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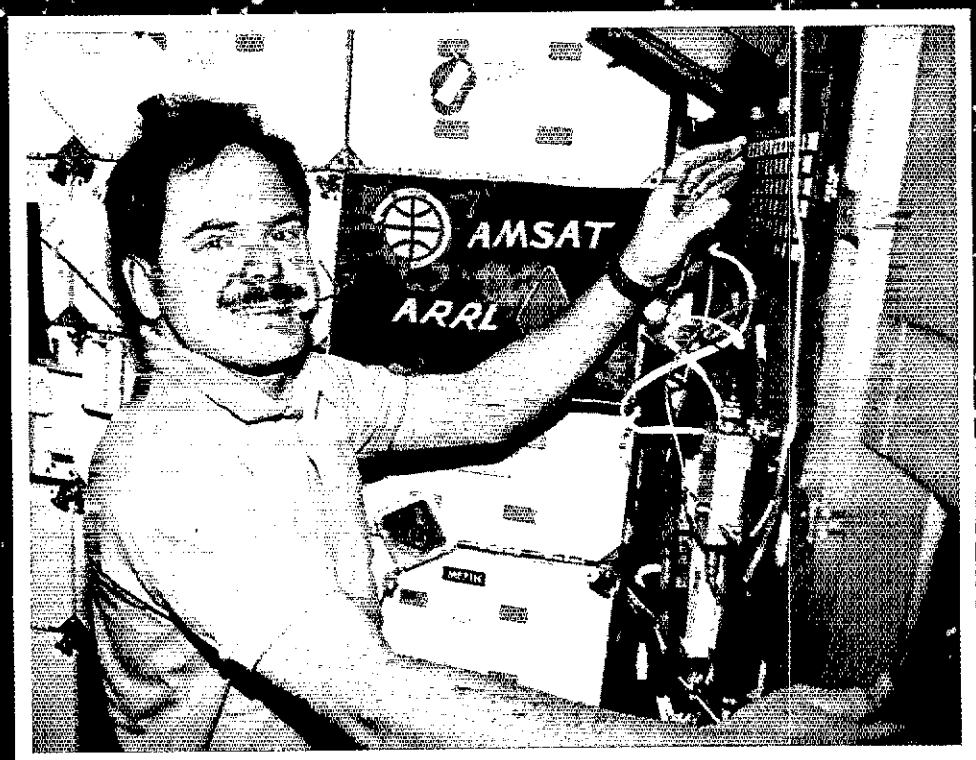

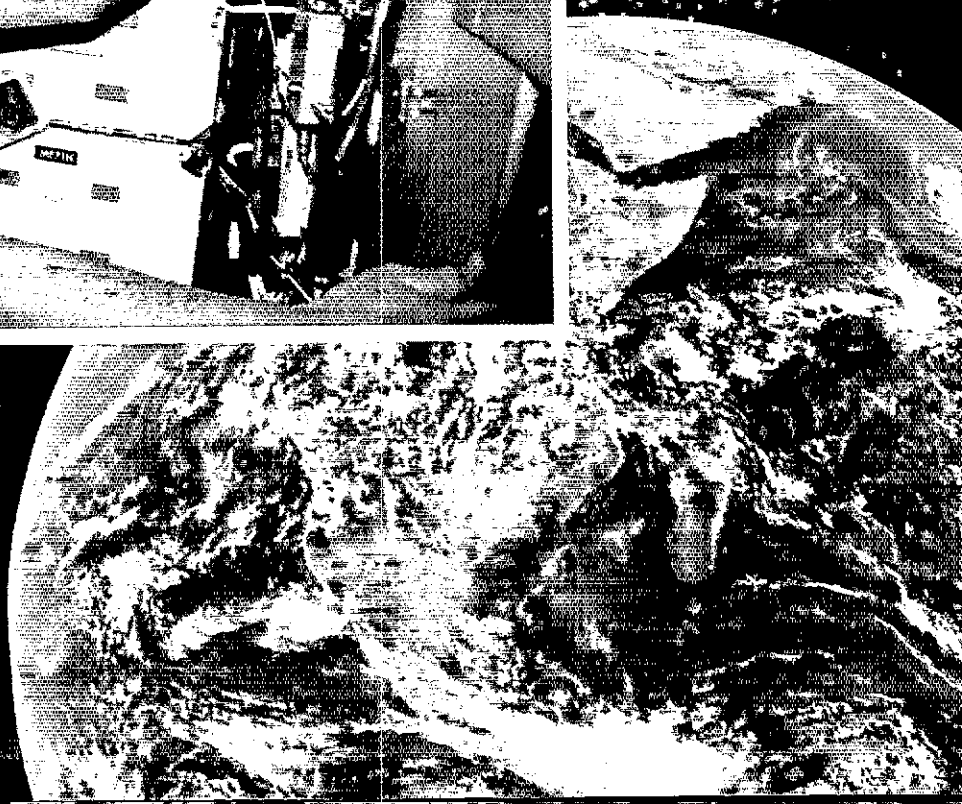

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The dual banders of the future are here! ICOM's IC-24AT dual band handheld and IC-3220 dual band mobile provide you all the advantages with the most feature packed, power packed dual banders available.

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OUR COVER

Payload Specialist Dr Ron Parise, WA4SIR, of Silver Spring, Maryland, enjoys the weightlessness of orbit aboard US space shuttle *Columbia* as he makes voice and packet contacts with earth-bound hams. Read about the latest SAREX mission aboard STS-35 on page 44. *(photo courtesy of NASA)*

CONTENTS

February 1991
Volume LXXV Number 2

TECHNICAL

NEWS AND FEATURES

OPERATING

DEPARTMENTS

OVER 45,000 PK-232s SOLD!

The AEA PK-232 multi-mode data controller remains the most widely used radio data controller in the world. More hams own the PK-232 than *any other* radio data controller, and AEA's hard-earned reputation for quality and service keeps them coming back. The '232 gained its popularity with features like these:

STATE-OF-THE-ART TECHNOLOGY

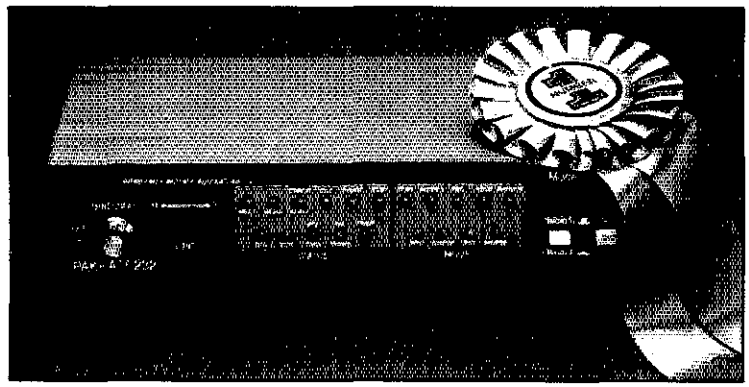
Since its introduction in 1986, the PK-232 has been updated **six times** to continue bringing you the breakthroughs. Six updates in four years! And even the very first PK-232 is upgradable to the latest model, with a relatively inexpensive user-installed kit.
If you want a state-of-the-art multi-mode controller, you want the PK-232 MBX.

SUPERIOR FILTERING

The 8-pole Chebyshev filter in the PK-232 was designed from the ground up to work on HF **and** VHF. We didn't just add some firmware to a Packet modem to create our multi-mode. Our modem was **proven** superior by tests in Packet Radio Magazine over *all the others tested.* Read the fine print! You just can't beat the PK-232 for performance, quality and integrity. 45,000 PK-232 owners can't be wrong!

INNOVATION

The PK-232 has been the one to follow for technology advances. It was the *first* radio data controller with weather-fax, the *first* with Host mode, the *first* with NAVTEX, the *first* with Signal Identification, the *first* with TDM, the *first* with AMTOR v.625, the *first* with a WHYNOT command, etc, etc. AEA has always strived to "Bring You The Breakthrough," and while others have tried to imitate, only one can be the best.



The only data controller **designed from the ground up** to be a true multi-mode, the PK-232's tuning and status indicators work in all modes, not just packet. Make sure the multi-mode you buy isn't just a converted Packet TNC. There's only one number 1!

HOST MODE

Many superior programs have been written specifically for the PK-232 in Host mode language: NEW PC-Pakratt II for IBMs and compatibles, updated MacRATT for Apple MacIntosh, and Com-Pakratt or Commodore C-64 and C-128 computers.

ALL DIGITAL OPERATING MODES

The PK-232 MBX includes all authorized amateur digital modes available today...Packet, Baudot, ASCII, AMTOR/SITOR (including the new 625 recommendation) and Morse code, as well as WEFAX (receive and transmit). Other features include the PakMail 18K byte maildrop system with automatic normal and reverse forwarding, NAVTEX/AMTEX reception, KISS protocol support, binary file transfer and more. Also included is the TDM (Time Division Multiplex) mode for SWLing that few others have. No other multi-mode has all these features.

SIGNAL ANALYSIS

The first multi-mode to offer SIAM (Signal Identification and Acquisition Mode) was, of course, the PK-232MBX. Indispensible to SWLers, SIAM automatically identifies Baudot, ASCII, AMTOR/SITOR (ARQ and FEC) and TDM signals, then measures baud rate and polarity. Once the PK-232MBX is "locked on" to the signal, a simple "OK" command switches to the recognized mode and starts the data display. You're even ready to transmit in that mode if applicable.
The PK-232MBX makes SWLing easy and fun, not difficult and frustrating.

REPUTATION

The PK-232MBX has helped AEA establish its hard-earned reputation for producing high quality amateur radio products. Anyone can **say** they have a good reputation, so it pays to ask around. Listen on the HF bands and see which multi-mode is getting *used.* You owe it to yourself to get the best possible value for your money. Don't settle for less!

Watch for the DSP-1232 and 2232 coming soon!

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HERE'S WHY

Performance is always your top criterion, and when space is at a premium the R5 is your best choice. It needs no ground radials and stands 17 feet tall.

10, 12, 15, 17 and 20 meters are yours with fully automatic band selection and RFI supression. The only connection needed is the 50 Ohm coax from your transceiver.

The unique counterpoise has four 48" x 0.1" stainless steel rods for excellent ground independence. This allows the antenna to be mounted anywhere from ground level to roof top.

With the R5 you get quick assembly, easy installation and the highest "performance to size" ratio of any antenna available to the amateur today. Whether your space is large or small, the R5 will make ham radio more fun.

YOUR FELLOW HAMS AGREE THAT R5 IS THE PERFECT CHOICE.

"Best vertical I have used...Great antenna for hams with smallest of back yards." G4DTK

Only 7' off the ground and have worked over 50 countries in a month." W2JD

"R5 covered the whole world with only 100 Watts." JA1VJL

"Some stations find it hard to believe I'm not using a beam." GW0MOI

"A masterpiece of quality engineering and performance." N4OEQ

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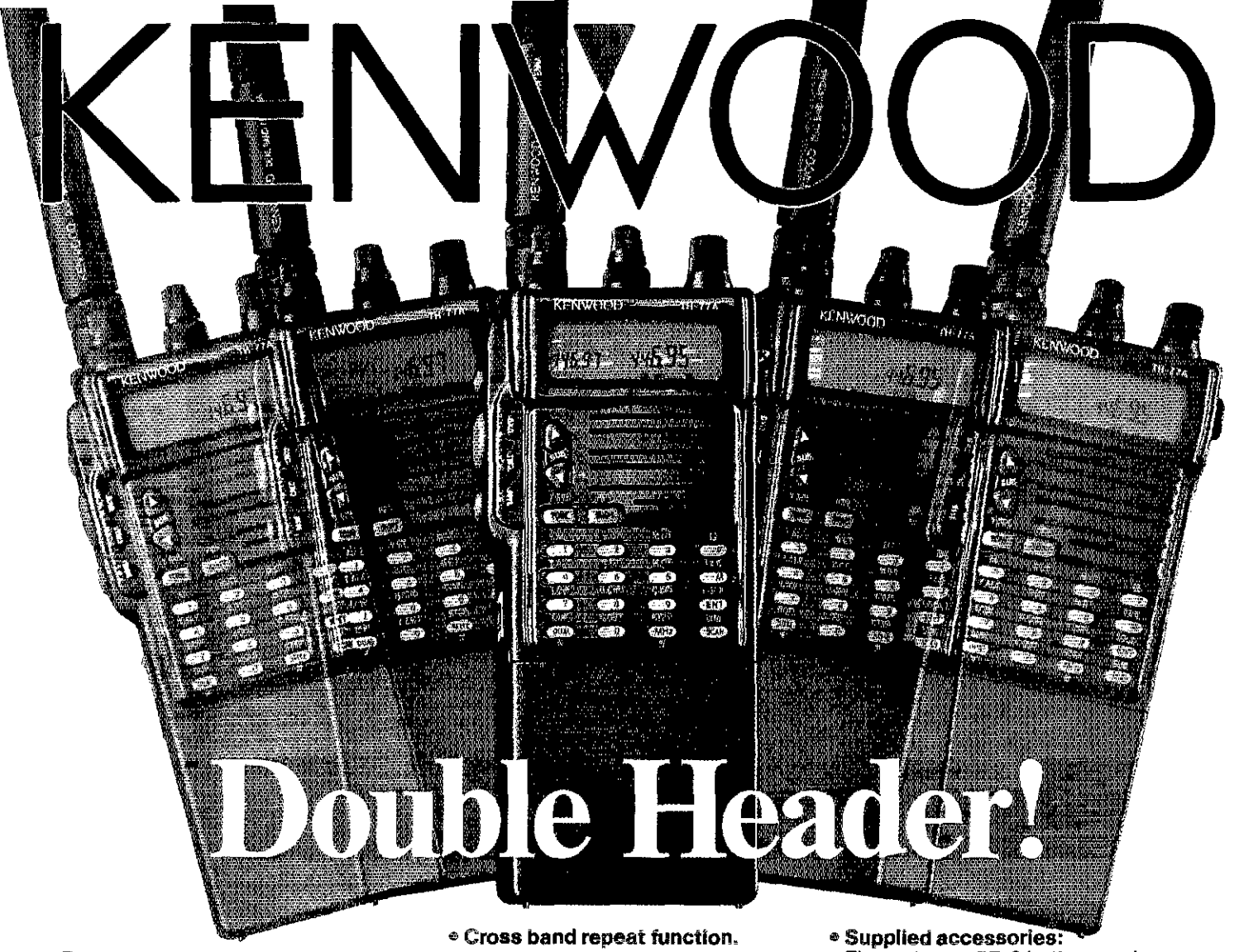

Double Header!

TH-77A

Compact 2m/70cm Dual Band HT

Here's a radio that deserves a double-take! The TH-77A is a feature-packed dual band radio compressed into an HT package. The accessories are compatible with our TH-75, TH-25, and TH-26 Series radios. Repeater and remote base users will appreciate the DTMF memory that can store *all* of the DTMF characters (*, #, A, B, C, and D) that are usually required for repeater functions!

- **Wide band receiver coverage.** 136–165 (118–165 [AM mode 118–136] MHz after modification) and 438–449.995 MHz. TX on Amateur bands only. (Two meter section is modifiable for MARS/CAP. Permits required.)
- **Dual receive/dual LCD display.** Separate volume and squelch controls for each band. Audio output can be mixed or separated by using an external speaker.
- **Cross band repeat function.**
- **Dual Tone Squelch System (DTSS).** Uses standard DTMF to open squelch.
- **CTCSS encode/decode built-in.**
- **Forty-two memory channels.** All channels odd split capable.
- **DTMF memory/autodialer.** Ten 15-digit codes can be stored.
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **Multi-function, dual scanning.** Time or carrier operated channel or band scanning.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Two watts (1.5 W on UHF) with supplied battery pack.** Five watts output with PB-8 battery pack or 13.8 volts. Low power is 500 mW.
- **DC direct-in operation** from 6.3–16 VDC with the PG-2W.
- **T-Alert with elapsed time indicator.**
- **Automatic repeater offset on 2 m.**
- **Battery-saving features.** Auto battery saver, auto power off function, and economy power mode.
- **Supplied accessories:** Flex antenna, PB-6 battery pack (7.2 V, 600 mAH), wall charger, belt hook, wrist strap, keyboard cover.

Optional accessories:
• **BC-10:** Compact charger • **BC-11:** Rapid charger • **BH-6:** Swivel mount • **BT-6:** AAA battery case • **DC-1/PG-2V:** DC adapter • **DC-4:** Mobile charger for PB-10 • **DC-5:** Mobile charger for PB-6, 7, 9 • **PB-5:** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6:** 7.2 V, 600 mAh NiCd pack • **PB-7:** 7.2 V, 1100 mAh NiCd pack • **PB-8:** 12 V, 600 mAh NiCd for 5 W output • **PB-9:** 7.2 V, 600 mAh NiCd with built-in charger • **PB-11:** 12 V, 600 mAh OR 6 V, 1200 mAh, for 5 W OR 2 W • **HMC-2:** Headset with VOX and PTT • **PG-2W:** DC cable w/fuse • **PG-3F:** DC cable with filter and cigarette lighter plug • **SC-28, 29:** Soft case • **SMC-30/31:** Speaker mics. • **SMC-33:** Speaker mic. w/remote control • **WR-1:** Water resistant bag.

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Complete service manuals are available for all Kenwood transceivers and most accessories.
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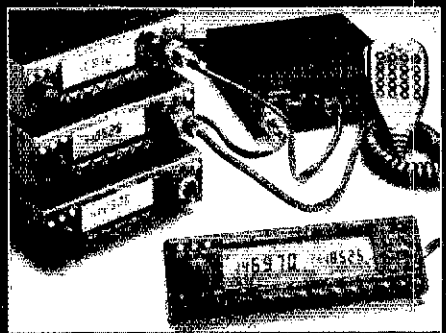
Mobile Companion!

TM-241A
TM-441A/TM-541A

Compact FM Mobile transceivers

Here are your new mobile companions — at your service whenever you're on the road! Their compact size makes installation a snap, and the remote control options allow you to customize your installation for that "professional" look!

- **Wide band receiver coverage.** The TM-241A receives from 118–173.995 MHz. Transmit range is 144–148 MHz. (Modifiable for MARS and CAP operation, permits required.)
- **TM-441A** covers 438–449.995 MHz, and the **TM-531A** covers 1240–1299.995 MHz.
- **CTCSS encode built-in, selectable from the front panel.**
- **Selectable frequency steps** for quick and easy QSY.
- **TM-241A provides 50 W. TM-441A 35 W, and TM-541A 10 W.** Three power positions, 5, 10, and full. The TM-541A has two power positions, 1 and 10 watts.
- **20 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2m is automatically selected.** There are **four channels** for "odd split" operation.
- **Tone Alert System with Elapsing Time indicator.**
- **Auto-power off function, and time-out timer.**



RC-20 Remote Control Unit
As supplied, one RC-20 will control two transceivers. **Most often-used front panel functions** are controllable from the RC-20. The RC-20 and IF-20 combine to allow control of up to four radios.

- **Selective calling and pager option.** The DTU-2 option enables the Dual Tone Squelch System (DTSS), allowing selective calling and paging using standard DTMF tones.
- **Digital recording system option.** Used in conjunction with the tone alert system, the DRU-1 allows message storage of up to 32 seconds.
- **Multiple scanning functions.** Band and memory scan, with selectable scan stops and memory channel lock-out.
- **Large LCD display with four-step dimmer control.**
- **Automatic Lock Tuning (ALT) for the TM-541A.** Compensates for drift.
- **Supplied accessories.** Mounting bracket, DC cable, fuses, MC-44DM multi-function DTMF mic.

Optional accessories

• **DRU-1** Digital Recording Unit • **DTU-2** DTSS unit • **IF-20** Interface unit, used with the RC-20, allows more than two transceivers to be remotely controlled • **MA-700** 2m/70cm dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mounting bracket • **MC-44** Multi-function hand microphone • **MC-55** (8-pin) Mobile mic. with time-out timer • **MC-60A, MC-80, MC-85** Base station mics • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **PG-4G** Extra control cable • **PG-4H** Interface connecting cable • **PG-4J** Extension cable kit • **PS-50/PS-430** DC power supplies • **RC-10** Handset remote controller • **RC-20** Remote control head • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **TSU-6** Programmable CTCSS decoder

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Eastern Massachusetts — Mort Cohan, KA1IU, 16 Oriole Rd, Medfield 02052 (508-359-7979)
Maine — Jeff Weinstein, K1JW, PO Box 646, Yarmouth, 04096 (207-846-0700)
New Hampshire — William Burden, WB1BRE, 11 Briand, Nashua 03063 (603-889-9322)
Rhode Island — William Foss, KA1JXH, 70 Mayfair Rd, Cumberland 02864 (401-334-3058)
Vermont — Mitchell Stern, WB2JSJ, PO Box 99, Essex 05451 (802-879-6589)
Western Massachusetts — Jean Hurtle, KA1IFC, 10 Hospital Rd, Baldwinville 01436 (508-939-8108)

Northwestern Division
Alaska — Harley Steward, KL7IZZ, 12102 Lilac Cir, Anchorage, 99516 (907-345-1530)
Eastern Washington — Tom Plaisance, KC7PH, 101 N 37th Ave, Yakima 98902 (509-966-4612)
Idaho — Don Clower, KA7T, 5103 W. Cherry Ln, Meridian 83642 (208-888-7020)
Montana — A. F. "Pete" Peters, KF7R, Rte 38, Box 2017, Livingston 59047 (406-222-2601)
Oregon — Randy Stimson, KZ7T, 9890 SW Inglewood St, Portland 97225 (503-297-1175)
Western Washington — Harry Lewis, W7JWJ, 10352 Sand Point Way NE, Seattle 98125 (206-523-9117)

Pacific Division
East Bay — Bob Valtio, W6RGG, 18655 Sheffield Rd, Castro Valley, CA 94546 (415-537-6704)
Nevada — Joseph D. Lambert, W8IXD, PO Box 1201, Boulder City 89005 (702-294-0505)
Pacific — Ronald Phillips, AH6HN, SR-6637, Keaau, HI 96749 (808-966-6113)
Sacramento Valley — Jettie Hill, W6RFF, 306 St Charles Ct, Roseville, CA 95661 (916-783-0383)
San Francisco — Richard Wilson, K6LRN, PO Box 4212, San Rafael, CA 94913
San Joaquin Valley — Byron Smith, WA6YLB, 504 S. Joyner, Exeter, CA 93221 (209-592-1038)
Santa Clara Valley — Steve Wilson, KA6S, 813 Berryessa St, Milpitas, CA 95035 (408-946-7410)

Roanoke Division
North Carolina — W. Reed Whitten, AB4W, 1208 Oxford Place, Cary 27511 (919-467-7464)
South Carolina — Charles E. Moeller, N4FVU, 116 Willow Winds Dr, Columbia 29210-4454 (803-772-1186)
Virginia — Edward Dingler, N4KSO, PO Box 1517, Chilhowie, VA 24319 (703-646-5798)
West Virginia — Karl S. Thompson, K8KT, Rte 7, Box 422K, South Charleston 25309 (304-744-7829)

Rocky Mountain Division
Colorado — William Sheffield, KQØJ, 1444 Roslyn St, Denver 80220 (303-355-2488)
New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd, NE, Albuquerque 87112 (505-299-4581)
Utah — Richard Fisher, NS7K, 1510 Celia Way, Layton 84041 (801-544-1928)
Wyoming — James E. Raisler, N7GVV, 1102 East 9th St, Gillette 82716 (307-686-0794)

Southeastern Division
Alabama — Mildred Cullen, AA4XF, 2331 Ivy Lane, Birmingham 35226 (205-822-6130)
Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave, Columbus 31909 (404-322-2856)
Northern Florida — Rudy Hubbard, WA4PUP, PO Box 843, Milton 32572-0843 (904-626-0620)
Southern Florida — Richard D. Hill, WA4PFK, 12380 NW 30 St, Sunrise 33323 (305-572-3172)
Puerto Rico — Luis Lopez, WP4EPC, PO Box 20719, Rio Piedras 00928 (809-765-6867)
Virgin Islands — Ronald Hall, Sr, KP2N, PO Box 3987, St Thomas 00803 (809-774-4740)

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 (805-868-1359)

West Gulf Division
North Texas — W. W. "Dan" Dansby, W5URI, 5805 Walta Ave, Fort Worth 76133 (817-292-5019)
Oklahoma — Joseph Lynch, N6CL, PO Box 73, Oklahoma City 73101 (405-528-6625)
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..."

A Codeless Amateur License

Beginning on Valentine's Day 1991, for the first time in the history of the United States, there is a place in Amateur Radio for people who are enthusiastic about radio communication but don't know Morse code. The League was among the petitioners for a codeless license, and is now preparing to welcome newcomers to our midst and to expose them to the breadth of opportunities the rest of us have so long enjoyed.

Thus ends a controversy nearly as old as radio itself, one that long ago was settled elsewhere. Most European countries have had VHF codeless licenses for decades; so have most of the countries on the Pacific Rim. Their experience with a codeless license generally has been positive. Canada's initial codeless license flopped because the written *examination was too demanding; its new* Basic license, introduced last October, aims at encouraging broader participation.

Nonetheless, reflecting what was then the collective opinion of its members and of most radio amateurs, the League had long opposed a codeless license. In the mid-'70s, in response to a sweeping FCC proposal for a "dual ladder" licensing structure, the League supported an entry-level VHF license with a minimal "code recognition" requirement. However, the Commission finally decided not to do anything drastic to the licensing structure at that time.

At the final stage of preparations for WARC-79, someone at the FCC engineered a surprise addition to the US proposals that would have changed the Morse proficiency *requirement* for operation below 144 MHz into a mere *recommendation* to administrations. The proposal was defeated in Geneva and an alternative proposal simply to lower the frequency from 144 to 30 MHz was adopted instead. The incident unleashed a shower of criticism on the FCC, both for the substance of the proposal and for the way it was handled. As we entered the '80s, our confidence in the Commission was at a low ebb. When *in 1983 the FCC*, on its own motion, proposed two alternative ways of implementing a codeless amateur license, the grassroots reaction was negative by a margin of 20 or 25 to one. In the face of this determined opposition the Commission abandoned its initiative.

That's where matters stood until little more than two years ago. A codeless license, for several years considered a dead issue, began to be discussed anew—and in an altogether different way. It was soon apparent that amateurs' opposition, while still significant, had diminished considerably. Opinions varied as to what had caused the change, but that change had occurred was undeniable: Proponents of some form of codeless amateur license suddenly were at least as numerous as opponents, and they were effective in arguing their case.

A dozen petitions, including the League's, spurred the FCC once again to consider a codeless license. Unfortunately, the problem of scarce resources overshadowed the proceeding: The Commission said it could implement such a license only if doing so would not add to its administrative burdens, and proposed to accomplish this by issuing no new Novice or Technician licenses. Horrified at the prospect of losing the Novice, amateurs responded that if this was the price of a codeless license, the price was too high. Aside from that, and in sharp contrast to seven years ago, the comments received by the Commission reflected general support of the concept.

Motivated to adopt a codeless license but constrained from being able to commit new resources, the FCC elected to modify the requirements for an existing class of license, the Technician, in preference to creating a new one. The story begins on page 57, where you will find the Report and Order, whole and unexpurgated.

What the Commission has done is not exactly what the League supported. What emerged from the League's democratic processes was a carefully balanced package. It was designed to accomplish the objectives of a codeless license while minimizing the impact on previously licensed amateurs, whose support is crucial to a successful implementation. On the other hand, what has emerged from the Commission's administrative processes is simpler to implement and perhaps more expedient, although it results in there being four different (and poorly documented) kinds of Technician licensee, and other anomalies.

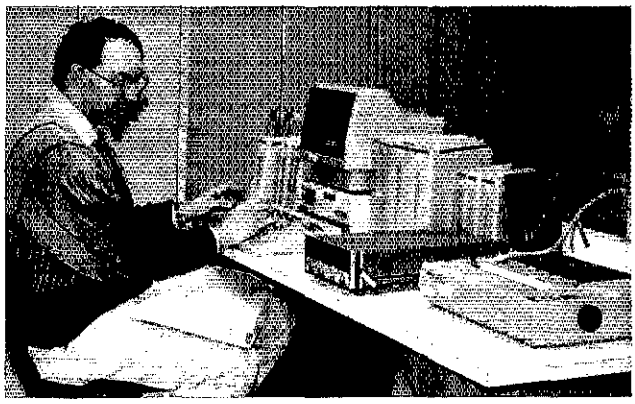
In this, as in any other Commission proceeding, there is a 30-day period following release of the Report and Order in which petitions for reconsideration, in full or in part, may be filed. After this *QST* goes to press, but probably before you receive it, the ARRL Board will hold a regularly scheduled meeting. At that meeting, the Board will be able to consider a range of options based on membership reaction heard up to that time.

We can't predict whether the Board will fully accept the Commission's package. But we *can* safely predict this: The League will remain *totally committed to welcoming all amateur licensees* to our ranks. So should every club, every group, every individual amateur.

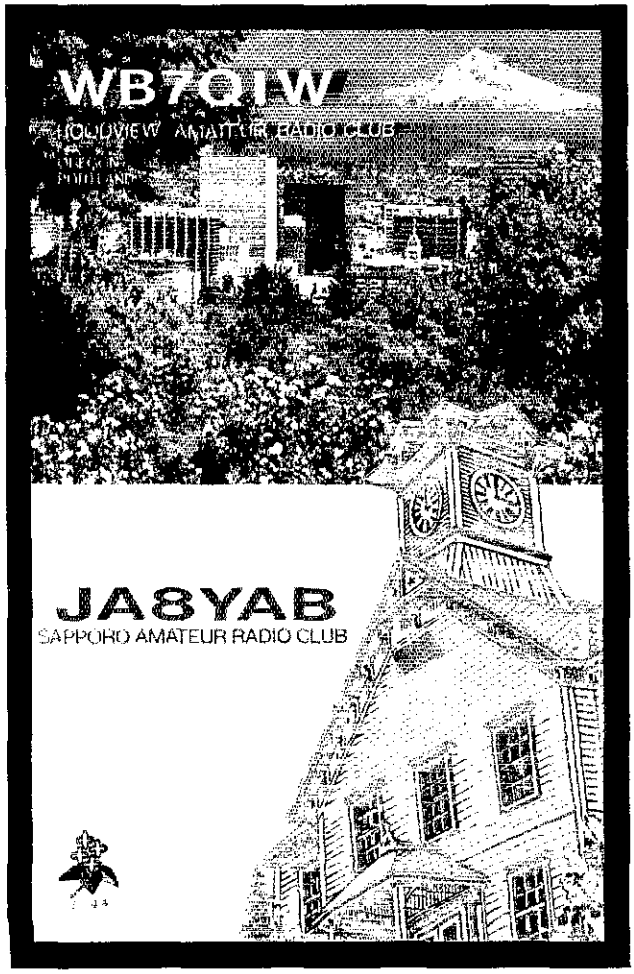
The first codeless hams will be our family members, our friends, our neighbors. If a British amateur (or a German, an Australian, or Japanese) were to show up at your club meeting, would you welcome him (or her) any less hospitably if you knew he had a codeless license than if you didn't? Of course not. He shares your interests. Indeed, you may well have contacted him on the air by satellite, on 6 meters, or via packet. Surely we should treat our neighbors at least as well as our friends from far away.

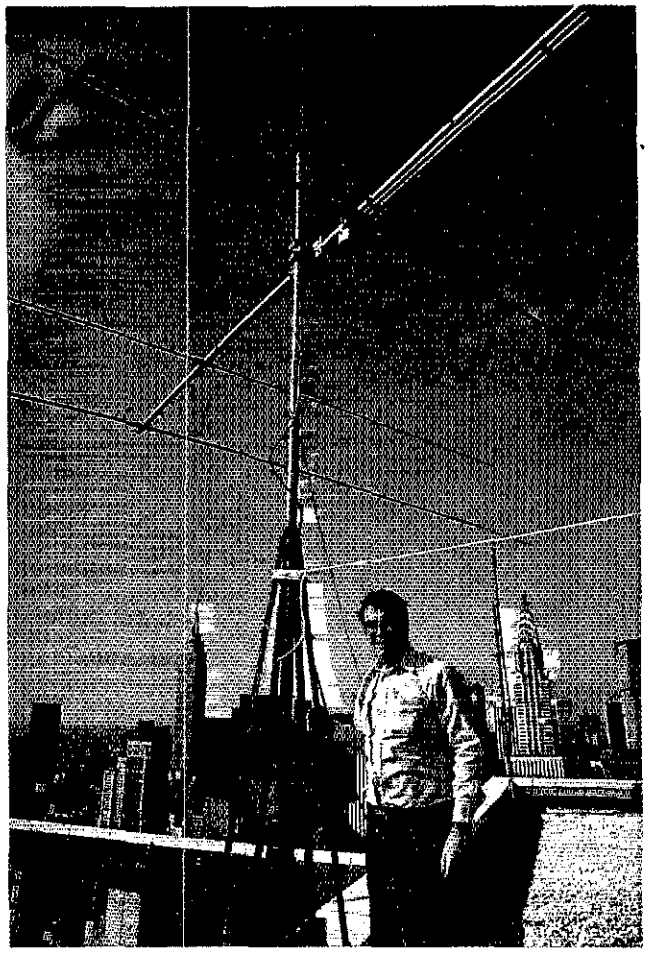
In closing, some more predictions. Five years from now, our first codeless amateurs will be providing personnel and leadership in local public-service communications efforts from coast to coast. Many, infected by our enthusiasm for the world below 30 MHz, will have upgraded; some even will have become enthusiastic and accomplished CW operators.

Let's put out the welcome mat.—*David Sumner, K1ZZ*



Control operator: HQ Laboratory Supervisor Jon Bloom, KE3Z, controls the computer that controls test equipment (we don't know *what* controls Bloom!). The Hewlett-Packard model 9816 computer was donated to the League by HP's Colorado Springs division, thanks to arrangements made by HP's Technical Computing Manager Bdale Garbee, N3EUA. Garbee is known for his *BM* program, widely used in packet radio TCP/IP applications. *(KA1CV photo)*





Skyscraper skyhook: David Rosen, K2GM, stands by the 4-element Yagi atop the United Nations building in New York City. The UN headquarters station, 4U1UN, also has a new vertical antenna covering 80-10 meters and an upgraded operating position. *(N2IEB/JS1DLC photo)*

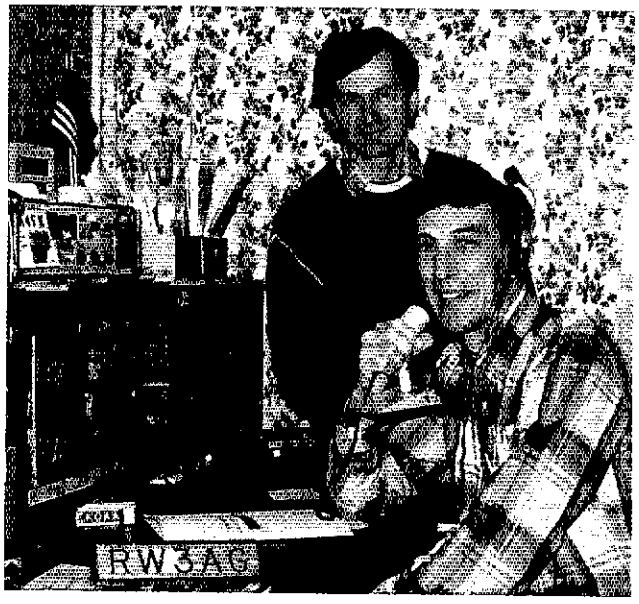
Gifts from afar: This attractive QSL card was presented to the Hoodview (Portland, Oregon) ARC by the Sapporo ARC of Japan. The two groups signed an agreement to be sister clubs when visitors from the Sapporo organization visited Gresham, Oregon, on November 25, 1989. In September of 1990, Jim and Cory Schach, KA7AGH and KA7IUG; Armand Pilotte, WA7IIM; and Pilotte's wife, Merilyn Abe, went to Japan to visit and renew the clubs' friendship.

The reverse side of the card has QSL info for both clubs with text in English and in Japanese describing the alliance. *(QSL card courtesy of W7QMU; thanks, KA7IUG)*

Soviets at Harvard...Hams from the Leningrad Institute of Aircraft Instrumentation visited friends at the Harvard Wireless Club (HWC) last fall, completing an exchange started when W1AF ops traveled to the USSR to operate UZ1AWT.

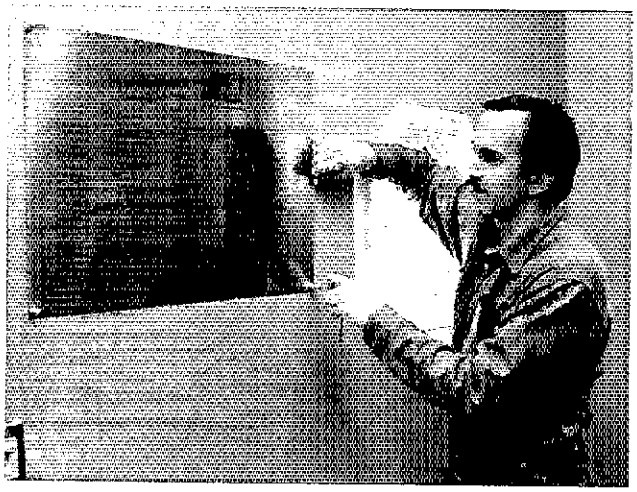
In one photo, HWC President Gunnar Trumbull, KC1SW, and the Leningrad Institute's Vladimir Alexandrov, UA1IU, display their countries' flags from W1AF's tower. In the other, members from both clubs huddle behind a Harvard Wireless banner.

A highlight of the Cambridge, Massachusetts, visit was a first-class dinner at the impeccable Harvard Club in downtown Boston, hosted by Carter Pfaeizer, W1TCD, president emeritus of the Harvard Wireless Club. *(KM1G photos)*



...**An American at Moscow State U:** Dr Frank Starmer, UA3A/KB4GZ, of the Duke University Medical Center in Durham, North Carolina, operates from Moscow on 15, 20 and 40-meter SSB. He and Nick Kholodov, UV3GZ, operate Vlad Plugin's station, RW3AG, in Vnukovo, on the fourth of July 1990.

Starmer was participating in a scientific exchange program between the National Institutes of Health in Washington, DC, and the All Union Institute of Cardiology of the Soviet Ministry of Health in Moscow. Friends from the Federation of Radio Sport helped obtain permission for Starmer to operate. *(photo courtesy of KB4GZ)*



W1AW Kilowatt Club members honored: HQ Building Manager Greg Kwasowski hangs a new plaque in the vestibule of W1AW, in recognition of the 132 League Members and clubs who donated $1000 or more toward the W1AW Renovation Fund. The Hiram Percy Maxim Club plaque hangs nearby, honoring 148 Members and clubs who gave $500-$1000 each. More than 10,000 Members contributed a total of $500,000 from 1988 to date to remodel and modernize Amateur Radio's landmark station. *(NTØZ photo)*

League Lines

The FCC has approved another one-year extension of ***Special Temporary Authorizations*** (STAs) for selected HF packet stations under automatic control. The extension, until January 4, 1992, is to permit continued experimentation until new FCC rules regarding automatic control of data communications are adopted.

Instructors are gearing up for an ***influx of hams-to-be*** resulting from the imminent code-free Technician class license. The ARRL's Educational Activities Department is preparing a new class instructor guide for Amateur Radio's newest entry point. EAD seeks ideas from instructors on the content of the guide, as well as suggestions on how to "mainstream" the new Technicians into our ranks (as well as convincing them of the importance of League membership).

Assuming the code-free Technician license becomes a reality on February 14, amateurs who passed Element 2 and/or Element 3A after February 14, 1990, may now qualify for (or have partial credit toward) the new license. (Element credit is good for only 365 days from the examination date).

And a note to all Novices and Technicians: Keep your license (or a copy) to document that you have passed the 5-WPM Morse code examination for future upgrades.

Farewell to Joan Hushin, KA1IFO, manager of ***the ARRL QSL Bureau*** for the past dozen years. The bureau handles both outgoing and (some) incoming cards—in 1990, some 3 *million* of them. At press time, applications are still being accepted for the position of Bureau supervisor; see January League Lines.

As for your incoming cards, please help your call area bureau by ensuring that you have a stock of SASEs on file, with proper postage. The unofficial word is that First Class US postage will increase to 30 cents for the first ounce and 23 cents for each additional ounce, beginning February 3. So please send your hard-working bureau volunteers additional stamps or money, according to their preference.

Nearly one hundred countries have reciprocal Amateur Radio operating agreements with the United States, according to the latest list issued by the FCC. HQ has the necessary forms to be used in applying to these and certain other countries for operating permission. They're yours for an SASE.

Regulations governing telecommunications facilities in time of war or national emergency have been changed. As of Dec 11, 1990, Amateur Radio stations no longer will automatically be shut down in such cases. FCC licensees will, however, be obliged to observe whatever orders and instructions the FCC issues in the interests of national security and spectrum use.

If you're renting or borrowing space on a commercial tower, be advised that ***the FCC may be interested in you***. According to the Dec 17 issue of *Broadcasting* magazine, a two-day inspection of such towers by the FCC in November found 16% (160 out of 1031) "in apparent violation of safety rules governing their painting and lighting." Each licensee using tower space is separately responsible for lighting and painting, said Richard Smith, chief of the FCC Field Operations Bureau. According to *Broadcasting*, the Commission has begun tentatively levying fines (mostly $2000) against each tower user it found in violation.

In response to a request from US Army Brigadier General Wesley B. Taylor Jr, community commander of the Nuernberg (Germany) Military Community, ***the ARRL has shipped two HF radios for MARS use by the First Armored Division in Saudi Arabia***. "Our present MARS equipment is insufficient for a deployment of this kind," Taylor said, "and we are desperately in need of additional equipment."

The rigs, a Kenwood TS-140S and an ICOM IC-735, were donated by the manufacturers in September of 1989 for use in Puerto Rico following Hurricane Hugo.

MARS traffic from the Middle East can be heard on 20.994, 19.532, 14.650 and 14.665 MHz.

MCI Communications Corporation has announced it is providing equipment "to establish 15 new MARS stations" in Saudi Arabia. Since September, MCI has been donating free emergency long-distance telephone service to US troops in Saudi Arabia through the American Red Cross.

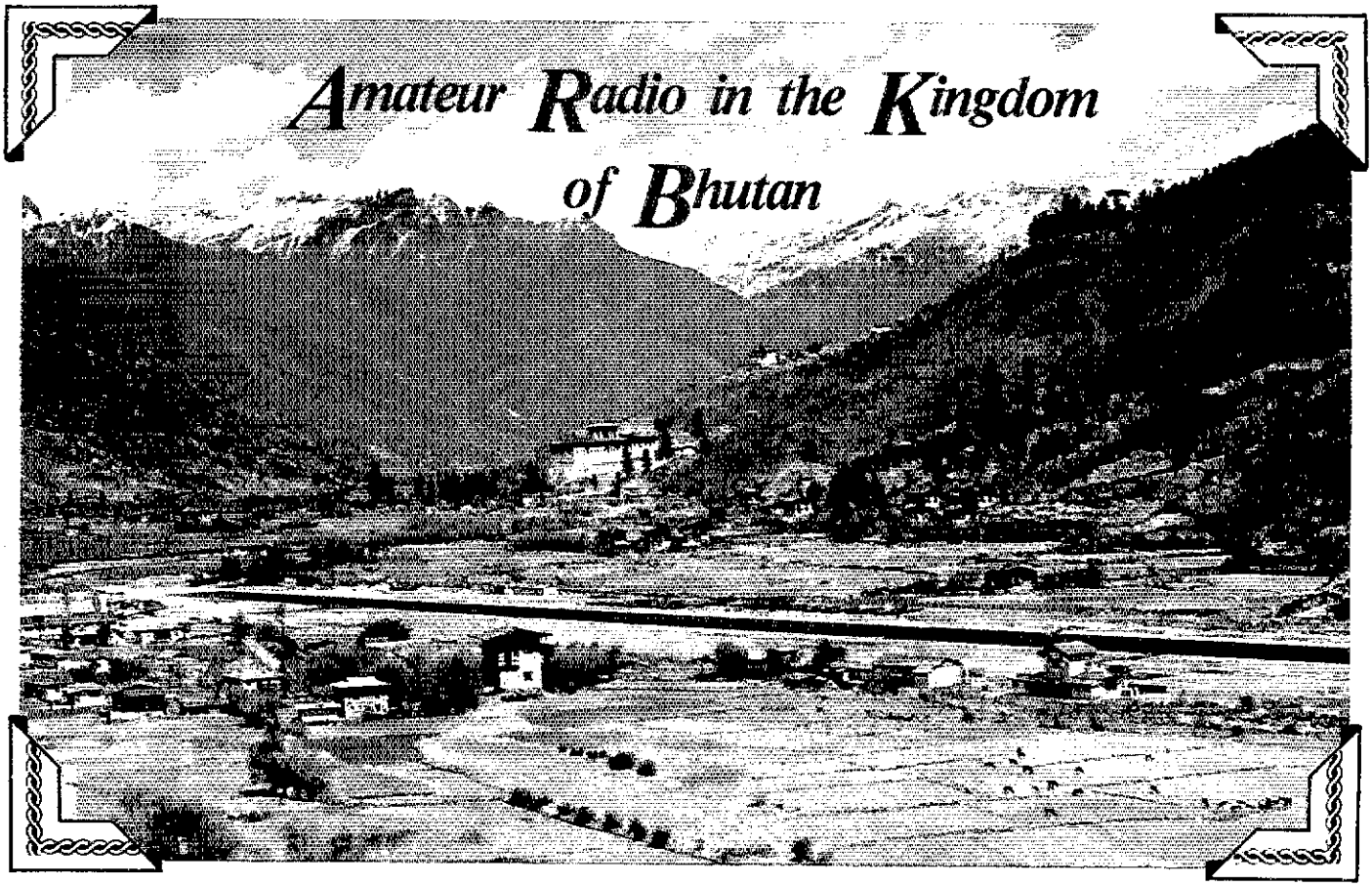
WIAW has returned to 160 meters with code practice transmissions and bulletins on 1.818 MHz (CW) and 1.890 MHz (SSB). And, since Jan 2, the Headquarters station has changed CW frequencies on 10 and 15 meters, to 28.0675 and 21.0675 MHz, to avoid interfering with AMTOR operations.

Lowering the median: An active Amateur Radio club has ***polled its current licensing students*** by asking them four questions: (1) Age; (2) Occupation; (3) How they heard about the licensing class; and (4) Why they want to become hams.

35% of the students were age 18 or under, 40% were 19 to 50, and 22% were over 50 (3% kept it a secret). 41% of the class were students, 20% had "electronics-related" jobs, and 12% were retired. 75% of the class heard about it from a friend or the newspaper. And their reasons for getting a license ranged from DXing (the most popular response), to Scouting, to "for the fun of it."

Writing is merely thinking on paper, so ***why not put on your cap*** and write for *QST*? In addition to technical articles, submissions for the new Op-Ed column are sought (see *QST*, Oct 1990, p 70), as are fictional submissions for the Walker A. Tompkins Writing Award (see Jan *QST*, p 45). The rewards are more than just monetary, too; published writing adds a nice touch to a resume or college application.

Amateur Radio in the Kingdom of Bhutan



Paro Airport greets many travelers to Bhutan. The approach through the mountain passes is particularly memorable! (photos by the author)

By J. B. Smith, VK9NS, Box 90, Norfolk Island, Australia 2899

A few years ago, you entered Bhutan via Phuntsholing, India, in the southern foothills of the Himalayas. After days of travelling along a winding, climbing thread of a road, clinging to the edge of the mountains, you would finally arrive at Thimphu. At Phuntsholing, the road starts at a tropical 500 feet above sea level and climbs to just over 7500 feet above sea level at Thimphu, Bhutan's mountain-shrouded capital. Continuing north, you'd eventually sight the majestic peaks of the Himalayas.

My journey, however, was much easier: Norfolk Island, Auckland, Bangkok, Dhaka (Bangladesh) and finally, Paro, Bhutan. Only a couple of weeks prior to my departure I had received a telex that said in part, "Permission is granted to enter Bhutan as a tourist. Amateur Radio permission will be granted on arrival, subject to checks of radio equipment." After more than three years of contact with the Bhutan Government, a germ of an idea had come to fruition.

In recent years, His Majesty Jigme Singye Wanchuck, the ruler of Bhutan (The Land of the Druk, or Thunder Dragon), has steadily moved his country forward, embracing Western technology on many occasions. Yet magically, the King has been able to keep the country's culture intact. Tourist entries are kept to a minimum. Visitors witness real life, not the tourist-oriented hype prevalent in other destinations.

A51JS put rare Bhutan on the air in a big way. But Jim Smith's trip was more than Amateur Radio.

It was a mad rush to get things organized. Because of difficulties with air freight on the Bangkok-Bhutan leg, there was no beam, no extra coax (for other antennas), no 6-meter rig and so on. I left Norfolk Island, however, with two rigs: an ICOM IC-740 and an ICOM IC-751, 30 meters of coax and a Butternut HF6V vertical antenna. Upon check-in at Norfolk Island, I was carrying about 160 pounds of baggage. These days, I look at airline passengers checking in with a suitcase and a piece of hand luggage (regulation size of course) with admiration.

In Auckland, a change in airline schedules had me leaving on Thai Airlines for Bangkok earlier than planned. Ten minutes later and $700 poorer, I was ready for departure.

The nonstop flight was uneventful and several hours later I landed at Bangkok Airport. The facilities at Bangkok are excellent. All of my main baggage was loaded on a trolley and I approached Customs with caution—yet with just a moment's explanation, I was waved through with a smile. A few minutes later, a taxi was taking me to the hotel in town. With three nights in Bangkok, I spent Monday and Tuesday trying to finalize arrangements with the Bangladesh Embassy and sent a telex off to Dhaka about my intended visit. I also organized my entry visa and a return air ticket: Bangkok, Dhaka, Paro, Dhaka, and Bangkok.

On Wednesday morning, I was up very early for an uneventful 0630 check-in at the Druk Airline counter. After Auckland, I was worried about excess baggage and had visions of additional expenses or the pos-

sibility of it being off-loaded. The check-in girl was delightful, hardly batting an eyelid as my main items were handed over. After a token charge of US $200, I was breathing freely again.

A bus came to pick up our small group of 30 passengers. We passed a number of planes, big and small, and finally stopped beside our Druk Airline plane. It seemed quite small, but it was comfortable and modern. Soon, we were on our way, climbing out over Bangkok.

At Dhaka, through passengers were kept on the plane. Forty minutes later, Paro, Bhutan, was our next stop. The approach to Paro seems to be a real test of pilot skill (not to mention passenger nerve). The descent had us winding and twisting through the mountain valleys. The airport lies in the fertile Paro valley, some 6500 feet above sea level.

Paro's terminal was quite small and it took some time to get organized. Money had to be changed to pay for visa and possible customs charges. My visa was valid for two weeks and carried a renewal option. With those formalities out of the way, we moved to the baggage-collection and customs area. Having declared almost $4000 in Amateur Radio equipment, I was concerned about possible problems. I quickly spotted Sherab Dorji of the Wireless Division, however, and after our formal introductions, he took my customs declaration form. As my baggage was collected, each item was passed by customs and we were soon on our way.

Our first stop was for lunch at the local Olathag Hotel. Over lunch, many things were discussed, including permission to operate Amateur Radio. Then, it was off to Thimphu, our final destination, a couple of hours away. This journey was my introduction to the winding, climbing roads of Bhutan. The sealed road was in excellent condition and the views of the countryside were spectacular. Shortly thereafter, I was checked into the Hotel Motithang, my home for the next three weeks.

The hotel was large, and soon all my baggage was safely in the room, which was enormous. Because it was late afternoon, I decided to look at the Amateur Radio equipment in detail. With several willing helpers, the main items were soon unpacked. My room was on the ground floor, and it appeared that getting the Butternut vertical set up would be pretty easy. Indeed, with the help of Sherab and others, the antenna was assembled and erected within 30 minutes.

Sherab Dorji, of the government's Wireless Division, was instrumental in helping VK9NS to obtain operating permission in Bhutan. Here he puts on a convincing display of Bhutan's national sport. Note Sherab's American-made compound bow!

The author and Pradhan, A51PN, who for more than four years in the late 1970s was the sole "voice" of Bhutan.

Meanwhile, I turned on the IC-751 and demonstrated its main controls, power output, frequencies and so on. I soon had the operating permission I had sought. My CW CQ was answered at 1143 UTC on the 21st of March: The Kingdom of Bhutan was again active on the amateur bands—A51JS was in QSO with YB5BZ on 20-meter CW.

This story does not truly reflect the tremendous trust and genuine interest of the Wireless Division of the Royal Government of Bhutan. Eight years of inactivity is a long time. It meant that thousands of hams had never worked Pradhan, A51PN, who for more than four years in the late 1970s had been the sole "voice" of Bhutan.

Sherab Dorji mentally copied the early QSOs and smiled broadly. I like to think that he was glad that Amateur Radio was on its way again. The pileups increased as more amateurs realized that Bhutan was again active. About an hour later, I worked Kan, JA1BK, on SSB. It was the first A51 phone QSO in more than eight years. Kan telephoned Kirsti, VK9NL, and we were soon in QSO. Sherab and the others had to leave, so an appointment was made for next morning to secure an official letter of authorization. In the meantime, I was free to operate!

In the days and weeks to follow, my respect for the Bhutanese people grew. They are some of the most open and honest people in the world. Sherab and the others

An A51JS QSL card was earned by nearly 15,000 hams from around the world. *(VK9NS photos)*

A detail of a religious "Thanka," photographed at an annual Buddhist festival.

were determined to show me something of their country (other than the inside of my hotel room, that is). I was not going to sit in front of the rig hour after hour, day in, day out. As a result, I slept, operated Amateur Radio and I became a tourist (without really realizing it). I discussed Amateur Radio at length—regulations, frequency allocations, power, band planning and so on.

In the early days, I found the large room quite cold. It was sometimes uncomfortable, but I gradually adjusted. There were frequent power outages, too, some lasting only a few minutes, others an hour or more. Murphy, as usual, seemed to intrude at the most inconvenient times, usually late in the afternoon as the band was opening to the US or when I was talking to Kirsti. Propagation to various parts of the US was unpredictable. I used a *DX Edge*—it was just like working on 80 meters. Gradually, my QSO total rose and more contacts were logged with hams in the US, South America and Europe.

A few days after my arrival, I awoke to silence, a sure sign that the power was off. On looking out the window, I was surprised to see everything covered in about three inches of snow. Minutes later, still 6:30 in the morning, I was crunching through the snow taking photographs. The thin fishing line guys of the Butternut vertical now looked like one-inch ropes.

Although the HF6V was at 7500 feet, the hotel was tucked at the end of a valley with mountains all around. Incoming signals (in particular those from North America) were almost unreadable because of the flutter. Some of this was because of polar effects, but there were many multipath reflections because of the surrounding mountains. Many US amateurs found that beam headings to A51JS varied widely.

Line voltage was frequently low, and the '751's power output was often about 80 watts, key down. I have no doubt that a small amplifier would have helped. With the usual DXpedition approach of "you're 59" it's easy to be lulled into believing the exaggerated signal strengths. Many signals didn't even move the S meter. I worked 80-10 meters, but I avoided operating on the WARC bands because I didn't want to risk causing QRM on bands that might not even be recognized in Bhutan.

One of my biggest thrills as A51JS was getting on RTTY—the Kingdom of Bhutan had never been available on this mode. RTTY fascinated my friends. I demonstrated keyboard Morse, automatic Morse read out, random Morse generation and so on. It was a huge success. Bhutan's first RTTY QSO took place between Gin, JA1ACB, and A51JS on the second day of the operation. Again, a beam would have helped. The pileup was tremendous.

As a "tourist," I saw a great deal. I made the 160-km journey south to Phuntsholing—the Indian gateway I mentioned earlier. The trip took six hours, and was quite educational.

Some 50,000 foreign workers (mostly on contract from India) keep Bhutan's extensive road system in good repair. It was an eye opener to see the "labor-intensive" methods they used. A worker would fill an old sack with dirt and rocks, carry it away, dump its contents and return for another load.

We passed through one spot that had recently had a major slippage. A small bulldozer helped things along. It didn't pay to look out the car window—the drop was often well over 1000 feet.

In tropical Phuntsholing, the weather seemed quite hot after the chilly temperatures of Thimphu. The border between India and Bhutan runs through the bustling town. We decided to stay overnight. That evening, I sat outside on the hotel veranda in the balmy air, listening to the "chit chats" (small lizards), fighting off the mosquitoes and watching the myriad of small bats catching their evening meal around the lights of the hotel.

The next morning was the long uphill haul back to Thimphu. We stopped several times to take pictures. The people smiled and were very friendly. At the halfway point, we lunched at one of the government tourist centers. After the meal, I was introduced to the art of "mushroom growing," Bhutan style. It was a revelation to see the mushrooms growing from dozens of "blind" holes drilled in damp pieces of wood. The spore was imported from Japan and the venture was apparently quite profitable.

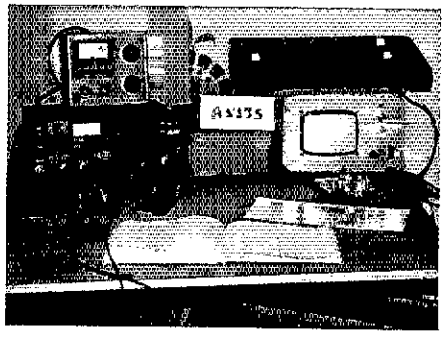
Table 1
QSO Breakdowns for A51JS

Band	*CW*	*SSB*	*RTTY*
10 m	1682	1607	
15 m	2105	2537	
20 m	3056	2767	
40 m	828	10	
80 m	98	0	
Subtotals =	7769	6921	182
Grand Total = 14872			

Back in Thimphu, I was soon wrapped in my regulation clothes: two pairs of socks, long johns and thick trousers, a vest, a shirt, a pull-over and a parka. A small 800-W heater helped somewhat, but made little impression on the room.

In a joking moment, Sherab asked me what I would like to see most in Bhutan. I replied, "Yaks, and of course a Yeti, not necessarily in that order." The next morning, we set out in search of the Yak. Sherab warned me that a Yeti sighting would be unlikely! After a couple of hours of driving, we were at about 8500 feet, well above the snow line. As we continued our journey over the pass, we suddenly stopped. Sherab had spotted some Yak. The next hour or so was hilarious as Sherab, the guide, and the driver tried to "muster" the Yak for my benefit. Eventually, the Yak galloped (if that is what Yak do) past me as I took several photographs.

Sherab eventually reappeared and was grinning from ear to ear. He then produced his masterpiece—a roadside picnic with coffee, homemade biscuits and fruit. It was a jovial lunch. We couldn't stop laughing about the Yak! On the way back to Thimphu, we saw our four Yak as we rounded the first curve. I took a few more pictures and our laughter returned. We never did see a Yeti!



The author made thousands of contacts from this unassuming station, including the first-ever A51 RTTY QSOs.

I met Pradhan, A51PN, on several occasions. He was unable to operate as A51PN immediately because there were still formalities to complete. I left an ICOM IC-740, my trusty Butternut vertical, a microphone and an antenna tuner and coaxial cable for future use.

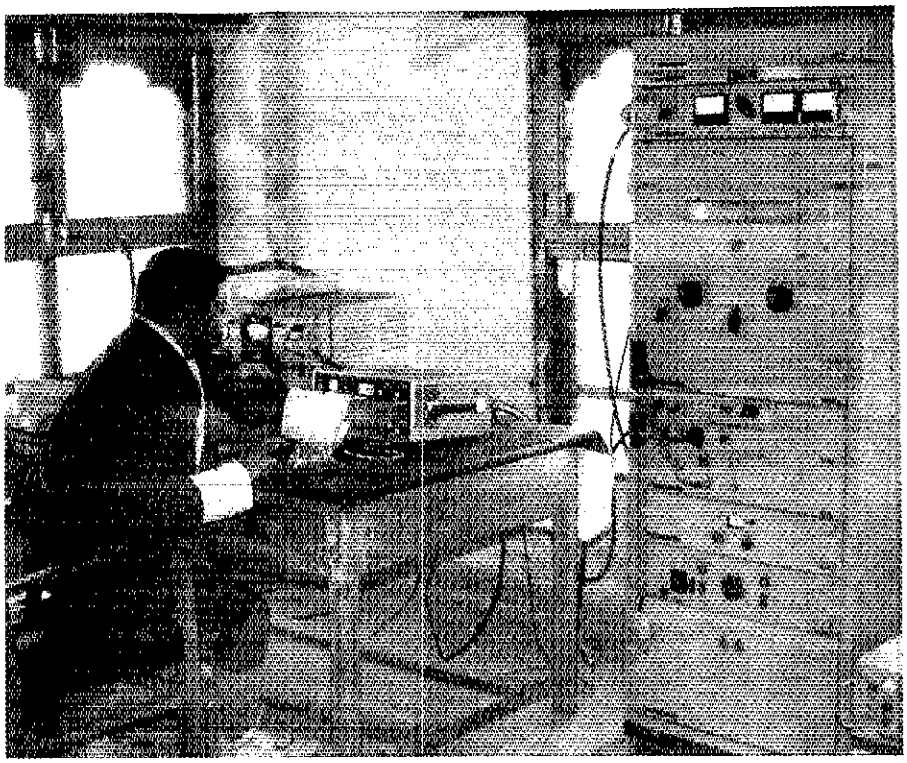
I had expressed a desire to meet Yonten (ex AC5TY), and in due course this was arranged. Despite being a busy government official, Yonten gave me a warm welcome. We had a courteous meeting in his office and we talked about old times, his travels and his activities as AC5TY.

Bhutan's national sport is archery, and it is taken very seriously. In fact, I used this hobby as a direct parallel to Amateur Radio: skill, interest, competition, fellowship and so on. The archery range is more than 300 feet long, with a target at each end. The target is a 10-inch bull on a board about three feet long and 12 inches wide. The archers are extremely accurate, and after each competitor has released two arrows, they head to the opposite end of the range. A steadily growing group stands close to the target area and each arriving arrow is greeted with an appropriate call or indication. When an arrow hits the board or bull area there is a delightful "song and dance" routine for the occasion. A wide miss is greeted with another appropriate routine. After scoring, it's "off again" to shoot the arrows back down the range at the other target. Incidentally, most of the competitors used high-tech bows and arrows made in the US!

Sherab, in his capacity as Deputy Chief Engineer, showed me around several of the Bhutan Wireless Stations. There is an extensive network in the Kingdom. More than 90% of the traffic is on CW, so all of the operators are very proficient in Morse. The battery-powered Yaesu equipment operates on multichannel SSB/CW links, and all circuits were busy. I attended one of the Morse training classes and discovered that after using a Bencher paddle for so many years, my brass pounding was very rusty. Within a few minutes, however, I could feel my confidence returning. My fist gradually improved and I was able to send tolerable Morse. We had a lot of fun. There is plenty of potential for Amateur Radio in Bhutan!

In one of the major stations, we passed a padlocked room. Sherab murmured, "This is our junk room, we keep our old equipment in here." Some minutes later, the key was located and there on the floor were a couple of old RCA AR88 receivers. Nostalgia, indeed. I had cut my teeth on this receiver in the late 1940s. There were also many 807s and 813s around.

A Cushcraft tribander was mounted on the roof. I was tempted to try to borrow it for a week, but decided against the idea. It was used on a busy Indian circuit running just below 20 meters. An FT-101 poured out the code.



An extensive network of wireless stations links Bhutan and India. The traffic is passed on CW. Note the Yaesu FT-101 at the end of the CW hand key!

The famous Paro Festival was held during my stay, which was a real stroke of luck. The festival gave me further insight into the Bhutanese way of life and provided many moments of pleasure. After the religious festival itself, a large area was set aside to cater to the participants. There were food and drink stalls, places to buy toys and so on. It was like a miniature fairground. I remembered many of the old "rackets" from my trips to such places as a youngster: Hoopla stalls; the old three-card trick; and an ingenious dice thrower who could throw any number he wanted, usually the one nobody wanted to see. The stakes were small, however, usually a one-rupee note (about six cents), so nobody was going broke.

It was fun watching the kids hanging around the toy stalls selling cheap plastic toys. They agonized over what to buy with their few rupees. Food stalls were also in demand, and that same rupee note could be exchanged for a large portion of curry, straight from the pot.

Before I left Bhutan, Murphy took his parting shot. A couple of days before my departure, I decided to leave the HF6V, which meant that I could use the rig until I was ready to leave, with no need to pack. On the last evening, however, propagation was terrible and band conditions clamped down. About 2300 local, I finished packing: The A51JS operation was over. The final multihour marathon came to nothing.

Early Wednesday morning, we left the Motithang Hotel and Thimphu for Paro Airport. I felt sad as Sherab and the others said goodbye. The Druk Airline plane left on schedule, ending my three-week stay in the tiny Himalayan kingdom. By lunch time, I was back in Bangkok for another two-day stay. All of my excess baggage was sent ahead unaccompanied, a much cheaper solution. In the hustle and bustle of Bangkok, my adventure seemed more like a dream than reality. Finally back on Norfolk Island, however, the inevitable pile of mail awaited my attention, much of it for A51JS.

Sincere thanks is due to BTC and in particular to Sherab Dorji of Civil Wireless. Without his continued efforts (over several years) on my behalf and for Amateur Radio in the Kingdom of Bhutan, A51JS would never have become a reality.

To the members of the HIDXA and all my fellow DXers who helped: many thanks. Sincere thanks too to the RSGB and the ARRL. Both national societies donated Amateur Radio material for use in Bhutan, and with considerable thought, sent everything air mail. The material arrived during my stay in Bhutan and was warmly welcomed and officially acknowledged. All acknowledgments of assistance appear on the A51JS QSL card.

As the people of Bhutan say: *Tashi Dalek!* (may your journey be a safe one).

MININEC: The Other Edge of The Sword

MININEC antenna-modeling software is powerful and popular. But you need to know about its limitations to use it effectively. Here's the lowdown.

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Since the dawn of Amateur Radio, *predicting* antenna performance has been justifiably regarded as nearly impossible. No wonder: The only available tools for doing so have been analyses of textbook antennas (that bear a resemblance to our backyard creations to the same extent that a horse resembles a camel), testimonials, folklore and an awesomely lavish dose of "horse puckey."

Now, however, we have been armed with a sharp and powerful sword against decades of antenna-design darkness. But that sword is double-edged and some of us are getting pretty bloody from self-inflicted wounds as we blaze new trails in antenna design.

Our sword is, of course, the powerful antenna-modeling program *MININEC*. One of its edges is its ability to help us answer questions about antennas; its other edge is its limitations which, should we fail to recognize and carefully avoid them, can lead us to conclusions that are embarrassingly and profoundly wrong. For example, from a letter I recently received: "My personal favorite is the 45 dB gain I get [with a dipole] at 0.110 feet [high, over poor ground]. Boy, am I gonna be a big shot on 75 meters now!"

The only error the writer made was not being aware of one of *MININEC*'s basic limitations (discussed later). Tongue firmly in cheek, he had recognized that the answer was ridiculous, but sometimes we're not so lucky and the errors are tougher to spot.

Your ability to avoid the sword's other edge will greatly improve if you take time to gain a basic understanding of what *MININEC* is and how it works.

MININEC was written in BASIC for IBM®-compatible personal computers by J. C. Logan, N6BRF, and J. W. Rockway of the Naval Ocean Systems Center in San Diego. Both the source code and compiled program are available as public-domain software.[1,2] In addition, several commercial programs that use *MININEC* calculation code and additional features have appeared.[3-5] The limitations I'll describe

[1]Notes appear on page 22.

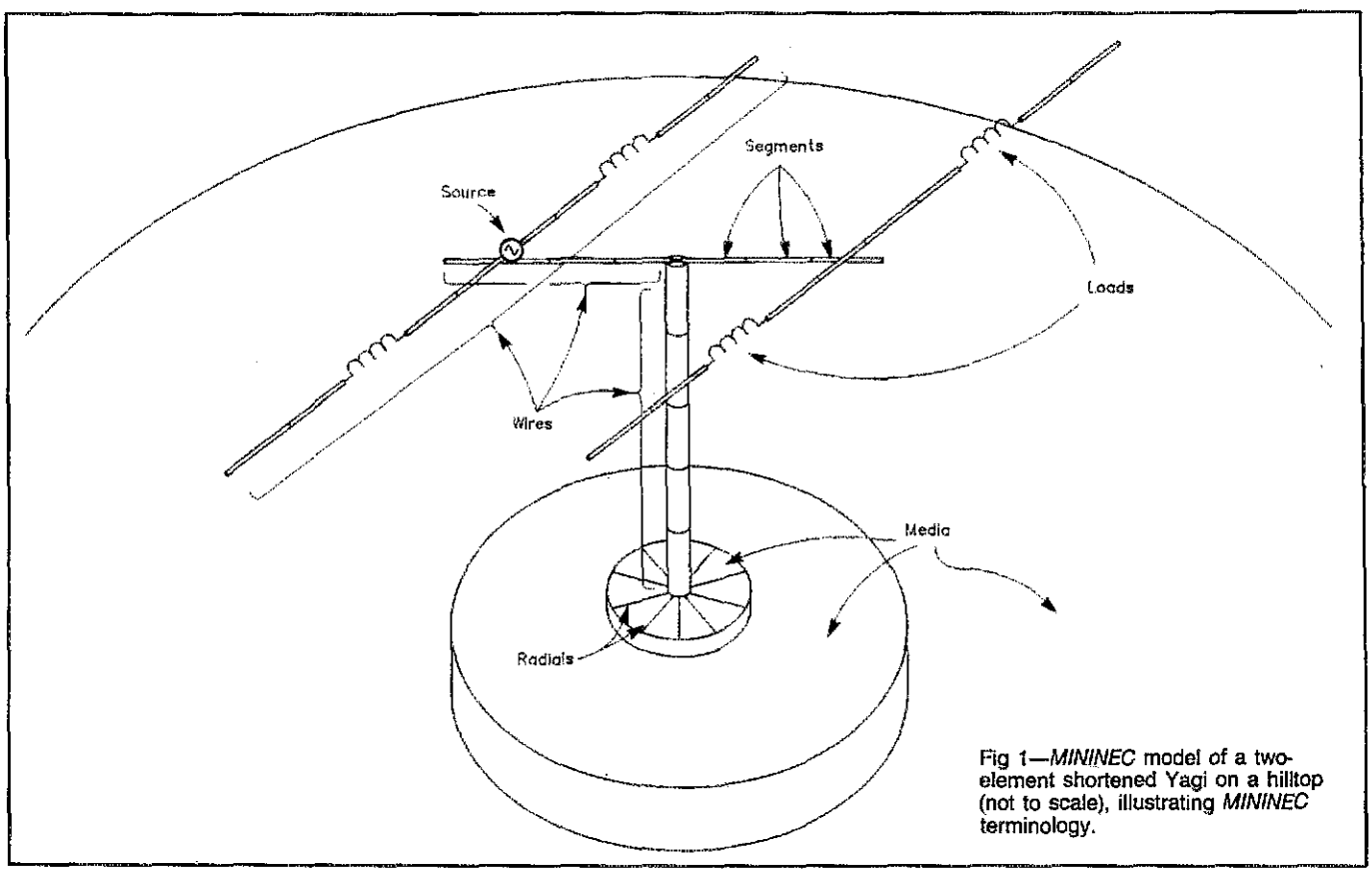


Fig 1—*MININEC* model of a two-element shortened Yagi on a hilltop (not to scale), illustrating *MININEC* terminology.

are, in general, shared by these and other derivative programs. Some variants work around some of the program's limitations, but some also add constraints of their own. Before you use any modeling program, thoroughly *read the documentation* and carefully observe the program's limits.[6] The most important thing you can do is to ask yourself: Does the result *make sense*?

How *MININEC* Works

MININEC is an extremely versatile and powerful program that permits you to "build" an antenna of straight conductors (called *wires*—you choose the diameter), put voltage *sources* and lumped impedances (*loads*) wherever you choose, place the structure over a realistic ground (if desired), and observe the input impedance, current distribution, and near and far fields at any azimuth or elevation angle. (See Fig 1.) Active (driven) and passive (parasitic) structures can be modeled. With some skill and understanding, you can accurately model anything from rhombics to rain gutters and towers to tribanders.

Let's take a closer look at *MININEC*'s operation. You enter the antenna description by specifying the diameters and end points of the wires and the number of *segments* into which they're to be divided for calculation (more about this later). End points are defined in an XYZ coordinate system. A free-space or ground-plane environment can be specified. If you choose a ground plane, it can be perfect or made of one or more sections (*media*) having finite depth, conductivity and permittivity and, if desired, radial wires. Sources and loads can be placed in series with any of the wires. (See Fig 1 for an example.) After entering the antenna description, you select one of several analysis options.

MININEC uses a procedure known as the *method of moments*.[7] In *MININEC*, each wire is divided into a group of equal-length segments for calculation. A uniform current is assumed to flow in a region extending to both sides of each segment junction (see Fig 2). These regions of uniform current, centered about the segment junctions, are called *pulses*. In any analysis, the program first calculates the self-impedance at each pulse and the mutual impedance between each pulse and all the others. If a ground plane has been specified, the impedances to and from the "image" antenna created by the ground plane are also calculated. This operation consumes the majority of the total computation time, reported by the program as *fill matrix*. The result is an internally stored matrix of impedance values. The program then solves an Ohm's Law equation using the values in the impedance matrix, a source-voltages matrix, and a matrix of the unknown pulse currents, reporting *factor matrix*. After this step, the impedances seen by the sources, as well as the currents at each pulse, are available. If near- or far-field analysis is requested, the contribution

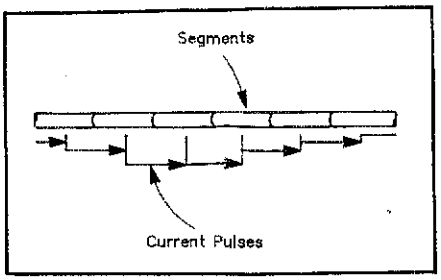


Fig 2—Illustration of the relationship between segments and pulses.

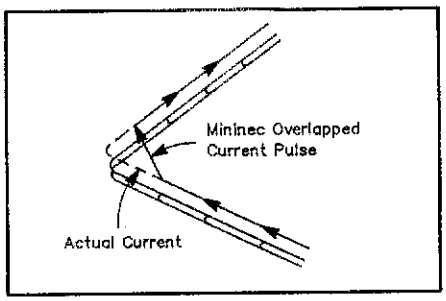


Fig 3—Pulse overlap at wire junctions can cause problems if it's not accounted for.

of each current pulse to the total field is calculated. If a ground plane has been specified, direct and reflected rays are summed to obtain the total field strength at each point of the near or far field.

The Limitations

MININEC's authors did an amazing and commendable job of reducing some very complex mathematical operations to a level that a PC can handle in a reasonable amount of time. But to do so, they had to make some compromises. Most of the program's limitations are due to these consciously chosen compromises.

Wires

In *MININEC*, every antenna must be described using only *straight wires* as the basic model building block. With some ingenuity, though, a wide variety of structures, including towers, top hats, rotators, rain gutters and even garages, can be adequately modeled. But overlapping wires *aren't* automatically connected by the program. For example, four wires are required to model an X-shaped structure if the conductors are connected at the center of the X. No limit is imposed on the minimum wire radius, and the program will produce accurate results with wire radii as large as 0.01 λ.

Number of Segments

It's up to you to decide how many segments to break each wire into for analysis purposes. To make an appropriate choice you have to have some knowledge of the trade-offs involved. Because the results become more accurate as the number of segments is increased, *MININEC* users naturally tend to use a large number of segments. Two factors suggest caution here. First, the size of the complex-impedance matrix calculated by the program goes up as the *square* of the number of pulses. (The number of pulses is approximately equal to the number of segments.) Therefore, *MININEC* and all its derivatives have some limit on the allowable number of pulses. Second, analysis time increases approximately as the square of the number of segments.

So, just how many segments are required to "do it right"? There's no exact answer, because the analysis accuracy nearly always improves with more segments. A straightforward (but time-consuming) way to determine if you've used enough segments is to increase the number of segments, rerun the analysis and see how much the results change. Some rules of thumb work well and can be used as a starting point if particularly good accuracy is required. As I'll describe, you need to take special care at wire junctions, especially where wires are connected at an acute angle.

Straight Wires

If you want to look at the pattern of an antenna with straight elements (like a Yagi), eight to ten segments per half wavelength are adequate. The pattern won't change much as you increase the number, although the program may give more accurate null depths with more segments. If you require *really* accurate feed-point impedances, use more segments.

Connected Wires—General

It's easiest to understand some of the problems of connecting wires if you have an understanding of what *MININEC* does at wire junctions. An unconnected wire is left with a zero-amplitude half-pulse at its end. However, the end pulses of later-defined connecting wires have nonzero current amplitudes. The half-pulse that extends beyond one of these wires is overlapped onto the lowest-numbered connecting wire (Fig 3). *This half-pulse of current takes on the segment length and wire diameter of the lower-numbered wire.*

When the program does its calculations, it considers only the pulse center or end points. When the straight-line path between the pulse ends becomes substantially different from the actual current path, errors result. This occurs wherever wires are connected at a nonzero angle. Accuracy also suffers when wires having greatly different segment lengths are connected. John Belrose, VE2CV, has observed[8] that the best results are obtained with square loops when the segment lengths are the same on all legs. He also observes that, as a rule, segment lengths on connected wires should differ by no more than a factor of two. Both rules are reasonable considering the way *MININEC* handles connections, and both rules have experimentally been proven sound.

Table 1

Feed-Point Impedances Reported by *MININEC*†

Straight Dipole

Segments	*Impedance (ohms)*
10	74.073 +*j* 20.292
20	75.870 +*j* 21.877
30	76.573 +*j* 23.218
40	76.972 +*j* 24.053
50	77.222 +*j* 24.517

Bent Dipole

Segments	*Impedance (ohms)*
10	11.509 −*j* 76.933
20	11.751 −*j* 53.812
30	11.819 −*j* 46.934
40	11.848 −*j* 43.783
50	11.861 −*j* 41.988
14††	11.312 −*j* 43.119

†Impedances for a straight 0.5-λ dipole and dipole bent horizontally at its center at a 45° included angle, with various numbers of segments. Both antennas have a wire radius of 0.001 λ and are placed 0.5 λ above perfectly conducting ground.

††Tapered segment length. See text.

Wires Connected at Right Angles

Wires connected at a nonzero angle require more segments than unconnected wires or those connected at a 0° angle. Eight to ten segments per half wavelength are required for reasonable results if the connection angle is 90° or less and the segment lengths of both wires are equal. Far-field accuracy of a one-wavelength-circumference square loop is reasonably good with four segments per leg, although once again the impedance accuracy improves with more segments.

Wires Connected at Acute Angles

This is where *MININEC* becomes tricky. Accuracy can rapidly degrade as wire-connection angles decrease, although here again the impedance loses more accuracy than the far-field pattern. An example is shown in Table 1. The *MININEC*-calculated impedance of a dipole is reasonably accurate when the antenna is divided into only ten segments. When the same dipole is bent at a 45° included angle, *more than 30 segments are required for similar accuracy.* In both cases, however, ten segments produce far-field patterns that are virtually indistinguishable from those produced using more segments. The only way I know of to evaluate these cases is to change the number of segments and see what happens. Described next, however, is a technique that you can use to reduce the number of segments required for wires connected at sharp angles.

A Technique for Improving Accuracy

MININEC's accuracy can be markedly improved at wire junctions with only a slight increase in the total number of segments. This is done by tapering the segment length, making it short in the vicinity of the wire junction and increasing it at greater distances. Typically, only a few extra wires are required. This technique is illustrated in Fig 4 for the bent dipole of Table 1. Wires 1, 2 and 3 and their counterparts on the other half of the dipole have only one segment each. The remainder of the half-dipole is one four-segment wire. These segments are just slightly longer than when the dipole was made up of 10 segments total. The net result, shown in the last row of Table 1, is that the impedance for this 14-segment model is similar to the 40-uniform-segment model.

Close-Spaced Wires

MININEC documentation includes analysis of parallel wires at various spacings and finds the program to be well-behaved even when wires are very close together. Nonetheless, it cautions, "Whenever a model has close spacing, however, it is advisable to examine the results very closely to ensure proper behavior." Some time ago I analyzed a typical open-wire transmission line and found it necessary to make the segments no longer than three times the wire spacing. With longer segments, dramatic impedance errors resulted. More recent experiments have indicated that the problem is caused not by the close spacing, but by the connection at the ends of the two wires. The wire connecting the end has a maximum possible segment length equal to the wire spacing. The rule of having no more than a 2:1 segment-length ratio (see *Connected Wires—General*) on connected wires is violated unless the main wire-segment lengths are no more than twice the wire spacing. The tapered-segment-length approach outlined above can be successfully applied in this situation.

Additional factors limit your choice of the number of segments to use. Because *MININEC* assumes that current is uniform along a pulse, segment lengths should be short enough that the current in the real antenna doesn't change much in this distance. Therefore, the maximum segment length shouldn't exceed about 0.1 λ. *MININEC* documentation also states that segment length should always be greater than 10^{-4} λ, and greater than 2.5 times the wire radius.

Sources and Loads at Multiwire Junctions

This one can be a real surprise. When you place a source or load at a junction of more than two wires, you have to be very careful, or the source or load won't end up where you thought! Sources and loads can be placed only at pulses (segment junctions), so to understand the problem you need to know how *MININEC* assigns pulse numbers. Here are the rules it uses:

See Fig 5. Pulse numbering begins at end number 1 of wire number 1. A pulse number is assigned to each segment junction on the wire, and at a wire end if the end is connected to ground or an already-defined wire. No pulse numbers are assigned to open wire ends. After pulse numbers are assigned to the first wire, pulses are assigned to wire number 2, again beginning at end 1, and so forth.

Wire 1, shown by itself in Fig 5A, has four segments to which three pulses are assigned. Pulse numbers 1-3 belong to wire 1. In Fig 5B, wire 2 is added. Note the assignment of pulse number 4, which belongs to wire 2 since it didn't exist until wire 2 was defined. When wire 3 is added in Fig 5C, pulse number 8 is assigned *to the same physical junction as pulse number 4,* in accordance with the above rule. Pulse 8 belongs to wire 3. Now suppose the antenna in Fig 5 is a groundplane with two drooping radials, and we want to place a source at the base of wire 1, the main radiating portion. If we specify pulse 4 for the source position, *the source ends up on wire 2,* as shown in Fig 6. If the source is producing I amperes, I amperes flows in wire 2, and the return current of I amperes splits between wires 1 and 3—not the desired result. The same thing happens if pulse 8 (Fig 5C) is specified, except that wire 3 gets the full current and the return current splits between wires 1 and 2. Putting the source at pulse number 1 gets it on wire 1 all right, but 25% of the way up from the junction. *There is no way to place the source on wire 1 at the wire junction as this antenna has been defined.* This is because there's no pulse belonging to wire 1 at the bottom (end 1) of wire 1. *The only way to achieve the desired result is to avoid placing the source in the lowest-*

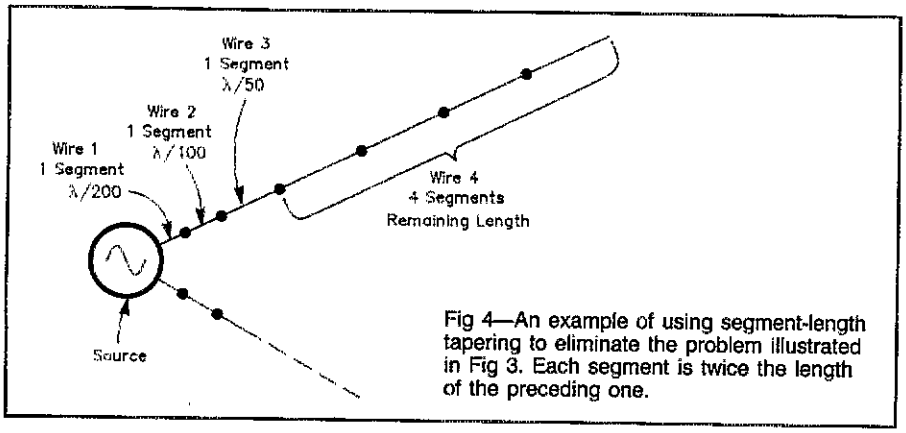


Fig 4—An example of using segment-length tapering to eliminate the problem illustrated in Fig 3. Each segment is twice the length of the preceding one.

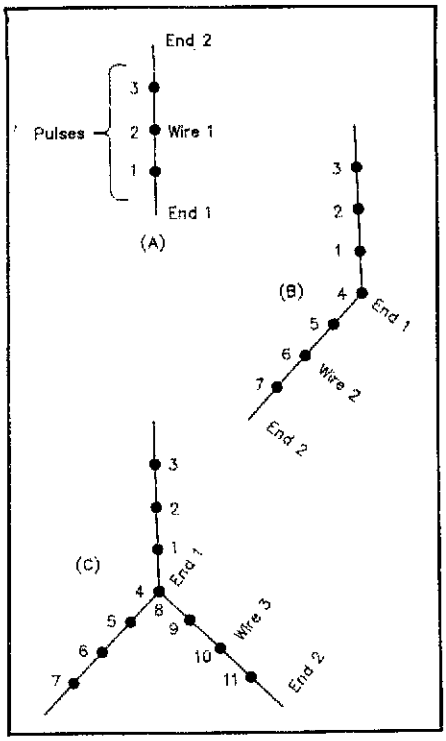


Fig 5—Pulse assignments are made in the order that wires are defined. See text for explanation.

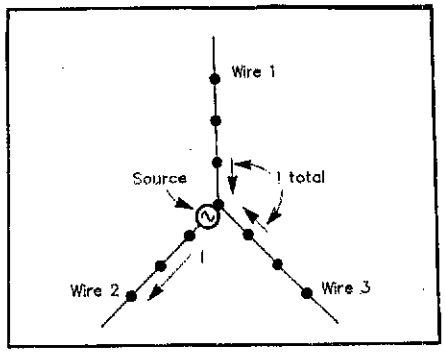


Fig 6—Result of placing a source at pulse 4 on the antenna shown in Fig 5C.

numbered wire (the one defined first) in the group sharing a common junction. To make sure you've put the source where you think you have, always look at the currents and *make sure they make sense.* Load placement behaves the same way, but mistakes can be harder to spot, so be extra careful when placing loads at multiwire junctions.

When only two wires are connected, there's no problem. Regardless of which wire the common pulse belongs to, the entire source or load current flows in both wires.

Ground—General

Probably the most misunderstood limitation of *MININEC* is its ground-modeling capability. Even though the program permits you to define a real ground in considerable detail, this definition is used *only for calculating far-field patterns. MININEC* uses *perfectly conducting ground* when calculating impedances and currents if either a perfect or real ground is specified. Ground has several effects on antennas.[9] Let's look at them one at a time and see how this simplification affects the accuracy of results.

Impedance and Gain

The feed-point impedance of an antenna changes with antenna height. The magnitude of this effect depends on antenna length, diameter, and orientation, and the ground characteristics. The impedance change of a half-wave dipole above ground is well documented.[10] When a dipole is at least 0.2 λ above ground, its impedance is nearly the same whether the ground is real or perfect, so *MININEC* results are adequate. If the antenna is lower, however, *MININEC* results can deviate greatly from the true impedance of an antenna over real ground. Specifically, the resistance reported by *MININEC* will be lower than it really is. This in turn leads to excessively high reported gain, as noted by the correspondent quoted earlier. I don't have any information on longer dipoles (such as the extended double Zepp), but I suspect that these antennas must be somewhat higher than 0.2 λ before *MININEC* gives accurate impedance results. Vertical dipoles have about the same impedance over real ground as over perfect ground, so *MININEC* results are satisfactory for these antennas at any height.

Ground System Losses and Efficiency

Efficiency of ground-mounted low-impedance vertical antennas is frequently the most severe limitation on such an antenna's performance. In such antennas, power is lost due to feed-point return current flowing through lossy ground in the vicinity of the antenna base. Placing radial wires around the base of the antenna raises efficiency by reducing this loss. A common way to determine the loss in such an antenna is to measure the feed-point resistance and compare it with the resistance of a similar element over lossless ground. The loss is simply the difference in the resistances, and usually this is nearly all ground loss.

Because *MININEC* uses a perfect ground for impedance calculations, it always reports the impedance seen over a perfect ground. Therefore, *MININEC* can't be used to determine the impedance or efficiency of antennas fed against ground; you can't use the program to evaluate the effectiveness of radial systems, for instance.

Low-Angle-Radiation Attenuation

Vertically polarized waves, in particular, are attenuated when reflected from lossy ground, leading to the well-known phenomenon of low-angle radiation attenuation.[11] *MININEC* models this correctly as part of the far-field calculation. If radials are specified, they modify the conductivity of the ground on which they are placed. *MININEC* documentation cautions that the radial calculations are accurate only for large numbers of radials.

One additional caution is necessary when specifying ground constants. It's frequently convenient to model antennas at 299.8 MHz, where a wavelength is one meter. If you do this, *you must scale ground conductivity in proportion to the frequency.*[12] For example, an antenna operating at 7 MHz over ground having a conductivity of 0.002 S/m will behave like a size-scaled antenna operating at 299.8 MHz over ground with $0.002 \times (299.8 \div 7) = 0.086$ S/m conductivity. However, even with a ratio this large, neglecting to scale ground conductivity usually won't be apparent in the far-field patterns, except at very low angles.

Multiple Media

Other limitations appear when the ground is broken up into several pieces (*media*). Once again, it's helpful to understand how *MININEC* functions in this regard.

Height of Ground Under the Antenna

It's important to realize that *MININEC* always assumes a ground-plane height of 0 ($Z = 0$ in *MININEC*'s XYZ coordinate system) when calculating impedances and currents. Also, it regards a wire-end Z coordinate of zero as meaning that the wire is connected to ground (except when the antenna is being modeled in free space). For these reasons, the region of the ground plane immediately under the antenna must have a height (Z coordinate) of zero. If you're modeling an antenna on top of a hill, the top of the hill must have a Z coordinate of zero, with the rest of the hill having negative Z coordinates.

Other Concerns

At each elevation angle, *MININEC* looks for reflection from ground. It begins at the most distant medium and looks for the intersection of the direct and reflected rays. This process is repeated for all other media. *MININEC* uses the innermost reflection point it finds; it makes no attempt to evaluate multiple reflections or those from corners. *MININEC* doesn't look between the antenna and the reflecting point or beyond the reflecting point. Therefore, the program assumes that RF passes through hills and cliff walls with no shielding or reflections. A puzzling simplification is that the program assumes a height of zero for all media during the process of determining the wave-reflection point to be used for far-field calculations, although media height is taken into account during summation of the incident and reflected rays. This can lead to pattern errors with media of differing heights. If you have access to a compiler, you can easily patch *MININEC*'s source code to overcome this deficiency. See the appendix for details.

These ground approximations were pur-

posely made to keep the program length and speed compatible with PCs. We can hope that improved ground-modeling code will become available in the future as PCs continue to increase in speed and power.

Loss

MININEC doesn't automatically account for loss. Therefore, be wary of antennas with low feed-point resistances. The answers might be entirely legitimate, but only if there is no loss in the antenna structure. In the lossy real world, these antennas just won't work. Whenever you see a surprisingly high gain, look at the feed-point resistance and you're likely to find it's very low. Imitate reality by adding loads having a few ohms of resistance at each source (and anywhere else the current is high) and watch what happens to the gain!

Frequency-Related Errors

At least two writers have reported apparent frequency-dependent errors in *MININEC*.[13,14] This was determined by comparing *MININEC* results to those of *NEC*, a much more sophisticated mainframe program. Their observations were that, for certain frequencies and element diameters, the two programs seem to give similar results at slightly different frequencies. The only specific example of this I've seen was provided by Peter Beyer, PA3AEF.[15] It shows *NEC* and *MININEC* analyses of a 10-element 144-MHz Yagi. The *NEC* analysis was done at 144.5 MHz. *MININEC* analysis is closer to the *NEC* results when done at 145 MHz than at 144.5 MHz. I ran some brief experiments to see if there is, indeed, a frequency-sensitive error *within MININEC*. I scaled the same antenna for different frequencies and analyzed them with *MININEC*. No frequency-dependent effects (resonance shift, etc) were found, but the tests were far from exhaustive, and the program's *absolute* accuracy is what's in question. My feeling is that the differences arise because of the much more sophisticated way in which *NEC* deals with currents. I hope we'll see more about this phenomenon in amateur publications. In the meantime, be careful when trying to get high accuracy from *MININEC* analysis of highly directional structures, especially at VHF and UHF.

Bugs

I know of only two actual bugs in *MININEC*. They both deal with Laplace ("S-parameter") loads. One causes an overflow and the other is very obscure and highly unlikely to affect you. If you'd like some further description and fixes for the bugs, contact me.

Summary

All modeling tools, no matter how elaborate, powerful and expensive, have limitations. Absolutely none of these can be used sensibly unless you're constantly conscious of their limitations. *MININEC* is no exception. You must always be alert for answers that don't seem quite right. Are the impedance and gain values *reasonable?* If the antenna is symmetrical, is the pattern symmetrical about the axis you intended to specify? Do the currents change abruptly from one segment to another?[16] Do the results seem too good to be true? *If so, they probably are!*

We owe *MININEC*'s authors a great debt of gratitude for the pioneering work they have done. They've put fast, accurate antenna analysis within the reach of thousands of amateurs. The program they have created is very useful for analyzing a variety of antenna designs. Wielded properly, *MININEC* can be a powerful tool—a weapon against a decades-long void in knowledge about antenna design. This article should help you avoid the other edge of the sword.

APPENDIX

If you have access to BASIC compiler software (eg, Microsoft® *QuickBasic*, Borland *Turbo Basic*), you can patch the *MININEC* source code to improve *MININEC*'s handling of multiple media of different heights, then recompile the program.† Of course, the source code could be run directly with a GWBASIC interpreter, but the speed will be so slow as to render the program virtually useless. In the following code segments, the added lines have no line numbers since such are not required by the compilers.

```
702 T3 = -SIN(U4)
IF ABS(R3) < 0.00001 THEN ATU4 =
  100000 ELSE ATU4 = ABS(T3/R3)
703 T1 = R3 * V2

756 FOR J = 1 TO NM STEP -1
IF B9 > U(J1) * (1 + ATU4) THEN 759
758 J2 = J1
```

Note: Delete line 757
[IF B9 > U(J1) THEN 759].

If the program is to be compiled with Microsoft *QuickBasic*, one other change must be made. In *MININEC*, "IS" is used as a variable. Because "IS" is a reserved word in *QuickBasic*, it must be changed. (If you're using a different compiler, check its documentation to see if this change is required.) Change "IS" to "ISX" in the following lines: 1592, 1593, 1596, 1605-1609, and 1612.

†Patched *MININEC* in compiled form is available from the author on an MS-DOS 5¼- or 3½-inch disk for $3 postpaid to the US, Canada, and Mexico. Add $3 airmail postage to other countries.

Notes

[1]*MININEC* is available from National Technical Information Service (NTIS), US Department of Commerce, 5285 Port Royal Rd, Springfield, VA 22161, tel 703-487-4650. Order no. ADA181681 (software and documentation).

[2]A technical reference describing the program is J. C. Logan and J. W. Rockway, *The New* MININEC *(Version 3): A Mini-Numerical Electromagnetic Code*, NOSC TD 938, Naval Ocean Systems Center, San Diego, CA, 1986. It is available as document number ADA181682 from NTIS (see note 1). This is a highly technical manual.

[3]J. Rockway, J. Logan, D. Tam and S. Li, *The* MININEC *System: Microcomputer Analysis of Wire Antennas*, available from Artech House, 685 Canton Street, Norwood, MA 02062. Includes several programs with source code and a comprehensive manual.

[4]*MN* and *MNjr*, by Brian Beezley, K6STI. Available from Brian Beezley, 507½ Taylor St, Vista, CA 92084.

[5]*ELNEC*, by Roy Lewallen, W7EL. Available from Roy Lewallen, PO Box 6658, Beaverton, OR 97007.

[6]Documentation files for *MN* and *ELNEC* are available on 5.25-inch diskettes from their authors for $5 and $3, respectively. Add $3 for postage to locations outside North America. See notes 4 and 5 for addresses.

[7]A good description of the method of moments is included in J. D. Kraus, *Antennas*, 2nd edition (New York: McGraw-Hill, 1988), pp 359-408.

[8]J. S. Belrose, VE2CV, ARRL Technical Advisor, private correspondence.

[9]An excellent description of these effects appears in G. L. Hall, ed., *The ARRL Antenna Book*, 15th edition (Newington: ARRL, 1988), Chapter 3.

[10]See note 9, p 3-11, Fig 16.

[11]See note 9, pp 3-1 through 3-6 and 3-10.

[12]G. Sinclair, "Theory of Models of Electromagnetic Systems," *Proceedings of the IRE*, Nov 1948, pp 1364-1370.

[13]P. Beyer, "Antenna Simulation Software," *Proceedings of the Third International EME Conference*, Thorn, Netherlands, Sep 9-11, 1988. Thanks to Warren Butler, W2WD, for bringing this to my attention.

[14]R. Cox, "An Update on Computer-Aided Antenna Design," *1990 Central States VHF Conference Proceedings*, published by ARRL. Thanks to *QST* Assistant Technical Editor Rus Healy, NJ2L, for bringing this to my attention.

[15]Peter Beyer, PA3AEF, private correspondence.

[16]Positive current flow is defined as being from end 1 to end 2. Current reversals at wire junctions are normal if wires are connected "head to head," ie, end 1 to end 1 or end 2 to end 2.

New Products

The ARRL and QST *in no way warrant products described under the New Products banner.*

SIMPLEX REPEATER

☐ Brainstorm Engineering has introduced its model SR3 Simplex Repeater. Based on digital voice recording and delayed playback, the SR3 is primarily intended for multistation communications on a single frequency where the stations don't have solid simplex communications capability, or as a voice mailbox. With the optional DTMF decoder, the SR3 can be used as a repeater identifier. Maximum message length is 64 seconds (with four memory ICs installed), and the SR3 comes with 16-second recording capability. Specifications: power requirement, 11.6-15 V dc at 200 mA; audio input, 0.1-2 V rms; audio output, 5-500 mV; 1.75 × 10.5 × 6 inches (HWD). Price class: $230-$330, depending on configuration. For more information, contact Brainstorm Engineering, PO Box 415, Montrose, CA 91021-0415, tel 818-249-4383, fax 818-846-2298.

The BP-80: An 80-Meter CW Transceiver

This 5-watt rig is a natural for use at home—or in the field. It's even got its own carrying handle!

By Mike Agsten, WA8TXT
405 W Bogart Rd
Sandusky, OH 44870

The BP-80 transceiver. A three-digit frequency display is immediately above the control panel. To the right of the display are the speaker grill holes. The holes at the bottom left of the front of the case are for ventilation. Clockwise from the top left of the control panel are the display on/off switch (DSP/OFF), main-tuning knob, audio-filter bandpass-selection switch (AFN/AFW), PHONES jack, KEY jack, a push-button key, the AFG control and the RIT control.

Radiotelegraphy . . . for some, it conjures up exciting images of messages flashing invisibly through the sky. It's tradition: the glue binding us to Morse, Marconi and Maxim. It's dependability: Radiotelegraphy's ability to get through in a pinch remains undiminished.

What does it take to enter this fascinating world of radiotelegraphy (more commonly known as CW)? Not much—you need a ham license, radio and antenna. In this article, I'll describe one way to fulfill the radio requirement: Build it yourself![1]

Overview

The BP-80 is a 5-W output, 80-meter CW transceiver. It's suitable for beginners on a tight radio budget and for experienced hams who simply enjoy QRP operation. The BP-80 is ideal for emergency, Field Day and QRP operation. The transceiver's power-supply requirement is minimal: 12 to 14 V dc at less than 1 A.

The main circuit diagram for the BP-80 is shown in Fig 1; Fig 2 shows the diagram of the 5-W amplifier board (PA5). A schematic of the optional digital display is shown in Fig 3.

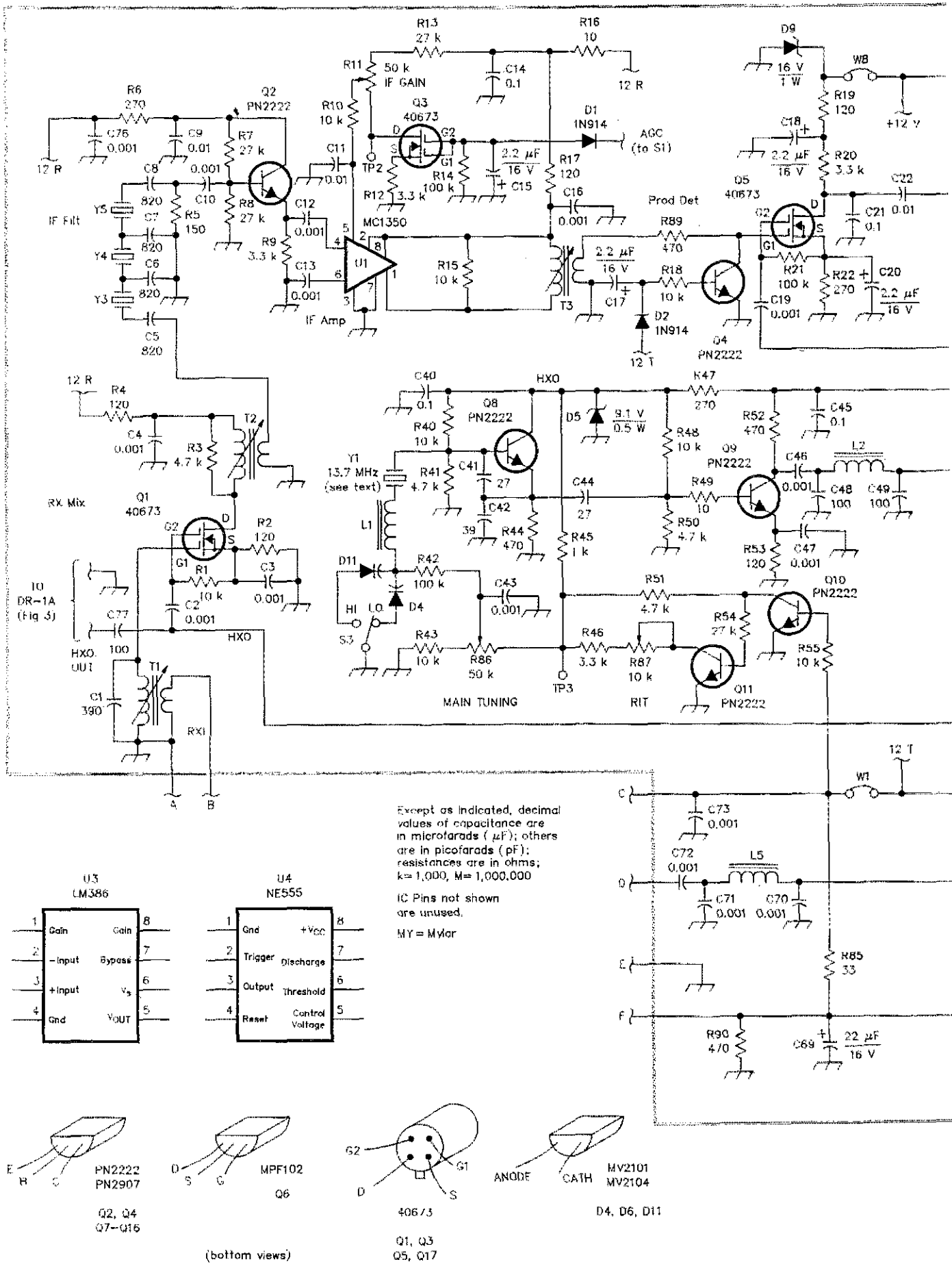
In an effort to reduce construction difficulties, frequency control is accomplished with a voltage-tuned, high-frequency VXO (referred to hereafter as the HXO) opera-

[1]Notes appear on page 32.

Please see next two pages.

Fig 1—Schematic of the BP-80 transceiver main circuit board. A description of circuit operation is given in the text. Because a single-sided PC board is used, some jumpers (W1-W9) are required; they are shown here to aid in circuit tracing. W3 joins PC-board ground traces between the BXO and the Product Detector. W9 is a twisted-pair jumper connecting the BXO output to the input of TX MIX, Q17 (see Fig 5). The triangle and rectangle adjacent to W9 indicate PC-board identifiers. Points labeled A-F, inclusive, connect to the PA5 amplifier circuit (Fig 2). Unless otherwise specified, all resistors are ¼-W carbon-composition or film units; capacitors have a dc voltage rating of 25. Parts sources are provided in Table 1.

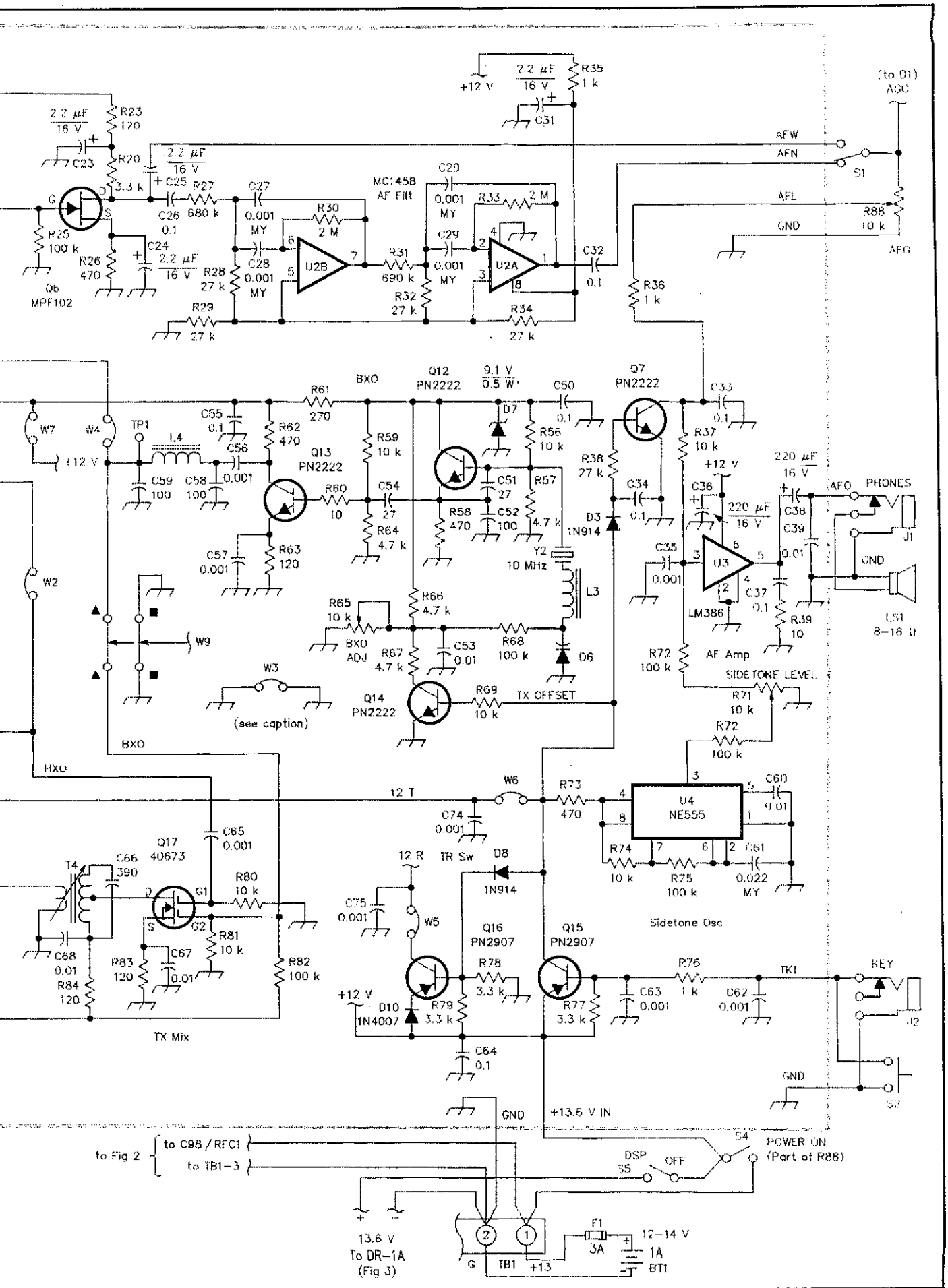
D4, D6—MV2104 or ECG612.
D9—1N4745.
D11—MV2101 or ECG610.
D14—1N4751A.
L1—67 turns no. 30 enam wire on a T-50-6 core. (Secure turns with lacquer, nail polish or Q-dope®.)
L2, L4—16 turns no. 24 enam wire on T-50-6 core. (Powdered iron and ferrite cores are available from Amidon.)
L3—18 turns no. 24 enam wire on FT-37-61 core.
L5—5 turns no. 24 enam wire on FT-37-61 core.
L6, L8—22 turns no. 24 enam wire on T-50-2 core.
L7—25 turns no. 24 enam wire on T-50-2 core.
L9—30 turns no. 28 enam wire on FT-37-61 core.
Q19, Q20— MRF237 (available from RF Parts). Use a heat sink on each transistor (Thermalloy no. 2228 or equivalent). Homemade heat sinks fabricated from 3/8-inch thin-wall aluminum tubing may also be used. Each sink should be 1½ inches long.
R11—50 kΩ, PC-mount trimmer (Mouser 32AG405).
R65, R71, R101—10 kΩ PC-mount trimmer (Mouser 32AG401).
R86—50 kΩ, linear taper (Mouser 31VA405).
R87—10 kΩ, audio taper, panel mount (Mouser 31VJ401).
R88—10 kΩ, audio taper, panel mount, with switch (S4); Mouser 31XP401).
RFC1—30 turns no. 28 enam on FT-37-61.
RFC2—3 turns no. 28 enam wire on FB-43-101.
S1, S3, S5—Slide switch (Mouser 10SM002).
S4—Part of R88.
T1-T3, incl—10.7-MHz IF transformer (Mouser 42IF123).
T4, T5—10.7-MHz IF transformer (Mouser 42IF128).
T6—Broadband transformer: 12 bifilar turns of no. 24 enam wire on FT-50-43 core.
U1—MC1350 IF amp.
U2—MC1458 dual op amp.
U3—LM386N-3 audio amp.
U4—555 timer IC.
Y1—13.535 to 13.750 MHz (see text); Crystek type RMF-10 or equivalent.
Y2-Y5, incl—10.0 MHz, HC-18 holder (Jameco CY10 or equivalent). Y3-Y5, inclusive, are a matched set; see note 3.



