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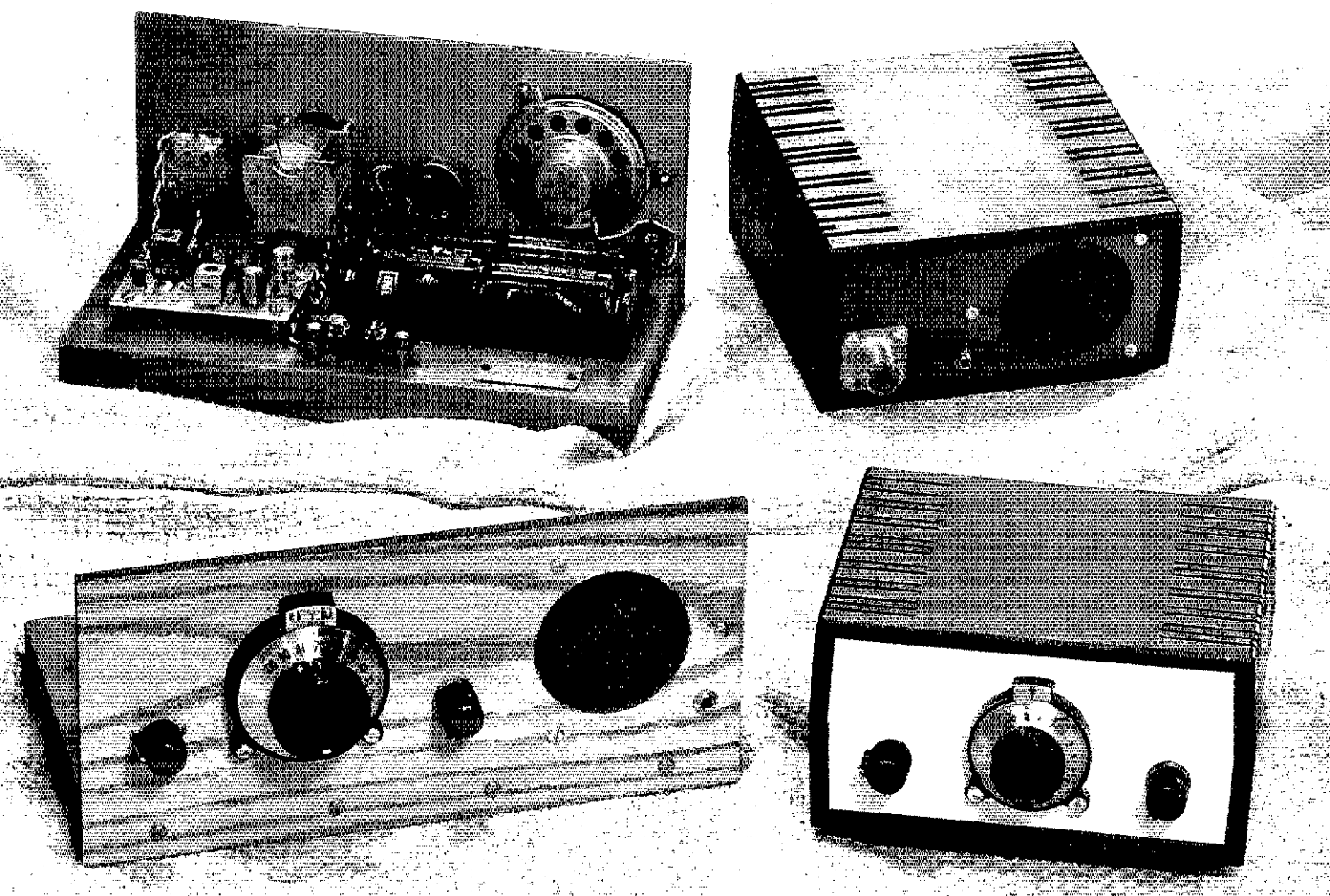

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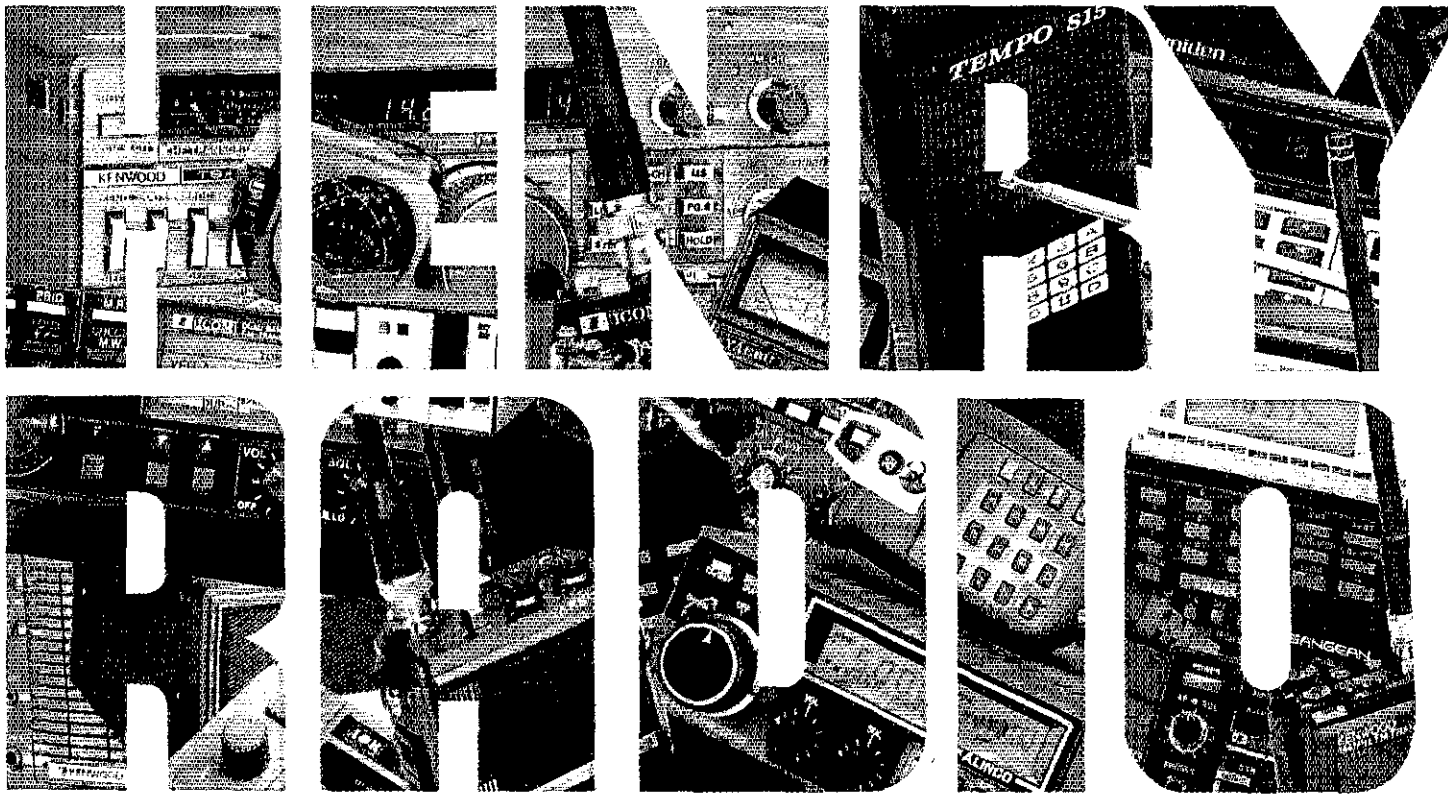

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TS-140S

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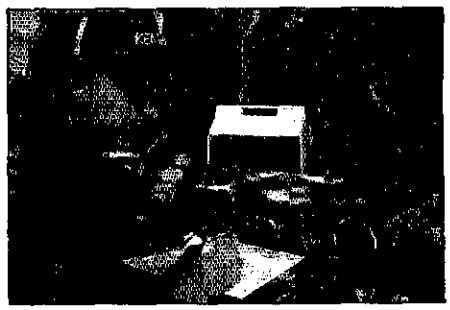
Compact, easy-to-use, full of operating enhancements, and feature packed. These words describe the new TS-140S HF transceiver. Setting the pace once again, Kenwood introduces new innovations in the world of "look-alike" transceivers!

- **Covers all HF Amateur bands with 100 W output.** General coverage receiver tunes from 50 kHz to 35 MHz. *(Receiver specifications guaranteed from 500 kHz to 30 MHz.)* Modifiable for HF MARS operation. *(Permit required).*
- **All modes built-in.** LSB, USB, CW, FM and AM.
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.

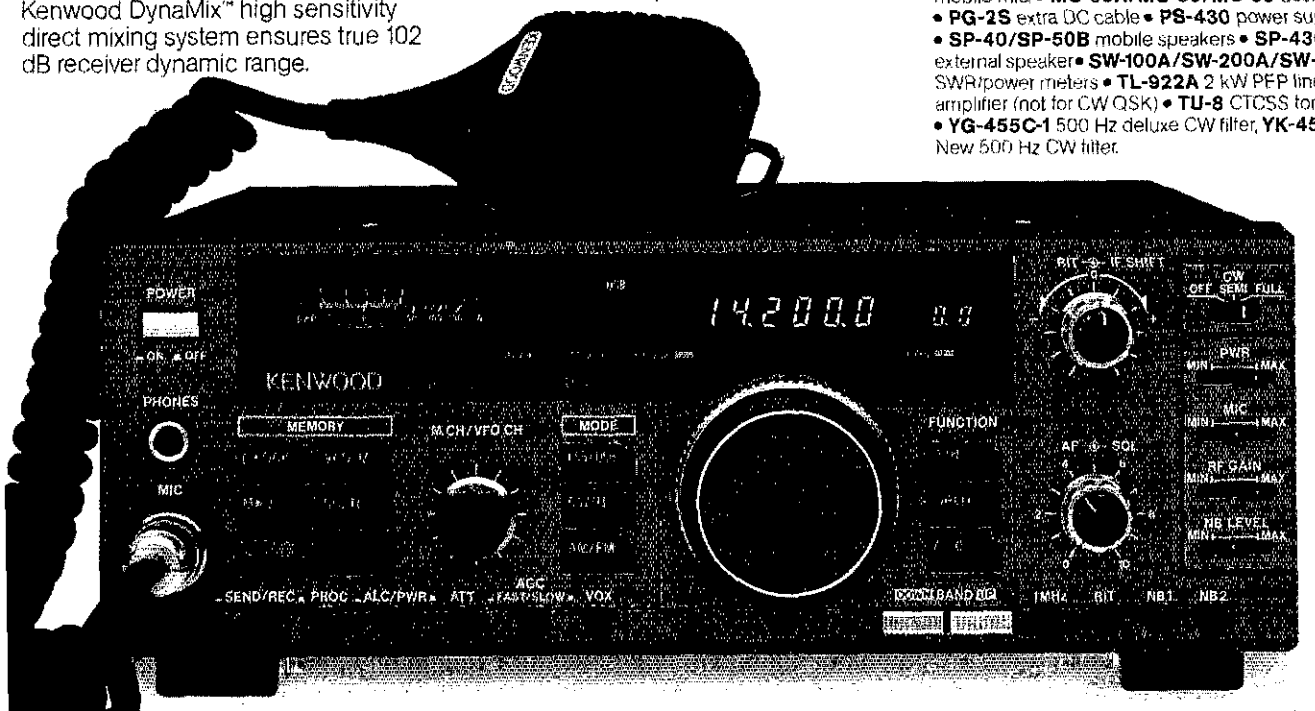


- **New Feature! Programmable band marker.** Useful for staying within the limits of your ham license. For contesters, program in the suggested frequencies to prevent QRM to non-participants.
- **Famous Kenwood interference reducing circuits.** IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.

- **M. CH/VFO CH sub-dial.** 10 kHz step tuning for quick QSY at VFO mode, and UP/DOWN memory channel for easy operation.
- **Selectable full (QSK) or semi break-in CW.**
- **31 memory channels.** Store frequency, mode and CW wide/narrow selection. Split frequencies may be stored in 10 channels for repeater operation.
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- **MC-43S UP/DOWN mic. included.**

Optional Accessories:

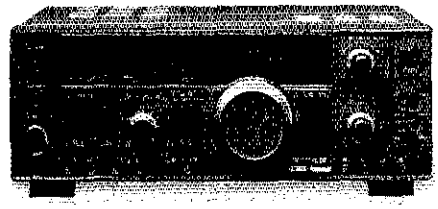
• **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface • **MA-5/VP-1** HF mobile antenna (5 bands) • **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85**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



TS-680S

All-mode multi-bander

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



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OUR COVER

With just two ICs, a handful of passive components and four "C" cells between you and your antenna, how much can you hear? Plenty! That's what we learned the first time we fired up the Neophyte, a simple receiver *you* can build for 80- or 40-meter reception. The story begins on page 14.

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February 1988
Volume LXXII Number 2

TECHNICAL

NEWS AND FEATURES

OPERATING

DEPARTMENTS

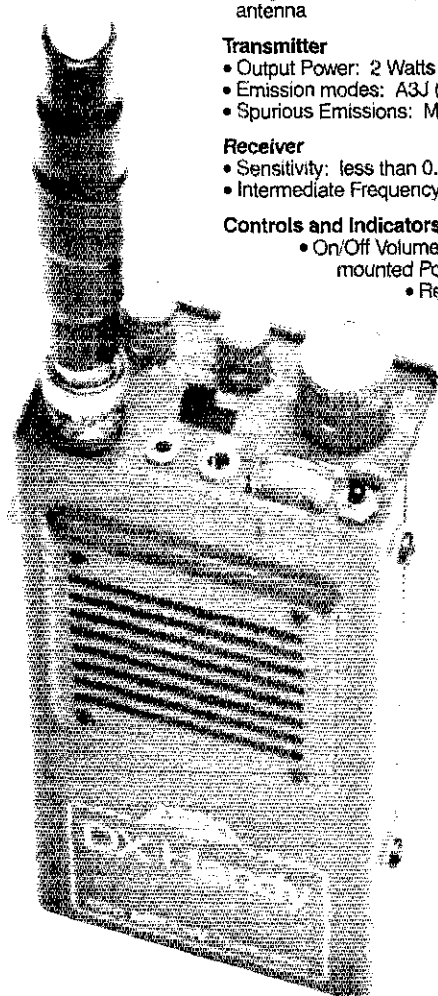
Handheld DX with the DX Handy™

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

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

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

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



Specifications

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

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

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

Controls and Indicators
- On/Off Volume control Top mounted Potentiometer
- Receiver Incremental Tuning (RIT): Top mounted Potentiometer with center off detent position
- Frequency: Top mounted 50 KHz VXO
- Frequency Range: Top mounted 2-position switch
- Noise Blanker: Top mounted On/Off switch
- S/RF meter: Top mounted S/RF meter
- Built in CW key: Top mounted momentary switch
- External Speaker output: Top mounted 1/16" phone jack
- External Microphone input: Top mounted 1/8" phone jack
- Antenna Connector: Top mounted Female BNC
- Transmit Indicator: Top mounted Transmit LED
- Push-To-Talk: Side mounted momentary switch
- External Power: Bottom mounted 2.1 mm coaxial
- External key input: Bottom mounted 1/8" phone jack
- Mode Selector Switch: Bottom mounted 2-position switch
- Charge/External Power: Bottom mounted 2-position switch selecting 12 VDC external power function

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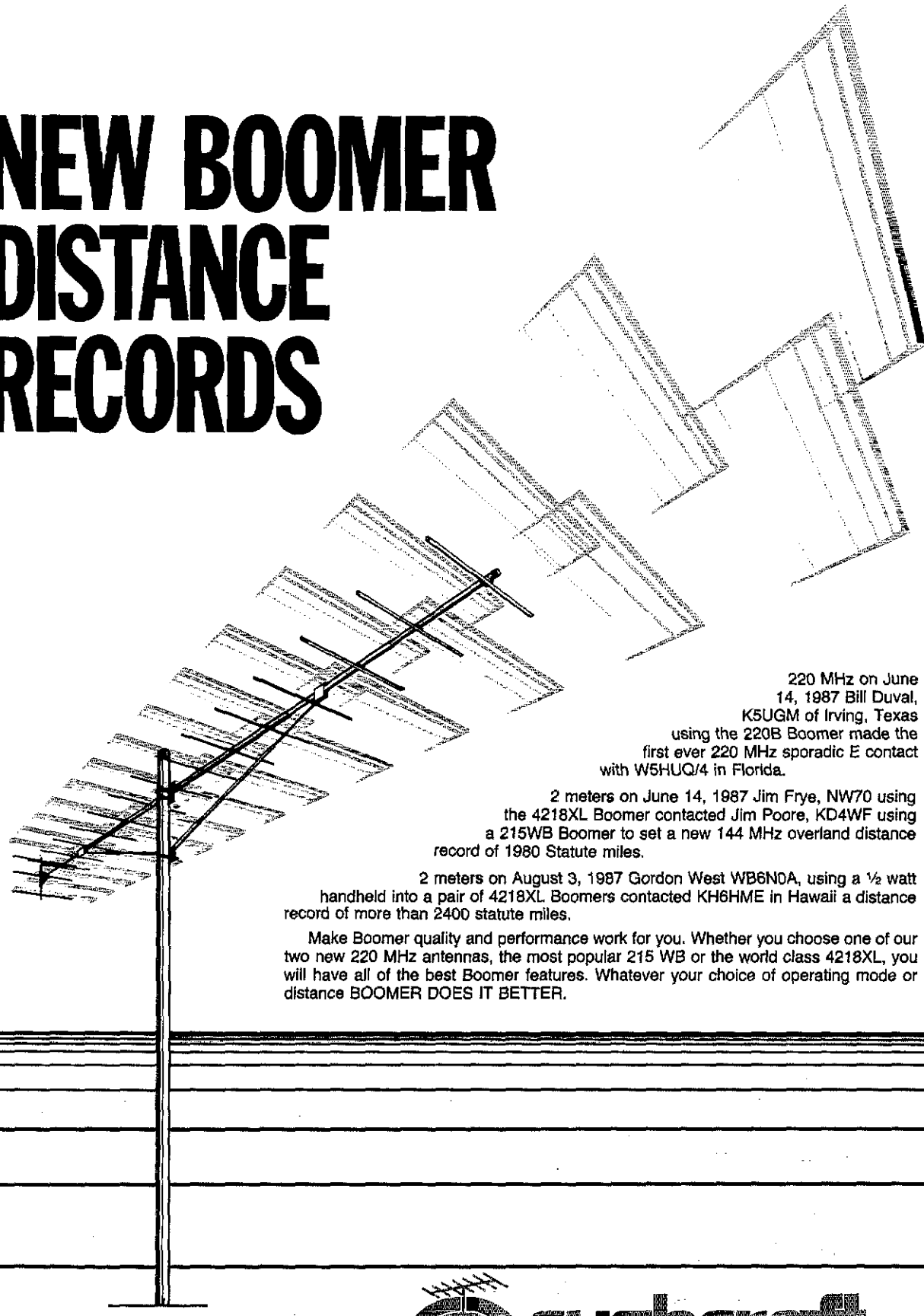

220 MHz on June 14, 1987 Bill Duval, K5UGM of Irving, Texas using the 220B Boomer made the first ever 220 MHz sporadic E contact with W5HUQ/4 in Florida.

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

2 meters on August 3, 1987 Gordon West WB6N0A, using a ½ watt handheld into a pair of 4218XL Boomers contacted KH6HME in Hawaii a distance record of more than 2400 statute miles.

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

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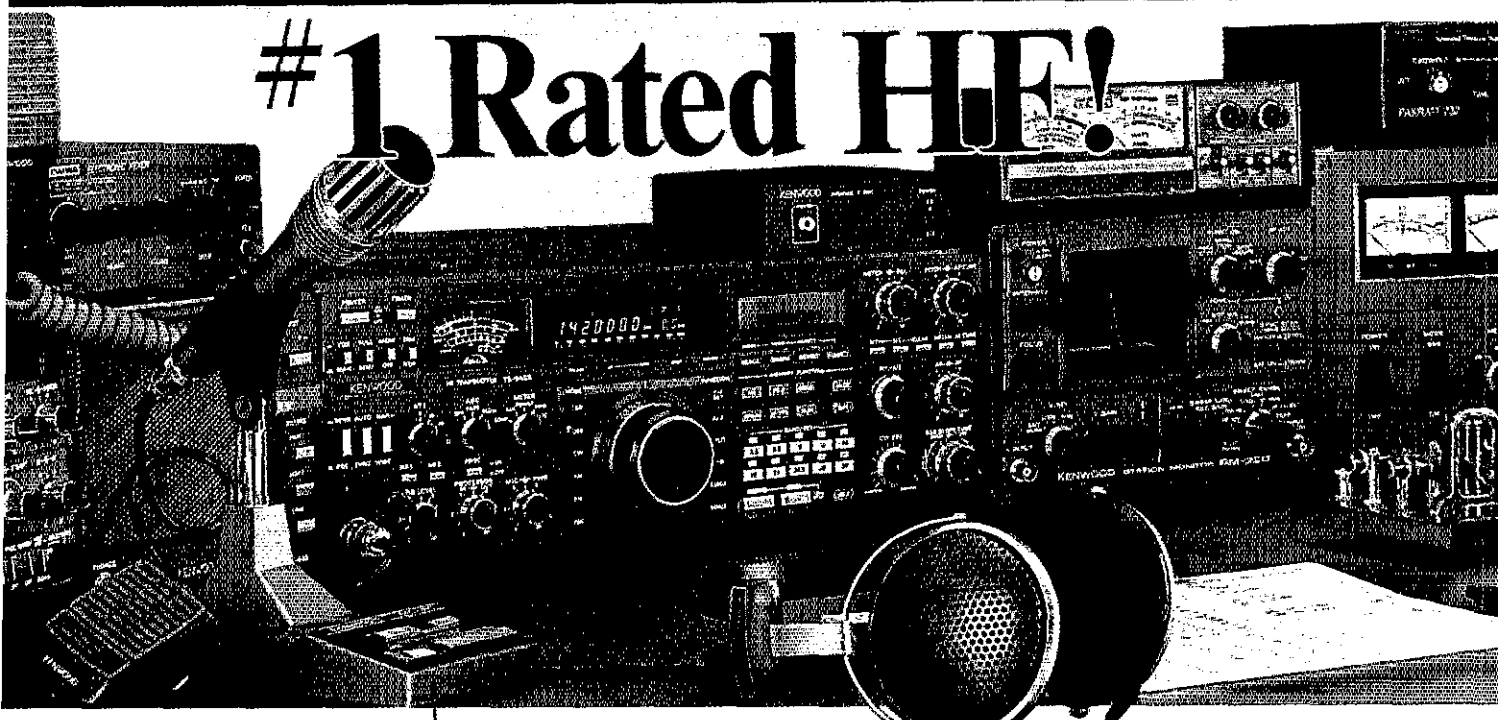
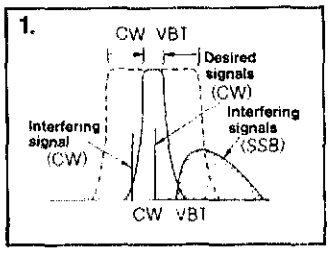


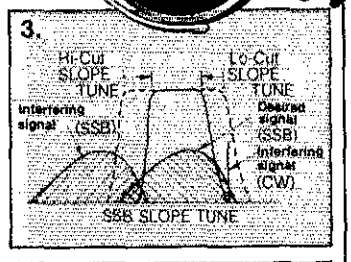
TS-940S

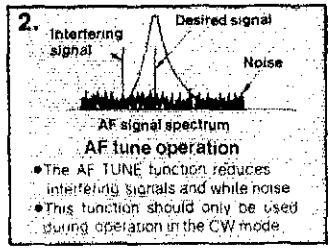
Competition class HF transceiver

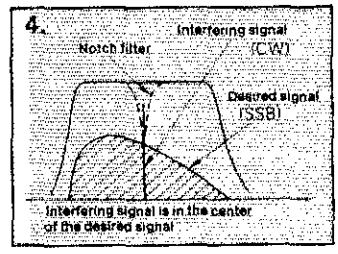
TS-940S—the standard of performance by which all other transceivers are judged. *Pushing the state-of-the-art* in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and *the field-proven performance* shows that the TS-940S is "The Number One Rated HF Transceiver!"

- **100% duty cycle transmitter.** Kenwood specifies transmit duty cycle ***time.*** The TS-940S is guaranteed to operate at full power output for periods ***exceeding one hour.*** (14.250 MHz, CW, 110 watts.) Perfect for RTTY, SSTV, and other long-duration modes.
- **First with a full one-year limited warranty.**
- **Extremely stable phase locked loop (PLL) VFO.** Reference frequency accuracy is measured in ***parts per million!***









1) CW Variable Bandwidth Tuning. Vary the passband width continuously in the CW, FSK, and AM modes, without affecting the center frequency. This effectively minimizes QRM from nearby SSB and CW signals.

2) AF Tune. Enabled with the push of a button, this CW interference fighter inserts a tunable, three pole active filter between the SSB/CW demodulator and the audio amplifier. During CW QSOs, this control can be used to reduce interfering signals and noise, and peaks audio frequency response for optimum CW performance.

3) SSB Slope Tuning. Operating in the LSB and USB modes, this front panel control allows independent, continuously variable adjustment of the high or low frequency slopes of the IF passband. The LCD sub display illustrates the filtering position.

4) IF Notch Filter. The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

- **Complete all band, all mode transceiver with general *coverage receiver.*** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
- **Superb, human engineered front panel layout for the DX-minded or contesting *ham.*** *Large fluorescent tube* main display with dimmer; direct keyboard input of frequency; flywheel type main tuning knob with optical encoder mechanism all combine to make the TS-940S a joy to operate.
- **One-touch frequency check (T-F SET) during split operations.**
- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
- **Simple one step mode changing with CW announcement.**
- **Other vital operating functions.** Selectable semi or full break-in CW (QSK), RIT/XIT, all mode squelch, RF attenuator, filter select switch, selectable AGC, CW variable pitch control, speech processor, and RF power output control, programmable band *scan or 40 channel memory scan.*

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters • IF-232C/IF-10B computer interface.

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

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See the TS-940S product review in our February 1986 issue.

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Michigan — George E. Race, WB8BGY, 3865 Gibbs Rd, Albion 49224 (517-531-4758)
Ohio — Jeffrey A. Maass, K8ND, 9256 Concord Rd, Powell 43065 (614-873-3234)

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NYC-Long Island — Walter M. Wenzel, KA2RGI, 373 Fifteenth St, West Babylon 11704 (516-957-5726)
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Nebraska — Vern J. Wirka, WBØGQM, 3106 Vinton, Omaha 68105 (402-341-4572)

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Rhode Island — Charles H. DiLuglio, K1DA, Nun Ave, Jamestown 02835
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Western Massachusetts — William C. Voedisch, W1UD, 240 Main St, Leominster 01453 (617-534-6256)

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Wyoming — James E. Raister, N7GVV, 1102 East 9th St, Gillette 82716 (307-686-0794)

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Southern Florida — Richard D. Hill, WA4PFK, 3800 SW 11th St, Fort Lauderdale 33312 (305-583-6932)
West Indies — Jose A. "Tony" Purcell, KP4IG, Urb Tomas Carrion, Calle 2, #95, Juana Diaz, PR 0066

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

West Gulf Division
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Oklahoma — William E. Goswick, K5WG, 12717 S 124th E Ave, Broken Arrow 74011 (918-369-2115)
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 1954. 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 and Canada.

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 . . ."

Rumors

Unfounded rumors have long been an unwelcome part of the Amateur Radio scene. In last month's "50 Years Ago" column, John Huntoon recounts a 1937 incident in which the thoughtless act of a single ham, in spreading inflammatory misinformation on the air, caused a lot of others to have to devote their time and energy to setting the record straight. That struck a very responsive chord here, because rumor control occupied what seemed to be an ever-increasing share of our attention during the latter part of 1987.

Human nature hasn't changed in the intervening 50 years. Some people are well-intentioned, but aren't very precise; they'll repeat something they've heard, but leave out an important detail or add some embellishment either through ignorance or carelessness, or to make it a better story. Others seem simply to crave attention, and lack a conscience as to the damage they do. Finally, there are the Chicken Littles; to them, everything they hear is further evidence that The End Of The World Is Near, and so of course it's repeated in that vein.

Here are a few examples of the kinds of rumors we've been afflicted with lately:

• "We're going to lose the 430-440 MHz band to Land Mobile." This one cropped up during the Mobile WARC last fall, the result of a misinterpretation of a much more limited Mexican proposal. The problem—which in reality was about 30 dB less than the rumor—had been handled effectively by the IARU observer team in Geneva while the Chicken Little version was still ricocheting around the globe.

• "The 18-MHz band is open!" Unfortunately, at least as of the time this is being written, this one is not true for FCC-licensed stations. But just before Christmas the rumor got started that we could operate there, and some people actually did before being set straight.

• "The League is recommending the use of telephone area codes for packet message forwarding." What we did do, was to report in a newsletter on some informal discussions by packeteers and traffic people where they concluded this might be a feasible approach. What we didn't do, was to make a recommendation—and we still haven't, though the packet world seems to be headed toward using ZIP codes on at least an interim basis.

• "The FCC Part 15 proposals would allow unlicensed devices to radiate signals that would be as loud in nearby HF receivers as the Voice of America tries to deliver to its target audience." There are lots of reasons to be unhappy with the Commission's Part 15 proposals, but you'd make this particular observation only if you believed that a millivolt is the same as a microvolt.

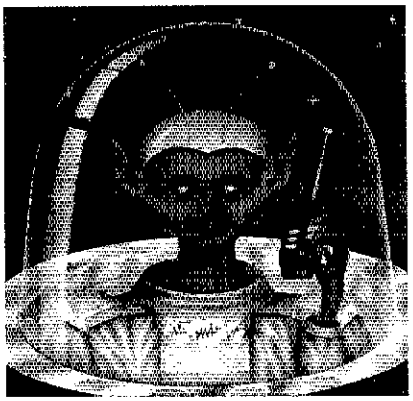
Ironically, one reason the rumor problem might be worse now than ever is that our communications are better. Packet radio, and especially the system of automatically linked packet bulletin boards that has developed, is a highly efficient means not only of communicating between two individuals, but of disseminating information as well. But without some human intervention, the system is noncritical as to message content; the wildest rumor gets forwarded as efficiently as the most vital piece of hard news. Also, people tend to place greater credence in what they read on their computer screens or printers than in, for example, what they might overhear on 75 meters. We've not yet had a major crisis develop, but it's not too early to sound a warning: If we're not careful, packet radio will become recognized mainly for its efficiency at spreading unfounded rumor and idle speculation.

Can we do something to head this off? Probably. It's long been a tradition in Amateur Radio that in handling traffic, one pays no attention to the message content other than to make sure it is relayed accurately. Over League objections the FCC made us modify this slightly in the early '70s; now, each operator in the chain is responsible for avoiding business communications. The FCC notwithstanding, the basic principle is still a good one; a message-relaying service would not last very long if each participant had veto power over every message. On the other hand, messages addressed not to a single individual or small group, but rather to "ALL" the world at large, can and should be held to a standard of accuracy. Simply stated, if your station and your license are being used as a link in a chain to spread misinformation, you ought to be concerned about it—and to do something about it.

For our part, at ARRL Headquarters we have a simple policy. We'd rather be dull than wrong. We'd even rather be late than wrong. But if we are wrong, we'll correct it. That's why you can rely on what you read in *QST* and the *ARRL Letter,* and on W1AW bulletins. It's also why, when we do ring the alarm bell as we did last year on 220 MHz, as a League member you know it's not a false alarm.

Credibility. That one word says it all.
—*David Sumner, K1ZZ*

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



Why just dream of talking beyond earth?

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

You see, the FT-736R is the most complete, feature-packed rig ever designed for the serious VHF/UHF operator. But you'd expect this of the successor to our legendary FT-726R.

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

Crossband full duplex capability is built into every FT-736R for satellite work. And the satellite tracking function (normal *and* reverse modes) keeps you on target through a transponder.

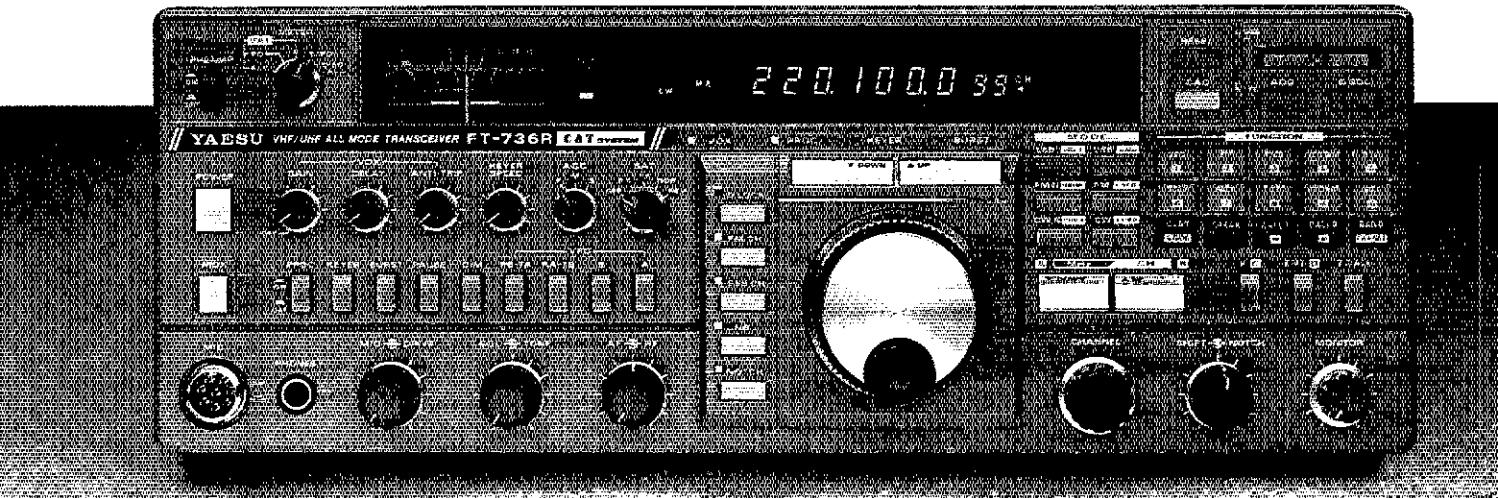
The FT-736R delivers 25 watts RF output on 2 meters, 220 MHz, and 70 cm. And 10 watts on 6 meters and 1.2 GHz. Store frequency, mode, PL frequency, and repeater shift in each of the 100 memories.

