, W7HR, PO Box 1590, Port Orchard, WA 98366. I have used it and it works!

FM/RPT

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

Dear Stan

The mailman has been kind to me this year. He has filled my mailbox with some interesting letters from my readers out in ham radio land. A sampling of the better epistles follow

An ID With Individuality

Dear Stan: Your article has unleashed a few "holier than thou" individuals from the ham radio self-enforcement task force upon me!

How is it that one (even the FCC) can be so stupid as not to recognize the fact that a station is operating as a repeater whether or not a "/R" or "repeater" follows the call sign?

In fact, if a repeater identifies as "repeater service from Podunk on WA1XYZ" or "welcome to the Podunk repeater, WA1XYZ," one has to be overzealous to proclaim that this is an improper identification. Sure, the FCC rules are quite plain in the way they are written and I am also sure that most of us are able to properly interpret them. But, the reason that the word "repeater" must follow the call sign rather than occur just before or within the identification sentence of a voice identification escapes me. Again, it takes total stupidity not to make the connection and, furthermore, one has to know that it is a repeater in order to know that the ID is "illegal."

It is a wonderful thing that the amateur service is, for the most part, self-regulated. It is unfortunate that the zealots cannot apply themselves to some other rot that occurs on the bands. Your article was a cheap shot at a big nothing!

Signed, Put Off in Podunk

Dear Put Off: If you feel that your interpretation of the FCC rules is the correct one, then ignore everyone else and go on your merry way. It's your repeater and if a user does not like the way you run it, tell him that it is your license that is on the line and he is free to use another repeater. (He will probably appreciate your advice to go elsewhere because your machine probably won't be on the air much longer after the law sweeps down on you!)

In Search Of...Resistive-Wire

Dear Stan: Your column in the January issue of *QST* was read with great interest, but my attention was particularly grabbed by one paragraph..."Today, many vehicles come off the assembly line with resistive-wire cabling already installed, however, after a few years, this cabling may deteriorate (as evidenced by cracked insulation) and should be replaced for continued effectiveness."

It brought to mind an experience of a couple of years ago when the charge/discharge meter on my 1967 Mercury Cougar failed. The short story is that the local garage man never was able to find the trouble and he "blew" the meter completely while tracing the trouble. Eventually, my son patiently traced the wiring and found what was completely mysterious then, a length of wire which was cracked open and a green powder-like substance falling out.

Now, my object in writing to you is to ask for your kind help in explaining more about just what is resistive-wire! What does it look like? How is it listed in given catalogs? I am willing to bet not a single one of the garages I know would admit to any difference between resistance wire (no hyphen) and resistive-wire. Excuse my ignorance; you have piqued my curiosity.

Signed, Curious in Wireland

Dear Curious: To tell you the truth, I would not know resistive-wire cabling if it bit me in the final amplifier, so I pulled out the trusty J. C. Whitney auto parts catalog and, lo and behold, "Custom-Tailored Resistor Ignition Cable Sets" do exist! Among the features of this ignition cable is a "wire-wound resistor over ceramic core" that "suppresses RFI well within the standards established by the FCC and SAE to prevent disruption of radio and TV reception, aircraft, police and fire communications." Sounds like the right stuff.

Those Irrepressible "WR" Call Signs

Dear Stan: I read your columns in May and July *QST* with interest. You stated that "...the licenses of all such repeater stations (WR8xxx) have long since expired..." I would like to point out that the *1988 Radio Amateur Callbook, North American Listings* lists the following repeater-class licenses: WR8AES, WR8AGH, WR8AJT, WR8AMG, WR1AJM and WR1AKW. These are just some of the ones I have run across in the 1- and 8-land sections of the *Callbook*. I do not know if they are errors or what, but they appear to be valid calls.

Signed, Now Checking the
Six-land Listings

Dear Now Checking: After reading your letter, I was puzzled, so I called Bart Jahnke, KB9NM, the editor of the *Repeater Directory* at ARRL HQ and presented the problem to him. After Bart did some checking, he called me back explaining that all "WR" call signs, as listed in the *Callbook*, should have expired, but, for one reason or another, have not been removed from the book (similar to the call signs of deceased hams that are still listed). If you are aware of any repeaters that are actually using a "WR" call sign, both Bart and I sure would like to know about it!

(By the way, Curious In Wireland is actually A. J. Gaston Wagner, VE3LBT, Now Checking the Six-land Listings is Chuck Bair, W8XT, and Put Off In Podunk shall remain nameless.)

TUNE-UP TIME

The following meeting notice was published in *The LCARA Patch*, the newsletter of The Lake County (Ohio) Amateur Radio Association. Perhaps your radio club might consider the same sort of program at a future meeting. Food for thought?

> How is your 2-meter rig? Audio okay? Is the deviation within limits? If you have doubts about these mystical subjects, then you are a candidate for the next LCARA meeting. That is when you get to bring your FM rig to "Dr. Deviation," Rusty, WA8HAR, for a check-up.
>
> Yep, it's FM rig tune-up time! Rusty will have a deviation meter on hand and all you need to bring is your rig and a power supply plus instructions to help you find the deviation control. It would be nice if you could pinpoint it prior to the meeting; however, we will have nurses on hand to assist if necessary.

REPEATER LOG

According to June 1988 reports received, repeaters were involved in the following public-service events: 673 vehicular emergencies, 34 medical emergencies, 23 fire emergencies, 16 alerts/drills, 8 criminal activities, 6 power failures, 8 public-safety events, 5 weather emergencies.

The following repeaters were involved (followed by the number of events): K1UN/K1ISR/WA1UCO 12, W2VL 45, NK2W 14, WB2WPA 10, WA2ZWP 3, WA3BXW 9, W3LIF 5, WD4ONK 7, W5FC 76, WA6BJY 8, WD6DIH 91, KA6EEK 53, W6FNO 339, N6ME 107, WA7RPS 3.

Strays

I would like to get in touch with...

☐ anyone using an Eagle II CP/M computer for Amateur Radio use. I'm looking for terminal and Amateur Radio software, plus the user and service manual for the Eagle. Larry Balzer, KF5ZD, 410 Senator St, Conneaut, OH 44030

☐ anyone who has a manual and/or enhancements for a Dentron 160-10L linear amplifier. Gary Young, WI2D, RD 5, Box 936A, Sussex, NJ 07461.

Correspondence

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

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.

PORTABLE WHERE?

☐ [My call is W6NKT and] I operate my station part of the year in Florida and part of the year in California. I feel that I am deceiving foreign operators if I do not use the words "portable four" [following my call] when operating in Florida. Although portable identifiers are no longer required by the FCC, many amateurs still use this method to indicate that they are operating in a call district other than that which is indicated by their call sign.—*Dr Harry K. Wolf, W6NKT, Sun City Center, Florida*

DEMISE OF A GOOD CW BAND?

☐ Fellows, we have a problem. I refer to the invasion of the 10-meter CW band by CB operators and other illegal operators on a continuing basis and in ever-increasing numbers. Some illegal CB operators are apparently operating with power ranging from 1 to 4kW from their SSB rigs! All of this can add up to splatter as much as 75 kHz wide. One VK told me that at times, these illegal operators are all he can hear. It's also the same at my location. It seems to me that some action must be taken by either the ARRL or the FCC since this type activity has been going on since at least 1983. These stations mostly operate on frequencies ending in the numeral 5 on the low end of the 10-meter band. I am sincerely concerned that we could lose 28 MHz due to the illegal operations of CBers. We must act soon!—*Lyle Smithers, W5LW, Sperry, Oklahoma*

TIPS ON YOUR TOWER

☐ I would like to offer some additional points to Thomas Willeford's excellent article ["Don't Fall Head Over Heels Because of Amateur Radio," April 1988 *QST*]. (1) Never work alone! This is good advice for any hazardous activity, and is particularly applicable to tower work. (2) Hard hats for the ground crew! Even with the best of care, anything can get dropped and be lethal from far enough aloft. (3) If a tower has high-intensity strobe lighting for aircraft, these strobes must operate both day and night.—*John V. von Sneidern, Jr, K2GTY, Bronxville, New York*

MORE ON RFI

☐ I read with much interest KA7WAR's letter entitled "RFI—The Demise of Ham Radio?" in the July 1988 Correspondence column. Being a member of SMIRK [Six Meter International Radio Klub]—"the" international club of six meters, matters concerning RFI always interest us. Vince Policani, KA7WAR, might very well be right. I know of many, many amateurs who no longer work six meters (or other bands for that matter) because they do not know how to handle RFI problems with their neighbors. Many just stop being active in ham radio. Others go to HF or UHF and hope that they don't have problems.

I was glad to see Dave Sumner, K1ZZ, address the subject of RFI in the editorial column of July *QST*. We encourage the ARRL to take action that will cause the FCC to take the onus off the Amateur Radio operator and put it on the manufacturer where it belongs.—*Ray Clark, K5ZMS, San Antonio, Texas*

☐ The July 1988 *QST* item in the Correspondence column entitled "RFI—The Demise of Ham Radio?" struck me as appropriate for my line of work—designing and installing business telephone systems. Virtually every modern telephone system sold today is analogous to the "home electronic devices" mentioned in the KA7WAR letter.

Even though any trained, reputable installer will insist that a separate cold water pipe or steel ground be furnished to properly ground equipment, I'd like to bet that it's only a matter of time before amateur operators are blamed for disrupting someone's telephone service as well as broadcasting over their office stereo. —*Ray Skrabut, WA2CNJ, Floral Park, New York*

CHANNEL 9, WHERE ARE YOU?

☐ A couple of weeks ago, here in Kitsap County, Washington, ham radio suffered a blow to its ego. Well, to mine anyway. A close friend of mine was driving home from shopping in the evening when a motorbike whizzed past doing at least a hundred miles per hour. My friend was listening intently to a conversation going on a local repeater.

Meanwhile, further up the hill, re-enter the motorcycle. The rider exceeded his safety envelope and became a statistic. The rider was prostrate on the road and suffered severe injuries. My friend was unfortunately rock-bound to only one frequency. He attempted to call rescue personnel, but was kept from doing this due to the intense haranguing that was going on. Repeated attempts to break were ignored.

Enter "stage left"—the CBer. The CBer immediately switched to Channel 9 on his set and, before my friend could even break our own frequency, medics, firemen and policemen were at the site. The incident was embarrassing to the ham community in general, but it also points to a serious lack which I have pointed out to many Amateur Radio groups in the past. As far as I know, we hams have no equivalent to CB Channel 9 at all. We are endowed with a zillion frequencies, but apparently we have no fixed, set, "known to us all" frequency that we may use on 2 meters or any other band, for that matter, I believe this is a serious situation and should be rectified. —*John Teale, N7FKV, Public Information Officer, Silverdale, Washington*

[While this situation may not have developed had the ham had more than one crystal in his rock-bound rig, it does bring up a good point.—Ed]

FB ARTICLES!

☐ As an ARRL Technical Advisor, I would like to compliment two recent *QST* articles as being a "cut above" the average. While I was singularly impressed, a colleague of mine, Dr Adolph Paul, expressed the same thoughts. Dr Paul is one of this country's top ionospheric scientists and is respected worldwide. We both have spent many hours observing sporadic-E (E_s) effects in trying to develop the theoretical models that would accurately predict its occurrence. Thus far, the exact cause of E_s is unknown. In April 1988 *QST*, W3EP presented as concise and up-to-date an assessment of sporadic-E propagation as I have seen in recent years. The article, "Sporadic-E Propagation at VHF: A Review of Progress and Prospects" is well written and easy to understand. It is a good teaching article.

Also, the May 1988 *QST* article entitled "The Great Sporadic-E Opening of June 14, 1987" by Michael Owen, W9IP, was impressive in the amount of data discussed. Dr Paul and I concluded that if we were able to design a government experiment to do this, it would cost several hundred thousand dollars. The data collected was impressive and the analysis was innovative and sound. The author should be complimented on an interesting experiment that exposes the erratic nature of sporadic E.

As I periodically teach HF/VHF propagation phenomenon, I intend to integrate these two articles into a single sporadic-E lesson.—*Bob Rose, K6GKU, El Cajon, California*

GEOGRAPHY—WE'RE EXPERTS!

☐ On July 27, the Gallup Poll, commissioned by the National Geographic Society, showed that a number of Americans cannot locate or identify neighboring states or foreign countries. This helped me to realize how glad I am to have had knowledge of Amateur Radio, beginning in my preschool years, to bring those far-off lands closer to home.

I say thank you to the wonderful hobby of Amateur Radio.—*James Smith, WB6PRS, Reno, Nevada*

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

Amateur Operation on the High Seas

Good amateur practice and strict rule compliance have always characterized the vast majority of US amateurs operating within the US and in international waters. The FCC has even commended the amateur community for its self-policing abilities and for adherence not only to the rules, but also to unwritten ethics dictating high standards of conduct.

From time to time, problems do crop up, and these usually stem from misinterpretations of the rules or from myths surrounding the so-called "gray areas" in the rules. Nowhere is this more true than in the case of amateur maritime mobile operation in and around foreign ports. Even hams with good intentions often have trouble in determining just what they are supposed to do when in *international waters,* ie, the high seas.

On the darker side, while certainly not characteristic of all maritime operators, unscrupulous yachters have been known to operate on the ham frequencies without a license. They often are of the mistaken opinion that, because they are on the high seas, the rules somehow don't apply to them. These unlicensed operators often do not install maritime mobile emergency communications gear, relying instead on a ham transceiver for all communication. This disregard of the rules and of domestic law can, among other things, complicate US and foreign efforts to reach third party traffic and other such agreements.

Recently, ARRL HQ has received a number of questions concerning amateur operation in international waters. In this month's column, we will discuss maritime mobile operation and those commonly asked questions associated with this subject.

Q. My wife and I will set sail on a luxury liner for a cruise among the Caribbean island nations. I'd like to bring my ham rig with me. Whose rules do I follow when operating?

A. When an FCC-licensed amateur is operating an amateur rig aboard a US-registered vessel in international waters, he or she must follow Part 97 of the FCC rules. Specifically, you must comply with all five of the provisions as set forth by Section 97.101. These are outlined later in this article. US and Canadian licensees need no special permit or authorization other than their own FCC or Communications Canada (formerly DOC) license, since these two countries share an automatic reciprocal agreement.

If you are an alien to the US (a citizen of a foreign country) and you are operating on a US-registered vessel, you must obtain either an FCC license by passing the required examinations, or a reciprocal permit for alien licensees, before operating your ham rig. A reciprocal permit is issued by the FCC to licensed amateurs of a foreign country which has signed an agreement with the US to issue such permits on a reciprocal basis. The amateur must be a citizen of that country (his home country). Application should be made to the FCC on Form 610-A. It should be noted that US citizens are not eligible for an FCC-issued reciprocal permit. If you are an alien operating on a non-US registered vessel, you must follow the licensing procedures of that particular country.

Q. I am an FCC licensee operating aboard a US-registered vessel. I understand what to do while in international waters; however, whose rules do I follow when my ship sails into the waters of another country?

A. When sailing or anchored in the territorial waters of another country, you must abide by the rules of that particular country. Since you are under that country's communications jurisdiction, you must comply with its rules and obtain the necessary license (by passing the required examinations) or obtain a reciprocal permit (by submitting the necessary forms to that country's government). It is recommended that you study that country's requirements well in advance of your departure date since some administrations can take as long as six months to issue the necessary permit or license. *Always plan ahead.* Never operate in a foreign country or in its territorial waters without proper authorization. HQ can provide you with the necessary application forms for any given country or countries. Please send a business-sized SASE with one unit of postage for the application forms of each country requested.

Q. What if the vessel on which I am sailing is not of US registry even though I am an FCC-licensed amateur?

A. If you are an FCC-licensed amateur sailing in international waters aboard a ship which is not of US registry, check the rules of the country in which the ship is registered. Since a ship is considered a part of the country in which it is registered, you must obey those rules and obtain any necessary license or permit from that country prior to your proposed operation. If you are sailing in the waters of a foreign government, then you must observe the rules of that government. You must obtain any necessary license or permit from that government prior to your operation in its territory.

Q. Are foreign Amateur Radio rules really very different from those of the FCC?

A. While many countries have similar rules to those of the US, the frequencies (particularly concerning the recently allocated WARC bands), power limitations, identification requirements, third-party-traffic restrictions and other regulations can vary widely. We in the US often assume that Amateur Radio operators in other countries have been allocated the same frequencies that we have been allocated. This is simply not the case! Each of the three International Telecommunication Union (ITU) "Regions" has their own allocations for the various services, and they do not necessarily conform to our frequencies in the US, which is in Region 2. See Section 97.7(c) of FCC rules for the frequency allocations of the three ITU "Regions." When operating in a foreign country, always observe all of their rules.

Q. When FCC rules apply, what provisions pertain specifically to international and maritime mobile operation?

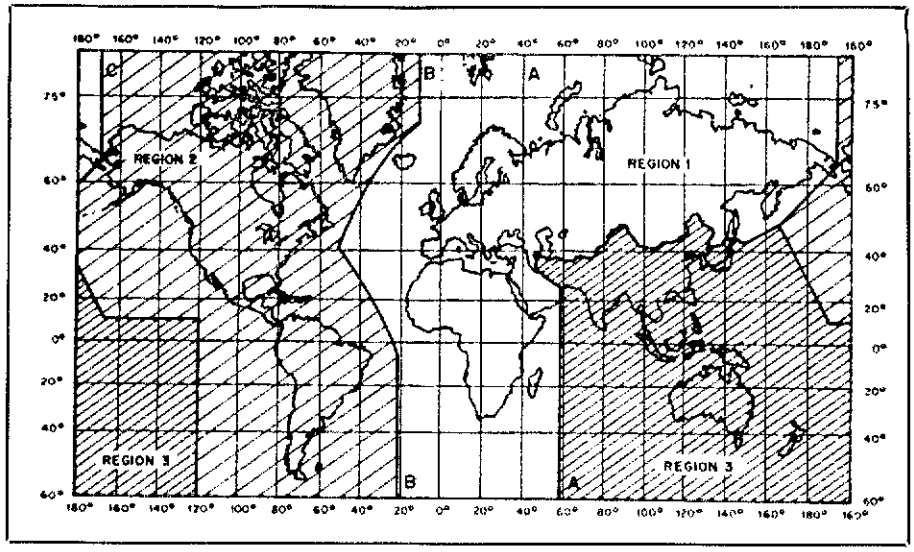
A. Concerning equipment aboard a ship or an aircraft, you must meet all five requirements in Section 97.101 of FCC rules: "(a) The installation and operation of the amateur mobile station shall be approved by the master of the ship or captain of the aircraft; (b) The amateur mobile station shall be separate from and independent of all other radio equipment, if any, installed on board the same ship or aircraft; (c) The electrical installation of the amateur mobile station shall be in accord with the rules applicable to ships or aircraft as promulgated by the appropriate government agency; (d) The operation of the amateur [maritime or aeronautical] mobile station shall not interfere with the efficient operation of any other radio equipment installed on board the same ship or air-

craft; and (e) The amateur [maritime or aeronautical] mobile station and its associated equipment...shall not constitute a hazard to the safety of life or property."

For stations operating under an FCC license or an FCC-issued reciprocal permit, the privileges of the control operator's license class must be observed, and the frequencies listed in Section 97.7 must be employed. Amateurs must be mindful of these allocations. For example, in the 40-meter band in Region 2, 7.0-7.3 MHz is allocated to the Amateur Radio Service. In Regions 1 and 3, only 7.0-7.1 MHz is allocated to the Amateur Radio Service and 7.1-7.3 MHz is allocated to the Broadcast Service.

Q. How do I know in which ITU Region I am operating?

A. If your station is operated in Europe, Africa or the adjoining waters, you're in Region 1. North and South America and the adjoining waters make up Region 2. The "rest of the world" is comprised of the countries of Southern Asia (excluding the countries of the Arabian peninsula) as well as the islands of the Pacific and Indian Oceans. See the map for a more detailed look at the ITU Regions.



The boundaries of the three ITU Regions. Note: Region 2 is defined as follows: On the East, a line (B) extending from the North Pole along meridian 10° W of Greenwich to its intersection with parallel 72°; thence by Great Circle Arc to intersection of meridian 50° West and parallel 40° North; thence by Great Circle Arc to the intersection of meridian 20° West and parallel 10° South; thence along meridian 20° West to the South Pole. On the West, a line (C) extending from the North Pole by Great Circle Arc to intersection of parallel 65°, 30′ North with the international boundary in Bering Strait; thence by Great Circle Arc to the intersection of meridian 165° East of Greenwich and parallel 50° North; thence by Great Circle Arc to the intersection of meridian 170° West and parallel 10° North; thence along parallel 10° North to its intersection with meridian 120° West; thence along meridian 12° West to the South Pole.

Q. What type of identification procedure should I use when operating maritime mobile in international waters?

A. FCC rules place no special identification requirements upon a station in maritime (or aeronautical) mobile operation. It is helpful to listeners, however, to follow your call with the words MARITIME MOBILE followed by the ITU Region in which you are operating, if you're on phone. If operating on CW or some digital mode, the identification procedure can be to send your call sign followed by a slant bar, the letters MM (maritime mobile) and the number of your ITU Region, such as N4MEJ/MM2. Your ITU Region will always be either 1, 2 or 3. ITU Regions should not be confused with domestic call areas.

Q. If I am sailing in international waters, can I pass third party traffic and make phone patches?

A. In cases where FCC rules apply, you may pass third-party traffic to countries with which the US holds third-party-traffic agreements. Be advised that certain countries prohibit phone patches even if a third-party-traffic agreement exists between the countries. You may not pass traffic with countries which have *not* signed a third-party-traffic agreement with the US. There are no exceptions to these rules—unless there is an immediate threat to life or property [97.3(w)]. Even thoughtless violations can cost amateurs the good reputation we have earned over the years.

Although a complete list of phone (and autopatch) guidelines was published in the August 1988 Washington Mailbox, here are a few reminders of special interest to mariners: Do not use phone patches for ordering parts or supplies, originating or delivering business messages or making accommodations arrangements at ports of call. This would constitute business communication. All third party messages must be limited to messages of a personal nature; general greetings, for example. Of course, if a bona fide emergency presents a threat to the safety of life or property, then use whatever means you can to get help. For further details, see *The FCC Rule Book*, pp 6-7 and 7-3.

Q. How far do the territorial waters of a particular country extend?

A. The territorial limits extend to whatever that particular country says they do. The US claims three nautical miles. Canada and Mexico claim 12 nautical miles. Most Caribbean island nations claim 3-12 miles, although there are exceptions. The territorial limits of certain Caribbean nations and other island nations whose area consists of many small islands often overlap, creating a larger territorial area than one would assume.

Q. A ham friend of mine recently told me that FCC-licensed amateur operators who are within international waters could operate on all frequencies, regardless of their license class. Is this true?

A. *Absolutely not!* If an FCC-licensed station operates outside the privileges of his or her license class, it could lead to serious consequences such as fines or license revocation! The FCC is aware of this problem, particularly with yachtsmen who choose to disobey the rules. The FCC continues taking enforcement action on these illegal operators. While most maritime mobile operators are law-abiding citizens, as are most radio amateurs, the few who do exhibit improper behavior cast a bad light on all amateurs.

Note: Questions in this column are typical of those asked of the FCC and other agencies. Questions and answers which appear are prepared by ARRL staff and have been informally reviewed by the FCC's Personal Radio Branch for agreement with current FCC policy. They do not represent a formal interpretation of the rules by the FCC.

Strays

***QST* congratulates...**

☐ Owen G. Robbins, KB6WYU, of Pico Rivera, California, on being voted California Teacher of the Year using computer technology by IBM and *Classroom Computer Learning Magazine*. He is one of 12 regional finalists from which the national winner will be chosen.

I would like to get in touch with...

☐ anyone who has a schematic, owner's manual or service manual for a Midland model 13-500 2-meter transceiver. Scott Swanson, KBØCEM, 11785 83rd Ave, Blue Grass, IA 52726, tel 319-381-2036.

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

Running on the Edge...of the Western World

By Peter Hatton, N6JBV

The 1988 Big Sur International Marathon. Monterey Peninsula ARES members provide continuous communications along 26 miles of California's rugged Big Sur coast.

Twenty-five members of the Monterey Peninsula ARES group arose well before sunrise on April 17, 1988 and traveled south from Carmel to take up their positions along California's Highway 1. This was the third presentation of the Big Sur International Marathon and local hams were again asked to provide primary medical communications and to handle traffic relating to runners' health and safety.

Although the BSIM is rated by *Runner's World* magazine as one of the top 20 marathons in the nation, it is still very small, with the list of runners totaling only 1600. Amateur Radio operators who cover major marathons face many problems—thousands of runners, congested city streets, multiple medical facilities, runner drop-out lists, multiple nets, and so on. The major challenge for the BSIM operators was to establish continuous communications over unusually rough terrain. With the Pacific Ocean to the west and the rugged coastal range to the east of the course, the hams exercised ingenuity in linking all stations to the Command Headquarters.

While this race had no major incidents, it was noteworthy in that it was a textbook example of a well-planned, well-executed and well-disciplined exercise.

The BSIM is always a popular event with the local hams. One reason for this is the magnificent coastal setting along Highway 1, the nation's first nationally designated scenic highway. As has been stated in the past about the BSIM, "At the Big Sur Marathon, they don't run for speed, but for the fresh ocean air, the awesome vistas, the wildflowers, the sound of classical music along the roadway...and the incredible feeling."

Runners are cautioned to pace themselves carefully as this all rural marathon course is hilly and extremely strenuous. From the starting line at Big Sur, the course follows a gentle slope down across the Big Sur River, through the redwood forest, into the cattle country of the El Sur Ranch and then across the Little Sur River bridge at an elevation of 40 feet. In the next 2 miles, the runners must climb to Hurricane Point at an elevation of 560 feet, then down and across the concrete-arched Bixby Creek Bridge, often seen in television commercials. From mile 13 to the finish line at Rio Road in Carmel, the course follows the contours of small coastal canyons and over a half-dozen smaller but grueling hills.

Communications Operation

Twelve runner aid stations were set up along the course at 2-mile intervals. The task was to establish direct voice communications (no relays) with each station as well as with the starting line. Since there are no repeaters on the south coast, the hams elected to operate a remote base from the lighthouse at Point Sur. Permission to use the facility was granted by the California Department of Parks, which has custody of the historic 1898 lighthouse keeper's quarters. From "The Rock," as the locals refer to it, with an elevation of 400 feet located opposite mile 8, the hams had solid communications with all aid stations in addition to the starting line. To tie the Command Headquarters at the finish line into the system, they established a second remote base in Carmel at the QTH of Art Hoffman, WA6TVN. All stations on the course operated on 2-meters through the Point Sur remote base, while the Command HQ operated on a different 2 meter frequency through the Carmel remote base. The two bases were tied together on 220 MHz. Net Control worked into the system on this same 220-MHz frequency.

In constant contact with Command HQ were the two mobile units on the course; Keith Beard, WE6R, medical director's shadow, and Assistant DEC Bernie Bisnett, W6TMG, who tracked the last runner.

The first time the race director asked to have a message "relayed" to one of his race officials on the course, he was simply handed the microphone. His look of surprise upon hearing the clear voice of the race official was definitely worth the effort put forth by all!

Traffic

There is another reason hams enjoy working the BSIM—traffic! There is plenty of it, and it all has substance. There is someone (usually more than one person) who needs to know and will use the information that each operator transmits, giving each Amateur Radio operator a sense of purpose and responsibility.

Certain events along the course are unique to this race. Highway 1, the only road between Carmel and Big Sur, was closed during the race. Orange pylons were set along the centerline of the highway, and the runners were restricted to the west or oceanside lane. To keep traffic flowing on Highway 1, the Highway Patrol operated convoys in the east lane, each convoy having one patrol car leading and one following. Only vehicles carrying official vehicle markers were allowed to travel the course unescorted.

Race officials asked to be advised of the following events as they occurred at each aid station: first and last runners passing, north and southbound convoys, and the passage of the truck setting out the pylons. The Highway Patrol requested sightings of any unescorted vehicles not carrying official vehicle markers.

Additional radio traffic included responding to NCS calls, race-official-to-race-official traffic, emergency vehicles (displaying red lights and sirens) on course, injury reports, runners needing transportation, other emergency traffic and, of course, checking into and out of the net.

Two serious injuries that may occur during a marathon are hyperthermia (overheating) and hypothermia (overcooling), both of which are largely dependent upon weather conditions. A series of colored flags displayed at each aid station let the runners know how the weather could affect their ability to complete the race. Five colors were used ranging from green, indicating near-perfect running conditions, to black, indicating extreme risk (in which case the clock would be stopped and the race canceled). To allow the race director to determine which flag should be displayed, the weather conditions, which were

Dave Duncan, KB6JAU (wearing hat) and Steve Naslund, KB6GNG, track race events on the topographic map at Command HQ during the Big Sur International Marathon. (*photo by N6JBV*)

The Monterey Salvation Army Van equipped with 2-meter and 1¼-meter antennas housed net control for the Big Sur International Marathon. (*photo courtesy Salvation Army*)

determined by a weather person on the course, were transmitted to Command HQ. The flag color to be displayed, as well as the weather conditions, were included under race-official-to-race-official traffic.

Standard directed net procedures were followed, using aid station mile markers as tactical call signs. FCC call signs were used only to satisfy Part 97 requirements. Net Control terminated a series of transmissions by transmitting the time in 24-hour format plus FCC call signs, thus indicating a free net. This also ensured that the times were recorded on the log sheet. Quoting from the printed instructions, "No Q-signals on voice nets. Ensure continual monitoring of radio channel, refrain from chatter, cute phonetics, and unprofessional conduct."

Assignments

Two operators were directed to set up and monitor the remote base at Point Sur and one operator was assigned to monitor the remote base in Carmel. Each aid station had one operator (several had two, one as backup). The one operator and driver at the starting line became the last runner monitor station. Four operators were assigned to Command HQ. One operator was assigned to the medical director and four operators were assigned to the NCS at mile 21.2.

How It Came Together

Ken Vincent, WA7EFP, and John Benka, KF6JG, who were assigned to the remote base on the south coast, elected to take their four-wheel-drive vehicle to Point Sur the evening before the race to set up the remote base and the two gain antennas. At 2000 hours that evening, the remote base on The Rock came alive, followed by the remote base at the home of WA6TVN in Carmel. Ken and John pitched a tent and spent a windy night on The Rock. Both remote bases were left percolating all night, ready for the events of the next day.

On the morning of the 17th, all operators were on station at their specified times—100% response. The four operators in the Command HQ tent worked in teams of two—one on the microphone and one on the log sheet, working one-hour shifts. Having worked with marathon officials at Command HQ for the previous two years, the hams decided that the information they received could be used more effectively if it were properly displayed. An Army topographic map was mounted on sheet metal and neatly framed. Colored magnets were labeled to indicate key events on the course, such as first and last runners, Highway Patrol convoys, etc. Using the magnets, the hams were able to continuously display and update events as they occurred.

NCS was set up in the newly outfitted Salvation Army Van at mile 21.2. The van, equipped with an onboard generator, has HF, VHF and UHF capabilities. Although the van is not intended as a communications center, the local Salvation Army officials graciously allowed the hams to use it as such. As this was the first real test of the van, the event proved to be an effective shakedown for the equipment and its operators. Net Control Station efforts were directed by Event Leader KØMC and Monterey Peninsula EC Don Nichols, KB6BZL.

With a doctor and several qualified medical personnel, station 21.2 became a key location. The ambulance assigned to this location was shadowed from its repeater and had to rely upon ham operators. This was also the southern checkpoint for the California Highway patrol with several black and white cruisers parked diagonally as a road block, reminiscent of a scene from the '50s Broderick Crawford TV series, *Highway Patrol*.

Recognition

Preparation is fundamental to success. With careful planning, the Monterey Peninsula ARES unit has taken a local event and used it as a vehicle to display their professionalism and ingenuity while making a significant contribution as race volunteers. Utilizing a rather low-key, friendly approach, they have earned the respect of the Highway Patrol, Cal-trans (state highway department), local fire departments and other agencies involved in the race, thus helping to make the community aware of the significant capabilities of the Amateur Radio Service.

Field Organization Reports
July 1988

ARRL Section Emergency Coordinator Reports

Thirty-one SEC reports were received, denoting a total ARES membership of 13,116. Sections reporting were: EPA, IA, IN, KS, LAX, MI, MN, MO, MS, MT, NFL, NH, NM, NNJ, NV, OH, ORG, SD, SDG, SFL, STX, SV, TN, UT, VA, VT, WA, WNY, WPA, WTX, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	96	80.00	424	852
TCC Central				
TCC Pacific	109	88.79	422	797
Summary	205	84.39	846	1656
Cycle Three				
TCC Eastern	60	96.77	27	54
Cycle Four				
TCC Eastern	116	93.55	447	902
TCC Central	56	69.10	209	489
TCC Pacific	102	82.26	471	902
Summary	274	81.66	1127	2293

TCC Roster

Eastern Area, Cycle 2: KW1U Director. K1EIC K1EIR WA1FCD KN1K KT1Q W1QYY WA2FJJ W2FR NN2H KA1UBD N2XJ N3AZW N3EMD KK3F NJ3V AA4AT K4DOR WD4FTK H4GHI WB4PNY N4SS W8PMJ WB8YDZ VE3ORN.

Eastern Area, Cycle 3: KN1K Director. WA1FCD NN2H WA2SPL N3EMD AA4AT KA8WNO K8TPF.

Eastern Area, Cycle 4: KN1K Director. KB1AF W1CE K1GRP W1QYY WA1TBY KW1U W2FR W2GKZ NQ2H KB2HM W2LWB W2RQ N2XJ N4GHI KB4N W4UQ K4WJR K4ZK W8BO W8PMJ N8XX VE3FAS VE3GSQ.

Central Area, Cycle 4: K5GM Director. W5GHP K5GM WB5J AJ5K K5MXQ WZ5N N5TC K5TL W5TNT KB5W W9CBE WB9UYU KAØEPY AIØO KSØU.

Pacific Area Cycle 2: ND5T Director. W5JOV W6AMM KU6D N6LHE K6UYK WF6O WA7CBN KF7R W7TGU W7IGC NØHFZ NØIA.

Pacific Area, Cycle 4: KØDJ Director. N2IC ND5T W5QVK K6LL W6EOT W6INH W6VZT NI6A K7GXZ N7CSP

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	743	23.96	.605	88.7	
CAN	31	448	14.45	.368	100.0	
PAN*	50	357	7.14	.489	79.5	
Region Nets						
1RN	62	333	5.37	.357	90.4	100.0
2RN	58	264	4.60	.383	86.6	93.6
3RN	31	138	4.45	.395	93.5	87.1
4RN	62	360	5.80	.280	70.0	100.0
RN5	62	534	8.61	.361	85.0	100.0
RN6	46	120	2.60	.273		98.0
RN7	62	278	4.50	.394	86.4	100.0
8RN	61	267	4.37	.260	92.4	96.8
9RN	62	243	3.32	.300	87.7	100.0
TEN	71	665	9.36	.362	78.0	100.0
TWN	60	260	4.33	.462	77.7	98.0
ECN						54.8
Cycle Three						
Area Net						
EAN	31	136	4.39	.282	67.7	
Region Net						
1RN	31	80	2.58	.246	82.0	70.9
2RN	30	110	3.70	.336	97.3	74.2
3RN	27	16	.54	.089	81.5	83.6
4RN						41.9
8RN						83.6
ECN						80.6
Cycle Four						
Area Nets						
EAN	31	851	27.45	.943	95.4	
CAN	31	846	27.29	.879	99.5	
PAN	30	695	23.16	.810	93.5	
Region Nets						
1RN						100.0
2RN	50	97	1.90	.268	69.7	100.0
3RN	62	166	2.67	.318	96.2	100.0
4RN	62	374	6.03	.271	94.2	96.7
RN5	62	417	6.73	.520	77.4	100.0
RN6	61	356	5.83	.690	97.0	100.0
RN7	62	331	5.34	.713	88.7	100.0
8RN	61	237	3.89	.299	85.0	100.0
9RN	62	294	4.70	.390	98.4	100.0
TEN	62	359	5.79	.513	69.8	100.0
TWN	56	268	4.79	.479	92.8	90.0
ECN						
ARN	31	87	2.80	100.0	77.4	

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AR, AL, AZ, CT, DE, EMA, ENY, EPA, GA, IA, ID, IL, KS, ME, MI, MN, MO, NC, NH, NTX, OH, OK, OR, RI, SB, SV, TN, VT, WA, WMA, WNY, WTX, UT.

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 written notification of qualifying months to ARRL Public Service Branch, will be awarded a special PSHR certificate from HQ. This certificate is a one-time award, ie, it is not issued more than once.

258
KC9CJ
147
WD8V
135
N4GHI
WB2OWO
133
WA2SPL
131
W9YVC
130
KA9VII
128
KF5BL
127
KW1U
125
WG7H
N2EIA
124
WB2ZJF
122
K4NLK
121
N9BLD
118
WD4COL
113
W7LRB

K2YQK
112
W7VSE
111
W2QNL
KD7ME
N1CPX
W2MTA
110
NM1K
WB7WOW
AA4TE
108
WF6O
WB2UVB
WB2VUK
WE2G
KA3DLY
107
K6UYK
106
KA2F
N8HHH
WA2JBO
AG9G
KE2GX
K5MXQ
105
WA4PFK
WB4DVZ
104
N3EMD

KT1Q
103
WA4JDH
W9CBE
102
W4RWB
W4JLS
WA2ERT
101
K8TVG
KZ8Q
WB4WII
99
NØFOO
98
W4PIM
K4MTX
WB4KSG
KA7AID
K5UPN
97
W2RRX
KI4YV
N4JRE
KA1FVY
96
WD8KQC
KD8HB
WA2FJJ
W3FA
95
WA9VND

AA4ZV
KB2BKE
94
K4ZK
WB8JGW
KB1AF
WA3WIY
WA3YLO
93
W6INH
92
NO3M
N4EXQ
N7ELF
WB1GXZ
91
KJ4VT
KA1GWE
90
N4KFU
WB4WQL
KA9RNY
WA1FCD
K1GGS
89
KA2INE
VE7BNI
N6NLW
WA1JVV
88
KA7EEE
N2HIF

87
N8GPU
W7LBK
W1KX
86
KF8J
N7BGW
N3AZW
K3JL
85
N8GPU
WAØHTN
K2YAI
84
WB6QBZ
KT9I
82
W7GHT
81
WD4KBW
K2VX
KA7SYG
N6EQZ
NB1A
KC3Y
80
KA1JXH
KAØARP
N5KCL
79
W1PEX
77
KA4FZI
WBØYH
KA8WNO
N8CEI
KAØKPY
WØKK
KJ3E
76
N2XJ
KB4WT

WA6WJZ
KA2QOO
KAØBCB
WAØTFC
WDØGUF
NC3V
74
W8FPA
WA3UNX
WB1BTJ
N2AKZ
73
WBØZNY
KJ9J
KØERM
N3COY
NJ3V
KL7CB
72
KA9RII
71
NDØN
W4TZC
K2ZVI
KN1K
70
W7LNE
NOØA
69
KF4FG
WA6QCA
AIØO
WA6WJZ
WA1TBY
WD6BZQ
68
WA4RUE
WB8R
N3DRM
NN2H
KDØNH
KF5RD

67
KA4HHE
WØOUD
N8FXH
N8FWA
N4KSO
WZ5N
66
KI6ZH
VE7ANG
W4HON
65
KA6TND/T
WB9PFZ
N2HLZ
K2TWZ
64
KB4JPN
WB2QMP
KD8KU
KBJDI
KDØYL
WGØS
63
N2DXP
WA8DHB
WB4ZTR
KC2JW
KA2ZNZ
K1EIC
62
KA8CPS
N8EFB
WD8KWC
KA2CQX
KA1KML
AA4AT
K4BGZ
KI4BR
KB4OPR
VE7EJW

61
KBØZ
K9ZBM
N2ABA/T
KA1KP
WBØWNJ
60
WB2FTX
WD8KBW
W9UMH
KK4FV
N4SMB
K4IWW
KB2EPU
N3EGF
K3GHH
55
N2ETO/T
54
KB4CYC/T
51
KA1NOI/T
50
KB2BNW/T
48
KA2JMA/T
47
KA1HOP/T
45
N2EVG/T
44
WA2GYY/T
42
KA2UIU/T
40
N8HRW/T

The following stations qualified for PSHR during the month of June, but were not listed in last month's column: KT9I KAØAPR NØFOO WDØGUF NØHWD WAØTFC KØQBE WBØWNJ.

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.

The Brass Pounders League Medallion is available to individual operators who achieve BPL and are listed in the BPL column for the third time. This medallion is a one-time-only award, ie, it is not issued more than once. It is not necessary that the three months involved be consecutive. Any three months will qualify an operator. Stations that qualify for the BPL medallion, upon written notification of the qualifying months to the ARRL Public Service Branch, will be awarded the callsign-engraved BPL medallion.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	837	745	1234	89	2905
WB9YPY	0	1120	79	762	1961
W1PEX	0	301	1064	25	1390
WA1FHB	1	548	539	2	1088
WA2SPL	6	527	492	32	1057
WBØWNJ	211	130	615	2	958
W3VR	314	197	239	36	786
KT9I	0	330	416	0	746
WF6O	1	293	293	12	599
N3AZW	27	259	259	23	572
KC9CJ	7	354	48	187	596
KT1Q	0	294	252	3	549
KA9VII	118	189	269	8	538
NM1K	51	239	208	28	526
KW1U	—	—	—	—	512
K4DOR	24	227	247	4	502

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	26	160	273
Central Gulf Coast Hurricane Net	31	70	3064
Clearing House Net	31	333	361
Early Bird Net	31	324	
Empire Slow Speed Net	30	42	274
Great Lakes Emergency & Traffic Net	31	100	1077
Hit and Bounce Net	31	159	571
IMRA	26	756	1453
Mission Trail Net	31	49	816
NYSPTEN	31	56	421
Southwest Traffic Net	31	262	1504
West Coast Slow Speed Net	99	99	490
20ISSBN	26	597	249
75 Meter Interstate SB Net	31	538	1141
7290 Traffic Net	47	349	3003

Conducted By
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Getting On the New OSCAR

Part 2: What is CP and What Does It Mean to Me?

Last month, I started you on your way toward using AMSAT OSCAR 13 by offering some thoughts on where you should place your new OSCAR antennas. This month we'll look at one significant aspect of OSCAR antennas: the "mysterious" attribute called circular polarization (CP).[1]

Among the questions most often asked by the satellite communications newcomer are those concerning which antennas are appropriate to use for OSCAR work. Although many of you may have experience with various beams (vertically polarized Yagis for repeaters and horizontally polarized antennas for DX work), when it comes to space communications antennas, and CP in particular, many amateurs draw a blank. The questions most frequently asked about CP are: "What is it?," "why is it needed?" and "how do I get it?" After defining some basic terms, we'll look more closely at these key questions.[2]

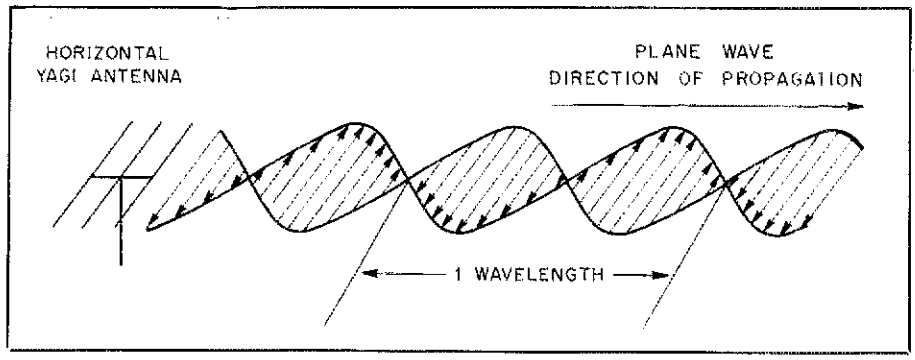


Fig 1—A horizontally polarized Yagi generates an E-field wave in a horizontal plane. Unless affected by strong magnetic fields, the E-field part of the wave remains horizontal and can be visualized as a ribbon, the width of which corresponds to the E-field strength at that instant at that point in space. The arrows indicate relative changes in the polarity and magnitude of the electric field.

First, Some Basics

Radio waves are *plane* waves. A plane has two dimensions, say, length and width. You can describe the electric field (E field) associated with a radio wave as intensity directed perpendicular to the direction of travel of the wave. The direction of propagation—and the direction in which its E field is expressed—describe "a two-dimensional surface."

Visualize a ribbon: It's a simple two-dimensional surface having length and width (but negligible thickness). Imagine a "ribbon" of signal energy emerging from your antenna and stretching toward the horizon in the direction of maximum gain (Fig 1). If your antenna is horizontally polarized, the ribbon is parallel with the ground. If your antenna is vertically polarized, the ribbon is perpendicular, or at a right angle, to the ground.[3]

Some special antennas (such as CP antennas) produce a wave that can be described as *rotating as it propagates.*[4] It's like twisting that imaginary ribbon as it moves through space. If an antenna produces *perfect* CP, you could place a dipole in the field and rotate it around an axis between the dipole and the source antenna. As you did this, you would find *no preferred polarization;* the field strength measured in any orientation around the axis of propagation would be equal. Compare this with single plane, linear polarization (LP), and you demonstrate vividly the key difference between LP and CP. With LP, there is a definite preferred orientation of the antennas. With CP, axial orientation of the receive and transmit antennas is irrelevant. In other words, if someone transmits to you using CP, and you receive that signal while switching between your horizontally and vertically polarized antennas, you would notice no difference in received-signal strength. If the CP antenna produces less-than-perfect CP, however, some signal-strength differences will be detected when switching receive antennas (see Fig 2).

The ratio between the field strength in one plane to the field strength in the associated perpendicular plane is called the *axial ratio,* and is expressed in decibels. Thus, an axial ratio of 6 dB means that the field strength (potential in microvolts per meter) in one plane is twice that of the field strength in the plane perpendicular to it.[5] Good CP antennas have axial ratios of 1 dB or less.

If the signal "ribbon" departing the trans-

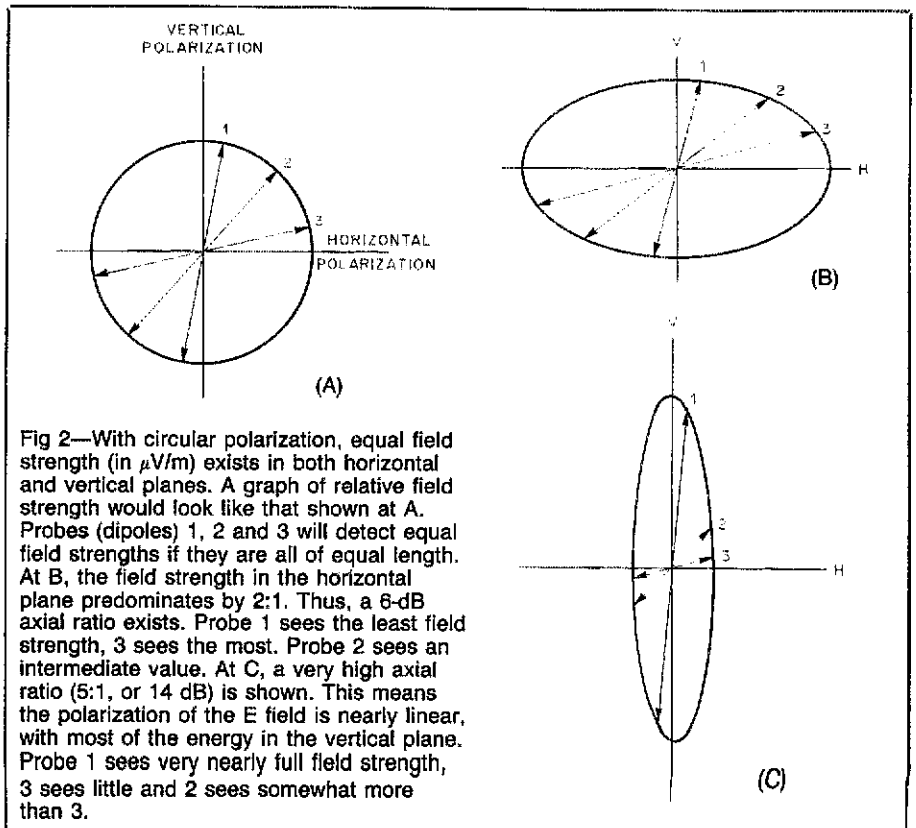


Fig 2—With circular polarization, equal field strength (in μV/m) exists in both horizontal and vertical planes. A graph of relative field strength would look like that shown at A. Probes (dipoles) 1, 2 and 3 will detect equal field strengths if they are all of equal length. At B, the field strength in the horizontal plane predominates by 2:1. Thus, a 6-dB axial ratio exists. Probe 1 sees the least field strength, 3 sees the most. Probe 2 sees an intermediate value. At C, a very high axial ratio (5:1, or 14 dB) is shown. This means the polarization of the E field is nearly linear, with most of the energy in the vertical plane. Probe 1 sees very nearly full field strength, 3 sees little and 2 sees somewhat more than 3.

[1]Notes appear on page 84.

mit antenna rotates clockwise (as viewed from behind the source antenna, looking in the direction of propagation), you're observing *right-hand circular polarization* (RHCP). If the plane of the transmitted wave rotates counterclockwise, it's called *left-hand circular polarization* (LHCP).

At Cross Purposes

Cross polarization can spell doom for reception. For example, if your transmitting antenna is *horizontally* polarized, and you're trying to work someone whose receiving antenna is *vertically* polarized, the result is usually a dismal failure. Why?

Imagine the receiving antenna as a probe measuring field strength in the vertical plane. If the transmitted wave is horizontally polarized, *theoretically* there would be no energy whatsoever in the vertical plane; no energy, no field strength—and no signal. In essence, the horizontal antenna is placing all the transmitted energy in the horizontal plane. "Okay," you say, "all that's needed is to ensure the transmit and receive planes match and all will be well." True enough, but in satellite work, there's no way of ensuring the energy will arrive from space in the desired plane. The incoming signal could arrive at your LP antenna in the "wrong" plane—and you would hear nothing!

The only reliable solution to this problem is to put an equal amount of energy into the horizontal and the vertical planes. Doing so is like paying your insurance premium: There is some cost, but the result is your assurance there will be energy in both planes. Distributing energy in this way comprises CP. The cost of this insurance is potentially wasted energy. Because equal energy is placed in both horizontal and vertical planes, if your receive antenna is LP and can thus recover the signal from only one plane (regardless of which one it is), half of the transmitted energy goes unused (undetected).

With this in mind, you might ask, "If the satellite is transmitting CP waves (which makes the plane of the receive antenna irrelevant), why does one need a CP receive antenna?" The answer is simple: Under many circumstances, *you don't!* In fact, *if* the polarization of signals from the satellite were always perfectly circular, and *if* there were no other effects to cope with, then you could be perfectly content to take the worst case 3-dB penalty for a CP-to-LP link and forget about CP entirely.[6] Confused? Let's take a closer look.

Earlier, you imagined your linearly polarized antenna as a probe. Because the antenna is more sensitive to energy in one plane than another, it is also a kind of polarization filter that accepts coplanar energy while rejecting orthogonal energy. If the incoming wave has equal energy in both planes—as we said was the case for CP—then the LP antenna would see the same signal regardless of its polarization—vertical, horizontal or something in between and an LP antenna would give excellent results.

Unfortunately, AO-13's signal polarization is actually circular *only under ideal circumstances.* When the satellite is looking directly at you, the polarization is *almost* perfectly circular (the axial ratio approaches 0 dB). However, when the satellite is looking off to the side of you (as it often does when not at apogee), the polarization is *not perfectly circular.* When the axial ratio increases, the polarization is said to be *elliptical.*[7] Elliptical polarization means that intensity in the vertical plane exceeds that in the horizontal (or vice versa), but there is at least *some* energy in *both* planes. Remember, if energy is totally absent from one plane, you have LP.

Thus, when the satellite is not pointed directly at you, you don't get good CP. "Then all you have to do," you might say, "is to find out which plane predominates, and match your antenna to it." Although that's certainly true, it's also totally impractical because the satellite rotates at more than 30 r/min, and because of other effects (such as Faraday rotation).[8] When the incoming wave is elliptically polarized, and the source (satellite) is spinning, the axis of the ellipse is spinning. That's the equivalent of spinning an LP antenna. If your receiving antenna is also LP, you can see what's going to happen. Most of the time, the incoming wave and your LP receiving antenna will not be coplanar. The received signal will vary from maximum—when the planes match—to zero when the planes are orthogonal. Consequently, the received signal will vary dramatically in amplitude. This effect, commonly called *spin modulation,* is very noticeable—and detrimental to QSOs.

How Can I Get CP?

First, do you *need* CP? If you intend to work AO-13 only around the time of apogee when the satellite will be very nearly pointed at you, then you probably don't need CP. Your linearly polarized uplink and downlink antennas will work just fine when the satellite's signals closely approximate RHCP. So you *don't* have to wait to get CP antennas to work AO-13. You can even use your old 2-m and 70-cm horizontally polarized Yagis to get started. But you must keep in mind that here we are discussing *ideal* conditions! What happens under less-than-ideal circumstances?

If you intend to work AO-13 at other than ideal (near apogee) times, then RHCP antennas are *the* way to go. The reduction in spin modulation is, in the opinion of many veteran users, worth the bother of getting good RHCP to and from the satellite. Using RHCP antennas on both the uplink and downlink, you'll not be as vulnerable to the annoying and detrimental effects of spin modulation that could ruin your QSOs. Although spin modulation can't be totally eliminated under all circumstances, using CP is an important help.

How is CP generated? Helical antennas provide excellent CP and are easily built by the home-brewer. By far, the most common antenna choice among OSCAR users at wavelengths of 2 m and 70 cm is the crossed Yagi. A crossed Yagi is a pair of Yagis that share a common boom and are orthogonally oriented. Phasing the elements and splitting power between the planes produces either RHCP or LHCP. In another scheme, the two Yagis are on separate booms and the planes of the elements are orthogonal. In theory, at least, the gain realized by a well-designed helix is equal to that of a crossed Yagi of comparable boom length. In practice, however, the Yagi usually outperforms the helix by a slim margin.[9,10]

In summary, CP is a special case of elliptical polarization. LP is the other special case of elliptical polarization. All the CP antennas on AO-13 use RHCP. CP provides some worthwhile benefits in working AO-13 under less-than-ideal conditions. The benefits of CP can include increased intelligibility because of decreased spin-modulation effects. CP can be produced by a variety of antennas including helices, properly phased crossed Yagis and turnstiles.

Next month, we'll look at basic AO-13 operating practices.[11]

Notes

[1]Circular polarization was addressed in the Feb 1987 installment of this column, "Introducing Phase 3C: Newest High Flyer Debuts Soon," pp 70-71. Also, see B. Olsen, ">50," *QEX,* Aug 1988, pp 11-12.

[2]With the forbearance of the purist, I will gloss over fine points of physics for the sake of general understanding with the occasional unfortunate sacrifice of rigor.

[3]This model illustrates the plane of the electric or *E field* of your antenna. The magnetic or H-field plane is perpendicular to the E field, but propagates in the same direction. A more refined model would have the "width" of the ribbon vary with the E-field intensity as if arrows (vectors) of various lengths were printed on the ribbon and then the ribbon were trimmed to accommodate only the length of arrow printed there. The length of the arrows—and thus the width of the ribbon—would repeat periodically at intervals of one wavelength.

[4]The plane of the wave can be visualized as a twisting ribbon. The plane of the ribbon at a given distance from the source at a given instant is the plane in which the E-field intensity is maximum.

[5]Ratio in dB = 20 log E1/E2

[6]M. Davidoff, *The Satellite Experimenter's Handbook* (Newington: ARRL, 1984), p 6-5.

[7]Circular polarization is the special case of elliptical polarization where the axial ratio is 0 dB. For non-zero axial ratios, the polarization is said to be elliptical. Linear polarization is the other special case of elliptical polarization.

[8]For a description of Faraday rotation, refer to the Feb 1987 installment of this column (see note 1).

[9]An excellent discussion on antennas for CP is provided in M. Davidoff, *The Satellite Experimenter's Handbook,* pp 6-4 and 6-5 (see note 6) and *The ARRL Handbook,* 65th ed, on pp 17-22 and 23-5.

[10]Counterintuitively, loop Yagis produce LP, not CP.

[11]For more information on getting started on OSCAR and information on AMSAT membership and membership benefits, call AMSAT, 301-589-6062 or write: AMSAT, PO Box 27, Washington, DC 20044. Please include a business-size SASE.

Strays

☐ anyone with software for the PK-232 that is compatible with the Model 4 Radio Shack Computer. A. B. Hall, Rte 3, Box 538, Arab, AL 35016.

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

International Amateur Radio in Birmingham

The Radio Society of Great Britain recently celebrated its 75th anniversary at ceremonies in Birmingham, England. This writer was honored to have lunch with the patron of the RSGB, His Royal Highness Prince Philip, and to spend an extended period chatting about international organizations in general, our common naval experiences in the Pacific during the 1942-1945 time frame and various facets of international Amateur Radio.

The day after the official ceremonies celebrating the RSGB's 75th anniversary, with appropriate remarks by His Royal Highness and by Sir Richard Davies, G2XM, president of the RSGB, there was an informal international meeting to explore the various challenges facing Amateur Radio. Some 40 amateurs took part in this discussion, which was chaired by IARU president W1RU. Many of those present were the presidents of their national societies, and they came from all three regions. IARU Region 1 was represented by its chairman, PAØLOU. ARRL was represented by President W4RA and Executive Vice President K1ZZ, while the prize for the greatest DX would have gone either to JARL President JA1AN or to NZART President ZL3QL. Of course, by far the greatest number of society representatives came from Europe.

What was Discussed?

First and foremost was the possibility of some sort of an ITU allocations conference that might take place as early as 1992. IARU has already begun its preparations for such a conference, and we'll know better about the date after ITU holds its Plenipotentiary Conference in 1989. Many of the speakers at this informal international meeting pointed out the pressures that exist at various points in the spectrum, pressures for expansion that may cause problems for the Amateur Radio Service.

This concern about the future led to a spirited discussion of how the growth of the Amateur Radio Service can be encouraged. Some of the suggestions concerned the wider adoption of a beginner or novice license, a class of license that would make it easier to cross the initial barrier of an examination.

But as G3OUF put it, the examination should be regarded as a challenge, not as a barrier, and so we should strive to find ways to make Amateur Radio more interesting to more people. That led VP9IM to suggest that we share resources in order to develop what might be called an "IARU Training Course," one that would have universal applicability, and that would tackle the problem of how to attract people to the ranks of Amateur Radio. VK3KI pointed out the necessity for encouraging radio amateurs to upgrade, so that amateur portions of the spectrum are better utilized, and the necessity for marketing Amateur Radio, for projecting a suitable image of Amateur Radio to the world at large.

The Patron of the Radio Society of Great Britain, His Royal Highness the Duke of Edinburgh, KG, was the honored guest at the RSGB 75th Anniversary luncheon. Among those seated at his table were, to his right (backs to camera), Col. Fender, Lord Lieutenant of the County of West Midlands, and IARU President Baldwin; and to his left (top of photo), RSGB President Sir Richard Davies, G2XM; Mrs. Fender; and ARRL President Larry Price, W4RA.

Returning to the subject of an allocations conference, while IARU has already proceeded with the process of establishing some common goals which could be adopted worldwide, it appears that none of the major administrations has yet begun any visible preparation for such a conference. Quite possibly, such activity awaits a decision on a firm conference date by the membership of the ITU at the 1989 Plenipot. VK3ADW reiterated his belief in the importance of Amateur Radio participation in the work of the CCIR (the CCIR being the arm of the ITU which establishes the technical standards for radio on which many ITU decisions are based).

There was discussion on the desirability of encouraging more amateurs to join their national societies, not only to provide strength for the society in terms of representation before its telecommunications authorities, but also to encourage more amateurs to follow the IARU band plans. As PAØLOU put it, we want everyone playing on the team. ZL3QL noted that if "we" (both IARU and the national societies) were seen to be doing a good job, peer pressure would encourage the growth of membership. I1RYS went on to say that every opportunity should be taken to educate individual amateurs of the role that IARU plays in maintaining our frequency allocations at the international level.

One intriguing thought by LA5QK was that there should be an informational leaflet included with each piece of amateur-band equipment sold, a leaflet which would explain some of the background of Amateur Radio and how it is regulated and how its international standing is maintained.

These are some of the topics that were discussed in late July in Birmingham. Oh, there were others, including QSLs, third-party traffic, the Amateur Radio Administration course, the CEPT common license, operating procedures, electromagnetic compatibility, the promotion of Amateur Radio in the developing countries, the possibility of standardizing the physical size of certificate awards, and beacons and their possible use in scientific investigations.

In general, what came out of these meetings was the realization, once again, that we share common problems worldwide, and that it is often valuable for us to share our solutions. Amateur Radio is truly international, not just in its ability to communicate but also in its administration. We profit by sharing our experiences. Further, it is also essential to recognize that whatever we do in one country, in one society, can have an effect for better or worse in another country, another society. There is no isolation.

On behalf of IARU, a great many thanks to RSGB who, on their 75th birthday, took the initiative to organize this informal international meeting and thus to make it possible for so many national and international representatives of Amateur Radio to share ideas.

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

Japan Ladies Radio Society Celebrates 30th Anniversary

Thirty years ago, JA1AEQ and JA1YL founded the Japan Ladies Radio Society, and in June 1987, YLs gathered to celebrate the organization's anniversary. Over 100 members, including five DX members, attended celebration activities in Hokkaido and Okinawa. A special exhibition of handcrafts, paintings, calligraphy and photography was set up by the JA YLs. Members who were not able to attend the convention sent articles for exhibit and auction. Top scorers in the 1986 JLRS Party Contest and winners of the YL-10 Certificate were honored. JA7PCH, JA2BBH, JE2EWW, JR3HII, HE1IWR, JG2HOK and JA1AEQ were among those cited for their certificate and contest participation. At the business meeting of JLRS, newly elected officers were introduced: President, JA1EYL; Vice Presidents, JE1IWR, JF1IZM; Treasurers, JF1IM, JE1BLS; and Secretary-Editors, JA1CFS, JH1HDU, JE1NWB, JL1XWR.

Among those DX members who attended the anniversary party were Lia, WA2NFY, and Betty, WD8IEW. These YLs were each presented with a yukata, a Japanese summer kimono, made especially for them. After the convention, Betty and Lia went to JAØ with several JA YLs to operate the commemorative station, JAØYWM/Ø in Nagano. (*Thanks to JH1GMZ*)

YLs gather for JLRS 30th anniversary meeting in Tokyo. (*photos JH1GMZ*)

HS1YL, HS1DF, WA6UVF and WA2NFY model Oriental finery in the JLRS Kimono Show.

Lia, WA2NFY/7J1ADY, an unidentified JA YL and Jeanie, WA6UVF/7J1ACN, are QRV from JAØ.

YL ANNIVERSARY PARTY
Sponsored by YLRL

Date/Time: CW: Starts Oct 12 at 1400 UTC, ends Oct 14 at 0200 UTC. SSB: Starts Oct 26 at 1400 UTC, ends Oct 28 at 0200 UTC.
Eligibility: All licensed women operators throughout the world are invited to participate. YLRL members only are eligible for the cup awards. Nonmembers will receive certificates. Only YLRL members are eligible for the Corcoran and Hager awards.
Procedure: Call CQ YL.
Operation: All bands may be used. No crossband operation. Net contacts, repeater contacts, and contacts with OMs do not count. A station may be counted only once in each contest for credit. Participants may operate only 24 hours of the 36 hours of the contest. Operating breaks must be indicated in the log.
Exchange: Station worked, QSO number, RS(T) and country/state/province. Entries in log must also show time, band, date, transmitter power and operating breaks.
Scoring: (A) CW and SSB will be scored as separate contests. Submit separate logs for each contest. (B) All YLs within one of the United States (Hawaii and Alaska included) or within a Canadian province: Score one (1) point for each QSO with another station located in a state or province. Score two (2) points for each contact with a station not located within a state or province (ie DX). Definition of DX: All stations not located within a state or province. DX YLs shall score two (2) points for each contact with a station located in a state or province; two (2) points for each contact with a station on another continent and one (1) point for each contact with a station on their own continent. Multiply the number of contact points by the total number of different states/provinces/countries worked. (C) Contestants running 150 W or less on CW and 300 W PEP or less on SSB, at all times, may multiply the results of B by 1.25 (low-power multiplier).
Logs: All logs must show the state/province/country to qualify for awards. Logs should also state whether or not operator is a member of YLRL. Do not send carbon copies of logs. Please print or type. Logs must be signed by the operator and no logs will be returned. Remember to file separate logs for each contest. Logs must show claimed score, be postmarked by November 11, 1988, and be received by December 2, 1988 or they will be disqualified. Send logs to: Carol Shrader, WI4K, 4744 Thoroughgood Dr, Virginia Beach, VA 23455, USA.

Meet Judy, NØGFE (Novice KAØTMZ), the only YL to op in the 2-meter "health and welfare" communication for the annual John Beargrease Sled Dog Marathon held on the north shore of Lake Superior in Minnesota. (*photo KØMAH*)

Coming Conventions

KANSAS STATE CONVENTION

October 1-2, 1988, Wichita

The Kansas State Convention is sponsored by the Wichita Amateur Radio Club. It will be held at the Red Coach Inn at 53rd and North I-135. The door will open at 9 AM both days. Features will include large indoor flea market, commercial displays, technical seminars, nonham activities and Saturday night banquet with entertainment followed by a Wouff Hong Ceremony. On Sunday, there will be a morning breakfast and a hospitality suite, compliments of the Midian Shrine Temple Amateur Radio Unit. Admission is $5 in advance and $6 at the door. Talk-in is on 146.22/82 for out-of-town hams, and 146.34/94 for local hams. Send advance reservations to Vern Heinsohn, WAØZWW, 950 Back Bay, Wichita, KS 67203.

MISSISSIPPI STATE CONVENTION

October 1-2, 1988, Biloxi

The Mississippi State Convention is sponsored by the Mississippi Coast Amateur Radio Association. It will be held at the Point Cadet Plaza on US 90 at the foot of the Biloxi-Ocean Springs Bridge. The doors will be open 8 AM-5PM on Saturday and 8 AM-3 PM on Sunday. Admission is free. Talk-in is on 146.13/73. For more information contact Edward L. Byrd, KA5VFU, 18316 Landon Rd, Gulfport, MS 39503, tel 601-832-3249.

October 1-2
New England Division, Boxboro
October 1-2
Mississippi State, Biloxi
October 1-2
Kansas State, Wichita
October 2
Illinois State, Rockford
October 8-9
Delta Division, Memphis, TN
October 8-9
National Capital DXPO 88, Falls Church, VA
October 14-16
Pacific Division, San Jose, CA
October 28-30
Oklahoma State, Kingston

ARRL NATIONAL CONVENTIONS
June 2-4, 1989—Dallas/Forth Worth, Texas
June 8-10, 1990—Kansas City, Missouri

PACIFIC DIVISION CONVENTION

October 14-16, 1988, San Jose, California

The Pacific Division Convention is sponsored by the Santa Clara Amateur Radio Club. Doors will be open for registration on Friday at noon, sessions will start at 6 PM; registration on Saturday at 8 AM; sessions at 9 AM Saturday and Sunday. Features will include walk-in VE exams. Admission will be $12 in advance and $15 at door. Talk-in is on 146.385/985 and 442.425/447.425 (W6UU). For more information contact Emmett Freitas, AE6Z, tel 408-243-8349.

OKLAHOMA STATE CONVENTION

October 28-30, 1988, Kingston

The Oklahoma State Convention is sponsored by the Texoma Hamarama Association. It will be held at the Texoma State Lodge, 5 miles east of Kingston, on US Hwy 70. The doors will be open from 8 AM-5 PM Saturday, and 8 AM-12 PM on Sunday. Features will include equipment dealers, flea market, technical forums, Wouff Hong Ceremony, women's programs, VE exams, auction and much more. Special rates are available at the Lodge by calling 405-564-2311, or you may wish to camp in the park area. For more information write to Texoma Hamarama Association, PO Box 610892, DFW Airport, TX 75261, or call Dave Cox, NB5N, 918-250-2285.

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.

Connecticut (Gales Ferry)—October 29. *Sponsor:* Tri-City ARC. *Time*: setup at 9 AM, auction starts at 10 AM (bring your equipment to be auctioned). *Place*: Gales Ferry Fire House, Rte 12 across from Dow Chemical. *Features*: refreshments, wheelchair accessible. *Talk-in*: 146.52. *Admission*: free. *Contact*: WA2RYV, tel 203-464-6555.

Connecticut (North Haven)—November 13. *Sponsor*: South Central Connecticut ARA. *Time*: sellers 7 AM, public 9 AM-3 PM. *Place*: North Haven Park and Recreation Center, 7 Linsley St. *Features*: VE exams, commercial exhibits, refreshments, wheelchair accessible. *Talk-in*: 146.01/61. *Admission*: $2. *Tables*: advance $12, door $15 (reservations for tables must be received with a check by Nov 2; no reservations by phone). *Contact*: for more information or reservations send SASE to South Central Connecticut ARA Flea market, PO Box 81, North Haven, CT 06473 or tel Brad Oestreicher, WA1TAS, 203-265-6478, 7-10 PM.

†**Florida (Pompano Beach)—November 5-6.** *Sponsor*: Broward ARC. *Time*: Saturday 9 AM-6 PM, Sunday 9 AM-4 PM. *Place*: I-95 and Copans Rd, West 70 Powerline Rd, approximately 1 mile, JR's Expo Center is on the northeast corner. *Features*: flea market, ICOM America, refreshments, handicap facilities. *Talk-in*: 146.31/91 and 444.825/449.825. *Admission*: advance $4, door $5.

†ARRL Hamfest

Contact: David DeBear, WA1RXB, 1870 NW 42 Terr C106, Lauderhill, FL 33313, tel (D) 305-941-2325, (N) 305-735-7908, or Jim Lorah, WB4KOB, 2407 Flamingo Ln, Fort Lauderdale, FL 33312, tel 305-584-7822.

†**Florida (West Palm Beach)—October 15-16.** *Sponsor*: Palm Beach Repeater Assn. *Time*: 9 AM-5 PM Saturday, 9 AM-3 PM Sunday. *Place*: take the West Palm Beach exit off the Florida Tpke or the Southern Blvd exit off I-95 and follow the "Fairgrounds" sign west. *Features*: flea market, exhibits, VE exams, packet radio demo and forum, free parking, full RV hookup at $10 a night. *Talk-in*: 147.765/165, 146.52. *Admission*: advance $4, door $5. *Contact*: for tickets send check and SASE to Palm Beach Repeater Assn, Hamfest, PO Box 461, Lake Worth, FL 33460, tel (D) 407-439-8514, (N) 407-982-0459.

†**Georgia (Augusta)—October 22-23.** *Sponsor*: Amateur Radio Club of Augusta. *Time*: Saturday 9 AM-5 PM, Sunday 9 AM-3 PM. *Place*: National Guard Armory, on Lake Ohmstead, Milledge Rd, 1 block north of the west end of Broad St. *Features*: dealers, flea market, forums, hospitality suite on Saturday night, VE exams. *Talk-in*: 146.34/94, 146.385/985, 144.51/145.11. *Admission*: advance $3, door $4. *Contact*: Jim Abercrombie, N4JA, PO Box 5943, Augusta, GA 30906, tel 404-790-7802.

†**Georgia (Rome)—October 2.** *Sponsor*: Coosa Valley ARC. *Place*: Rome Civic Center on Hwy 20 across from Shoney's. *Features*: camper parking (no hookups), refreshments, VE exams (begin at 8 AM). *Admission*: free. *Tables*: inside $6, outside spaces $2. *Contact*: James or Linda Sineath, 1124 New Rosedale Rd, Armuchee, GA 30105, tel 404-291-9767.

Indiana (Bedford)—October 9. *Sponsor*: Hoosier Hills Ham Club. *Time*: Saturday—gates open 10 AM for overnight camping and setup; Sunday—gates open for public at 6 AM. *Place*: Lawrence Co 4-H Fairgrounds, take US Hwy 50 4 miles southwest of Bedford, or ½ mile west of Jct US 50 and IN 37. *Features*: refreshments, free swap shop, Saturday night social 6:30 PM. *Talk-in*: 146.13/73. *Admission*: $5, children under 16 free. *Tables*: bring your own. *Contact*: Hoosier Hills Ham Club Inc, PO Box 891, Bedford, IN 47421.

†**Louisiana (West Monroe)—November 5.** *Sponsor*: Twin City Hams. *Time*: 9 AM-3 PM. *Features*: dealers, swap tables, forums. *Talk-in*: 146.52, 146.25/85 and 147.81/21. *Admission*: $1. *Contact*: Benson Scott, AE5V, c/o 107 Contempo, West Monroe, LA 71291-5311, tel (D) 318-323-3478, (N) 318-396-2424.

Massachusetts (Framingham)—October 23. *Sponsor*: Framingham ARA. *Time*: setup 8-10 AM, public 10 AM-2 PM. *Place*: Framingham Civic League Buildings, 214 Concord St, Rte 126; from Rte 128 go west on Rte 9, from Rte 495 go east on Rte 9, take 126 south toward downtown 2 miles after traffic light near Dunkin Donuts, the Civic Buildings are the 2nd and 3rd on the right. *Features*: refreshments, VE exams. *Talk-in*: 147.75/15. *Admission*: $2, Early admission before 10 AM *Tables*: $6 for 10 ft. *Contact*: for tables tel Jon 617-877-7166; for general information tel Dick 617-877-3340.

Michigan (Kalamazoo)—October 23. *Sponsor*: Southwest Michigan Amateur Radio Team and the Kalamazoo ARC. *Time*: sellers set up at 6 AM, public 8 AM. *Place*: Kalamazoo Central High School, 2431 N Drake Rd, take US 131 to M 43, east to Drake Rd, then north to the school. *Features*: free parking, forums, walk-in VE exams at 9 AM. *Talk-in*: 147.64/04 SMART repeater. *Admission*: advance $2, door $3. *Tables*: $6. *Contact*: send requests and payment with SASE before Oct 1 to Gary Hazelton, KB8PL, 67332 32nd St, Lawton, MI 49065 (make checks payable to Kalamazoo Hamfest).

†**Michigan (Shelby Township)—October 30.** *Sponsor*: Utica-Shelby Emergency Communications Assn. *Time*: 8 AM-2:30 PM. *Place*: Eisenhower High School on 25 Mile Rd, ½ mile west of Van Dyke. *Features*: VE exams, refreshments. *Talk-in*: 147.78/18. *Admission*: advance $2, door $3. *Contact*: Harold A. Henry, KE8LT, 53062 Tundra Dr,

Rochester, MI 48064, tel 313-651-3279.

†**Michigan (Southfield)—November 6.** *Sponsor*: Oak Park Swap and Shop. *Time*: 8 AM-4 PM. *Place*: Southfield Civic Center on Greenfield between 10 and 11 Mile Rds. *Features*: refreshments, free parking. *Talk-in*: 146.04/64, 223.26/224.86 and 146.52. *Admission*: $4. *Tables*: $10 reservations required, send check or money order to OPARC Swap and Shop, 303 S Vermont, Royal Oak, MI 48067. *Contact*: Larry Lacionski, WA2AJQ, 303 S Vermont, Royal Oak, MI 48067, tel (H) 313-398-7731, (B) 313-825-1684 (digital beeper).

†**Minnesota (Minneapolis)—October 29.** *Sponsor*: Twin City FM Club. *Time*: 7:30 AM-3 PM. *Place*: Hennepin Technical Institute, Brooklyn Park Campus, 9000 Brooklyn Blvd. *Features*: ARRL forum, packet radio demonstrations, VE exams (start 9 AM, registration cut-off Oct 22, send SASE and check for $4.55 to address below), guest speaker Roy Neal, K6DUE, former NBC science correspondent and on-camera personality on "The New World of Amateur Radio," indoor flea market, CW contest, free parking, new and used computers. *Talk-in*: 146.16/76. *Admission*: advance $4, door $5. *Contact*: Ron Schulz, NAØU, 6308 Peacedale Ave, Edina, MN 55424, tel 612-920-7473 for advanced hamfest tickets and information, send SASE to Hamfest Minnesota and Computer Expo, PO Box 5598, Hopkins, MN 55343, or tel Mike Sigelman, KØBUD at 612-542-8450.

Missouri (Grandview)—October 29. *Sponsor*: Southside ARC. *Time*: 8 AM-4 PM. *Place*: Grandview Junior High School. *Features*: swap tables, VE exams, refreshments, seminars. *Talk-in*: 147.72/12. *Admission*: $2 per ticket, 4/$5 advanced, 3/$5 door. *Tables*: swap tables $7 (includes 1 ticket). *Contact*: Southside ARC, PO Box 1142, Grandview, MO 64030, or tel Walt, NBØE, 816-763-9637.

New Jersey (Paramus)—October 9 (rain or shine). *Sponsor:* Bergen Co ARA. *Time:* 8 AM-4 PM. *Place:* Bergen Community College, 400 Paramus Rd. *Features:* VE exams (Novice through Extra Class from 7-10 AM). *Talk-in:* 146.19/79 and 146.52. *Admission*: buyers free, sellers $5 per space. *Contact:* for exam information tel Pete, K2MHP, 201-796-6622, for hamfest information tel Jim, K2ZO, 201-664-6725 or write 286 Ridgewood Blvd N, Westwood, NJ 07675.

†**New Jersey (Wall)—October 16.** *Sponsor*: Jersey Shore Amateur Radio Clubs. *Time*: 8 AM-3 PM. *Features*: VE exams, tailgating, Amateur Radio demonstrations. *Talk-in*: 145.485, 146.31/91, 144.51/145.11, 146.52. *Admission*: advance $4, door $5, children under 12 free. *Contact*: Al Jackson, NK2O, PO Box 957, Point Pleasant, NJ 08742, tel 201-922-8121.

†**New York (Syracuse)—October 15.** *Sponsor*: Radio Amateurs of Greater Syracuse. *Time*: 9 AM-5 PM. *Place*: Arts and Home Center at NY State Fairgrounds, 2 miles east of Thruway exit 39 on Rte 690. *Features*: tech talks, contests, entertainment, large indoor flea market, commercial vendors, tailgating area ($3 per car), free parking, VE exams (preregister by Oct 7, send SASE if you need 610 form), programs for nonhams. *Talk-in*: 146.31/91 and 147.90/30. *Admission*: $4 US or $4 CN (for VE/VOs only), children under 12 free. *Tables*: $6. *Contact*: Ed Swiatlowski, WA2URK, 315-487-3417 or Viv Douglas, WA2PUU, 315-469-0590 or write RAGS, PO Box 88, Liverpool, NY 13088.

†**New York (Queens)—October 9 (rain date October 16).** *Sponsor*: Hall of Science ARC. *Time*: setup at 7:30 AM, public 9 AM-3 PM. *Place*: NY Hall of Science parking lot, Flushing Meadow Park, 47-01-111 St. *Features*: films, ARRL information, HOSARC's Amateur Radio station exhibit, free parking, refreshments. *Talk-in*: 144.3, 223.6, 445.225. *Admission*: buyers $3, sellers $5 per space. *Contact*: Steve Greenbaum, WB2KDG, 718-898-5599 or Arnie Schittman, WB2YXB, (N) 718-343-0172.

North Carolina (Concord)—November 6. *Sponsor*: Cabarrus ARS. *Time*: dealers setup at 6 AM, public 9 AM. *Place*: National Guard Armory, Hwy 49 and Old Charlotte Rd. *Features*: VE exams (preregistration by Oct 21; send completed 610 form with a photocopy of present license and code credit certificate if applicable and a check or money order for $4.50 payable to Charlotte VEC, 227 Bennett Ln, Charlotte, NC 28213, bring original license and certificate to test for ID). *Talk-in*: 146.055/655. *Admission*: advance $3, door $4. *Tables*: $5 each (6 ft). *Contact*: Cabaruss ARS, PO Box 1290, Concord, NC 28025.

Ohio (Marion)—October 30. *Sponsor*: Marion ARC. *Time*: 8 AM-4 PM. *Place*: Marion Co Fairgrounds. *Features*: parking, refreshments. *Talk-in*: 146.52 or 147.90/30. *Admission*: advance $3, door $4. *Tables*: $5. *Contact*: Ed Margraff, KD8OC, 1989 Weiss Ave, Marion, OH 43302, tel 614-382-2608.

Oklahoma (Salt Plains Lake)—October 2. *Sponsor:* Salt Plains ARC. *Time:* 10 AM-5 PM. *Features:* swap. *Talk-in*: 147.90/30. *Admission:* free. *Contact:* Gary Gerber, KBØHH, tel 316-842-5079.

Pennsylvania (Sellersville)—October 30. *Sponsor*: RF Hill ARC. *Time*: sellers 6 AM, public 8 AM. *Place*: PA National Guard Armory, Rte 152. *Talk-in*: 144.71/145.31, 144.59/145.19, 146.16/76 and 146.52. *Admission*: $4. *Contact*: Bob Buonfiglio, KA3POV, 361 School House Rd, Souderton, PA 18964, tel (N) 215-723-1016.

South Carolina (Rock Hill)—October 16. *Sponsor*: York Co ARS. *Time*: 8 AM-4 PM. *Place*: Joslyn Park. *Features*: flea market, QLF CW Contest, refreshments. *Talk-in*: 146.43 or 147.63/03. *Admission*: advance $3, door $4. *Contact*: York Co ARS, PO Box 4141 CRS, Rock Hill, SC 29731.

†**Tennessee (Chattanooga)—October 29-30.** *Sponsor*: Chattanooga ARC. *Time*: Saturday 9 AM-5 PM, Sunday 9 AM-3 PM. *Place*: Chattanooga-Hamilton Co Convention and Trade Center in downtown, take Martin L. King Jr Blvd exit off Hwy 27. *Features*: exhibitors, flea market, forums, refreshments. *Talk-in*: 146.19/79, 223.18/224.78, 449.10/444.10. *Admission*: free. *Contact*: exhibitors contact Barbarra Gregory, WA4RMC, tel 615-892-8889; for flea market contact Terry Davis, KB4TZ, tel 615-886-6812.

†**Tennessee (Gray)—October 15.** *Sponsor*: Tri-Cities Hamfest. *Time*: 8 AM-5 PM. *Place*: take exit 57 south off I-81 onto I-181, get off Gray exit 42 and follow signs. *Features*: forums, CW contest, VE exams, women's crafts. *Talk-in*: 146.07/67, 146.19/79 and 146.37/97. *Admission*: no advance, at door $4. *Contact*: Wendell Messimer, K4ZHK, PO Box 3682, Johnson City, TN 37604, tel (D) 615-926-5755, (N) 615-928-4407.

Texas (El Paso)—October 22-23. *Sponsor*: El Paso ARC. *Place*: Club House at 2100 San Diego. *Features*: Milley's Radio. *Contact*: Clay Emert, K5TRW, 109 Paso Dale, El Paso, TX 79907, tel 915-859-5502, or Milly Wise, W5OVH, 8516 Mt Scott, El Paso, TX 79904, tel 915-751-4160.

†**Texas (Odessa)—November 5-6.** *Sponsor*: West Texas ARC. *Time*: setup Friday 4 PM-midnight, Saturday 8 AM-5 PM and Sunday 9 AM-3 PM. *Place*: Holiday Inn Centre, 5901 E Hwy 80 (hotel phone 915-362-2311), located on East Side just east of Loop 338 and old Hwy 80 overpass. *Features*: QCWA, ARRL forums, MARS, VE exams, packet, refreshments. *Talk-in*: 147.62/02, 146.10/70. *Admission*: advance $5, door $6. *Tables*: $7. *Contact*: Otis E. Brasfield, Jr, N5LEV, 3103 N Hancock, Odessa, TX 79762, tel 915-366-8364.

Exam Info

ARRL/VEC
225 Main St, Newington, CT 06111

PREPARING NOVICE EXAMS

To qualify for a Novice license, an applicant must pass two tests—a 5 WPM Morse code test (Element 1A), and a 30-question written exam (Element 2). Examiners who administer these tests under the VEC program usually get them from the VEC that coordinates the sessions where the tests will be given. But how are the two tests made up if they are to be administered under the two-examiner program outside of the VEC system? Here's how!

Code Exams Per Section 97.21 of the FCC's regulations, a telegraphy examination for the 5 WPM test must contain all letters of the alphabet, numerals 0-9, period, comma, question mark, plus prosigns $\overline{AR}$, $\overline{SK}$, $\overline{BT}$ and $\overline{DN}$. The code test can be generated using any kind of text that the examiners make up (but must not be of a familiar song or poem!). Although the ARRL/VEC uses QSO-format CW tests, there is no regulation requiring this; the two examiners in the Novice program have a free hand in designing the message of the code test.

Written Exams All Novice written exams (Element 2) must consist of at least 30 questions. All nine topical areas (subelements) must be represented on the exam. The percentages of questions that should be taken from each subelement are specified in Section 97.21(d). Regardless of whether the exam is to be administered under two examiners or under the VEC program, the FCC has interpreted the regulation that examiners preparing Novice class written tests should use questions that come from the VEC-approved pool.

The ARRL/VEC has available (SASE please) a list of Element-2 questions that are currently used among all VECs at coordinated sessions. The distractors and answers to the questions are not included on this list. (The questions with answers and distractors are published in *Tune in the World*.) The FCC states that the examiners are responsible for determining the correctness of the answers given by the applicant.

Also, the Educational Activities Branch (EAB) at ARRL HQ offers sample Novice class exams to amateurs holding General class or above licenses. When requesting the exams, please provide your call sign and license class (plus an SASE) so that EAB staff are certain that they are providing the materials to the right persons.

Within ten calendar days after the Novice applicant has passed both tests and is qualified for the ticket, send the Form 610, *signed* by the applicant and both examiners, to the FCC's mailing address that appears at the top of the application. The new Novice should receive the ticket within a few weeks. Good luck!—*Jim Clary, WB9IHH, Manager, ARRL/VEC*

Improved Anode Parasitic Suppression for Modern Amplifier Tubes

(continued from page 66)

Acknowledgments

Kudos to Dave, AK7M, and Dr Charles Bird, K6HTM, for helping me to make the article more understandable. Kudos also to Jim, WA6BJE; Greg, WD6CFJ; and Terry, N6UR, for amplifier testing and evaluating low-Q suppressors.

Notes

[1]Such networks may also be required in the grid (in a grounded-cathode amplifier) and/or screen leads (if the tube is a tetrode or pentode). This article concentrates on parasitic suppressors in the anode (plate) lead because most modern, high-power Amateur Radio amplifiers use triodes in a grounded-grid configuration.

[2]See the evidence with your own eyes in Zack Lau, "More Choke Info," Technical Correspondence, *QST*, Jun 1988, p 51.

[3]The earliest use of an anode parasitic suppressor that I've found is a transmitter (the 150B) built in the early 1930s by the Collins Radio Company. See Bill Orr, "ham radio techniques," *ham radio*, Dec 1987, pp 83-87.

[4]The voltage amplification factor (μ) of a triode is the ratio of the change in anode voltage divided by the change in grid-to-cathode voltage for a specified constant anode current. μ is not a fixed quantity because it varies with changes in anode current and voltage. μ is greatest at high anode voltages with low anode current. μ is lowest at low anode voltages and high anode current. Because of the variable nature of μ, manufacturers' specification sheets often give the *average* μ.

[5]It is possible to build an oscillator with only one resonant circuit; the Hartley and Colpitts oscillators are two examples of this. A vacuum-tube oscillator with resonant grid and plate circuits is known as a tuned-plate, tuned-grid (TPTG) oscillator.

[6]A common misconception about parasitic suppressors is that they work by soaking up parasitic oscillations *after they have started*. This is false logic. The presence of a parasitic oscillation in a suppressor-equipped circuit proves that the anti-parasitic battle has already been lost! *If a parasitic suppressor is effective, the parasitic never starts.*

[7]At resonance, the RF voltage developed across L and C in a tuned circuit is directly proportional to the Q of the tuned circuit; the Q of the tuned circuit depends on the Q of its L and C components. The basic formula for Q is Q = X ÷ R (where X is reactance and R is resistance, both in ohms). The position of reactance in this formula indicates that Q varies with frequency. Because of this, it's important to specify the frequency or range of frequencies at which a given Q is measured, expected or desired.

[8]Testing a parasitic-oscillation cure is best done with the amplifier cover in place and some—not all—of the cover screws installed. This allows rapid access should something start to pop. Amplifier stability under these conditions can be misleading, though: The amplifier may leap into parasitic oscillation as soon as you've installed the rest of the cabinet screws! According to David Newkirk, AK7M, this phenomenon could be related to VHF-tuned-cavity resonance of the box in which the amplifier is built. [Yes, that's one theory. It's also possible that changing the cover's grounding and/or proximity to amplifier components may shift the tuning and/or Q of the parasitic circuit. The article cited at note 2 provides photographic proof that component self-resonances can be shifted by this means.—*AK7M*]

APPENDIX 1
Notes on Constructing Low-Q Parasitic Suppressors

Basic Configuration of the Suppressor Network

LR parasitic suppressors are best made of nichrome conductors and paralleled metal-film resistors, although stainless-steel wire can be used in place of nichrome. For starters, try LR networks consisting of two 100-Ω, 2-W metal-film resistors in parallel, shunted by a coil made of three turns of no. 18 nichrome wire or ribbon about ½ inch long, with an inner diameter of 9/32 inch. (As mentioned in the text, a 7-mm or 9/32-inch drill bit works well as a winding form. If you use ribbon, increase the coil diameter to about 3/8 inch to compensate for the reduced inductance of the ribbon.) The inductance of such a coil is about 0.07 μH. In amplifiers with longer anode-circuit lead lengths, two or more of these suppressor assemblies can be connected in series for even lower Q.

Keep the paralleled inductor and metal-film resistors at least 3/32 inch away from each other to allow the resistors to cool. *Don't wind the inductor on top of the metal-film resistors* in the manner of traditional LR parasitic-suppression networks; their conductive film is close to their outer surfaces. Keep the axes of the inductor and resistors parallel to each other.

Special note on 3-500Z amplifiers: If possible, ensure that your anode parasitic-suppressor coils have no more inductance than about 0.07 μH. More inductance than this forces enough RF current through the paralleled 100-Ω network resistors to overheat them at 29.7 MHz. (At 10 meters, approximately 1.8 A of RF circulating current flows through the 4.7-pF plate-to-grid capacitance of a 3-500Z.)

Choosing a Conductor Size

When selecting materials for use in VHF-parasitic-resistant circuitry, keep in mind that bigger or wider conductors aren't necessarily better. (Decreasing a conductor's width increases its inductance [undesirable for parasitic-suppression purposes] and resistance. With nichrome ribbon, however, the net effect of decreasing width is a desirable *Q decrease*. Thus, use the narrowest nichrome ribbon [or smallest nichrome wire] you can without overloading the conductor at MF/HF.) Remember: If you can't find nichrome, you can use stainless steel, although nichrome is the better Q killer of the two.