Except as indicated, decimal values of capacitance are in microfarads (µF); others are in picofarads (pF); resistances are in ohms; k= 1,000, M= 1,000,000

IC Pins not shown are unused.

MY = Mylar


+12 V
2.2 µF 16 V
R35 1 k
C31
(to 01) AGC
AFW
AFN
S1
AFL
GND
R88 10 k
AFG
2.2 µF 16 V
R23 120
C23
R20 3.3 k
C25
R27 680 k
C26 0.1
C27 0.001 MY
R30 2 M
C28 0.001 MY
R28 27 k
R29 27 k
Q6 MPF102
R25 100 k
R26 470
C24 2.2 µF 16 V
MC1458 AF Filt
U2B
U2A
C29 0.001 MY
R33 2 M
R31 690 k
R32 27 k
R34 27 k
C32 0.1
R36 1 k
BXO
Q12 PN2222
9.1 V 0.5 W
C50 0.1
Q7 PN2222
C33 0.1
R61 270
R62 470
R59 10 k
R56 10 k
D7
R37 10 k
+12 V
220 µF 16 V
AFO
PHONES
J1
GND
LS1 8–16 Ω
W7
W4
TP1
L4
C55 0.1
C56 0.001
C59 100
C58 100
Q13 PN2222
R60 10
C54 27
R64 4.7 k
C51 27
C52 100
R57 4.7 k
R58 470
D3 1N914
R38 27 k
C34 0.1
C36
220 µF 16 V
C38
C39 0.01
C57 0.001
R63 120
Y2 10 MHz
L3
C35 0.001
U3 LM386
C37 0.1
R39 10
W2
W9
R65 10 k
R66 4.7 k
BXO ADJ
R67 4.7 k
C53 0.01
R68 100 k
D6
R72 100 k
AF Amp
SIDETONE LEVEL
R71 10 k
W3
(see caption)
Q14 PN2222
R69 10 k
TX OFFSET
R72 100 k
BXO
HXO
12 T
W6
C74 0.001
R73 470
U4 NE555
C60 0.01
R74 10 k
R75 100 k
C61 0.022 MY
Sidetone Osc
C65 0.001
Q17 40673
T4
C66 390
R80 10 k
C68 0.01
R84 120
R83 120
C67 0.01
R81 10 k
R82 100 k
TX Mix
12 R
TR Sw
D8 1N914
C75 0.001
W5
Q16 PN2907
Q15 PN2907
R78 3.3 k
R79 3.3 k
D10 1N4007
R77 3.3 k
R76 1 k
C63 0.001
C62 0.001
TKI
KEY
J2
C64 0.1
GND
S2
GND
+13.6 V IN
S4
POWER ON (Part of R88)
DSP
S5
OFF
to Fig 2
to C98 / RFC1
to TB1–3
13.6 V
To DR-1A
(Fig 3)
TB1
+13
F1
3A
12–14 V
1A
BT1

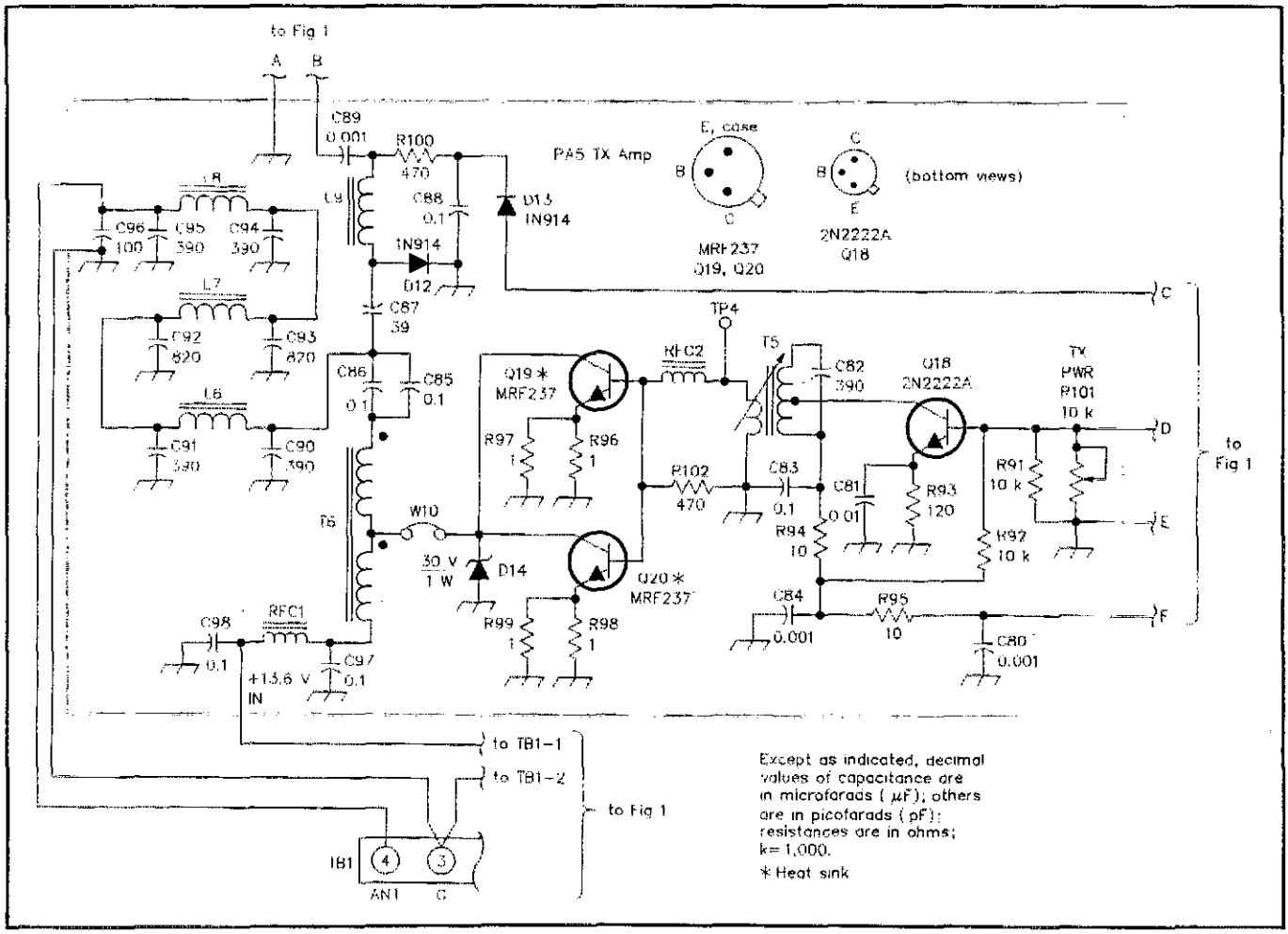


Fig 2—Diagram of the PA5 amplifier board. Unless otherwise specified, all resistors are ¼-W carbon-composition or film units; capacitors have a dc voltage rating of 25. Points A-F, inclusive, connect to the main circuit (Fig 1).

Table 1
Parts Suppliers

Amidon Associates, PO Box 956, Torrance, CA 90508, tel 213-763-5770.
Circuit Specialists, Inc, Box 3047, Scottsdale, AZ 85271, tel 800-528-1417.
Crystek Crystals, Box 06135, Ft Myers, FL 33906-6135, tel 800-237-3061.
Jameco® Electronics, 1355 Shoreway Rd, Belmont, CA 94002, tel 415-592-8097.
Mouser Electronics, 11433 Woodside Ave, Santee, CA 92071, tel 800-346-6873.
RF Parts, 1320 Grand Ave, San Marcos, CA 92069, tel 619-744-0728.

ting well above the 80-meter band. The HXO is as easy to wire as an audio gain-control pot, and provides about 25 kHz of high-stability band coverage per crystal. Although it's difficult to get lost in a band segment of this size, you have to have some means of ensuring you're operating within the assigned ham band. The optional digital frequency display can be included during the initial construction stage or added later. This display is a direct descendent of an earlier *QST* project,[2] tailored for use with the BP-80.

Other features of the BP-80 include a superhet receiver, a three-crystal IF filter (expandable to five crystals[3]), AGC, switchable audio bandpass filter, RIT and sidetone. Transmit-receive control is full break-in (QSK). To send, you merely close the key. On release, receiver recovery is less than 100 ms and very quiet, having no annoying clicks or thumps in the speaker—or on the air!

Physically, the entire project resides on three PC boards: the BP-80 main board, PA5 transmit-amplifier and the DR-1A digital display. These boards, along with the speaker, front-panel controls and jacks, and the antenna/power terminal strip, are housed in a plastic school case.[4] The transceiver can be operated in a vertical or horizontal position. I couldn't resist the temptation to include a built-in emergency telegraph key: a push-button switch!

Circuit Description

The heart of the BP-80 is the HXO. A beat oscillator (BXO) is used for the 10-MHz local oscillator. Because the HXO and BXO run continuously into steady loads, there is little chance of chirp. The HXO operates in any selected portion of the 13.5- to 13.75-MHz range, determined by your choice of crystals. Because of tuning-diode limitations, two voltage-variable capacitance diodes (D4 and D11) are required for 25-30 kHz of band coverage per crystal in two adjacent segments. Each diode is selected by the **HI/LO** frequency-range-selection switch, S3. The average main-tuning rate (controlled by R86, **MAIN TUNING**) is an easy-going 12-15 kHz per knob revolution.

During receive (key up), Q15 is off, so Q16 is on, passing 12 V to the 12R bus and energizing selected receive circuits. At the HXO, Q10 is off, holding Q11 on and activating **RIT** control R87. The HXO output is fed to receive mixer Q1 via C2.

Eighty-meter-band signals from the **ANT** terminal (TB1-4) pass through low-pass

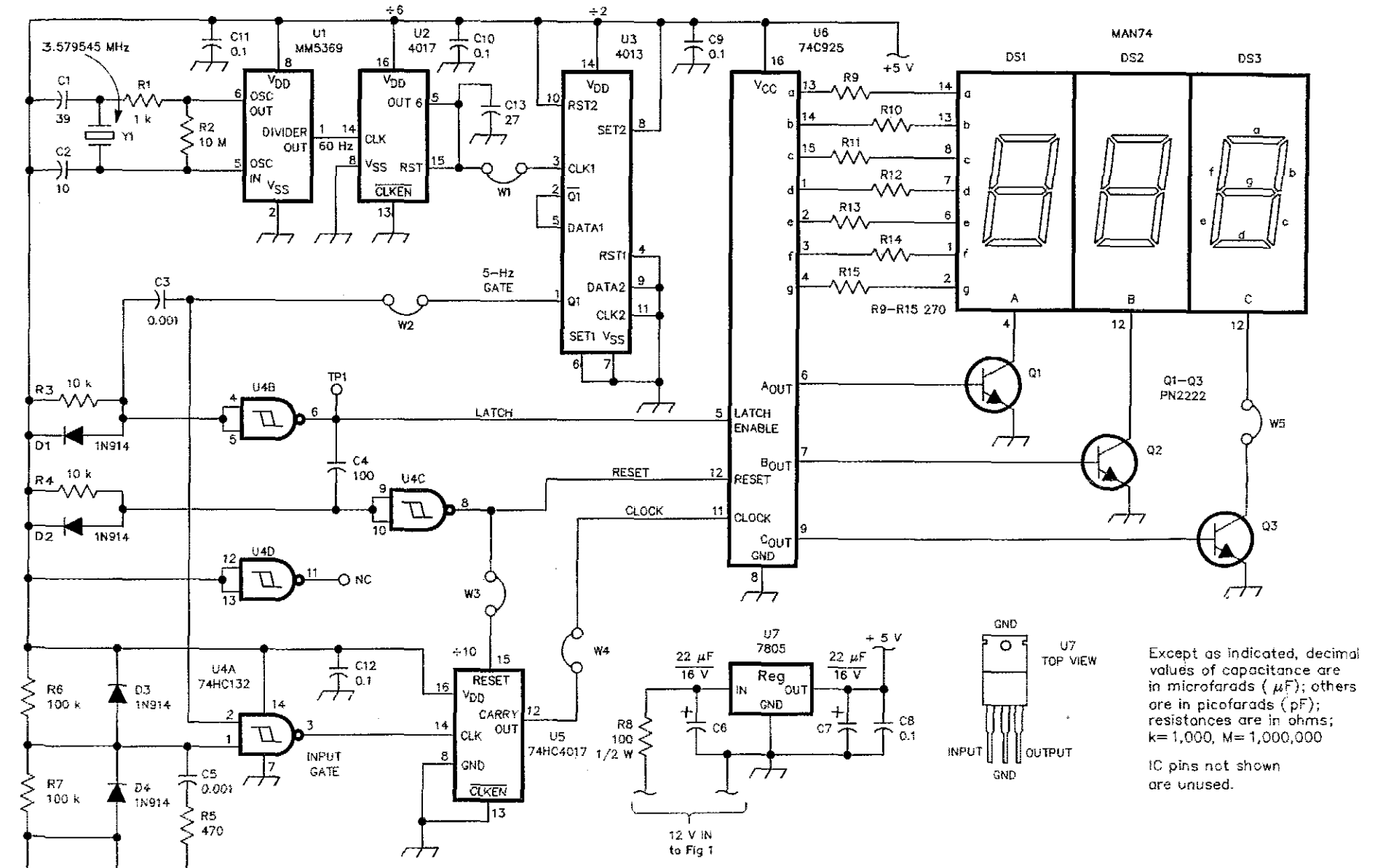


Fig 3—Schematic for the optional digital display. This circuit is based on a design that appeared earlier in *QST* (see note 2). Unless otherwise specified, all resistors are ¼-W carbon-composition or film units; capacitors have a dc voltage rating of 25.

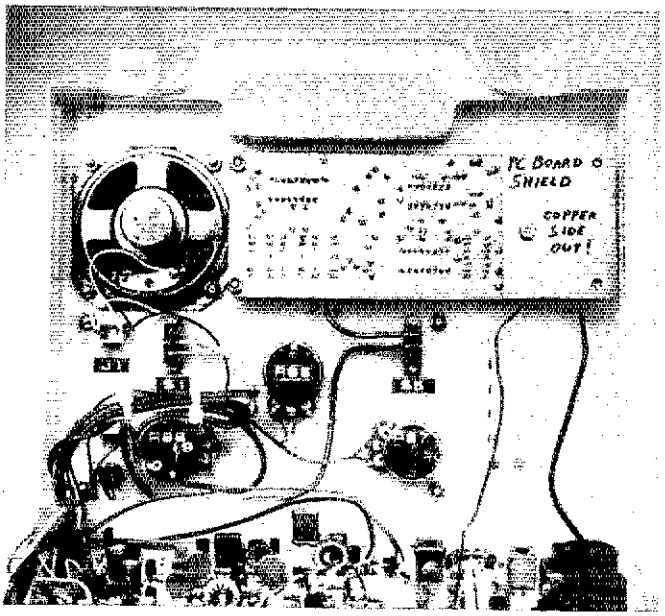


Fig 4—An inside view of the cover section of the BP-80. The DR-1A display board occupies the top right-hand section. Note the ventilation holes drilled in the cover. See text for an explanation of the PC-board shield. The push-button key is located at the bottom left, with the KEY jack (partially hidden by the wiring harness) immediately above it.

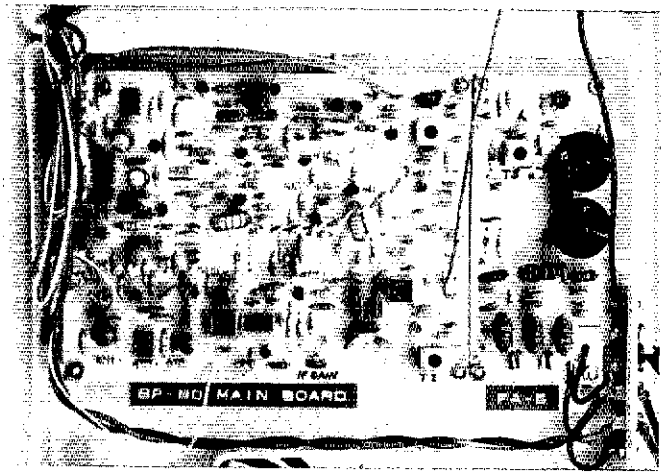


Fig 5—This inside view of the bottom section of the BP-80 shows the main PC board, with the PA5 power-amplifier board to the right. A four-lug terminal strip at the lower right of the enclosure provides for connecting the antenna and power leads to the transceiver. Ventilation holes are drilled in the right-hand panel near the PA transistors, which are easily identified by the two round, black heat sinks attached to them. Barely visible beneath the wiring at the top of the main board is the frequency-range-selection switch, S3 (HI/LO), which is mounted on the foil side of the board. The twisted-pair jumper between the center and upper-right-hand section of the main board connects the BXO output to the input of TX MIX, Q17. This jumper is designated W9 in Fig 1.

filter L6-L8, series-resonant TR limiter C87/L9 and jumper **B** to receiver input RXI. The combination of T1 and C1 tune and match this low-impedance input to mixer Q1 for upconversion to 10 MHz. Bandpass filtering is provided by Y3-Y5, and IF amplification by Q2 and U1. U1's gain is manually controlled by trim pot R11 **(IF GAIN)** and automatically by Q3. High audio levels at D1 drive Q3 toward cutoff, reducing U1's gain. This simple AGC circuit relies heavily on the high transconductance of the 40673 used at Q3.

At product detector Q5, the 10-MHz IF signal is mixed down to the audio range by high-side BXO injection via C19. AF preamplifier Q6 feeds audio bandwidth switch S1 **(AFN/AFW)** via C25 for wide, and U2 for narrow selectivity using a 700-Hz center frequency. In either case, audio is routed back to the IF amplifier for AGC, and to R88 **(AFG)** for volume control. Q7 is off during receive, so low-level audio passes to U3 for power gain and speaker drive.

Closing the key for transmit turns Q15 on, energizing the 12T bus which, through D8, turns Q16 and the 12R bus off. Q14 turns on, allowing R67 to reduce BXO tuning voltage for a 700-Hz transmit offset. At the HXO, the 12T bus turns Q10 on and Q11 off, swapping the **RIT** variable resistor (R87) for a fixed-value resistor, R51. This centers the HXO for transmit. The sidetone oscillator starts, feeding audio amplifier U3 through trim pot R71 **(SIDETONE LEVEL)**. D12 on the PA5 amplifier board switches on, protecting the receiver input.

Envelope shaping provided by R85 and C69 allows all of these transitions to occur before significant RF output develops. As transmit mixer Q17 powers up, its two inputs—HXO and BXO—are ready and waiting. The difference product in the 80-meter band is tuned by T4/C66, filtered, and leaves the main board at jumper **D**.

R101 **(TX PWR)** sets the drive level for Q18. The collector impedance of the final amplifiers, Q19 and Q20, is stepped up to 50 Ω by T6, a 1:4 transformer. A low-pass filter consisting of L6-L8 and C90-C96 attenuates harmonics as the signal proceeds to the antenna.

When the key is opened, transmitter output starts decaying. Even though Q15 is now off, the 12T bus follows the discharge of C69 and remains high enough to hold HXO and BXO in the transmit mode until RF output falls to zero. Q4 and Q7 hang on slightly beyond this point, suppressing pop in the receiver as it springs to life.

Construction Highlights

PC-boards, parts kits and a detailed construction manual are available (see note 1) and greatly simplify construction of the BP-80. Table 1 contains a list of parts suppliers for those who'd like to tackle the project completely on their own. Inside views of the transceiver are shown in Figs 4 and 5. The main circuit board measures 4.5 × 6 inches; the PA5 TX AMP power-amplifier board is 4.5 × 2 inches. A 2¼ × 6-inch board is used for the optional digital display (discussed under "About the Display"). The amplifier board must be installed adjacent to the main board (as shown in Fig 5) to minimize lead lengths and ensure stable operation. The two boards are interconnected by means of six short jumpers labeled **A** through **F**. Apart from this requirement, great latitude in the physical layout is afforded by eliminating the usual air-variable capacitor and dial-drive mechanism used for tuning.

The inductance of L1 in the HXO is somewhat critical. Extra wire turns will increase the tuning range up to a point, but at the expense of stability. An insufficient number of turns will restrict the tuning range. The turns difference between these two extremes is only two or three. After you're satisfied with the tuning range and stability of the unit, glue the core of L1 to the PC board. A drop or two of glue will take the strain off the no. 30 wires.

S3 **(HI/LO)** is installed on the bottom (foil) side of the main board with the flange even with the board edge. The switch terminals are soldered directly to the three pads provided on the board, and the flange is tack-soldered to the PC-board's perimeter ground for additional support. The twisted-pair jumper seen in Fig 5 connects BXO output to the input of TX MIX, Q17. Holes to be connected are identified by triangles and by squares on the parts overlay (connect triangle to triangle and square to square).

I housed the BP-80 in a 9 × 7 × 2-inch plastic school case (see note 4) shown in the accompanying photos. The main and TX amplifier boards and TB1 are mounted in the case bottom (rear). Access to S3 **(HI/LO)** on the main board is provided by an opening in the case bottom near the hinge. The

display board, speaker and control panel are attached to the case top (front). Ventilation holes on the left (front and side) keep the power amplifier cool.

The control panel is a 3 × 6-inch piece of 0.032-inch-thick aluminum sheet. (A drilling template is available; see note 1.) Paint and letter the panel to suit your taste. If you deviate from the layout shown, just be sure there is no conflict between the front-panel and PC-board-mounted parts when the case is closed.

I used a thin piece of red plastic glued over the cutout for the digital display. Irregularities in the opening are covered with 1/8-inch wide PC drafting tape. Initially, the appearance of the front panel looked unbalanced, so I installed a hamfest call-sign badge in the vacant area to the left of the display window.

I recommend hooking everything up and testing it before you package the BP-80 in the case of your choice. It's easily done, and may save you a lot of trouble.

About the Display

Almost any frequency counter can be used as a digital display for the BP-80. Just connect it to the HXO output point on the main board and ignore the leading 1. Rather than tie up my lab counter, I chose the most economical circuit I could find for dedicated display use. With the addition of a 5-V regulator, Bainbridge's circuit (see note 2) will work as is. For fitting into the plastic case shown here, a different physical layout is required.

My display board measures 2¼ × 6 inches and includes the 5-V regulator. Unable to obtain the DL34M for DS1, I used three easy-to-find MAN74s instead. These are located at the lower-right-hand corner of the board. Only the last three digits of the operating frequency (units, tens and hundreds of kilohertz) are displayed.

The general-purpose features of the original counter are not needed for display-only use. I deleted U6, U7, S1 and Q4-Q6 that appeared in Bainbridge's version, leaving just a kilohertz counter. At U8, I used a 16-pin 74C925 because carry-out and display-select pins are not used in this application.

With the physical layout I used, there is a small amount of coupling between the display reference oscillator at 3.579 MHz and the receiver-input circuits when the case is closed. This interference can be reduced to a negligible level by installing a shield over the bottom side of the oscillator portion of the display board. I attached a piece of single-sided PC board to the voltage-regulator mounting screw, copper side out (see Fig 4), for this purpose.

Display accuracy depends on how close the crystal-filter center frequency is to the frequency marked on its crystals. If the center is 1 kHz low, then for a given 80-meter frequency, the HXO will also read 1 kHz low on a calibrated counter. You can compensate for this in the display by detuning reference oscillator U1. You can also try altering the value of C2 to improve readout accuracy.

Selecting a Crystal

Although component tolerances prohibit precise prediction of the crystal frequency needed for a given tuning range, a conservative formula, derived from test data, makes a good starting point. Select any 25-kHz segment of the band and jot down its upper edge. To this frequency, add 10.008 MHz. The sum is the crystal frequency required. If you have a frequency spread of more than 25 kHz, it will likely extend the lower limit of your tuning range. If necessary, fine tune the formula for your rig when you see what you get.

One useful crystal frequency is 13.595 MHz. In my BP-80, this "rock" tunes 3.558 to 3.586 MHz, valuable spectrum that includes QRP, the Ohio Buckeye Net and W1AW frequencies. Further, it allows using the display reference oscillator at 3.579 MHz as a signal generator during tune-up! For Novice-band use, I recommend a crystal frequency of 13.745 MHz. Typically, this will provide coverage from 3.710 to 3.737 MHz, and keep you well clear of band edges. Use fundamental-mode crystals in HC-25 holders. When ordering crystals, I specify a load capacitance of 20 pF and 0.005% tolerance.

Tune Up

Do a careful job here and you'll discover the BP-80 will practically "fly itself" on the air! All adjustments are done when viewing the board from the top. Preset the **SIDETONE LEVEL** control (R71) to 9 o'clock, turn **IF GAIN** R11 fully clockwise, **BXO ADJ** (R65) to midrange and **TX PWR** (R101) fully counterclockwise. Back out the RF-transformer tuning slugs until they are just snug with the top. Then, turn them down as follows: T1, 2 turns; T2, 2¼ turns; T3, 2½ turns; T4, 2 turns; T5, 1 turn. Set the bandwidth control to **AFW**, display on, and remove the knob from the **RIT** control. To TB1, connect an RF power meter in series with a dummy load to the antenna terminals, and a 13.8-V, 1-A dc power supply to the power-input terminals.

This tune-up procedure uses the 3.579-MHz reference oscillator on the display board as a signal source. You may substitute an RF signal generator or strong on-the-air signal if you don't have a crystal to cover this part of the band. Remove the PC-board shield from the back of the display board. Connect one end of a clip lead to interboard jumper **B** (RXI). Turn on the rig using the **AFG** control. The display should briefly show **000**, then the operating frequency. (Pretend there's a leading 3 all the time!) Proximity-couple the clip-lead wire to Y1 on the display board. You can tape the lead to the rear of the board or wedge it between the board and the front panel. Ensure that the clip lead doesn't short anything!

Attach a voltmeter (set to the 10-V dc scale) between TP2 and ground. Tune in the reference signal and adjust T1, T2 and T3 for maximum audio output. If necessary, readjust clip-lead coupling for a stronger signal, until discernible upward deflection occurs on the meter. Rotate the **MAIN TUNING** knob for the meter peak; you've just found the center of the crystal IF filter.

Switch to **AFN** and adjust R65 for a maximum reading at TP2. If you find two peaks, select the more clockwise one. You should hear a 700-Hz tone from the speaker. Touch up the tuning of T1, T2 and T3 for a maximum indication at TP2. Remove the clip lead or signal generator.

Press the front-panel key button and adjust R71 (**SIDETONE LEVEL**) for a comfortable output level. Move the voltmeter to TP3. While keying the rig, adjust the **RIT** shaft for no voltage change at TP3 between receive and transmit modes. Reinstall the **RIT** knob with the pointer set at 12 o'clock (0).

Ensure that your dummy load and wattmeter are still attached. Set R101 (**TX PWR**) to midrange. Key the rig and adjust T4 and T5 for maximum RF output. Adjust R101 for 5 W output. If you have doubts about your meter's accuracy, insert an ammeter into one of the dc power leads and adjust R101 for a meter reading of 750 mA during key-down.

Transmit offset can be measured with a frequency counter connected to TP1. The BXO near 10 MHz should shift downward about 700 Hz during transmit. If it doesn't, decrease the value of R67 to increase the downward shift. On the air, incorrect transmit offset results in stations consistently answering you above—or below—your transmit frequency. Don't be hasty to conclude you have an offset problem, though. Contact someone who knows how to zero beat to ensure the problem isn't yours!

Compare the coverage of the two frequency ranges selected by S3 (**HI/LO**). Do they overlap slightly? If not—and you want some overlap—tack solder a small-value capacitor (try 1 pF) across D4 on the bottom side of the PC board. This will move the high range down somewhat.

This alignment will remain okay beyond the range of main tuning, but if you plug in another crystal and move, say, 100 kHz down the band, touch up the tuning of T1 only for maximum received-signal level, and T4 and T5 for maximum RF output. All other adjustments remain the same.

On the Air

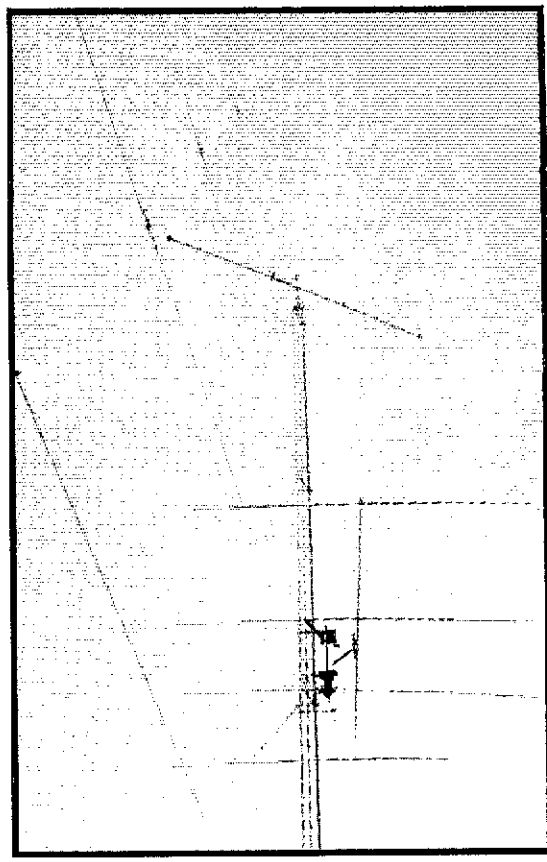
Operating the BP-80 is a cinch. Replace the dummy load used during tune-up with a 50-Ω 80-meter antenna. Turn on the rig

(continued on page 32)

Rugged Side-Mounting for Rotatable Antennas

Tower-side-mounted antennas can be stacked, placed at optimum heights and independently rotated. But the mechanics of a sound side mount can be a challenge. Here's one good way to do the job.

By Malcolm P. Keown, W5XX
14 Lake Circle Dr
Vicksburg, MS 39180



A four-element, 20-meter beam at 120 feet and a four-element, 15-meter beam, side-mounted at 70 feet, adorn this tower at W5XX. *(W5XX photos)*

I've never been very enthusiastic about stacking large Yagis close to each other. I searched the ham literature looking for a side mount that would allow me to mount a 15-meter beam on my tower at 70 feet as an alternative to mounting it five to ten feet above my 20-meter beam, which is at 120 feet. (I also wanted to avoid the grief of trying to mount a beam above another that was already in place!)

Finding only limited useful information in back issues of various journals, I began to experiment on graph paper with a scale model of Rohn 25G tower and a three-element Yagi. It didn't take long to figure out that, with the rotator mounted immediately adjacent to one of the lower legs, the greatest arc of rotation would be slightly more than 120° (see Fig 1). In this configuration, the boom-to-mast plate on some antennas has to be moved off-center to ensure that the driven element clears the tower as the antenna rotates. This is a less-than-desirable mechanical situation, and I didn't want to be stuck with only 120° of rotation. There *had* to be a better way.

After talking with Fred Abide, K5FA, and John Day, W4XJ, I saw the error in my logic. I needed to develop a mount in which a *movable* side arm offsets the Yagi boom far enough from the rotator that the boom clears the opposite tower legs when the side arm is rotated adjacent to the tower (see Fig 2). Using this approach, it is possible to rotate a Yagi 240° or more, depending on the number of elements the antenna has and how far the rotator is from the closest tower leg.

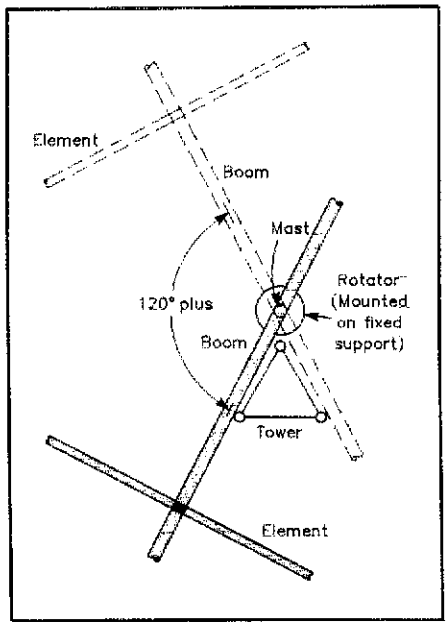


Fig 1—Slightly more than 120° of rotation can be realized with a rotator mounted immediately adjacent to a tower leg. The farther the rotator is from the tower, the greater the possible arc of rotation; however, mechanical complications make it best to keep the rotator as close to the tower as possible.

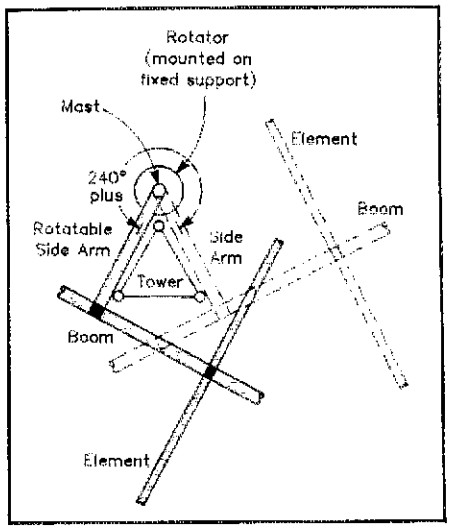


Fig 2—A side arm can be used to position a Yagi boom far enough away from the tower legs to yield more than 240° of rotation.

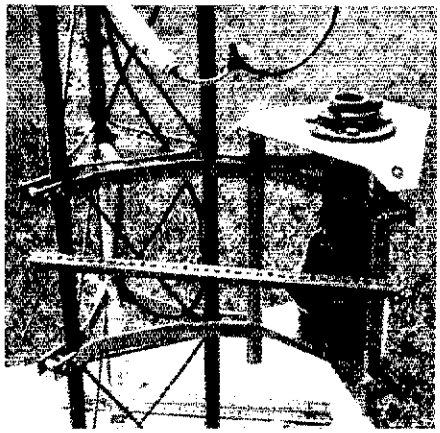


Fig 3—Rohn 25G short top section mounted outside the tower using Rohn guy-wire brackets. A length of 1½-inch angle stock braces the tower to the short top section to minimize stress where the bracket and the tower meet. A second piece of angle stock, used on the other side, had not yet been attached when this photo was taken.

More experimentation with graph paper indicated that using a four-element beam would avoid problems that would result from the driven element of a three-element beam bumping into the tower legs.

The Design

The first problem I had in designing the practical system was mounting a rotator outside the tower without constructing a mechanical nightmare. I drew up all sorts of rotator plates that could be fastened to the tower legs using angle stock, each being a major engineering project in itself.

Then it hit me: How about mounting a standard Rohn 25G thrust-bearing/accessory shelf (also known as a short top section—Rohn part number BAS25G) to the tower with a couple of Rohn 25G guy-wire brackets? This would eliminate drilling a plate for mounting the rotator,[1] and would provide a place to mount a thrust bearing to reduce lateral stress on the rotator (see Figs 3 and 4).

After rounding up and assembling the needed parts, I found that the mount was rock solid. (At this point in the project, the mount was only 3 feet above the tower base). I attached sections of 1½-inch angle stock from the outer tower legs to the appropriate legs on the short top section to minimize stress where the guy brackets were attached.

Then I cut a short section of 2-inch steel electrical conduit and inserted it through the top of the thrust bearing and into the rotator, and then attached a 90° elbow to the top of the mast. Into the other opening in the elbow, I inserted another section of conduit, long enough to clear the opposite tower leg and attach to the beam's boom-to-mast plate. I attached a four-element 15-meter beam to this side arm.

One rotation of the antenna was enough to prove that I had all the makings of a disaster. The side arm drooped, the whole antenna vibrated erratically, and the beam's elements hit the tower legs!

Back to the Drawing Board

Obviously, I needed to put a support above the thrust bearing to prevent vibration of the side arm and antenna. I also needed a side-arm design strong enough to survive more than half a thundershower.

At about that time, Mike Wetzel, W9RE, published a suitable side-arm design in the *National Contest Journal*.[2] I modified his dimensions slightly (Fig 5) and had the side arm made of 2-inch OD, thick-wall truck exhaust pipe. Mine was welded locally and painted with rust-inhibiting primer. (You should use steel pipe of at least 1½ inches ID and schedule-40 wall thickness for your version, as recommended by ARRL Technical Advisor Bill Shaheen, N1CQ.) I solved the vibration problem by supporting the rotator mast with an ultraviolet-resistant ¾-inch-thick plastic plate fitted with an aluminum bearing,[3] greased on the inside, mounted above the short top section (see Figs 6 and 7). Like W9RE, I added gusset plates at the welded joint just above the rotator to reinforce that joint (see Fig 5). I attached this assembly to the tower using 1½-inch angle stock[4] and U bolts (Figs 6 and 7).

The side mount worked fine after the top-plate bearing was shifted slightly to prevent mast binding. After the four-element 15-meter beam was attached to the side arm, I had to move the boom-to-mast plate a couple of inches to keep all the elements clear of the tower legs as the beam rotated.

Mounted at 70 feet, this side arm turns my four-element 15-meter beam through 300°. The antenna is positioned to rotate clockwise from West through a bit west of South, losing direct coverage of only the South Pacific.

This basic side-mount design is suitable for Rohn 25 and 45 towers, and can probably be adapted to other tower types. (Of course, for Rohn 45 towers, use the appropriate hardware in the Rohn 45 series.) Before beginning construction, make sure the side-arm dimensions match your application.[5]

Summary

After more than three years in the air, the side mount continues to perform flawlessly. A couple of construction tips: Build and test the entire assembly, complete with the antenna, near the ground to work out any mechanical kinks. This is no project

[1]Notes appear on page 32.

Fig 4—Standard Rohn guy-bracket hardware holds the bracket to the tower. Rohn supplies a cylindrical spacer with the guy-wire brackets, but two nuts are used in place of the spacer in this application, as the required spacing here is ¼ inch less than in the standard guy-bracket utilization. You could also shorten the stock spacer to serve this purpose.

(continued on page 32)

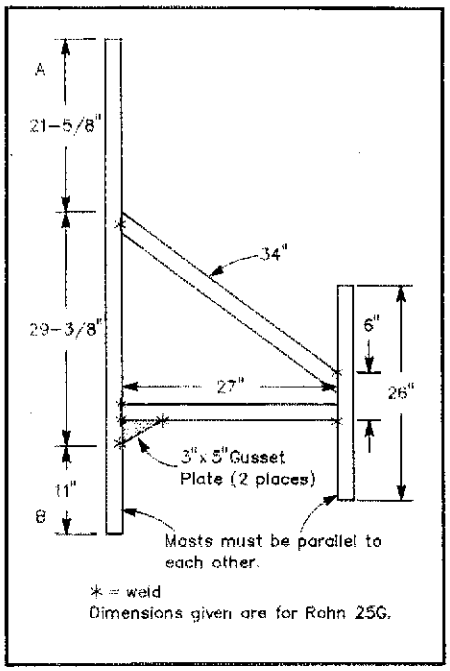


Fig 5—Dimensions for the side arm. Dimension A is noncritical, but should be long enough to allow the mast section to extend through the top-plate bearing with a few inches to spare. Triangular gusset plates welded to the side arm reinforce the pipe joint just above the rotator, which has proven to be a weak point without such reinforcement. Dimension B should allow an inch of clearance between the thrust bearing and the gusset plates when the mast is fully seated in the rotator.

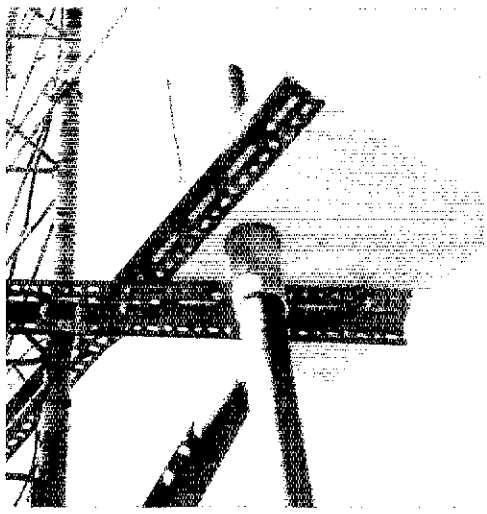


Fig 6—This upper mast support is made from a special ¾-inch plastic plate and an aluminum-pipe bearing, but a steel plate and a common flange-type thrust bearing should be used in your application. Washers between the plate and the angle stock allow easy leveling of the plate so that the mast doesn't bind in the collar.

to put together for the first time 70 feet in the air! When you determine where on the tower that you want to mount the side arm, make sure that the guy wires won't interfere with antenna rotation. Measure or calculate the turning radius of your beam (plus the side arm) from the point of rotation to the tip of the longest element. Then, with a pole (PVC or aluminum) of the same length as the turning radius, climb your tower to the planned mounting location and swing the pole horizontally through 360° to make sure that the elements won't hit the guy wires.

Since completing the initial project, I have placed ¼-inch-thick rubber matting on the tower legs at the boom/leg contact points so the boom won't damage the zinc plating on the tower legs. I've also placed torque bars on the tower guys to minimize torsional metal fatigue. I've been on the tower above the beam when it is rotating and have found the resulting vibration and torque on the tower to be minimal.

Like many hams, I was somewhat skeptical of side mounting—before I installed a side-mounted beam as described here. Now I can say that side mounting is *the* best solution for some antenna puzzles. Like everything else that goes into a good tower-mounted-antenna installation, a side mount's safety, success and longevity depend on careful planning and constructing and installing it *right*.

Notes

[1]Rohn 25G rotator plates are predrilled for Hy-Gain rotators (I use Hy-Gain Tailtwister rotators).
[2]M. Wetzel, "Rotating Side Arm," *National Contest Journal*, Sep/Oct 1987, pp 14-16.
[3]Although I used a plastic plate that's heat- and ultraviolet-resistant for this application, plastic is not an acceptable long-term solution. At minimum, a 3/16-inch-thick steel plate with another thrust bearing should be used here. Three-eighth-inch (or thicker) T6061-6511 aluminum is also acceptable.
[4]If you build a side mount based on this article, ARRL Technical Advisor and mechanical engineer Bill Shaheen, N1CQ, recommends that you use solid 1½- × 1½-inch × ¼-inch-thick angle stock for these reinforcements.—*Ed.*
[5]See note 2.

Fig 7—The assembled side mount, at ground level.

Malcolm Keown, W5XX, was first licensed in 1957 as KN4RIN, and later became W5RUB. His major ham-radio interests include antennas, contesting and DXing. He's a graduate of the University of Chattanooga, Tennessee (AB, physics, 1965; MS, 1968), and the University of Florida (MS, Environmental Engineering, 1973).

Malcolm has worked as a physicist at the US Army Engineers Waterways Experiment Station in Vicksburg, Mississippi, since 1968. His major research efforts have been in the areas of trans-oceanic canals, helicopter-landing zones and airfields, stream-bank stabilization, filter fabric placement, soil erosion on military training ranges, and underwater radiotelemetry. He is presently the manager of the Army's military hydrology, background signatures, and camouflage, concealment and deception programs. Malcolm is also the chairman of the NATO committee on reducing the conspicuity of high-asset targets against threat airborne radar target-acquisition systems. He's written more than 60 technical reports, journal articles and symposium papers.

The BP-80: An 80-Meter CW Transceiver

(continued from page 29)

and adjust the **AF GAIN** control for a comfortable audio level. Except during daylight hours, you should hear plenty of signals, especially in the Novice band. In general, operate with the **RIT** control centered and the audio bandwidth set to **AFW**. When you've made contact with another station, adjust the **RIT** control for a beat note you prefer. If QRM becomes excessive, kick in the "whisker filter" by switching to **AFN** and adjusting the **RIT** control for best reception.

In lieu of the built-in speaker, you may prefer to use headphones. I use a cheap pair of miniature stereo headphones. Because their impedance specification is 32 ohms, I wired the earpieces in parallel and installed a two-circuit (monophonic) plug on the cord.

If you plan to power the BP-80 from batteries, you can reduce the current drain by 50 mA if you switch off the display. Remember, this is a low-cost frequency display. Its accuracy should be verified by independent means, such as a calibrated frequency counter temporarily coupled to the transmit signal. Ensuring correct frequency display is especially important if you'll be operating near the band edges.

Summary

What can you do with 5 W on 80 meters? Plenty! But, finding out for yourself is half the fun! Building the BP-80 is the first half. (By the way, if you haven't guessed what the "BP" stands for, it's *Brass Pounder*!)

Notes

[1]PC boards, kits and detailed assembly instructions for this project are available from LECTROKIT, 401 W Bogart Rd, Sandusky, OH 44870; a telephone number is not available. Send a business-size SASE with one First-Class stamp for complete details and pricing. (The ARRL and *QST* in no way warrant this offer.) A template package containing the three PC-board patterns, parts overlays, a front-panel-plate etching pattern and a drilling template is available free of charge from the ARRL Technical Department Secretary, ARRL HQ, 225 Main St, Newington, CT 06111. Request the AGSTEN BP-80 template package.
[2]D. Bainbridge, "A Low-Cost Frequency Counter," *QST*, Feb 1989, pp 21-26; see also Feedback, *QST*, Apr 1989, p 43.
[3]W. Hayward, "A Unified Approach to the Design of Crystal Ladder Filters," *QST*, May 1982, pp 21-27; see also Feedback, *QST*, Jul 1987, p 41; "Designing and Building Simple Crystal Filters," *QST*, Jul 1987, pp 24-29. Also, D. DeMaw, "A Tester for Crystal F, Q and R," *QST*, Jan 1990, pp 21-23.
[4]The deluxe school cases are available at local drug and discount stores. One source is W. T. Rogers Co, 2514 Fish Hatchery Rd, PO Box 4327, Madison, WI 53711, tel 608-257-2227. Case part numbers are 54907 (blue), 54908 (red) and 54912 (yellow).

Conducted By James W. Healy, NJ2L
Assistant Technical Editor

QST Compares: Peak-Reading MF/HF Wattmeters

By James W. ("Rus") Healy, NJ2L

The popularity of peak-reading wattmeters has risen greatly in the last couple of years; a number of manufacturers, foreign and domestic, have responded by introducing such devices. Rather than reviewing each individually, we've taken a new approach to certain kinds of reviews, starting with this one: a comparison of features and performance of products in a distinct class. Tell us what you think; your feedback will help us decide what classes of products to review this way in the future.

Each of the peak-reading wattmeters reviewed here was selected based on ready availability, coverage of at least 1.8 through 30 MHz, and the ability to display forward power to at least 1.5 kW. Some of the meters reviewed cover broader frequency and power ranges, but all meet these basic criteria. All but one of the reviewed meters feature direct SWR-measurement capability.

Peak-reading wattmeters can be divided into two classes: active and passive. The active variety sample peak power electronically, then amplify and display forward power. The peak-reading circuitry in such meters requires a dc power source to operate. Passive models use unamplified meter-damping circuits for peak-power readings, and require no power to operate. The performance differences are apparent in the test results of Table 1. All the wattmeters tested here indicate average power (and SWR, for those that display it directly) without requiring an external power supply. In Table 1, note that some meters calculate and display SWR directly, and others require calibration before SWR readings can be made.

We developed a set of tests for these meters that would yield results allowing qualitative comparison of the performances of each one with respect to the others. These tests are briefly described below the test results in the table.

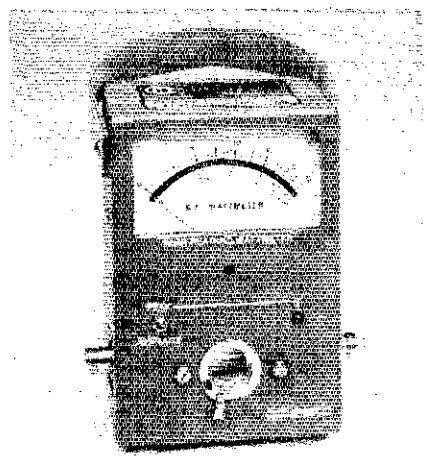
The Contenders

The meters reviewed here include the Coaxial Dynamics 83000-A, Comet CD-160H, Daiwa NS-660PA, Diamond Antenna SX-100, Heath HM-2140-A, Mirage MP1, MFJ 815B, Nye Viking RFM-003 and Yaesu YS-60. Not included here, but also meeting the stated criteria, are the Autek WM1 and the Bird 43P; these meters were reviewed in the November 1989 and December 1989 issues of *QST*, respectively. At least two wattmeters that otherwise meet the review criteria were released too late for this review.[1]

Here are the results of the individual evaluations.

Coaxial Dynamics 83000-A

Manufacturer: Coaxial Dynamics, Inc, 15210 Industrial Pkwy, Cleveland, OH 44135, tel 800-262-9425 or 216-267-2233.



The 83000-A bears a strong resemblance in function and accuracy to the Bird 43P. In fact, the 83000-A works with Bird's power-measurement elements. Able to store two spare elements and equipped with a large (4.5-inch-wide), mirrored scale and a detachable line section (coupler/element holder), the 83000-A is flexible and rugged. A single 9-V battery powers the peak-reading circuitry. An external-power receptacle is not included; Coaxial Dynamics specifies average battery life as "at least 90 days," although the original battery has lasted more than nine months in intermittent service. A rechargeable battery is optional. The instruction sheet provided with the 83000-A is adequate, if sparse.

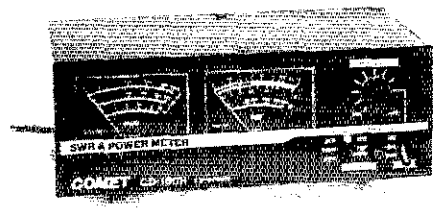
The 83000-A, like Bird's analog wattmeters, allows separate measurement of forward and reflected power (not at the same time). SWR must be calculated based on these readings. Coaxial Dynamics has achieved excellent peak-power-measurement accuracy, as shown in Table 1.

Power-measurement elements for the 83000-A are optional, and are available for full-scale power levels ranging from 5 W to 10 kW and frequency ranges of 2-30, 25-60, 50-125, 100-250, 200-500, 500-1000 and 950-1300 MHz. Prices (as of mid-December, 1990) range from $52 each for the 25- to 1000-MHz elements to $104 for the 900- to 1300-MHz units, and most 2- to 30-MHz elements are $61 each. A variety of connectors (N, UHF, BNC, TNC, etc) is also available.

All things considered, the 83000-A is well-suited to heavy-duty use where good accuracy is required, such as installation and maintenance applications. A long meter-hold time constant, the need to calculate SWR from power readings, and the expense of power-measurement elements make the 83000-A less appropriate for everyday ham-shack use than most of the other meters reviewed here.

Comet CD-160H

Manufacturer: NCG Co, Ltd, 1275 N Grove St, Anaheim, CA 92806, tel 714-630-4541.



The CD-160H is a sturdily built, dual-meter unit that uses a passive PEP-indication circuit. Its controls have a smooth feel and the meter scales are easy to read, even in low-light situations. Reading the meters can be confusing, however, because separate scale markings are used for each of the meter's three power ranges.

Of the meters we tested, only the Comet displays reflected power as a percentage of forward power. An absolute reflected-power scale is also included, but is of little value at forward-power levels of less than 1 kW or so. A brief Japanese/English instruction sheet, complete with schematic diagram and parts list, is included with the CD-160H.

Daiwa NS-660PA

Manufacturer: Daiwa Electronics Corp, 1908-A Del Ammo Blvd, Torrance, CA 90501-1303, tel 714-895-6645.

A solidly made, attractive and flexible unit, the sloped-front NS-660PA is one of two cross-needle wattmeters we tested. Its flexibility lies mainly in its ability to accept external directional couplers for VHF and UHF. This meter comes with a 9-V battery

[1]Those just released include AEA's cross-needle wattmeter and the Palomar Engineers LED-bargraph meter.

Table 1
Wattmeter Features and Performance

	Coaxial Dynamics			Comet			Daiwa			Diamond Antenna		
Manufacturer												
Model	83000-A			CD-160H			NS-660PA			SX-100		
Mfr's Suggested List Price	$275			$159			$199.95			$149.95		
Frequency Range	Element-dependent			1.6-60 MHz			1.8-150 MHz‡			1.6-60 MHz		
Power Range(s)	Element-dependent			20/200/2000			30/300/3000 W			30/300/3000 W		
Auto-Ranging	No			No			No			No		
Active PEP Circuit	Yes			No			Yes			No		
Automatic SWR Calculation	No			No			Yes			No		
Remote Dir Cplr Capability	Yes			No			Yes*			No		
Cable Length	36 in.			—			*			—		
Connector Type	N*			UHF			UHF			UHF		
Illuminated Meter(s)	No			Yes			Yes			Yes		
Power Requirement	9 V†			13.8 V dc			9-14 V dc†			13.8 V dc		
Int/Ext/Both	I			E			B			E		
Power Cable	N/A			36 in.			36 in.			None		
	Average/Peak			*Average/Peak*			*Average/Peak and Hold*			*Average/Peak*		
Actual Forward Power	*2 MHz*	*14 MHz*	*28 MHz*	*2 MHz*	*14 MHz*	*28 MHz*	*2 MHz*	*14 MHz*	*28 MHz*	*2 MHz*	*14 MHz*	*28 MHz*
5 W CW	5/5	5/5	5/5	5.2/5.2	5/5	5/5	4.3/4.3	4.3/4.3	4.3/4.3	5.2/5.2	5.2/5.2	5.2/5.2
5 W 50%	—/4	—/4	—/4	—/3	—/3	—/3	—/3.7	—/3.8	—/3.8	—/4	—4.1	—/4
100 W CW	97/100	98/102	96/98	112/112	108/108	105/105	98/95	98/95	98/95	120/120	110/110	110/108
100 W 50%	—/84	—/90	—/91	—/88	—/86	—/85	—/80	—/85	—/90	—/94	—/90	—/95
100 W Two-Tone	—/93	—/92	—/88	—/78	—/72	—/72	—/82	—/83	—/85	—/90	—/80	—/80
100 W Voice	—/—	—/90	—/—	—/—	—/50	—/—	—/—	—/80	—/—	—/—	—/60	—/—
1 kW CW	900/940	980/1000	960/990	950/950	980/980	990/990	910/900	995/990	995/990	1040/1040	1050/1050	1080/1080
1 kW 50%	—/900	—/940	—/1020	—/880	—/880	—/920	—/800	—/900	—/920	—/975	—/1000	—/1040
1 kW Two-Tone	—/930	—/930	—/860	—/880	—/800	—/810	—/950	—/950	—/980	—/1000	—/800	—/1020
1.5 kW Voice	—/—	—/1300	—/—	—/—	—/800	—/—	—/—	—/1300	—/—	—/—	—/1150	—/—
SWR Accuracy												
1:1 SWR	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1.1:1	1.1:1	1.1:1
2:1 SWR	2.3:1	2.3:1	2.3:1	2:1	2:1	2:1	1.9:1	1.9:1	1.9:1	2.3:1	2.3:1	2.4:1

*Optional. †9-V battery included. ‡Other ranges available with optional directional couplers. ††Ac-operated supply included.

Lab Notes

Each of the wattmeters was tested at three frequencies (2, 14 and 28 MHz), with test signals generated by the same transmitter and, where applicable, a legal-limit amplifier. No speech processing was used for any of the tests. The power standard on CW was an EIA-standard-calibrated Hewlett-Packard 453B/8482A micro power meter used with suitable attenuation (specified accuracy: +3/−5%). The peak-power standard was the Lab's calibrated Bird 4381 digital computing SWR/wattmeter (specified accuracy: ±5% of full scale). We also used the peak-detection capability of one of our Hewlett-Packard spectrum analyzers to confirm the accuracy of these measurements. Other specifics:

- The 50%-duty-cycle signals were generated by the CW-keying generator usually used in ARRL Lab testing of transceiver keying characteristics. Equivalent keying speed was approximately 20 WPM.
- The two-tone tests were made using the test-signal generator usually used in measuring SSB-transmitter two-tone intermodulation-distortion (IMD) performance.
- The voice signal, which was applied to each wattmeter at 100 W and 1.5 kW at 14 MHz, was a brief tape-recorded message spoken by the test engineer.
- For the SWR tests, we used a noninductive 25-Ω load.

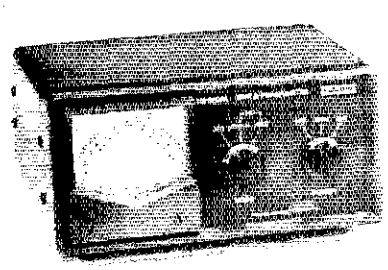
We initially had some difficulty determining whether the Bird 4381 was a suitable standard for peak-power measurements. At the time, we were also using a Bird 43P for comparison purposes. Here's a snippet from ARRL Lab Engineer Ed Hare's test-results report:

> The Bird 4381 and Bird 43P were not in agreement on voice signals. The 43P would typically indicate 1250 W for a signal that was metered as 1500 W by the 4381. ARRL Lab Engineer Zack Lau, KH6CP, performed a test of the Birds versus the peak detector in the spectrum analyzer to try to quantify the problem. Consultation between the lab engineers [following this test] yielded the conclusion that we could use the HP 453B to accurately measure a CW level of 1500 W, then use an analog oscilloscope to determine when an envelope peak was at or greater than this level in order to accurately measure peak SSB power. The fact that we need to rely on test equipment worth thousands of dollars and spend hours of engineering time just to get a go/no-go test of actual voice power speaks volumes about the techniques currently used for SSB peak-power measurement by Amateur Radio operators.

Indeed. In addition to the power tests, we tested each wattmeter for insertion loss and swept return loss (a measure of input SWR). All of the meters had insertion losses of less than 0.1 dB and input SWRs of less than 1.1:1 across their specified frequency ranges.—*NJ2L*

and a battery clip that's wired to a coaxial power plug; an external-power cable is also included.

Except for one humorous gaffe in which actual forward power is referred to as "effective radiated power," the four-page Japanese/English instruction sheet is adequate. It includes good pictorial connection diagrams and information on the two optional directional couplers (300 W, 140-525 MHz, N or UHF connectors; 60 W, 1.2-2.5 GHz, N connectors).



The NS-660PA has a quirk that limits the usefulness of its peak-reading mode: It doesn't indicate reflected power in this mode. So, when you're using the meter in its peak or peak-and-hold mode, the SWR always appears to be 1:1. Only in average-reading mode does the reflected-power needle deflect. The '660PA is more accurate in its peak-and-hold mode than in its peak/no hold mode.

The NS-660PA is nicely made and, even with its marginal illumination and sub-

Heath HM-2140-A $129.95			MFJ 815B $69.95			Mirage MP1 $188			Nye-Viking RFM-003 $300			Yaesu YS-60 $127		
1.8-30 MHz			1.8-30 MHz			1.8-30 MHz			1.8-30 MHz‡			1.6-60 MHz		
200/2000 W			200/2000 W			25/200/2000			300/3000 W			20/200/2000 W		
No			No			No			Yes			No		
Yes			No			Yes			Yes			Yes		
No			Yes			No			Yes			No		
Yes			No			Yes			Yes			No		
36 in.			—			48 in.			36 in.			—		
UHF			UHF			UHF			UHF			UHF		
No			Yes			No			Yes			Yes		
9 V dc			12 V dc			9-12 V dc†			13.8 V dc			13.8 V dc		
B			E			I			B			E		
*			None			N/A			††			36 in.		
Average/Peak			*Average/Peak*			*Average/Peak*			*Average/Peak and Hold*			*Average/Peak*		
2 MHz	*14 MHz*	*28 MHz*	*2 MHz*	*14 MHz*	*28 MHz*	*2 MHz*	*14 MHz*	*28 MHz*	*2 MHz*	*14 MHz*	*28 MHz*	*2 MHz*	*14 MHz*	*28 MHz*
6/5	7/5.5	6.5/5	9.5/9.5	9.5/9.5	9.5/9.5	4.5/4.5	4.2/4.2	3.8/3.8	4.5/5.5	4/5	4/4.8	6/6	5.3/5.3	5.1/5.1
—/4.5	—/4.5	—/4.5	—/6.5	—/7	—/7	—/3.5	—/3.5	—/3.2	—/4	—/4	—/4	—/4	—/4	—/4
83/82	90/90	82/85	105/105	102/102	105/105	90/90	90/90	82/82	98/104	96/102	90/95	120/120	107/107	100/100
—/70	—/82	—/95	—/81	—/83	—/89	—/75	—/81	—/75	—/85	—/92	—/90	—/88	—/90	—/90
—/98	—/90	—/78	—/85	—/73	—/78	—/70	—/62	—/75	—/80	—/72	—/70	—/105	—/92	—/85
—/—	—/75	—/—	—/—	—/45	—/—	—/—	—/60	—/—	—/—	—/85	—/—	—/—	—/75	—/—
950/1000	1020/1050	980/1000	930/930	920/920	975/975	1020/1020	1000/1000	950/950	1050/1060	1050/1060	950/1000	1200/1200	1150/1150	1100/1100
—/900	—/980	—/1000	—/830	—/820	—/900	—/860	—/900	—/900	—/960	—/1050	—/1000	—/1050	—/1020	—/1050
—/1050	—/1000	—/920	—/840	—/780	—/820	—/840	—/750	—/750	—/920	—/850	—/780	—/1280	—/1180	—/1150
—/—	—/1200	—/—	—/—	—/850	—/—	—/—	—/1200	—/—	—/—	—/1480	—/—	—/—	—/1500	—/—
1.2:1	1.2:1	1.3:1	1:1	1.1:1	1:1	1.2:1	1.1:1	1.1:1	1:1	1:1	1.2:1	1:1	1:1	1.2:1
2.3:1	2.3:1	2.7:1	2.4:1	2.4:1	2.3:1	2:1	2:1	2.3:1	2:1	2:1	2.3:1	2.4:1	2.4:1	2.5:1

optimal contrast between the SWR markings and the meter face, is one of the easiest to read of the bunch. Only one reviewer disliked the cross-needle metering function; all the others appreciated the amount of information you can gather at a glance from such a meter. The NS-660PA was quite popular among the group of reviewers.

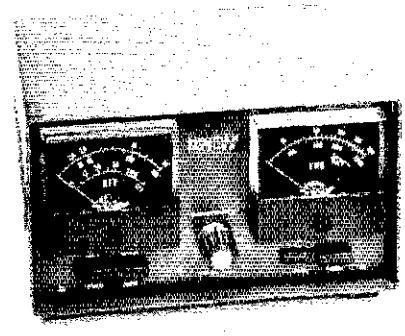
Diamond Antenna SX-100

Manufacturer: Diamond Antenna, imported by RF Parts, 1320 Grand Ave, San Marcos, CA 92069, tel 619-744-0728.

The $149.95 SX-100 uses a single wide-deflection meter movement to indicate forward and reflected power in three ranges (30, 300 and 3000 W). One of the most attractive meters in the bunch, this one uses no active circuitry for peak-power measurements, so its accuracy suffers on low-duty-cycle signals. A four-page instruction sheet explains the meter's installation and use in reasonable detail.

In some cases, the SX-100's SWR readings change with variations in applied power. In one case, the SX-100 indicated an SWR of 1.8:1 on a 40-meter dipole with 100 W applied; when power was increased to 1 kW, the indicated SWR rose to 2.4:1. (The problem wasn't in the antenna; other meters in series with the SX-100 indicated the same SWR at both power levels.)

In general, the SX-100 is nice to use; the cabinet is sturdy, the well-illuminated meter is easy to read, and, with the exception of the somewhat vague **AVG/PEP MONI** switch, the controls have a smooth, solid feel.



Heath HM-2140-A

Manufacturer: Heath Co, Benton Harbor, MI, tel 800-444-3284.

Heath has a long history of making good kits, and the HM-2140-A is no exception. An easy evening construction project, this wattmeter is the only kit in the group reviewed here. As such, its documentation is excellent, and contains complete, straightforward alignment instructions. Heath's calibration procedure yields good power-measurement accuracy in the finished kit, and the '2140 is quite sturdy.

A complaint voiced by more than one reviewer is the meter's open back (where the detachable directional coupler is usually stored); it's easy for things such as the ends of coaxial cables or tools to sneak into the meter's workings, possibly coming into contact with the active electronics. Also, the cabinet is a clamshell affair that's held together only by four sets of screws, nuts and washers; it's made such that, if the hardware isn't tight, the meter can come apart when you pick it up by the top cover. Operationally, the meter is a bit clunky; two sets of push-button switches set the power and SWR functions, but their operation isn't quite intuitive. Fortunately, Heath provides a sticker for the cabinet top (or bottom) containing condensed operation instructions.

On the plus side, the HM-2140-A's two meters give useful indications that are easily readable at arm's length (although this is one of only three wattmeters in the batch that don't have illuminated scales). This meter is relatively inexpensive and hefty enough to stay put on a desktop; cables won't pull it around the surface. For those interested in having a hand in building what

goes into their stations, the HM-2140-A is a good value.

MFJ-815B

Manufacturer: MFJ Enterprises, PO Box 494, Mississippi State, MS 39762, tel 601-323-5869.

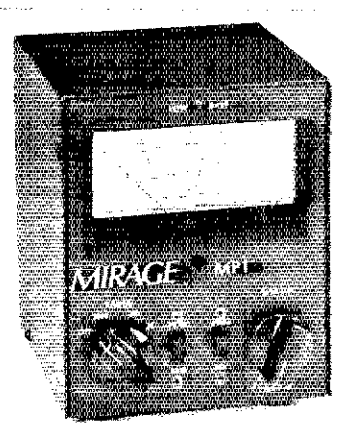
The 815B is the only sub-$100 wattmeter we tested. For $69.95, you get a lightweight box with a large, easy-to-read cross-needle meter. The red SWR markings stand out well against the meter face's white background, and the meter illumination is effective in low-light conditions. An adequate instruction sheet accompanies the meter.

The '815B isn't without flaws. Made of lightweight materials, the meter is easily pulled across a tabletop by attached RG-8 cables, and its passive peak-indicating circuitry makes it one of the least accurate meters in the group. The feel of its controls is not particularly solid, and the front-panel finish is easily scratched.

If you're looking for an inexpensive cross-needle wattmeter with plenty of room inside for modification, the MFJ 815B is certainly one to consider.

Mirage MP1

Manufacturer: Mirage Communications Equipment, Inc, PO Box 1000, Morgan Hill, CA 95037, tel 408-779-7363.

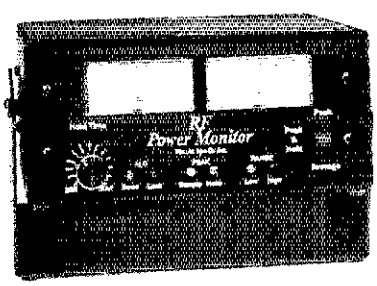


The MP1 is a nice meter to use, but its accuracy isn't great, even though it features an active PEP-indication circuit. Its good features include a flashing low-battery indicator, a large, easy-to-read meter, and a choice of internal or external power sources. The meter comes with a schematic diagram, but its readability is poor; the diagram looks like a photocopy of a photocopy. The instruction manual is informative and complete.

The MP1's internal 9-V battery isn't conveniently accessible for replacement, and if you forget to turn off the meter when you're done using it, you'll be replacing the battery often. The meter's power rating is 1 kW continuous, 2 kW intermittent. According to a technician at Mirage, they've received no reports of problems resulting from applying 1.5 kW CW signals to the MP1 for extended periods (such as contests).

Nye-Viking RFM-003

Manufacturer: William M. Nye Corp, 12031 Northrup Wy, #101, Bellevue, WA 98005, tel 206-454-4524, fax 206-453-5704.



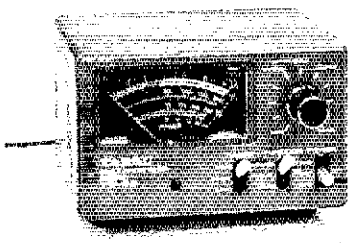
In describing the $300 RFM-003, the reviewers used words and phrases like *rugged, professional, smooth* and *nicely engineered.* This meter has more features than any of the others we tested (and perhaps more features than any other wattmeter aimed at the Amateur Radio market), and no performance compromises are evident in the test results. In fact, the Nye is one of the most accurate meters we tested.

Its list of nifty features is long; those not listed in the table include: a detachable directional coupler that uses a 4-pin connector (TS-520/820-style mike connector); meter illumination and peak-circuit operation that come on when RF is applied and go off five minutes after RF is removed; a removable swivel mount; adjustable-threshold high-SWR lock-out for amplifiers; peak-and-hold operation; an internal NiCd battery that charges from applied RF or from the supplied ac-operated adapter; and optional directional couplers (1.8-30 MHz, 500 W; and 10-160 MHz, 500 W). Add to that a sturdy, attractive design with easy-to-read meters and complete documentation, and you've got a winner. Another nice touch: a schematic diagram and parts list are supplied, and there are no unidentified "black boxes" in the RFM-003. If you're of a mind to troubleshoot your RFM-003, you can do so relatively easily with the supplied diagram, and common parts are used throughout.

Although its $300 price tag was daunting to some, the RFM-003 was the clear crowd pleaser in the lineup. The amplifier-lock-out feature alone makes it worthwhile to those who use fragile amplifiers and want the peace of mind that comes with knowing that, even if the antenna falls off, the wattmeter will keep the amplifier from blowing up!

Yaesu YS-60

Manufacturer: Yaesu USA, Inc, 17210 Edwards Rd, Cerritos, CA 90701, tel 800-999-2070.



In terms of sheer value, the YS-60 is high on the list. Its list of standard features isn't long, but this meter isn't Spartan, either. The least expensive wattmeter with active peak-power-indicating circuitry that we tested, this easy-to-read unit provides better accuracy than you might expect from a $127 wattmeter. Ergonomically, the YS-60 is pleasant, although one reviewer had trouble reading the scale at arm's length. A two-page instruction sheet, including a schematic diagram and parts list, explains meter operation. This sheet cautions you to reduce power to 1 kW for CW or RTTY transmissions of more than 10 minutes.

Red LEDs in the upper corners of the meter tell you at a glance whether the meter is in average or PEP mode, and the cabinet is sturdy and the controls are smooth and positive. The YS-60's size and its use of a 13.8-V dc supply make it a good candidate for mobile operation, too.

Summary

The wattmeters that use passive peak-measurement schemes are generally weakest in accuracy on low-duty-cycle signals (such as SSB), although all the meters we tested were fairly accurate with CW signals at the 100-W and 1-kW levels. Note the frequency dependency of the readings of some of these meters; different readings over a range of frequencies with the same input signal level indicate directional-coupler response that varies with frequency.

Based on our test results and individual evaluations, there's a wide range in quality, accuracy and usefulness between the $69.95 MFJ 815B and the $300 Nye RFM-003. For the most part, the players between these extremes have performance commensurate with their prices, with one notable exception: The $127 Yaesu YS-60 provides good accuracy, is solidly made, attractive, and easy and pleasant to use; it's an excellent value. Of all these meters, if

(continued on page 63)

Hints and Kinks

Conducted By David Newkirk, WJ1Z
Assistant Technical Editor

A 10-MINUTE ID TIMER

☐ Here's a 10-minute ID reminder that can be built in one evening for under ten dollars. All of its parts are available at Radio Shack. Accurate to within 1 second per timing cycle, it resets automatically at power-up, and at the end of each timing cycle.

Construction and adjustment. The timer (see Fig 1) can be built on a small piece of perfboard and housed in any convenient enclosure. Parts layout is not critical.

Adjustment. Adjust R1, **COARSE TIME ADJ**, to get you into the ball park, then adjust R2, **FINE TIME ADJ**, for precise 10-minute timing. The LED flashes for about 3 seconds at the end of each timing cycle. If a frequency counter or oscilloscope is available, you can save yourself much trial and error by adjusting R1 for 106 Hz (period, 9.5 ms) at pin 5 of U1.—*John Conklin, WDØO, 1704 Lower Silver Lake Rd, Topeka, KS 66608*

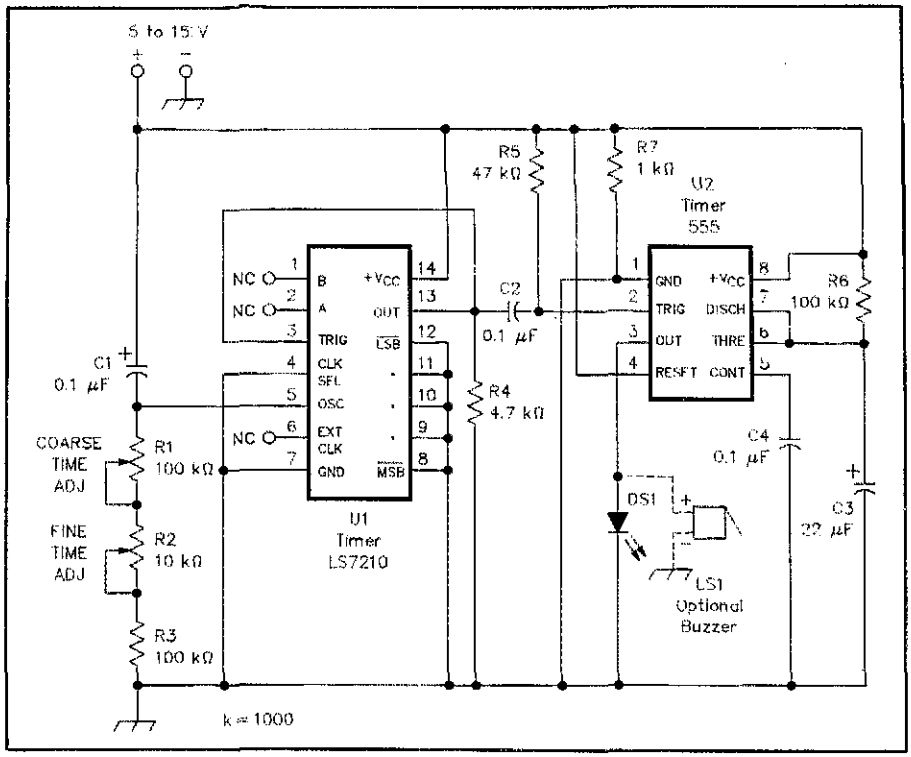


Fig 1—John Conklin's 10-minute ID timer is accurate to within 1 second per timing cycle. Use your TR relay to connect the circuit to its dc supply on transmit; the circuit resets automatically. All of the timer's resistors can be 5% or 10%-tolerance units. A standard (non-blinking) LED may be substituted for DS1; if you use a standard LED, wire a 220-ohm resistor in series with it for current limiting. If you use a buzzer, select one that draws less than 100 mA.

C1—Polyester, metallized film or tantalum (for low leakage), 16 V or more.
C2, C4—Ceramic disc, 16 V or more.
C3—Aluminum electrolytic, 16 V or more.
DS1—Blinking LED (Radio Shack 276-036 [red] or -030 [green]).
LS1—Buzzer, current drain 100 mA or less (optional).
R1—Trimmer potentiometer.
R2—Multiturn trimmer potentiometer.
U1—LS7210 timer IC (RS 276-1307).
U2—555 timer IC (RS 276-1723)

MORE ON 3-500Z FILAMENT PINS

The 3-500Z triode, a vacuum tube rated for up to 500 watts of anode dissipation, remains popular in commercial and amateur-built RF power amplifiers; the 400-watt 3-400Z preceded it. In January 1989 Hints and Kinks, John C. Norback, W6KFV, described "Fixes for 3-400Z and 3-500Z Tubes"—hints on how to clear filament-to-grid short circuits and cure intermittent filament operation in these tubes. Our next three correspondents have more to say about the 3-500Z's filament. Hints and Kinks prefaces their remarks with this caution: If your tube fails under warranty, *use* that warranty and *contact the tube manufacturer for advice* before attempting to modify or repair your tube.—*Ed.*

☐ The output power of my home-made 3-500Z linear amplifier suddenly dropped. Inspection revealed that one of its 3-500Zs was unlit. Further checks showed correct filament voltage at the tube sockets. I replaced the tube but wondered why a fairly new tube would develop an open filament. A close inspection of the tube pins uncovered the problem. During manufacture, the tube pins are force-fitted over tube-base wires. Apparently, in areas with high humidity like ours, the contact between the pins can become lossy. One of the filament pins was so loose I could turn it on its underlying wire! After much experimentation, I have found a way to restore the reliability of the tube-pin connections.

Wrap the 3-500Z in a towel or other soft cloth. Lay the tube on a rug or towel placed on your workbench. With a high-wattage soldering gun or iron, unsolder the bottom of the pins on the filament wires. (Attach a large heat sink to the wire between the pin and the tube base to avoid overheating the wire-to-glass seal.) Using a drill bit that just fits inside the tube pins, ream the inside of the pins until they're clean and bright. Resolder the pins carefully and wipe the newly soldered pins with solvent to remove remaining rosin. I have used this method on several intermittent-filament tubes with good success.—*Jim Brenner, NT4B, 5690 SW 36 Ave, Ocala, FL 32674*

☐ Having had considerable experience with 3-500Z failure related to apparent filament-pin-soldering failure, I am beginning to wonder if the real problem is how the wires are soldered into the pins. Because I had very carefully cleaned and resoldered the intermittent filament pins with each repair, I looked more carefully at the problem the last time it occurred.

The first thing I noticed was that the affected filament pin was very hot. (I had removed the tube immediately after it failed.) In fact, it was so hot that solder had melted and run out of the pin! Although it is possible that a poor solder connection in the pin could have caused resistance heating, I am quite sure that the pin was well soldered because I had carefully resoldered it myself.

I suspect that the real culprit is *poor spring tension in the socket contact*, which leads to poor contact between the socket contact and pin, and hence to resistance heating of the contact and pin. Putting this thinking into practice, I replaced the socket involved (it had been somewhat damaged by the heat anyway) and tightened the spring part of the contacts on my amplifier's other 3-500Z socket.

To date (about six months later), I have had no further problems. The amplifier, by the way, is a Heathkit SB-220.—*Wayne Mills, N7NG, Box 1945, Jackson, WY 83001*

☐ I don't believe that manufacturers build these tubes with bad filament-pin solder connections. The problem is created by loose tube sockets. Loose pins in the socket cause high-resistance filament-pin-to-socket connections, further causing the pins to heat up and the solder to drop down in the pin and cause an open circuit.

Cure: On my Drake L75 amplifier, I in-

stalled a new tube socket and, using a jeweler's torch, resoldered the pins with EZ Flow silver solder. End of problem. Before replacing the socket, I had the same 3-500Z fail twice.—*Paul "Van" Van Bolhuis, W4ZBD, R 4-Box 17D Pumphouse Rd, Westminster, SC 29693*

CURING PANEL-LIGHT BRIGHTENING IN MODIFIED-FOR-160 HEATH SB-220 AMPLIFIERS

☐ When the key is mashed down, the SB-220 draws lots of amps, which causes the line voltage to sag a bit and the meter lamps to dim, right? *Fasten your seat belt.* On the 160-meter band *only*, some modified-for-160 SB-220s exhibit just the opposite effect. This blew me away the first time I saw it. Apparently, just enough 1.8-MHz energy gets into the 5-V filament circuit (which also powers the lamps) to make the bulbs get *brighter*. The great puzzle is that the filaments of the SB-220's two 3-500Z tubes, which are powered by the same 5-V source, but at the other end of the filament choke, do *not* get brighter. Adding a bypass capacitor across the 5-V source at the RF-ground end of the filament choke does not prevent the meter lamps from brightening during key down. So, apparently the RF gets into the filament wires between that point and the meter lamps. (This is bananas because the RF source is at the other end of the 5-V filament circuit!)

The fix is simple: Install a 0.1- to 0.2-μF, 100-V ceramic capacitor across the 5-V terminals on the meter-lamp terminal strip, next to the SB-220's meters. (Initially, I thought the RF source for this phenomenon was the HV circuit [which passes close to the meters]. To stop the 160-meter RF at this point, I substantially increased the RF-bypass capacitance on the HV feedthrough insulator. But this had no effect on the problem.)—*Richard L. Measures, AG6K, 6455 La Cumbre Rd, Somis, CA 93066*

QUICK MOBILE SWR MEASUREMENTS WITH RADIO SHACK'S HTX-100 10-METER TRANSCEIVER

☐ The Radio Shack HTX-100 transceiver does not include an SWR meter. Measuring SWR with the HTX-100 means inserting an external SWR meter between the transceiver and its antenna. Doing this at home is one thing; in an automobile, inserting the external meter is inconvenient because it requires groping around on the rear of the HTX-100 and being something of a contortionist. I solved this problem by screwing a male-UHF-to-female-BNC adapter (Radio Shack 278-121) into the HTX-100's **ANTENNA** jack and installing a male-BNC-to-female-UHF adapter (RS 278-120) in *this* adapter. The antenna cable, which terminates in a UHF plug (RS 278-205), plugs into the 278-120 adapter. The BNC interface between the 278-121 and 278-120 adapters allows quick insertion of an SWR meter equipped with BNC-equipped cables.

A continuous carrier from the HTX-100 was the next thing necessary for SWR measurements. I solved this problem by shorting a 1/8-inch-diameter phone plug (RS 274-286 or -287) and inserting it into the HTX-100's **KEY** jack as necessary. With the HTX-100 in CW mode, inserting the shorted plug immediately puts the HTX-100 in transmit and provides the steady carrier necessary for SWR measurements.

Because my mobile antenna is not broadband, it presents an unacceptably high SWR to the transceiver above and below certain frequencies. After determining these frequencies with my SWR meter, I use my HTX-100's memory feature as an SWR-limit notepad, entering the lower frequency into memory 1 and the upper frequency in memory 2. This keeps my antenna's high-SWR limits handy for easy reference.—*Manny Kramer, KD3BU, 13820 Arctic Ave, Rockville, MD 20852*

CURING DC-TO-DC-CONVERTER SPURS IN THE DRAKE TR-7 TRANSCEIVER

☐ Is your TR-7 transmitting and receiving spurious signals 23 and 46 kHz above its tuned frequency? Checking this is easy. With a 50-ohm dummy load attached to your TR-7's antenna jack and the transceiver in a narrow CW mode, turn on the TR-7's 25-kHz **CAL**ibrator and tune in the 1800-kHz marker. Now, tune for a signal at approximately 1802 kHz (1825 − 23). If you find an 1802-kHz signal, turn off the calibrator to see if the signal disappears at the same time. Spurs of the type discussed in this hint disappear when the calibrator is turned off.

In my case, the spurs registered S5 on the TR-7's S meter, while the 25-kHz markers came in at 15 dB over S9. This "multichannel" response degraded my TR-7's ability to receive weak signals. On transmit, other hams heard me at several unexpected places on the band—at reduced strength, but still quite readable.

Replacing C2108, a dc-to-dc-converter decoupling capacitor on the transceiver's internal power-supply circuit board (Fig 2-23 in the TR-7 *Maintenance Manual*), reduced the spurs to S2. This is acceptable, but adding another pi filter section in cascade with RFC2101/C2108 (Fig 2) pushed the spurs into the noise.

There's plenty of room on the back of the power-supply board to "kludge in" the new parts. The added filter inductor (L1 in Fig 2) is a junk-box ½-inch-OD ferrite toroid filled with no. 24 enameled copper wire.—*Mike Agsten, WA8TXT, 405 W Bogart Rd, Sandusky, OH 44870*

ONE PROTECTIVE CASE FOR MANY BATTERY PACKS

☐ Dissatisfied with the performance of the rechargeable battery pack provided with a newly purchased hand-held, many people purchase optional battery packs with energy capacities more suited to their needs. This often means that the overall height of the hand-held and new battery pack differs from that of the stock configuration—a problem if you want to keep the radio in a protective case. To avoid the expense of purchasing a protective case for each transceiver/battery pack combination, I suggest the following solution:

Purchase the protective case designed to accommodate the hand-held and its largest optional battery pack. When you use battery packs smaller than maximum size, insert soft plastic-foam blocks cut to fit the extra case space. To avoid short-circuiting charging contacts on the pack, *be sure to use nonconductive foam.* Size the blocks to permit normal access to the hand-held's controls.—*Marc Norikane, N7MBE, 19005 4th Ave SW, Seattle, WA 98166*

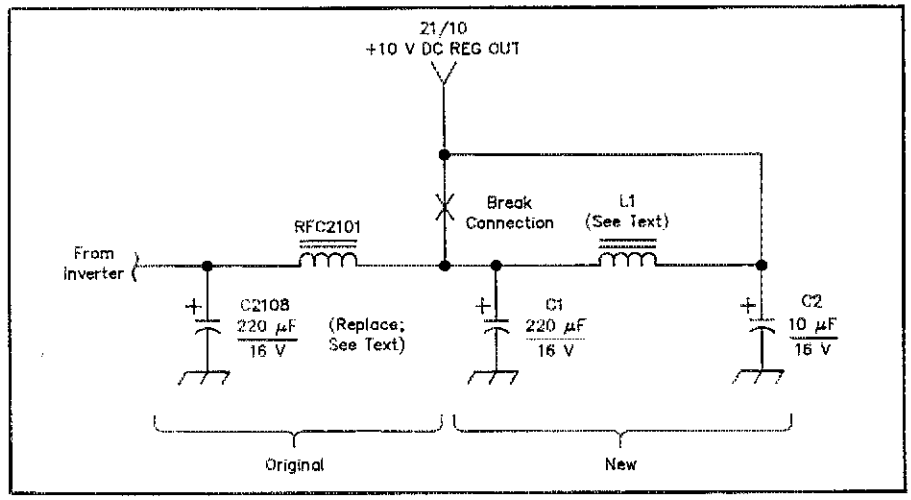


Fig 2—Mike Agsten reduced dc-to-dc-converter-related TR-7 spurs by replacing the rig's C2108 and adding three filter components (C1, C2 and L1) as shown here. L1 consists of no. 24 enameled wire wound to fill a junk-box ½-inch-OD ferrite toroid.

Technical Correspondence

Conducted By Paul Pagel, N1FB
Associate Technical Editor

MORE ON THE HALF SLOPER

☐ "The Half Sloper—Successful Deployment is an Enigma," was a popular article.[1] Many amateurs had success with the antenna, others did not. Why? I found that if the half sloper was fed against an empty tower (a tower supporting no other antennas above the sloper), the sloper could not be made resonant at the desired frequency (where the length of the sloping wire was ¼ λ long). Measured on an antenna range, the pattern of such a half sloper is more or less omnidirectional. Those hams who had successfully resonated the half sloper had suspended the sloping wire from a tower that supported a "plumber's delight" Yagi antenna. Those amateurs reported that the half sloper had directional characteristics and was a good DX antenna.[2]

Fig 1A shows a half sloper dimensioned for the 75-meter band. This configuration is similar to the version I originally modeled. The input impedance (Z_a) for this antenna at 4 MHz (as calculated by the *ELNEC* version[3,4] of *MININEC-3*) is 374 + *j* 1109 Ω, which shows clearly the antenna is not resonant. According to *ELNEC*, the antenna is resonant at a much lower frequency (2.714 MHz). At this frequency, the antenna's impedance is 22 Ω. The ratio between the actual resonant frequency and the desired resonant frequency is 0.68 (2.714 ÷ 4). The curves of Fig 2 show radiation patterns for this redimensioned antenna over average ground (σ = 3 mS/m, ϵ = 13). The azimuthal pattern is more or less omnidirectional, which again is in agreement with the experimental measurements, and the predicted gain is rather low.

Fig 1B shows a half sloper suspended from a 50-foot tower that supports a 20-meter 3-element Yagi. The Yagi is a monoband, wide-spaced beam (the spacing between the reflector and driven element is 1/4 λ; 1/8 λ between the driven element and director). The input impedance for this half-sloper system at 4 MHz is 33 − *j* 104 Ω. Certainly, this is a more reasonable impedance, and the trend agrees with expectation. Lengthening the sloping wire from 58.43 feet to 68.27 feet (0.274 λ) resonated the antenna at 3.95 MHz (input impedance 46 Ω). The curves of Fig 3 show radiation patterns for this antenna. Clearly, this half sloper has directivity (F/B of 8 dB at 25°) and reasonable gain. The 20-meter Yagi is an important part of the antenna system. It plays the part of the disc of a "skeleton discone" antenna. This analogy is clearer if you examine the current in the vicinity of the feed point. The amplitude of the currents on the fed end of the sloping wire and on the pipe mast that supports the Yagi are more or less equal and approximately in phase. The amplitude of the current on the tower is much smaller (by a factor of three) with a large phase difference (about 135°).

The antenna-input impedance, the length of the sloping wire required for resonance and the antenna pattern all depend on the tower height, the angle between the sloper and tower, the type of Yagi on the tower and the direction in which the Yagi is point-

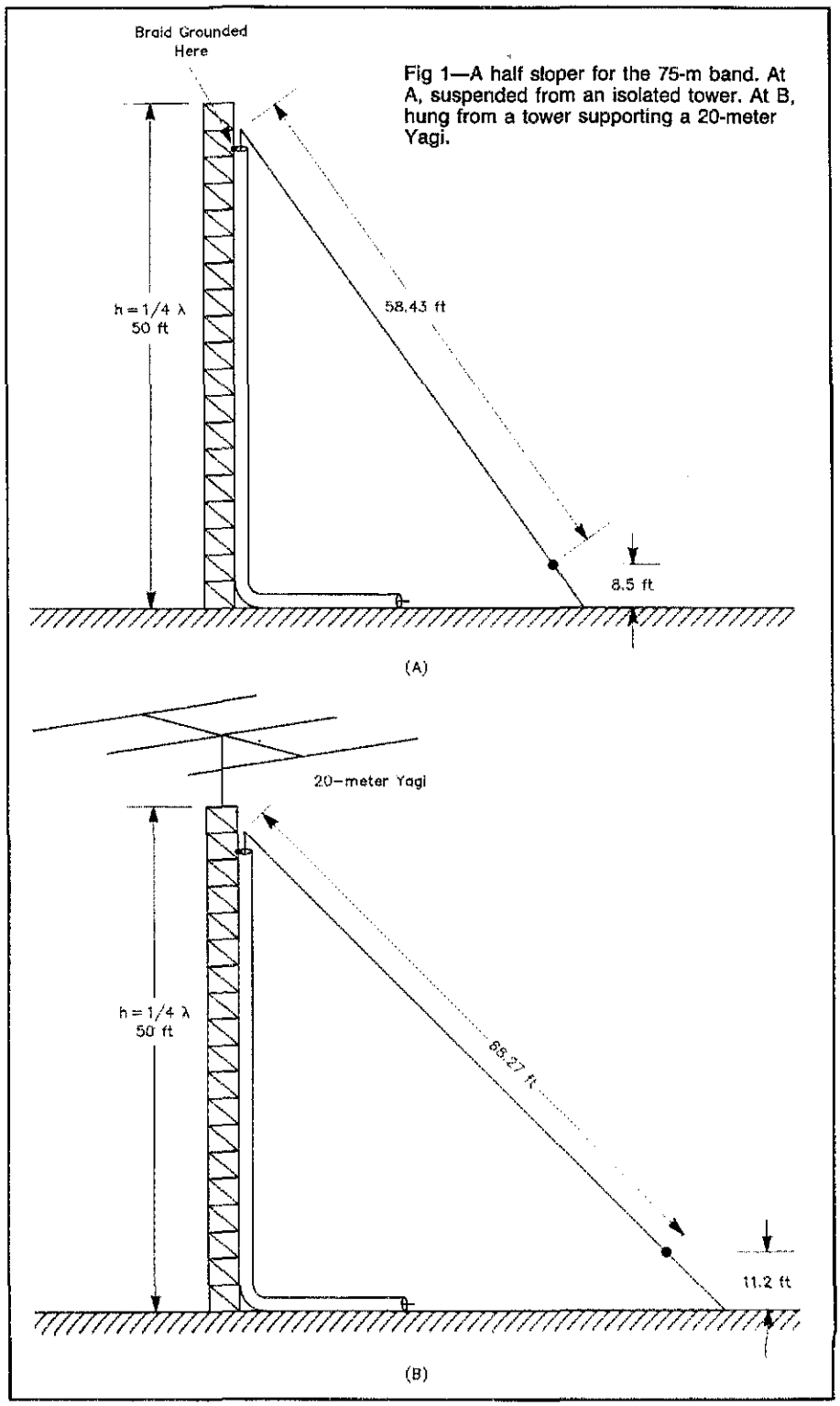


Fig 1—A half sloper for the 75-m band. At A, suspended from an isolated tower. At B, hung from a tower supporting a 20-meter Yagi.

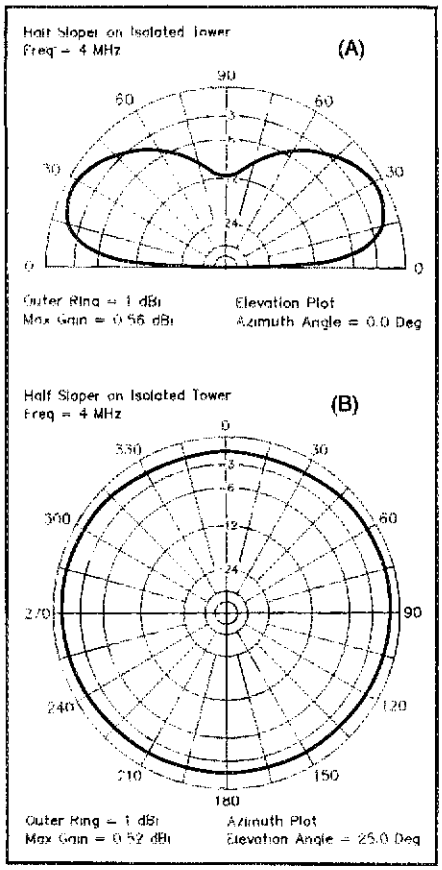


Fig 2—Vertical-plane pattern (A) in the plane containing the antenna, and azimuthal pattern (B) for the antenna of Fig 1A, calculated by *ELNEC* for an antenna over average ground (f_o = 4 MHz).

ing. For this study, the Yagi was aimed in the direction of the sloping wire—toward 0° azimuth. If the Yagi is 90° to the wire, the gain at low angles is essentially the same, but there is a small change in the shape of the radiation pattern (about 0.25 dB increase in the field at high elevation angles), and a small change in the input impedance.

After convincing myself that *ELNEC* could accurately model the antenna system—the sloping wire, tower with Yagi atop and guys (if one wished to include guys in the model)—I made a detailed study of half slopers[5] and reached the following conclusions:

1) For an 80-meter half sloper, the pattern and gain are not strongly dependent on the type of Yagi on the tower. However, the sloper's impedance (particularly the reactance, and hence the length of wire required for resonance) depends on the size of the Yagi. The larger the Yagi, the more effective it is as a ground plane, and the more nearly the length of the sloper for resonance approaches that of a ground-plane ¼-λ monopole. For 160-meter operation (with the half sloper suspended from a 95-foot tower), a 20-meter Yagi is too small to be an effective ground plane. According to *ELNEC*, a resonant length for the half sloper can be found, but this length is much longer than ¼ λ: 203.4 feet, or 0.39 λ, and the input impedance is rather high for coax feed—about 400 Ω instead of about 50 Ω. A 3-element, 40-meter Yagi on the tower, however, is just fine. The input impedance (according to *ELNEC*) is 55 Ω, and the sloping-wire length is 145 feet for resonance at 1.9 MHz (length 0.28 λ).

2) For a 50-foot tower, there isn't much choice in regards to the angle that an 80-meter half sloper makes with the tower. For a 95-foot tower, however, this angle can be varied. As this angle increases from 25° to 50°, the azimuthal pattern becomes more and more cardioidal, the low-angle radiation decreases marginally (by about 0.3 dB for the range of angles studied), and the high-angle radiation increases (by about 1.8 dB). The antenna's resistance decreases as the angle between the sloping wire and the tower decreases: For an 80-meter half sloper attached to a 95-foot tower, the resistance changes from 21 Ω to 13 Ω when the angle decreases from 50° to 25°.

3) Although a 40-meter half sloper (attached to a 50-foot tower with a 3-element 20-meter Yagi atop) can be resonated (resonant length is about 0.24 λ), the radiation patterns no longer resemble those that characterize 80- and 160-meter half slopers. In fact, the differences are astonishing. The pattern and impedance depend very strongly on the azimuthal position of the Yagi. According to *ELNEC*, the antenna resistance (for antennas dimensioned for resonance), changes from 76 Ω to 127 Ω when the Yagi is rotated from the position where its elements are parallel to the plane containing the sloping wire and the tower to a position perpendicular to this plane. Antenna lengths for resonance are 32.37 feet and 33.88 feet, respectively. The azimuthal pattern (which is roughly bidirectional) is maximum, but skewed in the plane containing the sloping wire and the tower, and in the plane broadside to this plane for the described azimuthal positions of the Yagi.

I knew the answer to the enigma in regard to successful deployment of the half sloper a long time ago, but now—thanks to modern antenna design using a computer—I have a better understanding of the characteristics of this antenna. And we now have the ability to generate radiation patterns for particular configurations.—*John S. Belrose, VE2CV, ARRL Technical Advisor, 17 Tadoussac Dr, Aylmer, Quebec, Canada J9J 1G1*

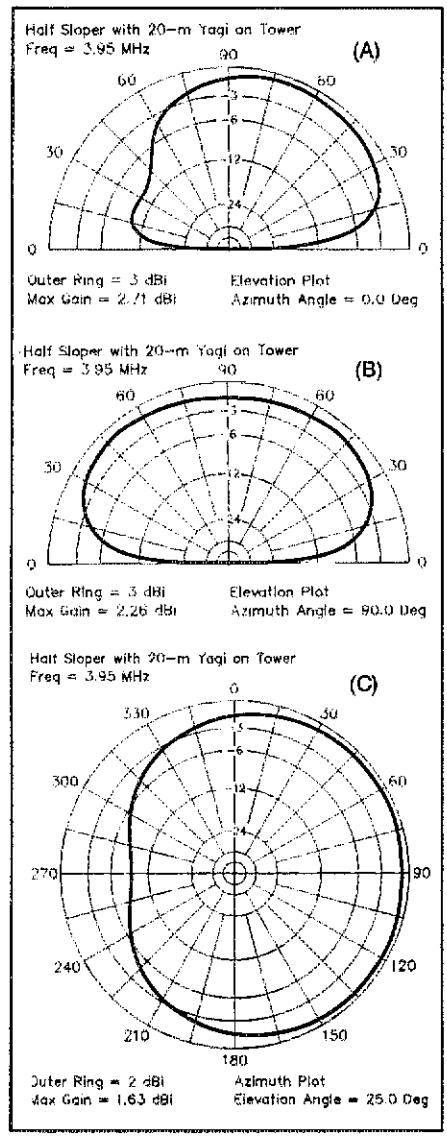


Fig 3—Vertical-plane patterns: A, in the plane containing the antenna (0° azimuth corresponds to the direction of the drooping wire away from the feed); B, in the plane orthogonal to the antenna; C, azimuthal pattern for the antenna of Fig 1B over average ground, as calculated by *ELNEC* (f_o = 3.95 MHz).

Notes

[1]J. Belrose, "The Half Sloper—Successful Deployment is an Enigma," *QST*, May 1980, pp 31-33.

[2]J. Belrose, "An Update on Sloping-Wire Antennas," *QST*, Sep 1984, p 40.

[3]*ELNEC* is available from Roy Lewallen, W7EL, PO Box 6658, Beaverton, OR 97007; price $49 postpaid in the US, Canada and Mexico. Specify coprocessor or non-coprocessor version. (The ARRL and *QST* in no way warrant this offer.)

[4]*ELNEC* and *MININEC* do not accurately predict the real gain for antennas close to the ground, particularly for horizontal antennas close to poor ground (height less than 0.2 λ). However, for the present analysis, the gains predicted by *ELNEC* are thought to be about right, particularly for the tower and Yagi arrangement, since there is little current on the tower.

[5]I have a folder full of patterns for different tower heights (50 and 100 feet), different types of Yagis (monoband 3-element, 20- and 40-meter Yagis, and 5-element triband Yagis for 20/15/10 and 40/20/15 meters.

Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include your daytime telephone number.

1990—Was it Only One Year Long?

A codeless ham license is created, WARC-92 preparations proceed, the FCC toughens up, we lose another round on 220 MHz, records are set, the face of Europe changes and *QST* turns 75—not a typical year!

By Brian Battles, WA1YUA
QST Copy Editor

1990 was a year of high drama for radio amateurs everywhere. It began with a bang as Club Bouvet members journeyed to a desolate volcanic island 1000 miles from Antarctica to operate as 3Y5X. The sought-after DXpedition generated excitement and controversy. Although it gave thousands of hams a chance to log a "new one," it also resulted in the FCC's issuance of 240 citations to amateurs for improper operation.

As 1990 came to a close, history was made as the FCC created its first Amateur Radio license class that does not require a Morse code examination. Created on December 13, 1990 (to be implemented on February 14, 1991), the new codeless Technician license conveys full amateur privileges on all amateur bands above 30 MHz upon successful completion of two written tests totaling 55 questions.

A subject of spirited debate for decades, the codeless license was most recently proposed by the FCC on February 16, 1990, in response to several petitions (including one from the ARRL). Unfortunately, the FCC also proposed to eliminate the successful Novice license! ARRL comments requested that the Commission retain the existing Novice and Technician class licenses and suggested that the new codeless license be an additional class allowing use of the bands above 220 MHz.

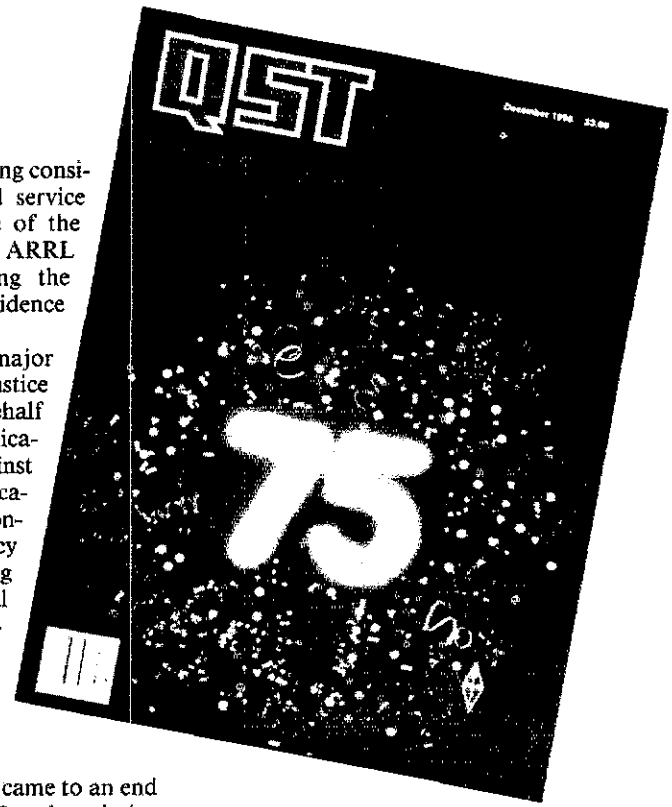
Hams Lose Another Round on 220 MHz

After the FCC decided in 1988 to reallocate the 220-222 MHz portion of the 220-225 MHz (1.25-meter) amateur band to private land mobile use, radio amateurs' opposition continued to be vocal and adamant. In its effort to retain that portion of the band, the League challenged the FCC's decision-making process in court, contending that the Commission had not properly considered comments filed by interested parties and that it had used invalid evidence in its study of Amateur Radio's use of those frequencies. The ARRL filed its petition for review of the FCC decision with the US Court of Appeals for the District of Columbia Circuit.

While the appeal was being considered, the FCC proposed service rules for land mobile use of the 220-222 MHz band. The ARRL opposed the action, citing the pending court appeal as evidence it was premature.

Amateurs briefly had a major ally in the case as the Justice Department, acting on behalf on the National Communications System, filed suit against the FCC, stating that reallocation of 220-222 MHz was contrary to national emergency preparedness goals. Acting on a letter from the National Telecommunications and Information Administration, however, the Solicitor General withdrew the suit, leaving the amateurs to fight for themselves.

This chapter of the saga came to an end when, on December 3, 1990, a three-judge panel dismissed the petition for review, saying that the court was obliged to give great deference to FCC expertise in matters involving technical judgment. At press time, the League was considering whether there was a basis for further appeal.



The December issue of *QST* marked the journal's 75th anniversary. What started out as the 24-page *December Radio Relay Bulletin* is now one of America's longest-running periodicals. And we're still going strong. . . .

The FCC Was Busy

In 1990, the FCC made visibly increased efforts to control illegal radio operation in and near the amateur bands. FCC enforcement actions included equipment confiscation, license revocations and fines against hams and others for selling illegal CB equipment, causing willful and malicious interference to amateur, commercial and marine services, broadcasting, unlicensed operation and threats against FCC personnel.

Trouble on 20

The 20-meter phone band came under close scrutiny by the FCC. Disputes over allegations of broadcasting, bulletin transmissions and phone-patch activities were widespread.

The Commission issued several $1000 fines to hams for allegedly interfering with operations on 20 meters.

Other FCC News

- US communications laws have sharper teeth, thanks to a bill originated years ago by now-retired US Senator Barry Goldwater, K7UGA. Section 333 of the FCC Authorization Act, signed October 1, added prohibitions against willful or deliberate interference to the Communications Act of 1934. Previously, such transgressions were violations of FCC rules; now they violate federal law, and pave the way for sharper penalties.
- On February 28, Ervin F. Duggan was sworn in as an FCC Commissioner by Chairman Alfred C. Sikes. Duggan replaced former Commissioner Patricia Diaz Dennis, who had resigned her post. Duggan's appointment brought the FCC back to its

full strength of five Commissioners.

• The FCC also released statistics through September showing steady annual growth in new Amateur Radio licenses: 26,134 this year compared to 17,373 in 1985. Upgrades also grew from 16,184 in 1985 to 29,699 in 1990. The total number of licensees grew from 464,800 in 1989 to 494,292 in January of 1991, a 6.1% increase.