For serious VHF/UHF work, use the RF speech processor. IF shift. IF notch filter. CW and FM wide/narrow IF filters. VOX. Noise blanker. Three-position AGC selection. Preamp switch for activating your tower-mount preamplifier. Even an offset display for measuring observed Doppler shift on DX links.

And to custom design your FT-736R station, choose from these popular optional accessories: Iambic keyer module. FTS-8 CTCSS encode/decode unit. FVS-1 voice synthesizer. FMP-1 AQS digital message display unit. 1.2-GHz ATV module. MD-1B8 desk microphone. E-736 DC cable. And CAT (Computer Aided Transceiver) system software.

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

YAESU



Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Repair Service: (213) 404-4884. Parts: (213) 404-4847.
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Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc. FT-736R shown with 220-MHz option installed.

UP FRONT in QST

Encouraging youth: The Long Island Mobile Amateur Radio Club Helen Reed Memorial Fund presented a check for $500 to the Victor C. Clark Youth Incentive Program at the club's November meeting. ARRL Hudson Division Director Steve Mendelsohn, WA2DHF, accepts the check, presented in memory of Woody Gerstner, WB2IAP, from Mrs Fran Gerstner. LIMARC Vice President Henry Wener, WB2ALW, and Trustee Joe Kolb, W2NL, look on. (*photo courtesy KA2YHY*)

Here's your chance: Enjoying the 1987 Jamboree on the Air, Boy Scouts Greg Horne, Wayne King and Tommy Pendleton were guests at the station of Andy Corbin, WD4KDN, of Vinton, Virginia. The Roanoke Valley ARC contacted 25 Boy Scouts for the October event. For information on how you can help introduce young people to Amateur Radio, see the article that begins on page 47 of this issue. (*photo courtesy AF2D*)

A little help: That's what friends are for. When he needed a tower and beam installed back in October, friends of Jerry Vaughn, KE7AS (right), of Bremerton, Washington, got together and had an antenna-raising party. Jerry and Glenn Ritchey, W7SAB, watch as work on the structure proceeds. Jerry, who has multiple sclerosis, got his antenna and everyone had a good time. (*photo courtesy N7FKV*)

Keep those cards and letters coming: The "Pan Am Hams" crew of W87PAX, the 10th Pan American Games special-event station, have received about 10,000 QSL card requests already. About 1000 of the requests are from nonamateur shortwave listeners. The task of mailing the QSL cards for the August 1987 operation, held in Indianapolis, should be complete by the time you read this. Perhaps some of those SWLs who heard W87PAX will join the ham ranks soon! (*QSL courtesy W9SU*)

New 50-MHz DX

Part of the 50-MHz band (50.00-50.45 MHz) will be opened to amateurs in the Netherlands on a temporary basis on March 1, 1988. Amateurs holding class A, B or C licenses may apply individually for permission to operate using CW and digital modes; no phone operation will be allowed. Power output will be limited to 30 watts. The special amateur authorization is for a five-year period.

DX family: Bobbi Loeschman Baker, KA5BOA (center), and her sons, Al Loeschman, WD5IQR (left), and Buzz Loeschman, N5FTR, show off the consecutively numbered DXCC awards they recently acquired. The three received their licenses in 1978 and began actively DXing in October 1986. They have formed the Loeschman DX Society, which sends a certificate of appreciation to DX stations which all three have worked and from which they have received a QSL. So far, 26 of the 35 DX stations all three have worked have been issued certificates. *(photo courtesy N5FTR)*

Broaden Your FM Horizons

Looking for a way to spice up your FM operations, or maybe just an interesting construction project that will fill a need around the shack? Try the DTMF decoder and selective call system—even the nonhams in the family will appreciate its usefulness in eliminating channel chatter. In addition, it provides a DTMF-operated relay to control whatever needs controlling in *your* shack. You'll find details, along with construction information, in the article beginning on page 19 of this issue.

Loch Ness Mystery Solved?

Operation Deepscan, the October 1987 search for the Loch Ness monster, may not have conclusively proved or disproved the creature's existence, but it did uncover something interesting. One set of sonar returns, larger than anything previously spotted at such a depth, registered as an inverted "V" on the graph recorder! KA9OIH speculates that the creature is a ham, and might be induced to surface if offered a higher-gain antenna, such as a Yagi!

Soaring to new heights: To commemorate the 649th weekly session of the '49er Net, Net Manager Jerry Bette, N9BMT (left), conducted net operations *from* the air. The net, run by the Tri-Town RAC (Hazelton, Illinois), meets on 146.49 MHz. Jerry, seen here with his grandson Doug Peters and son-in-law (and pilot) Steve Peters, conducted the net operation from a symbolic height of 1464.9 feet. Sounds like maintaining that altitude was a lot tougher than staying on frequency! *(photo courtesy N9KDO)*

What Are the Chances?

Back in March, Bill Boyd, WA7TWB, of Orcas, Washington, was excited about his new rig, so he put up a quick-and-dirty 30-meter dipole. His first contact was with Richard Little, KY9L, of Barrington, Illinois.

Eight months later, Bill decided to have a try at 12 meters. Using an 80-meter dipole, open-line feed and a matchbox, his first contact, again on CW, was KY9L!

Bill and Richard are looking forward to the opening of the 17-meter band to US amateurs so they can further test the laws of probability!

Merry Christmas to All!: Children in three Miami hospitals got to talk to Santa Claus at the North Pole via Amateur Radio, thanks to the Fellowship Amateur Radio Club of South Florida. Club members also donated toys and distributed them to the children. *(photo courtesy KB4ARD)*

League Lines

Personnel changes at FCC: FCC Chairman Dennis Patrick has appointed Ralph Haller, N4RH, as Chief of the Private Radio Bureau. This Bureau directly oversees over 30 different radio services, including the Amateur Radio Service. Haller has been Deputy Chief of the Bureau since December 1986 and has been with FCC since 1971. Patrick has also appointed Lex Felker, N4LF, as chief of the Mass Media Bureau.

In another FCC development, Ray Kowalski, Chief of the FCC Special Services Division of the Private Radio Bureau, has left the FCC. He has joined a Washington communications law firm.

For further details, see this month's Happenings column.

Attention VHF contesters! Sponsors are solicited for plaques to be awarded for the first time in this year's ARRL June VHF QSO Party. These handsome plaques with a distinctive VHF motif will be awarded to the top ten single- and multi-op scores, and top five in the QRP Portable category. The cost is $40. Clubs and individuals wishing to be listed as sponsors in the May *QST* announcement should call Billy Lunt at the HQ Contest Branch at 203-666-1541 before March 1. Credit card orders will be accepted.

Father Moran, 9N1MM, winner of the 1986 ARRL Humanitarian Award, will be visiting the USA in September and will receive the award at the ARRL National Convention in Seattle. ARRL-affiliated clubs wishing to have Father Moran speak at their convention, hamfest or club meeting may contact Jack Moran, W1ZLG, of Stoneham, Massachusetts for coordination of Father Moran's itinerary and for further information.

Interested in assisting the FCC with amateur-to-amateur difficulties? ***The Amateur Auxiliary to the FCC's Field Operations Bureau still needs volunteers*** to spend a few hours a month monitoring for rules infractions and technical problems that cause on-the-air difficulties, and occasionally to provide survey data on overall Part 97 rules compliance.

ARRL Sections that may particularly be able to use Auxiliary volunteers are AK, AR, DE, ENY, KS, MI, MT, ND, PAC, SB, SF, SJV, TN, UT, VT, WI, WY, WMA and WTX. Also needed are amateurs who can monitor a wide variety of digital emissions and frequencies at or above VHF. Contact your ARRL Section Manager or Luck Hurder, KY1T, at HQ for further information.

The address of the 8th call area QSL bureau has changed. Effective immediately, the new address ***is: Columbus Amateur Radio Association, PO Box 182165, Columbus, OH 43218-2165.***

The ARRL Education Task Force (ETF) is interested in hearing from you if you have been successful in establishing an Amateur Radio club in an elementary, junior or senior high school. Particularly, the ETF wants to know what specific problems you had to resolve to establish your club and what you recommend to others who wish to get started. Write to the Education Task Force, c/o ARRL HQ.

Last September, Andrew Bodony, K2LE, won a portion of his suit in US District Court against the Village of Sands Point, New York that voided the village's 25-foot height ordinance as applied to Amateur Radio antenna towers. The remainder of his suit was against the village for monetary damages for violations of his constitutional rights. ***The village has now settled out of court with Bodony.*** As part of the settlement, the exact dollar amount wasn't revealed. However, the amount was enough to pay Bodony the vast majority of his attorney's fees, which totaled over $60,000.

The special "200" prefixes, which honor the 200th anniversary of the US Constitution, are quite popular, judging by the pileups of stations trying to work the special prefixes. ***In February and early March, look for special "200" prefixes from preregistered clubs in the following states:***

January 30-February 5—Kansas
February 6-12—Massachusetts
February 13-19—Arizona, Oregon
February 20-26—Nebraska
February 27-March 4—Ohio
March 5-11—Florida

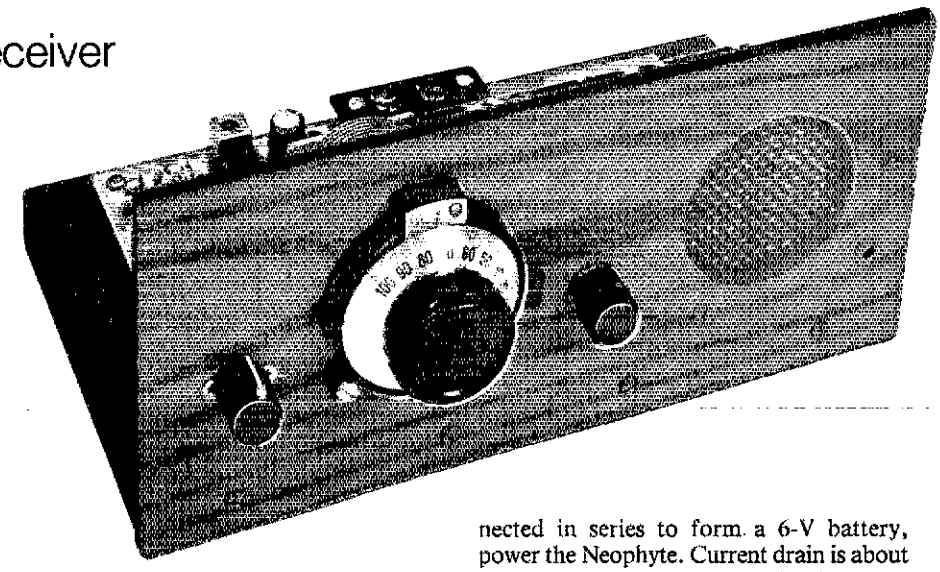
A reminder: ***The 1988 ARRL International DX Contest weekends are: CW—February 20-21, and phone—March 5-6.*** Also, although the period for working 100 countries for the ARRL Golden Jubilee of DXCC Award is over, HQ will continue to accept applications until the end of this year.

courtesy ARRL

The Neophyte Receiver

Looking for a simple receiver to tune the 80- or 40-meter ham bands? Build the Neophyte!

By John Dillon, WA3RNC
Penntek Electronics
14 Peace Dr
Lewistown, PA 17044



It doesn't take long for prospective hams to discover that there's much more excitement in hearing real signals than listening to "canned" code from a tape or computer program. After all, getting on the air and working with *real* radio is the object of getting an Amateur Radio license! Here is a simple 80- or 40-meter receiver that can bridge the gap between a code-practice machine and your first transceiver by giving you on-the-air listening experience. Dubbed the Neophyte, it's been designed with the needs of the neophyte (beginner) in mind, but will find favor with long-time hams as well.

The Neophyte uses two ICs to receive CW, SSB and AM signals in the 3.5-4.0 or 7.0-7.3 MHz ham bands. It's battery-powered, and most of its circuitry fits on a circuit board just 1-7/8 × 2-5/8 inches in size. The Neophyte's frequency stability allows copy of SSB and CW signals for hours without retuning, and it's sensitive enough to detect signals of less than 0.5 microvolt at its antenna terminals.

How the Receiver Hears

The Neophyte is a *direct-conversion* (D-C) receiver. A D-C receiver converts radio signals directly to audio by mixing the incoming signal with a local oscillator (LO) operating very close in frequency to the incoming signal. The mixing process has this effect: Whenever the LO is tuned so that the frequency difference between it and an incoming radio signal is in the audio range—a few hundred to a few thousand hertz for usable CW, SSB and AM reception—the frequency difference appears at the mixer output as an audio signal. Example: For an incoming Novice CW signal operating at 3737.0 kHz, setting the Neophyte's LO to 3737.6 kHz (a difference of 0.6 kHz, or 600 Hz) will allow you to hear that CW signal as dots and dashes at a 600-Hz pitch. (You could also set the Neophyte's LO to 3736.4 kHz, 600 Hz *below* 3737.0 kHz, to receive the same signal at a 600-Hz pitch.) AM and SSB signals are received by tuning the Neophyte's LO to zero beat—zero frequency difference—with the incoming carrier (or suppressed carrier, in the case of SSB signals). The Neophyte converts the modulation on these signals to audio.

The Neophyte does its D-C job with just two active devices, both of which are ICs. The receiver's *front end*—the RF-handling circuitry from the antenna to the mixer, inclusive—consists of a Signetics NE602N mixer/oscillator IC. The NE602's 8-pin mini-DIP (*mini*ature *d*ual *i*nline *p*ackage) contains bipolar-transistor LO and doubly balanced mixer stages, and a voltage-regulator circuit. The mixer circuitry provides 20 dB of *conversion gain*. This means that the power of an incoming signal is amplified 100 times as the signal is converted to audio by the NE602's mixer and LO.

The other active device in the Neophyte is a National Semiconductor LM386N-1 audio amplifier IC, also contained in an 8-pin mini-DIP. This IC provides 46 dB (power gain, 40,000) of audio amplification to drive headphones or (in a quiet room) a 2¼-inch speaker. Four "C" cells, connected in series to form a 6-V battery, power the Neophyte. Current drain is about 10 mA at low audio-output levels.

Fig 1 shows the schematic diagram of the Neophyte. If you'd like to learn the function of each component in the schematic, see the sidebar, "Signal Flow in the Neophyte." You needn't wade through signal flow, however, if you just want to do what we're going to do next: *build* the Neophyte.

Table 1

Neophyte Capacitor Values for 80 and 40 Meters

Band	*C1*	*C7,C8*	*C9*	*C10*	*C11*
80 m	330	1000	470	270	120
40 m	not used	330	120	68	150

All capacitances are in pF (1000 pF = 0.001 μF). C1 is disc ceramic; C7-C11 are NP0, polystyrene or silver mica units.

Building The Neophyte

Fig 2 shows a rear view of the Neophyte. Most of the receiver's components are contained on the circuit board. Fig 3 shows the etching pattern for the board; parts placement is shown in Fig 4A. The Neophyte's "cabinet" consists of a 4½- × 8¼-inch piece of ¾-inch-thick pine (base) and a 4- × 8½-inch piece of ¼-inch-thick particle board, plywood or similar material (front panel). The base can be stained or painted as desired; alternatively, a metal or plastic cabinet can be used to house the Neophyte, if desired.

Components

Although no exotic electronic parts are required, many of the Neophyte's parts are not available at the corner Radio Shack® store. T1 and T2 are 10.7-MHz IF transformers with a 7:1 turns ratio; they have green-colored cores. Other transformers (with different turns ratios) were tried, but receiver performance suffered. Capacitors C7-C11 should be NP0, polystyrene or silver mica units for good frequency stability. At this point, you should decide what band you'd like your Neophyte to cover. The values of C7-C11 depend on the band you choose (see Table 1). For details on the differences between the 80- and 40-meter versions, study the sidebar, "Building the Neophyte for 40 Meters." In the rest of this discussion, I'll concentrate on the construction, testing and adjustment

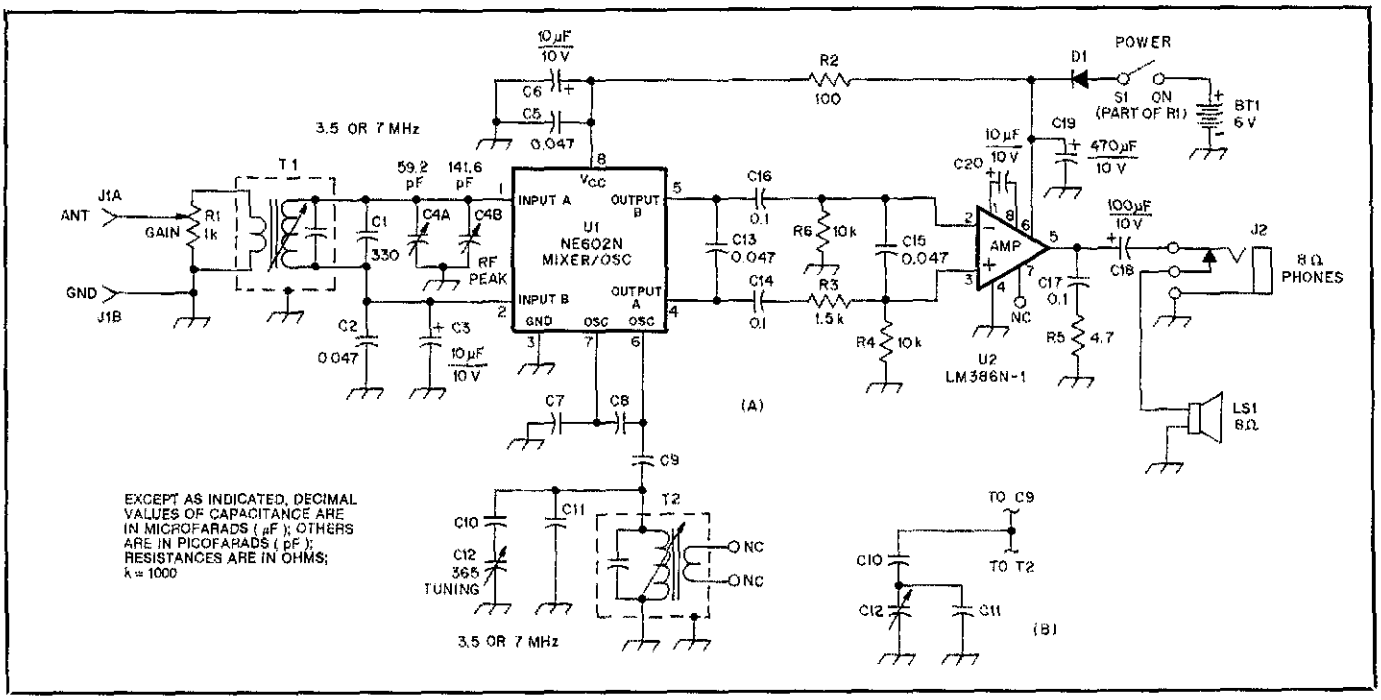


Fig 1—Schematic of the Neophyte receiver. Ceramic capacitors shown below, but not listed in Table 1, may be monolithic or disc units; fixed resistors are ¼-W, carbon film. Component designators shown in the schematic, but not listed below, identify parts for placement on the PC board (see Fig 4). For 40-meter operation, the oscillator circuit is modified slightly, as shown at B. See text and the sidebar, "Building the Neophyte for 40 Meters." Parts kits are available from Penntek Electronics; see Note 2.

BT1—6 V battery (four "C" cells connected in series).
C1—Ceramic. This capacitor is not used, or is changed in value, for 40-meter operation—see "Building the Neophyte for 40 Meters."
C2, C5, C13, C15—0.047-µF polyester film or ceramic. (0.01 µF also suitable for C2 and C5).
C3, C6, C20—10-µF aluminum electrolytic, 10 to 25 V.
C4—Two-section, polyethylene-dielectric variable; sections 59.2 and 141.6 pF (Mouser 24TR222 or equiv). See text.
C7-11—See Table 1.
C12—365-pF, air-dielectric variable (Mouser 524-A1-227, Circuit Specialists A1-227 or equiv). See text.
C14, C16, C17—0.1-µF polyester film or ceramic.
C18—100-µF aluminum electrolytic, 10-25 V.
C19—470-µF aluminum electrolytic, 10-25 V.
D1—1-A, 50-PIV silicon diode (1N4001 suitable).
J1—Two-position terminal strip (Mouser 534-4188, Radio Shack 274-663 or equiv).
J2—Closed-circuit phone jack, 1/8-inch.
LS1—8-Ω speaker, diam 2¼ inches (Mouser 25SP024 or equiv).
R1—1-kΩ audio-taper potentiometer with SPST switch (Mouser 31VM301 or equiv).
S1—SPST switch mounted on R1.
T1, T2—10.7-MHz IF transformer, 7:1 turns ratio, green core (Mouser 421F123 or equiv). See text.
U1—Signetics NE602N mixer/oscillator IC (Arrow Electronics 9778CA2).
U2—National Semiconductor LM386N-1 audio-amplifier IC.

Signal Flow in the Neophyte

RF energy from the antenna is fed through GAIN control R1 to the untuned, low-impedance primary winding of T1. This control actually is an RF attenuator. It can be adjusted to prevent very strong signals from overloading U1 when band conditions are especially good, or when strong local signals are present. T1's primary couples incoming signals to the tuned circuit consisting of the T1 secondary, padding capacitor C1, and RF PEAK capacitor C4. This tuned circuit provides *preselection*—it emphasizes signals at its resonant frequency and tends to reject others. The preselected RF is injected into pin 1 of the mixer/oscillator IC, U1.

The oscillator section of U1 serves as the receiver LO. Capacitors C7-C12 and the tuned winding of T2 make up the LO tuned circuit. (T2 is used as a tuned circuit in this application and not as a transformer; its untuned winding is not used.) Because the frequency stability of the oscillator determines the stability of the receiver, temperature-stable capacitors (NP0, polystyrene or silver mica types) are used to minimize drift. Energy is applied to U1 at pin 8. Capacitors C5 and C6 *bypass* U1's supply pin for ac. Their purpose is to bring the supply pin to ground potential for RF and AF signals while blocking dc. R2 helps these capacitors do their bypassing job by resisting the flow of RF and AF signals on the power-supply line. C2 and C3 are bypass capacitors, also.

Within the mixer section of U1, the LO and preselected RF signals are mixed to provide balanced audio output. The audio appears at pins 4 and 5 of U1. This signal is fed through a simple low-pass filter (C13, C15 and R3) to the inputs (pins 2 and 3) of U2, the audio power amplifier. The low-pass filter tends to pass lower audio frequencies while rejecting higher ones, hence its name. C14 and C16 are blocking capacitors: They block the flow of dc while allowing ac—in this case, audio—to pass.

R4 and R6 set the bias on the input transistors of U2. C20 sets U2's gain to 46 dB. C17 and R5 suppress unwanted HF oscillation in U2. C18 is the output blocking capacitor: Like C14 and C16, it blocks dc while allowing audio signals to pass—in this case, to headphones or speaker. C19 bypasses U2's dc-supply pin for audio. (Because C5, C6, C19 and R2 also work to reduce unwanted audio coupling between U1 and U2 along the dc supply line, they serve as *decoupling* components in the dc line. Decoupling aids stability in high-gain circuits.)

Energy for the Neophyte is provided by four "C" cells connected in series (6 V). S1 is the receiver POWER switch. Diode D1 allows current to pass in only one direction between the battery holder and the receiver circuitry, preventing damage to the receiver components should the batteries be placed in the holder backwards.

About the NE602 Mixer/Oscillator IC

The Signetics NE602 (SA602 for operation over a wider temperature range) is an IC of interest to builders and designers of low-power communications gear, particularly where low power consumption (as during battery operation) is important. Fig A shows its equivalent circuit. The '602 contains doubly balanced mixer, oscillator and voltage regulator elements. Its oscillator circuitry can operate up to 200 MHz in LC and crystal-controlled (fundamental and overtone) configurations. The '602's mixer typically can handle signals up to 500 MHz. Typical dc current drain is 2.4 mA; minimum supply voltage is 4.5, maximum 8.0.

The NE602's mixer is known as a *Gilbert cell* multiplier. (If you've ever built a circuit using a Motorola MC1496 or one of its equivalents, you've used a mixer based on the Gilbert cell.) The Gilbert cell consists of balanced switching circuitry driven by a differential amplifier; in the NE602, the amplifier inputs serve as the mixer RF inputs.

The NE602's mixer inputs (RF) and outputs (IF) can be single- or double-ended (balanced) according to design requirements. The resistance of these ports is 1.5 kΩ; the mixer input capacitance is approximately 3 pF up to 50 MHz. The mixer noise figure is typically 5.0 dB at 45 MHz; typical conversion gain is 18 dB at this frequency. The typical two-tone, third-order intercept point of the '602 (measured at 45 MHz with 60-kHz spacing), is −15 dBm.

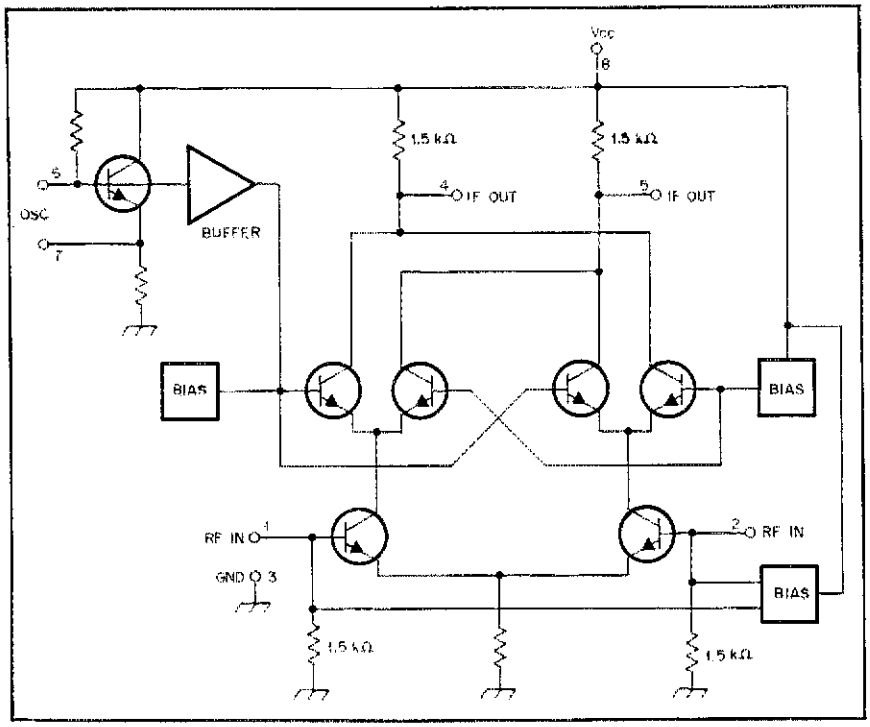


Fig A—The equivalent circuit of the NE602 doubly balanced mixer/oscillator IC.

The Neophyte uses the NE602's on-board oscillator circuitry to achieve good frequency stability at 3.5 and 7 MHz. If the '602's oscillator is unsuitable for a particular application, however, an external LO can be applied to pin 6 of the chip via a dc blocking capacitor. At least 200 mV (P-P) of external-LO drive is required for proper operation of the mixer.—Ed.

This material is based on information in Signetics Corporation's SA/NE602 Product Specification, and in Robert J. Zavrel, "Tomorrow's Receivers: What Will the Next Twenty Years Bring?," *Ham Radio*, Nov 1987, pp 8-9, 11-13 and 15.

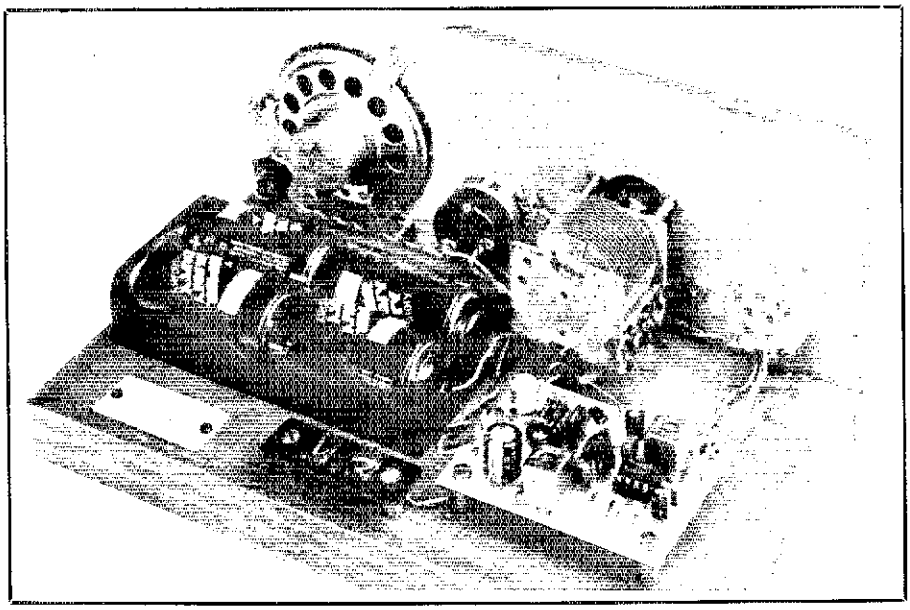


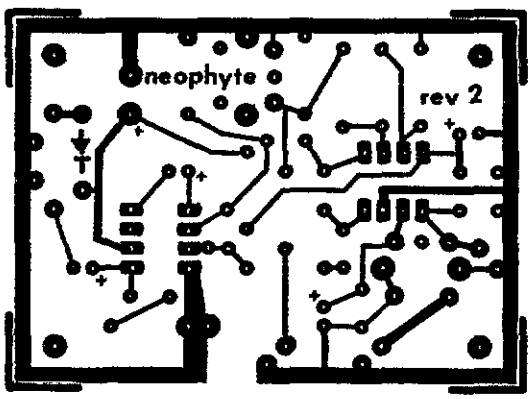
Fig 2—The Neophyte's cabinet, battery and front-panel controls dwarf its circuit board (right foreground). From left to right, the front-panel components are J2, LS1, R1, C12 and C4. The tuning capacitor mounts to the front panel by means of flat-head, 1-inch, no. 6-32 screws, and no. 6-32 nuts. The screws serve both as fasteners and mounting standoffs for the tuning capacitor (see Fig 5). The antenna terminals have been colored with felt-tip markers to indicate their function: black for the ground connection, green for the antenna.

of the 80-meter Neophyte.

The TUNING capacitor, C12, is a 365-pF, air-dielectric unit. One section of a two-section capacitor can be used at C12, but you may have some difficulty mounting such a capacitor to the front panel with the technique we'll cover shortly in "Construction." Local hamfests offer an excellent opportunity to find a tuning capacitor, as well as a reduction drive to turn it. These reduction drives are generally found in two diameters, 1½ and 2 inches. You can use either size.[1]

RF PEAK capacitor C4 is a two-section, plastic-dielectric variable. Similar capacitors are commonly used in small, portable radios. The unit specified for C4 in the parts list (see the Fig 1 caption) provides a maximum capacitance of about 200 pF with both sections connected in parallel. Off the shelf, its shaft is only about ¼ inch long—too short to be useful for our purposes. The shaft can be extended by bolting a ¼-inch-diameter round standoff, ½ inch long, to the existing C4 shaft. Use a *metric* (2.5-mm-diameter) screw to match the threads in C4's shaft; the force necessary to turn a non-

[1]Notes appear on page 18.