Fabrication Tips

Nichrome and stainless-steel wire can be soldered with an ordinary soldering iron if flux containing zinc chloride is used. Place a small drop of the flux on the joint to be soldered, touch the soldering iron to the joint and solder as usual. (Zinc chloride flux can usually be purchased at hobby shops that sell model trains and airplanes.) One brand of zinc chloride flux I've seen, *stay-clean*™ (made by the J. W. Harris Co), comes packaged with *stay-bright*™ tin-silver solder, which is about five times stronger than ordinary tin-lead electronics solder. Welding-supply stores, and some hardware/plumbing stores, usually carry this and similar products. Warning: *Zinc chloride flux and its fumes are hazardous substances, as are solder fumes in general. Steam and smoke from zinc chloride flux are toxic. The liquid flux, which splatters during soldering, is hazardous. As is appropriate for all soldering activities, use zinc chloride flux only with adequate ventilation.*

Obtaining Material for Low-Q Parasitic Suppressors

Building good parasitic suppression into an amplifier requires very little nichrome wire and ribbon. I will send 1 foot of nichrome ribbon and 5 feet of no. 18 nichrome wire to any North American address via First Class Mail® for US $2 (stamps accepted) postpaid. For additional information and diagrams, add $1. For overseas airmail delivery, add $1. I will sell larger quantities via telephone order. This offer is good while supplies last. My address: Richard L. Measures, AG6K, 6455 La Cumbre Rd, Somis, CA 93066, tel 805-482-3034. [*QST* and ARRL in no way warrant this offer—*Ed.*]

APPENDIX 2
Notes on Amplifier-Tube Protection and Biasing

VHF oscillations in a high-power MF/HF amplifier can result in extremely high VHF-RF voltages and dc-supply currents because the oscillating amplifier tube(s) have no load at VHF. To protect your triode amplifier tube(s) against these potentially destructive effects, install a 10-Ω, 7- to 10-W, wirewound resistor in series with the positive HV lead.* The resistor acts as a high-voltage fuse should a full-blown parasitic oscillation occur. Use a higher-wattage resistor only if increased current demand requires it. The resistor is intended to burn out quickly during an anomaly and open the HV lead.

Current limiting is necessary to protect the amplifier tubes and associated components from the current pulse latent in charged high-voltage filter capacitors. Applied without limiting to the amplifier tube(s) during a parasitic oscillation, this current pulse can produce magnetic fields strong enough to disturb the grid-to-cathode alignment in the tube(s), resulting in fatal grid-to-cathode short circuits. *Caution:* Do not install the current-limiting resistor close to other components or conductors—the resistor semi-explodes during a full-blown parasitic oscillation or a HV-circuit fault. Leave the resistor in place even after you've cured the parasitic—it's good tube insurance should a tube change cause the parasitic to return.

Check the Bias Components

A parasitic oscillation and its accompanying anode-supply current pulse may destroy components in the amplifier bias supply. In particular, check the amplifier's cathode-bias Zener diode, if there is one. If the diode is shorted, I suggest replacing it with a perfboard-mounted string of RF-bypassed, 1-A silicon rectifiers (such as 1N4003s) with their cathodes pointing in the direction *opposite* that of the Zener-diode cathode. (The replacement diodes operate in the forward-conducting mode; a Zener operates in the reverse-biased, avalanche-breakdown mode.) Use as many diodes in series as necessary to achieve the zero-signal current appropriate for your amplifier tube(s)—160 to 200 mA for a pair of 3-500Zs.

*HV current limiting in a tetrode or pentode amplifier must be done in such a way that plate *and* screen voltages are removed from the tube simultaneously when the current-limiting resistor blows. Operating a screen-grid tube with screen but no plate voltage can destroy the tube quickly.

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

W1FWT, Ralph G. MacGuire, Merrimack, NH
W1JB, Basil F. Cutting, Suncook, NH
KA1OQM, Francis A. Spellman, Augusta, ME
W1QXR, John J. Hennessey, Bangor, ME
W1RE, Paul S. LeVan, Waterford, CT
K1ZAU, Dana L. Hodgkins, Brewer, ME
K2CWQ, Sidney M. Heller, West Palm Beach, FL
W2FBV, Richard R. Kleinert, Jr, Hampton Bays, NY
W2GXU, Andrew T. Henderson, Glens Falls, NY
N2GY, Charles G. Bowen, Sr, Elm, NJ
K2MMC, Art Schroeder, Jr, Summit, NJ
W2NMP, Robert L. Peckham, Wainscott, NY
W2QOD, Shepard E. Parker, East Meadow, NY
WA2UMM, Warren Herziger, Newburgh, NY
K2VNV, Thomas K. Murray, Jr, Poughkeepsie, NY
WB2WMB, Frederick J. Yannes, Fulton, NY
K2ZKE, Harry Horowitz, Forest Hills, NY
KA3AQG, Albert R. Karz, Paupack, PA
W3BKO, Everett L. Dillard, Titusville, FL
W3FHX, Henry E. Byrd, Jr, Haverford, PA
WB3IMR, F. Gene Shellenberger, King of Prussia, PA
KA3IQJ, John F. Monath, Jr, Havre de Grace, MD
W3KRN, Glenn L. Scillian, Silver Spring, MD
KA3MKC, Tommy J. Noeman, Oxon Hill, MD
W3NWP, Leo R. Luciani, Frackville, PA
K3TSO, Larry G. Hildenbrandt, Easton, PA
W4AGB, Eleree H. Atkinson, Fort Walton Beach, FL
WB4AID, Alfred R. Suhr, Lake Worth, FL
W4BH, Hiram R. Martin, Boca Raton, FL
KA4BRO, Walker M. Taylor, Germantown, TN
WB4BSD, Emary F. Bryant, Sr, Cleveland, TN
K4DNY, L. O. Van Blaricom, Clemson, SC
W4EGM, R. N. Smith, Pinellas Park, FL
W4EPI, James W. Diggs, Etowah, NC
W4FII, Allen H. Johnston, Myrtle Beach, SC
*WB4GIO, Kay W. Klages, Orlando, FL
W4IVT, Francis W. Coke, Germantown, TN
KB4JUH, Lowell W. McCrary, Greenville, SC
KB4UQ, Thomas I. Hicks, Maryville, TN
W4VT, John C. Flippin, Memphis, TN
KB4ZJH, Max Lear, Brooksville, FL
W5AS, Howard W. Baker, Oklahoma City, OK
K5BVO, James W. Fraser, Ocean Springs, MS
*N5EBJ, Richard T. Carpentier, El Paso, TX
N5FPM, Charles B. Richardson, Sr, Houston, TX
K5ITC, Charles H. Debenport, Odessa, TX
N5LIW, Marvin Art LaBounty, Albuquerque, NM
NX5M, Leon M. Matheny, San Antonio, TX
W5OQT, Sue Soard, Oklahoma City, OK
WA5SVB, Harry A. Grahs, Amarillo, TX
W5SYH, Frank J. Salamon, Rogers, AR
W5TXK, Margaret Anne Brown, Jackson, MS
K5WFZ, Wilson R. Brogdon, Sour Lake, TX
W6ADL, Norman C. McVea, Paradise, CA
N6BCN, Frank D. Spicer, San Anselmo, CA
WA6BJS, Herbert R. Lehmann, San Carlos, CA
W6CJC, Elwyn G. Lambert, Berkeley, CA
N6CNF, Vincent Moore, Redding, CA
*KA6DZV, Allen B. Foster, Bellingham, WA
W6EBC, Charles T. Corey, San Luis Obispo, CA
W6ECY, Desmond H. Stovall, Los Osos, CA
W6ERT, Albert E. Goodyear, San Pedro, CA
*WA6HQW, Fredric C. Smith, Santa Clara, CA
K6JSS, Harry E. Blomquist, Saratoga, CA
WB6KTM, Lee F. Jamison, Lompoc, CA
K6LJ, Stanley E. Hyde, Burbank, CA
WA6LOF, Bert C. Quigley, Napa, CA
N6RHK, Robert L. Lawler, Yucaipa, CA
K6RJ, Arthur W. Gelbke, San Marino, CA
WA6VPW, Irene M. Prockish, Fresno, CA
W6VWK, James G. Iversen, Clearlake, CA
WB6WFG, Thomas Dollard, Jr, Sacramento, CA
KA6WPL, Roger M. Alison, Newport Beach, CA
KB6XO, Alva E. Squires, Napa, CA
*WA7DUG, Fran Galland, Las Vegas, NV
W7EFO, D. Vernon Harrah, Cottonwood, CA
N7FKA, John E. Payne, Spokane, WA
NI7F, John D. Corbett, Phoenix, AZ
W7GMY, Thomas E. Martin, Coos Bay, OR
W7IKW, Warren K. Scott, Portland, OR
KA7MWS, Eugene L. Flint, Somers, MT
K7PFQ, Willis G. Alford, Clancy, MT
*N7PM, Samuel W. Milligan, Wichita, KS
WA7RMJ, Charles W. Brannon, Jr, Casper, WY
W8BBG, Lewis H. Baker, Englewood, OH
WD8BJL, Ronald W. Ruddle, Rocky River, OH
W8CJK, Raymond Glaug, Beavercreek, OH
K8EGP, J. Carl Parker, Sr, Monroe, MI
K8IMX, Clarence W. McDowell, Ashtabula, OH
W8KI, Ellis B. Merry, Grosse Pointe Farms, MI
KC8KW, James O. Eads, Goose Creek, SC
KD8MP, O. Martin Holland, Kettering, OH
*WA8OEN, Theodore S. Warren, East Detroit, MI
K8OUB, Marvin K. Loader, Newcomerstown, OH
K8RZJ, James S. Johnson, Columbus, OH
W8SRF, George G. Kish, Hinckley, OH
W9AX, Rex N. Eyler, Juda, WI
K9EJW, Mike Mendes, Oak Lawn, IL
N9EOH, Robert M. Niewold, Sycamore, IL
K9MOH, Milton J. Leitzke, Oconto Falls, WI
W9MXD, Alvin C. Demmin, Bartonville, IL
K9OGG, Martin Larsen, Janesville, WI
W9VXS, Kenneth L. Kaye, Chicago, IL
KD9XE, James C. Thomson, Eau Claire, WI
KAØDMB, Walter J. Brown, Jr, Omaha, NE
WØOM, Clarence A. Brockert, Dubuque, IA
NQØR, Bernard V. Borst, Wichita, KS
KØSI, W. B. Stewart, Columbia, MO
ZS5IV, Clive W. Barnes, Durban, South Africa

*Life Member, ARRL

Notes: 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*.

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. Canadian reports should be sent to the CRRL HQ address on page 9.

Many hams have remembered a Silent Key with a memorial contribution to the ARRL Foundation. Should you wish to make a contribution in a friend or relative's memory, you might designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund or for the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation, Inc, 225 Main St, Newington, CT 06111.

50 Years Ago

October, 1938

☐ Communications Manager F. E. Handy describes the elaborate setup at the brand-new W1AW memorial to our late president, Hiram Percy Maxim. He traces the history of Hq. stations from the little 1924 rig in a back office on Main Street in Hartford.

☐ Amateur radio's growth and the resultant QRM requires more than the old t.r.f.'s we've been using. George Grammer shows us a low-cost, single-signal receiver with double regeneration for i.f. selectivity and image reduction.

☐ Amateurs played an important part in the recent record-breaking, round-the-world flight of Howard Hughes. W6CUH, W4DHZ and W2UK were principals in an extensive ground network that kept in constant touch with the aircraft and furnished up-to-the-minute weather reports from around the globe.

☐ "Television for Thin Pocketbooks" could be the title for J. B. Sherman's treatise on how to build a TV receiver with standard cathode-ray tubes available to amateurs.

☐ Most of us can't afford the vacuum condenser in the plate circuit of W6EI's six-band, one-kilowatt rig, but there are some good pointers to be picked up for use in other designs.

☐ W9BOE, a prof at Kansas State College, explains the formation and propagation effects of reflecting ionized layers, with resulting skip distance, seasonal changes and the multiple layers.

☐ Four channels on 56 Mc. are used to manipulate rudder and elevator controls on a 14-foot wingspan model airplane, a procedure which allows instantaneous reversal, says author W1CBD.

☐ W8QBW comes up with an economy stunt for the low-power ham, using flashlight bulbs (of several varieties) in series with power and antenna leads in place of expensive meters. Tune so the antenna bulb(s) burn brightest and the plate bulb the dimmest, and you're in!

☐ Although popular, 6L6 tubes as Class-B driver produce considerable feedback distortion, so W6ABF and W6AAR advise us to switch to the newer low-mu tubes such as 6A5Gs; their push-pull parallel output circuit does require pretesting to obtain closely-matched tubes.

☐ W1LJI's exciter design includes an all-push-pull audio speech amplifier and some 25 watts of r.f. output, with a single bandswitch and only one tuning control for the several stages.

☐ The Editor says that while amateur radio is the greatest avocation ever, with both personal rewards and public service accomplishments, we should not get so wrapped up in DX, traffic, or whatever, that it affects health and/or home relationships. Says one point in The Amateur's Code: *The amateur is balanced.*

25 Years Ago

October, 1963

☐ In the continuing program to improve our emergency-communication training and capabilities, the Amateur Radio Public Service Corps has now been established, combining the Amateur Radio Emergency Corps and the National Traffic System, thus marrying the local-area and long-distance services.

☐ W9YRV and WA9DNF have designed a sideband rig for six meters, but usable at any frequency are their circuit features: beam-deflection mixing and cascode output coupling, offering a high degree of stability in balance.

☐ In another example of teamwork, K2CU and W2OCM produced a field-strength meter which works on the magnetic field rather than the conventional electric. Compactness of construction is a particular advantage.

☐ After three years of working out of garages and home workshops, Project Oscar has found a home in a two-story building on the campus of Foothill College in Los Altos, California.

☐ W1ICP updates his popular "Novice gallon" design of a year ago, with minor modifications and some hints on remedies for buffer self-oscillation and final-stage neutralization problems a few builders experienced.

☐ Grounded verticals are great space-savers, but often hard to feed. WØRUG takes us from the simple shunt feed through gamma and omega matches.

☐ Sooner or later there will be another international radio conference to divide up the spectrum between government, commercial and yes, even amateur radio. WØDCA, a 15-year veteran of such international meetings, lays out the problems and a solid program to follow to ensure maximum success in protecting our bands.

☐ QSLing is really an art, with many facets, but thanks to KZ5SW we learn the ins and outs to ensure a greater percentage return.

☐ W3GRF took top c.w. honors in the 1963 DX competition, with K5MDX leading the voice list. —*W1RW*

Results, 1988 ARRL International DX Contest

Everything was up: participation, propagation, scores and enthusiasm.

By Billy Lunt, KR1R, Contest Manager, ARRL and Mark Gamble, N1FOZ, Assistant Contest Manager, ARRL

All bands sprang to life during the weekends of Feb 20-21 and Mar 5-6, providing vast amounts of activity for this year's ARRL International DX Contest. The Contest Branch received logs from 119 different DXCC countries and virtually every US state and Canadian province. For those who were participating, it was possible to achieve DXCC in a single 48-hour period. Propagation was a primary factor in generating the excitement and enthusiasm which evolved from this year's contest. Band openings were lengthy and extensive. It seemed like the good ol' days when twenty never closed! Fifteen was hopping and even ten meters provided good QSO and multiplier totals. The top Caribbean entries monopolized on the ten-meter band openings, especially during the phone weekend. PJ2FR (N6KT op) knocked out 3377 QSOs on ten meters alone! All bands seemed to be overflowing with activity. It was hard to decide which band you should be on at any given time. QSOs were plentiful everywhere. Overall W/VE single ops averaged 335 QSOs on CW and 275 QSOs on phone per entry. The average QSOs per operator is impressive in itself, but better still are the QSO totals of the W/VE champions, KM1H (KQ2M op) and K3TUP (K3LR op). Their massive efforts secured 2515 QSOs and 2177 QSOs respectively. By no means did the DX single ops let their side of the competition down. They generated an average of 296 QSOs on CW and 526 on phone. P40GD (W2GD op) and PJ2FR (N6KT op), the DX single-op leaders, cranked out 6001 and 9205 QSOs respectively. A glance at this year's standings shows a substantial increase over last year's. Just think, this is only the beginning of the new sunspot cycle!

Great band conditions were reported from nearly all areas of the globe. "I couldn't believe I heard a ZL on 160 meters," stated Art, N2KA. Tom, VU2TJW, was "pleased to hear 21 MHz open to W/VE!" "The sunspots are good enough for milliwatting again," exclaimed Chris, G4BUE. "Fifteen meters to Japan sounded as good as 15 meters to Missouri from my Georgia QTH," said Bill, KM9P. "I broke the loudest pileup ever on 160 for 9Q5NW," contends WA4SVO. CT1BOH claims, "There was super propagation!" "This year's contest was a great one! I doubled my score from last year," remarks Julio, WD4JNS. These are just a few of the many sentiments that summed up the feelings of this year's contenders.

A total of 3394 logs were received for the 1988 contest. This marks yet another substantial increase in HF contest participation, marking a gain of 612 log entries over last year's DX contest. Logs received from DX stations totaled 873 CW and 575 phone; as for the W/VEs, there were 810 CW and 904 phone. A special thanks to those 232 ops who submitted checklogs.

W/VE Highlights

It was an East Coast battle for the top single-op positions on both CW and phone. The winner of the CW single-op plaque was

Affiliated Club Program

Unlimited Category	*Score*	*Entries*	*CW Winner*	*Phone Winner*
Yankee Clipper Contest Club	78,341,070	105	KM1H	KC1F
Frankford Radio Club	75,472,197	105	N2LT	N3OO
Northern California DX Club	27,767,298	134	VE2AOS/W6	K6HNZ
Southern California DX Club	4,555,848	67	W6BA	K6EID
Medium Category				
Potomac Valley Radio Club	30,374,367	45	K3ZO	KE9A
Mad River Radio Club	18,336,965	24	K3TUP	K3TUP
North Texas Contest Club	13,914,102	25	N5RZ	N5RZ
Texas DX Society	6,896,679	5	W5ASP	K5DX
Dixie DXers	6,150,519	15	WX4G	WX4G
Minnesota Wireless Assn	4,890,240	4	—	—
Willamette Valley DX Club	4,636,659	11	K5MM/7	AI7B
Central Virginia Contest Club	4,608,285	6	WU4G	W4DR
Western Washington DX Club	4,494,549	33	N7TT	N7TT
San Diego DX Club	3,911,784	11	W6BZE	N6AW
Murphy's Marauders	3,789,531	20	KG1D	KG1D
Mississippi Valley DX/Contest Club	3,227,070	5	NIØG	K4VX/Ø
Eastern Iowa DX Assn	3,145,068	30	NØSM	WØWP
Rochester (NY) DX Assn	2,291,685	13	W2TZ	W2TZ
Society of Midwest Contesters	2,269,299	15	K9CAN	K9CAN
Western New York DX Assn	1,891,311	11	KA2AJT	KA2AJT
Salt City DX Assn	1,726,956	6	K2KIR	WA2UUK
Kansas City DX Club	1,361,847	10	WØJLC	WAØTKJ
South Jersey Radio Assn	1,297,233	27	WA2VYA	W2PAU
Southeastern DX Club	1,277,517	14	W4DXI	W4DXI
Grand Mesa Contesters	1,158,990	11	NØZA	NØZA
Northern California Contest Club	1,084,035	8	N6TU	NC7K
Albany ARA	1,059,342	7	K2VV	WB2HIH
Redwood Empire DX Assn	757,989	16	K6ZUR	N6OJ
Central California DX Club	695,250	12	K6DT	K6DT
Southern California Contest Club	607,374	6	N6AA	N6AA
Long Island DX Assn	249,159	6	K2YGM	K2MFY
Glouchester Co ARC	205,107	3	K2JF	K2JF
Tyler ARC	116,919	6	—	KD5GD
West Park Radiops	71,430	7	W8IDM	W8IMF
Clark Co (IN) ARC	31,842	5	WB9NQQ	N4DBJ
Local Category				
Overlook Mountain ARC	9,594,462	8	K5NA	KY2J
Long Island Contest Club	5,129,865	4	KD2TT	—
Northern Ohio DX Assn	2,774,016	4	N8BC	N8BC
Hoosier Contest Club	1,764,117	4	W9RE	KBØC
Boiled Owls of New York	1,696,683	3	K2LE/1	—
Dauberville DX Assn	1,694,625	9	—	KQ3V
Western Pennsylvania DX Assn	968,679	8	KX2A	K3MD
River City Contesters	844,209	4	KV6H	KV6H
Grumman ARC	808,974	4	WA2LQO	WA2LQO
Central Arizona DX Assn	697,488	4	KC7V	KC7V
Carolina DX Assn	666,534	5	N4IR	N4UH
Utah Contest Club	554,652	4	W7HS	WE7B
Fox Cities ARC	424,911	3	N9ER	W9OP
Columbus (OH) ARA	402,501	5	W8ZCQ	W8CZQ
Fox River Radio League	308,952	7	NJ9C	WD9GIG
Metrocrest ARS	257,232	4	W5MW	N5IET
Alamo DX Amigos	217,107	7	N5HB	K5DB
Northern Illinois DX Assn	214,278	4	K9KA	W9CH
Madison DX Club	37,500	3	W9WAQ	N9BUS
Arrowhead Amateur Club	24,465	3	WØRXL	N9DMG
Great South Bay ARC	23,361	3	—	KA2RGI
Lake Success Radio Club	13,629	6	WA2MAV	N2DSL

Top Ten—W/VE CW

Call	Score	160	80	40	20	15	10
KM1H (KQ2M,op)	2,799,195	75/45	361/65	578/72	781/79	686/81	34/29
KC1F	2,541,720	50/34	256/59	589/81	859/79	563/75	43/31
K1TO	2,476,803	51/36	329/59	440/76	981/79	583/78	23/15
K3TUP (K5ZD,op)	2,338,098	34/30	212/66	491/80	742/80	659/78	39/24
K1EA	2,255,478	24/21	354/55	488/66	771/70	738/81	27/20
N2LT	2,132,688	31/25	205/53	604/74	764/70	634/76	27/16
K3ZO	2,120,520	23/23	319/65	463/65	756/75	568/75	26/25
K1BW	2,054,517	44/31	295/60	389/71	687/68	615/76	39/25
K3OO	1,915,842	33/27	270/63	434/67	634/65	737/67	35/19
N3AD	1,802,832	33/25	289/57	562/64	726/68	478/57	28/13

Top Ten—W/VE Phone

Call	Score	160	80	40	20	15	10
K3TUP (K3LR,op)	2,818,044	35/24	133/54	124/57	892/119	1162/100	75/34
KC1F	2,631,585	46/34	188/69	125/57	1198/116	642/85	56/28
WX4G	2,142,546	45/30	93/51	172/48	677/105	865/94	94/39
K3OO	2,029,200	44/29	115/51	106/49	678/101	894/92	63/34
VO1MP	1,997,088	18/17	149/62	210/61	1479/90	405/54	11/9
K1DG	1,966,965	41/31	134/61	117/62	745/108	613/95	53/28
W2RQ	1,830,132	0/0	138/58	127/52	930/119	496/85	62/34
KE9A	1,595,751	35/24	103/51	79/44	725/105	608/79	57/28
N2LT	1,576,845	33/24	86/48	119/54	611/102	663/84	57/23
K1IU	1,474,704	41/31	172/51	408/64	442/59	497/74	36/29

Top Ten—DX CW

Call	Score	160	80	40	20	15	10
P40GD (W2GD,op)	8,031,005	377/51	744/57	901/57	1215/57	1170/57	1594/96
NP4A (K7JA,op)	5,662,302	424/52	661/55	1083/57	1090/57	1185/57	1208/56
8P9EK (K4TKM,op)	3,772,062	128/30	432/53	943/56	1013/57	658/55	935/55
VP2MDC (K1TN,op)	3,168,756	52/18	220/47	438/48	991/56	999/54	1127/53
KH6XX (KH6ND,op)	2,671,200	190/41	344/50	713/55	587/54	769/56	365/44
HD8D (N6EK,op)	2,089,860	0/0	98/29	601/52	574/52	755/56	827/55
F6BEE	1,667,742	94/24	308/45	515/47	649/55	721/52	39/16
OK1RI	1,497,222	77/20	262/45	632/52	745/57	522/49	0/0
NP4Z	1,480,290	0/0	246/44	275/47	395/48	559/56	539/50
OA4SS	1,369,980	0/0	139/37	238/43	322/47	680/57	556/52

Top Ten—DX Phone

Call	Score	160	80	40	20	15	10
PJ2FR (N6KT,op)	9,030,105	227/47	523/54	713/56	2502/57	1863/57	3377/56
P40V (AI6V,op)	7,274,946	269/45	512/54	654/53	1875/58	1423/55	2798/57
FY5YE (OH0XX,op)	5,913,756	164/42	315/52	251/43	1605/58	2819/56	1288/55
VP2MBA	5,522,139	159/39	303/50	538/52	1560/56	1847/57	1550/54
KH6XX (KH6ND,op)	4,646,235	159/49	440/57	986/55	1161/58	1521/58	588/42
ZP5JCY	4,157,727	2/2	121/40	380/48	1996/59	1164/56	1688/54
WR6R/KH6	3,329,460	79/29	566/53	672/56	1141/54	1521/55	209/18
J52US (K8MN,op)	3,011,295	7/5	327/46	345/45	1218/55	1517/51	753/39
HD8D (N6EK,op)	2,997,540	0/0	218/46	252/37	729/57	1597/56	1169/56
KH6RS	2,898,960	62/24	447/50	440/49	1389/55	1217/54	205/25

Top W/VE Single-Band Scores—CW

160		20	
K1ZM	21,960	K2VV	483,276
N4IN	15,741	K1RU	452,076
K4TEA	9,768	N2AA	410,685
N4SU	9,648	K2TW	277,200
W0ZV	8,178	NM2L	274,125
WB8JBM (KW8N,op)	5,775	VO1QU	270,354
W1NG	5,460	N8CXX (K8JM,op)	257,805
WB3AVN	4,092	N4ZC (WA8MAZ,op)	253,170
W4OO	3,192	WD8LLD	232,815
W2FCR	2,550	W6QHS	204,072
80		**15**	
W6RJ	70,584	K1RM	265,236
K1IK	51,840	N4ZZ	212,640
K8HVT/1	44,388	W5VX	202,704
W4HBK	27,189	K6LL/7	181,920
AA4NC	26,822	WB4TDH	173,145
AA7A	24,804	N4VZ	170,813
W9WAQ	24,360	VE6CB/3	170,100
N6AW	15,876	KA5W	162,960
W2FR	15,606	K5MK	161,238
WB5ZKR	14,664	K6PU	158,670
40		**10**	
K2EK	317,376	N4BP	24,165
K1XA	242,802	K5UR	23,580
K8PO	214,110	N4EJV	16,992
K5RR (WD5K,op)	162,000	W4VQ	6,528
KS1L	153,090	W9GIL	5,376
N6ADI	134,748	W5BOS	5,247
KB0G	115,911	K1EFI	4,524
K8XR	113,295	VE1BNN	4,437
K9KA	95,202	K6SIK	4,368
K9AY	66,816	VE2AEJ/3	4,284

Top W/VE Single-Band Scores—Phone

160		20	
WA4SVO	17,658	KS1L	566,547
WB3GCG	8,316	K1UO	549,582
KF4HK	8,160	VO1QU	416,700
K4TEA	6,954	K1NG (KD2SX,op)	385,104
W2FCR	5,100	W7EJ	335,664
WB3AVN	4,998	VE1BDK	290,418
K3UA	3,240	KK9A	286,848
N2KA	3,219	W7WA (K7RI,op)	273,600
K8CFU	2,484	W6QHS	262,680
N6LL (WA6CDR,op)	1,176	W8TWA	224,100
80		**15**	
N2NT	78,210	K4XS (WC4E,op)	561,600
KW8N	72,420	K5KT	405,132
W6RJ	51,333	WB8JBM (N8DCJ,op)	354,594
KU8E	35,190	N4ZZ	341,802
WB2ULI	32,436	VE3XN	305,316
WA4YBV	28,620	KM6B	294,903
K8CCV	23,010	W2IIJ/6	241,488
N3AHF	21,870	W2HPF	238,992
KE9U	14,820	NO4J	234,522
K8OQL	13,158	KA5W	217,854
40		**10**	
K6NA	124,806	K5UR	77,175
K8XR	58,539	N4EJW (N4EJV,op)	66,096
K8PO	56,160	K9MK/5	34,626
K4RIG	33,540	N4VZ	23,940
W9CH	31,482	VE1BNN	22,605
KC7KU	26,970	W5EW	20,904
W4OWY	20,790	KR9G	17,901
KD5IA	19,812	K1EFI	15,870
AD8C	13,608	KQ1V	14,628
W5PWG	13,254	K2OLG	14,238

once again Bob, KQ2M, operating from NH-based KM1H. Bob's 2.8-meg points outgunned Stew's (KC1F) score by over 200k. The two NH big guns were not alone. K1TO was blowing some serious smoke from CT. Dan scored 2.4 meg for the third place spot.

Tim, K3LR, guest operating at K3TUP, scored over 2.8 meg to secure first-place phone. Stew, KC1F, put in yet another strong second place effort. His final score was 2.5 meg points. Bob, WX4G, secured third place with an impressive 2.1 meg score.

Once again, for the fourth year in a row, Gus, VO1MP, out-maneuvered all others on low power (150 W or less) CW for the win. Fred, W2TZ, more than doubled his last year's score of 371k, finishing second with 703k. Mark, K0EJ, put in a respectable third place effort of 579k points.

Fred, W2TZ, didn't give it a rest; he returned to win low-power phone with 563k. Ron, K8NZ, scored 477k to finish second, followed by Richard, KA2AJT.

CW QRPer Joe, W8VSK, outdistanced the second-place finisher, Jeff, N8II, by more than 60k for the win. Their final scores were 226k and 161k respectively. Chuck, N6OJ, won the QRP phone plaque with a score of 135k. WA0VBW put forth his best foot and placed second with 117k.

In the single-band 160-meter phone category there were 13 entrants. WA4SVO more than doubled the second-place phone finisher's score, with 17k. Jeff, K1ZM, reclaimed the 160 CW plaque again with 21k points. The 80-meter W/VE phone crown went to Andy, N2NT, scoring 78k. Bob, W6RJ was the 80-meter CW champion this year, outperforming the competition by over 18k. Glenn, K6NA, won the 40-meter single-band phone plaque with a score of 124k. The 40-meter CW winner was Bill, K2EK. Lou, KS1L, topped all the others on 20 meters with a score of 566k. The 20-meter brass-pounding champ was John, K2VV, with over 483k. Jeff, WC4E, operating from K4XS, won the 15-meter phone category with 561k. With over 265k points, K1RM won the 15-meter CW category. Rick, K5UR, led the way on 10 phone with over 77k . The CW 10-meter champ was Bob, N4BP, with 24k points.

There was some rigid competition in the W/VE multi-single category. During the CW contest, the struggle for top spot was between K3WW and KY2J. The K3WW bunch won with a score of over 1.9 meg outdistancing KY2J and crew by over 180k. The phone multi-single category proved to be a EPA brawl between W3BGN and N3RS. W3BGN and crew rose above and won with well over 2.4 meg. In the multi-two CW category, N3RS gave no ground. They took the K2TR crew on and won with 3.6 meg. The multi-two phone contest was a different story for K2TR, however. Fred and the boys laid down the law with a score of over 4.1 meg. W3LPL left no survivors in both the CW and phone contests. Their multi-unlimited efforts just

Top W/VE Multioperator Scores—CW

Single Transmitter

Call	Score	160	80	40	20	15	10
K3WW	1,911,996	45/36	194/64	508/86	621/70	449/68	25/22
KY2J	1,700,244	46/36	152/58	374/75	595/75	423/66	48/36
W3XU	1,644,300	0/0	162/50	426/66	728/72	543/77	31/25
KM1C	1,637,685	31/30	249/58	435/73	611/67	372/62	30/25
WM5G	1,570,668	20/17	86/47	589/79	374/71	476/76	61/36

Two Transmitter

N3RS	3,692,808	48/39	260/69	700/97	1083/94	697/88	68/44
K2TR	3,318,912	74/47	149/55	488/71	1270/91	846/84	54/36
K8AZ	2,939,625	30/26	242/64	411/80	1140/88	737/83	53/34
KY1H	2,824,620	32/26	218/58	580/80	1111/90	643/72	46/32
N6RO	2,788,560	40/14	261/54	667/83	877/93	608/82	129/34

Unlimited

W3LPL	6,017,760	117/55	641/77	1090/101	1196/101	1018/91	117/55
K1ST	3,777,018	54/40	226/65	870/94	1257/90	640/85	54/32
AA1K	2,703,477	58/42	258/56	579/83	836/81	660/80	38/29
K1AR	2,509,050	49/35	220/61	511/91	832/87	494/84	44/31
N6ND	2,491,983	55/21	264/58	699/86	571/86	585/74	127/36

Top W/VE Multioperator Scores—Phone

Single Transmitter

Call	Score	160	80	40	20	15	10
W3BGN	2,481,717	56/36	151/64	180/70	868/113	679/92	69/38
N3RS	2,241,594	39/30	111/55	211/69	573/106	802/107	83/44
N5AU	1,881,810	34/25	75/51	220/66	256/94	751/102	209/68
N2FB	1,722,513	38/27	148/62	149/59	604/94	745/85	61/31
WB8K	1,669,305	26/20	73/46	149/59	604/94	745/85	61/31

Two Transmitter

K2TR	4,181,706	89/52	303/87	179/79	1428/127	706/110	94/43
N6RO	3,954,846	12/9	141/54	601/60	885/122	1234/104	374/57
NB1H	3,080,784	42/32	90/56	136/67	1626/136	456/94	72/39
K8CC	2,760,000	37/23	126/65	152/59	814/108	1074/105	97/40
N2MG	2,720,400	30/21	210/72	126/55	1237/122	586/94	78/36

Unlimited

W3LPL	6,568,521	106/56	397/91	315/84	1273/135	1525/126	273/71
NR5M	4,841,751	58/36	194/71	391/72	886/113	1363/118	395/81
K5NA	3,733,047	77/45	240/75	171/68	1413/128	699/102	111/41
WM5G	3,644,775	47/30	203/85	327/78	745/120	1003/112	180/60
K1AR	3,369,900	43/36	157/69	185/78	1097/133	840/111	68/43

Top DX Multioperator Scores—CW

Single Transmitter

Call	Score	160	80	40	20	15	10
ZF2KE	5,851,110	413/53	809/57	984/57	1259/57	1618/58	739/53
PJ9J	5,521,473	389/51	640/56	982/57	972/57	1167/56	1377/56
J34A	3,730,647	198/42	560/55	824/54	812/55	878/54	701/53
OH5BA/CT3	2,772,840	172/33	467/51	721/54	925/57	822/53	206/32
XE2EBE	2,616,090	206/44	536/54	556/51	798/53	546/50	365/38

Two Transmitter

JA1YXP	626,982	5/2	147/28	212/36	504/51	391/49	0/0
JA1YFG	532,857	0/0	155/35	187/32	412/52	291/47	6/3
JE3ZFS	477,630	4/2	104/12	396/43	339/47	254/40	1/1

Unlimited

I3FIY	2,400,840	153/25	504/48	865/51	950/57	733/52	35/14
YT2R	1,838,376	147/25	374/38	899/48	797/55	614/47	6/3
JE2YRD	1,031,940	16/6	181/28	440/47	619/55	480/52	28/7
HG8Q	1,004,640	5/4	256/36	398/42	569/53	611/46	1/1
YZ4J	257,040	0/0	24/12	390/40	189/36	117/31	0/0

Top DX Multioperator Scores—Phone

Single Transmitter

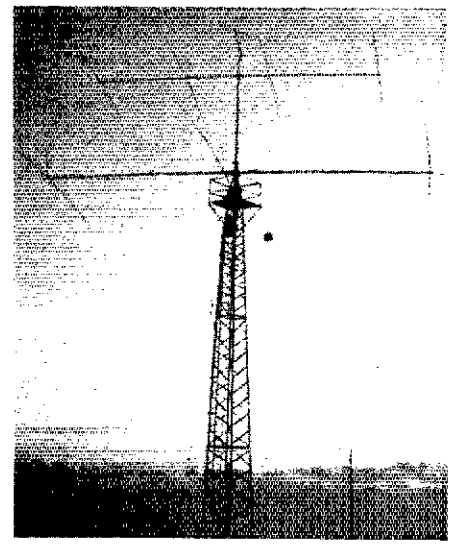
Call	Score	160	80	40	20	15	10
VP2MU	8,605,653	291/51	586/54	471/53	2653/57	1610/58	3108/56
8P9X	8,518,002	367/54	786/55	1014/57	1422/57	1725/56	3187/55
PJ9J	7,820,475	343/52	643/55	762/53	1868/56	1574/56	2831/53
XEØDX	6,796,566	394/56	1059/57	890/57	1519/58	2210/57	711/49
PØX	5,964,720	30/17	548/54	566/54	1874/57	1334/56	2504/52

Two Transmitter

KP4BZ	11,428,860	276/50	689/56	1857/57	3275/58	3712/59	1563/55
6D2DX	8,723,310	181/44	997/57	1188/57	2622/58	2735/55	1567/42
XE2GDK	6,297,360	446/51	1050/56	1168/56	1826/55	1529/48	886/38
JA1YWX	972,942	0/0	108/17	313/38	455/50	1013/56	53/6
JA7YFB	747,516	0/0	58/10	252/32	621/54	651/54	36/4

Unlimited

I3MAU	2,439,840	96/25	501/45	560/46	1308/57	1066/55	5/2
KL7RA	1,076,706	0/0	15/7	438/42	1158/56	675/52	0/0
JA7YAA	1,016,028	0/0	153/19	293/32	822/55	654/51	106/10
JA9YBA	701,790	0/0	102/12	227/28	408/50	730/51	43/8
YZ4J	48,741	0/0	13/8	66/21	95/27	37/21	0/0



A view of the antennas used by Veroli, I4VEQ, who finished second-place world 40-meter single-band.

plain crushed the competition. On CW, they scored 6 meg finishing ahead of K1ST by over 2 meg. During the phone weekend, the king of the multi-multi stations, W3LPL, set the pace set, once again, scoring 6.5 meg for the plaque. NR5M and crew finished second with 4.8 meg points.

DX Highlights

The competition for DX plaques was thick, particularly in the single-operator categories. PØGD (W2GD op) returns for the CW single-op win. His score of over 6 meg was enough to beat NP4A (K7JA op), who slid into second with over 5.6 meg. Walking away with the phone plaque this year was PJ2FR (N6KT op). His score of over 9 meg outlasted PØV by a solid 1.7 meg. Though not winning the plaque, PØV (A16V op) walloped those behind him by well over 1 meg.

The multi-single battle for both CW and phone plaques was furious. On CW, ZF2KE was able to pull an additional 300k out of the ether for 5.8 meg and the win. PJ9J feuded his way to second place with an formidable 5.5 meg. The scores on multi-single phone were extraordinary; VP2MU, the winner, scored over 8.6 meg points. In a close second, with a score that certainly can't be scoffed at, was 8P9X with 8.5 meg. The CW multi-two plaque went to JA1YXP. On phone, with the highest overall score of the contest (both weekends), was KP4BZ and crew scoring 11.4 meg. The multi-unlimited categories were won by I3FIY on CW and I3MAU on phone.

Affiliated Club Competition

It was a tough battle for the unlimited-category gavel. For the second year in a row, the Yankee Clipper Contest Club has been able to outdistance their archrivals, the Frankford Radio Club. They won this year with a score of 78.3 meg as opposed to the FRC's 75.4 meg. In the medium-club category, it was the Potomac Valley Radio Club returning for the win. But this year they clobbered the Mad River Radio Club by over 12 meg points. The PVRC's final score was 30.3 meg. The Overlook Mountain ARC won the local category with 9.5 meg. They

defeated the Long Island Contest Club by a solid 4 meg.

The year 1988 brought an increase in entries along with great band conditions, resulting in high scores and fun for all. The Contest Branch would like to thank all those who participated in this year's contest. A special thanks to Contest Assistant Mark R. Burke, KA1MIS, for his help in preparing this report. We hope to see you all again next year. BCNU.

SOAPBOX

W/VE CW

It was great fun to operate in the ARRL DX Contest from home again (K3UOC/1). I had some truly unusual and unpleasant experiences as I pushed myself to the limit in the ARRL CW Contest! After

Special Plaques

Single Operator	*Winner*	*Donor*
W/VE Combined Score	KC1F	National Contest Journal
W/VE Low Power, Combined Score	W2TZ	Rochester (NY) DX Assn
World Combined Score	KH6XX (KH6ND,op)	Mike Manafo, K3UOC, P46S, 4M4A
Africa, Combined Score	J52US (K8MN,op)	N4NW, KC4NC and AL7EL
Atlantic Division (CW)	K3TUP (K5ZD,op)	K2NY Memorial-Salt City DX Assn
Great Lakes Division (CW)	K8CC	Livonia Amateur Radio Club, Livonia MI
Great Lakes Division (Phone)	WB3KKX	Livonia Amateur Radio Club, Livonia MI
Hudson Division (CW)	N2LT	W2AO Memorial-Order of Boiled Owls
Japan, Low Power, All Band (CW)	JA7SUR	Western Washington DX Club
Seventh Call Area (CW)	K5MM/7	Willamette Valley DX Club
Seventh Call Area (Phone)	AI7B	Willamette Valley DX Club
Single Operator Under 18 (Phone)	WE7B	Virginia A Greene, WB1AVA
USSR All-Band (CW)	UQ1GWW (UQ2-037-116,op)	K1KI, K1ST, W2NC, WB4TDH, W5BOS, AA6BB, KA6V, SVØAA
USSR All-Band (Phone)	RAØFA	K1KI, W2FG, NT2X, W4MOM, W5BOS, AA6BB, KA6V, KI8M
Multioperator		
Caribbean Multi-Single (CW)	ZF2KE	The YASME Foundation
Caribbean Multi-Single (Phone)	VP2MU	W5MYA
Multi-Multi Combined World	YZ4J	W2PV Memorial-Schenectady ARA

DX Plaque Winners—CW

Single Operator	*Winner*	*Donor*
World	P4ØGD (W2GD,op)	North Jersey DX Assn
Africa	J52US (K8MN,op)	Byron P. Peebles, WB3KTX
Asia	JA7FWR	Alamo DX Amigos
Europe	F6BEE	Clarke V. Greene, K1JX
North America	NP4A (K7JA,op)	Vic Clark W4KFC Memorial Award-PVRC
Oceania	KH6XX (KH6ND,op)	Robert J. Halprin, K1XA
South America	P4ØGD (W2GD,op)	Herbert Hoover W6ZH Memorial
1.8 MHz	YV1OB	Jim Dionne, K1MEM and Bill Poellmitz, K1MM
3.5 MHz	K8WW/VP9	Mad River Radio Club
7 MHz	KV4FZ (N6OP,op)	Dr W.R. Staples, W4SME
14 MHz	G3FXB	Bencher, Inc.
21 MHz	PY5ZBA	Southern New England DX Assn
28 MHz	VP2ERA (N6RA,op)	N4PW
QRP	NP4Z	Rick KZ2E-Woodbridge Wireless, Inc
Multioperator, Single Transmitter		
World	ZF2KE	John Brosnahan, WØUN
Africa	OH5BA/CT3	David Brandenburg, K5RQ
Asia	UZØCWA	Kenwood USA Corporation
Europe	F5IN	The Radio Place
North America	ZF2KE	Kenwood USA Corporation
South America	PJ9J	Kenwood USA Corporation
Multioperator, Two Transmitter		
World	JA1YXP	Tom Frenaye, K1KI
Asia	JA1YXP	Kenwood USA Corporation
Multioperator, Unlimited		
World	I3FIY	H. Stephen Miller, NØSM
Asia	JE2YRD	Kenwood USA Corporation
Europe	I3FIY	Texas DX Society

DX Plaque Winners—Phone

Single Operator	*Winner*	*Donor*
World	PJ2FR (N6KT,op)	North Jersey DX Assn
Africa	J52US (K8MN,op)	Kenwood USA Corporation
Asia	JH7DNO	Acadiana DX Assn
Europe	GW4BLE	Gerald Griffin, MD, W8MEP
North America	VP2MBA	Chod Harris, VP2ML
Oceania	KH6XX (KH6ND,op)	Doc Sayre, N7AVK
South America	PJ2FR (N6KT,op)	Kenwood USA Corporation
1.8 MHz	4U1UN (K2GM,op)	Fred Race W8FR in Memory of Charlie O'Brian, W2EQS
3.5 MHz	TI2LTA	Kenwood USA Corporation
7 MHz	XE2NQ (AA5B,op)	Central Arizona DX Assn
14 MHz	HC1HC	Don Wallace W6AM Memorial, Central CA DX Club
21 MHz	PT9ZZ (PY5CC,op)	Ray Molony W2NCL Memorial, Long Island DX Assn
28 MHz	YU6PM	Contest Committee-LIMARC
QRP	TG9GI	Gerald Griffin, MD, W8MEP
Multioperator, Single Transmitter		
World	VP2MU	ARRL
Africa	EA9AM	Kenwood USA Corporation
Asia	JE2YRD	Kenwood USA Corporation
Europe	F6BEE	Metro DX Club
North America	VP2MU	Society of Midwest Contesters
Oceania	KH6WO	Society of Midwest Contesters
South America	PJ9J	Kenwood USA Corporation
Multioperator, Two Transmitter		
World	KP4BZ	Kenwood USA Corporation
Asia	JA1YWX	Kenwood USA Corporation
Europe	LZ1KDP	Tom Middleton, WB4CKY and Joy Middleton, KB4OMW
North America	KP4BZ	George Schultz, WØUA and John Brosnahan, WØUN
Multioperator, Unlimited		
World	I3MAU	Phil Sager, WB4FDT, in memory of John Wilson, K4YF
Asia	JA7YAA	Kenwood USA Corporation
Europe	I3MAU	ARRL
North America	KL7RA	ETO Inc/ALPHA

W/VE Plaque Winners—Phone

Single Operator	*Winner*	*Donor*
All Band	K3TUP (K3LR,op)	Frankford Radio Club
1.8 MHz	WA4SVO	Butch Greve, W9EWC, Memorial
3.5 MHz	N2NT	Lance Johnson Engineering, KØCS
7 MHz	KN6A	David L. Thompson, K4JRB
14 MHz	KS1L	Dayton Amateur Radio Assn
21 MHz	K4XS (WC4E,op)	Kenwood USA Corporation
28 MHz	K5UR	Windsor Amateur Radio Club, VE3OW
QRP	N6OJ	Marlis, N4MZJ, Woodbridge Wireless Inc
Multioperator		
Single Transmitter	W3BGN	Kenwood USA Corporation
Two Transmitter	K2TR	Kenwood USA Corporation
Unlimited	W3LPL	Western New York DX Assn

W/VE Plaque Winners—CW

Single Operator	*Winner*	*Donor*
All Band	KM1H (KQ2M,op)	Frankford Radio Club
1.8 MHz	K1ZM	Billy Lunt, KR1R
3.5 MHz	W6RJ	Dayton Amateur Radio Assn
7 MHz	K2EK	Northern Arizona DX Assn
14 MHz	K2VV	Fox Cities ARC, W9ZL
21 MHz	K1RM	Carl Luetzelschwab, K9LA
28 MHz	N4BP	W5MYA
QRP	W8VSK	David Newkirk, AK7M
Multioperator		
Single Transmitter	K3WW	Northern Illinois DX Assn
Two Transmitter	N3RS	Kenwood USA Corporation
Unlimited	W3LPL	ETO Inc/ALPHA

Top DX Single-Band Scores—CW

160		20	
YV1OB	66,144	G3FXB	233,682
CT1AOZ	34,440	OH7MA	180,918
XE2NNZ	22,080	G3SXW	175,896
YU2TW	10,530	GM4CXM	142,968
YU4BR	7,410	YT3T	125,064
K6GSS/KH6	4,980	HA5HO	124,578
OK1DWJ	2,958	OH6YF	122,430
OK2BQU	957	HAØNNN	121,632
OK1JDX	576	RQ2GN	121,014
JE1SPY	399	JA7HMZ	109,065
80		**15**	
K8WW/VP9	184,800	PY5ZBA	312,852
TE4T	108,240	HK1KXA	261,801
I2UBI	87,300	KX6BU	156,750
DK8ZB	58,455	IK2EGL	150,891
F6HLC	49,920	G3MXJ	135,945
HA3MY	47,880	AL7HC	133,485
YU2NW	38,205	I2UIY	130,356
UP3BI	29,298	DLØIU	
JA5DQH	27,306	(DL4AAE,op)	126,516
W7AW/KH6	26,532	YU3AI	115,992
40		YU4EBL	114,639
KV4FZ		**10**	
(N6OP,op)	261,972	VP2ERA	239,085
I2MQP	185,136	ZY5FR	112,728
4N4L		LU5DVO	96,252
(YU4OO,op)	181,335	PJ5/W1JP	88,755
YT7A	124,500	PT7AA	78,435
OK3YX	123,450	CU3AA	45,780
4M7A		KH2F	29,898
(YV7QP,op)	104,346	AX4XA	
9L1GG	91,152	(VK4XA,op)	19,008
YW4B		JA9RPU	2,556
(YU4BOU,op)	88,605	JH6WHN	132
LZ1GC	85,800		
SP3RBR	85,104		

Top DX Single-Band Scores—Phone

160		**20**	
4U1UN		HC1HC	486,330
(K2GM,op)	191,352	I1ZEU	340,692
TI2CC	86,013	PY1ZFO/Ø	331,296
YV2IF	61,308	9Y4RX	286,776
XE2NNZ	34,545	ZY4OY	208,620
CT1AOZ	34,515	TR8SA	208,620
CU2AF	6,525	OH6LK	205,200
YU2TW	5,072	YU2W	
IV3PRK	4,500	(YT2GW,op)	201,840
OK3CWQ	240	OA4ZV	201,609
80		LS8E	
TI2LTA	223,497	(LU8EJP,op)	201,318
4M3B		**15**	
(YV3BKC,op)	133,392	PT9ZZ	
AH6AZ	93,132	(PY5CC,op)	637,188
YY5R		PY5ZBA	592,419
(YV5EFP,op)	66,456	HC1OT	592,173
I5MXK	58,590	LS1E	
G4AMT	42,228	(LU8DPM,op)	515,214
4N2Y	29,304	AH6GQ	433,608
I4AVG	19,998	YW1A	384,066
4N1A	17,496	HK1LDG/HKØ	313,170
VK2CWG	14,916	GUØ/NN5O	242,400
40		YV6DNP	165,648
XE2NQ		YU1EXY	
(AA5B,op)	219,051	(YZ6AA,op)	157,896
I4VEQ	140,913	**10**	
CU3AA	106,812	CE6EZ	491,112
4N4L		YU6PM	385,416
(YU4OO,op)	72,756	CX2AAL	383,382
CT3DL	64,860	YV6BXN	354,729
JA2BAY	56,760	HC1EA	208,890
HC1PF	54,849	LS6E	190,176
IK2BTI	43,080	LU1NCO	184,968
I8RS	41,886	LU4US	125,235
ISØWON	38,076	CE1HBI	119,952
		ZY1NEZ	72,720

DX Continental Winners—CW

Single Operator	*Africa*	*Asia*	*Europe*	*North America*	*Oceania*	*South America*
All Band	J52US	JA7FWR	F6BEE	NP4A	KH6XX	P40GD
160	—	JE1SPY	CT1AOZ	XE2NNZ	K6GSS/KH6	YV1OB
80	—	JA5DQH	I2UBI	K8WW/VP9	W7AW/KH6	—
40	9L1GG	JA1YWX	I2MQP	KV4FZ	VK2FEX	4M7A
20	—	JA7HMZ	G3FXB	—	K8CV/KH6	ZY5AKW
15	—	JA8RWU	IK2EGL	AL7HC	KX6BU	PY5ZBA
10	—	JA9RPU	CU3AA	VP2ERA	KH2F	ZY5FR
QRP	—	JA7RHJ	YU2TY	NP4Z	—	CX8DT
Multioperator						
Single TX	OH5BA/CT3	UZØCWA	F5IN	ZF2KE	—	PJ9J
Two TX	—	JA1YXP	—	—	—	—
Unlimited	—	JE2YRD	I3FIY	—	—	—

Continental Winners—Phone

Single Operator	*Africa*	*Asia*	*Europe*	*North America*	*Oceania*	*South America*
All Band	J52US	JH7DNO	GW4BLE	VP2MBA	KH6XX	PJ2FR
160	—	—	CT1AOZ	4U1UN	—	YV2IF
80	—	JH4UYB	I5MXK	TI2LTA	AH6AZ	4M3B
40	—	JA2BAY	I4VEQ	XE2NQ	—	HC1PF
20	TR8SA	JH1NBN	I1ZEU	KL7ISO	DU1NH	HC1HC
15	CN8FC	JH1EDB	GUØ/NN5O	HK1LDG/HKØ	AH6GQ	PT9ZZ
10	—	JH1LBR	DJ1ZU	PJ7/K2KTT	—	YU6PM
QRP	—	JH7LRS	FD1BEG	TG9GI	—	—
Multioperator						
Single TX	EA9AM	JE2YRD	F6BEE	VP2MU	KH6WO	PJ9J
Two TX	—	JA1YWX	LZ1KDP	KP4BZ	—	—
Unlimited	—	JA7YAA	I3MAU	KL7RA	—	—

37 hours of non-sleep, the walls started to close-in, followed by double-vision and trouble focusing my eyes. Then after an overdose of No-Doz and coffee, I started having "out-of-body" experiences. Really scary stuff! (KQ2M). When my wife woke me up Saturday morning at 4 AM, I thought she was finally coming around to my way of thinking about contests. Unfortunately, it was to tell me that the dishwasher was leaking! Repairing it really put a crimp in that day's effort. I still beat last year's score and snagged a new country, as well as some new band countries. The mission was still successful (KT2D). When I worked ZL3GQ, I really passed out—it was time for bed! It was a nice contest, as usual; I wish I had more time to operate (N2KA). I enjoyed the contest. I didn't call CQ at all. All my contacts were made by answering foreign CQs (W4JFL). I saw very little activity from the Pacific! Were they all fishing? (WD4JNS). I had fun! (W5FO). It was great fun! (K1EQA). I had a great time in the contest. If DX ops would send their calls more often, they wouldn't get so many dupes (W6JTI). I found it necessary to take more time out than I would have wished, because my wife is ill. The bands were in fair shape. I had the usual noise levels, which inhibited the lower bands somewhat. No DX heard on 160 meters at all, although listened several times. It's getting tougher each year—I'm now pushing 78! (W6BYH). Too bad points are not given for stations called! (WB7TSS). Please enter me in the "CPAs who are stupid enough to try to operate a contest in the middle of tax return preparation season and who can only get away from work long enough to operate for 3 hours during the entire contest" category (KQ7I). Great fun, even though winds at 70-mi/h-plus took down receiving antennas. I started with 4 Beverages and ended up with none. Wait until next year! (WC7S). It was a great contest and lots of fun with 50 watts mobile, but Brrrr with temperatures in the teens (K9RN). This was my first International DX Contest (WA9TZE). With five watts out, that 25-dB loss sure makes a difference! (WØIZ). Now that I can copy 30 WPM, this contest is getting fun! (KDØEE). The prefix I used (VX3 is a special prefix for the

Members of the Hill Top Ham Club, JE2YRD, put forth two multioperator winning efforts: 3rd-place world multioperator unlimited on phone and continental winner for multi-single on CW.

W/VE Low Power Top Ten (<150 W)

CW		Phone	
VO1MP	931,500	W2TZ	563,832
W2TZ	703,416	K8NZ	477,945
KØEJ	579,084	KA2AJT	462,231
N5AW	531,300	N5AW	354,978
KG1D	467,313	KQ3V	353,700
AD1C	440,568	WB3FYL	263,004
W8JTI	391,776	N3II	218,241
KA2AJT	359,085	N6ADK	192,717
K4MF	325,752	WA1FCN	183,027
K2SIG	301,713	W7YAQ	177,642
W7YAQ	300,144	KD3U	172,200

W/VE QRP Top Ten

CW		Phone	
W8VSK	226,548	N6OJ	135,000
N8II	161,898	WA8VBW	117,594
NN4Q	160,920	KG6AR	74,787
WB2ENW	83,304	AA2U	69,084
WØIZ	64,575	WA8AGH	56,244
KW6Q	57,057	W6CN	52,320
K7SS	44,460	N1AFC	41,664
KH6CP/1	42,768	W6YVK	29,223
AA2U	38,766	KB4GID	28,728
WU4G	27,813	AA4YZ	24,375

Top DX QRP Scores—CW

Call	Score	Call	Score
NP4Z	1,480,290	CX8DT	37,587
YU2TY	116,352	IS0LYN	28,728
JA7RHJ	81,672	JR1IOS	27,720
G4FDC	72,828	JH7AJD/1	20,433
I0KHP	54,747	PA0ADT	18,354

Top DX QRP Scores—Phone

Call	Score	Call	Score
TG9GI	1,169,280	OK1DKS	10,836
JH7LRS	30,438	YU1LM	9,996
FD1BEG	29,040	4X6IF	7,752
JA2JSF	27,636	JA0BMS/1	4,674
I0KHP	20,748	OZ3PE	3,300

XV Winter Olympic Games) caused some confusion. Thanks to all who participated and made it a most enjoyable contest (VE3MVP).

W/VE Phone

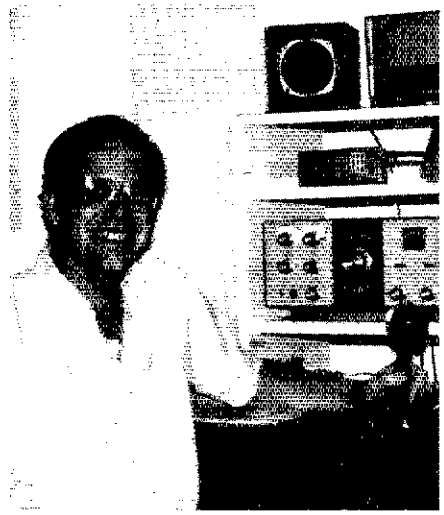
Conditions really seemed to improve on Saturday afternoon, after all the ice melted off the antennas! (K1CC). Friday's ice storm brought down my 75-meter phased array, limiting my 75 activity to a hastily strung long wire! (KC1BG). Five hours sleep sure helps when you're almost at the big 4-0! (K1UO). Thanks for the fun. It was a real learning experience (KC1EO). This is my first contest! I thoroughly enjoyed it, and look forward to more! I did learn something. Thanks (KE2DF). Many US and DX stations on phone could use a little brush-up on good operating procedures and simple courtesy (WB2AMU). Those stations not identifying by the 4th or 5th QSO were bypassed. I do believe IDing after every QSO may be an overkill. However, every third contact or so seems to be a good balance. I also believe that DX stations should save the unconventional prefixes for the WPX contests (KT2D). Was expecting a baby any moment, so only went single band. Will be back next year as a multi-single. By the way, had a baby girl the next weekend! (WB2ULI). The best catch was J52US on 3 bands! (KA3B). This was my first single-op effort in 5 years and had lots of fun. Also, it was the first time I used a computer duping program. I'll never do it any other way again! (K3OO). I just have to get an outdoor antenna! (WB3KTX). I didn't set the band on fire, but I worked every station I heard (WB3CDX). TS-520 and a 10-year-old vertical make for rough contest conditions, but I still had fun! (N3CGK). This was the first contest that I ever entered. I had a ball and am looking forward to next year's contest (KA4NXP). This is my first ARRL International DX Contest. I picked up a lot of new countries. It was quite a difference from my old QTH—Colorado! (KK4RV). This was my first contest of 1988 and was great! I know 1989 will be fine! (N4PMQ). It was a good contest! (W5FO). This was my first contest entry on 20—fantastic! I am looking forward to next year and even better results (N5IMO). I made more contacts than in any other contest (W6SIK). There is nothing like computers to make things more fun! (N6IC). Ten meters not being operational on my 735 really hurt! (W8AKS/6). It was a great contest. It is always fun to break a few pileups with /mobile suffix. Thanks to all my JA friends for listening (N6NKN). I'm real happy to have worked 15 new countries (KB6RXF). I wish I could have back those few hours on Saturday morning when Europe was hot on both 15 and 20. I was trying to work them QRP with my 40-meter sloper instead of a beam. How foolish! It was an interesting contest anyway (W6YVK). I heard 9Q5NW on 160, but there was no way that I would even attempt to crack the East-Coast pile-up (KC7UO). East Coast contesting was never like this: Sixty JAs, KH2 and a KH3 off a CATV coax dipole held together with electrical tape and copper crimp-ons with 60 watts output from your QTH-of-the-month—my bathroom! (NG1J/7). The antenna was stuck at 60 degrees on Africa or East Coast for the entire contest. Murphy's Law strikes again! (WB7CLU). The contest gets better every year as propagation starts to improve. It is, however, still hard work when not using a linear. Working barefoot this year made it more of a contest to find multipliers than just running them (WB8WZT). It was lots of fun. I can't wait until next year (WB3KKX). Murphy strikes! One of the worst ice storms in the Ohio area in a long time prevented me from being able to load up the towers! (WA8AGH). A half-inch of ice was caked on my antennas Friday and Saturday. I'll be seeing you next year (KN9C). Operating on line with a computer logger/duper program sure was nice (K9QXY). My entry won't win any "prize," but it was fun chasing multipliers on a single band (KØZFL). This was my first contest ever. The conditions on 10 and 15 were impressive (KAØZEP). It was a great contest on Saturday, but Sunday was a total loss. There is always next year! (VE1BDK). This year's contest was a complete success. I hope next year I'll even or better my score! (VE3TJL). My score was not much due to very limited time that I could participate, but at least I gave out the multiplier to some people. It sure is nice to be a separate multiplier from VE8 (VY1CW).

DX CW

I was very pleased with my first effort from Morocco, especially with the 80- and 40-meter results, using a Butternut vertical (CN8FC). The pile-ups were terrific! I managed quite well with a 500-Hz filter and operated split as often as possible. Every station I heard was worked. I only shut down after complete silence on frequency and complete exhaustion (9J2AL). I only had power until 0700Z Sunday. The loss of 18 hours made a high score difficult (9Q5NW). I tried to get WAS, but didn't hear many US stations (JA4ATV). Many of the big-gun stations have good ears. They picked me out easily (JH6NBW). I had a broken rotator, a broken linear amplifier and a broken keyer! Sigh (JM1CAX). I was very glad to enter this contest for the first time! (JA6SHL). The conditions weren't so hot, but I enjoyed the contest very much (JA2FJP). Twenty meters was unbelievably good on Sunday evening. The XYL finally gave up trying to get me down for dinner (C31LHJ). It was an excellent contest! I hope to be in next year's too (DL9LAI). I worked all my multipliers on Saturday. There were very nice conditions on 15 meters (DL4AAE). It was a nice contest (EA7AAW). This is my first ARRL CW Contest and I'm all ready for next year's! (EA4EFK). This was my first contest and I really enjoyed it! (EI4DQ). The 40-meter band was fantastic! (HA5PP/1). The conditions were very good on 80 meters. I never heard a station on 10 meters (HB9DDZ). It was nice to be able to work the ARRL International DX Contest seriously for the first time! (OH6YF). I worked all I could hear. Next year I will have a bigger antenna or work a different band! (OH3WD). Last year, I won with 20 QSOs. This year I will win again, but with many more QSOs (PA3EOB). Thanks for a very attractive contest, but where were the South Dakota brass pounders? (PA3AMA). I'm still missing 7 states for WAS (SMØOFW). There was no propagation on 10 meters! (SP2FAP). Two days of hunting produced only one QSO on 160 meters! (RA3DX). Thanks for the nice contest and good luck to all the VE and US hams (UA6LTI). It was the first contest with my new QRP CW transceiver (UA3DPX). The conditions were nice on 15 meters, but the QRM was very hard to copy through! (RW3AH). Thanks for the nice contest (UB5FBV). Thanks for the contest (UO5OBD). Many thanks for the fine CW contest (YN3EO). These contests are great, but the paperwork is a real drag (W2GD).

DX Phone

This is our first contest experience. Our score wasn't



Mark, NT6G, uses the help of a spotting net to rack-up 37k as a multi-single for the Northern California DX Club.

Olli, OHØXX, handles the pile-ups at FY5YE to make 6388 QSOs and almost 6 million points finishing 3rd-place world.

Overall Division Leaders

CW	Division	Phone
VO1MP	Canada	VO1MP
K3TUP (K5ZD,op)	Atlantic	K3TUP (K3LR,op)
W9RE	Central	K9CAN
KT9T	Dakota	NZØR
W4XJ	Delta	K5MK
K8CC	Great Lakes	WB3KKX
N2LT	Hudson	W2RQ
NØSM	Midwest	K4VX/Ø
KM1H (KQ2M,op)	New England	KC1F
K5MM/7	Northwestern	AI7B
W6JTI	Pacific	K6HNZ
K4PQL	Roanoke	KE9A
N2IC/Ø	Rocky Mountain	KI3L
WX4G	Southeastern	WX4G
W6AE	Southwestern	K6EID
N5RZ	West Gulf	N5RZ

Low-Power Division Leaders (<150 W)

CW	Division	Phone
VO1MP	Canada	VE4KE
W2TZ	Atlantic	W2TZ
NJ9C	Central	NG9L
—	Dakota	ACØW
NT5G	Delta	K4JHT
K9ALP	Great Lakes	K8NZ
K2SIG	Hudson	NN2C
WEØM	Midwest	KBØU
KG1D	New England	WA1FCN
K7WA	Northwestern	W7YAQ
W6JTI	Pacific	KE6OT
KØEJ	Roanoke	N4PMQ
WØGOR	Rocky Mountain	KE7NS
K4MF	Southeastern	KK4RV
W7YAQ	Southwestern	N6ADK
N5AW	West Gulf	N5AW

QRP Division Leaders

CW	Division	Phone
—	Canada	—
K2LGJ	Atlantic	—
K9PNG	Central	—
—	Dakota	—
NU4B	Delta	—
W8VSK	Great Lakes	WA8AGH
WB2ENW	Hudson	AA2U
WØIZ	Midwest	WAØVBW
KH6CP/1	New England	N1AFC
K7SS	Northwestern	—
W6YVK	Pacific	N6OJ
N8II	Roanoke	AA4YZ
NØCNV	Rocky Mountain	KB7M
KB4GID	Southeastern	KB4GID
KW6Q	Southwestern	KG6AR
—	West Gulf	KA5PVB

very high, but we had fun (CN8EK). Another power failure hampered this operation as with the CW weekend. Positive aspects were the flawless operation of the W2HPF logging program. All logs were printed, duped and scored within one hour after the contest! (9Q5NW). I'm very sorry to have missed some multipliers from the East Coast on 80 and 10. Next year I'll get them (JA1XAF). Thanks for the nice contest (JA7RXU). QRP is very interesting, HI! (JO1LDY). I hope to work all 50 states in the next ARRL International DX Contest (UAØABK). Great to hear stateside signals on 20 meters as early as 1800Z (VU2TJW). I was very happy with my first participation. It was nice to see the US stations looking for Europe (F6DYK). It was a fine contest. I only missed five states on 15 meters (F6AUS). Thanks for the enjoyable contest. It was my first, but I'll be back next year so I can reach the magic 500 QSOs (G4MET). I only used an indoor aerial! (G8GD). What happened to the 21-MHz band on Sunday? (GM4HQF). Beautiful propagation Saturday! (I4UFH). The aurora spoiled 21 and 28 MHz, but I had some night scatter to the US (OH1ZAA). Unfortunately, there was only a little time for the contest! (OH6VR). The conditions were very poor in Belgium (ON6JG). After two years of involuntary absence from the annual ARRL International DX Contest, it was a great pleasure to be able to participate again. Conditions, however, were poor which resulted in a rather modest score (OZ8T). The conditions were good on Saturday, but very poor on Sunday! (OZ1DPW). I wish I could have spent more time in the contest. The time I did put in was enjoyable! (PA3AYN). Sorry, I was only able to put in a couple of hours. It's an interesting contest (SM4BTF). FB contest! I'll see you in the 1989 contest! (SP9JZT). Thanks for the nice contest. I'll have to QRV next year! (UA3AGW). Thank you California for 913 of my 3760 QSOs (KH6RS).

Feedback

Please note the following corrections to the results of the 1987 ARRL International DX Contest starting on page 74 of October 1987 *QST*. In the Affiliated Club Program, Unlimited Category, the Southern California DX Club should have a score of 8,516,064 placing them in 3rd place. W2YV (KQ2M op) should have been single-band 20, phone. VO1MP should have been low power, phone.

Scores

The scores are listed by mode—CW and phone. For both W/VE and DX scores, single operators are listed first, followed by multioperator single-transmitter, multioperator two-transmitter, then multioperator unlimited. W/VE single transmitter scores are broken down by call area and ARRL Section. W/VE multi-single scores are broken down by call area only. All W/VE multiop two-transmitter and unlimited scores are grouped together in descending order by score. DX single-op and multiop scores are broken down by continent and country. Under each ARRL Section (and country for DX), single-op scores are listed in descending order by category. All-band scores are listed first, followed by 160, 80, 40, 20, 15, and 10-meter single-band scores. Each line score lists the following information: call, score, QSOs, multipliers, power output used (A = 5 W or less; B = 6-150 W; C = more than 150 W). Single-band entries are indicated by 160, 80, 40, 20, 15, and 10. For example, in Connecticut, the top all-band CW scorer is K1TO. The top low-power (150 W or less) entrant is KG1D. W1NG has the top 160-meter single-band score, K8HVT/1 has the top 80-meter single-band score, K1XA has the top 40-meter single-band score, K1RU has the top 20-meter single-band score, K1RM has the top 15-meter single-band score, and K1EFI has the top 10-meter single-band score. KH6CP/1 has the top QRP score.

W/VE CW

Single Operator

1

Connecticut

K1TO	2,478,803	2407	343	C	
K1RX	1,172,421	1557	251	C	
W1WEF	729,495	1131	215	C	
KG1D	467,313	833	187	B	
K1DD	148,920	365	136	C	
W1AW (KJ4KB,op)	134,406	393	114	C	
K1BV	134,301	503	89	C	
K1WA	108,108	308	117	C	
N8RA	82,680	265	104	C	
N1CC	50,796	166	102	C	
KH6CP/1	42,768	162	88	A	
WA2WIP	41,292	148	93	C	
W1VH	27,528	148	62	C	
W1HUE	21,888	114	64	A	
N1JW	15,450	103	50	B	
KC8PE	11,280	80	47	C	
W1AB	9,660	70	46	C	
AA2Z	4,437	51	29	B	
KC1CB	2,244	34	22	B	
NI1L	1,026	19	18	A	
W1NG	5,460	52	35	C	-160
K8HVT/1	44,388	274	54	C	-80
K1XA	242,802	861	94	C	-40
KS1L	153,090	630	81	C	-40
K1RU	452,076	1492	101	C	-20
WA1FCN	66,906	354	63	B	-20
W1OPB	12,954	127	34	B	-20
KC1CB	1,296	27	16	B	-20
K1RM	265,236	961	92	C	-15
K1EFI	4,524	52	29	C	-10

Eastern Massachusetts

W1KM	1,423,782	1908	249	C	
W1FJ	846,983	1143	247	C	
AD1C	440,568	696	211	B	
W1MK	393,024	736	178	C	
W1GIH	346,743	653	177	C	
W1WAI	329,058	606	181	C	
N1QY	214,650	477	150	B	
WB1CNM	188,625	503	125	C	
K1CLN	176,715	367	165	C	
KA1CLV	85,995	245	117	B	
W1FV	58,531	331	67	C	
W1HNZ	65,637	221	99	C	
W1AX	38,288	128	96	C	
WB2DND	32,292	138	78	B	
K1DX	23,664	136	58	B	
KA1IOR	20,445	145	47	B	
KC1BC	18,444	106	58	B	
KB1VL	6,378	59	36	B	
K1IJV	1,482	28	19	B	
N1EDM	1,209	31	13	C	
KA1INL	840	20	14	A	
K3UOC/1	3	1	1	B	
KQ1V	1,920	32	20	C	-80
K8PO	214,110	793	90	C	-40
K1TWF	22,578	142	53	B	-40
N1DC	28,143	177	53	B	-20
K1IJU	2,394	38	21	B	-20
W1PLJ	1,890	35	18	C	-15

Maine

K1UO	12,420	90	46	C	-40
N1AFC	8,448	88	32	A	-15

New Hampshire

KM1H (KQ2M,op)	2,799,195	2515	371	C	
KC1F	2,541,720	2360	359	C	
K1PTF	92,202	254	121	B	
W1JSM	15,300	102	50	B	
N1ACH	7,830	58	45	C	
K1KA	2,760	40	23	C	
W1LQQ	35,844	208	58	C	-20
W1VY	19,800	110	60	C	-20

Rhode Island

W1GL	1,329,042	1549	286	C	
KS1J	1,055,424	1472	238	C	
KA1GQW	458,640	784	195	C	
K6IM/1	39,360	180	82	C	
W1RFQ	32,868	132	83	B	
K1VSJ	15,738	86	61	B	

Vermont

K2LE/1	1,300,032	1464	298	C	
W3SOH	155,109	347	149	B	
K1IK	51,840	288	60	C	-80

Western Massachusetts

K1EA	2,255,478	2402	313	C	
K1BW	2,054,517	2069	331	C	
KI2P	99,294	247	134	C	
W1MM	70,512	226	104	C	

2

Eastern New York

K5NA	1,647,030	1771	310	C	
N2BA	1,216,617	1433	283	C	
W2XL	754,452	1103	228	C	
K2SIG	301,713	617	163	B	
N2AIF	147,744	342	144	C	
N2AZS	120,204	318	126	B	
W2AWF	81,900	260	105	C	
W2KHQ	61,056	192	106	B	
WA2AXK	49,305	173	95	C	
W2QYA	7,452	69	36	A	
K1ZM	21,960	122	60	C	-160
K2EK	317,376	1102	96	C	-40

NYC-Long Island

K2SX	376,371	589	213	C	
N2UN	355,833	621	191	C	
WA2LGO	265,356	546	162	C	
KD2TT	197,238	463	142	C	
K2YGM	123,552	312	132	C	
W2HLI	116,335	343	115	B	
WB2ENW	83,304	267	104	A	
W2GKZ	76,275	225	113	C	
KD2HE	24,960	128	65	C	
N2FBV	14,400	100	48	B	
W2AFM	8,733	71	41	B	
WA2MAV	1,938	38	17	B	
WA2IRC	480	16	10	B	
N2KA	1,872	26	24	C	-160
N2KW	2,496	32	26	B	-80
N2DTW	60,822	327	62	C	-15
K2MFY	57,960	276	70	B	-15
WB2AMU	21,009	149	47	B	-15
W2AYJ	20,280	130	52	C	-15
WA2NFS	108	6	6	B	-15

Northern New Jersey

N2LT	2,132,688	2264	314	C	
W2NJ	191,970	405	158	B	
KT2D	42,861	157	91	B	
AA2U	38,766	142	91	A	
W9NTU	23,010	130	59	B	
K2JT	14,025	85	55	A	
WAØQOA	1,026	18	19	B	
W2FCR	2,550	34	25	C	-160
N2AA	410,685	1441	95	C	-20
K2TW	277,200	1155	80	C	-20
WA2ASQ	54,900	300	61	C	-20
WB2FGZ	5,460	70	26	C	-20
W1GD	119,700	525	76	C	-15
KB2HZ	102,564	444	77	C	-15
N2ZR	62,220	340	61	C	-15
K2FE	36,540	210	58	C	-15

Southern New Jersey

N2MM	1,743,144	1963	296	C	
N2MR	252,333	529	159	C	
WA2VYA	166,881	389	143	C	
K2PS	162,162	378	143	B	
W2PAU	152,520	328	155	C	
W2EA	104,676	268	122	C	
K2FL	84,750	250	113	C	
K2JF	77,528	177	148	B	
K2OSV	75,051	269	93	C	
WA2LBT	50,274	171	98	B	
K2SWZ	48,384	168	96	B	
WB2R	28,125	125	75	B	
N2FY	26,910	138	65	B	
K2JLA	20,400	100	68	C	
W2CN	16,200	100	54	C	
K2HPV	8,260	60	46	A	
W2BLV	8,235	61	45	B	
W3ELJ	6,216	56	37	B	
K8XR	113,295	455	83	C	-40
K3JGJ	47,196	276	57	C	-15

Western New York

K2KIR	1,058,064	1316	288	C	
W2TZ	703,416	1106	212	B	
KA2AJT	359,085	647	185	B	
W2FTY	126,750	325	130	B	
K2IJ	108,108	308	117	C	
KW2J	68,138	201	113	C	
WB2ADQ	58,422	214	91	B	

K2CBM	55,080-	204-	90-B	
W2IRZ	51,939-	199-	87-B	
KD2YP	45,045-	165-	91-C	
W2PHT	43,056-	184-	78-S	
N2WK	29,040-	110-	88-B	
WB2DVU	27,738-	138-	67-C	
WB2NRK	23,004-	142-	54-C	
W2FUI	18,975-	115-	55-C	
K2LGJ	18,810-	95-	66-A	
W2OMV	12,210-	74-	55-B	
KB2NU	8,100-	64-	50-C	
KK2B	2,835-	35-	27-B	
W2FR	15,606-	102-	51-C	-80
KA2VYW	9,030-	70-	43-C	-40
K2VV	483,276-	1584-	103-C	-20
NM2L	274,125-	1075-	85-C	-20
W2HPF	151,632-	648-	78-C	-15
W8VU/2	4,032-	48-	28-C	-10

3

Delaware

K3WUW	501,372-	733-	228-C	

Eastern Pennsylvania

K3OO	1,915,842-	2143-	298-C	
N3AD	1,802,832-	2116-	284-C	
K3IPK	1,264,788-	1673-	252-C	
W3UM	1,015,815-	1205-	281-C	
AA3B	438,303-	757-	193-C	
KJ3R	402,906-	742-	181-C	
K4JLD/3	267,007-	553-	173-C	
W3KV	207,038-	426-	162-C	
W3OV	170,892-	404-	141-C	
W3ARK	158,870-	415-	126-B	
W3EVW	139,992-	307-	152-C	
N3HW	130,176-	452-	96-C	
N3ED	113,805-	281-	135-C	
K3TEJ	102,459-	287-	119-B	
KC3M	76,002-	239-	106-C	
KU3X	36,072-	167-	72-C	
WA3FZQ	33,024-	172-	64-B	
KY3N	30,261-	131-	77-C	
W3EAN	29,187-	141-	69-C	
W3YFV	12,098-	72-	56-B	
W3EHZ	9,288-	72-	43-B	
N3RW	8,775-	85-	45-C	
W3AP	7,200-	50-	48-C	
KC3O	4,698-	48-	34-C	
K3OX	4,212-	52-	27-B	
KY3M	4,050-	50-	27-C	
K3NW	44,103-	241-	61-C	-40
KW3W	11,484-	132-	29-B	-20

Maryland-DC

K3ZO	2,180,520-	2155-	328-C	
K3NA	1,563,705-	1755-	297-C	
W3USS (W9LT,op)				
	722,541-	1061-	227-C	
K3SA	495,117-	813-	203-C	
K3YGU	465,534-	699-	222-C	
W3UJ	428,852-	756-	189-C	
W3HVQ	290,190-	590-	147-C	
W3IUU	248,370-	487-	170-C	
N3II	196,308-	399-	164-B	
W3FG	106,392-	286-	124-B	
KA3PGL	84,132-	228-	123-C	
N3AM	53,136-	216-	82-C	
WB3BRF	48,578-	204-	81-B	
W3EE	19,602-	99-	66-B	
W3GN	18,522-	98-	63-C	
W3FX	11,520-	80-	48-C	
W3TFA	8,037-	57-	47-B	
W3FQE	6,630-	65-	34-C	
WB3AVN	4,092-	44-	31-C	-160
N3RR	171,456-	752-	76-C	-20
W3EWL	73,710-	390-	63-C	-15
WA3EEE	35,904-	187-	64-B	-15

Western Pennsylvania

K3TUP (K5ZD,op)				
	2,338,098-	2177-	358-C	
KX2A	80,480-	192-	105-C	
N3CGK	36,465-	143-	85-B	
W3HDH	27,360-	120-	76-C	
W3DKL	19,947-	109-	61-B	
K3UA	300-	10-	10-C	-160
K3MD	12,987-	111-	39-C	-80
AD8J	4,176-	58-	24-B	-15

4

Alabama

KR4F	456,855-	665-	229-C	
W4NTI	195,564-	379-	172-C	
KK4SM	111,276-	261-	132-B	
WB4VKW	15,189-	83-	61-C	

Georgia

WX4G	1,690,128-	1936-	291-C	
N4RJ (KM9P,op)				
	1,555,686-	1782-	291-C	
K4BAI	840,285-	1065-	263-C	
W4DXI	246,840-	440-	187-C	
W1UA	218,937-	437-	167-C	
K4EZ	134,784-	312-	144-C	
K4PI	67,569-	223-	101-C	
KB4GID	17,298-	93-	62-A	
K4TEA	9,768-	74-	44-C	-160
W4JFL	20,727-	147-	47-B	-20
KA1WR	4,248-	59-	24-B	-20
N4VZ	170,613-	639-	89-C	-15

Kentucky

WB4FOT	65,088-	192-	113-C	
N4XM	59,388-	202-	88-C	
K4FU	21,054-	121-	58-C	-40

North Carolina

K4POL	1,470,432-	1866-	289-C	
K4PB	259,677-	473-	183-C	
NN4Q	160,920-	380-	149-A	
K4FOY	4,455-	45-	33-B	
N4SU	9,648-	67-	48-C	-160
AA4NC	26,622-	174-	51-C	-80
N4ZC (WA8MAZ,op)				
	253,170-	970-	87-C	-20
WD4OHD	2,394-	42-	19-A	-15

Northern Florida

WC4E	372,198-	697-	178-C	
AB4ES	267,972-	548-	163-C	
W4WKQ	17,550-	90-	65-C	
WD4IIO (W4ILE,op)				
	7,236-	67-	36-B	
W4HBK	27,189-	159-	57-C	-80
WA4SSB	1,080-	24-	15-C	-80
W4VQ	8,528-	68-	32-C	-10

South Carolina

W3VT	1,345,968-	1438-	312-C	
K9EJ	579,084-	902-	214-B	
W8OKX/4	229,632-	416-	184-C	
N4LM	5,400-	60-	30-B	-15

Southern Florida

N8DH	919,050-	1114-	275-C	
K4MF	325,752-	554-	196-B	
WD4AHZ	217,152-	416-	174-B	
K4GKD	164,754-	339-	162-C	
W4YN	72,846-	213-	114-C	
WD4JNS	34,362-	136-	83-C	
KA4YAE	18,810-	95-	66-B	
W2SDB/4	4,752-	44-	36-C	
W9LRY/4	4,218-	38-	37-B	
N4IN	15,741-	99-	53-C	-160
W4OO	3,192-	38-	28-C	-160
WB4TDH	173,145-	679-	85-C	-15
N4BP	24,165-	179-	45-C	-10
N4EJV	16,992-	118-	48-C	-10

Tennessee

W4XJ	882,189-	1273-	231-C	
K4AMC	380,628-	654-	194-C	
K4YPX	21,080-	108-	65-B	
NU4B	18,216-	88-	69-A	
KI4UZ	11,094-	86-	43-C	-80
N4ZZ	212,840-	886-	80-C	-15
N4IR	119,232-	552-	72-C	-15

Virginia

KE9A	405,309-	809-	187-C	
N3OS	126,984-	286-	148-C	
K4FPF	124,089-	311-	133-B	
KC4CDS	71,910-	235-	102-B	
W4YE	67,230-	249-	90-C	
KA4RLJ	65,142-	231-	94-B	
W6UZ/4	43,608-	158-	92-C	
N4MM	42,768-	144-	99-C	
N4RA	35,280-	147-	80-B	
WU4G	27,813-	127-	73-A	
K6ETM/4	17,136-	102-	56-B	
N4LJS	15,732-	92-	57-B	
W3FTG	10,950-	73-	50-B	
K3ZJ	864-	18-	16-B	
AA4UJ	13,992-	106-	44-C	-80
W4KMS	5,742-	58-	33-C	-40
N3AVA	8,748-	108-	27-C	-15

5

Arkansas

K5FUV	48,510-	165-	98-C	
W5EIJ	4,515-	43-	35-C	
K5UR	23,580-	131-	80-C	-10

Louisiana

WA5IGD	341,226-	534-	213-C	
NT5G	281,610-	447-	210-B	
W5ZR	181,080-	503-	120-C	
WC5D	32,736-	124-	88-B	
NO5W	6,090-	58-	35-A	

Mississippi

WQ5H	56,430-	198-	95-C	
WB5ZKR	14,664-	94-	52-C	-80
W5AQ	15,851-	111-	47-B	-40
K5MK	161,238-	698-	77-C	-15
WA5OYU	630-	15-	14-B	-15

New Mexico

KI3L	393,120-	780-	168-C	
KT5X	3,276-	52-	21-C	-80
K7UP	22,572-	209-	36-C	-40
KN5S	8,316-	77-	36-C	-40
W5TVX	5,037-	73-	23-B	-20
KF7E	95,424-	448-	71-C	-15
NC5O	76,992-	401-	64-C	-15
N7RP	2,079-	33-	21-C	-10

North Texas

N5RZ	1,322,994-	1418-	311-C	
WN4KKN/5	1,013,760-	1320-	256-C	
N5AW	631,300-	644-	275-B	
WM5K	411,248-	737-	186-C	
N4QS	172,638-	417-	138-B	
KY5N	147,288-	323-	152-B	
WO5W	105,534-	286-	123-B	
W5MW	48,662-	188-	89-C	
K5MR	26,289-	127-	69-C	
WK5K	17,400-	100-	58-B	
NZ5M	8,316-	63-	44-B	
K5WXZ	1,827-	29-	21-C	-160
K5RR (WD5K,op)				
	162,000-	600-	90-C	-40
NX5H	23,825-	145-	55-C	-40
W5FO	138,972-	626-	74-C	-20
KA5W	162,960-	679-	80-C	-15
W5VCS	11,880-	88-	45-B	-15
W5LKP	8,775-	75-	39-B	-15
W5BOS	5,247-	53-	33-C	-10

Oklahoma

W9RRV/5	17,523-	99-	59-C	
N8CL	3,564-	44-	27-B	-80

South Texas

AD5Q	541,026-	774-	233-C	
N5HB	79,296-	236-	112-B	
W5XD	70,731-	271-	87-C	
N5DEE	67,527-	183-	123-C	
W5NR	28,512-	144-	66-C	
KA5IAU	19,344-	104-	62-B	
N5JEE	4,644-	43-	36-B	
W5WQN	12,423-	101-	41-C	-80
KE5JA	12,144-	92-	44-C	-80
K5TSQ	3,864-	46-	28-C	-80
W5VX	202,704-	624-	82-C	-15
W5ASP	142,200-	600-	79-C	-15

West Texas

KD5IA	1,080-	24-	15-C	-80
WB5UDX	48,195-	255-	63-C	-15
WF5E	17,061-	121-	47-C	-15

6

East Bay

VE2AQS/W6	390,852-	693-	188-C	
K6ATV	143,157-	401-	119-B	
W6FSJ	98,154-	287-	114-C	
KS6H	92,367-	311-	99-C	
K6TS	17,955-	105-	57-B	
K6CSL	13,440-	112-	40-B	
WZ6Z	3,813-	41-	31-C	
AK5Q/6	1,512-	28-	18-C	
W6RJ	70,584-	346-	68-C	-80
W6BSY	40,850-	271-	50-C	-15
K6SIK	4,368-	52-	28-B	-10

Los Angeles

W6AE	322,830-	833-	170-C	
WK6V	175,938-	413-	142-C	
N6AA	168,705-	345-	183-C	
K6EID	146,916-	371-	132-C	
ND6G	113,982-	314-	121-C	
K6EV	57,909-	199-	97-C	
NE6I	50,367-	183-	103-C	
W6NNV	48,384-	188-	98-B	
N6IBP	43,092-	171-	84-B	
K6HMA	23,850-	159-	50-C	
K7EG	19,170-	142-	45-C	
W6AUG	15,840-	80-	66-C	
NK6A	15,582-	108-	49-C	
N6IC	14,061-	109-	43-C	
W6ABW	12,183-	131-	31-C	
K1EQA	9,900-	110-	30-A	
W6FA	8,664-	76-	36-B	
W8AKS/6	8,610-	82-	35-B	
W6CN	8,241-	67-	41-B	
W6MFC	5,655-	65-	29-C	
N6AW	15,876-	147-	36-C	-80
K6ICS	66-	11-	2-A	-40
WA6TLA	20,160-	140-	48-B	-20
W6EL	147-	7-	7-C	-20
K5KT	82,080-	456-	60-C	-15

Orange

W6BA	253,980-	510-	166-C	
W6TZD	58,590-	217-	90-C	
K6VI	45,264-	164-	92-C	
WB6OKK	9,840-	80-	41-C	
K6RR	58,968-	378-	52-C	-40

Santa Barbara

K6DC	193,158-	441-	146-C	
W6UJX	130,063-	331-	131-C	
WA6FGV	72,864-	276-	88-C	
AA4Q	23,760-	132-	60-C	
AA6EQ	8,532-	79-	36-B	
N6VR	4,853-	47-	33-C	
N6ADI	134,748-	591-	76-C	-40
W7CB	4,050-	50-	27-C	-40

Santa Clara Valley

W6VG	132,696-	368-	114-C	
W6ERS	92,106-	301-	102-C	
W6FGD	68,970-	209-	110-C	
K6RQ	67,374-	197-	114-C	
AD6E	64,881-	287-	81-B	
W6XR	63,300-	211-	100-C	
N6NF	59,625-	265-	75-B	
NC6S	29,820-	140-	71-C	
K6CXT	28,152-	136-	69-C	
W6PLJ	26,544-	158-	56-B	
KE6OT	25,200-	140-	60-B	
K6WD	22,896-	144-	53-C	
W6YVK	15,732-	138-	38-A	
W6PHF	6,708-	62-	43-B	
W6SYL	5,445-	55-	33-C	
WB6YIR	2,775-	37-	25-B	
KD6XY	2,772-	33-	28-B	
KA6HSM	1,155-	35-	11-C	-40
W6QHS	204,072-	773-	88-C	-20
N6TU (K6XO,op)				
	164,475-	645-	85-C	-20

San Diego

W6UQF	270,216-	558-	162-B	
KW6Q	57,057-	247-	77-A	
K6MC	40,299-	133-	101-C	
K6NA	31,680-	132-	80-C	
W6JVA	29,754-	174-	57-B	
W6BZE	27,360-	160-	57-C	
AA6EE	1,887-	37-	17-B	
W6ZT	28,313-	179-	49-C	-20
AA4M	3,196-	41-	28-C	-10

San Francisco

W6JTI	391,776-	742-	176-B	
K6ZUR	57,534-	223-	86-C	
WA6LLY	23,058-	122-	63-B	
W6PM	13,509-	79-	57-C	
WT6V	11,088-	112-	33-C	
WA6CTA	2,178-	33-	22-C	
K6ILM	330-	11-	10-A	
KD6NT	252-	14-	6-B	

San Joaquin

N6EA	54,000-	150-	120-C	
K6DT	50,736-	151-	112-C	
W6BYH	43,407-	158-	91-C	
N6OT	28,728-	133-	72-C	
W6BVM	5,856-	61-	32-C	
WB6ITM	5,184-	54-	32-C	
W6FAH	1,140-	20-	19-C	

Sacramento Valley

N6JV	254,508-	508-	167-C	
KV6H	222,000-	592-	125-C	
K6SG	137,295-	339-	135-C	
K6DR	133,028-	379-	117-C	
W6REC	120,345-	355-	113-C	
W6NKR	114,372-	353-	108-C	
K6RK	24,003-	127-	63-C	
N6GG	132,825-	575-	77-C	-20
K6PU	156,670-	815-	86-C	-15
N6JM	12-	2-	2-B	-10

7

Arizona

KC7V	308,720-	568-	180-C	
NG7S	115,884-	333-	116-B	
KX7J	58,232-	213-	88-C	
N7IR	26,820-	159-	60-B	
W2HTX	11,880-	99-	40-B	
K7GM	6,156-	54-	38-B	
AA7A	24,804-	159-	52-C	-80
WE7G	36,366-	319-	38-C	-20
K5LL/7	181,920-	756-	80-C	-15
WB7FDQ	58,650-	326-	60-B	-15
W7AYY	26,772-	194-	48-C	-15

Idaho

K8RN	80,478-	263-	102-C	
WA7GVM	46,926-	158-	99-C	
N7HJM	18,645-	113-	55-B	
W7QDM	2,244-	34-	22-C	
KA7T	46,746-	318-	49-C	-40