• Consumers who have problems with legal Amateur Radio signals getting into their TV sets, alarm systems, and baby monitors lost the FCC's support on December 7. Although these gadgets may unintentionally receive—or interfere with—ham radio signals, manufacturers are only required to put simple labels on them. The Commission denied an ARRL Petition for Reconsideration filed shortly after the FCC's March 1989 adoption of the amended regulation of nonlicensed RF devices covered by Part 15 of its Rules. Intentional radiating devices such as garage door openers were also permitted on seven "consumer bands," including the amateur bands at 902 MHz and 2.4, 5.6 and 24 GHz.

• Unless you upgrade or move out of your district, you have to be satisfied with the call sign you have, right? Not anymore; although the FCC does not honor requests for specific call signs, on April 19 the Commission announced that it now permits hams to apply for new call signs—drawn in the regular sequence—at any time.

• Effective April 9, 1990, 6-meter repeaters are no longer restricted to 52-54 MHz. The FCC widened the 6-meter repeater subband to 51-54 MHz to permit operation of additional repeaters to meet increased demand.

• On October 31, the FCC denied an ARRL petition that sought to maintain a 1000-watt dc power-input limit for amateur AM operation instead of the lower limit of 1500 watts PEP output, put in place June 2.

• The FCC proposed minor adjustments to its Part 97 rules on November 16, but turned down League requests to remove its ban on the sale of 10-meter linear amplifiers; to permit amateur stations to retransmit other services such as NOAA weather broadcasts; and to allow hams with suspended or revoked amateur licenses to serve as Volunteer Examiners after a 10-year period.

Work on WARC

The ARRL and other IARU member-societies around the world spent most of 1990 quickly gearing up for the February 1992 World Administrative Radio Conference (WARC) to be held in Spain.

A previous WARC, held in Geneva, Switzerland, in 1979, was a success for Amateur Radio, yielding new ham bands at 10, 18 and 24 MHz.

This time around, however, certain amateur UHF bands may be vulnerable to loss, and some HF allocations may also be affected.

The International Telecommunication Union (ITU), an official agency of the United Nations, is the organization that oversees the allocation of RF spectrum worldwide, based on decisions voted on by member-countries. Major WARCs are held to determine policies on spectrum use.

Comprehensive planning is vital to protect and preserve Amateur Radio interests. This was borne out by the successes at WARC-79, for which planning began in 1964. Planning for the 1992 WARC had to be much more abbreviated: little more than two years' notice was given for administrations to prepare for WARC-92.

Amateur Radio has been represented by the ARRL at more than 100 WARC-related meetings in Washington by Executive Vice President Dave Sumner, K1ZZ; Technical Development Manager Paul Rinaldo, W4RI; Washington Area Coordinator Perry Williams, W1UED; and Assistant Washington Area Coordinator Cpt Charles Dorian (USCG-Ret), W3JPT. Rinaldo also attended two IARU Region 1 WARC preparation meetings in Germany and CCIR meetings in Geneva and Helsinki. Dorian represented the IARU at Helsinki.

As WARC-92 research progressed, hams learned of pressure on existing spectrum allocations by proponents of new technology proposed by commercial and private interests. Motorola's Iridium® system, for example, would make personal communications possible for consumers using convenient shirt-pocket-sized "telephones" to access a worldwide network of satellites. The satellites would be connected to the land-based telephone network, permitting instant, worldwide communication from virtually any location.

In September, ARRL President Larry Price, W4RA, sent out a letter appealing for financial support for WARC-92 preparations; members responded generously.

MARS Supports *Desert Shield*

US troops deployed in the Middle East to defend US and allied interests, and persuade Iraq to withdraw from Kuwait have enjoyed the availability of contact with their loved ones back home. The Military Affiliate Radio System (MARS) sprang into action to handle thousands of pieces of traffic to and from US military personnel overseas.

While not an Amateur Radio entity *per se*, MARS is mainly supported by FCC-licensed hams and is a proud example of radio amateurs' ability and willingness to perform in a public-service capacity.

Updated Wartime Rules Let Hams Serve

For decades, rules have been in place that said US hams must QRT in the event of a war emergency, except for those operating as official Radio Amateur Civil Emergency Service (RACES) stations. Getting this old policy changed has been a long-term goal of the ARRL, and in 1990, the rules were amended so that they no longer routinely take amateurs off the air in the event of a national emergency.

The *Federal Register* released December 11, 1990, carried a rewrite of national security and emergency preparedness telecommunications procedures (Title 47 CFR 201 et al) from the Office of Science and Technology and National Security Council. The revisions state that the FCC may still explicitly require hams and other radio services to cease operating in case of emergency, but it's no longer automatic.

The National Communications System (NCS) feels that Amateur Radio can be a vital resource in time of need, and played a role in getting the rule changed.

A Rousing Celebration and a Bittersweet Farewell

ARRL members rejoiced over the 75th anniversary of *QST* with a special December issue. (Incidentally, the 75th birthday makes *QST* one of the longest-running publications in the US!) Assistant Technical Editor Dave Newkirk, WJ1Z, painstakingly prepared a stirring 10-page article that chronicled the history and development of the journal.

In the same year, at the Dayton HamVention®, April 27-29, Skip Tenney, W1NLB, and Dick Ross, K2MGA, announced that *HAM RADIO* magazine and the *HAM RADIO Bookstore* had been sold to *CQ* Communications. Published since March of 1968, *HAM RADIO* catered to a technically oriented readership. It has been combined with *CQ*.

World Championship Spotlights Teamwork

Glasnost in the USSR and changing political climates in many eastern European nations continued to have worldwide effects. The dictatorial Romanian government was overthrown and the infamous Berlin Wall was razed. The two Germanies united (eliminating an ARRL DXCC country in the process) and it became much easier for US hams to meet their counterparts from the USSR.

Many Soviet hams visited America; some even obtained US Amateur Radio licenses. American amateurs extensively toured the Soviet Union, too. Communications between former Cold War adversaries thawed and it became routine to be able to chat naturally and QSL directly with Soviet hams.

Spotlighting the political and social changes in Europe and the renewed spirit of kinship felt by amateurs the world over, the World Radiosport Team Championship was held July 20-22, in conjunction with the Goodwill Games in Seattle, Washington. A team representing the US prevailed over 21 teams from 16 countries. But the WRTC was more than just an international competition; it accelerated the trend of international Amateur Radio cooperation

World RadioSport Team Championship competitors George, UA9AM (foreground), and Willy, UW9AR, rack up contacts during the landmark July competition. Seattle-area amateurs hosted visiting teams from the USSR and some 20 other countries. The WRTC spotlighted the trend toward openness and friendship that is sweeping the world of international Amateur Radio. *(photo courtesy of ICOM)*

past the point of no return.

After the WRTC, an international group of hams helped form the World Radiosporting Federation to further sanction and promote international Amateur Radio competition. One of the group's biggest goals is to secure the sport's place in the Olympic Games, perhaps in time for the 1996 Summer Games to be held in Atlanta, Georgia.

The Year of the Amateur Satellite...

The Radio Amateur Satellite Corporation (AMSAT) deployed six new OSCARs, including four Microsats, on January 21. OSCARs 14-19 began operating in a variety of modes, and thousands of hams copied DOVE-OSCAR-17's packet telemetry transmissions. On February 6, just 16 days after the OSCARs were sent up, Japanese radio amateurs under the direction of the JARL saw their latest creation, Fuji-OSCAR-20, shoot into orbit. A joint Soviet-German amateur satellite, RUDAK-2/RS-14, nears completion at this writing, and may be launched by the time this issue is in your hands.

On the manned space-communications front, after numerous launch delays, the third Shuttle Amateur Radio EXperiment (SAREX), was a success. Originally scheduled for launch in May, US space shuttle *Columbia* overcame a series of delays to get mission STS-35 underway on December 2. Children at about half the 34 schools scheduled to participate via ham radio made breathtaking voice QSOs with payload specialist Dr Ron Parise, WA4SIR, while about 1500 earthbound hams completed contacts with the WA4SIR packet "robot" during the eight-day mission.

VHF Firsts

In January 1989, *QST* readers were awed by a description of the world's largest privately owned moonbounce (EME) array, the 32-dBi-gain "Mighty Big Array" (MBA) antenna owned by Dave Blaschke, W5UN, of Manvel, Texas. Last spring, Blaschke graciously obliged members of AMSAT who needed his station's maximum EIRP (about 2 megawatts) to overpower a stuck transmitter on the malfunctioning DOVE-OSCAR-17 Microsat. From W5UN, AMSAT's Bob McGwier, N4HY, and Harold Price, NK6K, were able to reset DOVE's onboard computer.

Unfortunately, just a few days after the rescue, with 97 countries logged via 2-meter EME, the MBA was destroyed by a tornado that touched down nearby. Undaunted, Blaschke rebuilt his array (managing to squeeze out another dB or so!), and on October 28, became the first ham to work 100 countries on 2 meters (and EME). Blaschke began his once-unimaginable pursuit in 1982.

The ARRL awarded the first 6-meter DXCC certificate to Lee Fish, K5FF; her husband, Fred, W5FF, received no. 2. The effort rounded out an 11-year quest by the couple from Edgewood, New Mexico.

Emerging Technology

1990 was the year in which digital signal processing (DSP) finally reached the Amateur Radio marketplace. Kenwood's TS-950SD HF transceiver and JPS Communication's NIR-10 audio processor are examples of devices that incorporate a new generation of signal-handling sophistication.

DSP is a flexible engineering medium—one that's less dependent on hardware design; DSP hardware essentially consists of computer microprocessors, so equipment (or its function) can be altered simply by changing the software.

Kenwood's transceiver offers digital filtering and manipulation of outgoing signals; the JPS device reduces noise and interference on receive.

DSP technology promises to radically change digital communications and, when more fully developed, could provide the key to easily unlocking the secrets of spread-spectrum and digital/satellite communications.

Radio Pioneer Honored

Major Edwin H. Armstrong, the inventor of regeneration, the superheterodyne receiver and wideband FM radio was honored in memorial celebrations of what would have been his 100th birthday, December 18, 1990. His roots firmly planted in Amateur Radio, Armstrong was denied the credit he deserved during his lifetime because of patent disputes.

The Road Ahead

As Amateur Radio years go, they don't get much livelier than 1990. But that doesn't mean this year will be any quieter.

On the horizon are potentially sweeping changes to Amateur Radio brought on by the new codeless license. What impact will it have? Will thousands flock to Amateur Radio, or will only a few take advantage of Amateur Radio's new entry point?

One thing's for sure: WARC preparations will be going full speed ahead. The February 1992 deadline is coming up quickly.

And what of *Desert Shield*? A full-scale confrontation with Iraq could have great consequences for Amateur Radio, here and abroad.

Stay tuned, radio amateurs: 1991 will definitely not be a sleeper! QST

SAREX: Sharing the Exploration of Our World and Beyond

Amateur Radio in space ignites our youth's imaginations in schools across the country.

By Rosalie White, WA1STO
Educational Activities Manager

"T minus 3, T minus 2 and we have liftoff!" Thousands of hams and students cheered loudly upon hearing these words as space shuttle *Columbia* raced skyward from its launch pad on December 1, 1990. It had been a long wait since the Shuttle Amateur Radio EXperiment (SAREX) had previously ridden to outer space, but the crew of *Columbia* was enthusiastic with Payload Specialist Ron Parise, WA4SIR, on board.

We hams enjoy exploring our world, learning about other cultures and the hundreds of bits of knowledge that allow us to successfully communicate via radio. SAREX, co-sponsored by the ARRL and AMSAT-NA, let us explore beyond our world and share earth-to-space contacts with hundreds of youngsters. Parise, who worked from space on 2-meter voice and packet, comments on the mission:

"Despite several serious failures in the space lab electronics, our Astro mission went amazingly well. When the second computer terminal failed, the crew had no further command capability of the ultraviolet telescopes. Within 12 hours, however, Marshall Space Flight Center, Johnson Space Flight Center and the *Columbia* crew worked out a method of completing our science operations. SAREX performed beautifully throughout the flight! I had more time available for voice QSOs than anticipated and worked many stations in response to CQs from orbit. The packet robot proved to be very popular and literally lit up like a Christmas tree every time we approached a populated area! It was very exciting for me to be able to participate in this ultimate of DXpeditions!"

Young explorers thought of intriguing questions to ask their new Amateur Radio role model aboard *Columbia*. Parise's excitement about space came through clearly with answers such as: "Weightlessness is absolutely wonderful; you can stand wherever you want, even on the ceiling!" and "Simulations of the launch in no way compare with the real thing—going from being forced back in your seat to floating in your shoulder harness when the engines shut down is awesome!"

Marshall Space Flight Center Amateur Radio Club members in Huntsville, Alabama, assist students with a voice contact with Payload Specialist Ron Parise, WA4SIR. *(photo courtesy of Marshall Space Flight Center)*

Roy Neal, K6DUE, Chairman of the SAREX Working Group, holds down "SAREX Control," where a telebridge connects classrooms with *Columbia*. *(KO5I photo)*

Teachers piqued their students' imaginations with hands-on radio demonstrations and additional SAREX activities suggested by the ARRL's Educational Activities Department. Goddard Amateur Radio Club (Greenbelt, Maryland) members retransmitted all SAREX and mission communications around the clock, allowing additional schools to listen to all types of shuttle happenings.

The ARRL is preparing to accept QSL cards with SASEs for SAREX voice QSOs and nearly 2000 packet attempts from all over the world.

Thousands of Hams Volunteer

Teachers, school administrators, parents, grandparents, friends, local Amateur Radio club members, Amateur

Columbia Thrills *Columbia, Connecticut*, Students

"Were you disappointed?"

"Maybe just a little bit."

So answered enthusiastic fourth-grader Leslie Bolster after her school just missed getting an answer to its question from Ron Parise, WA4SIR.

The good news is that the state of Connecticut, home to Leslie Bolster and to the Horace Porter School in Columbia, Connecticut, was plastered with ham radio publicity for a week before the attempted shuttle contact, culminating in televised reports by all three major Hartford-area stations and by stories in a dozen newspapers.

This kind of publicity—repeated in cities and towns around the country—can't be bought.

For Dennis Hoddinott, KA1MXI, parent and Amateur Radio enthusiast, the exciting moment was the culmination of several months' work for him and other volunteers. In addition to setting up the necessary radio equipment, the group arranged for the display of a genuine space suit, on loan from Hamilton Standard of Windsor Locks, where the suits are made, as well as a color computer to track the shuttle's path. Telemedia, a local television operation, donated a satellite video feed from Houston to the basement of the school, where some 100 students, teachers, and parents gathered for the shuttle pass.

Not only was media coverage extensive, it was positive, too. Hoddinott's advance stories had alerted local news editors. As the countdown to the QSO began, the hams' and students' every move was filmed and noted. The thrill came when Ron's voice came over the airwaves.

Following the shuttle pass, most of the audience stayed for an on-the-air discussion among SAREX net control officials in Houston and the three schools with scheduled voice contacts (one in Oregon and one in South Carolina, as well as the Porter School).

The students plan to send Parise a poster and T-shirts to "thank him for being interested in us."

These nine-year-olds, for whom Sputniks, Apollo moon landings and even most shuttle flights are just stories in the history books, weren't in the least intimidated by the array of ham gear and computers laid out in the school cafeteria. They left with a challenge, to try again. SAREX is worth it!—*K1TN*

Radio industry personnel, the ARRL and AMSAT-NA spent countless hours making SAREX successful. They lined up equipment, planned activities and corralled the media. We could fill this magazine if we recognized each individual. A big-league contribution, however, came from Johnson Space Flight Center (Houston, Texas) Amateur Radio Club members' tireless efforts—from SAREX's infancy to plans for the *next* mission.

NASA expressed surprise at the number of ham volunteers wanting to help in the classrooms. The ARRL Educational Activities Department received 887 requests for SAREX teacher packets—lesson plans, student activity pages, sample news releases and resource materials to help teachers and students delve into Amateur Radio and space exploration.

The delays experienced by STS-35 didn't dampen student excitement. Young people's studies taught them that complex equipment such as the shuttle can develop unexpected glitches. The need for *Columbia* to be oriented so its telescopes and, consequently, its 2-meter antenna, were pointed toward deep space caused some signal problems. Volunteers' assistance and unique ideas for publicity never faltered.

The need for school stations to have relays from Brazil and Australia—the astronomy mission required the orbiter to be over the Southern Hemisphere during school hours—allowed Murphy to make his mark on a few QSOs. Schools were linked by the international goodwill of PY2BJO, VK6IU, VK5AGR and VK2AS, with Roy Neal, K6DUE; Doug Loughmiller, KO5I; and Bill Tynan, W3XO; acting as SAREX net control ops through the Darome Connection telebridge in Arlington, Virginia, which also allowed schools to call in for listening.

NASA allows SAREX equipment on shuttle missions as secondary payloads because a large number of young people will be exposed to technology and Amateur Radio.

An excellent way to round up a large number of students to explore Amateur Radio and space is to communicate from places where young people congregate. Better yet is to communicate from *a lot of places* where young people congregate. And hams in the following locations did just that: the Tampa Museum of Science and Industry; the Discovery Center Museum of Rockford, Illinois; the Children's Museum of Wichita, Kansas; San Jose Children's Discovery Museum; Space Camps in Huntsville, Alabama, and Titusville, Florida; and Marshall Space Flight Center's student Project Laser Lab, in Huntsville, Alabama.

Not to be outnumbered, hams and teachers such as John Slough, KB9ATR, in Indiana, interconnected equipment so that students at several schools could take part in a voice contact with Ron, WA4SIR.

Sam Brown, WA4IUM, evening news anchor for Knoxville's ABC affiliate, took his crew to a school to record students talking with Ron for use on his station's newscasts (covering eastern Tennessee).

Joe Mullins, N5PNB, mayor of Emerson, Arkansas, arranged for his daughter's (N5PNL) school QSO to be retransmitted over the entire Arkansas state education radio network!

Larry Luchi, W7KZE, sent flyers to 160 schools in the northwestern US to gather listeners for his school's QSO which was patched through the Boeing Employees Amateur Radio Society repeater intertie.

Vikki Gigante-Hueber, KA3PVS, broadcasts yet another announcement to those listening to the Goddard Amateur Radio Club's (Greenbelt, Maryland) shuttle communications retransmissions.

STS-37—All the Astronauts are Hams!

If you're kicking yourself for not taking part in STS-35, you can switch your thoughts to making plans for STS-37! Every astronaut aboard is a licensed ham! Pilot Ken Cameron, KB5AWP, prompted Mission Specialists Linda Godwin, N5RAX; and Jay Apt, N5QWL; and Flight Commander Steve Nagel, N5RAW; to get their Novice and Technician licenses, while Ken upgraded to Advanced class. Jerry Ross awaits his new call sign, having just passed his Novice exam. The five will get on the air as often as their schedules permit—but their mission lasts just five days, so operational time will be less than on STS-35.

STS-37's SAREX plans include not only 2-meter packet and voice operation, but also slow- and fast-scan television. Ken's so enthusiastic about endorsing Amateur Radio to young people that he's trying to convince NASA to make Amateur Radio the subject of STS-37's "Lessons in Space." He asked the ARRL Educational Activities Department to assist in developing the lesson plans. Hams with SSTV equipment and schools that have TVRO capabilities for picking up "NASA Select" video can retransmit the video lessons to hundreds of classrooms. NASA facility Amateur Radio clubs are planning a "first for Amateur Radio" by transmitting fast-scan television QSOs between crew members and their families.

Why do we expend all of this effort? Russell Harris, N2IZV, who assisted Webster, New York, school students in listening to other schools' voice contacts, sums it up this way: "I answered enthusiastic questions for over an hour; I concluded that the experiment was a success. My immediate problem is the 25 students who want to become hams!" Dick Hoff, AA5NT, sent HQ a Dallas newspaper clipping covering his Richardson school voice contact stating that "Rocket boosters couldn't have pulled the kids away from the radio!" An SWL wrote: "Hearing Ron aboard *Columbia* makes me even more interested in getting my ticket."

Opportunities abound for getting involved in the fun of delighting young people with Amateur Radio and technology through SAREX. Contact local teachers or principals and offer your services. Write to ARRL for SAREX lesson plans, teacher resource materials and suggested student activities. You can also ask for materials to persuade school administrators to use Amateur Radio in the classroom on a regular basis. The climate is right for community volunteers to assist in school systems, and Amateur Radio has the perfect offering—friendly ham astronauts to entice students to explore our world and beyond!

Dennis Hoddinott's (KA1MXI) students in Columbia, Connecticut, got as much exposure to the news media as they did to SAREX! Shown here is one of the students being interviewed by a reporter from a Hartford TV station. *(K1TN photo)*

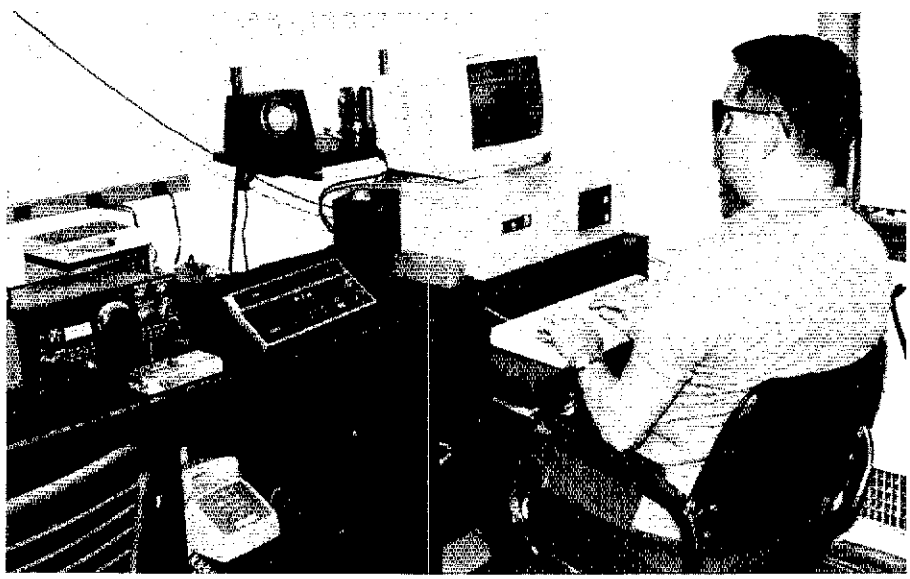
Lou McFadin (l), W5DID, of the Johnson Space Flight Center, and STS-37 Mission Specialist Jay Apt, N5QWL, hold a SAREX equipment module. Its green and red indicators lit up like a Christmas tree in time to the packet tries on STS-35! *(WA1STO photo)*

QST Profile:

Roger Jeanfaivre, K1PAI: A Special Weather Observer

He never sees snow, clouds, sunshine or rainbows, but this ham is invaluable to the community as an expert weather spotter.

By Bill Clede, K1AH
272 Ridge Rd
Wethersfield, 06109-1019
CompuServe 74736,165



Roger Jeanfaivre, K1PAI, has set up his computer as a talking weather station. After it gives him accurate readings of conditions, he reports to the National Weather Service via 2-meter FM relay or by telephone to WTNH-TV. *(K1AH photo)*

Roger Jeanfaivre, K1PAI, has been interested in the weather all his life. When he was a kid, he kept records of his observations. Although he has no degree in meteorology, he's as knowledgeable as many of the weather reporters you see on television. When SKYWARN activates, you can bet K1PAI will be on 147.00 MHz, the gateway repeater to the National Weather Service at Bradley International Airport in Windsor Locks, Connecticut.

I purposely picked an afternoon when a front was forecast to move through Connecticut to interview Jeanfaivre at his home in Wethersfield, just south of Hartford. We were on the second floor of his bungalow. The window faced west. The sky was quickly darkening.

The phone rang and Jeanfaivre answered. It was the WTNH-TV weatherman in New Haven. Jeanfaivre's a weather observer for the television station. He quickly read the accumulated precipitation. We'd had 0.1 inch since the day before. He read the wind direction and speed, and noted that the barometric pressure was falling, then he checked the outside air temperature.

Uniquely Equipped for the Job

An HF transceiver sits to the left of his computer weather station. He uses it to check into the New England Weather Net on 75 meters. Beside it is a scanner for monitoring aviation reports. A 2-meter rig is behind him, crackling with the conversations of hams describing the darkening sky. He uses it to check in daily to the weather net on the Mt Ascutney, Vermont, repeater. Jeanfaivre has as complete a weather observation facility as anyone could. The Channel 8 weatherman thanked him. Had the situation been worse, Jeanfaivre could have been in direct contact with NWS-Hartford.

Jeanfaivre's not the kind of guy who does all his weather work indoors, either. In 1971, he went to Pennsylvania to operate ham radio during the flood. When Windsor, Connecticut, was struck by a tornado on October 3, 1979, Jeanfaivre was on the scene for most of the full four days of amateur operations. He manned the 2-meter station in the command trailer.

What's unusual about a ham interested in the weather, you ask? Lots of hams work with the National Weather Service, but there's a difference in this case. Roger Jeanfaivre is blind. He can't read his weather instruments, they must talk to him.

His first barometer was one designed and built by Joe DiMaggio, WA1HFQ, an engineer with WVIT-TV in West Hartford. It plays chimes to indicate rising or falling pressure, then voices the reading in figures.

His new Digitar Weather Station board installs in an expansion slot in his computer. It includes barometric pressure with its other readings, but it displays on the screen. From Science for the Blind, Jeanfaivre got a voice synthesizer board for his computer. The next challenge was to make everything work together.

Voices Inside the PC

Jeff Katz, N1CLW, an engineer with General Electric in Bloomfield, Connecticut, wrote software to read the registers of the Digitar board. This signal is fed to the synthesizer board and its voice comes out of the speaker.

"It's a little funny-sounding," Jeanfaivre explained. "Many tell me they can't

understand it. Just takes a little getting used to."

Jeanfaivre adjusted the pitch and pace of the synthesized voice as I listened. It became more intelligible to me, but there are still quirks in it. When the weather program loads into computer memory, it announces "Rho-gurr's Weather Station." It voices "wind speed" correctly, but when it says "wind direction" it pronounces "wind" as in "wind up." And temperature comes out "tem-per-aa-ture." But when you've heard it a time or two, it's not hard to understand.

Function keys on the computer execute specific readouts: Indoor or outdoor temperature, barometric pressure, wind speed, wind direction and accumulated rainfall. Pressing the F10 key plays the full report.

Jeanfaivre figures he has $1300 invested in his weather station so far, including the computer, the voice synthesizer board and the weather board.

Putting Technology to Work

He got the idea for a synthesizer from Advanced Computer Control repeater controllers installed by the Pioneer Valley Radio Association in Connecticut. They provide voice synthesis so that a control operator can record a message to be played back whenever another ham keys two certain digits.

For his computerized weather station, Jeanfaivre chose a phonemic system that sounds each ASCII character. It reads whatever goes to the computer screen, but the quality leaves something to be desired. Of course, by choosing this system, Jeanfaivre's synthesizer will also work with other computer programs.

Installing the sensors required the services of sighted friends. A mast holds the anemometer on the east quadrant of the roof. "It took a while to adjust the cups so the reading was accurate," Jeanfaivre commented. The outside air temperature sensor is under a short plank on his antenna tower. The rain gauge is mounted on a piece of wood tacked at the gutter line where it's easy to reach for service.

Jeanfaivre has his weather station fully operational, but hams and projects go together. It's a never-ending hobby. He plans to improve the synthesizer so others can understand it easily. He wants to upgrade the software so he can store the weather data to disk. The only thing he has no ambition for is radar. That's understandable, because he couldn't see the scope.

Hamming Has its Rewards

Jeanfaivre's vision impairment started with his premature birth. "In the 1940s, they didn't understand about oxygen starvation causing the eyes to not develop fully," he said. Now 43, he became totally blind at age 24.

As a preteen, he attended the Oak Hill School for the Blind in West Hartford. Blind twin sisters Betsy Doane, K1EIC, and Barbara Lombardi, K1EIR, of Shelton, Connecticut, taught a Novice class and Jeanfaivre caught the radio bug. He qualified for his Novice ticket at age 12 and upgraded to Conditional class at 14. He got his father interested in ham radio, and the elder Jeanfaivre became K1QPM, an avid DXer. Roger graduated from Bloomfield High School in 1965 and then earned a degree from Windham College in Putney, Vermont.

Amateur Radio has meant even more in Jeanfaivre's life. Through his friendship with Milt Chaffee, W1EFW, of Southington, Connecticut, ARRL New England Division Director from 1957-64, Jeanfaivre met Milt's daughter Deborah. She's now Mrs Roger Jeanfaivre.

Seeing isn't Everything

It's easy to forget that Jeanfaivre can't see. We were fishing on Long Island Sound with Dan Sudarsky, K1MWU, of Nantucket, Massachusetts, and we spent a night on Sudarsky's boat. During the night, I woke up and went to the head, dutifully shielding the light. After I got back into my bunk, Jeanfaivre got up. "Wait, I'll turn on the light," I said. "No, thanks," Jeanfaivre replied. "You forget, I don't need it." QST

The rear of Jeanfaivre's bungalow supports a small tower with several antennas, with the thermometer sensor sheltered underneath. The rain gauge is the dark inverted cone mounted to the gutter (center). The anemometer, not visible in this photograph, is mounted on the other end of the roof, away from obstructions. *(K1AH photo)*

New Products

The ARRL and QST in no way warrant products described under the New Products banner.

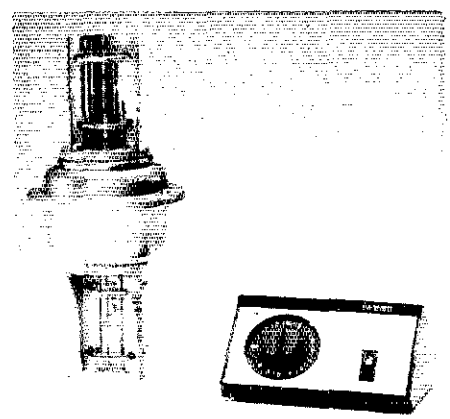
500-W MF/HF LINEAR AMPLIFIER

☐ Ameritron, Inc, seeing a need for an amplifier that uses inexpensive tubes, has introduced the AL-811. Using three 811A power triodes, a tuned input circuit, illuminated metering of grid current and anode current (or anode voltage), the AL-811 is rated at 500 W CW or 600 W PEP output on SSB from 160 through 15 meters. Adding 10- and 12-meter coverage to the AL-811 is straightforward, and requires presentation of a valid Amateur Radio license.

The AL-811 measures 8 × 13¾ × 16 inches (HWD), weighs 30 pounds, runs on 120 V ac, and carries a list price of $599. For more information or the name of an Ameritron dealer near you, contact Ameritron, 116 Willow Rd, Starkville, MS 39759, tel 601-323-8211, fax 601-323-6551. —*NJ2L* QST

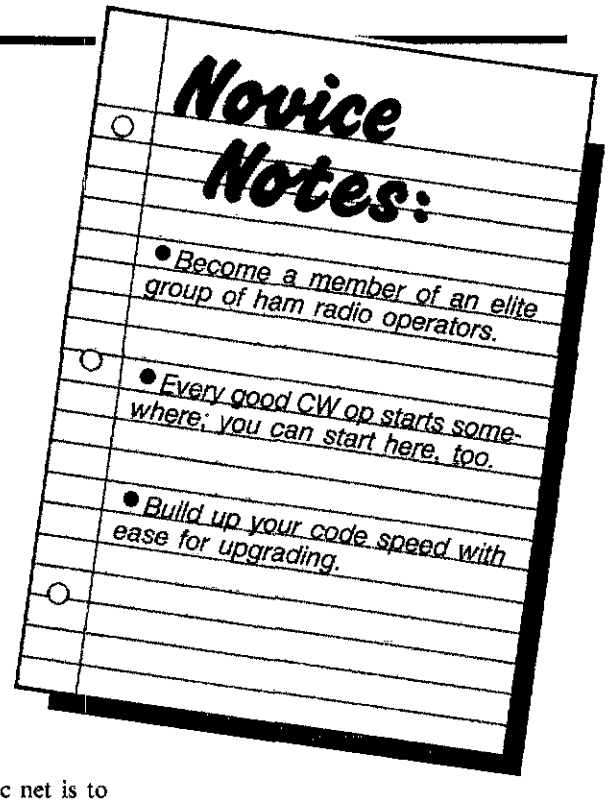
YAESU LIGHT-DUTY ROTATOR

☐ Yaesu has announced the availability of a light-duty rotator: the G-250. Intended for small to mid-size VHF and UHF Amateur Radio and TV/FM broadcast antennas, the G-250 includes a desktop controller with a 360° control dial and position indicator. The rotator housing is melamine-coated die-cast aluminum. Specifications:



360° rotation time, 45 seconds; rotation torque, 14 ft-lb; stationary torque, 43.3 ft-lb; rotator weight, 4 lb; controller weight, 2.5 lb; power consumption, 37 W. Suggested retail price: $111. Contact Yaesu USA, Inc, 17210 Edwards Rd, Cerritos, CA 90701, tel 800-999-2070, or your local Yaesu dealer, for more information. QST

CW Traffic Nets: Take the Plunge!



Any ham is welcome to join Amateur Radio's oldest and (still) most respected on-air public service activity.

By Michelle Noel, WM1C
PO Box 204
Harrison, ME 04040

It's 7 PM. Dinner is finished and the dishes have been put away. You trot off to the shack and fire up the rig to see what kind of action's on the air.

Tooling around the CW portion of 80 meters, you happen upon a cryptic bit of dialog. You turn up the volume and hear something like this:

CQ CQ MSSN QNI K
B
B
DE KA1REB GE QRU K
KA1REB GE AS MSSN K

One of two things will happen. You'll say "Huh?" and resume spinning the dial, or you'll recognize this exchange as a CW traffic net. If you're like many hams who have never experienced a CW net, you might be interested in checking in. But you might also be intimidated by the proliferation of abbreviations and afraid you won't be able to follow proper net procedures. You may be overwhelmed by those 30-WPM guys that sound like frantic mosquitoes.

Well, it really isn't all that mysterious and there's hope for us CW operators who get brain lock past 10 WPM, so read on!

Listen First

The first thing you should do, as always, is listen. These nets usually last only 15 to 30 minutes or so. Copy every word, and after the net is finished, go back over your copy. If you've stumbled upon a net that's too fast for you to copy, look around, especially in the Novice subbands, and you'll probably find a slow-speed net. *The ARRL Net Directory* makes them easy to find. See the sidebar.

After listening a few times, you'll begin to make sense out of most of it. Let's start with the basics.

Anatomy of a CW Net

The purpose of a CW traffic net is to pass messages that go through the National Traffic System.

Every net is run by a Net Control Station (NCS). The NCS is in charge of things. That station is responsible for checking everyone in, keeping track of who is on frequency, who has traffic to send and who is willing to receive messages. Every net needs participants, and that's where you come in. When someone volunteers to take traffic, the NCS usually instructs the sending and receiving stations to move to an adjacent frequency to pass the traffic.

Checking In

When you arrive at the net frequency, be sure to zero beat (QNZ) the NCS before attempting to check in. The NCS has to handle a dozen stations trying to check in and doesn't need the added annoyance of trying to copy a station that's off frequency!

Let's say you've found a net, listened to it for several nights and the CW speed isn't too deadly. That first check-in (QNI) is terrifying for everyone and you'll probably be no exception.

Unplug the telephone and tell everyone in the house that the shack is off limits for the next half hour because you're on a mission of the utmost importance. Your heart is pounding and your sweaty fingers keep slipping off the keyer, but you take a deep breath and flip the switch anyway. This is when you usually forget your call sign.... And once you've managed to spit out something resembling your call, you could swear the NCS is replying in Swahili instead of English.

That's how it may seem the first time you gather up the courage to check in, but it gets easier after that!

Your First QNI

Presume for the moment that the NCS is me, WM1C, and you are KA1VHI (my old call sign). Here's how checking into the Maine Slow-Speed Net would work:

CW Traffic Nets are Fun for All

Checking in to a CW net is a sure-fire way for Novice or Technician hams to build Morse code proficiency and have fun, but operators with General, Advanced and Extra Class licenses can enjoy CW nets, too. If you'd like to sharpen your code skill, learn net procedures, meet new people or just want a good reason to fire up the rig and paddle, a CW net is just the thing.

There are plenty of medium- and high-speed CW nets for QRQ operators, too. The ARRL NTS always needs reliable participants and you can quickly earn the respect and gratitude of your fellow hams by volunteering your time to ease some of the message load. No matter what you like, there's a CW net for you.

More information about traffic handling, nets, the ARRL NTS and CW techniques is available in *The ARRL Net Directory* and *The ARRL Operating Manual* or from your Section Traffic Manager or the Field Services Department at HQ.

See you on the slow-speed nets!

NCS: MSSN DE WM1C QNI K

Translation: "Maine Slow-Speed Net. This is WM1C. Stations wishing to check in (QNI), please do so now."

You: I

Translation: You send something just to get the NCS's attention. Many people send the last letter of their call sign.

NCS: I

Translation: The NCS will acknowledge you by sending back exactly what you sent to get his attention.

You: DE KA1VHI GE QRU K

Translation: "This is KA1VHI, good evening (GE), I have no traffic (QRU)."

NCS: KA1VHI GE AS

Translation: "Okay, KA1VHI, good evening and stand by, please (AS)." Note that the AS is sent as one character (di-dah-di-di-dit).

Now You're In; What Next?

That's it—you have now checked into the net. Be prepared for the NCS to ask you for a name and QTH so he doesn't have to refer to you as "Hey, you" in the future. He may do it as soon as you check in, when he checks you out or right after he closes the net (QNF, by the way). He'll also introduce himself then, too, and invite you to continue checking in to the net.

If this is your first time checking in, you're probably praying no one asks you to take any traffic, so let's assume the best for the moment and pretend it's a slow traffic night.

The Net Control will continue to check in stations and will be sending stations off to other frequencies to pass traffic. After a while, you'll hear the NCS start to check out participants. Here's what will happen:

First, he'll call you.

NCS: KA1VHI

Translation: "Hey, KA1VHI, you still there?" Note that he might send just the last three letters of your call sign.

You: R (or HR)

Translation: Just send something brief that indicates your presence.

NCS: TNX FOR QNI HPE TO CU AGN HR SN QRU QNX 73 GE K

Translation: "Thanks for checking in (QNI) and hope to see you again here soon. I have no traffic for you (QRU) and you're excused from the net (QNX). 73 and good evening."

CW NCSs are particularly fond of abbreviations.

You: OK TNX CUL 73 DE KA1VHI

That's it, you're free to go.

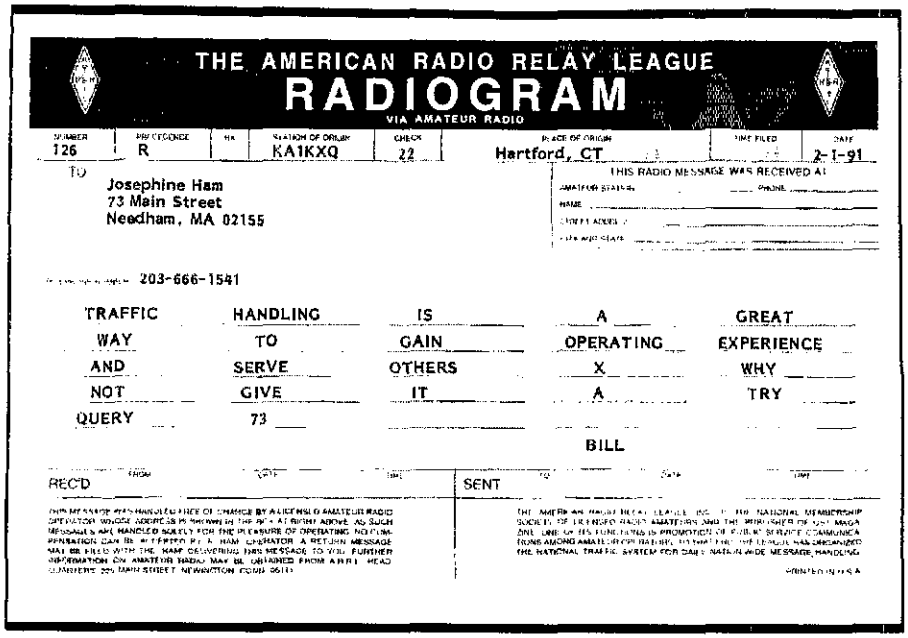
Traffic? Who, me?

That's nice, you say, but what if there's traffic that needs to be handled? Or if you have traffic to send? That leads us to more

Slow-Speed HF CW Traffic Nets

Here's a list of CW nets that welcome slow-speed Morse code operators. Most are NTS traffic nets, but some meet for other purposes. Listen to see what kind of operation is conducted on each. Not all slow-speed CW nets are on Novice frequencies. If you have trouble finding a slow-speed CW net, contact your ARRL Section Manager (SM), whose address is on page 8 of *QST*, or your Section Traffic Manager (STM).

kHz	Net Name	Days	UTC
80 Meters			
3577	Ohio Sunrise Slow Net	M-F	1145
3590	Empire Slow-Speed Net (New York)	Dy	2300
3645	Wisconsin Slow-Speed Net	Dy	0030
3680	Virginia Slow Net	Dy	2330
3702	West Coast Slow-Speed Net	Dy	0230
3705	Illinois Training Net	Dy	0100
3705	Indiana Code Net	Dy	0100
3705	Northern California Net	Dy	0430
3708	Ohio Slow Net	Dy	2310
3710	Minnesota Slow-Speed Net	Dy	0000
3710	Puerto Rico Net-Slow	Dy	2300
3710	Tuolumne Co Novice Emergency (California)	Sun	1530
3714	Hit and Bounce Slow Traffic Net	Dy	1230
3715	All-Florida Slow Traffic Net	Dy	0100
	Eastern Massachusetts/Rhode Island Slow Net	Dy	0200
	Carolinas Slow Net (NC/SC)	Dy	2300
	Colorado-Wyoming Net	Dy	0230
3715	Kentucky Novice Training Net	Dy	0000, SaSn 1400
3717	Maryland Slow Net	Dy	0030
3719	Iowa Code Net	TTh-S	0100
3720	New England Novice Net	Dy	1015
3722	Michigan Novice Net	Dy	2230, 0100
3723	Wisconsin Novice Net	Dy	0000
3725	Alabama Training Net	Dy	0130
	Crackle and Bang Instruction Net (Texas)	M-S	0300
	Maine Slow-Speed Net	TuThSu	2300
3725	South Dakota Novice CW Net	Sun	0100
3730	West Virginia Novice Net	Dy	0030
3733	Mississippi CW Slow Net	M-F	0045
3735	Kansas Slow-Speed Traffic Net	MWF	0130
	New Jersey Slow Net	Dy	2330
	Nebraska Novice Net	Dy	0200 (winter)
3737	Albany Traffic and Emergency Net (New York)	TuTh	0030
3742	Southern Patuxent Slow Net (Maryland)	W	0100
3745	Texas Slow-Speed CW Net	Dy	0200
3940	Early Bird Net	Dy	1000
40 Meters			
7057	Christian Morse Code Training Network	TuTh	2300
7114	Hit and Bounce Slow Traffic Net	Dy	1230
7115	Carolinas Slow Net (North and South Carolina)	Dy	2300
7125	Puerto Rico Novice Net	S	1430
7128	Hawaii Any Speed Net	Dy	0600
7137	Nebraska Novice Net	Dy	0200 (summer)
7145	North Dakota Slow Net	S	2300
30 Meters			
10,105	Pacific CW Training Net	Sn	2000
10,147	Utah Code Net	Dy	0230
20 Meters			
14,077	Christian Morse Code Training Network	MWF	2200
15 Meters			
21,110	Planetary Citizen Novices Net	TuTh	2100
21,150	Slowfist Net (Connecticut, New York, New Jersey)	TTh	0100
10 Meters			
28,142	Southern Patuxent 10-Meter Slow Net (Maryland)	F	0000



THE AMERICAN RADIO RELAY LEAGUE

RADIOGRAM

VIA AMATEUR RADIO

NUMBER	PRECEDENCE	HX	STATION OF ORIGIN	CHECK	PLACE OF ORIGIN	TIME FILED	DATE
126	R		KA1KXQ	22	Hartford, CT		2-1-91

TO

Josephine Ham
73 Main Street
Needham, MA 02155

THIS RADIO MESSAGE WAS RECEIVED AT

203-666-1541

TRAFFIC	HANDLING	IS	A	GREAT
WAY	TO	GAIN	OPERATING	EXPERIENCE
AND	SERVE	OTHERS	X	WHY
NOT	GIVE	IT	A	TRY
QUERY	73			

BILL

RECD FROM ____ DATE ____ TIME ____

SENT TO ____ DATE ____ TIME ____

THIS MESSAGE WAS HANDLED FREE OF CHARGE BY A LICENSED AMATEUR RADIO OPERATOR WHOSE SIGNATURE IS SHOWN BY THE "X" AT RIGHT ABOVE. AS SUCH MESSAGES ARE HANDLED SOLELY FOR THE PLEASURE OF OPERATING NOTIFICATION CAN BE ACCEPTED BY A HAM OPERATOR. A RETURN MESSAGE MAY BE FILED WITH THE HAM DELIVERING THIS MESSAGE TO YOU. FURTHER INFORMATION ON AMATEUR RADIO MAY BE OBTAINED FROM ARRL HEAD QUARTERS 225 MAIN STREET NEWINGTON CONN 06111

THE AMERICAN RADIO RELAY LEAGUE, INC., IS A NONPROFIT NATIONAL MEMBERSHIP SOCIETY OF LICENSED RADIO AMATEURS AND THE REPRESENTATIVE OF THE RADIO ARM OF THE PUBLIC SERVICE COMMUNICATIONS AMONG AMATEUR OPERATORS, TO THAT END THE LEAGUE HAS ORGANIZED THE NATIONAL TRAFFIC SYSTEM FOR DAILY NATION-WIDE MESSAGE HANDLING.

PRINTED IN U.S.A.

abbreviations, but after all, the whole idea is to pass traffic quickly and efficiently, so the abbreviations are essential.

Let's say you have traffic going to East Overshoe. When you check in to the net, you'll say:

DE KA1VHI GE QTC EAST OVERSHOE 1 K

The abbreviation QTC means that you have traffic. Follow it with a list of where the traffic is going and how many messages you have for that destination. Once you've alerted the NCS that you have traffic, he'll announce that fact to the others when calling for check-ins:

NCS: MSSN NEED EAST OVERSHOE ES QNI K

Translation: "Maine Slow-Speed Net, we need someone to take traffic for East Overshoe. Also looking for any other stations to check in."

Moving the Mail

Let's assume that another participant in the net, KA1REB (that call sign belongs to a ham friend who got me interested in CW traffic nets), can take your traffic. He'll respond by getting the NCS's attention. He might send just the last letter or perhaps the suffix letters of his call sign. The NCS often addresses stations using just the suffix of their call signs—another way of speeding things along. Once acknowledged, he might say:

KA1REB QSP EAST OVERSHOE

KA1REB has indicated that he is able to relay (QSP) this message. This is not the time to go for a cup of coffee, because the NCS is going to give you some instructions. He may tell you to stand by (AS), and then disappear for a few seconds to check for a clear adjacent frequency. When he comes back, he'll call each of you and tell you something like:

VHI ES REB QNY DWN 5 K

Translation: "KA1VHI and KA1REB, move down 5 kHz and pass your traffic there."

There can be variations in how the NCS instructs you, but the intent should be clear. You'll respond with an R for acknowledgment or a G (for "going") and go. The station that receives the traffic calls the sending station upon arriving at the designated frequency. Keep in mind that, while the NCS probably checked the assigned frequency for activity, a QSO could have started up since then. Just because you're assigned to that frequency doesn't mean you should obliterate an ongoing QSO! Move up or down a bit, but don't get carried away, because the NCS may send another pair of operators to a spot just a few kilohertz away from you.

Accuracy Counts!

The proper procedure for writing and sending messages can be found in detail in *The ARRL Net Directory*. Let's just touch on a few things you'll encounter when passing the message to the other station. Now that you (KA1VHI again) and the other station (KA1REB again) are both on an adjacent frequency, KA1REB will call you, because he is going to be receiving the traffic and needs to be certain he can hear you okay. You'll respond, adding QRV? at the end—asking him if he's ready to copy. If so, he'll respond with QRV, and then you send him the complete message.

When you finish sending, he may respond with AS, asking you to stand by while he checks his copy and the word count. If he missed something, he'll ask you for "fills," using the abbreviations WA (word after), WB (word before), BN (words between), AA (all after) and AB (all before). If you make a mistake while sending, it's customary to send a question mark and pick up sending again from your last correct word. In this case, the question mark means "I repeat." Should the text actually contain a question, spell out the word QUERY in place of a question mark.

Listen carefully while you're sending. The station copying your message may have had a sudden interruption or problem (remember the admonition about unplugging the phone!) and may be trying to get your attention by sending a series of dits. Listening while sending is easy if you have break-in capability. If you don't, pause every few words, quickly switch back to receive, and listen for a second.

When the receiving operator is certain he has copied the traffic correctly, he will send QSL to indicate he's got it correctly and perhaps TU (thank you).

Meanwhile, Back at the Net

When you're done, return to the net frequency and alert the NCS to your return by simply sending the suffix of your call sign (the letters after the numeral). He'll send back those letters to let you know he heard you. Don't go back to the net frequency too quickly, though. While you were passing your traffic, the NCS could have sent someone over to the same subfrequency to receive another piece of traffic from you or to send you traffic. Listen for a couple of seconds or you'll end up hopping back and forth, never catching up with each other!

Why Join a CW Net?

Isn't it "easier" to jump on a phone net or send traffic by the bushel on packet? Perhaps. But people get involved in CW traffic nets just for the enjoyment of practicing the art of CW. Amateur Radio is a hobby, and many hams like to challenge themselves.

Unique friendships are made on CW traffic nets because of the mutual interest in CW and the relative rarity of CW traffic handlers. Most states have only a handful of dedicated CW traffic handlers. There is camaraderie among them and they garner great respect from other hams because of their skill.

Upgrade Without a Struggle

Perhaps the most useful reason for getting involved with these nets is for the CW experience they provide. What better way to increase your code speed painlessly for an upgrade! It's a lot more fun than listening to code-practice tapes, gives you experience with less-than-perfect fists and makes you stretch a bit to copy someone sending a word or two faster than you can lazily handle. If you're at a 13- or 20-WPM impasse, remember that a good number of CW net operators hold Extra Class licenses, and many got there after getting involved in CW nets.

CW traffic nets are rewarding and far from obsolete. Tune in to one soon and take the challenge!

The Media Game

Publicizing Amateur Radio takes patience and a deft touch.

By Rick Booth, KM1G
232 Washington St
Norwood, MA 02062

Amateur Radio always tries to expand its ranks. Hams already know its fabulous rewards and we know that there's strength in numbers, so we want to get the message out. In today's shrinking world—a world we help shrink—that means the mass media: publicity, broadcast airtime and ink on the page.

Your club gets bonus Field Day points for publicizing itself. Maybe you've tried promoting the hobby outside Field Day and had limited success. You want to score more often, get the hobby before the public, gain more exposure and more members.

Yet, the mass media doesn't always seem interested. You can't understand why. "If it isn't death, destruction, mayhem and muck," you grumble, "those stinkers don't want it."

Ham Radio is No Big Deal

I'm one of those stinkers—I've been called worse—and in many ways, you're wrong. It's all in how you play the game. You don't make the rules, the media professionals do, and you're not likely to change that. That's one fundamental truth hams don't usually understand. There is another.

One year, at the Dayton HamVention®, I wandered into a publicity workshop. On the panel were a half-dozen luminaries from the national press and TV, who also happened to be hams. These people were heavy hitters, at the top of their professional game. Yet, try as they might, they couldn't seem to get one fact across: To the public at large, *Amateur Radio isn't that big a deal.*

There, I said it. It wasn't easy, but it needed to be said.

Hams know how important it is, or how important it *can* be in a crisis. But Amateur Radio doesn't shake the world every day. Shrink yes, shake no. We're justifiably proud of ourselves, but to typical outsiders, Amateur Radio is just another hobby. It's a specialized, arcane hobby, at that. We can't beat our breasts and expect the world to exclaim how great we are, because they don't see us through our eyes. We need technique.

Put away your pride when dealing with the media. They talk every day with men and women who spend and earn your tax dollars, put out fires, keep your streets safe, chart society's successes and sweep up after its failures. Don't lose perspective. But does that mean the media don't want to hear you?

Not at all! Newspaper pages and television airtime are insatiable gluttons, demanding a never-ending stream of stories. On the grand scale, however, Amateur Radio isn't very high; you've got to wait for a slow news day and be ready when it comes. Fortunately, there are plenty of ways to do that.

Start Early, Be Patient and Know Your Turf

Don't worry about Page One of the Sunday metro edition or 60 seconds on the evening news. You have to *work* at winning, and the little things count. It's too late after the earthquake starts. And you can't expect to win right away. It's a long season.

What outlets cover your area? You can score big with a major daily paper, but there are smaller neighborhood or suburban weeklies that count on local news and they may be a better touch. It's the same with television. Sure, there are network affiliates, but UHF stations and cable access have burgeoned to where nearly every community in the country falls into someone's minor league park. Know them all, and what kind of pitches they swing at.

Know the Right People

Every media outlet maintains a stable of sources. Most are in the public arena—politicians, bureaucrats, civic and business leaders, police officers, firefighters and so on. Reporters deal with these sources every day, but they need special sources for those

Free Publicity

Free publicity for Amateur Radio is terrific. Imagine if your local newspaper ran a full-page story on your club's hamfest, with six photographs!

When the News Editor of the *Smithfield (North Carolina) Herald* asked me, a *Herald* staff writer, to come up with a feature story for the upcoming Friday paper, I jumped at the opportunity; my club, the Triangle East ARA, was holding its second annual hamfest the following day.

I particularly enjoyed writing this "teaser" item for the front page. Smithfield, North Carolina (like Smithfield, Virginia) is known for its tasty country hams.—*Pete Hulth, N4SXG*

Not his kind of ham

In a last-minute effort to direct visitors to the Triangle East Amateur Radio Association's annual convocation at the Smithfield Moose Lodge, some of the local hams eased out before daylight Saturday to erect sheets of plywood beside highways I-95 and 70-A proclaiming "Hamfest."

One motorist came to the event not knowing it was a get-together of hundreds of radio buffs.

He smiled sheepishly when it was explained that the only hams on hand were amateur radio operators — and they had no sugar-cured, salt-cured, or peppered country hams to sell.

Today's Feature Page, by the way, has more information about last weekend's gathering of radio hams.

once-in-a-while stories. Be one.

How? As a reporter, I once attended a zoning session where a contractor asked to build a controversial VHF radio tower. He told the committee he needed the site, "because it's higher and offers more effective radiated power, which we engineers call ERP." Hah! I knew what he *meant*, but that's not what he *said*. He tried to dazzle the folks with doubletalk. As a ham, I knew that—but I also knew one of the commissioners was a ham, so I solicited quotes from him. Other reporters rode my coattails and Amateur Radio got a nice plug. Equally important, a new source ended up in a lot of newsroom Rolodex files. With a little finesse, somebody from your club can be in a Rolodex, too.

Be Available

If you're a source, don't be out of town when the reporter calls, especially not the first time. When reporters need to know something, they need it *now* and they'll only get burned once. Get backup coverage and take the same care choosing a backup as you did a primary. Technical knowledge isn't enough. Look for the articulate person who can condense complicated subjects into a clear sentence or three.

Just because you're always trying to get Amateur Radio into the news doesn't mean it can't jump in by itself. When that happens, it can be in a potentially damaging context, and you can pitch relief. Antenna disputes, flagrant abuses by the inconsiderate ham—you never know. Reporters strive to find responsible sources for both sides of an issue; it's fundamental to their craft. If you're known as a responsible source, you'll get a call.

Look Behind the Scenes

Don't overlook the folks *behind* the cameras and microphone. Invite technicians to a club meeting with a program on something that's calculated to interest them. They're technically oriented and may become hams (or may already be, so check it out). They interact with the front-line reporters and there's nothing like an ace on the inside. Maybe they'll bring a reporter with them! Don't give up—keep trying. Be cordial and low key.

Get Input

Maybe you can get a news staffer as a meeting speaker. Then you can learn from the source what makes a good story. If they field questions, keep to the subject. Ask nonradio questions over coffee at the break. See if you can arrange a one-on-one meeting with your publicity chairman. Work hard to see through their eyes. It'll pay off.

Stick with the Basics

Our tendency is to try selling the whole hobby at once. Recognize that Amateur Radio is a broad subject, a real dazzler. Confused reporters write lousy copy. Spoon feed them without seeming to do so; don't patronize. Reporters are not dense by nature, but they may be young and inexperienced, especially at small local outlets. Perhaps they don't know what questions to ask. You're not on their beaten path, so you may have to work hard explaining things.

Highlight Individuals

You'd like to hype ham radio as a whole, but sometimes it's necessary to spotlight a single person. For instance, one reason the hobby appeals to the handicapped is because in Amateur Radio they're *not* handicapped. From the media perspective, this is a wonderful "news peg," although it can only be exploited at wide intervals and with great care by all hands. This is an area where a long-term relationship with a media representative can pay big dividends. You don't want just anybody handling this kind of story, but played right, it has "home run potential."

Reflected Publicity

Does someone in the club appear regularly in the news? A politician or civic leader? Maybe you can sell the papers or TV on a story about his/her "other" life in Amateur Radio. Regular news sources are used to handling the attention, too.

Back-Door Publicity

Don't overlook the "soft" pages of the paper, the Living or Lifestyle sections. How about a feature on "hamming and homemaking?" It would make an alternative to those "juggling home and career" stories. What about talk shows? Pick your speakers with care.

Highlight Narrow Aspects

The media have television and satellites, and everybody knows it. We hams have television and satellites, but how many people know it? Try pitching a segment on those. Packet radio might not sell—virtually every American relates to satellites and TV, but how many outside hamdom recognize the word "packet" as communications?

Don't Direct

You can suggest stories, but if the reporter wants to go a different route, let well enough alone. Reporters value their independence. It can be a pain, but there's nothing you can do about it beyond having a long-term relationship. If that foundation's carefully laid, you stand a chance of steering things, because you have a track record.

Think Small

Many small papers, "shopper" tabloids, and radio and TV stations accept community bulletin board items. Take advantage of them. Get your listings in on time; deadline means *deadline*.

People are the Key

Circumstances alter cases, and you have to learn to play the game where you live. It's a game, or rather, a never-ending season. We think so much about the equipment we use, we sometimes forget that the people in Amateur Radio are its greatest resource and we can never have enough good people. We never will, unless they hear about us—and word-of-mouth isn't enough.

Strays

NEW 10-METER NET

The Trident ARC of Charleston, South Carolina, runs a 10-meter fellowship net Sunday evenings at 0100Z on 28.450 MHz. They welcome DX and local NTS traffic, swap items and any other topics. All hams are invited to check in. NCS is John Reed, N4YVI, of Hanahan, South Carolina.

RESONANT CIRCUIT

On October 23, 1990, at 0406Z, Jim, W9NJP, met Jim, NDØF, for the first time, on 40-meter CW. W9NJP is from St Charles, Illinois; NDØF is from St Charles, Missouri. W9NJP is 44 years old and has been a ham for 30 years; NDØF is 44 and has been a ham for 31 years. Both have daughters but no sons. Both were using Kenwood rigs. But the strangest part is that *both stations were on the same frequency!*

HAMS HELP CHILDREN

The nonprofit Computer Foundation for the Handicapped is an organization set up by Don Peterson, WB7OCU, of Tempe, Arizona, that provides software for Commodore and Apple computers to disabled children and adults. They write and distribute programs that translate text to Morse code for the blind, Morse code to text input for nonverbal or paralyzed people and other public-domain software. These are distributed nationally for a handling charge averaging 20 cents per program.

Contact the Foundation at 2645 E Southern, #A326, Tempe, AZ 85282, tel 602-831-3519.

I would like to get in touch with...

☐ a Collins equipment club in the US or elsewhere. Joep Steeneken, PA2JST, Bovenover 319, 1025 JR, Amsterdam, The Netherlands.

Happenings

Conducted By James D. Cain, K1TN
ARRL Associate Editor

FCC Eases Morse Code Testing for Disabled, Sidesteps Issue of Examination Integrity

Beginning this month, there are procedures in the FCC rules for people with certain disabilities to follow who wish to be excused from 13- and 20-WPM Morse code examinations for Amateur Radio licenses. In a Report and Order adopted December 13, 1990, the FCC amended its rules "to exempt from the higher-speed Morse code telegraphy examinations amateur operator licensees who, because of severe handicaps, are incapable of passing those examinations."

This is the latest installment in PR Docket 90-356, which began with a public announcement by the FCC in early August and continued in the FCC's denial, on September 28, of an ARRL request for more time—until November 15—to comment. The new "procedures" had been in effect—but not codified—since summer.

The exemptions will not apply to the 5-WPM test, since some demonstration of Morse ability is required for operation below 30 MHz.

The Commission received more than 100 comments from the ARRL, the Courage HANDI-HAM System, physicians and individual amateurs. While "many of the commenters" supported the proposal, according to the FCC, many also had misgivings about abuse of exemptions or relaxation of testing methods.

The League, in its Application for Review of the Commission staff's denial of the request for more time, said "This proceeding is not merely a simple matter of attempting to accommodate the needs of the handicapped by waiving an inconsequential examination element. It is, rather, a reversal of stated policy, and an action which stands to jeopardize the integrity of the volunteer Amateur Radio examination program."

The League also noted that in 1982, the FCC held that "(s)electing a particular group of license applications for favorable treatment in terms of less stringent amateur operator requirements would not be sound licensing policy...if such a policy were instituted, the Commission ultimately could find itself in the untenable position of deciding which applicants actually qualified for telegraphy exemptions and which did not. Commission personnel clearly are not trained to make such judgments...."

According to the FCC, the most objections were to a proposed list of disabilities, a list drawn up by the government to indicate a person's "employability." Commenter Alan L. Braun, MD, NSØB, told the FCC "many persons who have handicaps that prevent them from working do not have handicaps that prevent them from taking a telegraphy examination."

As a result, the FCC will "rely on the integrity and the judgment of the physician who signs the certification to establish, after consulting with the patient, that the person is severely handicapped and because of the disability is unable to pass the telegraphy examination.

"We expect both the examinee and the physician to be honest," the FCC said.

Further, the Commission will "develop a briefing paper for physicians that describes the nature of the Morse code examinations."

"Physicians" will be defined as doctors of medicine (MD) and doctors of osteopathy (DO) only.

In the matter of whether a disabled person will be able to give a volunteer examination for an element from which he was exempted, the Commission said "Any VE not competent to perform the VE functions required for any particular examination should not administer that examination."

The Commission used the following example: an Amateur Extra Class licensee, acting as a volunteer examiner and having been exempted himself from the 20-WPM examination, still would be capable of administering a receving exam to another applicant by the use of taped CW and a written copy of the text sent.

Following an open meeting of the Commission on December 13, Private Radio Branch Chief Ralph Haller was questioned about amateurs' concern for the integrity of the program, particularly who would certify an applicant as "disabled." Haller responded that the FCC was relying on the certification by people who have themselves been certified by a board (ie, physicians).

"The Commission," Haller said, "will deal harshly with those who abuse the process."

The FCC, at the ARRL's urging, will also require that an applicant for exemption sign a release, permitting disclosure to the FCC of medical information pertaining to the disability. Revised Forms-610, which will include a physician's certification form, will "contain a warning regarding the penalties for making willful false statements to the Commission, in violation of 18 USC 1001."

In its Report and Order, the FCC acknowledged comments concerning "dilution of the amateur service" and "demeaning" the handicapped, saying in the first case that Morse proficiency had not in the past proven to be a "filter" for the service and, in the second, that disabled persons would still be able to choose to take the examinations even if they met the requirements for an exemption.

The amendment of the Commission's rules becomes effective February 14, 1991.

FCC DENIES APPEAL FOR RELIEF FROM RFI

The FCC has denied an ARRL petition for reconsideration of changes in the regulations governing nonlicensed operation of RF "Part 15" devices. Affected is consumer equipment including radios and televisions, VCRs, home security systems and garage door openers.

In March 1989, the FCC adopted a First Report and Order in General Docket 87-389, amending its Part 15 rules. Permitted leakage from receivers, VCRs and stereos was changed to the more stringent Class-B computing limits, but noncompliant designs were grandfathered for ten years.

At the same time, the FCC adopted seven new "consumer bands" where intentional radiating devices such as door openers could operate at higher power. Four of those bands are allocated to the amateur service on a primary or secondary basis (the amateur 902 MHz band and the 2.4, 5.6 and 24-GHz bands).

In the League's opinion, the Report and Order failed to deal effectively with RFI issues, requiring only simple labeling of devices.

Two days after the announcement, the ARRL Executive Committee voted to seek reconsideration and to seek whatever injunctive relief was necessary to protect amateur interests. Shortly thereafter, the League filed its Petition for Reconsideration, saying the Commission had failed to "respond in a reasoned manner" to the comments of the ARRL and others; that the Commission's "absence of complaints"

rationale for relaxing restrictions on Part 15 devices was fundamentally flawed; and that the Commission was arbitrary in excluding Part 15 devices from some bands allocated for services involving safety of life or for services that utilize very low received-signal levels without excluding them from the amateur bands.

Meanwhile, the ARRL filed an emergency motion for stay with the US Court of Appeals for the District of Columbia Circuit, on June 20. The court denied the motion, and the new rules went into effect June 23, 1989.

On December 7, 1990, the FCC finally acted on the League's Petition for Reconsideration, saying "we continue to believe that the rules set forth in the First Report and Order afford adequate and appropriate interference protection to the amateur service from the operation of Part 15 devices." The Commission found "that the additional restrictions and requirements the League seeks are unnecessary."

The Commission concluded that the League's petition had presented no new information, and therefore stood by its earlier decision.

Filing in opposition to the League's position were the Computer and Business Equipment Manufacturers Association (CBEMA), the Consumer Electronics Group of the Electronic Industries Association (EIA/CEG), General Motors Research Corporation and Wireless Technology Inc. These groups cited the absence of interference complaints and suggested that the new Part 15 rules "provide a reasonable balance of the need to protect authorized services from harmful interference with the need to allow for the consumer benefits made possible by electronic equipment authorized under Part 15."

GM and Wireless maintained that "to prevent all uses because some uses may be subject to interference is overregulation of the worst sort."

And EIA/CEG argued that the League had not "explained why the amateur service deserves more protection than other services such as broadcasting and public safety land mobile radio."

The Commission concluded that amateurs do not need the additional protection from Part 15 incidental radiators afforded to other weak-signal services, specifically "safety-of-life services," airport wind-shear detectors, radio astronomy and space-to-earth channels.

Amateurs engage in many types of operation on the affected bands that can "tolerate considerable levels of background noise," and "amateur operations typically involve recreational and hobbyist activities that can, if necessary, be repeated," the Commission said.

COURT DENIES 220 APPEAL BY "DEFERRING" TO THE FCC

Amateurs came one step closer to losing part of the 220-MHz band when the US Court of Appeals for the District of Columbia Circuit ruled on December 3 that the Federal Communications Commission acted within its discretion in awarding 220-222 MHz to land mobile users (in PR Docket 87-14).

On November 16, lawyers for the League and for the FCC argued before the court. The ARRL's position was that (1) the FCC underestimated use of the 220-MHz band by amateurs; (2) a previous FCC decision precludes new spectrum allocations to land mobile users; and (3) the FCC had wrongly estimated the ability of new narrowband technologies to conserve spectrum.

In the matter of band occupancy, the League argued that more than just the *ARRL Repeater Directory* should be used as a source, but the judges noted that FCC also had relied on materials "that petitioner itself submitted."

As for new allocations to land mobile, the court recognized "that the Commission would generally prefer to avoid new allocations and to look instead to technological solutions that would allow more parties to use the same frequency, but its preferences hardly rise to the level of a settled policy."

The court deferred to the Commission in determining that the frequency space in question should be taken from amateurs and awarded to commercial interests, and to the FCC's belief that using narrowband technologies on existing land mobile bands is not the answer to the perceived needs of those commercial interests.

"[The FCC's] determinations," the court said, "are based on a close acquaintance with the technical, economic and other aspects of the competing technologies, and we cannot say that the Commission did not arrive at a reasoned decision about the best way to advance the 'public convenience, interest, or necessity.'"

FCC-ISSUED CALL SIGN UPDATE

The following is a list of the FCC's most recently issued call signs as of December 1, 1990:

District	*Group "A" Extra*	*Group "B" Advanced*	*Group "C" Tech/Gen*	*Group "D" Novice*
0	AA0CW	KF0OI	N0MRS	KB0HUQ
1	WN1M	KC1YL	N1IGM	KA1WSU
2	AA2CN	KE2YH	N2LKZ	KB2LOI
3	WG3V	KD3UY	N3ISG	KA3YBS
4	AC4AY	KN4TI	**	KC4UJV
5	AA5WC	KI5LS	N5RTK	KB5OFU
6	AA6ZU	KK6TN	**	KC6PPF
7	AA7GV	KG7KW	N7PXO	KB7MBI
8	AA8CR	KF8KO	N8NCU	KB8LBL
9	WX9M	KF9AG	N9KHY	KB9FSV
Guam	KH2O	AH2CI	KH2EV	WH2AMU
Hawaii	**	AH6KT	NH6XY	WH6CJP
Alaska	**	AL7MP	NL7VP	WL7BZN
US Virgin Is	NP2I	KP2BV	NP2EB	WP2AHF
Puerto Rico	**	KP4RI	**	WP4JPM

**All calls signs for these groups have been assigned in these areas.

COMMENTS BACK PLAN FOR 40-METER BAND

On December 3, the League filed its comments with the FCC on the Second Notice of Inquiry in General Docket 89-554, the WARC-92 preparatory proceeding. The ARRL supported a proposal to provide a 300-kHz worldwide amateur allocation, free of broadcasting interference, at 7 MHz. A realignment of the 41-meter broadcasting band to provide a broadcasting band in Region 2 would make this possible. Feedback from League Members has largely supported shifting the current amateur 40-meter band downward by 100 kHz, in exchange for eliminating the present geographical sharing arrangement with broadcasting.

At its meeting November 27, the FCC Industry Advisory Committee agreed to recommend this 7-MHz realignment, adding to a growing consensus on this point among the key players in US WARC-92 preparations.

With regard to 2 meters, the League expressed concern about possible interference to the crowded band should a low-earth-orbit (LEO) satellite service be implemented in the adjacent band of 148.0-149.9 MHz, but did not oppose the proposed allocation.

The League did oppose a proposal to reallocate 420-421 MHz for LEO satellites, instead supporting an initiative of WARC Informal Working Group 2, which seeks ways of accommodating this new use without adversely affecting existing services.

Finally, the League opposed any reallocation of 2390-2450 MHz that would deny the amateur service, and particularly the amateur-satellite service, access to this important band. Recent good news on this front is that satellite broadcasting interests have studied the issue and have concluded that, for the next 15 years or so, satellite

sound broadcasting is not feasible above 2.0 GHz; the power requirements at the satellite end are too great. But other interests are still eying the band.

The League will file reply comments to the Second NOI on or before the deadline of January 7, 1991.

GROUP ASKS REVIEW OF AM POWER RULE

On November 23, 1990, the Society for the Preservation of Amplitude Modulation (SPAM) filed a petition for reconsideration of the FCC's power limits for AM stations. The Commission denied, on October 13, petitions by the ARRL, SPAM and others, to return to a dc power-input limit of 1000 watts on AM. Since June 2, 1990, the power limit has been 375 watts carrier-power output (at 100% modulation).

The SPAM petition contends that the FCC has a "hidden agenda concerning... A3E emission," in that it now restricts experimenters on AM to "a power level four times less than other emission types."

SPAM further contends that power-output measurement standards for other modes may not be directly applicable to AM, especially where interference to others is concerned, and that emissions containing a carrier signal should be subject to different standards than carrierless emissions.

SPAM points out the "adverse economic impact" on amateurs who own "$1.42 million worth of AM transmitters," noting that most AM gear is American-made and parts needed to modify equipment to the new, lower power level, may be difficult to obtain.

MONTSERRAT AMATEUR KNIGHTED FOR HURRICANE HUGO EFFORTS

Errol "Bobbie" Martin, VP2MO, has received the British Empire Award for public service. Martin, known to amateurs around the world, worked tirelessly during and after Hurricane Hugo struck Montserrat, his home, in September 1988. He provided the only communications into and out of the island for several days following the storm, which caused an estimated $100 million (US) damage and left a quarter of the island's 12,000 residents homeless.

The BEM award, formerly the Order of the British Empire, is made to civilian and military persons for distinguished service. Martin was the only resident of Montserrat to receive the award for service resulting from Hugo. It bestows an honorary knighthood on the recipient, who may then be referred to as "Sir."

But Martin would prefer you just call him Bobbie. "It's an honor," he said, "but it doesn't put food on the table."

(For more information on Martin and on the island of Montserrat see "A Montserrat Memoir," *QST*, March 1990, p 50.)

Royal Governor David Taylor pins the British Empire Award on Bobbie Martin, VP2MO, as Speaker of the House Howard A. Fergus looks on. *(photo courtesy of the government of Montserrat)*

COSMONAUT ON THE AIR AGAIN

Within two days of returning to the Soviet permanent space station *MIR* ("peace") in early December, Musa Manarov, U2MIR, resumed Amateur Radio operations, on 2 meters. Manarov was active from *MIR* two years ago (see "Full Quieting From Space," *QST*, Nov '89). *MIR*'s 51°-inclination orbit makes it accessible to the amateur population around the world.

There were plans to have Manarov attempt to contact astronaut Dr Ron Parise, WA4SIR, aboard the US shuttle *Columbia*, as SAREX relay station operator Junior de Castro, PY2BJO, had arranged a three-way QSO with *MIR*, the shuttle and himself, for late December 11, when the spacecraft would be within sight of each other. This opportunity was lost when the shuttle landed on December 10, slightly ahead of schedule.

De Castro did make contact with Manarov on 145.55 MHz FM, who switched from two to 20 watts during the QSO. "Wow, big difference, wonderful, amazing, extraordinary!" said de Castro.

Because it isn't known how long Manarov will be aboard *MIR* (his last tour of duty lasted 366 days), he could be aloft when the next SAREX flight, shuttle mission STS-37, is in orbit later this year.

MIR was scheduled to receive a packet radio experiment package in mid-January, which will be permanently installed, and will include a voice synthesizer to transmit bulletins in English, Russian and German. Manarov expected to begin packet activity sometime after January 15.

SILENT KEYS

- Roy Albright, N5RA, of San Antonio, Texas, died December 2, at age 83. Albright was ARRL West Gulf Division Director from 1969 through 1976.
- Former ARRL Rocky Mountain Division Director Maurice Carpenter, KØHRZ, of Denver, Colorado, died December 17 at age 77.
- George Sterling, W1AE, of Portland, Maine, died November 14 at age 96. In 1912, Sterling was issued one of the first Amateur Radio licenses. He founded the Radio Intelligence Division of the FCC, which played an important role in WWII and boasts a list of distinguished alumni who are still active in telecommunications and Amateur Radio. He was the only licensed amateur to be a Commissioner of the FCC, holding the post from 1948 to 1954.
- Connie Campbell, W1CIE, of Farmington, Connecticut, died November 26 after a long illness. She was 60, the wife of retired *QST* Managing Editor Laird Campbell, W1CUT, and also had worked at League Headquarters.

SECTION MANAGER ELECTION NOTICE

To all ARRL Members in the Maryland-DC, Nevada, New Hampshire, Northern New Jersey, Rhode Island, San Joaquin Valley, Utah and West Texas Sections: You are hereby solicited for nominating petitions pursuant to an election for Section

(continued on page 63)

FCC Releases Codeless License Report and Order

The new codeless Technician license takes effect February 14. Here's the entire Report and Order.

The Commission's Decision in a Nutshell

- The code is dropped from the Technician class license requirements.
- New codeless Techs have all privileges above 30 MHz.
- New Techs will, upon passing a 5-WPM code test before Volunteer Examiners, be issued a Certificate of Successful Completion, allowing them the same HF privileges as the "Old Technicians."
- The Technician written examination remains 55 questions (elements 2 and 3A).
- There will be no special identifier to distinquish "Techs" and "Techs Plus".
- Volunteer examiners are required to notify the FCC of the 5-WPM Morse CSCE issued to new Technicians so the FCC will have this information for enforcement purposes.
- The current Novice class license is retained without modification as an alternate entry point for persons willing to pass a Morse test without taking the more difficult Technician theory exam.
- Current Technicians will be grandfathered, so as not to lose any privileges (including those below 30 MHz, which they share with Novices).

Before the
Federal Communications Commission
Washington, D.C. 20554

PR Docket No. 90-55

In the Matter of

Amendment of Part 97 of the	RM-6984 RM-6985
Commission's Rules Concerning	RM-6986 RM-6987
the Establishment of a	RM-6988 RM-6989
Codeless Class of Amateur	RM-6990 RM-6991
Operator License.	RM-6992 RM-6993
	RM-6994 RM-6995

REPORT AND ORDER

Adopted: December 13, 1990; Released: December 27, 1990

By the Commission:

I. INTRODUCTION

1. On February 8, 1990, we adopted a *Notice of Proposed Rule Making (Notice)*[1] in the above-captioned proceeding. In the *Notice,* we proposed to establish a new class of amateur operator license (codeless class) that would not require applicants to prove that they can send and receive texts in Morse code telegraphy signals.[2]

2. In response to the *Notice,* we received over 1,100 comments and 12 reply comments from individuals and organizations. The comments are generally supportive of an entry level codeless class. They differ widely, however, in support for the proposed license requirements, operator privileges, and license class structure. This *Report and Order* adopts the rules for a new codeless class license as proposed in the *Notice* with the changes discussed below.

II. BACKGROUND

3. The International Radio Regulations require that persons seeking a license to operate an amateur station prove that they have the ability to send correctly by hand and to receive correctly by ear text in Morse code telegraphy signals.[3] Although this requirement may be waived for an operator of a station transmitting exclusively on frequencies above 30 MHz,[4] each of the five classes of operator licenses currently issued by the Commission requires the applicant to pass an examination in the international Morse code.[5]

4. Over the years, we have received many requests from persons who argue that proficiency in telegraphy is an unreasonable barrier to obtaining an amateur operator license. When we proposed codeless classes previously,[6] nevertheless, the amateur community strongly objected. Lately, however, the sentiment of the amateur community appears to favor at least an entry level codeless class. As a result, our *Notice* proposed to reprogram resources from processing applications for new Novice and Technician Class licenses to processing applications for licenses for a new entry level codeless class.

5. In the *Notice,* we stated the three fundamental objectives that we have with respect to the proposed codeless class. Our first objective is to offer an entry level operator license opportunity to otherwise qualified persons who find the telegraphy requirement a barrier to pursuing the purpose of the amateur service.[7] Our second objective is to establish a type of license that can be implemented promptly. Our third objective is to avoid negative effects upon current licensees,

upon the work of the volunteer examiners (VEs), or upon the Commission's workload and resources.

6. In the *Notice*, we proposed to add a new entry level codeless "Communicator Class" operator license in lieu of the existing Novice and Technician Classes of licenses. We also proposed to grandfather current Novice and Technician Class operator licenses indefinitely. The operator privileges proposed included all authorized emission types, a maximum transmitter power of 200 watts peak envelope power and authorization to transmit on amateur service frequency bands above 30 MHz with the exception of the 2 meter and 6 meter bands.

III. DISCUSSION

7. Approximately seventy percent of the comments to this proceeding favor at least an entry level codeless license. Some of these comments, however, advance proposals that go beyond establishing a single codeless class.[8] Other supporting comments suggest alternatives that would have undesirable effects upon present licensees.[9] Still other supporting comments suggest alternatives that would have unacceptable effects upon the VEs and the Commission's workloads.[10] The remaining thirty percent of the comments object to any form of codeless license.[11] In the paragraphs below, we address in detail the issues raised in the *Notice* and comments.

A. Need for codeless class

8. *Proposal.* Our *Notice* was issued in response to twelve petitions for rule making calling for codeless license classes. We observed that a significant segment of the amateur community appeared to have a new view of the role of telegraphy in the future of the amateur service.[12] We also stated that this was a propitious time to propose the establishment of an entry level codeless class, given the advances in electronic communications in the past few years.[13]

9. *Comments.* Among those affirming the need for a codeless class is the Quarter Century Wireless Association (QCWA) whose comments state that "[m]any QCWA members have a lifetime history of operating with, and a sentimental attachment to, use of the Morse code. It is understandable that some may not be overly enthusiastic in endorsing changes in licensing procedures which would delete the requirement of proficiency in this traditional mode of communication. Nonetheless, after consideration of the facts associated with licensing trends, we have concluded that the blanket code proficiency requirement may be a major cause of decline in the entry of many people into the Amateur Radio Service. Given this conclusion and in recognition of our responsibility to the Public Interest, we are agreed that a blanket Morse code requirement for entry into the Amateur Radio Service can no longer be justified."[14]

10. The American Radio Relay League, Inc. (ARRL) states that our objectives in this proceeding are basically sound and are consistent with its own rationale for the creation of a codeless class.[15] An ARRL study committee has concluded that the perception of the Morse telegraphy requirement filtered out too many desirable and technically qualified operators who have not recognized the value of manual telegraphy as a means of practical communication.[16]

11. The National Conference of Volunteer Examiner Coordinators (NCVEC) states that it found ample evidence that the Morse telegraphy requirement is no longer essential to an entry level amateur operator license.[17] The Amateur Radio Industry Group (ARIG), another codeless class supporter, states that "[a]mateur radio has evolved from a hobby of tinkerers and telegraphers into a service of communicators. . . . [T]he Morse code requirement at the entry level is a carryover from the origins of amateur radio which today may be preventing many interested and otherwise qualified persons from entering the Amateur Radio Service."[18]

12. The opposing comments hold that telegraphy skill is absolutely required for any participation in the amateur service. Their arguments are generally based upon claims for telegraphy as a superior communications medium and for telegraphers as model radio operators. Representative comments are as follows. "Morse code is the most effective means of communicating and the only one which can be used under the most adverse conditions."[19] "All hams must be prepared to use code in an emergency situation."[20] "We do not desire to have individuals join our ranks that would have us lower our standards."[21] Another argument is based upon the need to maintain tradition. "I had to take the code when I got my ticket, so why should someone else pass the code up?"[22] "I believe everyone should be blessed with the glory of learning code before operating in the amateur frequency spectrum."[23]

13. *Discussion.* The comments clearly confirm that the amateur community is undergoing a dramatic shift in sentiment concerning the value of Morse code as an entry level license requirement. For the amateur service to achieve its purpose it must have the participation of as many qualified persons as possible who desire to pursue that purpose. Modern commercial and military electronic systems require engineers to design them, technicians to install and maintain them, and a technologically literate citizenry that can use them. The amateur service should, as it has in the past, attract technically inclined persons, particularly the youth of our country, and encourage them to learn and to prepare themselves in the areas where the United States needs expertise. We do not foresee that telegraphers will be in as great demand by future systems as will electronics and communications experts.

14. Telegraphy skill has been required for each person who has ever been issued an amateur operator license in the United States, including the current 493,000 licensees. Mastering the Morse code was an arduous task for many of these licensees, and by developing their telegraphy skills they expressed their intense desire to become amateur operators. It is understandable, therefore, that there are licensees who are reluctant to share the amateur service frequencies with new licensees who have not made a similar effort to master the Morse code. We conclude, however, that telegraphy skill is not so essential to proper operation of a station that transmits exclusively above 30 MHz such as to justify turning away otherwise qualified persons who do not possess the skill. The *Notice*, furthermore, did not propose to delete the telegraphy skill requirement for a licensee to be the control operator of a station transmitting below 30 MHz where telegraphy communications take place extensively and worldwide communications are possible. The sharing of frequencies between codeless class licensees and other licensees can take place on frequency bands above 30 MHz where telegraphy operation is minimal and where the transmission of the more modern emission types such as data,

image, phone, pulse, RTTY, and spread spectrum, predominate.[24]

15. We do not concur with the comments alleging that the passing of a telegraphy examination is an indication of the examinee's good character, high intelligence, cooperative demeanor, or willingness to comply with our rules.[25] These traits are also found in individuals who have not passed a telegraphy examination rather than being exclusive to those who have passed such a test. For regulatory purposes, passing a telegraphy examination is no more and no less than proof of the examinee's ability to send and receive texts in Morse code at some specified rate. With respect to comments that make claims for the superiority of telegraphy over other types of communications, we do not consider these arguments as germane to this proceeding. The *Notice* did not propose to discontinue the authorization of telegraphy CW emission types on any amateur service frequency. The amateur service in the future, as it has in the past, can provide to those who personally desire to do so the opportunity to communicate by telegraphy.

16. We are adopting rules, therefore, that implement the codeless license option provided in the international Radio Regulations. These new rules offer a codeless class of license that authorizes control operator privileges at stations which transmit exclusively above 30 MHz. This satisfies our objective of providing an entry level opportunity to otherwise qualified persons who find telegraphy a barrier to pursuing the purposes of the amateur service.

B. Operator License Structure

17. *Proposal.* Our *Notice* proposed to add a new codeless class in a simplified license structure containing four ascending steps: new codeless Communicator, General, Advanced, and Amateur Extra Classes. There would also be, in effect, a "Communicator Plus CSCE"[26] operator class which recognized that some Communicator Class licensees hold a CSCE showing the licensee has passed an international Morse code test but which would not require additional license processing resources. The codeless class would be the first step in the license structure instead of the Novice Class. We stated that this structure could be rapidly implemented because the present license processing system and application form would continue to be used. Our *Notice,* however, particularly asked the amateur community to consider carefully the alternative of preserving the existing five-step ladder by simply eliminating the telegraphy examination requirement from the Novice Class license.

18. *Comments.* In general, the comments object to the proposal to discontinue issuing new Novice and Technician Class licenses. The NCVEC, in particular, stresses that the volunteer-examiner coordinators (VECs) desire that the existing license structure should be preserved to the maximum extent possible. It proposes the addition of a sixth class of license, although "[t]he VECs recognize that [this] position is not resource neutral.... This does not mean, however, the VECs would be any less in favor of a codeless license if the Communicator Class could only be implemented in place of one or more other classes."[27]

19. The QCWA states that another operator license class is unnecessary. It contends that the codeless class can be best implemented by simply removing the telegraphy requirement from the Technician Class operator license and modifying its privileges to comply with the international Radio Regulations.[28] The ARRL maintains, however, that there should be two paths of initial entry into the amateur service (a) the current code-required Novice Class and (b) a new codeless class. The ARRL acknowledges, however, that the resulting "six classes of amateur license are, for the long term, perhaps an overly complex scheme, (but) the matter can be revisited in the future, after the Amateur Radio Service has had some experience with, and becomes adjusted to, the now new concept of a codeless license class."[29]

20. Our inquiry concerning the desirability of conversion of the Novice Class into a codeless class was not supported generally. The ARRL states that a codeless class would not be a suitable substitute for the Novice Class as an entry level license. It adds that closing off the telegraphy "route of entry for the Service would in fact stifle a large percentage of the newcomers to the Service."[30] The NCVEC reports that a survey of VEs shows that "[m]any newcomers would still prefer to obtain a Novice Class license, which is also the least expensive path into amateur radio."[31] The QCWA "also urges that the Novice Class license... be continued... [as] a route for the person who finds little difficulty with a Morse code requirement but lacks the extensive skills and technical knowledge required by the Technician Class examination."[32]

21. *Discussion.* The addition of a sixth class of license to an already intricate license structure is neither desirable nor achievable without unacceptable effects upon our workload. Even if there were no increase in the number of new licensees, adding a sixth license class would result in an increased demand for license application processing: most newcomers to the amateur service initially obtain the lowest class of license and those who subsequently advance to the higher license classes usually do so one class at a time.

22. The disadvantages of a sixth license class are further compounded by the nature of our computer-aided application processing system. On further investigation, we have determined that our present computer system will not support six classes of licenses without new and significant expenditures of resources. The additional work to modify the system to have the capability of supporting the processing for a sixth class of license is inconsistent with our objective of limiting impact on our workload and resources. A new Communicator Class of license, consequently, is not a viable solution. The codeless class, therefore, must be incorporated into the present license structure.

23. Because it requires the least difficult written examination, the option of converting the Novice Class to a codeless class is not a solution generally supported by the commenters. The Novice Class, moreover, has very limited privileges above 30 MHz.[33] The Technician Class, however, has a more difficult written examination and authorizes all privileges above 30 MHz. The conversion of the Technician Class to a codeless class, as allowed by the international Radio Regulations and as recommended by QCWA and other commenters,[34] therefore, is the logical choice. Approximately ten percent of new licensees already enter the service at the Technician Class level.[35] The 126,543 current Technician Class licensees, however, are also authorized the same limited privileges as Novice Class operators below 30 MHz on the basis of having passed a telegraphy examination. To achieve our goal of avoiding any negative effects upon current licensees, therefore, we can make provisions in the rules for

these licensees to retain all of their current privileges.[36]

24. We are, accordingly, establishing the Technician Class as the codeless class of license that includes all amateur privileges above 30 MHz. We are amending Section 97.301(c), however, to grandfather frequency privileges below 30 MHz to currrent Technician Class licensees as well as to authorize these privileges to those holding a Technician Class license issued on or after February 14, 1991, who pass a telegraphy examination.[37] This satisfies our objectives of establishing a type of codeless class of license that can be implemented promptly and avoiding negative effects upon the work of the VEs or upon our workload and resources.

C. License requirements

25. *Proposed.* The *Notice* proposed to require applicants for the codeless class of license to pass a sixty question written examination. Thirty questions would be drawn from the current Element 2 question pool, twenty-five questions would be drawn from the current Element 3(A) question pool[38] and five questions would be drawn from a new pool. In effect, applicants for the new codeless class would be required to pass the same written examination as is required for the current Technician Class license, plus five additional questions.

26. *Comments.* The ARRL comments support our proposal and state that the five additional questions should concern operating practices.[39] Other comments call for even more written questions.[40] Still others recommend fewer written questions.[41] The NCVEC, however, points out that the only purpose of testing is to assure that the licensees are qualified to operate amateur stations on the frequencies authorized for the class of license held.[42] It recommends that the codeless class license requirement be the passing of the existing Element 2 and 3(A) examinations.[43]

27. *Discussion.* As pointed out by NCVEC, the written examination is administered solely to determine if the examinee possesses the operational and technical qualifications required by a station operator to perform properly the duties associated with the privileges of the license sought.[44] Our rules require that each examination question set administered to an examinee must use questions taken from the applicable question pool[45] and each pool must contain at least ten times the number of questions for a single examination.[46] The question pools for Elements 2 and 3(A), therefore, should already contain questions that test whether an examinee has the requisite qualifications to perform properly the operator duties at an amateur station transmitting exclusively above 30 MHz. We are not convinced that the addition of five questions is needed to establish the operational and technical qualifications of examinees for licenses having these privileges.

28. Each examinee is responsible for knowing the answers to the entire body of questions in the question pool. In the interest of practical examination administration, however, the VEs ask the examinee only a sample number of questions from the pool and they require a passing grade of approximately 74 percent.[47] When technological advancements, operating trends, or rule amendments alter the duties of a particular class of amateur operator license, the effect of our rules is to require that the VECs revise the question pools accordingly. The deletion of privileges below 30 MHz does not call for an increase in the number of questions posed in the written examination for a Technician Class license. Preparing and administering additional examination questions, moreover, would increase the workload of the VEs and VECs. We decline, therefore, to change the number of questions in the written examination elements required for the Technician Class license.

D. Technician Plus Certificate of Successful Completion of Examination

29. *Proposal.* The *Notice* proposed that upon passing a telegraphy examination, a codeless class licensee would be authorized Technician Class privileges below 30 MHz. To avoid an increased license processing burden, our proposal was that the documentation of the passing of the telegraphy examination be indefinitely evidenced by the Certificate of Successful Completion of Examination (CSCE), rather than by the issuance of another license document.[48] Each VEC would be required to provide paper or magnetic listings to the Commission for codeless class licensees who had been issued a CSCE for passing a telegraphy examination.

30. *Comments.* The NCVEC advises that the VECs could permanently document whether an examinee has passed a telegraphy examination that was administered by VEs, but that use of CSCE for this purpose would result in enforcement difficulties and would create a record keeping burden.[49] The ARRL adds that use of a CSCE for indefinitely documenting that a licensee has passed a telegraphy examination would be unwieldly.[50]

31. *Discussion.* The comments of NCVEC and ARRL, in effect, recommend that the documentation showing that a codeless licensee has later passed a telegraphy examination be accomplished by the Commission issuing a sixth class of operator license. The sole purpose of this sixth class would be to distinguish those codeless Technician Class licensees who subsequently pass the five words per minute telegraphy examination from those who have not. In paragraphs 21 and 22, we discussed why the addition of a sixth class of license is impractical.

32. We do not agree that use of the CSCE to indefinitely document the passing of a telegraphy examination would have any significant negative effects in this instance. The VEs and VECs already perform the necessary work. The VEs now issue a CSCE to each successful examinee. The VECs receive from the VEs the application forms and test results for every examination session. The VECs are required to make their examination records available to the Commission.[51]

33. We do not foresee, moreover, that there will be any increase in enforcement difficulty resulting from using the CSCE to document the passing of a telegraphy examination for an indefinite period. Our rules already authorize a licensee holding a CSCE to exercise the rights and privileges of the higher operator class for a period of up to 365 days.[52] This provision has not resulted in any increased enforcement burden. Section 97.301(e) is amended, therefore, to implement our proposal to use the CSCE to document indefinitely the passing of a telegraphy examination for the purpose of authorizing to codeless Technician Class licensees privileges below 30 MHz. We will confer with the VECs to establish a schedule for reporting the call signs and names of "Technician Plus CSCE Class" operators.[53]

E. Novice Class.

34. *Proposal.* The *Notice* proposed to discontinue issuing

new Novice class operator licenses and to grandfather existing licenses. We particularly invited instructors, VEs and VECs to submit factual information on the time and effort that would be required for persons to prepare for the codeless class written examination as compared to that required for the Novice Class license written and telegraphy examinations.

35. *Comments.* The few comments that addressed our question generally predict that, given the choice between a five words per minute telegraphy examination or an additional written examination, the numbers of newcomers choosing one over the other would be evenly divided.[54] The other prediction was that most newcomers would find additional questions easier to master.[55] The ARRL states that a codeless class would not substitute for the Novice Class, and that discontinuation of the Novice Class license would stifle a large percentage of the newcomers to the service.[56]

36. *Discussion.* The comments reveal that the amateur community, while it supports the establishment of a codeless class, is uncomfortable with the prospect of discontinuation of the Novice Class. The Novice Class is generally intended for beginning amateur radio telegraphers to gain actual experience in sending and receiving telegraphy messages. The comments indicate that the amateur community desires to retain the Novice Class license as an entry level for persons who do not have the knowledge to pass the written examination for the Technician Class license, but who can pass a telegraphy examination.

37. The keystone of our proposal was to reprogram resources currently expended in processing new Novice Class licenses annually to processing the new codeless class licenses. Retention of the Novice Class, however, precludes reprogramming all of those processing resources for the new codeless Technician class. We estimate, however, that with our current resources we should be able to process the applications for new Novice and codeless Technician Class licenses.[57] The Rules we are adopting, therefore, retain the Novice Class license.

F. Other matters.

38. We are persuaded by the comments[58] that our proposal to use the two-letter station identification indicator system[59] to distinguish stations having Technician Plus CSCE control operators is inconsistent with the call sign assignment policy. It would, in effect, cause the stations of codeless Technician Class operators to be identified with shorter call signs than those having Technician Plus CSCE operators. Shorter station call signs, however, generally are reserved for the more accomplished higher class operators. Further, in three of the frequency bands below 30 MHz that are authorized to Technician Class operators, only a CW emission type using the international Morse code is authorized.[60] The comments that addressed this situation confirmed our belief that it is improbable that a person who cannot pass at least the very slow speed 5 wpm Morse code examination would even attempt to communicate with other amateur stations by telegraphy.[61] In this situation, therefore, any need to distinguish between stations having Technician Class or Technician Plus Class control operators is subordinate to the need for an efficient identification procedure. We are, therefore, not adopting our proposal. We are, however, editorially revising Section 97.119(e) to clarify the station identification procedure.

IV. CONCLUSION

39. In summary, we have decided to provide a codeless class of operator license by eliminating the telegraphy requirement for the Technician Class. Our objective is to provide an entry level codeless operator license opportunity to persons who desire to pursue the purpose of the amateur service and who can demonstrate they are qualified to operate amateur stations that transmit exclusively above 30 MHz. In view of the comments received, we have also decided to retain the Novice Class operator license in order to provide an alternate entry level operator license opportunity to persons who desire to pursue the purpose of the amateur service and who can pass a telegraphy requirement in place of the more comprehensive written examination requirement for the codeless Technician Class operator license.

V. PAPERWORK REDUCTION ACT

40. The rules adopted herein have been analyzed with respect to the Paperwork Reduction Act of 1980, 44 U.S.C. §§ 3501-3520, and found to contain no new or modified form, information collection and/or record keeping, labeling, disclosure, or record retention requirements; and will not increase or decrease burden hours imposed on the public.

VI. ORDERING CLAUSES

41. For the reasons stated above, IT IS ORDERED that effective **February 14, 1991,** Part 97 of the Commission's Rules, 47 C.F.R. Part 97, IS AMENDED as set forth in the Appendix. Authority for this action is found in Sections 4(i) and 303(c) and (r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i) and 303(c) and (r).

42. IT IS FURTHER ORDERED that this proceeding IS TERMINATED.

FEDERAL COMMUNICATIONS COMMISSION

Donna R. Searcy
Secretary

APPENDIX

Part 97 of Chapter 1 of Title 47 of the Code of Federal Regulation is amended as follows:

1. The authority citation for Part 97 continues to read as follows:

Authority citation: 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303. Interpret or apply 48 Stat. 1064-1068, 1081-1105, as amended; 47 U.S.C. 151-155, 301-609, unless otherwise noted.

2. Section 97.119(e) is revised to read as follows:

§ 97.119 Station identification.

*****

(e) When the control operator is a person who is exercising the rights and privileges authorized by § 97.9(b) of this Part, an indicator must be included after the call sign as follows:

(1) For a control operator who has requested a license modification from Novice Class to Technician Class: KT;

(2) For a control operator who has requested a license modification from Novice or Technician Class to General Class: AG;

(3) For a control operator who has requested a license modification from Novice, Technician, or General Class operator to Advanced Class: AA; or

(4) For a control operator who has requested a license modification from Novice, Technician, General, or Advanced Class operator to Amateur Extra Class: AE.

*****

3. Section 97.301(e) is amended by revising the introductory text preceding the table to read as follows:

§ 97.301 Authorized frequency bands.

*****

(e) For a station having a control operator holding a Novice Class operator license, or a Technician Class operator license plus a CSCE indicating that the person passed element 1(A), 1(B), or 1(C), or a Technician Class operator license issued before February 14, 1991:

*****

4. Section 97.501 is amended by revising the introductory text and paragraph (d) to read as follows:

§ 97.501 Qualifying for an amateur operator license.

An applicant must pass an examination for the issuance of a new amateur operator license and for each change in operator class. Each applicant for the class of operator license specified below must pass, or otherwise receive examination credit for, the following examination elements:

*****

(d) Technician Class operator: Elements 2 and 3(A).

FOOTNOTES

[1] 5 FCC Rcd 880 (1990).

[2] Morse code telegraphy emission types are commonly referred to as "CW," the telegraphic abbreviation of the phrase "continuous wave." *See* Section 97.3(c)(l) of the Commission's Rules, 47 C.F.R. § 97.3(c)(l), for a listing of the CW emission types.

[3] *See* No. 2735 of the ITU Radio Regulations (Geneva, 1979) (hereafter international Radio Regulations).

[4] *Id.*

[5] The license classes are, in ascending steps, Novice, Technician, General, Advanced, and Amateur Extra. The examinations cover three levels of telegraphy skill. They are 5, 13, and 20 words per minute (wpm). The examinee must also pass written examination elements, depending upon the operator license class sought. *See* Sections 97.501 and 97.503 of the Commission's Rules, 47 C.F.R. §§ 97.501 and 97.503.

[6] *See Notice of Proposed Rule Making,* Docket No. 20282, 39 Fed. Reg. 44042 (1974) and *Notice of Proposed Rule Making,* PR Docket No. 83-28, 48 Fed. Reg. 1855 (1983).

[7] Section 97.1 of the Commission's Rules, 47 C.F.R. § 97.1, expresses the fundamental purpose of the amateur service in the United States in five principles: (a) Recognition and enhancement of the value of the amateur service to the public as a voluntary, non-commercial communication service, particularly with respect to providing emergency communications; (b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art; (c) Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art; (d) Expansion of the existing reservoir within the amateur service of trained operators, technicians, and electronic experts; (e) Continuation and extension of the amateur's unique ability to enhance international goodwill.

[8] For example, see comments of Edward P. Murphy at 1, Janet V. Whitney at 6, Gary Withington at 1.

[9] For example, see comments of Jack Bitzer at 3-4, Gordon Girton at 2-3.

[10] For example, see comments of John A. Carroll at 1-9, Scott B. Laughlin at 1, and Gordon Girton at 2.

[11] For example, see comments of O. D. Williams at 1, Michael Barry at 1, Joint Comment of Thomas A. Geis, Georgeann M. Geis, and Frederick R. Geis at 1.

[12] *Notice* at para. 5.

[13] *Id,* at para. 15.

[14] QCWA comments at 3.

[15] ARRL comments at 6.

[16] *Id,* at 2.

[17] Comment of NCVEC at 4.

[18] Comment of ARIG at 5.

[19] Comment of Alan Kaiser at 1.

[20] Comment of Michael C. Migliaccio at 1.

[21] Comment of Patrick D. Bouldin at 2.

[22] Comment of Joel Dunn at 1.

[23] Comment of Donald J. Ray at 1.

[24] *See* Section 97.3(c) of the Commission's Rules, 47 C.F.R. § 97.3(c), for a description of and the emission types associated with each of these terms.

[25] *See* para 12, *supra.*

[26] The CSCE (certificate of successful completion of an examination) is a document issued by the VEs to an examinee. It indicates which examination element(s) the examinee has passed. *See* Sections 97.505(a) and 97.9(b) of the Commission's Rules, 47 C.F.R. §§ 97.505(a) and 97.9(b).

[27] NCVEC comments at 9.

[28] QCWA comments at 4.

[29] ARRL comments at 11.

[30] ARRL comments at 8.

[31] NCVEC comments at 6.

[32] Comments of QCWA at 6. To qualify for a Novice Class operator license, an examinee must pass a 5 wpm telegraphy examination and a thirty question written examination. To obtain a Technician Class operator license, an examinee must pass the Novice Class examination elements and an additional written test of twenty-five questions.

[33] Above 30 MHz, Novice Class licensees are authorized privileges on the 222.10-223.91 MHz segment of the 1.25 meter band and the entire 23 centimeter band. [Editor's Note: This is an error in the Report and Order. Novice 23-cm privileges are limited to 1270-1295 MHz.]

[34] For example, see comments of QCWA at 8, Phillip David Howard at 3, Conrad Ekstrom at 1, Jay W. Underdown at 3, and Michael R. Burgin at 1.

[35] During fiscal year 1990, of the 26,134 persons who entered the amateur service, 2,617 persons did so by obtaining the Technician Class license.

[36] Existing Technician Class licensees are authorized all possible privileges above 30 MHz. Below 30 MHz, these licensees are authorized CW emission privileges in portions of the 80, 40, 15, and 10 meter bands, RTTY and data emissions in the frequency segment 28.100-28.300 MHz, and phone emissions in the frequency segment 28.300-28.500 MHz.

[37] For convenience, holders of a Technician Class license issued prior to February 14, 1991, and holders of both a Technician Class license and CSCE, for passing a telegraphy examination are referred to hereafter as "Technician Plus CSCE Class" operators to distinguish them from holders of the codeless Technician Class license only.

[38] Element 2 is the fundamental written examination required for every class of amateur operator license. Element 3(A) is a written examination concerning the additional privileges of the Technician Class *operator* license. *See* Section 97.503(b) of the Commission's Rules, 47 C.F.R. § 97.503(b).

[39] ARRL comments at 13. The ARRL proposed that the current twenty-five question Element 3(A) written examination be expanded by five questions and that the current thirty question Element 2 written examination continue as is.

[40] For example, see comments of Thomas J. Geiger at 6, William L. Glover at 1, and John C. Thomas at 1.

[41] For example, see comments of ARIG at 7, Interstate Repeater Society, Inc, at 3, Michael V. Morrelli at 1, and QCWA at 4.

[42] NCVEC comments at 11.

[43] NCVEC comments at 8. The current Element 2, 30 question written examination would be reduced by 5 questions and the current Element 3(A), 25 question written examination would be used as is in NCVEC's proposal.

[44] *See* Section 97.503(b) of the Commission's Rules, 47 C.F.R. § 97.503(b) and Section 303(l) of the Communications Act of 1934, as

amended, 47 U.S.C. § 303(l). See also No. 2736 of the international Radio Regulations.

[45] See Section 97.507(b) of the Commission's Rules, 47 C.F.R. § 97.507(b).

[46] See Section 97.523 of the Commission's Rules, 47 C.F.R. § 97.523.

[47] See Section 97.503(b) of the Commission's Rules, 47 C.F.R. § 97.503(b).

[48] Notice at para. 22.

[49] Comments of NCVEC at 6.

[50] ARRL comments at 13.

[51] See Section 97.519 of the Commission's Rules, 47 C.F.R. § 97.519.

[52] See Section 97.9(b) of the Commission's Rules, 47 C.F.R. § 97.9(b). In the case of a codeless Technician Class licensee who holds a CSCE for only a telegraphy element, the 365 day limitation on operator privileges would not apply because the CSCE does not indicate that the licensee has passed the necessary examinations for a higher class operator license.

[53] The data base for codeless Technician Class licensees who subsequently pass a telegraphy examination will be incorporated into the amateur service licensee data base when the necessary capability becomes available.

[54] Comment of Mark Forbes at 2.

[55] Comments of Elvin D. Lytle at 1, National Amateur Radio Association at 5, Douglas N, Stracener at 3.

[56] Comments of ARRL at 8.

[57] In fiscal year 1990, the Commission issued 20,704 Novice Class licenses, each of which required the processing of a license application. The Commission also processed 15,468 applications from Novice Class licensees that upgraded to Technician Class, and 2,617 applications from individuals who entered the amateur service by obtaining a Technician Class license.

[58] Comments of National Amateur Radio Association at 7.

[59] See Section 97.119(c) of the Commission's Rules, 447 C.F.R. § 97.119(c), for details of the indicator system.

[60] See Section 97.307(f)(9) of the Commission's Rules, 47 C.F.R. § 97.309(f)(9).

[61] For example, see comments of Thomas I. Geiger at 6.

Happenings

(continued from page 56)

Manager (SM). Incumbents are listed on page 8.

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 is suggested:

(Place and date)
Field Services Manager, ARRL
225 Main Street, 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 Sign...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 PM Eastern Standard Time March 8, 1991. Whenever more than one Member is nominated in a single Section, ballots will be mailed from Headquarters on or before April 1, 1991. Returns will be counted May 21, 1991. SMs elected as a result of the above procedure will take office July 1, 1991.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning July 1, 1991.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in July 1991 *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

Because no petitions were received for the New York-Long Island Section by the petition deadline of September 7, 1990, as a result of Notices in July and August *QST*, nominating petitions are hereby resolicited. See the above notice for details on how to nominate.

Product Review

(continued from page 36)

you're looking for one that's small, inexpensive and accurate, it's the one to consider first. In terms of accuracy, ruggedness and low price, the Heath HM-2140-A is also one to consider strongly.

As in just about everything else, when you buy a peak-reading wattmeter, you get what you pay for.