1 INCH

Fig 3—Circuit-board etching pattern for the Neophyte. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

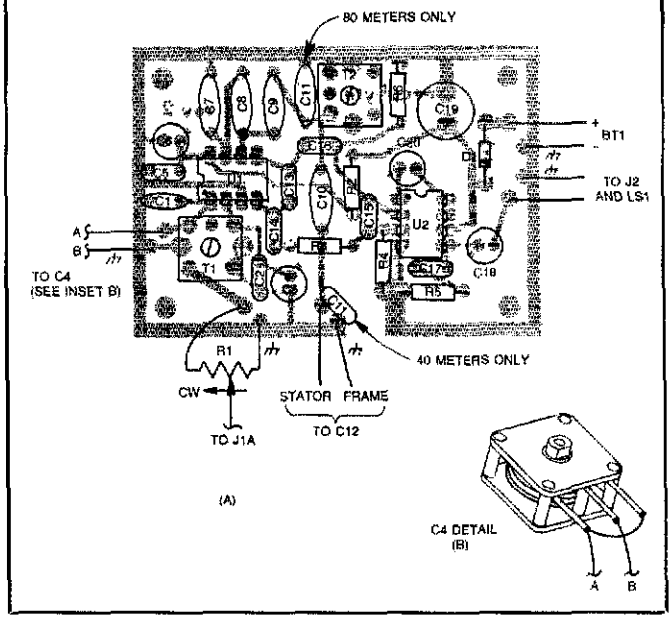


Fig 4—Parts-placement guide for the Neophyte (A) and detail of connections to C4 (B). Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. The placement of C11 depends on whether 80- or 40-meter coverage is desired; see text and "Building the Neophyte for 40 Meters."

metric screw into C4 can destroy the capacitor. (By the way, don't be tempted to use one of these inexpensive plastic capacitors for C12, the TUNING capacitor. You would be disappointed with the tuning drift that occurs as the capacitor's dielectric sheets settle each time you tune the receiver.)

In general, it's best not to attempt parts substitutions. By using the specified parts, you stand the best chance of being rewarded with a receiver that works correctly the first time it's turned on. Etched and drilled PC boards, and complete parts kits, are available from Penntek Electronics.[2] The Appendix shows the addresses of parts distributors if you'd rather order direct from them. Note, however, that some of these firms may have minimum order requirements or small-order service charges.

Construction

Building the cabinet and mounting controls and mechanical components is the greater part of contructing the Neophyte, so do this job first! Mounting the TUNING capacitor and reduction drive to the panel is the most time-consuming part of construction. The panel hole for the reduction-drive bushing must be large enough to allow rotation of the bushing and its set screw, but small enough to leave enough material to pass and hold the flat head screws used to mount the TUNING capacitor (see Fig 5). The best way to mark these holes is to make a drilling template by pushing a piece of paper down over the capacitor shaft. The shaft punches through the paper, marking the position of the hole for the reduction-drive bushing. Next, hold the paper against the capacitor frame and use a pencil point to punch holes in the paper corresponding to the mounting-screw holes in the capacitor frame. Instant drilling template! The bushing hole shown in Fig 5, 7/8 inch in diameter, leaves just enough panel material to hold the countersunk holes for the three no. 6-32 capacitor mounting screws. The best technique is to enlarge the bushing hole *last,* widening it only enough to pass the

Building the Neophyte for 40 Meters

The Neophyte receiver can be built for 7.0-7.3 MHz coverage as follows: Omit C1, C7 through C11 take the 40-meter values shown in Table 1. C11 is mounted in parallel with C12 instead of across T2 (see Fig 1B); this is easily done by mounting C11 across the PC-board connections to C12. Before mounting T2 to the circuit board, remove the small, tubular capacitor in the base of the transformer. Do this carefully with a small razor knife.

Forty-meter alignment is similar to that for the 80-meter Neophyte. Adjust T2 for an oscillator tuning range of 7.0-7.3 MHz, with some overtravel at both ends of the range. With the TUNING control set to the center of the band, set the RF PEAK knob to one o'clock. Adjust T1 for maximum signal strength. This completes alignment of the 40-meter Neophyte.

Because of decreased LO-mixer isolation in the NE602 at 7 MHz, adjustment of the RF PEAK control "pulls" the LO slightly in the 40-meter Neophyte. (Pulling is perceptible as a shift of received-signal pitch as RF PEAK is varied.) This isn't much of a problem, because the RF PEAK control needs little adjustment from one end of the 40-meter band to the other. In fact, you can eliminate the RF PEAK control in the 40-meter Neophyte if you do most of your listening in one part of the band. To do this, omit C4, install a 150-pF capacitor at C1 and adjust T1 for maximum signal strength at your favorite spot in the band.

The Neophyte in ARRL Lab Tests

ARRL Lab testing of one sample of the 80-meter Neophyte netted these results: minimum discernible signal (MDS), −118 dBm (decibels relative to a milliwatt) at 3520 kHz and −113 dBm at 3747 kHz; two-tone, third-order dynamic range with 100-kHz tone spacing, 73.5 dB; selectivity, 1 kHz at −3 dB and 7.5 kHz at −20 dB. Blocking dynamic range was not measured. No microphonics were noted.

The frequency coverage of the sample receiver was 3473-4027 kHz. The poorer of the two MDS figures above (−113 dBm) confirms that the Neophyte is capable of detecting signals down to 0.5 microvolts across 50 ohms, as specified by WA3RNC. At 3520 kHz, sensitivity improved to just under 0.3 microvolt.—Ed.

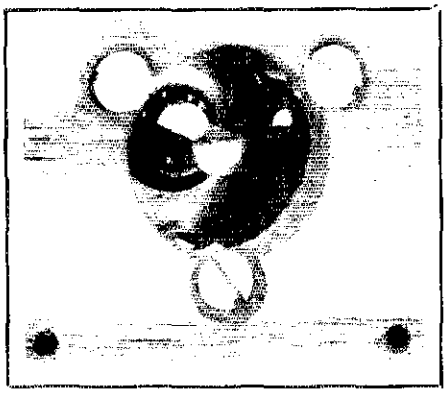


Fig 5—Detail of the mounting holes for the TUNING capacitor, C12. The holes are countersunk to keep the screw heads flush with the panel surface, allowing the reduction drive to be mounted flat to the panel. See text.

reduction-drive bushing and its set screw—*after* the capacitor mounting screw holes have been drilled.

Mounting the Neophyte's TUNING capacitor to the front panel as just described provides good mechanical stability. If you use a capacitor other than the one shown in the parts list for C12, carefully study your mounting options. Make sure that the mounting screws don't penetrate too far into the capacitor and damage the plates. Whatever you use for C12, mount it to the panel rather than the base, if possible.

The specified speaker requires a 2-inch hole (or a field of ¼-inch holes 2 inches in diameter). A small piece of wire screen or grille cloth between panel and speaker can be used to protect the speaker cone. (This is especially important if you mount the speaker behind a single large hole.) The speaker is attached to the panel with clips designed for this purpose (Mouser Electronics 48SC004); hot-melt glue or epoxy cement can be used instead. A 3.5-mm or 1/8-inch headphone jack is used to allow connection of inexpensive transistor radio earphones; if you prefer, you can use a ¼-inch jack here.

The antenna connectors (J1A and J1B in Fig 1) are part of a two-position terminal strip; this is mounted to the receiver base by means of standoffs and screws. Radio Shack push-button speaker terminals would be a good substitute here. The battery holder is a 4-"C"-cell holder from Mouser or Radio Shack.

Solder the components to the circuit board, being careful to observe capacitor polarity and IC orientation. (I recommend that you use IC sockets instead of soldering the ICs directly to the board.) After you've soldered the components to the board, cut off excess wire. Check carefully for solder bridges between circuit-board traces, proper electrolytic capacitor polarity, and correct orientation of D1, U1 and U2. If all looks well, wire the board into the rest of the receiver. As shown in Fig 2, use twisted-pair wiring for connections to C4, J1, J2 and R1. The capacitor specified for C4 has three terminals. Fig 4B shows how to wire these for connection to the circuit board.

When you've completed all connections, mount the board to the cabinet base by means of screws and spacers. Next, we'll align and test the Neophyte.

Checkout and Alignment

Before applying power to the receiver, recheck your wiring once again. Install four "C" cells in the Neophyte's battery holder. (Note: You can use a regulated dc supply in place of the batteries if you wish, but *do not apply more than 8 V to the receiver*, or you'll damage the ICs.) Install a milliammeter or digital multimeter (DMM) in series with the batteries, and turn on the receiver. If the meter indicates less than 15 mA, all's well so far.

Adjust the TUNING capacitor almost to minimum capacitance (plates just short of fully unmeshed). Connect a signal generator to the antenna terminals and inject a 500-μV, 4-MHz signal into the Neophyte.[3] Turn the Neophyte's GAIN control to maximum (fully clockwise if you've wired it correctly) and adjust oscillator coil T2 until you hear the test signal.

Position the RF PEAK knob on C4's shaft so that maximum capacitance (knob fully counterclockwise) is at nine o'clock and minimum capacitance is at three o'clock. Set the RF PEAK capacitor nearly to minimum capacitance (almost fully clockwise; near two o'clock) and adjust T1 for maximum signal strength. Verify that the receiver tunes 3.5-4.0 MHz with a slight overtravel at both ends of the range. Also check that the RF PEAK control tunes through resonance at both ends of the band.

Disconnect the signal generator from the Neophyte and connect a good antenna, such as a dipole, to the receiver. As you tune the Neophyte across the band, adjust the RF PEAK control for best signal strength. (Don't expect outstanding performance with a clip-lead antenna!) If you don't have a dipole, use a long random-wire antenna. (Use of a random-wire antenna also requires a ground connection.) Set the GAIN control no higher than necessary for solid reception; this reduces the likelihood of detector overload. This practice also lengthens battery life because U2 draws more energy from the battery as the receiver output increases. Battery life, longest when headphones are used in place of the speaker, can exceed 300 hours when fresh alkaline cells are used!

Summary

I welcome your comments and questions on the Neophyte—please include an SASE if you expect a reply. Several Neophytes have been built using different construction techniques. All perform flawlessly. The Neophyte usually can hear any signal audible on a typical ham transceiver. Its selectivity is adequate for band scans and casual listening, and it's an excellent project for schools, ham-radio classes, beginners and old-timers. In short, the Neophyte is fun!

APPENDIX

Parts for the Neophyte are available from a combination of these sources, and from Penntek Electronics (see Note 2):

Arrow Electronics
25 Hub Dr
Melville, NY 11747
tel 800-932-7769

Circuit Specialists
PO Box 3047
Scottsdale, AZ 85257
tel 602-966-0764

Mouser Electronics
11433 Woodside Ave
Santee, CA 92071
tel 619-449-2222

Mouser Electronics
2401 Hwy 287 N
Mansfield, TX 76063
tel 817-483-4422

Radiokit
PO Box 973
Pelham, NH 03048
tel 603-635-2235

Microphonics, Hum, LO Radiation: Low to Absent in the Neophyte

Although the Neophyte is simple, it does not exhibit the drawbacks sometimes associated with D-C receivers. Microphonics—unwanted noises that occur with vibration when electronic parts unexpectedly act like microphones—simply do not exist with this receiver, and I have not heard any hum, even when using an external power supply. LO radiation—sometimes a problem in simple receivers using LOs at *any* frequency—*isn't* a problem with the Neophyte: The measured LO level at the receiver antenna terminals is only 80 microvolts.

Notes

[1]Mouser Electronics carries 1½- and 2-inch reduction drives as part nos. 45KN100 and 556-S50, respectively. Radiokit carries a 2-inch drive as part no. S-50. See the Appendix for the addresses of these firms.

[2]Circuit boards and parts kits for the Neophyte receiver are available from Penntek Electronics, 14 Peace Dr, Lewistown, PA 17044, tel 717-248-2507. Prices are as follows: (1) An etched and drilled PC board, $4.50; (2) all PC-board-mounted components, and an etched and drilled PC board, $17.50; (3) a complete Neophyte kit, including drilled wooden panel, wooden base, all hardware and parts, $45; (4) builders who wish to supply their own parts for the Neophyte, but who have trouble finding a small-quantity source for the Signetics NE602N IC, can purchase the NE602N from Penntek Electronics for $3.25 postpaid. Add $3.50 for shipping and handling to all orders for options 1, 2 and 3. Pennsylvania residents, add sales tax to all orders. When ordering options 2 and 3, be sure to specify 80- or 40-meter operation. The ARRL and *QST* in no way warrant this offer.

[3]If you don't have access to a signal generator, you may be able to generate a test signal by feeding a 4-MHz transmitter signal into a dummy load. Connect a short length of wire to the Neophyte's antenna terminal (J1A) and bring the wire near the dummy load. Vary the spacing between the wire and the load—or reduce the transmitter output—until the transmitter signal is just strong enough to use.—Ed.

Professional Quality DTMF Decoder and SELCALL System

This inexpensive, simple-to-build project monitors the repeater for you! Don't be bothered with idle chatter, or miss a friend's call.

By Vince Yakamavich, AA4MY
220 Carriage Trail
Raleigh, NC 27614

My radio club was looking for a useful 2-meter repeater project when the idea of creating a selective calling (SELCALL) system surfaced. Club members searched through *The ARRL Handbook* for ideas, but were surprised to see only phase-locked-loop (567) technology.

The 567 device, like most tone decoders, is prone to false decodes from harmonics of the desired tones. Many commercial designs use substantial audio filtering to separate the inputs into a low and a high group to minimize the harmonics "seen" by the decoders. Commercially manufactured filters are expensive. The homemade approach is less costly; however, expensive test equipment would be necessary to set and maintain these filters. And, an accurate frequency counter is required to set the 567s. Lastly, the 567 decoders disregard Bell specifications (timing, differential amplitude, and so on) that were designed to ensure reliable operation while minimizing false decodes caused by voice phonemes and noise bursts that momentarily meet the frequency constraints of the dual-tone, multi-frequency (DTMF) system.

More advanced decoders have long since replaced old LC and 567 decoders. For about $70, you can build a SELCALL unit that responds to both an individual and a group call code and provides a means of controlling external equipment with DTMF tones. Best of all, *no* exotic test equipment is necessary to align the completed unit.

The Circuit

The design presented in Fig 1 is based on a family of ICs made by Silicon Systems, Inc: SSI-202P, 203P and 204P. Each decoder IC uses switched-capacitor technology to yield *both* high- and low-group tone filters, as well as the decoding function. Filter tuning is derived from a clock controlled by an inexpensive 3.579-MHz crystal. Thus, test equipment is unnecessary for alignment of the decoder. Because the decoder's switched-capacitor filters do not suffer the tuning drift problems of RC filters common in PLL decoders, this SELCALL is well-suited to a mobile environment.

The design calls for 12 CMOS ICs, one relay, and a handful of discrete components. The circuit can be built on a single PC board, and housed in your rig's external speaker enclosure.[1] A ribbon cable connects the main board to the accessory board(s).

A 16-pin header is used for the accessory socket, and is included on the unit. For several dollars more, other projects or planned additions to the circuit can be made. These projects may include an LED display, or a memory unit that allows others to access your SELCALL and leave *their* SELCALL code (or phone number).

Operation

The SELCALL connects to a transceiver through the radio's earphone jack. The only other connection is to a power source—9 to 15 V (ac or dc).

In normal SELCALL operation, received audio is blocked from the speaker until a valid DTMF sequence is received. This feature enables you to monitor a frequency without listening to every conversation. The SELCALL does the "listening," and "announces" when someone has called.

On receipt of a valid code sequence, the unit enables the speaker and optional audible alerting device, such as a buzzer. If you wish to listen to the activity on the channel, throw the SELCALL's switch to MANUAL for normal operation. If you are not monitoring the frequency, LEDs latch ON to indicate that your SELCALL sequence was received.

[1]PC board templates and a parts overlay are available from the ARRL for $1 to cover copying and handling costs. Send your check and request to ARRL-TD, 225 Main St, Newington, CT 06111, and ask for the Yakamavich DTMF/SELCALL templates.

What constitutes a valid code sequence? The unit features immunity to false decoding caused by partial decodes and repeated digits. It looks for the assigned digits, as well as a digit's proper placement within the string of digits. If your SELCALL is programmed for the code 000, it will not respond to anything other than 0-0-0. Pressing the 0 key continuously over a period of time will not be mistaken for a valid code sequence. If the code sequence is 19*, only that *exact* sequence works.

The unit has two separate SELCALL circuits. One is used for an individual call, the other for a group call. Both circuits can be programmed to accept any three-digit DTMF sequence from a 16-digit keypad (0-9, A-D, # and *).

A fourth DTMF digit accesses three additional functions. Two are latching functions with LED indicators. The third is momentary, and functions as a remote reset: It disables the speaker, and turns off latched functions. The intent of these secondary functions is more than turning on LEDs. By adding transistors and relays to the circuit, control of peripheral equipment is possible (turning on the coffee pot or opening the garage door, for example). The circuit can drive 5-V relay solenoids directly, allowing for control of peripheral equipment.

Programming

The SELCALL unit is easy to program. U3 in Fig 1 provides decoded tone outputs. The inputs to the logic decoders are labeled I1, I2 and I3 (one for each digit of the "individual" SELCALL circuit), and G1, G2 and G3 (one for each digit of the "group" SELCALL circuit). Strap the pin corresponding to the desired decoded digit to the appropriate input pin. For example, for an individual code of 730, run jumpers from U3's "7" output to I1, "3" to I2 and "0" to I3. Let's say the group call code is 55*. Run jumpers from the "5" ouput to G1, "5" to G2 and "*" to G3. For special

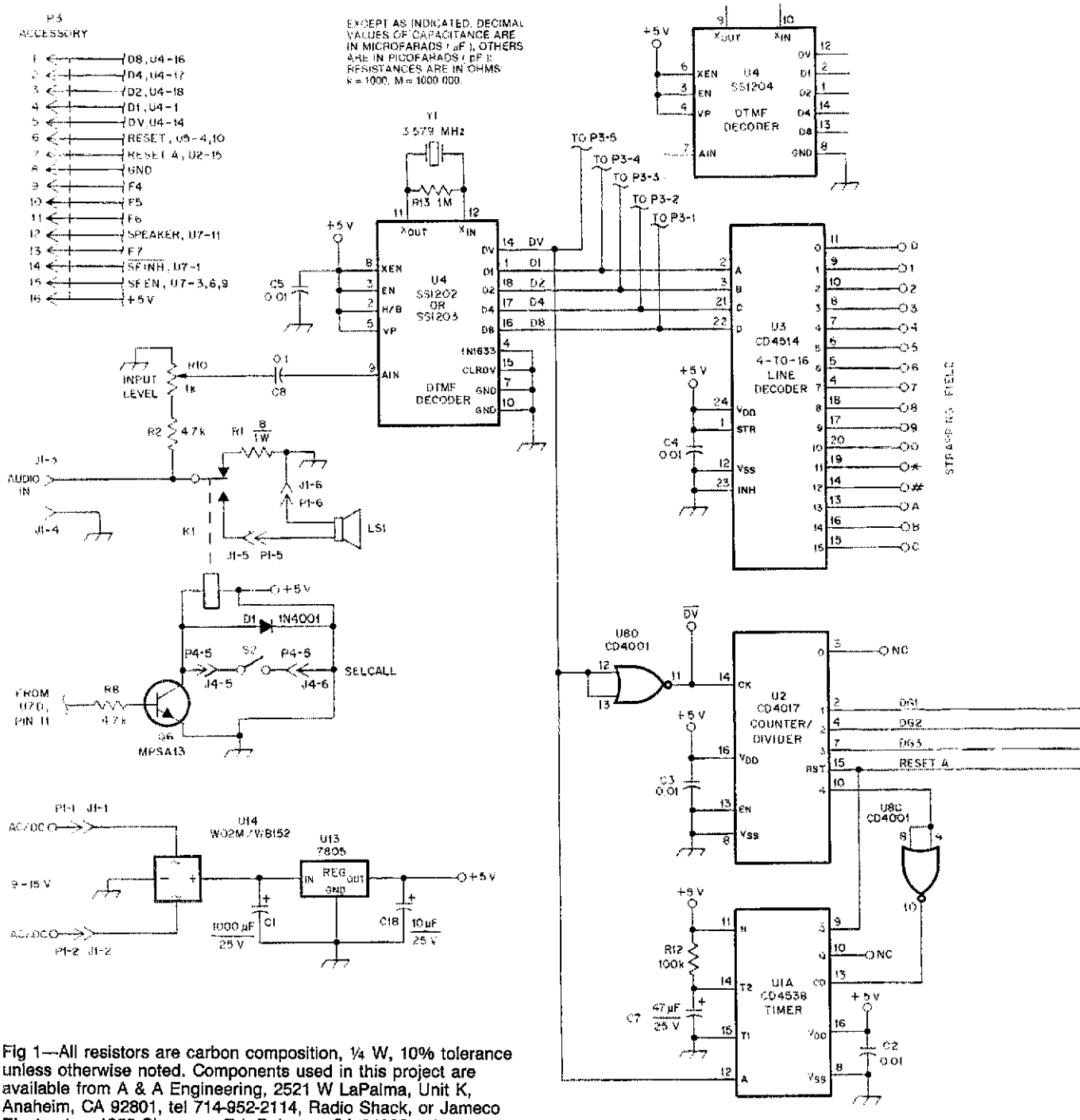
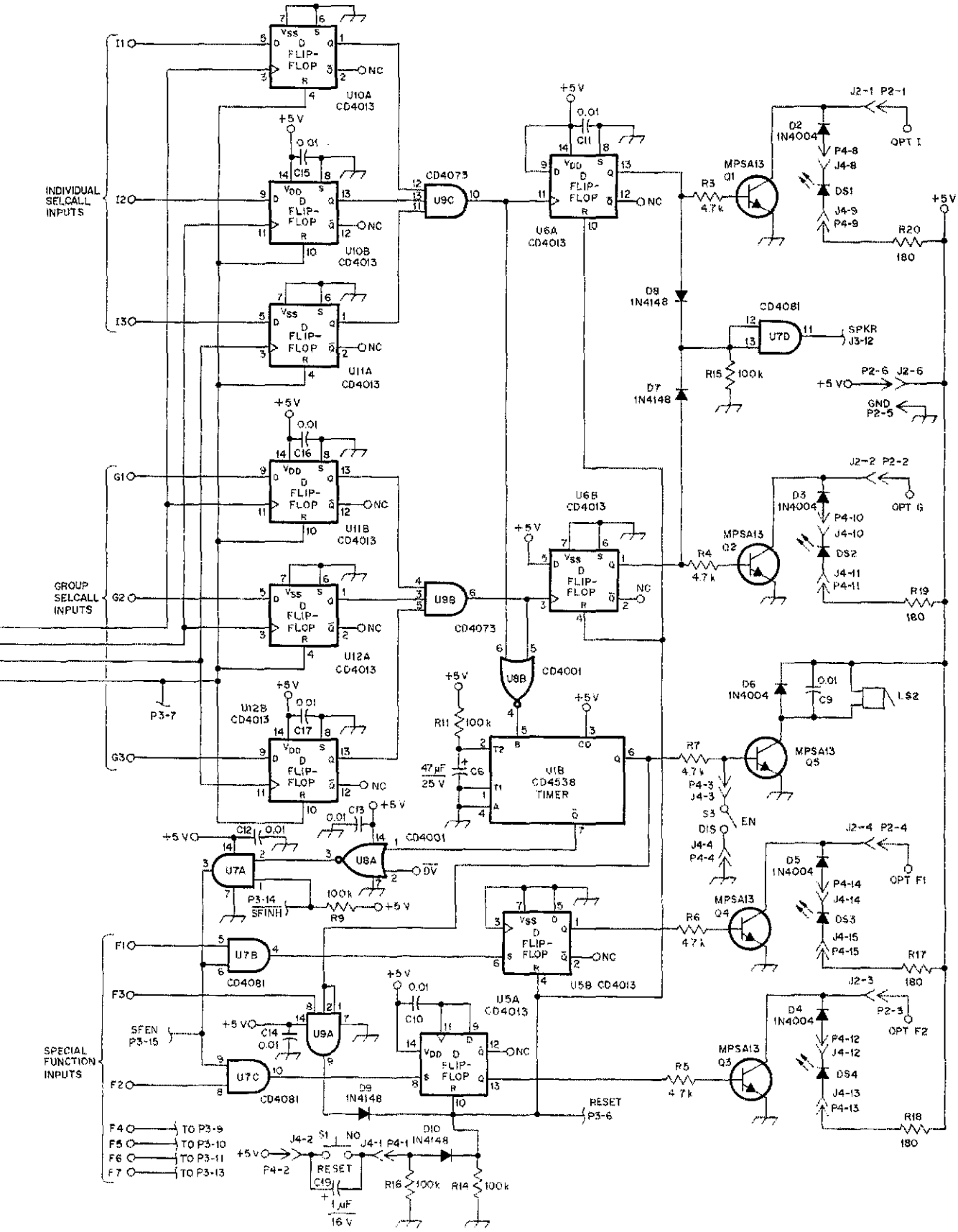


Fig 1—All resistors are carbon composition, ¼ W, 10% tolerance unless otherwise noted. Components used in this project are available from A & A Engineering, 2521 W LaPalma, Unit K, Anaheim, CA 92801, tel 714-952-2114, Radio Shack, or Jameco Electronics, 1355 Shoreway Rd, Belmont, CA 94002, tel 415-592-8097. SSI DTMF decoder chips may also be purchased from Hall-Mark Electronics, Inc, 11333 Pagemill, Dallas, TX 75243, tel 214-343-5000.

C1—1000-μF, 25-V electrolytic.
C2-5,9-17—0.01-μF, disc-ceramic.
C6,7—47-μF, radial.
C8—0.1-μF disc-ceramic.
C18—10-μF, 25-V electrolytic.
C19—1-μF, 16-V electrolytic.
D1-6—1N4004 diode.
D7-10—1N4148 diode.
DS1-DS4—LEDs.
J1,2—6-pin singular 0.156 header.
J3—16-pin dual 0.100 header.
J4—15-pin singular 0.100 header.
K1—5-V SPST DIP relay.
LS1—8-Ω speaker.
LS2—Piezo alarm.
Q1-Q6—MPSA13 Darlington transistor.
R1—8.2 Ω
R2-8—4.7 kΩ
R9,11,12,14-16—100 kΩ.
R10—1 kΩ.
R13—1 MΩ.
R17-20—180 Ω.
S1—Push-button, normally open switch.
S2,S3—SPST toggle switches.
U1—CD4538, dual-monostable multivibrator.
U2—CD4017, decade counter/divider with 10 decoded outputs.
U3—CD4514 analog multiplexer/demultiplexer.
U4—SSI-202P DTMF decoder (RS 276-1303).
U5,6,10-12—CD4013, dual D flip-flop.
U7—CD4081, quad 2-input AND buffered B series gate.
U8—CD4001, quad 1-input NOR buffered B series gate.
U9—CD4073, double buffered, triple 3-input AND gate.
U13—7805 voltage regulator.
U14—WO2M/WB152 full-wave bridge.
Y1—3.579-MHz crystal.


INDIVIDUAL SELCALL INPUTS
GROUP SELCALL INPUTS
SPECIAL FUNCTION INPUTS
I1
I2
I3
G1
G2
G3
F1
F2
F3
F4
F5
F6
F7
TO P3-9
TO P3-10
TO P3-11
TO P3-13
P3-7
P3-14 SFINH
SFEN P3-15
U10A CD4013
U10B CD4013
U11A CD4013
U11B CD4013
U12A CD4013
U12B CD4013
U6A CD4013
U6B CD4013
U5A CD4013
U5B CD4013
U9C CD4073
U9B CD4073
U8B CD4001
U8A CD4001
U7A
U7B CD4081
U7C CD4081
U9A
U7D CD4081
U1B CD4538 TIMER
+5V
NC
0V
0.01
C11
C15
C16
C17
C12
C13
C10
C14
C19
47 µF 25 V
1 µF 16 V
R11 100k
R9 100k
R16 100k
R14 100k
R3 4.7k
R4 4.7k
R7 4.7k
R6 4.7k
R5 4.7k
R15 100k
R20 180
R19 180
R17 180
R18 180
D2 1N4004
D3 1N4004
D6 1N4004
D5 1N4004
D4 1N4004
D8 1N4148
D7 1N4148
D9 1N4148
D10 1N4148
MPSA13 Q1
MPSA13 Q2
MPSA13 Q5
MPSA13 Q4
MPSA13 Q3
DS1
DS2
DS3
DS4
LS2
J2-1 P2-1
OPT I
P4-8
J4-8
J4-9
P4-9
J2-2 P2-2
OPT G
P4-10
J4-10
J4-11
P4-11
J2-4 P2-4
OPT F1
P4-14
J4-14
J4-15
P4-15
J2-3 P2-3
OPT F2
P4-12
J4-12
J4-13
P4-13
P2-6 J2-6
GND P2-5
SPKR J3-12
P4-3 J4-3
S3
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DIS
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P4-2
J4-2
S1
NO
J4-1 P4-1
RESET
P3-6

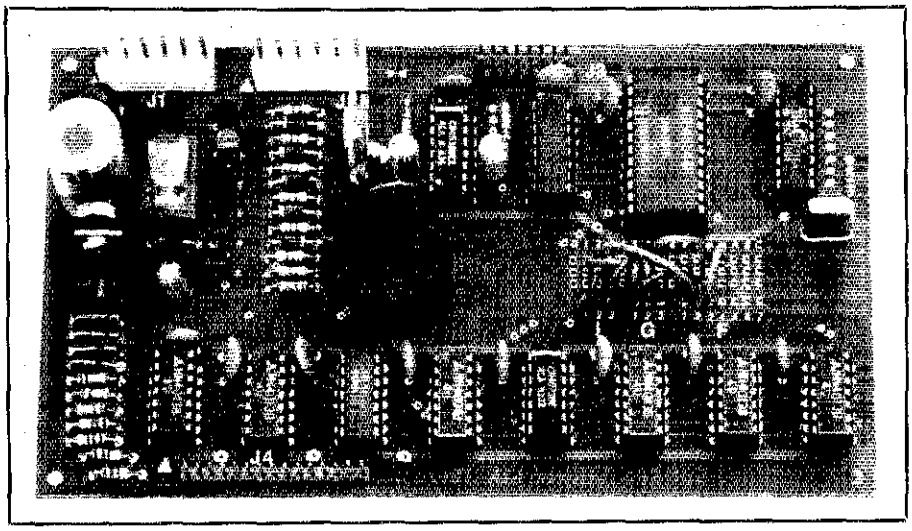


Fig 2—The DTMF decoder and SELCALL circuit. The unit shown was built from an A & A Engineering PC board and parts kit. (See text.)

functions, strap the appropriate output from U3's output to select the DTMF digits that will control special functions F1, F2 and F3. For a custom peripheral interface, connect your interface circuit to OPT F1 or OPT F2.

Circuit Operation

Audio from the radio's earphone jack is fed into the circuit's AUDIO IN jack, J1. This audio is routed through an 8-Ω resistor to ground (the resistor acts as a load for the receiver; very little audio power is required by the SELCALL system). A small sample of the signal is fed into U4, the tone decoder. DTMF signals are decoded, and the tone information (in binary format) is fed to a 4-to-16 line decoder, U3. U4 also sources a strobe pulse called DV (data valid). The DV strobe clocks U2, a digit counter, and triggers U1A, a timer. The timer automatically resets all decoding circuits five seconds after loss of tone at J1. This protects against "partial decode" falsing for situations in which the last digits of someone else's code are identical to the first digits of your code. This timer is retriggerable.

If the time from the *start* of one tone to the *start* of the next is five seconds or less, the timer will not reset. This provides sufficient time for even the slowest button-pusher to enter the right sequence.

U2 is the digit counter and clocks latches U10, U11 and U12. If the correct data from U3 is present at these latches when the appropriate clock occurs, AND gates U9A and U9B toggle and signal a valid code sequence.

U2 also resets upon receipt of a fourth tone. This prevents someone from repeatedly pressing buttons in an attempt to discover the correct code by trial and error.

When the condition for a valid code sequence is met at either AND gate (U9A or U9B), a latch is set (U6A for an individual code, U6B for a group code). These latches turn on a corresponding LED (DS1-DS2) and relay driver (Q2, Q3). They also turn on Q1, driving K1A and connecting a speaker, LS1, to the radio.

The AND gates (U9A and U9B) trigger another timer (U1A), turning on the buzzer (if enabled) and allowing reception of the fourth special tone. This timer allows the SELCALL unit to listen for approximately five seconds. If you want to turn on a special function, you must do it within five seconds of the successful recognition of your code by the SELCALL unit.

Once enabled, the buzzer sounds for five seconds. If the radio is unattended, the LEDs are latched to indicate a call was received. The radio speaker's audio remains on until the SELCALL system is reset. This may be done by pressing the RESET push button, or by sending an F3 tone immediately after another valid code sequence. This allows the calling party to turn off your speaker if you do not respond.

Conclusion

Although the SSI DTMF decoder chips have a wide dynamic range, they can be overloaded. Set R10 for 600 mV of signal at the IC for safe operation. Use 0.01-μF decoupling capacitors when working in an RF environment. It is worth the extra expense.

Fig 2 shows the completed circuit. Parts can be obtained from the junk box, local hamfest or A & A Engineering. Use IC sockets and be sure the relay has a 5-V coil. The transistors should be MPSA13s; the high gain and current capabilities of this Darlington are needed.

Comments, critiques and suggestions for added features are welcome. To packet a message to me use AA4MY @ WA4LPD. Happy SELCALLing!

A parts kit and the PC board for the SELCALL project are available from A & A Engineering, 2521 W LaPalma, Unit K, Anaheim, CA 92801, tel 714-952-2114. To order the circuit board only, ask for #152-PCB. The complete kit (PC board and parts) is #152-KIT. Prices are $17.95 and $69.95, respectively. Add $2.50 for shipping and handling. The ARRL in no way warrants this offer.

First licensed in 1967, Vince Yakamavich credits Amateur Radio as being responsible for a career in communications. He holds a BSEE, and General Radiotelephone and Amateur Extra Class licenses. Vince has worked in digital design, systems validation and product engineering for GE, ITT and ALCATEL. He spends his spare time chasing DX, packets and errant 1s and 0s. Vince also assists as an ARRL-accredited examiner and newsletter editor for the Raleigh (NC) Amateur Radio Society. His wife Joyce, WB7TXO (who he first met on the 80-meter Novice band), shares his enthusiasm for Amateur Radio.