Montana

KS7T	173,250-	525-	110-C	
KS7V	90,072-	278-	108-B	
K7ABV	3,960-	60-	22-C	-80
W6ALQ	30,528-	212-	48-C	-20

Nevada

NC7K	129,210-	590-	73-C	-20

Oregon

K5MM/7	971,520-	1408-	230-C	
AI7B	743,535-	1209-	205-C	
W7YAQ	300,144-	592-	169-B	
AD7T	61,938-	222-	93-C	
KS7P	27,666-	159-	58-B	
KA7FEF	14,160-	118-	40-B	
KQ7I	2,745-	61-	15-C	-10

Utah

W7HS	97,971-	289-	113-C	
KE7NS	57,597-	263-	73-B	
WB7TSS	1,320-	44-	10-A	
N7JLC	504-	14-	12-C	

Washington

N7TT	401,280-	836-	160-C	
K7DZ	208,050-	475-	146-C	
K7WA	139,380-	404-	115-B	
W7IIT	123,264-	428-	96-C	
N7RO	97,443-	401-	81-C	
N7HUS	70,080-	292-	80-B	
W7QN	60,009-	241-	83-C	
W7DG (WA7ILC,op)				
	59,738-	262-	76-C	
W7IEU	47,025-	209-	75-B	
K7SS	44,460-	228-	65-A	
K7RIE	44,457-	203-	73-C	
W7NEJ	39,372-	193-	68-C	
W7LGG	38,592-	192-	67-C	
K9JF/7	28,776-	218-	44-C	
N7EPD	18,848-	158-	38-B	
W7EKM	11,322-	111-	34-C	
W7VIH	432-	18-	8-B	
NX7K	201,939-	811-	83-C	-20
W7TJ	95,211-	447-	71-C	-20

Wyoming

WG7M	64,791-	313-	69-C	
WC7S	432-	18-	8-C	-160
K7MM	8,730-	97-	30-B	-15

8

Michigan

K8CC	1,317,180-	1514-	290-C	
W8VSK	226,548-	408-	186-A	
W8WVU	83,895-	235-	119-B	
WB8SFF	7,728-	58-	46-C	
WA8RTP	14,040-	90-	52-C	-40
W8UVZ	6,318-	54-	39-C	-40
N8CXX (K8JM,op)				
	257,805-	1011-	85-C	
K8QWG	6,630-	65-	34-B	
W8TJQ	21,150-	141-	50-C	

Ohio

WB3KKX	780,252-	1012-	257-C	
K9ALP	281,000-	485-	200-B	
W8RSW	259,752-	548-	158-C	
K3JT	229,896-	412-	186-C	
W8ZCO	89,271-	273-	109-C	
W8QOC	88,704-	231-	126-B	
W8YGR	80,816-	181-	112-B	
N8AM	58,473-	219-	89-B	
W8ETU	53,148-	172-	103-C	
W8NPF	52,332-	196-	89-C	
W8UPH	32,832-	152-	72-C	
K8MR	31,418-	154-	68-C	
N8BC	26,910-	130-	69-C	
K8EF	26,784-	96-	93-B	
WB8YJF	25,092-	123-	68-C	
W8IDM	24,570-	117-	70-B	
N8CB	13,035-	79-	55-B	
W8PN	7,473-	53-	47-C	
N8AGU	2,835-	35-	27-B	
WB8JBM (KW8N,op)				
	5,775-	55-	35-C	
WD8LLD	232,815-	913-	85-C	
AF8C	252-	14-	6-B	
KA8DJZ	43,968-	229-	64-C	
W8IQ	1,080-	24-	15-B	

West Virginia

N8II	161,898-	446-	121-A	
K8OQL	8,775-	75-	39-C	
WA8YCG	3,105-	45-	23-C	
KC8JH	960-	20-	15-B	
W8UMR	26,790-	190-	47-B	

9

Illinois

K9ZO	467,106-	731-	213-C	
NJ9C	125,550-	310-	135-B	
N9TI	116,640-	324-	120-C	
K9UIY	96,558-	242-	133-B	
NU9R	95,850-	225-	142-C	
W9AG	64,350-	195-	110-C	
W9EBY	31,464-	138-	76-C	
W9TNZ	27,720-	110-	84-B	
K9PPW	27,645-	97-	95-B	
K9PNG	23,310-	105-	74-A	
K9EIJ	13,284-	82-	54-A	
W9REC	8,448-	64-	44-B	
KG9N	1,140-	20-	19-B	
KE9U	11,340-	84-	45-C	
K9KA	55,202-	362-	88-C	
K9QVB	77,274-	318-	81-C	
K9RN	32,040-	178-	60-B	
W9IL	1,530-	30-	17-B	

Indiana

W9RE	1,531,008-	1772-	288-C	
W9KTP	82,818-	258-	107-C	
K9HCX	38,508-	132-	98-B	
NE9Z	30,576-	112-	91-C	
KD9YB	3,552-	37-	32-B	
KB8AC	330-	11-	10-C	
AG9S	27,216-	162-	56-C	
KK9V	75,960-	422-	80-C	
W8UD/9	51,813-	303-	57-C	
K9VQK	4,200-	56-	25-C	
WB9NQQ	390-	13-	10-B	

Wisconsin

K9CAN	695,885-	845-	239-C	
NB9C	233,310-	505-	154-C	
N9ER	158,288-	352-	148-C	
NE9U	153,873-	417-	123-C	
NI9C	86,190-	221-	130-B	
W9HE	80,894-	199-	102-B	
K9OSH	39,411-	151-	87-C	
NG9L	22,484-	117-	64-B	
W9CBE	16,182-	93-	58-C	
W9DYG	14,025-	85-	55-C	
N9EZ	10,800-	80-	45-B	
W9GXR	10,800-	100-	36-C	
W9YCV	2,604-	31-	28-B	
W9WAQ	24,360-	145-	56-C	
N4TZ	43,200-	225-	64-C	
W9OP	28,215-	209-	45-C	
WA9TZE	8,811-	89-	33-C	
W9GIL	5,376-	56-	32-C	
N9BUS	240-	10-	8-B	

0

Colorado

N2IC/0	1,415,232-	1728-	273-C	
N6ZA	166,110-	490-	113-C	
KJ6G	136,552-	353-	128-C	
W9GOR	96,631-	281-	117-B	
W8ZV	33,048-	162-	68-B	
N6FFZ	30,810-	158-	65-B	
K9ZFL	20,661-	97-	71-B	
N6GOS	16,848-	108-	52-B	
N6CNV	16,536-	104-	53-A	
N6HOT	11,880-	88-	45-B	
NN0M	9,910-	90-	33-C	
NX0Q	4,872-	58-	28-A	
NY8R	4,620-	55-	28-C	
W0TX (K9BQL,op)				
	1,125-	25-	15-B	
W0ZV	8,178-	94-	29-C	
N0TK	1,512-	24-	21-C	
K9AY	66,816-	348-	64-C	
K0OST	8,019-	81-	33-B	
W0UO	162,819-	687-	79-C	

wa

SM	420,552-	792-	177-C	
ØY	121,806-	303-	134-C	
ØZRL	72,834-	199-	122-C	
ØP	70,992-	232-	102-C	
NZ	64,575-	205-	105-A	
ØM	47,268-	202-	78-B	
NIM	35,235-	145-	81-B	
3C	24,408-	113-	72-B	
GT	24,398-	107-	76-C	
ØO	24,354-	123-	66-C	
ØW	22,605-	137-	55-B	
MJN	10,152-	72-	47-C	
WP	202,236-	887-	76-C	-20
9H	42,480-	236-	60-C	-15
ØQ	27,060-	184-	55-B	-15

nsas

ØTKJ	101,382-	277-	122-C	
ØYJT	40,044-	142-	94-B	
UY	27,648-	128-	72-B	
9G	115,911-	477-	81-C	-40
8U	24,108-	184-	49-C	-20

nnesota

ØR	79,980-	215-	124-C	
ØQ	25,515-	105-	81-C	
LP	18,522-	98-	63-C	
RXL	6,696-	62-	36-C	-40
0T	174,174-	754-	77-C	-20

ssouri

ILC	229,320-	384-	210-C	
0I	43,512-	148-	98-C	
ØB	20,160-	96-	70-C	
3L	2,088-	29-	24-C	
4P	363-	11-	11-B	
4G	9,828-	78-	42-C	-80

rth Dakota

ØO	67,326-	229-	98-C	
ØQ	34,866-	149-	78-C	
ØCU	3,816-	53-	24-C	-20

braska

4	140,751-	401-	117-C	
ØW	16,470-	90-	61-C	

uth Dakota

EE	109,710-	265-	138-C	
ØNSY	7,680-	80-	32-C	

ritime-Newfoundland

MP	931,500-	1350-	230-B	
KB	22,440-	110-	68-C	
CA	12,753-	109-	39-C	
AW (VO1AW,op)	7,668-	71-	36-C	
QU	270,354-	1099-	82-C	-20
AC/1	432-	16-	9-C	-20
BNN	4,437-	51-	29-C	-10

sbec

AYU	519,711-	907-	191-C	
UL	3,108-	37-	28-B	
FFE	1,350-	30-	15-C	-20

tario

KP	497,880-	922-	180-C	
NBE (VE3NBE,op)	74,025-	235-	105-B	
TEE	9,603-	97-	33-B	
CUI (VE3CUI,op)	7,770-	70-	37-C	-80
MVP (VE3MVP,op)	121,140-	673-	60-C	-20
ST	15,840-	165-	32-C	-20
CB/3	170,100-	700-	81-C	-15
NXQ (VE3NXQ,op)	39,780-	221-	60-C	-15
AEJ/3	4,284-	51-	28-C	-10

nitoba

AEX	47,256-	179-	88-C	

erta

RA/6	159,084-	491-	108-C	
APN (VE6APN,op)	7,176-	104-	23-B	-15

ish Columbia

DTA	6,880-	74-	30-B	
COP	2,703-	53-	17-C	
FPT	648-	24-	9-C	-80

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gle Transmitter

C (KB1T,KF1V,KM1P,NK1F,ops)	1,632,960-	1728-	315-C	
R (+K1IR,KC1GS,NB1Y)	1,512,420-	1820-	277-C	
H (+NET)	1,363,074-	1447-	314-C	
R (+NET)	898,875-	1175-	255-C	
X (+AK1L)	528,885-	805-	219-C	
R (+NET)	494,937-	797-	207-C	
CI (+NET)	385,296-	698-	184-C	
I (+NET)	332,568-	598-	186-C	
B (+NET)	249,300-	554-	150-B	
O (+NET)	212,148-	498-	142-C	
CB (+NET)	184,635-	373-	165-C	
OP (KZ1K,N1AKO,ops)	146,187-	439-	111-C	
K1TR (+NET)	146,160-	336-	145-C	
NC1M (+NET)	116,235-	315-	123-C	
K1CC (+NET)	82,080-	285-	96-C	
KB1H (+K1GX,KB1I)	75,756-	236-	107-C	
NJ1V (+NET)	60,840-	195-	104-C	
W1GG (+NET)	23,562-	102-	77-C	
KA1MP (+NET)	22,032-	108-	68-C	
N1AU (+NET)	21,105-	105-	67-C	
W1KKS (NK1P,WB9IHH,ops)	1,860-	31-	20-B	

2

KY2J (+KA2TIP,KU2Q,NA2N,WB2Q)	1,700,244-	1638-	346-C	
NF2L (+K2SU)	1,372,434-	1594-	287-C	
NY2L (+NET)	1,224,423-	1347-	303-C	
K2WI (+WA2IUO)	920,295-	1203-	255-C	
NG2X (+W2HG)	595,776-	928-	214-C	
W2RR (KA2WIK,WA2s AOG,MBM, WB2ABD,ops)	566,115-	803-	235-C	
K2QMF (+KA2UJH)	438,345-	765-	191-C	
W2UI (+N3KR)	328,248-	582-	188-C	
WB2P (+NET)	15,840-	80-	66-C	

3

K3WW (+NET)	1,911,896-	1842-	346-C	
W3XU (+NET)	1,644,300-	1890-	290-C	
K3ZA (+W3MA)	1,547,325-	1725-	299-C	
N3LR (+NJ3C)	970,320-	1244-	260-C	
KB3MM (+K3IE,N3ARK,WB3s FIZ,LFZ)	792,000-	1056-	250-C	
WB3CAC (+NET)	620,208-	876-	236-C	
KS3F (+NE3F)	604,800-	900-	224-C	
K3BSY (+K3RN)	490,860-	810-	202-C	
K3UEI (+NET)	480,816-	756-	212-C	
K3UC (+AJ3H,K3VDU)	446,775-	805-	185-C	
W3AZ (+NET)	308,967-	569-	181-C	
W3KWH (K3TP,KA3s KSD,OYI,KT3L, N3EQF,WA3TTS,WB3EML,ops)	231,861-	427-	181-C	
K3NZ (+KU3X)	222,651-	519-	143-C	
K3YO (+K3ANS,KC3II,KU3K,N3EYT)	126,480-	310-	138-B	
K3ND (+NET)	99,246-	238-	139-C	
KB3HH (+NG1W)	72,867-	227-	107-C	
WA3IJZ (+NET)	27,342-	147-	62-C	

4

N4KG (+KC4ZV)	1,375,668-	1442-	318-C	
N8LM (+K8HLB,W8MHS)	530,718-	898-	197-C	
N4LZK (+N4AU,WA4MTG)	131,868-	297-	148-C	
AA4NG (+WB8HDD)	72,667-	227-	107-C	
WS4F (+NET)	31,508-	118-	89-C	

5

WM5G (+AA5DX,K5s KJ,RX,KC5DX, KM5R)	1,570,668-	1606-	326-C	
N5RM (+WG5J)	950,355-	1293-	245-C	

6

AI6V (+NB6G,W6SZN)	1,236,668-	1564-	264-C	
KG6GF (+AA6Z,WA6HAT)	1,015,182-	1151-	294-C	
W6GO (+K6HHD)	869,886-	1086-	267-C	
N6VV (+K6s PJY,XV,WA0YOM)	682,224-	976-	233-C	
W6GP (+WJ6O)	363,600-	808-	150-C	
W6OAT (+WX5S)	308,385-	445-	231-C	
K4UVT/6 (+NET)	211,950-	471-	150-C	
KJ6V (+NET)	203,670-	465-	146-C	
K6MA (+NET)	190,476-	407-	156-C	
K2ITG/6 (+NET)	188,331-	439-	143-C	
W6BIP (+NET)	170,352-	338-	168-C	
K6LRN (+NET)	149,472-	346-	144-C	
W6TMD (+KB6RXF)	149,193-	411-	121-C	
KD6AZ (+NET)	105,456-	336-	104-B	
N6OJ (+NET)	64,428-	236-	91-C	
AE6H (+NET)	64,260-	255-	84-C	
W6CF (+NET)	53,628-	218-	82-C	
W6ET (+NET)	46,683-	171-	91-C	
W6SD (AA6FS,KB6s ENO,STD,N6s LGO, LIE,NXO,RGS,W6LPJ,WA6KYR, WB6OOX,WQ6P,ops)	45,732-	206-	74-C	
KA6BIM (+N6POF)	42,180-	185-	76-C	
W6RT (+NET)	34,170-	134-	85-C	
W6PKB (+W6TI)	32,571-	231-	47-C	
AG6Q (+NET)	24,543-	101-	81-C	
KE6WL (+NET)	23,256-	102-	76-C	
WX6M (+NET)	22,578-	106-	71-C	
NT8G (+NET)	11,868-	86-	48-C	
KG6AM (+NET)	11,232-	72-	52-C	
WB6ZUC (+NET)	9,588-	94-	34-C	
W6MZQ (+NET)	5,670-	54-	35-B	
N6ITY (+NET)	1,365-	35-	13-B	

7

KR7G (+KT7G,KW7Q,WA7BPI)	538,137-	1049-	171-C	
WA7EGA (+K7GS,NQ7M,WB7RBJ)	416,175-	775-	179-C	

8

W8FN (+NET)	1,048,350-	1205-	290-C	
W8CZN (+N8DCJ,W8JGU,WA8s BIN, DXG,RCN)	1,030,275-	1425-	241-C	
NF8R (+WA8DXB,WD8AUB)	873,264-	1288-	228-C	
W8EDU (AF8A,N8ARD,WB8WTS,ops)	270,906-	554-	163-C	

9

NA9J (+K9LJN)	605,826-	863-	234-C	
W9NNE (+N4CC,K9SD,WB9SBO,K8JPL, KA9GGI,KW8A,ND9F,W9HBH)	422,139-	631-	223-C	
KA9WPS (+WB9UGX)	9,306-	66-	47-C	

Ø

K4VX/Ø (+K9s BGL,FD)	1,484,403-	1591-	311-C	
ABØP (+WBØHCH)	351,540-	630-	186-C	
NØAT (+KBØMV,WAØM)	329,451-	569-	193-C	
WØNA (+WØs AR,CY,YR,WAØOZP)	205,242-	433-	158-C	

Two Transmitters

N3RS (+K3JJG,N3s NA,RD)	3,692,808-	2858-	431-C	
K2TR (+K2XA,WA2SPL,WB2KMY)	3,318,912-	2881-	364-C	
K8AZ (+K3TUP,K8s MR,NZ,KQ8M,N8s ATR,DMM,W8s HSK,KIC,WB8PHI, WD8IXE)	2,939,625-	2613-	375-C	
KY1H (+KB1W,KR1R,KY1K,N1EMG, NT2X)	2,824,620-	2630-	358-C	
N6RO (+K3EST,K6TMB,N6s IG,NE, WA6VEF)	2,788,560-	2582-	360-C	
W2RQ (+KR2J,KS1G,N2NT)	2,448,747-	2481-	329-C	
N2RM (+K2OWE,WA2HGM)	2,257,047-	2483-	303-C	
N2MG (+ops)	1,911,627-	2103-	303-C	
K2NJ (+ops)	1,619,079-	1793-	301-C	
K1XM (+AI3E,KQ1F)	1,498,722-	1591-	314-C	
KQ2O (+K2BK,NR2H)	1,154,588-	1318-	292-C	
AK6T (+K6ZM,KI6EZ,NB6L,NP4IW/W6)	898,805-	1345-	223-C	

Unlimited

W3LPL (+K1DQV,KA1GD,WB2EKK,K3RA, KM3T,N3GB,W3EKT,WB3JRU,NW5E, KC8C)	6,017,760-	4179-	480-C	
K1ST (+K1s DG,FWE,MNS,NB1H,NK1K, W1IHN,WB1AEL)	3,777,018-	3101-	406-C	
AA1K (+AD3V,K3WJV,N3FDL)	2,703,477-	2429-	371-C	
K1AR (+NET)	2,509,050-	2150-	389-C	
N6ND (+K6JYO,KI6MS,KZ6E,NI6W,W6s KUT,YA,K9VV)	2,491,983-	2301-	361-C	
WØAIH/9 (+KB9S,K0s FVF,PK,KI0F, KN0V,N0BSH,W0UC,WAØRBW)	2,349,270-	2310-	339-C	
W4MYA (+K4BAM,KX4S,W4s HJ,XR, WB4BVY)	2,175,264-	2324-	312-C	
NR5M (+K2s TNO,UA,K5s GA,GN,LZO, MA,TU,KE5IV,KG5U,KN5H,KZ5M,N5s DU,EA,IVF,NT5D,WB5N)	1,410,660-	1020-	461-C	
K2TD (+N2VW,WB2YOF)	645,792-	868-	248-C	

DX CW

Single Operator

Africa

Morocco

CN8FC	604,950-	1090-	185-B	

Canary Islands

EA8BIE	120,042-	351-	114-B	

Guinea-Bissau

J52US (K8MN,op)	1,042,272-	1551-	224-B	

Tanzania

5H1HK (WH6K,op)	863,511-	1507-	191-B	

Zambia

9J2AL	52,290-	415-	42-B	

Sierra Leone

9L1GG	91,152-	633-	48-C	-40

Zaire

9Q5NW (N4NW,op)	490,176-	1104-	148-C	

Asia

Korea

HL1XP	139,920-	530-	88-C	
HL9FN	4,830-	70-	23-B	
HL9CA	2,115-	47-	15-B	
HL1LW	10,692-	132-	27-B	-20

Saudi Arabia

HZ1HZ	386,128-	878-	139-C	

Japan

JA7FWR	845,208-	1548-	182-C	
JH7WKQ	763,047-	1437-	177-C	
JH7LVK	521,408-	1047-	166-C	
JA8FXO	260,997-	719-	121-C	
JA5JCC	243,198-	657-	118-C	
JH3CXL	215,232-	608-	118-C	
JA7SUR	213,510-	647-	110-B	
JA8KSD	190,494-	557-	114-C	
JH4UYB	169,776-	524-	108-B	
JR3BOT	140,544-	488-	96-C	
JA9CWJ	128,235-	415-	103-C	
JF3CCN	112,696-	448-	84-C	
JA7RHJ	81,672-	332-	82-A	
JA7JHT	66,160-	284-	80-B	
JR1GSE	52,704-	244-	72-B	
JHØSPE	48,678-	266-	61-B	
JE1AER	41,064-	236-	58-B	
JH3AIU	35,223-	199-	59-C	
JA1DFQ	33,562-	193-	58-B	
JJ1GQH	31,080-	185-	56-B	
JA8AJE	29,241-	171-	57-B	
JR1IOS	27,720-	165-	56-A	
JH9ETC	24,705-	183-	45-B	
JH7AJD/1	20,433-	139-	49-A	
JH3JYS	19,035-	141-	45-C	
JA2DN	13,824-	128-	36-A	
JA3QZW	13,632-	142-	32-B	
JAØHC	13,500-	125-	36-B	
JA1IZ	13,395-	95-	47-C	
JA6BWH	10,890-	110-	33-B	
JA4ATV	10,458-	83-	42-B	
JG1UZD	10,290-	98-	35-B	
JA3ARM	9,486-	93-	34-C	
JH7CJM	8,772-	86-	34-B	
JAØBR	8,325-	111-	25-B	
JA2WZ	6,075-	81-	25-B	
JA4FMS	6,075-	75-	27-C	
JA7TJ	5,994-	74-	27-B	
JA1BUN	5,490-	61-	30-B	
JH6NBW	5,265-	65-	27-B	
JA3EEM	4,956-	59-	28-B	
JR6IIB	4,140-	60-	23-B	
JH1NHY	3,630-	55-	22-B	
JA6HJP	3,264-	68-	18-B	
JA1KKA	3,120-	40-	26-C	
JA5IP	2,400-	50-	18-C	
JA3UWB	2,394-	57-	14-B	
JG3EHD	2,385-	53-	15-B	
JH1PXY	1,848-	44-	14-B	
JO1QZI	1,838-	36-	17-B	
JA1AAT	1,107-	41-	9-B	
JE1SPY	399-	19-	7-C	-160
JA5DQH	27,306-	222-	41-C	-80
JA1BWA	25,857-	221-	39-C	-80
JE4VVM	8,658-	111-	26-C	-80
JE7RJS	6,075-	81-	25-B	-80
JRØXOJ	2,442-	74-	11-B	-80
JH6TYD	1,692-	47-	12-B	-80
JA7YAB (JJ1NNJ,op)	1,386-	42-	11-C	-80
JA1SJV	165-	11-	5-B	-80
JA1YWX (JM1CAX,op)	65,550-	475-	46-C	-40
JAØUMV	49,833-	339-	49-B	-40
JAØJHA	35,916-	282-	41-C	-40
JH7VHZ	13,950-	150-	31-B	-40
JA6SHL	10,494-	108-	33-B	-40
JR7OMD/2	7,650-	116-	22-B	-40
JA7BE	2,379-	61-	13-C	-40
JE7ENK	1,620-	54-	10-B	-40
JF2LTH	990-	33-	10-B	-40
JR2IGV	525-	25-	7-B	-40
JM1SMY	126-	14-	3-B	-40
JM1SOX	38-	6-	2-B	-40
JA7HMZ	109,085-	661-	55-B	-20
JA3YKC	98,820-	610-	54-C	-20
JA2FJP	66,924-	429-	52-C	-20
JH1XUZ	61,200-	400-	51-C	-20
JR7CDL	24,921-	213-	39-B	-20
JM1AQU	24,420-	220-	37-B	-20
JH7QXJ	11,424-	136-	28-C	-20
JAØCGJ	9,300-	100-	31-C	-20
JA7MWC	3,843-	61-	21-B	-20
JA1VZM	3,465-	55-	21-B	-20
JF1MYI	2,508-	44-	19-B	-20
JA2KPV	2,387-	47-	17-B	-20
JA8RWU	83,634-	526-	53-B	-15
JHØKHR	74,235-	505-	49-C	-15
JF1SEK	44,676-	292-	51-B	-15
JO1QUB	38,100-	254-	50-B	-15
JF6DSZ	34,272-	272-	42-C	-15
JM1LRQ	27,192-	206-	44-C	-15
JA1WYQ	16,539-	149-	37-B	-15
JH7XGN	14,652-	148-	33-B	-15
JM1APN	12,969-	131-	33-B	-15
JH9KVF	6,240-	104-	20-B	-15
JL2AQX	6,075-	81-	25-B	-15
JA7ASD	5,967-	153-	13-B	-15
JR8OGB	4,050-	75-	18-A	-15
JI6BJQ	3,861-	99-	13-B	-15
JA1OP	1,710-	38-	15-B	-15
JA1EIA	912-	19-	16-B	-15
JA2FKG	729-	27-	9-C	-15
JA1YJR	48-	4-	4-B	-15
JA9RPU	2,556-	71-	12-B	-10
JH6WHN	132-	11-	4-B	-10
JH5GHM/1	42-	7-	2-B	-10

Mongolia

OK1XCJT	972-	54-	6-B	-20

Asiatic RSFSR

UWØLT	556,659-	1167-	159-C	
RAØFA	339,450-	775-	146-B	
RAØLDX	211,692-	598-	118-B	
UV9FM	83,025-	369-	75-B	
UZ9CWA	41,412-	203-	66-B	
UW9AG	22,932-	156-	49-B	
UAØQGB	20,448-	142-	48-B	
UA9XHT	18,450-	123-	50-B	
UA9AO	8,748-	81-	36-B	
UAØQHP	5,568-	64-	29-B	
UA9XAB	4,779-	59-	27-B	
UAØCS	135-	9-	5-B	
UAØFM	10,854-	134-	27-B	-80
UAØIDX	1,026-	57-	6-B	-80
UA9CBM	648-	24-	9-B	-80
UA9OF	19,680-	160-	41-B	-40
UV9FB	2,904-	44-	22-B	-40
UA9TX	41,100-	274-	50-B	-20
UA9XHJ	25,212-	191-	44-B	-20
UA8LCZ	7,614-	94-	27-B	-20
UA8KCL	6,000-	80-	25-B	-20
UA9SGN	4,002-	58-	23-B	-20
UA8SBQ	585-	15-	13-B	-20
UA9WNR	144-	8-	6-A	-15

Azerbaijan

UD6DKW	5,100-	68-	25-B	

Georgia

UF6CX	1,512-	28-	18-B	

Uzbekistan

UI8BAA	3,300-	55-	20-B	

Tadzhikistan

UJ8AQ	3-	1-	1-B	-80
UJ8JCM	2,052-	36-	18-B	-20
UJ8JA	1,428-	28-	17-B	-15

Kazakhstan

UL7BN	3,000-	50-	20-B	-20

Kirghizia

RM8MA	1,794-	46-	13-B	
UM8MAE	20,664-	168-	41-B	-20

Hong Kong

VS6UP	5,820-	97-	20-B	

India

VU2TJW	15,867-	123-	43-C	

Israel

W3FYT/4X	9,840-	82-	40-C	
4X/W1JR	27-	3-	3-C	

Europe

Andorra

C31LHJ	61,920-	258-	80-B	

Portugal

CT1BOH	196,206-	1234-	53-C	
CT1AOZ	34,440-	267-	40-B	-160
CT4DX	22,560-	188-	40-B	-40

Azores

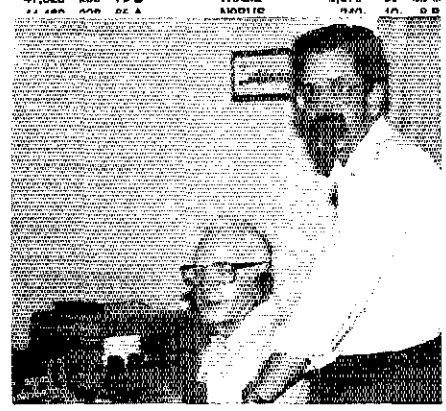
CU3AA	45,780-	436-	35-C	-10

Federal Republic of Germany

DL4BBO	1,073,754-	1914-	187-C	
DL7ON	720,372-	1388-	173-C	
DJ4OE	137,394-	449-	102-C	
DL8FBD	126,741-	509-	83-C	
DK8KC	74,538-	303-	82-B	
DJ6YI	72,738-	449-	54-C	
DL8SCG	22,794-	131-	58-C	
DL3SBI	21,000-	125-	56-C	
DF3QN	20,250-	135-	50-B	
DF4PD	17,760-	185-	32-B	
DL3SCR	16,686-	103-	54-C	
DL1NE	5,148-	52-	33-B	
DF4QP	2,664-	37-	24-C	
DK8ZB	58,455-	433-	45-C	-80
DK3KD	10,323-	111-	31-C	-80
DK5AD	6,723-	83-	27-C	-80
DJ6IF	4,380-	73-	20-C	-80
DL9LAI	1,089-	33-	11-B	-80
DL2ZAE	*60,030-*	*435-*	*46-C*	*-40*
DK2OY	22,347-	191-	39-C	-40
DF2UU	14,595-	139-	35-C	-40
DF3JD	2,499-	49-	17-C	-40
DL4RX	94,050-	570-	55-C	-20

Ralf, CE6EZ, captured first place 10-meter world phone.

Kunihiro, JL2RQH was active from Japan as a single-band 15-meter phone entrant with only 10-Watts output.



John, W1BIH and Pete, W1RM operated PJ9J and finished 3rd-place multi-single world on phone and-2nd place world on CW.

DF1SD	97,650-	451-	50-C	-20
DL6LH (DL6HCC,op)	59,100-	394-	50-B	-20
DJ2BV	53,136-	369-	48-B	-20
DL1EK	24,975-	225-	37-B	-20
DL1TH	22,200-	185-	40-B	-20
DL8NBW	14,364-	133-	36-C	-20
DK9TZ	165-	11-	5-C	-20
DL6IU (DL4AAE,op)	126,516-	811-	52-C	-15
DL6RAI	45,924-	358-	43-C	-15
DF4ZL	24,966-	219-	38-B	-15
Spain				
EA4EP	98,038-	302-	106-B	
EA7AAW	55,440-	240-	77-B	
EA3DBO	40,110-	191-	70-B	
EA5QR	31,536-	146-	72-C	
EA4EDU	17,934-	122-	49-B	
EA2CR	13,284-	108-	41-B	
EA3BOW	11,178-	81-	46-B	
EA7XC	756-	21-	12-B	-80
EA3IN	15,543-	157-	33-B	-40
EA7AZA	4,485-	65-	23-B	-40
EA5TX	1,092-	28-	13-B	-40
EA4AYX	7,308-	87-	28-B	-20
EA7FUR	21,762-	186-	39-B	-15
EA4EFK	15,732-	139-	36-B	-15
EA5DNO	3,960-	60-	22-B	-15
Ireland				
EI9J	58,085-	245-	79-B	
EI4DQ	4,872-	56-	29-A	
EI5DI	40,656-	309-	44-B	-15
France				
F6BEE	1,867,742-	2328-	239-C	
F6GCT	280,800-	780-	120-B	
F6EPQ	139,590-	423-	110-C	
F6AUS	68,376-	259-	88-B	
F6IJA	63,423-	261-	81-C	
F8TM	36,036-	156-	77-B	
FE1JCB	26,970-	155-	58-C	
F6BVB	25,428-	163-	52-B	
FD1MGZ	11,433-	103-	37-B	
F5AM	8,820-	84-	35-B	
F6EPO	5,100-	68-	25-B	
F6CCI	5,040-	56-	30-B	
FB1MNC	4,200-	50-	28-B	
FT5ZB	12-	2-	2-B	-160
F6HLC	49,920-	416-	40-C	-80
F8HLB	*20,976-*	*184-*	*38-B*	*-20*
F8DKV	55,842-	454-	41-C	-15
F8TQ	14,892-	146-	34-B	-15
England				
G4BUO	1,209,528-	1884-	214-B	
G3SJX	489,642-	1033-	158-B	
G3QT	297,171-	623-	159-B	
G3ESF	174,585-	515-	113-B	
G3APN	162,000-	432-	125-B	
G2HPF	120,528-	372-	108-B	
G4FDC	72,828-	289-	84-A	
G3HJF	53,295-	209-	85-B	
G3WRR	17,982-	111-	54-B	
G4BUE	14,850-	90-	55-A	
G6NK	11,880-	110-	36-B	
G3UIK	8,280-	60-	46-B	
G4ZME	5,325-	71-	25-B	
G3FXB	233,682-	1343-	58-B	-20
G3SXW	175,896-	1047-	56-B	-20
G3TXF	80,478-	528-	51-B	-20
G3MXJ	135,945-	855-	53-B	-15
G3CWL/A	3,600-	60-	20-A	-15
Northern Ireland				
GI4BBV	34,776-	168-	69-B	
Scotland				
GM3RAO	314,835-	755-	139-B	
GM3CFS	110,160-	340-	108-B	
GM3NHQ	66,759-	289-	77-B	
GM4CXM	142,968-	851-	56-B	-20
Wales				
GW3JI	178,659-	509-	117-B	
Hungary				
HA5PP/1	792,528-	1501-	176-B	
HA9RG	760,518-	1518-	167-B	
HA4XW	520,800-	1085-	160-B	
HA5AWH	376,470-	890-	141-B	
HA8XX	183,048-	526-	116-B	
HA5LZ	173,814-	491-	118-B	
HA5HH	138,672-	428-	108-B	
HA8NW	41,400-	230-	60-B	
HA4DB	37,080-	206-	60-B	
HA9TT	28,704-	208-	46-B	
HA7XL	21,195-	157-	45-B	
HA6NL	15,624-	124-	42-B	
HA8HG	8,880-	80-	37-B	
HA3MB	*5,124-*	*61-*	*28-B*	
HA4XG	1,275-	25-	17-B	
HA5MY	48-	4-	4-B	
HA3MY	47,880-	420-	38-B	-80
HA9RE	74,658-	541-	48-C	-40
HA8MK	72,864-	552-	44-B	-40
HA8ZO	35,919-	307-	39-C	-40
HA8HW	32,130-	306-	35-C	-40
HA5HO	124,578-	769-	54-C	-20
HA8NNN	121,632-	724-	56-B	-20
HA5KGT/7	53,550-	350-	51-B	-20
Switzerland				
HB9AGA	350,064-	816-	143-C	
HB9DDZ	73,320-	280-	94-C	
HB9KC	43,818-	218-	87-B	
HB9DFY	26,271-	139-	63-B	
HB9AGH	25,404-	146-	58-B	
HB9R/P (HB9QA,op)	90-	8-	5-B	-20
HB9DX	30,654-	262-	39-C	-15
HB9RE	2,052-	36-	19-B	-15
Italy				
I4IND	*226,545-*	*1373-*	*55-C*	
I8ZUT	160,704-	496-	108-B	
IK2AHB	126,048-	404-	104-B	
I2SVA	77,400-	344-	75-B	
IV3DXW	77,112-	306-	84-B	
I8KHP	54,747-	237-	77-A	
IK8FEC	39,982-	178-	73-B	
IK8EJN	32,802-	154-	71-C	
I8KHY	18,744-	142-	44-B	
IK4GNK	18,200-	108-	50-B	
I8IYW	15,087-	107-	47-B	
IK2GPQ	14,805-	105-	47-B	
IK2JEX	5,394-	62-	29-B	
I2UBI	87,300-	582-	50-C	-80
I3VHO	13,365-	135-	33-B	-80
I2MQP	185,136-	1102-	56-C	-40
IK4DCS	4,824-	67-	24-B	-20
IK2EGL	150,891-	949-	53-C	-15
I2UIY	130,356-	852-	51-C	-15
IK1ICC	100,968-	601-	56-C	-15
I2QIL	22,572-	209-	36-C	-15
I1XPQ	19,950-	175-	36-B	-15
IK4HLO	8,184-	88-	31-B	-15
Sardinia				
IS0OMH	181,080-	503-	120-B	
IS0XIE	90,000-	300-	100-B	
IS0LYN	28,728-	152-	63-A	
Norway				
LA9VDA	6,612-	76-	29-B	
LA6PB	4,800-	84-	25-B	
LA2EG	2,109-	37-	19-C	-80
LA7MFA	52,463-	443-	47-B	-20
LA9XG	28,248-	214-	44-C	-20
LA6DH	3,600-	60-	20-B	-20
LA8CE	1,782-	33-	18-B	-15
Bulgaria				
LZ1KNP	100,980-	340-	99-C	
LZ1KVZ	78,309-	339-	77-C	
LZ1KBL	42,336-	198-	72-B	
LZ1CW	35,376-	176-	67-C	
LZ1KZM	28,665-	195-	49-B	
LZ1FJ	2,394-	38-	21-B	
LZ2TU	144-	8-	6-C	-80
LZ1GC	85,800-	650-	44-C	-40
LZ1RU	49,140-	420-	39-C	-40
LZ1KOZ	17,238-	169-	34-C	-40
LZ1KBC	9,918-	114-	29-B	-40
LZ2CW	2,967-	37-	27-B	-40
LZ1KGB	87,804-	542-	54-C	-20
LZ1YG	18,432-	192-	32-B	-15
LZ1KVF (LZ1C-94,op)	13,464-	138-	33-C	-15
Austria				
OE9SLH	58,566-	227-	86-C	
OE3JOS	20,178-	114-	59-C	
OE2VEL	11,070-	123-	30-C	-40
Finland				
OH1AF	666,072-	1276-	174-C	
OH2BCI	211,356-	618-	114-C	
OH6VR	155,568-	463-	112-C	
OH3JF	67,680-	282-	80-C	
OH6NIO	63,048-	284-	74-B	
OH4RH	40,362-	217-	62-C	
OH3MC	26,076-	164-	53-B	
OH9UW	21,600-	150-	48-C	
OH2EJ	18,836-	122-	46-B	
OH6PA	13,338-	114-	39-B	
OH3NM	11,772-	109-	36-C	
OH3NPS	10,455-	85-	41-B	
OH2BQS	8,640-	67-	40-C	
OH6RC	5,022-	62-	27-B	
OH2KK	324-	12-	9-B	
OH2HE	45,671-	331-	47-C	-40
OH7MA	180,918-	1058-	57-C	-20
OH6YF	122,430-	742-	55-C	-20
OH2NRG (OH2BZD,op)	70,437-	443-	53-C	-20
OH5NFS	60,840-	390-	52-C	-20
OH3GD	38,844-	249-	52-B	-20
OH1EB	6,417-	69-	31-C	-20
OH2BJW	4,800-	64-	25-B	-20
OH3AC	3-	1-	1-B	-20
OH6AC	107,796-	691-	52-C	-15
OH7EU	10,508-	113-	31-B	-15
OH6NVC	8,742-	94-	31-B	-15
OH4NVX	5,292-	63-	28-B	-15
OH5RZ	4,176-	58-	24-C	-15
OH1MAR	1,620-	30-	18-B	-15
OH6NTO	1,298-	27-	16-A	-15
OH7NW	945-	21-	15-C	-15
OH3WD	756-	21-	12-C	-15
Czechoslovakia				
OK1RI	1,497,222-	2238-	223-C	
OK1VD	*497,550-*	*1070-*	*155-B*	
OK3CEI	174,570-	506-	115-B	
OK3YCA	103,323-	341-	101-B	
OK3FON	98,610-	346-	95-B	
OK3IF	81,576-	309-	88-B	
OK1KZ	66,040-	270-	84-B	
OK2HI	66,810-	262-	85-B	
OK3CEL	48,279-	209-	77-B	
OK1DVK	46,008-	216-	71-B	
OK1MNV	35,340-	190-	62-B	
OK1FBH	31,689-	173-	61-C	
OK3DU	19,125-	125-	51-B	
OK3CUG	18,252-	117-	52-A	
OK2PFP	17,952-	178-	34-B	
OK1ADS	12,642-	98-	43-C	
OK2SGW	11,349-	97-	39-B	
OK2PBG	10,920-	91-	40-B	
OK1MZO	10,800-	100-	36-B	
OK1AJY	9,657-	87-	37-B	
OK1OPT	5,751-	71-	27-B	
OK3CJE	2,961-	47-	21-B	
OK2KVI	1,428-	28-	17-B	
OK2PAW	891-	27-	11-A	
OK1DWJ	2,958-	58-	17-B	-160
OK2BQU	957-	29-	11-B	-160
OK1JDX	576-	18-	12-C	-160
OK3CWQ	270-	10-	9-C	-160
OK3CQD	27-	3-	3-C	-160
OK2FD	25,725-	245-	35-C	-80
OK3CGI	23,940-	228-	35-B	-80
OK2BFN	22,977-	207-	37-C	-80
OK1DRR	3,456-	64-	18-B	-80
OK2ABU	2,295-	51-	15-C	-80
OK1DRQ	189-	9-	7-A	-80
OK3YX	123,450-	823-	50-C	-40
OK2SG	13,410-	149-	30-C	-40
OK2BCI	9,396-	108-	29-C	-40
OK3TEC	2,142-	42-	17-B	-40
OK2BHY	106,272-	656-	54-C	-20
OK2KR	37,650-	251-	50-B	-20
OK2QX	32,670-	242-	45-B	-20
OK1ZL	26,004-	197-	44-C	-20
OK3CMW	15,162-	133-	38-B	-20
OK1DHJ	13,974-	137-	34-B	-20
OK1MHI	*9,393-*	*101-*	*31-B*	*-20*
OK1FZM	6,484-	101-	28-B	-20
OK2EC	7,728-	92-	28-B	-20
OK2SWD	6,399-	79-	27-B	-20
OK2BHQ	6,279-	91-	23-B	-20
OK1MKI	5,481-	87-	21-B	-20
OK3TPL	2,856-	56-	17-B	-20
OK3THM	2,583-	41-	21-B	-20
OK1DXW	2,400-	40-	20-B	-20
OK1JDJ	2,346-	46-	17-B	-20
OK3ZWX	1,632-	32-	17-B	-20
OK1ANS	792-	24-	11-B	-20
OK1AQW	660-	22-	10-A	-20
OK1DZD	480-	16-	10-A	-20
OK2PLH	17,442-	171-	34-A	-15
OK3IR	6,480-	72-	30-C	-15
OK2KHD	6,384-	76-	28-B	-15
OK1DZL	1,680-	28-	20-B	-15
Belgium				
ON5WL	13,959-	141-	33-B	-80
ON4XG	43,056-	312-	46-B	-20
ON5CW	33,561-	339-	33-B	-15
Denmark				
OZ1LO	976,819-	1703-	191-C	
OZ5KU	117,855-	405-	97-C	
OZ1DPW	44,100-	196-	75-B	
OZ1JVN	41,472-	216-	64-B	
OZ1W	32,565-	167-	65-B	
OZ5UR	11,475-	75-	51-B	
OZ1FTE	22,878-	186-	41-C	-80
OZ6PI	528-	16-	11-B	-40
OZ7YL	17,316-	158-	37-C	-20
OZ3PE	15,762-	142-	37-A	-20
OZ/FE1JDG	7,938-	98-	27-B	-20
OZ8E	1,302-	31-	14-B	-15
Netherlands				
PA8LOU	140,904-	456-	103-B	
PA3BTH	67,848-	257-	88-C	
PA3DUA	36,180-	180-	67-B	
PA8UV	31,164-	196-	53-B	
PA3EOB	23,040-	128-	80-B	
PA3AMA	11,316-	92-	41-B	
PA8CF	11,260-	94-	40-B	
PA3BNT	10,710-	85-	42-B	
PA3ACC	3,564-	44-	27-B	
PA8ADT	18,354-	161-	38-A	-20
PA8PLN	7,644-	91-	28-B	-20
PA3ENM	4,884-	74-	22-B	-20
PA9YN	1,248-	26-	16-B	-20
PA2REH	43,758-	374-	39-B	-15
Sweden				
SM6DHU	405,810-	1002-	135-C	
SM8TW	86,901-	349-	83-C	
SM6BZE	45,288-	229-	68-B	
SM5RE	20,550-	137-	50-C	
SM3CVM	20,130-	110-	61-C	
SM0DZB	16,870-	115-	46-B	
SM0LPC	15,015-	143-	35-B	
SM0OFW	10,296-	88-	39-B	
SM3SGP	7,656-	68-	44-B	
SM5CLE	7,242-	71-	34-A	
SM3OAU	1,932-	28-	23-B	
SM5CAK	312-	13-	8-C	-80
SM7OEL	11,818-	121-	32-C	-40
SK0LM (SM0DRD,op)	71,757-	469-	51-C	-20
SM7TV	12,268-	128-	32-B	-20
SM5NWX	13,050-	150-	29-B	-15
SM3CER	1,053-	27-	13-B	-15
Poland				
SP2FAP	123,735-	365-	113-B	
SP6CYX	68,085-	287-	85-B	
SP3CQP	41,535-	213-	65-B	
SP9AKD	39,576-	194-	68-C	
SP7CLB	29,646-	122-	81-B	
SP9BBH	26,226-	186-	47-B	
SP6CZ	24,723-	123-	87-B	
SP6BAA	20,436-	131-	52-B	
SP9DBE	12,426-	109-	38-B	
SP9PT	5,916-	66-	29-C	
SP3BYZ	4,050-	75-	18-C	
SP5CJQ	2,574-	39-	22-A	
SP2JS	*10,530-*	*135-*	*26-C*	
SP2ZT	3,780-	60-	21-B	
SP3JTR	3,782-	57-	22-B	
SP3RBR	85,104-	591-	48-C	
SP6HEK	35,742-	259-	46-B	
SP8JMA/A	7,857-	97-	27-B	
SP3HC	3,780-	70-	18-B	
SP8LTF	30,294-	297-	34-C	
SP2JKC	20,424-	184-	37-B	
SP3LPR	18,684-	173-	36-B	
SP2EWQ	4,092-	62-	22-B	
SP2BME	4,026-	61-	22-B	
SP4GFG	1,620-	36-	15-A	
Greece				
SV1UG	2,266-	42-	18-B	
Iceland				
TF3SD	10,815-	103-	35-B	
Franz Josef Land				
UA1OT	26,334-	209-	42-B	
RZ1OWA	2,646-	42-	21-B	
Kaliningrad				
RA2FB	2,337-	41-	19-B	
European Russian RSFSR				
RU1DZ	335,790-	861-	130-B	
UA1ZO	259,608-	746-	116-B	
UZ6HO	11,484-	116-	33-B	
UA3ST	8,820-	84-	35-B	
UA4ANZ	8,532-	79-	36-B	
UA3UCD	3,568-	46-	26-B	
UA3TG	3,240-	45-	24-B	
RA3DX	3-	1-	1-A	
UA4AO	60-	5-	4-B	
UA6LJT	*20,475-*	*175-*	*39-B*	
UW6NV	10,892-	132-	27-B	
RA4PC	10,272-	107-	32-B	
UA6BPM	14,178-	139-	34-B	
UA3ICJ	7,533-	81-	31-B	
UA6LFQ	7,047-	81-	29-B	
UZ1AWO	3,888-	56-	22-B	
UA1QBV	3,360-	56-	20-B	
RA3DJA	1,836-	35-	17-B	
RA3AS	312-	13-	8-B	
UA3DPX	240-	10-	8-A	
RW3AH	13,770-	135-	34-B	
RZ3DZ	8,484-	101-	28-B	
UW3UO	7,245-	105-	23-B	
UA6BPM	4,158-	66-	21-B	
UA3QJC	1,998-	37-	18-B	
UA3TAM	18-	3-	3-B	
Ukraine				
UB5UAT	164,500-	492-	125-B	
RT5UO	79,992-	303-	88-B	
UB5IAL	70,668-	302-	78-B	
UB5BZ	53,360-	264-	80-B	
UB5QJN	58,712-	278-	68-B	
UB6ZZ	26,998-	186-	46-B	
RB5SA	12,672-	128-	33-B	
UY5JC	7,176-	92-	26-B	
RB5EX	4,356-	56-	26-B	
UB5IFN	16,833-	181-	31-B	
RB5BM	10,608-	104-	34-B	
UW5WF	7,344-	102-	24-B	
RT5UY	5,382-	78-	23-B	
UB5UHD	3,300-	55-	20-B	
UB5CDX	480-	20-	8-B	
UB4FWC (UB5FBV,op)	38,142-	326-	39-B	
UB5ILW	32,382-	257-	42-B	
RB5HM	25,308-	222-	36-B	
UB5ZX	7,332-	94-	26-B	
UB5AEO	1,050-	25-	14-B	
RB5HB	900-	25-	12-B	
RB5QL	630-	21-	10-B	

QKC	600-	20-	10-B	-40
GHR	36,696-	278-	44-B	-20
MMP	29,118-	211-	46-B	-20
INT	14,400-	150-	32-B	-20
VK	14,076-	138-	34-B	-20
VT	9,504-	96-	33-B	-20
IKN	6,552-	84-	28-B	-20
AJP	2,904-	44-	22-B	-20
CL	1,092-	28-	13-B	-20
QW	1,014-	26-	13-B	-20
UH	26,640-	240-	37-B	-15
WR	8,250-	110-	25-B	-15
VW	3,975-	53-	25-B	-15
ZEL	75-	5-	5-A	-15

lorussia

AT	5,880-	70-	28-B	
WCY	5,460-	70-	26-A	
ADM	3-	1-	1-B	-80
ADX	11,682-	118-	33-B	-40
OCH	33,240-	277-	40-B	-15

davia

ON	28,718-	146-	61-B	
OBD	1,596-	28-	19-B	
OA	7,812-	93-	28-B	-40

usnia

BMQ	32,340-	196-	55-B	
PAQ	22,152-	142-	52-B	
BKJ	9,765-	93-	35-B	
BI	29,298-	257-	38-B	-80
BIP	6,396-	82-	26-B	-80
BIC	5,040-	80-	21-B	-80
OU	720-	24-	10-B	-40
BZ	21,660-	190-	38-B	-20
BEI	15,876-	147-	36-B	-20
BNH	12,753-	109-	39-B	-20

la

GWW (UQ2-037-116,op)				
	696,150-	1365-	170-B	
GN	121,014-	747-	54-B	-20
GMC	9,306-	94-	33-B	-20
GEO	7,743-	89-	29-B	-20
GEC	330-	11-	10-B	-20
GP	19,425-	175-	37-B	-15
GLW	5,850-	78-	25-B	-15

nia

RJ	10,506-	103-	34-B	-40
RNG	2,160-	45-	16-B	-20

an Democratic Republic

K	1,075,521-	1877-	191-C	
L	919,092-	1604-	191-C	
M	876,843-	1563-	187-C	
E	241,173-	633-	127-C	
O	191,862-	561-	114-C	
O	136,425-	428-	107-C	
O	119,196-	462-	86-C	
F	85,044-	373-	76-B	
VF	77,256-	348-	74-B	
F	48,231-	233-	69-B	
H	46,215-	237-	65-B	
C/				
RE	44,928-	208-	72-B	
M	44,556-	188-	79-B	
M	43,365-	245-	59-B	
M	42,120-	234-	60-B	
D	38,025-	195-	65-B	
A	36,864-	192-	64-B	
A	35,046-	177-	66-C	
D	34,596-	186-	62-B	
VI	33,567-	167-	67-B	
E	31,860-	177-	60-B	
M	30,420-	156-	65-B	
E	29,484-	156-	63-B	
O	25,326-	134-	63-B	
M	24,021-	157-	51-B	
E	23,016-	137-	56-B	
H/A	22,950-	153-	50-B	
O/A	22,680-	135-	56-C	
E	21,291-	151-	47-B	
VP	20,139-	137-	49-B	
	18,630-	138-	45-B	
E	15,795-	117-	45-C	
H	14,238-	113-	42-B	
F	10,296-	88-	39-B	
E	10,197-	103-	33-A	
N	9,840-	82-	40-C	
K	8,748-	81-	36-B	
A	8,295-	79-	35-B	
E	8,184-	88-	31-B	
K	8,094-	71-	38-B	
E	7,770-	70-	37-B	
E	6,882-	74-	31-B	
S	5,841-	59-	33-B	
VA	5,040-	60-	28-C	
	5,040-	70-	24-B	
F/A	4,524-	52-	29-B	
E	3,312-	46-	24-B	
A	2,967-	43-	23-B	
VP	2,679-	47-	19-B	
9	2,400-	40-	20-A	
N	1,890-	35-	18-B	
	1,665-	37-	15-C	
	798-	19-	14-B	
S	891-	27-	11-C	-80
	120-	8-	5-A	-80
J	15,048-	152-	33-B	-40
	8,148-	97-	28-C	-40
	3,876-	68-	19-B	-40
A	1,827-	29-	21-B	-40
	1,221-	37-	11-B	-40
	600-	20-	10-C	-40
	297-	11-	9-C	-40

Y54ML	254-	11-	8-C	-40
Y32KE	75,660-	485-	52-C	-20
Y22EK	42,900-	286-	50-B	-20
Y54UE	26,703-	207-	43-C	-20
Y22BK	26,574-	206-	43-B	-20
Y39ZH	23,736-	172-	46-C	-20
Y39FA	13,068-	132-	33-B	-20
Y71VG	11,583-	117-	33-B	-20
Y23GB	9,630-	107-	30-B	-20
Y27QO	8,370-	90-	31-C	-20
Y51YJ	8,316-	99-	28-B	-20
Y26SO	7,380-	82-	30-B	-20
Y23HN	7,224-	86-	28-B	-20
Y87WL/A	7,110-	79-	30-C	-20
Y21CL	6,699-	77-	29-B	-20
Y21UL	6,660-	74-	30-B	-20
Y24JJ	6,240-	80-	26-C	-20
Y21GO	5,304-	68-	26-B	-20
Y59ZF	4,950-	75-	22-B	-20
Y24VK/A	3,990-	70-	19-C	-20
Y48PJ/P	3,480-	58-	20-B	-20
Y77YH	3,477-	61-	19-B	-20
Y44SO	3,300-	50-	22-C	-20
Y58WA	3,120-	52-	20-B	-20
Y24TG	2,916-	54-	18-A	-20
Y51QL	2,394-	42-	19-C	-20
Y23HJ	2,106-	39-	18-B	-20
Y22YJ	2,040-	40-	17-B	-20
Y23TL	1,920-	32-	20-A	-20
Y23JN	1,620-	36-	15-A	-20
Y25TO	1,260-	30-	14-C	-20
Y62NN	1,050-	25-	14-B	-20
Y92ZL	828-	23-	12-B	-20
Y25PE	144-	8-	6-B	-20
Y22PF	25,092-	204-	41-B	-15
Y21YA	10,137-	109-	31-B	-15
Y32NL	8,988-	107-	28-B	-15
Y36VM	8,316-	77-	36-B	-15
Y83XN	8,025-	107-	25-B	-15
Y44QN	7,290-	90-	27-B	-15
Y57ED	4,224-	64-	22-B	-15
Y23QD	3,630-	55-	22-B	-15
Y61XM	3,339-	53-	21-B	-15
Y32RA	2,550-	50-	17-C	-15
Y23YE	2,250-	50-	15-B	-15
Y31ON	1,125-	25-	15-B	-15
Y26DM	975-	25-	13-B	-15

Romania

YO6KOS	20,424-	148-	46-B	
YO4BEX	11,178-	81-	46-B	
YO3NL	17,784-	156-	38-B	-40
YO8CDQ	10,092-	116-	29-B	-40
YO8CHH	2,538-	47-	18-B	-40
YO5AVN/3	663-	17-	13-B	-40
YO4DCF	273-	13-	7-B	-40
YO6ADW	1,776-	37-	16-A	-20
YO4ZF	11,664-	108-	36-B	-15
YO3RX	4,875-	65-	25-B	-15

Yugoslavia

YU2TS	530,565-	1141-	155-C	
YU7SF	133,728-	398-	112-B	
YU2TY	116,352-	384-	101-A	
YU7KM	46,413-	191-	81-C	
YU4RR	31,860-	180-	59-B	
YU1RA	3,354-	43-	26-B	
YU2TW	10,530-	135-	26-B	-160
YU4BR	7,410-	95-	26-B	-160
YU2NW	38,205-	283-	45-C	-80
YU3MM	13,764-	148-	31-B	-80
YU1EA	2,736-	48-	19-B	-80
4N4L (YU4OO,op)				
	181,335-	1099-	55-C	-40
YT7A	124,500-	830-	50-C	-40
YT3AU	45,279-	351-	43-B	-40
YU1TT	19,635-	187-	35-B	-40
YU2HCD	14,136-	152-	31-C	-40
YU3SX	1,722-	41-	14-B	-40
YT3T	125,064-	772-	54-C	-20
YU7FN	103,194-	637-	54-C	-20
YU3AI	115,992-	716-	54-C	-15
YU4EBL	114,639-	721-	53-C	-15
YU2EE	67,014-	438-	51-B	-15
YU1LM	75-	5-	5-C	-10
YT2ER	18-	3-	2-B	-10

North America

Bahamas

N4RP/C6A	1,278,216-	1732-	246-B	

Alaska

AL7CQ	729,120-	1568-	155-C	
NL7GP	653,280-	1381-	160-C	
NL7DU	211,830-	614-	115-C	
AL7HC	133,485-	809-	55-C	-15

Virgin Islands

KV4FZ (N6OP,op)				
	261,972-	1532-	57-C	-40

Puerto Rico

NP4A (K7JA,op)				
	5,662,302-	5651-	334-C	
NP4Z	1,480,290-	2014-	245-A	

Greenland

OX3KD	332,613-	873-	127-C	

St Maarten, Saba, St Eustatius

PJ5/W1JP	88,755-	305-	97-B	-10

Costa Rica

TE4T	108,240-	656-	55-B	-80

Anguilla

VP2ERA (N6RA,op)				
	239,085-	1449-	55-B	-10

Montserrat

VP2MDC (K1TN,op)				
	3,166,756-	3827-	276-B	

Bermuda

K8WW/VP9	184,800-	1120-	55-B	-80

Mexico

XE2GAT (K8OJ,op)				
	337,110-	661-	170-B	
XE2NNZ	22,080-	160-	46-C	-160

Nicaragua

YN3EO	395,160-	740-	178-B	

Cayman Islands

ZF2LW/ZF8	4,131-	51-	27-B	

Barbados

8P9EK (K4TKM,op)				
	3,772,062-	4109-	306-C	

Oceania

Philippines

N7ET/DU7	9,504-	144-	22-C	-40
K4YT/4I	624-	26-	8-C	-15

Guam

NY6M/KH2	45,675-	175-	67-C	
N7DF/NH2	15,225-	175-	29-C	-20
KH2F	29,898-	302-	33-C	-10

Hawaiian Islands

KH6XX (KH6ND,op)				
	2,671,200-	2968-	300-C	
K6GSS/KH6	4,980-	83-	20-B	-160
W7AW/KH6	26,532-	201-	44-B	-80
K8CV/KH6	42,582-	302-	47-B	-20
VE7QQ/KH6	102,942-	602-	57-C	-15
KH6WT	17,316-	148-	39-B	-15

Marshall Islands

KX6DC (NZ8B,op)				
	554,400-	840-	220-C	
KX6BU	156,750-	950-	55-C	-15

Australia

VK2APK	252,285-	605-	139-B	
VK8AV	249,477-	607-	137-C	
AX2BQQ (VK2BQQ,op)				
	183,726-	519-	118-B	
VK4QR	57,984-	302-	64-B	
VK2FEX	43,746-	317-	46-B	-40
VK2AEA	29,808-	207-	48-B	-40
AX4XA (VK4XA,op)				
	19,008-	192-	33-B	-10

Indonesia

YB3ASQ	48,800-	260-	60-B	
YC2UDH	540-	30-	6-B	-40
YC2CTW	8,928-	124-	24-B	-15
YC3HCM	4,446-	114-	13-C	-15

New Zealand

ZL8AFZ	444,990-	910-	163-B	

South America

Chile

CE3BFZ	376,164-	729-	172-C	

Uruguay

CX8DT	37,587-	187-	67-A	

Galapagos Islands

HD8D (N6EK,op)				
	2,089,860-	2855-	244-B	

Colombia

HK1KXA	261,801-	1531-	57-C	-15

Argentina

LU1EWL	344,565-	741-	155-B	
LU5ER	21,548-	189-	38-B	-20
LU5DVO	96,252-	617-	52-B	-10

Peru

OA4SS	1,369,980-	1935-	236-C	
OA4ZV	80,100-	534-	50-C	-40

Aruba

P40GD (W2GD,op)				
	6,031,005-	6001-	335-C	

Brazil

PT7AQ	729,390-	1186-	205-B	
PY2GCW	210,276-	649-	108-B	
ZY5AKW	39,312-	312-	42-B	-20
PY5ZBA	312,852-	1798-	58-C	-15
ZY5FR	112,728-	671-	56-B	-10
PT7AA	78,435-	581-	45-B	-10

Venezuela

YV1OB	66,144-	424-	52-C	-160
4M7A (YV7QP,op)				
	104,346-	682-	51-B	-40
YW4B (YU4BOU,op)				
	88,605-	537-	55-B	-40

Multioperator

Single Transmitter

Africa

OH5BA/CT3 (+OH2s BNW,BSI)				
	2,772,840-	3301-	280-C	

Asia

JE2YRD (JA1KFX,JE1s CKA,JKL,JA2s EZD,MGE,PHO,JF2EOC,JR2s SCJ,SQU, JR4WKV,ops)				
	1,031,940-	1764-	195-C	
JA9YBA (JA9s VDA,VSF,JA9-10148,ops)				
	642,060-	1230-	174-C	
JA1YXP (JO1JOZ,JI2DLF,JH9CAU,ops)				
	626,982-	1259-	166-C	
JA1YFG (JO1RUR,JQ1BRW,JS1MJE,ops)				
	532,857-	1051-	169-C	
JE3ZFS (+JG1LNY,JA3YDS,JG3s QBJ, WBB,JI3s GAB,JGJ,OPT, JJ3s FJS,TWT, JK3HZH)	477,630-	1098-	145-C	
JA8YBY (JH8s GFB,PNE,JJ2VXS,JO1DFG, JR8DHA,ops)	448,578-	1053-	142-C	
JA1YCL (JL1 LNC,QOC,JR7XMO,ops)				
	195,252-	614-	106-C	
JE6ZIH (JP1LRT,JF6DEA,JG6CVO, JR6GKT,ops)	193,125-	625-	103-B	
JA7YFB (JF7LEI,JQ1NBV,ops)				
	137,214-	462-	99-C	
UZ0CWA (RW0CA,UA0s CBI,CG,CZ, UW0s CA,CJ,CN,ops)				
	662,310-	1338-	165-B	
UZ0QWA (UA0s QAS,QDL,QHW,QN,ops)				
	340,032-	1012-	112-B	
UZ0LWA (UA0s LFT,LJ,MI,ops)				
	87,552-	384-	76-C	
UZ0KWI (+ops)	80,536-	433-	62-B	
UZ9XWV (UA9s 0902-10253,02902-1058, ops)	2,340-	39-	20-B	
UL8CWW (+ops)				
	21,315-	203-	35-B	
RL8PYL (RL7PHL,RL8PY,ops)				
	2,232-	62-	12-B	

Europe

DK7ZT (+DK7FP)				
	195,968-	573-	114-C	
EI7M (+EI2CNB,EI3DP,EI4s BZ,DQ,EI5FT, EI6BT,EI8EI,ops)				
	1,073,088-	1944-	184-B	
F5IN (+F6ARC)				
	2,414,880-	3120-	258-C	
G0FOS (+G0CLY)				
	17,100-	150-	38-C	
HG1S (HA1s AG,AH,DAC,SV,TD,TJ,ops)				
	1,096,110-	1923-	190-C	
HG8Q (HA8s IE,JP,JV,KQX,LKE,PG,ops)				
	1,004,640-	1840-	182-C	
HA6HZS (4 ops)				
	34,965-	185-	63-B	
I3FIY (+ops)	2,400,840-	3240-	247-C	
LZ2KSQ (LZ2F-239,LZ1F-156,ops)				
	474,605-	1122-	141-B	
OH1AD (OH1s EG,PS/OH2PM,QP,SX, WZ,ops)	428,730-	922-	155-C	
OK1KQJ (OK1s AYP,BY,DLE,ICM,IMR,ops)				
	762,795-	1541-	165-C	
OK3KAG (+ops)				
	391,644-	948-	138-C	
OK2KOD (OK2s BDI,BGR,BNX,ops)				
	207,204-	557-	124-B	
OK2KMR (OK2s BQZ,SSS,ops)				
	103,509-	371-	93-B	
OK2KRT (OK2s BJS,BUZ,XA,-4649,ops)				
	31,329-	177-	59-B	
OK1OFM (OK1s DDR,DRQ,ops)				
	22,680-	135-	56-B	
OK1KCF (+ops)				
	8,547-	77-	37-B	
OK2KPS (+ops)	4,224-	64-	22-B	
PI4SHB (PA3s DUA,EJW,ops)				
	1,674-	31-	18-B	
SK0PC (SM0s NAS,PSO,ops)				
	198,300-	661-	100-C	
SK0MT (SM0JHF,op)				
	49,410-	270-	61-C	
UZ4FWA (UA4s FZ,-148-363,-148-481,ops)				
	52,800-	320-	55-B	
UZ4WKO (UA4s WA,-095-754,ops)				
	21,600-	150-	48-B	
UZ3XWM (+ops)				
	7,917-	91-	29-B	
UB4CWW (RB5s CB,CQ,CW,UB5s CCN,CCP,-068-76,ops)				
	614,184-	1256-	163-B	
UB4XWB (UB5s-062-56,-062-248,-062-647,ops)	506,574-	1052-	159-B	
UB3IWA (UB4INC,RB5II,UB5s IFZ,IOK,ops)				
	432,849-	919-	157-C	
UB3JWW (UB4s JDF,JFR,JIW,ops)				
	363,906-	879-	138-B	
UB4QWV (+ops)				
	198,432-	636-	104-B	
UB4TWA (UB5s TCL,-079-328,-079-339, -079-345,ops)				
	148,200-	494-	100-B	
UT4UXW (UL7LER,UT7UZ,ops)				
	125,145-	515-	81-B	
UT4UWL (+ops)				
	45,171-	239-	63-B	
UB4LWY (+ops)				
	34,572-	172-	67-B	
UB4QYA (+ops)				
	33,432-	199-	56-B	
UB4TWL (+ops)				
	31,293-	171-	61-B	
UB4BWN (+ops)				
	9,213-	83-	37-B	
UC1AWZ (UC2s-188-48,-188-148,ops)				
	23,868-	221-	36-B	
UP1BYL (UP2sBKW,-038-1162,-038-2766, UL7FCT,UP0BA,ops)				
	646,737-	1339-	161-B	
UP1BZA (UP2s BIM,BLR,BLW,ops)				
	590,001-	1019-	193-B	
UP1BYC (UP2s CY,-038-2564,-038-2565, ops)	243,459-	639-	127-B	
UR2RDJ (+ops)				
	398,640-	880-	151-B	
Y54CL (Y54s ML,NL,ops)				
	137,052-	423-	108-C	
Y37CB (Y37s RB,WB,ZB,ops)				
	5,562-	103-	18-B	
YT2R (YU2s DQ,HO,OG,OH,LJ,MM,MP, MY,NJ,YT2s AA,FI,GW,ops)				
	1,838,376-	2837-	218-C	
4N2D (YU2s CQ,FK,YU4BZ/X,ops)				
	953,040-	1672-	190-C	
YZ4J (YT3OO,YU4s NW,RR,RW,ops)				
	257,040-	720-	119-B	
4N4C (+4 ops)				
	251,538-	742-	113-B	
YU3M (YT3s FM,GP,RO,YU3s HRF,HRU, PG,ops)	225,459-	611-	123-B	
YU7AJR (2 ops)				
	117,273-	403-	97-B	

North America

J34A (K4s LTA,PJ,W5PWG,ops)				
	3,730,647-	3973-	313-C	
V31TP (+V31BB)				
	1,649,535-	1985-	277-B	
XE2EBE (AA6DP,N6BT,W6JI,W7MAP,ops)				
	2,616,090-	3007-	290-C	
ZF2KE (K9s DX,HMB,RS,ops)				
	5,851,110-	5822-	335-C	

South America

PJ9J (W1s BIH,RM,ops)				
	5,521,473-	5527-	333-C	

Two Transmitter

Asia

JA1YXP (JO1JOZ,JI2DLF,JH9CAU,ops)				
	626,982-	1259-	166-C	
JA1YFG (JO1RUR,JQ1BRW,JS1MJE,ops)				
	532,857-	1051-	169-C	
JE3ZFS (+JG1LNY,JA3YDS,JG3s QBJ, WBB,JI3s GAB,JGJ,OPT,JJ3s FJS, TWT,JK3HZH)				
	477,630-	1098-	145-C	

Unlimited

Asia

JE2YRD (JA1KFX,JE1s CKA,JKL,JA2s EZD,MGE,PHO,JF2EOC,JR2s SCJ,SQU, JR4WKV,ops)				
	1,031,940-	1764-	195-C	

Europe

I3FIY (+ops)	2,400,840-	3240-	247-C	
YT2R (YU2s DQ,HO,OG,OH,LJ,MM,MP, MY,NJ,YT2s AA,FI,GW,ops)				
	1,838,376-	2837-	218-C	
HG8Q (HA8s IE,JP,JV,KQX,LKE,PG,ops)				
	1,004,640-	1840-	182-C	
YZ4J (YT3OO,YU4s NW,RR,RW,ops)				
	257,040-	720-	119-B	

W/VE Phone

Single Operator

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Connecticut

K1CC	1,394,424-	1284-	362-C	
KA1ION	611,832-	962-	212-C	
KG1D	306,936-	504-	203-C	
KC8PE	270,816-	496-	182-C	
K1DD	254,736-	464-	183-C	
WA1FCN	183,027-	361-	169-B	
N1CC	182,580-	340-	179-C	
W1RM	154,698-	437-	118-C	
K1WA	138,408-	292-	158-C	
N1JW	26,775-	119-	75-C	
K1TN	24,000-	100-	80-B	
KA1DSQ	22,110-	110-	67-C	
K1NGL	15,624-	93-	56-B	
W1AB	5,202-	51-	34-C	
NI1L	2,511-	31-	27-A	
KH6CP/1	2,175-	29-	25-A	
K1WVX	1,650-	25-	22-C	
AA2Z	1,512-	24-	21-B	
KS1L	566,547-	1487-	127-C	-20
K1BV	7,800-	65-	40-C	-20
K1BNO	5,292-	49-	36-C	-20
KB1H	2,346-	34-	23-B	-20
KA1MEH	297-	11-	9-B	-20
K1EFI	15,870-	115-	46-C	-10

Eastern Massachusetts

W1GIH	554,610-	695-	266-C	
K1CLN	313,389-	477-	219-C	
W1KRS	153,039-	367-	139-C	
W1JR	94,050-	209-	150-C	
KC1BG	49,928-	157-	108-C	
W1IHN	36,252-	114-	108-C	
N1FIO	30,723-	133-	77-B	
KA1IOR	5,670-	54-	35-B	
AD1C	3,612-	43-	28-B	
W1AX	2,970-	33-	30-C	
K3UOC/1	3-	1-	1-B	

K8PO 58,160- 234- 80-C -40
NK1Z 100,392- 376- 89-B -20
W1FJ 6,480- 60- 36-C -20
KB1RB 4,437- 51- 29-B -20
W1PLJ 3,300- 44- 25-C -15
KQ1V 14,628- 106- 48-C -10
WB2DND 4,176- 58- 24-B -10

Maine

KC1BS 43,587- 167- 87-C
K1UO 549,582- 1514- 121-C -20
N1AFC 41,664- 217- 64-A -15

New Hampshire

K1DG 1,968,965- 1703- 385-C
KC1EO 128,520- 306- 140-B
KA1LMR 1,134- 21- 18-A
W1LQQ 51,866- 218- 79-C -20
W1VY 33,972- 149- 76-C -20
W2IOL 45,084- 221- 68-B -15

Rhode Island

K1IU 1,474,704- 1596- 308-C
K1HMO 213,651- 369- 193-C
W1RFQ 43,758- 143- 102-C
K6IM/1 32,550- 155- 70-C
K1NG (KD2SX,op) 385,104- 1136- 113-C -20
K1VSJ 27,387- 179- 51-C -20

Vermont

NK1A 265,608- 651- 138-C
K1HKI 212,868- 438- 162-C
W3SOH 58,128- 173- 112-B
K1IK 7,920- 80- 33-C -10

Western Massachusetts

KC1F 2,631,585- 2255- 389-C
KB1W 427,140- 678- 210-C
NC1B 62,208- 192- 108-B
KA1MDG 32,058- 137- 78-B
K9ES 4,224- 44- 32-B -40

2

Eastern New York

KY2J 1,141,560- 1208- 315-C
K2EK 395,460- 780- 169-C
KD2NE 140,580- 355- 132-C
W2YG 79,560- 221- 120-C
WA3AFS 73,530- 190- 129-C
W2KHQ 31,872- 128- 83-B
WB2HIH 21,357- 113- 63-B
KD2HE 18,585- 105- 59-C
KE2DF 15,576- 88- 59-C
WA2AXK 11,100- 74- 50-C
N2AIF 7,776- 72- 36-C -80
K2IBW 135,660- 532- 85-C -20
N2AZS 2,220- 37- 20-B -10

NYC-Long Island

WA2LQO (W2DKM,op) 423,072- 624- 226-C
W2MOY 121,656- 296- 137-C
NN2C 61,446- 209- 98-B
NN2F 59,100- 197- 100-C
KA2NWO 33,600- 140- 80-B
NS2W 16,560- 92- 60-B
W2GKZ 13,572- 87- 52-C
N2GXY 10,512- 73- 48-B
N2DSL 6,105- 55- 37-B
WA2IRC 2,898- 42- 23-B
N2KA 3,219- 37- 29-C -160
KA2RGI 12,513- 97- 43-C -20
K2MFY 60,060- 260- 77-B -15
WB2AMU 3,094- 71- 38-B -15
WA2OVG 4,752- 48- 33-C -15
N2KW 10,185- 97- 35-C -10
W2KZE 6,528- 64- 34-C -10
KB2DRR 336- 14- 8-B -10

Northern New Jersey

W2RQ 1,830,132- 1753- 348-C
N2LT 1,576,845- 1569- 335-C
W1GD 691,968- 848- 272-C
AA2U 69,084- 202- 114-A
WB2HJW 25,842- 118- 73-C
W9NTU 23,985- 123- 65-B
WA2PNI 23,562- 119- 66-B
WA2ASQ 20,790- 105- 68-B
WA2UDT 15,120- 105- 48-C
KT2D 13,365- 81- 55-B
WA2CCN 6,426- 63- 34-C
W2FCR 5,100- 50- 34-C -160
N2NT 78,210- 330- 79-C -80
WB2ULI 32,436- 159- 66-C -80
N3AHF 21,870- 135- 54-C -80
KC7KU 26,970- 155- 58-C -40
N2HE 30,210- 190- 53-C -15
KE2CG 29,348- 146- 67-B -15
K2FE 25,740- 156- 56-C -15
K2OLG 14,238- 113- 42-B -10

Southern New Jersey

K2FL 271,794- 467- 194-C
N2MR 255,312- 432- 197-C
W2PAU 185,976- 369- 168-C
K2JLA 175,380- 316- 185-C
W2FGY 120,780- 305- 132-C
K2JF 119,301- 247- 161-B
WA2WJL 43,065- 165- 87-B
WA2VYA 41,712- 158- 88-C
K2OSV 38,868- 164- 79-C
WA2LBT 28,320- 118- 80-B
K2LOO 27,378- 117- 78-B
W2SDO 25,056- 116- 72-C
W2EA 13,572- 87- 52-C
KA2OJD 11,700- 78- 50-C
AB2Y 5,778- 58- 37-C
N2DJY 4,995- 45- 37-C
WB2OEZ 4,080- 40- 34-C
KA2KFO 3,780- 42- 30-C
KD2AE 330- 11- 10-C
K8XR 58,539- 247- 79-C -40
W2CN 612- 17- 12-C -20
K3JGJ 34,965- 185- 63-C -15
N2AWC 1,350- 25- 18-C -15

Western New York

W2TZ 563,832- 764- 246-B
KA2AJT 462,231- 609- 253-B
WB2ABD 223,758- 401- 186-C
KB2SE 195,615- 405- 161-C
KB2WN 133,644- 301- 148-C
KD2YP 119,952- 272- 147-C
W2HG 97,920- 255- 128-C
N2WK 78,174- 202- 129-C
WB2ADQ 66,456- 213- 104-B
WB2YQH 47,250- 150- 105-C
KK2B 39,270- 154- 85-B
W2PHT 33,600- 140- 80-B
W2FUI 23,994- 129- 62-C
WB2NRK 23,460- 115- 68-C
WA2UUK 19,008- 88- 72-C
K1JUL 14,664- 94- 52-B
W2OMV 8,505- 63- 45-B
W2FR 3,780- 42- 30-C -80
NG2X 180,000- 600- 100-C -20
W2HPF 238,992- 766- 104-C -15
W2FXA 2,480- 41- 20-C -15
WA2AOG 1,305- 29- 15-C -10

3

Delaware

AC3T (KA3B,op) 205,200- 475- 144-C
W3NX 139,587- 289- 161-C
K3WUW 61,446- 209- 98-C

Eastern Pennsylvania

K3OO 2,029,200- 1900- 358-C
K3IPK 915,552- 1158- 264-C
KQ3V 353,700- 524- 225-B
KA3DSW 302,886- 474- 213-C
N3EC 300,321- 441- 227-C
WA3LFY 297,546- 491- 202-C
K3ZA 290,472- 532- 182-C
WB3FYL 263,004- 434- 202-B
K4JLD/3 252,000- 420- 200-C
AD3Z 238,920- 362- 220-C
W3EVW 190,800- 400- 159-C
KY3N 173,502- 378- 153-C
N3HW 171,114- 361- 158-C
W3DHM 167,328- 338- 166-C
K3ZLK 160,875- 375- 143-C
W3KV 156,864- 344- 152-C
WB3CIW 152,805- 305- 167-C
KW3F 145,350- 323- 150-C
KB3TS 144,990- 358- 135-C
W3ARK 120,192- 313- 128-B
KA3NJA 97,536- 254- 128-B
KU3X 90,402- 247- 122-C
NA3K 77,526- 219- 118-C
W3YFV 75,756- 214- 118-C
K3PA 69,660- 215- 108-C
N3NA 68,904- 261- 88-C
N3CHL 62,217- 223- 93-C
KC3AD 32,895- 129- 85-B
KW3W 23,058- 126- 61-C
N3RW 18,800- 100- 56-C
KA3LCF 18,245- 95- 57-B
KJ3R 10,260- 90- 38-C
K3DYX 6,983- 63- 37-C
W3AP 1,680- 28- 20-C
AK3Z 1,050- 25- 14-C -40
K3ZPG 19,118- 118- 54-C -20
KI3N 16,848- 108- 52-C -20
WB3KTX (N/T) 5,124- 61- 28-B -10

Maryland-DC

K3ZJ 1,228,845- 1343- 305-C
K3ZO 998,379- 1077- 309-C
K3NA 695,838- 811- 288-C
W3MR 583,263- 849- 229-C
K3YGU 249,993- 423- 197-C
N3II 218,241- 411- 177-B
W3UJ 189,210- 394- 155-C
KD3U 172,200- 350- 164-B
W3EE 51,597- 189- 91-B
WB3BRF 30,660- 140- 73-B
N3FYN 24,750- 125- 66-B
N3AM 11,544- 74- 52-C
W3FQE 8,316- 66- 42-C
W3GN 1,863- 27- 23-C
W3TFA 1,740- 29- 20-B
WB3AVN 4,998- 49- 34-C -160
W6AXX 7,215- 65- 37-C -80
WA3EEE 37,632- 196- 64-B -15
WB3CDX (N/T) 5,348- 66- 27-B -10
WB2BZR (N/T) 2,772- 44- 21-B -10

Western Pennsylvania

K3TUP (K3LR,op) 2,818,044- 2421- 388-C
K5ZD/3 1,039,473- 1107- 313-C
K3MD 379,008- 658- 192-C
W3HRF 38,640- 115- 112-C
W3DKL 35,787- 151- 79-C
K3UA 3,240- 40- 27-C -160
N3EQF 7,884- 73- 36-C -20
K2QF/3 1,122- 22- 17-B -20
KM3J 58,500- 260- 75-C -15
N3CGK 20,352- 128- 53-B -15
AD8J 17,628- 113- 52-C -15
N3EQP (N/T) 510- 17- 10-B -10

4

Alabama

WZ4F 1,272,960- 1326- 320-C
KE4BM 84,000- 250- 112-C
KR4F 1,122- 22- 17-C -160
W4CYC 61,446- 268- 77-C -20
WA4VEK 6,324- 62- 34-C -20

Georgia

WX4G 2,142,546- 1948- 367-C
W4DXI 219,456- 381- 192-C
K4EZ 189,050- 350- 161-C
KJ4FW 184,220- 340- 161-C
K4BAI 142,788- 326- 146-C
W4GTS 83,394- 226- 123-C
K4JRB 63,840- 190- 112-B
W9KTB/4 56,454- 194- 97-B
W1UA 32,604- 143- 76-C
KB4GID 28,728- 133- 72-A
NQ4I 23,814- 126- 63-C
K4PI 14,640- 80- 61-C
W4UYC 8,316- 66- 42-B
N9REE 6,630- 65- 34-B-
K4TEA 6,954- 61- 38-C -160
W4OWY 20,790- 126- 55-C -40
N4VZ 23,940- 133- 60-B -10

Kentucky

N4XM 176,400- 336- 175-C
WB4FOT 166,212- 324- 171-C
KA4NXP 17,052- 118- 49-C -20

North Carolina

W8NGO 277,695- 495- 187-C
N4UH 263,772- 431- 204-C
KJ4TI 76,398- 214- 119-B
WA8WAU 13,038- 82- 53-B
W4HVU 8,550- 57- 50-C
WD4OHD 5,655- 65- 29-A
WB3GCG 8,316- 66- 42-C -160
KF4HK 8,160- 68- 40-C -160
K8CFU 2,484- 36- 23-C -160
W4CVX 23,427- 137- 57-B -15
K4GHS 6,048- 72- 28-B -10

Northern Florida

K4HRL 155,124- 372- 139-C
W4WKQ 110,088- 278- 132-C
KK4RV 93,744- 252- 124-B
W9LSD 30,261- 131- 77-B
WA4SVO 17,656- 109- 54-C -160
K4XS (WC4E,op) 581,600- 1600- 117-C -15
NO4J 234,522- 909- 88-C -15

South Carolina

W3VT 693,252- 786- 294-C
AA4V 243,660- 620- 131-C
K8EJ 19,500- 100- 65-B

Southern Florida

WD4JNS 193,431- 427- 151-C
WK4F 84,180- 230- 122-C
K4GKD 71,604- 204- 117-C
KA4UBC 60,282- 197- 102-C
W1MQK 10,575- 75- 47-C
WA4EMU 6,840- 57- 40-B
W9LRY/4 5,439- 49- 37-B
KC2KU/4 112,491- 431- 87-C -15
KF4MA 12,222- 97- 42-B -15
N4EJW (N4EJV,op) 66,096- 306- 72-C -10
N4ONQ (N/T) 1,887- 37- 17-B -10

Tennessee

K4UVH 264,060- 489- 180-C
K4JHT 136,782- 306- 149-B
NR4S 105,705- 261- 135-C
K4AMC 49,128- 178- 92-C
K4RWP 44,499- 183- 91-C
K4RIG 33,540- 172- 65-C -40
K4YPX 1,479- 29- 17-B -40
W4ZWZ 39,270- 187- 70-C -20
N4ZZ 341,802- 1117- 102-C -15
N4IR 30,222- 219- 48-C -15

Virginia

KE9A 1,595,751- 1607- 331-C
W4DR 234,736- 378- 207-C
N4PMQ 127,359- 267- 159-B
N4MM 88,308- 223- 132-C
K4KGU 73,272- 344- 71-C
KB4RME 47,310- 166- 95-B
N3AVA 32,880- 137- 80-C
W4LMJ 28,644- 124- 77-C
W4UG 24,480- 102- 80-C
AA4YZ 24,375- 125- 65-A
K4FPF 21,384- 108- 66-B
N3RC 8,280- 69- 40-B
W4YE 2,016- 32- 21-B
WA4YBV 28,620- 159- 60-C -80
WD4KXB 11,745- 87- 45-C -40
W4KMS 6,216- 56- 37-C -40
K1ZZI 90,450- 335- 90-C -20
WA4HOT 11,640- 97- 40-C -15
W3FTG 360- 12- 10-B -10
WA4MMP 105- 7- 5-B -10

5

Arkansas

K5GOE 62,304- 176- 118-C
K5FUV 6,150- 50- 41-C
K5UC 8,880- 80- 37-C -40
K5UR 77,175- 343- 75-C -10

Louisiana

W5ZR 160,362- 453- 118-C
WB5SSD 148,824- 318- 158-C
WC5D 429- 13- 11-B -80
W5EW 20,904- 134- 52-C -10

Mississippi

K5MK 483,890- 658- 235-C
KF5AU 33,726- 146- 77-C
WB5KSI 23,925- 145- 55-C -20
WB5ZKR 65,698- 414- 69-C -15
WA5OYU 2,646- 42- 21-B -15

New Mexico

KI3L 598,185- 945- 211-C
KN5S 11,352- 88- 43-C -40
KF7E 65,520- 364- 60-C -15
N7RP 8,532- 79- 36-C -10

North Texas

N5RZ 713,625- 865- 275-C
N5JB 483,009- 891- 233-C
N5AW 354,978- 481- 246-B
KD5GD 108,108- 273- 132-B
W5LMG 97,152- 253- 128-C
N5IET 73,630- 230- 107-B
KA4CVL 70,794- 207- 114-B
N5FHW 67,500- 225- 100-C
W5MW 66,240- 192- 115-C
W5AE 22,620- 116- 65-C
WK5K 6,216- 56- 37-B
AA5EG 3,960- 44- 30-B
W5FO 108,878- 379- 94-C -20
NZ5M 450- 15- 10-B -20
KA5W 217,854- 741- 98-C -15
W5CWQ 30,240- 168- 60-B -15
K9MK/5 34,628- 199- 58-B -10
N5BHZ 2,205- 35- 21-B -10
N5KVF (N/T) 1,125- 25- 15-B -10
N5KTS (N/T) 945- 21- 15-B -10
N5LXD (N/T) 576- 16- 12-B -10

Oklahoma

K5GL 99,038- 262- 126-C
W9RRY/5 37,800- 168- 75-C
WK5P 7,920- 66- 40-B
W5UXR 4,794- 47- 34-B
W5NZS 630- 15- 14-B
W5TZN 13,905- 103- 45-B -10
KB5FCH (N/T) 144- 8- 6-B -10
KB5FCE (N/T) 75- 5- 5-B -10

South Texas

K5DX 450,180- 610- 246-C
N5GIG 137,640- 296- 155-C
WA5IYX 105,408- 288- 122-B
KC5CP 51,888- 184- 94-C
K5DB 43,290- 185- 78-C
W5BE 38,700- 150- 86-C
W5KCR 27,135- 135- 67-C
KA5PVB 7,776- 72- 36-A
WB8YEA 5,301- 57- 31-B
N5JEE 4,898- 54- 29-B
W5PWG 13,254- 94- 47-C -40

West Texas

W5VGX 141,141- 329- 143-C
K5RF 123,240- 316- 130-C
WB5CRG 2,001- 29- 23-C -80
KD5IA 19,812- 127- 52-C -40
N5IMO 30,408- 181- 56-C -20
WB5UDX 121,518- 471- 86-C -15

6

East Bay

VE2AQS/W6 641,088- 954- 224-C
K6SIK 522,585- 711- 245-C
KS6H 294,930- 565- 174-C
K6HIH 74,256- 238- 104-C
WB6WFZ 33,306- 182- 61-C
K6CSL 19,650- 127- 50-B
WB6CUA 6,450- 50- 43-C
WA7G 2,475- 33- 25-C
W6RJ 51,333- 241- 71-C -80
W6FSJ 44,154- 223- 66-C -20
KS6Q 351- 13- 9-C -20
W6BSY 134,550- 598- 75-C -15
AK5Q/6 1,188- 22- 18-C -10

Los Angeles

K6EID 513,998- 812- 211-C
N8AW 472,491- 1117- 141-C
N8AA 199,880- 416- 160-C
WK6V 191,754- 402- 159-C
N6IC 175,980- 419- 140-C
K6EV 156,114- 354- 147-C
KG6AR 74,787- 257- 97-A
W8AKS/6 72,900- 225- 108-C
N8AHU 55,554- 197- 94-C
WA8POZ 55,200- 200- 92-C
W6CN 52,320- 218- 80-A
W6PQS 51,060- 185- 92-C
NE6I 46,746- 159- 98-C
WA6LOD 45,675- 203- 75-B
N6JZ 38,592- 192- 67-C
K6YRA 35,964- 148- 81-B
W6ABW 32,760- 182- 60-C
ND6G 31,257- 151- 69-C
K6SD 30,888- 104- 99-C
NK6A 25,479- 149- 57-C
WS6V 22,560- 160- 47-B
K6HMA 19,845- 135- 49-C
N6AHV 14,910- 71- 70-B
K6ICS 12,978- 103- 42-B
W6AUG 11,685- 95- 41-C
KB6ISL 6,480- 54- 40-B
K6HAE 5,670- 54- 35-C
W6FA 2,376- 33- 24-B
K1EQA 1,908- 53- 12-A
WB6PSY 816- 17- 16-B
N6LL (WA6CDR,op) 1,176- 28- 14-C -1
K6SVL 7,035- 67- 35-C -
W6OK 44,748- 226- 66-C -
K5KT 405,132- 1378- 98-C -
KM6B 294,903- 1057- 93-C -
W2IIJ/6 241,488- 936- 88-C -

Orange

WA6FIT 68,270- 235- 94-B
WB6OKK 57,816- 219- 88-C
W6BA 20,384- 103- 88-C
N6NKN 11,616- 121- 32-B
W6HT 2,574- 33- 26-C
N6UC 9,288- 72- 43-C -
NM6L 13,986- 111- 42-C -
KB6RXF (N/T) 12,099- 109- 37-B -

Santa Barbara

K6JG 167,904- 352- 159-C
W6UJX 138,444- 332- 139-C
WA6FGV 103,896- 339- 104-C
AA4Q 24,276- 119- 68-C
AA6EQ 24,090- 148- 55-B
W6OUL 22,680- 120- 63-C
W7CB/6 4,131- 51- 27-C -

Santa Clara Valley

K6HNZ 1,012,785- 1345- 251-C
W6XR 254,181- 439- 193-C
K6ITL 215,988- 439- 154-C
K6RQ 141,006- 331- 142-C
NC6S 114,939- 297- 129-C
W6FGD 78,975- 225- 117-C
KE6OT 73,920- 220- 112-B
K6CXT 64,515- 253- 85-C
KN6K 55,536- 208- 89-C
WD6EKR 45,264- 184- 82-B
KG6AO 41,067- 169- 81-C
W6LC 32,640- 160- 68-B
KA6HSM 29,646- 183- 54-C
W6YVK 29,223- 191- 51-A
K6FD 28,980- 138- 70-B
W6ZM 24,300- 108- 75-B
W6CSI 23,940- 114- 70-C
W8PHF 22,896- 106- 72-B
AA6Z 22,512- 112- 67-C
KE6ZE 21,780- 132- 55-C
KG6AM 19,383- 91- 71-C
KD6XY 15,792- 112- 47-C
W8MEP/6 13,122- 81- 54-C
WA6HRK 7,140- 68- 35-B
K6YO 8,327- 57- 37-B
WB6YIR 2,775- 37- 25-B
W6QDE 1,914- 29- 22-C
W6QHS 262,680- 796- 110-C
W6HXW 48,048- 208- 77-C
N6LTN 3,900- 50- 26-C
W6JZU 3- 1- 1-C
AA6T 117,192- 514- 78-C

San Diego

N6ADK 192,717- 437- 147-B
N6ND 156,390- 401- 130-C
KI6ZH 78,300- 261- 100-B
K6MC 30,324- 133- 76-C
W6JVA 23,718- 134- 59-B
K6ZH 22,350- 149- 50-A
WN6L 19,968- 104- 64-C
W6OVO 18,720- 120- 52-C
AA5EE 1,170- 26- 15-B
WA6VNR 756- 18- 14-C
K6NA 124,806- 682- 61-C
AA4M 134,045- 677- 66-C
N6RLE 75- 5- 5-C

San Francisco

N6OJ 135,000- 360- 125-A
K6ILM 48,807- 187- 87-B
WT6V 38,808- 168- 77-C
WB2CHO 36,180- 180- 67-B
W6PM 29,184- 128- 76-C
WA8LLY 25,100- 115- 75-B
WW6F 23,430- 110- 71-C
N6NF 14,136- 124- 58-A
KI6BK 528- 16- 11-B
KA6W 1,854- 103- 6-C

San Joaquin

K6DT 311,520- 590- 176-C
WW6O 144,054- 453- 106-C
W6BYH 54,684- 186- 98-C
W6YO 27,540- 108- 85-B
WB6TTM 22,230- 130- 57-C
N6DTB 22,140- 123- 60-C
K6URI 4,851- 49- 33-B
N6OT 4,140- 46- 30-C
KI6PG 3,450- 46- 25-B
KI6BN 119,085- 467- 85-C
N6EE 13,284- 123- 36-C

Sacramento Valley

KV6H 482,775- 1025- 157-C
N6JV 314,496- 872- 158-C
K6DR 167,280- 410- 138-C
K6RK 41,280- 172- 80-C
N6JM 29,502- 149- 68-B
N6GG 27,084- 122- 74-C
W6NKR 7,296- 64- 38-C
K6SG 2,139- 31- 23-C

7

Arizona

KC7V 262,524- 524- 167-C

Pedro, HC1OT, finished 3rd-place world 15-meter single-band scoring 592k points just short of 2nd place PY5ZBA.