Contributors

This review is a compilation of ARRL Laboratory test results and the observations of active hams on the ARRL Technical Department and Production Department staffs. Thanks to Ed Hare, KA1CV; Dave Newkirk, WJ1Z; Paul Pagel, N1FB; Larry Wolfgang, WA3VIL; Chuck Hutchinson, K8CH; Kirk Kleinschmidt, NTØZ; and Mike Gruber, WA1SVF, for participating.

Feedback

☐ Please refer to the parts-ordering information in footnote 2 of "The CMOS Super Keyer II," *QST*, Nov 1990, pp 18-21. The speed control pot (R13) is *not* included in the parts kit. R13 is a ¼-W, 100-kΩ linear-taper pot and is available at Radio Shack® stores (RS 271-092) and other electronic parts suppliers. When ordering CMOS Super Keyer II parts or kits, Illinois residents must include 7% state sales tax with their order.

A couple of builders reported failures that were traced to incorrect (backward) installation of the two transistors. If the transistors are installed incorrectly, the keyer will operate, but the sidetone level will be low and the current drain high. Double-check your work!

☐ Ground symbols were inadvertently left off the FL2, FL3 and FL4 sections in Fig 1 of "A Diode-Switched Band-Pass Filter" (Jan 1991 *QST*, p 25). All three filter sections should have a connection to ground from terminal 4 of the input transformers (T6, T8 and T10).

☐ The source for Kent Powloski's QRP transmitter kit in "Kayaking QRP" (*QST*, Jan 1991, p 16, footnote 1) was incorrectly identified as RF Communications. The correct source is Oak Hills Research, 20879 Madison St, Big Rapids, MI 49307.

Correspondence

Conducted By Brian Battles, WA1YUA
QST Copy Editor

BIRTHDAY GREETINGS

☐ The big "75" on the December 1990 issue of *QST* awakened me to something I hadn't pondered before. From the time I was a child, I was drawn to radio. I built receivers at age 12 and have been an ARRL Member since 1932. What would have made a kid that age excited about this hobby? Well, now I know: *QST* and I were born in the same month of the same year. There was something extraordinary in the air that year! Happy birthday!—*Jim McDonough, W3CY, Rockville, Maryland*

GOOD HAM-ARITANS

☐ On Sunday, July 29, 1990, about 6:30 PM, my 16-year-old daughter and I had car trouble and stopped at the Redford Rest Area, 30 miles from home. We tried to stop some of the eastbound motorists, but no one stopped (we were headed east). About 40 minutes later, we noticed a westbound pickup go by. Two minutes later, this pickup returned to the rest area. The good Samaritans were Darry A. Roberts, WN2F; his wife, Jean, N2KOR; eight-year-old daughter, Cassie; and two-year-old daughter, Barbara, of the Riverview/Saranac area. Darry and Jean are members of the Amateur Radio Emergency Service of Clinton County, and Darry is an Emergency Coordinator. This family stayed with us for at least an hour, until help arrived.—*Florence R. Corron, West Chazy, New York*

SATISFACTION OR APATHY?

☐ Of the 16 positions open this year for Director and Vice Director, 11 were uncontested. It would be comforting to ascribe this situation to general satisfaction with their representatives by ARRL Members. It's more likely a case of galloping apathy. Amateur Radio faces many challenges. In fact, it may have to fight for its very existence. There's something wrong with our ARRL representative system when we cannot get a vigorous dialogue over present and future issues. This dialogue can only be assured by active participation of our membership in the election process—a rarity.

Why can't we find more candidates to jump into that process and sharpen the issues? This is in no way a criticism of my present Director, who is a good friend and for whom I have the highest respect and regard. The same holds true of the other uncontested winners with whom I am acquainted. Experience is invaluable, but no representative government can thrive without the infusion of new blood and new ideas.—*Hugh Winter, W5HD, Albuquerque, New Mexico*

DISABLED HAM: KEEP THE CODE TEST

☐ *QST* reviewed the situation of code testing for the disabled. (Sep 1990 Happenings, p 60) I don't consider myself handicapped. My problem is Parkinson's, a neurological disease of the portion of the brain that coordinates muscle movement. In my case, it results in uncontrolled tremors of the right hand and otherwise interferes with my ability to write and manipulate a key.

When the time comes for me to take the exam for Extra Class, I'll do everything in my power to find a way to meet the code-speed requirements. Failing that, I should like to be able to pursue some form of relief. The purpose of this letter is to (1) apprise you of a situation that effects many older hams and (2) encourage you to use the ARRL's good offices to try to keep the code-requirement door open for those of us who suffer from this affliction.—*Howard Hummell, W2MKA, North Caldwell, New Jersey*

CODE MUST SURVIVE

☐ I began as a ham in 1960 as KN7TAX with a low budget and high ambitions. I'll never forget my first contact. I'd worked for weeks getting a shack organized in my bedroom and two weekends to put up an 80/40-meter dipole, worried about not knowing what I was doing. (I still worry!) The big night, that first tentative CQ and...lordy! An answer. It was an exciting moment and I could hardly contain myself. My hand was shaking so I couldn't send the code well. The operator I was talking to lived about ¼ mile away; not the DX I'd hoped for. The next few nights, I worked stations in Oregon and California, then the big one, the East Coast: Vermont came booming in and I nearly jumped out of my chair.

I built a home-brew 15-meter dipole from a *QST* article, and put it outside the bedroom window so I could rotate it manually. My first contact was Capetown, South Africa.

Had it not been for low power and CW, I'd never have those memories I cherish today. Remembrance of those days returned me to ham radio after 15 years of too much work and not enough hammin'. It's still a wonderful pastime and there are lots of pleasant people ready to help, chat or just give a nod and go to the next contact. If today's youth isn't interested in code, they're missing a part of radio that shouldn't be lost to the future.—*Dana A. Smith, N7KUZ, Elma, Washington*

"VOX, ANYONE?"

☐ I enjoyed the excellent article in the July 1990 FM/RPT column entitled "Simplex Anyone?" I'd like to add a few observations. We're all paying for VOX in our HF radios. Why don't more than a handful of us use it? I've heard many excuses, but I think the real reason is that hams want to "broadcast" without being interrupted. With VOX, amateurs can interrupt before the band fades or if the phone rings.—*Ben Piller, K9CSM, Strasburg, Colorado*

"EX-VENTING" RADIO

☐ I was disturbed by the letter entitled "Paternity Issue" in the December issue (Correspondence, p 74). As is too often the case, this falsely suggests that Tesla was the inventor of radio. Nothing could be further from the truth, for it wasn't invented at all, but rather, "ex-vented" (the ideas having come from without), by brilliant men beginning with Michael Faraday, whose "flux field" and "field theory" planted the roots of radiant energy. In 1850, James Clerk Maxwell's "field equations" predicted a new theory of magnetic radiation. In 1882, Heinrich Hertz took Faraday's "electric field" and Maxwell's "electromagnetic theory" and proved their existence. In 1895, Guglielmo Marconi, an observer of these experiments, began his famous series of practical experiments that gave us transatlantic radio transmissions in 1901.

To credit Tesla with the invention of radio is like crediting Louis Pasteur for the work of Dr Jonas Salk. There was nothing in the original October article (Up Front in *QST*, Oct 1990, p 11) from which to draw the conclusions voiced by Glevanik. —*Dino Argentini, W1NJN, Danvers, Massachusetts*

STUDENT ELMERS

☐ We have senior high students who take time out in the afternoon (for which we arrange academic credit) to go to a nearby elementary or junior high school to coach kids in ham radio. One of our Loma Prieta High School students, Todd Meyer, won a $5000 Hitachi Award for doing just that. As long as a mature ham supervises to satisfy the schools' regulations and ensure minimum mistakes, the younger kids are motivated by their older role models.—*Mary Duffield, WA6KFA, Santa Cruz, California* ☐

How's DX?

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

DX Newsletters

My mailbox is impressively full most days, with correspondence, reports, club periodicals, cards to answer, comments on this column and a variety of DX-related materials. There are respectable monthly DX club news sheets that are excellent in appearance and utility, periodic propagation printings and QSL listings that incorporate today's technology in an excellent manner.

New DXers and those with limited time (anything short of three hours a day on the air is considered "limited time" by the faithful) look for shortcuts to keep up with what's happening in our DX world. The following abbreviated listing is of those regulars that over the years have proven to be reliable in content and format. All will send you a sample issue (SASE, please) so you can make up your own mind on what suits you:

The Long Island DX Bulletin, PO Box 173, Huntington, NY 11743-0173. Harvey McCoy, W2IYX, fills this legal-size biweekly publication with features such as propagation forecasts, country news (by name), QSL update and a notebook of miscellaneous items.

The DX Bulletin, PO Box 50, Fulton, CA 95439. Telephone 707-523-1001, fax 707-523-1001, CompuServe 75755, 737. This four-pager is published 50 times a year by Chod Harris, VP2ML. DXpedition news, what's hot by country name, contest and propagation information, and "heard on the air" are regular features.

DX News Sheet, Lambda House, Cranborne Road, Potters Bar, Hertfordshire EN6 3JE, England. This weekly newsletter is jampacked with information covering what's new (by prefix), a DX calendar, ragchew (conventions, etc), Islands on the Air, QSL Roundup and what's been heard on the bands is timely and interesting. Write for subscription rates.

QRZ DX, PO Box 832205, Richardson, TX 75083; Telex 6502629526, MCI mail 262-9526, fax 214-238-9466. Bob Winn, W5KNE, edits this weekly paper loaded with "DX Tips for Big Guns and Little Pistols." The latest "hot news" on upcoming DXpeditions and operations is available, with excellent background provided by Winn (a recent issue discussed Malpelo flora and fauna). DX-tras fill in information on new DX operating aids, who's been heard on the various bands (call signs, frequencies, times) and extracts from *KH6BZF Reports*.

Long Skip, a monthly publication of the Canadian DX Association (administered by the Toronto DX Club), is edited by John Sklepkowycz, VE3IPR. Canad-X, Box 717, Station "Q," Toronto, ON Canada M4T 2N7. The November issue, for example, contains 24 pages, a short, amusing quiz and lots of interesting DX photos. The September issue carries a comprehensive presentation of the A51JS Bhutan operation by Jim Smith, VK9NS, complete with excellent photos.

The W6GO/K6HHD QSL Manager List, while not a newsletter *per se*, is a valuable tool. It's a computer listing of more than 5000 DX operators and their managers, published monthly by Jay and Jan O'Brien, Box 700, Rio Linda, CA 95673-0700. Three out of every ten of their subscribers have connected to a PacketCluster® node recently and are downloading *The GO List* from the DXBBS, making the listings timely.

CIRCUIT

☐ Al La Placa, W2WW, uses Whiskey Two Whiskey Whiskey as phonetics and got an interesting response from an FM5 who retorted "Please, no more whiskey or I'll pass out!"

☐ Routings: Send QSL cards for FO0BAG/FO0CRI via Richard Carbine, WB6UDS.

QSLs for PJ7/WY2W go via Rob Hummel, Box 92, S Deerfield, MA 01373.

Send QSL cards for VK2GFG/ZL0AAK/3D2CQ and WB4CCT/KH6 via Richard Marshall, WB4CCT.

Send QSLs for VK2KOH/3D2SM and N4QCJ/KH6 via Sharon Marshall, N4QCJ.

Michel Spelier, C56/ON7EH, says "be patient," his Gambia operation of last July will be confirmed.

If you need a card from HG3DXC, try again via Box 179, Paks, Hungary 7031.

QSL K9BQL/J6L and J6LNM via Jack Ekstrom, K9BQL, at his 1990 *Callbook* address.

UH8EA QSLs via Tony Miller, W5BWA, 5812 Hiawatha Dr, Alexandria, LA 71301.

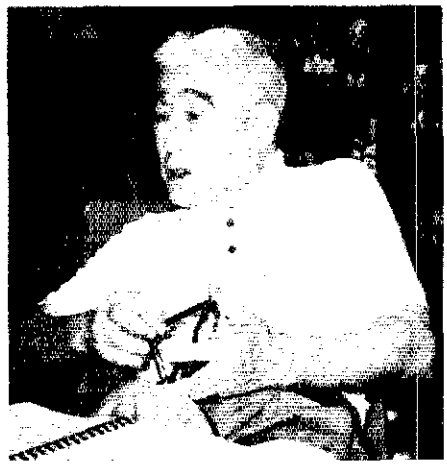
9J2AL QSLs sent via WD0HHM don't work; Garie Halstead, K8KFJ, asks if anyone has a better tip.

The International DX Association has DX and QSL information at 2330Z on 14236 kHz (without DX check-ins or lists). Membership information (SASE) is available from INDEXA, Box 607, Rock Hill, SC 29731.

☐ Bud Bane, W6WB, of San Francisco, the "living legend," was recently honored by the Northern California DX Club for his "pioneering in spark, 10 meters, DXing in the 20s and 30s, authorship of more than 200 articles, editor of the early *Radio Magazine* and penmanship of the first DX column."

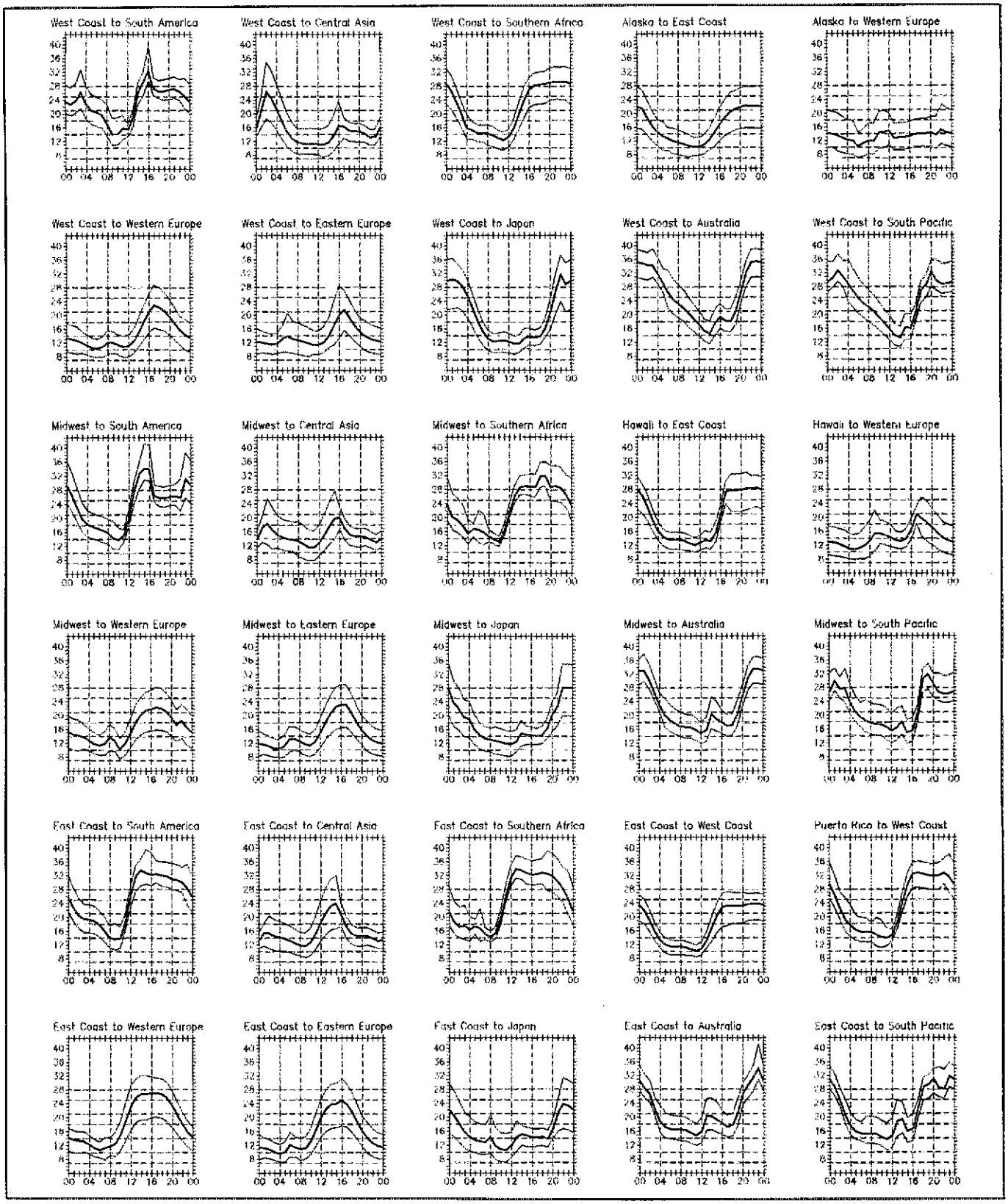
☐ VP8: South Sandwich/Georgia is "off" because of escalating fuel costs. 1991 is another possibility. This information comes from Gerald Branson, AA6BB. *(Thanks W8MAW)*

Valentin Makhalov, UF6DZ, is looking for a manager. He held UF6ABB in the late 1950s and has close to 200,000 contacts. Makhalov is 45 and likes his cards via Box 15, Tbilisi-2, 380002, Georgia, USSR. *(Thanks W6HCU)*



Taroh Yagi, JH1WIX, of Tokyo, is a true legend among OT DXers. (See Correspondence, Jan *QST*, p 52.) Yagi afforded super hospitality to Jim Armstrong, WB6EMR, during Armstrong's September visit to Japan, where he met with Kazuo Fukuda, JA1GUW, and Tomomi Terauchi, JG1GMM. *(WB6EMR photo)*

Jim Young, VK2JY, toured the US and visited with old-timer Prose Walker, W4BW. *(W4BW photo)*



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 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. Sunspot data is derived from *Solar Indices Bulletin*, National Geophysical Data Center (E/GC2), Boulder, Colorado. Curves are generated using IONCAP. These predictions, for February 16 to March 15, 1990, assume a smoothed sunspot number of 125, which corresponds to a smoothed 2800-MHz solar flux of 169.

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 DXCC Countries List. You may endorse your award in 25-country increments through 250, 10-country increments through 300, and 5-country increments above 300. The Satellite, 160 Meter, 80 Meter, and 40 Meter DXCC awards are endorseable in 10-country increments through 200, and 5-country increments above 200. Presently, there are a total of 324 current countries on the official ARRL DXCC Countries List. The totals shown below are exact credits given to DXCC members for new applications from June 1 to September 1, 1990, and for endorsements from June 1 to July 1, 1990. An SASE will bring you the rules and application forms for participation in the DXCC program. Send $1 to request the ARRL DXCC Countries List.

NEW MEMBERS

Mixed

BY4RSA/100
DJ5JI/261
DL2DBL/110
DL2ECI/108
DL5UF/149
DL8FM/246
EA3CYM/135
EA3FBO/145
F6EDW/238
FB1OMN/104
FE1MPS/106
GØAWA/231
GW3ARS/307
HB9ALO/308
HB9CMW/120
HB9DKV/154
HB9LI/102
HC2AI/106
HK4JSQ/128
HLØY/122
IKØEFR/197
JA1BGN/101
JA1MLV/227
JA1QCA/141
JE1GGI/322
JE1SBS/116
JG1XJI/192
JH1HDD/145
JK1AJX/114
JK1MRJ/105
JO1MQV/123
JQ1LSH/122
JA2TK/300
JF2PZH/114
JJ2HCM/168
JK2IXE/111
JA3WFQ/108
JE3GEL/110
JA4MRL/300
JE4HIH/243
JH4AAG/314
JA6CDA/323
JE7DOT/186
JR7RPW/120
JA8BTN/247
JA8FHM/261
JA9EAE/320
JAØBJY/107
JT1MTM/217
KP4AOD/218
KP4PX/109
LU3EX/101
NH4/NY6M/129
OE2LCM/208
OE6IMD/243
OH2BZY/304
OH2TI/331
OH5NUD/117
PY2KP/274
SM3SGP/161
UA3LAR/113
UA4RZ/322
UO4OR/210
VE2FRS/112
VE2WIL/136
VE3JPC/183
VE3KQS/124
VE4EF/155
VE4UT/157
VE6IC/106
VE7CQD/101
VE7FSB/101
VK3COR/102
XE1JRV/203
XE3XE/204
YU2TN/161
YU3NM/102
YU7AE/116
ZC4ZR/102
ZS6HZ/100
5B4/W6KG/102
5NØW6QL/100
9H3JM/105
K1MBF/100
K1MBQ/203
KA1IU/106
KA1PGU/122
KA1POP/102
KA1RUG/102
KC1CU/122
N1GRA/166
W1EHQ/112
W1EQG/103
WA1OVW/115
WA1QXR/106
K2KRI/102
K2MR/102
K2PBT/113
KB2XR/231
N2CWG/102
N2JFD/103
N2KOF/112
NS2T/102
W2ERJ/173
W2LCV/103
W2NEH/103
WB2DJL/127
WB2FCL/130
WB2QMP/194
WB2REM/204
WD2ADT/107
AG3G/118
K3TEJ/159
K3ZJ/109
KA3DOF/106
KA3OGL/163
KA3UHB/100
KQ3H/124
NK3O/122
WA3BAT/100
AB4ND/107
AB4PW/120
AB4VV/108
K4IKM/115
K4MF/301
KB4CRT/107
KB4IFS/105
KB4MIL/100
KC4GSD/144
KD4LP/102
KJ4LG/100
KK4DK/108
KM4EX/253
KM4ZO/130
KP4FBM/108
N4LIS/102
N4UKT/112
N4UMR/110
N4WP/180
NY4H/249
W4RQK/116
W4TYU/111
WA4JPT/109
WB4DSD/115
WD4CNZ/108
WD4GDZ/114
AA5CV/153
K5NA/342
KF5JN/107
KF5QR/111
KG5VK/108
N5KNN/115
N5MHZ/108
N5OGP/127
N5ORT/154
W5RJH/101
WA5VBE/108
WB5EUC/202
WB5RJK/116
WB5RUA/139
WU5S/110
AA6NP/205
K6DFF/149
K6ZX/322
KK6DU/103
N6EZF/105
N6RUH/102
W6NZX/301
WA6KAA/286
WA6VNO/261
WB6SXL/298
WD6GFF/281
AA7FL/105
K7FE/321
K7GB/182
K7LZJ/284
K7NHA/116
KE7KU/106
KF7PV/104
KK7A/107
N7BRW/104
N7NYO/108
NR7T/135
W7ACC/107
W7RK/106
WA7QCC/107
WB7OJV/137
WE7K/189
WJ7H/102
WS7I/102
WY7K/115
K8CV/176
K8YSE/302
KA8LAR/108
KB8S/234
KG8F/104
N8GFK/102
N8ILN/100
N8JQX/110
NQ8S/255
W8HTM/208
WA8LOW/107
WA8YPY/112
WB8TGY/100
WR8E/109
K9OSG/103
KA9ABC/205
KA9SSI/155
KA9UHW/109
KU9K/102
KX9O/210
N9IGP/122
W9LOC/110
W9LYA/123
WA9AWJ/100
WA9CVK/308
WA9PWP/132
WB9LQC/100
KØHOF/194
KAØGZS/109
KCØOC/142
KCØOS/145
KFØAD/110
KFØFN/129
KYØB/102
NØEJI/104
WØOIL/102
WØVKP/115
WRØU/104

Phone

CP5NU/156
CP6XE/119
DF7HX/109
DL5AX/115
EA2KL/303
F6FHA/173
FB1OMN/104
G4SSH/101
G4XRL/106
G4ZVT/110
GØAWA/231
GØKTN/100
GM4VBE/107
GW3ARS/306
HB9CYH/226
HB9DKV/153
HK4CYR/265
HL1IUA/166
HL9TB/131
I1UKM/291
I2YWR/201
I3SIV/140
I6XMT/109
IK1MJG/101
IK2EAE/106
IK2LRB/171
IK3FHO/173
IKØEFR/151
JA1MLV/222
JE1GGI/322
JG1UZD/118
JG1XJI/192
JK1MRJ/105
JA2KSI/312
JJ2HCM/168
JK2IXE/111
JK2PXQ/120
JA3WFQ/102
JE3GEL/110
JE4HIH/243
JH4AAG/304
JR5SWZ/135
JA6CDA/299
JE6LDS/129
JA7IPB/177
JE7DOT/182
JG7NDE/107
JA9EAE/313
JHØUFK/106
JT1MTM/120
KH6FKG/290
KP4AOD/218
LA3KY/105
LA4KGA/103
LA8RFA/125
LU6FAZ/216
OE2LCM/199
ON4AEY/126
OZ1CID/128
OZ1HAE/149
OZ1IWJ/120
OZ7OMR/113
PV8ML/124
SV9AHZ/150
TI2SAH/214
VE2WIL/136
VE3BAZ/100
VE3TJL/101
VE4EF/149
VE4GH/130
VE4UT/122
VE7DOG/101
VK3SX/280
XT2BX/120
YC2IAB/160
YC7BVY/108
YU2TN/103
YV3COK/139
YV6ACA/114
ZD8PJ/123
ZL1BJN/109
ZL2AAA/105
ZS6HO/102
4X4PG/110
9P9FF/108
9V1WK/106
K1JKS/261
K1MBQ/138
KA1PGU/122
N1CWA/277
N1DGC/120
N1GRA/166
NJ1Q/104
NZ1R/105
W1DU/131
W1VDI/101
W1WTG/202
WA1QXR/106
WF1Q/154
K2HPG/137
K2QZ/113
KA2DTG/100
KB2AR/141
KD2KC/129
KD2UC/100
KP2/VS6CT/117
N2DWR/102
NS2W/216
W2ERJ/129
WA2TQM/103
WB2GJE/101
WB2GOK/318
WB2QMP/194
WO2T/176
K3ZJ/101
KQ3H/104
NY3Y/104
W3BWU/208
W3ENL/170
WB3CMH/100
AA4VN/151
AB4JY/150
AB4TS/107
K4MF/144
K4XI/307
KB4UZN/165
KC4GSD/144
KC4MJ/103
KE4BM/108
KK4RV/114
KM4EX/249
N4EHL/110
N4NRA/166
N4UMR/110
N4VEL/141
N4VRR/108
W4UXI/234
WA4CQX/102
WA4JPT/107
WB4DSD/115
AA5CV/100
AA5NT/100
K5NA/332
W5CCP/322
W5CJV/101
W5CYF/102
W5IFJ/160
WA5YKO/255
WB5EUC/200
WB5NXH/250
WB5RUA/139
WJ5D/170
KC6ESL/119
KF6E/100
KK6DR/110
N6LFJ/105
N6PTI/182
W6YAR/125
WA6VNO/251
WB6VPG/102
K7GB/140
KF7PV/104
N7NYO/108
WA7QCC/102
WE7K/157
AJ8B/111
K8YSE/301
KB8S/225
KB8VZ/119
KX8G/288
N8ABW/111
N8AGU/156
N8JQX/110
N8LGP/110
WA8LOW/103
WA8MEM/215
WB8TGY/100
WT8S/270
K9OIM/101
KA9JNL/202
KD9PB/110
KE9QL/152
KE9TI/116
KX9O/210
N9IGP/121
N9IWL/121
NX9P/110
W9LYA/123
WA9CVK/308
WA9JMX/177
KØDIX/118
KAØJPM/125
KEØAH/102
KEØWJ/110
KFØFN/129
NØALC/123
NØGLQ/113
NØHWY/123
WØVGA/100
WØVKP/109
WAØQOA/120
WGØO/164

CW

DJ5GG/228
DL3DV/106
EA1AUI/112
FE1MAE/105
G3LZK/175
G4ZVJ/109
GWØFJT/104
HA5AWT/126
HB9AKB/136
HB9CMW/104
HB9DAX/156
IKØEFR/151
JA1QCA/111
JA1WYQ/221
JE1GGI/322
JE1SBS/115
JG1UZD/119
JH1HDD/134
JK1AJX/110
JO1MQV/123
JR1WGW/105
JR1WHI/147
JA2EJI/216
JA2IIT/134
JA4MRL/300
JA5CKD/110
JE7JZT/127
JA9EAE/194
JT1MTM/105
KH6JOI/101
LAØCX/260
OE6IMD/239
OH2BZY/304
OH2DW/255
OZ3FC/151
OZ7UC/106
PA3ABH/186
SM3SGP/149
SM5LBR/108
SV2AVP/110
VE3ICR/316
VE3PYA/120
VE6IC/104
VK7DQ/105
YU2TN/114
K1JKS/191
K1TNF/110
KA1ERL/119
N1CWA/221
NG1J/104
NX1L/227
K2PBT/102
K2WT/150
KC2KU/141
KQ2K/198
W2ERJ/121
WA2AXD/112
WA2AXJ/111
WB2GOK/302
WB2NRX/108
WO2N/111
AG3G/102
KB3X/127
W3MUM/114
WA3YRI/100
AA4GA/108
AA4VN/135
AB4FO/100
K4IKM/103
KM4FI/110
NY4H/230
W4LRE/161
W4TYU/111
W4UXI/201
WB4UPB/108
K5NA/314
KC5P/159
N5NXH/127
WU5S/108
AA6WJ/100
K6UO/100
K6ZX/305
KE6HV/108
KJ6GR/181
N6LUY/102
WA6AJB/121
WA6JCD/107
AC7A/106
KF7PG/108
NY7T/129
W7LQM/100
N8FVC/135
WA8MEM/133
WA8N/111
NY9C/107
WA9AKT/108
WA9CDY/119
KBØVO/100
KFØAD/108
WØIF/124
WAØQOA/128
WYØO/237

RTTY

SM6APB/112
AB4PY/102

SATELLITE

W4EEE/100
W5AU/102
KCØO/103
WØY/100

160 Meters

SM6CVX/101

80 Meters

G4BWP/108
JE1CTA/102
JA2EJI/112
JA3FYC/106
WL7E/109
SM6CCO/106
UA3AGW/125
VE3XN/168
YO3CD/163
KA1CB/108
NX1L/100
W1MK/103
WA1WTP/105
K2CL/139
K2IUK/102
K3PA/103
K4IQJ/120
NF5Z/108
K6DT/156
W6BCQ/100
WB7EWC/146
K8YSE/128

40 Meters

G4BWP/111
HI8LC/107
HJ3MCM/156
HL1IUA/166
JE1CTA/107
JA2EJI/150
JA3CMD/158
JA3FYC/307
JE7BQR/215
JI1PGO/129
KL7AF/149
WL7E/104
OE6IMD/111
OK3EA/185
SM6CCO/104
YCØDB/106
YCØMCA/107
YO3CD/227
KA1CB/122
WA1WTP/113
K2RIH/110
W3FX/107
N4ZQ/102
W4VOS/111
K6DT/213
W6GN/104
K8YSE/118
WA8MEM/117

10 Meters

CE3GDN/102
DH2PAH/159
DJ7AX/101
FB1OMN/104
G4BWP/109
JA1QCA/113
JA3FYC/128
JA6BMR/209
JF7GTL/108
JH8WXF/106
JI1HNJ/218
OE6IMD/170
OK3EA/216
SM6CCO/105
SM7DXQ/207
SMØKCR/122
VE3DIT/105
YO3CD/172
AB1U/120
KA1OKY/109
KA1PGU/122
KA1TFU/136
N1CVG/109
N1FNN/103
N1GRA/165
W1BYH/113
W1MK/108
WA1ZNT/143
K2RIH/130
KB2HQE/124
KD2BW/112
N2DWR/100
N2HIG/122
N2IGW/101
W2OMV/125
KB3X/134
N3GBM/100
W3KHQ/110
WB3JRU/105
KA4TMJ/165
KB4UZN/140
KC4DCL/113
KC4GSD/135
KC4MJ/103
N4VWP/131
W4KHL/178
W4VOS/137
WB4BMM/102
WB4UBS/102
WN4DXL/108
AA5GY/104
N5LFH/106
N5ORT/153
N5OUE/165
W5PKE/113
WA5YKO/126
WB5KYK/106
K6DT/273
K6QPZ/117
KC6CEM/106
KC6ESL/119
N6WQG/103
N7NYO/108
WL7E/109
K8WKZ/114
K8YSE/169
KB8S/150
KE8MK/107
N8DAQ/110
N8GFI/103
N8JHJ/102
WA8MEM/126
KA9KTY/102
WD9ERO/106
K8IYF/123
KØRW/108
NØHWY/122
WAØQIT/133

6 Meters

JA1BK/101

5BDXCC

W5PAQ
KB9LN
WB5ZKR
HC1H
NI2B
WB4OSN
LA5LT
HB9ATM
LA1K
IKØOL
JE1CTA
G4ZYQ
GW4UZL
WL7E
N8HTT
NY2A
WA2IZN

NEW HONOR ROLL MEMBERS

Mixed

317

OK3EA/349
VE7DFW/322
K5CSK/326

316

JA1QOP/319
W1WEF/320
W2NY/324
AK5B/320
K8UE/320
NJØC/321

315

JA9NLE/317
JH9AUB/315
W1ENE/340
K2EYJ/320
WA2UXC/320
W5BOS/336

Phone

320

JA1DM/348

317

KA5V/322
W6BJI/334
WB7CLU/322

315

K2EYJ/320
WA2UXC/320
W8QWI/319

CW

318

JA2EIV/323

ENDORSEMENTS

Mixed

CT4NQ/151
CX4CR/334
DF1DB/325
DF3UB/275
DJ3AS/284
DJ4PT/337
DK5AD/322
DK7XX/270
DL1RB/328
DL2SCQ/252
DL7EN/364
DL9NC/338
DL9OH/360
DL9TJ/320
DLØJK/271
EI2GS/234
F3CY/226
F5LQ/338
F6CLH/225
F6CXJ/235
F6DZU/322
FE6IFF/250
F9RM/358
G2FSP/360
G3EFS/266
G3UKH/175
G3UML/346
G4FEU/318
G5LP/209
GM3ITN/357
GM4SVM/125
HA5NK/272
HA8UB/281
HB9AHA/343
HB9AQA/324
HB9PL/357
HC1H/298
HC1MD/315
HL9EP/225
I1BRB/253
I2VDX/324
I5FLN/338
I8AAJ/346
I8IYW/273
I8NHJ/201
IK8BQE/306
IK8JWA/227
J87CF/132
JA1ADN/353
JA1DM/364
JE1CTA/287
JH1HLQ/330
JH1IED/311
JH1ROJ/299
JR1TNE/328
JA2AH/338
JA2BL/345
JA2CXK/311
JA2EIV/333
JA3AAW/340
JA3DM/273
JA3EMU/333
JA3UCO/288
JA4AFT/339
JA4VAD/324
JA4XH/303
JA4ZA/350
JA5ALE/317
JA7AER/222
JA7IL/330
JA7IPB/178
JH7QXJ/274
JA8CAQ/308
JA8JN/310
JHØLME/150
KH6IJ/365
WL7E/298
LA1K/353
LA1ND/292
LA3XI/333
LA7AFA/293
LA9FFA/230
LU6DJX/373
OE2BZL/203
OE2YGM/256
OE6MKG/332
OH2BGD/338
OH2BH/349
OH2NB/369
OH2QV/353
OH2VZ/343
OK1ADM/354
OK1AWH/254
ON6BC/327
OZ1CTK/324
OZ4RT/356
OZ5PA/282
PAØOI/276
PT2VE/299
PY2PE/349
PY2YP/310
SM6CST/337
SM7BIP/338
SMØMC/325
SMØNFA/137
VE1KG/341
VE1XT/306
VE2DWH/283
VE2QO/288
VE3BHZ/323
VE3BX/345
VE3CUI/225
VE3HO/327
VE3JGC/290
VE3MV/320
VE3NE/344
VE3OMM/153
VE3WT/351
VE7BD/336
VE7DX/325
VE7EW/267
VE7IG/343
XE1OW/307
XE1VV/303
XE2LV/178
YU1EXY/338
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4X1IL/287
4X4JO/289
AD1S/317
AF1U/308
K1AN/300
K1BV/336
K1DRN/347
K1ZZI/291
KA1CLV/226
KA1MX/262
KA1Z/123
KB1HY/300
KC1AQ/296
KC1LA/178
N1CPC/270
N1FNN/178
NJ1Q/127
NS1W/204
NT1I/254
W1AX/371
W1BIH/371
W1DK/366
W1ECH/321
W1GKK/375
W1GME/354
W1JZ/341
W1MIJ/355
W1OHA/347
W1UU/354
W1YRC/342
WB1CCH/302
WB1GBU/287
WB1J/291
K2BS/350
K2MK/126
KC2OL/175
KC2QF/312
KM2V/336
KU2V/159
KW2P/329
N2BAT/303
NY2A/301
W2AG/368
W2AGW/373
W2BOK/365
W2FG/344
W2FR/340
W2MJ/358
W2NCG/253
W2OB/318
W2QHH/368
W2TA/330
WA2FUE/290
WA2MUA/252
WB2EBS/201
WB2JZK/240
AG3S/251
K3UA/328
KC3WY/152
NR3Y/290
NX3A/172
W3DJZ/354
W3HCW/307
W3SAI/182
W3SOH/330
W3UJ/319
WA3EEA/250
WB3LFD/131
WB3LHD/235
AA4H/319
AB4N/295
AB4QN/257
AB4PB/207

AB4RI/149
AE4Z/330
K4ASF/208
K4CEB/343
K4FCT/331
KA4UPI/254
KC4HN/252
KC4XA/152
KC4ZH/301
KD4LB/225
KJ4MD/285
KK4PI/124
KK4YA/227
KZ4V/306
N4BQD/302
N4EM/192
N4JGI/150
N4MM/344
N4QN/127
N4XX/330
W4AIT/372
W4BQY/369
W4DZZ/323
W4EEE/364
W4FQT/270
W4GTS/344
W4IF/360
W4KHL/286
W4OMQ/345
W4OVU/308
W4PEW/203
W4ROM/280
W4USW/290
W4WSZ/276
WA4AFE/243
WA4WIP/347
WA4WTG/328
WB4NXG/158
WC4B/310
WD4IBO/232
WD4REX/175
AA5DX/290
AA5MH/314
AB5C/298
K5ABW/316
K5BZU/331
K5DK/190
K5DX/362
K5GKC/304
K5GL/316
K5KX/335
K5NV/315
K5PZ/272
K5RE/323
K5SSB/310
K5UC/369
K5XI/277
K5YY/348
KA5V/322
KC5NY/276
KD5MD/310
KE5BK/223
KE5OD/251
KF5AL/297
KF5DX/299
N5AR/350
N5DRV/228
N5ORT/175
N5TC/320
NA5U/305
NJ5N/290
NR5Q/247
NX5B/313
W5AH/258
W5AWT/328
W5CPI/335
W5EFA/325
W5IO/367
W5IZ/344
W5KGX/364
W5NDK/185
W5PLN/314
W5XX/325
WA5CMI/248
WA5YON/254
WC5P/311
WD5F/300
WI5A/321
WK5I/306
WN5MBS/269
WV5K/275
WW5L/205
WY5Q/275
K6DG/300
K6RF/357
K6UFT/333
K6UO/206
K6YB/152
K6ZH/261
KA6A/297
KA6DXY/295
KD6GC/227
KG6I/208
KG6JW/256
KJ6NZ/276
KM6K/309
KR6Q/360
N6FX/355
N6IXX/283
N6NBB/249
N6UC/339
NB6L/318
NE6I/293
W6BJI/338
W6CSI/296
W6CTL/325
W6EUF/348
W6GMF/355
W6HIB/227
W6JRY/336
W6KH/361
W6MFC/320
W6MI/346
W6MUR/361
W6QNM/358
W6REH/354
W6SUN/320
W6YA/354
WA6GFE/346
WA6WZO/327
WB6CUA/325
WB6ZUC/329
WK6E/335
K7APT/128
K7LJQ/308
K7NO/326
K7OXB/334
K7SP/328
KO7V/253
N7DDK/253
N7EB/361
N7EMY/200
N7OT/314
NV7J/265
W7CG/365
W7FY/293
W7IR/368
W7JFQ/342
W7KSG/337
W7OC/300
W7OF/366
WA7TNE/202
WB7CLU/322
AC8K/334
K8AJK/295
K8EJ/347
KC8MK/290
NR8Z/177
NY8E/185
W8ILC/344
W8JBI/367
W8KPL/365
W8KZM/230
W8LKH/368
W8OK/359
W8PR/350
W8QGP/201
W8QWI/343
W8RCM/343
W8RT/367
W8ZCQ/361
WA8SAE/309
WA8Y/281
WB8YJF/227
K9CJK/348
KA9VRA/233
KE9A/313
KG9Z/310
KJ9I/312
KO9Y/297
KR9F/306
N9EJL/290
N9GK/326
N9ZN/352
NC9T/288
W9DE/336
W9DWQ/362
W9DY/361
W9GGO/213
W9GIL/366
W9GSB/312
W9HK/356
W9IT/338
W9IVB/210
W9NT/257
W9OCL/322
W9RCJ/361
WA9TBA/235
WB9WHQ/175
WB9YXY/324
WF9K/231
AI0O/313
K0BUR/344
K0DEQ/301
K0GSV/331
K0IEA/337
K0VRW/318
K0VZR/305
N0IWL/236
NT0W/292
W0BWJ/259

Phone

DF1DB/325
DF7QD/290
DJ3AS/251
DJ6VM/336
DJ9ZB/337
DK5AD/306
DL2SCQ/236
DL9DY/336
DL9OH/360
DL9TJ/183
DL0JK/250
EA4JL/341
EA8JJ/336
EI2GS/211
F3EJ/255
F6DLM/324
F6DZU/321
F6GVD/276
F9RM/358
G3UML/345
G3ZBA/337
G4XTA/216
G4YRR/259
G4ZYQ/284
HA8UB/171
HB9AHA/339
I5FLN/338
I7IJU/210
I8AA/346
IK1LAI/253
IK2ECN/280
IK8BMW/290
IK8BQE/305
IK8HVH/273
IK8JWA/227
IT9LYF/256
IX1BZO/150
J87CF/130
JA1ADN/345
JE1CTA/251
JH1HLQ/328
JH1IED/308
JH1ROJ/293
JA2AH/335
JA2CXK/308
JA4AFT/337
JA4VAD/311
JA4XH/286
JA4ZA/347
JA7AER/222
JA7IL/330
JH7QXJ/269
JA8JN/261
JA9NLE/303
WL7E/284
LA1XDA/218
LA3XI/333
LU1JDL/284
OE2BZL/177
OE2YGM/211
OH2BGD/254
OH2VZ/281
OK1ADM/347
OK3EA/276
OZ3FC/304
OZ3WK/332
PY2PE/349
SM5CCH/280
SM6CST/318
SM0MC/315
SM0SMK/206
TI2HP/371
VE1XT/301
VE3BIF/275
VE3BX/333
VE3EGO/251
VE3HO/326
VE3MR/351
VE3MRS/324
VE3MV/320
VE3NE/345
VE3WT/350
VE5AEC/285
VE7DX/323
VE7EW/267
XE1J/331
XE1JRV/203
XE1OW/307
XE1VV/302
ZL1BOQ/301
ZL1HY/371
ZL3MS/347
ZP5CF/363
ZS4NS/151
4X1IL/281
AD1S/314
AF1U/293
K1DRN/347
KA1CLV/188
KB1CD/302
KB1CQ/225
KC1AG/296
KC1LA/176
N1BUA/131
N1GRM/175
NS1W/202
W1AX/349
W1BAL/282
W1BIH/349
W1GKI/359
W1VKQ/324
W1VXV/174
W1WAI/274
W1WKO/281
W1YRC/309
WB1J/272
WB1Q/277
K2BQW/249
K2EWB/310
KB2DE/262
KC2OL/175
KC2QF/289
KD2LM/247
KM2V/334
N2BAT/299
NY2A/298
W2FG/340
W2OB/271
WA2MUA/232
WA2VJL/200
WB2EZU/300
WO2N/149
K3AYK/221
N3EHD/286
W3DJZ/352
W3DR/292
W3HCW/307
W3YEY/253
W3YHR/300
WA3BKG/125
AA5MH/303
AE4Z/322
AK4T/312
KC4HN/218
KC4ZH/301
KD4LB/215
KE4SN/249
KI4ZN/244
KJ4MD/280
KK4YA/214
KM4ZM/209
KZ4V/303
N4CSF/270
N4JOS/290
N4MM/339
N4PFO/205
N4XR/127
N4XX/325
W4BQY/335
W4DZZ/301
W4EEE/364
W4KHL/286
W4MXD/235
W4NYN/347
W4PEW/202
W4TMN/202
WA4WIP/347
WB4NXG/158
AA5GY/131
K5DX/357
K5GKC/301
K5HT/301
K5OVC/338
K5RE/323
K5SSB/304
K5UC/363
K5XI/276
K5YY/344
KB5RF/310
KC5UO/311
KD5DR/298
KD5ZD/152
KE5BK/200
KE5JE/277
KF5CA/161
KF5CU/278
KF5DX/296
N5JEB/178
NK5Y/310
NT5C/293
W5ADH/250
W5BPT/319
W5EFA/325
W5GVP/291
W5ILR/271
W5IO/366
W5LLU/306
W5MUA/203
WA5LOB/325
WB5EXT/230
WB5TED/321
WC5O/284
WK5I/290
WN5MBS/269
WY5H/153
K6DG/300
K6RF/340
KE6KT/202
KM6K/295
N6JQL/229
N6UC/339
W5KGX/360
W6EUF/347
W6MFC/317
W6REH/350
WA6WZO/327
WK6E/269
K7LJQ/308
K7NO/301
K7OXB/329
K7SP/326
KB7TQ/304
KC7TO/312
KC7WO/287
N7AXW/137
N7OT/277
NV7J/261
NZ7D/292
W7JFO/342
W7LJJ/163
W7UPF/344
WB7WQE/298
WW7D/175
K8AJK/253
K8WWA/305
NA8C/177
NR8Z/170
W8ILC/338
W8JBI/356
W8KST/341
W8KZM/132
W8PR/339
W8QGP/203
W8RT/346
WD8MRC/276
AB9O/320
AI9U/300
KB9ANR/271
KB9LN/292
KE9QW/200
KO9Y/228
KR9F/294
KS9R/314
W9DE/320
W9DWQ/351
W9IVB/192
W9WHM/366
W9ZTL/277
K0BUR/344
K0DEQ/229
K0GSV/321
K0VZR/303
W0BWJ/259

CW

CT4NQ/151
DJ2GW/276
DK5AD/308
DK7XX/266
DL1HBT/232
DL2SCQ/142
DL8AN/323
DL9TJ/274
EA7CIW/214
F3SG/126
G5LP/136
GI4WYU/133
HA8UB/265
HB9BWB/126
I2IWM/267
IK8HVH/150
IT9VDQ/300
JE1CTA/259
JA3ARM/175
JA7IL/306
JA8CAQ/305
JH9AUB/284
KA1CLV/206
WL7E/271
LA3XI/316
LA7AFA/281
OE2BZL/157
OH4OJ/280
OK3EA/275
OZ1CTK/321
OZ5PA/252
SM6CST/321
SM9NFA/127
VE7DX/289
VE3BX/317
VE3CKF/320
VE3HO/303
VE3OMM/150
YB4FNN/202
KX1T/176
NX1L/252
W1WAI/281
WA1ZIC/168
K2OWE/305
KC2QF/263
W2OB/267
WA2MUA/168
K3UA/321
N3BQS/152
W3NB/223
K4CEB/316
KC4HN/252
KZ4V/302
N4MM/320
N4RJ/325
W4BQY/282
W4DZZ/257
AA5DS/197
AA5MH/293
AK5B/305
K5YY/316
N5DRV/153
N5TC/285
NT5G/277
W5PLN/305
WD5F/282
WK5I/205
WY5Q/237
KA6A/285
NE6I/259
W6CTL/257
W6FAH/200
W6HIB/226
WB6ZUC/319
WK6E/287
K7NO/285
K7SP/287
KO7V/228
KS7P/266
WA7HCE/234
KJ8G/300
W8JBI/308
W8PR/304
W8RT/321
W8ZCQ/316
WA8SAE/304
WB8YJF/227
AB9O/305
KR9F/276
W8QWI/317
W9DE/280
W9DWQ/323
W9GXR/135
W9IT/304
K0VZR/253
N0HRK/201

RTTY

CT1AUR/181
I5FLN/303
I8AA/293
N2BAT/167
W2FG/253
WA3IKK/205
WA4WIP/251
W8GKM/174

SATELLITE

DC8TS/112
VE6LQ/100

160 Meters

GM3ITN/118
K1MEM/198
W1AX/130
N4MM/110
K7SP/119
W7MB/121
KJ9I/161

80 Meters

DL9TJ/127
VE7DX/200
W3AP/241
KZ4V/181
K7SP/155
W8ZV/288

40 Meters

DL9TJ/194
GM3ITN/278
VE7DX/228
K3UA/268
KZ4V/254
N4MM/231
N4XR/186
AA5MH/162
K5AQ/226
K7SP/192

10 Meters

DL9TJ/171
F3AT/268
JE1CTA/217
JH1IED/277
VE3JFQ/125
VE7DX/184
W1AX/251
WA1G/150
N2BAT/207
K3UA/278
W3AP/291
KZ4V/263
N4MM/310
N4XR/209
AA5MH/228
K5AQ/267
KE6KT/151
W6CTL/183
WB6PSY/305
K7NN/188
K7SP/208
NZ7Q/135
WA9BDX/151
K0DEQ/221
W0IKD/174

6 Meters

K5FF/111
W5FF/111

DXCC NOTES

Honor Roll Listing Corrections: Mixed—K8OHG 350/321, NY5F 356/323, W1BL 326/318, W4FNS 330/314, W4YKH 329/314, DL7FT 349/323, JA3CDM 329/320, JA3AAW 337/315, JA7BJS 325/317; Phone—W5UAW 343/322, W8EVZ 345/319, W6ARJ 339/320, K6IR 334/320, W0IZ 321/316, F6RU 342/323, W6IJB 320/315, W6DL 354/318, WA3CGE 324/315, JA2AH 334/317; CW—K2FL 323/318. Other Corrections: Mixed—I8TQH/294; Phone—I8TQH/294.

Strays

I would like to get in touch with...

☐ amateurs interested in tarot, witchcraft, wicca and other facets of the occult. Charles E. Martin, AB4Y, 7103 Shawnee Way, Reynoldsburg, OH 43068-5126.

☐ anyone who has a program for an Apple III computer to run packet and other modes. Paul Sauer, K4ZC, 9353 Chase St, Springhill, FL 34606.

☐ anyone who knows what to do about a frequency shift of about 300-400 Hz that occurs randomly in my Yaesu FT-101EE transceiver. Cecil Van Buren, W5LWG, 1007 SW 4th, Checotah, OK 74426.

☐ anyone interested in tinkering with ULF gear. Some published studies suggest that 0.5-10 Hz signals may precede earthquakes. I'm trying to find good ideas for monitoring equipment, antennas and ways to cancel out man-made noise. Vince Migliore, N6UMC, 1525 Peterson Ln, Santa Rosa, CA 95403.

☐ anyone who has ever owned a Collins KW-1 transmitter. I'm compiling a serial-number listing, showing where they are and who has them. Roy Pollitt, KD4HC, PO Box 308, Prince George, VA 23875, tel 1-800-451-1514.

☐ young hams, age 15 or so, especially on packet. Travis Wise, KB8FOU, 1421 Grace Ave, San Jose, CA 95125. KB8FOU @ N6IIU. #NOCAL.CA.USA.NA.

☐ anyone interested in starting an environmental awareness net in the US and worldwide. Robert Wilderman, K3SRO, 19 Glen Rd, Lansdale, PA 19446-1405.

☐ any ham who's a member of the Junior Order of United American Mechanics (JOUAM). Allen L. Smith, W4IPP, 714 S Main St, Lexington, NC 27292.

☐ anyone who served aboard a US Navy PB4Y-2 Privateer long-range patrol bomber in WWII. James "Sparky" Summers, W5MVP, PO Box 406, Mt Hermon, CA 95041.

RECYCLE SK QSLS

If you know someone who has become a Silent Key and you need to dispose of their QSL card collection, the Q2DS Silent Key QSL disposition service distributes them to children and senior citizens to enjoy. Before sending cards, send a QSL card or postcard advising how many cards you wish to send. You pay postage/shipping. For details, write to Bill Wellborn, K4CLA, Q2DS, 562 Oak Dr, Lexington, SC 29073-9059.

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

Using Packet to Process Radiogram Traffic

By Tom Comstock, N5TC, ARRL West Gulf Division Director

Shortly after Hank Oredson, WØRLI, designed his original software for packet bulletin boards (PBBSs), he included provisions for handling messages in the ARRL Radiogram format. Other PBBS software has this capability. It's fortunate that this capability is available, because packet is an exellent means of handling traffic, particularly during emergencies.

What is Radiogram Traffic?

A radiogram is a message written in a particular format, processed by the PBBS software in a special way. This procedure permits timely, efficient and accurate dissemination of messages using a standardized method of preparing, entering and retrieving them.

Why Should I Use It?

Years ago, military operators discovered that the only way to accurately send messages, particularly by radio, was to use standard procedures. The ARRL National Traffic System (NTS) was founded on this concept and the procedures used by the NTS are similar to those used by the military. Countless emergencies have proven that a standardized message format and agreed-upon procedures for handling those messages are essential for timely and accurate dissemination.

ARRL RADIOGRAM FORMAT

NR 1 R HXG W1AW 8 Newington CT 1830Z July 1
a b c d e f g h
DONALD SMITH
164 EAST SIXTH AVE
NORTH EASTHAM MA 02651
508 255 4567 BT
HELLO DON X SEE YOU SOON X LOVE BT
DIANA

Explanation

Preamble:

- *a* The number of the message (assigned by the station that originates it). This number never changes as the message moves from station to station.
- *b* Precedence of message (R = Routine, W = Welfare, P = Priority or EMERGENCY, which is always spelled out).
- *c* Handling instructions (optional).
- *d* Station of origin (first amateur handler).
- *e* Check (number of words in text, between the BTs).
- *f* Place of origin.
- *g* Time filed (optional).
- *h* Date filed.

The address must be as complete as possible. Include ZIP codes and telephone numbers with area codes.

The text is the content of the message and is normally limited to 25 words or less. The character "X" goes where you'd normally place a period. Xs count as words when calculating the Check (*e* above).

The ARRL radiogram concludes with the sender's signature.

Use this exact format when preparing a message for entry on a PBBS. We're not being dictatorial in asking you to use this format; it has important advantages:

1) Computers don't care what format a message is in. Sooner or later, however, someone must take the message from the PBBS and do something with it. Many times, this process involves relaying the message by CW, voice, AMTOR or RTTY. Experience has shown that humans receive information more quickly and accurately if they know what's coming. This also explains the need to keep all punctuation out of NTS messages; put yourself in the shoes of a CW, AMTOR or RTTY traffic handler who suddenly comes across the "at" symbol (@) in the preamble of an NTS message!

2) If the message is in radiogram format and the person receiving it needs to enter it into "normal" NTS channels (CW, voice, RTTY or AMTOR, for example), he can do so easily. For example, suppose I wanted to relay a message from a packet BBS using AMTOR. I could download the message into my computer, hook up with the station that was to receive it on AMTOR and upload it to that station. With slight modification of the message, I could do the same thing on CW. Having the message in the proper format saves considerable time on voice, too.

Entering a Message on a PBBS

Although there are several ways to enter radiograms on a packet BBS, the following procedure is recommended:

I want to send the message described previously to Donald Smith. After logging onto the PBBS, I type:

ST 02651 @ NTSMA (Enter)

Packet—The Good, the Bad and the (Sometimes) Ugly

ARRL HQ would like to remind all amateurs equipped with packet radio equipment that the need to clear local packet bulletin boards of formal radiogram traffic is—in many areas—severe.

As the accompanying article states, typing **LT** on most full-service PBBSs will give you a listing of the formal message traffic. You're encouraged to do so often, as well as removing (**KT**) any that you are taking responsibility for.

Why is this need so critical? Let's take an example from Newington, Connecticut. This week I noticed yet another new PBBS that had popped up on 2 meters. I logged on, entered **LT**, and sure enough, there were two messages that had been sitting for six days without being forwarded to their destination states.

I reminded the SysOp, via a message, that there are certain responsibilities in running a PBBS, including the necessity of ensuring adequate forwarding files for traffic going out of the area. But it also struck me that the problems of the packet system could be ameliorated if the traffic-handling people and the PBBS management folks would work together more closely. Many do, of course. Indeed, the guidelines for each ARRL Section Traffic Manager clearly include the assigning of "liaison coverage adequate to insure that all digital bulletin boards and message storage systems within the section are polled on a daily basis, to prevent misaddressed, lingering, or duplicated radiogram-formatted message traffic."

There are a number of PBBSs and MSOs out there with SysOps devoted to the immediate clearing of message traffic. My hat's off to these people and to the systems they run.

Let's all do our part to keep a clear understanding of the purpose and basis of the Amateur Radio service. A glance at the rules under which we operate should alert every amateur that the first purpose stated by the FCC involves "service to the public." Handling formal message traffic and actual Amateur Radio public service communications are ways we can continue to make that purpose viable. Let's work together to make it happen—for the public and for ourselves.—*Luck Hurder, KY1T*

This command tells the PBBS that I want to send a formal NTS message (Send Traffic) in the NTS format to ZIP code 02651 in Massachusetts.

The PBBS responds:

SUBJECT:

(Some PBBSs will say "TITLE" or something similar)

I type:

Eastham MA 508/255

This is the area code and prefix of the telephone number. It gives those looking for traffic later a clearer idea of whether the message is in their delivery area)

The PBBS responds with:

MESSAGE: (or "TEXT")

I type in the message (using proper format) ending the message with **Ctrl-Z** or **/EX**. Then, to see if the message was received by the PBBS as I intended, I can type **L> 02651**, meaning "please list for me any messages addressed to 02651." The PBBS will respond with something similar to the following:

MSG #	TR	SIZE	TO	FROM	DATE	TITLE
19000	TN	500	00789	N5TC	011830	Eastham MA 508/255

If I want to read my message, I type:

R 19000, and the PBBS will repeat it on my screen.

How to Receive Radiogram Traffic

A quick way to find out if a PBBS has any NTS-formatted messages without having to list everything on it is to type **LT** (List Traffic). The PBBS will then list all "T" messages. This feature is particularly valuable to regular NTS operators who scan PBBSs routinely to find traffic they can move.

To read a particular message, type **R [message number].** If you want to accept the message for delivery or further relay, type **KT [message number]** (Kill Traffic). The PBBS will then delete the entry from its list of radiograms. You, of course, are now obligated to promptly deliver or relay the message.

One of the primary goals of Amateur Radio is public service. During emergencies, we're invariably asked to process messages. The best way to accomplish this important task is by using a standardized system of preparing and handling messages. The NTS method does that for us.

The best way to be ready for an emergency is to practice. The way to practice is to follow the procedures you would use in an emergency. If you routinely process traffic on packet BBSs as I've described above, you'll not only enhance your own ability to be of service during an emergency situation, but you'll increase the capability of the system itself.

Please see Field Organization Reports on next page.

Club Spectrum

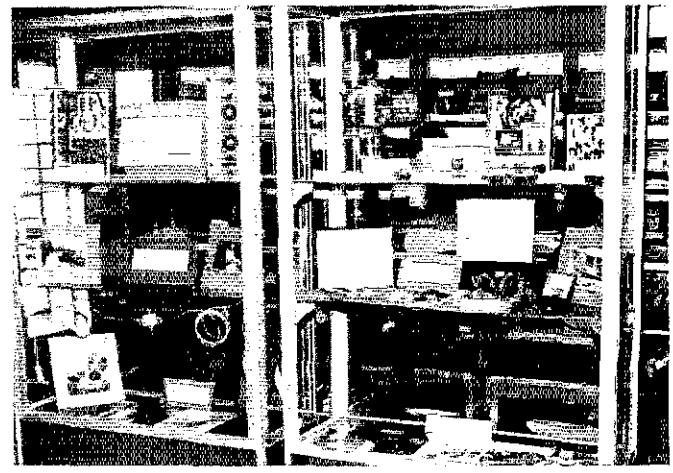
Conducted By Rick Palm, K1CE
Field Services Manager, ARRL

The Library Set

To encourage clubs to donate Amateur Radio publications to local libraries, the League makes available a special "Library Set" at a reduced rate of $120. The set includes the League's most popular volumes: *The ARRL Handbook for Radio Amateurs, Tune in the World with Ham Radio, The ARRL Antenna Book, The ARRL Antenna Compendium, Volumes 1 and 2, W1FB's Antenna Notebook, Yagi Antenna Design, W1FB's Help for New Hams, The FCC Rule Book, Fifty Years of A.R.R.L., Technician Class License Manual, General Class License Manual, Advanced Class License Manual, Extra Class License Manual, The ARRL Operaing Manual, The Satellite Experimenter's Handbook, 200 Meters and Down, First Steps in Radio, CQ Ghost Ship, Death Valley QTH, DX Brings Danger, SOS at Midnight, Grand Canyon QSO, QRP Notebook, The Gil Cartoon Book* and *The ARRL Electronics Data Book.*

A library donation is a great way to promote Amateur Radio in your community. Contact the Publications Sales Department for information on how to place your order.

Members of the Adams County (Pennsylvania) Amateur Radio Society (ACARS) donated League publications to the Adams County Public Library in memory of Silent Keys WB3HYO and WB3FRG. Shown (l to r) are members David Arendt, KA3VEI; Leon Kanopka, N2ENC; library Director Mark Merrifield; Jesse Lichtenfels, KA3IWE; Henry Rajotte, N3HRZ; and Walt Lane, W3KGN. *(Lane Studio photos)*



The library provided a large glass case for ACARS to display Amateur Radio gear and materials for viewing by the public. There are 20 points of interest in the display, with neatly mounted illustrations and printed legends explaining what ham radio is about and inviting visitors to become interested in the hobby.

Field Organization Reports
November 1990

Section Emergency Coordinator Reports

There are 33,607 ARES members accounted for in SEC records. The following sections reported this month: AL, EPA, GA, IA, KS, KY, ME, MI, MO, MN, NE, NFL, NH, NM, NV, OH, OK, SD, SDG, SFL, SNJ, RI, VA, WNY, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	102	85.00	510	1058
TCC Central	86	87.20	405	408
TCC Pacific	110	91.67	413	757
Summary	298	87.95	1328	2223
Cycle Three				
TCC Eastern	28	100.00	30	46
Cycle Four				
TCC Eastern	86	92.47	274	998
TCC Central	71	86.60	469	967
TCC Pacific				
Summary	157	89.53	743	1965

TCC Roster

Eastern Area, Cycle 2: KW1U Director. K1EIC K1EIR W1FYR KT1Q WA2FJJ W2FR WI2G NN2H WB2MNA W2MTA N2XJ N3DRM N3EMD N3FM KQ3T AA4AT W4FRR N4GHI K4MTX WB4PNY N4SS KA8CPS WT8L W8PMJ WB8YDZ W8YP KB9LT VE3GNW VE3ORN.

Central Area, Cycle 2: N0FBW Director. W4CKS WA4JDH W5CTZ AE5I N5SM W5QFU KG5TL K5UPN W5YQZ KE5ZV W0FE VE5KZ.

Central Area, Cycle 4: K5GM Director. WB5J W5JDF N5TC W5TFB W5TNT K5UPN KB5W W9CBE W9LKN WA9QCF KF0FI W0GRW AI0O N0SM NB0Z.

Pacific Area, Cycle 2: ND5T Director. W5JOV WF6O K6UYK KF7AG VE7EIL VE7FAZ W7IGC W7TGU KF7R.

Eastern Area, Cycles 3 & 4: W2FR Acting Director. AA4AT K1EIC K1EIR K4WJR K4ZK K8TPF KA1JAN KA8WNO N3EMD N3FM N4GHI N4SS N8XX W1CE W1FYR W1NJM W1UD W1WCG W2FR W2GKZ W2LWB W2RQ W3JKX W3OKN W3PQ Q8BO W8PMJ WA1TBY WA2SPL WB2MNA WB3GZU WT8L.

Pacific Area, Cycle 4: K0DJ Director.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN						
CAN	30	879	29.30	.718	100.0	
PAN*	60	624	10.75	.448	95.0	
Region Nets						
1RN	60	390	6.50	.453	95.0	
2RN	60	249	4.20	.371	97.3	
3RN	30	141	4.70	.392	97.1	
4RN	60	382	6.36	.360	70.0	
5RN	60	865	14.42	.546	92.0	100.0
6RN	60	274	4.56	.359		93.3
7RN						96.6
8RN	60	296	4.86	.321	97.7	
9RN	60	210	3.50	.276	97.5	100.0
TEN	60	681	11.40	.473	92.0	100.0
TWN	60	222	3.70	.314	84.6	95.0
ECN						
Cycle Three						
Area Net						
EAN	29	167	5.76	.499	88.2	
Region Nets						
1RN	30	79	2.63	.283	97.1	86.2
2RN	29	156	5.40	.387	100.0	93.1
3RN						89.6
4RN						89.6
8RN						93.1
ECN						79.3
Cycle Four						
Area Nets						
EAN	30	1153	38.43	1.396	100.0	
CAN	30	1210	40.33	1.455	100.0	PAN
Region Nets						
1RN	60	441	7.35	.589	95.2	100.0
2RN	49	197	4.02	.417	75.3	100.0
3RN						100.0
4RN	60	612	10.20	.437	97.0	100.0
5RN	60	546	9.10	.599	100.0	100.0
6RN	60	333	5.55	.700	95.8	
7RN	60	334	5.56	.597	95.8	
8RN	54	252	4.67	.378	86.0	100.0
9RN	60	284	4.73	.510	99.0	100.0
TEN	60	342	5.70	.549	60.6	100.0
TWN	60	178	2.97	.373		
ECN						100.0
ARN	30	85	2.83	.067	100.0	100.0

*PAN operates cycles one and two.

ARRL Section Traffic Managers reporting: AK, AL, AR, AZ, CT, DE, EB, EMA, EPA, GA, IA, IL, IN, LA, MDC, MI, ME, MN, NC, NFL, NLI, NNJ, NTX, OH, OK, OR, ORG, TN, SB, SD, SC, SCV, SDG, SFL, SNJ, STX, VA, VT, WI, WMA, WNY, WV, WWA.

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, one point each, max 30; (2) Checking into phone/RTTY nets, one point each, max 30; (3) NCS CW nets, three points each, max 12; (4) NCS phone/RTTY nets, three points each, max 12; (5) Performing assigned NTS liaison, three points each, max 12; (6) Delivering a formal message to a third party, one point each, no max; (7) Handling an emergency message, five points each, no max; (8) Serving as Emergency Coordinator or Net Manager for the entire month, five points max; (9) Participating in a public service event, five points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, upon sending notification of qualifying months to ARRL Public Service Branch, will be awarded a special PSHR certificate from HQ.

527
W8AKF

209
N5PGZ

176
WT0G

173
WA4EIC

172
WB2UVB

167
WA2SPL

164
KF5BL
WD9V

160
NZ2T
WD8V

153
N2JAW

145
N4KFU
W0OYH

136
KB2EPU

135
W2QNL

134
WI2G

133
WA9VND

125
K4FQU

124
KA1EXJ
W7VSE

121
KD0CL
N4GHI

120
W7VSE
KA4VZX/T

119
W9YCV

117
WA4QXT

115
WA1TBY
W2RRX

114
WB4DVZ
N1FLO
WA4PFK

113
WB2VUK
W4PIM

111
KD7ME

110
WB6DOB

109
KA1GWE
WB2ZJF
WD0GUF

108
KB5BNU
KT1Q
KA9FVX
N4EXQ
W2MTA

107
W7LRB

106
KM4JD

105
N4JAQ
WB4KSG

104
KB9LT
KA1GEP
KI6ZH
WX4J
W4ANK
KI4YV
W4QAT
W7LRB

103
WS7U
W2DMM
K4MTX
WA2ERT

102
W9CBE
K9CNP
WB8SYA
WA4JDH

101
AG9G
K4IWW
W1JTH

100
N4XFX

99
W7GHT

98
N2XJ
N2HLZ

97
WB8JGW
WB3AVZ
K0BXF

96
WF6O
KC4BHX
WB4MMD
W4CKS

95
KJ9J
WB5J

94
KD8HB
KA7AID
N9BDL
W2MTD
N4JTG
KA7AID

93
KA4FZI
WD5GKH
WT8J
AA4ZV
W1KK

92
K4ZK
WB5YDD

91
KA0VQN
KW1U
KJ4EX
ND2S
KD2WP

90
N3DRM
N2EIA
KA2ZNZ/T

89
WA2EPI
K2TWZ/T

88
W6VOM
W9DM
K0PIZ
KB1AF
NR9K
W5SHN

87
N7MAL
K0ERM
WB4FDT

86
KT6A
N0CYR
NN2H

85
KA1S
N2FET
KA4HHE
N0FOO
K4LM
WB2OEV

84
N7LVK
KT9I
KA8WNO
W5CTZ
KA2GJV

83
N4WFU

82
W3YVQ
WB8DOZ
N7BGW
WA0TFC
K6AGD
N7BGW

81
WA3YLO
WA1JVV
WA4GYR
WT0E
WA2FJJ
W7LNE

80
KA4RZZ
KA1ODT
N5BFV

79
ND0N
WB2QMP
K2YAI
K7OVK

78
W7LNE
NG2R
K2JLD
NY8W

77
K7OVK
K9KSA
K2VX
KA0KPY
WB4IDB
W4IBU
W4XI

76
KC5NG
N3IJJ
NW3K
KN4EE
W4DWN
KA1IFC

75
N5KCL
AA7CU
KC4FL
KE2JX
K4BGZ
WB8R

74
KA0ARP
N6CRV

73
WB8FSV
N4CYC
N5MEA
WA8DHB

72
KA5ZYQ
N2JXG/T
KC4IVI

71
WB8RAO
K2PBP/T
W7LG
KA2QDO
KB2JRT

70
KM4DY
KC3Y
K4FFM
AA4AT
AA4XF

69
WB1BTJ
W7NWP
N8FPN
KA8CPS

68
KD8KU
WA2PAC
N5LJF
KA0UEQ
W2FR

67
K3GHH
N2DXP
WA2UKM
WD5ERG/T

66
NB2D

65
W1TC
W4TZC
WB2ZIE/T
KB2IWN
NR1F

64
K8JDI
N8FWA
WA2CLP
W4MEE
WA4RUE
N5NAV
WB0ZNY
KC2HJ

63
KC4OJM
K2ZVI
KD0YL
N4VVX
WB2QIX

62
WB0HOX
K5WOD

61
N8INP
W1WCG
WB0WNJ
WB2FTX
KA2DST/T
WA4DTE
W9UMH
WA4RNP
AB4EZ
WA2UKX

60
W6RE
WD8OXT
N8EFB
KB0BE
K1UXB
N2GJ
WB4ZTR
WF2M

N5ILI
W7EJZ
N0MEA

58
N2EVG/T

57
N5PSW/T

56
N2KYE/T

55
N4CYV/T

53
KB7KUH/T

51
KB2CDB/T

50
KD7KUH/T

49
N6FWG/T

48
W1YOL/T
N2KHU/T
KB2HYT/T

47
KA2CXQ/T
KC4JGC/T

46
N5OWD/T
KC4LMD/T

44
KA6HJK/T

43
KA8YWV/T

42
N8JRV/T

41
KA2JMA/T

40
N2JRS/T

The following stations qualified for PSHR during October, but were not listed in last month's column: K3JL, WB4FDT, N5BVU, K5WOD, WD8RAO, NY8V. (Sep) N4SSX, N4VVX.

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 tone-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 call sign-engraved BPL medallion.

Call	Orig	Rcvd	Sent	Dlvd	Total
W8AKF	321	3912	3722	503	8458
W3CUL	841	901	1369	65	3176
WB9YPY	2	1355	48	963	2368
N0BQP	31	942	75	580	1628
WB0YNS	0	801	801	0	1602
WB0WNJ	220	115	965	7	1307
W3VR	534	267	410	31	1242
K6UYK	582	376	308	17	1283
NZ2T	261	252	419	77	1009
WA2SPL	0	471	445	66	982
W9IHW	2	477	36	441	956
WD4IIO	425	38	425	38	926
KB6ECH	417	21	456	7	910
K4FQU	46	354	341	61	802
W3IWI	2	385	381	0	768
KA4IFC	4	253	387	12	756
N5DST	169	207	172	203	751
W1UJ	103	233	347	44	727
W0GRW	1	343	345	14	703
WB2QMP	331	34	339	31	701
W0LVI	21	398	59	212	690
WB0TAX	36	325	325	2	688
K4DOR	70	271	331	10	682
KF5BL	52	280	270	48	650
WI2G	2	283	332	33	650
W2QNL	3	332	258	39	632
WA4JDH	0	283	318	1	602
WF6O	17	280	298	0	586
NM1K	100	230	240	0	570
N5PGZ	60	220	180	100	560
WA4EIC	1	260	197	101	559
N2DXP	51	253	248	6	557
WA6ZUD	4	267	268	3	542
WA9VND	4	205	289	37	535

BPL for 100 or more originations plus deliveries: KM4JD 126, N4XFX 157, N2JAW 135, W0FIR 130, KA1VED 130, KA1VEC 113, AA7GM 111.

The following stations qualified for BPL during October, but were not listed in last month's column: N5DST 1950, WB0TAX 1453, K6UYK 922, N4HOG 828, K4DOR 552, N4GHI 544, N4TRA 538, N2JAW 119. (Sep) K6UYK 1023.

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	26	331	388
Central Gulf Coast Hurricane Net	31	91	2295
Empire Slow-Speed Net	30	137	439
Golden Bear Amateur Radio Net	30	136	1579
Great Lakes Emergency & Traffic Net	30	63	1158
IMRA	26	857	1677
Mission Trail Net	30	157	956
NYSPTEN	30	56	504
Southwest Traffic Net	30	266	1711
20-Meter ISSBN	26	857	272
7290 Traffic Net	47	387	3313
75-Meter ISSB Net	30	386	1272

The World Above 50 MHz

Conducted by Bill Tynan, W3XO*

What Can We Do?

December's column cited a need facing the weak-signal/narrowband segment of the VHF/UHF community—namely the stimulation of activity.

The grid-square system has helped. In times past, a CQ might be ignored if a QSL card from the caller's state was already on the wall. VUCC gave us something else to chase. Openings became exciting again, especially when a gridexpedition to some uninhabited square was on. But now, we need something more—something to generate renewed and continuing interest.

Several ideas came up in discussions with K6MYC and other West Coast VHFers. Mike noted that VHF contests, of the conventional variety, often fall short of producing needed activity. He cited a recent example in which a concerted effort was mounted to help boost the score of multiop station N6CA. Prior to the contest, West Coast stations were encouraged to get on and work N6CA. They turned out in droves, but contest activity was still low for everyone *but* N6CA. Apparently, after working N6CA, most operators shut down—convinced they had no chance to run up decent scores. The attitude that one has to have a "big" station to have fun in VHF contests has been around for years and seems particularly prevalent on the West Coast. It is true, of course, that the topography of the western states does favor stations located on mountain tops; but those in the valleys might be surprised at how much fun they could have if they would only put out the effort.

How can this understandable attitude be countered? K6MYC suggested a contest in which only home stations can compete. I pointed out that the January VHF Sweepstakes almost fills the bill. If contest rules don't prohibit mountaintop operation, mother nature does a pretty good job of discouraging it. But no matter what can be done to improve contest participation, we clearly need something more—something that encourages consistent and continuing activity.

One idea we discussed was some kind of cumulative contest. The concept of the competition would be to score points for each contact made during a certain period throughout a month or a year. The same station could be worked repeatedly provided that a specified time elapses between contacts—6 hours, 12 hours or 24 hours. K6MYC suggested that separate contests be run each month. Awards would be made based on geographical divisions—ARRL Sections, perhaps.

Checking logs and certifying results for such a continuing affair would certainly present a challenging task. It is clear that this chore would require a group of volunteers.

Aside from the question of whether this kind of contest would increase VHF/UHF activity, there are a number of details that would have to be worked out. Should there be a point differential for the various bands? If so, what should it be? Should there be some kind of distance multiplier, perhaps credit given for the number of grids worked? What minimum time interval should be allowed between working the same station on the same band? Should there be a power multiplier? Should there be separate contests for each band? What verification should be required? What kind of report form should be used? Should detailed logs be required, or would summaries suffice? Can enough qualified, dedicated volunteers be found to administer such a continuing effort? How many volunteers will be required?

Most important, is the whole idea crazy? Can such a competition really bring about increased activity? Is there something else that will work better?

As always, your ideas and criticisms are welcome.

MAJOR HAPPENINGS

Two events occurred at deadline that will have have major impacts on the world above 50 MHz. First, there's the court's rejection of the League's pleadings in the 220-MHz case. Therefore, our 1¼-meter band can be expected to be 222 to 225 MHz. The impact of this on the weak-signal community and how we might adapt to it will be discussed in a future column. The other major event, one that many at least would classify as good news, is the FCC's decision on the codeless license. Since we are about to be joined by a new group of amateurs, we must find ways to accommodate them and welcome them to the amateur ranks.

REVISED BOX UPDATE SCHEDULE

As announced in the March 1990 column, the standings for each band will be run just once per year. Occasionally, circumstances suggest a change to this policy. Such is the case during this period of relatively high solar activity. Although 6-meter F2 conditions have been far from what we would have hoped, many new countries have been worked. It seems appropriate, therefore, to run the 6-meter DX standings box twice this year. Normally, under the schedule announced last March, the 2-meter standings would appear in May. But, to make room for second 6-meter DX standings, the 2-meter standings will appear in June and the May column will contain the 6-meter DX standings. To be listed in this box, updates should be received by March 1. Accordingly, updates for the 2-meter standings can be slipped from March 5 to April 5.

*Mail reports to Bill Tynan, W3XO, at HCR 5 Box 574-334, Tierra Linda Ranch, Kerrville, TX 78028, or phone 512-257-1296 to make a voice recording regarding late breaking information or to obtain the fax number.

ON THE BANDS

• WA7CJO has accomplished another milestone in the world above 50 MHz. On December 2, Jim completed a QSO with SM4DHN via 10-GHz moonbounce. His 300-W TWT and 5.6-meter dish antenna were instrumental in their success. A 6-meter dish fed with 55 W provided the needed signal for SM4DHN.

The two worked first on CW, WA7CJO receiving a 579 report. A few minutes later, the two exchanged 3 by 4 reports on SSB.

I4BER, working from a radio astronomy site that sports a 32-meter dish, heard both sides of the QSO, copying Jim 5 by 9. Unfortunately, a transmitter failure prevented I4BER from participating.

This is the first 10-GHz contact between North America and Europe, and the first two-way SSB QSO via the moon on that band.

Congratulations to all participants!

• Although F2 conditions remain below what everyone had hoped for the fall of 1990, 6 meters did shows signs of coming to life during the first week of December. Large portions of the eastern part of the country experienced good openings to Europe and northern Africa, resulting in jumps in DX totals for a number of stations.

The conditions reached as far as west Texas and New Mexico. On December 4, CN2JP worked K5CM, Muskogee, OK; W5AL, Amarillo, TX; and W5FF, near Albuquerque, NM; as well as a number of stations in the eastern part of the country. W5OZI, Junction, TX; hooked up with G4CVI on December 6 and 8. On the latter occasion, the G station was 599 at Pat's QTH, 100 miles northwest of San Antonio. W5OZI also worked G4UPS, G4GLT and KP2A that day.

December 9 and 10 produced openings from the central and southern parts of the country to KL7, with the 10th being the better of the two days. Call areas 5, 7, 8, 9 and Ø all took part on that occasion. The 9th also produced JA-to-W7 and JA-to-KL7 contacts, and the 10th produced a hookup between KG6DX and VE5, VE6 and KL7. Additionally, KG6UH/DU worked a GW about 1000Z on that day.

From G4UPS's 6-meter information bulletin comes an interesting story of a new Canadian ham whose call is VE1XDX. According to Ted's account, Mike received his license November 5, and only two weeks later had worked 20 countries on 6 meters using 10 W and a 4-element Yagi. What a beginning!

N4VC also benefited from the somewhat improved conditions by working GWØEWX December 8 and hearing G4CVI the day before. Al also notes contacts with PYØFF November 3, CT1LN on the 10th and 9L1US on the 18th.

• The weeks around the winter solstice are known for producing a spate of Sporadic E. While not as long lasting as the summer peak, excellent 6-meter openings are possible. 2-meter meter E_S openings this time of year, while not unknown, are somewhat rare. N4VC reports one such 2-meter opening November 29 that brought Al contacts with K1FJM/4 in south Florida.

• The 25th Central States VHF Society Conference will be held July 25, 26, 27 and 28 at the Sheraton Inn in Cedar Rapids, Iowa. This year's CSVHFS president, Rod Blocksome, KØDAS,

and his staff are planning an excellent and varied schedule of activities and presentations.

This year marks the group's 25th anniversary. The conference is open to members and nonmembers alike. Rod and his staff are still looking for a few speakers or presenters, so those interested should call Rod at 319-393-8022.

• The South Jersey Radio Association announces its second "VHF Challenge." The first was conducted in 1976, celebrating the club's 60th anniversary and the nation's Bicentennial. Like the original, this Challenge, celebrating the club's 75th year and the adoption of the Bill of Rights, calls for working each of the 13 original states on VHF. Details and rules can be obtained by sending an SASE to the South Jersey Radio Association, PO Box 1026, Haddonfield, NJ 08033.

• Longtime Vermont VHFer, K1LPS, has good news and bad news. Larry says that the bad news is, as was discussed in the lead for last month and this month, that "conventional" VHF activity (2 meters and 70 cm) has been very slow in his area as of late. The good news is that microwave activity, especially on 10 GHz, is on the rise. He notes that at least three Northeast stations completed 60 contacts in the August-September 10-GHz Cumulative Contest.

• Word has reached me of the passing of Walt Hicks, W6UZL. In recent years Walt has been known for his 6-meter activity from his QTH on the Baja Peninsula of Mexico as XE2UZL and XE2/W6UZL. To many, he is probably best known for directing a number of conventions in the San Diego area, including the ARRL National Convention in 1986. W6UZL is an old friend, so I feel a particular sense of loss. But Walt will be will be missed by all knew him, in person or over the air.

• KA9LOE wants it known that he is well equipped for 2 meters and 70 cm and is willing to sked anyone who needs Wisconsin or EN64. Gregg runs 180 W to a Cushcraft 4218XL at 95 feet on 2 meters, and 100 W to a 424B at 105 feet on 70 cm. His address is Gregg Seidl, 2580 South County Road T, Green Bay, WI 54311.

FM/RPT

Conducted By Brian Battles, WA1YUA
QST Copy Editor

Philly Hams Help Track Jammer

Another alleged radio jammer has been silenced with the assistance of Amateur Radio operators. On November 6, US marshals and engineers from the FCC's Langhorne, Pennsylvania, field office seized radio equipment, belonging to Ernest Woods, 30, of Norristown, believed to have been used to interfere with Philadelphia-area 2-meter amateur repeaters and frequencies of the Pennsylvania State Police, the Norristown Fire Department and other public service agencies.

Woods could face serious civil and criminal charges as a result. Woods was issued Novice amateur license KA3WHZ in May 1990 and a Technician license in August.

In late June, members of the Telford (Pennsylvania) Area Repeater Association (TARA) began to experience "persistent and purposeful interference" to their 145.190-MHz repeater. In August, the TARA executive committee and control operators met to discuss the situation after the jammer had gotten access, apparently through trial and error, to the repeater's phone patch and speed dial codes.

Concerned about the integrity of the repeater's emergency service codes, TARA changed these services to "controlled access" and began efforts to pinpoint the source of the interfering signal. Standard amateur foxhunting techniques narrowed the source of the signal to a neighborhood of Norristown, 20 miles from downtown Philadelphia.

On August 27, a preliminary formal complaint —with tape recordings—was filed by TARA's president with the Engineer in Charge of the FCC field office in Langhorne, Pennsylvania. Area ARRL and repeater officials were notified of the situation.

On September 2, a team tracked the jammer and concluded that additional equipment would be needed to positively identify the house from which the signal was being transmitted.

On September 6, a TARA official and one from the Fairview Village 2-meter repeater joined forces using a Doppler Systems direction-finding unit to localize the source of the signal to the same area.

Four days later, a station interfered with Pennsylvania State Police channels in the 159-MHz range. A TARA official monitored the police frequencies long enough to confirm to his satisfaction that the interfering operator probably was the TARA repeater jammer.

TARA informed the Pennsylvania State Police of the ongoing search for its repeater jammer and was told the police had been forced to move to alternate frequencies because of the interference.

As word spread through various agencies, interference to the state police continued, with the jammer telling the troopers to "drop dead" and at one point, making a false report of an accident.

By September 12, the FCC had stepped in to act on complaints from TARA and the state police. Engineer-in-Charge John Rahtes asked for TARA's assistance: Rahtes needed a safe house in the immediate neighborhood where his agency could set up equipment to monitor the jammer, identify him and gather legal evidence.

A vacant apartment was located near the suspected source of the signal and the FCC installed its equipment, including gear capable of identifying transmitters by their signal signatures. TARA personnel assisted the FCC in monitoring over the next few weeks. The jammer curtailed his transmitting for several days.

Additional transmissions were noted on the TARA repeater and on state police, county radio and Norristown Fire Department frequencies, as the jammer resumed operations in mid-September. FCC engineers narrowed the source down to a particular house in the congested area.

At the end of September, the US Attorney was presented with evidence gathered up to that time. Montgomery County Communications Chief Dennis Parker and Norristown Fire Dept Chief Joe DeDominic were asked to provide evidence they had gathered about interference to their operations and to file formal complaints.

In early October, the jamming increased and included harrassment of the Norristown Fire Dept on Oct 20, 23 and 26. In one transmission, an unauthorized person tried to recall several trucks from a fire call. By that time the fire department had filed a formal complaint with the FCC.

On October 19, US marshals and FCC personnel, acting on a search warrant issued by the US Attorney, entered the suspect house, but no radio equipment was found.

Although the raid was a disappointment, the FCC continued its probe. The landlord of the row house next to the house that had been searched told Rahtes that one of his tenants was known to have several radios and antennas in his room at the front of the building. The landlord supplied additional information, such as the tenant's work hours, which seemed to confirm that this person was the likely suspect.

On November 1, the Radio Amateur Civil Emergency Service (RACES) repeater in Eagleville, Pennsylvania, reported unauthorized access to its 9-1-1 emergency system. RACES net members were being beeped day and night, adding to the FCC's case for securing another search warrant, which soon was issued.

TARA president E. C. "Gene" Pressler, W3ZXV, joined FCC personnel and US marshals to enter the suspect premises. Several pieces of radio equipment were discovered, along with a directional antenna suspended from the ceiling and other evidence.

Pressler then operated the suspect's equipment as FCC engineers Barry Peahota and Frank Hurst made recordings of the signal for a later signal and voice-print analysis comparison with taped jamming transmissions.

Included among the equipment confiscated were two hand-held transceivers and several scanners, most of which were in operation at the time of the search.

The case was turned over to the United States Attorney's office in Philadelphia. As of late December, no charges had been filed against Woods.—*James D. Cain, K1TN, ARRL Associate Editor*

Packet Perspective

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

Packet Radio Basics, Part 4: Beyond the ABCs of TCP/IP

In the last installment of Packet Radio Basics (Packet Perspective, Dec 1990 *QST*), I discussed the use of TCP/IP software in amateur packet radio. That column generated a lot of interest and rather than leave you with a whetted appetite, I thought I'd go beyond the ABCs of TCP/IP and get you to a point where you can begin enjoying the fruits of KA9Q's labors.

There are three things you have to get before you begin TCP/IPing: a TNC that supports the KISS mode, an IP address and TCP/IP software for your computer (see the sidebar for an update concerning software availability). Assuming you've acquired these items, you can prepare to get on the air with TCP/IP.

First, make a copy of the TCP/IP software and put the original away. You'll work with the copy. If you have a hard disk, copy TCP/IP to it.

Besides *NET* and *Bdale's Mailer* (also known as *BM*), the TCP/IP software should also include the following files and subdirectories: files named ALIAS, AUTOEXE.NET, BM.RC, FTPUSERS, HOSTS.NET and subdirectories named \FINGER, \PUB and \SPOOL. \SPOOL should contain a file named LOG and subdirectories named \MAIL, \MQUEUE and \RQUEUE. (These are the required files and subdirectories for the IBM PC/MS-DOS and Apple Macintosh versions of *NET*. Other versions may have slightly different file and subdirectory requirements. Where it says "subdirectory," Macintosh users should think "folder.")

3-in-1 Customization

You have to modify the AUTOEXEC.NET, BM.RC and HOSTS.NET files before you can use *NET* or *BM*. It's also useful to modify the ALIAS and FTPUSERS files and \FINGER and \PUB subdirectories. You can use a simple text editor or word processor to modify these files. Your word processor must be able to save the files in plain text or ASCII format to be usable by *NET* or *BM*.

NET uses AUTOEXEC.NET whenever you start the program. It contains information unique to your station and, thus, configures *NET* to be compatible with your station. Some parameters in AUTOEXEC.NET must be modified immediately, while others may be changed later after you become experienced with TCP/IP.

To get things started, you must modify the following AUTOEXEC.NET parameters:

HOSTNAME (insert your call sign).ampr.org, eg, HOSTNAME WA1LOU.ampr.org

AX25 MYCALL (insert your call sign)-Ø, eg, AX25 MYCALL WA1LOU-Ø

IP ADDR [(insert your IP address)], eg, IP ADDR [044.088.000.014]

You can shorten your IP address (almost everybody does) by eliminating the first and second zero in each quadrant. I shortened my IP address (044.088.000.014) to 44.88.0.14, thus, the IP address entry in my AUTOEXEC.NET reads "IP ADDR [44.88.0.14]."

TZONE (insert the initials of your time zone followed by a space and the number of hours your time zone differs from UTC), eg, TZONE EST 5

Getting Attached to Your TNC

The next two items, ATTACH and ROUTE, are a little complicated. They must be set correctly or *NET* won't operate properly. ATTACH determines which computer port *NET* uses to communicate with the TNC. The AUTOEXEC.NET file included in your computer's TCP/IP package has the ATTACH parameter already set for a typical configuration. For example, in the IBM/MS-DOS version of the software, the ATTACH parameter is preset as follows:

ATTACH ASY 0x3f8 4 AX25 AX0 2048 256 4800

In this example, *NET* uses an asynchronous port ("ASY"), COM1 ("0x3f8"), which is connected to an AX.25 TNC in the KISS mode ("AX25"). The name of the port is "AX0" and it operates with a maximum buffer of 2048 bytes, a maximum packet length of 256 bytes, at 4800 bauds. Although ATTACH may be preset for your computer, you may wish to change last parameter, the data rate. It may be set to any rate you wish to use for communications between your computer and TNC (not the on-the-air data rate).

The ROUTE parameter determines where your packets go after your radio transmits. The routing table set up using the ROUTE parameter causes your packets to be transmitted directly to the destination station or to an intermediate station that will relay the packet to the destination station. It's the same concept as a direct connection v a connection via a digipeater or network node. Routing is complicated, so I'll suggest the simplest way to set up your routing table. Later, you can make changes to adapt the table to suit your needs. First, set the ROUTE parameter as follows:

ROUTE ADD DEFAULT AX0

This setting causes all packets to be sent to the destination station without interception and retransmission by an intermediate station. If there's a station you wish to contact via an intermediate station, you add a line to the routing table in the following format:

ROUTE ADD [(IP address of destination station)] AX0 [(IP address of intermediate station)], eg, ROUTE ADD [44.56.0.131] AX0 [44.88.0.26]

If other stations require intermediate routings, add their routes to the table.

When you're ready to connect to another TCP/IP station, *NET* will look up that station in the routing table to see how the packets to that station are routed. If a station is not listed in the routing table, *NET* uses the default routing scheme, ie, a direct connection.

The routing table will grow quickly after you get on the air and discover who needs intermediate routing. To avoid an ever-lengthening routing table, your TCP/IP software documentation discusses other ways to set up the routing table. For now, I want to get you on the air as quickly and simply as possible, and what I've described is one way to do it.

After you've made these changes, save the AUTOEXEC.NET file. In the next installment of Packet Radio Basics, I'll describe how to set up the ALIAS, BM.RC, FTPUSERS and HOSTS.NET files, \FINGER and \PUB subdirectories, and how to get on the air with TCP/IP.

Software Sources

- An IBM PC/MS-DOS version of *NET* (not *NOS*) is available from Tucson Amateur Packet Radio (TAPR), PO Box 12925, Tucson, AZ 85732-2925.
- An Apple Macintosh version of *NET* is available from Doug Thom, N6OYU, c/o Thetherless Access Ltd, 1405 Graywood Dr, San Jose, CA 95129-2210.
- An Atari ST version of *NET* is available from Mike Curtis, WD6EHR, 7921 Wilkinson Ave, N Hollywood, CA 91605-2210.
- A Commodore Amiga version of *NET* is available from Louis Mamakos, WA3YMH, 14813 Ashford Pl, Laurel, MD 20707.

There's typically a nominal fee charged to cover the cost of disk(s) and postage, so send an SASE first to find out what's required.

Amateur Satellite Communications

Conducted By
Douglas A. Loughmiller, KO5I
PO Box 247, Brookston, TX 75421

A Look at the Easybird: RS-10/11

In recent columns, we've explored topics geared toward experienced satellite operators. So this month, let's take a look at amateur satellite communications from a beginner's perspective.

An often-asked questions on amateur satellites goes something like this: "I'm interested in operating via the amateur satellites, but the only equipment I have in the shack is my HF transceiver and an assortment of HF antennas. How can I get started on the birds?"

My suggestion to such inquiries is to use the Easybird: The Soviet RS-10/11.

RS-10/11 comprises two amateur satellite systems and six transponders. Launched in June of 1987, RS-10/11 was placed into a low earth orbit with an average height of 1000 km.

RS-10/11 is an ideal tool for investigating issues unique to amateur satellite communications. Once you've learned the lingo of satellite communications, practiced the art of tracking[1] and become acquainted with things such as Doppler shift, you'll be an experienced satellite operator before you know it! The basics learned from operating through RS-10/11 are applicable to all the other birds.

As with any special interest, having access to good information is necessary to gain maximum insight and enjoyment. Thanks to the hard work and dedication of Dr Marty Davidoff, K2UBC, *The Satellite Experimenters Handbook* is an excellent reference that every amateur interested in satellite communications should have on his bookshelf. Published by the ARRL, the second edition of the *SEH* has just been released. I highly recommend it to beginners and old-timers alike.

Table 1
RS-10/11 Transponder Frequencies

RS-10	*RS-11*
Mode A:	*Mode A:*
Uplink: 145.860-145.900 MHz Downlink: 29.360-29.400 MHz	Uplink: 145.910-145.950 MHz Downlink: 29.410-29.450 MHz
Mode A Robot:	*Mode A Robot:*
Uplink: 145.820 MHz Downlink: 29.357 or 29.403 MHz	Uplink: 145.830 MHz Downlink: 29.407 or 29.453 MHz
Mode K:	*Mode K:*
Uplink: 21.160-21.200 MHz Downlink: 29.360-29.400 MHz	Uplink: 21.210-21.250 MHz Downlink: 29.410-29.450 MHz
Mode K Robot:	*Mode K Robot:*
Uplink: 21.120 MHz Downlink: 29.357 or 29.403 MHz	Uplink: 21.130 MHz Downlink: 29.403 or 29.453 MHz
Mode T:	*Mode T:*
Uplink: 21.160-21.200 MHz Downlink: 145.860-145.900MHz	Uplink: 21.210-21.250 MHz Downlink:145.910-145.950 MHz
Mode T Robot:	*Mode T Robot:*
Uplink: 21.120 MHz Downlink: 145.857 or 145.903 MHz	Uplink: 21.130 MHz Downlink: 145.907 or 145.953 MHz

About the Bird

RS-10/11's ease of use stems in part from its sensitive receivers and powerful transmitters. The satellite's uplink and downlink frequencies are also important factors. Table 1 lists them all.

RS-10/11 can be accessed with truly simple equipment. The spacecraft utilizes an HF uplink or downlink for every transponder. Because most beginners have HF transceivers, they already have more than half of the equipment needed to work through the satellite. A wide variety of station setups are used. Low power and simple antennas are commonplace on the uplink, and receiving the downlink signals is easy, too.

Over the Thanksgiving weekend, my junior op, Dustin, and I rigged up temporary antennas to listen to the bands. After raising an 80-foot wire for HF and a discone antenna for VHF, we settled in for some "band scanning." As we scanned across 10 meters, we decided to put our modest setup to the test: working through RS-10/11.

A quick glance at the tracking data showed that a pass was a few minutes away. Running 10 watts into the discone and tuning the wire antenna with an antenna tuner, we "optimized" our station as the bird came over the horizon. A few minutes later, as we lost the signal on the other horizon, we counted a total of three enjoyable QSOs during the 15-minute pass. If we can do it, you can, too!

Another unique aspect of this bird is its novel "robot" system that allows ground stations to have CW QSOs with the spacecraft itself. The format for answering a robot CQ (RS-10 in this case) is: RS10 DE KO5I AR. If you are successful, the robot will respond KO5I DE RS10 QSO NR 123 OP ROBOT TU FR QSO 73 SK. The robot is capable of copying clean CW in the 10-30 WPM range. Frequencies for robot operation are listed in Table 1.

Because RS-10/11 uses popular HF frequencies, it sees a great deal of activity worldwide. And because of operational considerations aboard COSMOS 1861 (RS-10/11's host spacecraft), it's usually operating in Mode A. Mode A was a workhorse mode during the early days of amateur satellites. Thousands of amateurs have logged Mode A QSOs. And although great advances have been made in satellite technology, Mode A is still a valid place to start.

Because of this, AMSAT-NA is often asked why it no longer constructs Mode A satellites. The answer has to do with today's amateur satellite service itself. In the early days, satellite construction activities were centered around a single construction group comprised of technical volunteers from a small number of organizations. Fortunately, this is no longer the case. A number of viable groups have emerged from around the world, and the number of amateur satellite launches has soared over the past several years. The net result is a broader base of resources that can be applied to an *international* amateur satellite program. The arena in which we participate is, after all, a truly international one. Hams everywhere benefit from each new satellite, regardless of its origin.

This is exactly the case with regard to Mode A. Our Soviet colleagues have indicated that they intend to design, construct and launch Mode A birds well into the future. By consulting with various international groups, the needs of the amateur satellite service are discussed and planned.

All of the satellite groups believe that the amateur community is best served by this approach. This way, our resources are put to the best use possible.

LOS

If you're thinking about joining in the fun of amateur satellites, we'd be pleased to count you among our ranks. Give RS-10/11 a try. I'm sure you'll enjoy it!

If you'd like more information, write to AMSAT, PO Box 27, Washington, DC 20044.

See you on the birds!

[1]The subject of satellite tracking could take up a whole column of its own. Future columns will discuss this topic in detail. For the purpose of this overview discussion it should be pointed out that two basic satellite tracking systems exist: plotter boards, such as the *OSCARLOCATOR*; and computer software. A complete software catalog can be obtained from AMSAT at the address given at the end of the article.

Coming Conventions

GREAT LAKES DIVISION CONVENTION

February 23-24, 1991, Cincinnati, Ohio

The Great Lakes Division Convention is sponsored *by the Committee for Amateur Radio/Hamilton* County ARPSC. It will be held at the Cincinnati Gardens Exhibition Center, Seymour Ave at Langdon Farm Rd. Take I-75 to Paddock Rd, E on Paddock to Seymour Ave, E on Seymour to Cincinnati Gardens. Doors open at 8 AM for ticket sales only, convention starts at 8:30 AM. Admission is $6 in advance and $8 at the door. Features include refreshments, forums both days, ARRL guests and officials, free parking, Wouff Hong ceremony Saturday PM, Hospitality room, banquet Saturday PM, VE session Saturday AM. Talk-in is on 144.59/145.19, 144.61/145.21, 222.46/224.06. Contact Stan Cohen, WD8QDQ, 2301 Royal Oak Ct, Cincinnati, OH 45237; 513-531-1011. Headquarters Hotel Quality Inn Central Norwood, 513-351-6000.

ROANOKE DIVISION CONVENTION

March 9-10, 1991, Charlotte, North Carolina

The Roanoke Division Convention is sponsored by the Mecklenburg Amateur Radio Society. It will be held at East Independence Blvd (Rte 74) and Briar Creek. Open Saturday 9 AM-5 PM and Sunday 9 AM-2 PM. Admission is $6 in advance and $8 at the door. Features include forums, VE session. Talk-in is on 146.34/94, 147.89/29. Contact Cathy Roberts, N4RUT, 704-536-7373.

1991

March 15-17
Florida State, Orlando

March 22-24
Midwest Division, Kearney, NE

ARRL NATIONAL CONVENTIONS
August 23-25, 1991—Saginaw, Michigan
August 20-23, 1992—Los Angeles

Attention Hamfest and Convention Sponsors

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your Division Director. For conventions, approval must be made by your Director and, additionally, by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541, ext 283.

Note: Sponsors of large gatherings should check with HQ for possible date conflicts before contracting for meeting space. Dates may be recorded for up to two years in advance.

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.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequencies, *Adm* = Admission fee.)

Colorado (Golden)—Feb 17, 8:30 AM-2 PM. *Spr:* Aurora Repeater Assn. Jefferson County Fairgrounds, 15200 W 6th Ave. Judi, WDØHNP, 303-450-6910, or Jan, KA7TYU, 303-680-8857 or write Aurora Repeater Assn, PO Box 39666, Denver, CO 80239.

Florida (Hernando)—Feb 23, 8 AM-3 PM. *Spr:* Hernando County ARA. Hernando County Fairgrounds, 3 mi S of Brooksville on US Hwy 41. Dealers, new & used radios, equipment, computers, related electronic equipment, tailgating, AMSAT seminar (10:30 AM), free parking, overnight parking (no facilities), refreshments. *TI:* 146.715/115. *Adm:* adv $3, door $4 (adv tickets can be obtained by sending your check & an SASE to Hamfest Chairman, PO Box 1721, Brooksville, FL 34605). *Tables:* $10 (to reserve tables, send check to the above address; everyone, including dealers, must *purchase a ticket*). Pat Brayton, WB4EXA, 904-796-4840 after 7 PM.

†**Florida (Pensacola)—Feb 23,** 8 AM-4 PM. *Spr:* Pensacola Area Hamfest Assn. Municipal Auditorium at the foot of Palafox St. Refreshments, tour of aircraft carrier *USS Lexington* (on site). *TI:* 146.16/76. *Adm:* Adv $2, door $3. Rick Lloyd, AA4W, 497 Ashley Rd, Cantonment, FL 32533; 904-452-9171 days, 904-968-6499 eves, or AA4W @ KK4CQ.

†**Florida (Sarasota)—Feb 16-17;** Sat 9 AM-4:30 PM, Sun 9 AM-3 PM. *Spr:* Sarasota ARA. Robarts Arena, 3000 Ringling Blvd. Refreshments, forums, pkt radio, traffic handling, VE sess (Sun 10 AM), free parking. *TI:* 146.31/91. *Adm:* adv $5, door $7 (SASE to Val Lopez, 427 Tarpon Ave, Sarasota, FL 34237; 813-951-1072). *Tables:* reserved $17.50, end booths $75, side booths $125 in adv ($ tables). Gene Marino, 4858 Tivoli Ct, Sarasota, FL 34235; 813-355-0675.

†**Georgia (Dalton)—Feb 23,** 9 AM-4 PM. *Spr:* Dalton ARC. Dalton Fairgrounds, N Glenwood at Legion Dr. Refreshments, VE sess (1 PM) no walk-ins, contact Felton Ausley, N4BZI, 404-673-2214. *TI:* 144.63/145.23. *Adm:* $3. Margret McKamey, KC4ITX, 404-259-3945 daytime only; Harold, N4OTC, 404-673-2291; or James Jordan, K4FLG, 404-278-0630 eves.

†**Illinois (Rock Island)—Feb 24,** 8 AM-3 PM. *Spr:* Davenport RAC. QCCA Expo Center. Refreshments, forums, VE sess, commercial exhibitors, flea mkt. *TI:* 146.28/88 WØBXR rptr. *Adm:* adv $3, door $4. David Johannsen, 2131 Myrtle, Davenport, IA 52804; 319-324-9164 days, 319-323-4204 eves.

†**Illinois (Sterling)—March 17;** set up Sat 6 PM-9 PM, Sun at 6:30 AM, public 7:30 AM. *Spr:* Sterling-Rock Falls ARS. Sterling High School Field House, 1608 4th Ave. Refreshments, free parking. *TI:* 146.25/85 W9MEP rptr. *Adm:* adv $3, door $4. Sue Peters, KA9GNR, Sterling-Rock Falls ARS, PO Box 521, Sterling, IL 61081; 815-625-9262.

†**Indiana (Indianapolis)—March 10;** set up Sat 3 PM-9 PM (security provided overnight), Sun 6 AM-8 AM, (all vehicles must be out of the building *by 7:50 AM, after 7:50 AM access is through* pedestrian door), public 8 AM. *Spr:* Morgan County Repeater Assn. Indiana State Fairgrounds Pavilion Bldg. Free parking, ladies' programs. *TI:* 144.65/145.25. *Adm:* no adv, door $7. *Tables:* 8-ft, including space, $12 each (no space without table will be sold). For table reservations, send SASE before Feb 23, 1991, to Aileen Scales, KC9YA, 3142 Market Pl, Bloomington, IN 47403; 812-339-4446.

†**Indiana (La Porte)—Feb 23,** 8 AM-2 PM. *Spr:* La Porte ARC. La Porte Civic Auditorium (50 mi SE of Chicago on Indiana Toll Rd). Forums, refreshments. *TI:* 146.52 simplex. *Adm:* no adv, door $4. *Tables:* $5 upstairs, $4 downstairs; reservations held until 8:30. 219-362-2679 or SASE to PO Box 30, La Porte, IN 46350.

Kansas (Burlington)—Feb 23; set up 8 AM, public 10 AM. *Spr:* Neosho Valley ARC. National Guard Armory. Refreshments. *TI:* 146.52 simplex. *Adm:* free. Bob, 316-364-5446, or write to NVARC, Rte 2, Box 38, Burlington, KS 66839.

Kentucky (Cave City)—March 2, 8 AM. *Spr:* Mammouth Cave ARC. Cave City Convention Center. Forums, flea mkt, VE sess (walk-ins welcome, bring your original license & a copy if you're upgrading). *TI:* 146.34/94. *Adm:* $4. *Tables:* $5 each. Mike Goad, N4HCO, 1379 Whites Chapel Rd, Glasgow, KY 42141.

†**Louisiana (Lafayette)—March 8-10;** Fri 2 PM-7 PM (Hospitality), Sat 8 AM-4 PM, Sun 8 AM-11 AM. *Spr:* Acadiana ARA. Holiday Inn Central (Holidome), NE Evangeline Thruway (I-49), S of I-10, exit 103 in Lafayette. Forums on AMSAT, amplifier construction, DX PacketClusters®, propagation, wire antenna construction, ladies' tour. *TI:* 147.81/21 primary, 146.22/82 secondary. *Adm:* adv $2, door $3. David Pierce, Rt 2, Box 625, Sunset, LA 70584; 318-896-5384 days, 318-662-7105 eves.

Massachusetts (Marlboro)—Feb 16; sellers 8 AM, public 10 AM-3 PM. *Spr:* Algonquin ARC. Marlboro Middle School Cafeteria, Union St off Rte 85. Electronics flea mkt, wheelchair access, VE sess (9 AM, prereg req'd, send check for $4.95 payable to Mark Schneider, W1IW, 14 Fuller Dr, Marlboro, MA 01751; 508-485-1857). *TI:* 146.01/61, 222.34/223.94, 444.925/449.925. *Adm:* $2. *Tables:* adv $10, door $12. Ann, KA1PON, 508-481-4988, or write AARC, Box 258, Marlboro, MA 01752.

Massachusetts (Northampton)—March 3; vendors 8 AM, public 9 AM. *Spr:* Mt Tom Amateur Repeater Assn. Smith Vocational School. Refreshments, VE sess, handicap access. *TI:* 146.34/94, 223.82, 448.2 rptr. *Adm:* $2, under 12 free. *Tables:* adv $12, door $15. Marvin Yale, N1CDR, 6 Laurel Terrace, Westfield, MA 01085; 413-562-1027.