New Products

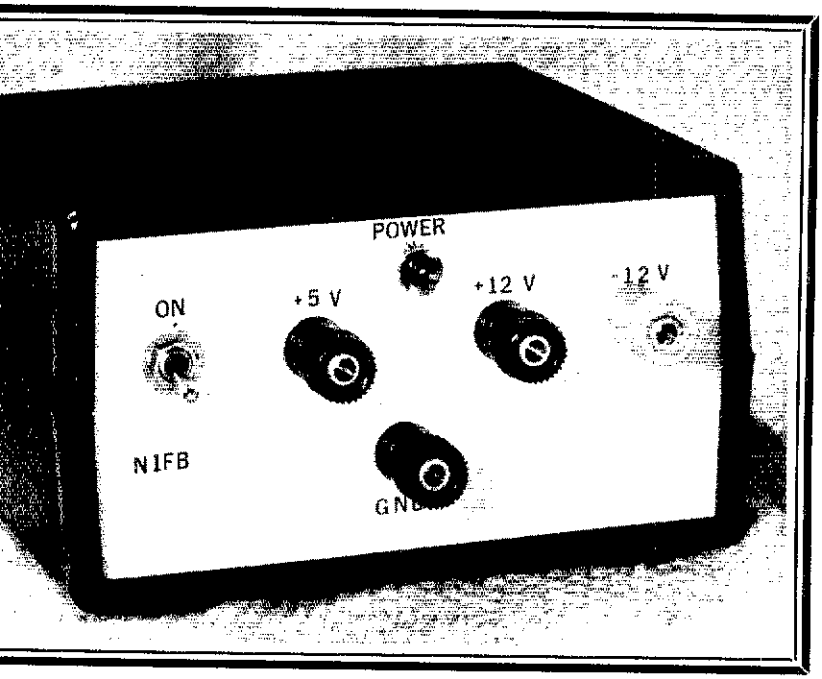
HUSTLER 10-METER AND WARC-BAND MOBILE ANTENNAS

☐ Newtronics Antenna Corp (Hustler) is now manufacturing resonators for the 24- and 18-MHz WARC bands. The resonators are compatible with the Hustler HF mobile antenna systems, and are rated at 400 W. Bandwidth (2:1 SWR) for the 24-MHz model is 90 to 120 kHz; for the 18-MHz model, 150 kHz. Suggested prices are $13.95 for the RM-12 (24 MHz), and $19.95 for the RM-17 (18 MHz). Hustler also has a new 1-kW mobile antenna for the 10-meter band, model RMX. Bandwidth is rated at 350 kHz or more. The coil is compatible with Hustler mobile antenna systems. Suggested price, $31.95. For more information, contact Newtronics at One Newtronics Place, Mineral Wells, TX 76067, tel 817-325-1386—*Rus Healy, NJ2L*

TRIDOS SOFTWARE "TERMINATOR" PROGRAM FOR THE IBM® PC

☐ Terminator is a graphic display program for the IBM PC and compatible computers that provides real-time daylight/darkness information in the form of a map. Geographical areas on the map display can be shown by adding their names, latitudes and longitudes, and zones to a parameter file. Terminator can be memory resident (allowing "hot-key" recall of the map display), or a stand-alone program. High-speed (elapsed-time) mode is available for viewing; sun position and local time can be displayed on the map. Suggested price, $39.95. For more information, contact TriDos Software Publishers, 4004 SW Barbur Blvd, Portland, OR 97201, tel 503-228-8223—*Rus Healy, NJ2L*

Power Supplies—Quick and Easy!



Need a low-voltage dc power supply? Here's how you can answer that need with a quick weekend project!

By Paul K. Pagel, N1FB
Senior Assistant Technical Editor, *QST*

One of the fundamental pieces of equipment you'll find in any amateur's shack, or on the workbench, is a power supply. Often, you'll find more than one supply, each delivering a particular voltage or number of voltages, and varying amounts of current.

Much of the low-power equipment in a modern ham shack or on the workbench can be operated from power supplies delivering ±5 to ±15 V at current levels of a few milliamperes to several amperes. Such supplies are relatively easy to assemble from a collection of parts we've gathered ourselves. But some hams prefer building kits or semi-kits: a form of one-stop shopping. Sometimes, too, it takes seeing a finished project to provide some initial momentum to get into the building mood. Hopefully, both of these suppositions are addressed by this article.

A Low-Voltage Supply

A & A Engineering, a supplier of PC boards, kits and parts for many *QST*, *QEX* and *Handbook* projects, offers several low-voltage, low-current, ac-operated supplies as kits or completely assembled units; you can also purchase the PC board only.[1]

[1]Notes appear on page 25.

One of the power supplies offered by A & A Engineering is the subject of this article. This is a simple project, something that you can easily slap together over a weekend. My version of the power supply (order no. 133-kit) is shown in the title photo and Fig 1.[2] A schematic diagram of the supply is presented in Fig 2. This supply delivers +5 V at 360 mA, and ±12 V at 60 mA. You'll find this supply adequate to power many small projects.

Circuit Description

Refer to Fig 2. Line voltage is fed to T1 through F1 and S1, the power on/off switch. T1 has two center-tapped secondary windings. One delivers 16 V ac to D1 and D2, the other winding supplies 27 V ac to bridge rectifier U4. The output of D1/D2 is filtered by C1 and fed to U1, a three-terminal regulator that delivers +5 V. U4's output is sent to U2 and U3, also three-terminal regulators, with output voltages of +12 and −12, respectively. Within their design ratings, U1-U3 supply a constant output voltage under varying load conditions. Each regulator is fitted with a heat sink to aid heat dissipation.

Putting It Together

As you can see from Fig 1, the entire power supply (with the exception of the panel-mounted hardware), is constructed on a piece of single-sided, fiberglass PC board. A two-terminal barrier strip (at the left rear) provides a means of securing the ac line cord. A strain relief from Radio Shack® (RS 278-1636) clamps the line cord to the rear panel. The four-terminal barrier strip (to the right) offers ground, +5, +12 and −12 V connection points. A board-mounted fuse holder is supplied, but I chose to bypass it (more on that later). Note the finned, U-shaped heat sinks on each regulator.

If you purchase the kit, assembling the parts on the PC board is straightforward; about the only thing you have to be careful of is orienting the components so that polarities are correct. If you decide to order the PC board only, however, you'll have to use parts that match the existing mounting holes exactly. Chances are slim that you'll find a transformer on the surplus market or in your junk box that physically and electrically matches T1. But, you can always mount a transformer (or transformers) off the board and bring leads to the board pads.

I used a take-down plastic box to house the supply. The box is composed of two clam-shell halves and removable front and back panels. This particular enclosure was scrounged from a friend (I've seen similar boxes for sale in mail-order catalogs), but any box of sufficient size will do. For

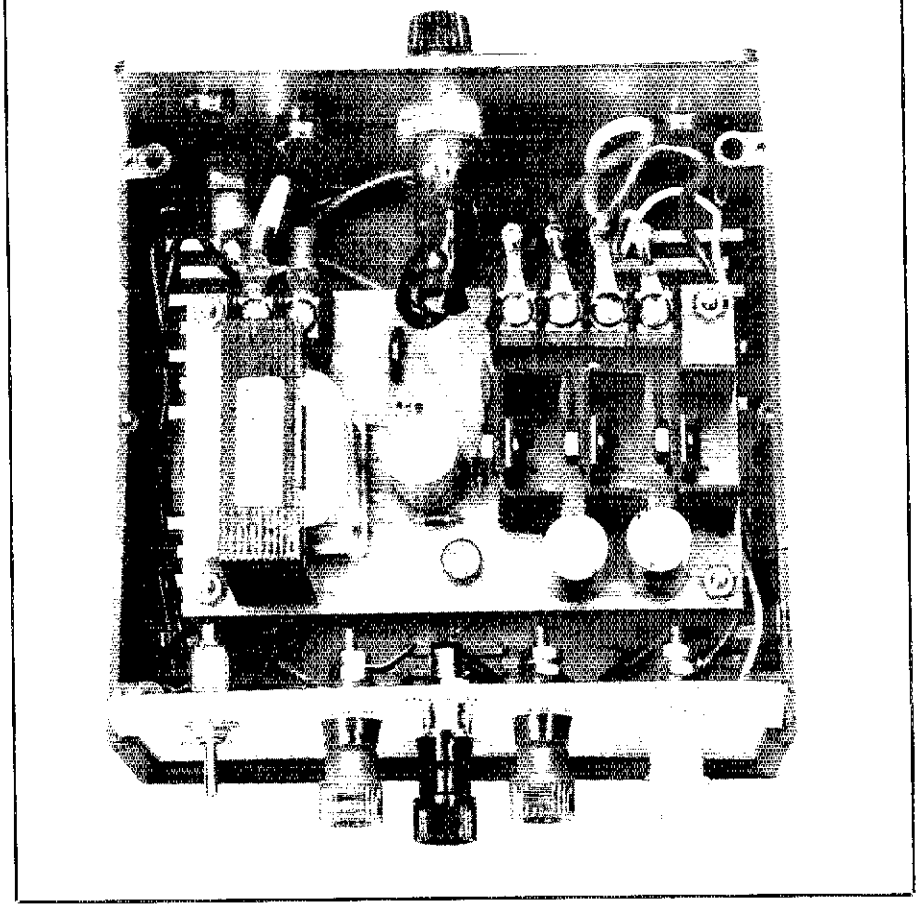


Fig 1—An inside view of the power supply (right). The finned objects to the right are the heat sinks on the regulators. A jumper wire (left of center) replaces the on-board fuse; a panel-mounted fuse holder is used instead.

instance, you could use a cookie tin, or make the box from double-sided PC board. The power supply PC board is supported within the enclosure by short, threaded spacers and no. 4-40 hardware.

The ac line cord enters the cabinet from the rear panel. Use a three-wire cord for safety's sake. The green (ground) conductor is connected to the common of the power supply board at the output terminal strip, J2. All connections to the two terminal strips are made with crimp-on lugs (for the ac line cord), or solder lugs.

For a couple of reasons, I elected to eliminate the on-board fuse holder and add a fuse holder to the rear panel of the enclosure. First, this allows routing the hot (black) lead of the ac line cord to the fuse holder *first*, then on to S1. Second, the fuse is readily accessible; I don't have to open the cabinet to change the fuse should it blow.

Finishing Touches

The top and bottom box halves are

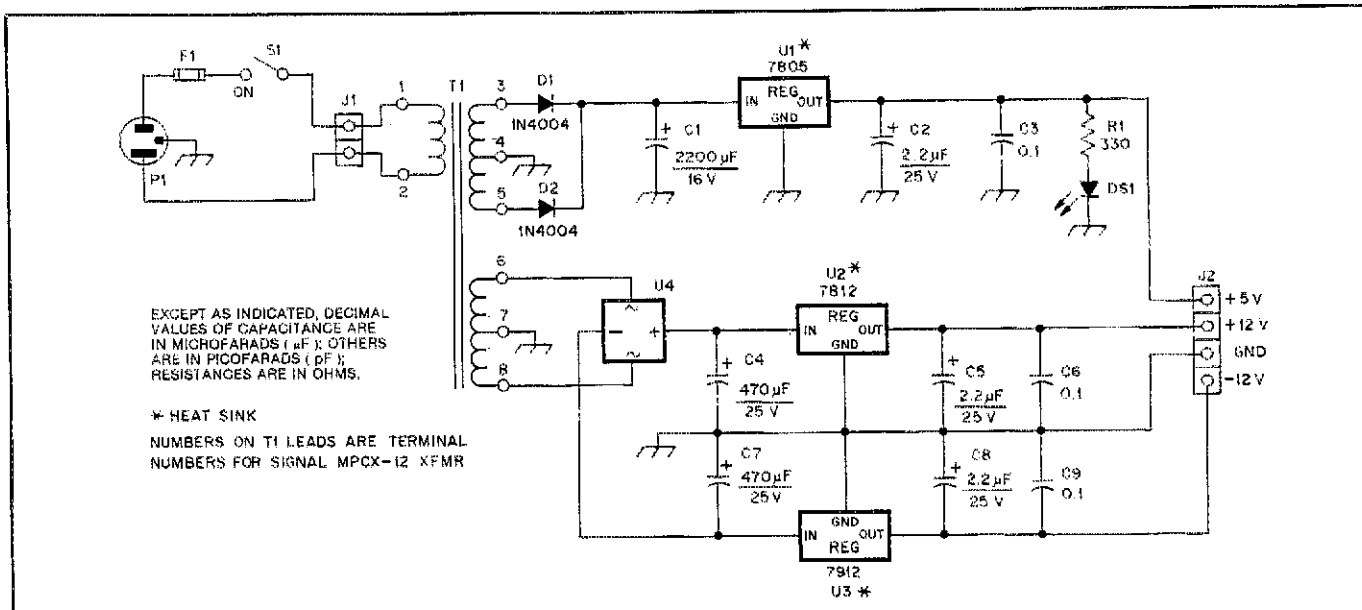


Fig 2—Schematic diagram of the A & A Engineering power supply. The numbered circles on T1's windings refer to the terminals of the Signal MPCX-12 transformer supplied with the kit. T1 has a 120-V primary winding and two center-tapped secondary windings.

The ground (green) wire of the three-conductor line cord is connected to the GROUND terminal on J2. A panel-mounted, easily accessible fuse replaces the on-board fuse (a jumper wire is used in its place). This also provides for properly routing the hot (black) lead of the ac line cord to the fuse holder first, then on to S1.

C1—2200-µF, 16-V electrolytic.
C2, C5, C8—2.2-µF, 25-V electrolytic.
C3, C6, C9—0.1-µF, 50-V disc ceramic.
C4, C7—470-µF, 25-V electrolytic.
D1, D2—1N4004, 400 PIV, 1-A rectifier.
DS1—Red LED.
F1—120-V, ¼-A fuse.
J1—Two-terminal barrier strip.
J2—Four-terminal barrier strip.
P1—Three-prong, 120 V ac plug.
R1—330 Ω, ¼ W.
S1—SPST toggle switch.
T1—Signal MPCX-12 power transformer; 120-V primary; sec 1, 16 V ac, 432 mA ct; sec 2, 27 V ac, 144 mA, ct.
U1—7805 three-terminal, +5 V, 1 A voltage regulator.
U2—7812 three-terminal, +12 V, 1 A voltage regulator.
U3—7912 three-terminal, -12 V, 1.5 A voltage regulator.
U4—100 V, 1.5 A full-wave bridge rectifier.
Misc—Heat sinks (Wakefield 286-AB), cabinet, binding posts, fuse holder, line-cord strain relief and hardware.

black. Because the original plastic front panel was damaged, I replaced it with a piece of PC board spray-painted beige. Rub-on transfers identify the front-panel components. The combination of black, red, beige and yellow colors is rather attractive.

Three binding posts (RS 274-661) are mounted on the front panel. The yellow (−12 V) post was originally a red one; a few squirts of spray paint made the transformation. The color-coding helps eliminate confusing the +5 V post (red) with the −12 V post. (As some of you may have already discovered, most components will not tolerate wrong voltage levels and polarity. They let you know this by spraying little pieces of themselves all over your shack, emitting noises or smoke signals!)

To finish off the panel, a red LED secured in a chrome-plated holder (RS-276-068) is used as a power-on indicator. An SPST switch (RS 275-624) is used for ac power on/off control.

Summary

Certainly, many of you can assemble this supply from components you have on hand, can scrounge from a friend or purchase at electronic components suppliers. But if your parts sources are dry, scarce or nonexistent, or you'd just rather go the kit route, here's a way you can enjoy the smell of heated solder, the fun of building and the pleasure of using something you've constructed with your own hands. You'll then have a power supply that will find many uses in your shack or workshop.

Notes

[1]A complete list of available kits and assembled units can be obtained from A & A Engineering, 2521 W La Palma Ave, Unit K, Anaheim, CA 92801, tel 714-952-2114. A & A Engineering is operated by Stas Andrzejewski, W6UCM.

[2]See "New Products," *QST* Feb 1987, p 43 for more information on these supplies. This project's PC board (133-PCB) is $6.25; the kit, consisting of the PC board and board-mounted components (133-kit), is $30.35. An assembled version of the supply, which includes only those parts mounted on the PC board, (133-asy), is $39.95. Add $2.50 for shipping and handling. The ARRL in no way warrants these offers.

Strays

CALL FOR PAPERS: *THE ARRL ANTENNA COMPENDIUM, VOLUME 2*

Antennas are my favorite subject. They are also one of the more popular topics in on-the-air conversations, as well as in Amateur Radio literature. Just tune across any active amateur band and copy or listen to the exchanges; you'll probably find antennas being discussed on more than one frequency. Further evidence of this fascination is exhibited by the continuing popularity of *The ARRL Antenna Compendium, Volume 1*. More than 6000 copies have been sold since its appearance in June 1985.

Volume 1 of the *Compendium* contains 31 papers, none of which had previously been published. The topics range literally from A (antennas) to Z (impedance matching). Several papers present ideas and information that even today are not covered in other amateur literature—information that is very pertinent if you want to know about or like to experiment with antennas.

For example, in my opinion (as one of the editors of the book), the paper by Roy Lewallen, W7EL, "Baluns: What They Do and How They Do It," is a classic—"must read" material for antenna experimenters. Another is "Optimum Design of Short Coil Loaded High-Frequency Mobile Antennas," by the late Bruce F. Brown, W6TWW. I could go on, but then this write-up would end up looking like the table of contents for the book. (By the way, you *do* own a copy of *Volume 1*, don't you?)

So much for *Volume 1*. Plans are already being laid for a new publication, *The ARRL Antenna Compendium, Volume 2*. The book will be typeset rather than computer printed as was done experimentally for *Volume 1*. Drawings will be prepared for publication by our drafting department instead of directly duplicating author—submitted drawings. Yes, based on the success of *Volume 1*, we're planning to make *The ARRL Antenna Compendium, Volume 2* a first-class publication—one that will shine among other antenna publications, and one that its contributing authors will be proud to show off. And, of course, one that will be bursting with really good information about antennas and related subjects. As with *Volume 1, Volume 2* will contain all new material—no reprints of old stuff. Editing work on the book has already begun. Our plan tentatively calls for appearance of the book in late 1988 or early 1989.

Right now is the time for *you* to think about submitting material for *Volume 2* of the *Compendium*, so you can become a part of these exciting plans. Is there a subject near and dear to your heart related to antennas, transmission lines or propagation effects, one about which you'd like to write a paper? Suggested topics are quads, loop antennas, Yagis, LPDAs, vertical arrays, radial or counterpoise systems, transmission lines, measurement techniques and results of unusual propagation conditions (especially at VHF/UHF) such as aurora, sporadic-E, grayline or solar eclipse effects. We're especially interested in material related to experience and in construction projects, although tutorial articles will be considered. If your material is accepted for inclusion in *Volume 2*, on publication you'll be paid the standard author's fee (presently $50 per published page).

Give this idea some serious thought; there is no need for a hasty decision. Maybe you *should* be one of the contributing editors for *Volume 2*. An author's kit is available from HQ to help you prepare your material. Submit your paper to *Antenna Compendium*, Technical Department, ARRL Headquarters, 225 Main St, Newington, CT 06111. Please advise us ahead of time if you plan to submit a paper after June 1, 1988. Thanks!—*Jerry Hall, K1TD, Assoc Technical Editor*

HQ IS LOOKING FOR ARTICLES

☐ HQ is always looking for well-written articles for *QST* and *QEX*. Payment of $50 per published *QST* page, $35 per published *QEX* page and $20 per published Hints and Kinks item is made upon publication. In addition, there is a $6 per published page premium for manuscripts that are already keyboarded into machine-readable form (IBM® PC format). If you have a completed manuscript or a Hints and Kinks item, please send it to us. If you have further questions, write to the following at ARRL HQ, 225 Main St, Newington, CT 06111: (for *QST* technical material, including Hints and Kinks) Paul Pagel, N1FB; (for other *QST* material) Joel Kleinman, N1BKE; (for *QEX*) Maureen Thompson, KA1DYZ. We look forward to reviewing your material for possible publication in *QST* or *QEX*.

I would like to get in touch with...

☐ anyone with a schematic for TCXO (temp control oscillator) *only* from Heath SM-128B Auto Ranging Frequency Counter. Harold Jones, WB1ABM, 48 Saning Rd, Weymouth, MA 02191.

☐ anyone with a manual for Hallicrafters Model SX-122. John Zonzo, WA9UZY, 2922 N Keating Ave, Chicago, IL 60641.

☐ anyone with a TPL 2-meter amplifier, Model 802-B. Chuck Davis, W9OKL, 722 S Market St, Hoopeston, IL 60942.

☐ anyone having technical specs on tuning the TET 10-15-20 meter beam. Harvey Lybolt, N3BNG, 2116 Sweetbrier Ln, Timonium, MD 21093.

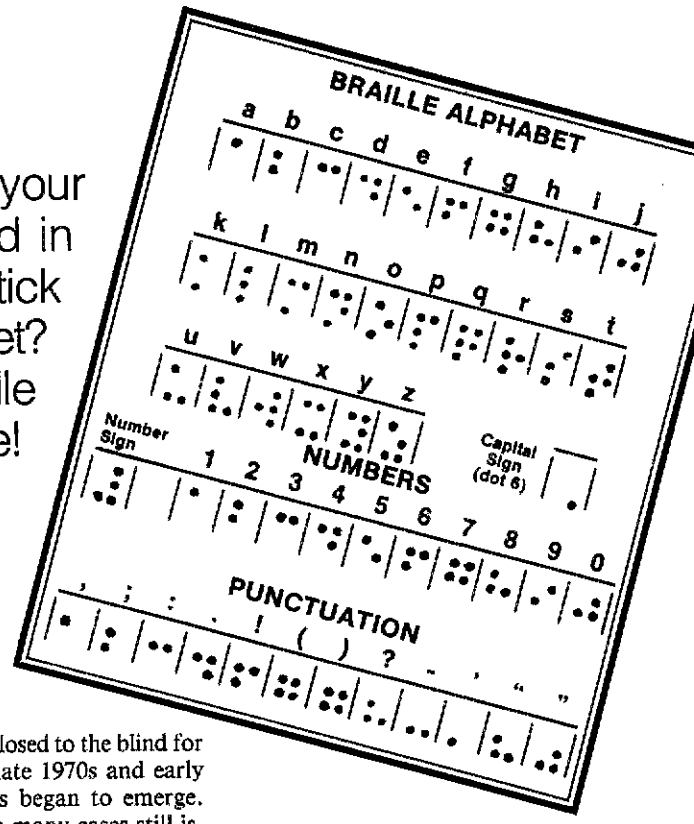
***QST* congratulates...**

☐ Richard Snyder, W6PPP, of Placentia, California on being named to Who's Who in California.

A Passport to Communications for the Blind

How'd you like to carry your communications terminal around in one hand—or be able to stick the terminal in your pocket? You can with PortaBraille and PocketBraille!

By Fred L. Gissoni, K4JLX
310 Pleasantview Ave
Louisville, KY 40206



Picture this: A packet-radio/RTTY terminal that weighs 3¾ pounds and measures 2½ × 8 × 6 inches (HWD). The unit is battery operated, has 256 kbytes of RAM, RS-232-C and parallel I/O ports, a full ASCII keyboard, keyboard adjustment of operating parameters and text-editing capability. What's more, it talks!

But, look! The ASCII keyboard has only seven keys! And, there's no video display! Why? It's because this terminal is designed for use by the blind. With this terminal, you have to read the incoming data by touch, or have the built-in speech synthesizer voice the data for you.

The terminal I've just described is the PortaBraille, a device conceived and developed in Frankfort, Kentucky. Frankfort is the home of the Technical Services Unit of the Kentucky Department for the Blind. That's where I work.

Some History

Well over 30 years ago, when the clack of teleprinters disturbed the sleeping family members of RTTY operators, Bob Gunderson, W2JIO (now a Silent Key) demonstrated successfully that RTTY signals could be used to generate the printing of Braille characters on paper. Unfortunately, the method isn't practical.

Using elite type, a printer or typewriter can place 12 characters in an inch. But, Braille information on paper is physically bulky. It takes only *four* Braille characters to occupy an inch! For example, W2JIO's Braille teleprinting was done on paper tape. A 1000-character message produced a strip of tape over 28 feet long!

When the use of video terminals became popular, the door to digital radio communication remained closed to the blind for a time. Then, in the late 1970s and early '80s, Braille terminals began to emerge. Their cost was, and in many cases still is, prohibitive. Prices range from $4500 to $13,000 per unit!

An Idea Forms

Braille is the raised-dot reading and writing system used by blind people the world over. Its basic unit is the cell. A single cell can contain up to six dots in a matrix two dots across and three dots high (Fig 1). Braille is not an international *language*, but any language that is written in Braille uses this basic pattern. The Braille keyboard requires only seven keys to do its work. (See the sidebar, "ASCII With a Seven-key Keyboard," for details about the Braille keyboard.)

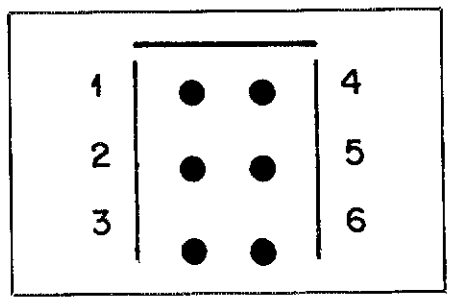


Fig 1—The six dots of a Braille cell are arranged and numbered as shown here. With these six dots, a total of 252 distinct characters and word signs are possible. From the six dots are formed complete literary, mathematical, chemical and musical codes. The Braille system can be adapted to any language having an alphabet.

Our mission in the Technical Services Unit is to modify jobs, methods of doing jobs or various devices so that they can be managed without the gift of sight. If blind people are to work in information-handling industries, they need fast and reliable data entry and retrieval systems. Speech synthesizers are excellent for some applications, but to the skilled reader of Braille, that is the preferred method. Why? Because a speech synthesizer can make things difficult to understand by pronouncing, for instance, the abbreviation "Dr" as "doctor" when it is intended to mean "Drive." With Braille, "what you feel is what you get."

The March 1982 issue of *QST* contains an article about an electromechanical Braille readout device for a frequency counter.[1] Wayne Thompson, our electronic engineer, and I asked ourselves how we might be able to use the readout. Time passed. We pondered—and the PortaBraille gradually took shape. It never would have come into being without Wayne's efforts. He did all the engineering and wrote all the software that went into the PortaBraille.

The PortaBraille and PocketBraille

The electromechanical display is to the PortaBraille as a CRT is to a video terminal; it is the gateway through which data passes from the terminal to the

[1]Notes appear on page 29.

ASCII With A Seven-key Keyboard

In order to understand the workings of the PortaBraille or PocketBraille keyboards, we need to consider the mechanical keyboard of the conventional Braillewriter. The Braille "cell" (see Fig 1) has a six-dot matrix: two dots wide and three high. Reading down from the top of the cell, dots 1, 2 and 3 are at the left; dots 4, 5 and 6 are to the right. On the Braillewriter (the device used for writing Braille on paper) the keys that produce dots 1, 2 and 3 are found to the left of the space bar; dots 4, 5 and 6 are found to the right of the space bar.

When the Braillewriter keys are pressed, the resulting energy is transferred by mechanical linkage to force blunt pins upward to press the appropriate dots onto the paper page. The embossing head moves to the next character position when the keys are released. Thus, if you pressed dots 1 and 2 to form the letter b, and realized (while one of the keys was still pressed) that what you wanted was the letter l, all you need do is to add the missing dot (dot 3).

With six dots to work with, you can have as many as 63 combinations within the single cell. How is it possible to obtain the full set of ASCII characters within such constraints? It's easy! Just use the space bar. Using the Braillewriter and paper, you cannot press the space bar at the same time you press a dot key and notice any difference. But with the electronic keyboard of the PortaBraille, we have a different situation. With paper Braille, we're dealing with mechanical linkage. With the PortaBraille, the linkage is through software.

The PortaBraille uses keyboard interrupt routines. That is, when a key is pressed, the system goes into a program loop waiting for the appropriate set of instructions. Whereas the paper Braille system responds to the press of each key, the PortaBraille waits until the last key of a multi-key press is released before reacting to the resulting signal.

The combination of any character key and the space bar is called a "chord," and may be compared to the action resulting from holding down the SHIFT key on a typewriter and pressing another key. These chords tell the PortaBraille to expect additional instructions. For example, if the dots that produce the letter *u* are pressed in conjunction with the space bar, the PortaBraille regards the next character as an uppercase symbol. Pressing two u-chords in succession is similar to locking the SHIFT key. All characters that follow are handled as uppercase characters until the power is turned off, or uppercase is unlocked with a q-chord. Of course, all this happens so quickly that you're unaware of the hundreds of instructions that are being transmitted and acted upon as keys are pressed.

Whenever a chord command is issued, the PortaBraille system sends it on to a "user interface" routine that looks to see what is going to happen next. Chord characters can be followed by other keyboard characters that define the command. In the case of the "delete line" command, the d-chord is followed by the letter *l*. This, in turn, can be followed by one, two or three digits indicating the number of lines to be deleted. It can also be followed by nothing more than a terminating indication to tell the system that it is time to execute the command.—*Fred Gissoni, K4JLX*

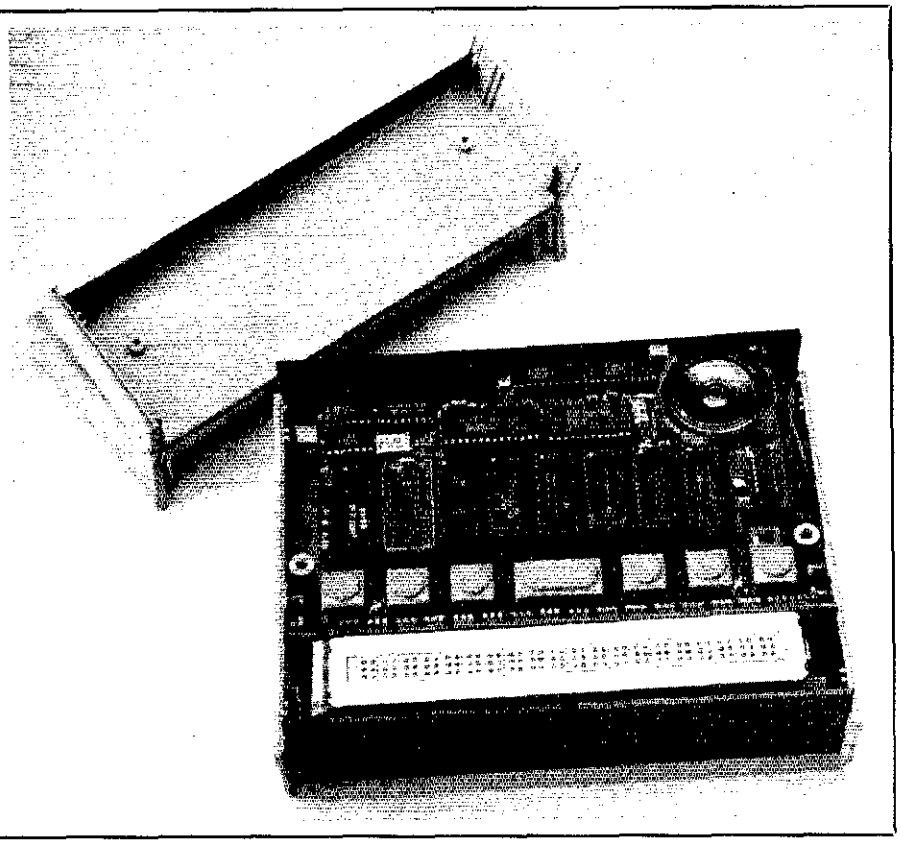


Fig 2—The PortaBraille. With this 7-key keyboard, all ASCII characters are entered by pressing keys singly or in combination. One command shifts the next character to uppercase; another command locks the system in uppercase. A third command shifts the next-entered character into the control register. The 20-character (cell) Braille display is located between the keyboard and the front of the case.

operator. The PortaBraille display (shown in Fig 2) contains 20 cells and reveals 20 characters at a time. Each cell contains six pins that pop up and latch into place to display a given character. A -12 V pulse raises the pins; a $+12$ V pulse releases the pins.

If we think of a video screen as a window through which we can view 25 lines of text with 80 columns per line, the PortaBraille can be thought of as a movable keyhole through which a 20-character segment can be examined at any given time. Think of it as indexing a strip of paper tape forward in 20-character jumps. This method is better than it might at first seem. Because Braille is read with one or two fingers, it's not possible to scan a page of text with the hand exactly as is done with the eye. Having a movable keyhole is alright if you can move it quickly enough. PortaBraille keyboard commands make swift movement of the display window possible—but that's getting ahead of the story.

Several elements make the PortaBraille different from the higher-priced Braille terminal units mentioned earlier. The PortaBraille is small enough to be truly portable. Yet its battery capacity (up to two or more weeks, depending on how it is used) offers you convenience when traveling.

One of PortaBraille's features enables it to function as a serial-to-parallel or parallel-to-serial converter. "Hooks" (readily accessible program entry and exit

points) are available for those who want to write programs for it. All documentation (including source code) is open and available to interested experimenters. PortaBraille's internal speech synthesizer can be used to voice the data, if desired.

When power is disconnected from the PortaBraille, all data is erased. That also happens when a video terminal is turned off. We have, however, designed a tape interface system that allows data to be stored on audio cassette tape at 2400 bauds for relatively fast storage and retrieval.