Carl, AI6V, operated P40V in the phone contest to the tune of 7.2M points for a second place world finish.

With the help of Ray, K9RS, ZF2KE pulls ahead of PJ9J by only 300k to obtain first place world, multi-single, CW.

GM 48,576- 184- 88-B
A7NWL 504- 14- 12-A
37FDQ 69,564- 341- 68-B -15
7AYY 43,818- 218- 67-C -15

aho

RN 121,716- 322- 126-C
7T 64,638- 266- 81-C
7ODM 3,308- 38- 29-C

ontana

7UO 151,368- 371- 136-C
7UP 60,180- 236- 85-C
A7PZO 36,960- 160- 77-C
7T 19,152- 114- 56-C
ABV 2,484- 46- 18-C -40
AALQ 33,000- 200- 55-C -20

evada

7K 663,852- 1129- 196-C

egon

B 1,180,659- 1633- 241-C
AVK 419,472- 971- 144-C
YAQ 177,642- 428- 139-B
7EQS 162,153- 419- 129-B
37A 134,205- 389- 115-C
GUR 80,700- 269- 100-C
QK 14,677- 87- 57-B
7FEF 1,290- 43- 10-B
EJ 336,664- 999- 112-C -20
7R 60,240- 502- 40-C -15
1J7 3,278- 78- 14-B -15

ah

7B 321,830- 710- 151-C
7Y 143,325- 325- 147-C
HS 103,368- 292- 118-C
7NS 45,675- 203- 75-B
7KF 31,683- 179- 59-C
JLC 2,688- 32- 26-C
7TUX 1,800- 30- 20-A
7CD 1,260- 28- 15-B -15

ashington

TT 805,410- 1413- 190-C
7L 789,618- 1303- 202-C
0Z 207,360- 480- 144-C
EKM 153,450- 550- 93-C
GEX 136,800- 380- 120-C
QN 95,424- 284- 112-C
IF 79,068- 269- 99-C
IIT 75,384- 349- 72-C
QO 46,242- 367- 42-C
7MCX 38,352- 188- 68-C
7DG (N3EG,op)
26,208- 168- 52-C
LGG 24,180- 130- 62-C
7BAY 23,688- 141- 56-C
KT 21,216- 138- 52-C
VIH 1,932- 46- 14-B
AGE 1,152- 24- 16-B
DX 990- 22- 15-C -160
IR 4,611- 59- 29-C -80
7WA (K7RI,op)
273,600- 912- 100-C -20
7CW 128,016- 508- 84-C -20
7CLU 9,360- 80- 39-C -20
7N 104,976- 729- 48-C -15

oming

7Z 46,035- 155- 99-C
7RX 26,880- 140- 64-B
7M 2,394- 38- 21-A
MM 12,750- 125- 34-B -15

chigan

7Y (KA3NTX,op)
70,902- 234- 101-C
8WZT 70,800- 200- 118-B
8N 66,690- 195- 114-C

NE8T 44,550- 150- 99-B
W8TJQ 38,354- 146- 83-C
K8OSF 2,325- 31- 25-B
W8TWA 224,100- 747- 100-C -20
N8CXX 216,840- 695- 104-C -20
K8GSR 11,223- 87- 43-C -15
KE8NH 4,284- 51- 28-B -10

Ohio

WB3KKX 1,273,743- 1383- 307-C
K8NZ 477,945- 645- 247-B
K8DJC 234,432- 444- 178-C
WA8BIN 226,431- 417- 181-C
K8MR 211,233- 407- 173-C
W8ZCQ 159,800- 350- 152-C
K3JT 157,410- 318- 165-C
W8UPH 102,465- 297- 115-C
KD8KX 90,264- 186- 108-C
KA8ZNZ 58,140- 204- 95-B
WA8AGH 58,244- 172- 109-A
W8NPF 53,460- 180- 99-C
W8DWP 48,150- 150- 107-C
N8BC 47,526- 178- 89-C
N8AM 44,880- 170- 88-B
NR8Z 44,634- 173- 86-C
W8EDU (KL7UO,op)
20,178- 114- 59-C
W8IMF 18,966- 108- 58-C
N8AGU 18,810- 110- 57-C
WD8AJF 18,720- 98- 65-C
W8RHY 15,390- 90- 57-B
W8IQ 14,742- 78- 63-A
NQ8K 9,165- 65- 47-B
W8CGG 7,488- 64- 39-C
W8IDM 4,704- 49- 32-B
AF8C 2,916- 36- 27-B
KW8N 72,420- 284- 85-C -80
KU8E 35,190- 170- 69-C -80
K8CCV 23,010- 130- 59-C -80
AD8C 13,808- 108- 42-C -40
W8CAR 2,178- 33- 22-C -40
WB8JBM (N8DCJ,op)
354,594- 1046- 113-C -15
KB8BHE 21,783- 137- 53-C -15
WD8KTM 1,512- 24- 21-B -15
KA8ZEP (N/T) 1,302- 31- 14-B -10
KA8WAS (N/T) 1,215- 27- 15-B -10

West Virginia

W8VEN 36,540- 140- 87-C
K8OQL 13,158- 102- 43-C -80
KC8JH 3,042- 39- 26-C -80

9

Illinois

WD9GIG 115,830- 270- 143-C
KC9UM 83,936- 192- 111-C
N9HCA 48,464- 176- 88-B
K9ZO 37,200- 155- 80-C
KA9YMV 38,450- 150- 81-B
W9TNZ 30,723- 133- 77-B
NM9C 12,054- 82- 49-B
KA9ACS 9,072- 63- 48-C
W9REC 3,780- 42- 30-B
W9PQH 1,311- 23- 19-B
W9ZGP 1,104- 23- 16-C
KE9U 14,820- 95- 52-C -80
W9CH 31,482- 159- 66-C -40
W9NB 10,320- 80- 43-C -40
KK9A 286,848- 996- 98-C -20
KA9TNZ 152,010- 563- 90-C -15
K9RN/M 27,999- 153- 81-B -15
KR9G 17,901- 117- 51-B -10
KA9OBH 897- 23- 13-B -10
WB9BTZ (N/T) 324- 12- 9-B -10

Indiana

W9NSZ 322,200- 600- 179-C
WA9NPM 162,729- 369- 147-C
KB9C 147,744- 324- 152-C
WB9TBD 60,184- 164- 102-C
KD9YB 37,845- 145- 87-B
N4DBJ 16,830- 85- 66-C
NX9B 7,050- 50- 47-B

N9HAV 4,464- 48- 31-B
NX9A 3,108- 37- 28-B
KB8AC 6,042- 53- 38-C -80
W8UD/9 65,520- 280- 78-C -20
K9VQK 19,856- 117- 56-C -20
KN9C 49,344- 257- 64-B -15
W9SC 10,320- 80- 43-B -15
W9RE 9,405- 95- 33-C -10

Wisconsin

K9CAN 469,812- 658- 238-C
K9QXY 448,920- 696- 215-C
NE9U 306,327- 503- 203-C
W9OP 240,408- 504- 159-C
K9OSH 158,004- 342- 154-C
WB9CXY 114,960- 479- 80-C
NG9L 89,856- 256- 117-B
NI9C 38,279- 139- 87-B
N9DMG 10,944- 76- 48-B
W9YCV 3,990- 38- 35-C
N4TZ 3,321- 41- 27-C
N9BUS 12,900- 86- 50-C -80
K9YNF 58,500- 260- 75-C -20
W9XT 163,404- 612- 89-C -15
W9GIL 66,960- 279- 80-C -15
KB9S 47,940- 235- 68-C -15

0

Colorado

K0UK 295,056- 683- 144-C
N0ZA 196,092- 419- 156-C
W0GOQ 163,212- 469- 116-C
W0TX (K9BQL,op)
36,432- 176- 69-B
NY0R 34,860- 166- 70-C
KD0NB 16,830- 110- 51-B
W0BWJ 16,371- 107- 51-C
W0ZV 3,978- 39- 34-C
N0TK 8,778- 77- 38-C -80
AC0S 7,215- 65- 37-C -80
W0GOR 5,040- 56- 30-C -40
K0ZFL 13,098- 74- 59-B -15
NN0M 4,416- 64- 23-C -15
KA0FPJ 2,268- 36- 21-B -10

Iowa

W0WP 301,788- 606- 166-C
KZ0C 244,755- 441- 185-C
K0QT 240,492- 409- 196-C
NC0O 153,153- 357- 143-C
WA0VBW 117,594- 262- 139-A
NG0W 114,660- 260- 147-C
N0SM 108,929- 327- 109-C
W0PPF 87,120- 240- 121-C
NK0N 58,176- 192- 101-C
KC0Q 54,450- 165- 110-B
W0MJN 39,780- 156- 85-C
K0UYH 35,784- 142- 84-C
NY0V 32,562- 134- 81-B
NU0P 25,410- 121- 70-C
WE0M 13,860- 84- 55-B
WA0DCB 2,574- 33- 26-C
KB0SY 1,764- 28- 21-A -80
WB0ZKG (N/T) 5,307- 61- 29-B -10

Kansas

WA0TKJ 510,480- 709- 240-C
WB0YJT 68,502- 233- 98-B
KB0U 105,924- 388- 91-B -15

Minnesota

NZ0R 145,971- 331- 147-C
AC0W 128,112- 314- 138-B
W0EKS 57,392- 192- 117-C
W0LP 36,654- 149- 82-C
KA0ZEP 360- 12- 10-B
W0RXL 6,825- 65- 35-C -40
NT0Y 31,374- 166- 63-C -15
KA0ZPP (N/T) 405- 15- 9-B -10

Missouri

K4VX/0 1,219,932- 1316- 309-C
NI0Q 90,768- 244- 124-C
KM0L 39,744- 144- 92-C

W0PKO 10,950- 73- 50-C
KA0P 390- 13- 10-B
KD0IT 25,368- 151- 56-B -20
WB0GFV (N/T) 1,887- 37- 17-B -10

North Dakota

KC0CU 26,544- 158- 56-C -20

Nebraska

KV0I 292,401- 613- 159-C
N0FYM 71,466- 277- 86-C
K0SW 41,769- 153- 91-C

South Dakota

WB0CT 93,177- 261- 119-C
KD0EE 67,716- 198- 114-C
W0WUU 11,040- 80- 46-C

VE

Maritime-Newfoundland

VO1MP 1,997,088- 2272- 293-C
VO2AC/1 90- 6- 5-C
VO1QU 418,700- 1389- 100-C -20
VE1BDK 290,418- 998- 97-C -20
VE1BNN 22,605- 137- 55-C -10

Quebec

VE2AYU 361,746- 594- 203-C
VE2UL 4,620- 44- 35-B

Ontario

VE3ST 157,080- 340- 154-C
VE3BXY 103,680- 256- 135-C
VE3NBE 22,385- 105- 71-B
VE3HX 9,165- 65- 47-C
VE3TJL 9,108- 69- 44-B
VE3CUI 4,350- 50- 29-C -40
VE3GRA 16,512- 128- 43-B -20
VE3XN 305,316- 1028- 99-C -15
VE3NXQ 125,247- 503- 83-C -15
VE3MKM 3,213- 51- 21-B -10

Manitoba

VE4KE 107,985- 313- 115-B

Alberta

VE5RA/6 675,597- 1019- 221-C

British Columbia

VE7FJE 69,948- 268- 87-C
VE7XO 56,481- 281- 87-C
VE7COP 4,347- 63- 23-B
VE7BS 966- 23- 14-C -160
VE7FPT 396- 12- 11-C -80

Yukon

VY1CW 4,575- 61- 25-B

Multioperator

Single Transmitter

1

K1YR (+K1s RU,RX,KB1WH)
1,523,676- 1309- 388-C
K1VR (+K1IR,KC1GS,NB1Y)
1,493,184- 1414- 352-C
K1TO (+KA1VC,NJ1V,WA1LVW)
1,478,304- 1416- 348-C
KY1H (+KR1R,N1EMG,NT2X)
1,364,682- 1334- 341-C
K1IU (+KA1GQW)
1,312,254- 1279- 342-C
K1KA (+W1HNZ)
967,300- 1097- 300-C
W1PH (+NET) 949,644- 977- 324-C
W1RR (+NET) 903,600- 1004- 300-C
NK1F (+NET) 607,410- 794- 255-C
NJ1F (+NET) 601,092- 708- 283-C
AK1L (+KA1X,WA2LGT)
406,146- 533- 254-C
KM1C (+KB1T)
205,842- 406- 169-C
NO1I (+NET)
129,870- 333- 130-C

N8RA (+N1ECY)
124,740- 315- 132-C
W1BK (+K1TXH)
70,620- 220- 107-C
K1TR (+NET) 57,285- 201- 95-C
KA1MP (+NET) 41,280- 160- 86-C
WB1CNM (+NET)
17,649- 111- 53-C
AI3E (+NET) 10,296- 78- 44-C
N1ACH (+NET)
6,888- 56- 41-C

2

NY2L (+NET)
1,481,541- 1399- 353-C
N2BA (+N2GSG,K8HUT)
1,404,804- 1402- 334-C
WB2P (+NET)
1,320,570- 1206- 365-C
NF2L (+NET)
598,587- 1067- 187-C
N2SS (+NET) 461,916- 611- 252-C
KE2BA (+KA2RQR,KB2s ESR,FBE,N2HIZ)
356,373- 603- 197-C
KD2TT (+WA2LOS)
300,600- 600- 167-C
W2UI (+N3KR)
298,048- 514- 194-C
KA2OJD (+NET)
11,700- 78- 50-C
WA2SDY (N2s HIV,HSG,ops)
11,178- 81- 48-B
W2YKQ (K2VTB,W2EIU,op)
2,100- 35- 20-B
KA2YKN (+N2HQL) (N/T)
1,536- 32- 16-B

3

W3BGN (+K2BU)
2,481,717- 2003- 413-C
N3RS (+N3RD)
2,241,594- 1818- 411-C
N2FB (+WB2EKK,K3YDX)
1,722,513- 1523- 377-C
N3AD (+NET)
1,574,688- 1396- 376-C
K3WW (+NET)
1,441,716- 1268- 379-C
W3XU (+NET)
1,337,661- 1443- 309-C
N3ARK (+K3IE,KB3MM,WB3LFZ)
482,328- 693- 232-C
NK3U (KU3T,NE3T,ops)
460,257- 707- 217-C
W3MA (+NET) 262,890- 345- 254-C
N3RR (+K3WE)
211,404- 446- 158-C
K3UEI (+NET) 150,273- 283- 177-C
N3CIX (+KA3s PDY,PKN,QOX,N3s AMY, ARI,EUK,FTI,WB3EPW)
140,013- 331- 141-C
K3ANS (+K3YD)
128,904- 328- 131-B
WA3IJZ (+NET)
104,742- 253- 138-C
K3NZ (+NET) 82,431- 213- 129-C
K3ND (+NET) 89,504- 181- 128-C

4

N4KG (+KC4ZV,KU4J)
1,382,100- 1355- 340-C
W4MYA (+K3RZR,AA4GL,K4BAM,KX4S, WB4BVY,WK4Y)
1,079,415- 1245- 289-C
N4RA (+NET) 213,486- 391- 182-C
KF4GW (+N4QGH)
130,782- 307- 142-B
WS4F (+NET) 107,550- 239- 150-C

5

N5AU (KM5X,WB5VZL,WD5N,ops)
1,881,810- 1545- 408-C
KA5KRI (+K5HKX,KA5SYW,NV5L,WB5J, NX8G) 305,976- 488- 209-C

6

W6GO (+K6HHD) 1,202,850- 1458- 275-C
W6AE (+W6HX) 709,137- 957- 247-C
AG6D (+N1EE,WX5S) 552,630- 845- 218-C
KF4AU/6 (+N4EQS,KB6s DXN,QAI) 492,651- 817- 201-C
K2ITG/6 (+NET) 438,785- 787- 185-C
KW6C (+NET) 427,896- 849- 168-C
K6MA (+N6OM,WC6I) 424,473- 697- 203-C
WV6N (+W6UQF) 416,892- 709- 196-C
N6CCL (+NET) 414,960- 780- 182-C
WA6OWM (+KF6OG,N6GRT) 380,520- 755- 168-C
KE6WL (+KD6NT) 273,159- 603- 151-C
WX6M (+NET) 249,084- 444- 187-C
W6REC (+NET) 229,620- 430- 178-C
W6BIP (+NET) 208,035- 345- 201-C
KA6BIM (+KJ6DL) 156,342- 367- 142-C
W6ZKM (+NET) 148,248- 348- 142-C
W6OAT (+NV6Z,W6SZN) 132,822- 314- 141-C
WA6AHF (+NET) 132,441- 337- 131-C
W6PKB (+W6TI) 132,108- 436- 101-C
K6PU (+NET) 94,242- 226- 139-C
KB6HW (+NET) 75,402- 213- 118-C
WA9WYB/6 (+NET) 66,300- 221- 100-C
W6RT (+NET) 61,596- 174- 118-C
NS6A (+NET) 61,425- 175- 117-C
W6VZZ (+NET) 52,704- 183- 96-C
W6ERS (+NET) 52,440- 190- 92-C
NQ6X (+NET) 49,728- 148- 112-C
W6ET (+NET) 47,970- 195- 82-C
WA6LIJ (+NET) 46,008- 213- 72-C
KX6C (+KB6G,WC6I) 44,793- 189- 79-C
KG6GF (+NET) 41,760- 174- 80-C
KJ6V (+NET) 38,960- 160- 77-C
NT6G (+NET) 38,936- 152- 81-C
W6FAH (+NET) 22,800- 100- 76-C
KD6AZ (+NET) 20,034- 106- 63-B
K6LRN (+NET) 17,955- 105- 57-C
W6CF (+NET) 15,300- 102- 50-C
WA6YNT (+NET) 13,770- 102- 45-C
KD6LV (+NET) 13,608- 81- 56-C
W6MKM (+NET) 13,113- 93- 47-C
N6ITY (+NET) 12,672- 96- 44-C

7

NO7F (+KF7DQ) 192,192- 572- 112-C

8

WB8K (+KC8MK,N8s ATR,DMM,W8s CZN,JGU,WA8RCN) 1,659,305- 1661- 335-C
KA8IIC (+KA8PTT,KB8DMC,II6BBI) 80,496- 208- 129-C

9

KD9ST (+KA9s SQR,SQS,SQT) 535,854- 706- 253-C
N9CMB (+N9BKM) 297,027- 513- 193-C
NU9T (+K9HWU,KA9BGI,WD9DSS) 111,720- 245- 152-C
N9JF (+NET) 92,862- 231- 134-B

0

W4NIM (WB8ZRL,K0VM,ops) 406,458- 579- 234-C
N8AT (+KB8MV,WA0M) 379,455- 617- 205-C
K0GAS (+KX5Z,KJ6G) 341,547- 629- 181-C
W0PLS (+N6BHR,WD8HOJ) 174,584- 373- 156-C
KC6LX (+K0QNS) 59,946- 194- 103-C

VE

VE4OX (VE4s AAA,AC,ANO,AOG,FR, GR,HQ,RI,RY,SF,SI,TM,UT,WS,ops) 56,568- 189- 98-B

Two Transmitter

K2TR (+K1ZM,K2XA,WA2SPL,WB2KMY) 4,181,706- 2799- 496-C
N6RO (+K3EST,K6TMB,N6IG,WA6VEF) 3,954,846- 3247- 406-C
NB1H (+K1s FWE,MNS,NK1K,NO1I) 3,060,784- 2422- 424-C

K8CC (+K8AQM,KE8OC,N8BTU,W8s LU,UA,WD,WA8RRR,WD8RHO) 2,760,000- 2300- 400-C
N2MG (+ops) 2,720,400- 2267- 400-C
AA1K (+AB1P,AD3V,K3WJV,N3FDL, N8NA) 2,561,694- 1954- 437-C
KA1GG (+K1KJT,KC1Q,W1KM) 2,545,620- 2204- 385-C
N2MM (+K2PS,W2BHK) 2,284,110- 1857- 410-C
N2RM (+KF2U,WA2HGM) 2,057,580- 1989- 345-C
WBAIH/9 (K9FVF,KM0O,N0BSH,W8UC,ops) 1,832,064- 1664- 367-C
KQ2O (+K2s BK,NJ) 1,739,688- 1676- 346-C
W7ZR (+N7s BSB,ZZ,W7GJS) 1,461,816- 1896- 257-C
NE3F (+WB2LEE,KS3F,NN3Q,W3UM) 1,362,720- 1336- 340-C
AK6T (+K4UVT/6,NP4IW/W6,K6ZM,KI6EZ, NB6L) 1,305,390- 1642- 265-C
N3LR (+KD3DM,N3FOB,NJ3s A,C) 1,075,683- 1267- 283-C
N1AU (+W1FJ) 671,688- 982- 228-C
KQ1F (+K1XM) 568,968- 628- 302-C

Unlimited

W3LPL (+K1DQV,K3s RA,RT,KO3Q,N3GB, W3s EKT,EMH, WB3JRU,WP4J, NW5E,N8II) 6,568,521- 3889- 563-C
NR5M (+K2s TNO,UA,K5s GA,GN,LZO, KE5s FI,IV,KG5U,KN5H,N5s DC,IVF, NT5D,W5ASP,WB5N) 4,841,751- 3287- 491-C
K5NA (+K2s RIH,SS,TW,KA2TIP,KC2IW, KU2Q,N2s AA,EK,NJ2L,WA2STM,WB2Q, WA3AFS,K5KG) 3,733,047- 2711- 459-C
WM5G (+AA5DX,K5s KJ,MR,RX,KC5DX, KM5R,KW5P,NJ5N,KO9Y) 3,644,775- 2505- 485-C
K1AR (+NET) 3,369,900- 2390- 470-C
K9RF (+K2NA,N2IC,KT3M,WZ6Z,K0GU, NI0E,W0PSY,WB0IKN) 3,249,909- 2561- 423-C
W3GM (+K3s GM,ND,RL,KA3s PIT,PLS, W3FV,AA4II) 2,189,025- 1725- 423-C
W4MYA (+K3RZR,AA4GL,K4BAM,KX4S, WB4BVY,WK4Y) 1,079,415- 1245- 289-C
N2VW (+K2TD,WB2YOF) 914,586- 974- 313-C
W2GD (+NET) 761,940- 747- 340-C
W2XL (+K2KBL,KA2TIP,KC2IW,N2GQS, WA2ZNU,WD2V) 404,019- 583- 231-C
W2UI (+N3KR) 299,148- 514- 194-C

DX Phone

Single Operator

Africa

Morocco

CN8EK 155,184- 488- 106-B
CN8FB 87,453- 369- 79-B
CN8FC 85,104- 591- 49-B -15

Canary Islands

EA8VV 59,964- 526- 38-C -15

Ceuta

EA9RY 52,572- 337- 52-B

Guinea-Bissau

J52US (K8MN,op) 3,011,295- 4165- 241-B

Gabon

TR8SA 208,920- 1220- 57-B -20

South Africa

ZS6AOO 619,546- 1729- 158-B
ZS6P 29,640- 260- 38-B

Tanzania

5H1HK (WH6X,op) 527,436- 1196- 147-B

Zaire

9Q5NW 2,786,028- 3902- 238-C

Asia

Korea

HL1XP 38,750- 245- 50-C
HL9FN 3,016- 88- 19-B
HL1LW 6,072- 88- 23-B -20

Japan

JH7DNO 842,619- 1789- 157-C
JA1XAF 812,940- 1594- 170-C
JH7WKQ 629,307- 1427- 147-C
JA9JHA 456,210- 1110- 137-C
JA7FWR 179,400- 598- 100-C
JR1GSE 162,864- 624- 87-B
JA2THS 115,182- 474- 81-C
JF3CCN 79,380- 441- 90-C
JE1AER 37,179- 243- 51-B
JH7LRS 30,436- 178- 57-A
JA2JSF 27,638- 198- 47-A
JA1ASO 25,380- 180- 47-B
JA2BNN 17,433- 149- 39-C
JR6XOJ 11,136- 128- 29-B
JR6IIB 9,309- 107- 29-B
JA7SUR 7,410- 95- 26-B
JA1IZ 5,394- 82- 29-C
JM1SOX 4,860- 90- 18-B
JA2WZ 4,320- 60- 24-B
JH7AJD/1 2,805- 55- 17-B
JA6BWH 2,730- 65- 14-B
JA1AAT 810- 27- 10-B
JG1UZD 252- 12- 7-B
JH6WHN 108- 12- 3-B
JA9GZ 72- 8- 3-B
JH4UYB 204- 17- 4-C -80
JA2BAY 58,760- 440- 43-C -40
JA8UMV 12,714- 163- 26-B -40
JO3DWD 132- 11- 4-B -40
JH1NBN 140,415- 851- 55-C -20
JA8NFV 111,708- 642- 58-B -20
JH7QXJ 55,554- 394- 47-C -20
JA7RXU 7,221- 83- 29-C -20
JA5IP 210- 14- 5-C -20
JH1EDB 131,544- 812- 54-C -15
JR6PGB 96,195- 605- 53-C -15
JH8YCT (JE8BFO,op) 90,114- 653- 48-B- 15
JA8QNJ 86,904- 568- 51-C -15
JP1NWZ 63,450- 450- 47-B -15
JA7NVF 49,920- 418- 40-B -15
JF1SEK 47,124- 374- 42-B -15
JL1MWI 19,899- 201- 33-B -15
JA1QXC 18,564- 182- 34-B -15
JE4VVM 13,671- 147- 31-C -15
JM1APN 11,700- 130- 30-B -15
JJ2HSC 6,840- 114- 20-B -15
JA1BUN 4,941- 61- 27-B -15
JA1WYQ 4,680- 78- 20-B -15
JA0BMS/1 4,674- 82- 19-A -15
JA3BBG 3,660- 61- 20-B -15
JA3UWB 1,920- 64- 10-B -15
JE7ENK 1,107- 41- 9-B -15
JL2RQH 792- 33- 8-B -15
JG7JBZ 126- 14- 3-B -15
JO1LDY 24- 8- 1-A -15
JQ1UNI 6- 2- 1-B -15
JH1LBR 7,938- 189- 14-B -10
JA6NFP 252- 21- 4-B -10
JA1FO 108- 12- 3-B -10

Jordan

JY9LC 1,440- 24- 20-C

Asiatic RSFSR

RA9FA 191,118- 801- 108-B
UA9MR 68,145- 413- 55-B
UA9MA 85,500- 500- 57-B -20
UW6CV 18,981- 171- 37-B -20
UA6ABK 15,120- 126- 40-B -20
UW9AG 8,100- 90- 30-B -20
UW6CF 7,728- 92- 28-B -20
RA6SU 4,416- 64- 23-B -20
UA9SN 1,134- 27- 14-B -20
UA6XAK 13,950- 155- 30-B -15
UA9AKO 972- 27- 12-B -15

Tadzhikistan

UJ8JCM 4,071- 59- 23-B -20

Kazakhstan

UL8CWW 17,604- 183- 38-B -20

Kirghizia

RM8MA 4,725- 63- 25-B
UM8MAA 36- 4- 3-B -15

Hong Kong

VS6UP 185- 11- 5-C

India

VU2TJW 6,210- 69- 30-C

Israel

W3FYT/4X 9,240- 88- 35-C
4X6IF 7,752- 78- 34-A

Europe

Portugal

CT1QF 73,899- 357- 69-B
CT3DZ 664- 19- 12-B
CT1AQZ 34,515- 295- 39-B -150
CT3DL 64,880- 460- 47-C -40
CT1DJE 7,245- 105- 23-B -40
CT1CIR 663- 17- 13-B -20
CT1AUH 94,962- 646- 49-B -15
CT8DIZ 39,438- 313- 42-C -15
CT1BBY 3,933- 57- 23-B -15
CT1UO 1,593- 59- 9-C -15
CT1BOP 420- 20- 7-B -10

Azores

CU2AF 6,525- 87- 25-B -150
CU3AA 108,812- 774- 48-C -40
CU2BR 79,335- 615- 43-B -15

Federal Republic of Germany

DL8PC 100,056- 379- 88-C
DK9SA (DJ1YJ,op) 61,230- 314- 65-C
DK5DS 30,912- 184- 56-B
DL3SBI 28,710- 145- 66-C
DL3SCR 23,010- 118- 65-C
DJ9IF 897- 23- 13-C -80
DK8AX 264- 11- 8-B -40
DF1SD 67,328- 458- 49-C -20
DK7ZT 13,260- 130- 34-B -20
DL1EK 12,474- 126- 33-B -20
DJ8BX 3,840- 64- 20-B -20
DL8RAI 124,848- 887- 48-C -15
DF2UU 63,691- 547- 51-C -15
DA2ER 30,098- 304- 33-C -15
DL8FBD 7,452- 108- 23-C -15
DL9YCS 5,796- 69- 26-C -15
DL3ME 2,940- 49- 20-B -15
DK9XT 1,881- 33- 19-B -15
DJ1ZU 3,432- 52- 22-C -10

Spain

EA7DHP 548,397- 1069- 171-C
EA3EGB 239,772- 689- 116-B
EA7CWC 34,038- 183- 62-B
EA5CPH 17,250- 125- 48-B
EA7CWA 16,650- 111- 50-B
EA2CR 15,876- 108- 49-B
EA1AW 10,647- 91- 39-B
EA5GEO 7,452- 92- 27-C
EA1EDC 5,475- 73- 25-C
EA5FYJ 2,142- 34- 21-B
EA7EBH 1,782- 33- 18-A
EA3ELM 1,887- 37- 17-C -80
EA3CZM 17,484- 188- 31-C -40
EA3AAY 77,250- 515- 50-B -20
EA3FKC 3,840- 64- 20-B -20
EA3EGV 2,484- 46- 18-A -20
EA5BLJ 1,920- 40- 18-B -20
EA7FTR 84,035- 596- 47-B -15
EA5BZS 13,056- 136- 32-B -15
EA5DIT 2,553- 37- 23-B -15
EC4CNA 1,218- 29- 14-B -15
EC7DEB 27- 3- 3-B -15

Balearic Islands

EA6SX 565,422- 1318- 143-B
EA6WY 330- 11- 10-B -15

Ireland

EI4DW 262,908- 804- 109-B
EI6FP 65,100- 434- 50-C
EI5DI 17,238- 189- 34-B -15

France

F6AOJ 988,428- 1681- 196-C
F6DYK 773,382- 1642- 157-C
F6DZU 530,370- 1245- 142-C
FD1BEG 29,040- 176- 55-A
F6EXQ 14,076- 102- 46-B
F6API 12,640- 107- 40-B
F6AUS 54,540- 404- 45-B -15
F6BVB 14,280- 136- 35-B -15
F1HWB 14,280- 136- 35-B -15

England

G2QT 321,485- 739- 145-B
G3SJX 305,724- 698- 146-C
G4IUF 156,080- 510- 102-B
G4MET 77,220- 286- 90-C
G4GFH 14,391- 123- 39-C
G4AMT 42,228- 306- 46-B -80
G4VMM 2,760- 46- 20-C -40
G4OSH 61,758- 438- 47-C -15
G8GD 924- 22- 14-B -15
G3CWL 180- 10- 6-A -15

Northern Ireland

GI4BBV 87,210- 342- 85-B

Scotland

GM3BCL 154,761- 853- 79-C
GM4HQF 31,668- 182- 58-B
GM3AYR 28,830- 155- 62-C
GM4WEW 17,589- 143- 41-B -20

Guernsey and Dependencies

GU0NN5O 242,400- 800- 101-B -15

Wales

GW4BLE 1,447,068- 2481- 198-C
GW8ARK 62,832- 476- 44-C -15
GW4RHW 33,396- 253- 44-B -15

Hungary

HA5WA 828,630- 1874- 165-B
HA8XX 139,308- 494- 94-B
HA6NW 27,873- 183- 57-B
HA8ZO 5,668- 79- 24-C -40
HA5WE/P 180,600- 1075- 58-C -20
HA8CO 108- 9- 4-B -20
HA5MY 1,782- 33- 18-B -15
HA8KZO 561- 17- 11-B -15

Liechtenstein

HB9/DL4OK 2,580- 43- 20-B

Switzerland

HB9AAA 308,850- 725- 142-C
HB9BVV 18,552- 144- 36-C -20
HB9BOU 77,328- 537- 48-C -15
HB9DX 12,390- 118- 35-C -15

Italy

IV3YYK 273,768- 671- 136-C
I2SVA 85,104- 394- 72-B
I0KHY 45,780- 218- 70-B
I2ZCE 41,340- 212- 65-C
I8IYW 25,281- 159- 53-B
IK2ANI 24,420- 148- 55-C
I6KHP 20,748- 133- 52-A
IO3BQC (I3BQC,op) 16,920- 120- 47-C
IK5CAY 16,206- 146- 37-B
IK3HMD 14,061- 109- 43-B
IK1GPG 7,866- 69- 38-B
IK8FEC 3,321- 41- 27-B
IK4GNK 3,213- 51- 21-B
IK4FNF 648- 18- 12-B
IV3PRK 4,500- 75- 20-B
I5MXK 58,590- 465- 42-C
I4AVG 19,998- 202- 33-C
I4VEQ 140,913- 921- 51-C
IK2BTI 43,080- 359- 40-C
I8RS 41,886- 358- 39-C
I2TZK 22,338- 219- 34-C
I1ZEU 340,692- 1958- 58-C
IK8DOI 187,224- 1076- 58-C
IO4ABF 147,675- 895- 55-C
IN3XUG 27,972- 222- 42-C
I1OLM 9,765- 105- 31-B
IN3PEE 1,218- 29- 14-B
IK4AUY 124,332- 787- 52-C
I8CZW 93,150- 675- 46-B
I5OYY 62,784- 436- 48-B
I4UFH 18,525- 247- 25-C
I4CSP 8,280- 92- 30-B
IK4CBM 6,075- 75- 27-B
IK8JMS 2,967- 43- 23-B
IK2DVG 1,248- 52- 13-C
I6YEF 3- 1- 1-B

Sardinia

IS6LLJ 17,955- 133- 45-B
IS0WON 38,076- 334- 38-C

Norway

LA4TE 49,530- 254- 65-C
LA5KK 12,426- 109- 38-B
LA2PFA 10,656- 98- 37-B
LA3YEA 180,056- 936- 57-C
LA9PW 2,880- 48- 20-C
LA2AD 2,709- 43- 21-B
LA5JX 240- 10- 8-B
LA4YGA 72- 6- 4-B

Bulgaria

LZ2WM 10,494- 106- 33-B
LZ1KZM 79,350- 575- 46-B
LZ1BJ 2,850- 50- 19-C

Austria

OE1WWL 3,600- 50- 24-C

Finland

OH1AD (OH1PS/OH2PM,op) 193,410- 814- 105-C
OH1ZAA 32,568- 184- 59-C
OH8NIO 27,930- 190- 49-C
OH2HE 9,831- 113- 29-C
OH8LK 205,200- 1200- 57-C
OH6YF 84,429- 531- 53-C
OH3GD 10,488- 92- 38-B
OH1AF (OH1TD,op) 45,360- 360- 42-C
OH6VR 2,484- 46- 18-C

Czechoslovakia

OK1ALW 1,126,488- 2008- 187-C
OK1DKS 10,836- 86- 42-A
OK1KZ 8,325- 75- 37-B
OK1MNV 2,981- 47- 21-B
OK3CWQ 240- 10- 8-C
OK2ABU 312- 13- 8-C
OK2BQL 9,765- 105- 31-B
OK3CMW 4,650- 62- 25-B
OK3CTX 1,440- 32- 15-B
OK2PKS 561- 17- 11-B
OK2BAT 27- 3- 3-A
OK2PEM 16,065- 153- 35-B
OK2SPJ 6,438- 74- 29-B
OK2BTC 1,485- 33- 15-B
OK1OPT 144- 8- 6-B

Belgium

ON6JG 1,512- 36- 14-B
ON4XG 11,655- 105- 37-B

Denmark

OZ5EV 48,048- 208- 77-C
OZ1LRT 8,300- 60- 35-B
OZ3PE 3,300- 44- 25-A
OZ8T 2,442- 37- 22-B
OZ2BM 1,596- 28- 19-B
OZ1FNX 429- 13- 11-B
OZ1CLG 32,076- 243- 44-C
OZ1INN 10,368- 108- 32-B
OZ1EMY 3,900- 52- 25-B
OZ1DPW 18,830- 170- 33-B
OZ1LTB 8,004- 92- 29-B

Netherlands

PA8DUO 41,040- 180- 76-B
PA8KDM 28,056- 167- 56-B
PA3ELU 19,875- 125- 53-B
PA3EMN 9,588- 94- 34-B
PA3ESZ 5,670- 70- 27-B
PA3DCU 3,744- 48- 26-B
PA8DJ 1,350- 25- 18-B
PA3ENM 4,830- 70- 23-B
PA8QX 28,854- 229- 42-C
PA2REH 27,750- 250- 37-B
PA2JCG 1,767- 31- 19-B
PA3AYN 936- 24- 13-B

Sweden

SM5GMG 86,112- 312- 92-C
SM5IWC 37,881- 207- 61-B
SM8JEM 6,930- 66- 35-B
SM3PHM 74,910- 454- 55-C
SM2LWU 16,884- 134- 42-C
SM5ARL 5,670- 70- 27-B
SM4BTF 1,938- 34- 19-C
SM5AAY 1,176- 28- 14-C
SM5CAK 1,482- 36- 13-C

land

P6DVP	56,880-	237-	80-B		
P5DYO	19,584-	128-	51-B		
P8CZ	8,094-	71-	38-		
P9AKD	8,073-	117-	23-C		
P5BNB	3,300-	50-	22-B		
P3BVI	780-	20-	13-B		
P9JZT	288-	12-	8-B	-80	
P5EMM	13,680-	120-	38-B	-20	
P1EOI	8,772-	86-	34-B	-20	
P9RTT	4,095-	65-	21-B	-20	
P9IWO	3,102-	47-	22-B	-20	
P3GVX	2,760-	46-	20-B	-20	
P9RQU	1,908-	21-	16-B	-20	
P6ANY	25,584-	208-	41-C	-15	
P6OJJ	14,796-	137-	36-B	-15	
P9EMQ	6,525-	75-	29-B	-15	
P2PMO (SP2JKC,op)					
	4,950-	66-	25-B	-15	
P3JHY	2,838-	43-	22-B	-15	
P2EXN	1,728-	36-	18-B	-15	
P3LPR	714-	17-	14-B	-15	

anz Josef Land

A1OT	17,328-	152-	38-B	-15

uropean Russian RSFSR

Z6YWB	76,224-	397-	64-B	
V3DF	61,908-	308-	67-B	
A6ADC	53,952-	281-	64-B	
W3QW	42,840-	238-	60-B	
A4NC	6,480-	72-	30-B	
A3DRB	33,798-	262-	43-B	-20
A3GBI	16,695-	159-	35-B	-20
A3AGW	8,445-	68-	32-B	-20
A6LDX	39,096-	362-	36-B	-15
A3DNR	3,240-	72-	15-B	-15
W6AC	1,575-	35-	15-A	-15
A3DJA	810-	30-	9-B	-15

raine

35IRN	105-	7-	5-A	
35IFN	2,052-	57-	12-B	-80
35VT	14,058-	142-	33-B	-20
35DX	101,508-	768-	44-C	-15
35UG	18,258-	179-	34-B	-15
34TWL	4,380-	73-	20-B	-15
35IMD	1,134-	27-	14-A	-15

huania

3BH	7,719-	83-	31-B	

tonia

2RZ	16,605-	135-	41-B	-20

rman Democratic Republic

3EK	1,137,933-	2143-	177-C	
4UI/A	443,940-	980-	151-C	
2JJ	223,944-	602-	124-C	
2WF	37,014-	199-	62-B	
1JH	9,828-	78-	42-B	
4CG	6,720-	70-	32-B	
5DA	3,000-	40-	25-B	
2WD	2,553-	37-	23-C	
9LF	2,205-	49-	15-B	
1WI	1,800-	30-	20-B	
2BF	960-	20-	18-B	
3DL	101,976-	607-	56-C	-20
2EK	50,544-	312-	54-B	-20
2WG	9,996-	98-	34-C	-20
4FB/A	2,736-	48-	19-B	-20
5PE	2,460-	41-	20-B	-20
8GO/A	1,665-	37-	15-C	-20
2BK	1,287-	33-	13-B	-20
8UA	1,209-	31-	13-B	-20
4KL	528-	16-	11-B	-20
5AH	480-	16-	10-B	-20
1GO	240-	10-	8-B	-20
3UL	78,276-	593-	44-C	-15
4XA	16,539-	149-	37-B	-15
8IF	14,580-	135-	36-B	-15
4TN	6,480-	80-	27-B	-15
5ML	1,755-	35-	17-B	-15
7TN	1,530-	30-	17-B	-15
7ZE	900-	20-	15-B	-15
5YA/A	720-	20-	12-B	-15
2VI	396-	12-	11-B	-15

mania

6KEA (YO6AWR,op)				
	10,440-	87-	40-B	
5BQ	27-	3-	3-A	-20
3DCO	2,709-	43-	21-B	-15
9DHZ	1,521-	39-	13-B	-15

goslavia

1LM	9,996-	98-	34-A	
7FT	6,424-	104-	27-C	
7SF	3,036-	46-	22-B	
2TW	8,072-	92-	22-B	-160
2Y	29,304-	264-	37-C	-80
1A	17,496-	243-	24-C	-80
4L (YU4OO,op)				
	72,756-	516-	47-C	-40
7A	23,520-	224-	35-C	-40
4M (YU4RT,op)				
	22,506-	242-	31-C	-40
2W (YT2GW,op)				
	201,840-	1160-	56-C	-20
KQ	129,528-	771-	56-C	-20
T	120,522-	758-	53-C	-20
EXY (YZ6AA,op)				
	157,896-	1032-	51-C	-15
3MM	157,584-	938-	56-C	-15
KF	123,627-	841-	49-B	-15
3AU	13,020-	140-	31-B	-15
4EKV	1,188-	33-	12-B	-15
YU2TY	312-	13-	8-A	-15

North America

Bahamas

N4RP/C8A	283,776-	739-	128-B	

Dominican Republic

HI3AMF	1,067,220-	1617-	220-C	

San Andreas and Provinces

HK1LDG/HKØ	313,170-	1898-	55-B	-15

Panama

HP2XVB	2,094,408-	3062-	228-B	

St Vincent and Dependencies

J87BN	41,940-	233-	60-B	

Alaska

NL7GP	451,356-	1297-	116-C	
NL7DU	85,890-	409-	70-C	
NL7HT	53,109-	281-	63-B	
WL7BIL	8,439-	97-	29-C	-80
KL7ISO	65,250-	435-	50-C	-20
NL7KB	252-	12-	7-B	-20

Puerto Rico

WP4GQB (N/T)	50,211-	797-	21-B	-10

Greenland

OX3KD (OZ1KPB,op)				
	21,480-	179-	40-C	

St Maarten, Saba, St Eustatius

PJ5/WB1ABF	190,080-	660-	96-B	
PJ7/K2KTT	63,591-	517-	41-B	-10

Guatemala

TG9GI	1,169,280-	2436-	160-A	

Costa Rica

TI2CC	86,013-	503-	57-C	-160
TI2LTA	223,497-	1307-	57-C	-80

St Christopher and Nevis

V47NXX	999,141-	1781-	187-B	

Montserrat

VP2MBA	5,522,139-	5957-	309-C	

Bermuda

VE3PE/VP9	1,404-	26-	18-B	-20

Mexico

XE1CHL	25,800-	200-	43-B	
XE2NNZ	34,545-	245-	47-C	-160
XE2NQ (AA5B,op)				
	219,051-	1281-	57-B	-40

HQ, United Nations

4U1UN (K2GM,op)				
	91,352-	1139-	56-C	-160

Oceania

Philippines

DU1NH	3,000-	50-	20-B	-20
K4YT/DU1	7,644-	98-	26-C	-15

French Polynesia

FO5IW	660-	20-	11-B	

Guam

N7DF/NH2	693-	21-	11-C	-20
KH2F	151,184-	988-	51-C	-15

Hawaiian Islands

KH6XX (KH6ND,op)				
	4,648,235-	4855-	319-C	
WR6R/KH6	3,329,460-	4188-	265-C	
KH6RS	2,898,960-	3760-	257-C	
AH6AZ	93,132-	597-	52-C	-80
AH6GQ	433,608-	2492-	58-C	-15
W7PSQ/KH6	120,945-	733-	55-B	-15

Marshall Islands

KX6DX (NZ8B,op)				
	790,224-	1304-	202-C	

Australia

VK2APK	260,209-	713-	131-C	
VK3YH	47,658-	338-	47-C	
VK2CWG	14,916-	113-	44-C	-80

Indonesia

YB3ASQ	126,504-	502-	84-B	
YB2FEA	17,589-	143-	41-B	
YCØRBG	10,275-	137-	25-B	-15

South Cook Islands

ZK1AR	460,890-	1138-	135-B	

New Zealand

ZL2AFY	18,480-	154-	40-B	
ZL1IM	9,504-	96-	33-B	

South America

Chile

CE6EZ	491,112-	2872-	57-C	-10
CE1HBI	119,952-	833-	48-B	-10
CE3AEZ	37,800-	280-	45-C	-10

Bolivia

CP1IL	164,592-	1016-	54-C	

Uruguay

CX8CG	29,700-	220-	45-B	-20
CX2AAL	383,382-	2242-	57-B	-10

French Guiana

FY5YE (OHØXX,op)				
	5,913,756-	6442-	306-B	

Ecuador

HC1PF	54,849-	389-	47-B	-40
HC1HC	486,330-	2795-	58-C	-20
HC1OT	592,173-	3463-	57-C	-15
HC1EA	208,890-	1268-	55-C	-10

Galapagos Islands

HD8D (N5EK,op)				
	2,997,540-	3965-	252-B	

Colombia

HK3JJH	1,292,922-	2082-	207-B	
HK1LDG	127,605-	905-	47-C	-20

Argentina

AY3F	1,813,170-	3181-	190-C	
LU1FYZ	358,938-	867-	138-B	
LU8DWN	98,808-	358-	92-B	
LU4D	37,536-	272-	46-C	-40
LS8E (LU6EJP,op)				
	201,318-	1157-	58-B	-20
LS1E (LU8DPM,op)				
	515,214-	2961-	58-C	-15
LU1YU/D	3,780-	63-	20-B	-15
LS8E	190,176-	1132-	56-B	-10
LU1NCO	184,968-	1101-	56-B	-10
LU4US	125,235-	759-	55-B	-10

Peru

OA4SS	2,753,244-	3922-	234-B	
OA4ZV	201,609-	1179-	57-C	-20

Aruba

P40V (AI6V,op)				
	7,274,946-	7531-	322-C	

Netherland Antilles

PJ2FR (N6KT,op)				
	9,030,105-	9205-	327-C	

Brazil

PP2ZDD	1,689,333-	2459-	229-C	
PT7VB	229,614-	781-	98-C	
PZ5JR	154,275-	425-	121-B	
PT7BL	130,290-	505-	86-B	
PY8WT	68,340-	268-	85-B	
PT7WA	11,070-	123-	30-C	-40
ZY4OY	208,820-	1220-	57-C	-20
PY1IJ	143,220-	866-	55-C	-20
PT9ZZ (PY5CC,op)				
	637,188-	3662-	58-C	-15
PY5ZBA	592,419-	3347-	59-C	-15
ZY1NEZ	72,720-	505-	48-C	-10

Fernando de Noronha

PY1ZFO/8	331,296-	1904-	58-C	-20

Venezuela

4M5T (YV5JBI,op)				
	727,488-	1263-	192-B	
YV2IF	61,308-	393-	52-C	-160
4M3B (YV3BKC,op)				
	133,392-	794-	56-C	-80
YV5R (YV5EFP,op)				
	66,456-	426-	52-B	-80
YY1C	702-	18-	13-B	-40
YV6BTF	153,945-	933-	55-B	-20
YV1ELM	12,810-	122-	35-B	-20
YW1A	384,066-	2246-	57-C	-15
YV6DNP	165,648-	986-	56-B	-15
YU6PM	385,416-	2424-	53-B	-10
YV6BXN	354,729-	2231-	53-B	-10

Paraguay

ZP5JCY	4,142,448-	5352-	258-C	

Trinidad and Tobago

9Y4RX	286,776-	1707-	56-C	-20

Multioperator

Single Transmitter

Africa

EA9AM (+EA9IE)				
	2,105,750-	2809-	250-B	

Asia

JE2YRD (JA2EZD,JF2s DQJ,EOC,VZU, JI2KVW,JR2SQU,ops)				
	630,900-	1402-	150-C	
JH1YDT (JL1RUR,JO1IDL,JH4UTP, JH5GHM,ops)	482,391-	1209-	133-C	
JA3YKC (JG3s MRT,WDN,JH4RHF, JI3ERV,ops)	444,822-	1246-	119-C	
JA8YBY (+ops)				
	428,312-	1146-	124-C	
UZ8CWA (RW8CA,UA8s CCD,CG,CZ, UW8s CA,CJ,CN,ops)				
	405,471-	1117-	121-B	
UZ9CWA (UA8s QBB,QCA,ops)				
	287,433-	879-	109-B	
UZ8LWA (UA8s LS,NL,UW8MF,ops)				
	86,292-	423-	68-B	
UZ9ZWA (UA9CGA,UA9154-2963,ops)				
	23,736-	184-	43-B	
RL8PYL (RL7PHL,RL8PY,UL7s PAE,PCZ, ops)	87,300-	485-	60-B	
UL8DZZ (+ops)				
	6,080-	101-	20-B	
UL8LYJ (+ops)				
	4,320-	72-	20-B	

Europe

ED3QD (EA3s BOW,BOX,CVA,DGQ,EIO, ops)	436,770-	1055-	138-B	
EI7M (EI2CNB,EI3DP,EI4s BZ,DQ,FZ, EI5FY,EI6BT,ops)				
	1,314,090-	2355-	186-C	
F6BEE (+F6ARC)				
	2,162,676-	3148-	229-C	
FF6KAW (F1FFB,F6s BPX,GDK,GWV, HMQ,ops)	889,668-	1901-	156-C	
FV8NDX (F6AOI,F9RM,ops)				
	500,253-	1313-	127-C	
GB75USA (+ops)				
	102,960-	624-	55-C	
GB6SC (G4s IEB,XOM,G8AGH,ops)				
	17,415-	135-	43-B	
GW8GT (GW3s KYA,NWS,GW4s IGR,JBQ, TTU,GW5NF,GW8s BIC,BRG,CID,ops)				
	1,291,797-	2353-	183-C	
HG1S (HA1s AG,AH,DAC,DAE,SV,TJ,ops)				
	1,078,440-	2090-	172-C	
HA5KKC (HA5s LV,MO,OG,ops)				
	434,520-	1020-	142-B	
HB9AUS (+HB9s BLQ,CIP,CXZ,SFO,STL, HE9EEX)	589,850-	1314-	175-C	
I2MQP (+I2s EOW,VXJ,IK2s AEQ,EGL, GSN)	1,653,546-	2078-	169-C	
I2CZ (+I2s MYF,QEA,QMU,SLA,IK2s AGN,AVH,FDM,GGP,I2-2184)				
	170,016-	616-	92-C	
IK7AFM (+I7IWX,IK7s AFM,CJV,IWX)				
	88,356-	398-	74-B	
OH4RH (+OH4OO)				
	148,716-	459-	108-C	
OK3KII (+ops)	231,816-	743-	104-C	
OK1KQJ (OK1s AYP,BY,DLE,IMR,ops)				
	185,367-	637-	97-C	
OK2ROD (OK2s BHM,WAZ,ops)				
	32,025-	175-	61-B	
OK3KAG (+ops)				
	29,097-	183-	53-B	
OK2KPS (+ops)	510-	17-	10-B	
SKØMT (+ops)	49,410-	270-	61-C	
SP9KJT (+ops)	67,620-	322-	70-B	
UZ6LWZ (UA6s UQ,UV,-158-1336,-1502-1402,ops)				
	138,957-	909-	91-B	
UZ4HWS (UA4s HPC,HSV,-133-3447,ops)				
	31,626-	251-	42-B	
UB3IWA (UB5s IFZ,IML,ops)				
	347,928-	872-	133-C	
UB4SWB (RB5EX,UB5s NQ,SDE,ops)				
	86,184-	378-	78-B	
UB4TWA (UB5s-879-278,-879-326,-879-345,ops)	52,992-	276-	64-B	
UB4WZW (+ops)				
	20,856-	158-	44-B	
UB4VWN (+ops)				
	7,980-	95-	28-B	
UB4VWA (+ops)				
	6,732-	68-	33-B	
UB4QWW (+ops)				
	4,224-	64-	22-B	
UB4RWW (+ops)				
	2,952-	41-	24-B	
UC1AWZ (UC2-188s-148,-172,ops)				
	29,700-	180-	55-B	
UP1BYL (UP2s BIJ,BKW,BMW,PX, UPØBA,ops)				
	561,393-	1273-	147-B	
UP1BZA (UP2s BIM,BLW,BQJ,OX,ops)				
	192,660-	494-	130-B	
UP1BYC (UP2s-638-2564,-638-2565,ops)				
	163,836-	666-	82-B	
UQ1GWW (+ops)				
	872,328-	1913-	152-B	
4N4C (YU4MA,+op)				
	220,968-	744-	99-B	

North America

WS4E/C6A (+KQ2M,N2AWM,AA4OV, W4LTT)	4,161,258-	4593-	302-B	
J6CQ (J8LMV,K4s LTA,PJ,N4FKO,ops)				
	1,999,128-	2687-	248-C	
KL7CQ (+NL7s LX,LY,LZ,MX,NB)				
	224,844-	914-	82-C	
V31BB (K3OJL,K3OX,ops)				
	4,610,634-	5089-	302-C	
V31HQ (N5IMW,WA5Y,WS5O,ops)				
	3,327,321-	3947-	281-C	
VP2MU (AA4NC,WB8SHD,ops)				
	8,605,653-	8719-	329-C	
XEØDX (WN4KKN,K5s JX,TSQ,KA5YJZ, KD5GY,N5KEV,NA5C,W5VX,ops)				
	6,796,566-	6783-	334-C	
XE2EBE (AA6DP,N6PE,ops)				
	1,838,235-	2501-	245-B	
8P9X (K3s KG,ZR,K4FJ,8P6PW,ops)				
	8,518,002-	8501-	334-C	
8P6BBS (8P6s SG,SH,ops)				
	1,719,756-	2852-	201-B	

Oceania

DXØHT (+ops)	38,211-	271-	47-B	
KH6WO (AH6IO,NH6LF,WH6s BIT,BLC, BVD,ops)	203,550-	590-	115-B	

South America

LU4FM (LU1s FOW,FZR,LU2s FYA,FFD, LU4FDV,LU6s FDZ,FN,LU8FDZ, LU9FFU,ops)				
	3,838,038-	4978-	257-C	
LU1VZ (LU1s VK,VV,LU8s VAB,VV,ops)				
	3,115,665-	4239-	245-C	
P4ØX (DL7AEY,KA1XN,P43JC,ops)				
	5,964,720-	6856-	290-C	
PJ9J (W1s BIH,WEF,ops)				
	7,820,475-	8021-	325-C	
YW3A (YV3s AZC,AGT,BQS,ops)				
	5,016,000-	5225-	320-C	

Two Transmitter

Asia

JA1YHA (4 ops)				
	175,296-	664-	88-C	
JA1YWX (JM1CAX,JO1BMV,JF2IWL, JI2GUT,JH7PKU,JH9GGH,JA6-9336,ops)				
	972,942-	1942-	167-C	
JA7YFB (JH7s XKJ,XMO,JQ1NBV,JR7GYC, ops)	747,516-	1618-	154-C	

Europe

LZ1KDP (LZ1JY,LZ2UV,LZ1-F-195,ops)				
	601,710-	1294-	155-C	

North America

KP4BZ (+NP4s A,CC,Z,WP4K)				
	11,428,880-	11372-	335-C	

South America

8D2DX (N7DD,NI7Y,WB7A,WØYOY, WAØNNC,VE7RG,XE2s ABB,AFK,AFV, CRN,FEF,JL,JRV,JSL,LF,SJF,SMA,SPN, UMV,WZ,ops)				
	8,723,310-	9290-	319-C	
XE2GDK (XE2MX,K8JYO,KB6VUE,KI6MS, N6CW,NI6W,N7CW,K9VV,ops)				
	6,297,360-	6905-	304-C	

Unlimited

Asia

JA7YAA (JN1VYN,JJ3CNL,JR7OMD,JE7s HFL,HLZ,QCQ,JA9CCP,JHØORW,ops)				
	1,016,028-	2028-	167-C	
JA9YBA (JJ3URK,JF6DEA,JR8GOU, JA9VDA,JH9s KIF,VSF,JA9-8148,ops)				
	701,790-	1570-	149-C	

Europe

I3MAU (+I3s FIY,JSS,KVW,MWP,ON,QJZ)				
	2,439,840-	3536-	230-C	
YZ4J (YT3OO,YU4s NW,RR,RW,ops)				
	48,741-	211-	77-B	

North America

KL7RA (+AL7s CQ,HC,KL7IEH)				
	1,076,708-	2286-	157-C	

Checklogs

AA4WX, AT4UH, CP1BN, CT1BOP, DF2UU, DF7WO, DK6US, DL4KBJ, DL5IJ, EA1ATQ, EA2BUN, EA3FER, EA5YU, EA6VQ, EA7GBD, EA8AKQ, G3KZJ, HA8DD, HA2EOA, HA3KHC, HA4XX, HA8KZO, HA8VK, IK8GGW, IK1LBL, IK2JEX, IK7BPV, IK7IJP, IS8LYN, JI1JVG, K6FM, KA1NXT, KA9EFX, KH6FQ, KW2J, KX7J, LA3JT, LA4TG, LZ1AF, LZ1GD, LZ1KAZ, LZ2DB, N1CIX, N1CRD, N4FFF, N8HZM, NT8W, OH1NOA, OH1XX, OH3HS, OH5FA, OK1DKR, OK1US, OK2SG, OK2SWD, OY7ML, OZ1EUO, OZ1GHS, OZ1IPP, OZ1NF, OZ2SI, OZ4RS, OZ7L, OZ7ON, PA0TV, PA3AAU, PA3BBP, PA3BWQ, PA3DCS, PJ9B, PY1IH, PY1OL, PY2AC, PY2QX, RA1QE, RA3ATM, RA3LPY, RA3VA, RA6LLL, RA9AE, RB5GW, RT4UA, RV9UV, RZ3DC, SM0BDS, SM8CSX, SM0RSM, SM2NTU, SM4AOH, SM4APZ, SM4GL, SM4SET, SM6BWQ, SM6CDN, SM6CPO, SM6DNF, SM6DUA, SM6GOR, SM6LJP, SM6OEF, SM8OLL, SP1AAQ, SP2DKI, SP3CB, SP3CDQ, SP3GVX, SP5DIR, SP6FER, SP7AWG, SP7DBI, SP7MOQ, SP7NMW, SP8HXN, SP9AGS, UA9FS, UA9II, UA9KZ, UA9QO, UA9SGN, UA1ANA, UA1OLL, UA3AAJ, UA3AGW, UA3DAT, UA3DRB, UA3EDP, UA3PB, UA3PHB, UA3PIU, UA3PP, UA3PPF, UA3RE, UA3TCJ, UA3ZOY, UA4CO, UA4ON, UA4YCJ, UA6BJQ, UA6WAV, UA6YW, UA9KM, UA9SAW, UB4WZA, UB5DW, UB5IFH, UB5IS, UB5JNW, UB5KAF, UB5LST, UB5ZFQ, UC2AGB, UC2AGD, UC2IU, UK3B, UL7JCP, UM8MIG, UP3BO, UQ1GWY, UQ2GLQ, UR2RMC, UV3DN, UV3MM, UW3HY, UW9CP, UY5GG, UZ8OWO, UZ8QXU, UZ1AWT, UZ1TWB, UZ3DYF, UZ3XWM, UZ4WWG, UZ6EWF, UZ6HXK, UZ9XXM, VE1ACK, VE3OMU, W2HAZ, W2LVP, W2WOE, W4DHZ, W4JTU, WA4CMS, WA4F, WV5K, XE2TCQ, Y21IM, Y21XH, Y21ZM, Y22KM, Y22PF, Y22YO, Y23CM, Y23KF, Y23UL, Y24GF, Y25BL, Y25DF, Y25MG, Y25VD, Y27GL, Y31EM, Y35ZK, Y36VM, Y43QF, Y43RJ, Y43VI, Y43VL, Y48ZF, Y49MH, Y55PG, Y55VF, Y55ZF, Y65KN, Y65LN, Y66ZF, Y75YL, YC8RFF, YO2ASJ, YO3CFF, ZC4DS, ZS6HO

55th ARRL November Sweepstakes Announcement

Rules

1) **Object:** For stations in the United States and Canada (including territories and possessions) to exchange QSO information, as detailed in Rule 4, with as many other US and Canadian stations as possible on 160 through 10 meters, excluding 30, 17 and 12 meters.

2) **Contest Period**

(A) **CW**—First full weekend in November.

(B) **Phone**—Third full weekend in November.

(C) **Time**—Begins 2100 UTC Saturday and ends 0300 UTC Monday. Operate no more than 24 of the 30 hours. Off periods may not be less than 30 minutes in length. Times off and on must be clearly noted in your log, and listening time counts as operating time.

3) **Categories**

(A) *Single operator.* One person performs all transmitting, receiving, spotting and logging functions.

(B) *Multioperator, single transmitter only.* Those obtaining any form of assistance such as relief operators, loggers or use of spotting nets.

(C) *QRP, single operator.* QRP is defined as 5 watts output or less.

4) **Exchange:** A consecutive serial number, precedence ("A" if you run 150-W output or less, "B" if more than 150 W, or "Q" if 5-W output or less), your call sign, check (last two digits of the year you were first licensed) and your ARRL Section. For example, NUØX/1 answers W1AW's call by sending W1AW NR178 A NUØX/1 66 CT for QSO number 178, less than 150 W, first licensed in 1966 and Connecticut Section.

5) **Scoring**

(A) *QSO points.* Count two points for each complete two-way QSO. No cross-mode contacts. Work each station only *once*, regardless of the frequency band.

(B) *Multiplier.* Each ARRL Section (listed on page 8 of this issue) plus VE8/VY1—maximum of 76. KP4 is the Puerto Rico Section, KV4/KP2 and KG4 stations are in the Virgin Islands Section, and KH6 and other US possessions in the Pacific count as the Pacific Section.

(C) *Final score.* Multiply QSO points (two per QSO) by the number of ARRL/CRRL sections (plus VE8/VY1).

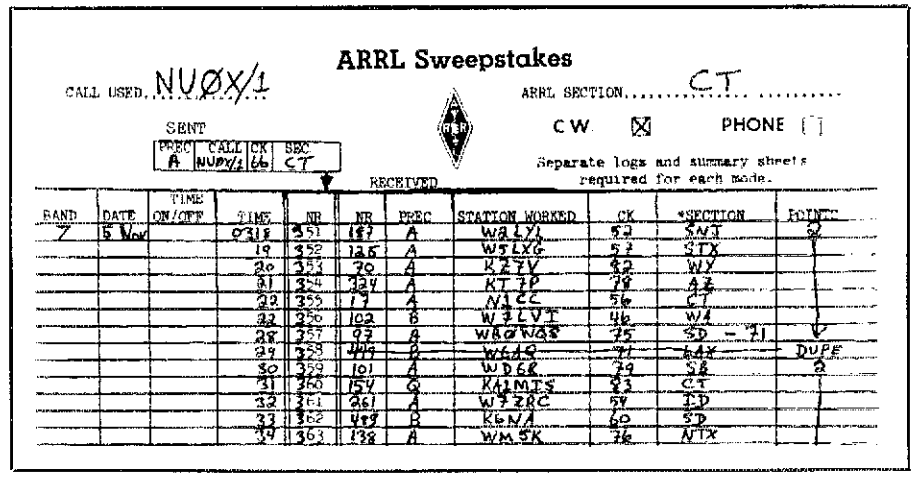
6) **Miscellaneous**

(A) A transmitter used to contact one or more stations may not be subsequently be used under any other call during the contest period (with the exception of family stations where more than one call is assigned by FCC/DOC).

(B) One operator may not use more than one call sign from any given location during the contest period.

(C) The use of two or more transmitters simultaneously is not allowed.

(continued on page 109)



ARRL Sweepstakes

CALL USED: NUØX/1 ARRL SECTION: CT

SENT: PREC A | CALL NUØX/1 | CK 66 | SEC CT

CW ☒ PHONE ☐

Separate logs and summary sheets required for each mode.

RECEIVED

BAND	DATE	TIME ON/OFF	TIME	NR	NR	PREC	STATION WORKED	CK	*SECTION	POINTS
7	5 Nov		0318	351	187	A	WA2LYI	52	SNJ	2
			19	352	126	A	W5LXG	57	STX	
			20	353	70	A	K2IV	52	WY	
			21	354	324	A	KT7P	78	AZ	
			22	355	17	A	N1CC	56	CT	
			22	356	102	B	W3LVT	46	WV	
			28	357	93	A	W8QW88	75	SD - TI	
			29	358	449	B	W6IG	71	EAX	DUPE
			30	359	101	A	WD6R	79	SB	2
			31	360	154	B	KA1MTS	83	CT	
			32	361	261	A	W7ZRC	59	ID	
			33	362	488	B	K6NA	60	SD	
			39	363	138	A	WM5K	76	NTX	

Do not write above this line

ARRL November Sweepstakes

CALL USED: NUØX/1 CW ☒ PHONE ☐ ARRL SECTION (P, K QST): CT

NOTE: *Separate logs must be submitted, with separate summaries, for each mode.*

SCORING: 1934 QSO points × 73 sections = 141,182 claimed score.

Count 2 points per complete QSO [Cross out sections worked on the list below.]

141,182 Claimed Score	967 QSOs	73 Sections	100 Power Output	22 Hrs. of Oper.

☒ Single Operator Station (operator's call *if different* from call used).....

☐ Multioperator Station (show calls of ALL operators, loggers).....

Club participation? (Yes) No
If yes, print the name of your ARRL Affiliated Club: Murphy Marauders

Equipment Description:

Rig: TS930S

Antennas: 80-40 Dipoles, TH6DXX

"I have observed all competition rules as well as all regulations established for amateur radio in my country. My report is correct and true to the best of my knowledge. I agree to be bound by the decisions of the ARRL Awards Committee."

Date: 12/10/88 Signature: Jay C Mabey Call: NUØX

Note your soapbox and other comments. Enclose your photos, as well as your SS logs and check sheets, and mail promptly to: ARRL Contests, 225 Main Street, Newington, Connecticut 06111.

MULTIPLIER CHECK-OFF LIST

1	2	3	4	5	6	7	8	9	0	VE
~~AB~~	~~BCK~~	~~DE~~	~~GA~~	~~KS~~	~~EB~~	~~AZ~~	~~MI~~	~~TN~~	~~OR~~	~~MAR~~
~~BMA~~	~~NB~~	~~EPA~~	~~GA~~	~~LA~~	~~MAR~~	~~ID~~	~~MN~~	~~OK~~	~~LL~~	~~PE~~
~~ME~~	~~NFD~~	~~MDE~~	~~HI~~	~~MS~~	~~ORD~~	~~MT~~	~~WY~~	~~WT~~	~~NS~~	~~QN~~
~~NH~~	~~ENT~~	~~WPA~~	~~NC~~	~~NNE~~	~~SB~~	~~NV~~			~~NFN~~	~~NB~~
~~RI~~	~~WNY~~		~~NH~~	~~NTN~~	~~SCV~~	~~OR~~			~~MO~~	~~ON~~
~~VT~~			~~NC~~	~~ONN~~	~~NNO~~	~~UT~~			~~NB~~	~~AB~~
~~WMA~~			~~SC~~	~~STX~~	~~SF~~	~~WA~~			~~NB~~	~~BC~~
			~~TN~~	~~WPA~~	~~SV~~	~~WT~~			~~NB~~	~~YU/NWT~~
			~~VA~~		~~EW~~	~~AK~~				
			~~DE~~		~~Pac~~					
			VE							

(CROSS OFF EACH NEW SECTION AS WORKED.)

Print or type:

NAME: Jay Mabey CALL: NUØX

ADDRESS: 225 Main Street

Newington, CT 06111

1. Check log for duplicate QSOs.
2. Copy ALL QSO info carefully. A penalty is assessed for incorrectly copied QSO info.
3. Observe mailing deadline.
4. Dupe/check sheet must accompany all entries of 200 or more QSOs.

MCS-87A (2/87)
Printed in U.S.A.

Contest Corral

Conducted By Mark R. Burke, KA1MIS
Contest Assistant, ARRL

October

1

AGCW-DL Straight Key Party, sponsored by the AGCW-DL, from 1300Z until 1600Z **Oct 1.** Frequencies: 7.010-7.040 MHz. Only straight keys (no bugs). Classes: A = 5 W output, B = 50 W output, C = 150 W output, D = SWL. Exchange RST, serial no., class, name, and age (YLs use XX) example 579001/A/John/32. Scoring: class A with class A = 9 points, with B = 7 points, with C = 5 points; class B with A = 5, with B = 4 points, with C = 3 points; C with C = 2 points. Certificates. Send logs (include SAE plus IRC for results) by Feb 28 to Friedich Fabri, DF1OY, Wolkerweg 11, D-8000 München 70, Fed Rep of Germany.

1-2

California QSO Party, see Sep, p 94.

International DX-HC Middle of the World Contest, sponsored by the Guayaquil Radio Club, from 0000Z **Oct 1** until 2400Z **Oct 2.** [The 1988 rules have not arrived at ARRL HQ as of yet. Being that it is an annual contest, we have included the 1987 announcement—Ed.] SSB only. Entry classes: single operator 7 MHz; single operator 14 MHz; single operator both bands; multioperator single transmitter both bands. No cross-band QSOs. Work HC stations. Exchange RS plus 3-digit serial number. Count 10 points per QSO with HC stations and 20 points per QSO with HD stations (HD1GRC, HD7GRC, HD8GRC, HDØGRC). Multipliers are the sum of the numerals in the HC zones worked (HC1 = 1, HC2 = 2, HC3 = 3, HC4 = 4, HC5 = 5, HC6 = 6, HC7 = 7, HC8 = 8). Count zones once per band (max 36). Final score is total QSO points times multiplier points. Send logs before Dec 31 to Contest Manager, Guayaquil Radio Club, PO Box 5757, Guayaquil, Ecuador.

VK/ZL/Oceania DX Contest, phone, see Sept, p 94.

3

CRRL Fall VHF/UHF Sprints, 144 MHz, from 6 PM until 3 AM local time (operate a maximum of 4 hours) on Mon, **Oct 3.** (Note: Other Spring Sprint dates are: 220 MHz on Tues, Oct 11; 432 MHz on Wed, Oct 19; 902 MHz on Thu, Oct 27; 1296 MHz on Thu, Nov 3; 2304 MHz on Thu, Nov 10; and 50 MHz on Sat-Mon, 1000Z Oct 29 until 0300Z, Oct 31 (operate a maximum of 24 hours).) Usual CRRL contest rules apply. Avoid operation on 50.110 MHz for North American QSOs. No repeater, digipeater or linear translator QSOs allowed. Exchange grid-square locator (see Jan 1983 *QST*, page 49). Signal reports are optional. Recommended frequencies: CW—50.100 144.100 220.100 432.100 903.100 1296.1 2304.010; SSB—50.200 144.200 220.200 432.200 903.100 1296.100 2304.010; FM—52.525 146.520 223.500 446.000 906.500 1294.500; packet—51.000 144.91 221.000 441.000 904.100 1294.100; ATV—439.250. Count one point per valid QSO. Multiply QSO points by number of different grid squares worked for final score. Contests are separate; there is no accumulation of scores. Logs must indicate time, call sign and complete exchange for each valid QSO. Multipliers must be clearly marked in the log, and total operating time must be shown. Submit separate log and summary sheets for each contest entered and mail contest entries in separate envelopes. Entries for each contest must be postmarked no later than Dec 1. Send logs to CRRL Sprints, c/o Dana Shtun, VE3DSS, 500 Willard Ave, Toronto, ON M6P 2S1, Canada.

4

West Coast Qualifying Run, 10-35 WPM, at 0400Z **Oct 4** (9 PM PDT Oct 5). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL HQ 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.

8-9

ARCI QRP Fall CW QSO Party, sponsored by QRP ARC International, from 1200Z **Oct 8** until 2400Z **Oct 9.** Operate max 24 hours. Work stations once per band. All-band or single-band entries. Send signal report, state/province/country and QRP number if member. Nonmembers send power output. Suggested frequencies: 1.810 3.560 3.710 7.040 7.110 14.060 21.060 21.110 28.060 28.110 50.060. No 12- or 30-meter QSOs. Count 5 points for QSO with ARCI member. Others count 2 points for same continent and 4 points for different continent. Multiply QSO pts by states/provinces/countries worked per band and by power multiplier (1-5 W output ×7; 0-1 W output ×10). More than 5 W output counts as a checklog. If 100% natural power, multiply final score by 2; if 100% battery, by 1.5. Bonus points: add 2000 pts for each band a home-brew XMTR is used; add 3000 pts for each band a home-brew RCVR is used; add 5000 pts for each band a home-brew XCVR is used (max 5000 bonus points per band). Team competition: Teams consisting of 2 to 5 members will be listed as individuals and the team score will be the total of the members' scores (team captains must send a list of its members to the contest manager postmarked at least one day prior to the QSO Party). Awards. Postmark entry no later than 30 days after the contest and mail to QRP ARCI Contest Chairman, Red Reynolds, K5VOL, 835 Surryse Rd, Lake Zurich, IL 60047.

Concurso Ibero-Americano Contest, sponsored by the Sección Territorial de URE del Vallés Oriental and CQ Radio Amateur de Boixareu Editores from 2000Z **Oct 8** until 2000Z **Oct 9.** Phone only. Classes: single operator Latin American; single operator non-Latin American; multioperator single transmitter Latin American; multioperator single transmitter non-Latin American; single operator EC (EA Novice); QRP (less than 5 watts output), single operator, all band; SWL. Bands: 1.8, 3.5, 14, 21, 28 MHz. Work stations once per band. Exchange signal report and serial number starting with 001. Count 3 points per Latin American QSO and 1 point per non-Latin American QSO (Latin American stations count 1 point per QSO). Multipliers are Latin American DXCC counties (CE, CO, CP, CR, CT, CX, C3, C9, DU, EA, HC, HI, HK, HP, HR, HT, KP4, LU, OA, PY, TG, TI, XE, YS, YV, ZP, 3C and DXCC dependencies). [This is the way the official rules read, but several of the prefixes listed are non-Latin American countries—Ed.] Final score is total QSO points times total multipliers. Awards. Send logs before Nov 30 to X Concurso Iberoamericano, Gran Via de les Corts Catalanes, 594, 08007 Barcelona, Spain.

GARTG-SSTV Contest, part 2, see Sep, p 95.

Pennsylvania QSO Party, see Sep, p 95.

Radiosporting Championship Contest, sponsored by *Radiosporting Magazine*, phone from 0000Z-2400Z **Oct 8;** CW Contest 0000Z-2400Z **Oct 9.** Phone and CW are separate contests, however, the combined phone and CW scores will be listed and awards issued. Classes: single operator all band, single operator single band, multioperator single transmitter, multioperator multitransmitter. In each class there are subclasses of high power (legal limit), low power (200 W PEP) and QRP (10 W PEP). Also, club competition for combined phone and CW. Club competition entries may claim a maximum of one station per category in selected power groups on each mode (max 18). Single operator stations may operate no more than 22 hours (they must take 2 hours rest period in one or two periods and noted in log). Multioperator stations may operate the full 24 hours. Bands: 1.8, 3.5, 7, 14, 21, 28 MHz. Work stations once per band and mode. Exchange RS(T) plus serial number starting with 001. Count: 1 pt for each exchange sent; 1 pt for each exchange received on phone; 2 pts for each exchange received on CW (2 pts for complete phone contact; 3 pts for complete CW contact). Multipliers: DXCC counties; call areas in the following countries—USA (W1-Ø), Japan JA1-Ø), Australia (VK1-8), Canada (VE1-8, VO1, VO2, VY1), USSR (UA1,3,4,6,9,Ø) per band. When counting call area as multiplier do not count country as multiplier. Also, a multiplier of one for each of the land, maritime and aeronautical mobile stations (/M, /MM, /AM). Final score equals total QSO point times total multipliers. Awards. Send logs before 30 after the contest to Radiosporting Contest Chairman, Walt McGugan, W3FG, PO Box 7, Odenton, MD 21113-0007.

VK/ZL/Oceania DX Contest, CW, see Oct 1-2 listing.

GARTG-SSTV Contest, part 2, sponsored by the German AR Teleprinter Group, from 1200Z **Oct 8** until 1200Z **Oct 9.** 3.5, 7, 14, 21 and 28 MHz only. Work stations once per band. Groups: A—SSTV transmitting and receiving stations; B—SSTV receiving stations (SWL). Exchange call signs, signal report and serial number. GARTG members also send membership number. Count 10 points per QSO. Multipliers: countries as defined by the WAE and DXCC lists and W/K, VE/VO, JA, PY, VK call areas. Final score is QSO points times multipliers worked per band times continents worked per band. Add 50 bonus points per GARTG member worked. Mail logs to be received within 2 months after contest to Wolfgang Pünjer, DL8VX, PO Box 90 11 30 D-2100 Hamburg 90, Fed Rep of Germany.

9

RSGB 21/28 MHz SSB Contest, sponsored by the Radio Society of Great Britain, from 0700Z-1900Z **Oct 9.** 21 MHz and 28 MHz phone only. Single operator and multioperator. Exchange signal report and serial number starting with 001. Suggested frequencies: 21.150-21.350 28.450-29.000. Non-European stations count 3 pts per QSO with G, GD, GI, GJ, GM, GU, GW stations (not GB). Multiply by number of call areas worked per each G prefix. Award. Log must be received before Dec 5. Mail entries to RSGB Contests Committee, PO Box 73, Lichfield, Staffs WS13 6UJ, England.

9-10

Illinois QSO Party, sponsored by the Radio Amateur Megacycle Society, from 1800Z **Oct 9** until 0200Z **Oct 10.** Phone and CW. No repeater QSOs. Suggested frequencies: CW—3.550 7.050 14.050; phone—3.890 7.290 14.290; Novice—30 kHz up from bottom. Other bands may also be used (except 30 and 12 meters). IL stations exchange RS(T) and county; others exchange RS(T) and state/province/country. Count 1 pt per phone QSO, 2 pts per CW QSO. Work stations once per band and mode, and once per band, mode, county for IL mobile stations. IL stations multiply QSO total by sum of states plus VE provinces plus a maximum of five DX countries. Count additional DX for points but not multipliers. IL portables and mobiles may add 200 to final score for each county from which 10 or more contacts were made. All others multiply QSO points by the number of IL counties worked. All stations may take one bonus multiplier for each eight QSOs with the same IL county. Awards. Stations with over 100 QSOs must submit a dupe sheet. Send logs by Nov 9 to RAMS, c/o Joe LeKostaj, WB9GOJ, 9134 Ewing Ave, Evanston, IL 60203.

11

CRRL Fall Sprints, 220 MHz, see Oct 3 listing.

W1AW Qualifying Run, 10-40 WPM at 0200Z **Oct 12** (10 PM EDT Oct 11). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Oct 4 listing for more details.

14-15

Columbus Day International DX Contest, sponsored by the Miami Havana Lions Club, from 1200Z **Oct 14** until 2400Z **Oct 15.** Phone, CW, RTTY and packet. 80-10 meters (except 30 and 12 meters). Work stations with QRA call signs and with official number (to be read off at 1200Z Oct 14 on 7.230 7.250 14.250 14.300 21.250 21.300 28.450 28.915). Exchange RS(T) and QTH. Awards. Send QSLs or log with SASE to Miami Havana Lions Club, Columbus Day International DX Contest, PO Box 674, Miami, FL 33135.

15

9V QSO Party, sponsored by the Singapore ARTS, 0000Z-2400Z **Oct 15.** Phone and CW (and possibly SSTV RTTY and packet). 80-10 meters (except 30 and 12). 9V stations send RS(T) and serial number. Others send RS(T) and CQ Zone. Send log extract to John F. Hoog, 9V1TJ/KØGYK, Singapore ARTS,

PO Box 2728, Singapore 0617.

15-16

Jamboree on the Air (JOTA), sponsored by the World Bureau of the World Organization of the Scout Movement will be 0000 local, **Oct 15** until 2400 local, **Oct 16**, although some activity will flop over from Fri to Mon. Scouts usually exchange their name, QTH, Scout rank and other hobbies, often becoming pen pals with their newfound radio friends. Look for K2BSA, the BSA HQ station in Dallas, Texas, and HB9S, the World Scout HQ in Switzerland. Suggested frequencies: CW—3.590 7.030 14.070 21.140 28.190; phone—3.940 7.290 14.290 21.360 28.350; packet, RTTY, SSTV, ATV on normal frequencies; check Novice bands. No logs are necessary, but activity reports including Scout unit number, number of participants and interesting incidents are appreciated. Photographs with captions are especially needed. Send reports to JOTA Coordinator, International Division, S221, BSA, 1325 Walnut Hill Ln, PO Box 152079, Irving, TX 75015-2079.

Rhode Island QSO Party, sponsored by the East Bay Amateur Wireless Assn, from 1700Z **Oct 15** until 0500Z **Oct 16** and 1300Z **Oct 16** until 0100Z **Oct 17**. Phone and CW. Work RI stations (RI stations work all). Suggested frequencies: CW—1.810 3.550 3.710 7.050 7.110 14.050 21.050 21.110 28.050 28.110; phone—1.860 3.900 7.260 14.300 21.360 28.350 50.130 144.200 146.520. Exchange RS(T) and state/province/county (city or town for RI stations). Score 2 pts per phone QSO, 3 pts per CW QSO. Multipliers are RI cities and towns (39 max). Multipliers for RI stations are RI cities and towns, states, provinces and countries. Multiply total QSO points by multipliers for final score. Certificates. Send logs (SASE for results) by Nov 30 to East Bay AWA, PO Box 392, Warren, RI 02885.

Simulated Emergency Test, sponsored by the ARRL Amateur Radio Emergency Service and the National Traffic System, **Oct 15-16.** The SET weekend provides an opportunity for ARES units to test plans, and capabilities of moving emergency and health-and-welfare traffic into and out of disaster areas via the National Traffic System. The event is conducted by the Emergency Coordinators, so be sure to contact your local EC for involvement. If you do not know who your EC is, contact your Section Manager (this issue, p 8).

16

RSGB 21 MHz CW Contest, sponsored by the Radio Society of Great Britain, from 0700Z-1900Z **Oct 16.** CW only. Single operator and QRP single operator (less than 10-W input). Exchange signal report and serial number starting with 001. 21 MHz only. Avoid 21.075-21.125. Non-European stations count 3 points per QSO with G, GD, GI, GJ, GM, GU, GW stations (not GB). Multiply by number of call areas per G prefixes worked. Log must be received before Dec 31. Mail entries to RSGB Contests Committee, PO Box 73, Lichfield, Staffs WS13 6UJ, England.

19

CRRL Fall Sprints, 432 MHz, see Oct 3 listing.

22-23

ARRL International EME Competition, see Sep, p 96.

27

CRRL Fall Sprints, 902 MHz, see Oct 3 listing.

29-30

CQ World-Wide DX Contest, phone, sponsored by *CQ*, from 0000Z **Oct 29** until 2400Z **Oct 30** (CW contest 0000Z Nov 26 until 2400Z Nov 27). 1.8 through 28 MHz. Entry classes: single op, all bands; single op, single band; single op, QRP; multiop, single transmitter; multiop, multi transmitter. QRP is defined as 5 W output or less. Multi-single: Only one transmitter and one band permitted during a 10-minute period. Exception: one—and only one—other band may be used during the same 10 minute period if—and only if—the station worked is a new multiplier. Stations found in violation of the 10-minute rule will be reclassified as multi-multi. Multi-multi stations are allowed one signal per band maximum. All transmitters must be located within a 500-meter-diameter circle, or within the limits of the licensee's address property, whichever is greater. All antennas must be physically connected to the transmitters by wires. Exchange signal report and CQ zone number. A station in a different zone or country than indicated by its call sign must sign portable. QSOs between stations on different continents count 3 pts. QSOs between stations on the same continent but in different countries count 1 pt. Exception: QSOs between North America stations in different countries count 2 pts. QSOs with your own country count for multiplier credit, but not for QSO points. Multipliers: Count one multiplier for each different CQ zone worked per band (max 40 per band). Count one multiplier for each different country worked per band (DXCC and WAE lists). Multiply QSO points from all bands operated by multipliers (zones plus countries) from all bands operated for final score. Single-band logs eligible for single-band awards only. Single ops must operate at least 12 hours (multiops, 24 hours) to be eligible for awards. Dupe sheets required for any band with more than 200 QSOs. Entry forms are available from the sponsor for an SASE, and all entrants are encouraged to send for a set. Each dupe removed by the CQ Contest Committee also carries a 3-QSO penalty. Phone logs must be postmarked by Dec 1, 1988, and CW logs must be postmarked by Jan 15, 1989. Mail logs to CQ Magazine, 76 North Broadway, Hicksville, NY 11801.

CRRL Fall Sprints, 50 MHz, see Oct 3 listing.

30

W1AW Qualifying Run, 10-35 WPM, at 1300Z **Sep 21** (9 AM EDT Sep 21). See Oct 4 listing for more details.

November

2

West Coast Qualifying Run, 10-35 WPM, at 0500Z Nov 2 (9 PM PDT Nov 3). See Oct 5 listing for more details.

3

CRRL Fall Sprints, 1296 MHz, see Oct 3 listing.

5-7

ARRL November Sweepstakes, CW, this issue, p 106.

QST QSO Award Party, phone, sponsored by the Canadian Radio Relay League, **Nov 5-6,** 1500Z-2200Z each day (CW—Nov 12-13). The award is available to any amateur who makes phone, CW or mixed contacts with 8 of the 11 QST stations in Canada. To receive the award send SASE or IRC to Garry Hammond, VE3XN, 3 McLaren Ave, Listowel, ON N4W 3K1, Canada.

Ten-Ten International Net, from 0000Z **Nov 5** until 2400Z **Nov 6.** Open to all amateurs but only paid-up 10-10 members are eligible for awards. Single operator only. CW and RTTY. Work stations once on 10 meters only. Contacts must be in the CW subband. Exchange call, name, state and 10-10 number (if member). Count 2 pts for each QSO with a member, count 1 pt for each QSO with non-member. Final score is total QSO points. Awards. Send logs along with cover sheet and dupe sheet postmarked before Dec 1 to Rep of Texas Chapter, c/o Ron Olson, NN5Y, 2913 Hillsdale St, Garland, TX 75042.

9

W1AW Qualifying Run, 10-35 WPM, at 1300Z **Sep 21** (9 AM EDT Sep 21). See Oct 4 listing for more details.

10

CRRL Fall Sprints, 2304 MHz, see Oct 3 listing.

11-13

Japan International DX Contest, phone, sponsored by *Five Nine Magazine*, from 2300Z **Nov 11** until 2300Z **Nov 13.** Operate a maximum of 30 hours. Rest period must be at least 60 minutes and noted in log. Multioperator stations can operate full 48 hours. 80-10 meters (except 30 and 12 meters). Entry classes: single op, single band; single op, multiband; multi-op, multiband. No crossband QSOs. Single ops may have only one transmitted signal at any given time. Once operation begins on a band, the station must remain on that band for at least 10 minutes. Listening time counts as operating time. Multiops may have a maximum of one signal per band. JA stations send RS and prefecture number (01-50). Others send RS and progressive serial number starting with 001. Contacts among DX stations or among JA stations do not count. Count 1 pt per QSO on 40-15 meters. Count 2 pts per QSO on 80 and 10 meters. Multiply by the number of different prefectures worked (max 50) per band for final score. Use separate logs for each band. Mark multipliers the first time worked. Awards and plaques. Provide a complete summary. Enclose SAE and IRC for results. Mail logs to arrive by Dec 31 to *Five Nine Magazine*, Japan International DX Contest, PO Box 8, Kamata, Tokyo 144, Japan.

12-13

European DX Contest, RTTY, sponsored by the Deutscher ARC, from 1200Z **Nov 12** until 2400Z Nov **13.** Work stations once per band; 3.5, 7, 14, 21 and 28 MHz only. Entry Classes: single operator, all band; single operator, high band (14, 21, 28 MHz only); multioperator, single transmitter; SWL. Stations must remain on a band for at least 15 minutes, except for a quick QSY to work new multipliers. Single operators may operate a maximum of 30 hours. The 6 hours of off-time may be taken in one to three periods and must be noted in the log. Non-EU stations work EU only. Exchange signal report and serial number. W/K stations also give state. Count 1 pt per QSO and 1 pt per QTC (explained below). Multiply by number of EU countries worked per band. European Country list: C31 CT1 CU EA EA6 EI F G GD GI GJ GM GM-Shetland GU GW HA HB HBØ HV I IS IT JW-Bear JW-Spitsbergen JX LA LX LZ OE OH OHØ OJØ OK ON OY OZ PA SM SP SV SV5-Rhodes SV9-Crete SY-Athos T7 TA1 TF TK UA-1346 UA2/UZ2F UA1-Franz Josef Land UB UC UN/UA1N/UZ1N UO UP UQ UR Y2 YO YU ZA ZB2 1AØ 3A 4U1-Geneva 4U1-Vienna 9H1. The multiplier on 3.5 MHz may be multiplied by 4, the multiplier on 7 MHz by 3, and the multiplier on 14-21-28 MHz by 2. A QTC is a report of a confirmed QSO that has taken place earlier in the contest and later sent back to an EU station. QTCs may be sent only by non-EU stations to EU stations. A QTC contains the time, call sign and QSO number of the station being reported (eg, 13Ø7/DA1AA/431). A QSO may be reported only once, and not back to the originating station. A maximum of 10 QTCs to the same station is permitted; the same station may be worked several times to complete this quota. Only the orginal QSO, however, has QSO point value. Keep a uniform list of QTCs sent. For example, QTC 3/7 would indicate that this is the third series of QTCs sent, and that seven QSOs are reported. Awards. List 40 QSOs or QTCs per sheet. Use separate logs for each band. Dupe sheets must be submitted for bands with more than 200 QSOs. Deadline: Dec 15. Mail to WAEDC-Committee, PO Box 1328, D-8950 Kaufbeuren, Fed Rep of Germany.