†**Michigan (Dearborn)—Feb 24,** 8 AM-4 PM. *Spr:* Livonia ARC. Dearborn Civic Center. VE sess (walk-ins 10:30 AM), refreshments, free parking. *TI:* 144.75/145.35, 146.52 simplex. Send 4 × 9 SASE to Neil Coffin, WA8GWL, c/o Livonia ARC, PO Box 2111, Livonia, MI 48151.

Michigan (Traverse City)—Feb 16, 8 AM-1 PM. *Spr:* Cherryland ARC. Immaculate Conception

†ARRL Hamfest

School, near Division St & 2nd St. Dealers, refreshments. *TI:* 146.86 rpt. *Adm:* $3. *Tables:* $4. Ken Musson, W8QKP, 9680 Peninsula Dr, Traverse City, MI 49684; 616-947-1372.

†**Missouri (Kansas City)—Feb 17**, 9 AM-3 PM. *Spr:* Mid-America FM Assn. National Guard Armory, 7600 Ozark Rd. *TI:* 146.34/94. *Adm:* free. Robert Atkeisson, WØAT, 12109 E 51st St, Independence, MO 64055; 816-356-8836.

Missouri (St Louis)—March 8; doors open 5 PM, auction starts 7:30 PM. *Spr:* Jefferson Barracks ARC. Concordia Turner's Hall, 6432 Gravois. Refreshments. *TI:* 144.61/145.21, 146.34/94 after 5 PM. Carl Hohenberger, *WBØBZP, 5266* Parker Ave, St Louis, MO 63139-1340; 314-351-7084.

†**New Jersey (Flemington)—March 16**, 8 AM-2 PM. *Spr:* Cherryville Repeater Assn. Hunterdon Central Regional High School Field House, Rtes 31 & 523, 1 mi N of Flemington Circle. Flea mkt, tailgating, new equipment dealers, VE sess, refreshments, free parking, handicapped access. *TI:* 147.975/375, 146.52 simplex. *Adm:* adv $4, door $5. Marty Grozinski, NS2K, c/o Cherryville Repeater Assn II, PO Box 308, Quakertown, NJ *08868; 908-806-6944* or *908-788-4080.*

New York (Melville)—Feb 17, 9 AM-4 PM. *Spr:* Long Island Mobile ARC. Electrician's Hall, 41 Pinelawn Rd. Refreshments, VHF tune-up clinic. *TI:* 146.25/85. *Adm:* no adv, door $5, exhibitors $20 advance. Neil Hartman, WE2V, 516-462-5549, or Mark Nadel, NK2T, 516-796-2366.

†**New York (Valhalla)—March 3**; vendors 6:30 AM, public 9 AM-3 PM. *Spr:* Westchester Emergency Communications Assn. Mt Pleasant NYS Armory, take the Cross Westchester Expressway (I-287) or any major Westchester parkway. Exhibit area, ARRL booth, forums, VE sess, technical clinic, free parking, refreshments, handicapped accessible, new shuttle bus service. *TI:* 147.66/06, 222.8/224.4, 442.475/447.475. *Adm:* no adv, door $5. Bob Wilson, N2DVQ, or Sarah Wilson, N2EYX, 2 Soundview Ave, Apt A5, White Plains, NY 10606; 914-993-0711.

Ohio (Cuyahoga Falls)—Feb 24, 7 AM-3 PM. *Spr: Cuyahoga Falls ARC. 6.5 mi S of OH Tpke Rte* 8 exit, then Rte 303 exit, straight ahead. From S Rte 8, Graham Rd, W to dead end, right 2 mi. Refreshments, wheelchair access. *TI:* 147.87/27. *Adm:* adv $3, door $4. Bill Sovinsky, 2305 24th St, Cuyahoga Falls, OH 44223; 216-923-3830.

Oregon (Salem)—Feb 16, 9 AM. *Sprs:* Salem & Oregon Coast Emergency Repeater Assns. Polk *County Fairgrounds. Flea mkt, exhibits, commer*cial dealers. *TI:* 146.26/86. *Adm:* adv $5, door $6. Write to 1991 Salem Ham Fair, PO Box 784, Salem, OR 97308; 503-585-9554.

Pennsylvania (Belle Vernon)—March 3; set up 7 AM, public 8 AM-3 PM. *Spr:* Two Rivers ARC. Rostraver Volunteer Fire Hall, Rte 51 S, 3 mi N of I-70 & PA 51 interchange. Refreshments. *TI: 146.13/73. Adm:* no adv, door *$1*, under 16 free. *Tables:* $6 full, $4 half. Michael Kowalcheck Jr, KV3L, PO Box 184, Greenock, PA 15047-0184; 412-751-9657 eves.

Pennsylvania (York)—March 3, 8 AM. *Spr:* York Springfest Committee. Dover Firehall, 6 mi W of York. Refreshments, parking, VE sess, tailgating *$1. TI: 146.37/97, 147.93/33. Adm:* $4, unlicensed spouse & under 12 free. *Tables:* inside $10. York Springfest, PO Box 316, New Freedom, PA 17349-0316, 301-239-3878.

South Carolina (Charleston)—Feb 23, 8 AM-4 PM. *Spr:* Charleston ARS. National Guard Armory, 69 Hagood Ave, across from the Citadel Football Stadium near Hwy 17. Refreshments, free parking, VE sess (9 AM) walk-ins accepted, Novice test will be given if requested, adv reg appreciated. *TI:* 146.16/76, 147.87/27. *Adm:* no adv, door $5. Jenny Myers, WA4NGV, 2630 Dellwood Ave, N Charleston, *SC 29405;* 803-747-2324 or Lin Sikes, N4LS; 803-556-5566.

Tennessee (Tullahoma)—March 9, *Spr:* Middle Tennessee ARS. Tullahoma, TN Airport, Hanger No. 6. Refreshments. *TI:* 146.10/70. Clifford Johnson, W4SFF, 109 Dogwood Lane, Winchester, TN 37398.

Texas (Orange)—Feb 23; set up 7 AM, public 8 AM-4 PM. *Spr:* Orange ARC. VFW on Hwy 87, 1 mi N of IH 10. Refreshments, flea mkt. *TI:* 147.78/18. *Tables:* $5 for individuals, no limit, $15 for dealers. Sherwood Buckalew, KA5VOT, 409-883-6111, or Dan Killough, WB4GYS, 409-769-9603.

†**Vermont (Milton)—Feb 23**; 9 AM-3PM. *Spr:* Northern Vermont Winter Hamfest Committee, Milton High School, Rte 7. I-89 Exit 17 to Rte 7 N, 4.7 mi. Milton H S on left, across from All-Star Sporting Goods. Indoor Flea mkt, forums, demos, auction, VE sess (1 PM). *Adm:* $2 US. *Tables: free (first come, first served). TI:* 145.47 (−600), 146.85 (±600). ARRL VT PIC Joe Tymecki, N1DMP, 802-893-6458; or ARRL VT SM Mitch Stern, WB2JSJ (see p 8).

Virginia (Vienna)—Feb 24; set up 6 AM, public 7:30 AM. *Spr:* Vienna Wireless Society. Vienna Community Center, 120 Cherry St, (off Rtes 123 & 66). Exhibition area, refreshments, tailgating ($10). *TI:* K4HTA/R 146.085/685 or W4LBL/R 146.190/790. *Adm:* no adv, door $5. *Tables:* indoors $15 noncommercial, $20 commercial (no adv door and/or tailgate sales). Harry Kakfikian, W4ACN, 4941 Andrea Ave, Annandale, VA 22003; 703-978-4402.

Washington (Puyallup)—March 9; set up Fri 4 PM-9 PM, set up Sat 6 AM-9 AM, public 9 AM-6 PM. *Spr:* Mike & Key ARC. Pavilion of W WA Fairgrounds. Free parking, refreshments, VE sess (walk-in), free overnight space for self-contained RVs. *TI:* 146.22/82, 222.52/224.12. *Adm:* $5. *Tables:* $20, commercial space $65. 206-821-4188 or 206-549-4062, reservations: PO Box 2121, Kirkland, WA 98083.

West Virginia (Fayetteville)—Feb 24, 9 AM-3 PM. *Spr:* Plateau ARA. New equipment displays, flea mkt, refreshments, free parking, VE sess (9-12). *TI: 146.19/79. John Witt, W8OQC, 135 Daniels St,* Fayetteville, WV 25840, 304-574-0532.

Strays

FINE BUSINESS BIRTHDAY CELEBRATION

☐ Amateur Radio operators worldwide will celebrate the birth of Samuel F. B. Morse on Saturday, April 27, 1991, demonstrating that *Morse code is still alive and well. The following* are some of the special CW stations and activities that will commemorate the occasion:

• The Poughkeepsie ARC will operate K2KN from Locust Grove, Morse's country home in Poughkeepsie, New York, from 1847 to 1871. They'll be on 3710, 7110, 14,050, 21,110 and 28,110 kHz from 1400-2000Z.

• The First-Class CW Operator's Club Jubilee 1991 offers a special award to the nonmember working the largest number of FOC members in 40 days beginning April 27. Listen for G4FOC on that day. For information, contact Peter Miles, G3KDB, PO Box 73, Lichfield, Staffs, England.

• A Morse Memorial CW meeting will activate PA6MMD in Maassluis, Holland, with special *QSL cards for the occasion.*

• The Friends of S. F. B. Morse plan a noncontest "Morse Memory Day" on all HF, VHF, UHF and SHF CW subbands from 0000-2400Z, open to all hams and SWLs. For information, contact Dr K. H. Ruggeberg, DJ4FP, Kaunitzstr 3, W-4781 Oestereiden, Germany.

• A new EUCW CW-only award will be launched, with up to 40 stations worked on the first day counting as double contacts. Contact award manager Gunther Nierbauer, DJ2XP, Illingerstr 74, W-6682 Ottweiler/Saar, Germany.

• Chapters of the Morse Telegraph Club will celebrate with ham stations and "dial-up Morse" connections via the public telephone system using old-time keys and sounders. Contact Robert A. Hubbard, W8MYU, 3541 H Dr S, E Leroy, MI 49051.

• The Sydney Morsecodians Fraternity will operate vintage instruments at the old Alice Springs telegraph station and be patched to an Amateur Radio station at the National Science and Technology Centre in Canberra via a 3000-mile landline link arranged by Telecom Australia. Contact Dr Bill Burch, NSTC, PO Box E28, Queen Victoria Terrace, Canberra, ACT 2600, Australia.

• The ARRL begins a Samuel F. B. Morse Bicentennial Code Proficiency Award, with the first qualifying run from W1AW at 2300Z.

• *Morsum Magnificat,* the journal for Morse enthusiasts, will have a special spring issue with features about Samuel F. B. Morse and his inventions, the code and early telegraphy. Contact the publisher at 8A Corfe View Rd, *Corfe Mullen, Wimborne, Dorset,* BH21 3LZ, England.—*Tony Smith, G4FAI, Consultant Editor,* Morsum Magnificat, *1 Tash Pl, London, N11 1PA, England)*

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

W1AWA, Joseph H. Washburn, Kingston, NH
*K1CH, Curtis H. Heuberger, Seekonk, MA
W1KGF, Morris Feigenbaum, West Hartford, CT
W1LMO, Linwood M. Pattee, Northport, ME
W1ONK, Donald H. Sleeper, Fairhaven, MA
*W1PQ, Roger C. Amundsen, Hawley, PA
W1RT, Robert DeBragga, Stonington, CT
W2BNE, Alfons L. Bygden, Largo, FL
K2BZT, Hayden W. Evans, Little Silver, NJ
WA2ELS, William E. Fieldhouse, North Haledon, NJ
KB2IIT, Samuel Marder, Brooklyn, NY
W2IU, Samuel E. Taggart, Absecon, NJ
W2IVF, William C. Goble, Elmwood Park, NJ
W2MDL, Jack Berens, Flushing, NY
W2QS, David B. Henderson, Little Silver, NJ
W2RGU, Isaac D. Gabel, Crosswicks, NJ
KE2SV, Dallas E. Sawyer, Omaha, NE
WA2UGE, Ralph P. Young, Rochester, NY
WA2VCY, Leo E. Swandick, North Arlington, NJ
K3ADE, Carlton H. Wenner, Bloomsburg, PA
*W3FBF, Paul D. Mercado, Devon, PA
KA3JJT, Michael Buckiso, West Mifflin, PA
W4BIA, G. W. Dickerson, Rome, GA
N4DQB, Allen Farr, Fort Walton Beach, FL
N4DTN, Stanley L. Warren, Hallandale, FL
W4GE, Robert C. Campbell, Jacksonville, FL
WA4HYM, Roland D. Flott, Fairhope, AL
N4JEI, Robert W. Herndon, Lakeland, FL
W4LSU, William J. Crosby, Charlotte, NC
WA4MTI, Merwin F. Carter, Lake Park, GA
W4MX, Stewart C. Hoeper, Sierra Vista, AZ
N4NAO, Albert R. Trottier, Port St Lucie, FL
AB4OY, Roy Aavik, Beaufort, SC
WA4QHR, Edward L. Hinson, Mobile, AL
*W4QX, John E. Platt, Alexandria, VA
WA4SXW, Glenn E. Prahl, Altamonte Spring, FL
KP4TIN, M. R. Taylor, San Juan, PR
WB4TLR, John Courlas, Kirkland, WA
K4VYM, Charles G. Carmalt, Alexandria, VA
KB5BFN, Roger L. Kikkert, Austin, TX
WD5CKT, Richard E. Nichols, Miami, OK
N5GNS, John T. Murphy, Baton Rouge, LA
WD5GYT, Walter A. Kessie, Dumas, TX
W5IQ, Ray K. Bryan, Kinston, OK
WB5ISL, Charles J. Collier, Albuquerque, NM
W5KIA, Howard D. Clark, El Paso, TX
NU5K, Elvin Skaggs, Carlsbad, NM
KA5LRS, Perry G. Hyde, Duncan, OK
W5MDY, Ralph L. Hitsman, San Antonio, TX
WN5M, Lanny Outlaw, Baldwin, MS
KA5NOR, Clarence R. Cole, Jonesboro, AR
K5OJ, Quido M. Shultise, Woodward, OK
WA5PCN, Robert J. Cozby, Carrollton, TX
KF5PW, Delmar W. Tooman, Anadarko, OK
W5QDQ, Cleveland P. Huggins, Pascagoula, MS
W5VOD, Julius C. Ritchie, St Amarillo, TX
K6AC, Alex J. Connolly, Northridge, CA
W6AEV, George W. Harper, Woodburn, OR
*N6BM, James T. Miller, Carson City, NV
WB6BPU, Louis S. James, Reno, NV
W6BXT, Robert S. Julian, Santa Ana, CA
K6DW, Capt R. W. Carter, Wilton Manors, FL
N6FXU, John H. Roberts, Redlands, CA
WA6JDS, Henry A. Martin, Ventura, CA
W6JJV, Henry L. Gould, Kingsburg, CA
KF6NS, Norman B. Purves, Perris, CA
W6OWA, Will L. Stalnaker, Longview, WA
KB6PBW, Joseph I. Hammond, Irvine, CA
KI6RJ, John G. Skowran, San Diego, CA
N6RUG, Freda Wiley, San Bruno, CA
KB6SSV, F. E. Davis, La Canada, CA
WB6TTW, Myron Koehler, McArthur, CA
KI6WR, Donna R. Skowran, San Diego, CA
WA6WZQ, Robert Landgrave, Oakhurst, CA
K6YP, H. A. Oldenkamp, Aptos, CA
N7ACX, Aaron H. Gast, Newberg, OR
W7AQB, Philip D. True, Puyallup, WA
W7BHQ, L. S. Jacobs, Cumac, WA
WL7BJB, Erldon Gratrix, Anchorage, AK
KA7BOM, Zene Nelson, Portland, OR
W7FON, Harry A. Hale, Bloomington, IL
W7IJT, Sam C. Phillips, Palos Verdes Est, CA
KA7JVN, Harry V. Olson, Seattle, WA
N7NXW, David Rapp, Blachly, OR
W7WBK, Thomas W. Matthews, Rexburg, ID
W7YIO, Frank M. Bosch, Woodland, WA
K7YNP, Chester M. Sander, Seattle, WA
WS8F, Beauford B. Rhodes, Springfield, OH
W8GRF, Allen W. Minor, Battle Creek, MI
W8HNG, Jay S. Dewey, Bellaire, MI
K8JAR, Edgar B. Honnell, Dayton, OH
KB8JDF, Jerry L. Hertz, Canfield, OH
N8LFD, Christine M. Young, Risingsun, OH
WD8MZH, Tim Purpura, Euclid, OH
K8OTA, Orville L. Miller, Bellaire, MI
WA8UXS, William E. Congdon, Masury, OH
WA9CCX, Ward L. Studor, Indianapolis, IN
W9DAG, James A. Lovell, Greenfield, IN
K9FBL, Raymond W. Fusick, Chicago, IL
KD9HB, Max L. Kalp, Rushville, IN
N9JQP, Michael Mazza, Schiller Pk, IL
W9LBO, Roy R. Lee, Belleville, IL
WB9OGZ, Dallas O. Littrell, Romeoville, IL
K9SKB, Ray N. Dustin, Indianapolis, IN
WØCMB, Jim Keith, Coffeyville, KS
WØFRQ, C. D. Niswender, Fort Collins, CO
*WØGOR, Robert B. Donaidson, Montrose, CO
WBØGTY, Robert W. Reynolds, Kimball, SD
KDØHI, Joe G. Ruzicka, Miller, SD
NØJAJ, Charles T. Shelton, Fountain, CO
KAØLRM, Lewis F. Maldeis, Ely, MN
*WAØMBC, Hershel A. Jackson, Florissant, MO
WØOKS, Gunter A. Hauptman, White Plains, NY
WBØUAZ, Ted Rice, Boulder, CO
WAØYKZ, Charles H. Black, Overland, MO
VE7ATH, Karel N. Tettelaar, Salmon Arm, BC

*Life Member, ARRL

Note: All Silent Key reports sent to HQ must include the name, address and call sign of the *reporter* as well as the name, address and call sign 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 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 p 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 or for 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.

75, 50 and 25 Years Ago

February 1916

☐ The front cover's rubber-stamped "Last Free Copy—Subscribe to-day" signals *QST*'s transition from a start-up gamble to a full-blown monthly magazine, now promoted as costing $1 for a 12 months' subscription instead of 25 cents for a three months' trial. This month's pagination—19 through 44—reflects *QST*'s (temporary) use of cumulative pagination—a choice rendered more than a little confusing because this month's advertising pages are included in the count and last month's clearly were not!

League members, 635 on December 1, 1915, now number 961. Almost three full pages cover additions to the League's list of stations, and seven station photos—three of which, along with a schematic, grace the five-page "Radio Communications by the Amateurs"—detail the state of the amateur art in 1916. Three more pages reveal answers to *QST* Nr 1's humorous pseudo-letter from fictional Japanese amateur Kathis Kathkan, with $5 each awarded to the authors of the funniest two.

☐ Lead-article author Hiram Percy Maxim's "Practical Relaying" depicts his vision of Amateur Radio in the world: "the idea of a citizen of Portland, Maine, being able to send a message to a citizen in Portland, Oregon, by wireless, and without cost . . . [with] the co-operation of a few unknown but nevertheless kindred spirits . . . by means of which the message is handled." Maxim proposes six trunk lines—Portland, ME, to Seattle; Chicago to San Francisco; Boston to Jacksonville, FL; Philadelphia to New Orleans; St Louis to Los Angeles; and Vancouver, BC, to San Diego—as a means of standardizing relaying and minimizing the number of traffic-competent operators necessary to move messages from region to region.

February 1941

☐ Represented by ARRL President George W. Bailey, W1KH, the League stands ready as the government's Defense Communications Board "begins its monumental task of planning a coordinated system of communications capable of serving the country in whatever may lie before it." K. B. Warner concludes, "Let the D.C.B. agree on what it wants—we'll deliver."

☐ Byron (W1JPE) Goodman's compact, two-tube 56-Mc. converter provides 3-Mc. output and takes the cover- and lead-article spots.

☐ Writing for the junior constructor, George Grammer, W1DF, describes an $11, two-tube, 1.7- to 14.5-Mc. superhet later included (in this form, and later with higher-Q coils and a 6SN7 in place of its 6C8G dual triode) in the 1942-1947 ARRL *Handbooks*.

☐ Carried under the headline "Opportunity—Through Registration," a form titled "A.R.R.L. Registration of Personal Availability and Station Facilities" appears on page 25 as part of an ARRL effort to enumerate how many ineligible-for-military-service hams are available for radio-related volunteer work or radio jobs.

☐ In part one of a two-parter, Dana A. Griffin, W2AOE, discusses "U.H.F. Superhet Design for Improved Performance in Audio and Video Reception."

☐ With ARRL survey results showing that 60% of amateur operation consists of radiotelegraphy, John (W1LVQ) Huntoon suggests means of improving code proficiency in "This Business of Code." Phone operators can stand to improve their operating techniques, too, so F. E. Handy, W1BDI, provides "Self-Training Hints for Voice Operators."

☐ W1JPE pens *QST*'s last prewar DX column; pickings are just too slim.

February 1966

☐ "It Seems to Us . . ." wonders why recent FCC statistics reflect the acquisition of fewer ham newcomers than we gained in the early 1960s. CB radio, incentive licensing, license fees and shortwave listeners' relative inability to listen in on hams via SSB transmissions are all possible causes, but the impact of competition by other interests probably overrides them.

☐ Dick Stevens, W1QWJ, gets HF efficiency with UHF circuits in a grounded-cathode kilowatt amplifier for 432 Mc., while Lew McCoy, W1ICP, keeps costs down at 80 through 10 meters by basing a 700-watt amp on a pair of 572B triodes.

☐ Joel Balogh, K3CFA, discusses "Improving Your Receiver with a Frame-Grid R.F. Pentode": the 6EH7 semiremote-cutoff tube.

☐ Last August into early September, Hurricane Betsy looped twice to pound the Bahamas, southern Florida and the Louisiana coast. George Hart, W1NJM, describes ham radio's role in relief.

☐ *QST* continues its 50th-year celebration by reprinting H. E. Rawson's "Measurement of Wavelength, Capacity and Inductance With Oscillating Vacuum Tube" (August 1919) and W. A. Hoffman's "A Grid-Meter Driver" (August 1926).

☐ Oscar IV is up, but not where it was intended to orbit, and not working quite as hoped. A photo spread and "The World Above 50 Mc." tell the tale.—*David Newkirk, WJ1Z*

Results, 5th IARU HF World Championship

By Billy Lunt, KR1R and Warren C. Stankiewicz, NF1J
Contest Manager Assistant Contest Manager

The 1990 IARU HF World Championship was held the weekend of July 14-15. Although this year's contest didn't measure up to the 1989 contest when it came to propagation and band openings, every entry class crushed ITU-Zone records. Thirty-five records went by the wayside: five on mixed mode, 11 on phone, 11 on CW and eight multioperator.

This summertime contest is always fun and morale was as high as usual. John, WB6DFA, exclaims, "I had a great time! Band conditions on the West Coast weren't as good as last year, but I was still able to add five new countries to my totals." ZM2AGY conveys, "Conditions seemed a little spotty, but that's half the fun." WA6HRK claims, "Even though the solar flux was down from last year, I still made 50% more QSOs." Peter, WW2Y, reveals, "The high bands weren't as good as last year's contest, but 80 and 40 were in great shape this time around."

This year's contest attracted 1166 entries from 43 ITU zones. CW remains the most popular entry category in the 24-hour contest. Second on the list is phone-only, followed by mixed mode and multioperator.

Eleven IARU member-society HQ stations submitted their logs, with five breaking the 1-meg mark. Congratulations in particular to the MRASZ station HG90HQ, whose 8.7M score topped the list. They are followed by Y61HQ with 8.4M; YP0A with 3.5M; W1AW with 2.4M; and GB5HQ with 1.3M points. Thanks to all the HQ stations that participated and gave us those extra multipliers.

Tom, 5H3TW (K3TW, op), boosted his last year's second-place effort by 400k points, winning the world mixed-mode category for 1990 with 1.8M points. Great going, Tom! Ben, DL6FBL, finished in second-place world with an impressive 1.3M points. Rich, K1CC, moving up from sixth-place world last year, finished in third-place world and first-place W/VE, scoring 1.0M points. Fred, K3ZO, placed seventh in the world and second for W/VE, scoring 907k points. Howard, K4PQL, was tenth-place world and third-place W/VE with 716k points.

Serge, UT5DK, scored 845k points to take first-place world phone. Janez, YU3HR, moved up the ladder from eighth place in 1989 to second-place world phone this year, scoring 822k points. Jack, W1WEF, moved up a notch from sixth place last year to fifth-place world and first-place W/VE phone, with 733k points. Bob, KW8N, finished eighth-place world and second-place W/VE, scoring 658k points.

On the CW-only front, Steven, WB2Q, moved up in the standings by seven notches to win first-place worldwide CW for 1990, scoring 1.2M points. Bill, KM9P, guest operating at N4RJ, finished second-place world CW with 1.0M points. Brass pounder Al, G3FXB, scored 974k points to finish third-place world. Dan, K1TO, finished sixth-place world and third-place W/VE, scoring 904k points. Ralph, N5RZ, was seventh-place world and fourth-place W/VE with 872k points. Dave, K5GN, scored 711k points, finishing eighth in the world and fifth for W/VE. In ninth-place world and sixth-place W/VE was Dave, K6LL, scoring 711k points.

In the multioperator category, there was a fierce battle for the world top spot between two Hungarian stations. When the dust settled, HG1S finished on top with 3.3M points, setting a new all-time score record. The crew at HG0X wasn't far behind with 3.2M points in second place. Last year's multiop winner, UC1OWA finished third with 2.7M points. The gang at K8AZ edged out K3EST and friends for first-place W/VE multiop.

IARU Headquarters Stations

HG90HQ (HA1YU,HA4s XT,ZZ,HA5s GF,IW,LN, MK,WE,HA6s NF,OQ, HA7JAO,HA8s FM, IE,ops) 8,740,732- 10,218- 259- D

Y61HQ (DF7RX,DK3EI,DL2NBU,DL3OI,DL4NAC, DL6RAI,Y21s EF,TL,Y23EK,Y24UK,Y24VF, Y32s NJ,QD,TK,VK,Y33VL,Y37XJ, Y42s IK,LK,MK,OK,PK,QK,Y58WA,Y77VH,ops) 8,404,968- 9891- 264- D

YP0A (YO2BV,YO3s APJ,FU,YO4s AVR,BEX, BQV,FM,HW,UC,YO6AWR,YO7UP,YO8s AXP,BAM,DDP,EB,YO9s AGM,BEI,FE,ops) 3,558,126- 6082- 202- D

W1AW (KA2AEV,KQ2M,KR2J,KZ2S,N2KW, NQ2D,W6LC,NI8L,ops) 2,439,500- 5169- 164- D

GB5HQ (G3OZF,G4s JUG,RTO,G0HSD,ops) 1,347,260- 2218- 155- D

4U1ITU (N6TR,op) 976,752- 2402- 126- C

JA3RL (JA3MAU,JG3s KUT,RPL,JI3ERV, JJ3WPF,JP3LKR,JR4ISF,JR5NMD,ops) 788,358- 2347- 118- D

SK3SSA (SM3s OSM,SGP,ops) 495,390- 1466- 105- D

EI0RTS (EI2s EZ,FN,GS,EI3GU,EI4s GK,HE, EI5CZB,EI7CX,EI9FL,ops) 469,371- 1471- 103- D

VE3QST (VE3XN,op) 163,785- 755- 61- A

SN9C (SP9s ADV,GDO,JPA,MZP,ops) 147,390- 976- 85- D

Operators at JARL headquarters station JA3RL in Osaka, Japan, are busy securing their seventh-place finish.

John Anderson, WB6DFA, of Laguna Hills, California, had a great time operating phone-only from the Orange Section in Zone 6.

Top World Scores

Mixed

Call sign	Score
5H3TW	1,859,822
DL6FBL	1,366,014
K1CC	1,057,383
RW9WA	1,010,096
RHØE (RH8EA,op)	963,010
EX3A (UW3AA,op)	917,769
K3ZO	907,531
EXØS (UAØSAU,op)	808,119
RW4LYL	767,167
K4PQL	716,001

Phone

Call sign	Score
UT5DK	845,427
YU3HR	822,780
LY2ZO (LY1R1-751,op)	800,640
UAØTO	737,832
W1WEF	733,134
OH2BU (OH1EH,op)	721,356
GMØECO	686,488
HAØNAR	674,576
KW8N	658,750
LY3BH	632,672

CW

Call sign	Score
WB2Q	1,270,620
N4RJ (KM9P,op)	1,017,640
G3FXB	974,974
RZ9UA	947,525
UL7CW	913,116
K1TO	904,400
N5RZ	872,395
K5GN	747,826
K6LL	711,674
OH1AD	693,852

Multioperator

Call sign	Score
HG1S	3,342,547
HGØX	3,253,341
UC1OWA	2,716,532
RT1U	2,517,972
RQ9W	2,133,224
R6L	2,118,741
4L4F	2,009,250
UW2F	1,877,213
UB3IWA	1,824,992
P3ØS	1,424,970

The IARU HF World Championship offers something for everyone. You have the choice of operating CW and phone or just one mode, if you like. Anyone, anywhere in the world can be contacted for contest credit, with a QSO point structure emphasizing contacts with stations in other continents, but not ruling out QSOs with colleagues in your own continent or country. Multipliers are the 90 ITU zones and IARU headquarters stations around the world. Almost any station can be competitive in the HF World Championship. It doesn't take big antennas or a lot of power to enjoy it, as Dan, AA6LM, expresses, "I didn't need anything fancy to join the fun!" You don't even have to win in your Section or country to qualify for "wallpaper" in this one. You can earn a contest certificate just by completing 250 QSOs or getting 50 multipliers and submitting your entry. If you demand a more intense challenge, such as finishing in first place or making the top ten, the championship offers plenty of tough competition.

See you in next year's championship, the weekend of July 13-14, 1991.

SOAPBOX

I passed my Extra Class exam the day of the contest and decided to give my new privileges a new try, and I even worked some new countries (N6NMH). This wasn't much of an effort, but I had a lot of fun (WXØB). I enjoy the format of this contest! (W7YAQ). I'll be better prepared next year (N7LOX). Conditions were good, although not as good as last year (AD5Q). I always enjoy the contest (W5NR). It was a great contest, as always, but propagation was not as good as it was last year. Even though I was tired in the wee hours of the morning, I still wish the contest was longer than 24 hours (WB7EZO). I'll see you next year, the good Lord willing (W1CNU). I didn't pay much attention to last year's results until I got the certificate in the mail (KC2TA). The propagation on 10 and 15 wasn't as good as last year and it seemed that the participation was down (K3IXD). This was my first DX contest (W3NGO). These were the worst conditions I've ever seen in a contest. What happened to the sunspots? (KD3GC). Although conditions seemed much better this year than last year, I still came out with about the same score (W9HE). I was glad to be able to do it again (PP7JCO). This was my first IARU contest, but not my last (LA9DFA). I had a nice holiday with my XYL (OHØ/OZ1JVN). This contest is one of our favorites (OH1EH). I enjoyed every minute of the contest (OH6YF). It's good this contest lasts only 24 hours (OH5NFS). It was an interesting contest (OH3YM). 10 meters was a disappointment (OZ7AX). It was an excellent contest, though conditions were not quite as good as last year. We're planning for next year already! (EJ1D). Conditions were not good on 10 or 15, but the QSO rate on 20 was better than usual (G4BKI). I enjoyed the contest, and hope to do better next year (GWØAJI). It was a good contest, but my going to bed at night cost me about 300 QSOs (PAØIJM). This is always the nicest contest of the year. I always anticipate it and the heat wave it brings with it (PA3EMN). It was hard to be active with the 35° C temperatures (PAØDOM). It was a pity that activity from Africa and Oceania on CW seemed so low

Top W/VE Scores

Mixed

Call sign	Score
K1CC	1,057,383
K3ZO	907,531
K4PQL	716,001
KZ5D	623,691
WD8LLD (WD8AUB,op)	577,096
WA3LFY	352,704
WF5E	312,067
K8AQM	280,600
KY2J	261,970
WA5OYU	254,616

Phone

Call sign	Score
W1WEF	733,134
KW8N	658,750
K6SVL	361,485
WB2K	360,360
KA5WSS	338,400
AA9A	308,976
N6YKL	265,866
KB2BF	227,664
KA1ION	220,168
WW6O	152,470

CW

Call sign	Score
WB2Q	1,270,620
N4RJ (KM9P,op)	1,017,640
K1TO	904,400
N5RZ	872,395
K5GN	747,826
K6LL	711,674
N2BA (K8HVT,op)	674,730
NI6W	659,475
K8CC	646,668
N6TV	579,852

Multioperator

Call sign	Score
K8AZ	1,010,940
K3EST	1,004,289
K4VX/Ø	960,480
N8CXX	709,496
K6XT	680,218
WW2Y	625,510
KA5W	600,288
KRØB	536,928
NF7P	496,496
K9SD	462,840

(PAØLOU). The power supply for my amplifier blew up at midnight (DL8PC). This is the best contest of all (DL2OBF). Two watts worked great from here (DL/WC6U). The bands weren't good. Starting the contest at 4 AM was a change (AL7CQ). It was a lot of fun to enter a contest from my home town, where I hadn't been active for 15 years (IX1MOL). It was a good experience (IK3ORD). The tower and 20-meter antenna were destroyed in a heavy storm 12 hours before the contest (IV3TQE). This was an interesting contest (SP3XR). I ran out of electricity! (SV1RP). Conditions were bad this year (Y21CL). This was my first try at this contest (YO5CTY). Although the propagation was poor, it was a nice contest (4N3AA). The contest was enjoyable in spite of the poor propagation (UA3DPX). It was an FB contest (UA3JD). We used four separate receivers coupled to a single exciter/PA (LY2WW). It was a nice contest! (YL2PJ). It was a good contest, but the conditions were bad here (ES4XB). The contest could have been great, as usual, if the propagation was as good as it should have been. I missed the skip to the Pacific on 10 meters, which cost me four multipliers (RV9CFA). This was my first contest! (UL7NEA).

Scores

Scores are listed by ITU zone and then by country within that zone. The line score indicates the call sign, final score, QSOs, multipliers and entry class. The entry class letters indicate the following: A = single operator, mixed mode; B = single operator, phone only; C = single operator, CW only; D = multioperator, single transmitter.

Zone 1

Alaska

KL7Y	755,375-	1539-	126-	A
AL7CQ	357,520-	1132-	82-	B
AA6DX/KL7	218,198-	681-	79-	C

Zone 2

Alberta

VE6GEI	24,318-	159-	42-	B

British Columbia

VG7ARS	65,721-	348-	57-	A
VE7XO	4,422-	51-	22-	B
VE7CC	666,995-	1345-	133-	C

Zone 4

Ontario

VE3TJL	2,320-	55-	16-	A
VE3BXY	64,042-	254-	71-	B
VE3KP	254,068-	827-	76-	C
VE3OSZ	25,415-	101-	65-	C

Zone 6

W6

East Bay

KI6OY	1,108-	27-	14-	B
N6EK	277,276-	742-	103-	C
NF6S	277,090-	613-	110-	C

Los Angeles

N6IBP	42,849-	173-	69-	A
K6SVL	361,485-	977-	87-	B
N6RVZ	148,434-	505-	78-	C
W6FA	2,277-	29-	23-	C

Orange

N6TIB	144,387-	670-	61-	A
NX6M	19,584-	179-	36-	A
N6WK	10,881-	103-	27-	A
N6YKL	265,866-	972-	73-	B
WB6DFA	42,030-	292-	45-	B
NI6W	659,475-	1235-	135-	C
W6SX	55,275-	301-	55-	C
AA6LM	1,785-	39-	15-	C

Santa Barbara

WA6FGY	121,408-	658-	56-	A
W6BKY	11,760-	137-	28-	C
N6NMH (+WA6IET)	8,568-	65-	24-	D

Santa Clara Valley

N6IP	109,344-	378-	67-	A
N6JM	54,340-	210-	65-	A
N6NF	14,582-	210-	23-	A
KE6ZF	119,968-	416-	77-	B
WA6HRK	21,462-	151-	42-	B
N6TV	579,852-	1176-	126-	C
AD6E	91,016-	400-	62-	C
WX6B	88,440-	338-	66-	C
K6MJ	57,152-	193-	64-	C

San Diego

KI6ZH	39,219-	213-	51-	B

The operators of MRASZ headquarters station HG9ØHQ celebrate their first-place finish. Pictured (l-r) standing: Peter, HA5WE; Tibor, HA5LN, and his wife, Eva, HA5YLN; and Tomi, HA7RY; sitting: Simon, HA5IW; Peter, HA5MK; Zoli, HA5ML; Sanyi, HA5GF in front.

W6YA 577,870- 1181- 122- C
AA4M 353,174- 811- 118- C
W6UQF 302,876- 711- 116- C
KI6V 5,616- 60- 24- C
AA6EE 168- 8- 7- C
K6XT (+K6JYO,KI6ZH) 680,218- 1159- 154- D

San Joaquin Valley

WW6O 152,470- 530- 79- B
KD6WW 582,950- 1066- 135- C
N6SUZ 53,361- 357- 49- C

Sacramento Valley

W6NKR 4,428- 52- 18- C
K3EST (+KI6EZ,N6RO,JH4RHF, JR4DUW) 1,004,289- 1787- 143- D
K6FO (+N6WR) 2,664- 403- 68- D

W7

Arizona

KG7EM 2,680- 38- 20- A
K6LL 711,674- 1375- 134- C
KC7V 1,980- 50- 10- C

Eastern Washington

K7WA 7,062- 69- 33- A

Montana

KS7T 26,936- 222- 37- A

Nevada

WB7VHH 1,744- 31- 16- B
KZ4H/7 25,425- 215- 45- C
NF7P (+NC7K,WX7W) 496,496- 1400- 104- D

Oregon

WR7E 46,748- 238- 58- B
W7YAQ 280,721- 669- 119- C
KA7FEF 8,034- 91- 28- C

Utah

K6XO 83,448- 380- 76- A
W7HS 80,754- 239- 88- A

Western Washington

NX7K 158,100- 491- 93- A
KI6NT 6,916- 100- 28- B
N7LOX 62,776- 353- 56- C
K7RA 55,460- 288- 59- C
W7QN 21,356- 140- 38- C

Zone 7

W5

Arkansas

A5VBE 17,438- 131- 37- A
AA5CV 13,062- 85- 42- B
W5EIJ 14,405- 109- 43- C

Louisiana

KZ5D 623,691- 1285- 131- A
W5GAD (AA5PN,KB5GQ,KG5XV,N5s NBC,OGW,RDI,WF5O,WB9VTN,ops) 67,520- 312- 64- D

Mississippi

WA5OYU 254,618- 710- 103- A

North Texas

KD5GD 84,942- 347- 66- B
N5RZ 872,395- 1496- 149- C
W5UDA 175,040- 566- 80- C
KA5W (+KS1G) 600,288- 1372- 111- D

Oklahoma

NW5H 20,079- 263- 23- B
WM4Z 5,980- 95- 20- C
KF5DA (+KG5TO) 47,142- 250- 54- D

South Texas

KG5YA 138,690- 578- 67- A
KA5WSS 338,400- 1006- 100- B
WA5IYX 63,480- 286- 60- B
K5GN 747,826- 1154- 167- C
AD5Q 575,236- 1149- 124- C
KI3L/5 136,192- 568- 64- C
W5NR 30,855- 144- 51- C
N5EA (+K5GA,W5s ASP,PWG,NB9T) 430,008- 1394- 82- D

West Texas

WF5E 312,067- 743- 109- A
N5NA 18,410- 166- 35- C

W9

Illinois

N8FFZ/9 19,129- 99- 47- C

W0

Colorado

NØZA 209,070- 658- 90- A
K9MWM/Ø 56,540- 359- 44- B
KDØNB 14,212- 112- 38- B
WBØZ 3,654- 54- 21- B
WØBWJ 2,808- 32- 26- B
ACØS 41,689- 251- 47- C
WØKEA (+W1XE,KR8U) 378,500- 99- 100- D

Iowa

NEØP 40,137- 258- 51- A
WØPPF 22,237- 151- 37- B
KFØKY 10,974- 114- 31- B

Kansas

WBØYIT 5,712- 53- 21- B
NØFMR 25,065- 158- 45- C

Minnesota

NØHUQ 24,477- 183- 41- B
KEØUI 20,736- 150- 36- C
KFØT 7,372- 98- 19- C
KFØB (AF9T,K8s II,IJL,KJØB,KSØT,NØs BIL,BKL,ops) 536,928- 1222- 119- D

Missouri

NSØB 60,568- 260- 67- A
KCØLX 68,103- 285- 63- B
K4VX/Ø (+AG9A,WOØG) 960,480- 1547- 160- D

Nebraska

KØSW 21,378- 111- 42- A

South Dakota

WDØBMR 90,610- 435- 65- B

Zone 8

W1

Connecticut

K1CC 1,057,383- 1719- 153- A
K1SSN (WB7EZO,op) 178,224- 758- 79- A
NTØZ 22,672- 182- 52- A
W1WEF 733,134- 1571- 118- B
KA1ION 220,168- 559- 104- B
NY1V 25,494- 178- 42- B
NF1J 9,660- 111- 28- B
N1FGX 1,309- 31- 11- B
KA1MIS 1- 1- 1- B
K1TO 904,400- 1588- 136- C
N8RA (NJ2L,op) 550,458- 1341- 106- C
K2SX 420,736- 1011- 128- C
K1TN 111,300- 510- 70- C
AB1U 40,500- 245- 60- C
W1CNU 27,931- 195- 31- C
W1KKF 8,530- 78- 15- C
KA1QAS (+KA1TMV,NR1L) 188,240- 1156- 80- D

Eastern Massachusetts

WB2DND 56,148- 200- 67- A
NB1B 149,224- 468- 92- B
WA1NPZ 94,546- 331- 82- B
KT2E 21,840- 138- 42- C

Maine

KN1M 125,205- 446- 85- B
K1SA (+K1RQ,KA1PRD,KB1U,KY1K, N1s AFC,FHS,FZL,W1OO) 29,280- 148- 48- D

New Hampshire

K8LT 186,960- 615- 80- C

Rhode Island

K1PLX 127,280- 543- 80- B
N1FWC 1,547- 33- 13- B

Western Massachusetts

KA1T 89,775- 349- 75- C
KZ1M (+KB1RI) 143,000- 544- 65- D

W2

Eastern New York

KY2J 261,970- 850- 85- A
WT2F 7,475- 59- 25- A
KB2JBL 784- 50- 8- B
WB2Q 1,270,620- 1751- 180- C
N2BA (K8HVT,op) 674,730- 1326- 126- C
N1CC 38,164- 225- 47- C
WI2N (+WI2E) 377,410- 934- 110- D

NYC-Long Island

KS2G 48,000- 276- 48- B
K2KTT 6,500- 62- 25- B
W2GKZ 31,266- 153- 54- C

Northern New Jersey

KW4E 49,500- 255- 60- A
WB2K 360,360- 714- 143- B
W1GD 103,335- 324- 83- B
K3FNW 87,516- 296- 78- B
W2HCA 38,857- 225- 49- C

Southern New Jersey

KB2BF 227,664- 778- 72- B
KC2TA 10,152- 125- 27- C
K2MK 7,756- 71- 28- C
WW2Y (+K2WI,N2NU) 625,510- 1185- 142- D

Western New York

KD2YP 105,939- 179- 79- A
W2TZ 89,404- 386- 62- C
KB4VL (+N2JYC) 13,600- 114- 34- D

W3

Delaware

KV3U 3,880- 61- 20- B

Eastern Pennsylvania

WA3LFY 352,704- 866- 96- A
NM3E 107,520- 438- 60- A
N3HHE 74,088- 269- 72- B
KA1CLH 14,664- 564- 26- B
K3ZPG 10,868- 66- 38- B
NN3Q 91,476- 502- 44- C
KL7HIR 86,170- 393- 70- C
NF3P 77,349- 409- 57- C
KI3S 55,108- 276- 59- C
W3BGN 41,572- 278- 38- C
K3WW 3,072- 56- 12- C

Maryland-DC

K3ZO 907,531- 1591- 139- A
K3EKA 31,880- 156- 55- B
K3IXD 31,185- 141- 83- B
KA3QER 2,568- 54- 12- B
N3GOF 39,167- 201- 53- C
W3GG (+KD3JH) 382,374- 1026- 97- D
KD3I (+NET) 67,396- 224- 83- D

Western Pennsylvania

W3YEY 39,300- 211- 58- B
N3GSC 35,990- 160- 59- B
WB3COA 8,990- 86- 29- B
W3NGO 3,744- 54- 18- C
KA3RRF 2,873- 49- 17- C
K3UA (+NET) 126,801- 500- 75- D

W4

Alabama

KK4SM 61,560- 196- 76- C
K4NNQ 51,243- 323- 57- C
AA4XM 8,050- 106- 23- C

Georgia

KD3GC 54,925- 227- 65- A
N4RJ (KM9P,op) 1,017,640- 1653- 152- C
N8LM 41,258- 214- 49- C
AA4VD 6,540- 118- 20- C
W4AQL (N4VMD,KØDI,ops) 73,740- 353- 60- D

Kentucky

N4XM 218,750- 625- 102- C

North Carolina

K4POL 718,001- 1321- 143- A
N4UH 121,104- 367- 87- B
KA4RVS 74,958- 309- 78- B
KJ4TI 57,834- 246- 83- B
WA8WAU 1,722- 39- 14- B
K4PB 126,960- 439- 80- C
N4UOH 14,340- 148- 30- C
N4QVM 12,456- 90- 36- C
N4AA 172,425- 455- 95- D

Northern Florida

WC4E 117,824- 501- 64- C

South Carolina

WD8AMV 5,406- 126- 17- C

Southern Florida

KO4J 136,032- 456- 78- A
WA5DTK 80,247- 293- 69- A
WK4F 35,370- 180- 45- B
WD4AHZ 287,436- 758- 102- C
N4ES (+KB4YA,KK4QN,WA4CVC,K9RY) 239,904- 658- 102- D

Tennessee

AA4NU 137,200- 525- 80- B
K4JHT 39,960- 200- 54- B
KS2X 8,586- 116- 27- B

Virginia

N4MM 138,048- 366- 96- B
W4JVN 89,325- 344- 75- B
KM4MP 30,702- 224- 51- B
KG4W 81,685- 455- 55- C
K4FPF 42,126- 223- 51- C
W4XD 27,429- 205- 41- C

W8

Michigan

K8AQM 280,600- 674- 115- A
KF8DF 22,074- 410- 39- A
K8DD 124,965- 420- 82- B
KDØPF 27,120- 163- 48- B
K8CC 646,668- 1268- 142- C
KJ8A 17,640- 110- 45- C
K8CV 8,896- 88- 32- C
N8CXX (+KJ8M,KC8OC,NE8T,WB8VMS) 709,496- 1404- 131- D

Ohio

WD8LLD (WD8AUB,op) 577,096- 1175- 124- A
K8MR 161,913- 499- 93- A
KF8K 80,199- 281- 63- A
K8NI 35,728- 241- 44- A
KW8N 658,750- 1110- 155- B
KA8ZNZ 71,622- 329- 69- B
KC8WR 30,626- 300- 32- B
NG8D 107,692- 507- 52- C
N8BC 77,316- 274- 68- C
W8CAR 63,375- 225- 75- C
W8FN 61,640- 374- 46- C
K8SJ 34,236- 210- 54- C
N8AGU 16,530- 145- 38- C
K8ES 14,688- 116- 34- C
K8AZ (+K8s BL,NZ,KC8M,N8s ATR, DMM,W8KIC,WT8C) 1,010,940- 1522- 174- D
W8LT (NZ4K,KU8E,ops) 441,220- 996- 130- D
NO8D (+NF8R) 403,425- 1115- 98- D
WD9INF (+KB8HAE,W8IQ,WA8ZZA) 400,980- 922- 123- D
WA8OSE (+N8JEC) 156,434- 360- 107- D

West Virginia

N9JF/8 26,460- 226- 35- A
KC1PR/8 5,775- 30- 21- B
WT8L (+N4SLR,N8MDC,WB8s VAZ, YZV) 152,516- 546- 91- D

W9

Illinois

WB9JKI 119,440- 487- 80- A
WD9DGE 44,160- 290- 60- A
KB9UG 43,188- 276- 59- A
WV7T/9 34,488- 249- 43- B
W9LYA 14,061- 121- 43- B
KB9CRY 3,978- 76- 17- B
N9AEJ 286,110- 772- 99- C
K9MMS 168,833- 551- 89- C
NA1R 109,798- 427- 82- C
W9EBY 34,776- 263- 54- C
K9UQN 10,276- 93- 28- C
K9SD (K3ZO,KC9AL,W9NNE,WB9SBO, KAØGGI,KWØA,WØHBH,ops) 462,840- 948- 140- D

Indiana

KBØC 96,714- 358- 81- B
K9JS 27,360- 161- 48- B

Wisconsin

KT9W 113,772- 499- 78- A
W9XT 108,262- 447- 74- A
NB9C 85,152- 376- 64- A
WD9EGC 1,638- 153- 9- A
AA9A 308,976- 820- 123- B
W9HE 54,320- 260- 56- C

Zone 9

VE

Maritime-Newfoundland

VO1CA 11,544- 82- 37- A
VE1CBF 38,920- 165- 56- B

Zone 11

Dominican Republic

HI9UD (HI3s AMF,LFE,ops) 30,927- 210- 39- D

US Virgin Islands

WA9SQN/KP2 61,480- 447- 35- C

Turks & Caicos

VP5JM 289,641- 1315- 67- B

Zone 12

Bolivia

CP1FF 39,270- 230- 35- B

Peru

OA4ZV 211,600- 534- 80- C

Venezuela

4M1E 23,184- 196- 24- B
YV5KWS 19,514- 188- 22- B

Zone 13

Brazil

PP7JCO 16,380- 110- 30- C

Zone 14

Chile

CE3BFZ 39,865- 137- 67- B

Argentina

LU1CX 52,206- 249- 42- A
LU8ESU 146,034- 470- 63- B
LR2D 132,600- 464- 60- B
LP3F 118,833- 723- 33- B
LU1EWL 86,118- 287- 62- C

Zone 15

Brazil

PP5JD 176,120- 566- 40- B
PY1CE 48,564- 366- 27- C
PY1AJK 35,196- 175- 42- C
PY2ORF 366- 19- 6- C

Zone 18

Svalbard

JW/DL3LAB 9,288- 150- 24- B
JW/DK2OY 50,715- 425- 49- C

Norway

LA9DFA 131,126- 562- 74- B
LA4KGA 33,040- 210- 56- B
LA2AD 17,131- 147- 37- B
LA6PB 1,152- 28- 12- C

Finland

OH1AF 690,846- 1788- 102- A
OH2BLF 97,601- 365- 73- A
OH7NW 39,672- 214- 58- A
OH5NBJ 12,750- 119- 34- A
OH2BU (OH1EH,op) 721,356- 1359- 141- B
OH3OJ 257,383- 895- 83- B

Gary Hammond, VE3XN, operated CRRL headquarters station VE3QST in London, Ontario.

OH6SU 14,534- 90- 43- B
OH3TZ 5,020- 80- 29- B
OH4MCV 936- 34- 9- B
OH3MIG 95- 7- 5- B
OH1AD 693,852- 1454- 134- C
OH6YF 504,758- 1349- 119- C
OH6OS 350,056- 1058- 94- C
OH5NFS 238,392- 765- 86- C
OH3YM 46,992- 323- 44- C
OH6MQE 11,286- 204- 33- C
OH2YL 7,898- 91- 22- C
OH6MIL 1,755- 29- 15- C
OH1WM 920- 25- 8- C
OH6NIO (+OH6MFN) 435,180- 1038- 110- D
OH3SWL (OH2BVM,OH3s GZ,MIG, NDH,ops) 4,077- 62- 27- F

Aland Island

OH0OZ1JVN 82,895- 439- 59- C

Denmark

OZ5EV 222,888- 607- 116- B
OZ1LTB 157,416- 527- 84- B
OZ7AX 42,224- 241- 56- B
OZ3ACZ 22,776- 154- 39- B
OZ8XO 1,183- 31- 13- C
OZ5MAY 168- 20- 3- C
OZ7GF 5- 1- 1- C
OZ5EDR (OZ1IVA,OZ3ABE,OZ7ABI, ops) 134,687- 578- 71- D

Sweden

SM3CER 20,223- 141- 63- A
SM6BDS 9,554- 89- 34- A
SM3JIV 36,028- 207- 54- B
SM5ARR 10,800- 107- 50- B
SM2NTU 10,304- 133- 32- B
SM5GXW 8,991- 156- 27- B
SM0OY 1,215- 33- 15- B
SM3CCM 197,520- 709- 80- C
SM1BVQ 100,230- 373- 78- C
SK8GX 64,296- 355- 76- C
SM7LAZ/6 14,904- 150- 46- C
SM6IJF 7,700- 83- 15- C
SM7TV 1,880- 42- 20- C

Zone 19

European Russian RSFSR

RA1AA 291,354- 863- 98- B
U1BA 24,975- 187- 45- B
UA1ZO 237,240- 648- 90- C
UA1OLL 41,864- 251- 52- C
US1N (OH6EI,RA9UR,UA1s NAW,NDY, UA9QO,ops) 186,676- 862- 58- D
UZ1AWO (UA1s AKC,AQF,-169-900,ops) 121,420- 688- 52- D

Zone 20

Asiatic RSFSR

RA9JB 28,952- 269- 40- A
UA9JJJ 21,240- 181- 34- A
UA9JFR 29,076- 176- 38- B
UA9XS 148,070- 513- 85- C
UA9XB 145,470- 277- 130- C
UV9CC 50,776- 268- 42- C
UA9XET 7,938- 95- 21- C
UZ9WXV (UA9s XC,-090-1053, -090-1058,ops) 152,561- 760- 41- D

Zone 21

Asiatic RSFSR

RW9HZ 103,235- 401- 55- B
UA9JBI 62,565- 318- 43- C

Zone 25

Asiatic RSFSR

4K4QQ 31,179- 298- 50- C
RW9I (UA4s HAD,HBR,IU,UA9KO,UA0s IAP,IAY,UB5ILU,ops) 313,875- 867- 93- D
UZ0IWA/A (UA0IBB,UW0IW,ops) 125,400- 520- 60- D

Zone 26

Asiatic RSFSR

UA0KBC 117,312- 436- 64- C
4K4POL 39,348- 265- 36- C
UZ0KWW (UA0s KB,KCL,KJ,KZ,ops) 333,683- 1022- 73- D

Zone 27

Ireland

EJ1D (EI2s CA,GB,EI3GE,EI6EW, EI7CC,GW4VEQ,ops) 884,912- 2080- 112- D

France

F1JDG 25,920- 245- 36- A
F1LBL 205,652- 833- 102- B
FD1NBX 76,808- 351- 43- B
F6WE 75,696- 395- 57- B
F/SP1NQF 70,914- 320- 53- C
F1MNC 48,078- 337- 34- C
FD1NQL 41,695- 374- 31- C
FD1OIE 11,424- 140- 24- C
F8TM 2,556- 38- 18- C
F2FX 2,166- 36- 19- C
TM5M (F1s JTL,MFI,FA1MXI,FD1s MXH,MYH,ops) 536,991- 1538- 91- D
F1HWB (+FD1ONJ) 44,550- 220- 55- D

England

G6MFO 353,704- 915- 104- A
G0KTN 21,630- 146- 42- B
G3FXB 974,874- 1621- 143- C
G3ESF 115,924- 440- 73- C
G4BKI 55,514- 405- 39- C
G6DE 48,336- 210- 48- C
G4ZME 24,786- 198- 34- C
GI0NGLO 23,050- 250- 25- C
GX3CSR (G1CYB,G3XWK,ops) 52,030- 278- 55- D

Scotland

GM0ECO 686,488- 1520- 116- B
GM3CFS 70,148- 276- 71- C

Wales

GW0AJI 41,361- 243- 51- B

Belgium

ON4AMI 295,740- 1101- 60- B
ON5CZ 15,624- 143- 36- B
ON6JG 5,832- 109- 16- B
ON4XG 104,080- 363- 80- C
ON6AH (ON5s AV,IQ,ON6s AH,MM,QR, VL,ON7PC,ops) 514,008- 1314- 99- D

Netherlands

PA3FDO 42,300- 293- 47- A
PA3EZL 11,569- 163- 23- A
PA3BNH 675- 25- 9- A
PA0JM 232,028- 804- 76- B
PA3EMN 128,128- 431- 88- B
PA0KHS 44,824- 254- 52- B
PA0KDM 18,963- 125- 49- B
PA0DOJ 3,458- 29- 26- B
PA0DOM 1,710- 23 18- B
PA8LOU 387,276- 905- 118- C
PA3ENM (+ PA3EQV) 410,755- 1015- 113- D

Zone 28

Federal Republic of Germany

DL6FBL 1,366,014- 2099- 166- A
DL1SBR 204,552- 804- 108- A
DJ1DB (DL1IAO,op) 11,550- 171- 35- A
DL8PC 445,640- 872- 26- B
DL8SDC 40,915- 255- 49- B
DL1YAW 32,095- 341- 35- B
DK5DS 26,488- 221- 56- B
DL2SDQ 20,400- 216- 48- B
DF3IS 7,290- 111- 30- B
DL2OBF 85,460- 592- 86- C
DL7BO 64,834- 439- 77- C
DL1ZQ 35,518- 295- 59- C
DL6SF 30,832- 263- 56- C
DJ1FH 26,820- 291- 40- C
DL1EV 13,132- 93- 67- C
DL4MFM 10,148- 116- 43- C
DJ6TK 9,400- 11- 40- C
DL2GBB 5,544- 87- 33- C
DL/WC6U 5,350- 98- 25- C
DK0LE (DL3s BCC,BCQ,BCZ,ops) 114,323- 426- 95- D

Hungary

HA8XX 185,040- 690- 90- A
HA6NW 172,078- 531- 97- A
HA0NAR 674,576- 1314- 133- B
HA8CQ 9,085- 136- 23- B
HG3FMZ 1,026- 40- 9- B
HA6NL 352,980- 1051- 108- C
HA6XG 124,392- 567- 73- C
HA6ML 100,152- 487- 72- C
HA8RH 99,372- 660- 42- C
HA6VA 81,312- 347- 77- C
HA7XL 71,850- 266- 75- C
HA8KCS 49,244- 303- 52- C
HA6IR 1,632- 60- 12- C
HA9CD 594- 32- 9- C
HG1S (HA1s AH,DAC,DAE,SV,1D,TJ, TW,TX,ops) 3,342,547- 4099- 223- D
HG0X (HA0s DU,LM,MK,MM,NNN,OB, VN,ops) 3,253,341- 4118- 221- D
HG5C (HA1s AD,AG,HA5s MO,OG,WU, HA8UB,ops) 1,223,034- 2594- 141- D
HA3KNA (HA3s FO,NS,NU,OV,ops) 502,059- 1385- 113- D
HA8KCK (HA8s EK,FT,FW,ops) 497,616- 1404- 112- D
HA5ROE (HA5s BBC,BCE,BNI,BPW, MY,ops) 461,250- 1260- 125- D
HA3KHC (+ops) 280,400- 954- 100- D
HA2KMR (+ops) 20,392- 422- 66- D
HA9KSF (+ops) 12- 4- 2- D

Switzerland

HB9DX 34,279- 181- 59- C
HB9DFY 16,560- 161- 45- C

Italy

IO0KHP 48,921- 287- 69- A
I1KAR (IK1GDE,op) 230,178- 755- 76- B
IK2LOL/I90 69,482- 354- 49- B
IK3ORD 25,330- 173- 34- B
IK2IKW 7,025- 85- 25- B
IK1NDB 92,960- 325- 80- C
I8QOO 29,982- 200- 57- C
IK8ADY 13,051- 133- 31- C
I1VTX 2,704- 59- 16- C
IK2EGL (+I2VXJ,IK2CFH) 995,400- 2047- 120- D
IE9CM (I9s FLY,SNY,IK0s AZG,EFR, IHA,LFL,LLK,ops) 849,807- 1652- 109- D
IV3TQE (+IV3KYQ) 713,830- 1353- 130- D
IN3ZNR (+IN3s ASW,QBR) 413,546- 1122- 109- D
IK2GAU (+IK2s GAU,HNJ,IKT,MMF, NVU,OFR,OHG) 151,250- 958- 50- D

Sardinia

IS0OMH 122,920- 678- 70- C

Bulgaria

LZ1ZD 126,800- 644- 90- A
LZ2RM 55,204- 272- 74- A
LZ2VP 45,795- 325- 43- A
LZ1TA 244,020- 861- 98- C
LZ2TU 242,320- 985- 80- C
LZ1RN 140,154- 463- 94- C
LZ2TF 85,824- 431- 64- C
LZ1MG 25,941- 400- 71- C
LZ3AA 18,700- 106- 55- C
LZ1OJ 16,830- 208- 22- C
LZ5W (LZ1s BP,PQ,I-244,ops) 965,343- 1869- 151- D
LZ1KGB (LZ1s DD,LZ,UO,ops) 329,940- 1069- 90- D
LZ2KRU (+ops) 191,120- 817- 80- D

Austria

OE3GOU 13,960- 113- 40- A
OE9SCH 27,434- 211- 58- C

Czechoslovakia

OM6KZ 133,980- 542- 84- A
OK3FON 126,625- 317- 89- A
OK3CVB 80,712- 323- 76- A
OK3CDZ 46,079- 257- 59- A
OM7TEG 25,092- 233- 34- A
OK2PGT 3,520- 57- 20- A
OK3CQG 10,516- 142- 22- B
OK3YK 6,820- 124- 20- B
OK1DXS 588,120- 1464- 116- C
OM6VD 391,431- 1015- 97- C
OK2PCF 164,255- 618- 91- C
OM1UCW 107,541- 581- 63- C
OM3YCA 88,734- 380- 69- C
OK2QX 72,261- 338- 93- C
OK3CAB 50,337- 323- 51- C
OK3CWF 36,507- 320- 43- C
OM6DXW 36,245- 187- 55- C
OK1MZO 28,710- 156- 55- C
OK2PCN 23,932- 129- 62- C
OK3CFS 18,241- 226- 29- C
OK2BWJ 14,601- 183- 31- C
OK2BBQ 12,969- 140- 33- C
OK1DLJ 12,795- 116- 28- C
OM6DOH 4,014- 192- 9- C
OK1MHA 3,825- 75- 18- C
OK3CXS 2,832- 52- 12- C
OM3TUM 2,340- 77- 12- C
OK3TNA 1,890- 69- 14- C
OK1DWJ 1,661- 69- 11- C
OK1AQW 1,584- 25- 16- C
OL9WCR 520- 31- 8- C
OK2PSZ 138- 19- 6- C
OK3KFF (OK3s TMW,TPG,TRG,ops) 1,008,432- 1941- 141- D
OK1KCF (+ops) 7,254- 76- 31- D

Poland

SP6PYL/7 3,792- 88- 24- A
SP3IBS 242,784- 715- 98- B
SP1AEN 139,860- 488- 90- B
SP4CJA 47,058- 232- 62- B
SP3XR 8,390- 133- 25- B
SP6DVP 7,450- 74- 25- B
SP9AVZ 6,424- 103- 22- B
SP5CJQ 50,028- 367- 44- C
SP4GFG 25,812- 164- 54- C
SP8LZC 10,432- 114- 32- C
SP3BGD 8,874- 82- 29- C
SP9NSV 8,350- 147- 25- C
SP6FXX 604- 31- 8- C
SP3PLD (SP3s CB,IBM,SBB,ops) 288,300- 815- 124- D
SP4KTO (+ops) 204- 16- 6- D

Greece

SV1RP/SV9 29,380- 320- 26- C

Corsica

TK/PA3EBT/P 62,997- 546- 69- A

German Democratic Republic

Y32KE 444,708- 1053- 132- A
Y32TD 287,547- 1014- 101- A
Y32WF 234,210- 620- 111- A
Y44NO 194,718- 681- 102- A
Y26DM 77,900- 282- 76- A
Y52TF 48,016- 351- 68- A
Y67UL 44,545- 215- 59- A
Y72SL 41,391- 181- 63- A
Y25TO 35,262- 245- 54- A
Y25FI 25,596- 302- 54- A
Y38ZB 12,920- 103- 40- A
Y25JA/a 11,934- 119- 34- A
Y34TH 9,353- 99- 47- A
Y24SH/a 9,216- 112- 32- A
Y21CL 8,668- 74- 44- A
Y61ZM 8,382- 96- 33- A
Y23HJ 7,840- 90- 40- A
Y77YH 7,337- 111- 29- A
Y25JJ/a 5,425- 49- 35- A
Y23IA 4,395- 146- 15- A
Y54TO 3,220- 71- 20- A
Y53GD 2,166- 38- 19- A
Y55SC 184,857- 707- 126- B
Y25KA 94,686- 368- 86- B
Y68TH 54,362- 272- 77- B
Y52WB 33,656- 249- 56- B
Y82WN 24,300- 206- 45- B
Y22OE 16,912- 104- 56- B
Y31NB 8,194- 84- 34- B
Y38WE 3,875- 41- 23- B
Y27BG 1,840- 35- 20- B
Y44UO 820- 40- 10- B
Y45OA 600- 40- 15- B
Y90SOP 311,400- 877- 120- C
Y21YT/a 190,460- 693- 89- C
Y71ZA 117,014- 388- 82- C
Y23TI 81,620- 417- 70- C
Y23GB 45,140- 245- 61- C
Y66YF 39,266- 363- 58- C
Y21OA 38,048- 237- 58- C
Y22UB 31,926- 192- 51- C
Y49RF 18,497- 147- 53- C
Y23VB 15,288- 104- 52- C
Y23CM 15,042- 89- 48- C
Y37ZM (Y21NM,op) 12,642- 91- 43- C
Y23CL/a 8,160- 92- 24- C
Y38ZM 6,200- 48- 40- C
Y87VL 5,106- 54- 23- C
Y23RJ 2,197- 47- 13- C
Y22HF 1,840- 43- 18- C
Y22PE/a 234- 20- 9- C
Y41CM (Y21RM,Y41s NM,YM,ops) 768,208- 1490- 112- D
Y37I (Y26YI,Y62s UI,YI,ops) 548,210- 1145- 130- D
Y43CO (Y43s GO,ZO,ops) 314,160- 1018- 112- D
Y45CJ (Y33OJ,Y45RJ,ops) 310,500- 883- 115- D
Y33CC (Y33s VC,ZC,ops) 303,584- 1013- 108- D
Y41CL (Y42VE,Y41s FL,HL,ops) 273,912- 864- 101- D
Y56CE/p (Y26AD,Y56s UE,ZE,ops) 147,476- 592- 92- D
Y33CJ (Y33s PJ,UJ,WJ,ops) 126,055- 519- 66- D
Y68CA (Y68s QA,HA,XA,ops) 73,350- 360- 75- D
Y65CN (Y65s KN,LN,Y84XN,ops) 65,450- 433- 77- D
Y39CH (Y24GH,Y39s SH,ZH,ops) 57,156- 304- 66- D
Y62CJ (Y62s TJ,WJ,ops) 11,687- 131- 31- D

Romania

YO2DFA 165,300- 623- 100- A
YO4CIS 25,668- 334- 31- A
YO7LFV 21,968- 221- 42- A
YO5DAS 10,116- 105- 36- A
YO2CJX 5,522- 138- 22- A
YO6BTY 3,933- 72- 23- A
YO9AHX 46,445- 238- 55- B
YO3DCO 28,810- 139- 67- B
YO6BKG 6,734- 102- 26- B
YO6OBH 4,950- 87- 22- B
YO5CTY 4,410- 103- 18- B
YO9BXE/7 3,650- 68- 25- B
YO2LBN 3,592- 77- 11- B
YO2LEF 2,436- 59- 12- B
YO9IAB 1,613- 49- 17- B
YO9KPM 728- 32- 14- B
YO9FEH 147- 22- 7- B
YO8BPY 43,305- 244- 59- C
YO2CLK 16,608- 208- 24- C
YO3BWK 7,280- 56- 26- C
YO9FJW 4,142- 103- 19- C
YO5CUU 963- 41- 9- C
YO7KAJ (YO7s CKP,LBU,ops) 159,341- 686- 91- D

Yugoslavia

YU3HR 822,780- 1565- 140- B
YU7FRU 36,936- 254- 54- B
YU2MM 609,612- 1489- 122- C
YU3EA 528,978- 1122- 132- C
4N3AA 489,312- 1388- 96- C
YT5R 331,548- 1118- 97- C
4N4U (YU4NS,op) 292,197- 963- 83- C
YU1HA 187,060- 812- 94- C
YU7LS 162,712- 1849- 88- C
YU7SF 106,653- 496- 73- C
YU7KM 39,300- 274- 50- C
YU1GN 19,620- 108- 45- C
YZ7V (+ops) 749,320- 1805- 130- D
YZ3A (YU3s AJK,WE,ops) 540,640- 1351- 124- D

Zone 29

Kaliningrad

UA2EC 35,742- 158- 69- C
UA2FBA 5,378- 77- 21- C
UW2F (UA2s FF,FJ,FM,ops) 1,877,213- 2419- 197- D

European Russian RSFSR

EX3A (UW3AA,op) 917,769- 1767- 141- A
RW4LYL 767,167- 1490- 138- A
UA3RAR 581,064- 1137- 132- A
RW3AU 333,438- 866- 119- A
UA1ANA 308,358- 963- 111- A
UV3FAB 207,460- 633- 92- A
RW3ZC 177,280- 568- 86- A
UA3RJ 150,920- 511- 88- A
UA3SBW 135,458- 424- 89- A
RA1WO 116,788- 604- 82- A
UA4LCO 107,325- 486- 81- A
RA3AOD 100,604- 363- 82- A
UA4LN 96,433- 378- 73- A
UV6LIX 71,981- 444- 49- A
RA3VR 61,420- 269- 95- A
RW3WX 51,786- 297- 54- A
UZ3DWZ 50,530- 270- 62- A
UZ6LU 36,176- 477- 68- A
UZ4AXN 21,856- 217- 32- A
UA6JDQ 19,546- 288- 29- A
UA4PDX 15,470- 178- 35- A
UZ6AZ 891,856- 1256- 142- B
UA3MDV 303,240- 744- 114- B
RA3VV 175,134- 536- 102- B
RA3ZH 172,800- 462- 98- B
UA4NC 79,079- 315- 77- B
UA1QM 72,491- 303- 71- B
UZ4AWB 69,450- 278- 75- B
UA3RBT 67,083- 349- 59- B
UA4CO 57,753- 260- 69- B
UA6HON 37,188- 281- 35- B
RA3DNC 24,864- 222- 32- B
UA4LAF 606,360- 380- 60- C
UA6ED 300,875- 1119- 95- C
UA3DPX 293,646- 970- 109- C
RZ3AW 144,144- 520- 88- C
UA4YS 128,100- 508- 84- C
UA3YAO 127,537- 481- 89- C
UA1TAF 113,032- 526- 71- C
RA3RN 106,700- 302- 100- C
UA1QBE 105,412- 458- 73- C
UA6HRZ 102,718- 470- 77- C
RA3PP 97,800- 484- 75- C
RV1AF 96,368- 444- 76- C
UA1AUA 87,906- 481- 69- C
UA3RO 74,550- 320- 75- C
UA6EDW 74,358- 505- 54- C
UW3WW 67,146- 438- 53- C
UA3JD 65,335- 323- 73- C
UA3VLO 64,824- 270- 73- C
UW3DW 62,444- 367- 67- C
RA3NB 62,433- 334- 63- C
UA6AJU 47,091- 437- 33- C
RA4YM 45,864- 265- 52- C
UV3ABN 44,544- 234- 64- C
UA3CJ 43,888- 268- 52- C
UI8BBN/ UA1T 40,695- 294- 47- C
UV6UP 39,450- 266- 50- C
UV3AFN 39,364- 263- 52- C
UA4YG 34,680- 292- 34- C
RA3EF 28,608- 1666- 52- C
UW6AU 25,620- 269- 28- C
RW3QA 24,896- 287- 28- C
UA3XGM 22,158- 352- 57- C
RV3DX 21,540- 353- 55- C
RA4AI 20,196- 146- 44- C
RA4CD 15,568- 167- 28- C
UA3TAM 14,400- 135- 36- C
UA4NGC 13,158- 281- 37- C
RA1WJ 13,080- 185- 24- C
UA4SBZ 13,050- 181- 30- C
UA3TU 9,790- 56- 55- C
U3EM 6,858- 82- 27- C
UA3TJV 6,560- 188- 16- C
UA3RAB 2,133- 121- 9- C
UV3BN 930- 21- 10- C
RA3RFW 222- 31- 6- C
UV3AGQ 65- 11- 5- C
R6L (UA6s LFQ,LO,LV,-150-1060, -150-1103,-150-1240,UB5ITW, UV6LPL,ops) 2,118,741- 2905- 201- D
4L4F (UA4s FAO,FDS,-148-6991, -148-6771,ops) 2,009,250- 2990- 171- D
UZ1AWQ (UA1AUD,-169427,-169442,ops) 426,250- 1238- 110- D
UZ1TWB (RA1TE,UA1-144-380,ops) 396,756- 1201- 107- D
UI4P (+ops) 392,486- 1328- 101- D
RZ6AXO (RA6AX,UA6s YJR,YN,YP, UV6s ADE,ADW,ops) 359,040- 1183- 102- D
UZ3PXR (UA3PPF,UW3PT,ops) 315,864- 838- 107- D
UZ6HWA (UA6HSV,UV6HTV,ops) 191,040- 667- 96- D
UZ3PWJ (UA3s PLS,PNN,PNO, UV3PF,ops) 85,848- 454- 56- D

UZ6EWF (UA6EN,UA1-109-33/U6E,ops)
44,856- 220- 58- D
UZ6LWB (RA6LW,UV6s LMK,LRI,LRW, ops) 42,240- 290- 56- D
UZ3AXK (UV3AHY,UW3FT,UA3-170-397,ops) 24,881- 420- 51- D
UZ3GXL (+ops)
21,032- 145- 44- D

Ukraine

UB5FAN	196,420-	700-	92- A
RB5IOV	178,192-	635-	86- A
UY5TE	161,767-	652-	83- A
RB5IIU	160,380-	546-	90- A
RB5EX	156,150-	588-	90- A
UB5CCP	124,640-	498-	82- A
RB5VT	99,838-	474-	77- A
UB4UXM	84,845-	322-	71- A
UB3MW	48,508-	240-	67- A
UB4QYA	40,755-	172-	57- A
UB4AR	29,205-	263-	33- A
UB4LAT	18,603-	211-	27- A
RB5FK	17,267-	205-	31- A
UB5IPN	6,308-	82-	19- A
UT5DK	845,427-	1867-	121- B
RB5CC	112,941-	393-	89- B
UB4TXN	100,866-	474-	73- B
UB5AFI	34,086-	251-	46- B
RB5IJO	25,760-	213-	40- B
UB5ZHQ	13,392-	184-	27- B
RB5QF	464,942-	1211-	122- C
UB7VA	395,980-	975-	130- C
UT5IAJ	328,968-	1042-	108- C
RB4JF	325,844-	1050-	106- C
RB5BA	256,188-	703-	111- C
RB5IA	250,638-	738-	111- C
UB5MLP	212,058-	688-	102- C
UB5IAN	201,390-	705-	98- C
UB5DBJ	189,069-	669-	93- C
UB4IX	171,598-	503-	98- C
RB5HY	96,552-	375-	72- C
UB4FWW	89,094-	530-	62- C
UB5IDG	78,870-	530-	69- C
UB5EF	76,452-	393-	69- C
RB5CL	75,554-	344-	74- C
UB5BCJ	70,609-	285-	77- C
UB5FZH	59,400-	274-	60- C
RB4INR	47,124-	275-	63- C
UB5MQS	47,034-	218-	54- C
UB5LAL	45,440-	200-	80- C
UB4LCB	44,858-	281-	54- C
UB4HZ	39,974-	259-	46- C
UB5ANK	38,872-	302-	43- C
UB4IUK	38,149-	297-	37- C
UB4MTJ	35,532-	270-	42- C
UB5JNW	33,440-	329-	32- C
UY5WA	27,105-	305-	39- C
UB4LSB	25,504-	254-	32- C
UB4IBF	25,278-	147-	66- C
UB3MP	21,822-	171-	31- C
RB5VW	19,800-	148-	33- C
UB5FAZ	19,459-	266-	29- C
UB5NBW	18,038-	194-	29- C
UB5GLX	13,828-	65-	62- C
UB4GU	11,067-	261-	17- C
UB4GY	8,910-	166-	18- C
UB4JFN	7,770-	203-	15- C
UB5VK	4,028-	77-	17- C
UB5LFG	3,386-	81-	12- C
UB5SBR	836-	32-	11- C
UB5ZME	152-	12-	4- C

RT1U (RB5MF,RT4UM,UT3UA, UT4UZ,UT5UGR,ops)
2,517,872- 3492- 204- D
UB3IWA (RB5IJ,UB5s IFZ,IML, IOK,IRZ,-073-1151,ops)
1,824,992- 2241- 208- D
4K5ZI (RB5s FF,FT,RO4OE,UB5s FAK, FBV,UO5OB,ops)
1,212,405- 2965- 131- D
UB4CWW (RB5s QRO,QRW,UB4QW, UB5s QLR,-054-866,ops)
651,598- 1451- 146- D
UB4LWA (UB5s LPZ,077-2031, 079-345,ops)
493,240- 1107- 120- D
UB4WZA (+ops)
478,160- 1053- 139- D
UB3JWW (UB4s JFV,JIW,JKA,ops)
440,135- 1452- 95- D
UB4GWP (+ops)
144,768- 631- 78- D
UB4IWI (RB4IVM,RB5ICY,UB5INT,ops)
49,980- 336- 49- D
UB4CWA (+ops)
19,750- 260- 25- D
UB4VZR (+ops)
8,496- 114- 36- D

Byelorussia

UC2DQ	150,777-	483-	99- A
RC2CO	81,720-	348-	73- A
UC1LWN	189,945-	696-	81- C
UC2WEL	136,990-	471-	95- C
RC2AY	130,500-	713-	60- C
UC2LN	26,531-	267-	43- C
UC2AFQ	13,136-	288-	42- C
UC2AJQ	12,996-	257-	19- C

UC1OWA (UC2s OE,OL,OM,OT,OZ, RZ,ops) 2,716,532- 3694- 221- D
UC1CWB (UC2s CBU,CBV,-009-23,-009-112,ops)
415,110- 800- 202- D
UC1IWW (UC2s IDC,IO,-008-256,ops)
139,601- 668- 77- D
RC6I/UC1WWO (+ops)
100,380- 356- 79- D
UC1WXE (+ops)
11,658- 171- 29- D

Azerbaijan

UD6DFF	79,164-	266-	98- A
UD6DWC	27,060-	249-	40- A
UD6DKW	35,728-	168-	58- C

UD7DWZ (UA9YBA,UD6s DCA,GFZ,ops)
130,510- 716- 82- D

Georgia

RF8O/UA6LIG	135,576-	496-	56- A
UW6LL/UF6O	31,349-	263-	29- B
UF6OBA	48,237-	524-	33- C

Turkmenistan

RH8E (RH8EA,op)
963,010- 1821- 115- A

Moldavia

RO5OI	27,262-	212-	43- B
UO5ON	71,868-	499-	53- C
UO5OLW	13,572-	184-	29- C

UO4OXA (+ops)
116,686- 569- 77- D

Lithuania

LY2OU	334,910-	939-	107- A
LY2BTA	230,775-	890-	85- A
LY3BP	191,142-	681-	74- A
LY2BLA	88,595-	513-	66- A
LY2BTD	85,820-	523-	70- A
LY1BB	38,989-	263-	47- A

LY2ZO (LYR1-751,op)
800,640- 1380- 160- B
LY3BH 632,672- 1308- 136- B
LY2ND 74,928- 280- 84- B
LY2PAQ 102,270- 523- 70- C
LY2BKM 86,360- 448- 68- C
UP2BDN 83,835- 353- 81- C
LY2BPO 44,840- 218- 59- C
UP2BF 28,880- 300- 38- C
LY2BHD 3,730- 179- 10- C

LY2WW (LY1BA,LY2s BKW,BIJ, PX,ops) 1,328,526- 2196- 172- D

Latvia

YL2PJ	125,044-	479-	86- A
YL2KO	103,674-	504-	74- A
YL2MB	124,700-	482-	86- C
UQ2GOV	41,084-	236-	63- C
YL2HB	38,428-	251-	52- C
YL2CA	30,564-	186-	54- C
YL2CV	30,157-	205-	53- C
UQ2GN	27,570-	282-	30- C
YL2EO	18,768-	119-	34- C
UQ2GOT	10,340-	151-	22- C

RQ9W (RQ2GG,UQ2s GDW,-037-53, -037-116,YL2s AG,OU,ops)
2,133,224- 3002- 194- D

Estonia

ES4XB (+ops) 181,052- 503- 126- D

Zone 30

European Russian RSFSR

UZ4WWQ	22,622-	422-	70- A
UA4LFA	43,000-	307-	43- C
RA4HKS	24,682-	162-	43- C

UZ4WZA (RW4s WR,WZ,UA4s WAM, WI,WW,ops)
704,462- 1391- 142- D
UZ4WWA (RW4WA,UA4s WA,-095-729, -095-789,ops)
525,266- 1262- 119- D
4K4BWL/R4H (RA4HMZ,UA4HKS, 4K4BGA,ops)
13,572- 115- 39- D

Asiatic RSFSR

RW9WA	1,010,096-	1565-	144- A
UA9FM	201,766-	595-	79- A
UW9CM	61,902-	260-	57- A
UA9QA	386,100-	791-	110- B
UA9SN	289,323-	697-	93- B
RW9AB	272,600-	620-	100- B
UV9FR	58,312-	300-	44- B
RV9CFA	455,416-	889-	116- C

RK9C (UV9CAF,op)
180,481- 677- 59- C
RV9WB 128,498- 341- 94- C
UA9AKS 84,525- 391- 49- C
UV9FB 82,782- 322- 63- C
UW9CZ 62,608- 268- 52- C
UW9SW 57,564- 252- 54- C
UA9CGL 46,200- 224- 50- C
UV9DZ 33,411- 213- 37- C
UA9FGJ 15,708- 137- 28- C

UZ9CZO (UV9CAZ,UA8s 154-2007, 154-2044,ops)
113,400- 487- 56- D

UZ9CYP (UZ9CX,UA9s 154-2103, 154-2269,ops)
87,516- 372- 51- D

Uzbekistan

RI8SP 269,190- 625- 90- A
UI4L/UA4AO 33,060- 256- 30- A
UI9ACQ 24,492- 214- 26- A

UI9AWX (RI8AK,UI8ACI,ops)
141,470- 469- 70- D

Tadzhikistan

UT4UX/RJ5J	60,419-	469-	31- A
UJ8JA	257,085-	646-	24- C

Kazakhstan

UL7LBI	27,475-	296-	25- A
UL7CW	913,116-	1393-	141- C

UL8LWU (UL7s 026-703,026-704,ops)
121,664- 458- 64- D

Kirghizia

UM8MFO 12,663- 148- 21- B

Zone 31

Asiatic RSFSR

EK9ZAA	95,874-	740-	29- A
RA9UKM	148,852-	626-	68- B
RZ9UA	947,525-	1423-	151- C
UA9OPI	71,280-	308-	55- C
UA9URF	41,097-	179-	57- C
RA9HO	28,860-	129-	60- C

UZ9YXI (+ops)
226,395- 639- 81- D

UZ9OXJ (UA9s OGI,-145-283,ops)
184,420- 604- 72- D

Kazakhstan

UL7FCW	98,250-	451-	50- A
UL7NEA	39,072-	392-	22- C

Kirghizia

UM8DX	165,726-	662-	54- A
UM8MTA	30,520-	211-	35- A
UM8QDX	171,654-	610-	67- B

Zone 32

Mongolia

JT1CS 4,431- 82- 21- A

Asiatic RSFSR

EX8S (UA9SAU,op)
808,119- 1679- 117- A
UA9WX 289,179- 979- 69- A
UA9TO 737,832- 1330- 142- B
UA9SR 369,150- 919- 107- B
UA9SY 168,316- 659- 58- C
UZ9AM 19,170- 321- 25- C

UZ9AWA (RA9ACP,UA9s ADN, -103-750,ops)
409,532- 1130- 86- D

RW9T/UZ9OWD (UA9s OLW,OOX,OPA, ops) 134,640- 576- 60- D

Zone 33

Asiatic RSFSR

UA9BK	27,584-	260-	32- B
UA9QFA	231,100-	736-	75- C
UA9JB	89,888-	378-	53- C
RA9JD	66,665-	269-	67- C

Zone 34

Asiatic RSFSR

UA9LCZ	79,730-	296-	70- A
RA9FA	244,398-	616-	77- C
UA9LH	134,672-	436-	76- C
RA9FN	7,220-	90-	38- C

UZ9CWW (UA9CHW,UW9s CF,CQ, CR,ops) 718,750- 1380- 125- D

Zone 36

Canary Islands

EA8BDR 49,147- 212- 49- B
EA8URL (EA8s BEE,BEZ,BIK,BVH,ops)
403,214- 982- 83- D

Zone 37

Portugal

CT1QF	28,888-	160-	46- B
CT1AHU	14,430-	92-	37- B

Spain

ED5URN	39,200-	293-	32- A
EA1GT	153,144-	636-	72- B
EC3WK	68,944-	604-	31- B
EA3GCJ	31,871-	313-	29- B
EA3DVJ	18,816-	140-	42- B
EA5CHT	13,520-	102-	40- B
EA1AHA	6,440-	70-	28- B
EA7BYM	3,770-	41-	26- B
EA5GKM	2,660-	47-	14- B
EA2BUZ	1,348-	48-	14- B
EA7GQZ	35,136-	203-	48- C
EA7AAW	21,866-	229-	26- C
EA5GFA	15,301-	252-	30- C
EA7CA	12,644-	136-	29- C
EA5YU	8,242-	97-	26- C
EC2ATN	2,892-	71-	12- C
EA2BSJ	2,440-	83-	10- C

Zone 39

Israel

4X6VY 121,923- 463- 57- B

Cyprus

P3ØS (5B4s MF,WN,XF,XN,ops)
1,424,970- 2111- 142- D

Zone 41

India

AT0T 109,320- 424- 60- B

Zone 44

Taiwan

BV2WA 33,557- 433- 23- B

China

BY5RT (+ops)
473,263- 1295- 97- D

Korea

HL0B (+ops) 148,419- 396- 69- D

Macao

XX9TDM 442,520- 1075- 104- C

Zone 45

Japan

JA8RWU	818,579-	1233-	117- A
JG3KIV	442,510-	1028-	95- A
JH1YDT	388,624-	808-	107- A
JR4GPA	168,285-	597-	65- A
JA0EZP	130,144-	348-	83- A
JE7DOT	71,829-	267-	69- A
JE1WBA	45,387-	265-	41- A
JA3UWB	26,981-	171-	47- A
JA1PUK	26,936-	122-	52- A
JA1BUI	17,325-	95-	45- A
JN1AIF	12,650-	67-	50- A
JL1ARF	12,349-	65-	53- A
JA0BJY	8,190-	71-	26- A
JA1XPU	3,460-	45-	20- A
JH4NMT	120,533-	409-	67- B
JA6BIF	108,663-	306-	87- B
JA8HYB	77,184-	282-	64- B
JH1UUT	63,104-	254-	64- B
JE8XRF	56,763-	298-	53- B
JA4DUD	48,762-	190-	63- B
JA7BEW	43,738-	317-	38- B
JA3IWA	43,566-	190-	53- B
JA0AW	15,060-	122-	30- B

JE2YUO/2 (JA4DWZ,op)
12,274- 105- 34- B
JA3DXN 9,792- 72- 22- B
JR7LVK 8,840- 86- 26- B
JR1MRG 5,964- 55- 28- B
JL1MWI 5,856- 51- 24- B
JO3SEL 5,589- 63- 13- B
JA3FZZ 5,263- 69- 19- B
JA6NQT 5,184- 52- 24- B

JA9ZJI (JH9EPA,op)
4,964- 71- 17- B
JI4ARB 2,736- 40- 19- B
JR1TFR 2,680- 34- 20- B
JI2OFG 2,100- 30- 14- B
JE0VSW 1,648- 29- 16- B
JL1KUH 1,456- 26- 13- B
JE8UZG 1,335- 23- 15- B
JH2WHS 936- 26- 12- B
JH1UBK 630- 30- 21- B
JR9GQP 567- 15- 9- B
JF8BNS/0 448- 16- 8- B
JO1MCC 306- 16- 9- B
JI1UTP 175- 7- 7- B
JR3KAH 145- 7- 5- B
JA1JLP 143- 29- 15- B
JA1AAT 135- 7- 5- B
JG1GCO 105- 5- 5- B

JA7YIK (JJ7EQY,op)
102- 11- 6- B
JR1GWE 48- 4- 3- B
JR8FLY 20- 2- 2- B
JF2LTH 1- 1- 1- B
JA7DLE 573,362- 1103- 118- C
JH7WKQ 507,424- 1140- 101- C
JE0UXR 296,393- 792- 83- C
JG1NBD 285,105- 701- 83- C
JA9CWJ 220,506- 610- 78- C
JH0GNM 149,364- 404- 81- C
7K1NUX 132,131- 444- 71- C
JA6AZH 117,975- 415- 65- C
JK1GKG 53,860- 264- 62- C
JA1WYQ 47,872- 170- 64- C
JE2UFF 41,580- 260- 35- C
JA8AJE 38,258- 182- 47- C
JA8HBO 31,700- 148- 50- C
JA1RKI 28,733- 126- 59- C
JA7JI 25,004- 86- 76- C
JR3XEX 24,000- 120- 48- C
JH3JYS 21,528- 114- 46- C
JR6IMF 21,056- 151- 32- C
JG1BPS 20,727- 119- 47- C
JO1QZI 18,180- 130- 30- C
JA2KPV 17,850- 99- 42- C
JA6ACZ 17,040- 98- 40- C
JH5OXF 16,372- 106- 36- C
JR4ISK 9,180- 69- 36- C
JA2QJ 8,550- 96- 19- C
JA2QVP 6,692- 53- 28- C
JA3ARM 5,481- 51- 27- C
JA9YE 3,536- 38- 26- C
JL2LPX 2,208- 30- 16- C
JI1LNR 1,360- 20- 20- C
JH9CAU 1,089- 23- 11- C
JG2IGY 888- 20- 12- C
JL1EUP/1 810- 38- 9- C

JA7YAA (JJ3CNL,JE7IZG,JE8AWL,ops)
781,592- 1336- 135- D

JA8YBY (JO1DFG,JE8s BRD,KLL,JF8s BNZ,LPB,JG8NFE,JH8s PNE,WBR, JR8s DHA,TON,ops)
773,415- 1353- 135- D

JA1ZLO (JF2IWL,JK1JFO,JQ1BTP, JR5KDR,JR8JFM,ops)
756,608- 1327- 128- D

JE2YRD (JF2s DQJ,EOC,JK2CZL, JH7OMD,ops)
733,568- 1237- 128- D

JA6YJS (JF4ETK,JG4SVN,JS1PWV,ops)
450,870- 1030- 113- D

JA1YAD (JN1HYU,JS1s SSC,MNF, JH7UCC,JA9UFS,ops)
138,488- 557- 56- D

JA0YAK (JS1PTU,JI7OED,ops)
26,360- 150- 40- D

Zone 46

Ivory Coast

TU2UI 293,095- 819- 73- A

Zone 50

Philippines

DX8I 81,575- 383- 44- B

Zone 53

Tanzania

5H3TW 1,859,822- 2403- 157- A

Zone 54

Indonesia

YB8RB	211,688-	483-	94- B
YC3OSE	92,895-	353-	55- B
YC7DF	28,992-	198-	28- B
YC7BVY	19,003-	129-	31- B
YC4GDZ	14,112-	1568-	39- B
YB2FEA	70,980-	245-	60- C

Zone 55

Australia

VK4SSB	92,079-	479-	39- B
VK4TT	34,272-	209-	32- C

Zone 57

South Africa

ZS6HO 21,728- 158- 28- B

Zone 58

Australia

VK6AJ 82,524- 252- 69- C
VK6ANC (+ops)
321,296- 772- 86- D

Zone 59

Australia

VK2AYK	14,894-	139-	22- B
VK5QX	14,231-	153-	19- B
VK2PWS	5,586-	64-	19- B
VK2APK	558,308-	985-	116- C
VK2BQQ	170,352-	419-	84- C

Zone 60

New Zealand

ZM2AGY 100,316- 275- 62- C

Zone 61

Hawaiian Islands

NH6T	186,720-	407-	96- A
AH6KE	13,225-	111-	25- A
KH6FKG	495,740-	1438-	70- B
AH6SF	33,251-	165-	41- C

Zone 63

Easter Island

CE0ZIG 45,100- 222- 41- C

Checklogs

4X4VF, CT1TM, DF3OL, DJ0MAQ, EA3FFQ, EA3FYD, F6GAS, HA8DD, HK3LR, IK0LMS/I90, IS0LLJ, JR1XKU, LA7XB, LA9FFA, LZ1HX, OH5FA, OH6GD, OK3KJF, ON5FV, OZ1JLX, OZ1KWG, OZ2JI, OZ5PA, OZ80X, PA3CWR, PA3EXI, PA8UV, PY2YN, R7AHAL, RA1AI, RA1WA, RA3ATM, RA4LAH, RB5FA, RB5ICY, RB5LM, RO4OA, RW3RO, SM5MHC, SM6CIX, SM7BNG, SM7CZC, SM7HEC, SM0BXT, SM0CSX, SP3FYM, SP5NOG, SP8BAB, UA0SZ, UA1NDW, UA1WDQ, UA3AFH, UA3CAM, UA3SDT/RA1N, UA4AHT, UA4PJP, UA4PKN, UA4QK, UA4YZ, UA9CDO, UA0KW, UB5FBN, UB5JQA, UB5JS, UB5PAN, UB5VCI, UB5XAN, UB5ZKE, UC1WWR, UC2LEG, UF6VBZ, UF7FWM, UL7BN, UM9QWC, UV9FG, UW3QD, UW3RR, UW9WH, UZ2FXA, UZ3AYE, UZ6HXK, UZ9FWP, UZ9JWV, Y21FA, Y25ZN/P, Y38YE, Y54ZA, Y55LA, Y79CL, YO3AAQ, YO4CBT, YO6ADM, YO6FGN, YO8ROO

ARRL International DX Contest Plaque Program

Listed below are all of the plaques that will be awarded in the 1991 ARRL International DX Contest. Sponsors as of October 20, 1990, are shown adjacent to the corresponding category. If you're interested in sponsoring one or more of the plaques that haven't been sponsored, call the Contest Branch at ARRL HQ.

The list of sponsored plaques may change because of *QST* lead time, so please call us for a list of what's available before sending payment. We salute all who have helped make the Plaque Program such a success!

W/VE CW—Single Operator

Category	*Donor*
All Band	Frankford Radio Club
1.8 MHz	Gordon F. Durk, KA1DWX
3.5 MHz	Dayton Amateur Radio Assn
7 MHz	Northern Arizona DX Assn
14 MHz	
21 MHz	Carl Luetzelschwab, K9LA
28 MHz	W5MYA
Low Power	Dauberville DX Assn
QRP	Tod Olson, KØTO
Assisted	Billy Lunt, KR1R

W/VE CW—Multioperator

Category	*Donor*
Single Transmitter	Northern Illinois DX Assn
Two Transmitter	Kenwood USA Corporation
Unlimited	ETO Inc/ALPHA

W/VE Phone—Single Operator

Category	*Donor*
All Band	Frankford Radio Club
1.8 MHz	Butch Greve, W9EWC, Memorial
3.5 MHz	Lance Johnson Engineering, KØCS
7 MHz	David Thompson, K4JRB
14 MHz	Dayton Amateur Radio Assn
21 MHz	Kenwood USA Corporation
28 MHz	Border City Radio Club, Windsor, Ontario
Low Power	Dauberville DX Assn
QRP	Michigan QRP Club
Assisted	Corona Norco ARC

W/VE Phone—Multioperator

Category	*Donor*
Single Transmitter	Kenwood USA Corporation
Two Transmitter	Kenwood USA Corporation
Unlimited	Western New York DX Assn, W2RR

DX CW—Single Operator

Category	*Donor*
World	North Jersey DX Assn
Africa	Byron P. Peebles Jr, NZ3O
Asia	Alamo DX Amigos
Europe	Clarke V. Greene, K1JX
North America	Potomac Valley Radio Club, W4KFC Memorial
Oceania	Robert J. Halprin, K1XA
South America	W6NMA Memorial Award
1.8 MHz	Fred Race, AL7JO, in Memory of W1BB
3.5 MHz	Mad River Radio Club
7 MHz	Gordon F. Durk, KA1DWX
14 MHz	Bencher Inc
21 MHz	Southern New England DX Assn
28 MHz	ZP6XDW (N4PW)
QRP	Dr Jerry Griffin, W8MEP
Assisted	

DX CW—Multioperator, Single Transmitter

Category	*Donor*
World	John Brosnahan, WØUN
Africa	Kenwood Employees ARC, WD6DJY
Asia	Kenwood USA Corporation
Europe	The Radio Place
North America	Kenwood USA Corporation
Oceania	Gary Stilwell, KI6T, and Glenn Stilwell, WR6O
South America	Kenwood USA Corporation

DX CW—Multioperator, Two Transmitter

Category	*Donor*
World	Kenwood Employees ARC, WD6DJY
Africa	Kenwood Employees ARC, WD6DJY
Asia	Kenwood USA Corporation
Europe	Kenwood USA Corporation
North America	Roger Williams VHF Society, K1JFI
Oceania	
South America	Dave Goggio, W4OGG

DX CW—Multioperator, Unlimited

Category	*Donor*
World	H. Stephen Miller, NØSM
Africa	Kenwood Employees ARC, WD6DJY
Asia	Kenwood USA Corporation
Europe	Texas DX Society
North America	ETO Inc/ALPHA
Oceania	David W. Brandenburg, K5RQ
South America	David W. Brandenburg, K5RQ

DX Phone—Single Operator

Category	*Donor*
World	North Jersey DX Assn
Africa	Kenwood USA Corporation
Asia	Acadiana DX Assn
Europe	Dr Jerry Griffin, W8MEP
North America	Chod Harris, VP2ML
Oceania	N7AVK—Commemorating a top SK op: W7IYW
South America	Kenwood USA Corporation
1.8 MHz	Fred Race, AL7JO, in Memory of Charlie, W8TCA
3.5 MHz	Kenwood USA Corporation
7 MHz	Central Arizona DX Assn
14 MHz	Don Wallace, W6AM, Memorial, Central CA DX Club
21 MHz	LIDXA, in Memory of W2NCL
28 MHz	Long Island Mobile ARC
QRP	Dr Jerry Griffin, W8MEP
Assisted	

DX Phone—Multioperator, Single Transmitter

Category	*Donor*
World	Carl Cook, AI6V
Africa	Kenwood USA Corporation
Asia	Kenwood USA Corporation
Europe	Kenwood Employees ARC, WD6DJY
North America	Nick G. Lash, K9KLR
Oceania	
South America	Kenwood USA Corporation

DX Phone—Multioperator, Two Transmitter

Category	*Donor*
World	Kenwood USA Corporation
Africa	Stanley Cohen, WD8QDQ
Asia	Kenwood USA Corporation
Europe	The Middletons: Joy, KB4OMW, and Tom, WB4CKY
North America	Jan Hubach, OH1ZAA, and John Brosnahan, WØUN
Oceania	Kenwood Employees ARC, WD6DJY
South America	Kenwood USA Corporation

DX Phone—Multioperator, Unlimited

Category	*Donor*
World	Wayne Yoshida, KH6WZ
Africa	Kenwood Employees ARC, WD6DJY
Asia	Kenwood USA Corporation
Europe	Doug Robbins, KY2O
North America	Scott Robbins, KY2P
Oceania	David W. Brandenburg, K5RQ
South America	Kenwood Employees ARC, WD6DJY

Special Plaques

Single Operator

Category	*Donor*
W/VE Combined Score	*National Contest Journal*
W/VE Low-Power Combined Score	Rochester, NY, DX Assn
W/VE Novice Combined Score	Stan Star, KY4O
W/VE Under-18 Combined Score	Connecticut DX Assn
World Combined Score	Mike Manalo, K3UOC, 4M4A, P46S
World 3.5 MHz Combined Score	DL7AEY and KA1XN
Europe Combined Score	Chris Williams, KG6AR
Japan Combined Score	JA7WME, JE7RJS, JG7SVZ and JH7AFR
Atlantic Division CW	K2NY Memorial—Salt City DX Assn
Great Lakes Division CW	Livonia Amateur Radio Club, Livonia, MI
Great Lakes Division Phone	Livonia Amateur Radio Club, Livonia, MI
Hudson Division CW	W2AO Memorial—Order of Boiled Owls
Japan Low-Power All-Band CW	Western Washington DX Club
Poland Phone	Stan Wisniewski, FO5IW
Seventh Call Area All-Band CW	Willamette Valley DX Club
Seventh Call Area All-Band Phone	Willamette Valley DX Club
Single Operator Under-18 CW	Virginia A. Greene, WB1AVA
Single Operator Under-18 Phone	Virginia A. Greene, WB1AVA
USSR All-Band CW	Warren C. Stankiewicz, NF1J
USSR All-Band Phone	Warren C. Stankiewicz, NF1J

Multioperator

Category	*Donor*
Caribbean Multi-Single CW	The YASME Foundation
Caribbean Multi-Single Phone	W5MYA
Multi-Multi Combined World	W2PV Memorial—Schenectady ARA

Contest Corral

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

JANUARY

26-Feb 3

ARRL Novice Roundup, see Jan *QST*, p 79.

FEBRUARY

2-3

Ten-Ten International Net Winter Phone QSO Party, see Jan *QST*, p 81.

New Hampshire QSO Party, see Jan *QST*, p 81.

North American Sprint, CW, see Jan *QST*, p 81.

Vermont QSO Party, see Jan *QST*, p 81.

YL-ISSB QSO Party, CW, see Jan *QST*, p 81.

5

West Coast Qualifying Run, 10-40 WPM, at 0500Z Feb 6 (9 PM PST Feb 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 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.

7

W1AW Qualifying Run, 10-40 WPM, at 0300Z Feb 8 (10 PM EST Feb 7). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 18.0975 21.0675 28.0675 147.555 MHz. See Feb 5 listing for more details.

9-10

North American Sprint, phone, see Jan *QST*, p 82.

PACC Contest, see Jan *QST*, p 82.

11-15

1991 School Club Roundup, see Jan *QST*, p 78.

16-17

ARRL International DX Contest, CW, see Dec *QST*, p 100.

22

W1AW Qualifying Run, 10-35 WPM, 2100Z Feb 23 (4 PM EST). See Feb 7 listing for more details.

23-24

***CQ* World-Wide 160-Meter DX Contest**, phone, see Jan *QST*, p 81.

UBA Contest, CW, see Dec *QST*, p 88 for further details.

MARCH

2-3

ARRL International DX Contest, phone, see Dec *QST*, p 100.

5

West Coast Qualifying Run, 10-35 WPM, 0500Z Mar 6 (9 PM PST Mar 5), see Feb 5 listing for more details.

8

W1AW Qualifying Run, 10-35 WPM, 0300Z Mar 9 (10 PM EST Mar 8). See Feb 7 listing for more details.

8-10

Japan International DX Contest, CW, sponsored by *Five Nine Magazine*, from 2300Z Mar 8-2300Z Mar 10. 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, 17 and 12 meters). Entry classes: Single op, single band; single op, multiband; multiop, 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 RST and prefecture number (01-50). Others send RST and progressive serial no. starting with 001. Contacts among DX stations or among JA stations do not count. Count one point per QSO on 40-15 meters. Count two points 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 Apr 30 to *Five Nine Magazine*, Japan International DX Contest, PO Box 8, Kamata, Tokyo 144, Japan.

10-11

Wisconsin QSO Party, sponsored by the West Allis RAC, 1800Z Mar 10-0100Z Mar 11. CW and phone. Entry categories (12): single operator—fixed, mobile, Novice, Technician; multioperator single transmitter—fixed, mobile, Novice, Technician; multioperator, multitransmitter—fixed, mobile, Novice, Technician. Work stations once per band and mode. Work mobiles again as they change county. No repeater QSOs. Exchange signal report and QTH (county for WI stations; state or province for others). Suggested frequencies: CW—3.550 3.725 7.050 7.125 14.050 21.150; phone—3.890 7.290 14.290 28.400. Count one point per phone QSO, two points per CW QSO. Wisconsin stations multiply by total WI counties, states and provinces worked. Others multiply by total WI counties worked (max 72). WI mobiles/portables may add 500 points to their score for each county outside of their home county that they make at least 15 QSOs from. Awards. Mail logs by Apr 15 (include large SASE for results) to WARAC, PO Box 1072, Milwaukee, WI 53201.

19

W1AW Qualifying Run, 10-35 WPM, 1400Z Mar 19 (9 AM EST). See Feb 7 listing for more details.

23-24

***CQ* World-Wide WPX Contest**, phone, sponsored by *CQ Magazine*, 0000Z Mar 24-2400Z Mar 25 (CW contest, May 25-26). Single ops are allowed a maximum of 30 hours operating time; off-times must at least 60 minutes in length and must be clearly indicated in the log. Multioperator stations may operate entire 48 hours. Phone only, 160-10 meters (excluding 30, 17 and 12 meters). Categories: single-op, all-band and single-band; QRP (5 W output maximum); multiop (multiband only) multi- and single-transmitter. Multi-singles must remain on a band for at least 10 minutes after making a QSO; multi-multis are allowed only one signal per band. All transmitters must be located within a 500-meter-diameter circle or limits of property; no remote stations. Work stations once per band for QSO-point credit, but prefix credit may be counted only once. Exchange signal report plus serial number, starting with 001. Multi-multis use separate numbers on each band. QSO points: Contacts between stations on different continents count three points on 28, 21 and 14 MHz and six points on 7, 3.5 and 1.8 MHz. For North American stations, contacts between stations in different countries on the NA continent count two points on 28, 21 and 14 MHz and four points on 7, 3.5 and 1.8 MHz. For non-NA stations, contacts with stations in other countries but on the same continent count one point on 28, 21 and 14 MHz and two points on 7, 3.5 and 1.8 MHz. QSOs between stations in the same country count zero points, but are permitted for prefix-multiplier credit. Multipliers are prefixes, to be counted only once. A prefix is the two- or three-letter/number combination that forms the first part of an amateur call sign, as in W1, G4, DF3, 8P6. Stations operating outside the call area indicated by their call signs must sign portable. The portable prefix counts as the multiplier; for example, AA1K/3 in Delaware counts as an AA3 multiplier. Final score is total QSO points times sum of prefixes worked. Awards and club competition. Mail logs by May 10 (Jul 10 for CW) to *CQ Magazine*, WPX Contest, 76 N Broadway, Hicksville, NY 11801.

Contest Announcements: Items for this column can be sent on a 5¼- or 3½-inch MS-DOS floppy diskette in ASCII format to ARRL HQ, via modem (ARRL HQ BBS, 203-665-0090, 2400-8-N-1), or in written form. 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 **March 1** to make the **May** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmations for contacts with the minimum number of maidenhead grid-square locators (indicated in *italics*) for each band listing. Numbers listed after call signs refer to endorsements. The totals shown are current as of November 21, 1990. An SASE will bring you the rules and application forms.