For those who either are not able to read Braille, or want a less-costly device, we have developed the PocketBraille (Fig 3); it measures 8 × 5 × 1 inch and weighs about 1 pound. The unit shown in the photograph is built inside a plastic videotape cassette container. The PocketBraille features an internal speech synthesizer, 256 kbytes of RAM and supports all the commands recognized by the PortaBraille, but does not include the electromechanical readout.

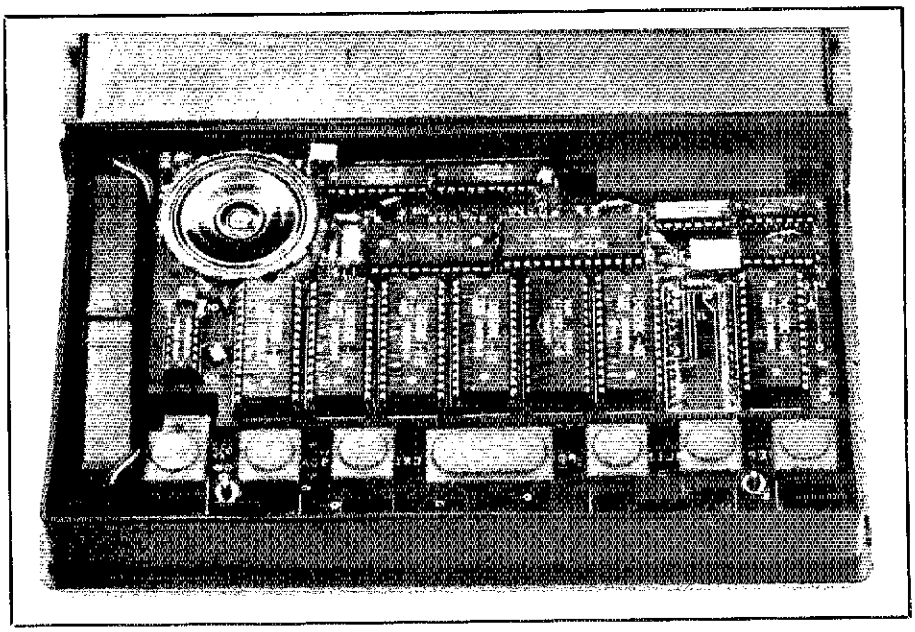


Fig 3—The PocketBraille, little brother to the PortaBraille. This unit contains all the features and functions of the larger device except for the Braille display unit. Light weight, small size and relatively low cost make the PocketBraille a worthwhile option for many blind amateurs.

Recent Additions

We have added an external memory port to the PortaBraille and PocketBraille. This port provides for insertion of 32-kbyte external memory modules. If you think of the PortaBraille or PocketBraille as a reading or writing device, these modules can be considered as documents that you can read, or notebooks into which you can write.

Another feature (still in the development stage) that works with the Pocket/PortaBraille units is the Screen Door add-on. See the "The Screen Door" sidebar for more information.

Flexibility

We have tried to make the PortaBraille and PocketBraille hardware stable so that further development can be done with software. This allows anyone interested in working on specific applications to get into the game, since all our documentation, including source code, is available. Our plans include modifying speech so that it is possible to have words spelled with or without the phonetic alphabet. Some letters sound like others, and there are times when such a modification would avoid confusion.

Availability

Some potential Amateur Radio applications for the PortaBraille and PocketBraille follow, but a complete description of the units and their operation is beyond the scope of this article. The Southland Manufacturing Company is building the Porta- and PocketBraille and sells them at manufacturer's cost.[2] They regard this as corporate giving, and it is an activity they are uniquely able to carry on.

For those who like to "roll their own," the Kentucky Department for the Blind offers a construction manual and a user's manual for both units. The construction manual provides step-by-step assembly instructions and includes a complete list of parts suppliers.[3] Each unit can be built by most kit builders in 8 to 12 hours. Parts cost for the PocketBraille is $350-$400; the PortaBraille cost is approximately $1300.

On the Air

Packet Radio

A vital part of any packet-radio station is the terminal node controller (TNC). Two manufacturers of packet-radio equipment,

The Screen Door

The Screen Door is so called because it enables a visually impaired person to read a video display by using the Porta/PocketBraille. This hardware/firmware computer add-on is still in the development stage. A working prototype is presently being used in an Apple® computer. An IBM® PC version is also contemplated.

The Apple version of the Screen Door is installed as any other peripheral card; it's plugged into a peripheral-card slot on the motherboard. The Screen Door reads the Apple computer's display and sends the information to the Porta/PocketBraille. The person using the system can then determine what's being displayed on the screen by using the PortaBraille's mechanical readout, or listening to the Porta/PocketBraille's speech synthesizer.

There are special Porta/Pocket Braille commands that help you navigate the Apple's display. You can go to the precise cursor location, or go to the line containing the cursor, and identify the line and the character position at which the cursor is resting. If you're familiar with the program you're using, this feature enables quick and efficient movement to important screen locations. For example, some Apple software uses inverse video and flashing characters to denote specific items. Using the Screen Door, you can go to the start of the line containing any inverse or flashing video character(s). Then, by reading across the line with the speech synthesizer active, you will hear the word "flash" before a flashing character, or "vid" before a character in inverse video. If the character is in uppercase, it will be voiced in a pitch higher than normal. As a result of this, it's possible for a blind person to effectively use a program such as AppleWorks.™

The Screen Door will be useful to many sight-impaired people. It will enable them to use commercially produced programs that cannot be made to talk because of copy-protection schemes employed by the software producer. Pascal, a programming language that has heretofore not been used successfully with speech synthesizers and the Apple, is now accessible.—*Fred Gissoni, K4JLX*

Kantronics and AEA, make operating manuals available to blind readers in the form of ASCII text files.[4] The availability of information in such a form makes it easier for the blind Amateur Radio operator to use a Braille terminal and synthesized speech output (the Pocket- and PortaBraille) in conjunction with a TNC—a passport to packet radio.

AMTOR and RTTY

I personally have not tested this, but there is every reason to believe that the PortaBraille and PocketBraille will perform well on AMTOR and RTTY. I have used both units to copy RTTY, but have not engaged in QSOs using RTTY.

Some modern transceivers have RS-232-C control capabilities. There should be full compatibility between such gear and the PortaBraille or PocketBraille.

Traffic Handling

Using the PortaBraille as a stand-alone device, it's possible to copy traffic (phone or CW) and quickly find spots where fills are needed. When you miss something, you include a unique mark, a tilde (~) for example. Then, when asking for fills, use the FIND capability to search forward or backward for the fill marker. If you're a liaison between sectional and regional nets, another mark, such as the "at" sign (@), placed immediately after the state name can help sort messages for routing.

Using such a method, a blind operator serving as the NCS (net control station) can easily make insertions of additional traffic, check-ins, and so on, where they need to be on a list. This method is advantageous if you compare it to that of a sighted operator having to check through several sheets of paper covered with notes.

Pocket- and PortaBraille are passports to packet radio.

Summary

I hope this brief look at the PortaBraille and PocketBraille will benefit others. Perhaps you can think of other applications for which these units are well suited. For many people, they're sure to be passports to modern data communications.

Notes

[1]J. Swail, "A Digital Readout System for the Visually Impaired Operator," Mar 1982 *QST*, pp 11-15. See also, G. Horn, "Braille Tactile Transducer—New Freedom for the Sightless," Dec 1981 *QST*, pp 45-47.

[2]Contact Mr Justin Ryan at the Southland Manufacturing Company, 680 Bizzell Dr, Lexington, KY 40510, tel 606-253-3066. Check for current prices. Prices at the time of writing are as follows: PocketBraille, $900. Four versions of the PortaBraille are available: 32 kbytes of RAM, no speech synthesizer, $1500; 256 kbytes of RAM, no speech synthesizer, $1800; 256 kbytes of RAM and the speech synthesizer, $2000; 224 kbytes of RAM, speech synthesizer and provision for an external memory module, $2000. Also available is a tape interface device that allows transmission of Porta Braille or PocketBraille data to and from an audio cassette tape recorder. This interface is priced at $70.

[3]The set of manuals is available for $5 payable to the Kentucky State Treasurer, Department for the Blind. Requests should be sent to the Technical Services Unit, Kentucky Department for the Blind, 427 Versailles Rd, Frankfort, KY 40601, tel 502-564-4754.

[4]Some of the older Kantronics equipment manual files are available on Apple formatted disks; newer manual files are on MS-DOS formatted disks. Contact Kantronics at 1202 East 23rd St, Lawrence, KS 66044, tel 913-842-7745. AEA manuals for the PK-87 and PK-232 can be obtained from Norm Sternberg, W2JUP, PO Box 125, Farmingville, NY 11738 (telephone number unpublished), or by contacting AEA at 2006 196th St, Lynnwood, WA 98036, tel 206-775-7373. (Requests sent to AEA are forwarded to Norm.) Please indicate the disk format preferred: IBM® PC or AT, Apple®, C64 and so on. Almost any disk format (with the exception of Atari) can be supplied. AEA and Kantronics do not charge for these services: Stamped mailers and formatted disks are not required.

Fred L. Gissoni, K4JLX, was introduced to ham radio in the late 1930s as a result of a case of BCI—to his radio. Fred visited the ham causing the BCI. The ham told Fred what was needed to become licensed. As a result, Fred learned the Morse code at age 10, and received his first call sign (W2QMV) at the start of his senior year in high school, 1946.

In 1956, Fred moved from New Jersey to Kentucky where he was assigned his present call. Fred and T. V. Cranmer, K4MMB, introduced the Japanese abacus, modified for touch reading, as a calculating device for the blind. Fred's also written articles for the Braille Technical Press on nonvisual alternatives for blind amateurs.

From 1968 to 1970, Fred was chairman of the Science Department of the Hadley School for the Blind in Winnetka, Illinois. Hadley is a correspondence school offering courses free of charge to blind people throughout the world. Fred is currently the Director of the Technical Services Unit of Kentucky's Department for the Blind. QST

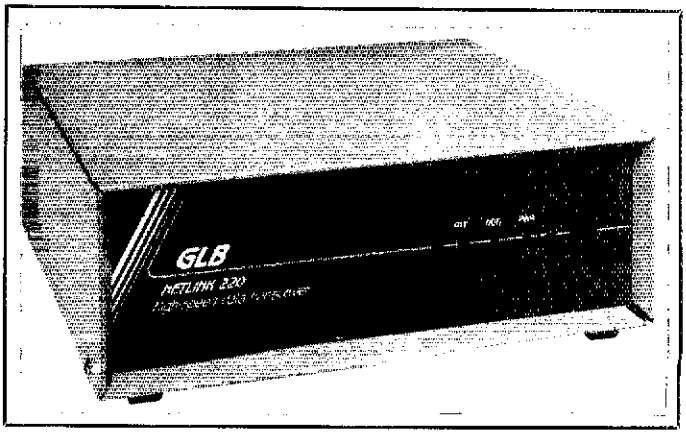
New Products

GLB NETLINK 220 HIGH-SPEED 220-MHz DATA TRANSCEIVER

☐ The GLB Netlink 220 is a digital-signal-in, digital-signal-out radio designed for high-speed packet linking. It is designed to solve the problems of interfacing high-speed modems to conventional VHF FM transceivers. The Netlink 220 is directly compatible with the GLB PK2 TNC. It also works with TAPR TNC 2s and TNC 2 clones, although a few minor PC-board modifications must be made to those TNCs. Designed for simplex operation in the 220-225 MHz range, NETLINK 220 features a data rate of 19,200 bauds and 2 W RF output. Additional features include

- oven-controlled crystal oscillators for high stability
- PIN diode antenna switching for fast (3 ms) turnaround time
- automatic receiver tracking for long-term drift compensation
- 5 helical resonators in the receiver for good spurious signal rejection
- TTL/CMOS compatible digital inputs and outputs
- conservative design for long-term reliability
- transmitter watchdog timer

The Netlink 220 requires 12-13.8 V dc at 1.2 A maximum. Size: 4.3 × 12 × 10.3 in. (HWD). Weight: 6 lb. For more information, contact GLB Electronics, 151 Commerce Pkwy, Buffalo, NY 14224, tel 716-675-6740.—*Mark Wilson, AA2Z*



Some QRP-Transmitter Design Tips

Full QSK is beneficial during QRP CW work. It is easy to achieve without relays at low power levels.

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

You may discover that full break-in (QSK) is an advantage for your QRP operating. It provides an opportunity to listen to your operating frequency during key-up periods. This lets you know if QRM is present, or if the other station is transmitting because the operator thought you stood by. (There may be times when your signals fade to such low levels that the person with whom you are communicating thinks you're standing by.) QSK can save wasted words in this situation. Full break-in is also beneficial during QRP Field Day operation. It saves time and can lead to a higher score.

This article is directed at those of you who like to build simple rigs. There is no practical project included, but the circuit in Fig 1 is a practical one. I built and tested the transmitter for the purpose of optimizing the performance, and to ensure that each stage operates as stated in this presentation.

Circuit Features

I will discuss the highlights of the Fig 1 circuit so you can understand how they work. This should help you design QRP transmitters on your own. Understanding the circuit functions is also useful when troubleshooting is necessary.

Refer to Fig 1. A VXO (variable crystal oscillator) is used at Q1 to generate the signal. Unlike most VXOs, this one takes the form of the familiar Pierce oscillator. I find this circuit more suitable for my needs than is the more common Colpitts VXO. The advantages are that no tuned output circuit is required to develop adequate excitation for the subsequent RF stage. Also, C2 (frequency control) will swing the crystal frequency *above and below* the marked value. Most Colpitts VXOs do not allow the crystal to be "rubbered" above the marked frequency. My tests were made with an AT-cut plated crystal in an HC-6 holder (International Crystal Mfg Co no. 433113) with a marked frequency of 7050 kHz. The load capacitance of Y1 is 30 pF. C2 of Fig 1 permits the crystal frequency to be moved from 7045 to 7052 kHz. Greater inductance at RFC1 will allow a wider frequency shift, but at the cost of frequency stability. The 7-kHz swing yields crystal controlled stability, even during wide excursions of ambient temperature. This is important when operating QRP during Field Day or on camping trips; vast temperature changes may occur from day to night. The negative feature of the Fig 1 VXO is that C2 must be insulated from ground. In other words, both the rotor and stator must be above ground. The tuning capacitor can be mounted on a plastic bracket to achieve isolation.

R5 and R13 of Fig 1 are used to lower the Q of RFC1 and RFC2. Too great a Q causes crud to appear at the leading edge of the keyed waveform (spurs). The resistors cure this problem. C1 is a feedback capacitor. The value is chosen to provide chirpless keying and high output from Q1. You may need to experiment with the C1 value. The crystal activity and the gain of your particular Q1 transistor will dictate the optimum value for C1.

RF Power Amplifier

I like to experiment with transistors that are not intended to be used for RF applications. The Motorola MPS-U02 is an example, a device that was designed for audio and switching use. It is frequently used as one half of a complementary symmetry audio amplifier (paired with an MPS-U52). The f_T (upper frequency limit) is 150 MHz, and it can handle up to 800 mA of continuous collector current. The specifications strongly suggest RF power use! The maximum V_{ceo} (collector to emitter voltage, base open) is +40. This allows plenty of leeway for the collector voltage to swing beyond 12 volts in RF or audio service. Typically, the RF collector voltage (sine wave) will rise to twice the power supply value, or 24 volts for a 12-V dc supply during CW operation.

The cost for MPS-U02s is quite low—another advantage. I bought 10 of them as surplus for 39 cents each. They are listed as new devices (88 cents each) in the Circuit Specialists catalog.[1] Numerous other high f_T audio/switching transistors are suitable for RF power amplifier use as well. Pick a device that has an f_T of five or more times the operating frequency. This will ensure ample gain at the desired frequency.

I used simple capacitive coupling between Q1 and Q2. C4 is selected to provide 1.5 watts of output from Q2. In my circuit I needed 33 pF of capacitance. Larger values will increase the transmitter power, but at the risk of exceeding the safe ratings of Q2. The light coupling provided by C4 minimizes oscillator loading. Too great a value at C4 can kill the oscillation of Q1. I chose the 1.5-W output power to cause the Q2 collector impedance to be 48 Ω. This is determined from $Z = V_{cc}^2/2P_O$, where V_{cc} is the collector to emitter dc voltage, and P_O is the power output. This enabled me to use a 50-Ω filter (FL1) without a broadband matching transformer between Q2 and FL1. A heat sink is required on the tab of Q2 to minimize the transistor junction temperature. A 1-inch

[1]Circuit Specialists, PO Box 3047, Scottsdale, AZ 85257. Phone 1-800-528-1417 when ordering. Catalog available.

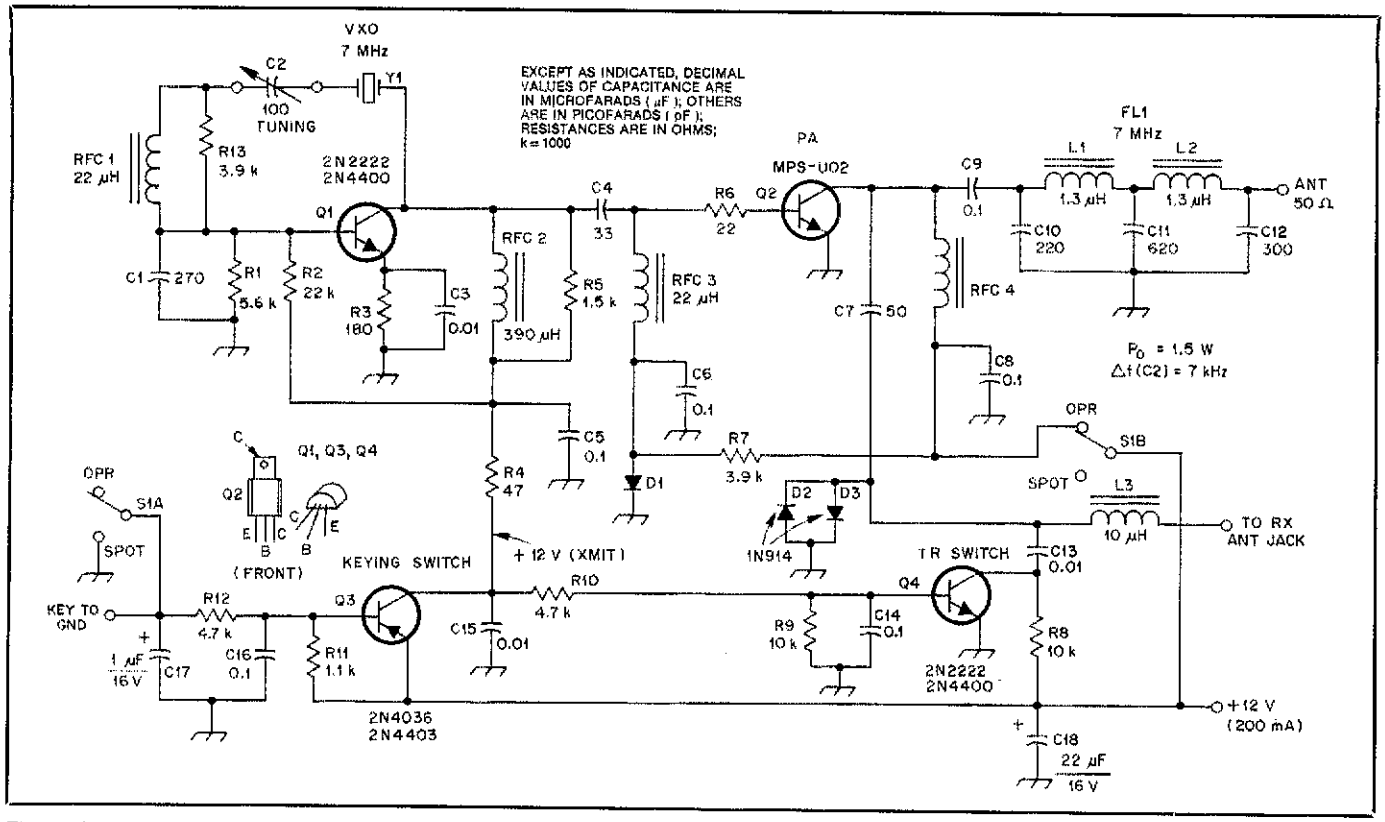


Fig 1—Schematic diagram of the test transmitter. Fixed-value capacitors are disc ceramic unless otherwise noted. Polarized capacitors are tantalum or electrolytic. Resistors are ½-W carbon composition.

C2—100-pF miniature air variable or 10-100 pF compression trimmer with shaft.
C10, C11, C12—Polystyrene or silver mica.
D1—Rectifier diode, 50 PRV, 1 A.
D2, D3—Small-signal switching diode, 1N914 or equiv.
L1, L2—1.3-μH inductor. Use 18 turns of no. 26 enam wire on an Amidon Assoc T-37-2 toroid.
L3—10-μH inductor. Use 45 turns of no. 28 enam wire on an Amidon Assoc T-50-2 torold.
RFC1, RFC2, RFC3—Miniature ferrite core RF choke.
RFC4—12 turns of no. 26 enam wire on an Amidon Assoc FT-37-43 ferrite toroid (850 μ).
S1—DPDT toggle or slide switch.
Y1—Fundamental crystal (see text).

square piece of no. 16 gauge aluminum or copper was suitable for my test circuit. A 10-minute key-down period at 1.5 W output caused the transistor and heat sink to be moderately warm to the touch.

Harmonic Filter

The FCC purity of emissions requirement is more liberal at power outputs under 5 W. A five-section low-pass filter (FL1 of Fig 1) is ample to comply with regulations. A seven-element filter would offer greater attenuation of the 2nd and 3rd harmonics, should that be your desire. My filter constants were obtained from the normalized filter tables in the transmitting chapter of *The ARRL Handbook*. I chose an f_{co} (cutoff frequency) of 8 MHz. The ripple factor is 0.01 for FL1. The ripple indicates the relative flatness (lack of amplitude dips and peaks) of the peak portion of the filter response curve.

If FL1 were terminated at each end with a 50-Ω nonreactive (purely resistive) load, C10 and C12 would have the same value. However, we must recognize the transistor output capacitance (20 pF for an MPS-U02), stray circuit capacitance (roughly 10 pF) and the value of the TR sampling capacitor, C7. During key-down periods, C7 is switched in parallel with C10 via D2, D3 and Q4. The approximate total of these capacitances is 80 pF. This value must be deducted from 300 pF (normal C10 and C12 value) if the filter is to perform properly. A 220-pF capacitor is, therefore, appropriate for C10. Additional harmonic reduction results from operating Q2 in the class-A linear mode. D1 provides approximately 0.7 V of forward bias for Q2. The class-A mode reduces the excitation requirement for Q2, which is also a benefit. A similar RF amplifier, operated in class C, would require significantly more RF drive, and the harmonic output would be somewhat higher in amplitude.

TR Circuit

You will note in Fig 1 that a TR (transmit-receive) circuit is included. Q3 is a PNP dc switch that applies operating voltage to Q1 when the key is closed. Key closure shorts the base of Q3 to ground, and this causes it to conduct. During conduction, + 12 V is connected to Q1 through the junction of Q3. The keyed + 12 V is routed also to NPN switch Q4. This transistor also conducts when the key is closed. At full saturation the Q4 collector-emitter junction closes and this shorts the receive antenna line to ground through Q4. D2 and D3 also accomplish this function, but leave a residual RF voltage of 0.7 V RMS on the receive line. The shunt-diode technique was popularized by Wes Hayward, W7ZOI, in some of his QRP transmitters that featured full QSK. I use the diodes as backup protection, should Q4 fail to operate for some reason.

TR circuit sampling capacitor C7 should have a reactance no less than 400 Ω. Smaller reactance values will rob transmitter output power when the key is closed. Some power is sacrificed with the value shown for C7, but it is minimal. The trade-off associated with this type of TR circuit is a slight signal loss during receive, owing to the small value for C7. Both Hayward and Lewallen (W7EL) reduced this problem by adding L3 in the receive antenna line. L3 has the same reactance as C7. This permits C7 and L3 to form a series-resonant circuit at the operating frequency, which in turn reduces the loss in the receive signal that is fed to the receiver. A slug-tuned coil (variable inductor) at L3 would help to make the series circuit exactly resonant.

I measured the RF voltage from the receive antenna line to ground with a Tektronix 453A scope during key down. It is 200 mV P-P (70.7 mV RMS) across 50 Ω. This potential will not harm any receiver, solid state or tube type.

Additional TR control is possible if you connect an outboard NPN switch to the keyed + 12 V (between Q3 and Q4). The

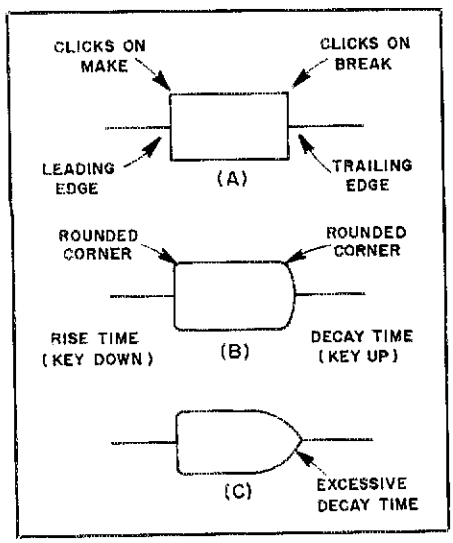


Fig 2—Examples of keyed RF waveforms. The illustration at A shows hard keying with square waveform corners. This waveform causes clicks on the make and break of the key. An acceptable waveform is shown at B. The corners are rounded to remove clicks and the decay time is lengthened somewhat over that shown at A. Soft keying is shown at C. The decay time has been increased over that at A and B. This waveform is not suitable for high speed keying. See the text for additional data.

outboard transistor switch can then be used for receiver muting, or for actuating a small 12-V relay, which may, in turn, serve as a receiver muting control.

The Keyed Waveform

Many homemade QRP transmitters are deficient in harmonic suppression and keyed wave shaping. I have been lax in the latter regard myself. One tends to justify hard keying as being somewhat more effective at the QRP level, and in a sense this is true. However, under no circumstances should the keyed wave cause clicks. The dividing line between acceptable hard keying and clicky keying is rather thin! It is better to stay on the safe side and attempt to obtain a keyed wave that has a 5 ms rise and fall time, which is considered entirely acceptable. This represents a clickless wave that has a fast enough recovery time to permit very high speed keying. Too long a decay time (key up) will limit the useful keying speed we can apply. Fig 2 shows a hard, clicky wave at A. The drawing at B illustrates a wave with rounded corners that does not cause clicks. Fig 2C shows a soft wave with a long tail. This waveform is unsuitable for fast keying.

The waveform from your transmitter can be examined by sampling the transmitter RF output energy across a 50-Ω load. Rapid keying of the transmitter will cause the RF envelope to be displayed on the scope tube.

Waveform shaping is accomplished in Fig 1 by means of C16, C17, R11 and R12. Bypass capacitors in the keyed circuit (such as C5 and C15) also affect the shaping.

The decay time (trailing edge of the waveform) is affected by C16, C17, R11 and the bypass capacitors mentioned above. R12 affects the attack time (leading edge of the waveform). In fact, you may add additional resistance between R12 and the key jack to shape the leading edge of the waveform. Values up to 10 kΩ are suitable. The larger the resistance of R11, the slower the waveform decay time. The R11 value shown allows the base of Q3 to return quickly to +12 V, thereby cutting off the Q3 conduction (key up) quickly. This fact was brought to my attention by Ed Hare, KA1CV, of the ARRL lab staff. The shaping-network values in Fig 1 ensure a keyed waveform that is clickless, but hard enough to give "presence" to the CW note. The frequency-control values for the VXO in Fig 1 prevent the signal from sounding chirpy when the VXO is keyed by Q3.

Final Comments

I added S1 to facilitate frequency spotting without placing the transmitter on the air. S1A closes the key line to turn on Q3. S1B removes operating voltage from Q2 at the same time. This reduces the signal strength of the beat note heard in my receiver. In other words, it is not so strong that it overwhelms my receiver. S1B also prevents the transmitter signal from reaching the antenna during zero beating or spotting.

You may feel that a VXO is not nearly as desirable as a VFO. I confess that 7 kHz of frequency swing is a small amount, but the VXO is stable under most conditions, and this appeals to me during operation afield. It is not a severe handicap to carry two or three crystals when camping. This provides sufficient frequency coverage of the 40-meter band. In fact, you may wish to include a low-capacitance crystal selector switch if you build a VXO rig of this type. But remember that the more stray capacitance you introduce in the crystal circuit, the smaller will be the frequency swing of a given crystal.

My purpose in writing this article is to pass along some design hints that you may not have considered. The points I have covered are among the most frequently asked questions I receive concerning QRP transmitters. The main point I want to make is that you *can* build your own gear, and it takes little additional time or money to develop a circuit that operates cleanly and reliably. QST

Strays

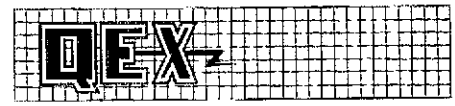
***QST* congratulates...**

☐ the following radio amateurs on 50 years as ARRL members:

- Gilbert Dippel, W6CXI, of Redwood Valley, California
- Clark Berry, K4GJB, of Arlington, Virginia
- Cameron Allen, W7OIF, of Phoenix, Arizona
- Morton Slavin, K3FGB, of West Palm Beach, Florida
- Donald Teague, W6AKI, of Montague, California
- Jim Filmer, K6ABP, of Palo Alto, California
- Truman Moore, W7FCQ, of Scottsdale, Arizona
- Ethel Smith, K4LMB, of McLean, Virginia
- Grant Storey, W6NTK, of Oakhurst, California
- James West, W6QLO, of San Diego, California
- Arthur Novak, WØZPU, of Lucas, Kansas

☐ Dr John Ryder, K4IHX, of Ocala, Florida, on receiving the Batcher Memorial Award from the Radio Club of America, Inc.

☐ William Eitel, W6UF, of Dayton, Nevada, on receiving the Armstrong Medal from the Radio Club of America, Inc.



QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

VHF Conferences have become the thing to do lately. Attendees may pass the time sitting through technical talks on equipment design and construction practices for the VHF, UHF and microwave bands, or they may have many eyeball QSOs, stock up on new and/or surplus items, or allow their latest antenna design to be subjected to the strict rules of the antenna-gain measurement contest. One of the Central States VHF Society participants successfully designed and constructed dish antennas to support his microwave activities. His story is told in the pages of the January issue.

The January issue of *QEX* includes articles on:

- "Antenna Ideas For 3.5, 5.8, and 10.4 GHz," by Donald L. Hilliard, WØPW
- "New Directions in Amateur Data Transmission Systems—Part 2," by Barry McLarnon, VE3JF
- "LPDA Book Review," by Domenic Mallozzi, N1DM

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Product Review

Conducted By Mark Wilson, AA2Z
Senior Assistant Technical Editor

Heath SB-1000 HF Linear Amplifier

Reviewed by Paul K. Pagel, N1FB

My first Heathkit® was a DX-40, a simple transmitter using a single 6146 RF amplifier stage running about 90 W input on CW. Here I am, 27 years later, with another one of many Heathkits I've built—this one an amplifier that runs almost 10 times the DX-40's input level in the same mode.

Latest in a line of amplifiers offered by Heath, the SB-1000 employs a single 3-500Z triode in class AB_2 grounded-grid service. An internal voltage-doubler supply produces 3100 V dc at rest, and 2700 V under a load of about 500 mA. Heath rates the SB-1000 for output powers of 1000 W PEP on SSB and 850 W on CW. Also, a continuous-carrier power-output rating of 500 W is specified for a maximum of 30 minutes. (That's what RTTY, SSTV and packet-radio operators can expect to have at their disposal.)

The front panel of the Heath SB-1000 is shown in the title photo. The left-hand panel meter is used as a multimeter to monitor high voltage, plate current, power output and ALC level. Two rocker switches, PWR/OFF and OPR/STBY, are used, respectively, to switch ac-line voltage on and off, and place the amplifier in standby or operational modes. Reduction drives are used on the PLATE and LOAD controls to provide smooth tuning. The BAND switch has six positions, though only five are marked on the front panel (more on this later). Additional views of the amplifier are shown in Figs 1 and 2.

The '1000 can be operated from a 120 or 240 V ac line. Changing the input voltage requires the installation of the proper fuse size, a minor wiring change on an internal barrier (terminal) strip, and the use of the correct ac line plug (a 120-V line-cord/plug combination is supplied).