QST QSO Award Party, CW, see Nov 5-6 listing.

19-21

ARRL November Sweepstakes, phone, this issue, p 106.

22

W1AW Qualifying Run

26-27

CQ World Wide DX Contest, CW

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 **November 1** to make the **January** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

55th ARRL November Sweepstakes Announcement

(continued from page 106)

Contest Period

	Starts	Ends
CW	Saturday, Nov 5 2100 UTC	Monday, Nov 7 0300 UTC
Phone	Saturday, Nov 19 2100 UTC	Monday, Nov 21 0300 UTC

Suggested Frequencies (kHz)

CW	Novice CW	Phone	Novice Phone
1800-1810		1855-1865	
3530-3600	3710-3730	3850-3950	
7030-7080	7110-7130	7200-7250	
14,030-14,060		14,250-14,300	
21,050-21,080	21,110-21,130	21,300-21,400	
28,050-28,080	28,110-28,130	28,550-28,650	28,350-28,400

Explanation of Exchange

	Number	Precedence	Call	Check	Section
Exchanges	Consecutive serial number	Power output less than 150-W PEP	Send your station call	Last two digits of year first licensed	Your ARRL Section
Sample	NR178	A	NUØX/1	66	CT

(D) 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.

7) **Reporting:** Contest forms (log sheets, summary sheet, dupe sheet) are available from ARRL HQ by sending an SASE with two units of first class postage. Official forms are recommended. Any entry claiming more than 200 QSOs must submit duplicate-checking sheets (dupe sheets). Incomplete or late entries will be classified as check-logs. Logs must include dates, QSO times, exchange sent/received, band and mode. Postmark your entry within 30 days after the phone portion of the contest (December 21, 1988).

8) **Club Competition:** ARRL-affiliated clubs for club gavels and awards in the local, medium and unlimited categories as described in January *QST*.

9) **Awards:** Certificates to the top single operator CW and phone scores in "A," "B" and "Q" categories in each ARRL Section, and the top multioperator entry in each ARRL Division.

10) **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 licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications. See January *QST*.

A Concise History of W1AW—The ARRL Headquarters Station

(continued from page 53)

propane-fueled generator set capable of supplying full power to the station in normal operation. The ARRL lab went to work constructing a common exciter for the several linears and transmitting equipment for 6 and 2 meters. The end result of all these changes was an entirely new vista for W1AW, a "new look" so different from the old that a visitor from before the change would not have recognized it as the same station!

While all these changes were being made, W1AW services continued from the basement operating position using commercial transceivers and amplifiers. When the new linears had been installed upstairs, the new custom-built operating console put in place and all interconnecting wiring completed, the operation was shifted from the basement to the new facilities upstairs without a single break in W1AW services. Such breaks in operation, throughout all the station's history, have been few, far between and of short duration, except for the 3½-year hiatus during WW II, thanks exclusively to the close attention and stewardship of the ARRL Headquarters staff and the W1AW operating crews.

Until the FCC (in 1975) decided that it was not proper for paid W1AW operators to make contacts with amateur stations, a big part of all W1AW operation was devoted to just this—personal contact between the W1AW staff and the general amateur population. Periods during each operating day were set aside for general contacts on each band. Additional periods were also set aside for transmission of bulletins and, starting in 1940 and resuming after WW II, code practice to assist in license upgrading. Nowadays, direct contact between amateurs and W1AW is conducted primarily by visiting operators and during contests, and for that purpose, separate operating positions are set up at the station, with equipment supplied mostly by generous manufacturers' donations. The main rigs are used exclusively for bulletins and code practice.

Time for Another Major Renovation

As outlined in this series of W1AW vignettes, Amateur Radio has, since then, expanded over new horizons, and the HQ station must reflect that expansion. This will require much new equipment and more of it and—you guessed it—money. An on-the-air presence is not only a great asset, but necessary to continue rendering past W1AW services and many new ones now possible with Amateur Radio expansion into fields heretofore undreamed of.

Since the "great renovation" of 1964, many changes have been made in the station's equipment and its operating schedule and programs (such as the 120-foot tower for 20 and 40 meters that was put up in 1977, the Alpha amplifiers that power code practice and bulletins on 80, 40 and 20 meters, and so on) but with the advent of satellites, computers and space communication, it is time for another major renovation and reexamination of prospects and possibilities. W1AW will flow with it and reflect it and continue to be the living representative of the League and all that is progressive in the Amateur Radio Service.

Special Events

Conducted By Mark R. Burke, KA1MIS
Contest Assistant, ARRL

Sarnina, Ontario and Port Huron, Michigan: The Lambton Co ARC and the Eastern Michigan ARC will operate XL3IG from 2000Z **Sep 30** until 2400Z **Oct 2** in commemoration of the 50th anniversary of the International Blue Water Bridge. Operation will be 30 kHz up from the bottom of the General CW bands and 10 kHz up from the bottom of the General phone bands. For beautiful certificate, send QSL and SASE to XL3IG, 801 Range Rd, Port Huron, MI 48060.

Wilmington, North Carolina: The Azalea Coast ARC will operate K4YNY 1300Z-2100Z **Oct 1** aboard the battleship *USS North Carolina*. Suggested frequencies: 7.235 28.465. For QSL, send long SASE to Azalea Coast ARC, K4YNY, PO Box 4044, Wilmington, NC 28406.

Albuquerque, New Mexico: The Honeywell ARA will operate WD5T **Oct 1-2** and **8-9**, 1200Z-1800Z each day, in celebration of the Albuquerque International Hot Air Balloon Fiesta. Suggested frequencies: SSB—7.240 14.240 21.340 28.390; packet—14.105 21.105 28.107. For QSL, send SASE to WD5T, 2 Camino Del Sanador, Tijeras, NM 87059.

Dothan, Alabama: The Wiregrass ARC will operate WB4ZPI 1500Z-2100Z **Oct 8** to commemorate the 10th anniversary of Landmark Park. Suggested frequencies: phone—7.240 14.260 21.325 28.350; CW—7.130 21.130. For commemorative QSL, send QSL to Wiregrass ARC, Box 958, Dothan, AL 36302.

Stratford, Connecticut: The Stratford ARC will operate W1ORS 1300Z-1900Z **Oct 8** to celebrate the club's 50th anniversary. Operation will be in the lower part of the General 40, 20 and 15-meter bands, and Novice portion of 10 meters. For certificate, send QSL, contact number, and 8½- × 11-in SASE with two units of postage to KA1JKT, 307 Park St, Stratford, CT 06497.

Dalton, Georgia: The Dalton ARC will operate **Oct 8-9** from the Cotton Gin at the Historic Prater's Mill. Operation will be 40, 20 and 10-meter SSB. For special QSL, send SASE to DARCI, PO Box 143, Dalton, GA 30722-0143.

Hampton, Virginia: The Southern Peninsula ARK will operate W4YCZ **Oct 8-9**, 1400Z-2300Z each day, from Casemate Museum. Operation will be in the low end of the 80-10 meter General phone bands and some Novice and CW operation. For QSL, send SASE to SPARK, 172 W Ocean Ave, Norfolk, VA 23503.

Lafayette, Indiana: The Tippecanoe ARA will operate W9REG from 1200Z **Oct 8** until 0200Z **Oct 9** in celebration of the Feast of the Hunters Moon. Suggested frequencies: 3.870 7.260 14.290 21.375 28.400. For certificate, send QSL and large SASE to W9REG, 111 S 7th St, Lafayette, IN 47901.

Poteau, Oklahoma: The Fort Smith Area ARC will operate W5ANR 1400Z-2300Z **Oct 8** and 1400Z-2200Z **Oct 9** in conjunction with the 2nd Annual Green Country Sorghum Festival. Operation will be the lower 30 kHz of the General phone bands, 28.435 Novice SSB and 145.010 packet. For certificate, send QSL and SASE to FSAARC, W5ANR, Box 32, Fort Smith, AR 72902-0032.

Southington, Connecticut: The Southington ARC will operate W1ECV from 1300Z **Oct 8** until 0100 **Oct 9** in celebration of the Apple Harvest Festivities and Ceremonies. Suggested frequencies: SSB—3.925 7.240 14.300 21.300 28.375 144.250; CW—3.540 14.040 21.140 28.140. For certificate, send 9- × 12-in SASE to SARA, PO Box 873, Southington, CT 06489.

Clarksburg, West Virginia: The Stonewall Jackson ARA in conjunction with Local 89 of the Clarksburg Firefighters Union will operate WB8ZVS 1400Z-0100Z **Oct 9** to commemorate National Fire Prevention Week. Operation will be in the lower portion of the General 80, 40 and 20-meter phone and 40-meter Novice CW. For certificate, send QSL, contact number, and SASE to J. R. Chiado, KA8ZQP, 289 Magnolia Ave, Clarksburg, WV 26301.

Cincinnati, Ohio: The University of Cincinnati College of Applied Science ARA will operate K8ORW from 0000Z **Oct 14** until 2300Z **Oct 16** to commemorate the Cincinnati Bicentennial "Tall Stacks." Suggested frequencies: phone—3.950 7.250 21.400 28.400; CW—3.725 7.125 21.150 28.170; FM—144.85/5.45. For QSL, send SASE to Tall Stacks, K8ORW, 100 E Central Pkwy, Cincinnati, OH 45210.

Branchville, New Jersey: The ARES of Edison Township in cooperation with the Thomas A. Edison Council of the BSA will operate N2AYJ **Oct 15-16** in observance of the 14th anniversary of the Kittatinny Mtn Scout Reservation. Operation will be in the General and Novice portions of 80-10 meters. For commemorative QSL, send SASE to JOTA/KMSR 40, Thomas A. Edison Council BSA, PO Drawer L, Edison, NJ 08818.

Chattanooga, Tennessee: The Chattanooga Choo-Choo Chapter of 10-10 International will operate KB4PIW **Oct 15-16**, 1400Z-2200Z each day, in conjunction with the Autumn Leaf Festival. Operation will be on 28.485. For commemorative certificate, send QSL and no. 10 SASE to Martie Perry, KB4PIW, Rte 3 Box 272, Signal Mtn, TN 37377.

Moberly, Missouri: The Tri-County ARC will operate NØAUX from 1600Z **Oct 15** until 0200Z **Oct 16** to commemorate the 120th anniversary of the incorporation of Moberly, MO, the "Magic City." Operation will be in the lower 25 kHz of 80-15 meters and Novice 10 meters. For certificate, send business-size SASE to Tri-Co ARC, PO Box 341, Moberly, MO 65270.

Mount Mitchell State Park, North Carolina: The Raleigh ARS will operate W4DW **Oct 15-16** from the highest elevation point east of the Mississippi River. Operation will be in the lower portion of the 80-15 General phone bands and 10-meter Novice segment. For special QSL, send QSL and SASE to Raleigh ARS, W4DW, Box 17124, Raleigh, NC 27609.

Chicago, Illinois: The Chicago ARC will operate W9CAF 1800Z-2200Z **Oct 16** to commemorate the 62nd anniversary of the club. Ask operators for QSL information.

Louisville, Kentucky: The Amateur Radio Transmitting Society will operate W4CN 1500Z-2100Z **Oct 22** from the steamboat *Belle of Louisville*. Suggested frequencies: 7.250 14.250. For QSL, send QSL to ARTS, W4CN, PO Box 7391, Louisville, KY 40207.

Webster, New York: The Xerox ARC will operate KE2T 0000Z-2400Z **Oct 22** to commemorate the 50th Anniversary of the Invention of Xerography by Chester Carlson. Suggested frequencies: phone—lower 25 kHz of the 80, 40, 20, 15 and 10-meter bands; CW—50 kHz above lower band edges; Novice portion of the 10-meter band. For certificate, send QSL and business-size SASE to XARC, Building 337, Joseph C. Wilson Center for Technology, 800 Phillips Rd, Webster, NY 14580.

Fall River, Massachusetts: The Quinnipiac Council of the BSA will operate W1GB from 0000Z **Oct 22** until 1800Z **Oct 23** from the battleship *Massachusetts*. Suggested frequencies: phone—General portion of 80-15 meters and Novice 10 meters; CW—middle of Novice 40 and 15 meters. For special QSL, send SASE to Skip Paquette, KA1EAJ, 121 W Dayton Hill Rd, Wallingford, CT 06492.

Lexington, North Carolina: The Healing Springs Mountain VHF Society will operate K4HOF 1300Z-2100Z **Oct 29** for the 5th Annual Lexington Barbecue Festival. Suggested frequencies: phone—7.245 14.245 28.320; CW—7.030. For special Bar-b-QSL, send SASE to Healing Springs VHF Soc, PO Box 41, Lexington, NC 27293-0041.

Grovers Mill, New Jersey: The GE Astro Space Division ARC will operate WB2JQR from 1400Z **Oct 30** until 0200Z **Oct 31** to commemorate the 50th anniversary of Orson Welles' Mercury Theatre "War of the Worlds." Suggested frequencies: phone—3.950 7.235 14.285 21.355 28.400; CW—3.535 7.035 7.135 14.035 21.135 28.135. For QSL and certificate, send QSL and 9- × 12-in SASE to Alex Montare, KA2VLP, Astro RC, MS 410-1B, GE Astro Space Division, PO Box 800, Princeton, NJ 08543-0800.

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 **Nov 1** to make the **Jan** issue. Please include the name of the sponsoring organization, the call sign of the special-event station, the city location, dates and times (Z), suggested frequencies and QSL information. 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- × 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.

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	May 1988, p 55
Club Contest Rules	Jan 1988, p 86
Considerate Operator's Frequency Guide	Jan 1988, p 13
Constitution Bicentennial WAS	Sep 1987, p 14
Element 2 Question Pool, New and Revised Questions, Answers	Apr 1987, p 23
Frequency/Mode Allocations	Jan 1988, p 77
Hamfest Calendar Rules	Apr 1988, p 73
License-Renewal Information	Jan 1988, p 77
Major ARRL Operating Events and Conventions—1988	Jan 1988, p 78
Packet-Radio Frequency Recommendations:	
Below 225 MHz	Sep 1987, p 54
Above 225 MHz	Mar 1988, p 51
QSL Bureaus	
Incoming	Jun 1988, p 72
Outgoing	Sep 1988, p 71
Reciprocal-Operating Agreements	This issue, p 63
Rules, September VHF QSO Party	Aug 1988, p 101
Rules, 1988 CRRL CAN-AM Contest	Aug 1988, p 103
Tech and General Written Exams	Apr 1987, p 29
Third-Party-Traffic Agreements	This issue, p 63
VUCC Annual Listing	Dec 1987, p 68
What is Amateur Radio?	Sep 1988, p 90

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

ATLANTIC DIVISION

DELAWARE: SM, Robert J. Pegritz, KC3TI—I have had several inquiries regarding radio clubs in schools. There are now computer listings of all ARRL club stations in schools nationwide. If you know of a teacher or school who's interested, CALL!! AWARE hosts the 1988 ARRL Humanitarian of the Year, Father Marshall Moran, 9N1MM, on October 11th. Contact me or ASM Bill Ryan, WB3DPJ, for details of this event. The Delaware Traffic Net is always looking for new and interesting folks (like yourself) every weeknight on 3.905 MHz at 2330 UTC. Get that Delaware card the easy way. . . join us. Fall is the time of the year for emergency drills and more. Do you have any ideas for ARES? Let us know. Section Staff. . .Meeting coming up next month. . .you'll get a letter. I'm on 220 now and the machines there are amazing. C'mon up and find out!! DTN stations 262, Tfc 30 in 21 sessions. DEPN stns 47, tfc 13, in 5 sessions. Traffic: K3YBW 46, W3QQ 29, WA3WIY 27, KA3GRQ 21, K3JL 20, W3FEG 8, PSHR WA3WIY and K3JL.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KA3A, KO3B, K3ZFD. SEC: KB3YS. ACC: KC3QB. OOC: W3IS. SGL: WA3IAO. STM, BM: KB3UD. PIO: W3ZXV. TC: W3FAF. This is Pennsylvania QSO Party month! Please put your county on the air October 8-9 for our EPA clubs, who are going to bring home the trophies, gavels, plaques, bacon, kitchen sinks, stray dogs, and anything else there is to win. Your SM is again sponsoring a Novice-Tech plaque. On 363 days of the year, we're pals with Western PA, but on contest weekend—push 'em in the lake! In ARES news, WB3FPL is now DEC3. WA3RPG and W3FTZ have been appointed OES's in Dist. 1. SEC KB3YS has been awarded a Certificate of Recognition from the United States Department of Commerce, National Oceanic and Atmospheric Administration, for his work in support of the Skywarn program in central and eastern Pennsylvania. Skywarn control operators in Districts 2, 3, 8, 9 and 10 have participated in a weekly practice net drill since mid-August. We appreciate K3SLG allowing us to use his repeater for this 2-month training program. Districts 2 and 9 received thanks from Harrisburg NWS's chief meteorologist for assistance to Skywarn. SGL WA3IAO's work with the Bureau of Motor Vehicles last year contributed to smooth sailing for the "Amateur Radio Operator" license plate legislation that was making its uncontroversial way through the General Assembly at press time. The bill was introduced through the efforts of WPA's SGL. Hamfests this month include Pack Rats on the 2nd, C-CARS on the 16th, and RF Hill on the 30th. Here's "Thanks" to all the volunteers who gave us another great hamfest season. Tri-State ARC is a new group formed last summer in Matamoras. TRIAC is a new club in northern Chester County. We hope both "tri's" will be successes! Assistant TC's have been busy. NG3Z helped with an RFI problem. K3NVI spoke on sunspots to the QCWA chapter he helped form. W3FM assisted with antenna advice and equipment adjustment. K3OQF, another antenna expert, will have a book published in Germany. TC W3FAF helped a ham get back on HF after 10 years QRT. KC3EC is back in EPA and on the ATC roster. STM KB3UD notes that 2 ORS's had 60 out of our 85 originations in July. There is no throughput without input! Why wait for a holiday season to offer NTS's service to people who don't know about it? Let's work on improving originations. Nets (QNI/QTC): EPA 408/91, EPAEPTN 425/105, SEPATN 61/18, MARCTN 140/43, MARCARES 82/14, D6ARES 61/12, D5ESN 93/17. PBBS: @K3RIL 203, WB3JOE 37, @WA3TSW 98, @WA7SSO24, @AG3F 89, @KB3UD 146. Traffic: N3AZW 572, N3DRM 136, N3CD 123, W3IPX 73, N3COY 72, W3JKX 70, AA3B 56, KA3DLY 52, KD3AO 43, KU3R 34, W3KAG 33, W3DP 26, WA3CKA 23, KA3RGF 23, W3AQN 21, W3BUR 20, W3CL 12, K3WPI 12, W3VA 6, W3ADE 4, W3FAF 4, WA3JFL 4, K3NB 4, W3HK 2.

MARYLAND-DC: SM, Philip E. Battey, W3FZV—The FCC held a well-attended meeting in June at which proposed changes to the Amateur Rules, call letter assignment, and the VEC program were discussed. The MEPN picnic, under the leadership of NM K2EB, was fun for all. Many familiar faces were seen at the Maryland Hamfest, sponsored by BRATS. One of them belonged to Larry, N3BE, who is experimenting with 24 GHz. Another was W3AZ, Bill, who just got on 6 mtrs. after about 50 years WA3YLO has a new responsibility: to keep tabs on training and testing activities throughout the section; he's hard at it. "Auto-Call" magazine carries a list each month of testing sites in the MD-No. VA area. Your local club can help. RCARA recently carried through on a project to have June 20-26 declared "Amateur Radio Week" in MD, and the club was awarded a Certificate of Merit. The CARA newsletter is now produced with the help of the Ventura desktop publishing system FB. Pud, W3DQI, has resigned as EC in N. PG county because of work and time constraints. We're sorry to lose him, but his replacement is Gary, WB3JRW, who is active in emergency work. KJ3E has been appointed ASM for section packet- radio affairs. Address queries about packet to Al. KX3U is back from six weeks of research in Paris. The niece of KW3X, John, just got married in CA. Congrats to W3HWZ who just celebrated his 84th Birthday! K3GHH and N3GJB spent a warm(!) day working on each other's antenna. KO4A has a new tower, Mike, KA3NXD, and yf entertained some Brownies and publicized ham radio. N3BMB went to a WAVE convention. Carroll Co. EC, NO3Z, has started a novice net which meets Thurs, 7:30 PM on 28.450 MHz. Here's one: WA3SCW qualifies people for RCC using packet radio! George, K3RPT, has been selected as National Volunteer Fireman of the Year. N3FHB is a new Computer Scientist. KN3U writes a superbly-composed bulletin for his emergency network. WA2WDT is a top-notch editor. Everyone: originate a message in the SET. MSN draws out-of-state members. CBRA was busy this summer. Needed: PIAs, BM, OOs. With the Nets: NET/MGR QND/QTC/QNI: MSN/KC3Y 31/38/308, PON/WB3BFK 26/18/131, MEPN/K2EB 30/101/721, MDD/W3FA 61/163/482 (Top Brass K3GHH 89, W3FA 88, WA3YLO 77, KC3Y 71, NC3V 69), HOCARES/WA1QAA 2/0/11. Traffic: PSHR: W3FA 96, WA3YLO 94, KC3Y 77, NC3V 76, N3EGF 60, K3GHH. Traffic: W3IWI 324, KJ3E 125, NC3V 116, WA3YLO 102, K3GHH 90, W3FA 81, W3LDD 66, KC3Y 62, NB3P 45, N3EGF 44, W3DQI 40, KK3F 38, WB3BJM 37, K3NNI 35, NC3Z 28, W3FZV 10, WA3GYW 9, WA1QAA 3, KC3DW 3.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—ASM: N2CER. SEC: K2QU. STM: WB2UVB. ACC: K2IXE. TC: N2BQT. PIO: VACANT. SGL: VACANT. BM: WB2UVB. OOC: WA2HEB. ATCs K2JF, KA2RJA and WB2MNF. VE testing this month: Thursday, Oct. 20 in Bellmawr. See June, 1988 QST SNJ column for further info. Cape May County ARC VE testing Oct. 22. See April, 1988 QST in the SNJ column for the lowdown. JSARS VE testing on Oct. 15 at the AMVETS Post No. 2 on Rt. 571 in Jackson. Applicants should arrive at 9:30 AM with testing starting PROMPTLY at 10. Contact Bill, AC2F at (201) 269- 5659 for information. During the winter, there was a message floating around on the various packet BBSs to the effect that NTS traffic passing through NJ might not make it to its destination. I received both a lot of in state and out of state inquiries about this and I wish to let all of you know that there never was, and there isn't now, a problem with NTS packet traffic going through our state. Speaking of NTS, please, all traffic handlers who want to submit their Station Activity Reports (SARs) for listing in QST should send them to ME, and they must be in my hands by the sixth of each month. Until next month, 73. Traffic: WB2ZJF 212, WB2UVB 110, KA2CQX 12, WA2HEB 7.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—HAMFEST: Syracuse Oct 15, the last of nine major events in WNY for 1988. . .thanks to all those who make them happen! PUBLIC SERVICE HONOR ROLL: N2ABA, N2EIA, N2EVG, WA2FJJ, NN2H, KC2JW, W2MTA, WB2OWO, KA2QOO, ND2S, NJ3V, K2YAI, KA2ZNZ. July BPL: W2MTA. CLUB OFFICERS: (RAGS) KD2OQ, NV2V, NT2D, WA2URK, WA2PUU. Squaw Island ARC celebrating 35 years October 11th. RAWNY W200PE had great Bi-Centennial time aboard the USS Little Rock. WNYDXA and W200RR had 6700 plus QSOs during Bi-Centennial week with W.A.S. and DXCC! RAWNY has renewed as a Special Service Club for another year. Six of eight SSCs in WNY are overdue on filing for SSC renewal. . .is your SSC one of those? Ask your Club President if your club is an SSC. . .don't lose the benefits of being a member of an SSC.

NET	MODE	QNI-QSP-QND
NYSEMO	SSB	099-007-05
WDN/M*	FM	346-103-31
NYS/M*	CW	328-203-31
NYPON*	SSB	472-326-31
ESS	CW	274-042-30
NYSPTEN	SSB	421-056-31
LCARES	FM	045-000-05
Oneonta	SSB	020-000-04
OCTEN/E*	FM	614-085-31
Q Net	FM	368-004-31
STAR*	FM	234-044-29
NYSR	CW	018-005-05
WDN/E*	FM	420-138-31
NYS/E*	CW	272-128-31
Blueline	FM	200-014-20
TIGARDS	FM	036-004-05
VHF THIN	FM	041-000-04
BRVSN	FM	314-005-31
CNYTN*	FM	233-119-31
OCTEN/L*	FM	194-066-31
WDN/L*	FM	428-082-31
NYS/L*	CW	273-153-31

*NTS Net. Late reports (June): Q Net 418-001-30, JCRACN 375-006- 30, NYS/E 286-133-30, NYS/L 278-190-30. APPOINTMENTS: (EC) KB2DVM, Clinton County. Thanks for past services to KD2AJ. A.R.E.S. ACTIVITIES: St. Lawrence County answered several calls to service including a search and rescue for a lost child. . .plus several SKYWARN alerts were called by NWS throughout the Section. The ARES Southern District in conjunction with the ten county NWS Office has developed a SKYWARN Spotter Report Form for both observers and control stations. Implementation of the ARRL associated Gridlocator System with its capability to identify location to a two by three mile area at these latitudes is continuing. We find it more advantageous to not refer to the system by its original name in presenting the locator system to the National Weather Service. OO Reports: KA2CHX. It will be interesting to see the final version of Part 97 re-write. All this business about not supporting the logistics of a "service" organization, coupled with the present day fears in regard to personal liability faced by the good Samaritan do make life interesting when one thinks about the future public service activities by Amateur Radio operators and their leadership. Traffic: W2MTA 559, NJ3V 442, WB2OWO 315, N2EIA 299, WA2FJJ 281, K2YAI 134, N2ABA 128, KA2QOO 115, KA2UBD 100, ND2S 94, KA2DBD 90, W2FR 86, WB2QIX 82, NN2H 77, WB2IJH 76, KG2D 74, KA2ZNA 74, KC2JW 58, N2EVG 26, AF2K 20, WB2OEV 20, K2QR 19, KE2EA 10, WA2OEP 4. June: KE2EA 6.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. STM: N3EMD. BM: KC3ET. TC: N3EFN. OOC: KX3V. ACC: AK3J. SGL: KA3OEM. PIO & ASM: N3DOK.

NET	QNI	QTC	SES	kHz	T/D	MANAGER
WPACW	223	111	31	3585	7:00 P/D	WA3UNX
WPAPTN	258	54	31	3983	6:00 P/D	WA3HLN
KFN	141	62	20	3983	1:00 P/D	KA3OEM
PFN	178	131	31	3958	5:00 P/D	WA3THT
WPA2MTN	238	41	31	46.28/88	8:00 P/D/	KA3BGC
NWPA2MTN	522	29	29	44.53/45.13	9:00 P/D	KC3NY

I must report a Silent Key, Larry P. Flavin, W3CV. Larry had a great many facets in his career. He was connected with various TV and radio stations including WQED, the first PBS station in the U.S. He was in the Merchant Marines for 24 years, 20 with the United States Lineseven. With his periods at sea he rolled up an enviable record making the DXCC Honor roll working 313 of the 317 of the current listed, he had a total of 349 countries including now-deleted countries. He had his Extra Class License and his station was all state-of-the-art with his license. All his friends will miss him very much and our condolences are with his family. dit dit dit.dah dit dah. The Breezeshooters new officers for 1988-1989: Pres. W3BIS, V.P. N3BPB, Treas. KA3AVB, Sec. WN3VAW, Checker N3DOS, Directors N3FXW, K3SDL, W3GVI, KA3LNG, K3SMB and WB3JEX. ???? Where have all our traffic stations gone. We need more tfc handlers around the section especially in the areas that have very few or no amateurs. Also in the areas with quite a few amateurs. I live in a large populated area and there are only one or two check-ins. We need you. July traffic: KQ3T 366, N3EMD 215, W3OKN 158, N3FM 136, N3AES 98, NO3M 58, W3KUN 53, K3SMB 50, KA3OEM 42, WA3DBW 33, KC3GO 24, KC3YE 18, KC3ET 16, KD3AC 10, KA3GXP 9, KA3EGE 7, N3COR 3. Note traffic handling is fun and you meet some fine people. 73 see you next month.

CENTRAL DIVISION

ILLINOIS: SM, Dave Carlson, AA9D—SEC, W9QBH. STM: K9CNP. OOC: W9TT. BN: K9EUI. SGL: K9IDQ. PIO: N9EWA. ACC: WB9SFT. TC: N9RF. DEC: WD9EBQ. Illinois Section Nets

NET	FREQ	TIMES (LOCAL ILLINOIS)
ISN	3905	1800 DAILY
ILN	3690	1830 & 220 DAILY
ITN	3705	1900 DAILY
CTN	149.69/09	2100 DAILY
ILARES	3905	1630 1ST & 3RD SUNDAYS
	Illinois Independent Nets	
IEN	3940	0900 SUNDAYS
ILPN	3855	1645 M-F; 0830 SUNDAY
NCPN	3915	0700 MONDAY-SATURDAY
NCPN	7270	1215 MONDAY-SATURDAY

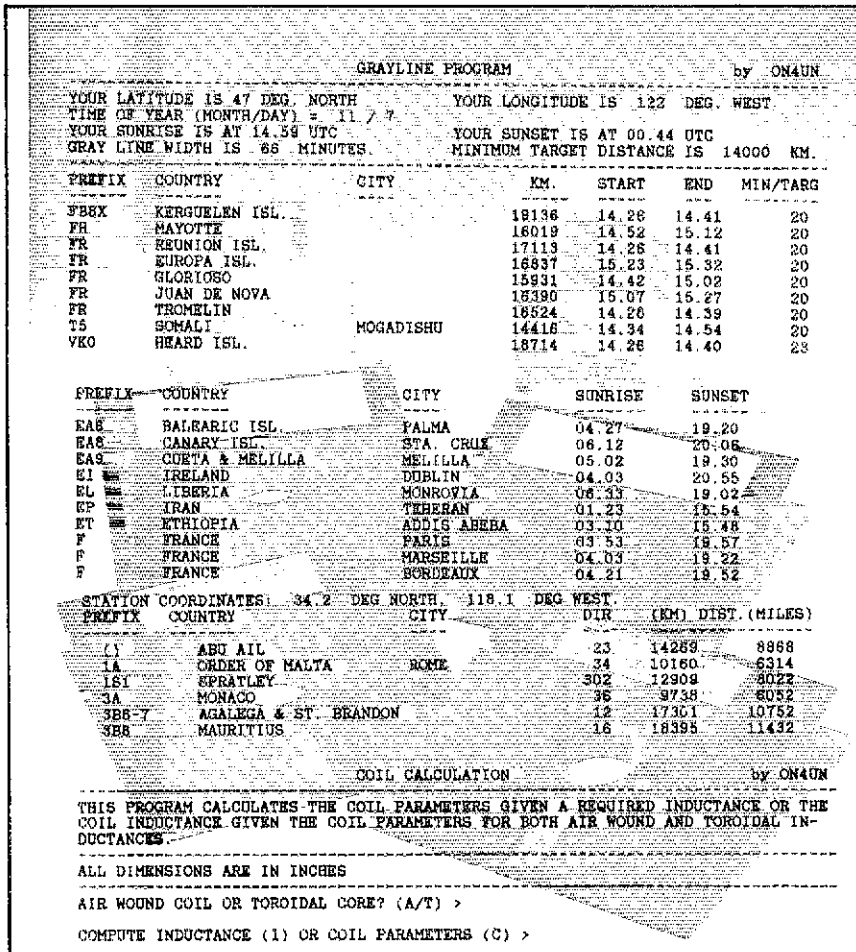
Greetings! We all owe WD9EBQ thanks for 6 years of outstanding service as SCM/SM. I will try to follow in his footsteps, and with your support we can continue to make progress. . .KC9NL, WB9CKS and WD9CLX performed communications duty for the "5K Run For Glory" in Streator on July 4th. KA9RVN, KD9RU, N9FWM, N9HHD, W9LRG and myself handled communications for the American Cancer Society Biathalon in St. Charles on July 10. Members of the Illinois Valley Amateur Radio Club demonstrated ARES and NTS capabilities to the public during the South Jacksonville Celebration on July 23rd. WB9MRL, W9THI and W9XA helped organize the Delnor Community Hospital "Community Classic" Run. WCRA sponsors a special net for hams 18 and under on their 222.54/224.14 repeater in Wheaton, Wednesday nights at 7 PM. Net control is Luke, KA9ZHL. If you are mailing monthly reports to me, please use the address printed in the front of QST. You may also phone in reports on the Illinois ARRL toll-free line, 800-451-2775. Traffic: NN9M 143, W9LWH 108, WA9VLC 105, K9QEW 81, WD9HQW 37, NC9T 36, KA9CTW/T 32, K9EHP/9 20, WD9EBQ 17, WB9JTK 16, W9VEY/M 8, W9JUM 6, WA9RUM 6.

INDIANA: SM, Bruce Woodward, W9UMH—SEC: WD9AVQ. STM: NX9I. ACC: K9ZBM. TC: WA9JWL. SGL: WA9VQO. BM: W9OCL. PIO: KA9WXT. Net Managers: ITN KA9EIV, QIN KJ9J, ICN KD9ER, VHF W9PMT, IWN KA9ERC. July Net Reports:

NET	FREQ	TIME DAILY UTC	QNI	QTC	QTR	SESS
ITN	3910	1330/2130/2300	3176	273	2577	93
QIN	3656	1430/0000/0300	533	178	1348	90
ICN	3705	2315	110	16	496	26
IWN	3910	1310	1125		365	31
IWN VHF Bloomington			735		217	31
IWN VHF Kokomo			1022		178	31
IWN VHF Ligonier			677		217	31
Hoosier VHF Nets (10)			2569	212	2313	85

D9RN for July 243 QTC 62 sess. 88% K9CGS, W9JU&J, W9UEM, N9DWU and NZ9S. CAND 448 OTC in 31 sess. D9RN 100% W9JUJ and N9DWU. Appointments: ORS Robert C. Bud Webb W9OCL. DEC District 9 Robert Damon, N9BRN, District 7, Larry Clark, KC9BQ. EC Jim Abbott, K9KTB Kosciusko Co, EC Robert Binzer, KA9ZOR Jefferson Co, EC Steve Redmon, KA9KTD Decatur Co. I attended the WVARA Picnic this month. It was a nice park and a well attended activity. I don't think it replaces their Hamfest, but they are pleased and that's what counts. Thanks to Ken Ralston, WA9ZGU a new organization of hams is taking shape in Central Indiana. Calling themselves The "Helping Hams" the group is made up of returned hams in the area. Their goals are noteworthy and their potential is great. If you are interested contact WA9ZGU. Congratulations to Franklin W Nicholson, WD9GBA of Salem, Indiana upon his receipt of a special commendation from the National Weather Service for his reporting of rainfall during the week of July 20, 1988. Frank reported over 10 inches of rainfall that week and enabled the

(continued on page 116)



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                        GRAYLINE PROGRAM                          by ON4UN

YOUR LATITUDE IS 47 DEG. NORTH          YOUR LONGITUDE IS  122  DEG. WEST
TIME OF YEAR (MONTH/DAY) =  11 / 7
YOUR SUNRISE IS AT 14.59 UTC            YOUR SUNSET IS AT 00.44 UTC
GRAY LINE WIDTH IS  66  MINUTES.        MINIMUM TARGET DISTANCE IS  14000  KM.

PREFIX   COUNTRY                CITY          KM.    START    END    MIN/TARG
------   -------                ----          ---    -----    ---    --------
3B8X     KERGUELEN ISL.                     18136    14.26   14.41       20
FH       MAYOTTE                            16019    14.52   15.12       20
FR       REUNION ISL.                       17113    14.28   14.41       20
FR       EUROPA ISL.                        16837    15.23   15.32       20
FR       GLORIOSO                           15931    14.42   15.02       20
FR       JUAN DE NOVA                       16390    15.07   15.27       20
FR       TROMELIN                           16524    14.28   14.39       20
T5       SOMALI                MOGADISHU    14416    14.34   14.54       20
VK0      HEARD ISL.                         18714    14.26   14.40       23

PREFIX   COUNTRY                CITY          SUNRISE    SUNSET
------   -------                ----          -------    ------
EA6      BALEARIC ISL.          PALMA          04.27      19.20
EA8      CANARY ISL.            STA. CRUZ      06.12      20.06
EA9      CUETA & MELILLA        MELILLA        05.02      19.30
EI       IRELAND                DUBLIN         04.03      20.55
EL       LIBERIA                MONROVIA       06.33      19.02
EP       IRAN                   TEHERAN        01.23      15.54
ET       ETHIOPIA               ADDIS ABEBA    03.10      15.48
F        FRANCE                 PARIS          03.53      19.57
F        FRANCE                 MARSEILLE      04.03      19.22
F        FRANCE                 BORDEAUX       04.21      19.52

STATION COORDINATES:  34.2  DEG NORTH,  118.1  DEG WEST.
PREFIX   COUNTRY                CITY          DIR    (KM) DIST.(MILES)
------   -------                ----          ---    ----------------
 (-)     ABU AIL                               23       14259      8868
 1A      ORDER OF MALTA         ROME           34       10160      6314
 1S1     SPRATLEY                              302       12908      8022
 3A      MONACO                                36        9738      6052
 3B6-7   AGALEGA & ST. BRANDON                 12       17361     10752
 3B8     MAURITIUS                             16       18395     11432

                        COIL CALCULATION                          by ON4UN
-------------------------------------------------------------------------------
THIS PROGRAM CALCULATES THE COIL PARAMETERS GIVEN A REQUIRED INDUCTANCE OR THE
COIL INDUCTANCE GIVEN THE COIL PARAMETERS FOR BOTH AIR WOUND AND TOROIDAL IN-
DUCTANCES.
-------------------------------------------------------------------------------
ALL DIMENSIONS ARE IN INCHES
-------------------------------------------------------------------------------
AIR WOUND COIL OR TOROIDAL CORE? (A/T) >