Compiled by Lisa Kustosik, KA1UFZ

50 MHz
100

479 WB8RDY
480 8P6JW
481 K2QIE
482 G6HKM
483 GW8TIX
484 AJ0E
485 K7BUY
486 WJ0F
487 WB5FCR
488 NI6E/KH6
489 WA5NFC

K2QE	200
K2QIE	175
N2WK	325
K4RWP	350
W4OO	450
AA5AM	425
AA5C	200
N5JYX	225
W5RCI	275
WA5NFC	125
WD5K	500
K6EID	375
NI6E/KH6	200
WA6VGS	125
N7DB	400
WA7OEU	325
WB8RDY	125
WB8YFE	425
AJ0E	125
W0FY	350
8P6JW	175

144 MHz
100

356 G6WEM
357 G4NBS
358 KF4FL
359 WB0CLL
360 W4ZPG

K4RWP	150
N5JYX	150
K8RZB	175
WB8CCL	175
K9MK	175

220 MHz
50

62 N0LL

432 MHz
50

167 WB8YFE
188 AA5AM

G4NBS	80
N5JYX	90
W5RCI	180
W9UD	100
WA9JFM	100
W0FY	90

1296 MHz
25

82 WQ0P
83 G6LEU
84 G4FRE
85 W9UD

G4FRE	45
W5RCI	50
G6LEU	60
WB8BKC	75

2.3 GHz
10

36 G4FRE
37 W3KWH

G4FRE 25

3.4 GHz
5

22 WW8M
23 WC2K
24 N5QGH
25 AA5C

5.7 GHz
5

11 N6CA
12 N5QGH
13 AA5C

10 GHz
5

48 WA6EXV
49 WA6EXV/DM14le

W2VC	10
K6UQH	10
WA6EXV/DM14le	15
WA6QYR	10

The following are corrections to the 1990 annual list:

50 MHz

18 W3EP/9 250
#409 W3EP/1 325

Special Events

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

Vernon, British Columbia: The North Okanagan RAC will operate VE7NOR **Feb 1-10** during the 31st annual Vernon Winter Carnival. 3.775 7.175 14.275 28.575. For award, send QSL, SAE and two IRCs to Winter Carnival Award—VE7NOR, Box 1706, Vernon, BC V1T 8C3.

Punxsutawney, Pennsylvania: The Punxsutawney ARC will operate KO3Z from daybreak to 2200Z **Feb 2** to commemorate Groundhog Day 1991. Operation is in the General portions of 40, 20 and 15 meters, and the Novice portion of 10 meters. For certificate, send QSL and SASE to Joanne Przestrzelski, N3HBL, 104 Myrtle Ave, Punxsutawney, PA 15767.

Wilkes-Barre, Pennsylvania: The Murgas ARC will operate K3YTL **Feb 2-3** at the close of the Wyoming Historical & Geological Society's Exhibit celebrating the 85th anniversary of Father Joseph Murgas' first public transmission over land. Operation is 25 kHz up from the bottom of the General and Novice phone bands. For QSL, send QSL and SASE to K3YTL, PO Box 1094, Wilkes-Barre, PA 18703-1094.

Anamosa, Iowa: The Jones County ARC will operate 1200Z-1800Z **Feb 3** in celebration of the first anniversary of the opening of the Lawrence Community Center. Operation is in the lower portion of the General subbands on 40, 20 and 15 meters, and the Novice portion of 10 meters. For certificate, send an SASE to Jim McClintock, NØCWP, PO Box 462, Morley, IA 52312.

Fairview Park, Illinois: The Cenois ARC will operate K9HGX **Feb 9** to commemorate Abraham Lincoln's birthday. Operation is in the lower 25 kHz of the General subbands on 40, 20, and 15 meters and 28.400-28.450 MHz. For certificate, send QSL and SASE to Cenois ARC, PO Box 4595, Decatur, IL 62526.

Metuchen, New Jersey: The Metuchen ARC will operate K2YNT 1500Z-1900Z **Feb 9** to commemorate the birthday of Thomas Alva Edison. 14.230 28.400. For certificate, send QSL and a 9- × 12-inch SASE to David Kanita, WB2AZE, 6 Bodnorik Rd, Edison, NJ 08837.

Austin, Texas: N5OWD will operate 1400Z-2300Z **Feb 9** to commemorate the 10th anniversary of the Armadillo BBS. Operation is in the Novice portion of 10 meters. For certificate, send QSL and SASE to Ron Hawkins, N5OWD, 1459 S Meadows, Austin, TX 78758.

Laramie, Wyoming: The University ARC will operate NQ7Q 0000Z-2400Z **Feb 9** in commemoration of the Wyoming Territorial Prison. CW—7.050 7.110; phone—3.925 7.250 14.275 21.325 28.325. For QSL, send QSL and SASE to University ARC, NQ7Q, PO Box 3625, Univ Station, Laramie, WY 82071.

Phoenix, Arizona: The Motorola ARC of Arizona will operate KB7FZC 1500Z **Feb 9**-0200Z **Feb 10** to commemorate Arizona Statehood Day. CW—7.130 14.050 28.050; phone—7.155 14.280 18.155 21.380 28.450. For certificate, send QSL and a 9- × 12-inch SASE to John Tucker, KB7FZC, 2802 N 34th St, Phoenix, AZ 85008.

Aberdeen, South Dakota: The Hub City ARC will operate WBØJZZ **Feb 14-17** in honor of National Vocational Education Week. Operation is in the General portion of 80, 40, 20 and 15 meters, and the Novice portion of 10 meters. For QSL, send SASE, QSL and contact no. to HCARK, PO Box 725, Aberdeen, SD 57402-0275.

Loveland, Colorado: The Loveland RA will operate KAØVFF 0000Z-0500Z **Feb 14-15** and 1500Z-0500Z **Feb 16-17** during Loveland's Valentine Festivities. Operation is 25 kHz up from the lower edge of the General bands. For certificate, send a 9- × 12-inch SASE to Michael H. Walker, KAØVFF, 3816 Ash Avenue, Loveland, CO 80538.

Hollywood, Florida: *KA4B will operate* 1800Z-2400Z **Feb 15** to celebrate the 30th anniversary of Chaminade-Madonna College Preparatory School. 28.400. For more information, contact Leo Dwyer, KA4B, c/o 500 Chaminade Dr, Hollywood, FL 33021.

Apache Junction, Arizona: The Superstition ARC will operate WB7JTD 1400Z-0200Z **Feb 16-17** to commemorate Lost Dutchman Days. Operation is on 20 and 15 meters, the Novice portion of 10 meters and 147.12. For certificate, send an 8½- × 11-inch SASE to SARC-WB7JTD, PO Box 1551, Apache Junction, AZ 85217.

George, Washington: The Central Washington ARC will operate W7WMO 1800Z-2400Z **Feb 18** in conjunction with the community's birthday party. 21.425 28.425. For certificates, send a 9- × 12-inch SASE to EuGene Bye, W7WMO, 18 J St NE, Ephrata, WA 98823.

Cherry Hill, New Jersey: The Chaverim of Delaware Valley will operate K2JCC 1400Z-2130Z **Feb 24** in conjunction with the Purim Carnival at the Jewish Community Center. Operation is on the phone bands on 80, 40, 20, 15 and 10 meters and 146.685/085. For certificates, send QSL, contact no. and a 9- × 12-inch SASE to Dave Bachin, KA3TSH, 11011 Philmont Terr, Philadelphia, PA 19116.

Fairbanks, Alaska: *KL7KC will operate* **Feb 22-Mar 10** during the running of the 8th annual Yukon Quest International Sled Dog Race. CW—7.050 14.050 21.050 28.200; phone—the General portions of 80, 40, 20 and 15 meters, and the Novice portion of 10 meters. QSL via KL7KC, PO Box 81389, Fairbanks, AK 99708.

Special Event Announcements: Items for this column can be sent on an MS-DOS floppy disk in ASCII format to ARRL HQ, via modem (203-665-0090, 2400-8-N-1), or in letter form. 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 **Mar 1** to make the **May** 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-inch 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 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 operators often print their cards and/or certificates after the operation is over so they will know how many to order. QST

Strays

OHIO EC OFFERS FREE COMMODORE® LOGGER

I've written a simple, functional contest logging program for Commodore C-64 and Plus/4 computers with 1525 or similar printers. It's free to anyone who sends me an SASE. Harry V. Noble PE, N8CYS, 1124 Old Springfield Pk, Xenia, OH 45385.

YOUNG HAMS FOSTER GOODWILL

Radio club members in the foreign-language department at LaFayette (Georgia) High School took part in two international operating events in October 1990. Students studying German participated in the East German Farewell Party and students studying Spanish contacted Hispanic stations in the Worldwide Hispanoamericano contest, celebrating Columbus' discovery of America. Students and teachers who were involved include N4XGE, N4YLN, N4XPV, KC4NDY, N4XGB, N4XNW, N4YLM, KC4LQM, N4XFZ and club sponsor/Spanish teacher Hunt Turner, KØHT.

KDKA ANNIVERSARY

Federally licensed commercial broadcasting began on November 20, 1920, as station KDKA went on the air. From the roof of the Westinghouse Electric Manufacturing Company's K-Building in east Pittsburgh, Pennsylvania, the transmitter sent its 50 watts out from a horizontal wire antenna.

Today, 70-year-old KDKA is a Group W Radio facility, still owned by Westinghouse Broadcasting, and although the K-Building still stands, the equipment is gone. To commemorate the historic event, the Pittsburgh Antique Radio Society (PARS) recreated the original 10- × 10-foot KDKA shack, complete with a replica of the original transmitter, on loan from the Smithsonian Institution in Washington, DC. KDKA Engineering Manager Jack Layton, W9UK, reports that PARS member Seth Ward, KC3YE, contacted more than 100 local hams from the recreated shack.

UK POSTCODE AWARD

The year 1990 marked the 150th anniversary of the British Post Office's issue of the Penny Black, the world's first self-adhesive postage stamp. In consultation with the UK Post Office, the Civil Service ARS in Westminster, London, England, has instituted an award for working 75, 100 or all 120 Postcode Areas of the UK. QSLs are not required and the award is also available to SWLs. For information, send an SASE with appropriate return postage to Civil Service Amateur Radio Society, Civil Service Recreation Centre, Monck St, London SW1P 2Bl, England.

The ARRL Field Organization Forum

ATLANTIC DIVISION

DELAWARE: SM, Randy Carlson, WB8JJX—Following the resignation of KC3TI, the ARRL Field Services Mgr appointed SEC Randy Carlson, WB8JJX, as SM to fill the unexpired term. His address & phone no. appear on p 8 & he can be reached @ WB8JJX pkt BBS. Thanks for your understanding & cooperation prior to & during the transition. Who is the outstanding ham in your area of the state? Who deserves a lifetime achievement award? Or a tech achievement award? Info on how to nominate DE's finest for the 1991 Atlantic Div awards is avail from Richard Goslee, K2VCZ, 24 Elaine Dr, Rochester, NY 14623. Deadline for nominations is Apr 10, so don't delay.

EASTERN PENNSYLVANIA: SM, Robert M. Stanhope, KB3YS—ASM: N3ECL @ WB3AFL. WA3PZO @ WB3JOE. ACC: KC3QB. BM: KD3OA @ NR3U. OOC: W3IS. PIC: W3ZXV. SGL: WA3IAO. SEC: WB3FPL @ WB3FYL. STM: KD3AO @ WB3JOE. TC: W3FAF. EPA *Feedline* Ed: N3GFM @ KA3CNT. The President of the US set a target date of Jan 15 for peace or war in the Middle East. I hope it's peace. I started to place the PBBS address for the staff in the heading back in Nov. I hope those of you on pkt will find us more accessible. Please note that the Ed. of the EPA *Feedline* is included. We welcome all items of interest from clubs & amateurs to be included in your quarterly publication. New to pkt this month is Eric, WB3FPL, the SEC. While on the subject of ARES, please forward the results of your SET drill to the SEC ASAP, so totals & comments can be sent to ARRL HQ. Because of health reasons, we've had 2 DECs resign. Hayes Eckard in Dist IX & Dan Manogna in Dist II. We're seeking replacements for these important posts. Qualifications: ARRL member, hold a Tech class or higher license, express a desire to organize & lead people & learn about the exciting emergency comms programs in EPA. Apply to the SEC or me via pkt or US Mail. I had the privilege to be invited to attend the preview of the Penn-Mar ARC's emergency comms room; it includes 10 operating positions with generator backup. They included stations for computer operations to medical facilities & Chemtrec. So complete, the York Co EMA Dir stated "It's the best site for the Co's backup comms network." It was impressive. The idea of the month, proposed when at the Hanover gala...How about a Section or statewide Pkt & rptr system for the SKYWARN, NDMS, RACES & ARES comms programs? Good question...now that the Nat'l WX office in Harrisburg is moving to State College (& WPA Section) & Philadelphia to Cherry Hill, NJ, we must change our comms program to meet this new challenge. We have a new pkt station at the NWS office in Allentown...Why not! How about the state's rptr clubs work on linking & networking? Please send me your suggestions. Hey, just because you live in WPA, don't feel left out. This should be a statewide program. New DLARC officers: pres W3TDF, vp K3CP, secy N3EYT, treas KA3MNY, bd members K3AUS KU3K W3PYF KW3W KA3MOU & W3FYK. Lebanon Valley ARC officers: pres KA2MVM, vp N3ICP, secy N3ICQ & treas N3HHI. The Atlantic Div. conference is this month. If you have any matters you feel need to be presented to the ARRL Dir, please send it to me ASAP. All requests will be presented. If you have any nominations for Atlantic Div "Amateur of the Year," "Grand Ole Ham" or "Technical Achievement" awards, please send them to: Richard Goslee, K2VCZ, 24 Elaine Dr Rochester, NY 14623. Nov tfc: PSHR N3DRM 1/30, 2/10, 3/12, 5/12 & 6/26. Total 90. @BBS: K3RLI 275, WA3TSW 109, WB3JOE 88 & N3ET 82. Nets: EPA 409/139. EPAEPTN 489/180. PTTN 197/46. D6ARES 106/14. MARCNET 58/3. MARTCN 115/30, SCARES 47/4. SEPATN 65/3 & PFN 161/167. Tfc reports: N3DRM 306, W3IVS 233, KD3AO 137, N3CD 115, W3DP 101. W3KAG 86, W3JKX 85, W3KOD 79, WA3EHD 54, N3AT 51, N3EFW 50, W3IPX 48, N3FLE 43, W3ADE 38, W3FAF 29, W3NNL 24, WB3EVL & NZ3G 23, W3EAG 22, WA3CKA 19, KU3R 18, W3BNR 17, W3CL 15, KA3MVM & KB3QW 14. WG3T 12, W3VA 10, WA3JKB 7, W3HK K3ARR 6, KG3C 4, K3NB 3 & WE3E 1. 73 de Carter, KD3AO. STM/EPA 73 & 88 to all, Bob, KB3YS, SM/EPA.

MARYLAND/DC: SM, Ken Cohen, NI3F (@ WA3ZNW), ASM/PKT: KJ3E (@ N2GTE): ASM/ACC: WA3YLO. SEC: WA1QAA. TC: W3VVN. STM: N3EGF (@N2GTE). SGL: KW3X. PIO/BM: WA3SCW (@ WB3V). Here are a few New Year's resolutions you may consider making: start a Novice class; learn how to handle formal msg tfc; make sure your club earns extra FD points by having its site in a conspicuous place. Here's another bright idea: Try downloading W1AW bulletins from pkt or directly from HF & enhancing your local net's program by reading them. If the latter suggestion interests you, why not consider becoming an OBS? Our BM, WA3SCW, would love to hear from you! NB3P reports that he's up to his eyeballs with school, so he's taking a leave of absense as OOC; we'll keep your spot warm, Jim. Now, just to make sure folks have their specs on & are reading all this small print, here's an offer: The 1st person to send me a properly serviced NTS radiogram stating the Latin motto of MD will win a prize & be listed in this column—the spelling must be right. Have you hugged your rptr repairperson lately? 73 es 88! With the nets: NM/QND/QTC/QNI: MSN/KC3Y 30/50/368, PON/W3DFW 26/14/194, MDD/K3GHH 60/124/518 (Top Brass: KC3Y/172, K3GHH/144, W3QQ/107), MEPN/WD3W 43/148/660, MPTN/KJ3E 30/387/600.

MEPN	Dy	2300Z	3920 kHz
MDD	Dy	0000Z	3643 kHz
MDD	Dy	0300Z	3643 kHz
MSN	Dy	0030Z	3717 kHz
MPTN	Dy	24 hrs	N2GTE-6 via nodes

Tfc: W3IWI 768 (BPL), N4QQ 357, N2GTE 229, K3GHH 131, KD0M 124, WD3W 101, NR3Q 98, KJ3E 97, KC3Y 96, WA3YLO 93, K3USO 60, NT3S 54, N3IJJ 52, N3EGF 52, W3YVQ 39, NV3N 36, W3LDD 34, N3DE 22, KA3WWI 21, NC3Z 17, N3GIY 16, KD3JK 14, W3DQI 11, K2EB 8, K3NNI 8, WA4GGH 6, KK3F 6, WA1QAA 3, W3ZNW 3, PSHR: W3YVQ 82, WA3YLO 81, N3IJJ 76, KC3Y 70, K3GHH 67.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEE—SEC: W2HOB. STM: WB2UVB. ACC: K2IXE. ATCs: K2JF, KA2RJA & WB2MNF. This is my last column as your SM. To try & thank, in this small space, the people who have been so helpful in the 7 + yrs of my tenure would just take too long. Ditto to the SNJ Section staff, without whom my job could not have been done. I'll just say "thanks" to all of you—it's been a pleasure. As I leave office, I'd like to say that we in this Section need to take a more active role in Section affairs. Despite all my pleading for help with the "Scanner Law," few in this Section got involved. Not one of our Section's Volunteer Counsels was ever heard from! The major thrust continues to come from our friends in the NNJ Section. I intend to keep working on this in the months to come, if we haven't gotten the law enacted. In another related area, in the 3 times I was "elected" SM, nobody ever ran against me. I know I didn't do that good of a job that nobody would run; it was just that nobody was interested enough. Please: When the next election for SM comes up, think about running. The more competition, the better the end product. So, goodbye & good luck to each of you. Enjoy Amateur Radio; it's the best hobby there is. 73.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—ASMs W2BCH W2GJ W2GLH WB2YQH. ACC N2EH. BM: K2KWK. OOC: W2MTA (A). PIC: WA2PUU. SEC: NN2H. STM: N2EIA. SGL: WB3CUF. TC: K2QR. Nominating forms now avail from K2VCZ for Atlantic Div 1991 "Amateur of Yr," "Tech Achievement" & "Grand Old Ham" awards. Club officers: Drumlins N2CMA WR2C WA2SOK N2IJM; Fulton W2TQF KA2RRY N2GAA KC2QV KA2GJV; Lockport KB2CUX WB2ITZ K2CYN K2BXS; N Chautauqua KB2EOQ N2ISQ KB2HWR K2OAD; Oneonta N2KGC N2LES WN2K KB2HPU. Skyline ARC "Ham of the Yr" to WA2QQU after a great yr of public service activities. OO Report: N2FHT. Hamfest Calendar: Dayton Apr 26-28; STARC May 4; Rochester May 17-19; Rome Jun 1; Batavia Jul 7. It's interesting to me to review FCC discussion about "Automatic control" in NPRM 90-561 on amending Part 97 of the Rules. "Amateur stations are not common-carrier comms systems, although technically, some configurations of amateur stations may be similar. All rules apply individually to each amateur station in the system, not to the resulting system. Each station licensee & each station control operator is responsible for the msg transmitted as well as those retransmitted by the station...we regard automatic control as being less reliable than local control or remote control and, therefore, in the nature of a subordinate privilege. In effect, automatic control of a station is similar in concept to secondary status in a freq band: A condition of using this type of control is that it may be used only as long as the station does not cause any interference or no improper transmission radiates from the station." Consider this when you think about HF comms in any model Section pkt nodes: KD2AJ Plattsburgh Zip 129xx; NA2B Massena 136xx (ST = 285); WF2A Vestal 137xx-139xx & temporarily 130zz-135xx; WB2WXQ Rochester 140xx-147xx; KC2AZ Elmira 148xx-149xx. Note: Reports for tfc killed (KT) & forwarded (ST) by pkt BBSs are requested for this column.

Net Name	*QNI-QSP-QND*	*Net Name*	*QNI-QSP-QND*
Earlybird	255-000-22	NYS/E* CW	384-192-30
NYSEMO	100-007-04	WDN/E*	499-219-30
NYSR CW	017-004-04	OARC Net	061-004-04
NYS/M* CW	310-208-30	TIGARDS	024-004-04
WDN/M*	357-117-30	VHF THIN	038-000-04
NY Phone*	191-153-29	BRVSN	289-006-30
NYSPT&EN	422-061-30	OCTEN/L*	276-119-30
ESS CW	423-161-30	CNYTN*	394-052-28
LCARES	057-000-04	ORTN	021-000-04
OCTEN/E*	933-178-30	WDN/L*	356-090-30
Q NET	457-001-30	NYS/L* CW	295-198-30
STAR*	262-041-29	NYPON*	430-240-30

*NTS Net. Missing net reports (3). Oct reports: CCETN 85-007-15; JCRCN 276-011-25; STAR 324-031-31. Oct & Nov BPLs to N2JAW. PSHR: N2EIA N2EVG WA2FJJ W2FR KA2GJV NN2H KC2HJ KB2HYT KB2IWN N2JAW N2JRS KB2JRT W2MTA WB2OEV WB2QIX KA2QOO ND2S WA2UKX KD2WP K2YAI KA2ZNZ. Tfc (Nov): N2JAW 493, W2MTA 428, K2YAI 255, WA2FJJ 242, N2FR 233, KB2JRT 213, KA2ZNZ 196, KB2IWN 186, ND2S 162, NN2H 154, WB2OEV 152, KC2HJ 143, KA2QOO 135, KA2GJV 122, N2EIA 119, N2EVG 106, WB2IJH 103, WB2QIX 101, WA2UKX 79, KD2WP 77, KA2ZKM 71, AF2K 66, WB2OWO 63, W2UYE 58, KA2SJG 49, KB2HYT 45, KA2DBD 33, KG2D 31, W2PPS 28, KB2EOQ 17, N2KWV 16, N2JRS 16, N2DLN 13, WA2OEP 6. (Oct) KA2SJG 16.

WESTERN PENNSYLVANIA: SM, Bernie Fuller, N3EFN @ K3ASI— ASM: KA3OEM (@ NM3G). SEC: WA3UFN (@ W3YA). STM: WA2QXA (@ KA3NVP). BM: KC3ET (@ KA3NVP). TC: K3LR. OOC: KX3V. ACC: AK3J. I've spent a great deal of time lately monitoring tfc nets—within the WPA Section & outside of the Section. One of the major problems I've noted is a surprising lack of net discipline. As a general rule, we here in the WPA Section seem to be on top of things in that dept, but it never hurts for us to review the proper controlled-net operating procedures. Perhaps the NMs could periodically hold an on-the-air sess outlining the procedures for his particular net—just as a reminder to all who participate. Here are some of the problems I've noted: Stations tuning up on the net freq while the net is in operation. "Doubling" is a problem on all the nets I monitored—listen before you transmit. When you have several pieces of tfc to pass to a single net member, why not go off the net freq & pass it? NCSs at times have to operate slightly away from the announced net freq. When this happens, the net operates on the freq of the one established by the NCS—rather than try to act as a freq standard for the net, you should zero-beat the NCS. The increase in tfc around holidays like Valentine's Day, etc, means we'll have to move the tfc with efficiency. The way that can be achieved is to maintain good net discipline and use good operating procedures. The tfc nets that meet dy on 3958 & 3983 need you to check in & assist in handling the tfc...try it & you'll be hooked on tfc handling. If you have any questions about tfc handling & how to get involved, call WA2QXA, the STM. The freq for the WPA Section Public Svc Corps Net will be announced shortly—we plan to hold the net each Sun prior to the 1800 WPAPTNet. The purpose of the net is to provide a forum for the exchange of info within the Section. Check in & add your comments & opinions. Mark your calendar for Mar 3—the TRARC Swap & Shop is scheduled for Rostraver VFD in Rostraver, PA. Kudos: Punxsutawney ARC on becoming an ARRL Affiliated Club; To the Horseshoe ARC on being officially designated a Special Service Club; N3FQQ & his ARES crew in Cambria Co for his outstanding work in establishing a capability for high-quality multimode emergency comms.

Net	*QNI*	*QTC*	*Sess*	*NM*	*kHz*	*T/D*
WPA CW	181	95	29	WA3UNX	3585	7 PM Dy
WPAPTN	459	106	30	WA3HLN	3983	6 PM Dy
PFN	161	167	30	WA3THT	3958	5 PM Dy
WPA2MTN	329	57	30	KA3BGC	146.88	8 PM Dy
NWPA2MTN	584	48	28	WA3ZSC	145.13	9 PM Dy

Tfc: W3EGK 405, N3EMD 379, W3OKN 165, N3AES 133, N3FM 127, WA3UNX 81, WA2QXA 73, W3NGO 49, W3RUL 32, NO3M 27, WA3DBW 22, WA3QNT 20, K3TJM 18, KC3HR 15, KA3VBY 14, W3KUN 13, KA3EGE 8, N3FQQ 8.

CENTRAL DIVISION

ILLINOIS: SM, Sharon Harlon, WB9SFT—SEC: W9QBH. BM: K9EUI. ACC: KI9G. STM: K9CNP. SGL: K9IDQ. TC: N9RF. OOC: W9TT. PIO: N9EWA. DEC: WD9EBQ. NASA & the ARRL designated the Rockford ARA & the Discovery Ctr Museum for a 2-way QSO with astronaut Dr Ron Parise, WA4SIR, to take place from the Discovery Ctr Dec 5. On Dec 4, there was a 1-way with the Young Astronauts listening to the QSOs between WA4SIR & school kids in other parts of the country. This was sort of a dry run for the next evening's activities. On the 5th, everyone was in place & N9JEL was in contact with SAREX control & everything seemed to be going as planned. WA4SIR's signal was to be relayed by VK5AGR in Adelaide, Australia, to VA & on to Rockford via a phone line so the children could experience the thrill of a live QSO with a shuttle astronaut. N9JEL explained to the children that this was an experiment & the attitude of the spacecraft might be such that the antennas would be pointed away from Earth & that's just what happened. Even though everyone could hear WA4SIR's voice talking to VK5AGR & to SAREX control, N9JEL could not make contact. The children were excited & disappointed that they couldn't make contact. We have a wealth of new amateurs coming in this community. New officers of the Hamtesters RC: pres KC9IC, vp NF9N, secy N9JZL, treas KB9CYP; the date for their hamfest is Aug 4 at the Will Co Fairgrounds.

Net	*Freq*	*Time*
ISN	3905	1800 Dy
ILN	3690	1830,2200 Dy
ITN	3705	1900 Dy
CTN	147.69/09	2100 Dy
ILARES	3905	1630 1st,3rd Sun
IEN	3940	0900 Sun
ILPN	3855	1645 M-F; 0830 Sun
NCPN	3915	0700 M-Sat
NCPN	7270	1215 M-Sat

Tfc: NS9F 146, W9HLX 135, W9HOT 107, K9CNP 102, W9LWH 91, KA9QEW 83, WV5Z 72, KA9JNE 70, WD9HQW 67, KA9IMX 26, WD9CIR 20, W9KR 11, KD9TK 11, K9WMP 11.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: WA4VWV. ASEC: WA9ZCE. STM: KJ9J. OOC: N9INN. SGL: WA9VQO. BM: W9OCL. PIC: N9IPA. TC: N9HQO. No silent keys reported this month. Received resignation of Frank Dick Jr, WA9JWL, as TC—sorry to lose him, but have certainly appreciated his help. Steve Wrightsman, N9HQO, has accepted the appointment. Looking for an ACC. If anyone would like to volunteer for this position, please contact me. W9OCL needs reports from the OBSs, as only 3 sent in reports: K9SBW, N9BAC & N9BS. ATC Ed, WA6OIZ, writes a tech article for the NE IN ARC each month. PIOs need to send a monthly report to N9IPA, PIC. N9INN reports receiving 4 OO reports. Thanks to NMs: QIN NR9K, ICN KE9GM, WN WA9OHX, ITN KJ9J. Nov net reports:

Net	*Freq*	*Time Daily UTC*	*QNI*	*QTC*	*QTR*	*Sess*
ITN	3910	1330/2130/2300	3083	458	1807	87
QIN	3656	1430/0000	326	136	880	59
ICN	3705	2315	178	104	686	29
IWN	3910	1310		1823	302	30
IWN	VHF	Bloomington		804	153	30
IWN	VHF	Northeast		674	600	30
Hoosier VHF nets		(13 nets)	1559	91	1518	93

9RN tfc 284 in 60 sess. IN 100% by N9HZ, KJ9J, W9JUJ, NR9K, W9PPO, WA9QCF & WB9UYU. Pkt BBS reports: Nov. N5AAA 5073, N8GTC 4281, KK9G 1982, WA9IVB 1543, W9ZRX 1370, N9BAC 1369, WB7QWG 666 & KB9AVO 600. Tfc: NR9K 396, WA9OHX 277, KJ9J 221, W9UMH 153, W9UEM 124, W9ZGC 124, WA9QCF 124, KE9GM 101, W9JUJ 96, W9OCL 48, K9GBR 38, K9SBW 34, W9PPO 27,

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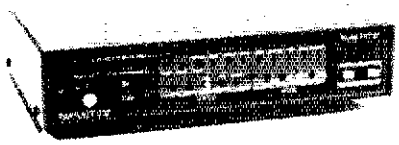

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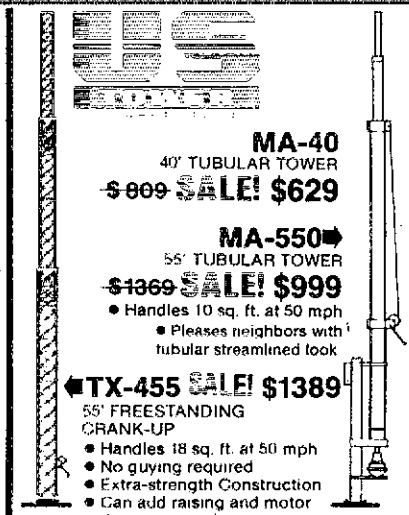

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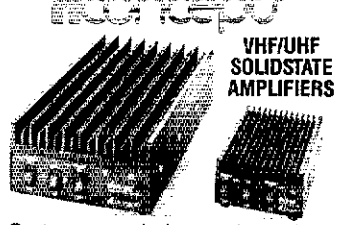

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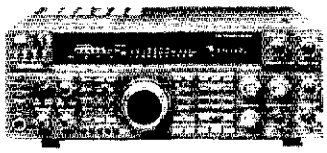

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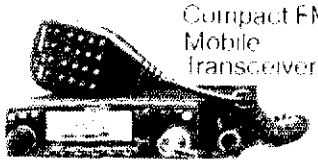

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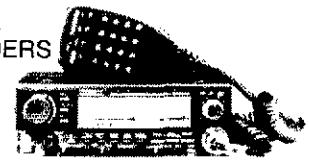

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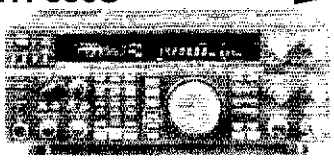

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Maximum Operation Flexibility

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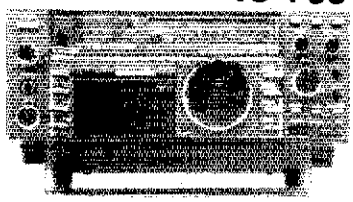

The latest in ICOM's long line of HF Transceivers

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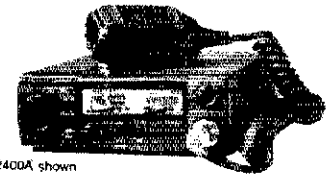
2m/440 MHz / 2m/440 MHz



IC-2400A shown

VHF/UHF DUAL BAND FM TRANSCEIVER

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SPECIAL PRICING ALL MONTH LONG!

ICOM DAYS at each store...

February is ICOM MONTH at HRO – with a special ICOM DAY at each of our stores:

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Feb. 9:	**Phoenix • Woodbridge • San Diego**
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Feb. 23:	**Oakland • Atlanta • Anaheim**

On these dates at these stores:
- Free prize drawing each hour (must be present to win)
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- Demos by ICOM representatives
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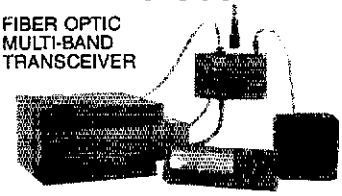
PRIZES • DRAWINGS • DEMOS

(no purchase necessary)

ICOM IC-901

FIBER OPTIC MULTI-BAND TRANSCEIVER



2 METER AND 440 MHz
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IC-32AT Dual Band Hand Held

IC-2GAT 2 Meter HT 7 WATT

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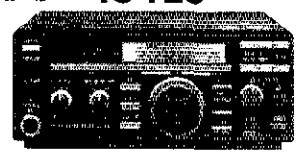
IC-2SAT, 2 MTR
IC-3SAT, 220 MHz
IC-4SAT, 440 MHz
IC-24AT, Dual-Band

ICOM IC-725



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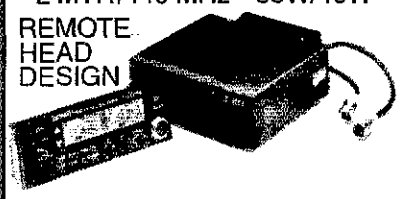

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Built-in TCXO

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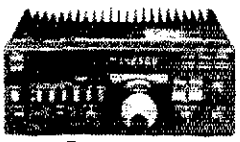

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Standard 2.5W
49 Memories
2m/140 to 174 MHz
EXTENDED RECEIVE

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440 MHz VERSION
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HF/VHF/UHF

DUAL VFO's, FULL CW BREAK IN
Optional Modules 50/144/430-440 MHz

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Computer Aided
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100 WATTS, DUAL VFO'S
Receives 100KHz to 30 MHz
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- Optimized for reduced Phase Noise
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TITAN 425

- Pair 3CX800A7 • External Power Supply
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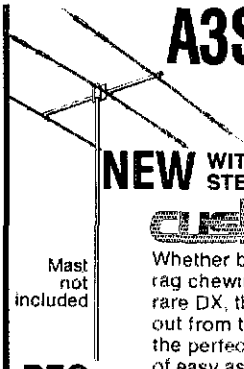


Mast not included

A3S

DX THAT STANDS OUT FROM THE CROWD

10, 15, 20 Meters

NEW WITH STAINLESS STEEL HARDWARE

cushcraft

Whether busting pileups, rag chewing or hunting rare DX, the A3 stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

- Boom Length 14 ft., Weight 27 lbs.
- Wind Surface Area 4.36 ft.

REG. 425.00
SALE 299.95

SALE

R5

14, 18, 21, 24, 28 MHz Half Wave Vertical

cushcraft

The new R5 has a broadband solid state impedance matching network for full coverage of all 5 bands. Frequency selection is completely automatic. There are no moving parts or remote tuner. The only connection required to the antenna is your 50 Ohm coax.

- The unique counterpoise has four 48" long .100" diameter stainless steel rods for excellent ground isolation
- No radials required

REG. 340.00
SALE 249.95

AR-270

NEW DUAL BAND RINGO

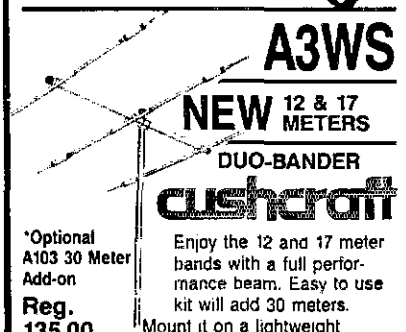
cushcraft

The AR-270 has Ringo Ranger technology in a durable all aluminum antenna with stainless steel hardware. Instant assembly and 3 short radials make it easy to install anywhere. AR-270 features sealed phasing coil and base matching network with single 50 Ohm cable connection.

- 2 Meters (144-148 MHz) 70 CM (435-450 MHz)
- Height: 3.75 feet

REG. 80.00
SALE 69.95

SALE



A3WS

NEW 12 & 17 METERS

DUO-BANDER

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Enjoy the 12 and 17 meter bands with a full performance beam. Easy to use kit will add 30 meters. Mount it on a lightweight tower and rotator or with your existing tribander. A3WS features all aluminum construction with stainless hardware.

- Boom Length: 14 feet
- Weight. 22 lbs.
- Turning Radius: 14.4 ft
- Wind Area: 4.1 ft²

*Optional A103 30 Meter Add-on

Reg. 135.00
Sale 109.95

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SALE

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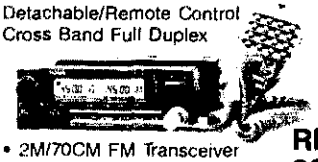

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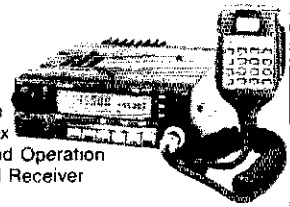

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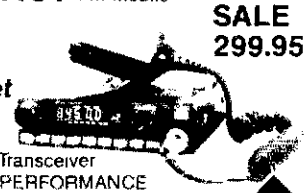

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N9BS 22, N9DTG 20, K9ZLS 16, WB9IHR 14, WA6OIZ 12, WB9NCE 11, K9ZBM 10, WD9CIV 5, K9OUP 5. W9RTH 4, *AD9A 4, KA9ZOD 4, W9KMY 3, K9DIY 3, K9EDF 2, NZ9S 1,* W9BDP 1. PSHR: (Nov) KJ9J 95, NR9K 88, W9UMH 61.

WISCONSIN: SM, Richard R. Regent, K9GDF—Congratulations to W9DLY for 50 continuous years as an ARRL member. Would you like free training to prepare for emergency comms? Please contact our SEC, WB9SMM, of Milwaukee, to get in touch with your local expert. Thanks to Rock River RC for inviting me to their Christmas party as guest speaker; RRRC nets meet Sat on 7.277 or 3.985 MHz (depending on band conditions) at 11 AM & Mon on 146.04 MHz at 7:30 PM. New officers of MANCORAD: pres KA9ZTF, vp WW9P, *treas KB9ESU, secy K9LWI. W Allis RAC: pres* K9WTF, vp W9YCV, secy WA9POV, treas WD9AYD. Green Bay Mike & Key Club: pres WA9SWX, vp KA9BXG, secy KE9AS, treas KA9VRK. Four Lakes ARC has 148 members & is using recycled paper for their newsletters. Sheboygan Co ARC will hold their Valentine's Party Feb 15. Exams on *Feb 2 in Racine & the 23rd at Tomahawk & Madison.* Milwaukee RAC will again have their all-classes amateur license school on 9 Weds at 7:30 PM, starting Mar 13; contact WB9BWP. Feb 18, Fox Cities ARC will feature Walt Hedges' computer & digital electronics program. Thought of the month: If you can distinguish between good advice & bad advice, you don't need advice. Tfc: WB9YPY 2368, W9IHW 956, W9CBE 258, N9IAI 160, W9YCV 154, KB9UE 95, W9UCL 92, KA9FVX 74, K9AKG 64, AG9G 58, K9KSA 51, KA9BHL 50, N9BDL 49, KA9KLZ 49, N9BCX 45, NS9Q 39, K9UTQ 38, W9NGP 36, WB9ICH 35, K9JPS 34, KE9LX 33, W9AYK 33, K9FHI 32, KB9B 31, K9GU 27, W9ODV 21, K9BED 14, W9UW 7, W9PVD 4.

DAKOTA DIVISION

MINNESOTA: SM, George Fredericksen, KCØT—I guess tfc corresponds to the experience of the business community, in the sense that most of our annual activity is directly related to the holiday seasons. And so, the pace has been quickening. *We had a good Nov with 2 BPLs: Judy, WBØWNJ, with 1307* & Geb, WØGRW, with 703 points—it looks like Geb has qualified for his BPL medallion. Congratulations to both. Maybe we'll have 3 BPLs next month...that would be great. Art, KDØCL, leads the PSHR list with 121 points for Nov—nice going, Art! Thanks to all for your help & support & it sure shows up in our overall activity. Our tfc total for Nov was 4057, the highest total for a single month since Dec 1989. So, keep up the great work. Just one more thing; send me stuff to print in our Section News. I need help! Until next time, 73 es GL. Jim Swisher, KFØFI. STM.

Net	Freq	Time	QNI/QTC/Sess	NM
MSN/1	3685	5:30 PM	355/57/30	KDØNH
MSN/2	3885	10 PM	179/48/30	KØQBE
MSSN**	3710	6 PM	500/43/30	KABSBY
MSPN/N	3860	12:05 PM	313/122/27	WAØTFC
MSPN/E	3860	5:30 PM	978/296/30	KCØT
PAW	3925	9 AM	3364/241/121	WDØBAC

Additionally, MSSN sent 35 training msgs. Tfc: WBØWNJ 1307, WØGRW 703, NIØA 346, WAØTFC 337, KAØARP 267, KFØFI 223, W9DM 117, NØFOO 104, KDØCL 94, WDØGUF 86, KDØNH 86, KØPIZ 70, KAØVQN 63, KAØSBY 48, KØQBE 38, KØWPK 37, KØERP 31, KT9I 28, KCØT 28, NØJP 21, NØFKU 17, KØOGI 6. Total Tfc: 4057.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—Bismarck's 1st hamfest is Mar 23 at the BSU with SKYWARN program, ARES presentation, swap tables & a planning mtg for overseeing the Superlink. We wish all the best to KAØHDN, who's been deployed with his Guard unit for possible action in the Mideast. Congratulations to NTØV for high ND score in the VHF contest. Upgrades: Tech KBØGKU, General NØMGP, Advanced NØMEC. Sioux Club members led by KAØBUQ, KBØACO & WBØZLX are rebuilding their station & antenna at UND. Also WAØLPV, WFØV, KAØCAF & KBØBSJ installed a new hardline on the Grand Forks 94 repeater. Also the GF area received a packet node. Call sign is WFØV-1 MNEGF. NØELA accepted *the position of awards mgr for the TRARC Club in Dickinson.* For information contact Steve Aller, 1701 6th Ave, Beulah, ND 58523. Hope WBØOAJ's (new?) tower & antenna hold together long enough to make a few QSOs, hi. Don't lick the pump handle. Hope you are having a good winter. Tfc: KAØFSM 162.

Net	Freq	Time	Sess	QNI	QTC	NM
Goose River	1885	9 AM Sun	4	93	0	NTØV
DATA	3937 kHz	6:30 DA	30	788	30	NØJR
WX Nets	3937 kHz	6:30 AM	50	927	48	WØGFE
	7230 kHz 13.30 PM winter only November to March					
Storm Net	3937 kHz	During Storms only				WCØM
North 40	146.64	8 PM, MST Sun	4	36	0	NØELA
MON-DAK	146.73	8 PM, MT	5	40	1	NØELA
Dickinson-ARES			4	29	1	NØELA
Superlink	7 PM Sn	All Superlink				NØKMG & KAØZKE

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—SEC: KAØKPY. *STM: KDØYL. PIO: NØHCR. TC: KØAS. When you read this,* the Pierre rptr will have changed from 73 to 144.75/145.35 & linked to Pierre Reliance. New rptr freqs in the Sioux Falls area are Beresford 147.24 with standard offset & Sioux Falls 147.510 & 144.510 offset. KAØAHI is now AAØCT. STM KDØYL reports Oct participation in the Novice net was the best in 3 yrs. *LARK Club of Watertown reports their Field Day finish* was 168th out of 280 entries in class 3A. Would like to have clubs send me any information that they would like to have in this column. Total tfc reported for Nov was 659. Total check-ins into the SD nets for Nov was 2519. The SD CW net & the QCWA net have been showing an increase. Hope all had a nice Holiday season.

DELTA DIVISION

ARKANSAS: SM, Bob Harmon, W5SEP—The Dec 1, 1990, ARES-RACES statewide earthquake drill was a success. *Hams across the state manned comms ctrs in most cos, in* conjunction with state OES & the Red Cross, hospitals, the Nat'l Guard & others. Operators also worked from their homes passing tfc. The CAP air-lifted an 8-man strike team & equipment to the state forward command ctr in Brinkley, AR. Ham radio again proved its value with emergency comms. Club *officer elections have taken place over the state & results are* as follows—Harrison club: pres Dan Pearson, KI5JB; vp Craig Cates, KB5JXE; secy/treas John Carter. KA5ETD. Malvern club pres Jack Edwards. KA5OVQ; vp Willis Spray, K5CVW; *secy/treas Mary Ann Green, KA5YZR. Pine Bluff club pres* Dave Algeo, N5RHI; vp Larry Carroll, N5JWJ; secy Joe McCullough, KA5OKO; treas Jack Jehlin, KA5OKN. Hot Springs club pres Don Nobles, KC5QY; vp George Kostelnik Jr, N5IRK; secy/treas Karen Hogaboom, KB5LJK. Saline Co club pres Wayne James, KA5OHP; vp Paul Clampit, K5TCK; secy Lester Woosley, W5EIJ; treas Jerry James, KA5NWA. Conway club pres Bill Thomas, N5PSA; *vp/treas Bob* Hambuchen, N5OMW; secy Perry Carleton, WA5RRM. MARC Little Rock club pres Mike Fuller, AA5BC; vp Rich Duncan, WD5B; secy Dora Anna Graziani, NI5D; treas David Montgomery, KA5SKU. CAREN, Little Rock club pres Bob Hancock; vps Mike Echols, WN5X & Fred Short, KI5KH; secy Skip Kendal, WA5KQU; treas Dale Temple, W5RXU. The MARC, Pine Bluff & Harrison clubs are organizing an ARES group. They join Ft Smith, Russellville, Hot Springs, Benton, Jonesboro, W Memphis, Malvern & central AR with an organized ARES plan. 73, Bob Hancock, KB5IDB.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX Alexandria. ACC: K5KR Metairie. SGL: KD5SL Baton Rouge. STM: WB4FDT Ruston. SEC: KG5PV Baton Rouge. Pkt: WB5ASD Alexandria. TC: KE5FZ Sunset. OOC: NO5H Epps. Welcome back to Gary Elliott, NO5H, of Epps, as the OOC. Gary was appointed as an OO until 2 yrs ago, when his relocation caused him to be temporarily inactive. Best wishes for an outstanding year to the following newly elected officers of the Baton Rouge ARC: pres Paul, KQ5N; vp John, N5OHQ; secy Gloria, N5NXK; treas Tom, N5ADP. ARRL HQ presented Certificates of Achievement to the Delta DX Assn, Metairie; SE LA Univ ARC, Hammond; Acadiana DX Assn, Lafayette & the Fist & Mouth Contest Company, Monroe, in recognition of 100% League membership during 1990. Freddy Keller, KF5VW, from Sorrento, was a blind ham who recently became a Silent Key. He was involved in amateur activities including daily participation in the NTS & MARS nets. Freddy *taped the incoming tfc & relayed the msgs by listening to the* tape & simultaneously repeating it to the relaying station or addressee. With a little help from his XYL, Veronica, KB5DKG, he handled RTTY & pkt tfc in an equally skillful & efficient manner. He is truly missed by many LA hams. 73 & GL de "Wondy" K5KR. Tfc: WB4FDT 81, N5BFV 74, N5CNK 72, *K5WOD 62.* (Oct: WB4FDT 66, N5CNK 55, K5WOD 42, N5BFV 38.

MISSISSIPPI: SM, Butch Magee, KF5DE—SEC: N5DVR. TC: W5VZF. STM: KB5W. BM: W5EPW. SGL: KA5WRX. OOC: WA5TMC. Richard Reed, KA5WRX, on Apr 1, will be the new *SM for the MS Section. There will be a smooth transition from* this shack to his. Richard will inherit a healthy Section & with his leadership & your support, he can make this a great Section. Christmas & New Year's will be history by the time you read this, but I hope you had a good one. May the New Year bring only good things to us. Good things continue to *happen on the nets, read the following nos. & we'll see you* next month. 73, Butch, KF5DE. Tfc: TCC Cycles 1 & 2, papa sked: 30 sess, 145 msgs passed, 93.6% efficiency. 5th Region Daytime (WB5YDD NM): 60 sess, 865 msgs, MS rep at 100% by KT5Z W5HKW NS5M WB5GFM N5HBB W5HKW and/or KB5W. Nets (NM) (Sess/QNI/QTC): MSPN, W5HTV, 30/2741/47; Magnolia Sect Phone Net, K5IVA, 30/1711/24; MTN, KB5W, 30/111/234; Gulf Coast Sideband Net, W5JHS, 30/22/1316; MSN, W5YRX, 19/132/2. GCEN, KB5KYB, 3/24/0; Coast ARES Net, WB4YRI, 4/41/7. Tfc: KB5W 591, W5JDF 238, NS5M 134, W5DEJ 62, N5KKI 60, KT5Z 57, KF5MQ 56.

TENNESSEE: SM, Harry Simpson, W4MI—E ASM & PIC W4TYU, W ASM & ACC K4CXY, STM WB4LAL, SEC K4UVH, *OOC K4LSP, TC W4HHK. The TN Phone Net is on 3980 kHz* with early sess at 6:40 AM Eastern, regular sess at 7:45 AM Eastern M-F, at 9 AM Central on Saturdays, Sundays & Holidays. Evening sess are M-F at 6:30 PM Central. CW Net sess are on 3635 kHz at 7 PM Central, M-F. After yrs of service as NM of the Phone Net Flower Fund, Harmon Sharp, K4WWQ, has retired. We're indebted to Harmon for his long & faithful service. KJ4CF James Brown will handle those duties in the future. Flower Fund donations should be sent to James H. Brown, KJ4CF, R 1, Box 18, Walling, TN 38587-9710. Glenn Snow, N4MJ, has started the W TN/W KY Emergency Net, using the Union City rptr on 146.70/10, meeting Sun at 9 PM Central; most participants are within 25 mi of the state line. This net will cover an important part of the now well-known New Madrid fault. Check in with Glenn whenever possible. Chattanooga will have the 1991 Delta Div Convention, AR gets it in 1992, & Memphis will have it in 1993. New heads of clubs *throughout the state include Nita Wofford, N4DON, in* Memphis (Nita is the 1st woman to hold the title of president in MARA's 52-yr history!), Bill Maupin, K4SSV, of Tri-Co; Bob Page, W4DVJ, of Nashville's RATS; Tom Cash, K4ZQX, of Chattanooga; Boyd Webb III, N4SSF, of Delta in Memphis & Sonny Dixon, WD4PIW, of Bristol. Tfc: WB4LAL 147, WA4FMR 128, K4ZUY 69, K4WWQ 68, W4DDK 65, W4MRD 51, W4MI 50, WA4GZZ 45, K4WOP 34, KN4HL 32, KA5KDB *17, WA4HKU 14, W4TYU 12, W4PSN 6.*

GREAT LAKES DIVISION

KENTUCKY: SM, John Thernes, WM4T—(Nov). My thanks to the BARS Club in Lexington as I presented their president with a plaque to honor their 50-Years affiliation with the ARRL. *Your SM was a guest speaker for a rptr roundtable discus*sion that took place with the guys in Louisville using reverse autopatch. This was an excellent way to get opinions & answer questions on current Section events.

MKPN	1490	87	30	WD4RWU
KTN	1050	50	29	KC4FRA
KYN (both)	465	91	59	K4AVX/KZ8Q
TSTMN	363	20	30	KZ8Q
KNTN	202	29	36	KB4UJA
CARN	594	30	30	KN4IV
KRN	590	25	30	N4NLY
SEKEN	56	1	4	KC4ALR

SAR (Nov): K4VHF 84, K4AVX 65, KB4UJA 54, WA4SWF 46, WD4RWU 42, KC4WN 19, WB4AUN 16, N4PEK 14, WB4ZDU 10, W4TPB 10, WA4HLW 9, KC4OBX 8, N4LAF 5, WB4NHO 4, WD4COF 2.

MICHIGAN: SM, George E. Race, WB8BGY (@ WA8URE)—*STM: KA8NCR (@ WA8OOH). SEC: K8CQF (@ N8JAT). SGL:* N8CNY. TC: W8YZ. OOC: WA2AJQ. BM: N8IWS (@

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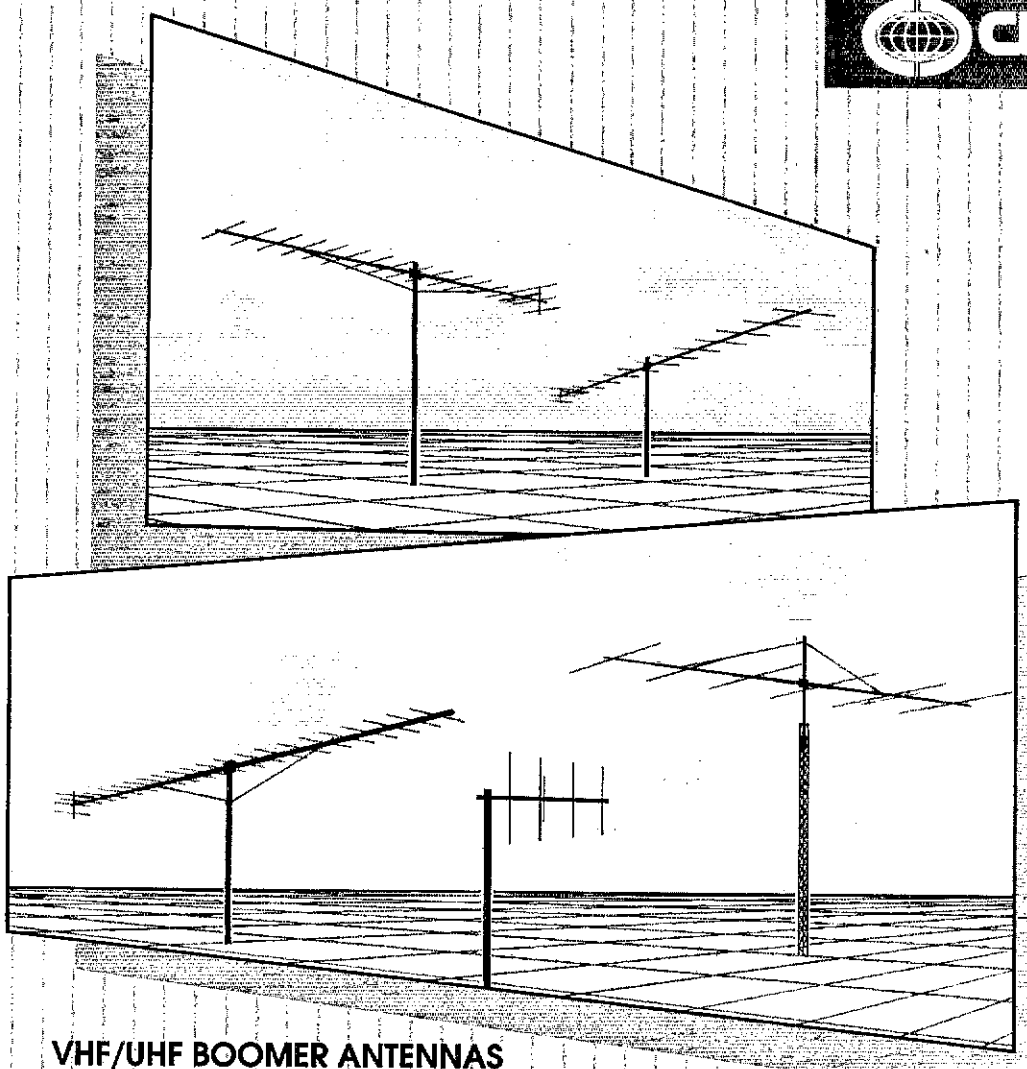

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32-19	144-146 MHz	19 Element	22' BOOMER
215WB	144-148 MHz	15 Element	15' BOOMER
220B	220-223 MHz	17 Element	19' BOOMER
424B	424-435 MHz	24 Element	17' BOOMER

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215WB	144-148 MHz	15 Element	15' BOOMER
230WB	144-148 MHz	2x15 Element	BOOMER
224WB	220-225 MHz	4 Element	3' BOOMER
225WB	220-225 MHz	15 Element	10' BOOMER

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WA8OOH). PIC: WR8R (@ KC8TU). ACC: W8POX. Silent Keys, with deep regret, K8RTI & KB8TN. The Stu Rockafellow ARC will be operating a special-event station, W8NJH, Jan. 19-21. The MI Section now has a RACES plan & a new ARES plan. Contact SEC, K8CQF, for a copy. Southfield Swap Jan 20 at Southfield H S. Livonia ARC Swap is Feb 24. Get info on your swaps & special events to *QRV* Ed. Mike, W8POX. The *QRV* is sent to all MI clubs on a regular basis. The National Convention Committee continues to make club presentations around the state. If you'd like a convention program for your club, contact Joe, K8CQF, for details. Jacki Treml, KB8CKT, is at school in Japan. She now has a new call sign, 7J3ABM. New Milford ARC officers: pres Dick, WI8X; vp John, WD8AXF; secy Carl, WN8U; treas Ernie, WA8DMW & activities, Harry, W8SWD. It's that time of yr again! Make plans for SKYWARN training with your WX Service soon—our spring storm season is only a couple of months away. My soapbox for this month concerns getting Amateur Radio before the public. While watching a late TV show, an idea appeared before my eyes that could make Amateur Radio better known. Most TV stations do public service announcements (for free) for nonprofit organizations. Let's start a new campaign around the state—send your local TV stations a card announcing your next club mtg. They usually need them at least 30 days in advance. Then, do it again, month after month. Who knows—this could lead to additional time on TV, interview shows, etc, it we generate enough interest. The same goes for your local radio station. Every station I know of has some kind of a club or mtg notes program during the broadcast period. Make sure your card indicates that the general public is invited & give a short outline of your mtg program. Check with your local station for details & deadlines. Don't forget the date, place & time. With your cooperation, this could bloom into a statewide program. Let's give it a try.—*73*. Please support the following MI-area nets:

Net	*Freq*	*Time/Day*	*QNI*	*TFC*	*Sess*	*NM*
MiTN	3953	7 PM Dy	712	210	30	WD8EIB
QMN*	3663	6 PM Dy	775	161	90	WB8SYA
SEMTN	145.33	10:15 PM Dy	301	116	30	N8HSC
MNN*	3722	6:30PM Dy	35	4	17	KF8AU
MACS*	3953	11 AM M-Sat	330	26	30	K8OCP
GLETN	3932	9 PM Dy	1277	57	30	KE8TJ
UPN*	3921	5 PM Dy	1299	92	34	WA8DHB
NMTN	147.12	7:30 PM Dy	379	32	30	N8JCL
WSSBN	3935	7 PM Dy	No report received			K8GOU
VHF Net Activity			1122	31	56	N8CRV

*QMN Early-6:30 PM Dy; QMN Late-10 PM Dy; MNN Late-8 PM Dy; MACS-1 PM Sun; UPN-12 PM Sun. Tfc for Nov: KA8CPS 378, WB8SYA 155, WA8DHB 119, N8FPN 115, NY8W 87, K8GXV 84, N6CRV 83, W7LVB 78, WB8R 77, W8RNQ 72, N8JAT/BBS 67, WD8DWO/BBS 59, K8HAP 56, N8IIC 50, W8EOI 46, WB8BGY 46, WB8YDZ 37, W8BEZ 35, W8YIQ 34, KA8BYK 32, K8UPE 31, WD8MJB 31, N8CNY 31, AF8V 31, KF8AU 30, K8OCP 28, K8ZJU 23, K3UWO 22, KA8YWV 18, WD8EIB 16, WD8KQC 13, KI8Q 12, WT8J 12, KA8NCL 12, W8MOF 11, W8IHX 10, NW8M 10, K8GOU 9, W8CUP 5, W8URM 5, WB8WJV 5, N8EXS 2.

OHIO: SM, David Kersten, N8AUH @ NO8M (see p 8); ASM John Haungs, WA8STX @ KC8TW, 513-563-7373; ASM (Pkt) Steve Wolf, NO8M @ NO8M. SEC: WD8MPV @ WA8SXN, 216-274-8240. STM: KF8J @ W8HHF. ACC: KJ3O/8. BM: W8PH @ WB8JIB. TC: KB8MU. SGL: N8CVK. PIC: K8QOE. OOC: WB8ZCE. This is my 1st chance to welcome Steve Wolf, NO8M, as part of our Section Cabinet. Steve is an ASM & will be working with the pkt community to establish an in-place, effective, statewide network to handle emergency tfc resulting from small or large-scale disasters. We have a good pkt system in OH, but it's not geared for rapid changeover to select means for handling a large volume of disaster msgs with expeditious forwarding. Therein is Steve's charge! We hope to make the *Section Club Newsletter* a regular item to be published more frequently, during months *OSJ* is not published. The *Club* paper is to keep all OH clubs updated on what clubs are doing for mutual support, ideas, cooperation, etc. Please advise Joe, K8QOE, or JoAnne, KJ3O, of your club activities so they can print factual, up-to-date material. While on the subject of keeping us informed, remember to update K3RC on license exams & KJ3O of hamfest data. Triple States ARC has taken big steps toward upgrading their emergency operations capability as a result of the Shadyside flooding: Included is more standby power to keep rptrs operating during a power failure & a 16-ft trailer outfitted as a mobile command ctr. Good work, folks. From Lake Co ARA *Patch*, a timely comment about our public service work, "...when we do nonradio things, such as direct tfc or help with crowd control, we're at risk...ARRL volunteer legal counsel Bob Winston, W2THU, was asked about hams performing nonradio duties. His response was quite clear: 'Don't do it.'" Our Section CW nets could use more participants. WD8KBW (OSN) & WB8FSV (OSSN) put out neat little newsletters: Join their nets so you get added to their distribution lists! Is there interest in seeing results of the Local NTS/ARES nets listed from time to time in Section News or *OSJ*? Please pass your ideas on this along to me: If enough interest is evident, I will respond accordingly. Yr-end sees many club elections & as I write this, not many results are available. Wayne Amateur Radio Technical Society reports pres N8FLS, vp KD8EU, secy/treas N8JBG. We have a few events of interest in Feb: The NOARS Winterfest Feb 3 in Lorain; the Mansfield Hamfest Feb 11. The Great Lakes Div Convention will be at the Cincinnati Hamfest Feb 23-24; details on p 76. We were not surprised to have no earthquake result on Dec 3 or 4, as someone predicted, but that prediction may have had beneficial results: Many people who haven't paid much attention to the probability of a disastrous earthquake in the midwest listened to what was said & reacted. A new awareness was evident and despite the fact that we were again shown earthquake prediction is an uncertainty at best, most everyone agrees there will be "the big one" in the Midwest before too long & I hope the populace in general & we communicators in particular, will be ready. Needless to say, our families come first: Their safety & well-being assured, we can then assist others.

Net (In 30 Sess)	*QNI*	*QTC*	*Time*	*NM*
8NE	230	113	408	WD8C
8NL	221	94	395	KD8HB
8NR	189	54		W8EK
OSN	265	76	738	WD8KBW
OSSBN	2152	758	2675	N8IBS
OSSN	181	53	767	WB8FSV

Tfc: W8BO 363, W8PMJ 253, KD8KU 247, K8JDI 234, KD8HB 164, WD8RAO 163, WA8HED 160, W8NO 136, W8ZOL 135, KE8CV 133, N8AUH 133, WD8KFN 129, KF8J 127, N8IIP 103, WD8IKC 99, W8EK 98, N8FWA 98, W8RG 94, KB8DJE 94, W8OZK 92, WA8SSI 89, W8LDU 87, KC8UR 80, KA8HBN 80, KA1S 79, WB8JGW 77, WD8KBW 68, K8IOW 65, KC8NM 64, K8DHD 56, KD9K 54, WA8EYQ 46, WD8OXT 45, WB8FSV 44, KA8DRR 42, K8ALV 40, WB8DPZ 38, WD8JYE 36, NF8B 35, NS8C 35, N8GOB 35, K8ES 34, KA8SON 33, N8EFB 33, W8JLW 32, KB8ESU 29, N8DMK 29, WB8WTS 28, WD8RIB 28, N8HJB 26, KA8BNQ 25, NY8V 23, KC8JV 22, N8JOC 22, W8LDQ 19, KA8GJV 19, KB8GUM 19, N8LCI 18, KB8XL 16, W8PBX 15, N8JRV 15, W8BDC 14, KF8DO 14, KB8DUX 14, N8CW 13, W9SWM 12, NE8X 12, N8AJU 12, K8LQM 12, KB2IFD 11, N2NS 11, KB8HJJ 11, WA8STX 10, N8JYF 10, N8INP 10, K8QIP 8, KA8YIT 8, W8GDQ 7, WB8HHZ 7, N8LSG 7, WV8B 6, K8WZX 6, N8JHP 6, N8FPH 5, N8MAW 4, KF8FU 4, N8CEI 4, WB8WEK 3, K8CKY 3, WB8KWC 3, WA8RLB 3, WB8NHV 1. (Oct) W8RG 45, NE8X 6.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—SEC: WB2NVR. ACC: KV2A. SGL: KB2HO. BM: WB2IXR. OOC: N2DVQ. PIC: KB2TM. AIC: WA2VGM. ASM/Pkt/Newsletter info: N2FTR. ASM/ENY NWSLTR: W92NHC. Note: Reports not shown were not received as of submission date, Dec 10. Club News: Catskill Mtn ARA is planning their annual dinner for Jan 19 & reports activity in Nov because of heavy rains. Mt Beacon reports RFI problems; seems RFI to rptrs seems to be more common these days! PEARL's *Bit Bucket* reports that N2EGS is taking over the helm from KC2TF. Overlook Mtn ARC held their mini-auction in Nov. Schenectady ARA had a presentation on what's new in Amateur Radio—just in time for holiday giving! Looks like W2SZ is doing it big in contests! W ECA (like SARA) had a talk at the Dec mtg on new equipment. They held their annual dinner on Dec 7. N2DVQ did a fine article on the steps involved in finding a source of RFI. Yonkers ARC's YARC *Link* is back & report a plan for upcoming VE sess. Special thanks to WA2YM for serving as SEC & to K2ZM for serving as STM/ASM. I appreciate their past assistance. Congratulations to WB2NVR, new SEC. Good luck, Bob, in your new job. Hope everyone had good holidays. Orange Co ARC will hold their Winter Hamfest Feb 9. WECA will hold their annual hamfest Mar 3. Please get info for the column to me no later than the 7th of the month. Thanks. Nov net reports (Check-ins/tfc passed): AESN 37/1 ESS 423/161 NYP 191/153 NYPON 430/240 NYSE 384/192 NYSL 295/198 NYSM 310/208 SDN 430/140. PSHR: KB2EPU WB2VUK N5MEA WB1BTJ K2ZVI WF2M. Nov tfc: WB2IIV 190, WB2VUK 131, KB2EPU 95, N5MEA 91, K2LYE 74, WF2M 57, WA2YBM 49, K2ZVI 39, WB1BTJ 34, W2CJO 21, N2FTR 14, K2HNW 12, N2CJN 6, W2DW 3.

NEW YORK CITY-LONG ISLAND: SM, Walter M. Wenzel, KA2HGI— ASM: WB2IBO. ASM: N2GQR. ASM/ACC: KA2LCC. SEC: W2HPM. STM: WI2G. OOC: NB2T. PIC: KA2JMA. TC: W2QUV. BM: W2JUP. VE sess: LIMARC (ARRL)—2nd Sat at 9:30 AM, Salten Hall, NY Inst of Tech, Old Westbury; contact Al Jones, W2ZDB, 516-676-5790. Suff Co VE Team (ARRL)—2nd Sat at 9:30 AM, Suff Co Community College, Islip Arts Bldg, Selden, NY; contact George Sintchek, WA2VNV, 516-751-0894. Grumman ARC (W5YI)— 2nd Tues at 5 PM, Grumman Rec Ctr, Plant 113, 800 S Oyster Bay Rd, Hicksville, NY; contact Howard Liebman, W2QUV, 516-354-6861. Great South Bay ARC (ARRL)—4th Sun at 12 noon, Babylon Town Hall Office Annex, 281 Phelps Ln, N Babylon, NY; contact Walter Wenzel, KA2RGI, 516-957-5726; Ebonaire ARS (W5YI/ARRL)—3rd Sun at 10 AM, EARS Club House in Roy Wilkens Park, St Albans, NY; contact Gwen Neal, KA2VKW, 718-981-8876. If your group is planning a VE sess, please let me know so it can be added to this listing; even if you do not hold a regular sess, please let me know at least 2 months in advance so it can make the column. Congratulations to the following on their recent appointments: Marc, WB2DWC, EC/Asst DEC-NYC; Anne, WI2G, EC-Queens; Matt, WA2UKM, EC-Brooklyn; John, KE2UN, EC-Manhattan; Brenda, N2KYE, OES; Frank, KE2WL, OES. Remember, as Ben Franklin spoke about the price of liberty being eternal vigilance, we must also be forever watchful about our operations & the effects of others on our radio service. We must keep active in our vigilance as to the status of our service in the eyes of others & continue our positive works so as to not cause darkening of thoughts to our benefits to our communities. We must keep our goals high & our works many & pure or we may see a decrease in the freedom of our operating privileges. The following tfc nets in & around the Section handle NLI:

Net	*Freq*	*Time Day*	*NM*
BAVHF	145.350/R	2000 Dy	K2TWZ
NCVHF	146.745/R	1930 M-F	N2IMP
NCVHF	146.805/R	1930 S-Sun	N2IMP
SCVHF	145.210/R	2000 Dy	KA2JMA
NYP	3.925 MHz	1300 Dy	W2MTA
NYPON	3.913 MHz	1700 Dy	WB2MNA
NYS/M	3.677 MHz	1000 Dy	N2EIA
NYS/E	3.677 MHz	1900 Dy	WI2G
NYS/L	3.677 MHz	2200 Dy	W2YGW
NLT	28.450 MHz	2100 Wed	N2IMP
ESS*	3.590 MHz	1800 Dy	W2WSS

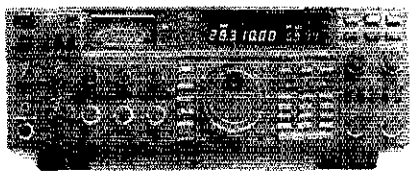
*Independent net, recognized by NTS, local times.

*** PKT NODE STATIONS ***

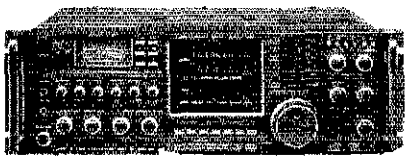
AI2O-4 Freeport 145.010 Nassau, W Suffolk
W2HPM-4 Farmingville 144.970 Central Suffolk
WB2IBO-4 Massapequa 145.030 Backup for AI2O-4

For NTS operations & info, contact Anne, WI2G, at 718-847-0155 or @ K2APL PBBS. For ARES operations & info, contact Joe, W2HPM, at 516-698-7987 or @ W2HPM-4 PBBS. Tfc: WI2G 650, KA2VZX 241, N2HLZ 90, K2JLD 88, K2TWZ 78, W2XS 76, WB2ZIE 58, W2GKZ 50, WA2UKM 45, N2KYE 32, KA2JMA 28, N2KHU 28, NB2D 16. (Oct) KD2HE 8.

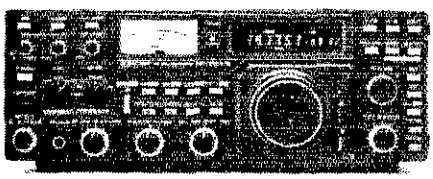
NORTHERN NEW JERSEY: SM, Richard S. Moseson, NW2L (@ KD6TH)—ASMs: Recruitment KA2F, Vol Counsel N2IGO. SE KY2S. SW KC2ZA. NW NW2S. ACC: WA2QYX. BM: K2ULR. OO/AAC: KA2BZS. PIC: WE2R. SEC: WB2HBZ. STM: WB2FTX. TC: WG2W. "Just do it." I'm writing this soon after returning from Akron, OH, where 2 local hams are getting 100 school kids licensed as part of a larger project called "Moonbase America," & from Bardstown, KY, where 1 ham inspired 1 teacher to build ham radio into his curriculum (see Oct '89 *QST*, p 39). Result? By now, 150 Bardstown students



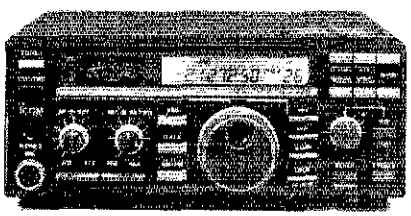
HF Equipment	Regular	SALE
IC-765 Xcvr/ps/keyer/auto tuner.....	3149.00	2699



IC-781 Xcvr/Rcvr/ps/tuner/scope	6149	5199



IC-751A 9-band xcvr/ 1-30 MHz rcvr	1699.00	1399
PS-35 Internal power supply.....	219.00	199.95
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-70 2.8 kHz wide SSB filter.....	59.00	



IC-735 HF xcvr/SW rcvr/mic.....	1149.00	969.95
PS-55 External power supply	219.00	199.95
AT-150 Automatic antenna tuner	445.00	389.95
FL-32A 500 Hz CW filter.....	69.00	
EX-243 Electronic keyer unit.....	64.50	
UT-30 Tone encoder	18.50	
IC-725 HF xcvr/SW rcvr..... *(Special)*	949.00	799.95
AH-3 Automatic ant tuner ... *(Special)*	489.00	379.95
IC-726 10-band xcvr/6m..... *(Special)*	1299.00	1039

Accessories	Regular	SALE
IC-2KL HF solid state amp w/ps.....	1999.00	1699
IC-4KL HF 1KW out s/s amp w/ps.....	6995.00	5995
EX-627 HF auto. ant. selector *(Special)*	315.00	269.95
PS-15 20A external power supply	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	349.00	319.95
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal; 751A, etc ...	79.00	
SM-6 Desk microphone.....	47.95	
SM-8 Desk mic - two cables, scan	89.00	
AT-500 500W 9-band auto. ant. tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip...	758.00	689.95
AH-2A Ant tuner system, only *(Special)*	559.00	469.95

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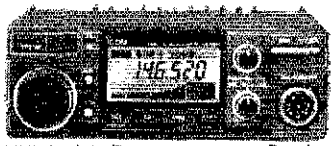
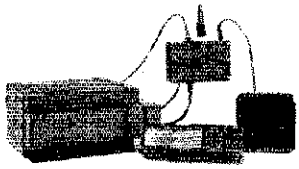
VHF/UHF Base Transceivers	Regular	SALE
IC-275A 25w 2m FM/SSB/CW w/ps...	1299.00	1129
IC-275H 100w 2m FM/SSB/CW.....	1399.00	1199
IC-475A 25w 440 FM/SSB/CW w/ps ...	1399.00	1199
IC-475H 100w 440 FM/SSB/CW *(Spec)*	1599.00	1269
IC-575A 25w 6/10m xcvr/ps *(Special)*	1399.00	1099
IC-575H 25w 100w 6/10m xcvr.....	1699.00	1469



VHF/UHF Mobile Transceivers	Regular	Sale
IC-229A 25w 2m FM/TTP mic.....	449.00	389.95
IC-229H 50w 2m FM/TTP mic.....	479.00	419.95
IC-448A 25w 440 FM/TTP ... *(Closeout)*	599.00	499.95

Dual-band FM Transceivers	Regular	Sale
IC-3220A 25w 2m/440 FM/TTP mic...	659.00	569.95
IC-3220H 45w 2m/35w 440 FM/TTP	699.00	599.95
IC-2400A 2m/440 FM/TTP... *(Special)*	899.00	699.95
IC-2500A 35w 440/1.2GHz FM.....	999.00	869.95



Multi-band FM Transceiver	Regular	Sale
IC-901 2m/440 Fiber opt. xcvr *(Special)*	1199.00	929.95
UX-R91A Broadband receiver unit...	389.00	349.95
UX-19A 10w 10m unit.....	299.00	269.95
UX-59A 10w 6m unit.....	349.00	319.95
UX-S92A 2m SSB/CW module.....	599.00	529.95
UX-39A 25w 220MHz unit *(Special)*	349.00	279.95
UX-129A 10w 1.2GHz unit	549.00	499.95

VHF/UHF Mobile Transceivers	Regular	Sale
IC-970A 25w 2m/430 MHz transceiver	2895.00	2499
IC-970H 45w 2m/430 MHz transceiver	3149.00	2699
UX-R96 50-905 Mhz receive unit....	389.00	349.95

Mobile Antenna	Regular	Sale
AH-32 2m/440 Dual Band mobile ant	39.00	
AHB-32 Trunk-lip mount.....	35.00	
Larsen PO-K Roof mount	23.00	
Larsen PO-TLM Trunk-lip mount.....	24.70	
Larsen PO-MM Magnetic mount	28.75	

Repeaters	Regular	Sale
RP-1510 2m 25w repeater	1849.00	1649
RP-2210 220MHz 25w repeater	1649.00	1399
RP-4020 440MHz 25w repeater	2299.00	1999
RP-1220 1.2GHz 10w repeater.....	2599.00	2249

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IC-04AT 440 *(Closeout)*	449.00	329.95
IC-2SA 2m .. *(Special)*	419.00	289.95
IC-2SAT 2m/TP *(Spec)*	439.00	319.95
IC-3SAT 220 HT/TTP	449.00	369.95
IC-4SAT 440 HT/TTP	449.00	369.95
IC-2GAT 2m HT/TTP	429.00	379.95
IC-4GAT 440MHz, TTP	449.00	369.95
IC-32AT 2m/440 HT	629.00	549.95
IC-24AT ..... *(Special)*	629.00	499.95

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IC-12GAT 1w 1.2GHz HT/batt/cgr/TTP	529.00	469.95

Aircraft band handhelds	Regular	SALE
A-2 5W PEP synth. aircraft HT.....	525.00	479.95
A-20 Synth. aircraft HT w/VOR *(Spec.)*	625.00	499.95

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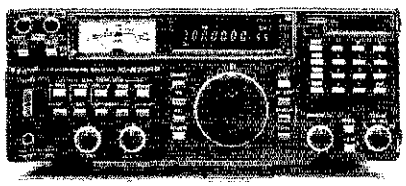
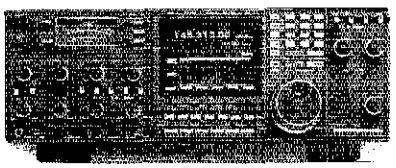
Receivers	Regular	SALE
R-71A 100kHz-30MHz rcvr ... *(Special)*	$999.00	799.95
RC-11 Infrared remote controller	70.99	
FL-32A 500 Hz CW filter.....	69.00	
FL-63A 250 Hz CW filter (1st IF).....	59.00	
FL-44A SSB filter (2nd IF).....	178.00	159.95
EX-257 FM unit.....	49.00	
EX-310 Voice synthesizer.....	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-2GHz receiver.....	1199.00	1029
RC-12 Infrared remote controller....	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit.....	139.00	129.95



R-9000 100KHz-2GHz all-mode rcvr ... 5459.00 4699

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are hams. That's 1 of every 10 students in the district! What's the secret? Careful planning? Months of legwork? I asked the hams from both places & they all had the same answer: Repeat & act on the magic phrase, "Just do it." You, too, can get ham radio into your schools. I'm working on materials to help. But, in the meantime, "Just do it." Welcome back & congratulations to former ASM & TC Tom Moulton, W2VY, who returned from FL to get married & settle down. Well, to get married, anyway. As of Dec, BARA is looking for a new flea mkt site & RATS is working on a spring hamfest (date & place to be determined). RATS is also seeking a new mtg place with some privacy, but not far from food. Congratulations to WA2DHF & WB2VUK on reelection as Hudson Div Dir & Vice Dir, respectively. I expect to speak at Ramapo Mt ARC on Feb 4, if anyone wants to talk to me about anything. As I write this, it looks like my work/travel schedule will be settling down, so I should be more available for club mtgs; call me about yours. VE sess info: See last month's column or call me. From STM WB2FTX: NJ Tfc Handlers Confab was Sat, Dec 1. Glad to see such a great turnout. Dunno Confab, the annual memorial awards were presented. K2VX won the W2SWE award for outstanding public service to NJ tfc handling. W2DMM was presented the W2UEZ award for outstanding newcomer to NJ tfc handling. KB4CYC won the K2SE award for outstanding VHF tfc handling. For Nov, WB2QMP, W2QNL & N2DXP qualified for BPL—congratulations, especially to Jack, N2DXP, who recently upgraded to Gen after being a Tech for 38 yrs. We welcome him to the HF tfc nets. Nov stats:

Net	NM	Freq	Time	Sess	QNI	QTC
NJM	WB2ZJF	3695	1000	30	249	158
NJN/E	KA2INE	3695	1900	30	230	65
NJN/L	WA2OPY	3695	2200	30	95	21
NJPN	W2CC	3950	1800	34	491	126
NJSN	WR2E	3735	1830	29	150	27
OBTTN	KB4CYC	147.12	2000	30	183	149
NJTTTN	N2DXP	223.88	2100	30	152	49
NJVN/E	WB2FTX	146.895	1930	30	543	138
NJVN/L	KA2KJF	146.49	2230	30	231	56

Tfc (Call sign/Total msgs/PSHR): WB2QMP 701/79, W2QNL 632/135, N2DXP 557/67, KE2JX 216/75, N2XJ 169/98, W2MTO 155/94, W2RRX 137/115, K2PBP/T 134/71, W2DMM 102/ 103, K2VX 68/77. WB2FTX 67/61, WA2CLP 57/64, WA2EPI 42/89, KA2DST/T 32/61, W2CC 30/—, WA2PAC 29/68, N2GJ 18/60, WB2GJE 4.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—ASM: KØCNM. SEC: KDØBG. STM: WØCON. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. SGL: WRØG. PIC: WEØM. The Des Moines Register recently published an article on the Collins ARC efforts to handle MARS phone patch tfc for military personnel in Saudi Arabia. Rockwell International is providing its Comm Central facilities. Much preparation was done to prepare for the Dec 3 New Madrid earthquake which did not materialize, fortunately. Many clubs performed SET exercises with this scenario & others worked at developing more efficient ways to handle emergency tfc. In that respect, a non existent earthquake was not all that bad! Re-elected officers of the Mt Pleasant ARC: NOØJ pres NØFIB vp & WDØENR secy-treas KAØHFN recently upgraded to General. Recent upgrades at a Sioux City VE sess include KEØWO & NØJTE: Extra Class. KBØHSM, KBØFVS & KAØVTA: Gen & KBØHNJ & KBØGXP to Tech. NØLNS is now KFØNA. KAØMTS celebrated his 92nd birthday in Oct! The DMRAA participated in that city's 42nd Operation Santa Claus. KDØZV should be home from the hospital now, recovering from a fall from a tower. Regretfully, WØYXK recently became a Silent Key. Newsletters: SW Iowa ARA, Fort Madison ARC, Siouxland ARA, Des Moines RAA, OCATC, Ft. Dodge ARC, Mt. Pleasant ARC, CIRAS, Cedar Valley ARC. Traffic: KØIPT 247, WØSS 222, KAØADF 96, KØCNM 82, KØGP 52, KAØVBA 39.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: KØBIX. STM: WØOYH. ACC/OOC: KØBXF. TC: KAØHEP. BM: open. PIO: WBØWSG. SGL: NØIZE. Net activity for Oct: KSBN QNI 1603, QTC 132. KPN 479/24. KMWN 881/753. KWN 1196/742. CSTN 2237/ 179. OKS 228/68 & QKS-SS 29/7. Winter WX always seems to bring a lot of sickness to us! Reported in the hospital since last report were WAØLBB & WØASY. On the continued ill list WØFDJ & I am sorry to make the report of another KS Silent Key, Don, NØFVR. Douglas Co ARC reports the following who will serve as officers for 1991: KAØZAF, pres; WK5M, vp; treas NØKRI; dir KBØEZY, KA6ZTX & NØKYS. Two new hams to hit the air soon will be the 9 & 11 yr old sons of WZØB. ACARA officers for '91: NØHYL, pres; NZØT vp/sec; KØPKY, treas WØEB, mbrship secy. Directors are KCØHF, KBØEVE, NØJWY, WØKA, KFØAO & KFØBY. The Kansas Nebr RC will see the following acting as officers for '91: KAØUAR, pres WBØSVM; VP WØTQ, Sec & WØWXY Treas. Board mbrs WØBBM & WØNBT. Does your club have a PIO?? If not, now is the time to think about it. Better yet—do something about it. Then do have him/her apply for the ARRL appt. Tfc (Nov): WØFIR 265, NZØM 260, WØFE 204, WØOYH 162, NØKOJ 151, KØBXF 148, WØFRC 112, NBØZ 87, WBØZNY 57, WAØYXK 29, WTØE 28, WØKL 21, WØMYM 17, KFØMJ 16, WØPB 15, WØOE 11, KXØI 10, WØEBL 8, KØFPC 5, WØCHJ 5, WZØB 5.

MISSOURI: SM, Bill McGrannahan, KØORB— Nov's hamfest was NEOSHO-a great success! ARRL was represented by Vice Dir Chuck Miller, WAØKUH. Jim Davis, NQØG, new pres of KARC, was featured in the SW Missourian paper-a fine article about his "selling" ham radio to the Rotary Club. McDonnell Douglas ARC club stn operated CW Sweepstakes. They also have a weekly net on 28.355 Thurs at 2100. In Columbia, the CMRA furnishes Amateur Radio materials to all the schools & libraries. The Ozarks ARS named Mr & Mrs Harold Schelin Honorary Lifetime Members & presented them with a plaque. The Schelins donated the site upon which the OARS rptr is located. STL Rptr Club member Gil Ludwig, WAØYCY, was promoted to Mgr of Tech Facilities at KDSK-Channel 5. Gil has also been involved with the Chesterfield Police & Fire Depts as Amateur Liaison in Emerg Comm planning. The MOKAN ARES Regional Council met in KC. SEC: KFØBM & SM-KØORB met with SEMA Director Richard Ross in Jefferson City. We signed a Memorandum of Understanding between MO Section ARRL & the State Emergency Mgmt Agency. Net reports Oct & Nov combined: MOSSB Sess 61 QNI 1613 QTC 268 Mgr: WBØWLU; MEOW 61/1137/118; NØGOU; HAMBUTCHER 45/1147/53 KØDSQ; CCARES 10/133/20 KAØSXY; SWMOSKY 9/317/14 KDØUD; HARC 9/259/32 KAØSXY; ROLLABB 57/692/9 WØDLG; PHD 9/222/11 WAØKUH; STLARES 8/604/7 KØWEX; JEFFCTYREP 4/59/2 (Nov) WØORI; CMEN 10/181/2 WBØTEG; FRI2MTR 9/168/1 NØKGD; AUDRAINARC 10/102/2 NUØH; KCBAARC 9/189/2 NØIWA; PREVERE 8/572/2 WBØEJJ; MON10MTR 4/47/0 (Nov) NØKGD; CARL 7/94/0 KCØMV; JACARES 8/87/0 KØUAA; SUL2MTR 9/170/2 KBØEVY. Stn Activity Reports: WAØYJX 703, NQØG 460, KØORB 148, NDØN 138, AIØO 128, WRØR 124, WØBMA 94, KØPCK 60, KEØAH 42, KFØBM 37, KØUAA 25, WBØWLU 23, WAØEMX 21, WØSHQ 5. Hope the New Year is going well for you! 73 Bill KØORB.

NEBRASKA: SM, Vern Wirka, WBØGQM—The NE Section needs tfc handlers to check into the NTS nets. The Tenth Region Net meets dy on 7232 kHz at 1945 UTC, the Central Area net meets dy on 7237 kHz at 2145 UTC & Tenth Region CW NM, David Hallock of Marion, IA, invites NE check-ins for the net which meets dy on 3679 kHz at 0145 UTC & again each day at 0330 UTC. The Lancaster Co Civil Defense Office is organizing volunteers with 4-wheel drive vehicles to assist in the transportation of critical hospital personnel during heavy snowstorms or blizzards. The Lincoln RC reports that transceivers & TNCs have been purchased for a high-speed backbone pkt system; the antennas have been installed at the 130-0 ft level of Beaver Crossing KOLN-TV tower. Mike Schuhmacher, KFØIT, Dawes Co EC for Chadron, reports there is an ARES net on the Chadron 147.36 MHz rptr every Sat morning. Tfc: KEØXQ 53, KØDKM 51, WBØGQM 22, WAØBOK 13, KØGND 10, WDØEWH 7, WCØO 6. KØBOY-BBS 202, NFØN-BBS 15.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Caesar Rondina, N1DCS—ASM: KB1H. STM: K1EIC. SEC: N4GAA. ASEC: N1FIO. OOC: KY1F. ACC: NK1J. BM: N1API. PIC: WA1CMF. TC: W1HAD. SGL: K1AH. Greetings to all & I trust everyone had a safe & enjoyable holiday season. Happy Valentine's Day to the women in our Section. Since we're now in the dead lock of winter, make sure you start your generators at least once a month to keep the internal condensation from bldg up & freezing the engine. Congrats to NE1A of the Tri-City ARC for his excellent job with the Novice classes. Stamford ARC published a nice list of hurricane & WX-related emergency freqs in the Dec issue of *Squelch Burst*; it's nice to have on hand. FARA published an informational article in the Dec *FARA News* regarding WX-proofing coaxial connectors; That's another gem to have on hand. Once again, thanks to hams who participated in their club activities & events in 1990; let's keep up the good work in 1991. CT had 98% rep in FRN in Nov. Remember packeteers, the N1API-4 PBBS is run by our Section BM Al, N1API. That's the place to check for the latest ARRL bulletins. MARS/CARES has a new 80286 computer driving the W1EDH MSYS PBBS on 145.09. MARS/CARES Open House is Tues, Feb 5, at United Methodist Church in Portland—stop by; they also made a generous contribution to the ARRL WARC Fund— have you? The W1AW-4 MSYS PBBS is up on 145.01 to get ARRL news out; read-only, no message-posting. Volunteers needed for March of Dimes Walkathon in Middletown Apr 28; see Andy, NX1Q, for info. Should you wish anything of interest to the Section printed in this column, my address is on p 8 of *QST*. I'll be more than happy to include it in my column. Please keep the newsletters coming. 73...Caesar.

Net	Sess	Stations	Tfc	NM	Liaison
CPN	30	391	161	KY1F	1RN
CN	59	292	124	KA1JAN	1RN
NVTN	30	293	131	K1HEJ	CPN
RTN	30	310	68	WA1FCA	CN
WESCONN	30	399	124	KA1GWE	CPN
PBBS	Received	Forwarded	Total		
CSTN		612	524	1136	

N1DCS-4

Tfc: NM1K 570, KA1VED 355, KA1VEC 323, K1EIC 302, KA1JAN 294, W1EFW 222, KA1GWE 185, W1WCG 104, N1HQJ 91, KY1F 77, WB1CKI 66, W1YOL 44, W1KYD 33, KA1SHO 30, N1ES 28, WA1K 26, N1GKJ 21, N1BOW 21, N1API 20, KA1TBM 18, W1GPS 7, W1CUH 5, W1QV 3, K1CE 2.

EASTERN MASSACHUSETTS: SM/SEC, Barry Porter, KB1PA—STM: WA1TBY. ACC: N1GTB. BM: KA1NOI. SGL: K3HI. TC: KA1IU. PIO: K1HLZ. OO/AA: KA1SNA. EMass Hotline: 617-437-0111. It's been an interesting 3 yrs. I want to thank you for voting in the recent SM Election, especially those who supported me. I hope our new SM, Mort Cohen, KA1IU, will get as much cooperation & support from everyone as I did. I can honestly say that the hobby in this area is in far better shape than it was a few yrs ago. I can't claim any credit for this—it's been you who have accomplished so much. While ham radio is an international hobby, it's also a personal hobby. The strength of the ARRL is not in the Board of Directors or the Section staff, but at the local grassroots individual level. I've been proud to serve as your SM. I'll continue to be available to speak to your club mtgs on topics such as computers & ham radio, shortwave listening, emergency communications & the future of ham radio, so please call me & I'll be glad to come & speak. One of my proudest accomplishments has been the work that I've done with the world's largest computer-user group, The Boston Computer Society (BCS). The Amateur Radio Special Interest Group is up to 383 members & still growing. A subgroup of shortwave listeners will be forming in the near future. Hams & computer users have a symbiotic relationship & this combining of the 2 groups under the BCS umbrella has had interesting effects. I want to thank you again for the support I've received in the past 3 yrs. Now (maybe) I'll have time to do some operating! Ham radio has been generating a lot of positive energy recently in EMA. For all those involved, thank you. Keep up the good work & good things will continue to happen to the hobby. Have you done anything to enhance ham radio's reputation this month?

Net	NM	Freq	Time(EDT)	Day	Sess	QTC	QNI
EMRI	KA1GEP	3658	1900/2200	Dy	60	235	322
EMRIPN	W1TC	3915	1730	Dy	9	102	176
EMRISS	N1CVE	3715	2100	Dy	18	19	87
EM/MN	N1DUB	63/23	2000	Dy	27	201	345
HHTN	N1FLO	04/64	2230	Dy	30	136	338
CITN	KB1AF	145/045	1930	Dy	30	107	374
NEEPN	WA1FNM	3945	0830	Sun	4	12	34

Tfc: WA1TBY 115, N1FLO 114, KA1GEP 104, KW1U 91, KB1AF 88, W1TC 65, K1UXB 60, WA1FNM 59, KA1VAX 49, N1GZQ 49, WF1M 30, K1GGS 19.

MAINE: SM, Jeff Weinstein, K1JW—New Appts: EC Wtvl Area: KC1OC. PIO: N1GOI. AECs: N1EXD, N1AKP, N1GOI. George Sterling, W1AE, an outstanding radio amateur &

600 WATTS OUT . . . $599

Ameritron's new

AL-811 linear amplifier gives you plenty of power to bust thru QRM.

You get a quiet desktop linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet -- no special wiring needed.

You get three tough 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC and much more . . . for an incredible $599 . . .

The first 600 watts makes the most difference

The AL-811 gives you 600 watts PEP output — that's nearly 2 full S-units over your barefoot rig.

That could mean the difference between hearing, "You're Q-5 armchair copy" and, "Sorry can't copy you, too much QRM."

Now you won't have to stand aside while the "big guns" steal your DX. You'll be able to log some of those stations first.

Going from 600 watts to the full legal limit gives you less than one S-unit increase. But is that fraction of an S-unit worth the 3 to 4 times more money it'll cost you?

The AL-811 gives you a powerful punch at a price that's easy on your wallet.

All band, all mode coverage

The AL-811 covers all HF bands (10/12 meters with easy user mod). There's no compromise on WARC and most MARS bands — you get a 100% rated output.

You can operate the AL-811 on all modes. You get 600 watts output PEP SSB and 500 watts output CW. You even get 400 watts on demanding continuous carrier modes like RTTY, SSTV, FM and AM.

How the low cost 811A tube resists premature failure - even when your amplifier is mistuned

811A tubes resist premature failure in two ways.

First, they're constructed with widely spaced elements that minimize the chance of elements touching and causing a short — even if the plate gets hot enough to melt.

Second, they use a directly heated thoriated tungsten filament cathode that prevents the electron emitting layer from instantly stripping off — even if mistuning causes a sudden, severe current overload.

Indirectly heated oxide cathode tubes (like the $400 3CX800A7) can be rendered instantly useless if their electron emitting layer is stripped off because of a severe current overload due to mistuning.

The Ameritron AL-811 is excellent for the newcomer because it's tough enough to withstand momentary mistuning. And the tubes are so inexpensive that you can replace one for mere pocket change.

The Ameritron advantage: extra heavy duty power supply that gives you peak performance year after year

The heart of the AL-811 power supply is its heavy duty power transformer with a high silicone steel core weighing a hefty 17 pounds.

A full wave bridge using 52.5 ufd of total capacitance (four 210 ufd, 470 volt capacitors) produces 1500 volts under full load and 1700 volts no load. That's excellent high voltage regulation!

Full height computer grade filter capacitors with screw terminals are used — not short stubby, light duty soldered-in "high technology" capacitors that can't dissipate the heat generated by high current.

The rectifier diodes are rated for a massive surge current of 200 amps. They won't blow even if you accidentally short the high voltage supply.

Wire wound, 7 watt, 50 K ohm equalizing resistors safely protect each filter capacitor — not 2 watt, 100 K ohm carbon composition resistors that can open and cause your filter capacitors to explode or fail.

The Ameritron AL-811 power supply is built tough so you get peak performance year after year.

Tuned input provides excellent load for any rig

A Pi-Network tuned input provides a 50 ohm load for your rig. Even fussy solid state rigs can deliver their full drive to AL-811.

Low loss slug tuned coils — tunable from the rear panel — let you optimize performance. High quality low drift silver mica capacitors maintain proper tuning.

Output tank: optimum Q on each band

The low loss pi-network output tank of the AL-811 has been carefully designed for optimum Q on each band and built with quality RF components.

The result is peak performance over each band, wide impedance matching range and exceptionally smooth tuning with efficiencies close to 70%. Even a 3:1 SWR load won't damage the tubes or tank components.

A ball bearing vernier reduction drive makes plate tuning precise and easy.

Quiet pressurized ventilation keeps your tubes safely cooled

A quiet fan pressurizes the cabinet with over 20 cubic feet per minute of cool air.

This large volume of air flow keeps the 811A tube temperature safely below the tube manufacturer's rating — even with a key down carrier at 500 watts output.

Two illuminated meters

Two illuminated meters give you a clear picture of your AL-811 operating conditions so you can tell right away if something is wrong.

The Grid Current meter continuously checks for improper loading. The other meter switches between high voltage and plate current to warn of abnormal conditions.

Ameritron exclusive Adapt-A-Volt™ power transformer

Too high line voltage stresses components and causes them to wear out and fail. Too low line voltage causes a "soft-tube" effect — low output and signal distortion.

Ameritron's exclusive Adapt-A-Volt™ power transformer has a special buck-boost winding that lets you compensate for stressful high line voltage and performance robbing low line voltage.

This makes your components last longer and gives you peak performance — regardless of your line voltage.

Plus more . . .

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

A transmit LED tells you when your rig is keying your AL-811.

A 12 VDC keying relay makes it compatible with all solid state and tube rigs. A built-in back-pulse cancelling diode protects your rig's keying circuit.

Shielded RF compartment. One year limited warranty. Compact 16" D x 13¾" W X 8" H. 30 pounds. UPS shippable. Shipped with transformer installed and wired for 120 VAC. Draws 8 amps at 120 VAC. Export model AI-811X wired for 240 VAC and includes 10 and 12 meters.

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former FCC Commissioner, became an SK last Nov after a long, full & exemplary life; see p 56. ARRL Certificates of Merit awarded to N1DEE & W1JTH for their outstanding work during the 1990 ME SET. NTS Svc Awards presented to N1AZH, K1RQG, WA1MZG, KQ1L, WA1GTT, W1TLC & Blackstrap Rptr Assn, for making their rptrs, digiptrs & PBBSs available for NTS tfc. Recent club election results: Port AWA pres K1JB, vp KC1UX, secy KA1FI, treas KC1HB & ch op KD2EU; Aug ARA: pres KA1RFD, vp WA1N, secy KA1LPW, treas KA1MLF, trustee K1NIT & dir W1JTH; Blackstrap Rptr Assoc pres N1AKP, vp KC1SN, secy N1AKR, treas KA1KAR & dir KD2EU. Hamfest season is imminently upon us! Poland Hamfest is Mar 2 at Poland Town Hall, with info/talk-in on 146.88 rptr. The Portland Hamfest, featuring a large indoor flea mkt & VE sess, is Mar 30 at Westbrook Jr HS at 0800, with the ARRL ME State Conv starting at 1100 on the same date in Yarmouth. The Conv includes an ARRL Forum, luncheon with guest spkrs, awards & several tech seminars in the afternoon. Thanks to KA1RTW for monitoring & relaying to me pkt trans from WA4SIR aboard the space shuttle *Columbia*. ARRL affiliated clubs I've visited in the past mos include Yar RC, Port AWA, Merrymeeting ARA, Aug ARA & Blackstrap Rptr Assn. PAWA has added a spiffy new controller/patch to the Port 146.73 rptr. The initial batch of public service spots promoting ham radio, produced by K1JW, NW1A & KA1IOD, should be seen & heard occasionally on ME's TV & radio stations & cable channels. The rum cake recipe submitted by KX1I & published in Mid-Coast ARC Nov *Coastal News* proved to be exceptionally moist. The S ME Sell/Swap Net sponsored by the Yarmouth RC, meets Mon at 2030, or at the end of the S ME Distr ARES Net, whichever occurs later, on the Blackstrap 147.09 rptr.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—Clubs were on the move again this month with the newly formed Amoskeag RC receiving their ARRL affiliation. And Dr Ted Cooley, N1GMC, at Dartmouth has reactivated the college RC (W1ET) on HF & VHF. We now have active ARCs at UNH & Dartmouth to add to WB1GXM's growing network of ham educators! The technical support group of the Field Organization is well-represented with articles by TC W1JY in the CNHARC *Communicator* & ATC AF1T in the Contoocook Valley RC bulletin. Both are recommended reading! A point of clarification—I took over as ARRL Vice Dir for the NE Div in Jan 1991, but my term as SM is not over 'til May 1991—I can get my 2-brimmed hat out again! New officers for Contoocook Valley RC: John, N1HFE, pres; Dale, AF1T, vp; Roger, NS1O, secy; Cliff, N1GJF, treas. New GSARA officers: Bob, KC1HH, pres; Al, W1VTP, vp; Bob, N1FIJ, treas; Marc, NI1E, membership; Paul, KA1FRS, Pub Serv; Jim, KA1SU, Newsletter. The Twin State RC is setting up monthly Amateur Radio displays at the Montshire Museum to promote the hobby with young people. Gary, N3CLZ, has been on the road rebuilding the ARES organization & his most recent visit was to the GBRA. GBRA has a new mtg place in the courtroom in Rochester & Bob, W1HJT, reports his latest Novice class has already tested 2 members & all should be completed by the end of Dec '90.

VERMONT: SM, Mitch Stern, WB2JSJ (@ KD1R)—STM: KT1Q (@ WA2UMX), SEC: NB1K (@ W1FYR), SGL: KA1TIF, OOC: WB1BWV, PIC: N1DMP (@ KD1R), EA: N1EYD. The big news this month is the 9th Annual Milton Hamfest Feb 23. The organizers are working to make the fest bigger & better than ever. VE sess at 1 PM. Hope to see you there. Hazen, N1EYD, our newly appointed Education Assistant (EA), will be working towards setting up Amateur Radio programs in schools around the state. Give him a call if this is an activity you wish to pursue in your area. The Twin State RC gives radio demos on the 3rd Sat every month at the Montshire Museum in Norwich; contact WA1ZCN if you'd like to help out in this worthy effort. The fall radio class in Essex has graduated 15 new amateurs. Graduation consisted of an extremely popular "Ham Fair" where local amateurs brought in their rigs & did a "show & tell" for the class. Contact the SM about the next class, which is just underway. We regret to report the passing of Romeo Gamache, W1TBG, of Winooski. The VT QSO Party Feb 2-3 kicks off the 1st operating event of VT's Bicentennial yr; special QSL card stickers to commemorate this event will be available. Tfc: WA2SPL 982, WA1JVV 244, KT1Q 426, KC1KI 113, NB1A 88. Net Tfc: VTNH 238, Carrier 37, GMN 29, VPN 4, TSFMNK 3, TSFMNK 2, CVFM 2.

WESTERN MASSACHUSETTS: SM, Jean Hurtle, KA1IFC—STM: KA1EXJ. TC/OOC: KA1SNA. PIO/ACC: K1BE. ARES is functioning well in the Section, those involved find participation provides great training & opportunities to assist in public service events such as races, parades, walkathons, test drills, etc. If you aren't already involved & are interested in these activities, contact W1SJV or K1ISW. Combined efforts have begun to coordinate a booth at the Spfld Exposition, "Big E," in Sep; info will be available at club mtgs & your help & time would be appreciated. If you'd like to spend an interesting hour or so, contact W1KK & make arrangements to visit & view his many antennas & hear the stories he has to relate. Have you visited another club in the Section? How have you helped promote Amateur Radio this month? Spring is upon us & I hope everyone's antennas fared well, but warmer weather seems to get us thinking about more antenna work & hamfests, hope to see you at one of the many. Tfc: KA1IFC 756, W1UD 727, WA1OUZ 312, KA1EXJ 182, W1KK 84, KA1QFV 62, W1SJV 62, NX1K 26, KA1TDL 24, KA1ULT 20, NM1U 16. PSHR: KA1EXJ, W1KK, KA1IFC.

NORTHWESTERN DIVISION

ALASKA: SM, Harley Steward, KL7IZZ—ASM: KL7HO. EC: AL7KE, OOCs: KL7IKX & AL7BB. STM: AL7LX. ASECs: WA6PGP & KL7JBV. ORS: KL7LA. OO: KL7EB. TCs: AL7CE & W5TKZ. The Anchorage Club was fortunate to have Tom Christian , VR6TC, for a talk/slide show on Pitcairn Island. Rick, KL7YF & Lil, NL7DL, graduated 7 Novices/Techs last sess; 14 in class at this writing.

Net	*Freq*	*Time*	*QNI*	*QTC*	*Sess*	*NM*
ABN	7.091	0500	1146	24	30	AL7LX
ALWN	1.843	0700	67	0	11	NL7UK
APN	14.292	1730	1160	36	30	KL7IPJ
MG	3.933	0600	1168	21	30	KL7GID
SSN	3.897	0330	118	0	30	KL7OM
SN	3.920	0300	1200	27	30	KL7GG

IDAHO: SM, Don Clower, KA7T—ASM: K7REX. SEC: N7MAL. STM: W7GHT. OOC: WB7CYO. Got word from Lee, WB7CYO, that the Twin Falls group had a great time at their Xmas party. We have a new NW Div Dir, Mary Lewis, W7QGP. Mary has been our Dir before & is the WWA SM. We wish her well in her new position. Thanks to Bill, W7QMU, for the good work he's done for our Div in the past; we wish him well in the future. Tfc: W7GHT 154, N7MAL 136, WS7U 83. PSHR: WS7U, W7GHT, N7MAL. 73, Don.

Net	*Sess*	*QNI*	*QTC*	*NM*
FARM	30	2028	59	K7CDA
NWTN	30	909	10	N7AH
IDA CD	23	727	23	K7UBC
IMN	30	294	80	WS7U

MONTANA: SM, Pete Peters, KF7R—Thanks to Helena-area hams, a new city ordinance on antennas & towers in Helena will not effect Amateur Radio. SK: Bill Frey, KA7ADY, of Billings. Congratulations to Ervin Davis, KY7I, our ARRL SGL was reelected to the state legislature. Erv is responsible for the new amateur license plates we got Jan 1, 1991: 145.470 - is a new freq on the 2-mtr rptr in the Hardin area. New officers for Billings club: pres N7LEQ, vp KB7ADL, secy K7BFJ, treas K7AEZ. Upgrades: Tech KB7KKZ, Gen KB7KKY, Adv K7BFJ. The 146.80 Missoula & 146.62 Bigfork rptrs are linked & working again, thanks to KC7HP, KE7WR & KA7LXG.

Net	*QNI*	*QTC*	*NM*
MTN	1512	113	N7AIK
IMN	294	80	WS7U
MSN	81	1	KF7R

Tfc: W7TGU 496, KA7YVR 140.

OREGON: SM, Randy Stimson, KZ7T—ASM: W7FBP. ASM: AL7IN. STM: W7VSE. SEC: KV7F. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. OO: WN7W. STC: N7ENI. An apology to Dave Nelson, WB7REC—in the article about Dave on Mt Hood & getting the rescue people up there to help a hypothermic climber, I used the wrong call sign; sorry about that, but my speller doesn't know the difference. The Portland ARC (PARC) captured 1st place again in the Field Day 4A Battery category; PARC also holds their Field Day in Portland & in the parking lot of the EOC, which is called Kelly Butte. The nice thing about having Field Day there is they get publicity on TV & radio. We have 2 awards in the Portland area. One fellow has been a ham for 50 yrs—that would make me 8 yrs old when Richard Pooley, W7HUY, became an ARRL member. The 2nd award is to Roy Lewallen, W7EL, for the best article in QST for Feb; congratulations, gentlemen. More ARES groups are becoming involved in local government SETs. The biggest reason is Bob, KV7F, our SEC—keep up the great work. I'm getting so many SET reports, I don't have enough room to put them all in, but keep sending them. I'm still looking for LGLs & PIOs in many cities & cos—if you're interested, let me know & I'll send you info. Marty, KD7LA (+ W7JXU), were mentioned in the June VHF QSO party & Tom, WA3RMX, who came in 2nd for OR, worked all freqs except light. Gee, Tom, why didn't you work a contact on the light freq? HI. In case you don't know the freqs, they are 50, 144, 220, 432, 902, 1295 MHz, 2.2, 3.4, 5.5, 10, 24, 48 GHz & light. Tfc (P = packet): W7VSE 671, AL7IN 386P, W7DCR 358P, N7BGW 270, AA7GM 239, KA9DFN 198P, K6AGD 179, WB7VMS 116P, W7ODG 121, K7OVK 106, W7LNE 39, K7NLM 24, KA7DEF 17, KA7AID 15, KA7WFW 14, W7DAN 10. AA7GM (KB7HOA) made BPL for the 3rd time.