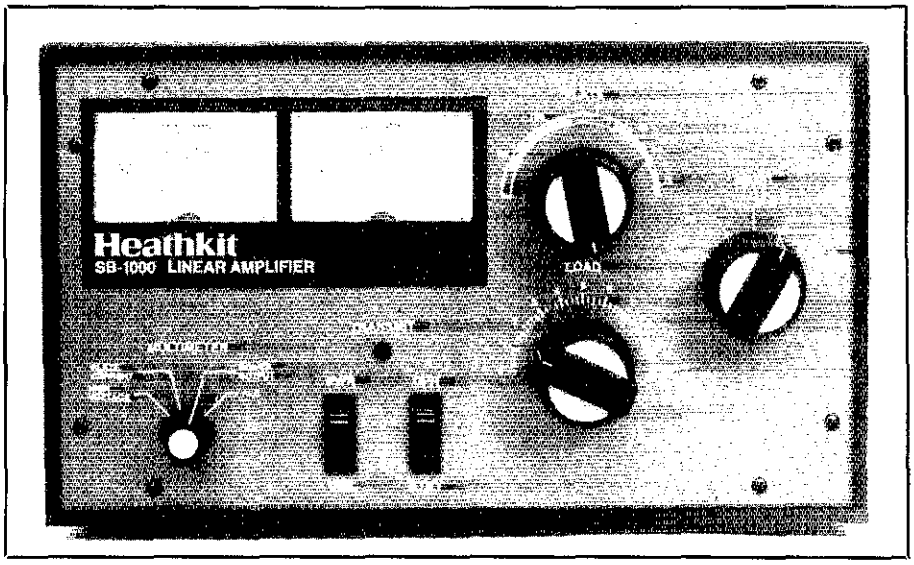


Table 1
Heath SB-1000 HF Linear Amplifier, Series no. 01 71112

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 160, 80, 40, 20 and 15 meters. (Also operable on MARS and WARC bands, where applicable.)	As specified, plus 10 meters. See text.
Driving power required: 100 W (85 W typical).	As specified.
Maximum power output: SSB, 1 kW PEP; CW, 850 W.	As specified.
Duty cycle: SSB, continuous voice modulation; CW, 50%; 30 minutes of continuous carrier at 500 W.	As specified.
ALC: 0-20 V, adjustable, negative-going.	As specified.
Spurious emissions: −30 dB or better.	See Fig 3.
Keying: Requires contact closure or keying circuit capable of sinking 100 mA at 12 V dc.	
Primary power requirements: 15 A at 120 V; 7.5 A at 240 V.	
Color: Two-tone gray with black trim.	
Size (height, width, depth): 8¼ × 14½ × 15½ inches.	
Weight: 48 lb.	

Construction

First, I made the several necessary changes to the assembly/operations manual and illustration booklet. Then, I built the manual binder (!). In lieu of providing a bound assembly/operations manual, Heath provides a cover, a plastic three-ring binder spine and hardware to assemble the cover. The prepunched pages of the assembly/operations manual—and the illustration booklet—fit in the binder.

A modular approach is used in the construction of the SB-1000; this makes overall construction easy to handle. There are four circuit boards to assemble: the power-supply rectifier, power-supply filter, ALC and metering-circuit boards.

Input-network assembly follows. Because of the small size of the enclosure, this is relatively close work—but it is easily managed.

Two numbers appear on each envelope containing an input-network coil; be careful not to misread them. Also, watch closely the numbering of the input-network switch contacts; it's easy to miscount them. (I feel that an exploded view of the switch wafer should be added to the manual for clarification.) Inspect the input-network coil wire terminations at the lugs. Note that they are *not* soldered to the lugs (Heath mentions this). I found one wire termination (on the 160-m coil) that had not been stripped of its insulation and would not take solder. If you find a suspicious-looking termination, carefully unwind most of the wrap—leave a half or full turn on the lug so as not to loosen the coil winding—scrape the insulation from the wire and rewrap it. (I opted to presolder the coil terminations at the lugs to eliminate the possibility of a poor connection.)

Tune-Up

This exercise should take no longer than an hour. Basically, all you have to do is touch up the tuning of the input-network coils (you'll need a wattmeter for this). The

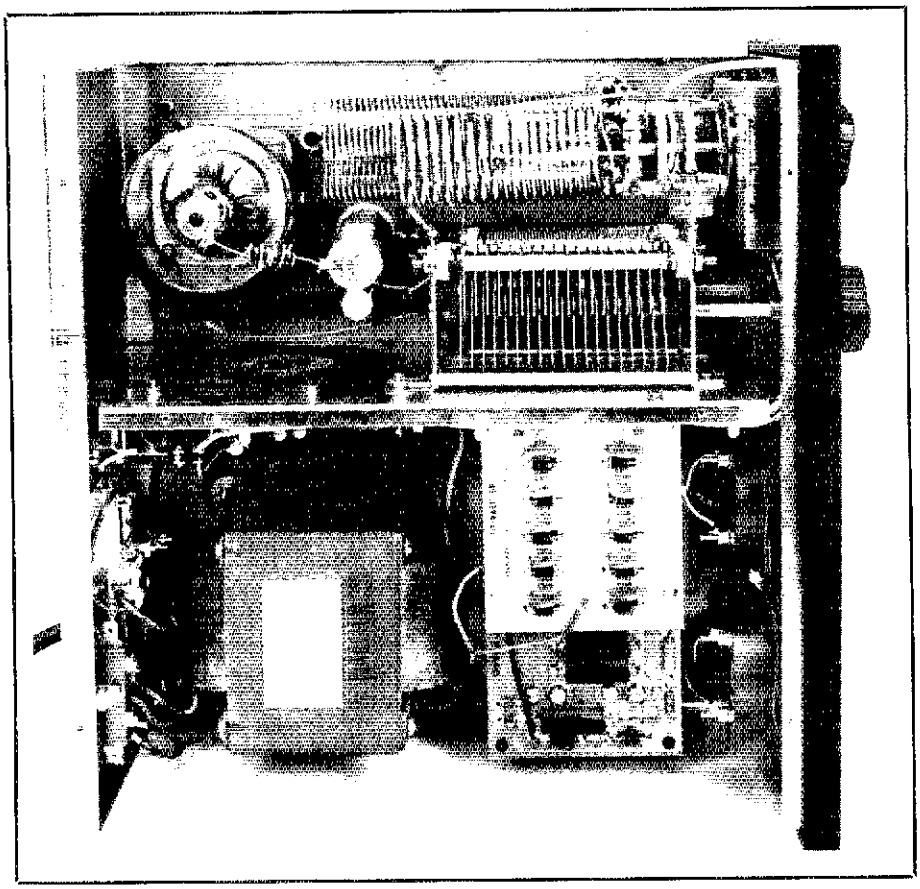


Fig 1—An inside view of the SB-1000. Here's where it all happens. In this photo, the amplifier is resting on its left side. The power supply, meters and metering circuit PC board (hidden beneath the meters) and cooling fan are contained in the left-hand compartment (at the bottom in this view) of the amplifier. High-voltage supply rectifiers and transient-suppression capacitors are mounted on a PC board supported by standoffs above another PC board that supports the filter capacitors and voltage-equalizing/bleeder resistors. The safety interlock switch is at the bottom left, mounted on the rear panel along with the power-supply primary circuit control relay. The amplifier TR relay is mounted at the left of the center shield, just above the fan. Next to it (not visible) is the ALC circuit PC board.

In the RF section (top of the photo), the input-network subassembly can be seen mounted behind the front panel. The long, black object barely visible between the fan and the 3-500Z is the filament RF choke.

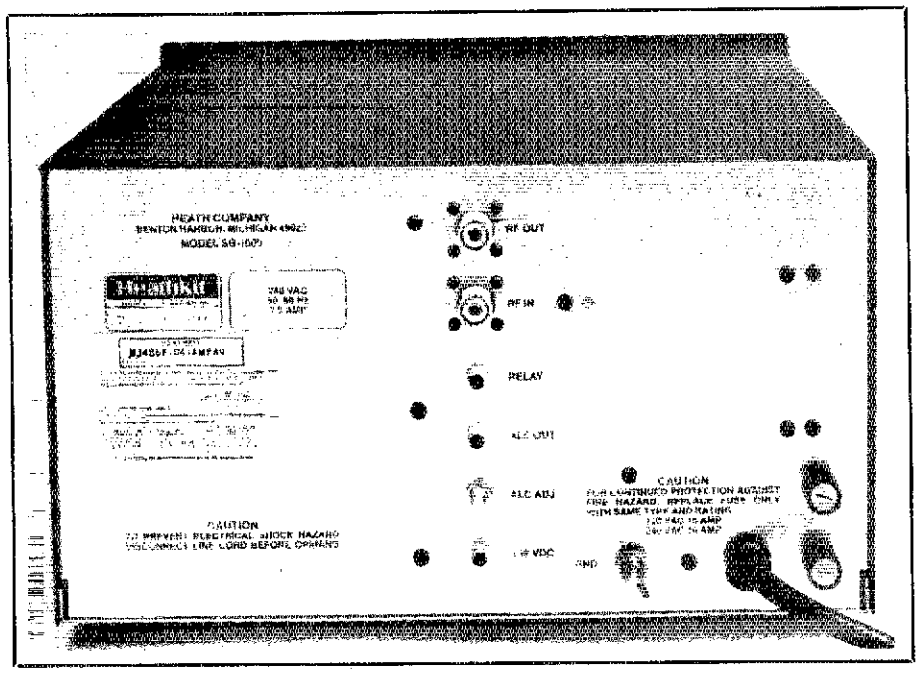


Fig 2—Rear panel of the SB-1000 (left). RF IN accepts the exciter's output; the RF OUT jack is connected to the antenna circuit. The exciter's TR control and ALC connections are made to the RELAY and ALC OUT jacks. The ALC ADJ potentiometer is adjusted for proper ALC interaction between the exciter and amplifier. You can power ancillary equipment (requiring +12 V dc at 100 mA or less) from the +12 VDC jack. The GND bolt is equipped with a wing nut. Two fuse holders are mounted to the right of the ac line cord.

slugs in the coils of my amplifier were already close to the optimum setting as supplied.

Before applying power to the amplifier, you're instructed to place the cabinet cover on the amplifier and slide it back slightly to gain access to the input-network coils. (They're located at the *front* of the amplifier on the right-hand side, immediately behind the front panel.) Resting the cover on the cabinet this way closes the safety interlock and simultaneously helps to keep tools and fingers from touching high-voltage areas.

After checking and double-checking to make sure everything was in order, I placed my finger on the PWR switch and rocked it upward to apply power to the amplifier for the first time. *KE-WANG!*...I was paralyzed!...After I picked my teeth and eyes up off the floor, and swallowed my heart to its proper position, I realized what had happened. The interlock relay is mounted on the rear panel, so it makes a metallic *whack* when it closes. But the cover, resting loosely on the amplifier, added enormously to the din by rattling noisily as the power supply came alive for the first time. With the wattmeter placed on top of the cover, the power-on noise was reduced to a dull *thunk*.

Once I'd convinced myself that the amplifier had suffered no damage, I proceeded with the tune-up. It was during the second touch-up of the 160-m coil that I heard an arcing noise and saw some sparking that appeared to be coming from the base of the plate RF choke. I could find no damage to any component or anything that looked amiss. Another try at 160-m tune-up, and another noise and sparks. Because of the position of the cabinet cover, I couldn't be sure just where the arcing was occurring.

Though I didn't care to do so, I had to completely remove the cover and jumper the safety interlock switch. (Caution: This exposes the high-voltage areas of the amplifier!) Not surprisingly, I was then able to complete the entire tune-up procedure without another incident of arcing. During subsequent full-power tests, the amplifier never again spit at me on 160 meters.

10-M and WARC-Band Coverage

During assembly, you'll install a 10-meter input-network coil, and the

illustration manual refers to one of the output network coils being used for 40, 20, 15 and 10 meters. Also, the specifications say: "(also operable on MARS and WARC bands, where applicable)." But that's it—there's no additional information in the manual telling you how to use the amplifier on these bands. Also, you won't find the 10-meter input coil in the schematic diagram! A call to Heath's Technical Service quickly brought the answers.

Enabling Operation on 10 M

This is a snap because everything is already in place for 10-meter operation: the input and output network coils, and the required position on the BAND switch. (The 10-meter position is not marked on the front panel, however.) All you have to do to get the SB-1000 working on 10 meters is to cut the black wire that exits the input-network enclosure and is attached to the ground lug secured by the PLATE tuning capacitor reduction-drive mounting screw. You can see this wire clearly on p 38 of the illustration book. When you're going to operate the SB-1000 on 10 meters, just remember to turn the BAND switch past the 15-meter position, or place a label on the panel as a reminder.

WARC-Band Operation

Using the SB-1000 on the 12- and 17-meter WARC bands is somewhat of a compromise. There are no input network coils supplied specifically for those bands, and the output network is not tapped for these bands. As you can imagine, there also are no BAND switch positions assigned for these frequencies. But, you can operate the amplifier on 12 meters by placing the BAND switch in the 10-meter position and on 17 meters by using the 15-meter position of the BAND switch.

With my TS-430S driving the SB-1000, I could obtain rated amplifier power output on 17 meters, but had to be satisfied with a maximum of 500 W of power output on 12 meters. I chose not to modify the amplifier in any way to acquire greater power output on 12 meters.

ALC Provisions

ALC voltage is available at the ALC OUT phono jack on the rear panel. The ALC ADJ control, immediately beneath the phono jack, enables you to vary the amplitude of the negative-going ALC voltage between 0 and 20 V. Instructions on setting the ALC ADJ control are given in the SB-1000 manual.

Comments

Total construction time (including 2½ hours for the four circuit boards) amounted to about 22 hours, spread over a period of several days. I encountered only two minor mechanical faults. The ground lug wing nut and one of the pi-network output coil nylon spacers were improperly machined. The wing nut was drilled off-center and incorrectly threaded. One end of the nylon spacer had been drilled out oversize, untapped, and wouldn't accept the no. 8-32 hardware. So, I used a no. 10-32 tap and screw and a larger lockwasher scrounged from my junk box. Of course, replacement items can be obtained from Heath, but I didn't want to stop assembly of the amplifier for something I could work around.

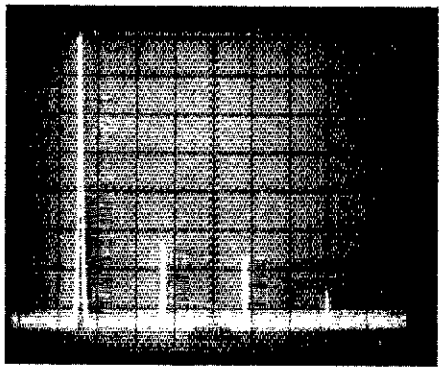


Fig 3—Worst-case spectral display of the Heath SB-1000 amplifier operating at 21 MHz with approximately 800 W output power. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. All spurious emissions are at least 54 dB below peak fundamental output. The SB-1000 complies with current FCC specifications for spectral purity.

Though the power-supply rectifier assembly has transient-suppression capacitors across each diode, no voltage-equalizing resistors are used.[1]

The ac line cord supplied is designed for use with standard 120-V outlets. If you're going to power the SB-1000 from a 240 V ac line, the male plug on the supplied line cord must be removed and a proper connector (not supplied by Heath) installed. Prepare for this by buying the proper plug in advance.

When the plate-circuit parasitic choke is installed, the instructions call for placing the 3-500Z tube in its socket. Though you're also warned to be careful in handling the amplifier from that point on, I chose to remove the "bottle" and return it to its carton. I did this because at that point, there's still a bit of construction to be undertaken, including the installation of the rather heavy power transformer. I felt safer handling the chassis without the tube in place.

Some may consider the SB-1000 to be a bit dated in that it is not specifically designed with additional input-network coils, output network coil taps and BAND switch positions for the WARC frequencies. But all you need to do to get the amplifier running on those bands amounts to a bit of interpolation.

I find the SB-1000 to be a smooth-tuning, quiet and stable amplifier. The amplifier never exhibited any signs of taking off for the nearest neighboring nebula during protracted periods of testing. I like the fact that the SB-1000 has a relatively small footprint and uses a proven, readily obtainable and inexpensive output tube. The amplifier goes together easily, operates well, looks good and has Heath's legendary support. You can't ask for much more than that.

The SB-1000 is available from the Heath Company, Benton Harbor, MI 49022, tel 800-253-0570. Price class: $740.

[1]See p 6-6 of the 1988 *Handbook* for information on voltage-equalizing resistors.

KENWOOD R-5000 GENERAL-COVERAGE RECEIVER

Reviewed by David Newkirk, AK7M

"Sure, I've seen the ads for that R-5000 receiver. It's just the receiver section of the TS-440 transceiver!" Is this true? Because just about every new ham transceiver includes a general-coverage receiver nowadays, you've probably heard this statement—or one just like it about the general-coverage receivers offered by other ham-equipment manufacturers—yourself. If you buy an R-5000, *are* you getting the receiver section of a TS-440, more or less?

Yes—and no. A no-options-added R-5000 and the receiver in the TS-440 *do* cover the same range: 100 kHz to 30 MHz. (Both radios actually tune down to 30 kHz, although their sensitivity drops off below 100 kHz.) They both *do* have 100 memories, dual digital VFOs, and keypad and rotary tuning. A no-options-added R-5000 can hear the same signals a stock TS-440 can hear, and maybe a few more: The manufacturer's specifications for the R-5000 give it a slight edge over the TS-440 in FM sensitivity, and in AM sensitivity above 150 kHz.

Because the R-5000 and the TS-440 receiver section are so similar, I'll concentrate on their differences in this review. I suggest that you refer to *QST*'s TS-440S Product Review for a rundown of TS-440 features.[2] Our test R-5000 includes two optional IF filters: the YK-88C (BW 500 Hz at −6 dB) and the YK-88A-1 (BW 6 kHz at −6 dB). The R-5000's optional 108-174 MHz VHF converter—the VC-20—was not tested.

Receiving Scheme

The R-5000 is a multiconversion superheterodyne receiver. For all modes except FM, it uses double conversion (IFs of 58.1125 and 8.83 MHz). During FM reception, triple conversion is used (IFs of 58.1125 and 8.83 MHz, and 455 kHz). (The

[2]T. Miller, "Trio-Kenwood TS-440S HF Transceiver," Product Review, *QST*, Dec 1986, pp 41-43 and 47.

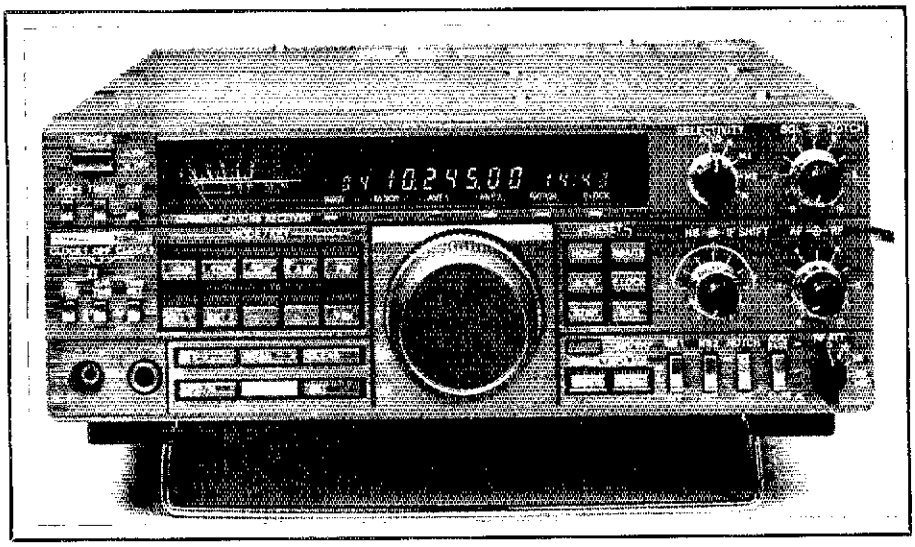


Table 2

R-5000 Step Span and Tuning Rate versus Mode

Mode	*AM*		*USB/LSB/CW/FSK*		*FM*	
STEP key	*off*	*on*	*off*	*on*	*off*	*on*
Tuning step	1 kHz	100 Hz	10 Hz	100 Hz	5 kHz	2.5 kHz
Per rev of tuning knob	20 kHz	50 kHz	10 kHz	50 kHz	100 kHz	50 kHz

TS-440 uses triple conversion for all modes; its IFs are 45.05 and 8.83 MHz, and 455 kHz.) Aside from a few small modules that use surface-mount devices, most of the R-5000's components are through-hole mounted on single- and double-sided circuit boards.

Tuning Methods and Mode Selection

The TS-440 and R-5000 are billed as having "dual digital VFOs" and 100 memories. In fact, their VFOs—neither dual nor digital, as explained earlier in *QST*[3]—are actually far more flexible than mere dual VFOs could ever be: They are *tunable memories* that store frequency, mode and antenna selection. The remaining 100 memories also store frequency, mode and antenna selection, but they are *not* tunable.[4] The R-5000's MODE/KEY keypad and M>V, SCAN, CLEAR, VFO/M, M IN and ENT keys function identically to those on the TS-440 transceiver. Unlike the TS-440, the MODE/KEY keypad also allows selection between two antennas.

The span of the R-5000's tuning steps varies with mode and with the status of STEP (see Table 2). In the TS-440, the tuning-step span is fixed at 10 Hz for LSB, USB, CW and FSK, and 100 Hz for AM and FM. Unlike the TS-440, the R-5000 does not include a receiver-incremental-tuning (RIT) control.

In both the R-5000 and the TS-440, switching between LSB and USB does not require retuning. The R-5000 and TS-440 control programs differ somewhat in how they handle sideband selection across the HF range, however. The R-5000 does not interfere with your choice of LSB or USB, no matter where you tune. Not so with the TS-440: If you have selected LSB below 9500 kHz, the TS-440 switches to USB as you tune across 9500 kHz from below. If you have selected USB above 9500 kHz, the '440 changes to LSB as you tune across 9500 kHz from above! In practice, this quirk causes no hardship: You need only switch the '440 back to the desired mode and keep tuning. (Curiously, this mode shift doesn't occur if you rock back and forth across 9500 kHz with the '440's RIT control.)

Second-IF Filtering

In both the R-5000 and TS-440, second-IF filtering begins at 8.83 MHz with a monolithic crystal filter (6 kHz wide at −6 dB; shape factor of 3).[5] No factory option is available to improve this filter in the TS-440, but the R-5000 allows replacement of this filter with the optional YK-88A-1 (same −6 dB bandwidth, but a shape factor of 2). Adding the YK-88A-1 makes the R-5000's 6-kHz selectivity considerably tighter than that of the TS-440. This is particularly important when listening to shortwave broadcast stations, which operate on channels spaced 5 kHz apart.

The TS-440 does its CW filtering, and some SSB and AM filtering, at 8.83 MHz. All of its FM filtering, and the remainder of its SSB and AM filtering, is done at 455 kHz. The R-5000 completes its CW, AM and SSB filtering at 8.83 MHz, using 455-kHz filtering for FM only.

The R-5000's 8.83-MHz filtering scheme is unusual in that narrower filters are brought into operation *in series* with wider filters. The narrower the bandwidth, the more filters there are in series. In addition to the YK-88A-1, three optional filters are available for the R-5000. These are the YK-88SN (1.8 kHz), YK-88C (500 Hz) and the YK-88CN (270 Hz). The R-5000 has space for mounting *any two* of these latter three filters. The *R-5000 Instruction Manual* warns us to refer installation of optional filters to qualified service personnel. If you want to find out how to install the filters, you have to buy the *R-5000 Service Manual.*

RF Inputs

The R-5000 allows selection between two antennas by means of ANT 1 and ANT 2 buttons on the MODE/KEY keypad. The ANT 1 input is an SO-239 coaxial jack intended for use with antennas fed by means of 50-ohm coaxial cable. The ANT 2 input is a set of three binding posts that allows wire connection to a 50- *or* 500-ohm antenna (not both at the same time). The TS-440 has only a 50-ohm antenna input; it's an SO-239.

The R-5000's RF attenuator is an expansion over that of the TS-440. The '5000 offers relay-switched attenuation values of 10, 20 and 30 dB; the TS-440 includes only a one-step (20-dB) attenuator.

AF Outputs

Like the TS-440, the R-5000 has an internal top-mounted speaker, and external-speaker and headphone jacks. In the panel position occupied by the MIC jack on the TS-440, the R-5000 has a fixed-level REC jack for connection to a tape recorder. (This function is duplicated, although not so handily, by the TS-440's AFSK OUT jack, and pins 3 and 4 of its ACC 2 jack.)

Clock/Timer

The R-5000 is billed as having two clocks on board. Because setting one of these clocks can affect the time displayed by the other—and because only *one* clock can be displayed at a time—it's probably more accurate to say that the R-5000 has two programmable displays for one clock. Clock 1 can be used as a timer to turn an outboard device on and off. The timer's

[3]D. Newkirk, "View: DigiVFO," Technical Correspondence, *QST*, Sep 1987, p 43.

[4]The R-5000's 100 nontunable memories can store an additional datum: Whether or not a particular memory channel is to be "locked out"—passed over—during memory scanning.

[5]Both radios use wide (tens of kHz) "roofing" filters at their first IFs; adjacent-channel selectivity is achieved by filtering at their second and third IFs.

Table 3

Kenwood R-5000 Receiver, Serial No. 8020070

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: 100 kHz to 30 MHz.	30 kHz to 30 MHz, with reduced sensitivity below 100 kHz.
Modes of operation: A3E (AM), J3E (LSB, USB), A1A (CW), F3E (FM), F1B (FSK).	As specified.
Receiver sensitivity (USB/LSB/CW/FSK for a 10-dB [signal + noise]/noise ratio, 2.4-kHz filter):	
100-150 kHz: less than 2.5 μV.	Not measured.
150-500 kHz: less than 1 μV.	0.5 μV at 450 kHz.
500-1800 kHz: less than 4 μV.	1.3 μV at 1000 kHz.
1.8-30 MHz: less than 0.25 μV.	0.19 μV at 3500 kHz. 0.15 μV at 14 MHz.
	Receiver Dynamic Testing
	Minimum discernible signal (noise floor), (dBm), 500-Hz filter: 450 kHz: −129.0 1000 kHz: −119.0 3500 kHz: −136.5 14000 kHz: −139.0
Receiver dynamic range: Not specified.	Blocking dynamic range (dB): 450 kHz: 129.0 1010 kHz: 131.5 3520 kHz: 126.5 14020 kHz: 129.0
	Two-tone, 3rd-order intermodulation distortion dynamic range (dB): 450 kHz: 96.0 1000 kHz: 95.5 3520 kHz: 98.5 14020 kHz: 99.0
	Third-order input intercept (dB): 450 kHz: 15.00 1000 kHz: 24.25 3520 kHz: 11.25 14020 kHz: 9.50
Receiver sensitivity (AM for a 10-dB [signal + noise]/noise ratio with 6-kHz filter and a test signal 30% modulated by a 1000-Hz tone):	
100-150 kHz: less than 25 μV.	Not measured.
150-500 kHz: less than 10 μV.	1.1 μV at 450 kHz.
500-1800 kHz: less than 32 μV.	2.5 μV at 1000 kHz.
1.8-30 MHz: less than 2 μV.	0.39 μV at 3500 kHz. 0.29 μV at 14 MHz.
Receiver sensitivity (FM for 12-dB SINAD): 1.8-30 MHz: less than 0.5 μV.	0.26 μV at 29 MHz.
First IF rejection: 100-1800 kHz: More than 60 dB. 1.8-30 MHz: More than 80 dB.	86.5 dB at 1 MHz. 91 dB at 14 MHz.
Notch filter attenuation: More than 25 dB from 500-2600 Hz.	35 dB at 750 Hz.
Squelch sensitivity, 1.8-30 MHz: AM/USB/LSB/CW/FSK: less than 2 μV. FM: less than 0.32 μV.	Not measured. At 29 MHz: min 0.1 μV, max 0.65 μV
Frequency display error: Less than ±10 PPM.	As specified.
S-meter calibration: S9 = 25 μV.	μV for S9 reading: 450 kHz: 90 1000 kHz: 228 3500 kHz: 32 14 MHz: 22
Audio outputs: External speaker, 1.5 W into 8-Ω load, (10% distortion).	2.23 W at 10% total harmonic distortion.
REC jack, 300 mV across 4.7-kΩ load (at 1 mV input with 30% modulation in AM or 3 kHz deviation in FM).	Not tested.
Clock accuracy: Better than ±60 s per month.	As specified.
Color: Gray	
Size (height, width, depth): 4.2 × 11 × 12 inches (includes projections).	
Weight: 12.3 lb.	

normally-open and normally-closed relay contacts are accessible via the 7-pin DIN REMOTE connector on the R-5000's rear panel. As the timer cycles, it turns the receiver on and off; there's no way of defeating this, short of modifying the timer circuit.

Multifunction Display

As it comes from the factory, the R-5000's fluorescent-tube display resolves frequencies to 10 Hz. (The display on a stock TS-440 resolves frequencies to 100 Hz; you must cut a wire to enable its 10-Hz display.) Where the TS-440 displays RIT or XIT offset, the R-5000 can display the time (HH:MM) of one of its clocks. (This part of the display is switchable between Clock 1, Clock 2 and off.) The R-5000's fluorescent tube also displays memory channel numbers (an added dot here indicates that a given channel is locked out of scanning); scan, timer and step status; and which VFO (A or B) is in use. Even with the R-5000 turned off, the time kept by one or the other of the two clocks can be displayed. If clock display is enabled with the R-5000 off, the memory-channel digit field indicates which clock has been selected (C1 or C2).

Two degrees of display/S-meter-lamp brightness can be selected with the R-5000's DIM switch. The brightness of the receiver's various LED status indicators is not adjustable.

Power Supply

Unlike the TS-440, the R-5000 comes with an ac-operated power supply—inboard. Its power consumption is 40 W at 120 V, and the operating voltage is not adjustable. An optional dc connector kit is available to allow energizing the receiver from a 13.8-V (nominal), 2-A dc source.

The R-5000 preserves its clock, VFO and memory information by means of a rechargeable NiCd battery. (The TS-440 uses a lithium cell for backup.) The *R-5000 Instruction Manual* says that the fully charged battery should last for about 10 days without recharging.

Additional Rear-panel Connections

In addition to the ANT 1 and ANT 2 connectors discussed earlier, the R-5000's rear panel also contains a REMOTE connector, an ACC jack (for use with the optional IF-232C computer interface unit), cutouts for VHF antenna and dc power connectors, and the external-speaker jack. The R-5000's REMOTE connector, a 7-pin DIN jack, allows connection of an external device (for example, a tape recorder) to the receiver's timer-relay contacts. Receiver muting can be accomplished by grounding a pin at this connector. (Did you ever try to find a 7-pin DIN plug at your local electronics store? The R-5000 package includes a receiver, a power cord, an

instruction manual and a warranty card. The TS-440 package includes a transceiver, a dynamic microphone, a dc power cable assembly, a calibration cable, a 20-A fuse, a knob, an instruction manual, a warranty card—*and* a 7-pin DIN plug.)

Additional Options

In addition to the crystal filters, VHF converter and dc connector kit mentioned earlier, optional accessories for the R-5000 include an IF-232 RS-232-C interface, a mobile mount, several choices of headphones and a voice synthesizer unit. According to the *R-5000 Instruction Manual*, the voice synthesizer announces only the frequency shown on the R-5000's display.

Instruction Manual

If the mission of an instruction manual is to provide detailed instructions to a purchaser on how to run an appliance, the R-5000 instruction manual is excellent. If, as many hams are, you're interested in what goes on *inside* the radio, forget it! The manual includes neither a block diagram nor schematic of the R-5000, and you're told to refer all servicing—including the installation of IF filters and other inboard options—to qualified service personnel. The *R-5000 Service Manual* covers the innards of the R-5000 in great detail, but a sticker on the front of the book enjoins you *not* to install any inboard options, including crystal filters, yourself: Have the job done by qualified service personnel. On the other hand, the TS-440 manual contains quite a bit of information on internal modifications performable by a TS-440 owner. In my opinion, hams who purchase an R-5000 should be able to obtain crystal-filter-installation information *without* buying a service manual: Kenwood obviously considers radio amateurs qualified to take the covers off their transceivers!

Rough Edges

Although the R-5000 can be muted for operation with a transmitter, no means are provided for injecting CW sidetone into the audio chain! During CW reception, you're stuck with an 800-Hz receiving pitch if you want the R-5000's frequency display to be accurate with a signal tuned at IF center. In the TS-440, this pitch can be lowered to 400 Hz by cutting a diode; neither the R-5000 instruction nor service manuals hints that there may be a similar diode in the R-5000.

As does the stock TS-440, the stock R-5000 emits beeps (or Morse letters) when any of its momentary-contact control buttons is pressed. The *R-5000 Instruction Manual* says nothing about adjusting the level of this noise; the TS-440 manual does. The *R-5000 Service Manual* shows qualified service personnel how to adjust VR8 (on the IF board) to vary the level of (or, as in my case, eliminate) the beep.

The R-5000 runs *very* warm. There *are* ventilation holes on the cabinet top and bottom, but communication between these is poor. After several hours of receiver operation, all metal parts inside the receiver are hot to the touch, including the IF filters. Even the tuning knob gets warm!

The R-5000 comes with a detachable, two-wire, polarized ac cord. This cannot be replaced with a three-wire cord because the chassis connector has only two pins. Both replaceable fuses—inside the box—in the R-5000 appear *after* the power transformer; if one of these blows, who you gonna call? You guessed it: qualified service personnel! The *R-5000 Service Manual* shows what appears to be a fusible link in the power-transformer primary—in the neutral side of the ac line!

On-the-Air Use

Having had experience with receivers (ICOM IC-R71A, Japan Radio Company NRD-525) in which all memories are *tunable*, I thought—before turning on the R-5000—that Kenwood's non-tunable memory scheme might drive me to distraction. Guess again! The R-5000's provisions for VFO/memory agility are well-thought-out. The non-tunability of the memories comes across merely as a design variation—not as a hindrance.

The R-5000's AGC switch has two positions: FAST and SLOW. The R-5000's AGC attack is fast enough to be reasonably free of popping on strong CW signals (test signal: W1AW, 0.6 mile away). Especially at the SLOW setting, noise pops and strong signals occasionally cause overly long AGC *recovery*, however. (The circuit can be reset by switching briefly to FAST.) Because of this, the *R-5000 Instruction Manual* recommends the FAST AGC setting for rapid band scans.