COMPUTE INDUCTANCE (1) OR COIL PARAMETERS (C) >


RQD. INDUCTANCE (uH)> ? 3.4
COIL DIAMETER IN INCHES > ? 3
COIL LENGTH IN INCHES  > 4

                REQUIRED NUMBER OF TURNS = 9
```

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 $30: **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 $35. Please add $2.50, ($3.50 for UPS) shipping and handling.

THE AMERICAN RADIO RELAY LEAGUE
225 MAIN STREET
NEWINGTON, CT 06111

NWS to issue flood warnings for the area. The Wet Net really helps! EC reports for July: KD9ZN, W9BTZ, KA9ZOR, N9FMO, KA9MNR, KA9FDF, N9FQF, WB9BKA, K9LMJ, KA9WCQ, N9AZD, KD9HB, KA9KTD, W9SIO, N9BHA, KA9DZM, KA8MRI, N9DCA and N9DTG. OBS Reports: W9OCL, KA9EIV, K9SBW, N9BS, N9BAC, N9CJT, WB9TFD, and N9DOP. OO Reports: WA9VLK, WA9JWL, WA9VQO, N9GHT, KA9QYK and N9EZU. Traffic: KD9QB 767, W9UMH 184, KJ9J 160, W9UEM 86, WA9QCF 61, WB9IHR 60, NR9K 54, W9OCL 53, KD9ER 46, K9SBW 41, KA9RNY 38, WD9GET 38, KW9C 36, W9ZGC 35, W9JVE 31, WB9PFZ 24, N9BS 21, WD9DWD 14, W9BTZ 14, N9FMO 12, K9ZBM 8, AB9A 7, W9PMT 6, WB9MDS 5, WD9CIV 5, W9RTH 4, WB9OZZ 4, W9XD 3, K9OUP 3, WA9JNC 3, W9KMY 1, WB9TFD 1, K9DIY 1.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9ZAG. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. TC: K9GDF. Special congratulations to 14-year old Stacy Garner, KA9WDE, of Harshaw, Wisconsin, for being selected as the winner of the ARRL Hiram Percy Maxim Award of $1,000 cash, plus travel and accommodation expenses to attend an ARRL Convention to formally receive the plaque. Quarter Century Wireless Association, Wisconsin Chapter 55, meeting will be October 1st, with a lunch and auction at the Oakwood Inn, 1040 West Fulton Street (2 blocks east of highway 10), Waupaca. Visitors welcome to join the QCWA fun. October 2nd exams will be held in Racine at the Red Cross Building, more information from N9DMP. October 15th at 1 PM Milwaukee Area exams by Badger Examiners, 5353 North Green Bay Avenue, registration with WA9UJK. Exams at the University of Wisconsin Facilities Management Building in Eau Claire October 15th at 9 AM check with W9NW. Help your local Boy Scouts to learn about Ham Radio October 15th and 16th during their Jamboree On The Air. Does anyone have info about Tomahawk exams on October 30th? W9YCV worked Oscar's Special Event station during Oscar 13's first day of operation and a few days later contacted Finland through the satellite. Congrats to W9YCV awarded Top Traffic Handler plaque for 1987 by Wisconsin Nets Association; WB9YPY and KC9CJ received endorsement tags for their plaques. New Official Observer KC9Q, of Sheboygan. New Officers of Milwaukee RAC: Pres. KD9AJ; V. Pres. W9VQD; Sec. KE9JJ; Treas. NE9W. Sorry to report Silent Keys W9UMO and WA9NMT. Thanks to communicators who worked hard, under the direction of EC WB9SMM, to make the Milwaukee City of Festivals and Circus Parades successful. Traffic: WB9YPY 1961, KC9CJ 596, KA9VII 538, W9CBE 246, W9YCV 191, KA9FII 123, W9UW 119, N9BDL 107, WA9WYS 89, K9AKG 77, W9KLN 75, K9UTQ 71, W9NGP 65, W9IEM 60, KA9KLZ 57, AG9G 53, W9UCL 53, N9BCX 44, WB9ICH 38, K9FHI 33, K9BED 27, W9ODV 27, NZ9Z 14, W9PDV 4, N9BYS 2.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—Traffic keeps moving. In spite of the drought and the severe QRN generated by thunderstorms that don't seem to get here, the traffic activity for July totalled 2,954 as reported by 17 stations—just about the same as for June. Not bad at all. Congratulations to Mike Mullin, NØBUI, Winona, as our Amateur of the Month for July. Thanks, Mike, and keep up the good work. I know that many of you have been involved one way or the other, in many special events this summer and other public-service activities. Unfortunately, many of them aren't reported to me. One I do have is from "OD" KØJIY of Alexandria. "OD" reports a successful event involving the 2nd Annual TransAmerica Trek (Bicycle) sponsored by the American Lung Association. The communications support group out of the Alexandria area, namely KØJIY, KAØORD, KAØPPU and NØAGO, with assistance by other members of the Runestone Radio Club, were substantially, and successfully involved with this venture. There was a nice write-up and publicity in the Alexandria Lake Region Press newspaper. By the time you read this, you will no doubt have heard from our SEC, Ray, KAØARP, in regard to plans for the annual SET in October. So, be ready for that one. Keep me up to date on happenings in your area. I would like to include more information in this write-up each month. Thanks Gang, that's it for this time. GL es 73. Jim Swisher, KAØEPY, STM. MN EMERGENCY FREQUENCY 3860 kHz BULLETINS 3860 kHz

NET	FREQ	TIME	QNI/QTC/SESS.	NET MGR
MSN/1	3865	6:30P	312/122/31	WØJCE
MSN/2	3865	10:00P	285/55/31	KDØNH
MSPN/N	3860	12:05P	364/232/31	WBØWNJ
MSPN/E	3860	5:30P	645/198/31	KCØT
MSSN*	3710	6:00	259/27/31	KAØSBY
PAW	3925	9:00A	3660/362/118	WDØBAC

*MSSN activity included 70 training messages. Traffic: WBØWNJ 882, KT9I 714, WAØTFC 349, KAØEPY 286, NØFOO 161, WØGRW 120, KAØARP 92, KAØPDM 83, WØTIV 58, KDØNH 49, WDØGUF 36, KCØT 34, KØQBE 32, NØIYE 30, WØKYG 11, WGØS 11, KØOGI 6. Total traffic: 2,954.

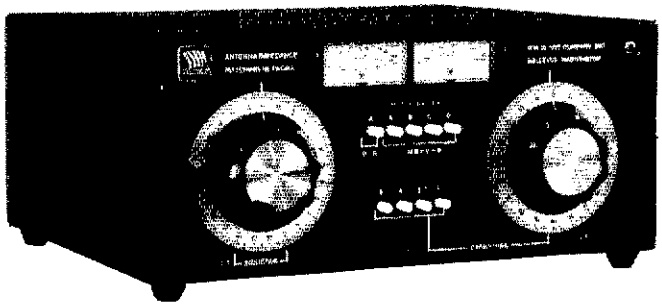
NORTH DAKOTA: SM, Bill Kurtli, WCØM—We enjoyed the International Peace Garden Hamfest very much. It was dry this year for a change. It was the 25th hamfest. The Hams that held the picnic were WAØHUD, WAØIOB, WAØCHR and VE4— Barry Riley who let his license expire. KAØSLI and VE4JA were elected ham of the year. The Hamfest station VE4IHF under the supervision of KAØSLI made over 300 contacts with a registration of about 330. Also this month the American Lung Assoc. made their Trek through ND. KØCQQ, WØTUP, KAØGVJ, KØGGI and KAØFSM were led by WBØBZH providing communications for the group. One cyclist was injured for which the amateurs provided assistance and three personal messages were relayed to the Trekkers. Four amateurs provided communications for Exercise THOR. An exercise involving state, county, city and hospital personnel. The amateurs from the Grand Forks area were led by WDØAQY in this project.

Net	Freq	Time	Ses/QNI/QTC	MGR
Goose River	1,990	9 AM Sun	5/87/3	WØCDO
Data	3,885	6:30 Da	28/838/21	KAØFSM
Wx nets to resume in Oct: WØGFE				
Storm Net	3.885			WCØM

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—ASST SM: NØABE, WAØFPR. SEC: KAØKPY. STM: KDØYL. On July 27 as The Rapid City Forest Fire was in the National News the Civil Defense called KØCXL to get help from the 2 meter ARES.

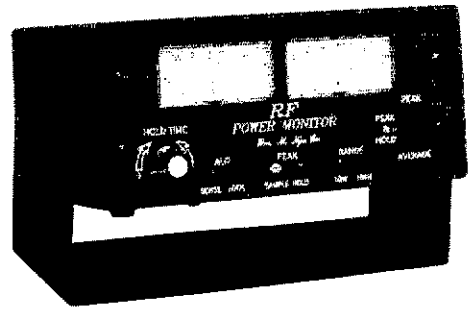
NYE Takes the fear out of full power antenna tuners, and the guesswork out of PEP measurement with these two MUST SEE PRODUCTS!!

MB-V-A



Discover this durably built, feature packed MB-V-A Antenna tuner. You'll find operating conveniences that make antenna tuning a snap and value engineered to do the job over wide operating ranges. Compare quality, features and the NYE VIKING TWO YEAR WARRANTY.

RFM-003



Get correct easy to read measurements of PEP for SSB, AM, and Pulse along with full time completely automatic SWR display with this unique Power Monitor System. Two models to choose from: The RFM-003 for 3KW indication and The RFM-005 for 5KW.

CHECK THE FEATURES:

- **Pi Network.** Low Pass Pi Network tuning 1.8-30 MHz. Heavy duty silver plated continuously variable inductor with 25:1 vernier dial. 7000 volt variable capacitor and 10,000v switch selected fixed capacitors on output side. Tunes 40-2000 ohms loads. Good Harmonic suppression!
- **Automatic SWR.** Hands free metering of SWR. No reset or calibration needed. Separate power meter—300 or 3000 w f.s. automatically switched. Easy to read 2.5" recessed and back-lighted taut band meters.
- **Antenna Switch.** PUSH-BUTTON antenna switching to (4) antennas (2 coax, single wire and twin lead). Coax bypassed on first coax output. We designed this switch to take the power. Rated at 10KV and 20 amps.
- **3 KW Balun.** Trifler wound triple core torroid gives balanced output to twin feeder from 200 to 1000 ohms and unbalanced output down to 20 ohms.
- **Maximum Power Transfer.** Match your transmitter output impedence to almost any antenna system for maximum power transfer. Amplifiers only run at their designed Q when properly matched.
- **Model Options.** MB-IV-A1 includes all MB-V-A features less antenna switch and balun. MB-IV-A2 is identical to MB-IV-A1 with the addition of a triple core balun.
- **1.8 MHz** will not tune on some antennas.
- **(3) Modes** — Peak Average and Peak and Hold with a unique non-drift Sample & Hold Analog memory circuit.
- **(2) Ranges** — Automatically switched power scales to 5 KW.
- **Fully Automatic SWR** — Full time meter displays ratios directly without drift.
- **Built-in ALC** — Protect your amplifier tube investment with this fast acting lockout.
- **Remote Couplers** — Six feet remotes the interchangeable calibrated couplers.
- **True RMS Conversion** — H.F. couplers use forward biased full wave detection.
- **Rugged Construction** — Heavy gauge aluminum construction. Top quality glass epoxy PCB. This meter is built to last.
- **Accuracy** — Guaranteed to ± 5% F.S.
- **Warranty** — TWO FULL YEARS.
- **Added Features** — Switchable reverse power all mode metering — Full status LED Display — Adjustable ALC is switchable SWR/REFL power — Heavy duty Nicad batteries charged by the applied RF for the field and a charger is supplied for fast charging and backlighting of the taut band meters for the ham shack.

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Within minutes more than 25 Hams responded and were set up with a communications net to the CD emergency control center for communications duty in evacuation of home occupants in endangered areas. Martha Shirley WØZWL who was NCS for the WX net for many years and a ham over 50 years became a silent key on July 8. Pallbearers were WBØCIP, WAØCUL, NFØT, KAØBEB AAØF and KBØBXI. Martha will be missed on the S.D. Nets. Hot Springs reports three new hams WA7RGV, KB7ADK from Utah and WB7VKB from Mass. Regret to learn of the Passing of Walter Schutz, WØEBO of Canton. A Ham for many years. Traffic and net activity has been down due to the severe Hot Wx. Total tfc reported for July was 361. Net Report:

NET	SESS	QNI	QTC	NET MGR
SD Morning Wx Net	26	765	105	WØHOJ
SD Novice Net	5	26	0	KDØYL
SDSVN Emer Net				KEØIR
Walworth Cty Net	4	23	4	WØYMB
SD CW Net	21	134	55	KØERM
SD QCWA Net	3	22	0	WØHOJ
NE SD Zm Net	4	80	2	KDØYL

Traffic: KAØAIE 115, KØERM 102, WØMZI 51, WBØOMF 30, KAØKPY 26, KDØYL 21, WØYMB 16.

DELTA DIVISION

ARKANSAS SECTION: SM, Dale Temple, W5RXU—This is my last article as SM of Arkansas. It is time for someone else to assume this post. Time requirements at work are such I need to resign. By the time this is printed, a new SM will have been appointed. Many thanks to Rick Roderick, K5UR for serving as Assistant Section Manager. John Barnett has served as Section Communications Manager for the last four or five years—many thanks to him. Section Traffic Manager Don Weatherford, W9OK has done a bang-up job, thanks. Dora Anna Graziana, NI5D has kept the affiliate clubs together and informed as Affiliated Club Coordinator, thanks. Bruce Vaughn, NR5Q has re-established the Official Observer Corp as Official Observer Coordinator, thanks. Elmo, W5LL has been faithful and efficient as Bulletin Manager. Rick Mobley, WB5FDP has served as frequency Coordinator for years, a job too often overlooked. Rick, thanks. Rich Duncan, WD5B is our newest appointment as Packet Coordinator. Rich is just getting started so everyone help him. Elmer, W5FD and Jim, W5LCI, Technical Coordinator and Govt. Liaison, respectively, have both served for years. Must close, thanks to all that helped. 73 W5RXU.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. SEC: N5ADF. ACC: K5DPG. SGL: KD5SL. TC: W5RWF. OOC: KE5QK. Packet: NE5S. Several Louisiana groups have operated a special-event station this year in observance of the 200-year anniversary of ratification of the United States Constitution. Shirl, K5OPL, sent a report on the recent Baton Rouge, KD200SL, station which also observed the 176 years since Louisiana was admitted to the Union. The Radio Amateur Service Club (RASC) of Baton Rouge sponsored this special-event station operating from the State Civil Defense Emergency Operating Center in the State Captial Complex. Participating were representatives from several Baton Rouge area clubs which included the RASC, Baton Rouge ARC, QCWA Chapter 109, False River Repeater Assoc., and the Plaquemine Repeater Assoc. & ARC. The combined effort made nearly 1300 contacts on HF & VHF. Over 500 special commemorative certificates were sent to local and DX stations requesting a confirmation of the contact. You have to be impressed by the outstanding organization and effort so frequently demonstrated by the Baton Rouge hams. And hats off also to the traffic gang for their day in and day out dedication. Traffic: DRN-5 for July 88. 534 msg in 62 sessions with La. rep 95% by K5WOD, WA5WBZ, N5LRZ, KF5VW & N5CNK. 73 de "Wondy"—K5KR.

MISSISSIPPI: SM, Jim Davis, KK5Z—ASM: W5TRD. SEC: KA4PKA. SGL: KA5WRX. PIO: WN5M. STM, KB5W; BM, W5EPW; TC, KF5DE; OCC, KK5K; ACC: NC5Y. VHF/UHF COORD: ND5DWU. PACKET MGR: WA5DVV. Congrats to K5OS on receipt of VHF Awards Mgr, GL Joe; to N5AMK on receipt of BPL and to N5MCI, Don Reed of Braxton on receipt of Extra Class. DRN5 (WB5YDD): Sess 62, QTC 534. MISS rep 97% by N5AMK, KT5Z, W5HKW, KB5W, W5HGN, WB7CQQ. GCSNB: Sess 71, QNI 1044, QTC 13. COAST ARES (N5LKT): Sess 9, QNI 172. MSBN (KF5DE):Sess 31, QNI 1772, QTC 54. ARRL INFO NET (KK5Z): Sess 3, QNI 39. ARRL INFO NET MOVED TO LAST TUESDAY IN MONTH. Traffic: N5AMK 261, KK5Z 15. Reg ARRL numbered bulletins: 10. Propo F'casts: 4, satellite bulletins, 1. From W5EPW, Miss BM. When no reports are received by SM, there is no news.

TENNESSEE: SM, Harry Simpson, W4MI—Eastern Assistant SM and PIO: W4TYU. Central Assistant SM: WA4GLS. Western Assistant SM and ACC: K4CXY. STM: NG4J. SEC: K4UVH. OOC: K4LSP. SGL: N4PQY. TC: W4HHK. The TN Phone Net is on 3980 kHz with early sessions at 6:40 AM Eastern. Regular sessions at 7:45 AM Eastern Monday through Friday, at 9 AM Eastern on Saturdays, Sundays and Holidays. Evening sessions are Monday through Saturday at 7:30 PM Eastern. CW Net Sessions are on 3635 kHz at 8 PM Eastern, Monday through Friday. There are many other nets for your convenience, just ask anyone on 3980 or 3635. Speaking of the CW net, I am gratified to learn that there are several TN amateurs who still enjoy that mode. We don't have much traffic, but we have a lot of fun. Join us when you can! Three Silent Keys since last publication: K4FDW, Jim Porter of Manchester, W4WXH, Joe Porter of Selmer and W4IVT, Frank Coke of Germantown. All were active, and will be sorely missed by their many friends. Thanks to NØOS for his report on the Bristol ARC Field Day Operations. It's people like Larry who make this column possible. In many cases, if someone doesn't tell me, I just don't know. I might mention that ETN ASM W4TYU, Jean Giesler, Jr., never fails! This month he reports on the Smoky Mountain ARC (Maryville) operation during the recent Triathalon, with AA4WX, WB4IDL, W4PCA, WZ4E, KB4KOC, N4BYR, KK4XA, KC4ALO, W4UWC and KK4NP assisting. They used the WA4KJH 25/85 repeater. Further, he reports on the Undisaster Day and Field Day in Knoxville, his ARRL program for the Oak Ridge Club (I received letters of praise for that endeavor) and a host of pictures that I wish I could use. Thanks to AD4F for her cards, she just might be trying to remind us of the Chattanooga Hamfest. I will be there, Charlie! Sincere thanks to all of you for your letters. You noticed that they were all answered quickly. Remember, I am here to help you with any League problem, and if I don't know the answer, I will go to Joel—he knows everything! Traffic: WA4FMR 142, W4DDK 55, K4WWQ 42, KA5KDD 34, W4MI 34, W4PFP 23, K4CXY 14, WB4LAL 9, WA4HKU 8, W4TYU 7, KE4LS 6, K4WOP 4, W4EWR 4.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thames, WM4T—Asst. SM: KC4WN. SEC: WB4NHO. STM: KA4MTX. PIO: WA4SWF. (July) our section is growing and we are making progress over this time last year. We now have 24 affiliated clubs (18 last year); We have 8 of the 14 DEC positions filled (5 last year); we have 32 EC positions filled (24 last year); we had a good SET in 1987. Traffic count is up on several of the nets; we have good liaison at the state level with our PIO and emergency planning is going ahead full steam with DES. It's been a good year and you are all to be congratulated. Without your support, it would not happen.

Net	QNI	QTC	Sess	Mgr
MKPN	1242	145	31	WD4RWU
KTN	668	62	30	WD4RWU
KYN (E/L)	424	119	62	K4AVX/KZ8Q
TSTMN	398	23	31	KZ8Q
KNTN	254	68	41	WA4EBN

SAR(July) K4VHF 143, WD4RWU 104; WA4SWF 52, WA4EBN 51, N4GNL 41, K4AVX 39, KI4QH 26, WB4AUN 16, KA4MTX 16, WA4NOG 12, WD4CQF 7, N4PEK 7, KU4A 4. PSHR: N4GNL 82, KI4QH 77, K4AVX 67, KA4MTX 64.

MICHIGAN: SM, George E. Race, WB8BGY (@ N8FTY)—ASM: WA1LRL (@ WA1LRL). STM: WD8KOC (@ NT8R). SEC: N8AYQ. SGL: N8CNY. TC: W8YZ. OOC: WA2AJQ. Silent keys, with deep regrets, WB8OIM, W8SS. This is SET month. Again the MI Section will be mounting a maximum effort. Why not take part and support your County EC. Scenarios will be played out and the many MI Traffic Nets will be in full swing for the weekend. Latest details can be found on the Sunday 5:00 PM ARPSC Net. The Ausable Valley ARC name the piggy contest is over! The winning name, FIFI. Let's all welcome FIFI to the group! Congratulations to Aileen, WA8DHB, for her re-election as UP NM. Also to John, WA8MVH, as the new UP Asst. NM. QMN NM, Larry, WB8R, presented Walt, WB8SYA, with a Certificate of Merit at the U.P. Hamfest. Walt is QMN Slow NM and was recognized for his exemplary performance during the past year. MI has been selected as the site of the Great Lakes Regional Monitoring Station. As part of the Amateur Auxiliary to the FCC's Field Operations Bureau, this RMS will act as a clearing-house for serious HF problems and as a resource to Local Interference Committees for VHF problems. Correspondence can be addressed to: GLRMS at PO Box 92092, Warren, MI 48092-0092. The Southeastern MI Traffic Net, (SEMTN), is Michigan's premier VHF Traffic Net. As part of the MI NTS, the SEMTN provides liaison to all other MI NTS Nets, and the MI Packet Network. Serving Detroit and surrounding areas, the SEMTN provides traffic outlets into a highly populated area of the state. NM is Steve, N8HSC. Hats off to all involved in this very FB operation! It would be great to see this kind of wide area coverage VHF Traffic Net come forth in other areas of the State. The Kalamazoo or Grand Rapids area comes immediately to mind. Is there any group out there that would like to take up the challenge? I am sure that Steve would be happy to share the details of his successful operation with anyone that is interested. The MI Novice Net will swing into action this fall under the leadership of its new NM, Ed, KA8QVH. Check MI Nets for start-up details. Please support the following MI area Nets:

NET	FREQ	TIME/DAY	QNI	QSP	SES	MGR
UPN*	3921	5:00 PM DY	1016	63	36	WA8DHB
MACS*	3953	11:00 AM M-SA	351	44	31	KBOCP
MITN	3953	7:00 PM DY	530	169	31	WD8EIB
OMN*	3953	6:00 PM DY	221	52	30	WB8R
SEMTN	145.33	10:15 PM DY	386	67	29	N8HSC
GLETN	3932	9:00 PM DY	1077	100	31	KA9EIZ
WSSBN	3935	7:00 PM DY	542	31	31	W8NDI
VHF Net Totals for May		None Received				NO8Q

*QMN Fast-6:30 PM Dy; QMN Late-10 PM Dy; MACS-1 PM Sun; UPN-12 PM Sun. Traffic: KA8CPS 248, N8HHH 203, WB8R 94, K8GXV 86, NW8M 79, WD8KQC 72, N8FTY/BBS 71, WA8DHB 51, W7LVB 46, K8HAP 37, WB8BGY 35, NY8W 33, W8YIQ 33, N8FPN 33, KI8Q 31, N8IIC 29, K8OCP 27, K8UPE 26, W8ECI 24, W8IHX 21, WB8YPG 19, WD8MJB 16, WA8MVH 15, KD8LZ 14, K8ZJU 14, WI8W 12, W8RNQ 11, WD8EIB 10, KA8PWM 8, W8BEZ 6, W8CUP 5, W8URM 5, W8YZ 5, N8EXS 3, N8GGO 2. (June traffic: K8HAP 36.)

OHIO: SM, Jeffrey A. Maass, K8ND (@ W8CQK). Asst SM: David Kersten, N8AUH (@ KB8CI) Phone: (216) 221-6740; SEC: WD8MPV (@ KB8CI); STM: KF8J. (@ W8HHF); BM: W8ZM (@ N8NN); ACC: KJ3O (@ KB8CI); TC: KB8MU. OOC: WB8ZCE; SGL: N8CVK.

NET	QNI	QTC	SESS	TIME	FREQ	MGR
BN (E)	244	102	31	1845	3.577	WD8C
BN (L)	190	96	31	2200	3.577	K8TVG
BNR	221	58	31	1800	3.605	W8EK
BSSN	147	44	26	1900	3.873	KD8FW
ONN	189	29	29			WD8KBW
OSN	264	91	31	1810	3.708	N8AEH
OSSBN	1944	704	93	1030	3.9725	KA8CGF
				1615 1830		
OSSN	177	98	31	0845 M-F	3.577	KA8GJV
				0800 S-Sn	3.577	KA8GJV
Ohio Section ARES Net				1700 Sun.	3.875	WD8MPV

Slow report for June: Ohio Slow Net, 229 QNI/56 QTC/31 Sessions. Hamfests in October and November: Lima 10/9. (Note: The Northwest Ohio ARC wants it known that all areas at this hamfest and at the associated Amateur Exams are accessible by the handicapped. Way to go!) Contact Affiliated Club Coordinator KJ3O to list your hamfest on our schedule: it's not too early for 1989! Amateur Radio Examinations: North Olmsted 10/8; Wickliffe 10/8; Maumee 10/8; Lima 10/9; Akron 10/29. Contact me or Assistant Section Manager N8AUH (phone number above) for details on any session listed above: we can provide names and phone numbers for VE session contact persons. I had the opportunity to speak at the July meeting of the Central Ohio ARES, discussing the ARRL Field Organization and our programs in Ohio. COARES has 150 members, and is one of the most active ARES groups in the US: their current schedule shows 36 events for which they have/will provided communications in 1988, ranging from two-hour runs and bikeathons, to two-day bicycling and sports car rally events! For more information, contact EC WB8INY or

DEC W8BKO. Congratulations to the Northern Ohio ARS (NOARS) on their renewal as an ARRL Special Service Club (SSC)! It appears that I may have mislaid some number of applications for Field Organization appointments between April and August: if you have been waiting for word on your application please forward another copy to our new Section Manager (identity as yet unconfirmed as this is written) for action. Sorry! I am sad to announce another Silent Key: Henry Clark, W8NXJ. Note the change in frequency of the Ohio Slow Net, which was effective September 1. The Ohio Novice Net (ONN) will cease to exist, and the Ohio Slow Net (OSN) is moving to the Novice band. The change will help to consolidate the slow-speed CW traffic handlers and the up-and-coming Novices on a single frequency, providing a better training situation. Bert Weller, WD8KBW, who has been Net Manager (NM) of the Ohio Novice Net, will switch to NM of OSN. Thanks to Ron Griffin, N8AEH, for his years of service as Net Manager of the OSNI Ron also serves as Editor for the Ohio Section Journal. Section Traffic Manager Len Brady, KF8J, is now using the "new" Toledo Packet BBS, W8HHF, but lightning knocked out his TNC and as I write this, he is temporarily off the packet. The stations listed below have practiced their traffic handling skills in preparation for disaster during July 1988: K8TVG 365, W8BO 221, W8ZOL 201, KD8HB 190, KD8KU 174, WD8KFN 149, W8QZK 144, W8SKP 136, WB8JGW 134, KF8J 131, KA8GJV 130, KA8CGF 126, N8AUH 122, K8JDI 107, N8IIP 101, W8PMJ 92, WA8SSI 88, KE8CV 87, W8EK 80, N8FWA 76, N8GEC 76, WD8QXT 75, W8CXM 68, N8AEH 65, K8IOW 62, N8CEI 61, N8GPU 60, K8CMR 58, WD8DPZ 58, W8LDU 56, WA8HED 51, KC8YV 45, NE8X 45, K8DHD 42, KA8SOM 40, WD8KBW 37, KA8BNQ 36, WD8KWC 35, K8ALV 34, WD8RIB 33, N8EFB 29, WB8HHZ 28, W8OM 28, N8GOB 27, WD8IKC 24, W8FPA 24, K8LQM 24, NW8E 24, KA8DRR 23, N2NS 23, W8JLW 20, KA8TNT 19, WB8VNV 18, K8DXZ 18, WD8JAW 16, KA8RIX 15, KC8JV 15, N8HSE 14, N8HJB 14, KD8XL 14, N8AJU 12, KE8DQ 11, WD8CTX 11, KB8EIW 11, N8CW 9, KB8ABO 8, N8FPH 8, N8HBF 7, W8XT 7, KA8SON 7, K8CKY 7, N8CJS 7, N8HRW 7, K8EF 7, WB8DEB 6, K8VOY 6, W8GDQ 6, NF8B 6, WB8KWD 6, N8GZX 6, WD8JYE 5, W8WGB 5, K8BYR 4, KA8UVU 4, N8IWC 3, WD8DKQ 3, KD8IC 3, WD8PWG 2, W8RG 2, N8GIO 1. (Jun.) WD8CTX 17.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK— ASM AND STM: K2ZM. SEC: WA2ZYM. BM: WB2IXR. PIO: KB2TM. OOC: N2DVQ. ATC: WA2VGM. SGL: KB2HQ. ACC: KV2A. ASM AND NWSLTR ED: WB2NHC. Net reports for July (QNI/QSP): AESN 49/0, CDN 583/80, ESS 274/42, HVN 289/76, NYPON 472/326, NYS/E 272/128, NYS/L 283/153, NYS/M 328/203, SDN 242/102. Club news is non-existent this month since most clubs take a summer hiatus. Several stations were active during the 200 call sign week in July including one by the Albany Amateur Radio Association and one by the Poughkeepsie Amateur Radio Club. Summary reports of activities have not yet been received but from the activity noted when Hudson Division Director WA2DHF and I were up in Albany on Tuesday of that week, I am sure that totals will be impressive. There was much interest in working the 200 stations. A number of people put a tremendous amount of time and effort into these stations and are to be commended! By the time you are reading this column, all appointments in ENY have been renewed and all those whose paperwork was received have been processed. If you did not receive the appointment you requested, please contact me or the appropriate person so any oversights can be corrected. The STM takes care of ORS and NM. The OOC is responsible for OO and Amateur Auxiliary. The SEC appoints DEC, EC and OES. The BM appoints OBS and the PIO appoints PIA. If you are wondering what all these letters mean, check with me or the Field Services Department. There's a place for you in the Field Organization if you are willing to put forth the effort. April tfc summary omitted W1BTJ's total: 134. July PSHR: WB2VUK, WE2G, WA2JBO, N2HIF, WB1BTJ, K2ZVI, KB2EPU, WA2GYY. Traffic: N2HIF 219, WB2VUK 211, N2FTR 85, WA2JBO 76, K2ZM 58, K2ZVI 58, KB2EPU 56, WA2GYY 52, WE2G 28, W2CJO 26, WB1BTJ 13.

NEW YORK CITY-LONG ISLAND: SM/SEC, Walter M. Wenzel, KA2RGI— ASM: N2GQR. ASM VE: W2NL. ACC: KA2WIJ. STM: K2MT. OOC: NB2T. TC: WA2YNH. BM: W2JUP. PIO: KA2LCC. The following are traffic nets in and around the section that handle NLI messages with the July report figures:

Net	Freq	Time Day	MGR	Ses	QNI	QTC	QSP
BAVHF	145.350/R	2000 Dly	K2YQK	31	..	N/A	..
NCVHF	146.745/R	1930 M-F	KB2BKE	31	267	85	84
SCVHF	145.370/R	2000 S-F	KA2JMA	26	213	32	29
NYPON	3.913	1700 Dly	KA2UBD	31	.	N/A	...
NYS/M	3.677	1900 Dly	N2EIA	31	328	222	203
NYS/E	3.677	1900 Dly	KU2N	31	..	N/A	..
NYS/L	3.677	2200 Dly	KU2N	31	..	N/A	..
NLT	28.450	2100 Wed	KB2BKE	4	71	6	6
ESS*	3.590	1800 Dly	W2WSS	30	274	—	42
PNS	145.01	24 hr Dly	AI2O-4				N/A
PNS(alt)	145.03	24 hr Dly	WB2IBO-4				N/A

*Independent Net, recognized by NTS, all times are local. EXAM SESSIONS: LIMARC—9:00 AM every second Saturday of each month at Salten Hall, Rm. 2, NY Inst. of Technology, Old Westbury, NY— contact Joe, W2NL 516-541-2450; SUFFOLK COUNTY VE TEAM—9:00 AM second Saturday of each month at the Islip Arts Bldg., Rm. 106, Suffolk County Community College, Selden, NY—contact George, WA2VNV 516-751-0894; GRUMMAN ARC—5:00 PM second Saturday every month at Bethpage High School, Bethpage, NY— contact Howard W2QUV 516-354-6861; GREAT SOUTH BAY ARC—12 Noon fourth Sunday every month at Babylon Town Hall Annex, Rm. 2, North Babylon, NY— contact Walt KA2RGI 516-957-6726. If your group holds regularly scheduled license exam sessions and/or classes let me know at least three months in advance so they can be added to the column before the printing deadline. Radio Central will be holding their HAMEXPO '88 on Sunday November 13, at the Selden Campus of the Suffolk County Community College. For further information contact Andy Feldman, WB2FXN or John Mark KB2QQ. Congrats to Lloyd WB2ZIT, Paul, AH2M and Jeff KA2SW on their recent appointments as PIA's. This is the last call for those who want to volunteer for the New York City Marathon which will be held on November 6, there are still positions that have to be covered for the event and one of them might be just right for you. It is with great sorrow I must report that there are two Silent Keys within the section, and they are Ray Wells, WA2LBJ who was known for his net activities and

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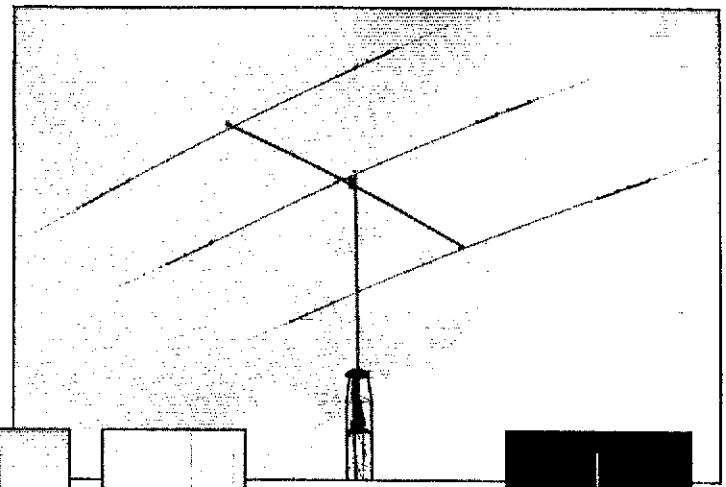

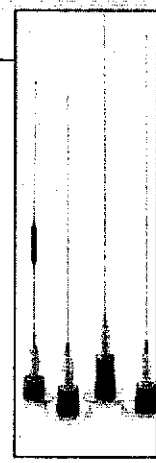

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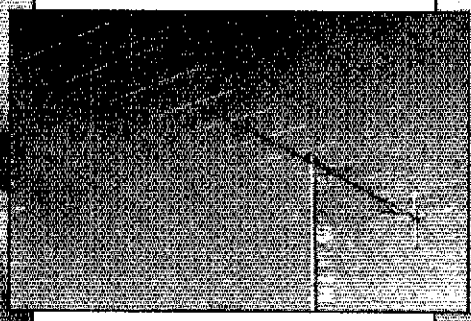

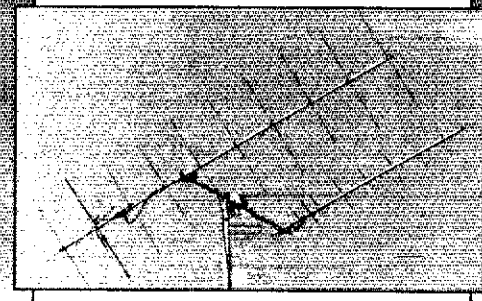

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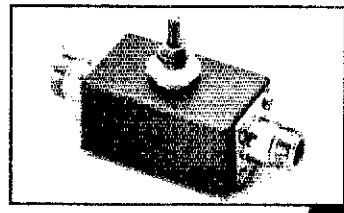

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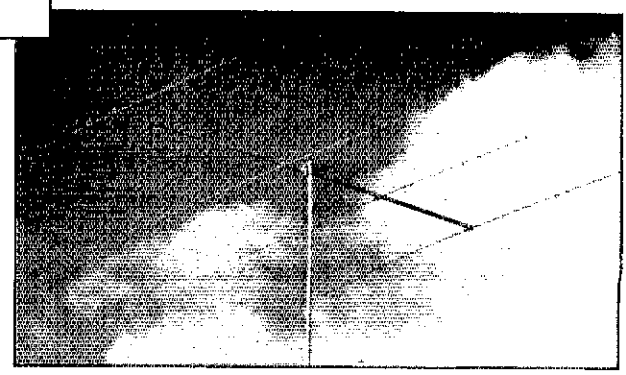

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as EC for Shelter Island and Everett Kolle, W2LOS "the Lousy Old Sailor", who was active within Grumman and Larkfield ARC's with various nets and on HF. With the passing of these two fine hams there is a personal loss felt for they both have touched my life personally and they will be missed.

NORTHERN NEW JERSEY: SM, Robert R Anderson, K2BJG—ASMs: N2EXX D (SE), N2WM (NW), WB2NQV (SW), N2XJ (Cen and VE). SEC: N2BMN. STM: KA2F. OO/AAC: KA2BZS. ACC: KY2S. SGL: W2KB. TC: K2BLA. BM: WA2UPK. PIO: N2WL. New appointments effective 08/88 are: KB2BLX replaces N2EXX as EC West Milford, KB2FDG EC Maplewood. OES's KB2BLX and KB2FDG. Appointment endorsements for the next two year term starting 10/88 are: Ronald A Loneker, KA2BZS as Official Observer Coordinator (OOC). EC's KB2BOG, K2KRF, KZ2X, N2DNO, N2ERH, NB2F, WA2GZB, WA2SPX and WB2PXJ. OES NV2D. The Garden State ARA Shore Hamfest is Oct 16. Congratulations to the following who were newly licensed or upgraded during July sessions conducted by: Raritan Bay ARC (6/4), NNJ VE Board (21/5), Bergen ARA (26/16) and Sussex County ARC (8/8). Novice (5): K Fleming, G Robbins, P McShane, B Hagal and C Lang. Technician (11): KB2EHV, KB2EPB, KB2FRQ, KB2GCI, KB2EJP, KB2FZC, KB2GEB, KB2CVK, KB2FVI, WA2LXU and R Johnson. General (4): N2HTC, WA2SDS, KB2FZA and WA2ZRX. Advanced (7): KB2FDN, N2HYV, KB2ESL, WB2ERT, KB2ENG, N2EES and WA2HGJ. Extra (5): KB2BUS, N2HRG, W2COR, KB2FSK and KE2HR. Total applicants (52). Total New or Up-Grade (32). 61.5%. The Major Armstrong ARC VE team is now the "Northeastern New Jersey Testing Association" (NENJTA). In addition to its monthly schedule this VE team is upon request also available to NNJ ARRL affiliate clubs without a VE team or those who need to relieve their own team to include an exam at a ham-fest. Our STM John King, KA2F is available to Clubs and ARES groups to present an audio/visual program on NTS traffic handling. Veteran traffic handler Jim Pope, WB2QMP has been appointed leader of the Hudson Division traffic committee. Three Net Managers are needed! See below. For appointment please contact STM KA2F. Traffic Nets and Statistics for May and June 1988:

NET	MGR	FREQ	TIME	SESS	SES	QSP	QNI
NJM	WB2ZJF	3695	1000	DY/5	31	108	255
				/6	30	98	216
NJPN	W2CC	3950	1800	DY/5	31	107	362
				/6	34	78	269
NJN/E	Open	3695	1900	DY/5	31	97	229
NJN/L	Open	3695	2200	DY	Not Available		
NJSN	KA3INE	3735	1830	DY/5	31	32	71
				/6	29	29	130
OBTTN	KA2F	147.12	2000	DY/5	31	100	233
				/6	30	83	230
NJTTTN	Open	223.88	2100	DY	Not Available		
NJVN/E	WB2FTX	146.895	1930	DY/5	31	64	485
				/6	30	65	417
NJVN/L	N2FGC	146.49	2230	DY/5	30	34	197
				/6	29	39	193
NNJ/PL	W2ONL	145.01	24hr via WA2SNA-1				

Packet NTS activity for July, 1988: Total 111. WA2SNA-1 auto forward (55) plus liaison (56) by NZ2T (44), W2ONL (10), WB2FTX (2). SAR/PSHR for May and June: W2RRX 78/91 41/-, W2QNL 238/119 161/114, K2VX 85/93 58/60, KB2BNW 16/45 26/48, W2XD 13/- 10/-, W2CC 36/- 22/-, N2XJ 289/116 172/100, N2DXP 104/67 130/81, KB4CYC 12/55 16/54, KA2INE 81/89 63/86, WB2FTX 54/64 60/64, KA2F 226/116 110/103, WB2QMP 33/69 38/63, ND2K 7/- 7/-, NR2N 7/- 24/-. May only: WA2PAC -/61, NR2O 35/-.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—ASM: WBØAVW. SEC: KDØBG. STM: KCØXL. ACC: NUØP. OOC: WAØQMU, BM: KØIR. TC: KØDAS. PIO: WEØM. Recent license upgrades include NØXY to Extra and KAØVPC to Technician. New calls heard are KBØCZC and WKØI. Congratulations to KAØYAK and KAØQLZ who are the proud parents of a new son! At least 343 pieces of traffic were originated and relayed during RAGBRAI week, about 90 percent of it on packet. Thanks go to WBØRSW and WØANZ who coordinated much of the entire statewide effort. A big thanks, also to the clubs and local groups in Sioux City, Ida Grove, Carroll, Boone, Des Moines, Oskaloosa, Fairfield, and Ft. Madison whose large contributions made the amateur activity a big success. And thanks also to the many who picked up, relayed and delivered traffic from the RAGBRAI operations. I enjoyed speaking at the Cedar Valley ARC recently and seeing many of you at the Midwest Convention in Des Moines. The Boone Mike and Key Club operated a special event station during Pufferbilly Days which celebrates the railroad heritage of Iowa. Remember that the Iowa 75 Meter Evening Net time will change to 5:30 PM with the change to Standard time on 3970 kHz. Regretfully, WØASM became a silent key. Traffic: WØSS 134, KØPT 120, KØGP 103, KAØADF 77, WØYLS 73, WBØMCX 64, W4JL 45, WBØAVW 40, KØCY 26, KCØKZ 21, KCØXL 19, WØOMV 12, KAØVBA 11, WBØOKA 10, KEØWO 2. June traffic: KCØXL 18.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. First off this month we must congratulate WBØZNY. For those of you that don't know Tom, he is our net manager for QKS. However, his most recent claim to fame is sharing the title of KANSAS BBQ KING for 1988, or something close. His team did win first place in Kansas this year for the best BBQ in Kansas, now the team is going to claim MISSOURI or at least give it a big try. DO YOU THINK WE SHOULD GET HIM AND FESTUS TOGETHER??? Traffic net totals for June, KSBN QNI 1310 QTC 128, KPN QNI 377 QTC 16, KMWN QNI 814 QTC 582, KWN QNI 687 QTC 547, CSTN 1958 QTC 68, QKS QNI 167 QTC 63, QKS-SS QNI 33 QTC 4. Still looking for an interested party to manage a RTTY net. Again our thanks goes to those who have been representing KANSAS on the TENTH REGION net levels. Someone asked me the question "How come all the net information in the section activities column and not too much of anything else". My answer was I report what I have been informed about. If there are others out there that would like additional information to be included in this column each month, then by all means do drop me a line giving all the details and I would be glad to pass the word. Traffic KØBXF 192, NZØM 169, WØFRC 126, WØOYH 81, WØFDJ 65, NBØZ 60, WBØZNY 60, KAØRCH 58, WØQMT 54, WØCHJ 18, WØRBO 10, WØMYM 9.

MISSOURI: SM, Ben Smith, KØPCK—STM: NDØN. SEC: K9OCU. BM: WBØTEG. OO COORD: WBØBZP. SGL: KDØUD.

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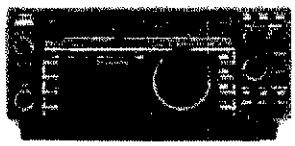

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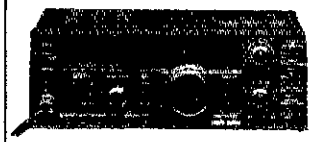

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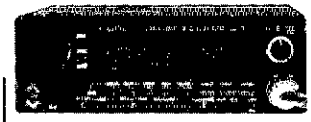

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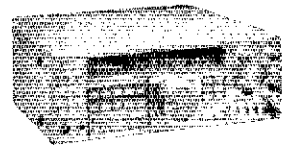

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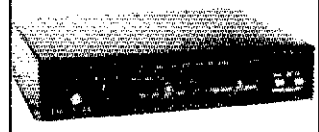

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ACC/PIO: KT5Y. Amateurs from the Kansas City area provided communications for the Hospital Hill ½ Marathon. WBØROQ and KAØSXY were Net Controls with the following stations helping: KAØSZY, NJØX, NØHKR, WAØZOG, KBØIA, WAØBVX, KØUAA, KAØLFR, WBØIZY, NKØB, WBØEJJ, WA5DYC, WØAIB, NØHOB, WBØTIN, KAØGQA and KØTLM. NØDAA has been appointed as Net Manager of the MORAT Net. The net meets every Saturday morning at 1300 utc on 3.630. They would welcome more RTTY check- ins. New Field Appointment of PIA goes to KBØAH. The Central Missouri Radio Association provided communications for the Saddle Soars Horse Trials Cross Country Event. Members assisting were: WBØTEG, NDØN, NØSIMS, WAØR and KAØNBM.

NET	SES	QNI	QTC	MGR
MON	62	255	106	AIØO
MOSSB	31	562	73	KØORB
MEOW	31	548	46	WDØELL
HBN	21	287	29	KØDSQ
RRARSN	30	362	4	KBØANP
SLARES	4	218	2	KØWEX
MOFON	4	16	2	AIØO
SWMSW	4	81	1	KØKXC
LOZBC	26	465	0	NØHVO
LOZFM	5	104	0	NØHVO
CMEN	4	54	0	KØPCK
JCRC	4	45	0	NSØB
MEXARES	4	26	0	KBØACG
CARL	3	18	0	WBØWLU
LOZYL	4	17	0	NØHVO
MMARC	4	15	0	NSØB

Traffic: WAØYJX 149, NDØN 109, AIØO 106, KM5L 74, WAØHTN 62, WØOUD 48, KØORB 44, KØPCK 23, K9OCU 18, WAØKUH 11, KDØAJ 10.

NEBRASKA: SM, Vern Wirka, WBØGQM—STM: Jerry Kohn, WDØEGK. SEC: michael Ruhrdanz, NØFER. Many amateur radio operators from eastern Nebraska and southwest Iowa participated in emergency nets when severe weather erupted over the metropolitan area of Omaha and Council Bluffs July 15. Winds up to 92 miles per hour were officially recorded in Omaha and portions of Council Bluffs sustained major damage when a tornado touched down. Emergency weather information was passed by stations participating in the Midlands ARES Net. Also, communications were provided after the violent weather left its path of destruction. There were about 100 storm-related injuries, many homes and businesses completely destroyed, power outages and telephone service disruptions. In June of 1988 Walter Brown, Jr., KAØDMB of Omaha became a Silent Key. Walt was a past president of the AK-SAR-BEN Amateur Radio Club, the first recipient of the AK-SAR-BEN Radio Club Amateur of the Year award. Walt was instrumental in equipping the Amateur Radio facility in the Omaha/Douglas County emergency operations center. The amateur EOC facility was dedicated to Walt. KAØDMB was an avid DXer and very active in ARES. Amateurs from many clubs provided communications this past summer for the Cornhusker State Games in Lincoln. Members from the Lincoln, AK-SAR-BEN, Grand Island, Aurora, Blue Valley, Hastings and Kearney Amateur Radio Clubs helped with the Cornhusker State Games. Amateur Radio exams are scheduled in Lincoln October 30, contact WAØYPY, and in Omaha November 28, contact KMØY.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Caesar Rondino—N1DCS STM: K1EIC. OOC: NA1I. ACC: NK1J. PIO: WA1CMF. TC: W1HAD. SGL: K1AH.

NET	NM	TIME	FREQ. (MHz)	Ses	QNI	QTC
CN	WB1GXZ	7 & 10 PM Daily	3.640	61	374	210
CPN	KY1F	6PM M-Sat 10AM Sun.	3.965	31	332	70
NVTN	NM1K	9:30 PM Daily	146.880	31	597	206
WESTCONN	NQ1P	8:30 PM Daily	147.180	31	474	104
RASON	N1FJW	9:00 PM Daily	146.730	31	178	54
CSTN	K1CE	24 HR. BBS	145.010			
SCN	WB1GXZ	7:30PM M-F	3.720	21	155	92
TMRCN	NM1K			5	60	2

There can be no measure of the loss to the CT Section with the passing of K1AQE, Eve Chandler. Deepest sympathy to Ev's family and may his memory be an example of our commitment to Section involvement. Hopefully you are planning to participate in the Section's S.E.T. plans. Bob York Chapman, W1QV recently reached a number of milestones. 81 years old, 65 years with the same call sign, 66 years a member of ARRL. RASON traffic net now under the new Net Manager, N1FJW. Tri-City ARC organizing a 10-meter FM rig project at the cost of about $30.00! Tri-City also planning Novice classes in Sept. and auction Oct. 29th. GNARC provided communications for the Royal Yacht Race on Sept. 25th. Group being made-up from SARC, SCARA, Zygo ARC, and Meriden ARC all provided support for the First Durham Fair Special Event Station on Sept. 23-25th. Known as "Central Connecticut Hams", the members have shown excellent cooperation between clubs. SARC also started Novice classes in Sept. CPN and Nutmeg Nets both have recently sent to the roster members excellent newsletters. The Traffic community continues to set representation records in the 1RN Nets. Waterbury ARC held the installation of officers during the Sept. meeting. Traffic: NM1K 526, N1EFW 287, WB1GXZ 268, N1DMV 237, K1EIC 185, KA1JAN 133, KA1GWE 86, W1WP 80, KY1F, KB1ZC 70, KA1FVY 66, KA1KP 32, W1YOL 24, N1FJW 20, KY1T 18, W1BDN 17, WA1NLD 17, N1BOW 15, WB2SGI 11, W1QV 9, K1CE 6.

EASTERN MASSACHUSETTS: SM/SEC, Barry Porter, KB1PA—STM: KW1U. PIO: K1HLZ. BM: KB1AF. OO/AA: AG1F. SGL: K3HI. TC: KA1IU. ACC: Open. EMass Hotline: 437-0111 Westlink: 449-2226.

NET MGR	FREQ	TIME (EDT)	DAY	SES	QTC	QNI
EMRI	N1AJJ	3658 1900/2200	DY			
EMRIPN	WA1FCD	3880 1730	DY	30	82	90
EM2MN	KA1MDM	63/23 2000	DY	31	158	453
NEEPN	K1BZD	3945 0830	SUN	5	3	44
HHTN	NG1A	04/84 2230	DY	5	3	44
EMRISS	N1CVE	3715 1800/2030	DY	36	19	54
CITN	KB1AF	745/045 1930	DY			

The FCC finally made its decision on the 220 MHz NPRM. It looks like now more than ever we Amateur Radio operators need to band together and fight to reverse the FCC's decision. Since it seems that the 6-month-late UPS comments completely overshadowed the overwhelming negative comments

on the NPRM, some in this area have suggested a local boycott of UPS services. Taking this action is an individual decision. What we can do is start a letter writing campaign (one more time, alas) to our Congressional Representatives and be sure to send copies to the FCC (and ARRL). Hopefully, our congressman will see this as one of a number of recent examples of the FCC's thwarting the public will. If the FCC continues to get thousands of letters on the 200 allocation it will make them take notice of the Amateur Radio Hobby's real clout. One of the reasons it took so long to make the decision was the sheer numbers of responses hams sent in. TIME TO DO THIS AGAIN AND SHOW THE FCC WE MEAN BUSINESS!!! If we can tie their staff up with a few thousand letters maybe they will listen to what we have to say. In the meantime the ARRL will be filing a petition for reconsideration and is considering other actions. Locally, not much is happening. The summer continues and most of the clubs are preparing for the first meetings of the fall, the upcoming NE Convention at Boxboro and the annual SET. If you are looking for programs, the EMass staff and I are available and will be glad to pay your club a visit. All you have to do is ask. October is computer learning month. Why doesn't your club plan a computer-oriented program? Maybe a joint meeting with a local computer user group and your club, with the program being computer use in ham radio. Computer groups are a large, untapped source of new hams of all ages. There is an Amateur Radio computer users group starting up in this area. Contact KB1PA for more details. Don't forget to publicize all your club activities. The more examples we have to show the public that our hobby is an essential community service, the less trouble we will likely have when tower ordinances and other problems (like the current one with the FCC) come up. It was nice to see all the traffic handlers at KW1U's picnic. WA1TBY used his connections and made the rain miss the cook out. Traffic handlers are amazing people. There are nets 365 days a year that meet at various times all over the US to ensure our messages get through. Thank you to all who give of their time so our hobby can thrive. Have you expressed your opinion on Amateur Radio issues to your section or division staff lately?? Please do! Traffic: KW1U 512, KN1K 365, KB1AF 318, WA1FCD 220, WA1TBY 191, K1GGS 171, W1TC 78, KA1MDM 57, N1CVE 55, WA1FNM 52, KA1NOI/T 36, N1EGN 33, KA1LIH 32, N1BNG 23, K1ABO 17, WA1CRE 10, KA1EDY 10, NK1L 8, K1LCQ 8, KA1RLT 8, KA1KCU 5.

MAINE: SM, Bill Mann, W1KX—WA2ERT has taken over as Manager for the Pine Tree Net, at least on a temporary basis. Thanks to ND1A for his service as manager for the past two years. Congrats to the Mid-Coast/Yankee clubs for a very successful Hamfest at the Union Fairgrounds, July 16. To curb interference problems, frequency shifting of several repeaters has been accomplished: Augusta 146.85, Bangor 146.805, Camden 146.82 and Wiscasset 146.985. W1RWG headed up communications for a Triathlon at Pennesseewassee Lake in Norway for the YMCA. Assisting were: KA1ADK, WB1HBJ, N1FCU, N1APN, WA1PCU, KA1REB, KA1RUC, N1CPF, KA1BRY and K1KQK. PEN BAY ARC is looking for volunteers for Operation Sky Warn on the 146.06 repeater. The Simulated Emergency Test in Maine will be held Oct. 27-28 in conjunction with other state disaster agencies. Silent Keys: W1BYK, KA1PFW and W1UIR. VE Exams: Oct. 8, Rockland, 8:30 AM (KX1I); Oct. 15, S. Portland (SMVTI), 9:00 AM (KD2EU); Oct. 27, Augusta (Cony HS), 6:30 PM (N1BCF). N1BCF keeps a list of all known upcoming VE exams.

NET	SESS	TFC	ON!	MGR
Aroostock Emerg Net	4	3	80	WA1YNZ
Central ME Emerg Net	9	4	157	N1EUK
Cumberland Co ARES	4	2	53	KA1ODT
Hancock Co Net	3	0	40	WA2ERT
Kennebec Co ARES/RACES	5	0	75	KA1LPW
ME Public Service Net	5	0	47	KA8UVQ
Pine Tree Net	31	71	261	ND1A
Sea Gull Net	28	92	773	K1GUP

Traffic: KA1JOJ 72, ND1A 68, W1KX 48, WA2ERT 36, AK1W 24, W1BMX 23, N1BJW 21, W1RWG 21, N1BCF 14, W1JTH 10, WA1YNZ 9, N1EZR 7.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—SGL: N1AIX. PIO: WA2MBQ. The summer heat continues without letup or change in this month. By contrast I found Amateur Radio in the NH section undergoing many changes in July. New club officers included: Interstate Repeater Society-Pres, KA1OU. VP, N1EQG. Record Sec, KH6GB. Corres Sec, W1FEW. Treas, KB1FS. For the Twin State RC-Pres, KA1OXS and new officers for GBRA include Pres, KC1KA. VP, N8AYZ. Sec, WB1ALO. Treasurer, WA1PEL. We had a major change in the Section staff in July with John, W1TN, retiring after many years as STM. John is really into retirement now, but we won't let him escape! I want to welcome Rich, KB4N, as the new STM for NH. Rich comes to the job with a wealth of traffic handling and emergency comm experience. Additional new appointees include Ted , W1ALE, as OES. I have created a new Asst Section Manager position with the appointment of Warren, WB1HBB, president of the NHARA state organization. This position is intended to further enhance the relationship between the Field organization and the state organization. Thanks to all for joining the Field Org. My own travels this month included the NARC meeting with W1WCR giving another excellent presentation on the Beverage antenna. Vic's expertise and ability to clearly explain how these antennas work makes his program an excellent one for club meetings. The Volunteer Examiners were busy in Salem with the Mt Moriah Repeater Soc. reporting that 21 of 38 applicants upgraded including 3 new Novices and 8 Tech upgrades. A report from K1ACL reveals that WB200CAG (GBARA) made 2054 contacts and W200WQM (PCARA) made 2083 contacts—both made WAS and worked much good DX! I attended the NE Div Director's cabinet meeting on Sat, July 17 in Boxborough, MA. This was an all-day session (9-4) to help Tom prepare for the ARRL Director's meeting the following week. We discussed many issues including Packet, Novice Enhancement, training, and the ARRL position on various FCC actions in process. I was able to relay many of your concerns and ideas directly to the Div Director during this session including a unique PR concept suggested by WB1GXM. Dot and I were invited to visit the Novice class in Derry by instructor Rich, NM1D. With us was Mark, KA1RTV, a new Novice who had just graduated from Dot's class. Mark was asked to talk about how he got interested in ham radio and talked about some of his contacts. Mark is 9 years old and this was his first try at "public speaking"—good job! The class had both young people and adults and by the time you

read this, most will be hams! Rich was assisted in the course by an excellent team including KA1OU and KX1T and othe area Hams. A severe storm moved through southern NH in July and the Western Rockingham Cty Emergency Net was actively involved, according to a report by EC N1FDJ. Liaison was established with NA1Q at the National Wx Service, with the GSFM net in Concord via NCPX and with WA1WOK at the Governor's Office of Emerg. Management in Concord. While flora (and maybe even fauna) flew in all directions, hams provided weather and damage reports for monitoring agencies and individuals in a professional manner. A note on repeater use—many people are listening to our repeater activities on scanners at all times. We reach many more people than those we hear in emergency or public-service activities. The public will judge us by our level of professionalism and the accuracy of the information provided. We are always on "public display" on repeaters and it can be a good method to let people know about club meetings, classes and other activities that might interest them in this great hobby. And don't forget that SET is here again—contact your local EC or DEC for information on how you can participate in this important test. Traffic: GSFM 136, GSPN 117, NHN 37, NHNTN 20, W1PEX 1390, WA1FHB/B 1088, K1TQY 381, N1CPX 244, KB4N 234, W1FYR 133, W1ALE 86, KA1GOZ 60, N1ALM 47, KK1E 46, NE1J 39, WB1HBB 34, KA1OU 23, KA1HPO 13, W1TN 12, KA1PFS 9, KA1OLK 7, KA1LBW 5, KA1KFX KA1JOU N1DQA 3. BPL: W1PEX, WA1FHB/B. PSHR: N1CPX, W1PEX, KA1HPO.

RHODE ISLAND: SM, William M. Foss, KA1JXH—WRONE lunch-in meeting is November 5 at the Ramada Inn in Portsmouth. Hosted by KA1DNB and KA1JKV. All YLs are invited. EMRI picnic was held July 31 in Concord, MA. Forty plus people attended. ARASNE worked the county hunters on July 29 from Haines Memorial Park. OSARG provided communications for the save bay on August 7. NCRC holds its business meeting the 2nd Monday of the month, 6:30 PM at the Newport Electric Co. on the corners of Turner Road and E. Main Road in Middletown. BVARA holds its meetings the last Monday of the month at the Red Cross in Woonsocket. NPRA holds its meetings Thursday at the E. Smithfield Community Center at 7 PM. KA1KML wants to thank all tfc handlers. Traffic: W1EOF 246, KA1JXH 239, PSHR 80, KA1KML 212 PSHR 62. WA1CRY 39.

VERMONT: SM, Peter G. Drexel, AE1T—SEC: W1KRV. STM: KT1Q. PIO: WA1YOY. TC: W1AIM. The BARC mid-summer hamfest is over for another year. I hope that everyone had a great time. Hamfest credit and compliments go to NB1A, the chief organizer this year, N1DLE and her OM, WA1VXW. Also involved were W1DQO, N1CPP, K1CSB, WA1OZE and a host of others. At the hamfest, K1RR won the CW receiving contest at 45 wpm. WA2SPL took the consolation prize. KA1QZD won Novice CW test at 15 wpm. KA1RZF was youngest ham in attendance. WB2MIC was awarded the 73 Amateur Radio Magazine Achievement Award for Education. Congratulations to Jozef! WA1JVV is a new A1 operator; well-deserved, Tom. The Border ARC officers for 1988 are: KA1PXZ (Pres.), WB1DSD (VP), W1ZNM (Sec-Tres.). The following supported Shelburne triathlon: WB1FWR, KG1H, KG1P, WA1UVW, WA2PNZ, W1EXZ. Late Field Day results: The CVARC group made 700+ QSOs worth over 2100 points. It sounds like a good time was had by all 18 operators. There has been additional work on repeaters this past month. The W1KOO 01/61 machine will receive a new controller. WA1DPA 147.045 logic board has been refurbished by N1AGY and WA1ONT. WA1ZMS arranged to build a replacement repeater for 145.39 (Mt. Equinox) while in process of moving into a new job in Burlington. N1BKK, N1BRT and KA1ODL getting ready to install new 2-meter machine in the Cabot area. Letters were sent by your SM to both Vermont Senators and our congressman requesting their support of the Senate and House Concurrent Resolutions. Senator Stafford replied in a personal letter and indicated that he will support the Senate version. See your local packet BBS for news concerning the proposed admendment regarding 220 MHz. WA1DPX is a Silent Key. 73, Ray. . .June meeting of VPRO was held in Montpelier, not at KA1NZA QTH. Pardon my error. GMWS is in the process of setting up a station at their new meeting location, the Red Cross building on Rt. 7. K2DDE has been heard on packet of late. W3SRO is using his new tribander. Thanks to a few of the GMWS folks. N1VT even dropped by to help. Recent upgrades: Extra: K1JKJ, N7IKM. Tech: KA1KHC. New calls: N1FWG, KA1RYZ, KA1SHY. Good work, folks. Your section is in need of a few good volunteers. The following section appointments are open and waiting for your interest to fill them. Public Information Assistant: Someone who is involved with local news media to spread the good word about Amateur Radio. Affiliated Club Coordinator: Section goodwill ambassador to ARRL Affiliated Clubs. Bulletin Manager: Information organizer—ARRL and Section level data. Please express your interest to the SM. New England ARRL Convention is upcoming on Oct. 1-2. I hope to see you there. Your section is lucky to have a corps of stations who are an integral part of the NTS. Vermont had 97% participation on 1RN/2 and 1RN/3. Four stations attained PSHR. WA2SPL and KT1Q achieved BPL. NTS node: 2983 messages. June traffic: WA2SPL 1057, KT1Q 549, WA1JVV 143, KC1KI 81, N1DHT 77, AE1T 58, NB1A 36, W3QQ/1 29, WA1VXW 20. Nets: VTN 31/147/158. W1KOO SEN 4/58/0. CVFMN 5/97/6. TSFMN 41/3. TSEN 4/58/6. GMN 26/403/27. VPN 5/84/10. Carrier 26/601/47.

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/RFI: N1CM. PIO/ACC: K1BE. SEC/SGL: WB1HIH. TC: KA1JJM. STM: W1KK. I want to congratulate Jean, KA1IFC, for her dedication to traffic handling. Jean has been the recipient of consecutive BPL certificates for the past eleven months. Do you realize the amount of operating that entails? Again, congratulations and keep up the good work. You certainly are a credit to the section. On July 4th, the WMEN, under the direction of Dick, WB1HIH, and Chris, KA1QFO, ran a weather net. National Weather Stations at Worcester, Bradley Field, and Albany were observing the operation. Representatives of TV station WWLP monitored also. With 218 stations checking into the net and each generating tactical weather reports, I am sure they all were impressed. Thanks to all that participated. A job well done. Traffic: KA1IFC 621, W1UD 161, WB1HIH 43, KA1EXJ 41, KB1TH 17, WA1YYK 40, W1SJV 31, KA1QFV 55, NM1V 30, W1ZPB 7, W1KK 54, KC1DI 22, WA1OUZ 29, KA1OFC 17.

NORTHWESTERN DIVISION

ALASKA: SM, Dianne Marshall, AL7FG—SEC: KL7AF. DEC Interior: NL7HI. DEC Interior: KL7JBV. DEC Kokiak: KL7JBV. STM: KL7VY. OBS Kodiak: NL7IY. A good effort by KL7AF, NL7NF, K7JUT, NL7ML, KL7GID and others who volunteered their time and energy standing by the forest fire emergency near Livengood July 20. Denali park now has a repeater 146.16/76 call is KL7KC DENALI sponsored by the Arctic ARC, thanks. A GREAT turn out for the Motely picnic about 70 hams plus their families. KL7HHO won the bunny hunt, so he's the bunny next year. Thanks to KL7GG, Master of ceremonies, the great cooks who brought the pot luck, KL7GID for the MOTELY mugs. And the KL7JKW, KL7GG, KL7IZZ Motely Group band. Marge, KL7VY, and Bill, NL7AY did a wonderful job escorting the world's longest wheel chair race to a successful conclusion. Thanks, Fred, KL7RO for letting Marge go.

IDAHO: SM, Don Clower, KA7T—STM: W7GHT. OOC: WB7CYO. ACC: N7BI. Dan Marler, K7REX has had to resign as SEC for Idaho. Dan has been SEC for two years and done an outstanding job. He has spent countless hours planning and organizing Idaho's ARES program. He has attended many meetings with the state emergency group and has done much to improve the image of amateurs in Idaho. Dan will be greatly missed. Many thanks to Dan for a FB job! We now need an SEC to take his place. Dan said he would help get the new SEC started. If you are interested please call me. The "200" call stations in Idaho made about 2500 contacts during the week of July 8th. Good job to all who helped! 73, Don

MONTANA: SM, Ken Kopp, K0PP—LYARS (Glendive) August newsletter has FB band allocation by license class info sheets—easiest to read I've seen. Copies via biz SASE to K0PP. AARC (Anaconda) FD trophy pix'd in August QST. Glacier/Waterton hamfest had 340+ with FVARC (Kalispell) hosting. GHRC (Bozeman) and GFAARC (Great Falls) had displays at fairs. GHRC's digi (W7YB-1) has site tech data on line. They had new Emerg trailer as float in local parade. QCWA Chapter 104 elected new officers: W7OTJ/P, W7QYA/VP, W7BC/S-T. W7LR and W7GP provided vital comm for week-long diabetic camp. W7JMX joined W1AW's upgrade KW Club. KA7JTN to Adv in July. W7JCU is SK.

NET	SESS	QNI	QTC	MGR
IMN	31	274	63	KA7EEE
MSN	5	34	0	K0PP
MTN	31	1348	102	KF7R

Traffic: W7TGU 1124 (PSHR), WB7WVD 50 (PSHR).

OREGON: SM, Randy Stimson, KZ7T—ASM: KM7R. STM: W7VSE. SEC: W7FBP. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. RFI: AK7T. OO: WN7W. STC: N7ENI. I just heard a story from the fires that raged in Southern Oregon last summer. The little town of Tiller lost their telephone service and the back up system for six hours during the Bland Mountain fire. Bob Benafel, NB7J, went to the phone company and offered his help which they gladly accepted. During the outage he handled traffic from the Post Office which was sent to Ed, W7KIC, in Days Creek and one emergency message to Ted, KA7AID, in Roseberg. Great work fellows. That is what ham radio is all about. We worked one of the longer public service events in the Portland area this month. It is a 150-mile bike tour to raise money for research to find a cure for Multiple Sclerosis and is called the MS150. The two-day event with 500 bicycles had many minor emergencies. The worst emergency was a woman fell from her bike and broke her shoulder which required an ambulance. We brought up 911 on the autopatch and handled the problem. A bit about packet, for the month of July the BBS of K7IFG handled 846 messages 87 NTS traffic had 74 users and system connect time was 78 hours 45 minutes. Traffic (P) = Packet. W7VSE 458, N7BGW 219, WG7H 170, N7ELF 137, KA7EEE 129, W7LRB 103, K7IFG 87P, KA7SYG 78, WB7SZM 53P, WB7EMO 52, N7CPA 46P, WJ7E 46, KV7F 39, KZ7T 39P, KA7AID 36, N7APC 31, Shriners Hospital 21, W7ODG 21, W7LNE 20, WB7VSN 18, KD7YJ 17. June traffic: N7ELF 93, WJ7E 53, N7APC 35, Shriners Hospital 30, KD7YJ 9P, N7IXS 5.

WASHINGTON: SM, Brad Wells, KR7L—STM: KD7ME. SEC: KA7INX. TC: W7BUN. OOC: N7DVR. SGL: KD7AC. BM: N7CAK. PIO: N7FKV. ACC/ASM: KC7PH. ASM: KD7G. ASM: KA7CSP. ASM: W7UOF. ASM: K7CLL. The big news is that the 220 MHz fight has been resolved by the FCC. The Federal Communications Commission has ruled in favor of commercial interests that have asked for the lower 2 MHz of our band. At some time in the near future, the frequencies from 220-222 MHz will be allocated to the Land Mobile Service. The Commission felt that, while amateurs had been very vocal and outspoken in their defense, the public interest would be better served if this band of frequencies were given to another radio service. However, as a part of this action, the FCC declared that frequencies from 222-225 MHz would be allocated exclusively to the Amateur Radio Service. It is expected that this change will take place within the next 12 to 18 months. At the time of this writing, the League was planning to file a Petition For Reconsideration. The current band plan for 220 MHz will have to be revised. Now is the time to contact ARRL Director Rush Drake, W7RM or Vice-Director Bill Shrader, W7QMU with your ideas on future spectrum management for this band. It should be noted that W7QMU is the Board Liaison for the VHF-UHF Repeater Advisory Committee. Another group that would like to hear your comments and suggestions on future 220 MHz band planning is the Western Washington Amateur Relay Association, 8515 Idlewood Drive SW, Tacoma, 98498. There will be increasing demands in the future by those commercial interests who want more frequency allocations for their services. Since we control large chunks of spectrum above 50 MHz, we must maintain a continued vigilance or lose parts of our other VHF-UHF bands. Congratulations to a new King County EC: KA7UFE. W1PRT has been appointed as an Official Relay Station. ARES members in King, Pierce, Thurston, and Yakima counties provided communications during an exercise which used a satellite to accurately measure the height of Mount Rainier. ARES also provided needed communications for those fighting forest fires at a number of locations across the State. Several repeater groups in the Section have expressed an interest in forming Local Interference Committees. If your group is interested in participating, contact our Official Observer Coordinator: Dan Rooks, N7DVR; POB 566, Kingston, 98346. The new WARTS Net Manager is W7GB. Many thanks to the outgoing manager, W7IGC, who did a fine job for this net. Y-T-D traffic net statistics:

NET	QNI	QTC	SESSIONS	FREQ	TIME
EWTN	472	411	259	146.64	5:30/9:30 pm
NTN	7693	799	213	3970	12:00 noon
NWSSB	3562	218	213	3945	6:30 pm
PSTS	809	375	391	146.92	5:30/10:30 pm
WARTS	21278	1334	213	3970	6:00 pm
WSN	3997	1105	416	3590	6:45/9:45 pm

Two other traffic nets which would benefit from your participation are WCN—3702 KHz @7:00 pm (Mgr: WG7H) and THN—3995 KHz @ 10:20 pm (Mgr: N6EQZ). O.A.R.S. will be operating N2ØØHOE, Nov. 5-11 with emphasis on HF phone operation. KR7L has proposed to DXAC that ARRL create a new DX award: Five Band Honor Roll. Don't forget the CQWW DX contest this month. Thanks to a much increased solar flux, the next six months should be one of the best contest seasons within the past five years. PUBLIC SERVICE HOURS: Asotin 1; Benton 237; Franklin 200; King 906; Pierce 381; Thurston 124; District One 288. Traffic: K7AJT 19, WA7CBN 14, K7CLL 18, N7DIP 9, KE7EO 92, N6EQZ 99, KF7FF 15, W7GB 95, N7GGJ 99, K7GXZ 171, W7IEU 15, W7IGC 235, W7LBK 54, W7LG 53, WA7PMD 28, W1PRT 12, K7SUX 64, KA7TTY 16, K7UQH 32, WB7WOW 254, WA7YEN 34, WA7PIN, KD7G, KD7ME, KR7L. PSHR: N6EQZ, W7LBK, KD7ME, WB7WOW.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. SEC: W6LKE. STM: K6APW. OOC: NY6Z. TC: N6AMG. The CCCC welcomes new members KB6YQJ. They have adopted 146.550 as their official simplex freq. EBARC set up a special events station at the Oakland Airport Hilton to provide communications to Australia for a banquet commemorating the first trans-pacific air flight by a joint Australian/American air crew. A message from Prime Minister R. J. L. Hawke was received from AX4BBS on their packet BBS, W6CUS-1. MDARC congratulates KI6YK and XYL, Lillian, on their 40th wedding anniversary. Concord, Walnut Creek and Pleasant Hill are where 125 of their 278 members live. LARK's new officers are: KF6VU/Pres, N6QPL/VP, WD6J/Sec and Treas, WX6G/Activities Chairman, K2BIO and K6USH/Directors. Their FD score went up 62.5% due to secret weapons like a helium balloon-supported 360 ft longwire! HRC qualified for the WAA (worked all ants) award during FDI Newly affiliated VVRC (Vaca Valley Radio Club) welcomes new members WA6YVS, K4JZE, KA4PGY, N6NIC and WA6LKP. Their FD set-up had no TVI, but was plagued by WSI—water sprinkler interference. Host WX6M's electric sprinklers went on and off with the syllabic rate of the 75 meter station! Traffic: WB6DOB 134, W6VOM 80, K6APW 59, K6TI 5.

NEVADA: SM, Joe Lambert, W8IXD—ASM: K7HRW. Hope everyone enjoyed the Reno Hamfest. Curly, K7HRW, is looking for a new Net Control for the Nevada Weather Net. If interested, contact K7HRW. Thanks to Dave, KA7EUA, for his conducting the Nevada Weather Net over the last few years. Jim, NW7O, is making several grid square strips through Northern Nevada, Alaska and Hawaii on various bands, 6-meters through 10 GC. FARS is setting up a special event staion in a Las Vegas Mall October 21-23 signing NW200O. If you can help, contact NW7O. WADG is planning a new repeater for Genoa peak at 9,125 ft. with excellent coverage. SIERA has its new repeater up on 147.270. SNARS has supported and is supporting more (too many events to list); also, SNARS has a new digipeater up on 147.05 with a new antenna. Most of the radio clubs in Nevada are now planning Christmas parties. Please try to get in on the action. Many Nevada Hams are working to overturn the FCC ruling on 220 MHz. If this is still going on when you read this, please help in this effort. Please send your inputs for this column to arrive by the 1st of the month.

PACIFIC: SM, Wayne Jones, NH6GJ—Hello to all from the land of Aloha. KL7IVQ/KH6 has accepted the position of STM. KH6H will be ASM, Maui, and AH6J is the new ASM for the island of Hawaii. KH6IJ has agreed to stay on as the PIO, AH6GR will remain the OOC. I will remain SEC, at least for the present. I still have positions open, and will be filling them soon, I hope. The ASM on each island will be a focal point for ARRL matters, but I still have an "open door" policy and will attempt to solve any problems presented. Feel free to call. Public Service: Guam amateurs WH2AEN, KH2CC and W1YRM provided support to the "Cocos Challenge" swim sponsored by the Red Cross. Congrats to KL7IVQ/KH6 for making the Public Service Honor Roll for July. Traffic: KH6S 59, KL7IVQ 46, KH6GMP 20, KH6H 12. Aloha from all of us to all of you!

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—Hams accompanied news media groups out into wildlife areas and provided base stations at the base camp of the major fire in Calaveras county. Not to provide communications for the news teams—they had plenty of their own but to keep the California Department of Forestry (CDF) informed as to the location and SAFETY of the news team. Special mention must be made of Lloyd, W6AJJ and Fred, KB6CGD who spent three days there and of Wayne, WB6EQX who had the hair on his head and arm singed when a small firestorm passed over him and then had air-dropped retardant dumped on him and his vehicle. Also of Bea, N6QHZ, a hardy soul who backpacks in the high Sierra alone, but was terrified when a manzanita bush "exploded" about 10 feet from her. Others participating in a less dramatic way were Howard, KG6EV; Joe, K6YIK; Charles, N6HCH, and Tim, KF6GY (32 hours at fire camp). Marj, N6JTJ rounded up ham participants including Shirley, KB6YSI and Charles, KB6YVB who got their Novice licenses only weeks ago and upgraded to Technician only days before going to the fire camp to help—as this is written they are still signing "interim KT". As a result of going out with a Channel 3 team, I appeared on several TV news broadcasts expressing my feelings on what should be done with arsonists. There were many offers of help from out of the immediate area but fortunately the fire was contained before they were needed. Loren, WD6BZQ was called out and had a ringside seat at a Lake Columbine fire just under CDF HQ in Auburn. Am pleased to report that Public Information Officer position has been filled by Bob McClard, WA6OWH for southern counties.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U. STM: N6AWH. TC: WA6EXV. ACC: W6DPD. Asst SMs: W6TRP, K6YK. Appointments renewed: OBS: N6MXG. SEC: WC6U. New Appointment: OO: WA6YLB.

(continued on page 134)

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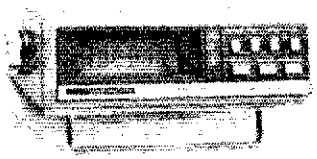

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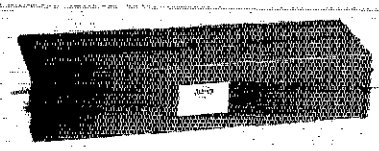
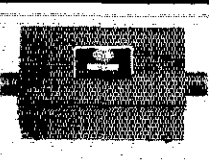


RL10/1500
RL6/1500



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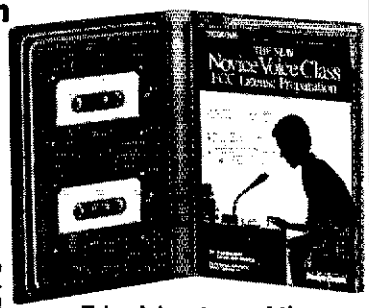

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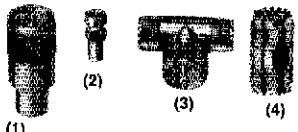

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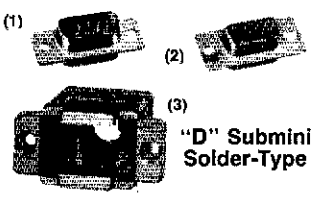

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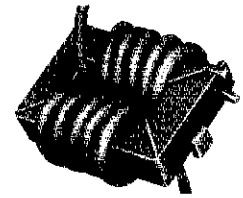

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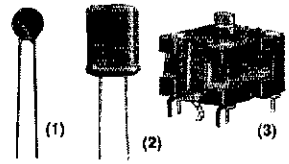

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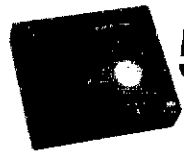

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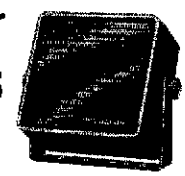

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A DIVISION OF TANDY CORPORATION

Emergency Coordinators are still needed in Maders, Mariposa, Mono, and Calaveras Counties. Contact W6DPD or WC6U for information and applications. Check with your EC about plans for the upcoming SET. WA6APF, W6ZZC, and W6QFR are SILENT KEYS. K6YK has 165 countries and 2200 counties worked from the mobile. N6SPF is Tech. N6RTU is KJ6IE. WA6UOR is RACES officer for Region V of the State Office of Emergency Services. The ARRL Pacific Division Convention is October 14-16, 1988 in San Jose.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: WA6OCV. TC: WA6PWW. STM: N6JLJ. PIO: WB6OML. ASM: N6JQJ. ACC: W6MKM. BM: (vacant) OOC: (vacant) JULY—First, a reminder. There is a telephone number that has information on Amateur Radio license classes. Well . . . it only has the info that I put on it, and I can only put on it what I know about. PLEASE, let me know about any classes your group or club is sponsoring so that I may include them on the recording. My phone number is on page 8 of this issue of *QST* and is (408) 263-9450. Jim, KA6YRK was busy running the CDF VIP Holiday Fire Watch organized for the weekend of the 4th of July . . . also over the 4th of July weekend 90 + of you participated in the Moffett Field Airshow. Well done to all concerned . . . The ARES group has had its hands full this month with two earthquakes and two fires, Alamaden (20 hams) and Uvas (70 hams), in addition to the assorted tennis tournaments and bicycle rides . . . thanks to all of you who participated and also to those of you who just listened when you had nothing to report . . . Both the Silicon Valley Emergency Communications System (SVECS) and the Southern Peninsula Emergency Communications System (SPECS) had their quarterly breakfasts this month. SVECS heard a talk on hazardous material spills in the home after an earthquake and SPECS saw a videotape the subject of which I've forgotten (it WAS interesting!). The Milpitas ARES/RACES repeater, KA6S/R (224.72,100Hz pl), will soon have the long awaited 2-meter remote. This homebrew job was designed and built by KA6S himself and assembled with the help of Mike N6PFK . . . There was an ARES/RACES meeting in Gilroy on July 26th at 1930 hrs at the Gilroy EOC. Jerry Harvey from Gilroy Communications was the Guest Speaker . . . The Gilroy ARES/RACES bus is still having the cabinetry installed. The radios that were ordered have come in and are awaiting installation after the cabinets are put in. The local repeater in Gilroy has been set up with emergency speed dials for Gilroy, Morgan Hill and the county for emergency services. Cyn, W6PHT, reports that she is back on the air "full strength." She has a new beam up for 2 meters, an HF "tribander" that includes 40 meters, and a new PK232. She says, "Boy, packet operation sure has changed after one year..." OO reports: KB6FPW, WN6I. Phone numbers: Amateur Radio Classes (408) 971-1424. License Exams (408) 984-8353 (ARRL VEC) or (408) 255-9000 (Sunnyvale VEC).

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—ASM: AB4S. SEC: N4MYB. STM: K4NLK. BM: K4IWW. ACC: WC4T. TC: K4ITL. SGL: KE4ML. PIO: AB4FW. The Net Managers for NC Traffic Nets are listed below in the quarterly traffic report. New Managers have a most important role in our section's activities. A big THANKS to all of them for the fine job they do. Traffic nets are critical to the public service and emergency communications role of Amateur Radio; as has been said before, these nets are the formal training ground of ALL emergency operators. Extensive training sessions are planned for all NTS nets in September; hope we get lots of new net participants as a result. [BT] The Simulated Emergency Test (SET), one of the most important ARES and NTS activities of the year, is scheduled for October. Details will be available from your ECs and Net Managers. Packet radio has been involved in previous SETs and is expected to have an expanded role this year. The NC section scored well in the SET two years ago, 4th in NTS and 5th in ARES activities—not quite as well last year. Lets ALL support our SEC, STM, Net Managers, DECs and ECs in this year's SET effort. Contact your EC, encourage him and let him know he has your support. [BT] SEC N4MYB advises that the Brunswick Nuclear Plant exercise is scheduled for October 18. [BT] Maysville Hamfest is scheduled for October 9. [BT] Additional Field Day traffic received, but not reported last month: Franklin ARC, Alamance Co. ARC and AB4FY. [BT] Quarterly traffic report, Apr-Jun 88:

NET	QNI	QTC	TPC	QND	SES	NET MGR
NCEN	1528	372	303	1424	91	WB4WII
NCMN	1310	360	330	1310	91	WD4MRD
CN	1735	703	670	3593	182	K4IIW
CSN	649	132	121	1854	91	AA4MP
CNCTN	2335	801	157	1276	91	WA4MNR
PCTN	1032	337	228	1085	91	AB4EO
RARS	1037	81	70	1854	91	K4ABJ
M2MEN	1660	97	89	1223	92	KF4MZ
CFARS	1397	74	74	1550	91	W4EHF
PETN	846	93	85	824	75	WB4HRR
THEN	958	88	75	701	91	N4LUO
TOTALS	14,487	2,558	2,200	16,484	1,067	

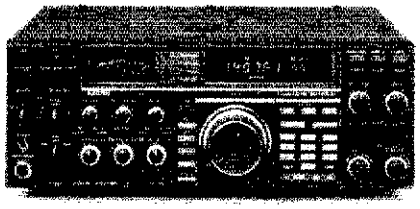
Traffic: K4NLK 403, AA4TE 310, WD4HTE 146, AA4ZV 127, N9CGD 123, K4IWW 99, KA4EYF 90, WD4RMQ 88, KA4OJN 82, KI4YV 75, WB4WII 69, N4JRE 66, AB4EO 49, WA4MNR 38, WD4MRD 34, W4EHF 31, N4UE 20, AJ5F 14, W4LWZ 13, WB4TOP 12, N4CJJ 11, AB4W 10, WA2EDN 8, WB4UOU 8, NT4K 7, N4TCH 3, WA5DJJ 1.

VIRGINIA: SM, Mark Witt, NN4I—BM: AB4U. SGL: W4UMC. PIO: AA4VP. TC: WX4C. STM: KB4WT. SEC: N4EXQ. ACC: NT4S. OOC: W4HU.

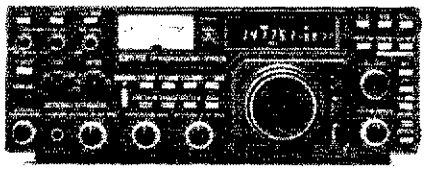
NET	TIME	FREQ	MGR
VTN	1 PM	3907	KB4NGO
VSBN	6 PM	3947	KI4BR
VSN	6:30 PM	3680	N4KSO
VN (EARLY)	7 PM	3680	N4HGI
VN (LATE)	10 PM	3680	WB4KSG
VLN	10:15 PM	3947	W4JLS
SVEN	7:15 PM	146.82	NT4S
STARES	9 PM	146.97	KJ4VT
DEC/ED	9:45 (3rd Wed)	3910	KA4NWK

Director Gay Milius will not seek re-election as Division Director for the 1989-90 term. Vice-Director John Kanode, N4MM, and former Section Manager Claude Feigley, W3ATQ, have both been nominated for the position. It is important that each of us consider the qualifications of these two men who have both long worked hard and loyally for Amateur Radio. Your vote will make a difference in the future of Amateur Radio. The Berryville hamfest in August saw many section appointees in at-

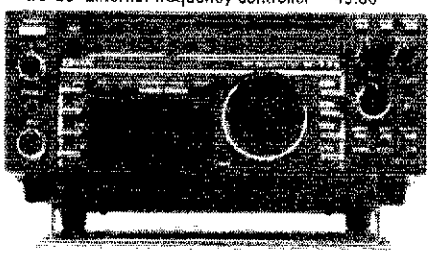
HF Equipment	Regular	SALE
IC-781 Xcvr/Rcvr/ps/tuner/scope	5995.00	Call



IC-761 Xcvr/Rcvr/ps/tuner	2699.00	2369
HM-36 Scanning hand microphone	47.00	
SP-20 Ext. speaker w/audio filter	149.00	139.95
FL-101 250 Hz 1st IF CW filter	73.50	
FL-53A 250 Hz 2nd IF CW filter	115.00	109.95
FL-102 6 kHz AM filter	59.00	
EX-310 Voice synthesizer	59.00	



IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	1469
PS-35 Internal power supply	219.00	199.95
FL-32A 500 Hz CW filter (1st IF)	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)	115.00	109.95
FL-33 AM filter	49.00	
FL-70 2.8 kHz wide SSB filter	59.00	
RC-10 External frequency controller	49.00	



IC-735 HF transceiver/SW rcvr/mic	1099.00	959.95
PS-55 External power supply	219.00	199.95
AT-150 Automatic antenna tuner	445.00	369.95
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	349.00	319.95
MB Mobile mount, 735/751A/761A	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal for 751A	79.00	
PP-1 Speaker/patch	179.00	164.95
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	139.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip	659.00	589.95
AH-2A Antenna tuner system, only	519.00	449.95
GC-5 World clock	91.95	79.95

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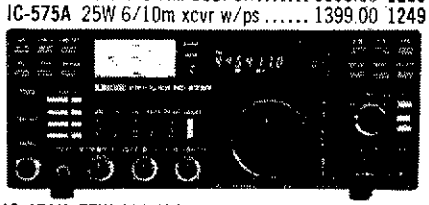
VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1299.00	1149
IC-275H 100W 2m FM/SSB/CW	1399.00	1229
IC-375A 25W 220 FM/SSB/CW	1399.00	1099
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1099
IC-475H 75W 440 FM/SSB/CW	1599.00	1289
IC-575A 25W 6/10m xcvr w/ps	1399.00	1249



IC-471H 75W 430-450 ..... Closeout	1399.00	989.95
PS-35 Internal power supply	219.00	199.95
AG-35 Mast mounted preamp	99.95	
AG-35 (Purchased with IC-471H)	99.95	9.95
SM-6 Desk microphone	47.95	
EX-310 Voice synthesizer	59.00	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	34.00	
UT-15S UT-15S w/TS-32 installed	96.00	

VHF/UHF/1.2 GHz Mobiles	Regular	SALE
IC-37A 25w 220 FM/TTP mic Closeout	499.00	349.95
IC-47A 25w 440 FM/TTP mic Closeout	549.00	399.95
PS-45 Compact 8A power supply	145.00	134.95
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28H 45W 2m FM, TTP mic	499.00	439.95
IC-38A 25W 220 FM, regular mic	459.00	349.95
IC-38A 25W 220 FM, TTP mic	489.00	389.95
IC-48A 25W 440-450 FM, regular mic	459.00	369.95
IC-48A 25W 440-450 FM, TTP mic	509.00	449.95
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-228A 25W 2m FM/TTP scan mic	509.00	449.95
IC-228H 45W 2m FM/TTP scan mic	539.00	479.95
UT-40 Pocket beep function	45.00	
IC-900A Transceiver controller	639.00	569.95
UX-19A 10m 10W band unit	299.00	269.95
UX-29A 2m 25W band unit	299.00	269.95
UX-29H 2m 45W band unit	349.00	319.95
UX-39A 220MHz 25W band unit	349.00	289.95
UX-49A 440MHz 25W band unit	349.00	319.95
UX-59A 6m 10W unit	349.00	319.95
UX-129A 1.2GHz 10W band unit	549.00	499.95
IC-1200A 10W 1.2GHz FM Mobile	699.00	549.95
IC-3200A 25W 2m/440 FM w/TTP	695.00	529.95
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	39.00	
AHB-32 Trunk-lip mount	35.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1529.00	1349
RP-2210 220MHz 25W repeater	1649.00	1469
RP-3010 440MHz 10W FM repeater	1299.00	1149