EASTERN WASHINGTON: SM, Tom Plaisance, KC7PH—STM: W7GB. SEC: WA5ZAY. OOC: W7LKR. ASM: KC7MM. SGL: KD7AC. ASM & WEN NM: KE7WG. GM: W7EQU. PIC: N7DWD. ACC: WV7Y. Many thanks to Frank Price, KD7AC, our man in Olympia, whose hard work on the price supports for amateur rptrs on DNR land has resulted in a fine report on the subject. Frank's investigation into the sites of amateur rptrs will help the entire amateur community & the public. Don Feigenhauer, K7BFL, of Spokane is the new NM for the WA Section CW Tfc Net. The hamfest season is just around the corner with the Walla Walla Swapfest Mar 17, (St Patrick's Day). Congrats to new DEC Pam Follansbee, WM7R, from Pasco. 73, KC7PH. Tfc: K7GXZ 163, W7GB 209, WA7YEN 197, W7LBK 104. N7HXT 4. (Oct) N7HXT 6.

WESTERN WASHINGTON: SM, Mary Lewis, W7QGP—STM: KD7ME @ W0LVJ. SEC: KC7FA. SGL: KD7AC. ACC: W7QGP. TC: W7JWJ. BN: N7CAK @ W0LVJ. OCC: N7DVR. New Officers NAPRA 91: pres N7IPB, exvp KB7DZ, tvp N7FSP, treas WA7FUS, secy KA7TTY, dirs N6RY & WB7USL. Ed. N8GNJ @ KD7NM. WWA.WA,44.24.0.71. 2100 Thu nite pkt radio ragchew, 145.33, down 600. Stanwood-Camano ARC ham class started Jan 12. Christmas potluck Dec 20, KB7DCD, KC7FA & W7QGP attended. Stanwood & all of Skagit, Whatcom, King & Snohomish cos, a job well done by ARES/RACES teams during & following 2 devastating floods. Please send list of all ops to KC7FA. We hope Santa left a new ham toy & you had a happy holiday. W7JWJ will complete my term as SM. I'm looking forward to further working with you as your NW Div Dir. Harry Hale W7FON is an SK. Chehalis ARS has a new mtg place—Fire Hall. Renton Airport was flooded, but no water in BEARS clubroom, just in storage area where used rptr equipment was stored. Net reports: NTN 1578/141/30; NWSSBN 745/49/30; PSTS 90/51/58; WARTS 2989/167/30. Activity reports: W7AZU 13, K7CLL 4, KA7CRN 19, W7EJZ 37, N6EQZ 20, KF7FF 122. W7IGC 350, W7LG 204, KD7ME 194, W7NWP 92, W1PRT 18, N7SUX 283, K7TTY 39. PSHR KD7ME 111, W7LG 71, W7NWP 69, W7EJZ 60.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. SEC: W6LKE. STM: K6APW. TC: N6AMG. It's with great regret that I announce that Section OOC, K6TI, has resigned from that position. Carson has done an outstanding job & his leadership will be sorely missed. NCN2 NM WB6UZX reminds us that this net meets dy at 8:30 PM local time on 3705 kHz & that check-ins to this slow-speed training net are always welcome. K6APW reports he's busy with the new accelerator at the Lab, but still managing to find time for RN6, PAN, NALCO & VEC. EBARC's KB6LHR donated a Yaesu FT-101 to JFK HS's club station. Club members WA6TNI, N6JNK, WB6DOB, KA6FFV & WD6GGC set up a demo at the school that was covered in the *West Co Times*, complete with photo, on the front page! SBARA will run a booth at the New Park Mall featuring msg delivery to NTS via the N6QMY PBBS. BARC provided comms for the annual Benicia Christmas Parade. MDARC welcomed new members WA6WOC, WA6ORG, KC6MLI, KB6MYV, W6TNU, Fred Doxsee, Walter Moser, Peggy Ploss & Barbara Smith. LARK upgrades: KC6OOK to Novice, N6YGF & KC6OIV to Tech, N6NQX & K8DVO to Gen. HRC welcomes new member NT6V. NALCO ARES/RACES has signed MOUs with UC Berkeley & the city of Berkeley. NBARA's latest mtg featured SEC W6LKE as the speaker. CCCC new members: KC6HDO, KC6HDQ, N6YAO & KK6QQ. VVRC mourns the loss of Charter Member W6MQG. Nov tfc: WB6DOB 480, W6VOM 162, WB6UZX 38.

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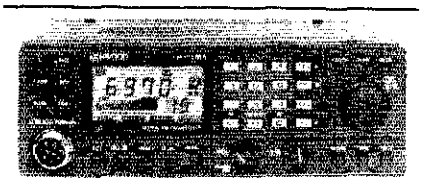

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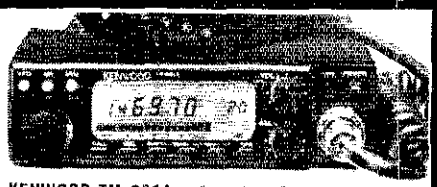

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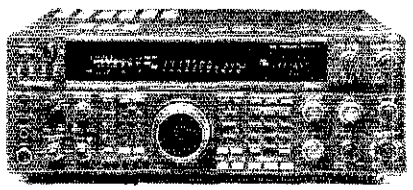

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NEVADA: SM, Joe Lambert, W8IXD—ASM: Curly Silva, K7HRW. TC: NW7O. STM: KK4M. SEC: K7HRW. Your SM attended mtgs of SNARS & TARA on Nov 10; Harrah's Lake Tahoe donated a shuttle bus to TARA, which will be converted into a mobile comms command post. TARA also made a generous donation to the ARRL WARC fund. The State Div of Emergency Mgmt held organizational mtgs in Carson City & Las Vegas, attended by many NV hams. In Carson City, W7QO starts new ham classes Feb 1; Carl also holds VE sess every other month—contact W7QO for info. In S NE, contact KF7GB for classes & NK7N for exams. In Reno, contact K7HRW regarding classes or exams. NARA & SNARS are busy organizing a Summer 1991 Reno hamfest. If you can help, contact K7HRW. SNARS brunches are at the McCarran House in Sparks at 9 AM on the 2nd Sat. 73 until next month.

PACIFIC: SM, Ron Phillips, AH6HN—Bob, WH2AEN, reports 2 typhoons, Owen & Page, passed close to Guam, causing a great deal of concern. The Pan-Pacific Triathlon was a success with many hams providing comms support. The Marianas ARC roster is growing with many new hams & upgrades—congrats for a job well done. Congrats to George, KH6DXO & the new officers of Kauai ARC & to Army, AH6P & officers of Big Island ARC. Nose, KH6IJ, Pacific Section PIC, visited the Big Island. We enjoyed seeing him & his XYL. Honolulu ARC reported interesting DX news. Thanks to Joe, KH6GDR, for an informative newsletter. Welcome aboard to Joe, NH6XQ; Paul, WH6CJE; Marc, WH6CJD; Mitsunori, KH2O; John, WH6CJB; David, KH2ES & Wendy, WH6CJC. Tfc: WV6K 87, KH6S 34.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—Section Staff: STM: WA6WJZ. TC: W6IEW. ACC: KB6COH. SGL: N6IG. SEC: KE6EP. PIC: WA6OWH. BM: WB5FIX. OOC: WY6O. GEARS received a certificate for 50 yrs of ARRL affiliation. They have a mint copy of the original affiliation in 1940—congratulations. New members of GEARS are N6OEG & N6XHE. W6DPD & W6RFF were guests at Amador Co ARC. KC6OMD upgraded to Tech. KA6CCU, at 94 yrs, is in a convalescent hospital. KB6WIJ has a new Yaesu FT-757GXII & WU6Q is putting up a new tower. River City ARCS completed classes & VE sess for 1990 & will start again in the new yr. W6SUP continues to arrange classes & VE sess for Sierra Foothills ARC. Your SM enjoyed a breakfast mtg in Yreka with the Siskiyou Rptr Assn. The Sacramento Valley Section Net meets 8 PM on 1st Sun on 146.085- WD6AXM/R. I thank the Yuba-Sutter ARC for the use of their rptr for the Section Net.

SAN FRANCISCO: SM, D. Wilson, K6LRN—Rich Freitas, KA6SSL, passed away in a tragic airplane crash at Clear Lake. W6YJL donated 400 ft of hardline & K6HSJ donated a dumb terminal to Anchor Bay club. Upgrades: KG6IL to Extra Class; KJ6PL & KB6LQQ to Adv; N6VUB, KB6LSB, N6YEU, N6OFR & WB6SJR to Gen; N6PWR passed written for Gen; KC6KTO, KB6PBD, KB6YYF & Michael Lennon to Tech. Newly licensed KC6OHD is daughter of WB6FAJ. Congrats to all & thanks to the VEs for conducting the test sess (AA6RD, W6DTV & WA8LLY-Sonoma). Best wishes to K6BMW at new QTH in Durham (SV). Sonoma & Humboldt clubs are reviving hidden-xmtr hunts. Golden Gate Chapter of Lambda ARC plans many social outings & looks forward to a busy 1991. Many clubs report recycling for additional income. Stuff like aluminum cans & deposit bottles are reclaimed. Joining or renewing your ARRL membership through your local club can help, too. Check your *QST* label for expiration date. Tfc: N6FWG 263.

SAN JOAQUIN VALLEY: SM, Byron Smith, WA6YLB—If you're looking for the FCC in San Fran, don't—they moved to Hayward in Jan. Report from Pacific Div mtg Dec 1 indicated DXCC awards are running a 6-month backlog; possible plans to have qualified checking of initial DXCC done in the field— more later. Talk of mtgs of ECs & SMs on 3895, 1st Thu at 8 PM local time. Also, talk of possibly having Pacificon located more into the SJV area; please let me know how you feel about this. W6MND has a KT-34XT. KC6CEX has an amplifier. KC6ESL has DXCC on 10m. Sorry to report Conrad Brown, AA6PO, as a Silent Key. Fresno Hamfest May 3-5, Holiday Inn at the airport. Tfc: WA6YAB (Sep) 26, (Oct) 24, (Nov) 49, W6DPD 3, KC6ESL 2, AA6UL 83.

SANTA CLARA VALLEY: SM, Steve Wilson, KA6S—SEC: N6JQJ. TC: WA6PWW. STM: W6ZRJ. PIO: N6VQV. ACC: KB6ICQ. BM: (vacant) OOC: KB6FPW DEC—I guess the biggest news event locally was the involvement in the SAREX program by the folks at the Children's Discovery Museum ARC in San Jose. Several people worked hard to put the operation together on short notice. I particularly thank Becky, N6VQV, for helping to pull it off. Ham radio received a lot of good PR from these peoples' effort! The NASA Ames ARC broadcast the NASA select audio channel. The club upgraded the 2m hardware & has a formidable signal now. Because of the efforts of Gary, W6KYF & Millard, WA6VZZ, the club carried the SAREX QSOs on 40m live. For their Nov mtg, the Gabilan RC saw a great presentation on earthquakes given by Jan Froom, K6VLE, who is an Amateur Radio operator & amateur seismologist. Congrats to the Los Cumbres ARC for their success on Field Day. LCARC took 2nd place in 2A for CA. Everybody better watch out, because they're already plotting their strategy for next yr! Congratulations to Kurt Schwehr, N6XWB, for receiving the Barry Goldwater Scholarship for 1990-91. Omn Serlin, AA6TA, wrote a great article in the Electronic Museum ARC newsletter about operating at 4U1ITU. Tfc: (Oct) W6ZRJ 11, W6VZT 4, Nov: W6ZRJ 8, W6VZT 4. Phone nos.: Amateur Radio classes/clubs 408-971-1424; license exams 408- 984-8353 (ARRL VEC) or 408-255-9000 (Sunnyvale VEC). PSHR: (Oct) NR7E, (Nov) NR7E.

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—ASM: AB4S. SEC: N4MYB. STM: KI4YV. ACC: WC4T. TC: KM4OX. SGL: KE4ML. PIO: WA9NEW. On Nov 28, 1990, KE4ML, our SGL & I attended a mtg of the NC Legislative Research Commission's Committee on License Plate Fees-Personalized & Special Plates. This Committee was considering legislation which would change the fee charged for Amateur Radio license plates. In my testimony before the committee I stated that the purpose of these plates was to provide for the rapid identification of private vehicles (and their drivers) that belong in emergency locations & can provide comms assistance. State & local Emergency Mgmt officials have repeatedly confirmed their preference for the identification of our vehicles with Amateur Radio license plates. The plate is the only direct, tangible way the State of NC shows the Amateur Radio operator that his or her public service & emergency comms capabilities are considered an important resource. I pointed out that Amateur Radio is unique among the groups holding special license plates. We provide our public service & emergency comms services as volunteers; we purchase our own equipment & vehicles, we're not reimbursed for expenses, have no pension system & receive nothing tangible. I recounted many instances where Amateur Radio was vital to the citizens of our state. In 1974, the fee was increased from $4 to $10/yr & the no. of tags purchased in following yrs dropped significantly. Legislation passed in 1988 reduced the fee to $10 for 5 yrs ($2/yr). The possibility now exists that the current session of the Legislature may consider increasing the fee again. *Do not* contact your legislators yet; it a change in the fee seems likely, your ARRL Section Officials will contact you through nets, clubs, BBSs, local ECs & at hamfests. The current law was passed unanimously because of support from all amateur operators in the state. We may need that level of support again & on short notice! The support my family received from the Amateur Radio community after our recent family tragedy was appreciated very much. Briarpatch & Foothills ARCs sponsors the Elkin Winter Hamfest Feb 17, 1991. Nov tfc: K4IWW 241, KI4YV 184, N4SMS 161, AA4ZV 113, KA4EYF 88, W4EAT 71, N4UE 67, N4JTG 63, WD4MRD 59, KA4KGZ 54, K4GI 42, KB4IVV 41, N4WFU 36, W4EHF 36, N4VVX 34, WA4MNR 34, N4YRD 30, WD4LOO 29, WA2EDN 22, K4AIF 19, AB4W 17, N4SNF 10, K4USV 10, N6LHE 8, W8KLF 6, N4XUN 1. Late report, Sep: N4SSX 51.

SOUTH CAROLINA: SM, Ned Moeller, N4FVU—The Sumter ARA sponsorship of the State ARRL Convention was a big success. Credit goes to chairman KC4HUT & his 24 helpers. Of the many statewide public service events in Nov, Sumter EC KK4QZ reported KB4CIH, KC4SZG, KC4NPD, WB4KIV, W4XMR, N4HTY, KK4TK, N4UYA, K4NOC, WA4UMU, KB4FIQ & W4GL provided comms in 2 annual events. Those most concerned about the proposed PSHR changes feel that credit for checking into CW NTS Nets should remain unchanged. As you read this, 1990 is history. As we look forward to 1991, may our unselfish service rendered to Amateur Radio & the community be honestly appreciated & not forgotten. A personal sense of accomplishment & sharing in the fellowship is our reward for the efforts we voluntarily give of ourselves. This spokesman for you wants you to know all your support was appreciated. Please support all activities, especially the Novice/Tech classes & the Charleston, Columbia, Lancaster & Greenville VE sess. Upcoming hamfests: Greenwood, Charlotte, Charleston & Greenville. Nov Tfc: W4ANK 166, K3LM 117, N4FVU 40, W4DRF 33, KA4LRM 30.

VIRGINIA: SM, Ted Dingler, N4KSO—SEC: WB4ZTR @ WB4D. STM: N4GHI @ WA3TAI. ACC: KA4YUY. OOC: W8IRT. TC: N4YA. SGL: W4UMC. BM: W3ATQ. PIC: WB3OOJ. Middletown VE team reported sess for 1991: May 4, Aug 3 & Nov 2; contact Walt Quitter, NC4B for info. SE VA exam sked: Mar 2, S Peninsula ARC, contact Ed Brummer, W4RTZ; Apr 6, Williamsburg-area ARC, contact Andrew Swanson, WJ4X. Thanks to KB1GW for completing the ARES EC certification test—if you haven't completed yours, please do so. Thanks to KB4XF for renewing as EC for Stafford, Caroline & King George Cos. Thanks to N4YET for accepting position of EC for Rockingham co, KA4GFY for EC of City of Alexandria & WB3R for EC of Amelia co. Your willingness to accept these positions will help further the image of Amateur Radio. Congrats to Bill Statzer, N4UPY, for receiving a Public Service Commendation from the ARRL for his outstanding coordination of comms during a disaster drill in Prince Edward co. Thanks to the Prince Will co ARES group for providing comms during the Boy Scouts food drive. Congrats to the NARES for expending a total of 137.5 man-hours Oct '90 supporting various activities in Norfolk. One of the great things about Amateur Radio & the Section workings is that it's all done by volunteers. We need to remember that we're doing these various jobs because of our interest in the hobby & our desire to offer our help in times of need. It's important to remember our parts in the various activities performed in the Section. If we've been asked to assist another group, we should assist. If we're directing the activity, we should direct. While every activity won't be conducted in a way to please everyone, we should all strive to work together. There are times we can lead & times we need to follow. This column was written in Dec '90; if you want something mentioned in *QST*, let me know 4 mos in advance. 73. Tfc: N5DST 751, WBØTAX 688, K4DOR 682, K4MTX 378, N4GHI 358, N4HOG 344, W4JLS 330, WD4MIZ 270, N4EXQ 237, W3ATO 228, AA4AT 147, K4YVX 128, WB4KSG 118, WB4FLT 114, K4BGZ 95, AA4GL 78, NW3K 77, WA4TVS 76, W4LQF 76, N6GVG 74, WA4DTE 69, W4FRR 66, WB4EDB 65, KB2GII 64, WB4QOJ 58, WB4ZTR 56, N4TRA 53, WB4ZNB 50, K4GR 46, KJ4LQ 44, WB4KIT 42, KC4OJM 41, KN4EE 40, KB4CAU 38, W4TZC 35, KN4DV 34, KJ4EK 27, N4KSO 22, KI4RO 20, N4MGQ 20, N4FZA 19, W8HNT 17, K4MLC 17, WB4UHC 16, N4JEO 15, K8EI 13, W4HU 12, KD4NH 12, K4MLD 11, N4NIG 10, W4HDW 8, K4KPT 7, KC4JGC 7, NM4R 6, NT4U 6, KJ4UF 4, N4FNT 4, KB4OPR 3, NW4O 3, K4JM 2, KC4GIA 2, N4DCC 1, W4DM 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8OEW. STM: N8FXH. SGL: K8BS. TC: K8LG. ACC: WA8FLF. Repeater Coord. WB8GDY. Mike, K8LG, has resigned as WVRN NM; thanks to Mike for his leadership during the past yrs. N8FXH is acting NM until a replacement can be named. The Jackson Co ARC is establishing a pkt link to the N8HHT PacketCluster® in Columbus. Clark, W8TN, again this yr went to Colorado to work the *CQ* WW DX contest. His group made 1848 QSOs. WV ARES has 723 members, adding 2 in Nov.

Net	*Freq*	*Time*	*QNI*	*QTC*	*Sess*	*NM*
WVFN	3865	6	1171	175	30	WD8V
WVN-E	3567	7	178	53	30	KZ8Q
WVN-L	3567	10	151	27	30	KZ8Q
WVMD	7235	11:45	670	82	30	WD8V
WVRN	3640	6:30	170	21	28	N8FXH
WVNN	3730	7:15	48	5	22	KB8CVR
Hillbilly	14290	Noon Sun	135	6	4	W8YP

Tfc: WD8V 491, KA8WNO 406, K8TPF 382, K8QEW 76, W8YP 71, N8FXH 56, K8KT 38, KA8OGF 10.

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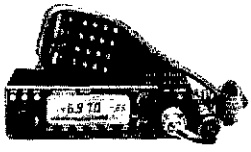

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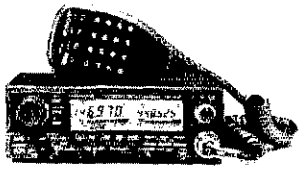

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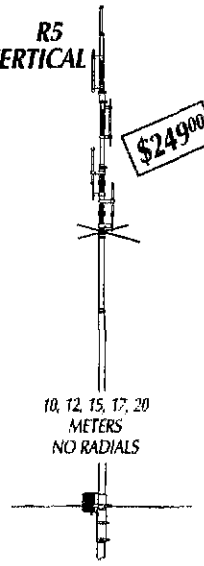

10, 12, 15, 17, 20
METERS
NO RADIALS

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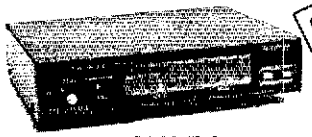

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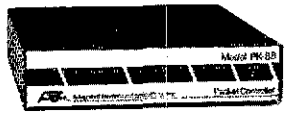

PACKET CONTROLLER

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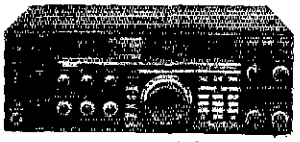
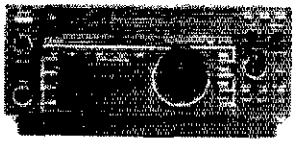
SIMPLY THE BEST

IC-765



COMPETITION GRADE

IC-735



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WTØG. ACC: WBØDUV. PIO: WBØFQB. TC: WØLJF. OOCs: KAØCDN WØIJR. SGLs: WDØHNO WDØHNP. BM: KAØVKM. Winter is not noted for fires in CO, however, 2 major fires required help with comms from the amateur community. A major fire in Boulder Co burned 2000 acres; EC WAØNHD & 50 amateurs supporting the ARES/BCARES group, carried out comms, primarily on pkt. There was use of ATV during this fire, which greatly assisted the Fire Dept & co officials with keeping track of this fast-moving blaze, which was contained by the 3rd day. During the 2nd day of the Boulder fire, a major fire broke out at Denver Stapleton Airport fuel storage farm. Several thousand gallons of fuel burned for another 3 days. EC KBØCHT had amateurs supporting comms for the Red Cross & Salvation Army at this fire—thanks to the amateurs involved for a job well done. Congrats to WVN for their successful balloon launch that carried an ATV camera, 10-mtr & 2-mtr beacons. Several amateurs, including 2 pilots, were involved with locating & pick-up on the eastern plains near Limon. Nets: CAHF: QNI 71, QTC 2, 4 sess. COL QNI 1198, QTC 106-136, QNF 941, 30 sess: CWN: QNI 68, QTC 86, QNF 212, 30 sess; CWXN: QNI 1581, QTC 1264, QNF 2700, 30 sess; HNN: QNI 2143, QTC 197-721, QNF 1153, 30 sess; NCTN: no totals; SCTN: QNI 259, QTC 36, 27 sess. Tfc: NØBQP 1628, WBØYNS 1602, WØLVI 690, WTØG 453, NØHFZ 420, KØYFK 416, WØACH 394, WØLJF 226, NØFCR 222, KCØVL 154, NØCYR 127, K9DCX 88.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. STM: ND5T. NMs: WA5UNO, K6LL & WB5ZME. TC: W8GY. ACC: KA5BEM. New linking system from 146.64 (Mt Taylor) & 146.74 (Buck Ridge) is working beautifully, thanks to the Roswell & Abq gangs, including hard work by W5YFN & crew & WB9ERE & crew. The N NM Christmas Dinner mtg at Rancho de Chimayo was outstanding. The 1st Annual Socorro Swapfest was a nice one. Very sorry to report the passing of WA5CPC & K5HRG; they will sure be missed. SW Net meets dy, 3583 @ 0230Z, handled 88 msgs with 99 check-ins; NM Roadrunner Net meets dy, 3939 @ 0100Z, handled 120 msgs with 1335 check-ins; NM Breakfast Club meets dy, 3939 @ 6:30 AM, handled 125 msgs with 1025 check-ins; Yucca 2-mtr Net, 78/18, handled 20 msgs with 492 check-ins; Caravan Club 2-mtr Net, 66/06 handled 7 msgs with 106 checkins; SCAT Net, 66/06 handled 10 msgs with 603 check-ins; Info Net 12/72, with 85 check-ins; ZIA Sunday Noon Pkt Net with 47 check-ins. Tfc: KF5VF 169 & N5NYV 5.

UTAH: SM, Rich Fisher, NS7K—Jim Brown, SEC/STM. Lon Stuart, PIO. On Dec 3, there was a helicopter crash near Vernal. With the help of an amateur on board the 'copter & help from the amateurs in Roosevelt & Vernal, their rescue was just a matter of hrs instead of overnight. N7MLR on 'copter, KA7BPB in Roosevelt & WX7L in Vernal. Paul Rudnicki became the 4th generation of Amateur Radio operators in the Rudnicki family—congrats; when is Amy going to follow? Wish all a good & prosperous New Year full of good DX. 73, Rich NS7K, SM.

WYOMING: SM, Jim Raisler, N7GVV—ASM: Steve Cochrane, WA7H. SEC: Jim Anderson, W7TVK. STM: Dan Ransom, K7MM. PIC: Wilson Sellner, WB7RRZ. I elected not to be renominated for SM for the term starting Apr 1. By now, we should know the results of the election between WA7H & WB7K for your new SM. HERC continues to grow, thanks to dedication of KD7EN, N7JJY, W7PAW, WB7AHL, N7JNI, N7ABC & others (I'm sure). To help with expenses, they've started a membership drive; $15/yr; send check to WS7W, Rev Morton, 1341 Trojan Dr, Casper, WY 82609.

Net	*Freq*	*Time*	*Day*	*QNI/QTC*	*NM*
Cowboy	3923	545 PM	M-F	907/11	WB7K
PonyExpress	3923	6 AM	Sun	203/0	W7MZW
Area 5 ARES	01/61	7 PM	Sun	63/0	W7ILL
Albany ARES	01/61	745 PM	M	32/0	WB7K

Tfc: W7SQT 179, K7SLM 39.

SOUTHEASTERN DIVISION

ALABAMA: SM, Mildred Cullen, AA4XF—ASM/STM: W4XI. SGL: WO4W. TC: N4MOK. SEC: AB4EZ. OOC: KE8BP. BM: KA4ZXL. ACC: KA4PKB. PIC: KB4KCH. Jack, W4PIM, STM & Pat, W4QAI, ASN NM have asked to be replaced. They have held these appts for more than 3 yrs. Thanks, guys, for the many hrs you've given to the AL NTS. Gordon, W4XI, will assume STM duties until an appt is made. Jim, WA4PIZ, with Tom, KA4RZZ, as his asst will be the ASN NMs. Dennis, KC4IVI, will be the ADN NM. Thanks, guys, for filling these vacancies. I regret to report 4 SKs: Ralph D. Lovett, WA4SEG, Sylacauga; William J. Suffich Sr, W4UUC, Mobile; Homer Dupree, W4OZK, Union Grove & James "Rock" Darrock, WD4NDQ, Montgomery—our sympathy to their families. Morgan Co ARC is now ARRL affiliated. Thank you for your involvement. Space is limited here to share with you all that's happening in AL. Check your BBS for the AL Section News written each month by the PIC, David, KB4KCH. ADN: QNI 712, QTC 198. ASN: QNI 138, QTC 37. ATN: QNI 167, QTC 28. ARES/RACES QNI 147, QTC 10. ATNM: QNI 3040, QTC 130. AL rep 100% on DRN5. BPL: WA4JDH, KM4JD, N4XFX. PSHR: W4PIM, KM4JD, W4QAT, WA4JDH, N4FXF, WB4MMD, W4CKS, KA4RZZ, WB4IDB, W4IBU, W4XI, KC4LMD, AA4XF, WA4RNP, AB4EZ. Tfc: WA4JDH 602, KM4JD 357, N4FXF 314, W4PIM 265, W4IBU 200, W4CKS 170, W4QAT 119, KC4IVI 99, AA4XF 97, WB4MMD 72, KC4LMD 65, KA4RZZ 49, WA4RNP 48, KD4KT 43, WB4TVY 16, W4XI 15, W4DGH 14, WB4IDB 14, WB4IXA 9, AB4EZ 8, KN4HD 7, W4CNQ 4. CUL/73 Mildred

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & BM: AA4UA. SEC: NC4E. STM: WB4WQL. ACC: KM4IH. OOC: W8BLA. Pkt: W4QO. SGL: WB4UVW. TC: W4ZTL. Come on & join the Dalton Gang Feb 23 for their annual hamfest. If you've never been, you'll miss a good one. New Atlanta ARC officers: pres K2UFT, vp N4UCK, secy N4MWR, treas KI4Y, act mgr N4REE. W4BIW writing articles on 1911 Atlanta Wireless Club, organized in 1911. If you can get a copy of the *Atlanta Ham*, it makes interesting reading. Nov PSHR: WB4DVZ, KA4HHE, KC4BHX & new member N4CYC. Thanks, Rick. Section still needs more OBS stations. Contact BM, AA4UA, for info. Bulletins are important nowadays, OBSs can get them out. Alford Memorial ARC new officers: pres KB4JHX, vp NØDBN, secy KA4IIA, treas N4HLE, trustee KJ4HL. Their recent hamfest was successful. The Olympics are a long way off & plans are being made to have Amateur Radio involved. It can be done, if pressure is put on the right people. Last yr was a yr of little bad WX in the spring, let's hope 1991 brings no tornadoes, etc. Once again, I have to compliment the Eds of their clubs' newsletters. The effort they put into them should be rewarded by all the members of their organizations—say thanks to them. From now on, if you hear of a Silent Key, please report it directly to League HQ. If possible, send an obituary from the newspaper. If you know of a ham in the Section handling tfc via pkt, please let me know. If you are an Extra Class or Advanced licensee & live in one of the smaller cities & want to be a VE so you can help conduct tests, write me & I'll send you the needed forms. Once again, God bless & 73. CU in Dalton? Tfc: N4CYC 176, KA4HHE 103, KC4BHX 85, WB4DVZ 79, W4AET 73, WB4WQL 46, WD4DSS 40, N4MWR 8, K4BAI 2.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ASM: N4ADI. ACC: KI4BI. BM: N4GMU. OOC: WB4GHU. SEC: W4MLE. SGL: KC4N. STM: KB9LT. TC: N4SS. PIC: KB4LB. Digital: K4CY. As this is written, Rudy is to undergo surgery & has asked me (N4SS), being guided by his thoughts, to submit this month's column. The primary subject this month is Special Service Clubs. Rudy is the prime mover in a drive to enlarge the ARRL membership & general activity in our Section. To that end, he (& I) solicit the support of all the SSCs in this effort. Specifically, it would be helpful if each of these clubs would have within their membership an OO, OBS, PIO & ATC. In some cases, especially OO & ATC, it would be appropriate to have more than one appointee. The staff is also using an extract from the ARRL HQ data base to contact all newly licensed or upgraded hams in the Section & encourage them to join a local club & the ARRL. Clubs in the Section can help by supporting this effort. While many of us do not support all of the ARRL's policies & some don't support any, we can't expect to have any influence on those policies if we don't become members & vote for those whose programs we do support. Rudy's recovery period may extend to several months & your support during that period will be sincerely appreciated. For myself as TC, I'd appreciate hearing from you if you might be interested in becoming an ATC & supporting the effort in your area. Join me in wishing Rudy a speedy & complete recovery. 73, Nick, N4SS. Tfc: WD4IIO 926, N4SS 461, KB9LT 413, WA4QXT 358, AA4FG 167, WA4GYR 167, N4JAQ 158, WC4D 155, WA4PUP 133, WB4GHU 120, WB4DNT 108, KC4FL 98, WA4NDA 94, WB3AVZ 77, W4KIX 54, KI4CQ 52, KC4MDY 46, WA8APQ 42, N4QYS 41, N4DY 37, KB4RTG 37, NF4O 37, N4QZD 36, N4UAV 34, KA4TAR 34, N4JHI 32, W4MLE 30, N4CYV 30, N2AOX 25, W4UEA 24, KK4UJ 24, K4UTY 22, W7YWF 21, W8IM 15, KF4SP 14, N4UF 13, WA4STZ 9, N4ADI 7, (Oct) N4DY 32.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—STM: K4ZK. SEC: W4SS. ASECs: WB4WDK WB2WPA. TC: KI4T. BM: WD4KBW. PIC: N4PBF. OOC: WB4GHU. ACC: K4EUK. SGL: KC4N. Pkt Mgr: K4CY. Broward Amateur Radio Digital Society minutes reported that KD4GR added the new 440 port for PBBS forwarding to the SUN node over the Christmas period. KB4XE & WB5JFM have been making data transfer-rate tests on digital modes including CW, Baudot RTTY, ASCII RTTY, AMTOR ARQ, AMTOR FEC & pkt. The Suncoast Convention in Tampa was great & many thanks to W8DUV who did a fine business job as program chairman. One of the highlights was having Carol Johnson from the Tampa FCC office at the OO Forum. KA4B became a Silent Key in Nov; he was active in teaching Amateur Radio classes, in addition to his teaching at Chaminade HS in Broward Co. KD4GR, Broward EC, reported 17 volunteers, including 5 ARES members, assisted the Broward Sheriff's office in search for 2 runaway children. ARES stations that participated in the search were N4QEG, N4ORN, N4TUS, N4HHP & N4OMB. Mitchel Jarboe & Steve Clark, who are awaiting call signs, also participated. The children were found without incident. K4CY sent reports from the following PBBSs for Nov: W2TKU, W4DPH, KB4VOL, N4DWY, W8DUV, WD4HIM, WB2WPA, K4CY, W4MWP, KB4PLH, WD4KAV, KB4T, WD4NKZ, K4GBB & K4OZS. WB2WPA sent a pkt stating that N5KFR has been carrying a pkt digi during CAP flights, testing WB2WPA's theory that 4 aircraft can provide statewide emergency comms; so far, so good. WB4WDK, ASEC, has had reports from Brevard W4MSQ, Collier WB4RAZ, Dade W4IYT, Hardee WD4KBW, Highlands WB4WDK, Lee WA4PIL, St Lucie W3DHN, K4INJ Okeechobee, Osceola KE8WH, Pinellas N4OBT, Manatee N8EHZ, Sarasota N4LML & Broward KD4GR. WB4WDK reports that Highlands ARC had 2 amateur stations at Highlands Hammock State Park honoring the Civilian Conservation Corp that built the park. ARRL literature was distributed to interested persons. Comms were also furnished to the Highlands Art Festival. Workers were K4ZNB, KI4XM, WA4WUP, AB4TA, W8OKW, WB4WDK. The Englewood ARS newsletter reports that KA4JKY has moved up to pres for the balance of the yr, because WB8RGM resigned due to health. The Florida Keys ARC bulletin announced that KD5JZ is the 1st WAKEY Award winner. The DADE ARPSC mtgs said that W4VBQ thanked the volunteers who turned out twice this season to assist during the storm season. The QCWA newsletter said that K4JMH went to Boston for a visit & that he ended up in the hospital for almost 2 weeks very ill—okay now, though. Other club bulletins received came from the IBM ARC Boca Raton, Platinum Coast ARC, Martin Co ARA, S Brevard ARC, Titusville ARC, Ft Myers ARC, ARC of SW FL & the St Lucie Rptr Assn. The Broward ARC had a nice hamfest—W4RH was there from FWB, as well as K4ZK from Jensen Beach. AB4SZ told me he got Novice Jul 1989 & Extra Class Dec 1989. At that time, he began on-the-air operating & a yr later has 100 countries confirmed. WB5YDD sent a radiogram saying DRN5 reps from FL would be much appreciated. W4MSQ, EC Brevard S, reports a successful air crash simulation held there. The Public Service Groups & the State Division of Emergency mgmt (KN4DX) gave them an A+! The full details are being forwarded to ARRL HQ. WD4KBW reports 179 bulletins rcvd & sent by WA4EIC, WD4KBW, KB4WBY & WT4F. The ARRL Info Net meets on 3940 at 7:30 AM Sat. 73 de WA4PFK. Tfc: W3CUL 3176, W3VR 1242, KB6ECH 910, KF4QU 802, WA4EIC 559, WA9VND 535, N4KFU 408, K4SCL 407, KB4WBY 361, AA4HT 326, WA4PFK 319, W4NFK 291, KD4GR 287, WBØHOX 274, W4MEE 226, K4ZK 217, KA4FZI 205, K4IA 198, WX4J 192, KC4ECA 159, W4DWN 159, KB4KXV 149, AA4BN 145, K4EUK 108, WT4F 107, WB4WYG 101, WA4NBE 98, WA4RUE 94, N4WAN 84, KA4NXF 80, KC4VK 60, WD4KBW 50, N4HAS 46, N4MFE 41, WA8EXA 35, AA4CH 34, WB4GCK 30, AB4WQ 29, AA4WJ 27, KB4MON 26, K4GMX 18, K3KT 18, W4VQE 17, K9EHP 12, KC4PZG 11, KI4ZW 11, W4NSY 10, KB4HAY 10, WD4BWC 9, N4YWC 9, N4RHJ 8, N4ZAW 8, W4MPV 7, NØABC 7, WA4PIL 6, W3IJR 5, KAØRUL 3, KN4HX

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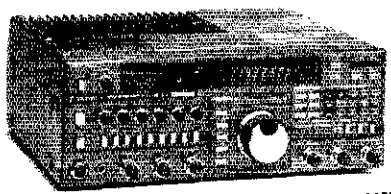
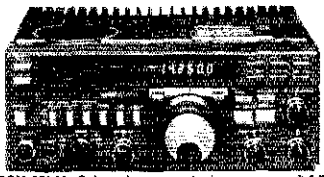
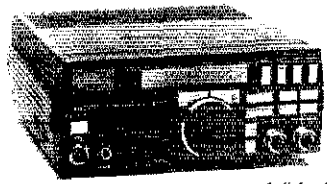


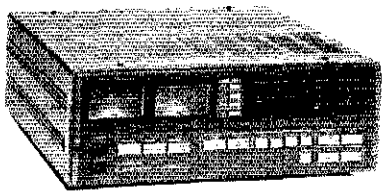
HF Transceivers	LIST
FT-767GX 160-10m xcvr	Call for Special
2M/767 2m module	239.00
6M/767 6m module	196.00
430/767 430-440 module	296.00
440/767 440-450 module	296.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/phone patch	136.00
FAS-1-4R Remote antenna selector	120.00
FIF-232C Interface	95.00
FTS-8 Encoder/decoder	55.00
FT-1000D Dlx 9-band xcvr	Call for Special
FT-1000 9-band xcvr	Call for Special



FT-757GX MkII 9-band xcvr w/mic	$1089.00
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
FC-757AT Automatic ant. tuner w/memory	429.00
FAS-1-4R Remote antenna selector	120.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/patch	136.00
FRB-757 External relay box	14.00
MMB-20 Mobile mount	26.00

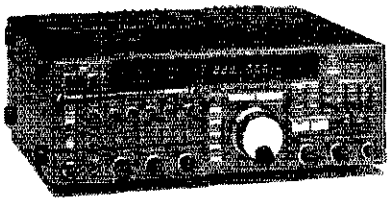


FT-747GX HF transceiver	Call for Special
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
SP-767 Speaker w/audio filters	99.00
MD-1B8 Desk microphone	115.00
FM-747 FM unit	47.00
MMB-38 Mobile bracket	14.00
TCXO-747 Increased freq. stability unit	42.00



FL-7000 Solid-state HF linear amplifier $2279.00

Misc. accessories	LIST
MD-1C8 Desk microphone	$ 115.00
MH-1B8 Mobile microphone	29.00
YS-60 1.8-60 MHz 2KW wattmeter	Call for Special
YS-500 140-520 MHz 200w wattmeter	99.00
YH-55 Lo-Z headphones	28.00
YH-77 Lightweight headphones	26.00



VHF/UHF Base	LIST
FT-736R 25W 2m/430	Call for Special
FEX-736-50 6-meter module	294.00
FEX-736-220 220MHz module	322.00
FEX-736-1.2 1.2GHz module	589.00
TV-736 1.2GHz ATV converter	163.00
Keyer-B Electronic keyer unit	19.00
FTS-8 Encoder/decoder	55.00
FVS-1 Voice systhesizer	37.00

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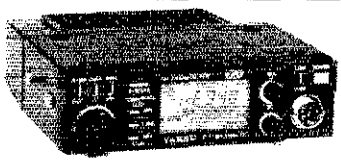

VHF/UHF Mobiles	LIST
FT-212RH/C8 45w 2m FM w/autodial mic	$405.00
FT-712RHT/C8 35w 440 FM w/autodial mic	497.00
FT-290R MKII 25w 2m FM/SSB xcvr	610.00
FT-690R MKII 10w 6m FM/SSB xcvr	752.00
FT-790R MKII 25w 430-450 FM/SSB xcvr	681.00
FBA-8 Holder for C-cell Nicads	32.00
NC-26B Wall Charger for FBA-8	10.00
CSC-19 Soft case	16.00
MH-10F8 Speaker/Microphone	30.00
MH-10E8 Hand Microphone	24.00
FTS-7 Encoder/decoder	40.00
FT-4700RHT/C8 50/40W 2m/440 FM/TTP	799.00
AD-2 50w 2m/440 duplexer	48.00

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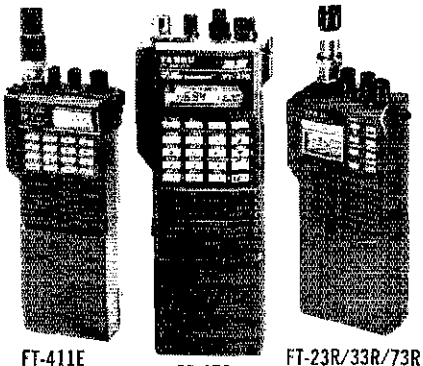
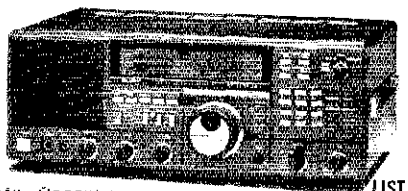


FT-411E FT-470 FT-23R/33R/73R

VHF/UHF Handhelds	LIST
FT-411E 2.5W 2m FM HT	Call for Special
FT-811 440MHz FM HT	410.00
FT-470 2m/440 FM HT	Call for Special
FT-23R-12 2m 5W HT	325.00
FT-23R-17 2m 2.5w HT	306.00
FT-33R 5w 220MHz HT	328.00
FT-73R 2w 440MHz HT	Call for Special
FT-73R/TTP 2w 440MHz HT w/TTP	Call for Closeout



SWL Receiver	LIST
FRG-8800 150 KHz-29.999 MHz Shortwave	$ 784.00
FRA-7700 Indoor active receive antenna	58.00
FRT-7700 Antenna tuner	77.00
FRV-8800 118-174 MHz VHF converter	107.00
FIF-232C Interface	95.00
DC-8800 DC kit	4.00
FM-W/8800 FM-wide kit	21.00

Antenna Rotors	List
G-500A Heavy duty elevation rotor	$249.00
G-5400B Az/El rotor combo	497.00

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PUERTO RICO: SM, Luis Lopez, WP4EPC—SEC: KP4AWI. PIO: KP4DLM. SGL: KP4ARY. BM: KP4EW. NM-PRN: KP4DJ. OOC: WP4IIW. SGL: WP4GPZ. ACC: WP4HWQ. We'll soon be holding our Section Cabinet mtg; you're welcome to send comments & suggestions to me at my address on p 8 of this issue of *QST*—it's important that you communicate with your leadership officials; through this, we can properly represent & help you when needed. RACES & PR CD held an interesting talk about earthquakes & civil emergencies—it was a tough job well done. Congratulations, guys! Rick Palm, K1CE, ARRL Field Services Manager, will be on Grand Cayman I Feb 15-19 to operate the ARRL Int'l DX Contest. He's planning to schedule travel to our Section. Thanks for your anticipated support & welcome to Puerto Rico, Rick. By the time you read this, we hope KP4DJ will be back from the hospital. We all wish Willie a speedy recovery from his operation.

VIRGIN ISLANDS: SM, Ron Hall, KP2N—ASM: KV4JC. SEC: NP2B. STM: NP2E. NM: VP2VI. WP2AEC was the pilot of a VI Nat'l Guard Huey helicopter forced to land in open seas between St Croix & St Thomas. The 3 crew members & 4 passengers made it safely into a rubber life raft & were rescued 40 mins later by a US Navy helicopter from Roosevelt Roads in PR. Nice going, Leyton! NP2AP sporting a new Paragon. NP2B & NP2E active for ARRL Sweepstakes, NP2AZ & N6JIB now back in PR from YV-land for the winter. Welcome back to W2KW, VP2VR & VP2VG. The KP2N PBBS & node active on 28.103 & 14.105. KC4RTC is now KP2BV. KV4AM still accepting QSL cards via VI bureau. NP2CX active from Mali as TZ6CX. VP2VI reports the VINE for Nov: QNI 118, sess 29. Net meets dy 0001Z on 1894Z. 73 de Paradise de KP2N.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—*STM: W7EP. NMs:* K6LL, K7POF. W7AMM reports that Harry Overson, W6VUW, of Benson, became a Silent Key in Sep. WZ7V sent in FB SET report from Yuma ARES—good work. Scottsdale ARC came thru by organizing their RFI Red. Committee. Spearheaded by new ATC AA7BJ, N7IZM and K7WK are also willing to serve & are applying for ATC—congrats. Congrats to Scottsdale & Green Valley ARCs for renewing their Special Service Club ratings—in my book they're "special." Keep up the good work. New ARRL affiliated club is Mingus Mtn Rptr Gp—welcome aboard! Superstition ARC's Hamfest at Apache Jct was biggest success they've ever had. WX was perfect & turnout broke all records. Larry, WB7CRK, did his usual FB job of MCing the event. Congrats to the club & Hamfest chairman, KB7ICP. A presentation to the City of Sedona relative to *antenna-height limitations was made by W6RXP, WI6S and* W7DHD. As a result, the Planning Commission recommended to City Council that all FCC-licensed amateur stations be exempted. Next step, a presentation to the Council. You fellas do good work! Keep it up. (Thanks, WI6S). W7YS sent in beautiful color photo QSL for their recent 4L9AG DXpedition to the USSR; other US op was NG7S. On Nov 8 K7PLO heard a MAYDAY call on Tower Mtn Rptr. N7IXW, Phx, had been shot accidentally while hunting in the Williams area. KB7CEH initiated the call and Stan called 9-1-1, where info was relayed to Kingman & a helicopter dispatched & transferred Terry to a Flagstaff hospital. Once again, ham radio comes thru! Congrats to all who participated. (Thanks, *Short Skip*). W Valley ARC continues to do great work on the FCC/ARRL RFI Red. program. They recently put together an RFI Test Kit for Members to use. It consists of various filters, dummy loads, connectors, etc, to be used in investigating & analyzing RFI problems. They also (W9WFV) put together an FB Radio Interference Manual for RRC Committee Members use. Many clubs report putting together Christmas parties—hope everyone had a good time of it. The QCWA/SOWP luncheon in Phoenix was great with former Senator Barry Goldwater, K7UGA, as guest speaker. About 85 OMs & XYLs attended. *Don't forget the spring hamfest sponsored by ARCA, hosted* by the Scottsdale ARC Mar 16 at Scottsdale Comm College—I'll see you there. Which brings me to my Swan Song: Beginning Apr 1, 1991, I will no longer be your SM, choosing not to run for reelection. Bernie Sasek, W9YOY has come forward & was elected without opposition. Bernie is well known in the Section as a VE, ARCA officer, former officer of the Old Pueblo RC & is an avid DXer. He'll make a fine SM. After 8 yrs, I feel it only fair to step down in favor of a new SM with fresh ideas & a new approach. I've enjoyed the job, but would like to spend more time in the future improving my golf score & improving my DXCC-country total by spending more time on the DX bands. Please give Bernie your support as you have to me in the past. I love Amateur Radio & will continue to support the hobby & the ARRL. CU & 73, Jim. ATN: QNI 1075, QTC 82, SES 30, Liaison TWN Tic: W7EP 87, W7OIF 57, K7RLL 54, K7POF 22, N7ETP 21.

LOS ANGELES: SM, Phineas J. Icenbice Jr, W6BF—CA automotive call sign license plates are avail from Dept of Motor Vehicles Reg 441 (rev 8/83). Details in the Dec issue of the *QS Bulletin* by Ron Miranda, N6TFT, of the Downey ARC; reflectorized plates are avail for $1 extra. According to the SCDX Club, the 42nd Int'l DX Convention is scheduled for Visalia, CA, Apr 12-14, 1991, at the Holiday Inn (800-348-8877). Seven hotels are nearby to serve you, but reservations are recommended. SCDXC rare DX rumors are expecting 5A0DX, Libya on anytime, YA0DX, Afghanistan in 1991, by Mr Uzbeki, a French Embassy employee & a group of East Coasters to operate from Kabul; ZA0DX, Albania is expected anytime—be alert; GW3WQU/4U counts for AP. Other DX rumors predict another group of DXers going to YA-land with the call sign YA0RR. To work all the DXCC countries, it takes more than a couple of yrs, so be patient & keep alert, in fact, it may take a couple of 11-yr solar cycles. Walt Braunstein, K6YE, would be proud if he could read the Pasadena ARC bulletin that stated how he served the Amateur Radio community with distinction, never striving for accolades! Lenore, W6ANZ, paid tribute to Walt's contributions at a packed *Temple Immanuel in Beverly Hills Nov 6, 1990. Walt's legacy* will be with all who knew him, especially his beloved XYL, Michelle, N6RFD, our ARRL Los Angeles PIO. The legal side of RFI may be of importance to you, so please contact me with an SASE for Chris Imlay's (N3AKD) rendition of pertinent legal facts concerning RFI law. 73, Phineas.

ORANGE: SM, Joe H. Brown, W6UBQ—ASMs: Riv Co-Bob, W6LKN, 714-686-3823; Org Co-Ralph, WB6JBI, 714-776-9272; SB Co-Ken, WA6ZEF, 714-983-1272; Inyo Co-

Steve, WV6T, 619-872-1199; ASM/PIC for Section News-Jerry, ADØA, 714-351-8824. New 1991 club officers—Bishop ARC: pres NW6C, vp KE7CC, secy KA6RFM, treas W6DQR; Anza Valley RC: pres WB6JRP, vp N6ETE, secy/treas K6VI; Tri-Co ARC: pres WD6FSX, vp WD6CLV, secy KC6NMP, treas WB6ASH, publicity N6AFO, prog WQ6I, trng N6SMT; Buena Park ARC reelected pres W6UCM, vp N6TRA, treas KB6EHX, ways/means KA6HUI; Riverside ARC: pres KF6ZH, vp KJ6BW, secy N6ZNT, treas W6TKV, dir of comm K6UUL, monitor Ed N6SHT, memb chr KA6ABL. Inland Empire ARC sez, "Why dontcha get in the habit of calling up new members, get acquainted, volunteer to help them. Ask if they have questions, as new members are shy to speak up—they think everyone else has experience. Remember how it was when you were new to the world of Amateur Radio?" Excellently stated! The Golden Triangle ARC sponsored a float in the Temocula Veterans Day Parade. PIO KØOV reports the Fullerton RC's participation in the Youth Science Ctr's Hobby Fair was a resounding success thanks to WB6GCT, KØIU, KK6AL & W6ZKZ. Note that the FCC recently ruled that "the control operator must cease automatic control of the (rptr) station, upon notification by an Engineer in Charge that the station is transmitting improperly or causing interference to other stations & the licensee is not entitled to hearing before such notification." Be advised that W1AW code practice & CW bulletins are on new freqs on 15 & 10 mtrs: 21.0675 & 28.0675 MHz, 10 kHz lower than the old freqs. STM WF6O reports: Handling a lot of traffic fm Desert Shield, all modes and nets. CW and voice moving a lot of traffic and are attracting some new stations. On the packet side, KB6GFT-2 BBS in S Orange Co has taken over for KJ6YT. Working out FB! Trffc as follows BPL: WF6O. PSHR: WF6O, W6RE, KA6HJX. Totals: WF6O 586, K6ZCE 179, W6SX 79, ADØA 66, W6RE 55, KA6GND 45, N6VEV 41, KA6HJK 33, KD6GX 20, W6OPB 12, WA6WKG 2.

SAN DIEGO: SM, Arthur R. Smith, W6INI—STM: N6GW. TC: N6JZE. SEC: W6INI. DECs: K7DCG NE, AA6JE S, N6NKJ E. SCN/1 NM: KI6ZH. An ARRL appointment, PIC, is avail for club members involved in PR. Contact me at 273-1120 for info. At the Poway Fire Dept Open House, Poway ARS's demo enabled the Poway Fire Chief to speak with a Riverside Co fire chief via 40 mtrs. Ramona Outback ARS is less than a yr old & has developed an emergency comms plan for Ramona. Classes run by KK6BL & AA6UU have licensed many more operators in the community. KB6NMC spearheaded comms for Cystic Fibrosis bike event assisted by KC6BJM, N6GNB, K6MGD, WB6NJY, N6OF, N6TJT, AA6UU, N6UWW, N6WLX & WA6YOO; Palomar ARC's 147.13 (KA6UAI) rptr was used. Palomar ARC placed 2nd in Field Day class 5A nationwide. WA6MHZ, KA6RLX, WS6F & KB6WB were winners in ARC of El Cajon home-brew contest. Upgrades: To Adv KA7FUW KA6OMK; to Gen KB6TOF; to Tech KC6MOA. SDCTN: 29 sess, QNI 325, QTC 78. ARES-CW 4 sess, QNI 8, QTC 3. Tfc: KI6ZH 386, KT6A 266, WA1ZEN 58, N6RVO 22, WA6IIK 5, N6GW 4.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA— ACC: KB5AH. ASMs: N.Vntra: N6MA. S. Vntra: W8AKF. Sbar: WB6BYU. SLO: WB6IIY. BM: N6TNG. STM: N6NLW. OOC: W8AKF. TC: W6KFV. DECs: Vntra-WB6RVA, S.Sbar-KA6KGF, SLO-W7AZF. San Luis Obispo Co ARES members got together on Nov 7 to honor ASM & retired SEC/DEC Van Lyons, WB6IIY, for his long, dedicated & outstanding service to ARES & the co. DEC Steve Woodward, W7AZF, organized the eve. Acting as Master of Ceremonies, Steve presented Van with a plaque on behalf of all SLO ARES members & was joined by Red Cross & Co Govt reps who also presented Van with certificates of appreciation. On Nov 8 Tom & Betty Christian, VR6TC & VR6YL, stopped in Santa Maria with 2 of their lovely daughters. Tom captivated an audience of local hams with a slide show of "Life on Pitcairn Island." After the presentation, everyone had a chance to chat with Tom & be thoroughly charmed by Betty & the girls. Eyeball QSOs supplemented over-the-air friendships that go back yrs & some of us who haven't met Tom before now eagerly await the chance to chat again on 15 mtrs. On the 16th, I had the pleasure of attending the Santa Barbara ARC monthly mtg & took the opportunity to present Public Service Commendations to those stalwarts who worked the "Paint" fire. Six amateurs whose extraordinary efforts require special mention were also recipients of the ARRL Emergency Comms Commendation: Ray Wilson, WD6ABU, drove to Santa Barbara from Lompoc to help at the Co Fire EOC, where he spent the entire night. During his more than 12 hrs of continuous operation, Ray served as a vital link, keeping NCS informed of what was happening throughout the greatest confusion. Ray's extra effort was critical to the initial success of our efforts. Bill Snyder, AA6KC, came up from Valencia & provided his considerable Red Cross expertise to facilitate that part of the effort. Jennifer Roe, AA6MX, having just come off the Ojai fire, came to Santa Barbara & served as NCS for hrs throughout the 3 days. Jennifer's efforts, which would have been remarkable in any event, were even more so because she was still recovering from major surgery 10 days earlier. Keri Miller, N6TME, is the 15-yr- old daughter of Santa Maria EC Esther, KK6AD; Keri served as the sole link between N & S Santa Barbara Co for 7 hrs on the 1st day. In that capacity, Keri coordinated all N/S efforts & maintained the only open channel to Santa Maria Red Cross via 224 MHz-to-telephone relay. Santa Barbara EC Bill Hoover, KB5AH, put in a superhuman effort, staying online for 34 consecutive hrs (after putting in a normal full day, catching a brief rest & coming back for another 28. Finally, Santa Barbara S Co DEC Don Fuller, KA6KGF, concentrated on maintaining liaison with Co officials during the period when the EOC was "smoke out" & personnel were spread over the entire S co. When co officials finally reassembled, Don spent endless hrs providing them with comms. Don provided appreciated leadership & guidance to ARES throughout the incident. The Nov 16 SBARC mtg also was the occasion for the "official" transfer of ARES leadership from retiring EC Bill Hoover (who has never before been accused of being "retiring") to Bob Tangel, WD6ESU. Bob has functioned as AEC for several yrs & will do an outstanding job for Santa Barbara ARES. Congratulations & best wishes to Bob & hearty thanks to Bill. We note with sadness the passing of Carl Kessenich, W6GEA & Lou Labiaux, KA6RKD, both of Santa Maria. Lou & Carl represented the opposite ends of the ham radio spectrum—Lou was licensed after his retirement & was a mainstay on the coastal 2-mtr link, monitoring WB6QEV/R at all hrs so he could be there to help when needed. Carl was one of the true radio pi-

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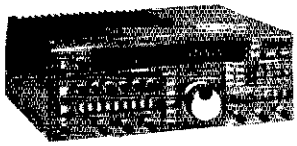

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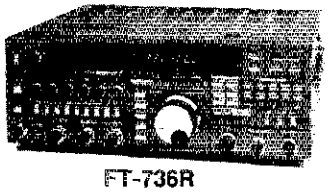

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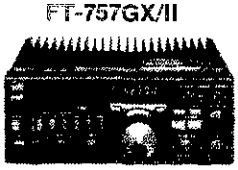

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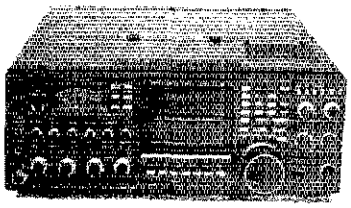

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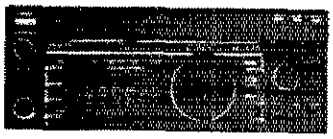

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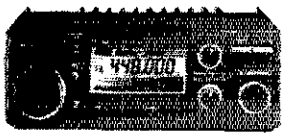

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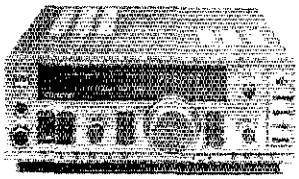

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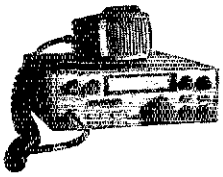

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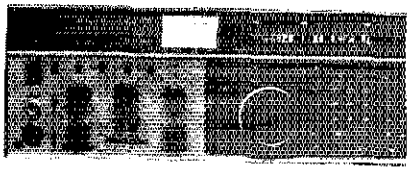

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oneers whose roots went back to the spark days & continued to experiment & investigate until failing eyesight & health forced him to slow down. Both were unique individuals & both will be missed. Testing successes for Nov: Estero ARC (ARRL) to Extra Class KK6PO; Adv N6WRV; Tech KC6NYB, Richard J. McMorran (unl), Dane Howalt (unl); VEs N6MUJ, W7AZF, W6MSW, W6PA, AA6CT, W6FL, W6JU. Conejo Valley ARC (ARRL) to Extra Class: KK6RY; Adv KC6IQY, WA2VNT; Gen N6VGJ; Tech KB6HAG, KC6OOY, James Cerine, George Fitzgerald, David Holohan, Peter Kranz, Michael Matthews, Margaret Pitt, Mark Rubin (all unl); Nov David Miller, Debe Holzer; VEs KI6YN, K6CY, N6LQ, N6UNX, WT6C, K7SDW. Satellite ARC (GLAARG) To Gen N6UPO; Tech KC6OXA, KA5NGP, Jim Arnold (unl), H. O. Jorzig (unl); VEs WB6IIY, N6IR, N6UE, NM6W, W6ELH. Congratulations to all who upgraded & thanks to those hardworking VEs. That's all for now—73 till next month. Tfc: W8AKF 8458, W8NOR 124, N6NLW 60. PSHR: W8AKF.

WEST GULF DIVISION

NORTH TEXAS: SM, Dan Dansby, W5URI—ASMs: W5GPO, W5IWE, KO5I, KG5SC, K5MXQ, WD5IVD, KF5BL. ACC: KA1CWM. STM: W5VMP. SEC: N0AJP OOC: WA5YKO. BM: W5QXK. TC: K5SXK. SGL: K5LP. PIC: WW5L. Again, I regret to announce another well-known friend Roy Albright, N5RA, is an SK. Congratulations to the new NMs: N5PGZ is running D-FW Tfc & K5UPN was reelected to TTN. Glen, NK1N, is Asst NM of TEX. The 7290 Picnic will be held this spring at Lake Whitney. KA5QYB & WI5J are organizing an event for all tfc handlers. The Hockaday School in Dallas has a new 2-semester elective course to lead to a Novice license, thanks to W8LNJ. VE team of K5VWG, K5BFK, KF5BL gave 1st exam & 20 of 31 passed code portion 1st time. Watch for influx of YLs on the nets around Dallas. The 4 States ARC holds the 2nd Annual Hamfest Mar 30, 1991, at the Fairgrounds in Texarkana; talk-in 146.62; contact K5AVH (903-792-2080), for details. Arl Hamcom is underway & looks like the best ever. The Section Amateur of the Yr nominations due to the SM by Feb 1, 1991. Presentation at the Banquet at Hamcom Jun 8, 1991—don't leave out a worthy ham because you failed to nominate someone. By the time you read this, it should be official: K2BSA has a new home at Camp Wisdom, in Dallas. The team working on this wants to make it a world class amateur station. 7290 Net report for Nov: QNI-3212, QTC-481, msgs in 46 sess, NTS liaisons. 2 per sess. NM WB5BKM. sig: Bob, NF5T, Secy. BPL for Nov: NZ2T-261- 252-419-77 = 1009; KF5BL-52-280-270-48 = 650; N5PGZ-60-220- 180-100 = 560; Tfc: W5TOO 545, W5YQZ 303, W9OYL 243, N5OXY 116, NK1N 92, KC5NG 65, KM4DY 41, AC5Z 40, KB5BNU 40, AA5VZ 34, K8LUY 15, W5VMP 12. 73, Dan, W5URI.

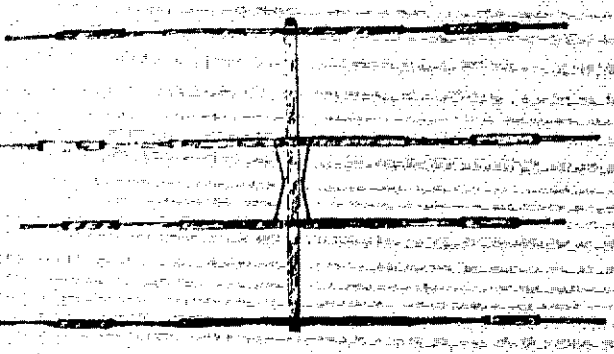
OKLAHOMA: SM, Joe Lynch, N6CL— Last month I told you about my trip to Montserrat in Sep; I asked if anyone had a lead on a rptr there to please contact me. A fantastic thing has happened since my last column: I met with Evelyn Garrison, WS7A, the Nat'l Mktg rep for ICOM America & Craig Boyer, WE5I, in Craig's office at OK Comm Ctr. I explained the need for a rptr for Montserrat & Evelyn volunteered to supply a rptr & absorb 1/2 the cost of the rptr. Craig agreed to absorb 1/4 the cost, leaving $600 to raise for me to be able to ship the new rptr to Montserrat. In the ensuing weeks, I've met with various clubs & the following clubs have contributed the respective amounts: Edmond ARS $100; OKC Autopatch $200; Wheatstraw ARC $100. Individuals have contributed $200, thereby completing the $600 needed. By the time you read this column, the rptr will be in Montserrat. My sincerest thanks go to those of you who contributed to this worthwhile cause. Wheatstraw had an excellent Christmas mtg at the Brass Apple in El Reno. K5CM is up to 98 countries confirmed on 6 with a couple of sure ones recently worked—nice going, Connie. K5SW & N5OSK continue holding forth the SWAT net on Mon night on 144.250 at 8 PM local. Those of you new to VHF SSB will want to join us. N5QKI was heard working lots of DX during the 10-mtr test. Welcome to the world of contesting, Robert. K5PER is active on the Golden Age Net, handling tfc for residents of rest homes. Jim has also set up a station at a rest home. Silent Keys this month: Roy Albright, N5RA, a former WG Dir & Otto Moates, W5HFN; both are remembered by the OTs around OK. Ham Holiday 1991 will be held at the OK Co Fairgrounds the last wk of Jul. Midwest City Swapmeet will be at the community ctr the last Sat this month. Regularly scheduled VE sess continues in Tulsa, McAlister & OKC. Contact your local officials for info on dates & times. That's all the space for the news. 73 for now de Joe, N6CL. Tfc: N5IKN 200, WA5OUV 85, K5CXP 62, K5GBN 43, WA5ZOO 29, WA5OGC 26, K5PER 8. PSHR: K5CXP, 1/30, 2/30, 3/12, 5/15, 6/18, 7/102; K5PER, 2/21, 5/6, 6/1, 8/5, 9/5, 7/38.

SOUTH TEXAS: SM, Arthur R.Ross, W5KR— SEC: K5DG. STM: WD5GKH. OOC: K5SBU. ACC: WB5YDD. TC: NZ5U. PIC: WA5UZB. BM: WA5WCY. SGL: K5KJN. ASM, all above & N5TC. The TEXan TX *CW Net Newsletter* (3697 kHz, 7 PM Central dy). edited by NM WB5J, reports KC5NG upgraded to Extra Class. Tfc picking up toward holidays. The 3M Austin ARC newsletter reports upgrades: KB5MSX, WB5EMI to Adv; KB5EIX to Tech; 3 unlicensed to Nov. The *BEXAR Wire*, San Antonio ARC, announced a CQ ALL SCHOOLS NET, 28.303 MHz, 1730Z Tue & Thu. TSN *Tfc Handler*, TX Slow Net quarterly (3719 kHz, 0200Z dy), NM KG5YB editing, is well-written, gives good operating hints; check in once in a while; you can help if you're an Old Timer; you can learn if you're a later-model ham. NW ARS, Houston, *NARS News* reports upgrades: KB5MKO to Gen; KB5MKP to Tech. DRN5 NM WB5YDD reports 865 msgs in 60 Nov sess; STX represented 100% by W5CTZ, KE5ZV, N5NAV, KG5TL, N5ILI, W5SHN & WB5YDD. Austin ARC *AARC-Over* reports upgrades; 2 unl to Nov; 3 unl to Tech; N5SNE to Gen; N5PQN, N5PAJ, N5MPA & KB5MBU to Adv. San Benito ARC Pres WA2VJL reports 14 students in new Novice class, including 7 ages 12-14. ACC WB5YDD reports Clear Lake ARC has been officially designated SSC; that's 1 hardworking crew. 7290 Tfc Net secy NF5T reports 481 msgs in 46 Nov sess, 3212 QNI, NTS liaison 2 per sess, NM WB5BKM. Brazosport ARC *News* reports data base established for ops avail for emergency service; WB5J reports SID bike ride went well. More OOs & BMs; see p 8 for SM's address & write it interested—we need all the help we can get.

WEST TEXAS: SM, A. Milly Wise, W5OVH—Before I start my article, I wish to say a prayer for Roy Albright, W5RA, who became a Silent Key in Nov. He started me out as an Asst Dir yrs ago & has been a staunch supporter in all my endeavors for the ARRL; will really miss him. Our thoughts & prayers go to Hazel & the others in the family. El Paso-area hams lost a good friend & fellow ham when Nat Welch, WB5MBL, became a Silent Key Dec 10. Am pleased to announce that Bill Shaw, N5ONC, has accepted the appt as AEC of Taylor Co. J. E. McCabe & Josh Stephen of the Key City Novice Class completed their Novice requirements & are awaiting their tickets. The SET of the Big Spring ARC W5AW, was a huge success—special thanks to all who participated: WD5EFJ, N5INC, KB5HQJ & the news media gave them excellent coverage. Dr Cade, WA5MPX, was Ham of the Month for Oct. New officers for the Key City ARC, Abilene, TX: pres Randy, N5JZH; vp Bill, N5ONC; secy Mazelle, N5HLS; treas Peg, KA4UPA— congrats to you all & keep up the good work. Congrats to the Top of the Panhandle ARC on being officially renewed as a Special Service Club. George, WA5RUF, was chosen Ham of the Month for Nov for the Big Spring ARC. The Prairie Dog ARC of Childress reports that W5HFN has become a Silent Key; his key, searching for DX on HF, will be silent. The WAE (Worked All El Paso) contest was the best ever this year the WAE Cert, "was" being the 1st; this yr, 250 WAE certs have been awarded. 5 100-station seals, 5 75-station seals & 14 50- station seals—hope you had a safe holiday season. 73, Milly, W5OVH.

MOSLEY...1ST AGAIN!

NEW LIGHT WEIGHT 5 BAND BEAM



The new TA-33-JR-WARC . . . This compact antenna gives you 10, 12, 15, 17, and 20 meters ALL IN ONE!

The antenna uses the MOSLEY military "Q" match, which enables you to use ONLY ONE feed line and gives you a perfect 50 ohm match on all 5 bands.

For those who already own a Junior, you can simply add 12/17 to your present junior.

Again, MOSLEY gives the Ham community the most flexible, durable antenna in the industry.

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TA-33-M-WARC
10, 12, 15, 17, 20

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lew for those who want a HIGHER power and HEAVIER duty model, The TA-33-M-WARC . . . This gives you the same World Famous erformance and reliability as the TA-33, PLUS 12 and 17 Meters. . . f course ALL of our antennas come with Stainless Steel hardware, O measuring Pre-Built, and a Full 2 year warranty. If YOU'RE wanting n antenna, GET THE BEST, Mosley . . . "A BETTER ANTENNA".

or the TA-33 owners, you too can ADD 12/17 meters with the simple ddition of the 33-WARC kit. (This kit can also be added to the 34-M nd 34-XL).

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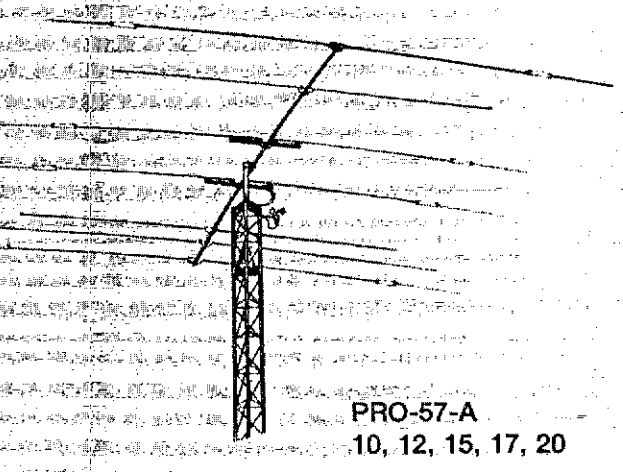

PRO-57-A
10, 12, 15, 17, 20

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34-XL-WARC KIT	140.95
TA-34-M-WARC	467.95
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Also NEW to the HAM community, is our STRETCHED versions of the PRO-57-A and PRO-67-A. These beams are from our Commercial line and are on 36' booms. These antennas have 4 elements on 12, 15, 17, 20, and 5 elements on 10 meters. The STRETCHED PRO-67-A also has 3 elements on 40 meters.

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Due to the conditions in the world our production lines, at times, are tied up with Military and Commercial runs. When this happens it will cause delays with our Amateur lines. We presently have a good stock of these new antennas, however, they could be placed on a 4 week back order basis. So order early and avoid any delays.

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- **Tone Encoding Microphone:** Choice of standard, or optional high performance DTMF tone encoding microphones.
- **Digital Voice System (DVS-1):** Optional system which allows local and remote digital voice recording and playback.

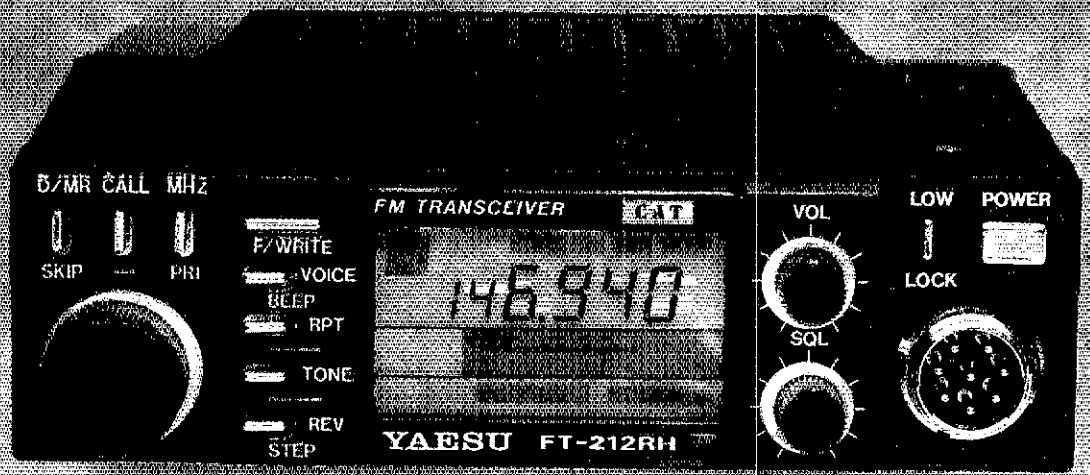
Specifications

Frequency Range: FT-212RH: RX: 140–174 MHz, TX: 144–148 MHz (modifiable for MARS and CAP) FT-712RH: 430–450 MHz

Power Output: 45 Watts (FT-212RH); 35 Watts (FT-712RH)

Case Size: 5.5 (W) x 1.6 (H) x 6.3 (D) in.

Weight (Approx.): 2.8 lbs.



(Shown Actual Size)

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KENWOOD Newsletter

KENWOOD U.S.A. CORPORATION Vol. 1 Issue No. 7

Accurate and timely information for the active Amateur Radio Operator from Kenwood U.S.A.

Digital Signal Processing

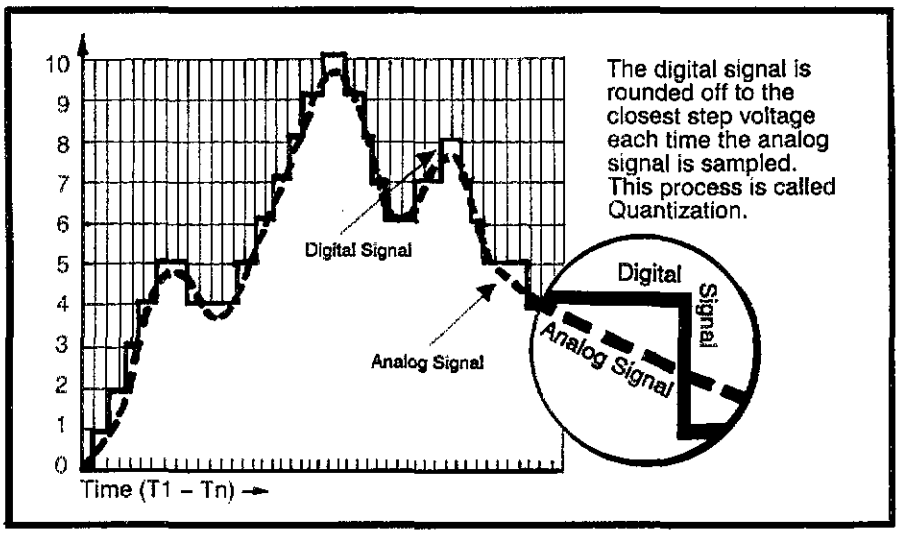
Digital Signal Processing is a term you will be hearing a lot about in the future. This fascinating new technology allows you to tailor both your transmitted and received signals in ways that were only dreamed of just a few years ago.

Fundamentals

The normal transmitted (and received) signals that you hear on the bands are analog signals. These signals usually have some level of distortion and noise riding on the signal. In the past, it was not practical to do much about removing this distortion and noise since most noise is amplitude modulated, just like the human voice.

The audio industry developed the Compact Disc to solve this problem of low signal quality and high noise levels. What should be of interest to us as amateurs is the technology that was developed by the recording industry (and the Telephone Company) is now finding its way into Amateur Radio.

The recording industry stopped using analog *techniques and started digitizing their* signals. The analog signals were applied to sampling circuits that generate a staircase type waveform similar to that shown in Figure 1. By using this sampling method of signal conversion they were able to remove much of the noise that was present on the audio signal. Any noise that might be present on the signal between the sampling periods (t_n in the figure) is ignored.



This Analog to Digital conversion is the basis for most Digital Signal Processing techniques.

Advanced Features

Digital Signal Processing techniques do not end with converting the signal into a digital waveform. The signal is also applied to programmable filter circuits that let you *select the desired audio passband. The* Kenwood DSP-10 and DSP-100 allow you to select low cut frequencies of 100, 200, 300, and 400 Hz, and high cut frequencies of 2600, 2750, 2900, or 3100 Hz. A 10 db improvement in the carrier and sideband suppression figures is also realized with these processors. This is especially valuable on crowded bands, as it helps to prevent interference with other stations and results in more efficient use of the power generated by the transceiver. This is because the power is not wasted on the carrier or unwanted sideband!

Why DSP?

*One of the most frequently asked ques*tions is why bother with DSP at all when changing crystal filters will allow adjustment of the audio passband?

Just adding analog filters to a circuit will not remove as much noise as converting the signal from analog to digital. Nor will analog filters allow you to tailor the audio passband as easily, since you would have to have many filters to do the same task as the programmable filters in a unit such as the DSP-100 or the DSP-10.

Analog filters are also unable to provide the improvement in the transmitted carrier and sideband suppression that are realized with DSP circuits.

The bottom line is that any device that will help you to break thru a pile up, or help you pick a signal up out of the noise is a definite advantage. Digital Signal Processing provides just such an advantage and is something you should seriously consider when purchasing your next rig.

Next month we will look at IF filter selection and provide a chart showing filter compatibility.

73 Craig (KR6T)

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Coming Next Month

Next Month: Filter Selection/Cross *Reference Guide.*

If you have a comment about a column, or have a question about any ham radio subject please let us know. We will select topics for the newsletter that have the widest appeal.

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TM-731A/631A

144/450 and 144/220 MHz FM Dual Banders

- **Extended receiver range** (136.000 – 173.995 MHz) on 2 m; 70 cm coverage is 438.000 – 449.995 MHz; 1-1/4 m coverage is 215 – 229.995 MHz. (Specifications guaranteed on Amateur bands only. Two meter transmit range is 144 – 148 MHz. Modifiable for MARS/CAP. Permits required.)
- **Separate frequency display for "main" and "sub-band".**
- **Versatile scanning functions.** Dual scan, and carrier and time operated scan stop.
- **30 memory channels.** Stores everything you need to make operating easier. Two channels for "odd splits."
- **50 Watts on 2 m, 35 watts on 70 cm, 25 watts on 1-1/4 m.** Approx. 5 watts low power.
- **Automatic offset selection.**
- **Dual antenna ports.**
- **Automatic Band Change (A.B.C.)** Automatically changes between main and sub-band when a signal is present.
- **Dual watch function allows VHF and UHF receive simultaneously.**
- **CTCSS encode/decode selectable from front panel or UP/DWN keys on microphone.** (Encode built-in, optional TSU-6 needed for decode.)
- **Balance control and separate squelch controls for each band.**
- **Full duplex operation.**
- **Dimmer switch.**
- **16 key DTMF/control mic. included.**
- **Frequency (dial) lock.**

Optional Accessories:
• **PG-4H** Extra interface cable for IF-20 (for three to four radios) • **PG-4J** Extension cable kit for IF-20 DC and audio • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SWT-1** 2 m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-41** Compact mobile speaker • **SP-50B** Deluxe mobile speaker • **PG-2N** DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MA-700** Dual band 2 m/70 cm mobile antenna (mount not supplied) • **MB-11** Mobile bracket • **MC-43S** UP/DWN hand mic. • **MC-48B** 16-key DTMF hand mic.

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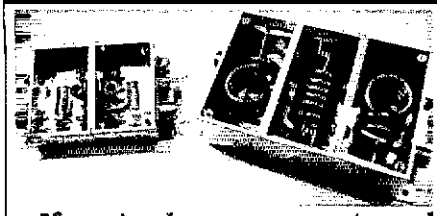
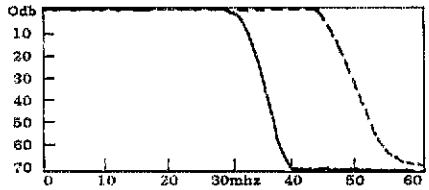
HEFTY! HEFTY! WIMPY! WIMPY!



If you've become accustomed to the same featherweight, thin walled, high cutoff low pass transmitting filters sold by many manufacturers to the amateur service for decades, then you'll appreciate I.C.E's musclebound high performance harmonic choppers for use with rigs up to 5kw from DC to 30MHZ.

PERFORMANCE CHARACTERISTICS



SOLID LINE — MODELS 420, 421
DOTTED LINE — AVERAGE OF MOST FILTERS MADE IN THE LAST 30 YEARS.

Models 420 (250W) and 421 (5KW PEP) feature the lowest cutoff (-3db at 31mhz) of any filter ever built for this application, and their sharp attenuation slopes go to work on spurious products immediately above the 10 meter band, reaching a near block before the TV I.F. frequency of 41mhz. Most filters made in the past 30 years that we have sweep tested don't even begin to attenuate before 45mhz, making them nearly useless for some of the most delicate forms of interference caused to consumer services.

Better yet, the brute-tough, robust construction of 420 series units mean long term dependability for serious operators and station owners. Both filters are built in split rectangular chassis, mill-finished 1/8" thick aluminum with 1/4" thick RF containment walls. Feed through fittings are machined from teflon TFE. Capacitor sections sheared from Phosphor-Bronze plate stock, smoothed & finished, and also Teflon insulated (421). Through coils wound from 3/16" copper tubing.

Both units feature all stainless steel ground fittings and constructon hardware, have extended bottom plates for mounting, and are individually boxed with mounting screws, slip-off connector covers, and manual.

SPECIFICATIONS:

POWER RATINGS:	250W PEP, 150DC (420) 5KW PEP, 3KW DC (421)
IMPEDANCE	50/75 OHMS
INSERTION LOSS:	LESS THAN .1db (TYPICALLY, 125W IN, 123 WATTS OUT.)
SIZES (HWD):	1-3/8 x 3 x 5 OVERALL (420) 2 x 4 x 7 OVERALL (421)

MODELS PRICES:

420(SO239s)	$ 29.95	421 (SO239s)	$ 39.95
420B(BNC)	29.95	421N (N CONNS)	41.95
420R (RCA PIN)	29.95	(1 YEAR WARRANTY ON	
420N (N CONNS)	31.95	ALL MODELS)	

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56–590–65–3B Ferrite Bead ..... $ .20
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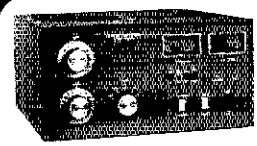


1500W.

MODEL PT2500A LINEAR AMPLIFIER

The Barker & Williamson PT2500A Linear Amplifier is a completely self-contained table-top unit designed for continuous SSB, CW, RTTY, AM or ATV operation. Intended for coverage of all amateur bands between 1.8 MHz and 21 MHz.

Two type 3-500z glass envelope triodes provide reliability and rapid turn-on time.

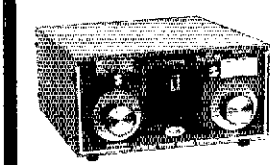
FEATURES INCLUDE:
- Full 1500 watt output
- Pi-network input for maximum drive
- Pressurized plenum cooling system
- DC antenna relay for hum-free operation
- Illuminated SWR and power meters
- Vernier tuning for accurate settings
- Pi-L output for greater harmonic attenuation

Ruggedly constructed of proven design, this amplifier reflects the manufacturer's critical attention to details – such as the silver-plated tank coil for maximum efficiency. Cathode zener fuse and internal/external cooling are among the protective and safety devices employed. Input and output impedances are 50 ohms.

Dimensions: 17" wide x 19" deep x 8"½ high
Weight: 80 lbs. (shipped in 3 cartons to meet UPS requirements)

Price: $2175.00 FOB factory. Price includes one year limited warranty.

Call or write factory for complete specifications.



1500W.

MODEL VS1500A ANTENNA COUPLER

The Barker & Williamson VS1500A antenna coupler is designed to match virtually any receiver, transmitter or transceiver in the 160 to 10 meter range (1.8 to 30 MHz) with up to 1500 watts RF power to almost any antenna, including dipoles, inverted vees, verticals, mobile whips, beams, random wires and others, fed by coax cable, balanced lines or a single wire. A 1:4 balun is built in for connection to balanced lines.

FEATURES INCLUDE:
- Series parallel capacitor connection for greater harmonic attenuation.
- In-circuit wattmeter for continuous monitoring.
- Vernier tuning for easy adjustment.

Front panel switching allows rapid selection of antennas, or to an external dummy load, or permits bypassing the tuner.

Dimension (Approx.): 11" wide x 13" deep x 6" high

Weight: 6½ lbs.

Price: $499.00 FOB Factory. Fully warranted for one year.

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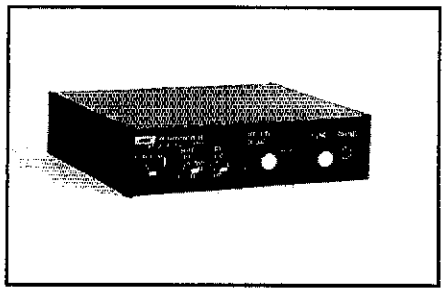

The NIR-10 is a Noise/QRM Reducer for SSB VOICE! It is a unique audio device that can reduce noise and remove heterodynes occuring in the presence of speech. What makes this possible? Real-Time Digital Signal Processing (DSP) using a 40 MHz DSP chip!

•The NIR-10 is a DSP audio processor that connects to the audio output of your receiver or transceiver and includes a built-in Speaker Amplifier.

•Automatically Enhances Voice Reception by Reducing or Eliminating:
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•Includes a Bandpass Filter Mode to Enhance CW and RTTY . Forms a Variable Center Frequency Digital Filter with Selectable Bandwidth. Provides performance that analog filters can't match!

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•Reduces Listener Fatigue.

• A Must for DXers, Contesters, and Field Day Ops.

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DR-590T(NEW)

VHF/UHF Twin Band Mobile

144-147. 995Mhz(RX137—173. 995Mhz)
440-449..995Mhz(RX410—469. 995Mhz)
45W Hi, 10W Mid., 5W Low on VHF
35W Hi, 8W Mid., 5W Low on UHF
Cross Band Repeater Function Simultaneous Receiving and Scanning on both Band
Front Control Panel is detachable. Remote Control will be available (Option)
MARS and CAP Modifiable (permit required)

DR-570T

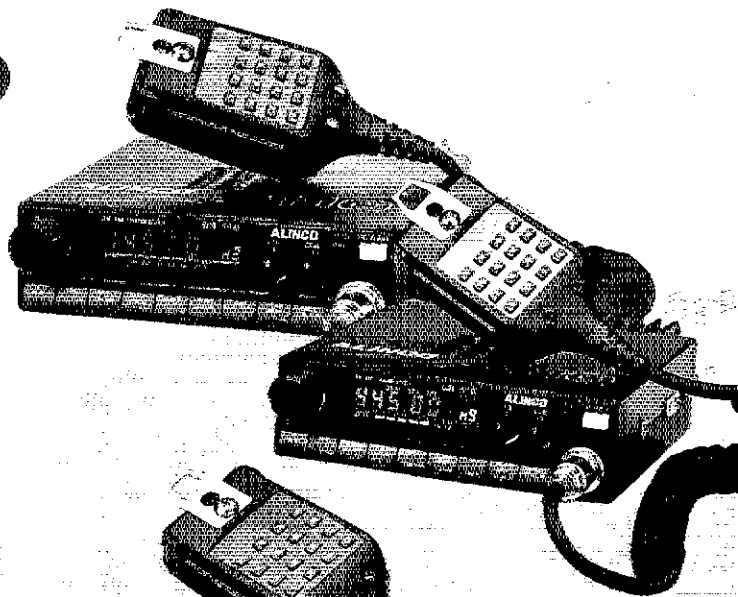
Set your sights for dual!

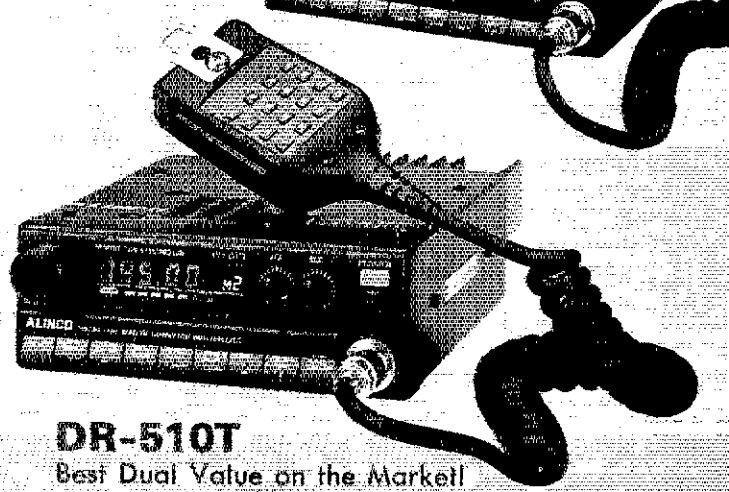
The Alinco DR-570T "Twin Bander" has dual LCD readout, volume, squelch and tuning controls. Double barrelled power with 45W on 2M and 35W on 70 cm, plus simultaneous receive on both bands or intermix with four modes of scan. The DR-570T will win the "battle" with its illuminated front function panel and LCD readout, readable in any lighting conditions. Don't let the "Tiny" DR-570T fool you! It's fast, and leaves the competition in the dust with many standard features you expect. Cross band repeat with the flick of a switch. Full duplex, 20 memory channels, call channels, 16-key DTMF Microphone, and subtones are just a few. "Reach" for the DR-570T today!

DR-110T & DR-410T

Tiny 2M Power From Alinco!

DR-110T, this 2M Alinco, enters the nineties a proven winner with the "reputation" of best value. The DR-110T packs a powerful 45W on 2M and sports all the features you expect in todays transceivers. Tuning is a snap with the multi-functioned easy-to-see keyboard, 14 memory channels, subtones, scan, multi-colored LCD readout, reverse, are a few of the many features of the DR-110T. The mobile of the future-today! DR-410T available for 70 cm.





DR-510T

Best Dual Value on the Market!

The Alinco DR-510T has most of the outstanding features of it's sister the DR-570T, including 14 memory channels, cross band duplex and cross band repeat. The multi color LCD display, and simple tune control panel makes simplicity the key word. The DR-510T with 45/35 watts is the best, featurepacked dual bander on the Amateur market today. See the DR-510T along with the other Alinco "Magnificent" ones at your favorite dealer today!

DR-112T(NEW)

Full Featured 2M Power Pack.

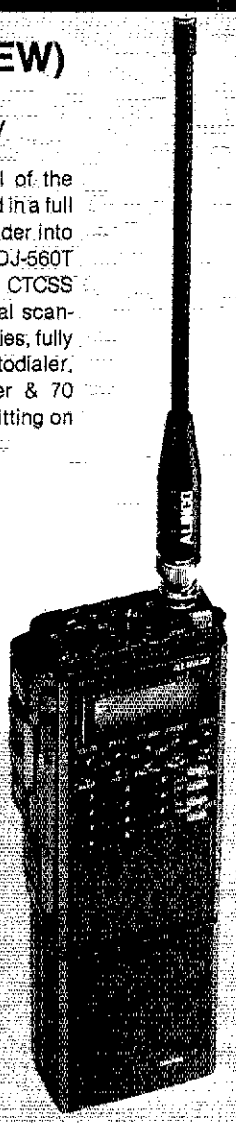
The DR-112T is a "True FM" full-power(45 watts) transceiver. The back-lit LCD display is ideal for bright or dim lit conditions. And as with most Alinco products, the control panel is engineered to be "User friendly" and still offer a full range of features.

ALINCO ELECTRONICS INC.

DJ-560T (NEW)

Full Featured Twin Band Handy

We packed almost all of the features you would find in a full sized mobile Twin Bander into this compact HT. The DJ-560T has key board entry, CTCSS encode built in, several scanning modes, 40 memories, fully programmable, Autodialer, Dual Display (2 Meter & 70 Cm). The DJ-560T is sitting on top of the mountain.



DJ-100T & DJ-120T & DJ-200T

Best 2M Micro Value

The Alinco DJ-100T/DJ-120T is "Magnificent" for its tiny size, but stands up to the competition with power and capability. 10 memory channels store offsets and subtones. Has LCD readout with call channels and reverse at your fingertips. 500 mah battery with direct DC to DC is standard. 3W on standard battery, 6W on optional battery leaves the competition in the dust! DJ-200T for 220 MHz.

DJ-500T

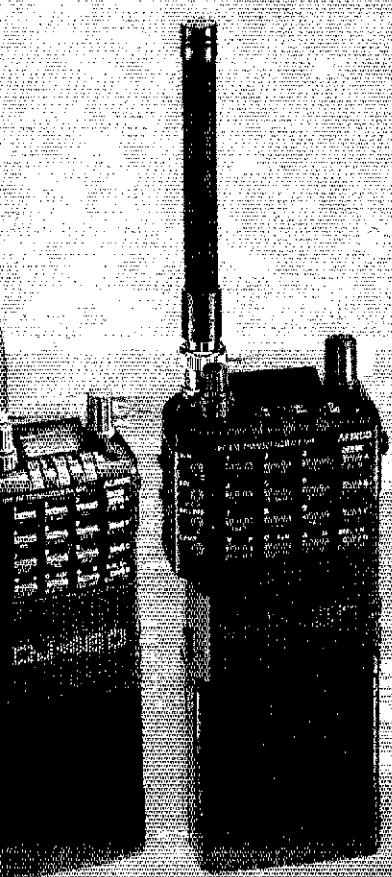
Power-Packed Dual Band!

20 Memory channels, subtones, built-in DC to DC, 700 mah nicad battery, LCD readout with 6W on 2M and 5W on 70cm (with optional battery) call channels, DTMF Touchtone, and direct keyboard entry, are just the few winning features of the Alinco DJ-500T Dual Band Handheld. Easy to use, and Value Priced at your Alinco Dealer.

DJ-160T & DJ-460T

2M H/T is here! And wow!

"Bells & Whistles" is a tame word to use for the new DJ-160T, newest "Magnificent" one from Alinco. Keyboard entry is just one of four ways to enter a frequency in the extended receiver (137-173.995 Mhz) of the DJ-160T. You can store duplex "simplex pairs in any of 20 Memories, or Call Channel, with offsets, and any of 38 encoding subtones. Choose one of 3 scan modes, "Band" "Program" or "Memory" and one of five step ranges in VFO. Priority mode can be used in VFO, Memory or Call. "Dual Watch" allows the DJ-160T to scan 3 seconds alternately on CALL, VFO or one MEMORY. "Pacer" is for group or single person alert. Other features include, Auto "Battery Save", Auto "Power Off", and 2-Memory Autodialer. Get 3-watts on standard 700 mah battery, or increased power from built-in DC to DC, or optional 12V battery. The Alinco DJ-160T, now the "Top Gun" with the competition today! DJ-460T for 70 cm.



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Tech Talk from ICOM

ISSUE #62

CW AND THE ICOM ADVANTAGE

Icom is proud to be celebrating our 62nd issue of the Icom Tech Talk. By popular request this month's Tech Talk spotlights CW and its operating features with Icom transceivers. It recognizes your demand for uncompromised CW performance and covers such high interest areas as semi versus full break-in, T/R switching techniques, narrowband filter selections and more.

First lets begin with CW operations. They reflect a combination of pride and skill all radio amateurs can enjoy. CW frequencies are less crowded than SSB allocations, thus DX'ing and/or general communications with a barefoot transceiver and basic-style antenna yields optimum results. Finally, working CW with a deluxe transceiver and modern iambic keyer or home computer is simply great fun!

Newcomers often ask if semi or full break-in/QSK operation is "best". The answer depends on personal preference. Semi break-in is quite pleasant for casual CW operation, while full break-in is advantageous for serious DX'ing and contesting. Many CW devotees state the ability to listen "in between" transmitted characters while using only 100 watts on full break-in yields DX'ing success comparable to running 400 to 500 watts on semi break-in. Present model Icom HF transceivers, excluding the IC-725 and IC-726, offer front panel selection of semi or full break-in operation.

Smooth T/R switching is very important for CW operation. Transceiver designs are paramount in this respect. Equipment used must be fast, quiet and exhibit superb long-term reliability. Icom meets and exceeds these requirements by minimizing T/R-switched circuits and incorporating a silent 60 wpm reed relay in the IC-781 and IC-765, and a high speed 40 wpm relay in the IC-751A, IC-735 and IC-725. Unlike PIN diodes that can become noisy with age or short with "spikes" and severely damage sensitive "front end" circuits, Icom's relays are very reliable and positive-acting to ensure residual RF energy does not degrade receiver performance. Their dependability has been proven in record-setting operations like WRTC '90, Aruba/P40V, Malpelo/HK0TU, and Jarvis/KH5J DXpeditions.

Narrowband filters make CW operating delightful and Icom truly excels here. Icom's IC-781, is factory-equipped with dual steep skirted 2.4 KHz/wide, 500 Hz/narrow and 250Hz/sharp filters that are independently selectable via the front panel as desired. Copy DX stations right through the heaviest pileups when you combine this transceiver's filters and twin passband tuning!

After installing an optional 250Hz filter in the IC-765 or IC-751A, bandwidths of 2.3KHz, 500Hz, and 250Hz are also front-panel-selectable. Use their 2.3 KHz or 500 Hz filter for quickly-spotting needed stations, then switch to the 250 Hz filter for blocking out QRM and working DX. Installing an optional CW filter in your Icom IC-735 or IC-725 likewise expands its performance. We suggest adding the 500 Hz filter for contesting daily and installing the 250 Hz filter only for serious DX CW work. Considering their DX'ing success, Icom filters are the industry's best.

Icom's excellence in transceiver designs extends well beyond T/R switching and CW filtering. Indeed, it is the "full package" concept that makes them superb. All Icom HF transceivers except the IC-725 and IC-726, feature a sharp IF notch filter with up to 60 db attenuation. Icom's passband tuning or IF shift also compliment narrow CW filters to cut QRM like a knife. Additionally, Icom's RIT and XIT are terrific for split-frequency DXing. When a station says "Listening up 5" (or 7, 8, or 9 KHz), simply press both RIT and XIT and tune in his exact listening frequency. Then press RIT off (your receiver returns to the DX station's transmitting frequency), and make your perfectly-timed call. That is DX'ing at its best!

We could continue with discussions of the tunable memories and iambic keyer built-in Icom's IC-781, IC-765 and IC-751A, optional in the IC-735, the amazing reliability and full one year warranty of all Icom HF transceivers, and more. The facts, however, have become clear. Regardless of the mode, Icom will answer your needs.

For a brochure on this or any Icom product, call our TOLL-FREE Literature Request Hotline:
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Visionary station design provides simple installation, the IC-4KL's RF/PS unit rolls conveniently into nearby corners for remote location and quiet operation. Only the handsome remote control featuring dual multi-function meters for SWR and output watts is visible to the eye.

Crucial elements such as a Built-In Automatic Antenna Tuner, Automatic Band Selection for Instant Band Switching, 100% Duty Cycle and Full CW Break-In supply the IC-4KL user the maximum advantage. Add the popular EX-627 and the IC-4KL even selects the proper antenna!

Reach the ultimate in HF signal performance, add the IC-4KL to your station. You'll soon find yourself commanding the airwaves! Supported by an unrivaled service policy, four factory service centers and a one-year warranty, the IC-4KL is far and away the leading HF amplifier available today.

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The IC-765 sports: **Band Stacking Registers.** Each band's VFO's retain the last selected frequency, mode and filter choice when changing bands. Produces the equivalent of 20 VFO's; two per band. Great for multiband DX'ing! **99 Fully Tunable Memories.** Store frequency, mode and filter selections. **Direct Digital Synthesizer (DDS).** Assures ultra-fast PLL switching and lock-in for excellent PACKET, AMTOR and CW QSK operations.

Unlimited Operating Capability! The three step attenuator cuts multi-station overloads. Additional features include a **Built-in AC Supply, 100 percent duty cycle** for consistent high quality operation, **Fully Automatic Antenna Tuner, Iambic Keyer, Narrow 500Hz CW Filters** and **CW Pitch Control.**

The IC-765 general coverage receiver covers all bands and all modes.

Backed by ICOM's full **one-year warranty**, the IC-765's world class performance and superb reliability make it . . . the Choice of Champions!

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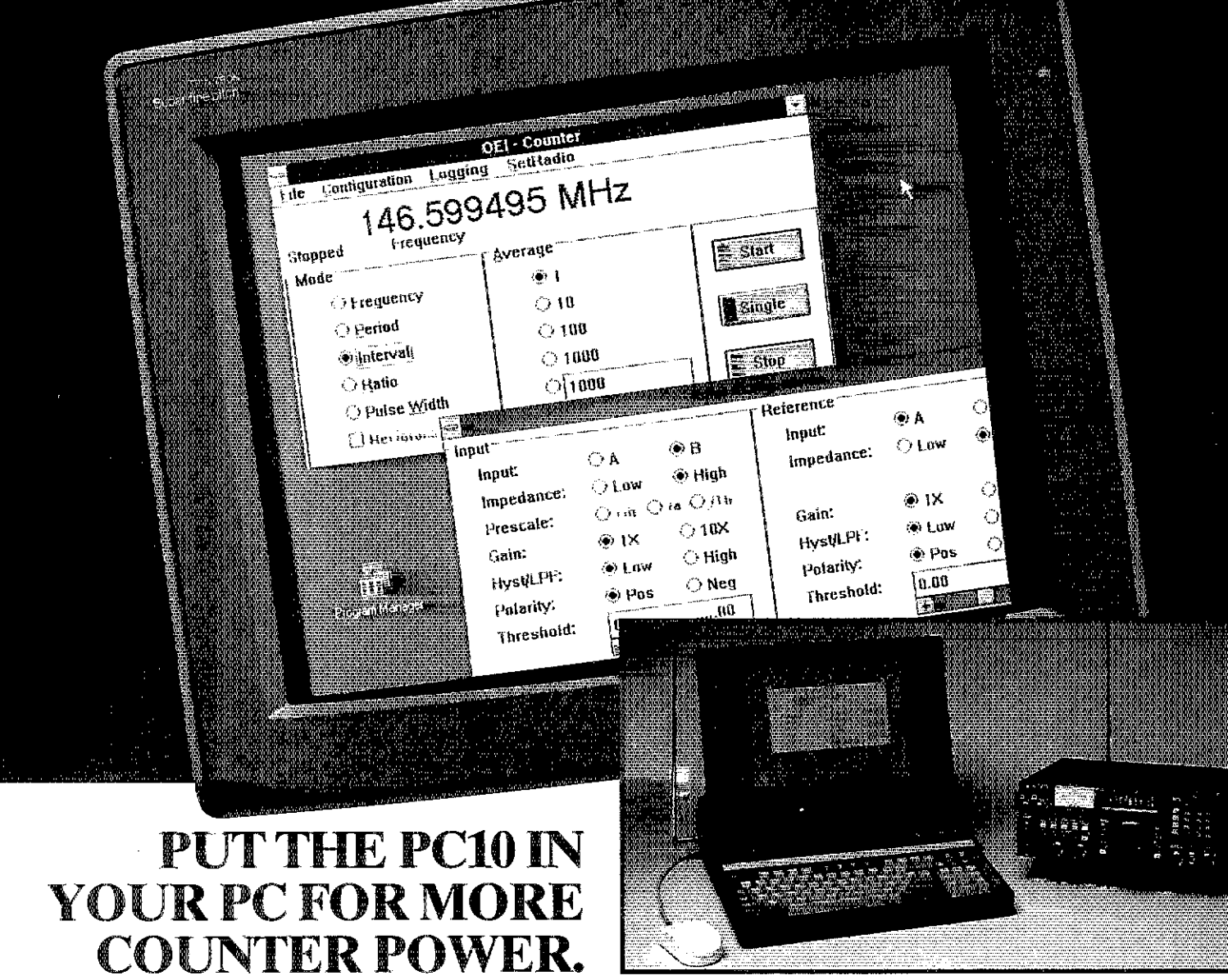

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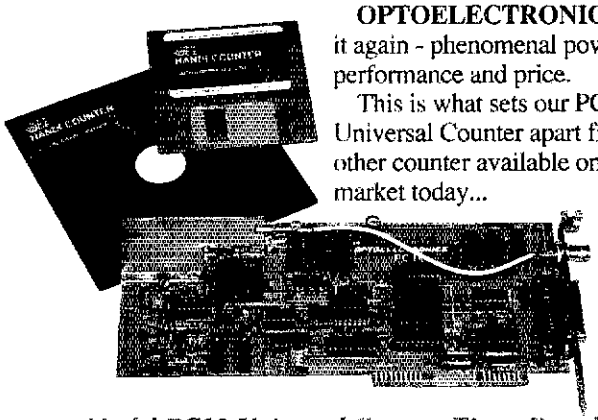

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This is what sets our PC Based Universal Counter apart from any other counter available on the market today...

Model PC10 Universal Counter Timer Board for the PC. Introductory Price $339.

The PC10 has on board 50 ohm RF input with amplifiers and prescalers to operate as a stand alone 1MHz to 2.4GHz RF counter. TTL level input signals can be connected directly to the miniature 25 pin D connector on the mounting bracket. For low frequency, high impedance inputs, the Model AP10H companion amplifier must be used.

Model AP10H Dual High Impedance Amplifier Head Unit (Not Shown). Introductory price $299.

The AP10H is the companion head unit that supports all PC10 Universal Counter functions from 10Hz to 100MHz with 1 megohm inputs. Input attenuators, low pass filters and trigger levels are software selectable.

Options: TCXO 10 Precision Temperature Compensated Time Base $195. *± 0.2ppm 20°-40°C, 1ppm - year aging.*

- Instant Direct Tune - Set a communications receiver such as ICOM R7000 to frequency detected by counter. Patent pending.
- Data logging and data file creation to keep records or measure frequency drift.
- Menu selection for Units includes CPM/RPM, Hz, KHz, MHz, GHz, Sec, mS, uS and nS.
- Software timebase calibration of 1ppm TCXO timebase.
- Windows 3.0 operating environment with fully developed operating and signal conditioning controls accessible through pull down menus.

In addition to these unique features, PC10 is a down right high performance counter...

- 10 digit 10Hz to 2.4GHz frequency range.
- Measurement Period (Gate Time) continuously variable from 1 milli-second to 28 seconds.
- Reciprocal Counting for high resolution measurement.
- Input sensitivity is less than 10mV from 10Hz to over 1.6GHz.
- Direct count frequencies over 200MHz with 1Hz resolution in 1 sec.

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Versatile Communications. The IC-970 comes fully equipped as an all mode dual bander for 144MHz and 440MHz. Expand your limits on 1200MHz with the optional UX-97 band unit or listen to the world with the UX-R96 50—905MHz receive unit.

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Progressive Quality Throughout. Dual band watch lets you receive both main and sub band audio simultaneously. Multiple scanning systems on the main and sub bands, plus 99 memories, an easy-to-read multi-function display and ICOM's DDS system create the transceiver of tomorrow. Additional features include a built-in pager, code squelch function, direct keyboard entry and ICOM's CI-V system.