The R-5000's S meter is calibrated in S units (to 60 dB over S9!), microvolts and millivolts. Despite the *Service Manual's* statement that "the S meter of the R-5000 is superior in accuracy and linearity to previous models in the 1.8 MHz to 30 MHz range...," meter calibration varied significantly (see Table 3). Despite this variation in absolute accuracy, the *relative* accuracy of the S meter is good. For indications above S9, a 10-dB signal increase produced a 10-dB increase in the meter indication with little error. The S meter reading varies greatly *with modulation* during AM (rectification) detection of full-carrier signals—an undesirable characteristic even in a relative S meter. During heterodyne reception, however, the meter works just fine.

The R-5000 has two noise blankers: one for short-duration pulses (such as those common to certain species of line noise), and the other for longer pulses (the Soviet over-the-horizon radar, for example). Blanker threshold is adjustable. Both blankers *do* suppress or reduce their intended targets under some conditions, but results vary with the characteristics of the interference.

Using AM detection with the optional YK-88A-1 filter, the R-5000 sounds great during reception of medium- and short-wave broadcasters. Narrow-band FM reception is solid, too. With its stock 2.4 kHz (YK-88S) filter selected, the R-5000 also does a first-rate job on CW, SSB, and AM signals received as SSB. During weak-signal CW reception with the YK-88C (500-Hz) filter, however, I hear what seems to be significant intermodulation distortion somewhere in the audio chain. This results in fuzzy audio during reception of CW signals close to the background noise level, making them harder—and unpleasant—to copy.

On HF, only one station caused noticeable overloading effects in the R-5000: W1AW, 0.6 mile away from my location. Within ±10 kHz of W1AW, I heard obtrusive blocking (desensitization). Within +1.5 and −0.75 kHz of W1AW, blocking was masked by hiss—possibly because of phase noise. RF IMD products were minimal compared to these blocking and noise effects.

Conclusion

Table 3 lists the results of how the R-5000 fared on the test bench. Uncritical ears may find the basic receiving performance of a stock R-5000 to be nearly identical with that of the stock TS-440 transceiver. The addition of the same optional IF filters to both radios improves their performance more or less equally. Adding the YK-88A-1 filter puts the R-5000 in the lead for reception of AM signals. Beyond this selectivity improvement, the R-5000 pulls farther into the lead with features not included in the TS-440: a clock/timer, dual noise blankers, antenna and tuning-step selection, and an optional VHF converter. Bottom line: The R-5000 takes the already good TS-440 receiver and significantly increases its utility.

Manufacturer: Kenwood USA Corp, 2201 E Dominguez St, Long Beach, CA 90810, tel 213-639-4200. Price class: R-5000, $950; YK-88C filter, $80; YK-88A-1 filter, $80.

Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

TO SEAL OR NOT TO SEAL

☐ When Larry Wolfgang, WA3VIL, reviewed the Cushcraft R3 vertical antenna in March 1983 *QST*,[1] he noted that the cover of the mast-mounted capacitor tuning assembly "should not have come off as easily as it did." I had the same impression when *my* R3 arrived. The cover was secure enough, but there were rather wide gaps between the cover and base plate.

My R3 was to be mounted on top of a 35-foot tower. I didn't want to take the antenna down once it was in place. I knew that the antenna was going to be exposed to the rigors of a Maine winter, and the thought of rain driving into the capacitor tuning assembly bothered me. So, with the intention of keeping out the elements, I ran a generous bead of silicone sealant along every joint and seam of the tuning assembly. I must have done a good job—*too* good. Shortly after the antenna was installed atop the tower, the SWR rose to an unacceptable level, and no amount of tuning from inside the shack would bring it below 3:1.

Eventually, I took the antenna down and opened up the box I had so carefully sealed. Inside, I found a considerable amount of water—enough to leave a puddle on my work bench—and some corrosion of the capacitor itself. Condensation was obviously the culprit. I removed all the sealant, drilled a couple of drain holes in the tuning-assembly base for good measure, and erected the antenna again. The SWR problem disappeared completely. The antenna tuned to a 1:1 SWR on all three bands—10, 15 and 20 meters—with no difficulty. The moral of this story may be that sometimes the manufacturer knows best.—*Hugh Aitken, W1PN/1, South Gouldsboro, Maine*

Editor's Note: Sealing an assembly with room-temperature vulcanizing (RTV) substances can cause corrosion problems even if condensation doesn't occur within the sealed enclosure, depending on the RTV product used. Some RTV sealants emit corrosive vapor (commonly, acetic acid) as they cure. Noncorrosive sealants are a must for electrical and electronics work.

Unscreened drain holes can provide a means for small insects and spiders to enter a compartment, as Paul Pagel, N1FB, relates in "Tune Up Your Tribander" (*QST*, April 1986, pp 27-28 and 31). Note 2 of the article suggests using RTV sealant to secure screening over drain holes against the entry of these intruders.

A TNC CONNECT ALARM

☐ We wanted an audible alarm for our MFJ-1270 TNCs so we'd know when someone connected to our packet-radio stations. Solution: The simple alarm circuit shown in Fig 1. The alarm uses a 555 timer IC (connected as a one-shot multivibrator) to drive a piezoelectric buzzer when the TNC's CONNECT LED lights. Only eight components are used, including the IC; in addition, we used IC sockets and Radio Shack® dual IC boards (RS 276-159) to hold the components. Layout is not critical.—*George Kammerer, K4HCD, Charleston Heights, and Pat McLeod, WA4NFK, Ladson, South Carolina*

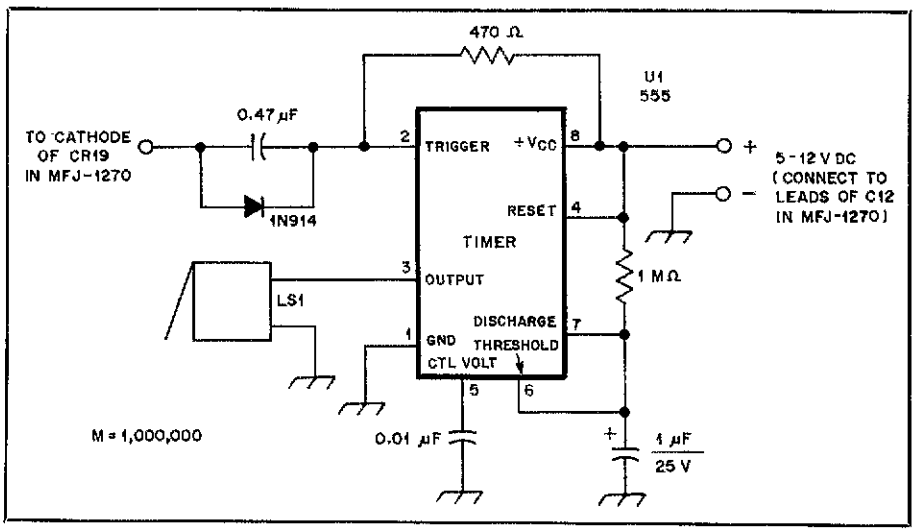


Fig 1—The K4HCD/WA4NFK connect-alarm circuit. CR19 is MFJ's nomenclature for the CONNECT LED on the MFJ-1270 TNC. Its cathode lead is to the *left* as viewed from the front of the TNC. Resistors are ¼-W, carbon film. The 0.01- and 0.47-µF capacitors may be ceramic or plastic film; the 1-µF capacitor is a tantalum electrolytic. LS1 is a piezoelectric buzzer.

AUTOMATIC SCANNING FOR THE KENWOOD TR-7930/7950

☐ As many radio amateurs do, I frequently operate 2-meter mobile. Whether I'm on a trip, or just tooling around town on my days off, the rig is in the car. I use a Kenwood TR-7930, and every time I start the car, I have to press the SCAN key or hold in the UP button on the microphone to initiate the '7930's SCAN feature. It seemed to me that there had to be a better way to start the rig scanning every time I turned it on!

The '7930's microprocessor senses keystrokes on the rig's 16-button keyboard by means of four input lines and four output lines. A pulse is sent on one of the output lines. To recognize which key was pressed, the microprocessor scans the input lines for the pulse. I developed a means of pressing the '7930's SCAN button *electronically* at power up. The circuit is shown in Fig 2.

U1 is a 4066 CMOS quad bilateral switch. Each of U1's four switches has a control line, an I/O port and an O/I port. When the control line is high, the I/O and O/I ports are connected. The automatic scanning circuit uses the fourth of U1's sections (U1D); control, I/O and O/I lines for the other three switches are grounded. With S1, ENABLE, closed, U1D's I/O and O/I lines are connected to the TR-7930 keyboard lines corresponding to the transceiver's SCAN button (K3 and KD, respectively, in

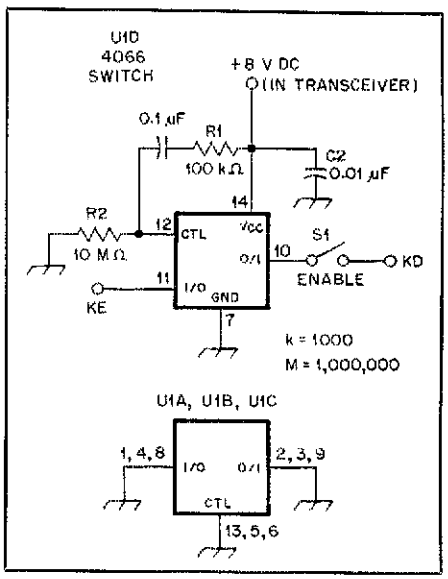


Fig 2—KD3ED's auto-scan circuit for the Kenwood TR-7930/7950. Keyboard lines KD and K3 can be accessed on the rig's control-unit PC board at J8. Dc supply for the circuit (8 V) is available at J17, pin 8C, on the RX-unit board. Resistors are ¼-W, carbon film; capacitors are disc ceramic. S1 is a subminiature SPST toggle. C2, not discussed in the text, bypasses V_{cc} to ground for RF.

[1]L. Wolfgang, "Cushcraft R3 Three-Band Vertical Antenna," Product Review, *QST*, Mar 1983, pp 45-46.

Kenwood nomenclature). R1 and R2, in conjunction with C1, provide the time delay needed to hold U1D's control line high when the circuit (along with the TR-7930) is powered up. This closes the bilateral switch, connecting K3 and KD to start scanning. Once C1 charges, the control line is held low by R2, allowing normal operation of the '7930's SCAN button. The circuit draws no current once C1 is charged.

Opening S1 disables the auto-scan circuit by disconnecting the KE keyboard line from U1. (Disabling the auto-scan circuit by lifting the dc line to U1 can cause U1D to behave unpredictably. All unused pins on the 4066 are grounded for the same reason.) In my installation, I mounted S1 on the rear panel of the TR-7930, just below the power connector.

Circuit layout is not critical; you can use a circuit board or point-to-point wiring. The 4066 functions with supply voltages from 3 to 15. If the keyboard on your rig uses matrix switching—8 lines for 16 keys—this auto-scan circuit should work for you.—*Daryl S. Cramer, KD3ED, Duncansville, Pennsylvania*

Editor's Note: Rus Healy, NJ2L, of the ARRL HQ staff, suggests that this modification may also work with transceivers in Kenwood's TM-2500 and -3500 series. This has not been tried, however. Kenwood designations for the SCAN switch lines, and for the RX-unit points across which 8 V dc is available, may differ from those used in the 7930/7950 series.

ROLLER-INDUCTOR SLIDER SWITCHES OUTPUT CAPACITANCE

☐ Lew Howard, W4LHH, Stone Mountain, Georgia, submitted Fig 3 among many photos of a 160-10-meter amplifier he built himself. The photo shows the rear end of the rig's output-network roller inductor. In Lew's circuit, 160-meter operation requires full tank inductance *and* additional output capacitance. The three doorknob capacitors, right, provide this capacitance. One end of the C-shaped metal strap immediately to the left of the doorknobs is common to the ungrounded ends of the capacitors. The other end of the strap isn't connected to anything—yet.

Set the inductor into motion in your mind's eye. As the roller inductor reaches maximum inductance (sliding contact moving to the right), the tongue on the inductor's traveling contact meets and lifts the C strap, connecting the doorknob capacitors into the circuit. Now, inductance is at maximum, capacitance has been added and W4LHH's homemade amplifier is ready to be tuned up on 160.—Ed.

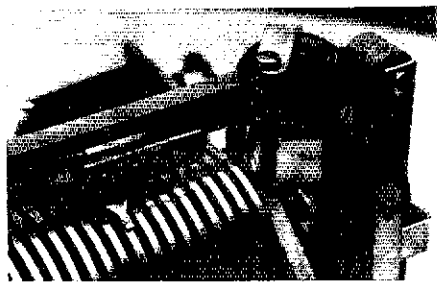


Fig 3—When W4LHH's roller inductor is set for maximum inductance, the tongue on the traveling contact switches in more tank capacitance. See text.

TRANSFORMER HUM

☐ After purchasing a Yaesu FT-901DM transceiver several years ago, I discovered that there was 60-Hz hum on my signal when I operated SSB. A careful redo of station grounding, replacement of the '901's audio-input IC, changing microphones and so on, failed to provide a cure. Finally, I just gave up and operated—despite the annoying hum.

Recently, I decided to reactivate a Collins 32S-3 transmitter for SSB operation. (It had been sitting on the shelf for several years unused, having been purchased as a spare.) At the same time, I constructed a boom for the microphone to allow hands-free VOX operation.

Once on the air with the 32S-3, I immediately received reports of 60-Hz hum. The hum was severe enough to be clearly visible on a monitor scope—as it had been with the Yaesu. Tube changes, double shielding of the microphone cable and other potential remedies all failed to solve the problem. Quite accidentally, while using a hand-held mic, I noticed that the hum increased when the mic was hung over the edge of the bench. Suddenly, I remembered that there was a power supply beneath the bench: the autotransformer-controlled high-voltage supply for my two homemade 4-1000A amplifiers! The hum came up when I held the mic close to the transformer.

The autotransformer, sitting on a shelf a foot above the floor, was unshielded. The shelf above the transformer was plywood; it contributed no shielding. Grounding the transformer case did not reduce the hum. Finally, I eliminated the hum by putting the transformer on the floor and pushing it farther away from the transmitter. Next, I reconnected the FT-901DM and tried it on SSB. The hum was gone! Moving the transformer resulted in a definite and complete fix.—*Joe Hertzberg, N3EA, Bryn Mawr, Pennsylvania*

USING THE ROBOT 800C AS AN ELECTRONIC TYPEWRITER

☐ The Robot Model 800C SSTV terminal can be used as an electronic typewriter for typing letters and other data. Your system must include a Robot 800C with parallel or serial printer modification, and a dot-matrix or daisy-wheel line printer. (I recommend the use of a parallel printer, if you have one.) To print: (1) *Do not use your transmitter* unless you are going to transmit whatever you type over the air to another amateur station. (2) Set the Robot to ASCII mode, wide shift (850 Hz). (3) With the split-screen function operating, set the Robot to the receive mode. Now type what you wish to print, using the SPACE bar for spacing and RETURN for changing lines or beginning paragraphs. Type until the 800C's buffer is full. Hit ESC and SPACE to send the text to the printer. (4) After the buffer contents have been printed, hit ESC and return to the receive mode. Continue steps 3 and 4 until your message is completed.

In its ASCII mode, the 800C's keyboard works just like a typewriter, including the CAPS LOCK function. This letter was composed on a Robot 800C and an SMC TP-1 daisy-wheel printer.—*Clyde W. Preble, WA6OLA, Mill Valley, California*

FOUR CUTS MAKE CHANGING IC-2AT BATTERY PACKS EASIER

☐ A good friend of mine and fellow ham, Russ, N8DMK, is blind and lacks the use of one arm. For 2-meter operation, his mainstay rig is an ICOM IC-2AT hand-held transceiver. Problem: Each time the '2AT's battery pack died, Russ' mother had to install a fresh battery for him. (Russ had tried many times, but could not get battery and radio to line up just right. His technique looked good: Sitting down, he held the transceiver between his thighs and worked at pack and radio with his good arm. But success at getting the pack to slide smoothly onto the '2AT continued to elude him.)

On a recent visit, while was I helping him practice putting the battery pack on, I got an idea and asked Russ for the IC-2AT and battery pack. After removing a few bits of plastic with my pocketknife, I handed the pair back to Russ and had him try again. Bingo! After a few tries, he slid the pack right on! Even when he began the change-over operation with the pack in a different position, Russ easily installed the battery on the transceiver. He was overjoyed, and his mother was thrilled with the accomplishment.

Fig 4 shows how to make the cuts. Remove just enough plastic to allow the mating metal rails of the battery pack and transceiver to catch *before* the plastic rails engage. This requires that the end of each metal rail be undercut slightly. I've modified *my* IC-2AT the same way: Now, I can change battery packs more easily, too!—*Casey Nowakowski, N8FCQ, Berea, Ohio*

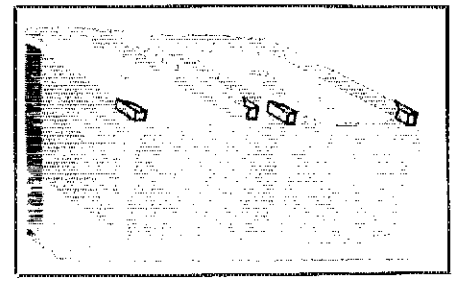


Fig 4—N8FCQ's removal of four bits of plastic takes the frustration out of IC-2AT battery-pack changes for N8DMK. The modification allows the metal shoe on the battery pack (left) to contact the metal rail on the transceiver (right) *before* the plastic rails interlock.

Technical Correspondence

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

TANDY CONSUMER SERVICES

☐ I've just read, with a great deal of interest, Doug DeMaw's excellent article in the October issue of *QST*.[1] I appreciate the fact that you recognize Radio Shack as a place to get parts necessary for different projects. I would like to bring to your attention another source of parts: Tandy National Parts, which is a part of Tandy Consumer Services, a division of Tandy Corporation.

Tandy National Parts has approximately 120,000 feet of warehouse space, and over 71,000 parts in stock for Radio Shack products, as well as a very large inventory of name-brand parts.

At Tandy National Parts, we maintain part inventory using the following guidelines: cosmetic parts, three years; mechanical parts, five years; electronic parts, seven years; Radio Shack service and owner's manuals, indefinite.

Parts may be obtained by writing to Tandy National Parts, 900 East Northside Dr, Fort Worth, TX 76102, or by calling 817-870-5600.—*Bud McClure, K5IUO, Senior Director, Tandy Consumer Services, 1600 One Tandy Center, Fort Worth, TX 76102*

10-GHz FREQUENCY DETERMINATION

☐ I have been experimenting with surplus microwave intrusion alarms for use on 10-GHz wideband FM. Determining the operating frequency of these units without fancy test equipment can be a challenge.

A simple method of determining the receiving frequency of these units is to use a low-frequency RF source to drive a diode multiplier that generates integral harmonics of the source frequency. Specifically, this equipment includes a 2-meter hand-held transceiver (operating at 1 to 2 W), a 6-dB pad and a 1N23 diode in a surplus X-band mixer cavity. This combination will generate strong harmonics past the X band. The problem is then to determine which harmonic you're hearing; this is solved neatly using the following technique.

There are a number of 2-meter frequencies that multiply to a common 10-GHz frequency. For example, the 70th harmonic of 146.615 MHz is 10,263.050 MHz. Similarly, the 71st harmonic of 144.550 MHz is also 10,263.050 MHz. So, if you use your hand-held to transmit on 144.550 MHz and think you're listening at 10,263.050 MHz, you can check by dialing in 146.615 MHz—the harmonic should be there. If it isn't, you're not listening to 10,263.050 MHz!

Of course, the overall accuracy of this scheme is dependent on the frequency accuracy of the 2-meter hand-held. If the hand-held's frequency is 0.5 to 1 kHz above or below the desired frequency (not at all uncommon), the 10-GHz frequency will be 35 to 70 kHz higher or lower. Given the wide passband of the 10-GHz FM receiver, the signal should still be audible.

I wrote a computer program that calculates the 2-meter frequency pairs producing the same 10-GHz harmonic. A copy of the printout is shown in Table 1. I hope others will find this of some benefit.—*Bill Koch, WA5LBQ, 9820 Deerfield Cir, Carmel, IN 46032*

Table 1

10-GHz Frequency Determination Using 2-M Signal Sources

(Frequencies are in MHz)

10-GHz Freq	*2-M Source 1*	*Harmonic*	*2-M Source 2*	*Harmonic*
10017.420	147.315	68	145.180	69
10040.880	147.660	68	145.520	69
10064.340	148.005	68	145.860	69
10094.700	146.300	69	144.210	70
10118.850	146.650	69	144.555	70
10143.000	147.000	69	144.900	70
10167.150	147.350	69	145.245	70
10191.300	147.700	69	145.590	70
10238.200	146.260	70	144.200	71
10263.050	146.615	70	144.550	71
10287.900	146.970	70	144.900	71
10312.750	147.325	70	145.250	71
10337.600	147.680	70	145.600	71
10377.360	146.160	71	144.130	72
10402.920	146.520	71	144.485	72
10428.480	146.880	71	144.840	72
10454.040	147.240	71	145.195	72
10470.600	147.600	71	145.550	72

COMPATIBLE ALC

☐ My thanks to L. B. Cebik, W4RNL, for pointing out the prior use of the triode ALC circuit suggested in a previous letter.[2,3,4] Since I use only tetrodes, I hadn't read Riley's article on triodes, but referenced it in my July 1986 article only as a convenience for readers.[5] It wasn't until almost a year later, when someone asked about triodes, that I thought of the untested circuit in my December 1986 letter, completely forgetting Riley's article. Since then Art Casebeer, W6DRL, reports that he has built my suggested triode ALC circuit into a Henry IIIK amplifier, driven by a Collins S-Line exciter, and has obtained excellent results.

There are some crucial differences in the ETO, Riley, Cebik and my ALC circuits for triodes, mainly in the output impedance and current-source capabilities. To follow a voice pattern, an ALC circuit must have very fast attack (on the order of 0.3 ms), and a fairly slow decay, about 0.3 s. Experiments with my homemade amplifiers and my Signal/One CX7 exciter show that any significant resistance in the amplifier ALC output line will greatly increase the attack time, causing the ALC system to malfunction. As Cebik mentions, however, exciters with high-impedance op amp ALC input circuits, which isolate the decay capacitor, will not put such severe demands on the amplifier ALC system. Because of this, any discussion of an amplifier ALC circuit is dependent on the exciter used. Thus, there seems a need for an industry and amateur standard for ALC provisions in exciters and amplifiers, so that operators can use any amplifier with any exciter. Here's my first proposal:

- All exciters, amplifiers (including VHF "bricks"), and all transverters will have compatible ALC circuits that follow specific standards.
- Levels will be set to prevent overdrive, flat-topping and splatter. Instruction manuals should specify clear procedures for proper operation.
- Normal ALC operation level, with 6 dB of compression and a normal exciter ALC meter reading of 20% full-scale should be obtained with a −1 V level applied to the exciter's external ALC jack.
- Full available compression of 20 dB, and a full-scale exciter ALC meter reading,

[1] D. DeMaw, "Stalking Those Fugitive Components," Oct 1987 *QST*, pp 24-26.

[2] L. B. Cebik, "More on ALC," Technical Correspondence, Jul 1987 *QST*, p 40.

[3] M. Mandelkern, "ALC For Triode Amplifiers," Technical Correspondence, Dec 1986 *QST*, pp 46-47.

[4] J. F. Riley, "Improving Amplifier ALC Circuits," Parts 1 and 2, *Ham Radio*, Aug 1984, pp 40-44, and Sep 1984, pp 52-56.

[5] M. Mandelkern, "ALC For Class AB, Amplifiers," Jul 1986 *QST*, pp 38-39 and 47.

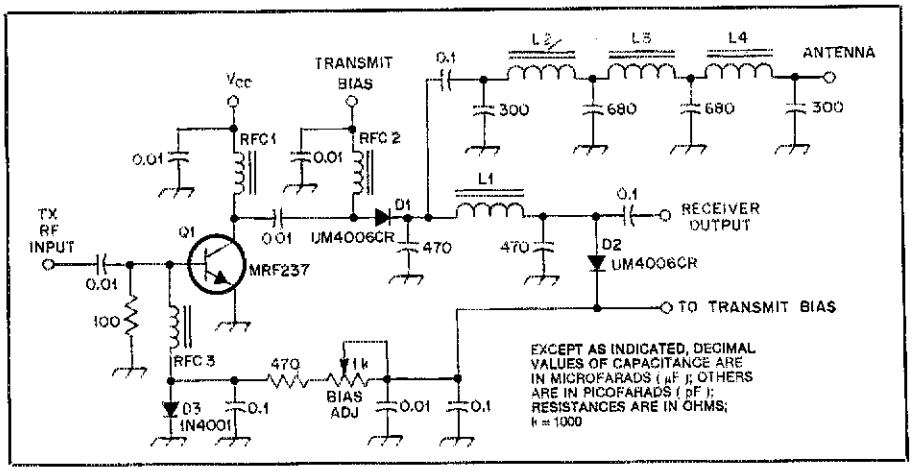


Fig 1—Schematic diagram of an integrated TR switch/transistor linear amplifier. Use a heat sink on Q1 (see parts list).

D1, D2—Unitrode UM4006CR, high-power PIN diodes. (Available from Microwave Components of Michigan, 11216 Cape Cod, Taylor, MI 48180, tel 313-941-8469 [evenings only]).
D3—1N4001 thermally coupled to Q1.
L1—13 turns no. 22 enam wire on an Amidon or Palomar Engineers T-50-2 powdered-iron toroid core.
L2, L4—14 turns no. 22 enam wire on T-50-2 core.
L3—15 turns no. 22 enam wire on T-50-2 core.
Q1—MRF237. (Use a heat sink. In the prototype, the case was soldered to the copper ground foil of the circuit board.)
RFC1-3, incl—5 turns no. 22 enam wire on Amidon FT-37-43 or Palomar Engineers F-37-43 ferrite toroid.

should be obtained with −5 V applied to the exciter's external ALC jack.

• Exciter ALC timing capacitors should be isolated from the ALC jack so that amplifier ALC circuits need provide a current of only 1 mA for fast attack.

It would help if product reviews in Amateur Radio magazines included comments on provisions for ALC. Compatibility details would enable buyers to decide before purchase which new gear would work with the equipment on hand.

Following Cebik's suggestion, I am interested in collecting information on exciter and amplifier ALC circuits. Would anyone who has built and used one of the ALC circuits in the cited references please write me, including details concerning the exciter and amplifier used, and results obtained?

Overdrive (which causes splatter) is a serious problem on our bands. The general use of ALC in amplifiers would increase the enjoyment of our hobby and reduce squabbles between operators.—*Mark Mandelkern, KN5S, Department of Mathematics, New Mexico State University, Las Cruces, NM 88003*

PIN DIODE-SWITCHED AMPLIFIER

☐ The TR switch/final amplifier circuit shown in Fig 1 is designed to eliminate the sequencing and biasing problems associated with PIN diodes. Although PIN diodes can switch quickly and silently, the sometimes poor receiver/transmitter isolation that results when the bias isn't sequenced properly can lead to expensive receiver failures! This circuit offers some protection by interlocking the final amplifier with the diode bias, preventing the final from putting out significant power with the diodes in the wrong bias state.

The performance of the switch is adequate for serious QRP work on 40 m. The isolation is good enough to keep the transmitted signal below −32 dBm at the receiver, even with a short or open circuit at the antenna port. (Unfortunately, the amplifier shown in Fig 1 oscillates when feeding a short circuit, but this is not unusual for many amplifiers.) The antenna-to-receiver loss is only 0.3 dB, 0.1 dB of which is caused by the low-pass filter.

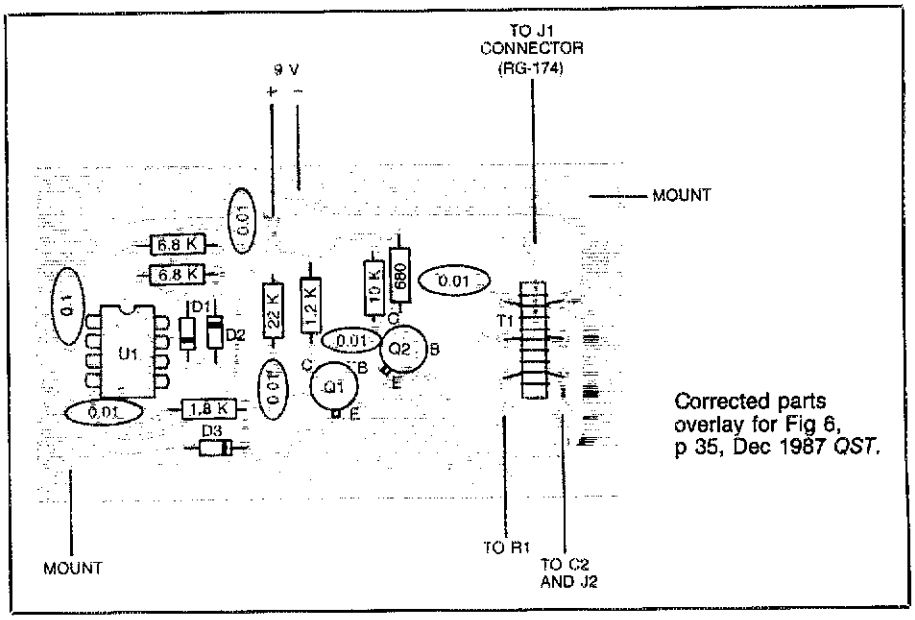
The output intercept is about +39 dBm —a figure arrived at using lab-grade signal generators and a spectrum analyzer. Driving signal cleanliness was not verified because of the analyzer's limited dynamic range. The intercept does not seem to be well behaved, as 10 dB more signal resulted in 10 dB more distortion, but dropping the signal level 10 dB took the distortion out of measurement range. Practically speaking, this diode switch should not degrade the performance of most amateur receivers.

For a linear amplifier, the performance of the final is reasonable. Biased for a resting current of 24 mA, with 1.4 mW of drive, a supply voltage of 12.5 and collector current of 220 mA, 1 W of output power is achieved. The 3rd, 5th, 7th and 9th-order IMD products are down 41, 47, 54 and 62 dB, respectively. Although much better efficiencies are possible for amplifiers, keep in mind the efficiency figure mentioned here includes amplifier-to-antenna losses *and power for the TR switch!* Some TR switches alone use as much power as this entire circuit!—*Zack Lau, KH6CP, ARRL Lab Engineer*

Feedback

☐ Please refer to "Some Reflections on Vertical Antennas," Jul 1987 *QST*. Author Michaels points out that in Eq 4 of the Appendix on p 19, the definition of the term B should be: $B = 5.6 \times 10^{-7}$. Calculations of depth of penetration of RF current with Eq 4 are correct for this value.

☐ A bit of gravitational pull in the westerly direction moved the parts overlay of Fig 6, p 35 in "A Laboratory-Style RX Noise Bridge," Dec 1987 *QST*. The correct placement diagram is shown in the accompanying figure.



Corrected parts overlay for Fig 6, p 35, Dec 1987 *QST*.

1987: A Year of Change and Challenge for Amateur Radio

Take a trip down (recent) memory lane through one of Amateur Radio's most memorable years.

By Jeff Kilgore, N1FGB
ARRL Editorial Supervisor

There are no dull years in Amateur Radio; even so, 1987 certainly stands out as one of the more exciting. It seems nothing stood still, with Novice Enhancement, the beginning of a new sunspot cycle, record VHF and microwave DX, commendable public service activities and the fight to retain valuable amateur spectrum. While not all the news was good, the amateur spirit showed through it all.

Novice Enhancement

March 21, 1987 will be remembered as a watershed date for the Amateur Radio Service—the inception of Novice Enhancement. Never before had Novices enjoyed such an array of privileges—or such an ability to fully join in on the many facets of Amateur Radio.

The new Novice privileges in the 220-MHz band proved very popular, especially FM/repeater operation. Packet operations on the band received a boost, due to the mode's popularity among Novices. The amount of 220-MHz commercial equipment also increased, a boon to all amateurs interested in VHF.

The quadrupling in size of the 10-meter Novice subband and the addition of SSB and digital privileges were also enthusiastically embraced by Novices. For the first time, Novices enjoyed privileges other than CW on an HF band—and what great timing, with a new sunspot cycle underway!

The addition of a Novice subband at 1270-1295 MHz also opened new vistas for Novices. In addition to all the modes available on 220 MHz, here in the microwave realm Novices could operate television—not the slow-scan variety, but *fast-scan* television, with live action and sound!

The Threat to 220 MHz

The ARRL responded forcefully when the FCC issued a Notice of Proposed Rule Making in General Docket No. 87-14, the proposal to reallocate 220-222 MHz to the land mobile service, in February. Faced with the possibility of losing 40% of the valuable 220-MHz band, amateurs deluged the FCC and elected officials in Washington with letters of protest. Repeater frequency coordinators assisted in the effort to save 220 MHz.

The proposal, originated by the FCC's Office of Engineering Technology, generated little support among land mobile users and manufacturers. One company, Forest Industries Telecommunications Services, requested that another megahertz be reassigned to land mobile, in addition to the 2 megahertz already proposed in the NPRM. Ironically, FITS was one of those applying to become Special Call Sign Coordinator in PRB-3, the proposal to allow special amateur call signs.