Due to the size of the ICOM product line, some accessory items are not listed. If you have a question, please call. All prices shown are subject to change without notice.

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Hand-helds	Regular	SALE
IC-2A 2-meters	289.00	259.95
IC-2AT with ITP	319.00	279.95
IC-3AT 220 MHz, TTP	349.00	299.95
IC-4AT 440 MHz, TTP	349.00	299.95
IC-02AT/High Power	409.00	349.95
IC-03AT for 220 MHz	449.00	349.95
IC-04AT for 440 MHz	449.00	389.95
IC-u2AT for 2m w/TTP	329.00	289.95
IC-u4AT 440 MHz, TTP	369.00	299.95
IC-2GAT for 2m, TTP	429.00	379.95
IC-4GAT 440MHz, TTP	449.00	399.95
IC-32AT 2m/440MHz	629.00	559.95

IC-u2A for 2m w/o TTP
Reg. $299 - **Closeout $249.95**

Aircraft band handhelds	Regular	SALE
IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	473.00	369.95
A-2 5W PEP synth. aircraft HT	525.00	479.95
A-20 Synth. aircraft HT w/VOR	625.00	569.95

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	79.00
BP-8 800mah/8.4V Nicad Pak - use BC-35	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8	21.25
LC-11 Vinyl case for DIx using BP-3	20.50
LC-14 Vinyl case for DIx using BP-7/8	20.50
LC-02AT Leather case for DIx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CA-5 5/8-wave telescoping 2m antenna	19.95
CP-1 Cig. lighter plug/cord for BP3 or DIx	13.65
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	24.50
MB-16D Mobile mtg. bkt for all HTs	25.99
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	35.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	24.50
HS-10SA Vox unit for HS-10 & Deluxe only	24.50
HS-10SB PTT unit for HS-10	24.50
SS-32SMP Commspec 32-tone encoder	27.95

For other HT Accessories not listed please CALL

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	$999.00	869.95
RC-11 Infrared remote controller	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker	65.00	
CK-70 (EX-299) 12V DC option	12.99	
MB-12 Mobile mount	25.99	
R-7000 25MHz to 2GHz scan rcvr	1199.00	1049
RC-12 Infrared remote controller	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit	139.00	129.95
AH-7000 Radiating antenna	99.00	(14)

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tendance. We were privileged to have Luck Hurder, KY1T, former SM now at ARRL headquarters in attendance as well as visitors from WV and MD. There are now 1136 ARES members in the section. Newest appointees are George McCulloch, WA3WIP, EC of Page County; Ken Wieringo, N4LYO, Official Observer Station in the Roanoke Valley; Jan Samoriski, N4QYW, EC Radford City and Montgomery County. Public Information Assistant Dave French, N4KET, who is CNN weekend anchor, was responsible for the TV coverage of an 89-year-old Amateur on national TV. To check your CW character speed with a keyer, count the number of DAHS for five seconds—that is your speed in WPM. Please remember to renew your ARRL membership early. It avoids unnecessary correspondence for the Leadership Staff and HQ. Expired memberships necessitate dropping your section appointment. Traffic: K4DOR 502, N4GHI 426, AA4AT 251, W4JLS 196, N4EXQ 182, W3ATQ 156, WB4PNY 154, WD4FTK 109, K4MTX 109, KB4WT 91, WD4MIS 88, AA4GL 81, WB4KSG 73, WB4ZNB 64, KI4BR 61, KB4NGO 58, N6ANQ 45, K4JM 43, N4KSO 41, W4TZC 39, KJ4VT 37, K4BGZ 34, KB4OPR 29, KK4FV 27, KI4W 19, K4AXF 18, K4GR 17, W4HU 16, K4MLC 13, WB4ZTR 13, N4SMB 12, W4HDW 11, KB4UED 10, WA4CCK 8, N4FNT 6, K4VWK 5, WA4TVS 5, WB4KIT 4, WA1VRFL 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. ACC: WA8CTO. SGL: K8BS. TC: K8LG. Rpt Coord. WB8GDY. New location for Ripley H.F. on Aug 13 was nice. Except for heat, everyone seemed to have a nice time. I am still battling my RFI problem with neighbor's VCR. W8LOU is new EC for Tyler Co. K8WYH is now WD8L. KB8ABZ is now KE8SX.

NET	FREQ	TIME	QNI	QTC	SESS	NM
WVFN	3865	6:00	834	110	31	WD8DHC
WVN	3567	7:00	239	82	31	KZ8Q
WVMD	7255	11:45A	887	57	31	WD8V
WVRN	3840	6:30	186	34	31	K8LG
WVNN	3730	7:30	123	28	31	WD8V
Hillbilly	14290	Noon Su	141	6	5	W8YP

Traffic: KA8WNO 297, W8YP 212, WD8V 187, K8TPF 164, KZ8Q 159, W8FZP 103, KE8FI 83, K8QEW 79, KD8WX 56, WD8DHC 55, KA8ZXP 51, N8FXH 46, K8KT 33, NC8G 4.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—ASM: KA0MQA. SEC: WB0TUB. STM: KB0Z. ACC: WB0DUV. OOC: KA0CDN. W0IJR. SGL: WB0FQB. PIO: N0DZA. TC: W0LJF. This past month has seen Amateur Radio play a big part in emergency situations. A CAP Search and Rescue plane went down in the Kenosha Pass area. The plane's antennas were damaged, but fortunately the pilot, KY0E, had his HT and was able to access 147.225/885 CRA repeater and get help to get off the mountain. The Rky Mtn Region has seen numerous forest fires this summer. One such fire was averted by the quick action of KC0QD & his two children, who happened on the fire on Piney Ridge located in Eagle & Grand Counties. He alerted the Grand County EC, N0GBJ on the Sares link 147.075/675, and while he and his children along with the help of a logger contained the fire, N0GBJ alerted the proper authorities and kept in constant communications with KC0QD. After 4 hrs on the mtn, the Forest Service made it there with several gallons of water. They commend KC0QD for averting what could have been a major forest fire. Congrats to KC0QD & N0GBJ for a job well done. Look for the Western Slope Swap to be the first weekend in Oct in Grand Junction. For info contact N0EVG. 73, KQ0J. NETS: Col: QNI 967. QTC 53-95, QTC 2950, 29 sess. CWN QNI 45, QTC 32, QNF 294, 25 sess. HNN: QNI 1871 QTC 138-664, QTC: 1477, 31 Sess. NCTN: QNI 187, QTC 55, QNF 231, 31 sess. SCTN: QNI 327, QTC 60, QNF 336. Traffic: N0HFZ 456, K0HOA 292, KE0WC 112, KB0Z 98, WB0FFV 67, K0INI 30, KE0GI 5.

NEW MEXICO. SM: Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO, KA5NNG, W5QNR. TC: W8GY. ACC: KA5BEM. Southwest Net meets daily, 3583 @ 0230 UTC, handled 101 msgs with 169 checkins. NM Roadrunner Net meets daily 3939 @ 0100 UTC, handled 73 msgs with 1090 checkins. NM Breakfast Club meets daily, 3939 @ 6:30 AM, handled 189 msgs with 933 checkins. Yucca 2-mtr net, 78/18 handled 9 msgs with 327 check-ins. Caravan Club 2-mtr Net, 66/06 with 140 check-ins. SCAT Net, 66/06 handled 6 msgs with 383 checkins. Info Net 12/72, with 67 checkins. Sunday Noon Packet Net, ZIA LINK, 36 check ins. Flagstaff was certainly a pleasant outing. Good to see all the New Mexicans and the many others there including Dave Sumner, K1ZZ, Fried and Sandy, WA6WZO & WA6WZN, Jim Swafford, W7FF, and many many others. Tfx; W5DAD 136.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. NV7V reports that Utah Co area hams will now have monthly VE exams. The Governor attended an emergency exercise/demo in Provo that included ARES packet demonstrations. The State of Utah ARC now has packet mobile and at the State EOC, with the call of WA7AKI. UCN has started having monthly breakfast meetings on the first Sat. of each month. 73 de NA7G. Traffic: N7JLC 84, WA7MEL 67, WA7KHE 56, N7IUN 52, NS7K 29, NA7G 23, W7OCX 13.

WYOMING: SM, Jim Raisler, N7GVV—July was a busy month with the Wyoming Hamfest which was attended by over 200 hams, great job by the University ARC. Five clubs operated 200-call stations and for those who send an SASE to the club they operated a good-looking QSL will be forwarded. For a bit of trivia, the latest FCC data base indicates there are 855 licensed hams in the state and 310 are ARRL members. Eighteen months ago there were 1034 licensed hams in the state. It appears the rapid decline in the state's economy had an effect on our ranks. Traffic: NN7H 168. The balance of the traffic and net reports will be added to next month's report, as this was prepared early as I was heading out of town on holiday.

SOUTHEASTERN DIVISION

ALABAMA: SM, James Spann, WO4W. ASM: W4XI. SEC: KB4GDN. STM: N4RT. ACC: AA4BL. PIO: KB4KCH. SGL: N4FRQ. OOC: KF4VS. TC: N4QII. BM: KA4ZXL. Fall in Alabama means football, cooler weather, and increasing Amateur Radio activity. Net managers are reporting more QNI figures on our section and local nets. You are especially invited to check into our CW nets, AENB (7 PM nightly on 3575 kHz) and AEND (5:30 PM nightly on 3725 kHz). Our section is saddened by the death of Howard Davis, K4GXS, of Holt. New Calhoun Co. ARA officers are N4DRZ, Pres., N4QLG, V.P., and N4HXK, Sec. Montgomery ARC has been busy working public service events, including the George Lindsey Golf Tournament. A new digipeater is going up at the Centreville radar station thanks to the Bibb Co. ARC. The Mobile ARC provided communications for a 20-mile night march by the Army's cadet corps. SEC KB4GDN wants you in ARES! Sign up today find out more from your EC or DEC. We are working on a plan to link our nine ARES districts using FM repeaters. Just one of many exciting projects going on now—why not consider an ARRL station appointment and get involved?

NET	FREQ	SES	QNI	QTC	MGR
ATNM	3965	35	3010	101	WO4E
AENB	3575	62	319	144	W4QAT

PSHR: WA4JDH, W4PIM. BPL: WA4JDH. Traffic: WA4JDH 606, W4PIM 198, W4DGH 10, WO4W 10, WB4TVY 2, W4ZJY 2.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM, ACC: WA4ABY. SEC: NC4E. STM: WB4WQL. Asst STM: (PACKET) W4QO. BM: WB4ZOJ. OOC: W4TG. PIO: WB4DEB. SGL: WB4UVW. TC: WD4PAH. Once again TNX to all you FB hams for the great things you are doing. It is absolutely an honor to be a SM of such a wonderful section. Atlanta ARC has gotten involved with the Kittredge Magnet School in Dekalb County installing a complete station and is fully operational for the 1988-89 school year. Students in grades 4-6 may join the club. 32 are in classes with six already licensed. To all that are involved TNX. The HAMS who were involved with providing communications, drivers for VVIP's and lots of other jobs during the DEMOCRATIC NATIONAL CONVENTION all said they had a ball. In fact our GA SGL, WB4UVW was talking to Senators and members of Congress regarding pending bills. Good things just go on and on. I'm hoping that by now all of you have talked to your State Legislators about the "TAG ISSUE" which will be brought up during the forthcoming session. If you haven't please do, we have had lots of real good publicity this summer so now's your chance. SILENT KEYS during July are: Jeannie, K4RHU of Columbus and Col. Fred J. Elser, KH6CZ of the Augusta area. Our sympathies to their loved ones and may God have mercy on them. PSHR honorees for July are: WD4COL, WB4DVZ, W4RWB, WB4WQL, KF4FG, KA4HHE, KB4JPN, and W4HON. Net managers for the section nets are: GSN: WD4COL, ARES: KA4HHE, GA Net: WA4IQU, GSSB Net: KF4FG, GCN: W4HON AND QCWA: K4VN. How about taking time and checking in once in awhile. Section is loaded with HAMFESTS in Oct—Rome on the 2nd, Warner Robins on the 8th and 9th, Augusta on the 22nd and 23rd then Lawrenceville on the 5th & 6th of Nov. Support these, they support yours. I have the skeds for license exams in the section, you can also call my ASM, Sandy, WA4ABY for information in case you need to take one. And last but not least, the KNOT was tied between two wonderful people. On July 16th Sharon Kroll, N4MAQ became Mrs Neil Foster, KC4MJ. The best of a happy life to both of you from all in the GEORGIA Section. God Bless.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—ACC: WD4RIQ. ASM: KB4LB. OCC: AB6I. TC: W0RAO. STM: AA4HT. BM: N4GMU. SGL: KC4N. SEC: WD4PUP. PIO: WD4PUO. FMTN has N4UF as its NM! Many thanks to Billy for accepting this important post. He will be helped by N4ADI as Asst NM and W4NFK as the Asst Mgr for D4RN Liaison. We are all sorry to hear that Clyde N4PL is very ill but that he does like to receive cards. The NFL Section has a fine group of Traffic Handlers, and it's been some time since we have listed the BPL's in that group! Three stations have made BPL for six months this year 1988, WX4H, WA4QXT and WD4IIO. N4PL made it in Feb and March. K4CY is in the running too, and we are considering how to count Packet messages. He and others are getting some traffic count because of their efforts in forwarding and re-addressing messages that are stalled in the system. The NTS/Packet meeting at JAX was a very good forum and we'll plan to do it again in April at the Orlando Hamcation. TNX to all who spoke and commented, we all learned a lot that will help keep NTS messages moving on the Packet Networks. Traffic: K4CY 418, WA4QXT 317, KB4LB 303, WD4IIO 303, N4SS 284, AA4HT 234, WC4D 165, KB9LT 153, WA4EYU 116, N4GMU 116, W7YWF 88, N4JAQ 83, WD4IUI 78, KC4FL 72, WB3AVZ 64, KB4FIY 47, N2AOX 46, N4JHI 46, W4UEA 45, N4ADI 44, KI4CQ 43, N4DY 40, KA4KAH 39, W4KIX 34, AA4QC 31, NL7GV 29, NF4O 25, AA4FG 25, WB4TZR 23, W4DTV 23, KI4NN 20, N4QYS 16, WA4SXW 16, KJ4HS 15, WA4PUP 15, WB4FJY 14, W8IM 7, KV4HI 5, W4AT 5, N4OZD 4. (Jun.) WB4FJY 9.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: N4PBF. SGL: KC4N. OOC: W4TAH. ACC: K4EUK. It is a pleasure to welcome Richard Vahan, N4PBF as our new Public Information Officer. He will relieve W4WYR, who is our very busy Vice Director for the Division. Many thanks, Evelyn. W4TAH continues his outstanding job coordinating Official Observer/Amateur Auxiliary operations with the FCC. WD4KBW reports 45 bulletins received and 46 sent by AA4BN 17, WA4EIC 24, WT4F 13, K4IEK 22, and WD4KBW 15. On the ARRL Information net W4TAH expressed his appreciation and thanks to W4IYT and Florida Skip for providing copies of Florida Skip to each of the FCC offices in Florida. This will give the FCC the latest and most complete information available for testing in Florida. KA4SIH announced via a QNC the arrival of a third harmonic, a great-grandson. Willard also has two great-granddaughters. The South Florida F.M. Association, Inc reports that a new set of Bylaws was presented at the June meeting and that a full discussion of them will be held at the July meeting. The Fort Myers Modulator had Leroy, WD4CHO speak on "The Fun of Packet Radio" at their July meeting. The Sarasota ARS received a plaque for Florida Child's Wish Come True, Inc. in appreciation for their gift of a computer to the organization. The Sarasota Hamfest, Inc. is very pleased with the requests for table reservations for their hamfest to be held February 18-19, 1989. Bulletins also received included Brandon ARS Slant/Bars, Broward ARC, Tampa Bay ARS QSP, and The South Brevard ARC Spark. A recent QNC reports that N4UF will become manager of the Florida Midday Traffic Net effective August 1. He was section manager for the Northern Florida Section for several years before retiring from that position. Congrats Billy! The same QNC reported N4ADI as assistant net manager and W4NFK as assistant manager for D4RN liaison. W4NFK is assisting N4PL who is extremely ill. N4ORZ has been unanimously re-elected as the Dade Emergency Net Manager with N4RMB

(continued on page 140)

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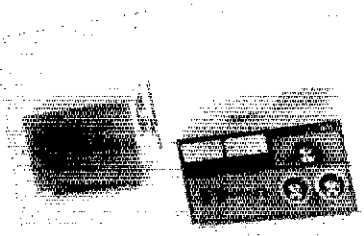

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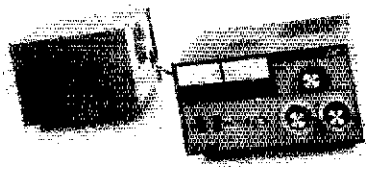

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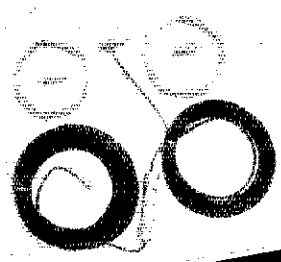

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and W2JTT as assistant managers. N4ORZ will also serve as assistant EC to W4IYT, EC of Dade County. Remember the ARRL Information Net on 3940 each Saturday at 8 AM. Traffic: W3CUL 2905, W3VR 788, WA9VND 341, WA4PFK 316, KA4FZI 188, K4ZK 175, N4HAP 173, K4SCL 146, WA4RUE 130, K4IA 117, W3TLV 114, WB4WYG 107, WD4KBW 105, N4KFU 103, KD4GR 101, AA4BN 92, KA4YHS 87, N4MML 86, K4EUK 83, K4FQU 79, N4ET 72, WD4CHO 67, WA4EIC 67, KY4U 55, N4ORZ 51, KB4MON 50, KJ4WJ 45, KF4RL 42, WV5Z 37, AB4BC 35, WB4GCK 32, KB4FO 31, K4JI 28, KY8Y 25, N4HAS 24, KA4NXF 23, WA4VWJ 23, N4OIA 22, KA4SIH 22, WD4NXK 19, N4QER 18, KB4LPL 18, N4FLG 16, W3IJR 16, KA9AKY 16, WA4LGT 15, WT4F 15, KA4AJR 13, W4DWN 10, N2COI 10, KB4YBS 9, KB4UHC 8, NX5Q 7, N0ABC 7, AA4IF 7, K9ALX 7, W4MPV 6, K4GVI 6, KA0GYF 5, KA4GDU 5, KI4ZW 4, W4MFD 4, AA4CH 3, W4NSY 3, N4PFQ 1, N4PSV 1.

WEST INDIES: SM, Jose A. Purcell Jr. KP4IG—STM: WP4FMH, PIO: NP4XM. SGL: WP4CSG. TC: KP4ARY. NM-WINS: KP4DJ, NM-W1NE: VP2VI. NM-WINC: KP4LP. The League recently announced the division of USVI and PR as separate sections. From now on the WEST INDIES will become PUERTO RICO Section and the respective nets will adopt the PR code: WINS is now PRN in CW on 3710 kHz Daily at 2300 UTC, WINE will change his name to the designated by the USVI section and WINC's new name will be announced later. Also a new CW novice net was opened in 7125 kHz every Sunday at 1430 UTC and the name will be PRNN. Congrats to the USVI group for their independence. The PR Government approved the issue of car license plates with amateur call signs. More details in the next article. 73.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NM's: K7POF, K6LL, WB7CAG. My attempt to list the AZ Section NTS in the August column somehow got badly garbled. Therefore I'll try again using different format. The AZ Cactus HF Net meets daily on 3915 kHz at 1800 hours MST. SWN meets daily on 3583 kHz at 1930 hours MST. AZ Tfc and Emergency Net, (ATEN) meets daily on 3992 kHz at 1930 hours MST. Cactus VHF Net meets daily on 145.37 MHz at 1830 MST. The Ft. Tuthill hamfest was the biggest ever! Crowd estimated at over 4,000 with hams from Texas, New Mexico, Utah, Nevada, California, Belgium, New Zealand, Colorado represented. We sold more ARRL memberships and publications than ever before. Notables present were K1ZZ from ARRL HQ, SW Division Director, WA6WZO, and XYL WA6WZN and ON4UN who gave a talk on Low Band DXing. Lots of fellowship, picnics, trading of "junque". VE testing hit a new high with over one hundred applicants. More later on the box score of success rate. Condolences to Jim, KE7WD on the recent untimely loss of XYL, Dorthy. Also a recent Silent Key is Richard Gillen, W3JOS of Phoenix. He made many contributions to the communications art including working with Dr. Edwin Armstrong during the development of the FM system of broadcasting. (tnx, Ray K7OMR.) Word is out that the new OSCAR satellite, AO-13 is up and running on Modes B, J and L. Technical details of transponder in the June issue of QST. Congratulations to Bernie, W0YOY and Karen, WA0NNC on their being selected "Hams of the Year" at Ft. Tuthill hamfest. They certainly deserved the award for all their contributions to ham radio in the AZ Section. Also, congratulations to ARCA for again hosting a FB hamfest. The OPRC will sponsor a one-day swapmeet in Tucson on Oct. 16. Location is the drive-in theater at 22nd and Alvernon. The annual Superstition Swapmeet will be held again in December. Details later. Your SM visited the Kachina ARC in Taylor in July, and the Navajo ARC in Holbrook in Aug. Both clubs are ARRL affiliated and are doing good work in emergency services. Plan to visit the Arizona ARC in Phoenix during their November meeting. In closing I want to sincerely thank the Coconino ARC of Flagstaff for their great help and support during the hamfest. They do good work! 73, Jim.

NET	QNI	QTC	SESS
SWN	169	101	31
ACN (HF)	235	49	31
ACN (VHF)	334	37	31
ATEN	898	114	31

Traffic: W7AMM 169, W7EP 156, WE7G 91, W7KCM 86, N7ETP 30, W7OIF 29, K7POF 27, K7VVC 26, W7GAQ 26, K7JKM 23. (June) WE7G 75, K6LL 31

LOS ANGELES: SM, Phineas J. Icenbice, Jr., W6BF—Many of the original "SYNCOM" team assembled for the 25th anniversary in July this year to celebrate the first Synchronous Orbiting Satellite employed for communications. The team included many notable hams such as K6QBC, Meridith; W6LHN, Tom; K6KR, Frank; WA6LOD, John and WB6JOI, Paul. The RADIO MUSEUM FOUNDATION on the W6AM/OLD PRESS WIRELESS site (on Palos Verdes Peninsula) is alive. They are actively seeking your support to build a museum with 30 K square feet of floor space. Docent support for Museum operation is identified and committed. Please contact one of the following Foundation Directors for more information: K5KT Joe Locascia (213)541-6235, K6SVL John Alexander (213)377-3807 or WA6LML Dick Mills (213)357-2758. HAMCON 89 yes 89 is off and running under the direction of Joe Cira, KB6AXK and the Los Angeles Area Council of Amateur Radio Clubs. Meetings are being held once each month. Call Joe Cira and send your club check for seed money to establish a position on the team of Clubs that are sponsoring this Los Angeles Convention. We have more than 30 clubs in Los Angeles County and this is your convention so get your feet wet and try out your ideas. This should be the GREATER LOS ANGELES CONVENTION—with your ideas and help it will be the greatest.—Hams in Torrance should be aware of the new disaster plan for their area. Please contact Mike Semos N6DBS, Dick Perkins W6ATT, Henry Schmidling WA6RJA or Chuck Lobb KN6H (213)325-3164, if you can help with this project. Membership in ARES or RACES is desirable but not required. The real requirement is a genuine interest in serving your community and neighbors in a time of serious need and projecting a positive image of Amateur Radio, to the public. According to the Spring 1988 WIND PIPELINE—every organization is made of four kinds of BONES: WISHBONES, they spend their time wishing that someone else would do the work, JAWBONES: they do all talking but very little work, KNUCKLE BONES: they knock everything and BACKBONES: they stand up and carry the load and get things accomplished!!!!! It has been reported that many of our aerospace corporations have active emergency communications teams that check in on 147.555 MHz

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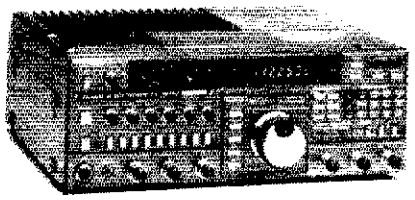

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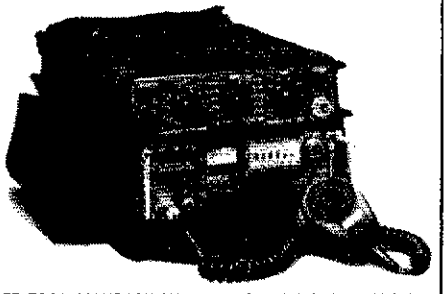

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YA-70* Tripod antenna	269.95
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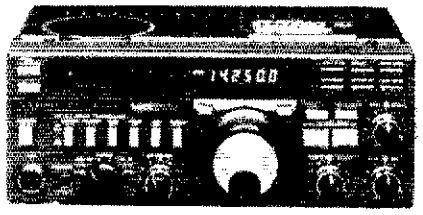

FT-757GX MkII 9-band Xcvr/SW Rcvr/mic	$1129.95
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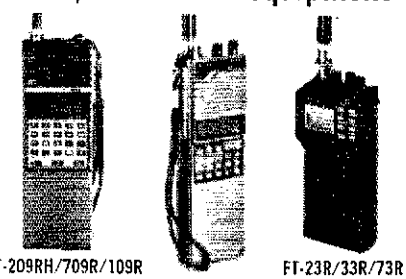

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every Thursday at 11:50 AM. WD6CZH is the call sign used from XEROX. HUGHES, TRW and AEROSPACE emergency groups are also active on their own nets and check into the XEROX Net.—According to N6HUQ, G.N. Hittinger of the Hughes Aircraft Co. HESEA A.R.C. the following HIGHWAY PATROL telephone numbers are released to radio amateur organizations and are only to be used by RADIO AMATEURS to report freeway accidents AND other serious problems. Los Angeles general area (213)756-3369, Orange County general area (714)547-8318. We have been able to keep things going this month with vacations and heat. We are doing fine. Thanks, KI6A, for your help on SCN and filling in vacant spots. W6TH has been a big help while K6UYK has been away. Traffic: K6UYK 377, W6INH 204, W6TH 129, N7CZF 101, KI6A 51, W6NKE 11.

SAN DIEGO: SM, Arthur R. Smith, W6INI—PIO: N6PKY. TC: N6JZE. STM: N6GW. SEC: W6INI. WD6CSS has retired after 10 yrs as ARES EC for So Dist of SD County. Tnx for an outstanding job. Steve Danon, N6PKY, 460-7485, has been appt PIO for the Section. Pls contact him for all public information matters. Clubs are encouraged to nominate Pub Info Assts to coordinate a Section Pub Info program. WF6L has been apptd EC for Tri- City Dist. which embraces the north-coastal area of San Diego County. Red Cross and American Legion in San Diego County will be tied together on 224.9(-), WD6HFR, for coordination in disasters. The 220 SMA quarterly meeting will be hosted by the 220 Club on Oct 8, 0900, at the Serra Mesa RecCen, 9020 Village Glen. Support of this organization is vital to all. Ham Radio swap meet on first Sat each month at Santee Drive-in Theater. So Dist ARES has RTTY net on 145.71 each Tues at 1900. Amateur Radio lost a good friend with the passing of W6BLK. Spearheaded by NE Dist EC, K7DCG, and the Poway ARS, hams provided an extensive emergency medical system for the Aug. 20/21 Blue Angels air show. NCTN 30 sessions, QNI 446, QTC 125. ARES CW 5 sessions, QNI 10. Traffic: KB6PCF 80, N6GW 74, KI6ZM 69, KI6ZH 55, N6RVO 46.

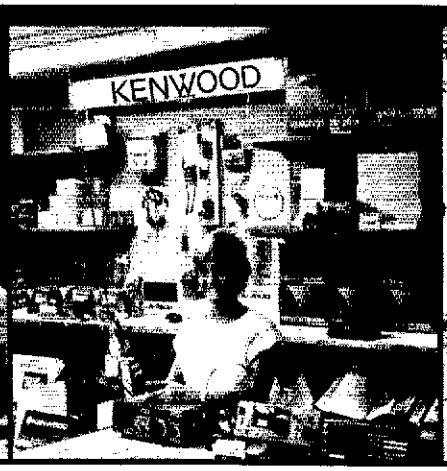
SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—ASM/Ventura: N6MA. ASM/Sbar: WB6BYU. ACC: KB5AH. BM: KI6XG. STM: N6WP. OOC: W8AKF. PIO: N6FOU. TC: W6KFV. SEC: WB6IIY. DEC/Ventura: WB6RVA. DEC/So. Sbar: KA6KGF. DEC/No. Sbar: KI6XG. DEC/SLO: WB6IIY. July has been a quiet month, with many away on vacation or enjoying other summertime activities. We've been expecting a rough fire season, and so far we haven't been disappointed. While Los Angeles TV stations ballyhooed a little 20-acre brush fire in their county, we lost over 3800 acres in the Los Padres National Forest in San Luis Obispo County. On this occasion, ARES support was not called in, but ARES is ready if the need arises. (Only three years ago ARES was instrumental in saving Ojai and San Luis Obispo from destruction by the Wheeler Ridge and Los Positas fires.) The results of the Field Day Trophy competition are in, with four clubs submitting entries. (We hope that next year will see at least eight submissions!) The first trophy winner is the Conejo Valley ARC, operating as K6CAB, whose 15-meter CW and 40-meter phone stations (plus allowed bonuses) scored an outstanding 8115 points. This performance is all the more remarkable for the fact that their entry class was "15A." Runners up were W6LKF-Paso Robles ARC (6108), W6AB-Satellite ARC (6002) and K6TZ-Santa Barbara ARC (4644). The Novice/Technician Station plaque goes to N6JOE, the Paso Robles ARC N/T station, who scored 554 points for 213 QSOs (64 cw/149 ssb) beating KA6EPF (Santa Barbara ARC-418 points) and KB6KZL (Satellite ARC-232 points). Congratulations to all on their fine efforts and especially to the winners for their superlative performance. 73 for now.

WEST GULF DIVISION

OKLAHOMA: SM, Bill Goswick, K5WG—ACC: Ernie Buck, WB5CDW. OOC: W. Goswick, K5WG. SEC: Bennett Basore, W5ZTN. SGL: Larry Hazelwood, W5NZS. STM: Sam Sitton, KV5X. TC: Ken Isbell, W5QMJ. The first ever Oklahoma QSO Party will be held 1200Z 12 November to 1200Z 13 November 1988. The event is being cosponsored by the South Canadian ARS and the Edmond ARS; see the August issue of *Collector* and *Emitter*, or contact KD5IT (SCARS) or N6CL/5 (EARS) for details. Congratulations to Joe Lynch, N6CL on being elected the Section Manager for the Oklahoma Section. Joe will take office effective 1 October 1988. Please give Joe your assistance and support as he takes over the SM's duties. The Tulsa Amateur Radio Club is now meeting on the second Tuesday of each month at the Mabee Red Shield Boy's Club, 1231 North Harvard, Tulsa. A club station is now in operation and many activities are being planned now that the club has a permanent home. Tnx, Jim Clifford, KB5AST, Club President. Traffic: KF5RD 123, K5GBN 93, WA5OUV 82, N5IKN 64, W5RB 59, WB5OHK 54, WA5ZOO 42, KV5X 28, W5VLW 19, W5VOR 17, N5FEM 15, NQ5Y 4, W5JJ 2.

WEST TEXAS: SM, A. Milly Wise, W5OVH—ASM: KA5PTG, ASM: AI5S. ASM: WD5EFJ. ASM: WF5E. ASM: N5DO. SEC: W5MVJ. PIO: KE5ZW. ACC: K5IS. OOC: K5KNC. TC: K5CU. STM: AE5I. ASM Glen KA5PTG reports the ARES/RACES group demonstrated the Amateur Radio emergency capabilities at the state RACES convention in Amarillo. Amateurs participating were KA5RSR, WZ5C, N5DWN and KA5PTG.—San Angelo ARC has acquired a new generator and trailer to be used with the SAARC emergency van. FD chairman K5JEZ advised during FD the SAARC incorporated five towers and used a wind generator (natural power) at Lake Fisher.—The W5ES (EPARC) summer radio class graduated six new novices. The fall radio class started Sept 10—ASM Raford, WD5EFJ advises Big Spring ARC has moved their repeater due to an unfriendly tower owner purchased an ACC RC-850 controller with all the bells and whistles.—The Lubbock ARC radio class recently graduated Charles KB5GMQ, Yale KB5GUF, Donna KB5GZQ, Betty KB5GZO and Scott and Ricky.—Snyder ARC spent Field Day at the clubhouse and used a bucket truck to mount the antenna on.—Lubbock ARC, ARES/RACES officers, and representatives of the city of Lubbock hope to have the emergency agreements worked out soon.—The top of texas ARC spent FD in Oklahoma.—West Texas ARC in Odessa went to UT Permian Basin Duck Pond.—El Paso ARC went to their usual FD site in Cloudcroft N.M.—San Angelo, Abilene and Sweetwater hams helped find an airplane along with the cap in which four people were killed. Need a Bulletin Manager for West Texas Section. 73, Milly. Traffic: N5KUC 17, KE5VH 4, 7290 Net,

Rob, WA3QLS



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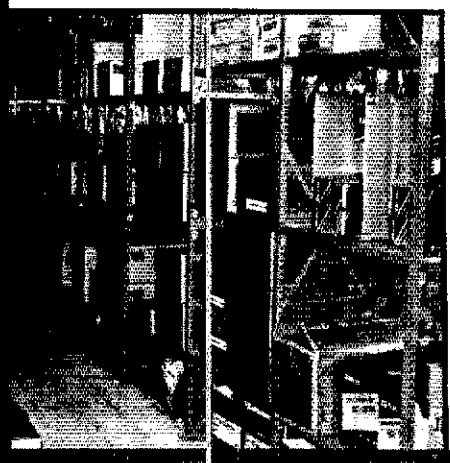

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SOUTH TEXAS: SM, Art Ross, W5KR—ORS KA5UVY attended 3-day honors colloquim at Univ. of Texas, Austin. PIO WA5UZB reports KB5AWM and OOC WA2VJL appointed as PIAs. PIA KG5HQ reports ECHO Society, Houston, held successful exam session; KA5WJB, KF5NU, KB5GEU upgraded to Extra; KB5GYN went to General; KB5GGE and 2 unlicensed went to Technician; 1 unlicensed passed Novice exam; THATS GREAT!. The 147.32 machine had 390 phone patches in June of which 20 were Public Service actions. OBS W5KLV reports 7 ARRL bulletins, 4 propagation forecasts given 31 readings on 7 nets in July. CAND Acting NM WB5YDD reports 448 messages in 31 July sessions; RN5 represented 100%; STX stations helping were KE5ZV, KD5KQ, W5KLV, WB5EPA, WB5FQU, NX5V and WB5YDD. San Benito ARC will have Texas State QSO party in December; OOC WA2VJL has details. PIA NZ5J, Seguin, reports KA5ZKC upgraded to Technician (CONGRATULATIONS!); W5FGG and spouse WA5UFL hosted several maintenance parties to refurbish WR5X/R tower; helper guests were 1 unlicensed grandson, WA5WZX, K5TJA, K5KXW, N5KEI, WD5IQR, NZ5J, and WR5X; WD5IQR has new 50-ft tower with tribander at the top; KY9V, CTTN NM, spent July visiting Ireland. 7290 traffic Net secy KB5DVF reports 349 messages in 47 July sessions; 3,003 QNI; NTS liaison 2 per session; NM KA5AZK. PIA N5FIX, NW ARS, Houston, reports oldest Ham WA4FGH age 88, honored with a big party; notes big increase in NARS satellite activity. Bexar Wire, San Antonio ARC bulletin, rprts KB5GJN and KB5GJO as the two newest Hams there; WY5L/KH3 still going strong on Johnston Island. RN5 NM WB5YDD rprts 534 messages in 62 July sessions; STX represented 100% by KD5KQ, W5KLV, WB5HZQ, KE5ZV, WB5EPA, WB5FQU and WB5YDD. PIA/OOC WA2VJL rprts excellent help from local Hams in helping police during the recovery of the derailed tank car in San Benito; help was needed to keep the area clear of curious because of danger if tank were to rupture; those helping were WA5DYV, KA5UVY, K5LAE, KD5IU, KA5WCQ, W5LOH, N5LNS, KA5RTV, KE5ZV, K5PXJ, N5GNK, W9IVM, N5HIT, W5KR, KB5FTV, WA5WNW, WB5CRK, N5LRD, N5KEV, W5DYV, KD5GY; the WD5KBZ/R machine worked great.

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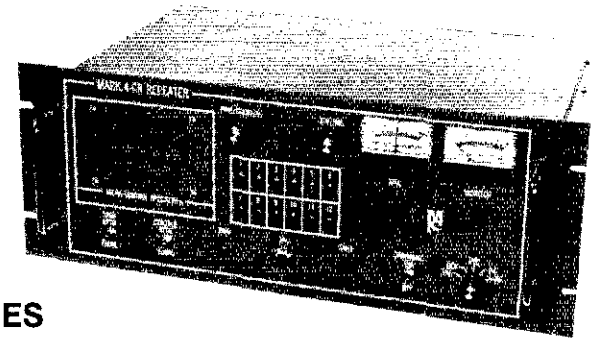

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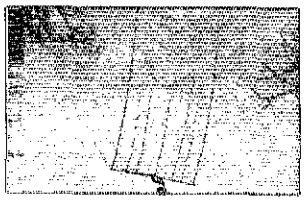

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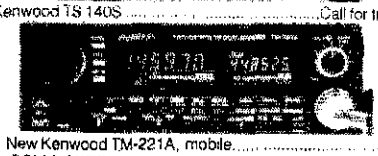

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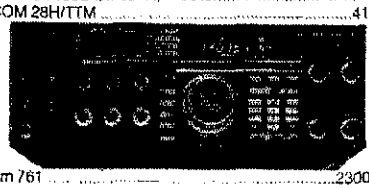

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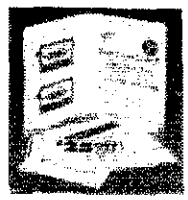

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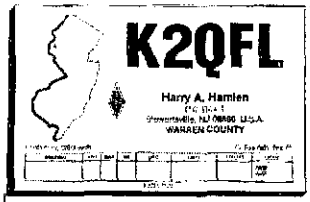

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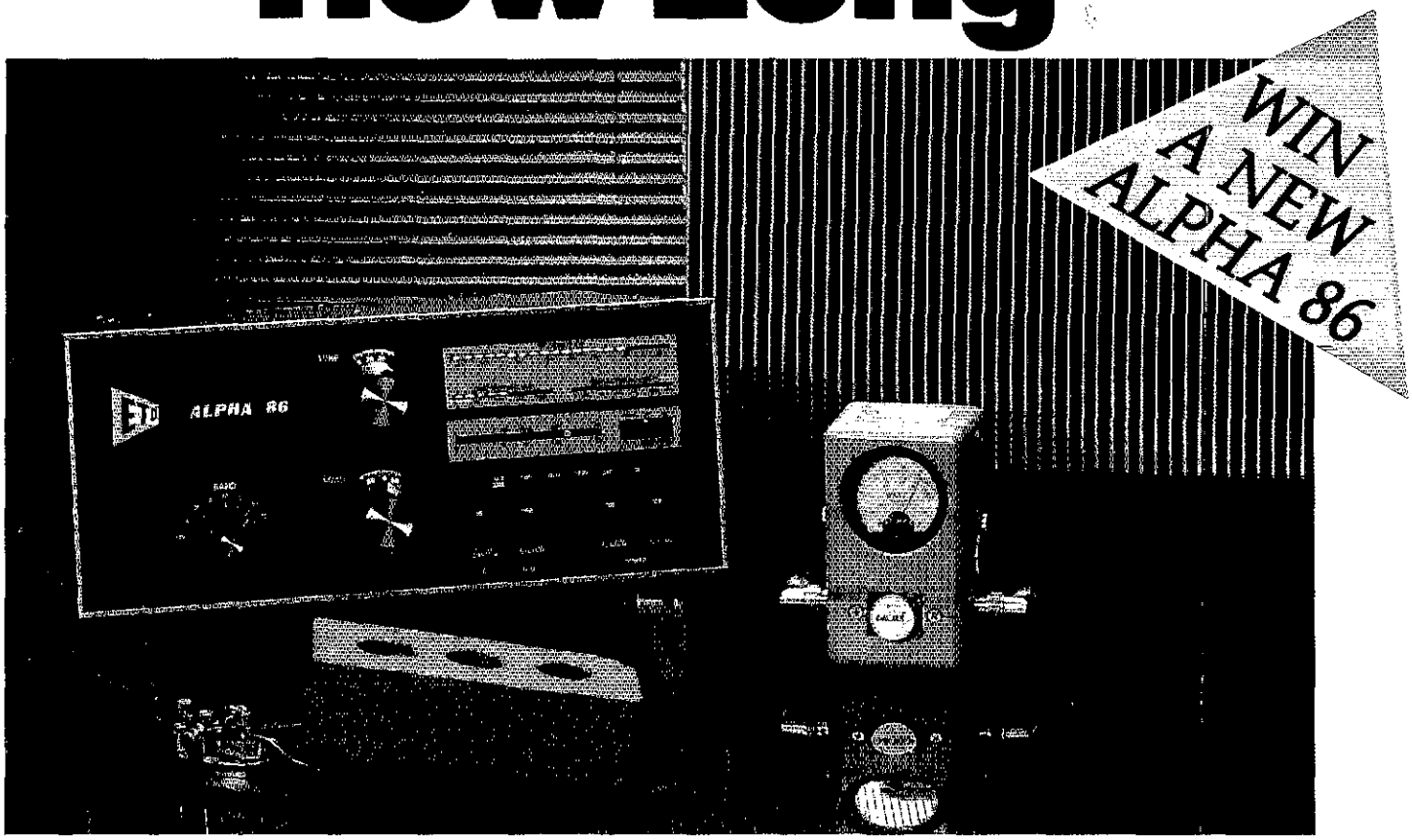

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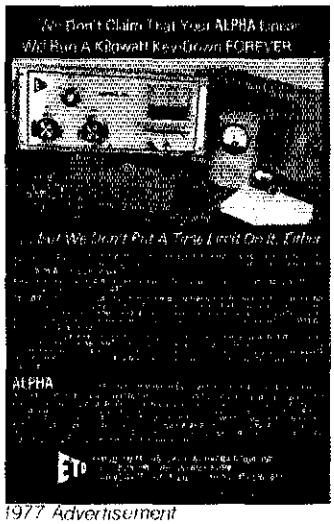
YOU'LL PROBABLY NEVER SET A BRICK ON YOUR KEY FOR 26,000 MINUTES, AS WE DID WITH AN *ALPHA 76* ELEVEN YEARS AGO.



1977 Advertisement

We did it to dramatize how ETO's unequivocal ***no-time-limit*** ratings set ***ALPHA's*** apart from other linears (including those that ***claim*** continuous duty of a sort, with time limits, and some that just aren't too clear about it). The *'76* ran maximum legal FCC power—which then was 1000 watts average D-C input, yielding about 675 watts RF output—continuously for 18 plus days.

SAME BRICK, 122% MORE POWER

ETO's new ***ALPHA 86*** *delivers maximum legal power, too. But today that means 1500 watts RF output. There's still no time limit. You get 122% more "brick on the key" power!*

YOU MAY WIN A NEW *ALPHA 86*

How long will we leave the brick on the key this time? Mail a post card or QSL to Ray Heaton with (a) the name of this magazine, (b) your guess in hours, minutes, and seconds as to how long we'll run the ***ALPHA 86*** continuously at 1.5 kW RF output (we plan to spend roughly $75 for electricity), and (c) your choice of ETO keychain or mug should your guess be one of the 50 closest.

Entries must be as above, postmarked by November 30, 1988, one only per licensed amateur. Closest guess wins a new ***ALPHA 86.*** If the winner already owns an *'86*, the prize will be a new ***ALPHA 87.***

GET YOUR *ALPHA* NOW

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TECH TALK from ICOM

ICOM

The IC-781: Hearing Is Believing

As discussed in a previous Tech Talk, the pacesetting IC-781 introduced a completely new dimension in HF communications for today's radio amateurs. Sporting features like a central monitoring screen with band spectrum display, simultaneous dual receive, twin passband tuning and much more, Icom's IC-781 represents the cutting edge of modern technology.

Advanced operating concepts are only one part of the IC-781's glamorous overall story, however. Innovative circuit designs in every section of this transceiver, from its Direct Digital Synthesizer and balanced mixers to its AGC-controlled pin diode gates and twin passband tuning, truly reflect Icom's position of leadership and technical excellence in the communications industry. Supporting that statement, this Tech Talk overviews some of the IC-781's revolutionary circuit designs in the areas of receive sensitivity and dynamic range.

Achieving an optimum balance in sensitivity for copying both weak and strong signals throughout the HF range is a challenging design criteria to all transceiver manufacturers. Lower frequencies are well-known for their high noise levels and strong signals while upper ranges are recognized for their lower levels of both signals and noise. Proper receiver design for optimum sensitivity thus involves three interrelated factors: overall gain, strong signal immunity, and noise figures associated with various ranges. Concentrating on only one or two of those factors without considering other related areas is seriously inadequate for several reasons.

Basic amplification, or merely increased gain raises all levels equally. Weak signals are boosted to the point of introducing receiver overload and blocking. Reduced gain sidesteps receiver overload, but upper band sensitivity is noticeably sacrificed and weak signals continue to be masked by noise. While noticeable advancements are being made in designs influencing dynamic range, many modern transceivers continue to fall short in performance... and noise levels are not reduced for adequate weak signal reception. The IC-781 excels in these areas because all front end stages work in tandem for assuring optimum sensitivity and exceptionally high signal to noise ratios vital to weak signal reception. Let's take a closer look at Icom's design engineering in this respect.

First, the IC-781 features front panel selection of front end configurations to mate with a wide variety of operating conditions. A **Direct Feed Mixer** arrangement can be selected for low bands, for example, while additional RF preamplification can be switched in for upper bands and/or weak signal DX'ing. The transceiver's **automatic antenna tuner operates during transmit AND receive**, matching impedences and assuring maximum signal transfer. An **AGC-controlled pin diode section** is also employed between the tuner/antenna and preamp for strong signal immunity.

Dual FET's, especially chosen for their wide dynamic range and overload immunity, are incorported in the RF preamp. Additionally, the FET's are operated in a **balanced circuit design** that significantly minimizes both external and internal noises. A night and day difference is apparent between conventional single ended circuits and Icom's (noise cancelling) balanced designs.

Dual balanced FET's are also featured in the IC-781's front end and mixer stages, again assuring widest dynamic range with lowest noise and minimum strong signal blocking in these sections. **Final results are demonstrated in the IC-781's overall noise figure of 8dB at 30MHz, which corresponds to a receiver sensitivity of 0.16uV.** The transciever's dynamic range is 105dB with an intercept point of +23 dbm when the preamp is off and 103dB with +16dbm with better specs than this.

Further outpacing the competition, a top-notch PLL/frequency synthesizer section is employed for generating mixer injection/local oscillator signals. The high carrier-to-noise ratio and excellent spectral purity of its output signal results from incorporation of special loop filters in the PLL's and multiple VCO's with limited operating ranges in the synthesizer. Since filters introduce time lags that slow transmit/receive switching, **Icom's new custom Direct Digital Synthesizer** is integrated in this section. DDS is the "last word" in assuring sparkling clear signal reception, plus it produces the fastest PLL lock-in and T/R switching time of any tranceiver today: a double shot of futuristic top performance! Although not directly related to sensitivity, we must also point out **dual first mixers and dual DDS sections are featured in the IC-781 for dual receive.** Icom truly adds new meaning to the phrase "no compromise!"

Looking at other transceivers after studying the IC-781 may remind you of comparing tri-band beam antennas on push-up masts with no-compromise monobanders stacked on a tall tower. Both items fill communication needs; deluxe systems are simply more effective. Icom's top quality makes the difference!

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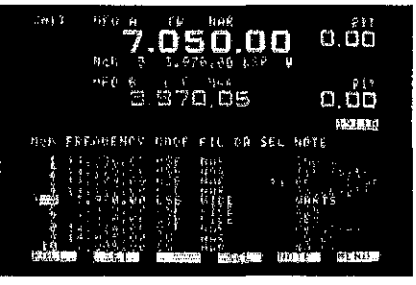
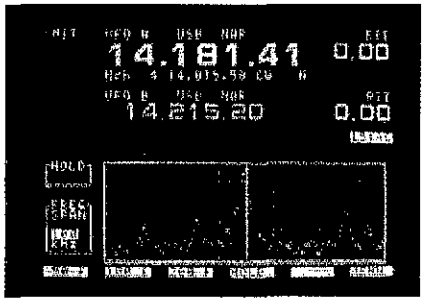
THE FUTURE OF AMATEUR COMMUNICATIONS

Once in a lifetime, a transceiver is introduced that's so extraordinary and innovative that it opens a totally new era in HF communications. ICOM's pacesetting IC-781 proudly exhibits that hallmark achievement with futuristic designs and features of true legendary proportions. Whether DX'ing, contesting, pioneering new interests or enjoying unquestionable top-of-the-line performance, the IC-781 is indeed today's standard of excellence!

Multi-Function Five Inch CRT. Displays frequencies, modes, memory contents, operating notes, RIT, two menu screens, plus a panoramic view of all signals in a selected range. A portion of the screen also serves as a display for data modes like RTTY, AMTOR, and PACKET.



Unique Spectrum Scope. Continuously indicates all signal activities and DX pileups with your operating frequency in the center. Selectable horizontal frequency spans of 50, 100, and 200KHz for each side of the frequency you're listening to. Vertical range indicates relative signal strengths. A contester's dream!



Dual Width Noise Blanker includes MCF filter plus **level and width controls** to eliminate pulse and woodpecker noise with minimum adjacent-signal interference.

Incomparable Filter Flexibility. Independent selection of wide and narrow SSB filters plus CW filters. Second and third CW IF filters are independently selectable!

Dual Watch. Simultaneously **receives two frequencies in the same band!** Balance control adjusts VFO A/B receive strength levels. You can check additional band activity, even tune in your next contact, while in QSO without missing a single word!

DX Rated! 150 watts of exceptionally clean RF output. Easily drives big amplifiers to maximum power.

Twin Passband Tuning with **separate controls for second and third IF stages!** Increases selectivity and narrows bandwidth, independently varies low and high frequency response, or functions as IF shift. **It's DX'ing Dynamite!**

A Total Communications System! Includes built-in 100% duty AC supply, high speed automatic antenna tuner, iambic keyer, semi-automatic or full QSK CW break-in to 60 wpm, Audio Peaking Filter (APF), RF speech processor, multiscanning, 105dB dynamic range, all-band/all-mode receiver with general coverage, and much more!

ICOM Dependability. The phenomenal IC-781 is built for action and backed with the most extensive warranty in the industry.

See the IC-781 at your local ICOM dealer.

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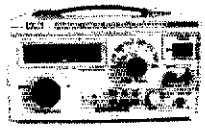
NOVEX

RF Signal Generator/Counter



- 1 - 150 MHz
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- AM modulation
- XTAL input/check
- Digital readout

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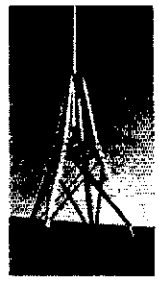
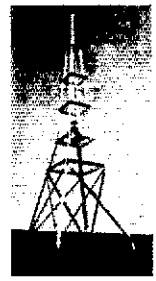
ROOF TOWERS



CR-18



CR-30

CR-45

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#303TB	Thrust Bearing For CR-18, CR-30, and CR-45 Maximum Acceptable Mast Diameter 2"					39.00

*BUYING IS REQUIRED ON ALL ROOF TOWERS. UPS SHIPPABLE

MODEL HF6V

Compare Active Element Lengths

Band	HF6V	Typical multiband free verticals
10M	28 ft. (7.78 A.)	+ 8 ft. (2.33 A.)
15M	12 ft. (4.29 A.)	+10 ft. (3.21 A.)
20M	26 ft. (7.73 A.)	+12 ft. (3.17 A.)
30M	26 ft. (8.04 A.)	
40M	26 ft. (8.08 A.)	+20 ft. (6.14 A.)
80M	26 ft. (8.07 A.)	+26 ft. (8.04 A.)

Electrical and Mechanical Specifications

Shipping weight: 12 lbs./5.4 kg
Height: 26 ft./7.9 m.
Feedpoint impedance: nominal 50 ohms through included matching link (includes RF connectors for direct connection to any length of 50-ohm cable terminated in PL-259).
VSWR at resonance: 1.5:1 or less on all bands in typical ground level or above ground installations.
Bandwidth for VSWR of 2:1 or less: 10 meters - 1500 kHz; 15 meters - entire band; 20 meters - entire band; 30 meters - entire band; 40 meters - 280 kHz; 80/75 m. - 40 to 100 kHz
NOTE: These SWR bandwidths are what may be expected over ground systems of better than average conductivity. Over average or less efficient systems over greater bandwidths are likely.
Power Rating: Legal limit SSB and CW all bands
Wind loading: 1.6 sq. ft./.49 sq. meters
Unguyed wind survival rating: 85 m.p.h./129 k.p.h. assuming no icing and precipitation

Installation

Comes complete with 2 ft./76 cm. tubular mounting post (1-1/4 in. O.D.) for direct placement in earth or into standard steel TV mast (1 1/4 in. O.D. with .058 in. wall) or Buhrmaster Mounting Post Sleeve (Model MPS). Eye-level adjustment of 80, 40 and 30 meter resonator coils, length adjustment on 15 and 10 meters. 20 meter adjustment is a function of 40 and 30 meter tuning. Coils for 80/75, 40 and 30 meters are 3/16-in. diameter aluminum wire, air wound and self supporting, typical spacing between adjacent turns is 1/8 in. or greater.

Model HF6V-X, an export/DXpedition version suitable for surface parcel post shipment to most countries is available. Electrically identical to the standard model. Shipping weight: 12 lbs./5.4 kg.

HF6V 127.00

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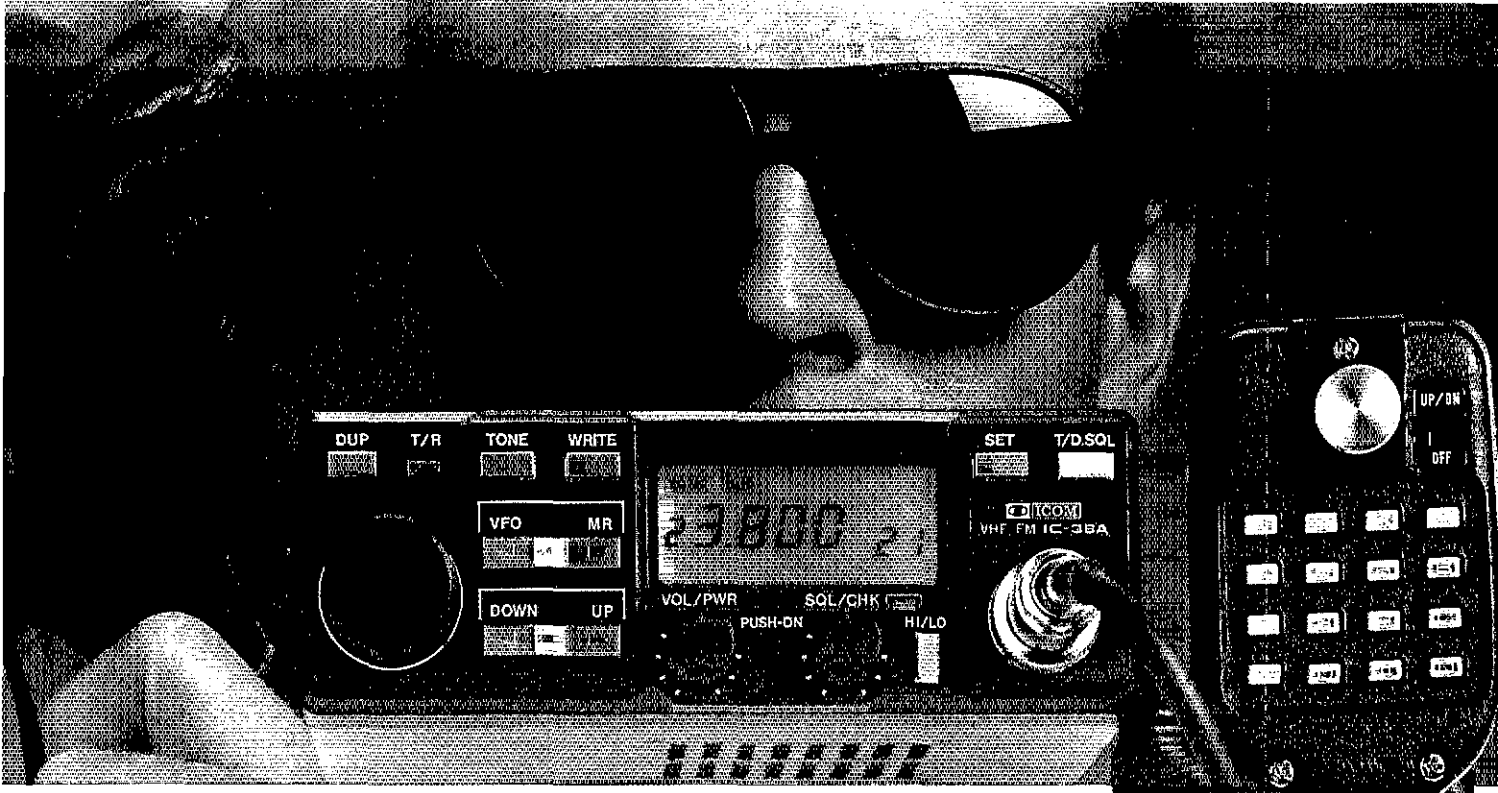

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ICOM has a commitment to high performance 220MHz gear. That's why we're the only manufacturer who can offer you a full line of 220MHz equipment...whether it's a mobile, handheld, base station transceiver, or fiber optic multi-bander.

Handhelds. Choose the full-featured five-watt **IC-03AT** with 10 full function memories capable of storing odd offsets and subaudible tones, scanning and DTMF direct keyboard entry. Or select the **IC-3AT** easy-to-operate handheld featuring thumbwheel switch frequency selection.

Mobiles. ICOM offers the **IC-38A**, which sports a large LCD readout, 21 memories, scanning, and memory lock-out. The slim-line **IC-37A** features an LED readout, nine memories capable of storing offset and subaudible tones and both memory and band scan.

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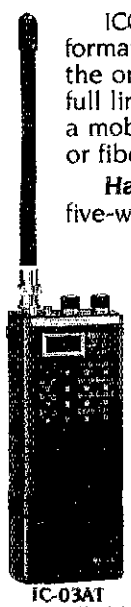
Multi-Bander. The newest addition to ICOM's 220MHz family...the **IC-900** fiber optic controlled six-band mobile, which has a 220MHz optional band unit.

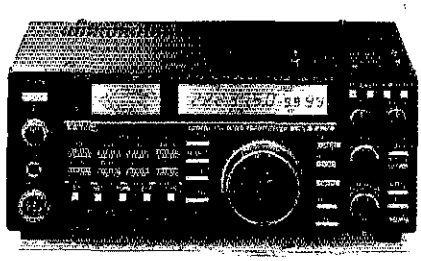
Quality. High Performance. That's ICOM 220MHz.

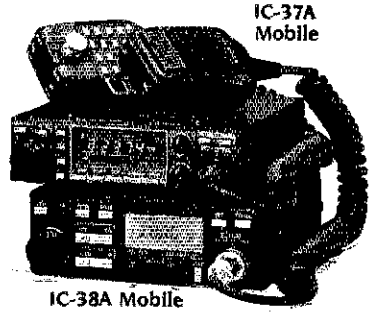
IC-3AT
Handheld



IC-03AT
Handheld

NEW! IC-375A Transceiver





IC-37A
Mobile

IC-38A Mobile

ICOM 220MHz

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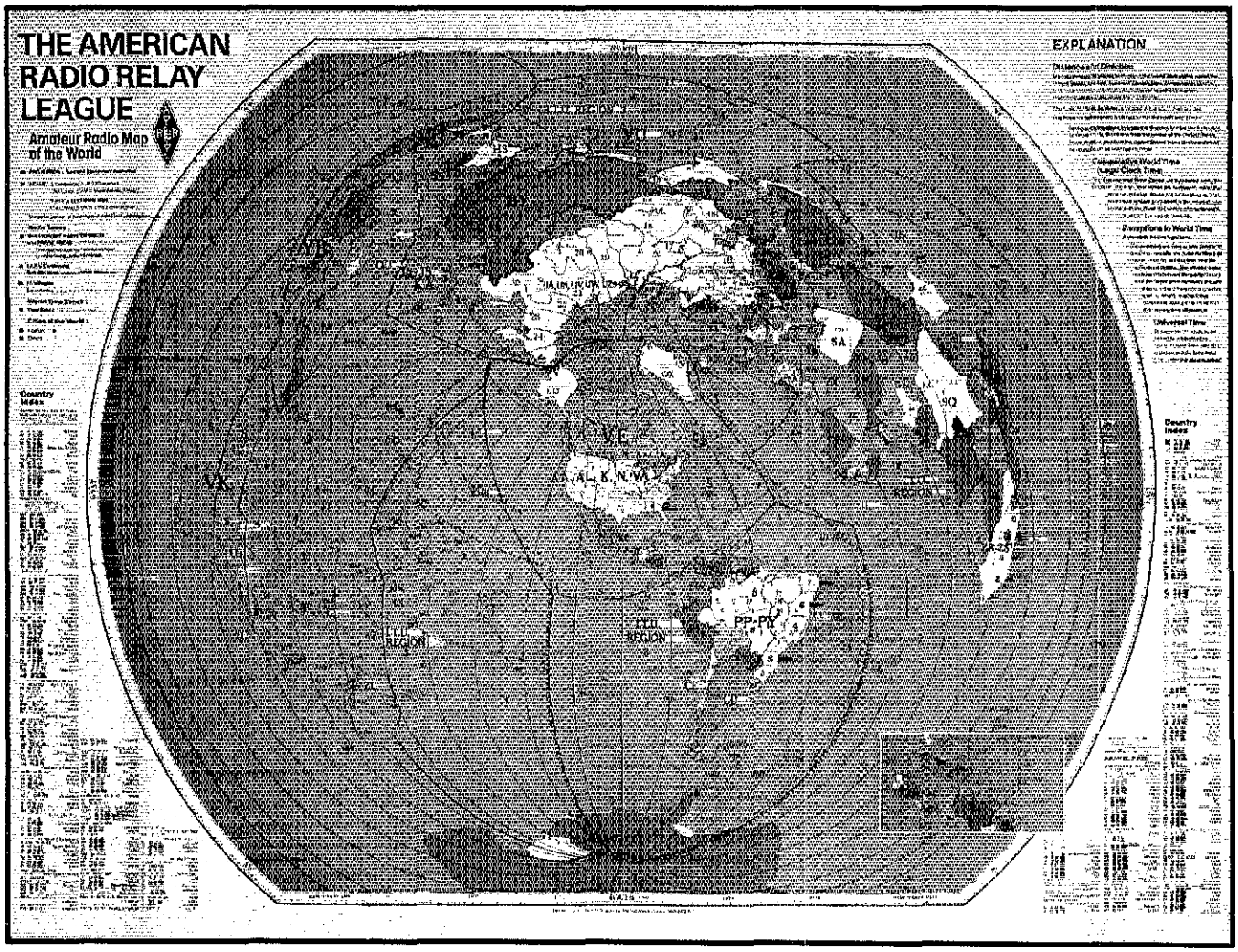
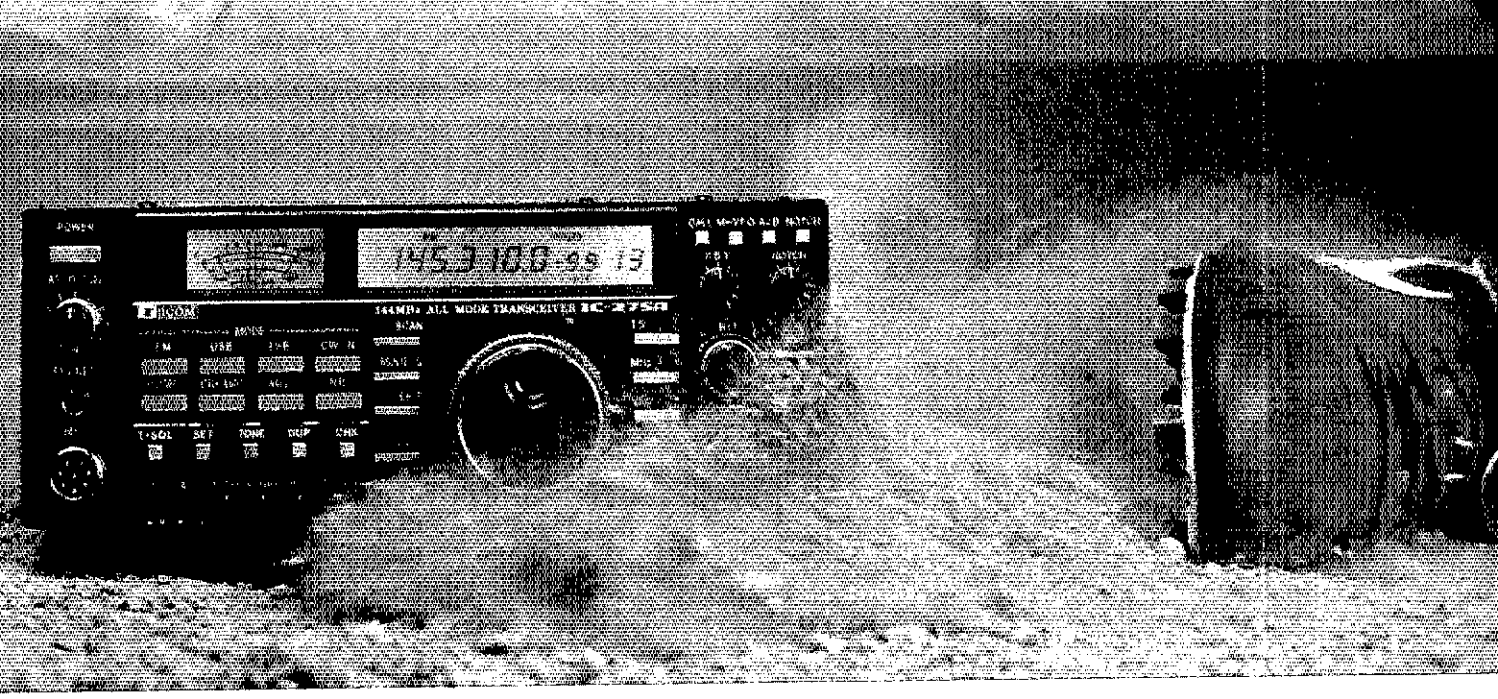


Where in the World?

New edition now available

The new 1988 edition of the popular full-color ARRL Amateur Radio Map of the World will brighten any ham shack wall! We've updated the map to reflect the changes in the DXCC list since the 1985 revision. As usual, Rand McNally has updated the geographic material and map base. The index lists countries alphabetically by prefix and shows ITU and CQ Zones and continents. On the map itself you will find ITU regions, time zones, country prefixes, call districts, important cities and great circle bearings centered on the US. Also the popular detailed Caribbean insert that we added to the last edition has been revised. 30 x 40 inches. $8.00.

The American Radio Relay League, Inc.
225 Main Street
Newington, CT 06111



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ICOM has your winning line-up for fixed, portable, and mobile operations on today's hottest amateur bands. Slide into the winner's circle with ICOM's deluxe "75" series transceivers, with a team committed to excellence from VHF to UHF communications. Each compact all-mode unit delivers maximum performance, reliability, and ease of operation. It's a championship line-up!

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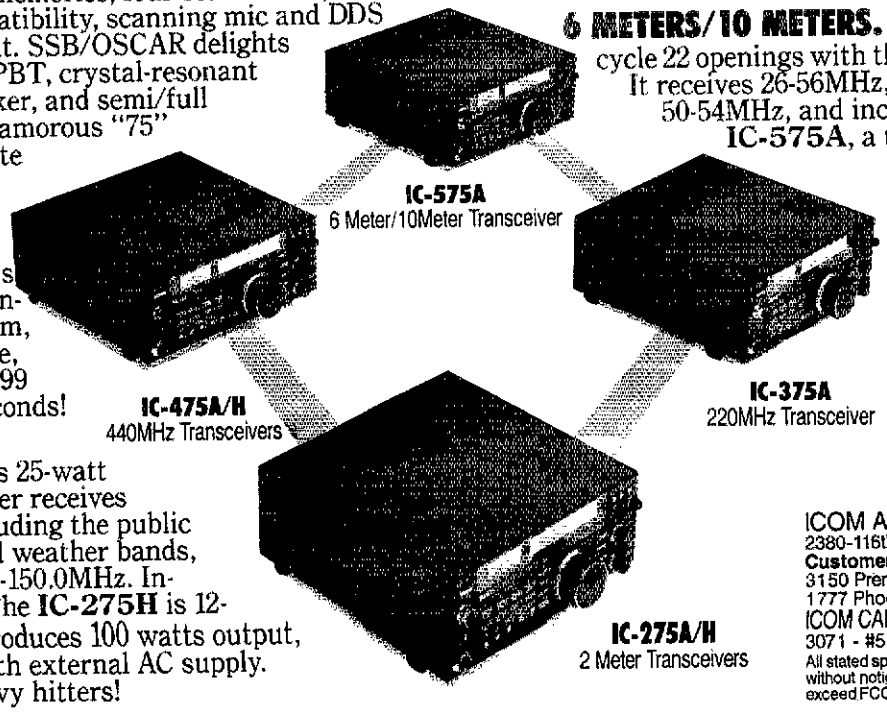
SUPER SCANNING Monitor all of today's action with four scanning modes: spectrum, programmable, mode, and memory. Scans 99 memories in five seconds!

2 METERS. ICOM's 25-watt **IC-275A** VHF leader receives 138.0-174.0MHz including the public service, marine, and weather bands, and transmits 140.1-150.0MHz. Includes AC supply. The **IC-275H** is 12-volt DC-powered, produces 100 watts output, and will operate with external AC supply. Two of ICOM's heavy hitters!

220MHz. The 25-watt output **IC-375A** receives 216.0-236.0MHz, transmits 220.0-225.0MHz, and includes AC supply. A genuine masterpiece!

440MHz. Enjoy top-notch 430.0-450.0MHz operation with the 25-watt **IC-475A** featuring AC supply, or go high power using the 75-watt, AC/DC-powered **IC-475H** "super rig.

6 METERS/10 METERS. Join the fun of sunspot cycle 22 openings with the superb 10-watt **IC-575A**. It receives 26-56MHz, transmits 28-29.7MHz, and 50-54MHz, and includes AC supply. The **IC-575A**, a true superstar!



IC-575A 6 Meter/10Meter Transceiver

IC-475A/H 440MHz Transceivers

IC-375A 220MHz Transceiver

IC-275A/H 2 Meter Transceivers

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Saturday
October 22, 1988
9am til 3pm

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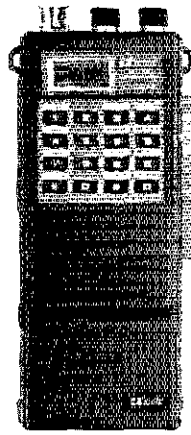

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★ **Prize drawings each hour! Come and register to win!**

Grand Prize

IC-02AT 2-Meter
Digital Readout
Handheld
(No purchase necessary to win.)

★ **Special pricing**
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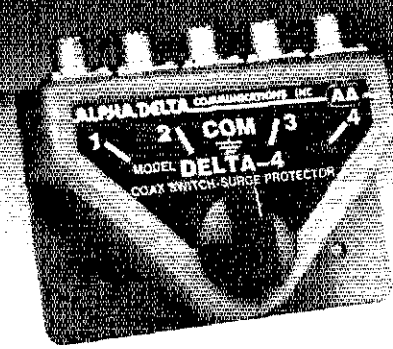
Alpha Delta Model DELTA-4 Lightning Surge Protected 4-Position RF Coax Switch

Superior RF switching and equipment protection for amateur, military and government communications stations.



- Exclusive center "off" (ground) position internally disconnects and grounds all antenna circuits for maximum protection when operator is away from the station — **an Alpha Delta first!**
- Incorporates the famous replaceable Arc-Plug™ cartridge for continuous protection of the active antenna circuit. Unused antenna circuits are automatically grounded — **an Alpha Delta first!**
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- DELTA-4 handles full legal power.
- Designed and produced in the U.S.A. by Alpha Delta.

Model DELTA-4 (UHF connectors, 500 MHz) $74.95
Model DELTA-4/N (N-type connectors, 1.3 GHz) $89.95

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See Data Sheet for surge limitations.

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current solutions to current problems

1 ANTENNA = 9 BANDS

The GARANT GD-6 dipole was tested and recommended by TCA (The Canadian Amateur; similar to QST) in June 1985. The GD-6 and GD-8 were tested and recommended as first choice in a test of three wire antennas by the CNIB (Canadian National Institute for the Blind.) TCA and CNIB confirmed that the GARANT GD-antennas need no tuner on all bands tested.

MODEL	BANDS	LENGTH
GD-6:	80-40-20-17-12-10M	137'
GD-8:	80-40-30-20-17-15-12-10M	137'
GD-7:	160-80-40-20-17-12-10M	255'
GD-9:	160-80-40-30-20-17-15-12-10M	255'

Choose between 500W PEP or 2KW versions. Install as a horizontal dipole or an inverted-V. SWR usually better than 1.5:1. No tuner needed if properly installed. See letters of our ham customers in our data report. The GD-windom dipoles are no dummy load antennas. Our special GD-balun (500W or 2KW) matches the low impedance (50Ω) coax feedline to the high impedance windom-type antenna. All GARANT GD-windom dipoles come with a 3-year limited warranty and a 10-day money-back guarantee. Who else has that much confidence in his products?

VE2MNL, Michel: "I have installed my GD-7. Only one antenna to cover 7 bands with practically perfect SWR on all bands. **VE1AZZ**, Gordon on his GD-8: "I find the SWR exactly as you claimed." **VE7TH**, John on his GD-9: "FB on all bands. Great for DX." **VE7BKU**, Rob on his GD-8: "A great antenna. Excellent bandwidth." **VE1VCO**, Stu: "Very pleased with the GD-6/2KW. In less than six months operation have logged over 85 different countries. Recommend it to anyone considering a wire antenna."

FREE DATA Report

Write or phone for our free data report on all our GARANT GD-windom dipoles with technical data, actual SWR curves, customer comments, and our low factory direct prices. Take advantage of our sale prices. We ship worldwide & accept VISA or MASTERCARD.

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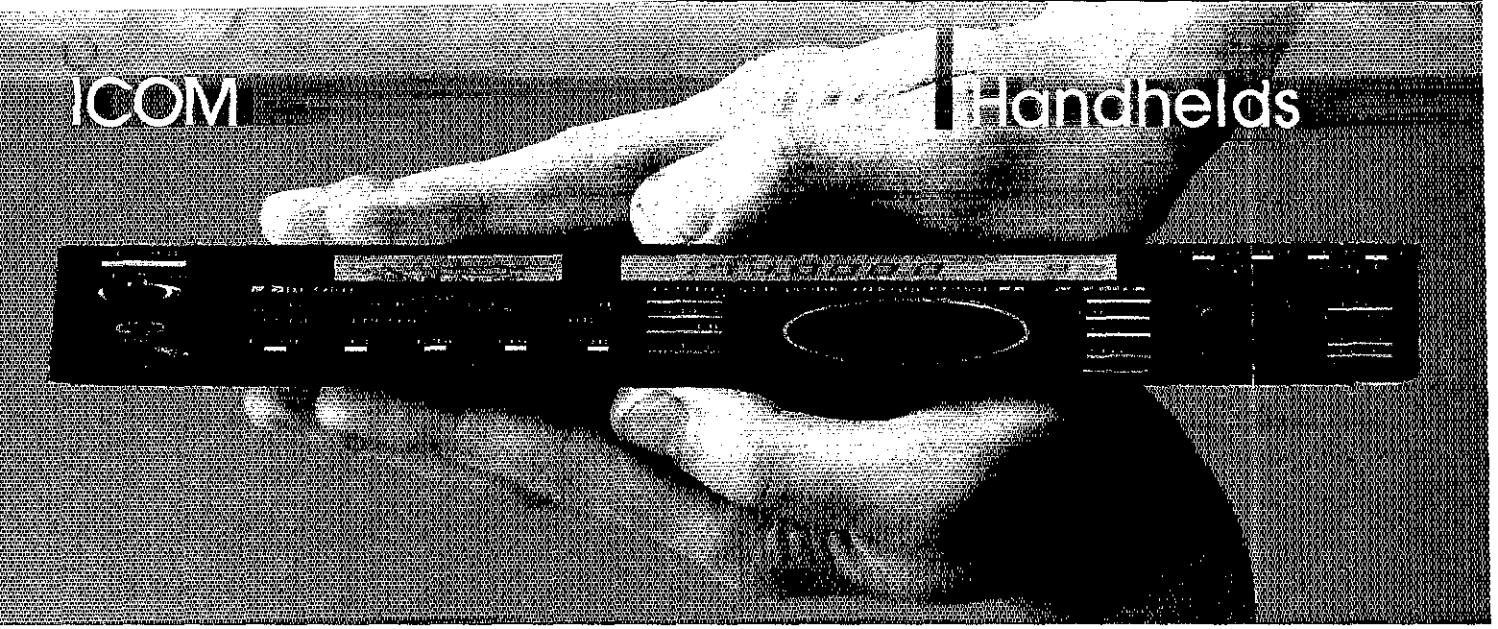
ICOM

Handhelds



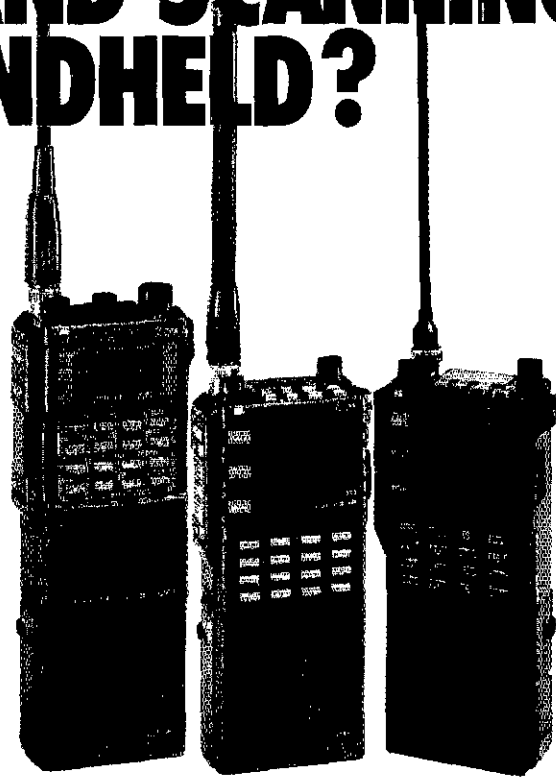
HOW DO YOU PACK 7 WATTS, 20 MEMORIES AND SCANNING INTO A HANDHELD?

IC-2GAT: 7 Watts Rx 138-174MHz; Tx 140-150MHz
IC-4GAT: 6 Watts 440-450MHz
IC-32AT: 5 Watts Rx 138-174MHz/440-450MHz; Tx 140-150MHz/440-450MHz

A New Generation of Powerful, Versatile Handhelds.

Select a new "G Series" or dual band ICOM transceiver and enjoy full base station luxury in a portable unit designed especially for you!

- **Maximum Frequency Coverage.** The IC-2GAT receives 138-174MHz, including NOAA, and transmits 140-150MHz to include CAP and MARS frequencies. The IC-4GAT operates 440-450MHz, and the IC-32AT receives 138-174MHz and operates 140-150MHz/ 440-450MHz.
- **Most Powerful Handheld!** The IC-2GAT delivers seven watts! The IC-4GAT is six watts and the IC-32AT is five watts! One watt level selectable for local QSO's.
- **20 Memories.** Store any frequency, Tx offset and subaudible tone in any memory. Total flexibility!
- **Programmable Scanning** of band and memories plus easy lockout and instant memory recall.
- **Additional Features.** Battery saver, call channel, all subaudible tones, multi-function LCD readout and DTMF pad.
- **Compatible Accessories.** All ICOM IC-2AT/02AT series battery packs, headsets and speaker mics are interchangeable.
- **Optional UT-40 Beeper** silently monitors a busy channel for your calls. When the pre-programmed subaudible tone is received, the unit beeps and the LCD flashes.



IC-32AT 2 Meters and 440MHz
IC-2GAT 2 Meters
IC-4GAT 440MHz

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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 "braaap" 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.

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TH-315A
Full-featured HT

TM-321A
Compact mobile transceiver

TH-31BT/31A
Pocket-held HT

New

TM-3530A
Full-featured mobile transceiver

The TM-321A comes with 16-key DTMF mic.
A complete line of accessories is available for all models.

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

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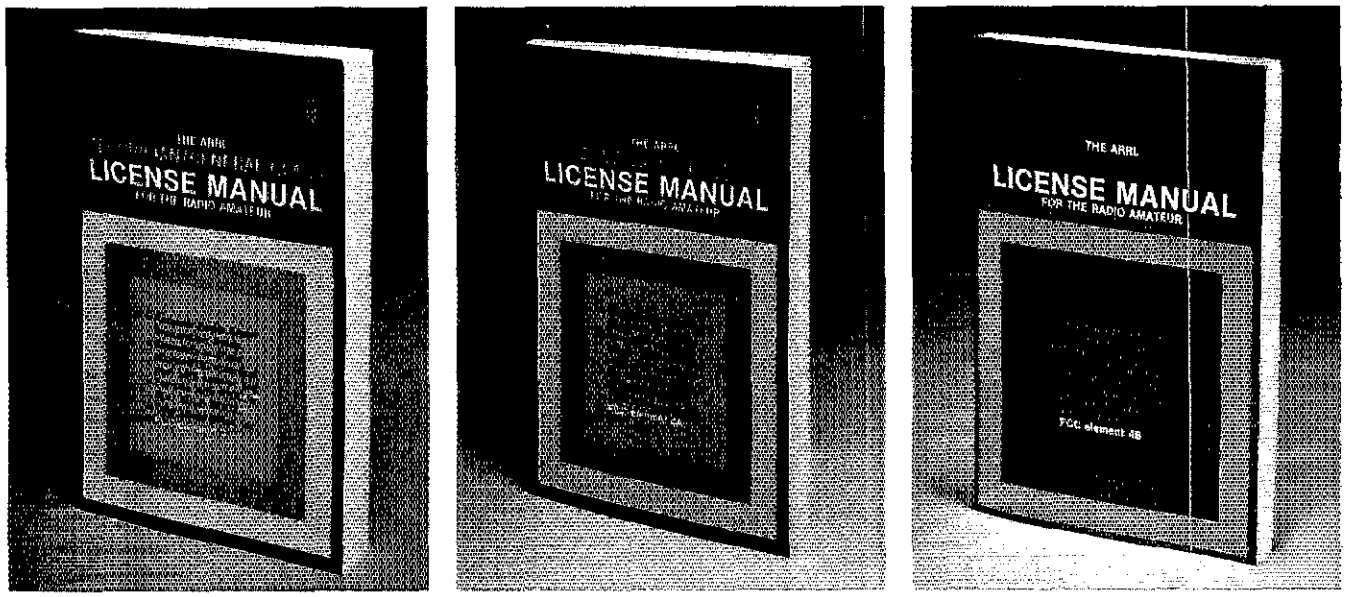
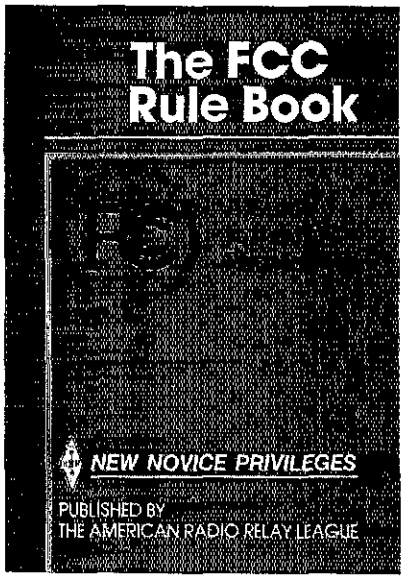


The popular **ARRL License Manual Series.** *The ARRL Technician/General Class License Manual* separates the study material for the Element 3A (Technician) and Element 3B (General) exams for easy study. The material covering the Technician Class is good for exams given through Oct 31, 1989; the General Class material is good through Oct 31, 1990. *The Advanced Class License Manual* is good through Oct 31, 1990 and *The Extra Class License Manual* shown is good for exams given Nov 1, 1988 through Oct 31, 1991.

New Extra Class License Manual

The latest of the **License Manual Series** to be updated includes the new Element 4B (Extra Class) question pool that will be used on exams given from Nov. 1, 1988 through Oct. 31, 1991. The text is organized in the order of the new Study Guide Syllabus released by the VEC Question Pool Committee. There is an alphabetical glossary of key words and important terms in the text are highlighted in bold print. Problem areas on the exam are detailed.

Our popular **beginner's package,** *Tune in the World with Ham Radio* will be good through Oct. 31, 1989 and is just the "ticket" for the prospective Novice! Don't forget that it now comes with 2 90-minute cassettes that were revised with this edition to teach the code painlessly. Other publications like *The FCC Rule Book* which has current FCC regulations are listed below.



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With book and cassettes	#0380	$15
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Set of 2 C-90 Cassettes	#0398	$10
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*Same tapes included in *Code Kit*

Orders must include $2.50 shipping for book rate or $3.50 for UPS.

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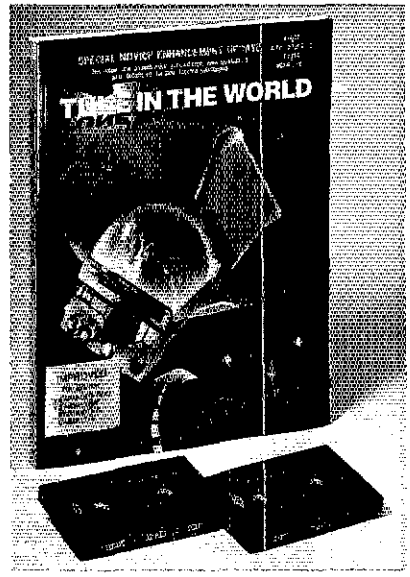

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NEW!

Affordable DX-ing!

TS-140S

HF transceiver with general coverage receiver.

Compact, easy-to-use, full of operating enhancements, and feature packed. These words describe the new TS-140S HF transceiver. Setting the pace once again, Kenwood introduces new innovations in the world of "look-alike" transceivers!

- **Covers all HF Amateur bands with 100 W output.** General coverage receiver tunes from 50 kHz to 35 MHz. *(Receiver specifications guaranteed from 500 kHz to 30 MHz.)* Modifiable for HF MARS operation. *(Permit required).*
- **All modes built-in.** LSB, USB, CW, FM and AM.
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.

- **New Feature! Programmable band marker.** Useful for staying within the limits of your ham license. For contesters, program in the suggested frequencies to prevent QRM to non-participants.
- **Famous Kenwood interference reducing circuits.** IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.
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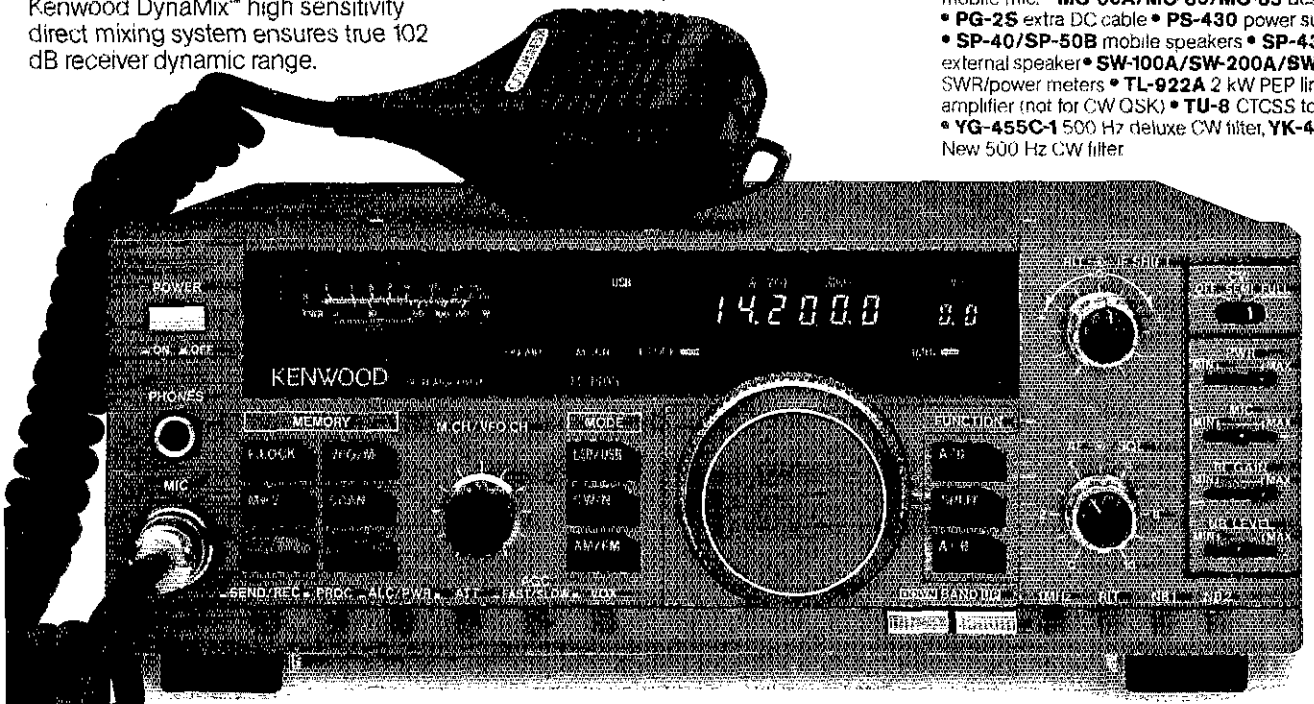
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- **MC-43S UP/DOWN mic. included.**

Optional Accessories:

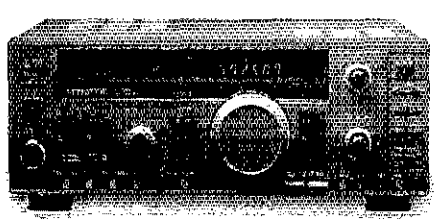
• **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface • **MA-5/VP-1** HF mobile antenna (5 bands) • **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85** desk 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).
- Preamplifier 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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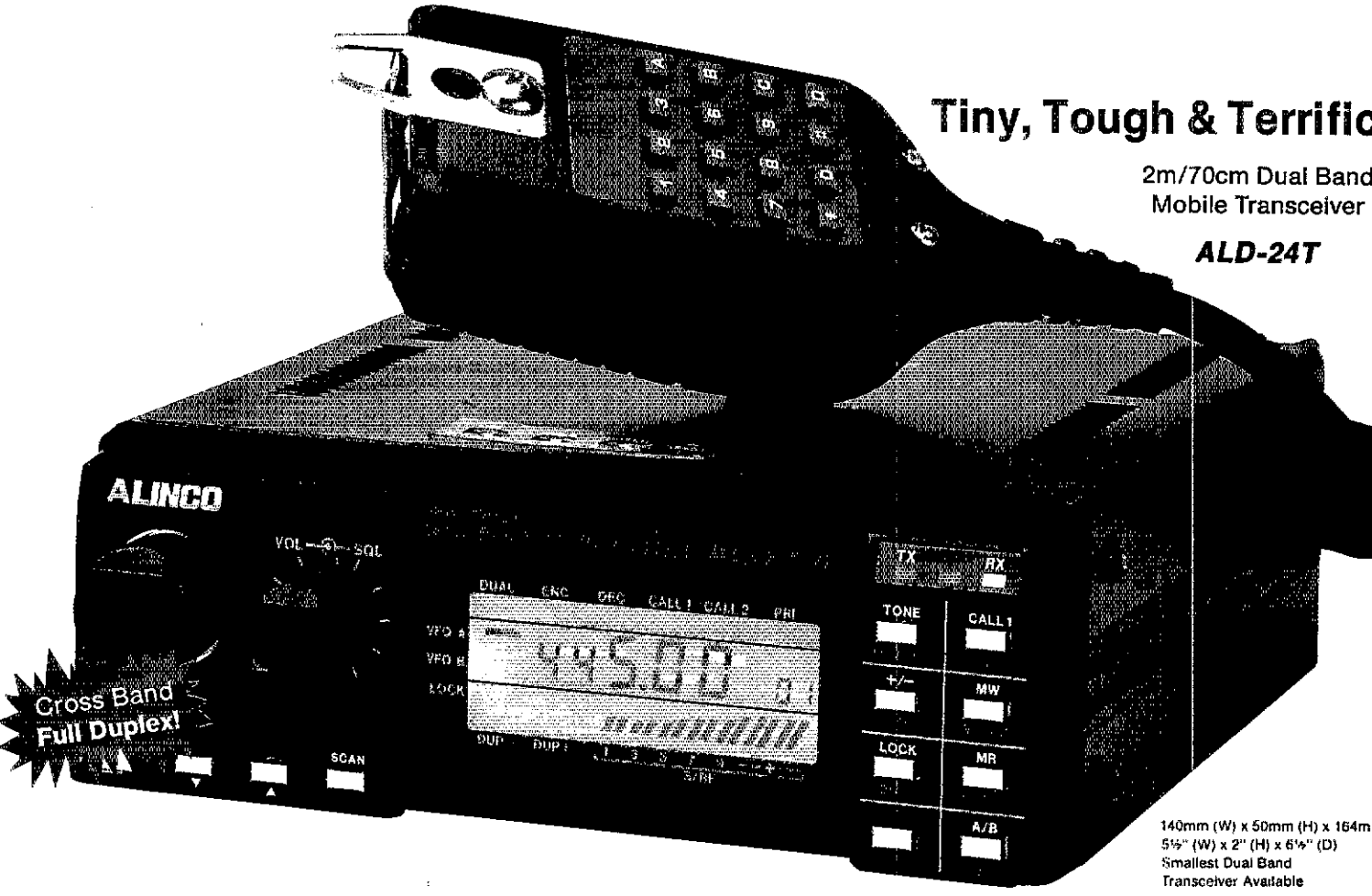
Dual Bander



Tiny, Tough & Terrific

2m/70cm Dual Band
Mobile Transceiver

ALD-24T

140mm (W) x 50mm (H) x 164m
5½" (W) x 2" (H) x 6½" (D)
Smallest Dual Band
Transceiver Available

With ALINCO's advanced engineering and technology, the ALD-24T 2m/70cm Dual Band Mobile Transceiver is designed to be the ultimate in compact size with an impressive array of features, allowing maximum flexibility in installation and ease of operation.

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- 21 Memory Channels
- Dual VFOs
- Large LCD
- **CTCSS Encoder/Decoder: Standard**
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- Memory Scan and Memory Lockout
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* Many more features, see your Dealer!
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HRO - Van Nuys, CA
HSC - Santa Clara, CA
HSC - Sacramento, CA
HSC - Sunnyvale, CA
International Radio Systems - Miami, FL
Jun's Electronics - Culver City, CA
Kennedy Associates - San Antonio, TX
KJI Electronics - Cedar Grove, NJ
Madison Electronics - Houston, TX
Maryland Radio Center - Laurel, MD
Memphis Amateur Electronics - Memphis, TN
Michigan Radio - Mt. Clemens, MI
Mission Consulting - Houston, TX
Missouri Radio Center - Kansas City, MO
N & G Electronics - Miami, FL
Omni Electronics - Laredo, TX
Quement Electronics - San Jose, CA
RF Enterprises, Merrifield, MN
R & L Electronics - Hamilton, OH
Reno Radio - Reno, NV
Rivendell Associates - Derry, NH
Rogus Electronics - Southington, CT
Rosen's Electronics - Williamson, WV
Ross Distributing Co. - Preston, ID
Satellite City, Minneapolis, MN
Sound North Electronics - International Falls, MN
Tel-Com Electronic Comm. - Littleton, MA
Texas Comm. Center - Houston, TX
Texas Towers - Plano, TX
VHF Communications - Jamestown, NY
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Tiny, Tough & Terrific

AVAILABLE NOW

The *NEW* Generation of T.T.& T. Hand Held Transceivers From Alinco Are Just Around the Corner!

Introducing The DJ-100T 2 Meter Hand Held Transceiver

- **Tiny** = 1-3/16" D x 2-3/8" W x 6-5/8" H
- **Tough** = 6.5 Watts (With Optional EBP-8NAZ Nicd Battery Pack)
- **Terrific** = Features and Benefits

Suggested List Price $299.00

- LCD with Switchable Backlighting
- 10 Memories
- BNC Antenna Connection
- 16 Button DTMF Pad
- Easily Accessible Dip Switches For Encoding Sub Audible Tones
- Battery Save Draws 15mA For Extended Battery Life
- .20uV Sensitivity
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- CAP and MARS Modifiable – Simplex only
- Standard Battery, EBP-9NAZ Has DC/DC Converter Built In
- Stores Standard Repeater Offsets In Memory
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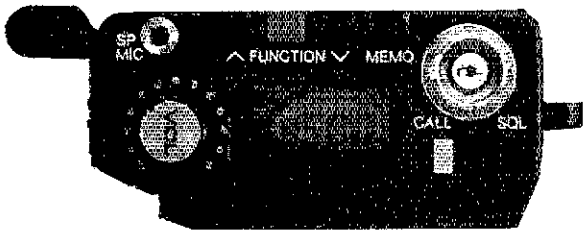
- 220 MHz and 440 MHz To Follow Shortly



(Optional EBP-2NAZ Ni-Cd battery)

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Tech - Burbank, CA
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mateur Comm. ETC. - San Antonio, Tx
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HRO - San Diego, CA
HRO - Van Nuys, CA

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HSC - Sacramento, CA
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Jun's Electronics - Culver City, CA
Kennedy Associates - San Antonio, TX
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Madison Electronics - Houston, TX
Maryland Radio Center - Laurel, MD
Memphis Amateur Electronics - Memphis, TN
Michigan Radio - Mt. Clemens, MI
Mission Consulting - Houston, TX
Missouri Radio Center - Kansas City, MO
N&G Electronics - Miami, FL
Omni Electronics - Laredo, TX
Quement Electronics - San Jose, CA
RF Enterprises - Merrifield, MN

R&L Electronics - Hamilton, OH
Reno Radio, Reno, NV
Rivendell Associates - Derry, NH
Rogus Electronics - Southington, CT
Rosen's Electronics - Williamson, WV
Ross Distributing Co. - Preston, ID
Satellite City - Minneapolis, MN
Tel-Com Electronic Comm. - Littleton, MA
Texas Comm Center - Houston, TX
Texas Towers - Plano, TX
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Williams Radio Sales, Colfax, NC

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

The sky's no longer the limit.

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

Join thousands of VHF/UHF pioneers already scanning the cosmos with their FT-736Rs. The most complete, feature-packed rigs ever designed for the serious operator.

Versatile frequency coverage. The FT-736R comes factory equipped for 2 meters and 70 cm (430-450 MHz), with two additional slots for optional 50 MHz, 220 MHz, or 1.2 GHz modules.

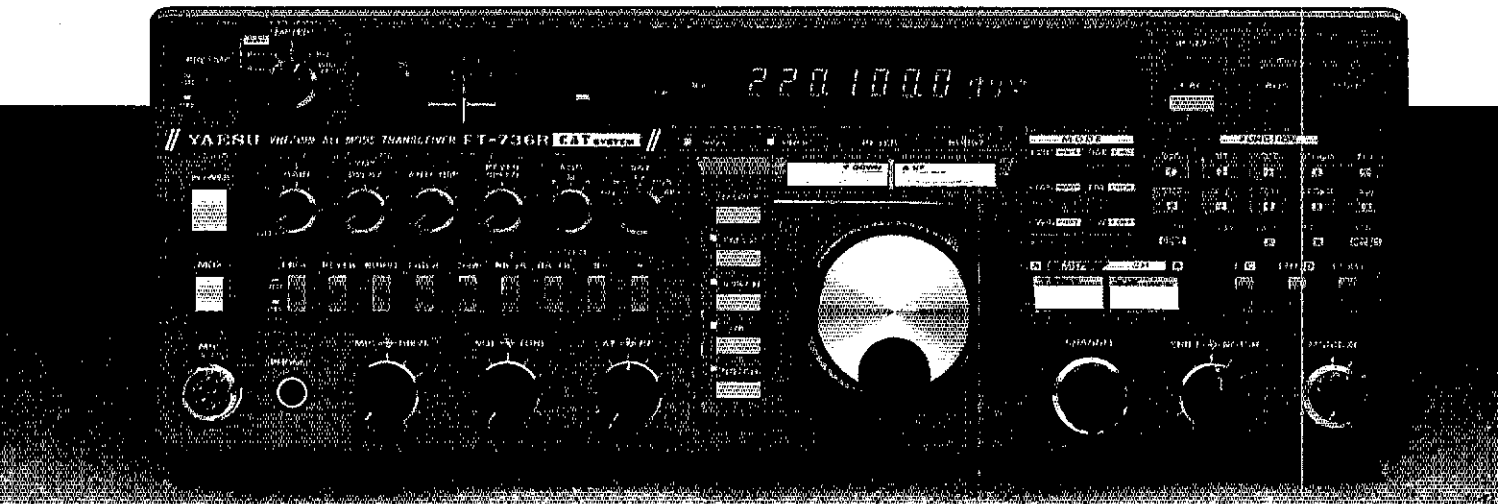
Multimode facilities. Every FT-736R is equipped for LSB, USB, CW, and FM operation. Wide/narrow filters for both FM and CW are factory installed—not expensive options. There's even all-mode squelch, too!

Satellite ready. A truly turn-key satellite rig, the FT-736R includes crossband full duplex capability. Plus VFO tracking for one knob tuning on both normal and inverted transponders. And with the optional 1.2 GHz module installed, you're QRV on Modes B, J, L, and JL. *With one box.*

Exceptional receiver design. The FT-736R was designed with low noise figure and careful gain distribution, for industry-leading sensitivity for weak signal work. And in addition to the wide/narrow CW and FM filter selection, you get IF shift. An IF notch filter. Noise blanker. Audio tone shaping control. Three-position AGC selector. And a preamp switch for activating your tower-mount RX preamplifier.

Operate Fast-Scan TV! Install the optional TV-736 and 1.2 GHz modules, and you're ready to operate fast-scan double-sideband TV with FM audio subcarrier. Black-and-white or color!

Contester's dream! Versatility is a must in VHF contests, as openings are brief. For quick activity checks, use the separate "channel" selector for a speedy trip up the band in selectable steps (SSB *or* FM!). Use the two



Video camera and monitor not available from Yaesu and not supplied with TV-736.

Prices and specifications subject to change without notice. FT-736R shown with 220 MHz option installed.

Seriously.

Write for your free extraterrestrial QSL card at our address below.

VFOs per band to watch different areas of the band. Keep your sked frequencies stored in any of the 100 memories, which retain frequency *and* mode. And let the RF speech processor get you through tough pile ups.

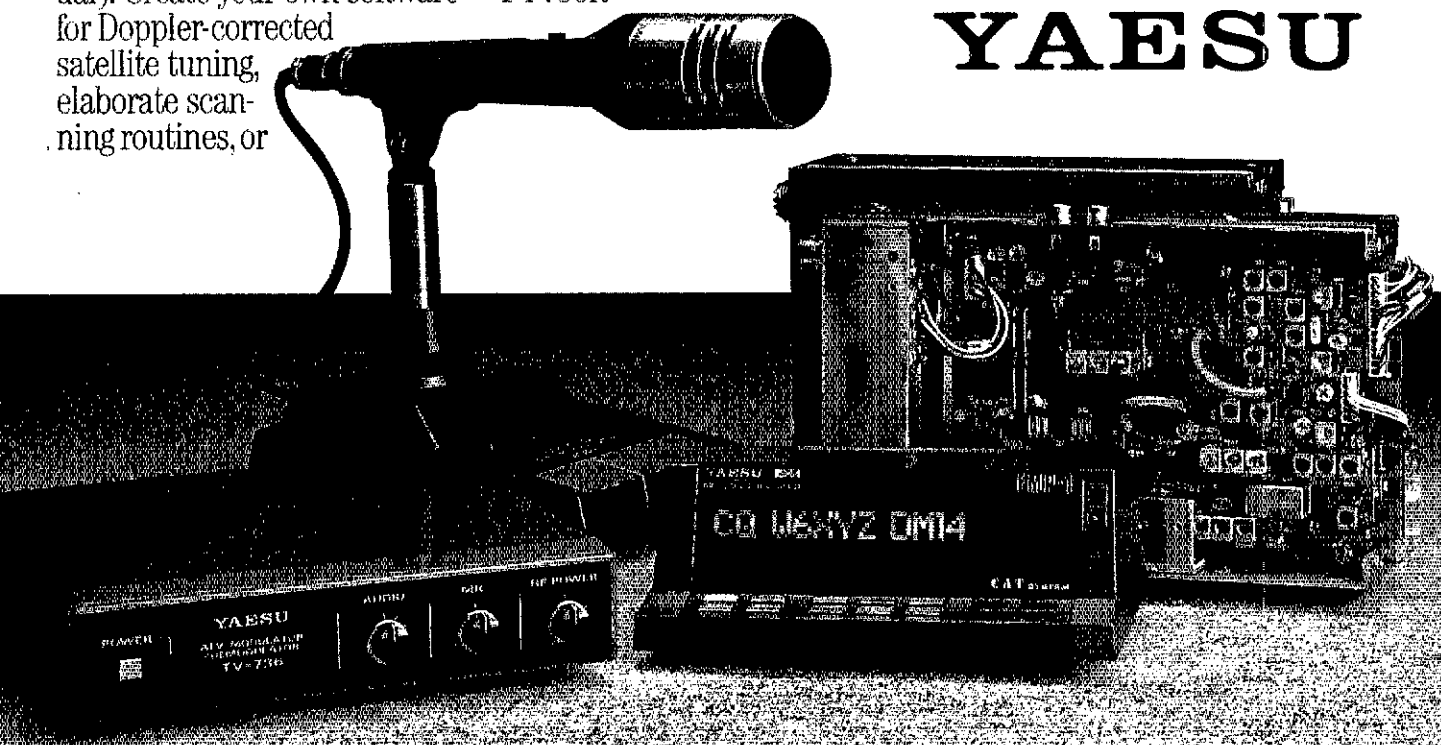
Ready for computer control. The FT-736R is equipped for CAT (Computer Aided Tuning) control via the rear panel 4800 baud serial data port (our command set is included in your owner's manual). Create your own software for Doppler-corrected satellite tuning, elaborate scanning routines, or complete frequency control *and* satellite/EME antenna tracking using our new G-5400B or G-5600B AZ-EL rotators.

Your total communications package. 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. With separate linear amplifier relay control lines for each band.

And to round out your FT-736R station, choose from these popular accessories: Iambic keyer module. FTS-8 CTCSS unit. FVS-1 voice synthesizer. FMP-1 AQS message display. E-736 DC cable. MD-1B8 desk microphone. And our super YH-55 headphones.

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

YAESU



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The PARAGON, Performance Plus...

The Paragon

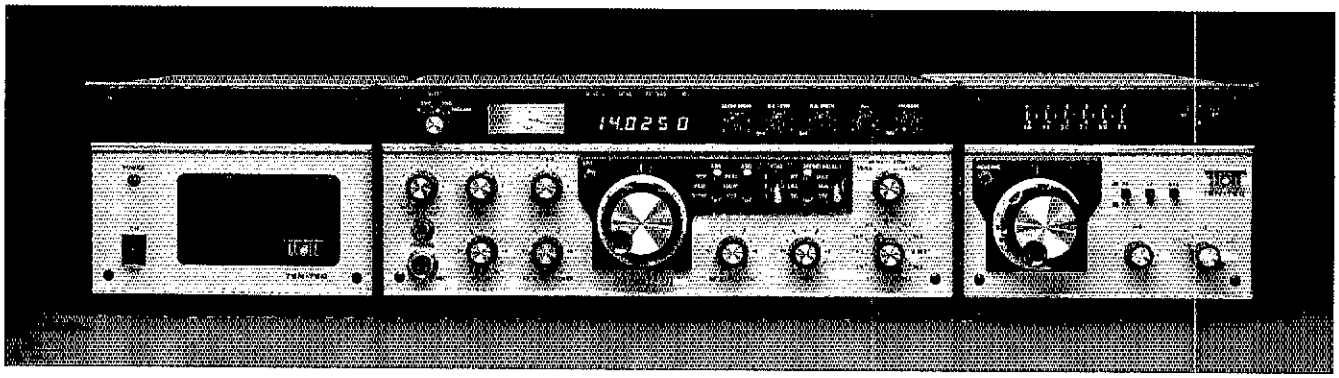
All mode versatility and a transmitted signal you will be proud of. A receiver that has set new standards for sensitivity and quietness. Receives from 100 kHz to 29.999.99 MHz. Transmits on all bands from 1.8 MHz to 29.999.99 MHz with 100 watts output. SSB, CW, real FSK and optional FM. Standard equipment includes speech processor, noise blanker, dual VFOs, TX split, RX split and QSK with a changeover time of 30 ms or less. Five I-F filter positions with the 6 kHz AM filter and 2.4 kHz SSB filter, standard. Optional 1.8 kHz, 500 Hz and 250 Hz filters are selectable independent of mode. Two selectable tuning rates. Passband tuning, notch filter, audio bandpass filter, tone control, squelch and more!

Sixty-two programmable memories that store frequency, mode, filter selected, channel number and a 7 character alpha-numeric "tag" for entering channel I.D. Scan rate is selectable and as each memory is scanned all of the stored information is displayed (what a light show!). Alternately, the memories can be tuned with the main tuning knob.

Frequency selection is with the main tuning knob, direct keypad entry or up/down buttons that will shift in 100 kHz or one MHz increments or to the next ham band. DISPlay button selects 24 hour clock or date or tag. VOICE button causes a voice frequency announcement with optional synthesized voice board installed.

Rear panel controls are provided to adjust the VOX, cw monitor level and tone, and SSB sidetone monitor level. Switching is provided to control conventional linear amplifiers and of course, high speed switching for QSK linears, such as the Titan or the Hercules II. Other rear panel inputs and outputs for transverters, FSK (170 Hz shift), fixed level audio out, audio in, external speaker, aux dc jack and provision for the optional RS-232 control interface. An absolute delight for the all mode operator.

The Paragon is the result of a three year engineering effort. We are proud of the Paragon and we think it has set new standards of excellence in synthesized rigs. Check it out yourself. We think that you will share our pride in the Paragon.



The Classic CORSAIR II...

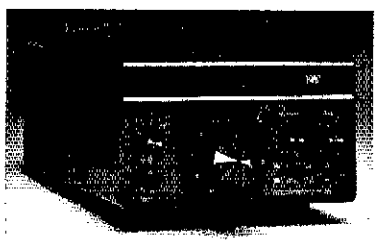
Unique in all the world, the CORSAIR II is the only ham transceiver available that uses a crystal mixed, permeability tuned oscillator. The ability of this scheme to reject strong adjacent signals and to dig out weak signals under the most adverse conditions is legendary. The 95 dB of dynamic range is all useable!

Frequency tuning is also unique. The main tuning is 18 kHz per turn. Dual range offset tuning can control transmit, receive or transceive. Selectivity is enhanced with a 16 pole crystal ladder filter and pass band tuning. The 50+ dB notch filter virtually eliminates carrier type interference. An eight pole audio filter is standard and the I-F filters are selectable independent of mode for superior operation on the digital modes.

The transmitter is well known for outstanding audio quality on SSB and QSK CW performance is simply beyond comparison. All ham bands are covered, 160 through 10 meters with WWV at 10 MHz. The front panel is a thoughtful and spacious arrangement with only the controls that you need.

If your number one priority is outstanding performance on the ham bands, and simplicity is still a virtue, you may be the kind of purist who deserves the classic CORSAIR II.

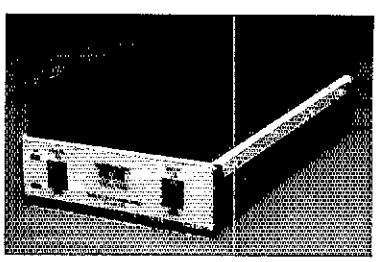
Add Satellite Communications To Your HF Station



Model 2510B

The Model 2510B, mode B, satellite station is a 70 cm, 10 watt SSB and CW transmitter with a super-sensitive, low noise, 2 meter to 29 MHz receive converter. The receive conversion idea takes advantage of the excellent selectivity and sensitivity that you already have in your HF station. Frequency tuning is with the PTO in the 2510B and the transmitter automatically tracks the receive frequency for "transceive" operation. "Split" operation is also provided. Two bands are included for full coverage of Oscar 10 and Oscar 13.

The Model 2410 is an all mode, broadband, 100 watt, 70 cm amplifier that adds 10 dB of gain to your up-link signal. Tx/Stby control can be hard-wired or automatic when the drive signal is present. Primary power is 12 to 14 Vdc at 20 amps.



Model 2410

TITAN: A Gallon And A Half Out! (5.68 Liters)

Titan

The TITAN has it all! 1500 watts output with ease, all legal bands 160 through 15 meters including MARS frequencies (10 meters after owner mod), lightning fast QSK for full break-in CW or the digital modes and a two speed blower for quiet operation on SSB. This awesome performance from a 17 lb desk top amplifier is made possible by a pair of Eimac® 3CX800A7 ceramic triodes and an external 45 lb power supply that is an absolute "horse."

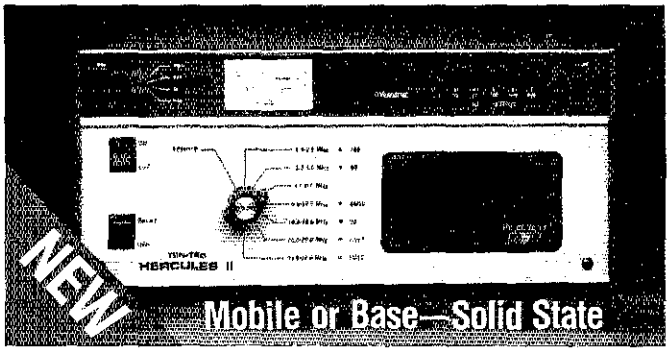
The heart of the power supply is our own tape wound, four core Hypersil® transformer that weighs in at an impressive 41 lbs. The transformer is conservatively rated at 2.5 kva CCS. (9.5 kva IVS.) The power supply is housed in a separate utility enclosure and is nearly noiseless even at full power.

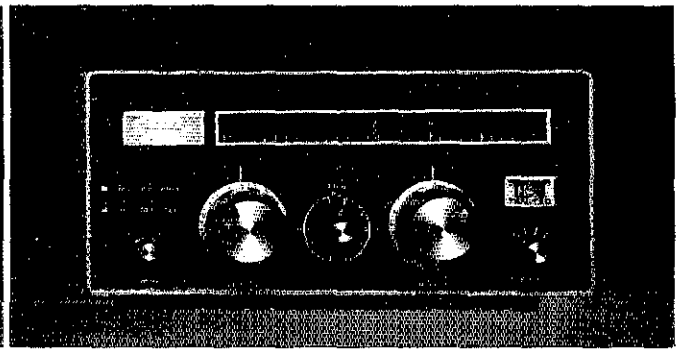
Front panel features include a ten element LED bargraph that displays peak power, a multi-meter selectable to read plate voltage, forward or reverse power and grid current. A matching meter is dedicated to display plate current. The TUNE and LOAD controls use 3:1 vernier drives *which, in combination with a great RF deck* design, make the TITAN a real "pussy cat" to operate.

The low drive requirement of the TITAN (65 watts for 1500 watts output, typical) makes life much nicer for your exciter too. This is especially comforting when operating keydown modes such as RTTY. Two product review articles have been published, see QST April 1986, CQ February 1986.

If you are ready to choose your dream amplifier the TITAN has everything but the highest price. Check it out!

THE TITAN IS BACKED BY A THREE YEAR LIMITED WARRANTY.





Hercules II No Tune HF Amplifier

The HERCULES II, Model 420, is an amplifier design that offers a *combination of unique features that can only be achieved using modern solid* state technology. Instant on, 12 - 14 Vdc operation, no-tune broadband final and compact size. General coverage operation from 1.8 to 22 MHz (to 29.999 MHz with authorized modification). Add to that lightning fast QSK cw, remote control, superb linearity and a low drive requirement. Outstanding!

The HERCULES II will interface nicely with virtually all transceivers. The front panel includes an analog multi-meter for collector current, voltage, forward power and SWR. A 10 element LED bar-graph display indicates peak output power. Band selection is made from the front panel switch or remotely controlled through a rear panel connector. Accessories are available for mobile remote control and automatic band tracking when using a Paragon. A front panel speaker is built-in.

The Model 9420 115/220 Vac power supply is in a separate utility enclosure and connects to the RF deck using a 6 foot power cable. It provides 80 amps to the amplifier plus 20 amps at 13.8 Vdc to power a 100 watt output exciter.

KW Antenna Tuner

The Model 229B adds a lot of versatility to your HF station antenna system. *With this tuner you can load virtually any unbalanced (coax or single wire)* antenna. With the accessory balun, antennas with balanced feeders can be used. Maximum legal power may be used from 1.6 to 30 MHz. The modified "L" network will tame an SWR of at least 10:1, any phase angle, without "false load" problems. Lighted multi-meter shows power in two ranges plus reflected power. A great way to operate all bands with something less than a world-class antenna farm.

ONE OF OUR BEST FEATURES IS ONE THAT YOU MAY NEVER NEED ... FAST, EFFICIENT AND CARING SERVICE.

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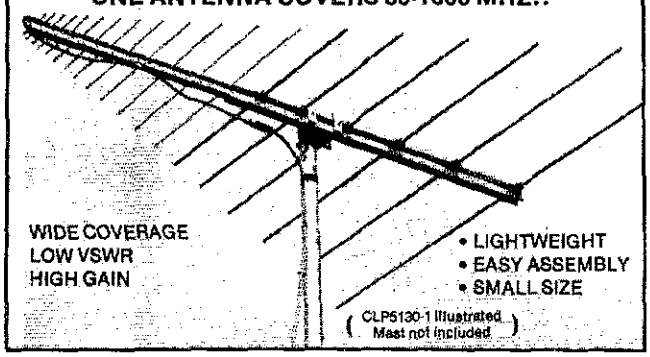
CREATE A GREAT SIGNAL THIS SUMMER!

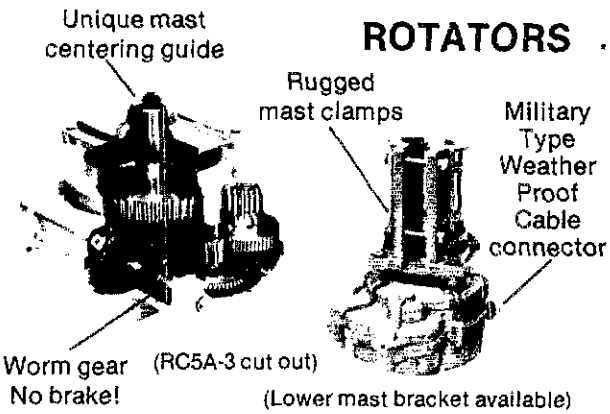
HIGH PERFORMANCE LOG PERIODIC ANTENNA
ONE ANTENNA COVERS 50-1300 MHZ!!



CLP5130-1 50-1300 MHz 25 el. 500W 6' Boom $239 + shipping
CLP5130-2 105-1300 MHz 20 el. 500W 4'6" Boom $139 + shipping

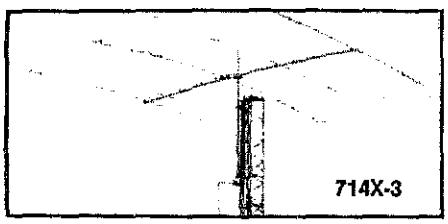
Operate on 6m, 2m, 1¼m, 70cm, 900 MHz and 1.2 GHz using only one antenna and one feedline. No tuning is required and the VSWR is 2:1 or less across the entire frequency range with excellent forward gain. The boom is made of high quality aluminum and the elements are precut for easy assembly. Each model 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.

ROTATORS



RC5-1	10 sq. ft.	**$251**
RC5-3	10 sq. ft. preset	**$328**
RC5A-2	25 sq. ft.	**$399**
RC5A-3	25 sq. ft. preset	**$459**
RC5B-3	35 sq. ft. preset	**$736**

All rotators will fit most towers. Please call for additional information.

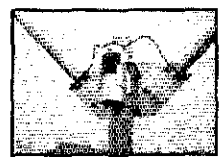


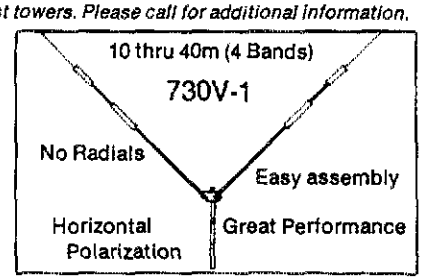
714 Series Tribanders
15-20-40 Meters
On One Boom!

Model	Elements 40-20-15	Boom Length	Longest Element	Turning Radius	Wgt. Lbs.	Power PEP	Price
714T	2/4/4	28'6"	43'	25'3"	71	2 kw	$574.
714X	3/4/4	32'5"	44'	26'2"	75	2 kw	$762.
714T-3	2/4/4	28'6"	43'	25'3"	75	3 kw	$707.
714X-3	3/4/4	32'5"	44'	26'2"	80	3 kw	$928.

(Prices include balun)

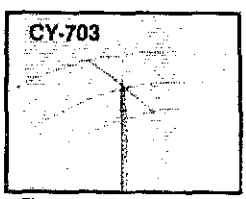
730V-1 DIPOLE!

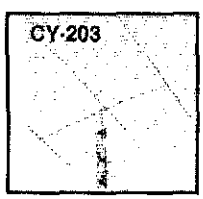


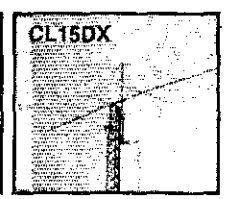


Find out why more and more people are replacing their lossy verticals and moving up to the super performing 730V-1 dipole. The 730V-1 consists of two 19 ft. heavy duty, self-supporting elements and bracket with an efficient balun that is ready for mounting on a standard TV mast. Rotation is not necessary! The V-dipole is superior to standard vertical antennas in gain, noise and efficiency. $159 + shipping.

Rugged High Performance Mono Banders!

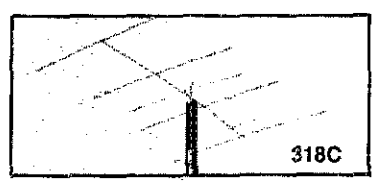






Mono Bander Data

	Freq MHz	El.	Boom Length	Longest El.	Turning Radius	Wgt. Lbs.	Power	Price
CY104	28.0	4	18'8"	18'4"	12'11"	19	2 kw	$185.
CL10DX	28.00	6	30'6"	18'½"	16'1"	33	2 kw	$310.
CY154	21.00	4	18'8"	24'5"	15'5"	21	2 kw	$205.
CL15DX	21.00	6	40'8"	24'3"	24'3"	58	3 kw	$559.
CL20	14.00	4	30'9"	36'8"	36'8"	58	3 kw	$495.



318 Series Tribanders
10-15-20 Meters

Model	Elements 20-15-10	Boom Length	Longest Element	Turning Radius	Wgt. Lbs.	Power PEP	Price
318JR	3/3/3	13'1"	31'1"	15'9"	28	1.2 kw	$289.
318	3/3/3	16'4"	31'1"	17'4"	40	2 kw	$345.
318B	3/4/4	20'11"	31'1"	18'4"	49	2 kw	$434.
318C	5/5/5	29'10"	31'1"	21'	58	2 kw	$643.
318B + 7	1/3/4/4	20'11"	37'7"	19'11"	52	1 kw	$606
			(Prices include balun)			2 kw	

Price does not include shipping.

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All Create Antennas Are Manufactured With High Quality, Heavy Duty, Precision Aluminum Tubing For Easy Assembly and Long Life.

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BOLDLY GOES WHERE NO OTHER TRANSCEIVER HAS GONE BEFORE!!

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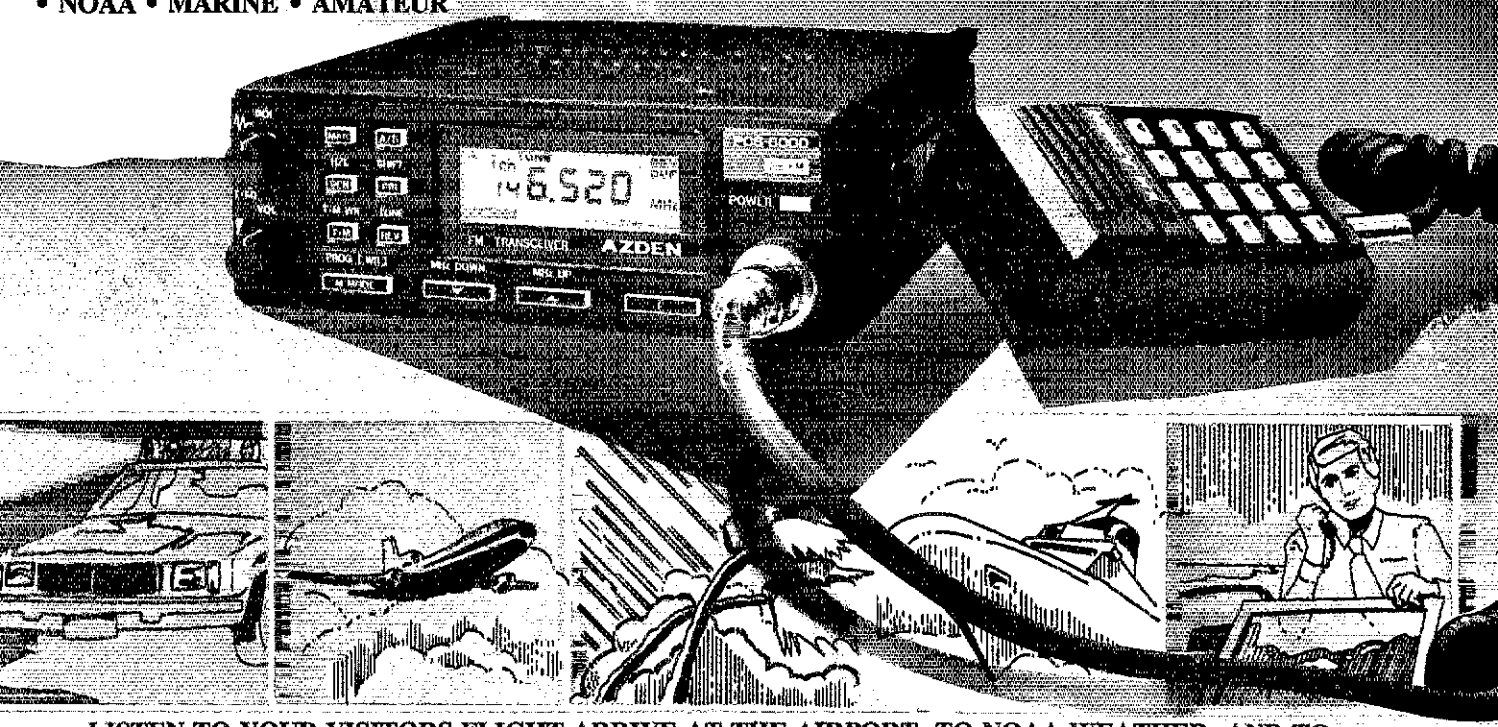

LISTEN TO YOUR VISITORS FLIGHT ARRIVE AT THE AIRPORT, TO NOAA WEATHER, AND TO PUBLIC SERVICE, POLICE, FIRE, FORESTRY AND MARINE FREQUENCIES

MODELS: PCS-6000/PCS-6000H (25W/45W). *Also coming soon PCS-6200 220MHZ, PCS-6300 70CM and PC-10 10 Meter FM Handheld.* **CMOS AND ADVANCED SURFACE MOUNT TECHNOLOGY PROVIDE UNPRECEDENTED COMMERCIAL QUALITY AND RELIABILITY.**

UNPRECEDENTED WIDE REQUENCY COVERAGE: The PCS-6000 receives 118.00 to 135.995 MHZ AM Aircraft/136-173.995 MHZ FM and transmits 140.100 to 150.000 MHZ. Modifiable to ALL MARS and CAP frequencies (proof of authorization/license required)

TINY SIZE: Only 2 inches high, 5½ inches wide and 7¼ inches deep!! Easily fits anywhere, even in the smallest car!

20 CHANNEL MEMORY IN TWO BANKS PLUS 1 TEMPORARY CHANNEL (TM): Two memory banks, A and B have 10 memory channels each. The memories store frequency, shift width, offset information, and PL tone frequency as programmed. *An extra memory channel (that we call TM-temporary memory) is provided to allow you to store any operating condition instantly again and again!!*

UP TO 21 NONSTANDARD SPLITS: Program any split in any channel.

VERSATILE SCANNING FUNCTIONS: Dual memory scan, programmable band scanning, hold scan and delay scan functions are provided, with selectable delay time. ALL memory channels are tunable independently.

PRIORITY CHANNEL MONITORING: Memory Channel B0(the first channel in memory bank B) is monitored every four seconds regardless of any operating condition. When a signal is received, a beep is heard.

DISCRIMINATOR CENTERING (AZDEN EXCLUSIVE PATENT): Always stops on frequency desired when scanning.

PROGRAMMABLE FREQUENCY STEPS: In memory, frequency steps can be set at 5KHZ to 20KHZ in any increment.

BUILT-IN PROGRAMMABLE TONE ENCODER: 57 different tones are built in for instant programming of PL tones into memory channels and microcomputer. Tone frequency can be entered independently in RX and TX. A tone decoder is available as an option.

LITHIUM BATTERY BACKUP: Memory information can be stored for up to 5 years even if power is removed.