See tomorrow's transceiver today at your local ICOM dealer. You'll see why the IC-970 is the transceiver of a new generation!

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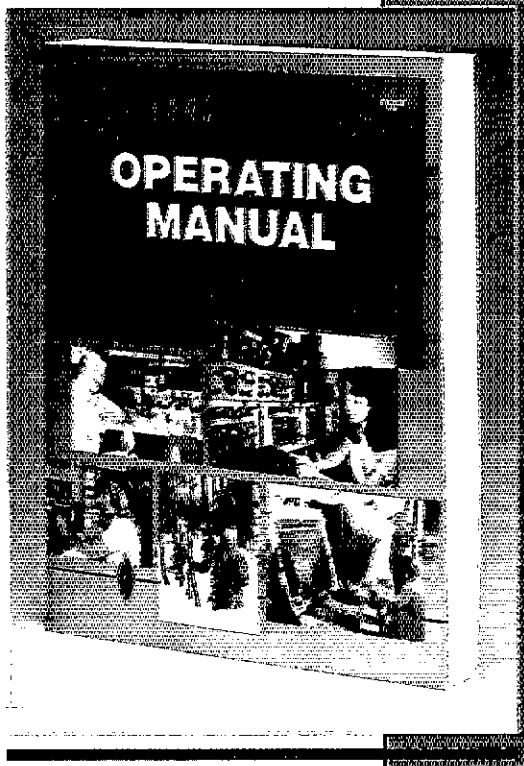
No one has ever called Amateur Radio boring. There's so much to do in this multi-faceted hobby and it is all described in the big 688-page *ARRL Operating Manual*! The book proved so popular that we had to go back on press for a second printing in less than a year.

Why is this League publication a smash hit? We gathered together the efforts of talented writers who are experts in each of their Amateur Radio specialties: Basic Operating by Bill Jennings, K1WJ and Carol Smith, AJ2I; FM and Repeaters plus the chapter on Packet Radio by *QST* columnist Stan Horzepa, WA1LOU; DXing by Bob Locher, W9KNI, Overseas DXing/DXpeditions by Carl Henson, WB4ZNH; Traffic Handling by Maria Evans, KT5Y; Emergency Communications by Richard Regent, K9GDF; Image Communications by Bruce Brown, WA9GVK; VHF/UHF Operating by Michael Owen, W9IP; Satellites by Dick Jansson, WD4FAB and Contests by Clarke Greene, K1JX.



The chapters on Shortwave Listening, The Amateur Radio Spectrum, Antenna Orientation, and RTTY Communications were written by HQ staffers: AK7M, W4RI, K1TD and WA3VIL. Bob Halprin, K1XA was the editor of the *Operating Manual* and was responsible for the popular Operating Awards chapter where more than seven dozen awards are described and illustrated in full color.

If you really want to be "in" on what is happening in Amateur

by a host of world-class operators

Radio operating today, you need a copy of the third edition of the *ARRL Operating Manual.* Available at your dealer or directly from ARRL for $15. For postage and handling add $2.50 ($3.50 for insured mail or UPS—please specify.)

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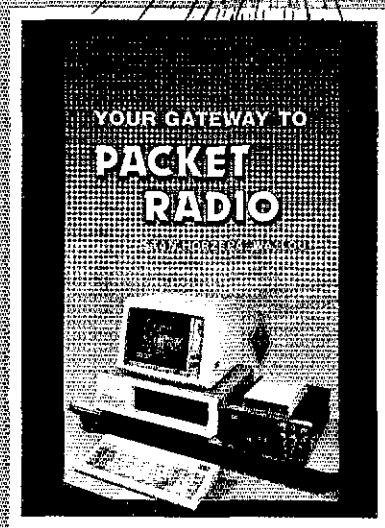
PACKET EXPLOSION!



In the two years since we first published **Your Gateway to Packet Radio**, interest in packet radio has exploded! To keep up with the expanding interest and evolving technology, the second edition contains 74 more pages—and nearly fifty percent of the original material has been revised. Newcomers will still find the basics on installation and operating procedures needed to get started.

Experienced "packeteers" will find information on the latest hardware and software available in today's packet radio world. Packet radio is making an impact on all aspects of Amateur Radio. It has become an integral part of the National Traffic System (NTS) and Amateur Radio Emergency Service (ARES). Bulletin Board systems contain bulletins, newsletters, computer programs, DX and multiplier spotting info, directories and loads of other data. With unequaled accuracy and speed, packet radio is being used to move and distribute vast quantities of information to an extent never seen before in Amateur Radio. **Your Gateway to Packet Radio** is written by long-time *QST* "On Line" and "FM-Repeat" columnist Stan Horzepa, WA1LOU. Stan also edits **Gateway** the ARRL packet radio newsletter. You can pickup a copy of the 315-page 2nd Edition of **Your Gateway to Packet Radio** at your dealer or directly from ARRL for $12 plus postage and handling (see the ARRL Bookshelf elsewhere in this issue for ordering information).

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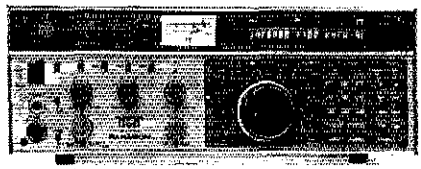
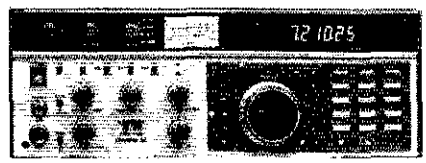


PARAGON	List	SALE
585 9-band xcvr w/.1-30 MHz rcvr	2245.00	1899
961 Deluxe 22A ps w/speaker	249.00	229.95
256 FM transceive module	65.00	
257 Voice synthesizer	89.00	
258 RS-232 Interface	65.00	
282 250 Hz 6-pole CW filter	74.00	
285 500 Hz 6-pole CW filter	74.00	
288 1.8 KHz 8-pole SSB filter	74.00	
700C Electret hand microphone	37.00	
705 Electret desk microphone	83.00	
1140 18/24.3A DC circuit breaker	18.00	
Other Accessories for 585	CALL	



OMNI V	List	SALE
562 9-band xcvr/xtal mixed osc	2245.00	1899
961 Deluxe 22A ps w/speaker	249.00	229.95
256 FM transceive module	65.00	
257 Voice synthesizer	89.00	
259 Universal ALC annunciator	39.00	
217* 500 Hz 8-pole (9MHz) CW filter	74.00	
218* 1.8kHz 8-pole (9MHz) SSB filter	74.00	
282 250 Hz 6-pole CW filter	74.00	
285 500 Hz 6-pole CW filter	74.00	
288 1.8 KHz 8-pole SSB filter	74.00	
Other Accessories for 562	CALL	

*Note: 562 will accept only one of the 9MHz filters

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9420 100A 12V p/s for 420 (air frt.)	795.00	699.95
422 CENTURION 1KW out (3-500Z's)	1995.00	1729
425 TITAN 1.5KW out (3CX800A7's)	3250.00	2799

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254 200W antenna tuner/SWR	159.00	149.95
239 160-2m 300W dry dummy load	32.00	
240 1.5KW dry dummy load	243.00	229.95
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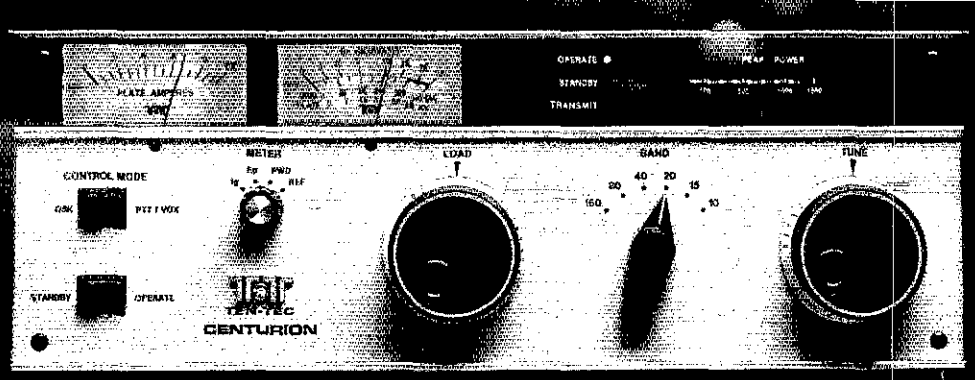

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Centurion ... The Classic Kilowatt!

The Model 422 Centurion uses the classic pair of Eimac® 3-500Z tubes. The RF deck and power supply are combined into a single, attractively styled, desk top cabinet. The power output is rated at 1300 watts on ssb, 1000 watts cw and *650 watts using "key-down" modes. Drive required for full power ssb operation* is 100 watts. The duty cycle is 50%.

Semi-break-in cw is achieved using a fast acting, non-vacuum, relay and the excellent QSK electronics used in the Hercules II. This system is also suitable for the fast switching digital modes. (For the "heavy duty" QSK cw operator, an accessory board is available incorporating a Jennings vacuum relay.) VOX ssb operation is silky smooth and virtually noiseless. This versatile control system assures compatibility with all exciters with amplifier control provisions.

A tube-axial fan is used for forced air cooling. Air flow is routed through the power supply as well as the upper and lower sections of the RF compartment. Air inlets and outlets are in the sides and top of the cabinet to optimize low pressure, low noise, air movement.

A dedicated meter for plate current, a multi-meter for plate voltage, grid current and forward or reflected power. A full time 10 element LED bargraph instantly displays peak power output.

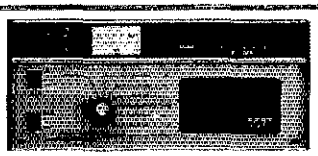
The Centurion operates on all bands from 1.8 to 21.5 MHz. 21.5 to 29.7 MHz is enabled with the installation of an expansion board, supplied no-charge upon proof of licensed authority.

A tough, easy to handle, amplifier that doesn't really mind a little abuse. The Centurion is a great value.

SPECIFICATIONS

Band Coverage: *1.8-2.0, 3.2-4.7, 6.5-10.3, 13.4-19.6, 17.6-21.5 MHz. 21.5-29.7* MHz after authorized modification.

Input Power: 2000 watts, maximum.
Power Output: 1300 watts ssb, 1000 watts cw. RTTY and SSTV 650 watts, 50% duty cycle.
Drive Power: *100 watts for full rated output.*
Efficiency: 50-65%, depending on frequency and load impedance.
Input/Output Impedances: 50 Ohms, unbalanced. SWR ◄2:1.
Distortion: -35 dB from 1 kw rf output level.
Harmonics: -50 dB typical.
CW Break-In: QSK capable. Relay switching.
Tube Compliment: Two Eimac® 3-500Z.
Power Amplifier Circuit: Class AB2, grounded grid.
Plate Voltage: 3100 volts, no load. 2600 volts, full load.
Cooling: Forced air with full chassis air flow.
Metering: Dedicated plate current meter. Selectable multi-meter for plate voltage, grid current, forward or reflected power. Ten element LED bargraph display for peak power indication.
Front Panel Status Indicators: Standby, operate, transmit.
Primary Power: 220-250 Vac @ 15 A, 110-125 Vac @ 30 A, 50/60 Hz. For full power operation, 220-250 Vac is strongly recommended.
Circuit Protection: Primary line fuses. Plate transformer primary interlock and high voltage shorting bar.
Front Panel Controls: Power on/off, standby/operate, control mode select (QSK - PTT/VOX), plate TUNE and LOAD, band switch, meter switch.
Tune and Load Controls: 6:1 vernier drives with calibrated dial skirts.
Construction: Aluminum chassis, front and rear panels, interior partitions and top and bottom covers.
Size: *HWS 8.25" x 15.25" x 18.5", (20.3 x 38.7 x 46.9 cm).*
Weight: 47 lbs (21.3 kg).



Hercules II Solid State, No Tuning!

High tech simplicity, base or mobile. A compact, lightweight HF amplifier that offers a unique combination of virtues that can only be achieved using modern, solid state technology. Instant on, 12 - 14 Vdc operation, general coverage from *160 through 10 meters, no-tune operation and compact size. Add to that,* lightning fast QSK cw, remote control, superb linearity and a low drive requirement. Outstanding!

The Hercules II is attractively styled to match our HF base station transceivers and will interface nicely with virtually all transceivers. The front panel includes an analog multi-meter for collector current, voltage, forward power and SWR. A ten element LED bargraph instantaneously displays peak power output. Band selection is either with the front panel switch or remotely via a rear panel connector. A front panel speaker is built in.

The internal heat sinks are air cooled by a temperature controlled tube axial fan. Whisper quiet in ssb operation, yet enough air capacity for cool operation in the key-down modes. The Hercules II is compact, good looking and generates a signal that is within one S-unit of the mighty Titan.

MODEL 9420 115/230 VAC POWER SUPPLY

Housed in a separate utility enclosure and remotely controlled through the 6 foot power cable, 100 amperes at 13.7 Vdc is provided. 80 amperes for the amplifier and 20 amps for the exciter. An alternate power supply can be a heavy duty, deep cycle, lead acid battery and an automatic 10 amp charger. This low cost alternative power source will support the Hercules II during sustained amateur service.

The Mighty Titan ... Simply Unbeatable!

The Titan has it all! Maximum legal power with ease, all full power bands 160 through 15 meters (10 and 12 meters after authorized modification), lightning fast QSK for break-in cw and the digital modes and a two speed blower for quiet *operation. This awesome performance from a desk top amplifier is made possible* by the remote power supply and a pair of Eimac® 3CX800A7 ceramic triodes. The heart of the power supply is our own four core, tape wound Hypersil® transformer. This 41 lb behemoth is conservatively rated at 2.5 kVa CCS (9.2 kVa IVS) and is nearly noiseless, even at 1500 watts output!

Other features include a front panel, peak reading wattmeter using an instantaneous ten element LED bargraph display. PTT/VOX or QSK control line select switch, built-in SWR meter and an "over-drive" warning LED. 3:1 vernier TUNE and LOAD controls in combination with an outstanding RF deck design, *make the Titan a real "pussy cat" to load and operate.*

The Titan is styled to match our transceivers but it interfaces beautifully, no matter what exciter you are using. If you are ready to choose your dream amplifier, the Titan has it all! Check it out.

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BROAD RX FREQUENCY COVERAGE: VHF RX 115 MHz to 180 MHz (with less than 0.158uV sensitivity for 12dB SINAD between 130 and 165 MHz typical, spec guaranteed in ham bands only). Plus incredible UHF RX capability of 328 MHz to 500 MHz! Supplied TX is Amateur Bands only, but can be modified for MARS & CAP, proof of participation is required.

100 MEMORY CHANNELS (20/band) store repeater mode and offset, CTCSS tone (with optional CTN5600 Twin Band CTCSS Encoder/Decoder), paging mode, code squelch mode, and DTMF mode. Also stores up to 15 digits each for 2 separate DTMF sequences for autopatch access and dialing or remote or repeater control. Four memory locations can store frequency limits for effortless band scanning.

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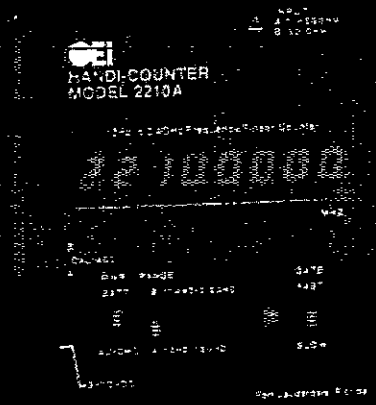

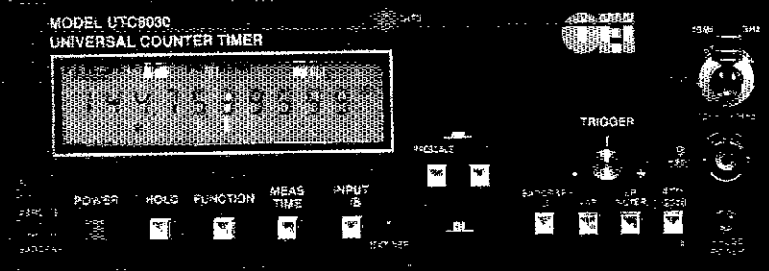

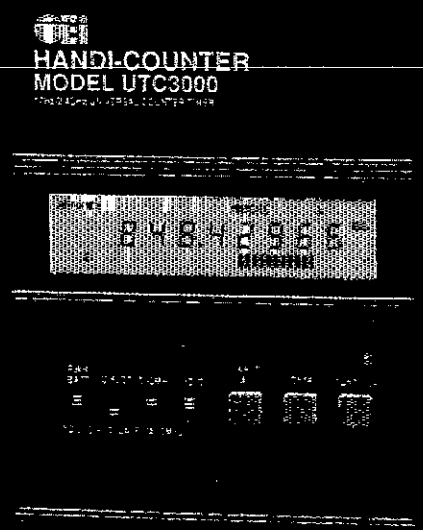

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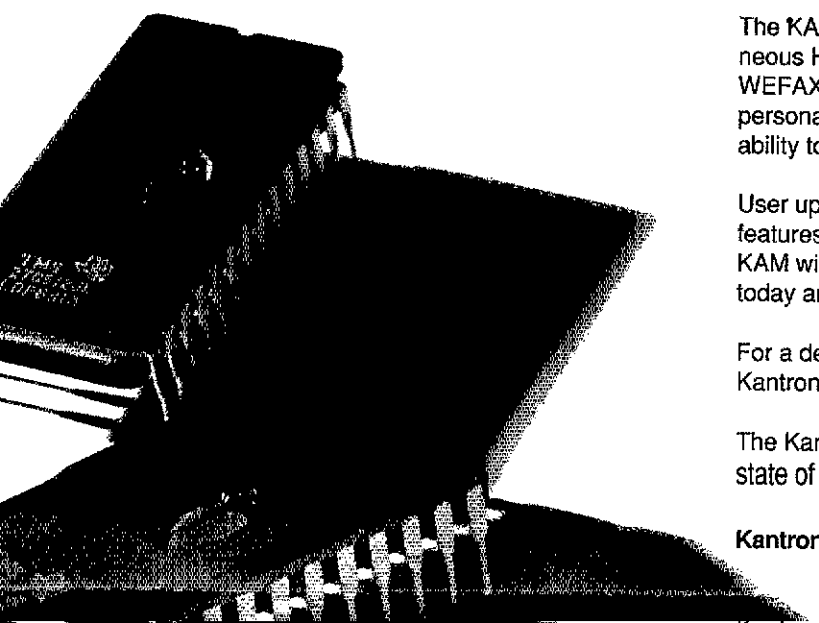

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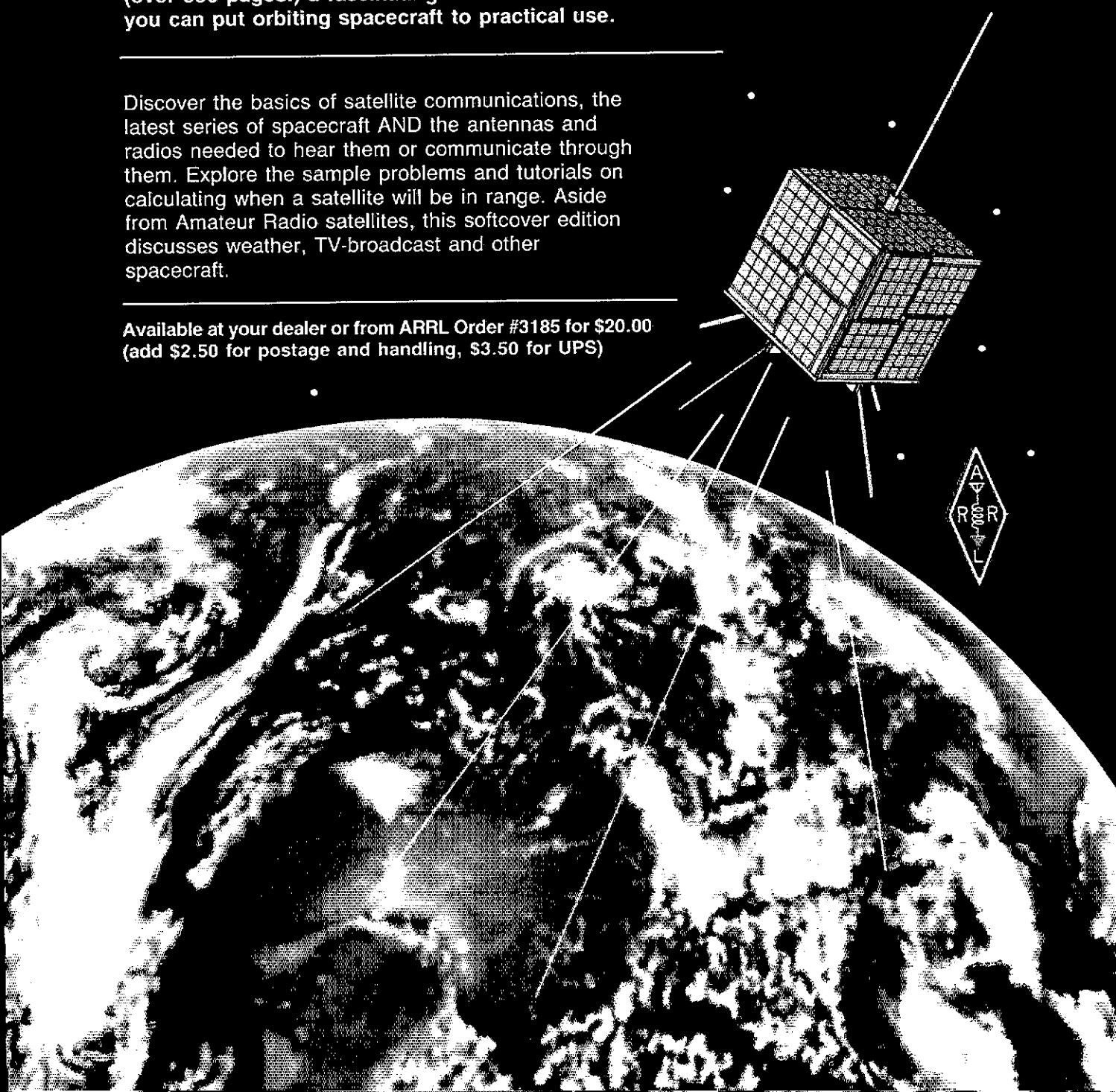

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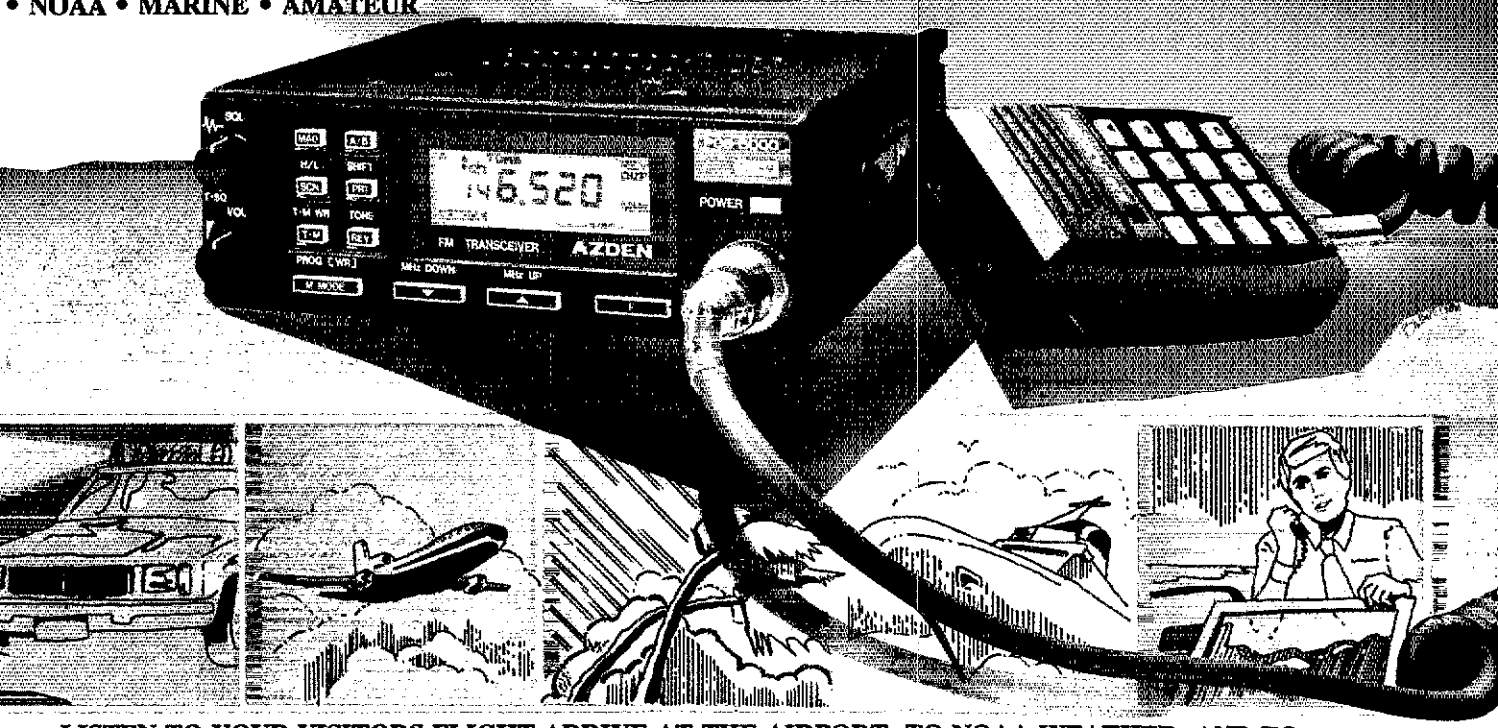

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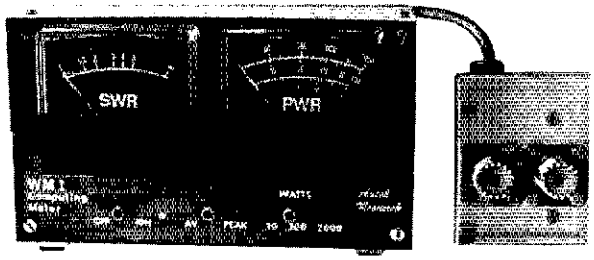

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- **GREATLY SIMPLIFIES TUNER ADJUSTMENT.** SWR reading not affected by forward power. No confusing readings.
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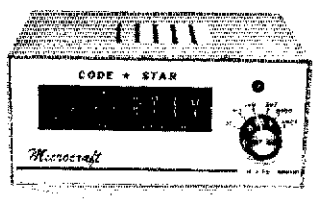

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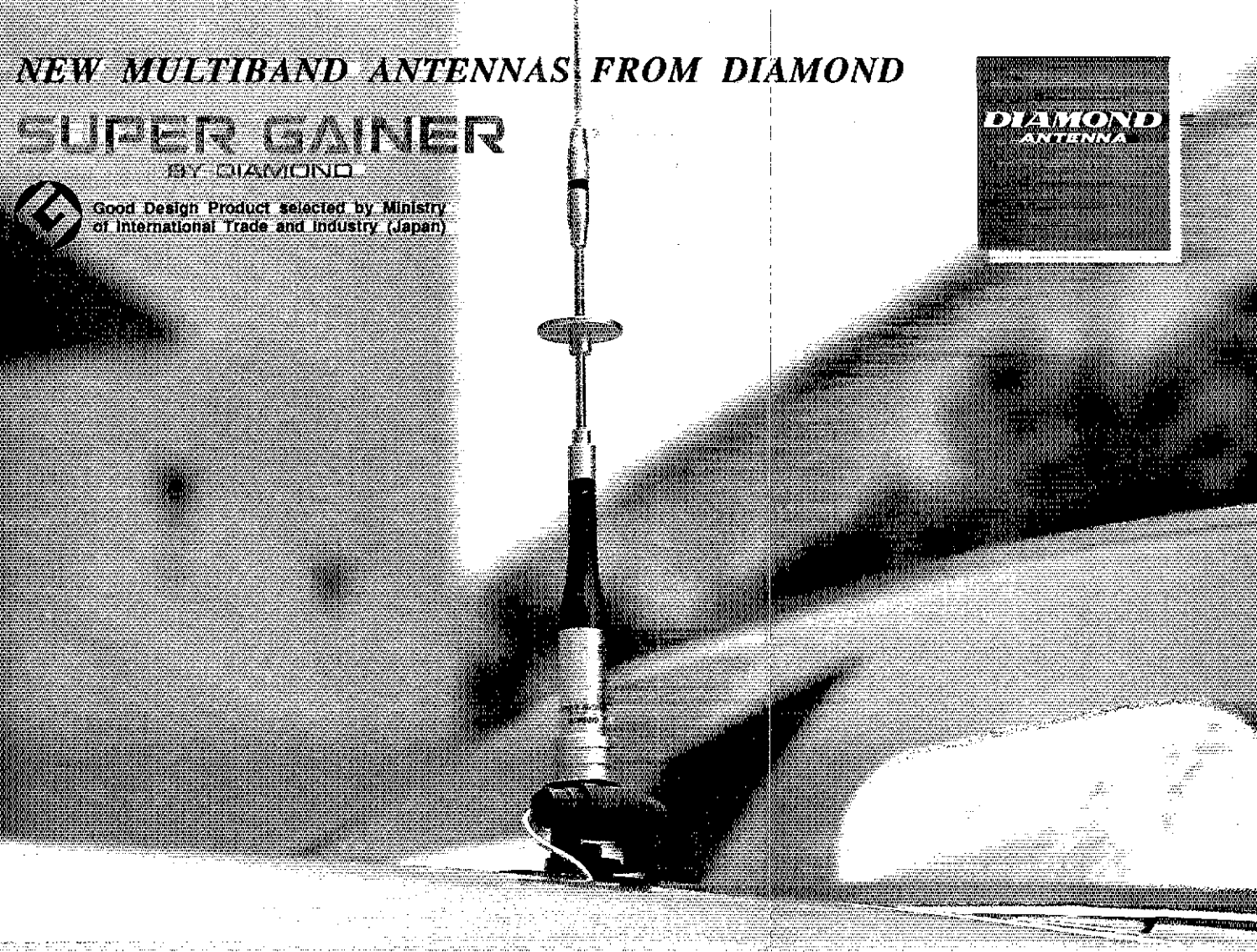

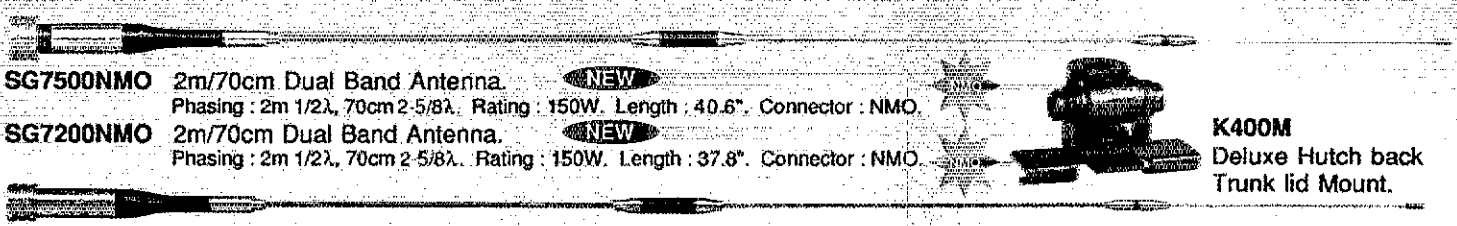

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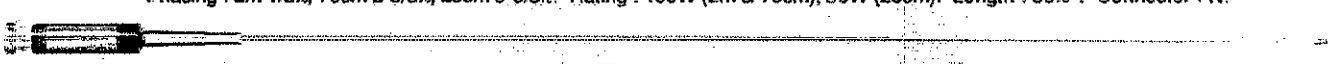

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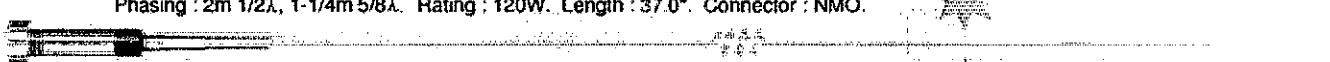

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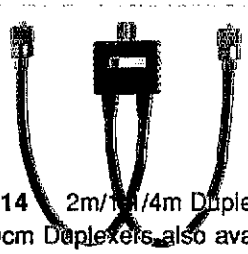

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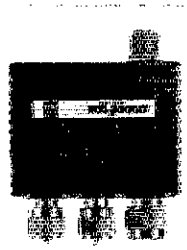

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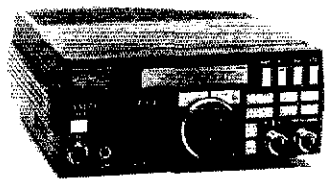

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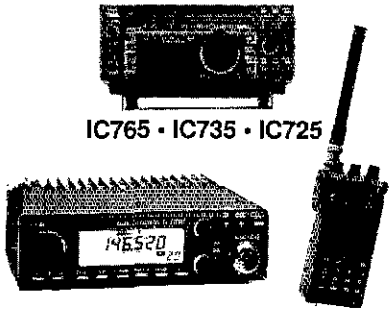

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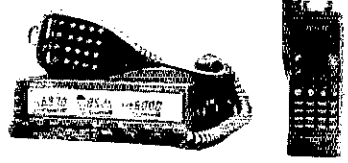

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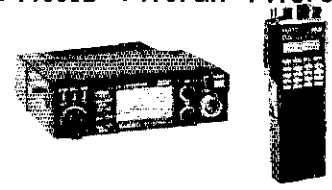

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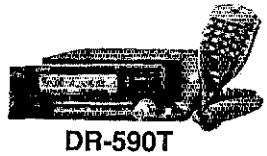

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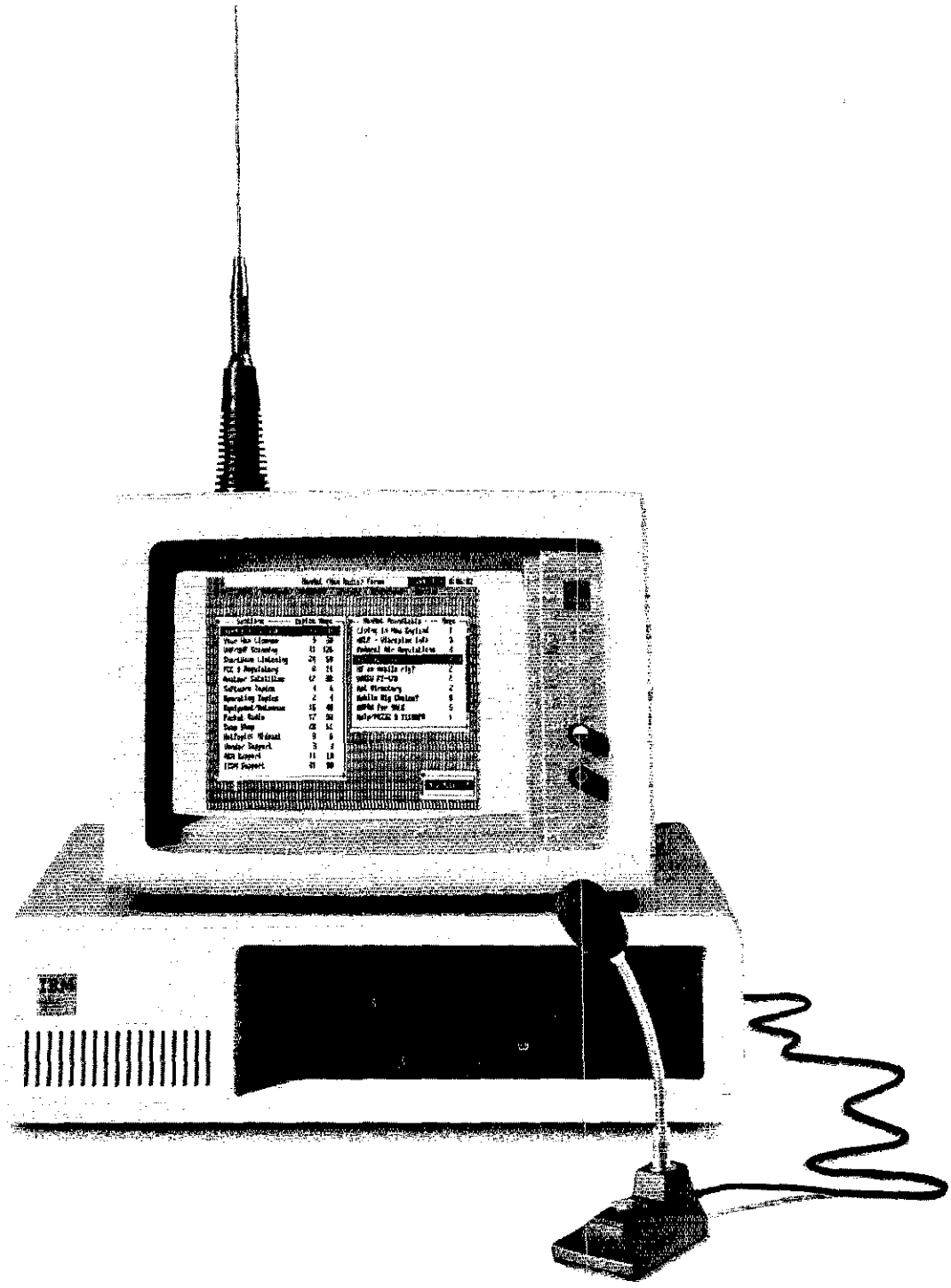

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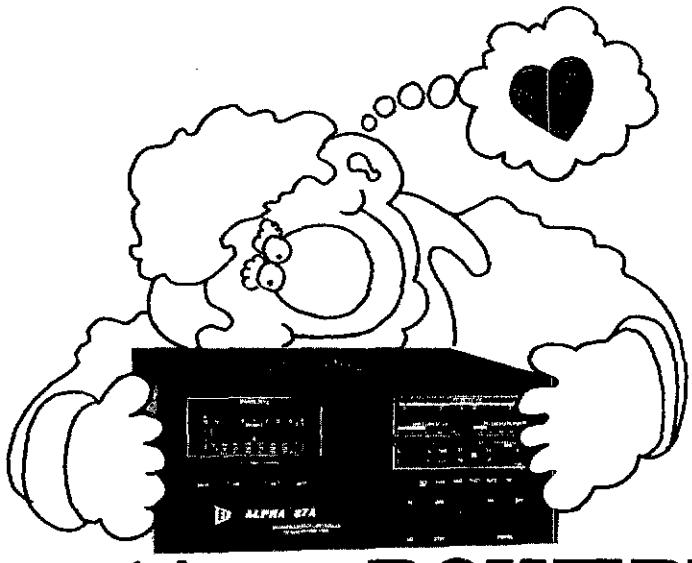

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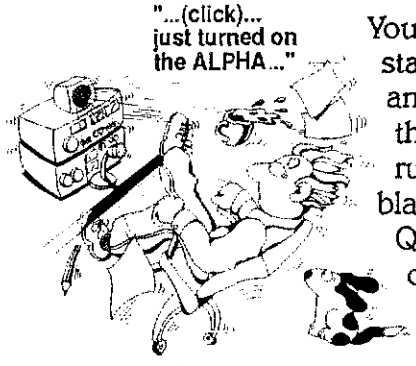

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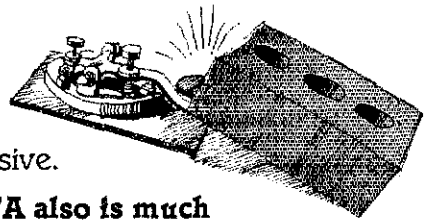

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3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly *printed on an 8-1/2" × 11" sheet of paper.*

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WANTED: US Amateur Callbooks 1920 thru 1945. Bob, W4JNN, 703-560-7161 or write P.O. Box 166, Annandale, VA 22003.

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AVAILABLE: Central Electronics 200V. Contact KD6WW.

NATIONALS WANTED: HRO *Senior* 1934-36, HRO-5, HRO-5A1, HRO-50 Rack Mount, HRO-60 Rack Mount, Canadian Air Force HRO. Bill Smitherman, KD4AF, Rt. 4, Box 79, East Bend, NC 27018.

LET'S TRADE HANDBOOKS!! I Need-1955, 60, 65, 70, 75, 80, 85, any 1930s & 1940s. I Have-1950 (Spanish Edition), 51, 52, 54, 56, 59, 64, 72, 73, 77, 79. Marty Levere, 26 Ellsworth Road, *West Hartford, CT 06107, 203-232-7676.*

SELL: *QST's*, 1959-1972, library bound volumes, except 1960, 1966, excellent condition, $140 firm, shipping extra. Louie, 718-748-9612, please call after 6PM.

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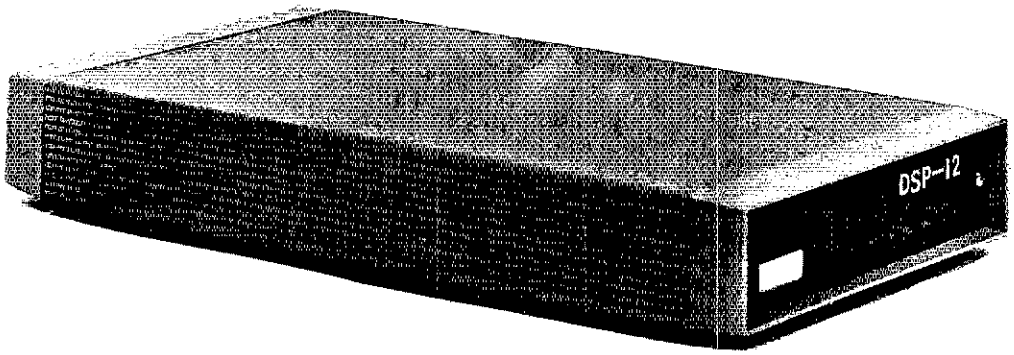

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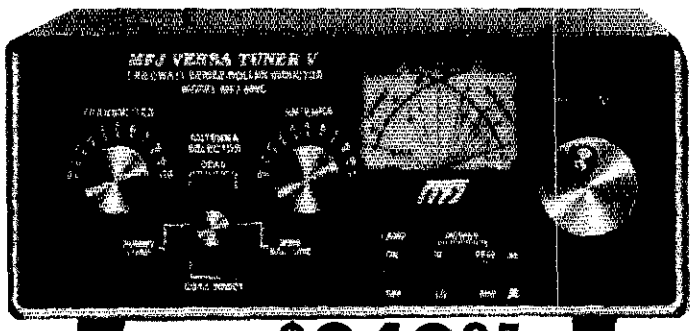

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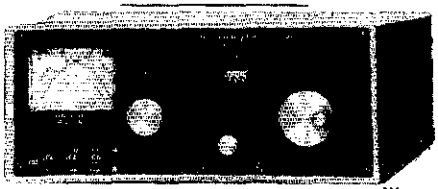

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A **new** current balun for balanced lines reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced for a more concentrated, stronger signal. Add $10 s/h.

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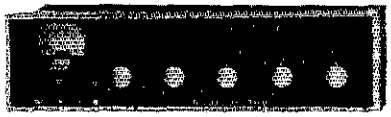

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SWR/Wattmeter reads forward/refelcted power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines (direct or through tuner), random wire, balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. 4:1 balun. 1000 volt capacitors. 10 x 3 x 7 inches.

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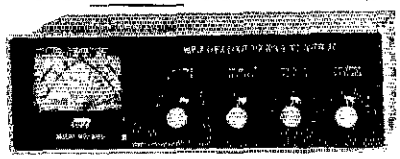

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Small 8 x 2 x 6 inches uses little room. SWR/Wattmeter and convenient placement of controls makes tuning fast and easy while in motion. 300 watts PEP output. Efficient airwound inductor. 1000 volt capacitors. Mobile mount, MFJ-20, $3.00.

144/220 MHz VHF Tuner

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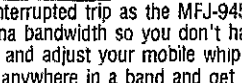

MFJ's new VHF tuner covers both 2 Meters and the 220 MHz bands **plus** you get a built-in **VHF SWR/Wattmeter.** Measures 8 x 2½ x 3 in. 2-knob tuning convenient for mobile or base.

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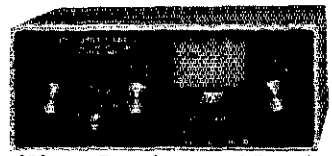

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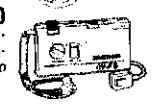

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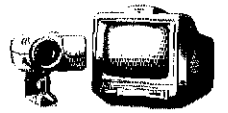

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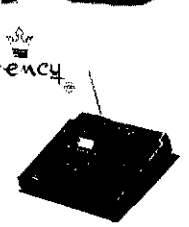

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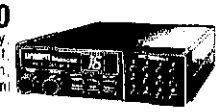

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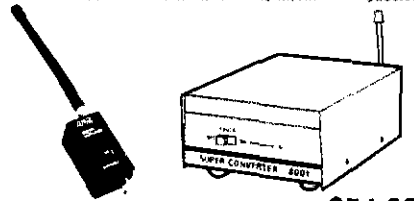
BC855XLT	40 Ch 12 band w/800MHz base	$199.90
BC1	Preprogrammed for police mobile	$119.90
BC590XLT	100 Ch 11 band mobile weather	$199.90
BC760XLT	100 Ch 12 band w/800MHz mobile	$259.90

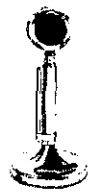


SUPER AMP **$54.90**
Compact pen-amp designed to work w/hand held scanners & amplify the reception of VHF/UHF bands from 100MHz to 1GHz as high as 20dB, adjustable gain control bypass switch

9001 ..... **$74.90**
Super converter is designed to receive frequencies between 810MHz and 912MHz and convert them down to 410MHz through 512MHz, requires 9 volt battery or AC adapter

8002 ..... **$79.90**
Hand held converter, same features as 8001, has bypass switch that allows user to go back to 400MHz without disconnecting the unit, BNC connectors

ASTATIC



D104 Silver Eagle **$69.90**
Chrome plated base station amateur microphone, factory wired to be easily converted to electronic or relay operation. Adjustable gain for optimum modulation

ETS D104 SE **$89.90**
Same as above with end of transmission Roger Beep

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VHF 1 watt, channel 151.625, full featured Motorola final power transistors. Alps steel cased controls & neoprene seals for weather resistance.

PCI150A **$119.90**
UHF 2 watt, 12 channel 464.500 installed full featured, machines aluminum controls, audio accessories plug, waterproof speaker, neoprene seals and special channel monitor button

TS470 ..... **$179.90**

RCI

10 METER transceiver 25 watt can be programmed to split receive, SSB CW, AM, FM, programmable scanning, noise blanker, roger beep, squelch

2950 ..... **$ CALL**

uniden

25 WATT 10 Meter Transceiver, all mode operation, backlit multi function LCD meter, frequency lock, auto squelch, NB, RF gain, PA, external speaker jack, 7¼Wx9¼Dx2½H

HR2510 . . . **$229.90**

PRINTED Circuit Boards for projects in *QST*, Ham Radio, 73's and ARRL Handbook. SASE for list. Far Circuits, 18N640 Field Court, Dundee, IL 60118.

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HOMEBREW Components Catalog SASE. KA7OJY, Box 7970, Jackson, WY 83001.

"HAMLOG" COMPUTER PROGRAM. 18 modules. Full features. Auto-logs, 7-band WAS/DXCC. Apple, IBM, CPM, Kaypro, Tandy, C-128, $24.95. *QST*-KA1AWH, P.O. Box 2015, Peabody, MA 01960.

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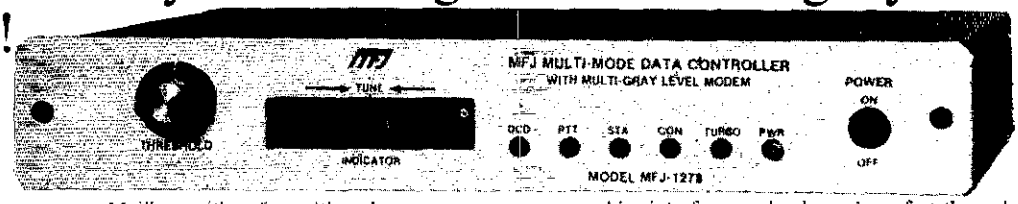
MFJ gives you *all 9* digital modes

and *keeps on* bringing you state-of-the-art advances

. . . while others offer you *some* digital modes using 3 year old technology!

MFJ-1278

$279.95



No 3 year old technology at MFJ!

Using the latest advances, MFJ brings you 9 exciting digital modes and *keeps on* bringing you state-of-the-art advances like new ASA™.

You get tons of features other multi-modes just don't have.

Only MFJ gives you *all 9* modes

Count 'em -- you get 9 fun modes -- Packet, AMTOR, RTTY, ASCII, CW, FAX, SSTV, Navtex and Contest Memory Keyer.

You can't get all 9 modes in *any* other multi-mode at *any* price. Nobody gives you modes MFJ-1278 doesn't have.

The best modem you can get

Tests in *Packet Radio Magazine* prove the modem used in the MFJ-1278 copies HF packet more accurately than all other modems tested.

MFJ-1278 is the *only* multi-mode with a ***true*** DCD circuit. This dramatically reduces sensitivity to noise and dramatically increases completed QSOs.

Exclusive Built in Printer Port

Only the MFJ-1278 has a dedicated printer port that lets you plug in your Epson or IBM compatible printer.

You don't need to buy a silly $40 cable just to plug in your printer.

20 LED Precision Tuning Indicator

MFJ's unequaled tuning indicator makes it really easy to work HF packet. Unlike others, you use it the same for all modes -- not different for each mode. Just tune your radio to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

New Easy Mail™ Personal Mailbox

You get MFJ's new Easy Mail™ Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

Multi-Gray Level FAX/SSTV Modem

You'll see tomorrow's news today when you copy outstanding FAX news photos with crisp clear details. MFJ-1278 is the *only* multi-mode with a built-in multi-gray level modem. It lets you transmit and/or receive multi-gray level pictures with an appropriate terminal program.

NEW! **MFJ's new Automatic Signal Analysis™ gives you *exclusive* HF packet idenification!** **MFJ's** new ASA automatically identifies HF packet, RTTY, ASCII and AMTOR signals. A quick "OK" command selects the mode!

One FREE Upgrade!

When you buy your MFJ-1278 *today*, you don't have to miss new modes and features that come out *tommorow*. **Why?** Because your 1278 comes with a coupon good for one *free* eprom upgrade exchange that'll add new features.

Plus More . . .

Plus you get . . . 32K RAM, *free* AC power supply, Host mode that lets MFJ-1278 serve as a kiss interface or dumb modem, fast throughput anti-collision technology, independent transmit level for each radio port, random code generator, lithium battery backup, RS-232 *and* TTL serial ports, socketed ICs, tune up command, peripheral I/O port, automatic serial numbering, programmable message memories, dual radio ports (*each* HF or VHF), CW paddle jack, audio amplifier and speaker jack so you can monitor CW sidetone, transmit and receive audio and packet connect bell, ***new*** fully intergrated instruction manual with *Fast Start*™ booklet and more. 9½ x 9½ x 1½ inches.

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You get MFJ's one year No Matter What™ Guarantee.

That means we will repair or replace your MFJ multi-mode (at our option) *no matter what* happens to it for a year.

Others give you a *limited* warranty. What if *they* say, "Sorry, your *limited* warranty doesn't cover *that*?"

Get 9 new ways of having fun

Don't settle for 3 year old technology.

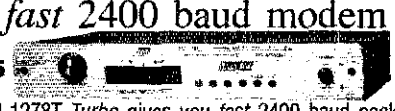
Choose the only multi-mode that gives you the latest advances and all 9 modes.

Get 9 new ways of having fun *today!*

New MFJ-1278T *Turbo* with *fast* 2400 baud modem

MFJ-1278T

$359.95



The new MFJ-1278T *Turbo* gives you *fast* 2400 baud packet -- *twice* the baud rate of any other multi-mode. By communicating faster you'll reduce chances for error, lessen congestion and more efficiently utilize our ham frequencies. You'll also get 1200/300 baud for compatibility with older TNCs.

The 2400 baud modem is also available separately. Order MFJ-2400, $69.95, for any MFJ and most other TNCs.

Software Pack gets you on the air *instantly!*

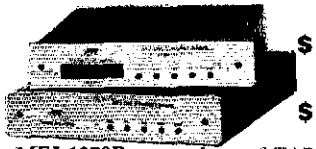
MFJ software packs with interface cable get you on the air instantly if you use an IBM compatible, Commodore or Macintosh computer. Here are some of the programs available:

MFJ-1289, $59.95. Menu driven. Super IBM compatible program. See ad below for details.

MFJ-1282B, $39.95. New with multi-gray receive for Commodore 64/128. Menu driven.

MFJ-1287, $24.95. Macintosh starter pack.

MFJ Packet Radio



MFJ-1274

$159.95

MFJ-1270B

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MFJ-1270B super clone of TAPR's TNC-2 gives you more features than *any* other packet controller -- for $139.95

You can double your fun by operating VHF and HF because you get ***high performance*** switchable VHF/HF modems.

You get the Easy Mail™ Personal Mailbox with soft-partitioned memory so you and your buddies can leave messages 24 hours a day.

In MFJ's new **WeFAX** mode you can print full-fledged weather maps to screen or printer and save to disk using most computers.

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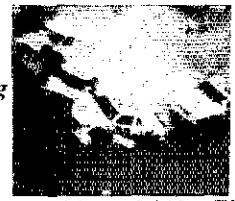
You also get 32K RAM and a free 110 VAC power supply (or use 12 VDC).

For dependable HF packet tuning, the MFJ-1274 gives you a high resolution tuning indicator -- and it's only $20 more.

New 2400 baud ***Turbo*** models available: **MFJ-1270BT,** $209.95; **MFJ-1274T,** $229.95.

New MFJ MultiCom™ . . . exciting new 1278 software

High resolution AP news photo received on 20.738 MHz using MFJ MultiCom and MFJ-1278 with multi-gray modem.



MFJ-1289

$59.95

New menu-driven MultiCom™ brings out the full power of your MFJ-1278 with multi-gray modem. No set-up required — just load and use. You get incredible high resolution WeFAX maps and AP news photos right off HF. You also get color packet pictures and multi-gray SSTV.

Bursting with features . . . One-Key Macros™ combine multiple keystrokes into a single touch, Call-Alert™ sounds an alarm when any characters you tell it to watch for come in, Auto-Set™ instantly switches entire stored sets of parameters, Auto-Router™ stores digipeater node routes for instant use, Packet Multi-Plex™ lets you transmit or receive a binary file and continue your QSO, Multi-Word™ gives a powerful word processor that is tailor-made for multi-mode communications.

Custom QSL created with paint program

Multi-Gray WeFAX weather map received on 16.410 MHz using MFJ MultiCom and MFJ-1278 with multi-gray modem.

can be transmitted by FAX, SSTV or Packet. On-line help. RS-232 cable. Tons more. Call for ***free*** MFJ catalog for full information: **800-647-1800.**

Optional MFJ-1292 digitizer, $199.95

. . . lets you instantly point, shoot and transmit a video picture -- all in one smooth sequence

Transmit your very own digitized pictures all over the world by packet, FAX or SSTV. MFJ MultiCom™ lets you integrate the MFJ-1292 "Picture Perfect" Video Digitizer, $199.95 with your MFJ-1278 for shooting and transmitting your pictures in one smooth sequence.

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(601) 323-5869; **TELEX:** 53 4590
FAX: (601) 323-6551; Include s/h.

MFJ . . . making quality affordable

Revolutionary NEW . . .

MFJ SWR Analyzer

MFJ's innovative new SWR Analyzer gives you a *complete* picture of your antenna SWR over an entire band — *without* a transmitter, SWR meter or *any* other equipment!

All you do is plug your antenna into the coax connector, set your SWR Analyzer to the frequency you want and read your SWR.

Setting up and trimming your antenna: Super simple and super accurate

You can instantly find your antenna's true resonant frequency right at your feedline -- that's something a noise bridge just can't do.

You can monitor SWR changes as you adjust your beam or vertical — you'll know right away which way to adjust it.

You can shorten or lengthen your dipole and see the effect immediately.

The MFJ SWR Analyzer is battery operated and handheld size so you can take it right to your antenna. It makes it sooooo easy to work on your antenna until it's just the way you want it.

Create your perfect multi-band antenna

You can instantly check multi-band dipoles and trap verticals to see if the low SWR points are where you want them and adjust your antenna until they're right.

Mobile Antennas made easy

You'll find the perfect adjustment for your mobile whip in seconds by actually seeing the SWR as you pull the whip in and out without transmitting

You can easily find the ideal place on the car for your mobile antenna by checking different spots with the SWR Analyzer.

All kinds of uses

You can see how the SWR varies over your entire band and quickly find your usable 2:1 SWR bandwidth.

You can see your SWR change as you drive under an overpass and see how mobile whip flutter affects SWR.

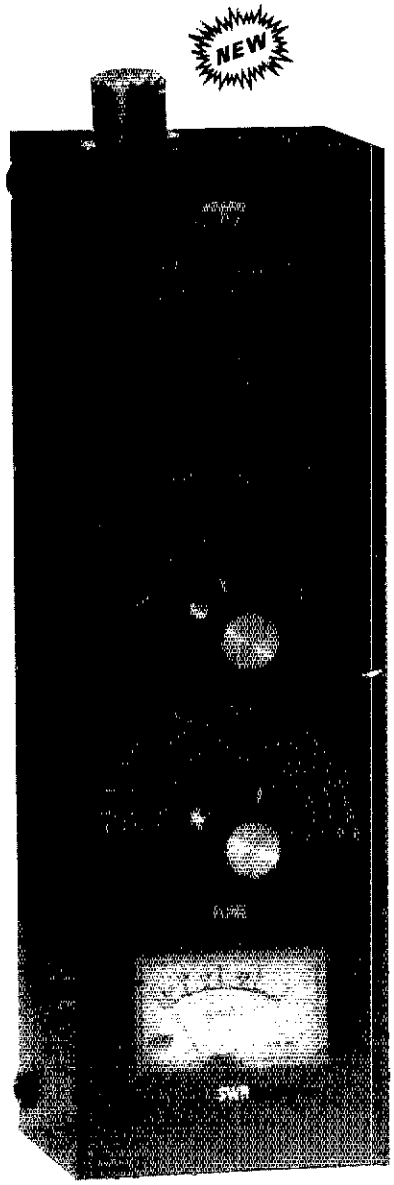
You can see what happens as you swing your beam toward the power line or away from your tower.

You can see how rain or snow affects your beam.

You can tune up your antenna tuner without transmitting.

You can check the SWR of the input to your linear amplifier.

You'll find all kinds of uses for this totally self-contained handheld unit that'll revolutionize how SWR is measured.



MFJ-207 **$99.95**

Super Value: Several Instruments in One

You get a super value because several instruments are combined into a single portable handheld unit.

It has a low distortion RF generator that covers 10-160 meters, an SWR bridge that gives forward and reflected components and a computing circuit that automatically computes the SWR and displays it on the meter.

Everything is automatic. All you do is set the frequency and read SWR. It also has a frequency counter output so you can connect a frequency counter for precise digital readout.

Use 9 volt battery or 110 VAC with MFJ-1312, $12.95, 7½" x 2½" x2¼".

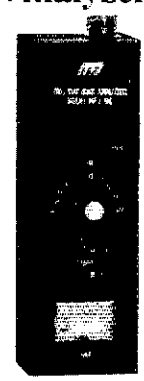
The best way ever to measure SWR

Here's the best way ever to measure SWR . . . so get yours today!

MFJ VHF SWR Analyzer

MFJ-208

$89.95 NEW

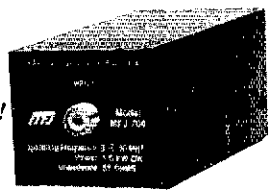


If you operate 2 meters this new MFJ-208 VHF SWR Analyzer helps get your antennas in tip-top shape. Just plug in the coax to find the SWR of any antenna from 142-156 MHz. Use 9 volt battery (not included) or 110 VAC with MFJ-1312, $12.95.

MFJ Low Pass Filter

MFJ-704 Regular Price: ~~$39.95~~

LOW SALE PRICE! **$29.95**



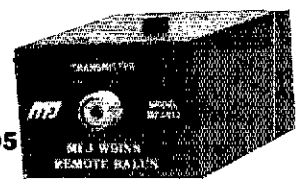
Now you can eliminate or minimize TVI problems caused by harmonics with this new MFJ Low Pass Filter that connects between your transceiver and antenna. It's the best way to ensure that your transceiver does not cause harmonic interference to your neighbors' TVs -- you can operate in peace while your TV watching neighbors completely miss out on the fun of ham radio.

Handles full legal power from 0 to 30 MHz. SWR below 1.15:1 to 30 MHz. High harmonic attenuation. Low insertion loss. One year unconditional guarantee.

W9INN Balun Box

NEW

MFJ-912 **$39.95**



Permits using coax from your wide range T-network tuner to the MFJ-912 W9INN Balun Box mounted outside the building. The MFJ-912 then converts the unbalanced coax to the balanced transmission line (ladder line). Provides the same function as the internal balun except it is located remotely from the tuner.

With an adequate tuner will permit feeding any balanced transmission line this way.

Retains flexibility and efficiency of the ladder line feed without bringing the ladder line into the shack. One year unconditional guarantee.

DC-650 MHz Dummy Load

MFJ-264 Regular Price: ~~$89.95~~

LOW SALE PRICE! **$59.95**

One dummy load that covers 160 Meters through 650 MHz and QRP through 1500 watts!

SWR is below 1.1:1 to 30 MHz, below 1.3:1 to **650 MHz.** Run 1500 watts for 10 seconds, 100 watts for 10 minutes. 3" x 3" x 7". Guarantee.

Nearest Dealer/Orders: 800-647-1800

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(601) 323-5869; **TELEX:** 53 4590
FAX: (601) 323-6551; Add $5 s/h.

MFJ . . . making quality affordable

Sale price offer subject to cancellation without notice or obligation.

WANTED: ICOM IC-02AT, 2M Handy, used, ok and working. Also BP-3's dead or alive. Rick, KA7CHT, 801-224-8080 days.

GENERATORS—New 1500W "brushless" lightweights, $448, free UPS shipping contiguous US. Used, surplus, all types bought & sold. Frank Strenk, N3FGH, 521 N. 4th Street, Telford, PA 18969-2132, 215-723-8223.

88' TRI-EX HZ588N Heavy Duty Telescoping Tower, $2500. W9AR, 708-272-2443.

KLM KT34, Ham IV Rotor, Rohn top section w/roof base. Best offer package only, pickup only Chicago area. Dan, NQ8N, 708-416-8167.

PERSONAL COMPUTER INTERFACING-Practical Instrument Automation, Networking and Control Techniques, including microcontrollers. A 3-day hands-on workshop at the Virginia Tech campus, Washington, DC and Charlotte, NC. $595. Blacksburg, VA March 21, 22, 23; Washington, DC June 6, 7, 8; Charlotte, NC July 18, 19, 20 and Blacksburg, VA August 22, 23, 24. Dr. Roy Jones, 703-231-5242/231-6478.

TRI-EX H2R-N 72 ft full-rotating electrically raised (and lowered) tower with 18 ft heavy duty mast and all hardware. Weighs 1850 pounds. Will support over 30 square ft at over 100 mph! $5000 FOB Oakhurst, CA. WA6NWP, 209-642-3363.

STRIP CHART RECORDER, Dual Channel, Brush-Gould Mdl# 2200-S with two DC-Amps (13-4615-10). Manuals and Chart Paper, G/C, $1900. Joe, WB2HED, Troy, NY, tel. 518-272-2905.

PHOENIX, Arizona Ham Home and Antenna Farm For Sale. The beautiful large home has 3 bedrooms, 1-3/4 baths, sunken living room, new carpeting and built-ins. Home is super-insulated with many desirable features and is located in a quiet residential neighborhood. The main tower is a Tri-Ex HZ471N crank-up with 3 Wilson monobanders, 10M-15M-20M. At 102' is a Diamond X-500 2M and 440MH vertical. The second tower is a Hygain 18HT. This setup is ideal for the serious ham who wants a very comfortable home and a high performace antenna system. $96,500. Jack, KG7BN, 1-602-439-5262.

YAESU FT-107M, internal power supply, desk mike, completely reconditioned, $495. Hallicrafters SR-500, 500W PEP, with mike, completely reconditioned, $195. Neal Graham, 26 Andrews Avenue, South Burlington, VT 05403, 802-658-4850.

TEN-TEC Paragon w/Filters and FM Board, Matching Power Supply/Speaker & Electret Desk Mike. Mint condition, original boxes and manuals. Complete station $1700 shipping included to 50 states or Canada. Fabio Fumagalli, N2GWT, 212-582-2549 weekdays or 914-254-4864 weekends.

MADISON: Kenwood, ICOM, Yaesu-Call. Madison Electronics, 12310 Zavalla, Houston, TX 77085, 1-800-231-3057, 1-713-729-7300.

WANTED: Collins S-Line, working or not, tubesters, mods, state condition and price first letter. Frank Krozel, K8JH, 27 West 235 Lennox Road, Wheaton, IL 60187, 708-653-9090.

MINT ICOM IC-28H 2 Meter FM Transceiver, both 5W low & 45W high power, used about 20 hours with Astron RS-20A Power Supply. $450. K9AGB, 217-245-8258.

SELL: Kenwood TS820, VFO820, Heath SB220, SB650 Scope, HD15 Phone Patch, HD10 Electronic Keyer with Vibroplex Paddle, Drake MN2000 Transmatch, Shure 444 Microphone, Telex Procom 100 Headphones, World Clock, $995 or best offer. Call N2TF, 716-692-5451.

ALPHA 76PA Amp, three 8874's, mint, $1500. KK9A, 708-516-0042.

WANTED: C-64 Amtor RTTY Software e.g. Hamtext, MBA-TOR. Scott Walker, 717-770-7406 or 717-774-2567.

EIMAC (2) 4CX250B, (4) RCA 7580 unused. Best offer. K3HSS, 215-342-4398.

FOR SALE: like new, complete station for $1000. Hy-Gain SSB/CW transceiver #3750, SWR meter, Hy-Gain speaker #3850, Hy-Gain VFO #3855, mike, TA-33 antenna, heavy duty rotor, control, co-ax, cable. K0SAZ, 507-282-0445.

WANTED: Drake T4XC Transmitter in good condition. John Magnuson, WB0EEG, 501 Loch Lane, Columbia, MO 65203.

100 ASSORTED Components mostly Radio Shack, new, $22.50 postpaid. John Uscinowski, RR #1, Box 379, Greenwich, NY 12834.

WANTED: Heathkit AR-14 FM Receiver, Kenwood TS-140. W4NBK, 822 Pack's Mtn. Ridge, Taylors, SC 29687, 803-895-1275.

FOR SALE: Heathkit Amp 10 thru 80 meters SSB 220 Tri Ex 50' Tower tilt over-crank up. Cushcraft A3 Antenna 10-15-20 mtrs. Alliance H/D Rotor H/D 73-1. Astiac Mike D104 new. $900 or best offer. WB6YIQ.

HEATH SB-221 Linear with 10 meters. Prime condition $550 to licensed Ham. Pick up only. Lew Prescott, W1RFQ, 15 Loring Drive, Lincoln, RI 02865, 401-725-9887.

WANTED: HF element (below 30 MHz) for Sierra model 164B RF wattmeter. Also need SO-239 wattmeter connectors. Bob Powell, 4644 South 2030 West, Salt Lake City, UT 84119, 801-969-9250.

SELL: Murch UT-2000A-LS $75, ICOM SM-10 $90. KI5DG, 3 La Quinta Court, Rogers, AR 72756, 501-271-2162.

REWARD! For Clean Heath DX-35 or HX-11 Xmtr! Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53220-0803.

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur Radio public domain software for $4 disk. SASE for catalog. Specify computer! WA4EFH Hamsoft, Box 1646, Orange Park, FL 32067-1646.

NEED TS-830S VFO unit with dial. Contact K4UO via W4LPO.

QST's-any issue 1930 to date $5 ppd. Please inquire about other dates. Parker, W1YG, 87 Cove Road, Lyme, CT 06371.

WANTED: Panasonic AG-100 camcorder junker for parts. Marvin Moss, W4UXJ, Box 28601, Atlanta, GA 30358.

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PROBEMASTER 4101 HIGH FREQUENCY OSCILLOSCOPE PROBE $24.95

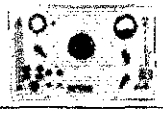
- SWITCHABLE X1, X10; RUGGED PROBE
- BANDWIDTH OF 15 MHz (X1); 200 MHz (X10)

Includes sprung hook, 6" ground lead, spare tip, IC test tip, tip insulator, trimmer tool, and storage pouch.

AUDIO OSCILLATOR MILITARY TS382 SERIES $59.00

- 20 Hz - 200 kHz
- OUTPUTS 100 mW POWER
- 10 V OUTPUT
- DISTORTION 3%

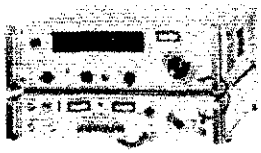
A great oscillator for checking wide band amps, measuring distortion, and modulating RF oscillators. We have A through F models. First come first choice.



HP 2590A MICROWAVE FREQUENCY CONVERTER $400.00

- 500 MHz - 15 GHz FREQUENCY RANGE
- SENSITIVITY IS -20 dBm - 10 GHz, -7 dBm TO 15 GHz
- AUTOMATIC GAIN CONTROL
- MEASURE FM DEVIATION, DEVIATION RATE AND AM MODULATION

This is a compact, all solid-state instrument that performs the functions of a transfer oscillator and a transfer oscillator synchronizer. Measures frequency drift over long periods, carrier frequency of pulsed signals and accurate CW frequency measurements.



2590A shown with 5245L Counter and 5253B Plug-In (sold separately).

HP 5245L FREQUENCY COUNTER SALE PRICE $250.00

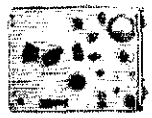
Now you can own one of the most versatile frequency counters ever built! Almost everyone who has been in the electronics business for the last 30 years has used one at one time or another.

- DC TO 50 MHZ (EXPANDABLE TO 18 GHZ)
- MEASURES PERIOD, MULTIPLE PERIOD & AVERAGE
- MEASURES RATIO & MULTIPLE RATIO
- ACCURATE TIMEBASE (2 PARTS IN 10^{-10})
- ALL SOLID STATE DESIGN

These won't last long at this price, so pick out a plug-in (or plug-ins) that will do your job, from the list below, then give us a call!

URM-25F SIGNAL GENERATOR $149.00

- FREQUENCY RANGE 10 kHz TO 50 MHz IN 9 BANDS
- 0.1 μV TO 0.1 V INTO 50 Ω
- 2 V INTO OPEN CIRCUIT
- 0 TO 50% AM MOD.
- INTERNAL 400 Hz & 1000 Hz MOD. FREQUENCIES

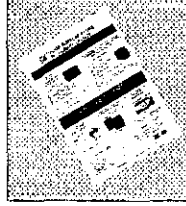


This ruggedized unit is portable and lightweight (35 lbs). Contains a crystal calibrator for high accuracy applications. Complete with the lid; less accessories.

TRANSISTOR TEST SET MILITARY USM206 $39.00

- FOR PNP OR NPN TRANSISTORS
- IN/OUT CIRCUIT BETA MEASUREMENTS ON X1 OR X10 RANGES
- ELECTRODE RESISTANCE MEASUREMENTS IN CIRCUIT CHECK RESISTANCE EMITTER-BASE, COLLECTOR-BASE, OR COLLECTOR-EMITTER.
- I_{CO} MEASUREMENTS OUT OF CIRCUIT ON X1 OR X10 RANGES
- DIODE I_R MEASUREMENTS OUT OF CIRCUIT ON X1 OR X10 RANGES.
- CHECK DIODE IN CIRCUIT FOR OPEN/SHORT CONDITION
- PORTABLE; USES 6 "D" CELL BATTERIES; EQUIPPED WITH BATTERY CHECK CIRCUIT

Sturdy unit comes complete with In Circuit Probe, cover and technical manual.



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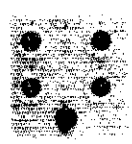


5251A Frequency Converter $ 50.00
Increases counter range to 100 MHz at 50 mV sensitivity.

5252A Prescaler $ 50.00
Increases counter range to 350 MHz at 50 mV sensitivity.

5253B Frequency Converter $ 70.00
Increases counter range to 512 MHz at 50 mV sensitivity.

5261A Video Amplifier $ 50.00
Increases basic counter sensitivity to 1 mV at basic frequency.

5262A Time Interval Unit $ 50.00
For measuring pulse length, spacing, and delays.

5265A DVM Unit $ 50.00
Converts counter to a digital DC voltmeter with 10, 100, and 1000 V ranges.

SAVE OVER $ 2,100.00!

BALLANTINE 9601M (MILITARY USM 413) $ 49.00

- 500 μV TO 500 V
- 10 MΩ INPUT Z
- 10 Hz TO 1 MHz
- AC AMP OUT
- LINEAR dB MIRRORED SCALE

This True RMS Analog AC Meter was manufactured for the U.S. Air Force in the 1980's for $ 2,250.00. Conforms to OSHA and UL requirements. Comes equipped with ruggedized case and probe. Can optionally be operated with an internal battery pack (11 C cells) for 8 hours, but will work standard on 110 VAC. Checked to be fully operational.

A SERVICEMAN'S DREAM! EXTECH 380911 $89.00 MULTIFUNCTION METER

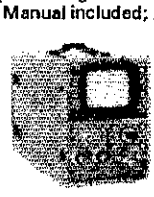
- 3 1/2 DIGIT
- AC CLAMP ON CURRENT 10 mA - 300 A
- AC & DC VOLTAGE TO 750 V
- CONTINUITY TESTER
- TEMPERATURE MEASUREMENT °F & °C
- DIODE TEST
- FREQUENCY COUNTER TO 2 kHz

At last, a digital multimeter that's designed to be used by the serviceman! This meter would be great for servicing air conditioning systems, autos, etc. Factory new with 1 year warranty.

RUGGEDIZED HP 180A SCOPE MILITARY AN/USM 281 SPECIAL PRICE $ 279.00

- DUAL CHANNEL 1 mV/div TO 20 V/div
- DC TO 50 MHz BANDWIDTH
- 23 STEP TIME BASE 10 nsec TO 2 sec/div
- DELAYED TIME BASE 0.1 μsec TO 20 sec
- WEIGHS 22 POUNDS (UPS SHIPPABLE)

Military version of the HP 180A Scope with a 1801A Vertical Plug-in and a 1821A Timebase. There are many other plug-ins available such as TDR's, spectrum analyzers, etc. The Mainframe 180A is actually usable to 100 MHz. All solid state. Snap up this bargain 50 MHz Scope while supplies last! Manual included; Accessories sold separately.



COMMODORE 64 HAM PROGRAMS—8 disk sides-over 200 ham programs-$16.95. 25 cent stamp gets unusual software catalog of utilities, games, and British disks. Home-Spun Software, Box 1064-Q, Estero, FL 33928.

PHASE V License Upgrade Software-For information write or call Calena Ware Products, 3102 Wilma, Wichita, KS 67211, 316-685-0747. $15/module. (WC6S/WS6X.)

SELL 4 El TET 443DX HF Beam 40-20-15 & 10M exc cond $325. W6GLG, Box 1010, Conifer, CO 80433.

R4C Late Serial 15 Accessory Crystals, 4NB, FL-1500, FL-250 and MS4. Pair of Sherwood CF2K/8's plus CF600/6 with four filter switch kit. Custom knob and switch sets. More, $700 in Sherwood improvements. $475 offers. Sony 2010 with Radio West DX Filter Mod plus almost new ANI Antenna $400. Realistic Pro 2005 Scanner $300. Uniden BC200XLT almost new $210. Jim, WB4ZCD, 606-441-9684.

ANY MODS For Hallicrafters FPM300II? K5TVC.

WANTED: Collins KW-1. Joel Thurtell, 382 N. Harvey, Plymouth, MI 48170, 313-453-8303.

WANTED: Heathkit Power Supply Model HP-24. Robert, KF8GK, 209 Primrose, Martinsburg, WV 25401.

FOR SALE: MFJ-484C Keyer $85; Ten-Tec 585 Paragon with 961 Power Supply, 705 Mic, 282, 285, 288 Filters, 258 RS-232 Interface, 256 FM Option, and 258-IBM Control Program $1675; Ten-Tec 254 Antenna Coupler $75. Paragon less than year old; as new condition. Call AA4DI, 919-756-8758.

FOR SALE: two mobile Mark Model CV-3160, 148-174MC, 4.5 dB gain, 6' long antennas plus one heavy duty spring and swivel joint mounting bracket. Chicago area only. $35 each. Call W9NJZ, 708-766-1166.

WANTED: Radiotron Designer's Handbook, 4th Edition. RCA Receiving Tube Manual, RC-21. RCA Electron Tube Handbook, HB-3. Ed Warden, 510 Rolfe Avenue, Lynchburg, VA 24503.

FOR SALE: Vic 20 with books, pwr supply and data cassette w/CW RTTY program tape also 1500 watt Murch 2000A Ant Tuner. KT3K, call 215-398-9720.

TUNER, MFJ 949-C, $115. Keyer with Bencher Paddle, MFJ-422, $100. Both mint. You ship. Jack, K5EQ, 3104 Robin Road, Plano, TX 75075, 214-596-5293.

WANTED: Ham Equipment And Other Property. The Radio Club Of Junior High School 22 NYC Inc. is a non-profit organization, granted 501(C)(3) status by the IRS, incorporated with the goal of using the theme of Ham Radio to further and enhance the education of young people nationwide. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. As 1991 begins please look over whatever unwanted equipment you may have, and call us. We will pick up or arrange shipping. You will receive the tax deduction, but most important, the privilege of knowing that your gift really made a difference in the education and upbringing of a child. Write us at: The RC Of JHS 22 NYC Inc., P.O. Box 1052, New York, NY 10002. Round the clock hotlines: Voice 516-674-4072, FAX 516-674-9600.

ANTENNA TUNER MFJ 9898 3KW 1.8-30 MHz $200. Sal, NX2R, 201-768-7776 after 6PM.

FOR SALE: Washington DC area. 3br, dr, lr, 2 baths, kitchen, wood stove plus electric plus gas heat. Full basement with radio room, office, storage room, shop and laundry. Underground utilities, 10 acres no TV! Two car garage. The K4RZ (Honor Roll) fire lookout tower at 1800 ft. walk up, no climbing. Will support about anything you can dream up! With 10-15-20 meter beams, prop pitch driven with RG-17 and hard-line feeds. AC power on top with intercom to house. 1 hr 15 mins to DC, 45 mins to Dulles. Available early 1991 at $275,000. Frank Hoose, P.O. Box 209, Bluemont, VA 22012, 703-592-3891.

WANTED: Yaesu FV901 VFO. W6NVA, 213-644-9084.

KENWOOD FM 430 Wanted. Premium price. Ray Knight, 13 Maple Street, Norway, ME 04268, 207-743-6690.

LONG WAVE and 1750 Meter Products and Kits. Free brochure. Mail SASE to Curry Communications, 852 N. Lima Street, Burbank, CA 91505.

HEATHKIT Frequency Counter Model SM-24107, no kit, $150. K1IPW, 203-378-0710 after 2PM.

COLLECTOR, restorer wants KW-1, 30K, 75A; any old amateur transmitters, tubes, parts by Collins, National, Rel, Harvey, Gross, Utah; old catalogs, manuals, schematics, etc. Parker, W1YG, 87 Cove Road, Lyme, CT 06371, 203-434-7783.

SELL: Test Equipment; Heath IM17 Utility Meter, IM18 VTVM, IM38 AC VTVM, IG5282 Audio Generator, ID101, Electronic Switch, IP18 Power Supply, IT12 Signal Tracer, IP 2717A Regulated Power Supply, Ramsey DM700 Multimeter. All for $399 or best offer. Call N2TF, 716-692-5451.

MINT YAESU FT107M Transceiver-includes WARC Bands & 12 Memories. Extra 2.1 KHz Filter & Built-in Power Supply. Over 300 coutries worked. $450. K9AGB, 217-245-8258.

WANTED: Collins PA581, SM3, 30S1, Eimac 3CV1500A7, 3CX1200A7, 8874, Alpha PA70V junker or parts, Sigma XR3000D, HRO 500/600, Tektronix 7A26, 7B53A, 7L5, WD5JFR, 4161 Oak Road, Tulsa, OK 74105, 918-742-1845, 800-364-4265.

SALE MOVING! 8877 amps. 6 mtr. 2 mtr. 1¼ mtr. Low hours. Plated custom aluminum chasis. Silver plated tanks. Simpson meters. Self contained switching and antenna relays. Use your own power supply. $800 each. Vic Foschini, 717-548-3164 after 7 PM.

1991 CALLBOOKS: Until 2/25/91: North American, $25.50; International, $25.50. Both $49.50. 1991 ARRL Handbook, $23.50. Postpaid USA. (California residents: add $1.55 tax/book.) Duane Heise, AA6EE, 16832 Whirlwind, Ramona, CA 92065, 619-789-3674 (eves).

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Emergency Operations Center has expanded to our new two acre facility and World Headquarters. Because of our growth, CEI is now your *one stop source* for emergency response equipment. When you have a command, control or communications need, essential emergency supplies can be rushed to you by CEI. As always, for over twenty two years, we're here and ready to help.

Our RELM two-way radio transceivers were especially created for government agencies. When you need to talk to police, fire, ambulance, or state, federal and international response forces, RELM transceivers may be quickly programmed for up to 48 frequencies. Listed below, are some of our most asked about transceivers. For additional assistance, call CEI at 313-996-8888.

NEW! RELM® RSP500-A

List price $465.00/**CE price $319.95/SPECIAL**
20 Channel • 5 Watt • Handheld Transceiver
Frequency range: 148-174 MHz. continuous coverage. Will also work 134-148 MHz with reduced performance.
The *RELM* RSP500B-A is our most popular programmable 5 watt, 20 channel handheld transceiver. You can scan 20 channels at up to 40 channels per second. It includes CTCSS tone and digital coded squelch. Snap on batteries give you plenty of power. Additional features such as time-out timer, busy-channel lockout, cloning, plug-in programming and IBM PC compatability are standard. It is F.C.C. type accepted for data transmission and D.O.C. approved. We recommend also ordering the **BC45** rapid charge 1½ hour desk battery charger for $99.95, a deluxe leather case **LC45** for $48.95 and an external speaker microphone with clip **SM45** for $59.95. Since this radio is programmed with an external programmer, be sure to also order one **PM45** at $74.95 for your radio system.

NEW! RELM® UC102/UC202

List price $128.33/**CE price $79.95/SPECIAL**
Now...Handheld gear you can afford.
CEI understands that all agencies want excellent communications capability, but most departments are strapped for funds. To help, CEI now offers a special package deal on the RELM UC102 one watt transceiver. You get a UC102 handheld transceiver on 154.5700 MHz., flexible antenna, battery charger and battery pack for only $79.95. If you want even more power, order the RELM **UC202** two watt transceiver for only $114.95.

NEW! RELM® RH256NB-A

List price $449.95/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority Time-out timer • Off Hook Priority Channel
The *RELM* RH256NB is the updated version of the popular RELM RH256B sixteen-channel VHF land mobile transceiver. The radio technician maintaining your radio system can store up to 16 frequencies without an external programming tool. All radios come with CTCSS tone and scanning capabilities. This transceiver even has a priority function. A 60 Watt VHF 150-162 MHz. version called the **RH606B** is available for $429.95. A UHF 15 watt, 16 channel similar version of this radio called the **LMU15B-A** is also available and covers 450-482 MHz. for only $339.95. An external programming unit **SPM2** for $49.95 is needed for programming the LMU15B.

NEW! RELM® LMV2548B-A

List price $423.33/**CE price $289.95/SPECIAL**
48 Channel • 25 Watt Transceiver • Priority
RELM's new LMV2548B gives you up to 48 channels which can be organized into 4 separate scan areas for convenient grouping of channels and improved communications efficiency. With an external programmer, your radio technician can reprogram this radio in minutes with the **PM100A** programmer for $99.95 without even opening the transciever. A similar 16 channel, 60 watt unit called the **RMV60B** is available for $489.95. A low band version called the **RML60A** for 30-43.000 MHz. or the **RML60B** for 37-50.000 MHz. is also available for $489.95.

RELM® Programming Tools

If you are the dealer or radio technician maintaining your own radio system, you **must** order a programming tool to activate various transceivers. The **PCKIT010** for $149.95 is designed to program almost all RELM radios by interconnecting between a MS/DOS PC and the radio. The **PM100A** for $99.95 is designed to externally program the RMV60B, RML60A, RML60B and LMV2548 radios. The **SPM2** for $49.95 is for the LMV25B and LMU15B transceivers. The **RMP1** for $49.95 is for the RMU45B transceiver. *Programmers must be used with caution and only by qualified personnel because incorrect programming can cause severe interference and disruption to operating communications systems.*

★★★ *Uniden CB Radios* ★★★

The *Uniden* line of Citizens Band Radio transceivers is designed to give you emergency communications at a reasonable price. Uniden CB radios are so reliable they have a two year limited warranty.

PRO310E-A3 *Uniden* 40 Ch. Portable/Mobile CB...$72.95
PRO330E-A3 *Uniden* 40 Ch. Remote mount CB...$99.95
GRANT-A3 *Uniden* 40 channel SSB CB mobile....$152.95
PC122-A3 *Uniden* 40 channel SSB CB mobile...$113.95
PC66A-A *Uniden* 40 channel CB Mobile.....$78.95
PRO510XL-A3 *Uniden* 40 channel CB Mobile.....$34.95
PRO520XL-A3 *Uniden* 40 channel CB Mobile.....$49.95
PRO535E-A *Uniden* 40 channel CB Mobile.....$73.95
PRO538W-A *Uniden* 40 ch. weather CB Mobile...$78.95
PRO640E-A3 *Uniden* 40 ch. SSB CB mobile.....$133.95
PRO810E-A *Uniden* 40 channel SSB CB Base...$174.95

★★★ *Uniden Radar Detectors* ★★★

Buy the finest *Uniden* radar detectors from CEI today.
CARD-A3 *Uniden* credit card size radar detector...$127.95
RD3XL-A3 *Uniden* 3 band radar detector.....$124.95
RD9GTL-A *Uniden* "Passport" size radar detector...$89.95
RD9XL-A3 *Uniden* "micro" size radar detector...$107.95
RD25-A *Uniden* visor mount radar detector.....$64.95

Bearcat® 200XLT-A

List price $509.95/**CE price $239.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-A3** for only $179.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-A

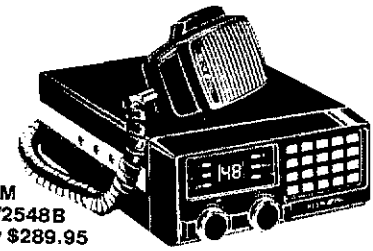
List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
Now...nothing excluded in the 806-912 MHz band.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-A** is available for $178.95.

NEW! Uniden® MR8100-A

List price $849.95/**CE price $486.95**
12-Band, 100 Channel • Surveillance scanner
Bands: 29-54, 116-174, 406-512, 806-956 MHz.
The *Uniden* MR8100 surveillance scanner is different from all other scanners. Originally designed for intelligence agencies, fire departments and public safety use, this scanner offers a breakthrough of new and enhanced features. Scan speed is almost 100 channels per second. You get four digit readout past the decimal point. Complete coverage of 800 MHz. band when programmed with a personal computer. Alphanumeric designation of channels, separate speaker, backlit LCD display and more. To activate the many unique features of the Uniden MR8100 a computer interface program is available for $19.95. Due to manufacturers' territorial restrictions, the MR8100 is not available for *direct* shipment from CEI to CA, OR, WA, NV, ID or UT.

NEW! Ranger® RCI2950-A

List price $549.95/**CE price $249.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Repeater Splits RIT • 10 Programmable Memory Positions
Frequency Coverage: 28.0000 MHz. to 29.6999 MHz.
The *Ranger* RCI2950 Mobile 10 Meter Transceiver has everything you need for amateur radio communications. The RF power control feature in the RCI2950 allows you to adjust the RF output power continuously from 1 watt through a full 25 watts output on USB, LSB and CW modes. You get a noise blanker, roger beep, PA mode, mike gain, digital VFO, built-in S/RF/MOD/SWR meter. Frequency selections may be made from a switch on the microphone or the front panel. The RCI2950 gives you AM, FM, USB, LSB or CW operation. For technical info, call Ranger at 619-259-0287.



RELM LMV2548B Only $289.95

OTHER RADIOS AND ACCESSORIES

XC365-A *Uniden* Ultra Clear Plus Cordless Phone...$89.95
CT785S-A *Uniden* speakerphone cordless phone...$109.95
BC55XLT-A *Bearcat* 10 channel scanner.....$114.95
AD100-A Plug in wall charger for BC55XLT.....$14.95
PS001-A Cigarette lighter cable for BC55XLT.....$14.95
VC001-A Carrying case for BC55XLT.....$14.95
BC70XLT-A *Bearcat* 20 channel scanner.....$159.95
BC142XL-A *Bearcat* 10 ch. 10 band scanner.....$84.95
BC147XLT-A *Bearcat* 16 ch. 10 band scanner.....$94.95
BC172XL-A *Bearcat* 20 ch. 11 band scanner.....$134.95
BC177XLT-A *Bearcat* 16 ch. 11 band scanner...$134.95
BC590XLT-A *Bearcat* 100 ch. 11 band scanner.....$194.95
BC760XLT-A *Bearcat* 100 ch. 12 band scanner.....$254.95
BC002-A CTCSS tone board for BC590/760XLT.....$54.95
BC003-A Switch assembly for BC590/760XLT.....$22.95
BC855XLT-A *Bearcat* 50 ch. 12 band scanner...$199.95
BC1-A *Bearcat* information scanner with CB.....$129.95
BC330A-A *Bearcat* information scanner.....$99.95
BC560XLT-A *Bearcat* 16 ch. 10 band scanner.....$94.95
BP205-A Ni-Cad batt. pack for BC200/BC100XLT...$39.95
ATS808-A *Sangean* shortwave receiver.....$159.95
ATS803A-A *Sangean* shortwave receiver.....$159.95
ATS800-A *Sangean* shortwave receiver.....$99.95
MS103-A *Sangean* shortwave receiver.....$84.95
74102-A *Midland* emergency weather receiver...$39.95
77116-A *Midland* CB with VHF weather & antenna...$66.95
77118-A *Midland* CB mobile with VHF weather....$62.95
77913-A *Midland* CB portable with VHF weather....$79.95
76300-A *Midland* CB base station.....$92.95
FBE-A Frequency Directory for Eastern U.S.A.....$14.95
FBW-A Frequency Directory for Western U.S.A.....$14.95
RFD1-A MI, IL, IN, KY, OH, WI Frequency Directory...$14.95
RFD2-A CT, ME, MA, NH, RI, VT Directory.....$14.95
RFD3-A DE, DC, MD, NJ, NY, PA, VA, WV Dir.....$14.95
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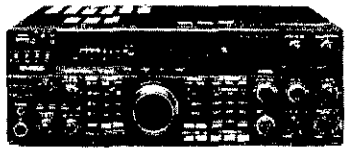

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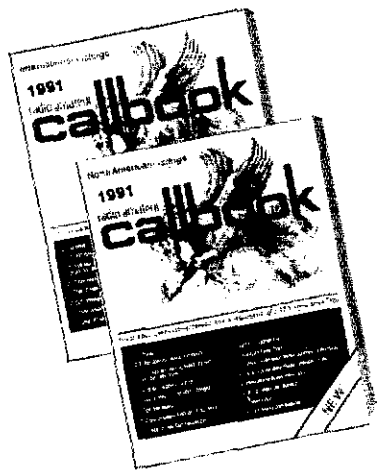

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TEN-TEC, new factory boxed latest 1991 production models, USA made. 562 Omni V, 585 Paragon Transceiver, 425 Titan, 422 Centurion, 420 Hercules Linear Amplifiers, 238, 253, 254 Antenna Tuners 239, 240, Dry Dummy Loads, Microphone, TVI Filters, 2510B Satellite Station, Mobile HF Antenna Keyers, Cabinets, Filters. Visa/MC or check. For best mail order deal, write/phone Bill Slep, 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763-0100.

TINY PACKET Modem For Digicom by N4PLK. Business card size, will mount inside your Commodore 64/128 or plug into cassette port. Uses 5v/60ma power from computer. 1200 baud. Easy kit = $40. Assembled board = $50. Add $2.50 *for overseas. Craig Rader, 385 Cherokee Court, Altamonte* Springs, FL 32701.

SERVICE MANUAL COPIES: Tek, H-P, Heathkit, etc. SASE for long list. J. Glass, WB6ZTI, 14316 Cerecita Drive, East Whittier, CA 90604-1740.

220 MHz: Sell Pair Thumbwheel HTs-Yaesu FT 103R 220 MHz, 2.5-4 watt, each w/TTP, PL board, 1 like new @ $195, 1 excellent @ $185; Lunar 30W Amp. $95 like new. WA2HGJ, 2 Pearl Drive, Monsey, NY 10952, 914-354-1815.

GROUND RADIAL Wire For Verticals Or Slopers: Improves performance, new #16 bare solid copper. Lowest cost: $38 1000 feet, includes shipping! Catalog: $1. Davis RF, P.O. Box 230-Q, Carlisle, MA 01741, 508-369-1738.

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COLLINS 51J-4 Receiver, excellent condition. Trade/cash for Collins 30L-1 Linear, excellent condition. Northern Virginia area. N3LC, 703-788-9797, 7-9 PM.

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SELL: Heath Oscilloscope 10-102, 50 Ft. Tower, Cushcraft ATB-34, COE Ham III Rotor and Rotor Box. K9OAJ, *317-966-9029.*

WANTED: instruction manual for operating Eico model 232 VTVM. Meyer Minchen, AG5G, 4635 SW Fwy., Houston, TX 77027, 713-622-6161.

FOR SALE DX: 70 ft. 4 sections US Tower heavy duty Hy-Gain rotor no. 300 stainless steel crank-up motor attachment & cable. All coax and 4-band 10-15-20-40 meters. 3 elements on 40 Telrex less than 1/2 price new will not separate $4500 your complete system. Call days Sandy, WB5RNC, P.O. Box 5566, Corpus Christi, TX 78465, call days 305-454-7962 or *407-852-1982 evenings only 305-454-7962. Write for complete* details.

WANTED: Alda 103 Xceiver. Must be working. K9FEI, In callbook, 317-839-5907.

SALE: Henry Radio 8K, 3CX3000A, 10-160 Meters, mint. Collins KWM-380, all mods to 1989, mint. NA0K, 505-268-5144, after 6PM MST.

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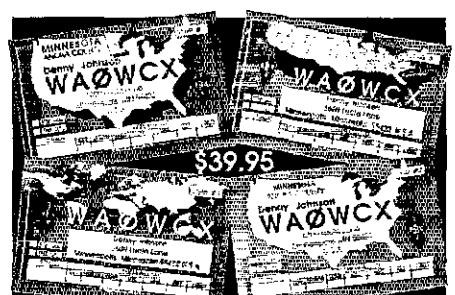

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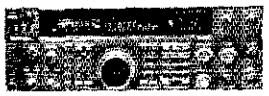

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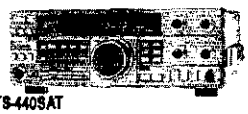

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TM-2530A - 2M, 25W
TM-2550A - 2M, 45W
TM-2570A - 2M, 70W
TM-3530A - 220, 25W
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IC-2400 - VHF / UHF Mobile Xcvr.
IC-228A - 2M - 25W Mobile Xcvr.
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ASTRON

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MODEL	AMPS	ICS	PRICE
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RS12A	9	12	79
RS20A	16	20	99
RS20M	16	20	119
RS35A	27	35	159
RS35M	27	35	179

Models With "M" Suffix Have Meters.

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AEA PK232MBX - All Mode TNC.
KANTRONICS KAM - All Mode
NYE MBV-A - 3KW Antenna Tuner.
RF CONCEPTS - Amplifiers.
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OTHERS TOO. - PLEASE CALL!

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Amphenol N Male For 9913 4.95.

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Telex CD45II - 8.5 SQ. FT.
Telex HAM4 - 15 SQ. FT.
Telex TAILTWISTER - 20 SQ. FT.
Telex HDR300 - 25 SQ. FT.
Yaesu G500A Elevation Rotor.
Please Call For Prices On Rotors!

cushcraft

A3S - 3 Element Triband Beam.
A4S - 4 Element Triband Beam.
A743 / A744 - 30/40 Kit For Above.
R5 - 20-10M, No Ground Vertical.
AP8 - 80-10M Vertical Antenna.
D40 - 40M Rotatable Dipole.
40-2CD - 2 Element, 40M Beam.
A50-5 - 5 Element, 6M Beam.
215WB - 15 Element, 2M Beam.
230WB - 30 Element, 2M Beam.
4218XL - 18 Element, 2M Beam.
3219 - 19 Element, 2M Beam.
ARX2B - 2M Vertical antenna.
Call For Prices On All Cushcraft!

PHILLYSTRAN GUY CABLE

HPTG1200I - 1200 Lb. Rating. $ .32
HPTG2100I - 2100 Lb. Rating. $ .36
HPTG4000I - 4000 Lb. Rating. $ .59
HPTG6700I - 6700Lb. Rating. $ .79
Phillystran Guy Cable Is Non-Conducting - No More Insulators. Also, The New Phillystran No Longer Uses Potting Heads, But Uses Regular Cable Clamps. Please Call Us For Details!

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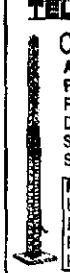

CRANKUP SALE

All Models Shipped Factory Direct - Prepaid. Features: All Steel - Hot Dipped Galvanized - Self-Supporting - With Rotor Shelf and Winch.

Model	Height	Load
HG37SS	37 FT.	9 S.F.
HG52SS	52 FT.	9 S.F.
HG54HD	54 FT.	16 S.F.
HG70HD	70 FT.	16 S.F.

Accessories For Hygain Towers Are Also Available For Immediate Delivery. CALL FOR PRICE!

TELEX HYGAIN ANTENNAS

New DX88 HF Vertical Antenna.
7-2 Discoverer - 2 El., 40M Beam.
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QK710 - 30/40M Add-on Kit.
V2S - V3S - V4S - VHF/UHF Vert.
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18AVT/WBS - 80-10M Vertical.
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ROHN

GUYED TOWER PACKAGES

HEIGHT	25G	45G	55G
50	849	1229	1549
60	939	1389	1939
70	999	1719	2159
80	1199	1869	2369
90	1269	2039	2579
100	1369	2199	2989
110	1449	2459	3209
120	1669	2619	3429

These Towers Are Shipped Complete With The Following: All Guy Hardware, Base Section, Rotor Plate; According To ROHN Specifications. 70 MPH Design. Towers Are Shipped Freight Collect From Plano, TX. **IN STOCK NOW!**

FOLDOVER TOWERS

Model	Height	Load Cap.
FK2548	48 Ft.	15.4 S.F.
FK2558	58 Ft.	13.3 S.F.
FK2568	68 Ft.	11.7 S.F.
FK4544	44 Ft.	34.8 S.F.
FK4554	54 Ft.	29.1 S.F.
FK4564	64 Ft.	26.4 S.F.

GGK25GII - Double Guy Kit $ 299.
GGK45GII - Double Guy Kit $ 319.

The Above Specifications Are At 70 MPH, With The Above Double Guy Kit Properly Installed. ROHN Foldover Towers Are Drop Shipped Freight Paid; Cost 10% Higher West Of The Rockies.

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20G - Light Duty 12 Inch $ 54.50
25G - Medium Duty 12 In 65.50
45G - Heavy Duty 18 Inch 153.50
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US TOWER

All Steel Crank Up Towers And Poles. Hot Dip Galvanized To Withstand Rust. Totally Self Supporting - No Guy Wires! Coax Arms, Thrustbearings, Masts, Motor Drives, Optional Bases, And More Are Also In Stock For Quick Delivery. **Call For Special Pricing.**

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MA40	21 Ft.	40 Ft.	10 Sq.'	629
MA50	22 Ft.	50 Ft.	10 Sq.'	999
TX438	22 Ft.	38 Ft.	18 Sq.'	919
TX455	22 Ft.	55 Ft.	18 Sq.'	1385
TX472	22 Ft.	72 Ft.	18 Sq.'	2279
HDX555	22 Ft.	55 Ft.	30 Sq.'	2079
HDX572	22 Ft.	72 Ft.	30 Sq.'	3559

Shipping On US Tower Models is Collect From Visalia-California. Calif. Residents Please Add 6% State Tax.

ROHN SELF SUPPORTING BX TOWERS

Model	Height	Load	Weight	Price
HBX40	40 Ft.	10 Sq.'	228	$ 449
HBX48	48Ft.	10 Sq.'	303	589
HBX56	56 Ft.	10 Sq.'	385	699
HDBX40	40 Ft.	18 Sq.'	281	569
HDBX48	48 Ft.	18 Sq.'	363	689

All ROHN BX Series Towers Are Shipped Freight **Prepaid** In The Contenental United States. These Towers Come With The Base Stubbs At No Additional Charge As Well As The Rotor And Top Plates. The Above Antenna Load Ratings Are At 70 MPH. Please Note That ROHN Does Not Reccomend Using This Tower With Antennas That Have A Boom Length Exceeding 10 Foot.

GUY WIRE AND HARDWARE

3/16 EHS Guywire (3990 Lb. Rating)	.15 / Ft
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5/16 EHS Guywire (11,200 Lb. Rating)	.29 / Ft
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1/4 TH - Thimble For All Guywire Listed	.45
3/8 EE - 3/8 X 6 Eye And Eye Turnbuckle	6.95
3/8 EJ - 3/8 X 6 Eye And Jaw Turnbuckle	7.95
1/2 X 9 EE - 1/2 X 9 Eye And Eye Trnbkl.	9.95
1/2 X 9 EJ - 1/2 X 9 Eye And Jaw Trnbkl.	10.95
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1/2 X 12 EJ - 1/2 X 12 Eye And Jaw Trnbkl.	13.95
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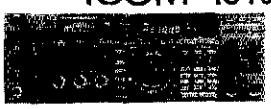

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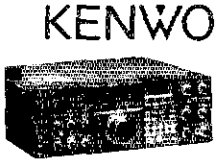

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1108 RG8, Mini	21¢
1198 RG8, Super Flex	30¢
1180 9913 Type	41¢
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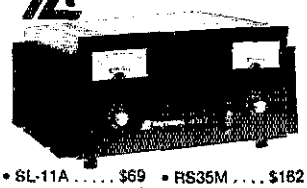
10% DISCOUNT ON FULL ROLLS

ASTRON



• SL-11A	$69	• RS35M	$162
• RS12A	$73	• VS35M	$179
• RS20A	$90	• RS50A	$205
• RS20M	$112	• RS50M	$225
• VS20M	$128	• RM50M	$259
• RS35A	$144	• VS50M	$237

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WANTED: QUALITY USED GEAR, CASH OR TRADE

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It's All in the Trunk.

FT-4700RH

Trunk-Mountable High Power Dual-Band VHF/UHF FM Transceiver

The Trunk-Mountable FT-4700RH is a high power FM dual-band mobile/base transceiver. 5 watts low power is also selectable on both bands. A truly mobile Dual-bander.

The front panel can be detached from the main body of the transceiver, which can then be installed under a seat or safely hidden in the trunk, using YSK-4700 controller cable option to connect to the front panel/controller, mounted conveniently on the dashboard.

Other features include:

10 for each band

Programmable Scanning: Band and memory channels can be scanned, with time operated or carrier operated scan resume.

Operator selectable steps in 5, 10, 12.5, 20 and 25 KHz.

Automatically controls the brightness of the display back lighting and pilot lamps.

Independent squelch and mixing balance, for simultaneous listening or transmitting.

Encode/Decode included for each band.

MH-15C8 Microphone with DTMF Pad Standard. MH-15D8 Hand Microphone with DTMF Memory Keypad.

Other Options: SP-3 and SP-4 External Loudspeakers; FP-700 AC Power Supply for base station operation.

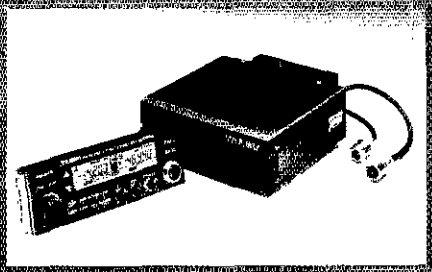
Specifications

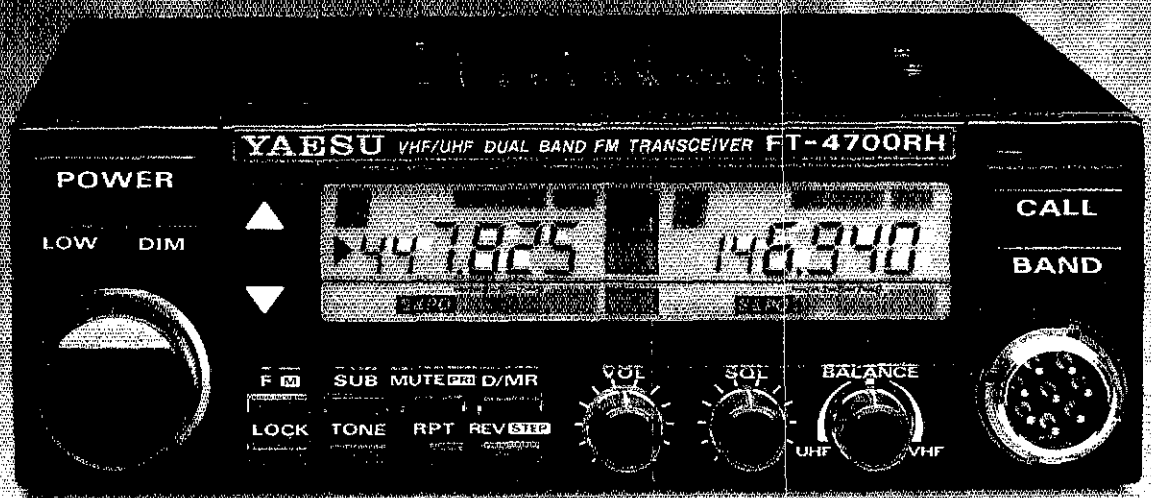
RX: 140–174 MHz, TX: 144–148 MHz (2m), 430–450 MHz (70cm)

50 Watts (2m), 40 Watts (70cm)

5.9 (W) x 2.0 (H) x 7.1 (D) in.

4.4 lbs.





Shown Actual Size

YAESU

Performance without compromise™

KENWOOD

Compact Champion!

TH-27A/47A

2 m and 70 cm Super Compact HTs

Here is a great new addition to Kenwood's HT family — the all new TH-27A for 2 meters and TH-47A for 70 cm! Super compact and beautifully designed, these pocket-sized twins give you full-size performance.

- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
- **Extended receive coverage.** TH-27A: 118–165 MHz; TH-47A: 438-449,995 MHz. TX on Amateur bands only. (TH-27A modifiable for MARS/CAP. Permits required. Specifications guaranteed for Amateur bands only.)
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Built-in digital clock** with *programmable timer.*
- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!

- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)

Optional accessories:

- **BC-14:** Wall charger for PB-13, 14
- **BC-15:** Rapid charger for PB-13, 14
- **BH-6:** Swivel mount • **BT-8:** Six cell AA Alkaline battery case • **HMC-2:** Headset with VOX and PTT • **PB-13:** 7.2 V, 700 mAh NiCd pack • **PB-14:** 12 V, 300 mAh NiCd pack • **PG-3F:** DC cable with filter and cigarette lighter plug • **PG-2W:** DC cable • **SC-30:** Soft case • **SMC-31:** Standard speaker mic • **SMC-32:** Compact speaker mic
- **SMC-33:** Compact speaker mic with controls
- **WR-2:** Water *resistant* bag.

- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

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