FREQUENCY REVERSE: Allows you to listen to repeater input frequency.

FEATHER-TOUCH TUNING CONTROL KEYBOARD: The LED backlighted light touch keyboard performs all tuning operations simply by pushing the key(s) and key actuation is audibly verified.

LARGE LCD (LIQUID CRYSTAL DISPLAY): The LCD display shows the operating frequency, S/RF, memory channel in use and various other operating functions. The LCD is back-lighted by green LEDs, making it possible for you to read the display even in total darkness.

FULL 16 KEY TOUCHTONE PAD MICROPHONE: DTMF Microphone functions as auto-patch when transmitting.

DIGITAL S/RF METER: Shows incoming signal strength and relative transmitter power.

MICROPHONE CONTROLS: Up/Down memory and frequency control.

TRUE FM, NOT PHASE MODULATION: Unsurpassed intelligibility and audio fidelity. High/Low Power: 25W/45W or 5W/10W (6000/6000H). Output-Fully adjustable.

SUPERIOR RECEIVER: Sensitivity is better than 0.15 Microvolt for 20-DB quieting. Commercial-Grade design assures optimum dynamic range and noise suppression.

AUDIO OUTPUT: 2 Watts or more.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

OTHER FEATURES: Rugged dynamic touchtone DTMF microphone, built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses and hardware are included.

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- » Full power is always available
- » Completely automatic
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- » No time limit for QRO
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- » Remote control up to 250 feet away
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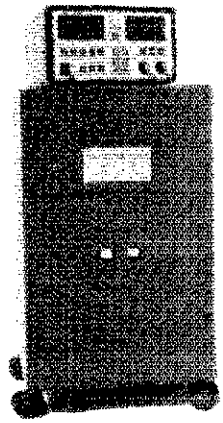

Frequency: all amateur (1.8 - 21 MHz)
Drive: 50 - 80 watts for full output
Output: 1500 watts PEP
Input Impedence: 50 ohms unbalanced
Input VSWR: 1.5:1 (higher on WARC)
Output Impedence: 50 ohms unbalanced
Harmonic Supp: greater than -45 dB
Intermod prods: more than -35 dB down
Duty: CCS (cont. commercial svc.)
Tubes: EIMAC 3CX800A7 (two)
ALC: 0 to -6 VDC
Output Configuration: Pi-L
AC Power: 230 VAC at 20A
Size (WHD in inches) & Weight
Microcontroller: 10x6x9 at 5 lbs
RF/AC unit: 14x22x13 at 86 lbs

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The Advanced Radio Devices (ARD) R9100 is the heavy duty antenna rotator designed for the big gun with antenna loads to one ton. All components are designed and selected for durability and long life, a quality often over looked.

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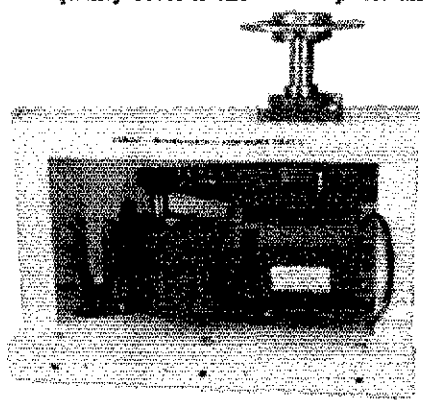

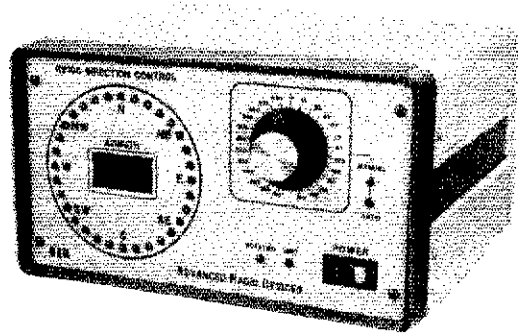

SPECIFICATIONS
Rotating torque: 10,000 inch lbs.
Braking torque: 24,000 inch lbs.
Vertical load: 2000 lbs.
Mast sizes: 2.0 to 3.5 inch O.D.
Motor: 1/3 HP
Rotation speed: 1 RPM
Weight: 230 lbs.
Size: 14.9x25x15.1 inches (wlh)

Write for complete specs and installation information

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THE 1989 ARRL HANDBOOK

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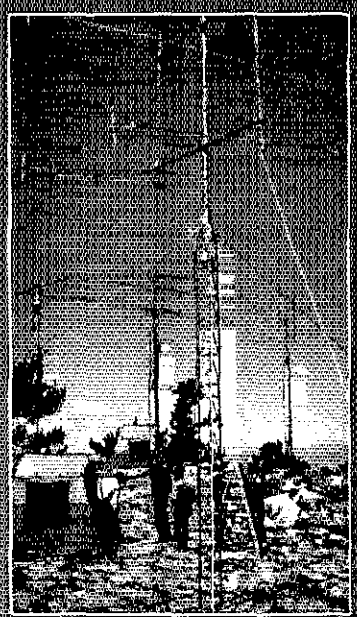

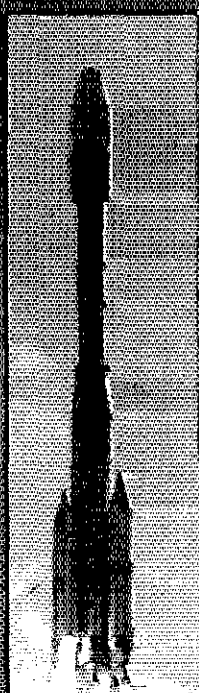

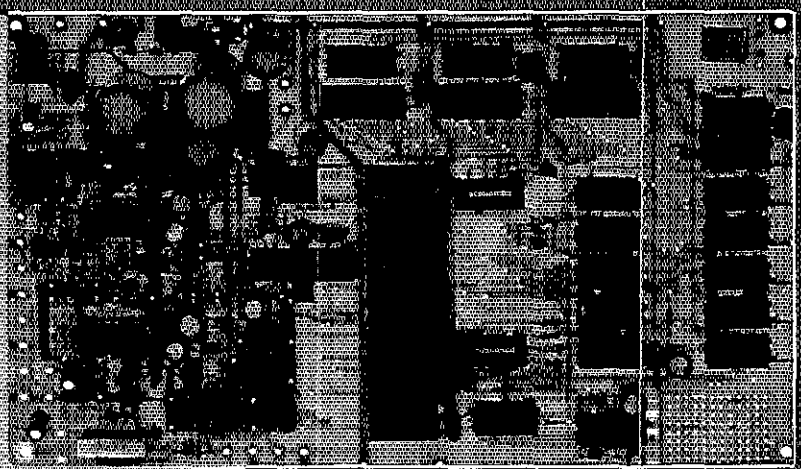

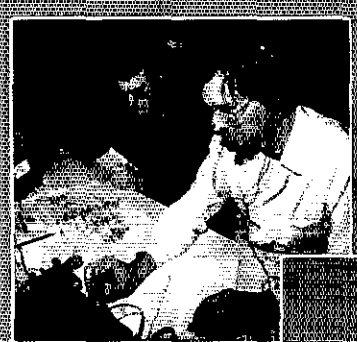

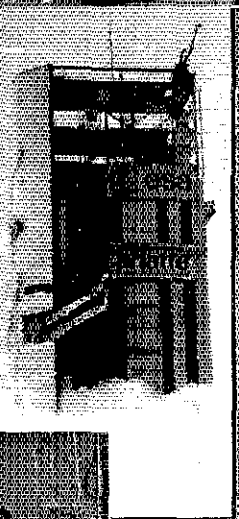

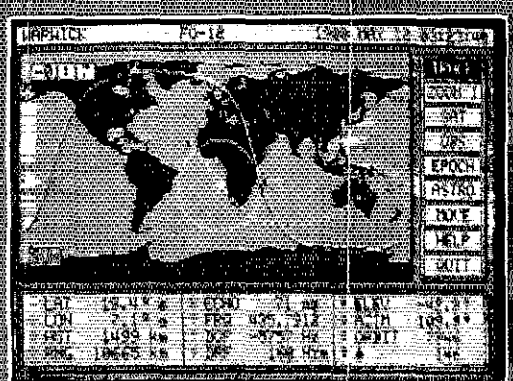

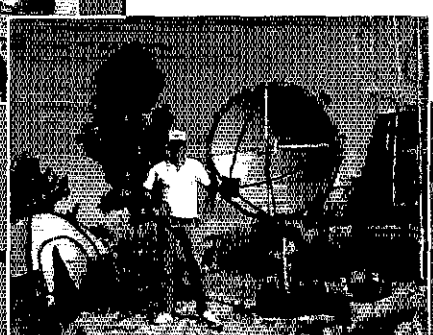

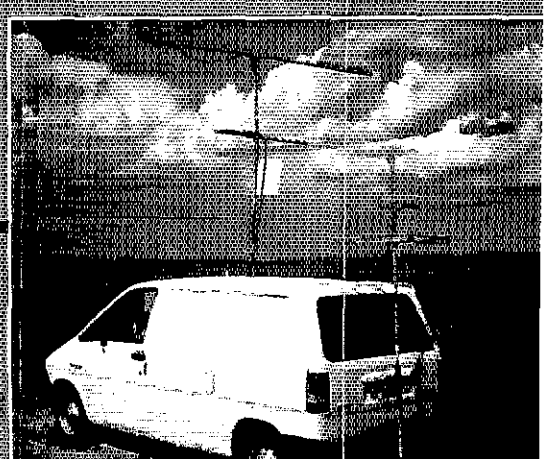

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THE AMERICAN RADIO RELAY LEAGUE

CELEBRATE

the 75th anniversary of ARRL with a new Handbook!

1989 is the 75th anniversary of the founding of the League. What's a better way of celebrating this momentous occasion than with the new 1989 *ARRL Handbook for the Radio Amateur*?

The 1000-page, sixty-sixth edition contains over 2100 tables, figures and charts. The new *Handbook* is better than ever with new text information on phase noise measurement, direct frequency synthesis and spread spectrum communication techniques. The section on repeaters has been updated including a new CW identifier circuit. You'll find new spectrum analyzer and oscilloscope material, as well as several new projects in the test equipment chapter.

As always, we've added a host of new construction projects to this new edition. Just some of the new projects include: A 500-MHz frequency counter, 160 through 10 meter legal limit amplifier, simple CMOS keyer project, digital audio memory keyer and a L/C meter for measuring coil inductance.

But that's not all. You'll find many other popular construction projects that can be built in a weekend such as power supplies and VHF/UHF preamps. For the more ambitious builder there are projects like the 1.8 MHz QSK transverter (there are VHF/UHF transverter projects too!) and there are many amplifier designs to suit your needs from HF through microwaves.

The Handbook has always been famous as a reference for component data and you will find an entire chapter devoted to everything from transmitting tube and transistor specifications to aluminum tubing sizes. Satellite enthusiasts will find that the digital TR sequencer will add operating convenience to your station. Of course, you'll find the most up-to-date information on digital techniques, and the video communications chapter is packed with information not only on SSTV, ATV and FAX but Weather FAX as well. QRP enthusiasts will find the famous "Cubic Incher" transmitter; not much bigger are the QRP SWR indicator and QRP Transmatch. There is also a VXO-controlled 6-watt CW transmitter for your favorite band between 80 and 15 meters. There are a number of useful station accesories that you can build like DTMF encoders and decoders, PIN-diode TR switch, digital PEP wattmeter and SWR calculator, Transmatches and dummy loads.

For $21, *The ARRL 1989 Handbook for the Radio Amateur*, remains an exceptional value for a hardcover technical publication. The price outside the US is $23. For postage and handling, add $2.00 (or $3.50 for insured mail or UPS — please specify)

Here's a brief description of the contents:

INTRODUCTION
1. Amateur Radio
2. Electrical Fundamentals
3. Radio Design Techniques and Language
4. Solid State Fundamentals
5. Vacuum Tube Principles

RADIO PRINCIPLES
6. Power Supplies
7. Audio and Video
8. Digital Basics
9. Modulation and Demodulation
10. Radio Frequency Oscillators and Synthesizers
11. Radio Transmitting Principles
12. Radio Receiving Principles
13. Radio Transceivers
14. Repeaters
15. RF Power Amplifiers
16. Transmission Lines
17. Antenna Fundamentals

MODULATION METHODS
18. Voice Communication
19. Digital Communications
20. Image Communications
21. Special Modulation Techniques

TRANSMISSION
22. Radio Frequencies and Propagation
23. Space Communications

CONSTRUCTION AND MAINTENANCE
24. Construction Techniques
25. Test Equipment and Measurements
26. Troubleshooting and Repair
27. Power Supply Projects
28. Audio and Video Equipment
29. Digital Equipment
30. HF Radio Equipment
31. VHF Radio Equipment
32. UHF Radio Equipment
33. Antenna Projects
34. Station Accessories
35. Component Data

ON THE AIR
36. How to Become a Radio Amateur
37. Assembling a Station
38. Operating a Station
39. Monitoring and Direction Finding
40. Interference

Available in late October or early November

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Twice the size of the previous edition
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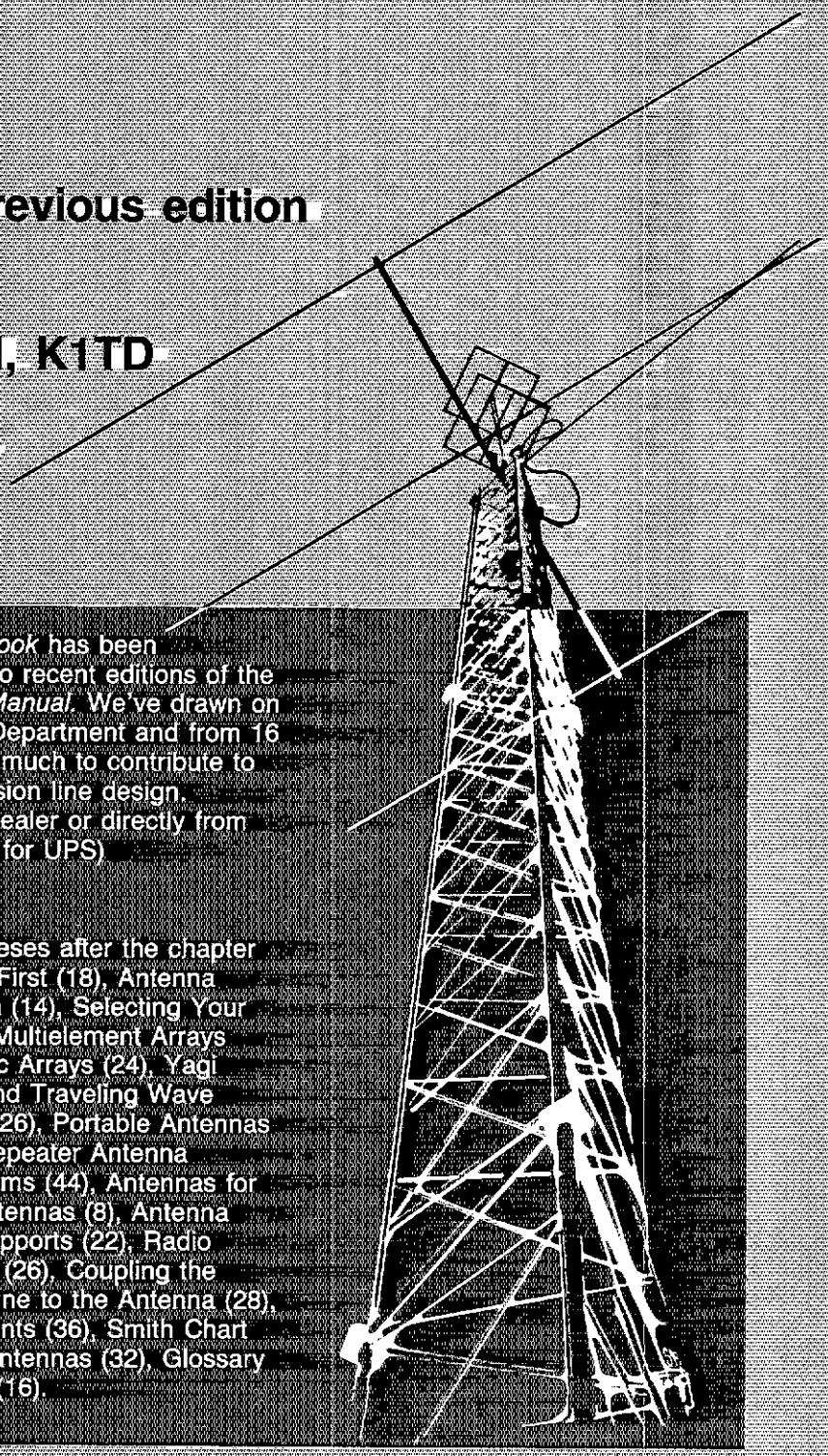

The 15th Edition of *The ARRL Antenna Book* has been dramatically expanded in a similar fashion to recent editions of the *ARRL Handbook* and the *ARRL Operating Manual*. We've drawn on material produced by the ARRL Technical Department and from 16 well-known outside authors who have done much to contribute to the state-of-the-art in antenna and transmission line design. Available in softcover only for $18 at your dealer or directly from ARRL (shipping and handling: $2.50, $3.50 for UPS).

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The number of pages appears in parentheses after the chapter title. Page counts may vary slightly. Safety First (18), Antenna Fundamentals (42), The Effects of the Earth (14), Selecting Your Antenna System (30), Loop Antennas (16), Multielement Arrays (42), Broadband Antennas (12), Log Periodic Arrays (24), Yagi Arrays (26), Quad Arrays (14), Long Wire and Traveling Wave Antennas (18), Direction Finding Antennas (26), Portable Antennas (10), Mobile and Maritime Antennas (30), Repeater Antenna Systems (20), VHF and UHF Antenna Systems (44), Antennas for Space Communications (32), Spacecraft Antennas (8), Antenna Materials and Accessories (20), Antenna Supports (22), Radio Wave Propagation (26), Transmission Lines (26), Coupling the Transmitter to the Line (18), Coupling the Line to the Antenna (28), Antenna and Transmission-Line Measurements (36), Smith Chart Calculations (16), Topical Bibliography on Antennas (32), Glossary and Abbreviations (4), Contents, Index, etc (16).

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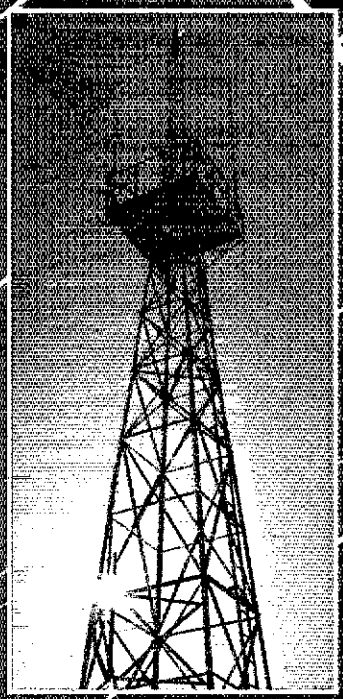

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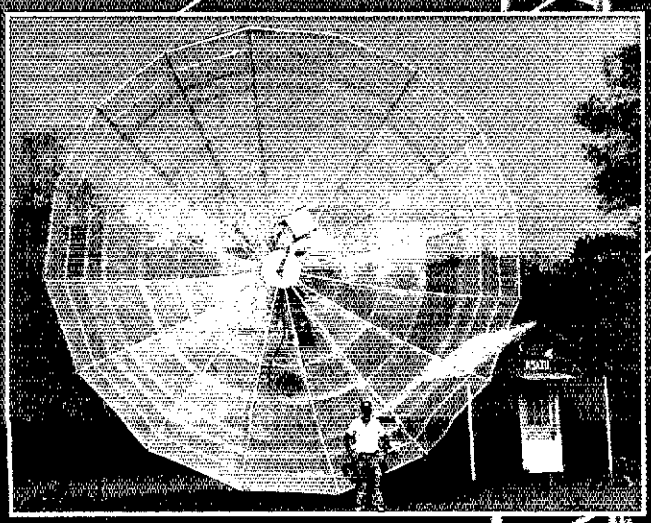

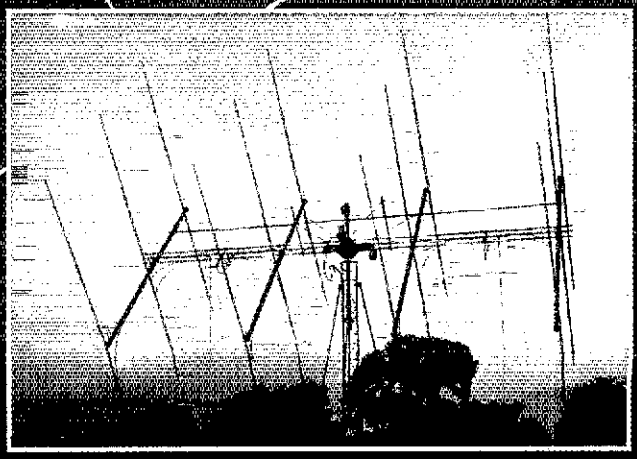

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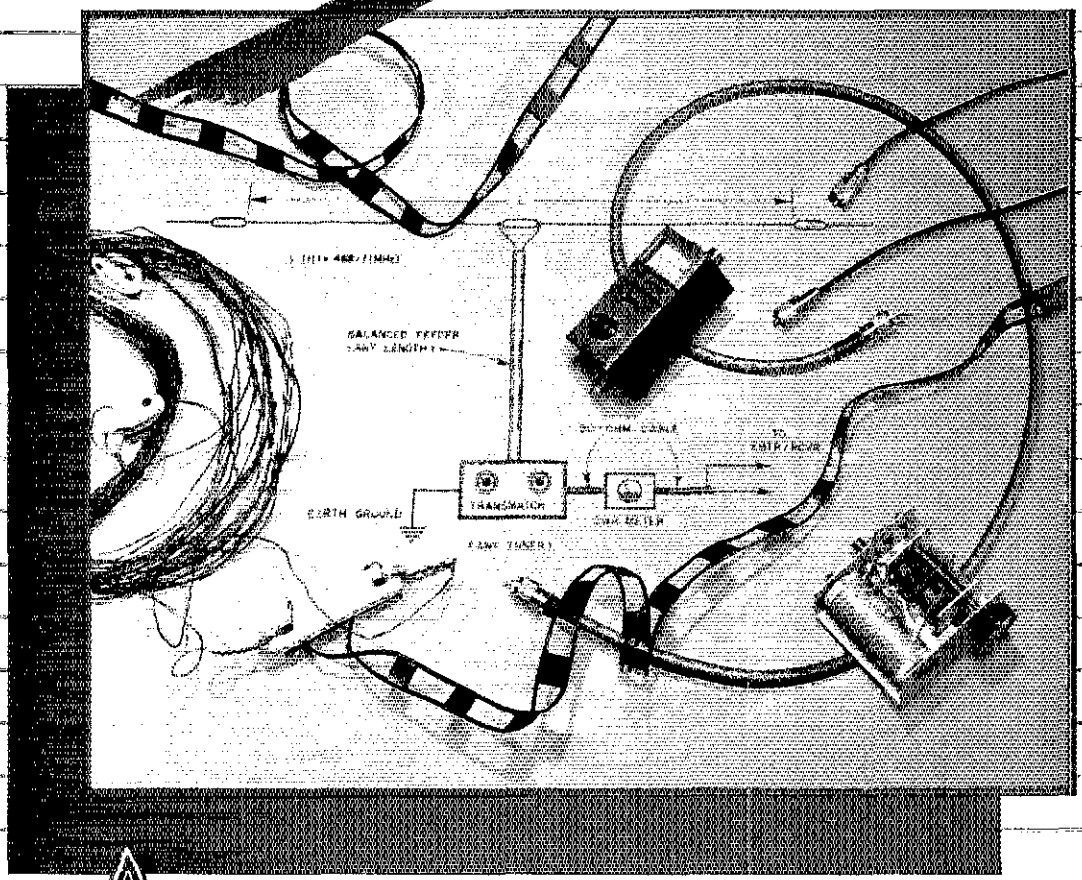

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MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610.

LITTLE Big Horn Net Sundays: 14.067 MHz, 2200 UTC, 21.176 MHz 2230 UTC. Historians and Native Americans welcome. SASE WA2DAC.

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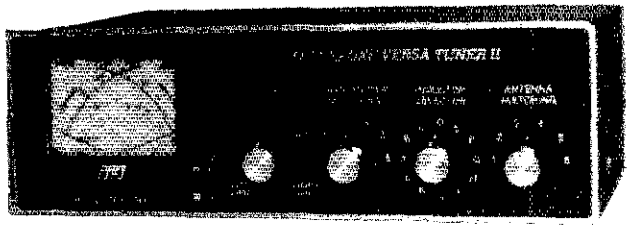
MFJ's BEST 300 WATT TUNER HAS A CROSS-NEEDLE METER THAT READS SWR, FORWARD AND REFLECTED POWER – ALL AT A GLANCE



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 compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A 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. 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome 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 1.8-30 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 give you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

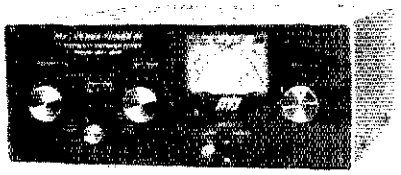
MFJ 12/24 HOUR LCD CLOCKS

MFJ-108 $19.95 **MFJ-107 $9.95**

Huge 5/8 inch bold black LCD numerals make these 24 hour LCD clocks a must for your ham shack. Choose from a dual clock that displays UTC and local time or the single unit that displays 24 hour time.

Mounted in a brushed aluminum frame, these clocks feature 5/8 inch LCD numerals and a sloped face for easy across the room reading. Both also feature easy set month, day, hour, minute and second functions that can be operated in an alternating time-date display mode. MFJ-108, 4½x1x2 inches; MFJ-107, 2¼x1x2 inches. Battery included.

MFJ-962B VERSA TUNER III



MFJ-962B $229.95

Run up to 1.5KW 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 200 and 2000 watt ranges. 6 position antenna switch handles 2 coax lines, random wire and balanced lines. 4:1 balun. 250 pf, 6 kv variable capacitors. 12 position ceramic inductor switch. Smaller size matches new rigs: 10¾ x 4½ x 14 7/8 inches. Flip stand for easy viewing. Requires 12V for light.

MFJ RANDOM WIRE TUNER

MFJ-16010
$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. Tunes 1.8-30 MHz. 2x3x4 inches.

REMOTE ACTIVE ANTENNA

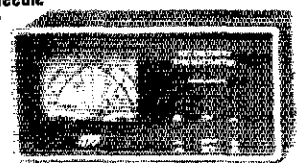
54 inch remote active antenna mounts outdoor away from electrical noise for maximum signal and minumum noise pickup. Often outperforms long-wire hundreds of feet long. Mount anywhere-atop houses, buildings, balconies, apartments, ships.

Use with any radio to receive strong clear signals from all over the world. 50 KHz to 30 MHz. High dynamic range eliminates intermodulation. Inside control unit has 20 dB attenuator, gain control. *Switch 2 receivers and auxiliary or active* antenna. "On" LED. 6 x 2 x 5 in. 50 ft. coax. 12 VDC or 110 VAC with MFJ-1312, $9.95.

MFJ-1024
$129.95

CROSS-NEEDLE SWR/WATTMETER

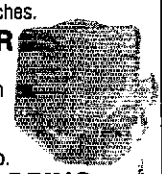
MFJ-815
$59.95



MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power -- all at a single glance! SWR is *automatically* computed -- no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter needs 12 V. ±10% full scale accuracy. 6½x3¼x4½ inches.

COMPACT SPEAKER

MFJ-280 $18.95



Mobile speaker. Tilt bracket on magnetic base. 3½ mm phone plug. Use with 8 and 4 ohm impedances. Handles 3 watts audio.

HANDHELD TELESCOPING ANTENNAS WITH BNC

MFJ-1710, $9.95, 3/8 wave 2 meter. Pocket clip. 5¾" - 24½".
MFJ-1712, $14.95, ¼ wave 2 meter; 5/8 wave 440 MHz, 7¼" - 19".
MFJ-1714, $16.95, ½ wave 2 meter. End-fed halfwave dipole. Shorter, lighter, more gain, less stress than 5/8 wave mounted on handheld. When collapsed it performs like rubber duck.

MFJ "DRY" DUMMY LOADS

MFJ-262
$64.95

MFJ-260
$26.95

MFJ's "Dry" dummy loads are air cooled -- no messy oil. Just right for tests and fast tune up. Non-inductive 50 ohm resistor with SO-239. Full load to 30 seconds, de-rating curve to 5 minutes. **MFJ-260 (300 watt),** SWR 1.1:1,1-30 MHz, 1.5:1, 30-160 MHz, 2½x2½x7 inches. **MFJ-262 (1 KW),** SWR 1.5:1,30-160 MHz 3x3x13 in. Alum. housing.

MFJ DELUXE ELECTRONIC KEYER

MFJ-407B
$69.95

MFJ-407B Deluxe Electronic Keyer sends iambic, automatic, semi-auto. or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8-50 WPM. Speed, weight, tone, volume controls. On/Off. Tune. Semi-auto switches. Speaker. RF proof. 7x2x6 inches. Uses 9 V battery. 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

ANTENNA CURRENT PROBE

***MFJ-206* $79.95**

MFJ Antenna Current Probe lets you monitor RF antenna currents -- no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **Determine if ground** system is effective.
- ***Pinpoint RF leakage** in shielded enclosures.*
- **Locate best place** for mobile antenna.
- **Use** as tuned field strength meter.
- **Indicate transmission line radiation** due to high SWR, poor shielding, antenna unbalance.
- **Detect re-radiation** from gutters, guy wires that can distort antenna field patterns.

Monitors RF current. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strength meter. 4x2x2 inches.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT SATISFIED RETURN WITHIN 30 DAYS FOR A PROMPT REFUND (less shipping).
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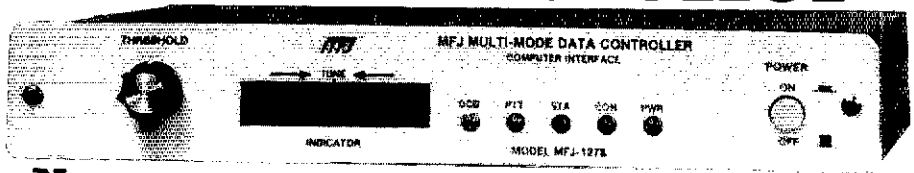
MFJ multi-mode data controller



Now with AMTOR, KISS
eight digital modes for...$249.95

Amateur radio's newest multi-mode data controller -- the MFJ-1278 -- lets you join the fun on Packet, AMTOR, RTTY, ASCII, CW, Weather FAX, SSTV and gives you a full featured Contest Memory Keyer mode . . . you get 8 modes . . . for an affordable $249.95.

Plus you get high performance HF/VHF/CW modems, software selectable dual radio ports, precision tuning indicator, 32K RAM, AC power supply and more.

You'll find it *the most user friendly of all multi-modes.* It's menu driven for ease of use *and* command driven for speed.

A high resolution 20 LED tuning indicator lets you *tune in signals **fast** in any mode.* All you have to do is to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

All you need to join the fun is an MFJ-1278, your rig and any computer with a serial port and terminal program.

You can use the MFJ Starter Pack to get on the air instantly. It includes computer interfacing cable, terminal software and instructions . . . everything you need. Order MFJ-1282 (disk)/ MFJ-1283 (tape) for C-64/128/VIC-20; MFJ-1284 the IBM or compatible; MFJ-1287 for Macintosh, $19.95 each.

Packet

With MFJ's super clone of the industry standard -- the TAPR TNC-2 -- you get **genuine TAPR** software/hardware plus more -- not a "work-a-like" imitation.

Extensive tests published in *Packet Radio Magazine* ("HF Modem Performance Comparisons")prove the TAPR designed modem in the MFJ-1278 gives better copy with proper DCD operation under all tested conditions than the other modems tested.

Hardware DCD gives you more QSOs because you get reliable carrier detection under busy, noisy or weak conditions.

A hardware HDLC gives you full duplex operation for satellite work or for use as a full duplex digipeater. And, it makes possible speeds in excess of 56K baud with a suitable external modem.

A new KISS interface makes MFJ-1278 TCP/IP compatible.

Good news for SYSOPs! New software lets the MFJ-1278 perform flawlessly as a WORLI/WA7MBL bulletin board TNC.

New AMTOR mode!

Now MFJ-1278 has a new AMTOR mode, making it the only controller to feature eight digital modes.

MFJ-1278 transmits and receives AMTOR in the standard 100 baud rate. MFJ gives you all the AMTOR modes: ARQ (Mode A), FEC and Mode S (Mode B).

Baudot RTTY

You can copy all shifts and all standard speeds including 170, 425 and 800 Hz shifts and speeds from 45 to 300 baud. You can *copy not only amateur RTTY but also press, weather and other exciting traffic.*

You can transmit both narrow and wide shifts. The wide shift is a standard 850 Hz shift with mark/space tones of MARS and standard VHF FM RTTY.

ASCII

You can transmit and receive 7 bit ASCII using the same shifts and speeds as in the RTTY mode and using the same high performance modem. You also get Autostart and selectable "Diddle".

CW

You get a Super Morse Keyboard mode that lets you send perfect CW effortlessly from 5 to 99 WPM, including all prosigns -- it's tailor-made for traffic handlers.

A huge type ahead buffer lets you send smooth CW even if you "hunt and peck".

You can store entire QSOs in the message memories, if you wanted to! You can link and repeat any messages for automatic CQs and beaconing. Memories also work in RTTY and ASCII modes.

***A** tone Modulated CW mode turns your VHF FM rig into a CW transceiver* for a new fun mode. It's perfect for transmitting code practice over VHF FM.

An AFSK CW mode lets you ID in CW.

The CW receive mode lets you copy transmitted CW. Even with sloppy fists you'll be surprised at the copy you'll get with its powerful built-in software.

You also get a random code generator that'll help you copy CW faster.

Weather FAX

***You'll** be fascinated as you watch WEFAX signals blossom into full fledged weather maps on your printer.* Other interesting FAX pictures can also be printed -- such as some news photographs from wire services.

Any Epson or IBM graphics compatible printer will print a wealth of interesting pictures and maps.

Automatic sync and stop lets you set it and leave it for no hassle printing.

You can save FAX pictures and WEFAX maps to disk if your terminal program lets you save ASCII files to disk

Pictures and maps can be *printed to screen in real time or from disk* if you have an IBM or Macintosh with the MFJ-1284 or MFJ-1287 Starter Pack.

You can transmit FAX pictures right off disk and have fun exchanging and collecting them.

Slow Scan TV

The MFJ-1278 introduces you to the exciting world of slow scan TV.

You'll not only see what your ham buddies look like but *you can send your own pictures* to them, too.

You can print slow scan TV pictures on any IBM or Epson graphics compatible printer. If you have an IBM or Macintosh you can print to screen in near real time or from disk with the MFJ-1284 or MFJ-1287 Starter Pack.

You can transmit slow scan pictures right off disk -- there's no need to set up lights and a camera for a casual contact.

You can save slow scan pictures on disk from over-the-air QSOs, audio tapes and other sources if your terminal program lets you save ASCII files.

The MFJ-1278 transmits and receives 8.5, 12, 24, and 36 second black and white format SSTV pictures using two levels.

Contest Memory Keyer

***Nothing** beats the quick response of a memory keyer during a heated contest.*

You'll score valuable contest points by completing QSOs so fast you'll leave your competition behind. And you can snag rare DX by slipping in so quickly you'll catch everyone by surprise.

You get iambic operation with dot-dash memories, self-completing dots and dashes and jamproof spacing.

Message memories let you store contest RST, QTH, call, rig info -- everything you used to repeat over and over. You'll save precious time and work more QSOs.

You get automatic incrementing serial numbering. In a contest it can make the difference between winning and losing.

A weight control lets you penetrate QRM with a distinctive signal or lets your transmitter send perfect sounding CW.

More Features

Turn on your MFJ-1278 and it sets itself to match your computer baud rate. Select your operating mode and the correct modem is automatically selected.

Plus . . . printing in all modes, threshold control for varying band conditions, tune-up command, lithium battery backup, RS-232 and TTL level serial ports, watch dog timer, FSK and AFSK outputs, output level control, speaker jack for both radio ports, test and calibration software, Z-80 at 4.9 MHz, 32K EPROM, and socketed ICs. FCC approved. 9x1½x9½ in. 12VDC or 110 VAC.

Get yours today and join the fun crowd!

New Firmware Update

A new KISS/AMTOR Firmware update is available if you already have your MFJ-1278. Contact your dealer or MFJ to get your upgrade today.

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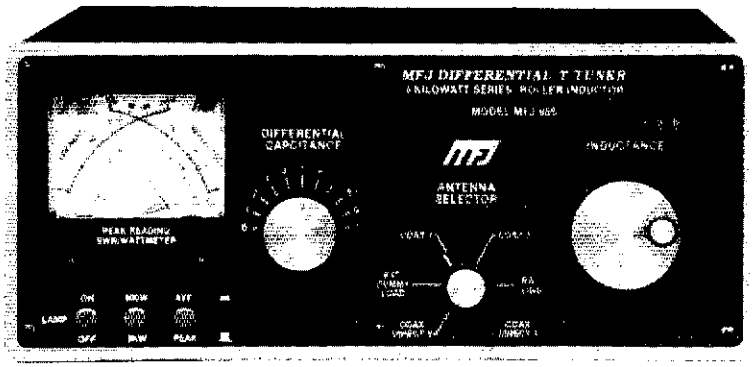
MFJ 3 KW Roller Inductor Tuner

. . . lets you get your SWR down to *absolute* minimum -- something a tapped inductor tuner just can't do . . .

. . . *plus* you get a ***peak* reading** Cross-Needle SWR/Wattmeter, 6-position antenna switch, balun for balanced lines and 1.8-30 MHz coverage...$239.95



NEW

MFJ-986

$239.95

Made in U.S.A.

MFJ's innovative new Differential-T Tuner™ uses a differential capacitor that makes tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only *one* setting.

The new MFJ-986 is a rugged no-compromise 3 KW PEP Roller Inductor antenna tuner that covers 1.8-30 MHz continuously, including MARS and all the WARC bands. **The roller inductor lets you tune your SWR down to the absolute minimum** -- something a tapped inductor tuner just can't do.

A 3-digit turns counter plus a spinner knob gives you *precise* inductance control -- so you can quickly return to your favorite frequency.

You get a lighted Cross-Needle meter that not only gives you SWR, forward and reflected power at a glance -- but also gives you a **peak-reading** function! A new directional coupler gives you even more accurate readings over a wider frequency range.

You get a 6-position ceramic antenna switch that lets you select two coax lines and/or random wires (direct or through tuner), balanced line and external dummy load.

A new **current** balun for balanced lines minimizes feedline radiation that causes field pattern distortion, TVI and RF in your shack. Ceramic feedthru insulators for balanced lines withstand high voltages and temperatures.

New Antenna Tuner Technology

MFJ brings you **three innovations** in antenna tuner technology: a new *Differential-T*™ circuit simplifies tuning; a new *directional coupler* gives you more accurate SWR, forward and reflected power readings; and a new *current balun* reduces feedline radiation.

Differential-T Tuner™: A New Twist on a Proven Technology

By replacing the two variable capacitors with a single *differential capacitor* **you get a wide range T-network tuner with only *two* controls** -- the differential capacitor and a roller inductor.

That's how you get the new MFJ Differential-T Tuner™ that makes tuning easier than ever, gives you minimum SWR at only one setting and has a broadband response that ends constant re-tuning. You'll spend your time QSOing instead of fooling with your tuner.

The compact 10¾ x 4½ x 15 inch cabinet has plenty of room to mount the silver-plated roller inductor away from metal surfaces for maximum Q -- you get high efficiency and more power into your antenna.

The wide spaced air gap differential transmitting capacitor lets you run a full 3 KW PEP -- no worries about arcing.

A New Directional Coupler: Accurate SWR and Power Reading

MFJ's Cross-Needle SWR/Wattmeter gives you more accurate SWR and power readings over a wider frequency range with no frequency sensitive adjustments.

That's because MFJ's new directional coupler gives you up to an order of magnitude higher directivity and coupling factor than conventional circuits . . . *plus* it gives you a flat frequency response that requires **no** frequency compensation.

The cross-needle meter lets you read forward/reflected power in 2 ranges: 200/50 and 2000/500 watts. The meter lamp is front-panel switched and requires 12 volts.

A switch lets you select peak or average power readings.

A New Current Balun: Reduces Feedline Radiation

Nearly all commercially built tuners use a "voltage" balun. The "voltage" balun forces the *voltages* to be equal on the two antenna halves. It minimizes unbalanced currents *only* if the antenna is perfectly balanced --not the case with practical antennas.

The MFJ-986 uses a true **current balun** to force equal *currents* into the two antenna halves -- *even* if your antenna is not perfectly balanced -- so you get minimum unbalanced currents.

The *current* balun gives superior balance over the "voltage" balun.

Minimum unbalanced current reduces field pattern distortion -- which concentrates your power for a stronger signal -- *plus* it reduces TVI and RF in your shack caused by feedline radiation.

The MFJ-986 Differential-T Tuner™: Get *absolute minimum* SWR

Get the tuner that incorporates the latest innovations by the world's leader in antenna tuner technology.

See your dealer today for the new MFJ-986 Differential-T™ 3 KW Roller Inductor Tuner. Include $10 shipping/handling if ordering direct.

WHY CHOOSE AN MFJ TUNER?

Hard-earned Reputation: There's just no shortcut. *MFJ is a name you can trust* -- more hams trust MFJ tuners throughout the world than all other tuners combined.

Proven Reliability: *MFJ has made more tuners for more years than anyone else* -- with MFJ tuners you get a highly-developed product with proven reliability.

First-rate Performance: MFJ tuners have earned their reputation for being able to match just about anything -- *anywhere.*

One full year *unconditional* guarantee: That means we will repair or replace your tuner (at our option) *no matter what* for a full year.

Continuing Service: MFJ Customer Service Technicians are available to help you keep your MFJ tuner performing flawlessly -- no matter how long you have it -- just call 601-323-5869.

Your very best *value:* MFJ tuners give you the most for your money. Not only do you get a *proven* tuner at the lowest cost -- you also get a one year *unconditional* guarantee and *continuing* service. That's how MFJ became the world's leading tuner manufacturer -- by giving *you* your very best *value.*

Choose your MFJ tuner with confidence! You're getting proven performance and reliability from the most trusted name in antenna tuners. Don't settle for less.

Call or write for a *free* full-line MFJ catalog with all 10 of our tuners and tons of ham radio accessories!

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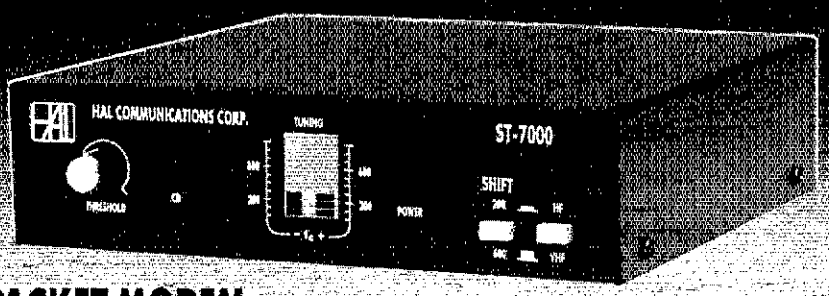
GREAT HF PACKET DESERVES A GOOD MODEM



ST-7000 HF PACKET MODEM

The verdict is in and the opinion of HF Packet operators is clear . . . the HAL ST-7000 is a winner!

The HF Packet communications world is not forgiving. Selective fading, noise, and interference coupled with poor tuning indicators and simplistic phone line modems contribute to the poor performance of packet controllers on HF.

The ST-7000 makes HF Packet Work

The ST-7000 is designed specifically to greatly improve the 300 baud HF Packet performance of all packet and multi-mode controllers. Techniques developed for our government and military ST-8000 (MD-1232/G) HF modem are applied to the special problems of HF Packet radio. It's simple . . . just connect the ST-7000 to your existing packet or multi-mode controller . . . and you're ready to send data, **not** repeats.

The "standard" 200 Hz shift mode of the ST-7000 has a 6-pole input bandpass filter, an optimized detector circuit, plus a 40 db AGC system. These design features make 200 Hz HF Packet work!

The ST-7000 also includes a 600 HZ shift mode for even better performance than is offered by the 200 HZ "standard" shift mode.

Other features of the ST-7000 include:

- A new tuning indicator design assures quick and accurate tuning of HF Packet signals
- CD (carrier detect) and threshold level circuits designed specifically for 300 baud HF Packet
- A sine-wave synthesized transmit tone generator assures minimum phase distortion and splatter
- Easily interfaces with all packet and multi-mode controllers via RS-232C, TTL, or TNC VHF audio tones

Best of all, the ST-7000 is manufactured and tested entirely in the United States by HAL Communications, a company you've known and trusted for years.

The ST-7000 is available directly from the factory at a price of $299.00, which includes a 12VDC, 0.25A power supply.

WRITE OR, BETTER YET, CALL TODAY TO ORDER YOUR HAL ST-7000.

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WANTED: Old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Avenue, Milw., WI 53204.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201, 818-242-8961.

WANTED: *QST* VOLUME 1. W6ISQ, 82 Belbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brand-name, Model No., SASE Scaramella, Box 1, Woonsocket, RI, 02895-0001.

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BUY, Sell, Collect and Restore early tube equipment? Early receivers, tubes and telegraph gear? Join the Antique Wireless Association which sponsors old-time "meets", flea markets, museum and journal with technical articles and free want ads. Membership and annual dues only $10. Write for information and Museum hours: Bruce Kelley, W2ICE, Route 3, Holcomb, NY 14469.

WANTED: Hallicrafter silver panel Skyriders and other very old or unusual Hallicrafter equipment, parts, etc. Chuck Dachis, "The Hallicrafter Collector", 4500 Russell Drive, Austin, TX 78745.

MICROPHONES and related memorabilia used in radio/TV broadcasting prior to 1960 wanted. Cash paid: trade terms available. Write: James Steele, 160 West 77th Street, New York, NY 10024-6942.

MANUALS For most hamgear made 1935-1970, plus Kenwood. No quotes. Our current catalog "H" at $1 required to order. Over 2,000 models. Hi-Manuals, P.O. Box H-802, Council Bluffs, IA 51502.

WANTED: WWII Military Radios and Accessories. Need ATD Tuning Units, DY43 Dynamotor, BC 222/223 Manuals, ART-13 Connectors, ARR/41/MT-1518 Mount, ATB, GRC 106 Receiver, Hallicrafters HT20. Charlie, 501 Mystic Valley Pkwy., Medford, MA 02155.

WANTED Books: Pre-1900 Electricity and Telegraphy, Pre-1925 Radio, Pre-1940 Television. Books, Magazines or any other related literature. Jim Kreuzer, N2GHD, 6270 Clinton Street, Elma, NY 14059, 716-681-3186.

WANTED: Pre-WW2 Pan American Airways aircraft transmitters/receivers and schematics/manuals for same; Pre-WW2 Speed-X bugs. Conly, 819 Henrietta Avenue, Sunnyvale, CA 94086.

WANTED: Old Hi-Fi Gear, Manuals, Literature, Etc. For my collection. Life ARRL Member. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53220-0803, 414-545-5237.

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E. F. JOHNSON Transmitters, Literature, and Accessories wanted for my station. Will pickup. Len Crispino, Box 702, Hudson Falls, NY 12839, 518-638-8199.

TELEGRAPH Items Bought By Collector: old or unusual keys, bugs, sounders, meters, pre-1920 books, franks, etc. Larry Nutting, WD6DTC, 4025 Slate Court, Santa Rosa, CA 95405, 707-539-1883.

BUY/SELL Pre-1930 *QST*. Richard Titus, NV2C, 231-9 Lucas Lane, Voorhees, NJ 08043, 609-772-0316.

COMPLETE restoration of all tube ham receivers, including full alignment. All work 100% guaranteed, FCC licensed. Contact Healy, Classic Radio Service, Box 764, Woodacre, CA 94973, 415-488-4596.

I PAY CASH for new and used vacuum tubes, especially vintage and transmitting types. Randy Nachtrieb, WA6GJA, 6392 Park Avenue, Garden Grove, CA 92645, 714-897-9351.

SELL: Technical Material Corp. GPR-90 General Coverage Receiver with GSB-1 SSB Adapter and original Speaker, all mint, $275. Gonset GSB-100 SSB/CW 80-10 transmitter, mint, $125. K9ZTV, 309-582-5145.

TELEGRAPH BUGS, old keys, keyer paddles sought for private collection. Donations of parts, inoperable items, or memorabilia appreciated. Write: John Hensley, WJ5J, 5054 Holloway Avenue, Baton Rouge, LA 70808.

WANTED: Older Model Bugs and Canadian Dow Keys. Smiley White, WB4EDB, P.O.B. 5150, Fredericksburg, VA 22403.

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2-117	2m	10-170	299
2-417	2m	45-170	299
3-22	220	2-20	112
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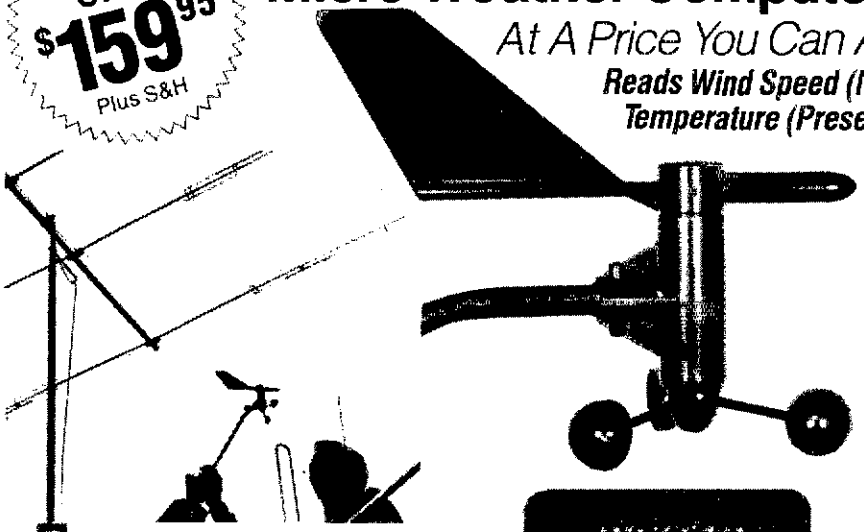

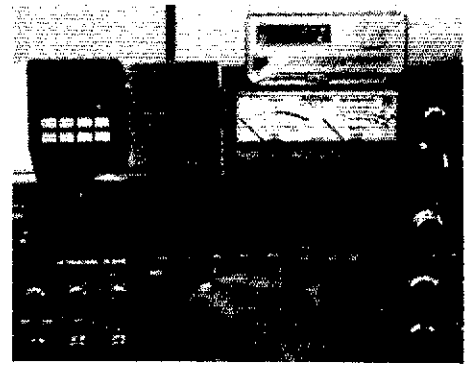

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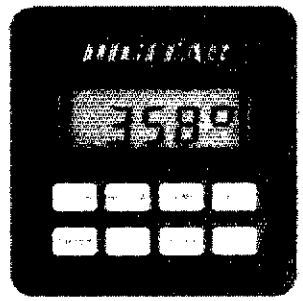

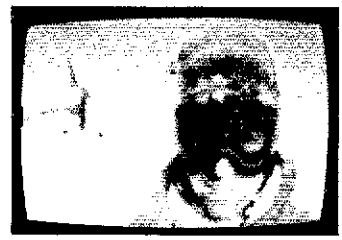

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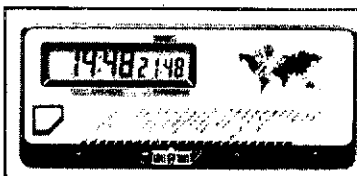

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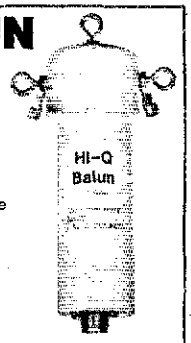

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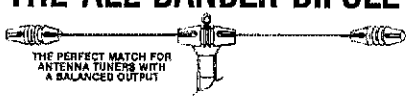

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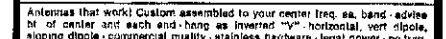

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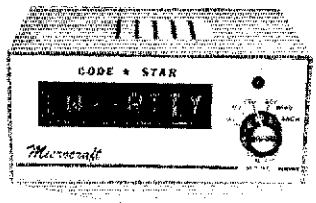

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FOR SALE: 52/75 Non-Inductive Resistors, Jennings V/V's, Chokes, Transformers, Tubes, Sockets, Tank Coils, and other Linear Parts. Send $ one dollar for 20 page list. Bill, KA7VJO, P.O. Box 2030, Upland, CA 91785, 714-986-3515.

ATARI CW, RTTY, ASCII, and Packet Programs for 8 bit models. Each program available on disk for $15 and on cartridge for $35. SASE for info. Electrosoft, 1656 South California Street, Loveland, CO 80537.

WANTED: Vomax + 8874 + Swan WM3000. K4NBN, "No Bad News".

RIGID Plexiglas Cover for following keys: Bencher $9.95; MFJ-422 $9.95; Vibroplex Iambic $11.95. George Chambers, KØBEJ, 302 S. Glendale Avenue, Coffeyville, KS 67337.

FOR SALE: Henry 2KD-Classic, 32S-1 (new), Antenna Tuners, Dummy Loads, Groth Turn Counters, Yaesu Model YR-901 CW/RTTY Reader (new), Swan 350 Transceiver (matching P/S), Swan 500-CX Transceiver (matching P/S), Collins KWM-2A (P/S), 75A-1, 32V1, Kenwood 21AT (many extras), Heathkit SB-104A, SB-634A, SB-614, SB-604, and HP-1144A (all new), many others. SASE for list. Bill, KA7VJO, P.O. Box 2030, Upland, CA 91785, 714-986-3515.

HAM HOLIDAY in VP5. Join cycle 22 fun from rare DX QTH Turks & Caicos Islands. We supply transceiver, antenna, process license and offer accomodations as low as 7 nights $390 each double occupancy in private bungalow. Direct Pan Am service, 80 minutes Miami. Details VP5D, P.O. Box 100858, Ft. Lauderdale, FL 33310.

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INTERNATIONAL Radio Inc. ICOM, Kenwood, & Yaesu Newsletters Available. Send SASE ($.45) for details. International Radio Inc., 751 S. Macedo Blvd., Port St. Lucie, FL 34983, 407-879-6868.

ATLAS RADIO - Swan Repair Service: Factory trained technicians, fast service and reasonably priced. RF Parts Co., 1320 Grand, San Marcos, CA 92069, 619-744-0720, 800-854-1927.

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SALE: Ten-Tec Omni 546C, 280PS, Filters, Xtals, VFO, Tuner, $780. WB8HLI, 419-447-8229.

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NATIONAL SW-3 Wanted. Marvin Faupel, WØGYA, 400 4th Street SE, Altoona, IA 50009, 515-967-4627.

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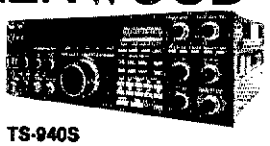

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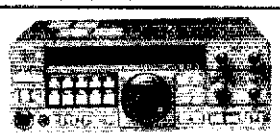

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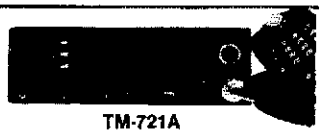

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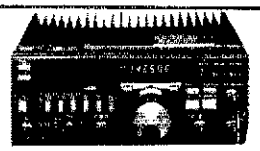

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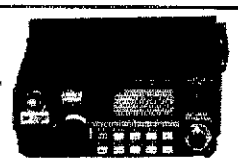

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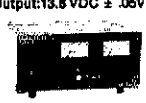

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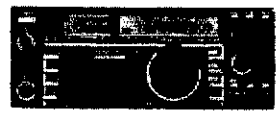

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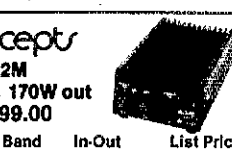

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3-211	220	2-110W	$299.00
3-312	220	30-120W	$264.00

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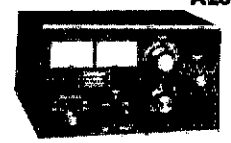

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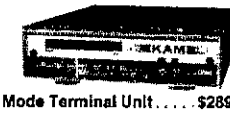

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NICADS new AA 500 MAH Quick Charge. Ten for $12 plus $1.80 shipping. Twenty for $23 plus $2.45 shipping. Raymond Richard, 5113 Town Ridge, Middletown, CT 06457.

WANTED: CE-600L Linear. Good condition and working. Chip Tilton, K5RSG, 513 Dorrington, Metairie, LA 70005, 504-456-0212.

WANTED: Yaesu FT-680R 6M Xceiver. Any condition. QSL w/price or call collect (best time 7-11 PM EST). Bob, KI4MB, 6608 N 18th Street, Arlington, VA 22205, 703-533-0650.

UNLOCK THE Power Of Your Heath Counter. IM-2400 owners, easy one evening kit yields two decades greater resolution. Measure things you thought you'd have to buy another counter for. You won't believe the difference. SASE for info or, $12.95 for kit #1093 to L & R Distributing Inc., P.O. Box 4643, Northbrook, IL 60065-4643.

SWAN Cygnet 270B 80-10M, $150. UCS 300PF Vacuum Capacitor, $75. Genave GTX200 (needs work), $40. Robot 70A/80B, $100. Ham 4 Rotor/Control, $50. WA7WOC, 602-488-9215.

WANTED: Bencher Paddle. J. Waskowitz, 560 83rd Street, Brooklyn, NY 11209.

MACKET: MacIntosh Packet Program, $42.45. Now supports RTTY and PK-232 HOST MODE. Contact WD8PUH, S. Fine Software, P.O.B. 6037, State College, PA 16801.

'N-TENNA Quad Kits, Boomless Tribanders, $84.50. Box 5332, Hickory, NC 28603.

KWM-380/HF-380 Repairs. Kirby, K7WOC, 713-320-2324.

WANTED: Collins KWM-2A, power supply, accessories, Heath Mohican, Apache, also Drake TR-4CW, E.F. Johnson Ranger II, Hammarlund SP-600. Very good to excellent shape only. Steve Stutman, KL7JT/1, 27 Lillian, Sudbury, MA 01776, 617-494-9393.

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QRP CW Xmtr Kits and Components. SASE brings catalog. W1FB, Box 250, Luther, MI 49656.

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HAM PROGRAMS for Commodore, IBM-PC, Apple, TI99/4A. Send legal size SASE: EPO Software, 7805 NE 147th Avenue, Vancouver, WA 98682.

SELL: Kenwood TS820S w/CW Filter, MC50 Mic., Heath 2060 Antenna Tuner, Dentron W-2 SWR & Watt Meter. With all manuals in original cartons. Mint condition. I ship UPS—call Louis, 213-836-3102 after 5:00 PM PST.

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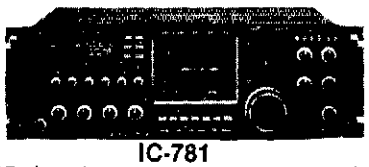

IC-781

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IC-735 Gen Cvg Xcvr	1099.00	Call $
IC-751A Gen. Cvg. Xcvr	1699.00	Call $
IC-575A 10m/6m Xcvr	1399.00	Call $
Receivers		
IC-R7000 25-1300 + MHz Rcvr	1199.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	999.00	Call $
VHF		
IC-228A New 25W Mobile	509.00	Call $
IC-228H New 45W Mobile	539.00	Call $
IC-275A All Mode Base w/PS	1299.00	Call $
IC-275H All Mode Base 100w	1399.00	Call $
IC-28A FM Mobile 25w	469.00	Call $
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IC-2AT FM HT	319.00	Call $
IC-02AT FM HT, HP	409.00	Call $
IC-μ2AT Micro HT	329.00	Call $
IC-900 Six Band Mobile	639.00	Call $
IC-2GAT New 2M HT	429.95	Call $
UHF		
IC-475A All Mode 25w	1399.00	Call $
IC-48A FM Mobile 25w	509.00	Call $
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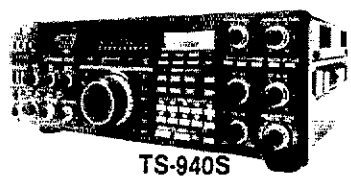
IC-04AT FM HT	449.00	Call $
IC-μ4AT 440 FM HT	369.00	Call $
IC-3200A FM 2m/70cm 25w	649.00	Call $
IC-4GAT	449.95	Call $
IC-32AT Dual Band Handheld	629.00	Call $
New 440 HT	499.94	Call $
220 MHZ		
IC-375A All-Mode, 25w, Base Sta	1399.00	Call $
IC-38A 25w FM Xcvr	489.00	Call $
IC-37A FM Mobile 25w	499.00	Call $
IC-3AT FM HT	349.00	Call $
IC-03AT Deluxe HT	449.00	Call $
1.2 GHz		
IC-1271A All Mode 10w	1269.00	Call $
IC-1200 FM, 10w Mobile	699.00	Call $
IC-12AT Deluxe 1w HT	473.00	Call $



TS-940S

HF Equipment	List	Juns
TS-940S/AT Gen. Cvg Xcvr	$2449.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1379.95	Call $
TS-140S Compact, Gen. Cvg Xcvr	929.95	Call $
TS-680S HF Plus 6m Xcvr	1099.95	Call $
TL-922A HF Amp	1649.95	Call $
Receivers		
R-5000 100 kHz-30 MHz	999.95	Call $
R-2000 150 kHz-30 MHz	749.95	Call $
VHF		
TS-711A All Mode Base 25w	1029.95	Call $
TR-751A All Mode Mobile 25w	649.95	Call $
TM-221A Compact FM 45w	439.95	Call $
TM-2530A FM Mobile 25w	479.95	Call $
TM-2550A FM Mobile 45w	499.95	Call $
TM-2570A FM Mobile 70w	599.95	Call $
TH-215A, 2m HT Has It All	379.95	Call $
TH-25AT 5w Pocket HT NEW	349.95	Call $
TM-721A 2m/70cm, FM, mobile	699.95	Call $
New TM 621A 2M/220	699.95	Call $
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TS-811A All Mode Base 25w	1,229.95	Call $
TR-851A 25w SSB/FM	749.95	Call $
TM-421A Compact FM 35w	449.95	Call $
TH-415A 2.5w 440 HT	399.95	Call $
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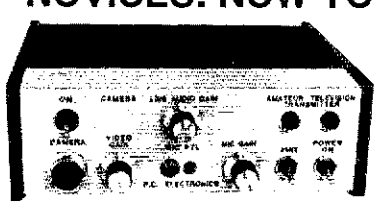

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HALLICRAFTERS SR-400A Transceiver with PS-500A AC Power Supply, HA-20DX VFO and Spare Tubes. $175 plus shipping. W1QUT, 22 Woodridge Road, Wayland, MA 01778, tel. 508-358-4953.

WANTED—Homemade Antenna Tuner sold for me by W5IWE at Dallas sidewalk sale several years ago. Contains roller inductance and has both coax fitting and binding post for output. W5SXW, 817-338-2853.

DX FINDER for the Apple // Computers. Provides over 400 beam headings, distances, plus data files for PFS: File and Appleworks. Only $14.95 (plus $3 ship) from Kraig D. Pritts, Data Services, 76 West Elizabeth Street, Skaneateles, NY 13152.

KENWOOD TS120S, with microphone, excellent, $375. Barker & Williamson 300 watt antenna tuner, new, $65. Mike, WB6CNE, 818-707-0083.

WANTED: Drake L4B Linear. R4C Receiver w/Tube Mixer, 4NB Noise Blanker. DJ8GO, 914-635-8592.

SPACIOUS 5 year old home For Sale, located 10 mins. south of San Francisco, panoramic ocean view. Wall to wall carpeting, fireplace; deck & spa overlooking garden with fruit trees & flowers. Huge all-electric kitchen. 70 ft. motorized telescoping tubular tilt-over tower, 2 years old. Explorer 14 (3 band 4 element) beam with rotatable 40 meter dipole included with sale of house. Home can be used either as a 4 bedroom, 2 bath, with an extra 2 bedroom 1 bath apartment, or as a 6 bedroom home with 3 baths & family room. Lyon, KF6ED, 415-355-9195.

YAESU FT-690R Mk.II six meter all-mode, like new, $425 postpaid; Heath IM-2410 freq. counter to 225 MHz, $90. KI4SU, 216 Harrogate, Longwood, FL 32779, 407-682-5431.

FOR SALE: Collins F455B-21 mechanical filter; with three crystals for upper, center, and lower passband points. W8GDQ, Wellington, OH 44090.

WANTED: Atlas 210X in working condition. Send description and price to W6FKF, 1375 Gilmore Street, Mountain View, CA 94040. All letters answered.

WRITTEN EXAMS Supereasy. Memory aids from psychologist/engineer cut studytime 50%. Novice, Tech, Gen: $5 each. Advanced, Extra: $10 each. Moneyback guarantee. Bahr, P.O. Box 15433-G7, Rioranco, NM 87174.

REPEATER—Deluxe UHF machine with RC-850 controller, Spectrum RX (.10 uv holds squetch open), 40 watt TX both in RF tight boxes, Wacom BPBR duplexer, Telex circulator/isolator, Telex band pass cavity for RX, frequency-agile 30 watt 2 meter remote base, fixed 220 remote base, programmable CTCSS (PL) decoder. All controller leads are labelled. RF components are wired using Molex connectors. Just "plug and talk". Over $5400 invested. System is currently in full service on 440.525 MHz. Reasonable offer accepted. WA6ZHE, 415-832-6311.

DRAKE R7, mint, 3 filters, $800 firm. Can see Washington DC area or ship. KP4AZ, P.O. Box 56, Humacao, PR 00661, 809-852-2100.

FOR SALE: ICOM 251A $250, ICOM 451A $250, Mirage D1010 100 Watt Amp $150, KR-500 Elevation Rotor $100, Welz SWR Power Meter Model SP-45M 140-470 MHz $50. W1OER, 617-891-5287.

QTH—DIX HILLS, Long Island - farm ranch on wooded acre, mother-in-law apartment with complete living, kitchen and bath facilities on lower level. Total of 5 bedrooms, 3 baths, shop, radio shack, 2-car attached garage and oversized separate garage. At 300 feet above sea level, this location is one of the highest amateur radio sites on the Island. Complete with 50 and 40 foot towers with antennas for operation on all bands 160 meters thru 450 MHz. $400K by owner. W2HD, 516-549-5131.

SELL: Heath SA-2500 Auto-Tune Antenna Tuner, $425 (mint). W9HF, 6203 Devils Hollow, Ft. Wayne, IN 46804, 219-672-2377.

SELL: converter transformer for mobile power supply, 1380 VDC, $12. 1938 Radio amateur handbook, like new, $8. Wouff Hong cast iron 1938, $25. W6BIH.

WD4BUM MOBILE Antennas. 5/8 Wave Magnet Mount, 2 meter or 220; $22.50. Quarter Wave Magnet Mount; $13. Ham Sticks for HF Mobile; $15. Add $3 per order for shipping. Many other bargains. Send for catalog. Dealer inquiries welcome. Lakeview Company, P.O. Box 5706, Anderson, SC 29623, 803-226-6990.

SONY ICF-2002 Synthesized Receiver 153 KHz - 30 MHz, AM, FM, SSB, CW. $200. W3FYC, P.O. Box 1296, North Wales, PA 19454, 215-362-2119.

COLLINS 75S-3C, 32S-3, 312B-4, 516-F2, mint cond., new cables, manuals, $1500. Louie Davis, W5QQU, Box 564, Hughes Springs, TX 75656, 214-639-2749.

TRANSMITTING Tubes—4D32, 812A, 813, 304TH $10 plus $2 shipping; RK38, RK28A, 807, 809, 811A, 815, 829B, 872A $5 plus $2 shipping. W1QUT, 22 Woodridge Road, Wayland, MA 01778, tel. 508-358-4953.

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COLLINS: 75 SSB, 32S3, 516F2 (all circa 1972 - r/e), $1600; 189 A-2 Patch, $50; 302C-2 Watt Meter, $50; KWS1, P8 Parts, Signal One CX7-B, $1200. W1FBG, 603-964-6658.

FC-301D Antenna Tuner Wanted. KA1NRW, call collect 508-879-1381.

TEN-TEC Paragon, all filters, 705 mike, 960 power supply. Absolutely mint, virtually unused, late serial, $1875. W3ALZ, 301-384-2969.

R-390A Receiver Parts: Info SASE. CPRC-26 military manpack radio, 6 meter FM, with antenna, crystal, handset: $22.50, $42.50/pair. Military-spec TS-352 voltohm/multimeter, leads, manual: $12.50. $4.50/piece shipping, $9 maximum. Baytronics, P.O. Box 591, Sandusky, OH 44870.

DIGICOM/64 Packet Operations Manual. Goes beyond documentation. $6 ppd. N3EFN, RD 2, Box 40-31, Guys Mills, PA 16327.

FOR SALE: Mirage B23A 2 Meter Linear @ $85. ICOM IC-502 Trancvr. @ $175, includes IC-3PS ICOM Power Supply. Hickok 5" Scope @ $35. Heathkit Condenser Checker, $20. Eico Signal Generator, $25. 15 Amp Variac, $25. One pair 110 Volt Selysns, $20. Complete Heathkit Security System with Siren, $90. Magnum Six Processor for Collins S Line, $25. Syntec Pre-Amp, Automatic 10-80 Meters, $49. All good condition and FOB CT. W3NV, 12 Westborough Drive, Simsbury, CT 06089, 203-651-0351.

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YAESU FL-7000 Solid State Amplifier with Automatic Antenna Tuner Built-In. 1200 Watts PEP Input. Automatic Remote Antenna Switch Included. Like new condition, $1295. Dick, K7RP, 17393 Grandview Court, Lake Oswego, OR 97034, 503-635-7895.

FOR SALE: Kenwood TS-430S, FM Unit, 1.8 MHz SSB Filter, Mobile Mount, MC-30S Mic, $600. PS-30 Power Supply, $110. Allan Moser, W7GYR, 2800 Samuels Road, Sandpoint, ID 83864, 208-263-3726.

SELLING: Ten-Tec Model 229A Antenna Tuner with 3 KW Balun. Mint condition, $185. W4YHB, phone 407-732-1673.

FOR SALE: Kenwood TS-530SP with 500 Hz CW and 1.8 KHz SSB Filters, $650. ICOM IC-471A, $575. Dave, WD2AHD, 201-738-5260.

WANTED—PL-172 made by Penta for use in the Hallicrafter's HT-33A. Used OK if functional. Also want to find an 8877. Gerald Parker, K0GPX, 3420 Birdie Street NE, Fargo, ND 58102.

WANTED: Heath SB-10 for DX-100. W6PEA, 4353 Brown Road, Inyokern, CA 93527.

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KENWOOD TS-520, MC-50 Mic, CW Filter, Mint condition, $395. WB2OKO, Margaretville, NY 12455, 914-586-4669.

FOR SALE: Kenwood Dual Bander Model TM721A, like new, $450. (Reason for selling - have too many dual banders.) ICOM 4AT, good condition, $135. Mirage B23 2M Amp 2 In 30 Out, good condition, $25. I'll pay shipping. Bob, KU5J, 24 W. Compress, Artesia, NM 88210, 505-746-6514.

WANTED: 2M FM Mobile Xcvr. Prefer 45 W; 25 W okay. Must have DTMF & PL, or Capability of such. Jim Shook, KB8BIH, 11440 Sioux, Redford, MI 48239.

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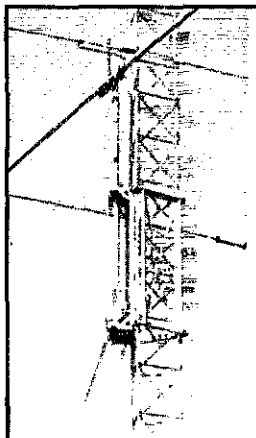

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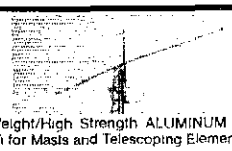

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A147-11	11 element 146-148 MHz beam	$50.50
A147-22	22 element "Power Packer"	$141.75
A144-10T	10 element 2 mtr. "Oscar"	$54.00
A144-20T	20 element 2 mtr. "Oscar"	$77.50
215WB	15 element 2 mtr. "Boomer"	$81.00
220B	17 element FM "Boomer"	$101.25
230WB	144-148MHz, 30 element	$216.00
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4248	24 element "Boomer"	$81.00
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4BTV	40-10 mtr vertical	$79.00
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Alliance	HD73 (10.7 sq ft)	$104.00
Alliance	U110	$47.00
TELEX	AR40 TV, 3 sq ft	CALL
TELEX	CD45-II (8.5 sq.ft.)	CALL
TELEX	HAM IV (15 sq. ft.)	CALL
TELEX	T2X (20 sq. ft.)	CALL

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(2-16 & 6-20)	4090 - per foot	$0.35
1108	RG8U Mini 8 low loss foam per foot	$0.17
1198	RG8U Columbia superflex 100'	$31.00
1180	RG8U Low loss 100% bonded foil shield 88% tin copper braided shield -per foot	$0.35

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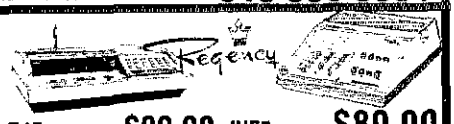

Z45 . . . . . $99.90
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HX1500 . . . . . $179.90
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TS1 . . . . . $199.90
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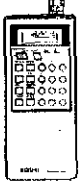

BC70XL
$159.90
20 Ch 10 band, Ch lockout, priority, scan delay, auto search, programmable, LCD display, track tuning, direct Ch access, AC/DC w/rechargable nicads & charger/adapter

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100 Ch 11 band aircraft H/H
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16 Ch 10 band mobile w/bracket.
BC580XLT $219.90
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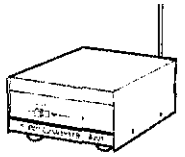
BC760XLT $279.90
10 Ch 12 band mobile, 800MHz

SUPER CONVERTER



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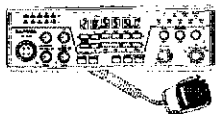

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Util-Com, 1 watt/2 Ch 2-way, lightweight, battery operated portable, w/flexible antenna, plastic case & battery charger. Supplied with itinerary frequency list 625.
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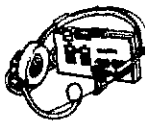

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Hands free operation, voice activated transmit up to ½ mile. Batteries optional
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same features as 495A except uses AA nicad batteries and comes with battery charger

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FOR SALE: Heath HW101, HP23 PS, Best Offer. Call Jim, KB0CIR, 701-628-3298.

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$60 REMAINS of obsolete 2000-pound Navy Transmitter. Send SASE to Gabriel Rumble, Route 3, Forsyth, GA 31029 for details.

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HEATH HW-9 new, assembled & A-1, $200. W8MDV, ph. 616-445-8447.

GROUND Radial Wire For Verticals Or Slopers: Improves performance, new #16 bare solid copper. Lowest cost, 1000 foot spool, $33 includes shipping. Davis RF, P.O. Box 230, Carlisle, MA 01741, 508-369-1738.

ROSS' $$$$ Used October Specials: Kenwood TS-930S $1249.90, TR-9500 $459.90, TR-9400A $229.90, TH-415A $309.90, T-599D & R-599D $649.90, Ameritron AL-1200 $1199.90, ICOM IC-471A/PS-25 $679.90, IC-471H $829.90, IC-271H/PS-35 $799.90, Ten-Tec 2510 $369.90, Collins GD-6C $229.95, F-250 $200. Looking for something not listed?? Call or write. We have over 315 used items in stock. MENTION AD. Prices Cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, P.O. Box 234Q, Preston, ID 83263, 208-852-0830.

HAM WANT Advertiser: Free Advertising, you only pay small fee if sale is made. 200 ads per issue, SASE sample. Communications Exchange Sheet, P.O. Box 754, Concord, MA 01742.

WANTED: Vacuum Capacitor UCSL or CVCD 3000, Computer Grade Capacitors to make up 200 UF at 4500 VDC. Joe, KA1BWO, 32 Kimball Road, RFD 3, Lisbon, CT 06351, 203-376-0134 after 5 PM EDST.

MICROLOG AIR-1/C64 CW/RTTY Modem $100. Steve Marti, 46 Buckingham Road, Seymour, CT 06483, 203-735-2338.

DIGITAL Automatic Displays, All Radios. Grand Systems, P.O B. 3377, Blaine, WA 98230.

9 MHz HC-18 CRYSTALS. Set of 10, with specs & bibliography. Build high performance IF filter. Only $9.95 shipping included. HSC, 3500 Ryder Street, Santa Clara, CA 95051, 408-732-1573.

FOR SALE: Kenwood TS830S, Cushcraft R3 Antenna, SB200 Heathkit Linear, Turner Mike, Radial Switch, Drake 1550 Dummy Load. All perfect—$1200 FOB Baldwin, NY. Norman Lazar, 360 Central Avenue, Lawrence, NY 11559, 516-569-3763.

WANTED: Selenium Rectifiers, especially 28VDC 10 Amp Bridge. N9ALD, P.O. Box 9302, Green Bay, WI 54308-9302.

1989 CALLBOOKS: Prepublication orders this month; North American, $24; International, $26. Both, $47. Any four or more, $22. Postpaid USA. Century Print, 6059 Essex, Riverside, CA 92504-1599, 714-687-5910.

WANTED: Knight-Kit Star Roamer Receiver, Heath SB-401 Transmitter. Mark Kohlbacher, KB2EFQ, 123 Martin Road, Jamestown, NY 14701, tel. 716-484-1696.

ALLIANCE Rotator Units T-45; T12. $5 each plus shipping. K1BW, 508-797-4190.

NEW—UNIVERSAL Timer, World Time and Temperature Electronically Displayed in F° or C°. $20 + $2 shipping. Wrist World Timer Calculator. $10 + $1 shipping. NY add Tax. Small Solar Panels Chargers. Send SASE. B.E.A.M. Solar And Electronics, 6205-11th Avenue, Brooklyn, NY 11219.

BUSINESS, Part-Time: Ham/Computer Want Advertiser For Sale. Excellent retirement or family business. Accounts, procedure, data base, etc. Serious, write Brooks Publishing, 222 Cedar Avenue, Arlington, MA 02174.

ANTENNA Parts Catalog, Lowest Costs: Dipole/Quad/Ground Radial Wire, Insulators, Center Feeds, Coax, Relays, etc. (#14 multistrand dipole/quad wire, non-stretch, flexible, $29 per 275' (minimum), $.105 thereafter, includes shipping.) Catalog: $2. Davis RF, P.O. Box 230, Carlisle, MA 01741, 508-369-1738.

SELL: Swan MK II 80-10 Meter, 2 3-500z Amplifier $500. Ten-Tec Century 21 with Calibrator $190. Brian Shiptoski, WA3NGU, Box 2, RD 2, Wapwallopen, PA 18660, 717-379-2401.

WANTED: Green Lee Chassis Punches, assorted sizes or in sets. Please state condition and price. Write to Louis L. D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209.

DRAKE Wanted: FS-4 frequency synthesizer, C-4 station console. Contact: G. Hawrysko, K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

WANTED: Current address KZ5BA - Bill, KZ5BF - Boyd, and KZ5CG - Gene for QSL card from 1960's QSO. W5BWA, 5812 Hiawatha Drive, Alexandria, LA 71301.

WANTED: TS-940S. W8KK, 419-529-3651.

WANTED: Drake TR7 or TR7A, Noise Blanker, External VFO, Service Kit, etc. Also Power Amplifier like L7, SB220, etc. Eckhard Straeter, Box 317, Dublin, NH 03444, 603-563-8816.

KENWOOD TS430S w/FM Board, AM Filter, $550 OBO. AT-250, $200. PS430, $125. As a station $800. MFJ 1270B, $90. Butternut HF4B, $100. QSK A1A Filter, $40. Ameco PT-2 Preamp, $40. Uship. N1DRB, 203-444-2780 after 6 PM.

SELL: WE Stock 1.2 GHz and 900 MHz Bricks, Pre-Amps and 900 MHz Linear Power Amps and FM Transmitters. Pauldon, 210 Utica Street, Tonawanda, NY 14150, 716-692-5451.

FOR SALE: Drake TR6 six meter Transceiver, with Power Supply, GE. Trade for Digital General Coverage Receiver, or Mobile HF Rig. WB8P, 419-726-0084.

MICROLOG AKB-1, AVR-2 Keyboard and Terminal for RTTY, CW, and ASCII. Inexpensive way to get into RTTY. With manuals, will ship. $110. KE8JH, 616-327-2142.

YAESU 2M SSB/FM Base FT-726R $629. Packet TNC MFJ-1270 $79. UDS 103J Modem 300 Baud $59. Heath Remote Antenna Switch $49. Grab Bags $3, no trash. B. Carling, AF4K, 13 Briarstone Lane, Gaithersburg, MD 20877, 301-990-1424.

SELL - TRADE; Excellent Hammarlund HQ-160 w/Manual $100, Mint Drake 2NT w/Manual $60, Heathkits w/Manuals HW-16, HG-10B, HG-10 (2), HR-10 $40 each, Trade any/all for Ten-Tec ORP 509, 515, 525, Accessories. NC0N, 316-421-8468/88 callbook.

FOR SALE: TS440S HF Transceiver PS50 Power Supply DC w/AT Kenwood SP430 Communications Speaker. Like new, $1200. Eleanor, Dayton, Ohio, 513-434-4785.

WANTED: Noise Blanker for Drake TR-4C Xcvr. State condition and price. Philip Schmitt, WA8JXE, 800 S. Kendall Avenue, Kalamazoo, MI 49007.

DIGICOM < 64: A software-based Packet radio system for the Commodore 64 by W2UP, Aug. 88 issue of 73 Magazine, page 22. The software is public domain and requires a simple modem interface to the C64 which is provided by our kit. The board plugs directly into the cassette port or remote mounted via a cable. A watchdog timer, reed relay PTT and PTT inversion options are included. Circuit power is derived from the computer and uses 7910 chip so no alignment is required. A switch allows HF or VHF operation. Order Kit #154 for $49.95 or Assembly #154 for $79.95, both include Free Disc. Add $2.50 s/h. A & A Engineering, 2521 W. LaPalma #K, Anaheim, CA 92801, 714-952-2114. MC or Visa accepted.

SONY ICF2001 $120. Also Millen 2KW Transmatch Type 92200 $125. Both exc. N6CNY, 13331 E. Ashlan, Sanger, CA 93657, 209-875-3002.

ANNOUNCING: Call Sign Lapel Pins and Pendants. Specify horizontal, vertical or diagonal. Solid 14 karat gold. Great gifts. $48.95 plus NY sales tax. Chains available. KB2MB, H&M Jewelry, 26 Edgecomb Road, Binghamton, NY 13905.

HAVE That old Heath Radio Gear Reconditioned, Aligned, Calibrated. SASE for quote. RTO Electronics, 4166 Maple Street, Berrien Springs, MI 49103.

YAESU FRG-7 Communications Receiver $225. Hy-Gain 18-HT-S Hy-Tower 160-10 Meter Vertical $175. KD5VN, Box 323, Ballinger, TX 76821, 915-365-5078.

TS440S with AT-1 auto-tuner, 500 Hz filter and PL-50 heavy duty pwr. supply, excellent cndx., factory aligned and boxed, $1050. You ship. N2GLH, 35 College Street, Brockport, NY 14420, 716-657-2376.

FOR SALE: Yaesu FT-757GX, Stone Mountain QSYer, Autek Audio Filter. All equipment in perfect operating condition and like new in appearance, very low hours. $725 firm for all. Harry Benson, NF5R, 405-252-2585, before 8:00 PM Central time please.

SLEP Specials, Military USM-117C Solid State Small Portable DC-5 MHz Oscilloscope, ideal for bench work or Modulation/RTTY Testing $95. Military USM-207 Solid State Portable 0 thru 500 MHz Frequency Counter, Lab Quality, Late Model $185. HP606A Signal Generator 50 KHz thru 65 MHz $295. TS-403/U Microwave Signal Generator 1.8 GHz thru 4.2 GHz Military Version of HP616B $195. TS-510A/U Signal Generator 10 MHz thru 420 MHz Mil/Spec Version of HP608D $195. HP614A Microwave Signal Generator 900 MHz thru 2100 MHz $285. URM-25 Signal Generator 10 KHz thru 50 MHz $145. Lab Calibrated, Have Quantity. Visa/MC or Check, Add Shipping. Phone Bill Slep, 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763.

WANTED: Collins 75S-3B or 75S-3C R/E, and 51S-1. Would consider with 32S-3. Need 811A Tubes and HRO-60 Coils E, F, AD. Lee, W0VT, 914 Golden Bear Lane, Kingwood, TX 77339, days 713-780-4360.

FOR SALE: ICOM IC-490A 70cm SSB/CW/FM Transceiver, $365; TeleVideo TPC-1 Portable PC, 9" Amber Monitor, 64K, 2-DSDD 5¼" Drives. Uses CP/M Operating System. Wordstar, plus utilities included. Great for use with TNCs, $525. Bart, KB9NM, 203-666-1541, x241 days, 203-282-0719 evenings.

COMMODORE and Amiga Chips, Parts, Diagnostics. Low price on repairs. Heavy Duty Power Supply, ($27.95 + UPS), for the C64. We ship worldwide. Kasara Microsystems Inc., 341 Route 306, Wesley Hills, NY 10952, 1-800-248-2983 or 914-362-3131.

TOWERS, TOWERS, TOWERS, TOWERS, TOWERS, TOWERS. Winter's dreams can become summer's reality. We offer the best towers, US Tower, (formerly Tristao), at truly competitive prices. Plus, we will help you design your system and provide friendly advice at no extra charge. Patience is our forte. First Call Communications Inc., 1-800-HAM-TOWER. In NY call 914-352-6701.

Spider Antenna

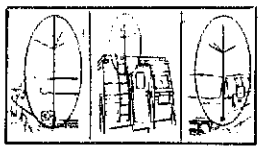
U.S. Patents 4349825, 4460896

These trademarks are your assurance of quality and performance.

Wherever you may roam, on Land or Sea . . . or even at Home

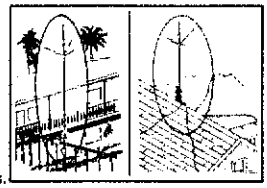
The Spider™ Antenna will help you keep in touch with your ham friends around the world. Four bands — 10, 15, 20 and 40 (or 75) meters. Needs no antenna tuner. Custom made with highest quality workmanship and materials.

On Land . . . Suitable for use on any motor vehicle from a compact automobile to a motor home. Work four bands without stopping to change coils.



Or Sea . . . The Spider™ Maritimer™ is for use on or near the ocean. Highly polished non-magnetic stainless steel and nickel-chrome plated brass.

At Home . . . If you live in an apartment, condominium or restricted area, the Spider™ may well be the answer to your antenna problems.



MULTI-BAND ANTENNAS
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CANOGA PARK, CALIF., 91303
TELEPHONE: (818) 341-5460

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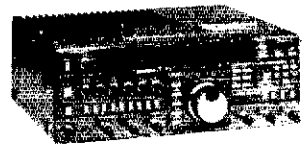
BUTTERNUT • LARSEN • WELZ • MFJ • YAESU • ASTRON • ALINCO • BENCHER

KENWOOD

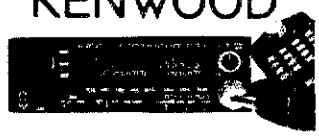
TS-140
- Kenwood Quality at a Great Price
- HF Transceiver with General Coverage Receiver
- 100 W on All HF Bands

YAESU



FT-767GX
- HF/VHF/UHF Base Station
- 160-10 Meter Powerhouse with Modules for 6m, 2m, 70 cm
- Easy Computer Control Performance

KENWOOD



TS-621
- Deluxe FM Dual Bander
- 45 W on 2 Meters 35 W on 70 cm
- Loaded with Most Wanted Features

YAESU

FT-212RH
- 2 Meter Mobile that Doubles as Answering Machine
- 45 Watts Output
- Covers 138-174 MHz
- FT-712RH for 70 cm

uniden

BC-560XLT	$ 99.00
BC-580 XLT	$199.00
BC-760 XLT	$269.00
BC-800 XLT	$239.00
BC-200 XLT	$259.00

ASTRON

• RS7A	$50.00	• RS35M	$155.00
• RS12A	$72.00	• VS35M	$175.00
• RS20A	$92.00	• RS50A	$199.00
• RS20M	$109.00	• RS50M	$225.00
• VS20M	$129.00	• RM50M	$245.00
• RS35A	$139.00	• VS50M	$239.00

WE TRADE **800-227-7373** WE TRADE

525 E. 70th Unit IW • Denver, CO 80229
303 • 288 • 7373
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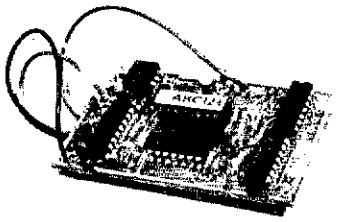
PROUD OF YOUR CALL? WORRIED ABOUT THEFT? BUILDING A REPEATER?

Identify your FM transceiver with automatic code on each transmission.



SMALL: 1 3/4" X 2 1/4" X 5/16"
Perfect means of RTTY code ID

PRICE **$49.95** Ppd.
+$3.00 for Calif. address.

Full feature repeater IDer with timer **$79.50** Ppd. +$4.77 for Calif. address.

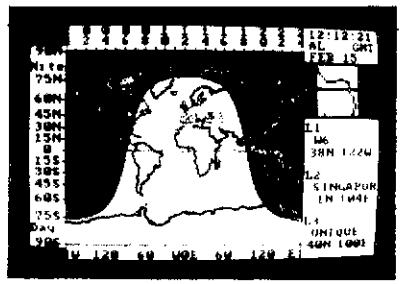
WARRANTY
Returnable for full refund within ten day trial period. One year for repair or replacement.

Your call sign programmed at factory, please be sure to state call sign when ordering.

Inquire about commercial models.

AUTOCODE
P.O. Box 7773 Dept. Q
Westlake Village, CA 91359
(805) 497-4620

IBM PC® owners: Now a Super **DX EDGE®** for you



- Use with IBM PC XT AT and compatibles
- Fabulous graphics for the great DX aid
- Long path Gray Line Sunrise-Sunset on a fine map
- Automatic Gray Line updating simulates earth's rotation in real time
- Maximum Usable Frequency (MUF) & Great Circle Bearings

It's fantastic! Daylight and darkness paths in real time on your computer. As simple as can be

- Minimum requirements: 2 disk drives 384K Hercules, CGA, or EGA graphics, DOS 2.1 or later

Price: $34.95, ppd. in U.S. and Canada. Add tax in N.Y.S. Add $5.00 elsewhere, air mail U.S. funds only

Please make check or M.O. payable to the DX EDGE and mail to
The DX EDGE, P.O. Box 834, Madison Square Stn., New York, N.Y. 10159
An information flyer is available free of charge

ADVERTISING DEPARTMENT STAFF

Bruce O. Williams, WA6IVC, Advertising Manager
Angela M. Beebe, KA1SER, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel.

Index of Advertisers

ANTENNA/TOWER SALE!

hy-gain CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

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
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

ROHN Self Supporting Towers On SALE! FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	228	$419
HBX48	48 ft	10 sq ft	303	$539
HBX56	56 ft	10 sq ft	385	$629
HDBX40	40 ft	18 sq ft	281	$519
HDBX48	48 ft	18 sq ft	363	$619

*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
- Multi purpose towers satisfy a wide range of needs
- Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.

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
50'	$669	$1369	$1689
60'	849	1549	1899
70'	919	1699	2069
80'	1099	1899	2299
90'	1179	2199	2489
100'	1269	2399	2689
110'	1499	2569	3129
120'	1579	2749	3349

US TOWER CORPORATION

These rugged crankup towers and masts now available from Texas Towers!

Check these features:
- All steel construction
- Hot dipped galvanized
- Totally self-supporting—
- No guys needed

Coax arms, Thrustbearings Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock-

CALL FOR SALE PRICES!

Model	Min.Ht.	Max.Ht.	Ant.Load*	Sale price
MA40 mast	21'	40'	10 sq ft	$629
MA550 mast	22'	50'	10 sq ft	999
TX438	22'	38'	18 sq ft	919
TX455	22'	55'	18 sq ft	1385
TX472	23'	72'	18 sq ft	2279
HDX555	22'	55'	30 sq ft	2079
HDX572	23'	72'	30 sq ft	3559

Note-US Towers Shipped Freight Collect From Visalia, CA Factory

**Note-towers rated at 50 mph to EIA specifications*

RG-213U

$.36/ft $349/1000 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!

RG-8X

$.22/ft $209/1000 ft.

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086

$.42/ft $409/1000 ft.

- Same Specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HARDLINE/HELIAX®

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft.
½" LDF4-50 Andrew Heliax®	$1.99/ft.
⅞" LDF5-50 Andrew Heliax®	$4.99/ft.

select connectors below

Heliax® is a Registered Trademark of the Andrew Corp.

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE & HELIAX® CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$25	$25	$33	$33
⅞" Heliax®	$29	$29	$29	$29
1¼" Heliax®	$55	$55	$55	$55

COAX CONNECTORS

Amphenol Silver PL259	$1.50
UG21B N Male	$3.50
9086/9913 N Male Connector	$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga	$.10/ft.
¼ mile 18ga copper-clad steel wire	$30
Dog bone end insulator	$.79 ea.

Van Gorden

1:1 Balun $15 Center Insulator $8

Dipole Kits: D80 $31.95/D40 $28.95

Short Dipole Kits: SD80 $35.95/SD40 $33.95

All-band Dipole w/ladder line $29.95

G5RV all band antenna $49.95

ALPHA DELTA

DX-A 160-80-40 Sloper	$49

CUSHCRAFT

A3 3-el Tribander	$259
A4S 4-el Tribander Beam w/S.S. Hdwre.	$349
A743 & A744, 30/40 mtr KIT for the A3 & A4	$ 89
R4 20-10 mtr Vertical	$229
AP8 80-10 mtr Vertical	$159
AV5 80-10 mtr Vertical	$119
D40 40 mtr Dipole	$159
40-2CD 2-el 40 mtr Beam	$339
A50-5 5-el 6 mtr Beam	$ 98
215 WB NEW 15-el 2 mtr Beam	$ 89
230 WB NEW 30-el 2 mtr Beam	$229
4218 XL 18-el 2 mtr Beam	$129
3219 19-el 2 mtr Beam	$109
424B 24-el 432 MHz Beam	$ 89
ARX2B 2 mtr Vertical	$ 45

hy-gain

Discoverer 2-el 40-mtr Beam	
Discoverer 3-el Conversion Kit	
EXPLORER-14 SUPER-SPECIAL	
QK710 30/40 mtr. Add-On-Kit	
V2S 2-mtr Base Vertical	
V4S 440MHz Base Vertical	
TH5MK2S Broad Band 5-el Triband Beam	
TH7DXS 7-el Triband Beam	
TH3JRS 3-el Triband Beam	
205BAS 5-el 20-mtr Beam	
155BAS 5-el 15-mtr Beam	
105BAS 5-el 10-mtr Beam	
204BAS 4-el 20-mtr Beam	
64BS 4-el 6-mtr Beam	
12 AVQ 20-10 mtr vertical	
14 AVQ 40-10 mtr vertical	
18 AVT/WB 80-10mtr Vertical	
18HTS 80-10 mtr Hy-Tower Vertical	
23BS 3-el 2 mtr Beam	
25BS 5-el 2 mtr Beam	
28BS 8-el 2 mtr Beam	
214BS 14-el 2-mtr Beam	
2BDQ 80/40 mtr Trap Dipole	
5BDQ 80-10 mtr Trap Dipole	
BN86 80-10 mtr KW Balun W/Coax Seal	

CALL FOR SPECIAL PRICES!

HUSTLER

6BTV 80-10 mtr Vert $149 5BTV 80-10 mtr Vert $129

4BTV 40-10 mtr Vert $99 G7-144 2-mtr Base $129

G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts In Stock!

BUTTERNUT ELECTRONICS CO

HF6V 80-10m Vertical $129 Delivered
- Full Legal Power
- Highest Q Tuning Circuits

HF2V 80-40m Vertical $129 Delivered
- Full Legal Power
- Automatic Band Switching

Accessories:

RMK II Roof Mtg. Kit	$49
STR II Stub-Tuned Radials	$29
TBR160 160m Coil Kit	$49
30m Add-on Kit	$29
20m Add-on Kit	$39
17/12m Add-on Kit	$27

HF6V HF2V

FREE UPS on ACCESSORIES when purchased w/antenna

HF5B "Butterfly" 20-10m Compact Beam $199.00

- Unique Design Reduces Size
- No Lossy Traps
- Turns w/TV Rotor
- Boom Length 6 Feet
- Element Length 12.5 Feet

FREE UPS Shipping in Continental USA

MIRAGE/KLM

KT34A 4-el Broad Band Triband Beam	$399.95
KT34XA 6-el Broad Band Triband Beam	$589.95

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119.95
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	$Call

ROTOR CABLE

Standard 8 cond cables $.22/ft. (vinyl jacket 2-#18 & 6-#22 ga)

Heavy Duty 8 Cond cable $.39/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS

10 FT. STACKED SECTIONS

20G	$49.50	45G	$139.50
25G	$59.50	55G	$179.50

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	$1129
FK2558	58 ft.	13.3 sq. ft.	1199
FK2568	68 ft.	11.7 sq. ft.	1239
FK4544	44 ft.	34.8 sq. ft.	1489
FK4554	54 ft.	29.1 sq. ft.	1599
FK4564	64 ft.	28.4 sq. ft.	1699

25G Double Guy Kit	$279.
45G Double Guy Kit	$299.

*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.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$.15/ft
1/4 EHS Guywire (6650 lb rating)	$.18/ft
5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7 x 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 x 9EE (1/2" x 9" Eye to Eye Turnbuckle)	$9.95
1/2 x 9EJ (1/2 x 9" Eye & Jaw Turnbuckle)	$10.95
1/2 x 12EE (1/2" 12" Eye & Eye Turnbuckle)	$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle)	$13.95
5/8 x 12EJ (5/8" x 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4 "Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.32/ft
HPTG4000 Guy Cable (4000 lb rating)	$.52/ft
HPTG6700 Guy Cable (6700 lb rating)	$.72/ft
9901LD Cable End (for 2100/4000 cable)	$9.95
9902LD Cable End (for 6700 cable)	$11.95
Socketfast Potting Compound (does 6-8 ends)	$16.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$29	$49	$69	$89
.18 in Wall	$49	$89	$129	$149
.25 in Wall	$69	$129	$189	$249

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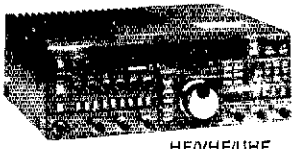

FT-767GX HF/VHF/UHF BASE STATION
- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-in
- Lots More Features

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IC-761 HF "PERFORMANCE" RIG
- 160-10M/General Coverage Receiver
- Built-in Power Supply and Automatic Antenna Tuner
- SSB, CW, FM, AM, RTTY
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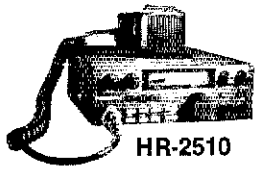

HR-2510
- Mobile 10 Meter Transceiver
- SSB/AM/FM/CW
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- Computer Controlled Operation

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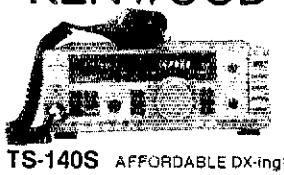

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- 100 W Output
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FT-736R VHF-UHF BASE STATION
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- 25 Watts Output on 2 Meters, 220 and 70 cm
- 10 Watts Output on 6 Meters and 1.2 GHz
- 100 Memories

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IC-781 NEWEST SUPER RIG
- 5 Function Display Screen
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- 150 Watts Output
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2m and 220 MHz Amplifiers GaAsFET Receive Pre-Amps and High SWR Shutdown Protection

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2-117	10 in/170 out	
	220 MHz	
3-22	2 in/20 out	
3-211	2 in/110 out	
3-312	30 in/120 out	

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- 30 Memory Channels

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TH-25AT
POCKET-SIZED AND POWERFUL
- Frequency Coverage: 141-163 MHz (Rx), 144-148 MHz (Tx)
- Front Panel DTMF Pad
- 5 Watts Output
- 14 Memories
- TH-45AT Available for 440 MHz

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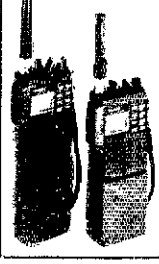

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A high-performance HF rig... with a great receiver and full-power transmitter. Light in weight and low in price.

This is Yaesu's FT-747GX.

Whether you're a novice or a veteran, it's a great way to start. And a great way to go.

DX ready. The 747 packs a full 100-watt RF punch on 160 to 10 meters, with continuous receive from 100 kHz to 30 MHz.

And its control panel is refreshingly simple. So you can hop around the band *fast* to nail those DX stations. While other guys are warming up their amplifiers, you can be working the DX!

Multimode versatility. The FT-747GX is ready to go on LSB, USB, CW, and AM. With provision for the FM-747 FM unit—great for watching 10-meter repeaters.

You get 20 memories to store frequency and mode. Dual VFOs with split frequency operation for DX-pedition work. And manual band scan plus auto-resume memory scan via the microphone up/down buttons.

Great receiver. Utilizing a directly-driven mixer, the FT-747GX receiver features superb overload protection. You also get factory-installed narrow CW *and* AM filters. A one-touch noise blanker. All-mode squelch. RIT. And a 20-dB attenuator for local QSOs.

Lightweight construction. Housed in a metallized high-impact plastic case, the FT-747GX weighs in at about 7¼ pounds! With the loudspeaker mounted on the front panel for maximum audio transfer. And internal heatsinking for the transmitter, rated at full power for FM, packet, RTTY, SSTV, and AMTOR when used with a heavy-duty power supply.

Available options. FC-1000 or FC-757AT Automatic Antenna Tuners. FL-7000 500-watt Automatic, Solid-State Linear Amplifier. TCXO-747 Temperature-Compensated Crystal Oscillator. FAS-1-4R Remote Antenna Selector. FRB-757 Amplifier Relay Box. FP-700 Standard Power Supply. FP-757HD Heavy-Duty Power Supply. MMB-38 Mobile Mounting Bracket.

Discover the price/performance leader. Check out Yaesu's low-cost FT-747GX at your Yaesu dealer today. Because now, Yaesu puts priceless DX into *your* price range.

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Compact all mode transceivers

It's the "New Sound" on the 2 meter band—Kenwood's TR-751A! Automatic mode selection, versatile scanning functions, illuminated multi-function LCD and status lights all contribute to the rig's ease-of-operation. All this and more in a compact package for VHF stations on-the-go!

- Automatic mode selection, plus LSB

144.0 144.1 144.5 145.8 146.0 148.0 MHz

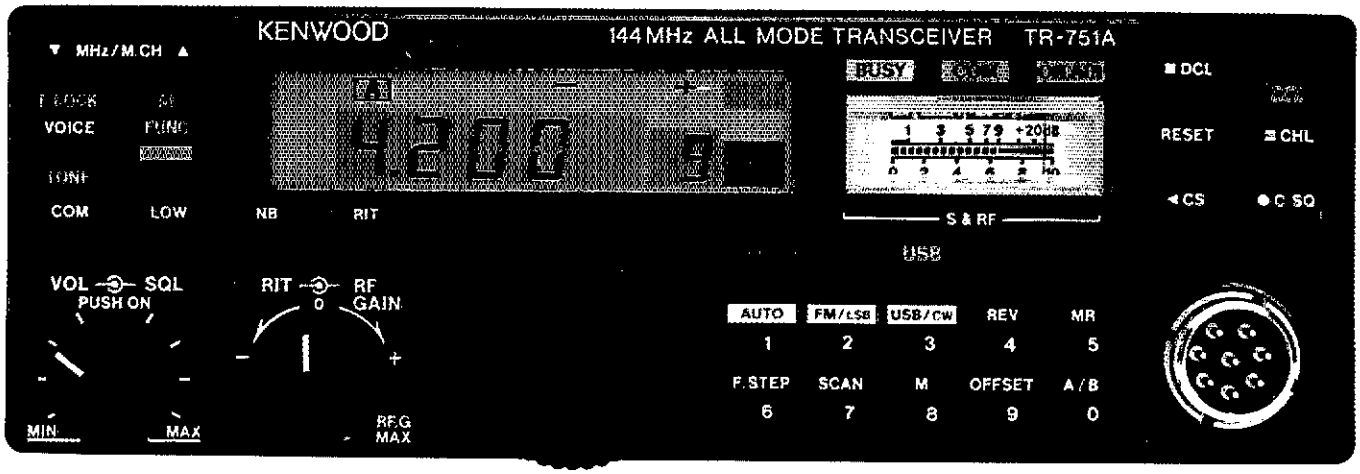
CW	USB	FM	USB	FM

- Optional front panel-selectable 38-tone CTCSS encoder
- Frequency range 142-149 MHz (modifiable to cover 141-151 MHz)
- High performance receiver with GaAs FET front end
- VS-1 voice synthesizer option
- 25 watts high/5 watts adjustable low
- Programmable scanning—memory, band, or mode scan with "COM" channel and priority alert
- 10 memory channels for frequency, mode, CTCSS tone, offset. Two channels for odd splits.
- All mode squelch, noise blanker, and RIT
- Easy-to-read analog S & RF meter

- Dual digital VFOs
- Semi break-in CW with side tone
- MC-48 16-key DTMF hand microphone and microphone hook included
- Frequency lock, offset, reverse switches
- Digital Channel Link (DCL) option

Optional accessories:

- **CD-10** call sign display
- **PS-430, PS-30** DC power supplies
- **SW-100A/B** SWR/power meter
- **SW-200A/B** SWR/power meter
- **SWT-1** 2 m antenna tuner
- **SWT-2** 70 cm antenna tuner
- **TU-7** 38-tone CTCSS encoder
- **MU-1** modem unit for DCL system
- **VS-1** voice synthesizer
- **MB-10** extra mobile mount
- **SP-40, SP-50B** mobile speakers
- **PG-2N** extra DC cable
- **PG-3B** DC line noise filter
- **MC-60A, MC-80, MC-85** deluxe base station mics.
- **MC-43S** UP/DOWN mic.
- **MC-55** (8-pin) mobile mic.
- **MA-4000** dual band antenna with duplexer



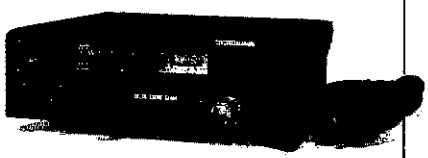
Actual size front panel

TR-851A

70 cm SSB/CW/FM transceiver

The same winning features are yours on 70 cm with the TR-851A!

- Covers 430-439.999 MHz
- 25 W high power/5 W adjustable low
- MC-43S UP/DOWN mic. and mic. hook included



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