Novice Enhancement was a boon to Amateur Radio and resulted in an increase in Novice licensing. Hewitt-Trussville Junior High (Trussville, Alabama) offers an Amateur Radio program which is popular with students. With their own VEC, the school offers upgrade as well as Novice testing. *(photo courtesy WA4JNX)*

Technical Developments

The ARRL lab developed a transmitted phase-noise measurement technique, with details to be published in *QST* in early 1988. Equipment test results will appear in future Product Reviews.

Technical development of advanced amateur satellites made measureable progress in 1987. Phase IIIC is scheduled for launch in early 1988. Two design conferences were held on the Phase 4 geostationary satellite program. AMSAT began work again on a packet satellite (PACSAT) program in November, in hopes of a 1988 launch for the first satellite in the series.

Packet radio continued to gain in popularity, with more and more stations becoming active. Digipeaters (digital repeaters) continued to increase in number, gaining their own section in the 1987-88 *Repeater Directory*. The number of digipeaters is now so large that the 1988-89 directory will list only those that operate on a 24-hour basis.

The Sixth ARRL Amateur Radio Computer Networking Conference was held in Redondo Beach, California on August 29. Papers presented at the conference showed a high level of sophistication. Topics included networking, message handling and higher transmission speeds. One paper described a 56-kilobaud RF modem designed and built by Dale Heatherington, WA4DSY. The PS-186™ advanced packet-network switch designed by members of the San Diego Packet Radio Association (SANDPAC) was also described at the conference. The switch supports data rates to 1 Mbit/s and can be used as a local packet node, mail system or a gateway to other networks.

In an era of Japanese imports, US packet-radio equipment manufacturers are designing and marketing some impressive products, with AEA and Kantronics exporting their wares to Japan!

First 220-MHz Sporadic-E Contact

The first documented two-way sporadic-

E contact on 220 MHz took place on June 14. William Duval, K5UGM, of Irving, Texas, and John Moore, W5HUQ, of Orange Park, Florida, made the record contact after first working each other on 2 meters. Their contact was another example of the contributions made to the technical art by amateurs, and the value of the 220-MHz band to such efforts.

Another record was broken on July 19 when Robert Dildine, W6SFH, and Glen Elmore, N6GN, made a two-way contact of 413.8 miles on 10,368.0003 MHz. The contact, substantially farther than the previous record of 296 miles, was made by tropospheric ducting with 250 milliwatts. The contact was the culmination of months of preparation by WB7ABP, N6GN, WBØHLC, W6OYJ, WA6EXV and W6SFH.

Publications

The new edition of the *ARRL Operating Manual*, offering several times the information of the previous one, presented a wealth of valuable information for all amateurs. The *National Contest Journal* became an ARRL publication and continued to attract new subscribers.

The 1988 ARRL Handbook; a Novice Enhancement edition of *Tune in the World with Ham Radio*; updated license manuals; instructor's guides for Novice, Technician and General class; *Yagi-Antenna Design* by Dr James Lawson, W2PV; *Transmission Line Transformers* by Dr Jerry Sevick, W2FMI; *Low-Band DXing* by John Devoldere, ON4UN; *Your Gateway to Packet Radio* by Stan Horzepa, WA1LOU, and *W1FB's Antenna Notebook* by Doug DeMaw, W1FB, were published during 1987.

The 1986 Technical Excellence Award went to Rich Arndt, WB4TLM, and Joe Fikes, KB4KVE, for their article, "Super-SCAF and Son—A Pair of Switched-Capacitor Audio Filters," which was published in April 1986 *QST*. Some *QST* technical articles of note for 1987 included "The Tandem Match—An Accurate Directional Wattmeter," by John Grebenkemper, KA3BLO; "The W2CXM 2-Meter Cube Receiver and Scanner," by Steven Powell, N2BU, and "Amateur Radio and the Blind," a series of articles by Butch Bussen, WAØVJR.

QEX, the ARRL experimenters' exchange and AMSAT satellite journal, reported in detail the first QSO via mid-latitude E-layer skip on 220.1 MHz during June. The "13 Centimeters" column, written by Bill Olson, W3HQT, premiered in the September issue.

Documenting the innovative work being done by Amateur Radio experimenters, especially in the digital and microwave areas, conference proceedings were printed for the 6th Computer Networking Conference, the 21st Central States VHF Conference, Microwave Update '87 and the 1987 Mid-Atlantic States VHF Conference. The ARRL publishes these proceedings to encourage the exchange of ideas among Amateur Radio experimenters in order to further development in these areas.

Amateurs assisted in many public service emergency operations during 1987, but such emergency preparedness paid off in other ways as well. The PHD ARA (Liberty, Missouri) used their emergency communications van to give Boy Scouts a firsthand demonstration of Amateur Radio during the October Jamboree on the Air. *(photo courtesy AJØE)*

Public Service—1987 Style

Enhanced frequency and mode privileges were not the only results of Novice Enhancement; revised license qualifications made Novices eligible for six additional Field appointments. Novices can now also serve as Assistant Section Manager, Official Bulletin Station, Net Manager, Technical Coordinator, Assistant Technical Coordinator and Affiliated Club Coordinator.

The year found viable packet-radio/NTS networks in place in many regions. For example, a New England network of section traffic nodes can automatically forward NTS mail throughout the region. A similar transcontinental capability is not far away, after the FCC issued a Special Temporary Authorization (STA) allowing unattended automatic packet operation below 30 MHz. The SKIPNET experiment, with 58 stations initially authorized and the possibility of later additions, is meant to prove the feasibility of, and provide information for, a national fully automatic HF-packet message-forwarding net.

The ARRL Board of Directors established the ARRL National Emergency Response Committee (ANERCOM) to interface with served agencies for the purposes of establishing points of contact, assessing their emergency communications needs and recommending procedures for satisfying those needs through Amateur Radio. ANERCOM will consist of an ARRL HQ staff member, one ARRL Board liaison, the Chairman of the Public Service Advisory Committee, and four to six additional members with demonstrated experience and expertise. ANERCOM will provide for effective national direction in the event of a widespread communications emergency.

Amateur Radio went into action before a tornado struck Saragosa, Texas on May 22. Amateurs enabled a warning to be issued 21 minutes before the tornado struck, after cloud rotations were reported by amateurs on the SKYWARN system of the Midland weather service. Amateurs from all over the region, alerted by the West Texas Connection, a system of linked 2-meter repeaters covering West Texas, assisted in the search for victims, carried supplies and provided emergency communications.

Amateur Radio also played a vital role in assisting after the Reventador disaster in Ecuador on March 5. Early reports described damage from the volcanic eruption, earthquake and flashflooding as moderate, but several hours later Matts Gunnarsson, HC7SK, reported that the damage was much worse. Most of the buildings in Ibarra were leveled and

The FCC authorized many club stations to use special "200" call signs in celebration of the Bicentennial of the US Constitution. The JANET Club, a Japanese-speaking radio club, operated N200ATT December 19-25 from Ramsey, New Jersey. Here the station is being operated by N2ATF and JS1DLC/W2. *(photo courtesy N2ATT)*

survivors spent the night outside in the rain. By the 7th, reports of landslides and flash floods were coming in. Amateur Radio provided communications for Civil Defense and the armed forces in the aftermath of the disaster.

When an earthquake struck the Los Angeles area on October 1, amateurs were quick to respond. Field Services Manager Rick Palm, K1CE, was informed by NTS Official Tom Greenhalgh, W1QYY, of Dublin, New Hampshire, moments after the first shock hit. An emergency net was put in operation on 14.160 MHz, but there was little activity. Public safety agencies were able to cope with the situation, and telephone service was not interrupted for long.

As it has done since the inception of the race in 1973, Amateur Radio provided communications for the annual Iditarod Trail event in March. The race commemorates the emergency transport by dog sled of antitoxin from Fairbanks to Nome, Alaska to combat a diphtheria outbreak in February 1925. Amateurs connected checkpoints with race headquarters in Anchorage, assisted in supply operations and handled calls for medical and veterinary assistance. While the event is not an emergency situation, Amateur Radio does play a vital role, not only in the smooth running of the race, but in protecting the participants as well.

W87PAX, special-event station at the 10th Pan American Games, made over 23,000 QSOs with 136 countries during its August operation. The Indianapolis station handled more than 200 personal messages during the games.

Father Moran Among Award Winners

The 1986 ARRL International Humanitarian Award was awarded to Father Marshall M. Moran, 9N1MM, for his lifetime commitment to the furtherance of international brotherhood and peace through Amateur Radio.

Scott L. Young, N9FZS, received the 1986 Hiram Percy Maxim Memorial Award. He was selected by the League's Board of Directors for "his outstanding efforts in Amateur Radio, including public service activities, recruiting new amateurs and improving the general public awareness of Amateur Radio."

The 30th Annual Scout Jamboree-on-the-Air was held in October. During the two-day event, amateurs gave Scouts a chance at hands-on operating experience and perhaps started some of them toward a rewarding hobby or career.

Amateurs Celebrate the Constitution's Bicentennial

Amateur Radio joined in the celebration of the Bicentennial of the United States Constitution with club "200" calls and the "We the People" WAS.

The FCC, acting on an ARRL request, authorized the use of special Bicentennial calls for preregistered club stations in state capitals and other places approved by the FCC. Each state was given one week during the period December 1987 to December 1988 for special-event participation using the number "200" in the call rather than the normal number.

The "We the People" WAS is available to all amateurs who work all 50 states between September 17, 1987 and December 31, 1988. In addition, endorsements will be offered for working "200" club stations in all 50 states. A special "Heard All States" endorsement is available to nonlicensed shortwave listeners.

DXCC Golden Jubilee

The ARRL Golden Jubilee DXCC Award, commemorating 50 years of DXCC, proved very popular, with the first 100 qualifying listed in April 1987 *QST*. Putting the island on the air for the first time, 3Y1EE/3Y2GV made almost 20,000 contacts in 10 days with the Peter I operation. Having split off from the Netherlands Antilles, Aruba, P4, became a separate DXCC country.

Volunteer Examining Moves Forward

In February, the FCC authorized credit to be issued to candidates for written elements passed. This opened the door for thousands of licensed and unlicensed applicants who wanted to take only written elements and to defer code elements that were required to complete their upgrades. This allows a candidate who fails a code test to take the written test for credit—good news indeed!

Shortly thereafter, Novice Enhancement took effect. As part of the Novice Enhancement docket, the Element 2 (Novice written) test was expanded to at least 30 questions, and the question pool to at least 300 questions. The Element 3 (Technician and General class written) pool was separated into Elements 3A (for Technician) and 3B (for General). Even though the FCC gave the Amateur Radio community only six weeks to make appropriate changes to the three pools, the ARRL/VEC solicited comments from other VECs and accomplished this enormous task quickly enough that the new tests were in place when Novice Enhancement took effect.

In July, the ARRL/VEC was represented by VEC Manager Jim Clary, WB9IHH, and Assistant Manager Don "Mac" McGrath, KZ1A, at the Conference of VECs that was held concurrently with the ARRL National Convention in Atlanta, Georgia. At the Conference, the ARRL/VEC was elected to chair a committee of three VECs—made up of ARRL/VEC, Greater Los Angeles ARG/VEC and Western Carolina ARS/VEC, with W5YI Report/VEC as an alternate. The committee was charged with developing and maintaining the question pools.

The Extra Class (Element 4B) pool was the first of the five to be tackled. At year's end, the question pool committee was on track, having released the final Element 4B syllabus and a rough draft pool of questions to all VECs. The finished pool will be distributed to all VECs and publishers of Amateur Radio training materials on

March 1, 1988. The Novice- and Technician-class pools will already be under review by that time.

Independence Day for CRRL

December 31, 1987 marked the end of the Canadian Division of the ARRL and the beginning of the Canadian Radio Relay League as a fully autonomous organization. The League's relationship with CRRL has been a long and fruitful one, and one which we hope will continue in the future. The ARRL wishes CRRL the best of luck for 1988 and in the years to come.

FCC Actions

There were a number of important events on the regulatory front. Novice Enhancement was certainly one of the most sweeping and offered great potential for Amateur Radio.

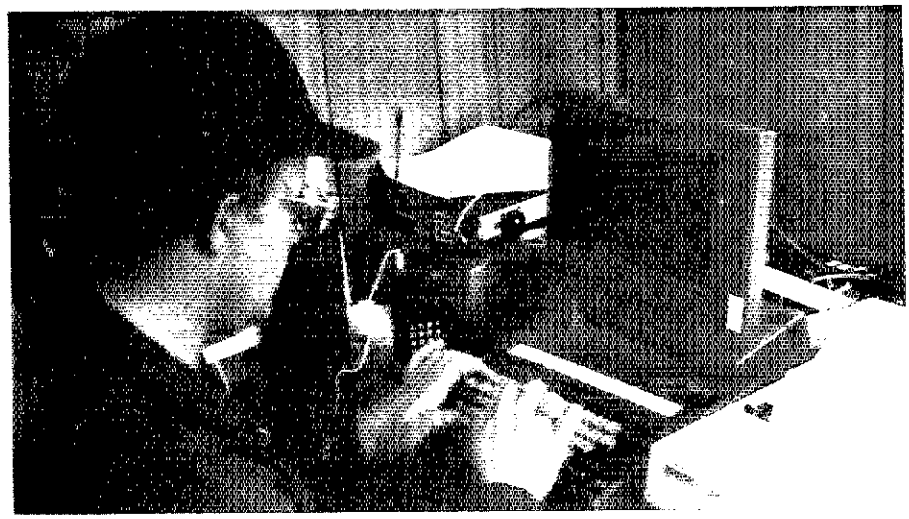
A number of pending FCC actions could have great impact on Amateur Radio. General Docket No. 87-14, the proposal to reallocate 220-222 MHz to the land mobile service, certainly generated much furor and could greatly affect amateur operations.

PRB-3, the proposal to allow the private sector to issue special call signs, also stirred up a great deal of interest. The League's comments emphasized the desirability of the FCC being responsible for administering such a program, but stated that the League would be willing to assume responsibility for administering special call signs provided that only a single entity administers the program. In addition, there would be a $25 initial fee and a $10 fee for license renewal, and the liability of the SCSC (Special Call Sign Coordinator) would be limited to this fee. A one-time mailing by the FCC to all amateurs to inform them of the program, with material provided by the League, would ensure fairness.

In Docket 87-389, a proposal to amend Part 15 of its Rules, the FCC proposes to permit RF devices with greatly increased frequencies of operation and no usage, bandwidth or modulation-type restrictions. The proposal would allow the devices in all but a few restricted bands used for public safety or for services which involve very weak signals, such as astronomy or satellite downlinks. The ARRL Technical Department is conducting a thorough examination of the proposal to aid in filing our comments, which are due March 7, 1988, with the FCC.

In April, the FCC addressed the use of obscene, indecent or profane language by amateurs. In a reversal of an FCC Review Board's overturning an amateur license revocation, the Commission noted that Amateur Radio is "sufficiently like broadcasting" in that its frequencies are shared and there is the risk of children listening. The Commission also noted that Section 97.119 specifically governs indecent transmissions and that the rules will be enforced. While the Commission did not fine the amateur nor revoke his license, it gave notice that similar violations after April 16 "would be subject to more severe sanctions."

The Forest Service proposed new fee schedules for radio and television services, including Amateur Radio, renting US Forest Service land sites for repeater, microwave and other radio uses. To further complicate the situation, each Region proposed a different fee schedule. The ARRL, with the aid of survey information contributed by repeater owners/trustees, filed comments emphasizing the noncommercial nature of Amateur Radio and its purposes.



Packet radio continued to gain in popularity in 1987. Marked by both continued experimentation and regular use in public service activities, packet is fertile ground for the future growth of Amateur Radio. Here, N3CVL sends a message during the Pittsburgh Marathon, held in May. Packet radio was used for medical communications during the event. *(photo courtesy N3DOK)*

International Affairs

The IARU Region 1 Conference, held in April in Noorwijkerhout, Holland, reached a number of decisions important to the amateur community. Among these were expanding the 20-meter RTTY segment to 14.070-14.099 MHz, encouraging meteor-scatter work on 28 MHz, promoting greater usage of amateur satellites, and the urging of member societies, whenever possible, to provide QSL Bureau service for nonmembers. ARRL President Larry Price, W4RA, was among those who attended the conference.

High-Frequency Broadcasting and Mobile WARCs

The HF Broadcasting WARC, held in Geneva, Switzerland, from February 2 to March 8, was of interest to amateurs for several reasons. Resolution 641, enacted at WARC-79, which stated that "the band 7,000 to 7,100 kHz is allocated on a worldwide basis exclusively to the amateur service," was further strengthened by a proposal by the Republic of Paraguay. The proposal gave effect to the resolution by including a date of January 1, 1990, after which broadcasters must stop using the band. The proposal passed by consensus (no vote taken), with China and Pakistan taking a reservation.

On a less cheerful note, the Conference recommended that the ITU Administrative Council take the necessary steps to have the Plenipotentiary Conference, to be held in 1989, consider whether a WARC with frequency-allocation authority should be held. This would include the possibility of allocating more HF spectrum exclusively to the broadcasting service. The IARU and its member societies are already preparing to defend amateur interests at such a WARC, which could occur sometime around 1992.

The Mobile WARC, held in Geneva, also recommended that the above-mentioned WARC be held no later than 1992. Amateur preparations already underway as a result of the HF BC WARC's recommendation were given a further push of urgency by this recommendation.

There were also some other developments at the Mobile WARC. Mexico introduced a footnote which would enable them to allocate 430-440 MHz to the land mobile service on a primary basis. The IARU observer team present at the conference persuaded Mexico to exclude the amateur-satellite-service segment, 435-438 MHz, from their proposal.

Other footnotes making land mobile the primary allocation from 1700-2450 MHz and allocating 1215-1300 MHz on a primary basis to the radionavigation service were also introduced. Again, these events made clear the need to be prepared for the next WARC with frequency-allocation authority.

What's Ahead?

Looking back, it was a busy and exciting year for Amateur Radio; it should also remind us to look ahead. As did Novices in jumping into their new bands and modes, so should all amateurs embrace the future. May we all enjoy continued success in our amateur endeavors, and keep the amateur spirit, in 1988.

Radio for 1,000,000 Scouts

Become a Boy Scout merit badge counselor for the new Radio Merit Badge!

By Steve Place, WB1EYI
ARRL Volunteer Resources Manager

"The merit badge program is one of Boy Scouting's basic character-developing tools. Earning merit badges gives a boy the kind of self-confidence that comes from overcoming obstacles to achieve a goal. Through the merit badge program a boy also learns career skills, develops socially and may develop physical skills and hobbies that give a lifetime of healthful recreation.

The Merit Badge Counselor and the Scout

"The merit badge plan is based on the concept that a counselor working closely with a Scout acquaints the boy with an adult knowledgeable in one or more fields, an experience invaluable to a Scout. The counselor introduces the Scout to subjects that may lead to a career choice or to a lifetime hobby. The one-on-one relationship between the counselor and the Scout is the key to the success of the merit badge plan."[1]

A challenge? You bet it is. But few other challenges offer the opportunity to make so meaningful an impact on youngsters' lives. From astronauts to US Senators, from high-tech patent holders to corporate officers in the communications and electronics industries, many people's careers grew out of their early involvement in Amateur Radio. Today's youngsters need that chance to expand their horizons both intellectually and socially through wholesome, challenging and constructive activities. Amateur Radio, Scouting and you, working together, can provide that needed focus.

You are Needed

The millions of boys who can now be exposed to Amateur Radio through Scouting may not have that opportunity in years to come. Over the past five years for which statistics were reported (1982-1986), an average of only 658 Radio Merit Badges were earned annually. We can do better, a lot better.

Though we can't realistically expect "Radio" to compete with required badges

Before giving them a chance at the mike, Darryl Scarborough, WA4NKA, gives Scouts from the Jacksonville Beach, Florida area a brief lesson in proper procedures and conduct on the air. (*photo courtesy WD4FHD*)

Ideas for Amateur Radio Scouting

- Have your merit badge candidates build the 80- or 40-meter "Neophyte Receiver"; not only will they learn the required construction basics, they'll end up with a solid CW, SSB and AM receiver tuned into a ham band. What better way to further their interest in Amateur Radio? (See "The Neophyte Receiver," page 14 of this issue.)
- Help interested local Scouts earn the ARRL "We the People" WAS "Heard All States" SWL endorsement. The certificate is one that any Scout would be proud to display. (See "Amateur Radio Celebrates the Bicentennial of the United States Constitution," *QST*, September 1987, pp 14-16, for details.)
- Show "The New World of Amateur Radio" at a Scout troop meeting to generate interest in the merit badge (and in Amateur Radio). Have the boys invite their parents—especially when the boys' interest grows from earning merit badges to earning Novice tickets.
- Host Scouts in your shack during the annual Scout Jamboree on the Air (third weekend in October) in which Scouts talk about Scouting with their counterparts around the world. See the sidebar "1987 Jamboree on the Air."
- Help interested Scouts convert Radio Shack "Weatheradios" to 2 meters so they can monitor local repeater activity. Schedule code practice, theory tutorials and a weekly net for licensed Scouts—all aimed at the unlicensed Scouts who are monitoring. (See "The W2CXM 2-Meter Cube Receiver and Scanner," *QST*, June 1987, pp 15-21 and "Feedback," *QST*, August 1987, p 39.)
- There's nothing to prevent your working with local Girl Scouts or other youth groups which do not have formal radio achievement programs. We're particularly interested in learning of your successes in these areas.

What else works? What have you found to be productive, enjoyable activities for Scouts in Amateur Radio? Do you sponsor an Amateur Radio Explorer Post? Have you had success with Cub Scouts during their annual Communications Month? Send your ideas to "Radio BSA," in care of ARRL Headquarters.

[1]Notes appear on page 48

1987 Jamboree On The Air

Skatakvedja! Icelandic Scout greetings! That's how US Scouts of Troop 364 in Iceland greeted many over the air during the 1987 World Scout Bureau "Jamboree On The Air" on October 17 and 18. Using the call sign WA4JVL/TF, Troop 364 completed two-way contacts with 44 other Jamboree stations in 17 countries. The 10-operator troop worked DF6TX, F6ICT, Y39ZC, SP3PMA and others while busily spotting and logging station locations on a large world map.

As a popular Scouting/Amateur Radio annual event, the Jamboree On The Air provides a "radio-flavored" kickoff to the many fall and winter activities Scouts traditionally enjoy. California Girl Scouts from Troops 78, 116 and 321 of the Santa Clara County Council joined in the fun at the Foothills Electronics Museum JOTA operations and exhibit. Cub Scout Packs 70, 74, 77 and 103 were also present, along with Troops 30, 37, 40 and 80 of the Stanford Area Council. The museum exhibit featured packet-radio operations, a fast-scan TV demonstration, Morse-code instruction and at-the-mike operating pointers from Foothills Amateur Radio Club members, sponsors of the exhibit. Donald Simmonds, K5BDX, of Springtown, Texas, was assisted in a JOTA operation by K2BSA station trustee Walter Dansby, W5URI, and Tom Anderson, WW5L.

The Bell Tower Pioneer Radio Club hosted members of Boy Scout Troop 434, of Orange Park, Florida, to a presentation of the video, "The New World of Amateur Radio," a short code-practice session and a discussion on the requirements for obtaining a Novice-class license. Instruction in the proper operation of equipment, followed by each Scout's chance at the key and mike, made for a well-rounded and enthusiastically received presentation. Club members have scheduled a Novice class in January for the many Scouts who were inspired by their participation.

In the Midwest, the Central Kansas Amateur Radio Club took their communications van out to the Ellsworth-area JOTA gathering. The van made contact with neighboring Abilene/Junction City-area Scouts to provide more than 140 Scouts with an opportunity to experience Amateur Radio firsthand and discover a little about Scouting in other parts of the world.

Many Scout troops combined Jamboree-On-The-Air activities with full-scale weekend campouts. Camporees were held in Kentucky, Missouri and Texas, where Troops from the Central Texas area constructed a giant "Tent City" to house an estimated 1300 campers!

Commemorative cards are available to all who participated in JOTA 1987 by sending a business-size SASE for 10 cards to: Jamboree On The Air Certificates, S221, 1325 Walnut Hill Ln, Irving, TX 75038-3096.—*Mary Schetgen, N7IAL, Volunteer Resources Assistant*

such as cooking, camping and first aid, we can remove it from the "endangered species" list. In 1988, with updated requirements, a revised pamphlet and growing numbers of active counselors, we have the opportunity to reach thousands of 11- to 14-year-old Scouts. We're betting that with your experience and enthusiasm for Amateur Radio, many of those Scouts will quickly outgrow the limitations of the Radio Merit Badge and seek your help in earning their Novice tickets. Though earning the badge represents a significant achievement in a Boy's Scout career, *he still can't transmit with it.*

Do You Qualify?

"Merit badge counselors do not necessarily have to register as adult Scouters, but they must meet Scouting's membership requirements. They must be men and women of good character over age 18, recognized as having the skills and education in the subjects for which they are to serve as merit badge counselors, as well as having the ability to work with Scout-age boys."[2]

What's the first step? Get the approval of your regional BSA Council or local BSA District Advancement Committee. They'll explain the purpose of Scouting, advancement procedures and the merit badge counselor's role in Scout advancement.

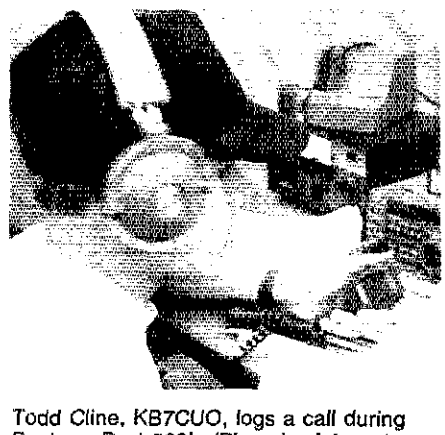
Start with a local Boy Scout troop, maybe one sponsored by your church, synagogue or a local civic organization. Ask one of the leaders for the name and phone number of the troop's Advancement Committee Chairman. He can steer you from there. If you're a newcomer to Scouting in your community, simply call your local Council office; most are listed in the white pages of the telephone book under "Boy Scouts of America." Tell them you want to register as a counselor for the Radio Merit Badge and they'll put you in touch with the right person at either the District or Council level. One of their toughest jobs as Scouting volunteers is to recruit counselors: Expect a warm welcome!

They'll want your name, address and phone number, and permission to release them in a listing of the Council's merit badge counselors. The list is distributed annually to all Scout troops in your area. They'll also want to know why you're interested in becoming a radio merit badge counselor and what your qualifications are. The fact that you're an FCC-licensed radio amateur and an adult who knows the importance of a youngster's developing an interest in the sciences, a familiarity with modern technology, a first-hand appreciation of other cultures and a personal sense of citizenship in the world should be sufficient.

Let us know how you make out. We'd like to add your name to our growing list of Scouter-Ham counselors and keep you informed of what's happening in Amateur Radio and Scouting. When you write, we'll send you guidelines, program suggestions and a list of resources for making your experience as a counselor productive and rewarding. And don't forget to pick up a copy of the revised Radio Merit Badge pamphlet (1987 or later edition), which should be available through your Council office or local Scouting supplier in March.

Special thanks go to Mike Brown, WB2JWD, for writing the latest edition of the Radio Merit Badge pamphlet; to Larry Eichel, K2NA, for his comments on the manuscript; and to the thousands of Scouter/Hams who have recognized the value of a close Amateur Radio-Scouting relationship over the years.

Steve Place is an Eagle Scout, a lifelong Scouter and a member of the National Advancement Committee of the Boy Scouts of America.



Todd Cline, KB7CUO, logs a call during Explorer Post 599's (Phoenix, Arizona) Field Day 1987 operation. (*photo courtesy N7AGX*)

Notes

[1]*Advancement Guidelines: Council and District Functions*, 1985, Boy Scouts of America.
[2]See note 1.

VU2: Not Many Hams, but Active

By William J. Eccles, KE4VT
Electrical and Computer Engineering
University of South Carolina
Columbia, SC 29205

VU2. India. Three-quarters of a *billion* people, 3000 hams. Quite a contrast to the US—one-third as many people, over a hundred times the hams. But then, India *is* a land of contrasts.

It's a democracy, the world's largest, and they take their citizenship very seriously. I watched the elections there in late 1984. By comparison, we look almost apathetic.

It's a poor country with a soft currency. A $600 rig costs about 8000 Rupees at the current exchange rate. But in loaves of bread, that translates to about $4000.

It's a friendly country where many people speak English. And hams—well, they fit the image that hams have everywhere. What a grand time I had with them!

It's a country where the small ham population is active. You probably haven't worked very many VU2s, especially with the sunspots the way they are now. But those folks are there just the same.

Where are the VU2s?

India has many of the same bands we have in the US, but they can use phone everywhere. There is no 160-meter band, 80 is in two small pieces, 40 runs from 7.0 to 7.1 MHz and 30 doesn't exist. Above those, the bands are the same. Most 2-meter activity is at 145.500. Nothing much is going on above that.

Three nets are important around the Indian Ocean, and they carry traffic every day. The big one is the Southeast Asia Net (SEANet), meeting daily at 1200Z on 14.320. The All India Communications and Propagation Net (AIRNet) is a carefully coordinated net at 1530Z daily on 14.150, so you Extras can work that one. Much looser is the Charminar Net, named after an old monument in Hyderabad, which meets on phone at 0230Z daily on 7.080, outside our sub-band.

Shacks and Rigs

Shacks look like shacks everywhere, but they aren't as jammed with equipment as some of ours are. Much of the equipment is from Japan, but I saw home-brew rigs as well—even one with an 807 standing in the middle of a nest of wires on an uncovered chassis. The problem is cost.

Import restrictions have been eased greatly in the last several years, originally in honor of World Communications Year, and now partly because the Prime Minister, Mr. Rajiv Gandhi, is VU2RG, and his Italian wife, Sonia, is VU2SON. Hams can import without duty (but with lots of paperwork) equipment up to a total value of 10,000 Rupees per year.

VU2VPR has a modern shack and often works Indian ships in the Antarctic region through a vertical, a single-loop quad, a 40/20 dipole or a five-element beam.

Cost and space make for some interesting antennas. Many people who can afford to be hams live in flats in buildings of three to six stories. Space for antennas is limited, yards around buildings really don't exist, and towers are very rare. Antennas on rooftops tend to be quads in various arrangements or small beams if there is space. I saw one they called a *German quad*, a square loop of wire around what yard there was. Trap verticals are popular and most are home-built. One they call the *Slim Jim* fits neatly in a small space on the roof. But more than one ham has a vertical wire running up the side of the building.

Activity

Ham activity is much the same the world over. India does not allow third-party traffic, even inside the country. But you hear "modulation tests" quite often. The bands are very quiet with little QRM. The only time I have heard 20 as quiet in the States is when the band was completely dead. Two stories will show you that we are not all that different.

Indian Amateurs Assist After Bhopal Disaster

From the *Indian Express*, December 20, 1984

Ten hams—amateur radio operators—stationed in different parts of the city, are assisting civil authorities in their communication tasks.

Bhopal has only five hams. However, five more came here from Bombay on hearing about the gas tragedy. All ten of them have been extending silent but efficient service to the district administration and the people . . .

In all eight ham stations have been set up in this gas-stricken city, including one . . . at the Union Carbide control room . . . The base station will continue to be in operation even after the situation in the city has returned to normal.

Mr. Mesharan, a local ham, told UNI that their primary function was to provide additional communications facilities, particularly since the police network was hard-pressed and overburdened. "However, if people really have emergencies, they are free to come to us," he said.

But the problem is that not many people in Bhopal know who the hams are or where they are located.

The ten hams here have four High Frequency (HF) sets—which helps them send messages anywhere in the world—and five very high frequency (VHF) sets for local communication.

Mr. Mohan Arora, an Indian in the United States, was finding it difficult to contact his sister, Prema Wadhwa, a school teacher in Bhopal. All he did was approach a ham in his area, who passed on the message to a Bombay ham, who in turn flashed it to Bhopal. In hours, Mr. Arora knew his sister was safe.

Education Network Experiment a Success

From the *Hindu*, datelined Madras, October 27, 1985:

A beginning in what may blossom into a country-wide network between educational institutions enabling the services of expert professors available to many students in far-flung areas was made here today in the campus of the Indian Institute of Technology at Adyar.

Groups of students dispersed in four different hostels . . . listened to Dr. T. M. Srinivasan, Professor and *Head of the Biomedical Engineering Division,* lecture on "Model for consciousness" from his house in the campus. The scholars also interacted with the professor by putting questions to him and getting clarifications.

The exercise, lasting nearly three hours, was made possible through the efforts of the Federation of Amateur Radio Societies of India in collaboration with the IIT Amateur Radio Club and the Madras Amateur Radio Society. It proved that amateur radio stations could provide a two-way communication link. This, incidentally, made the groups of scholars feel and react as if they were in the same classroom . . .

Mr. M. V. Chauhan [VU2MV] of the Federation, an experienced ham, who guided the experiment, said the next step would be to establish a link between the IIT, Madras Institute of Technology, Chromepet and the Engineering College, Guindy and then getting one professor from each to deliver a lecture with audience participation from the three campuses.

The programme is to be expanded to cover all the engineering colleges in South India so that even visiting academics and experts can address simultaneously the entire student body . . .

That students could put questions very freely and without any inhibition (unlike what happens in a classroom situation) from their respective locations was a feature of this unique experiment.

VU2EN's home-brew delivers 8 watts to a "German quad" looped around his small yard.

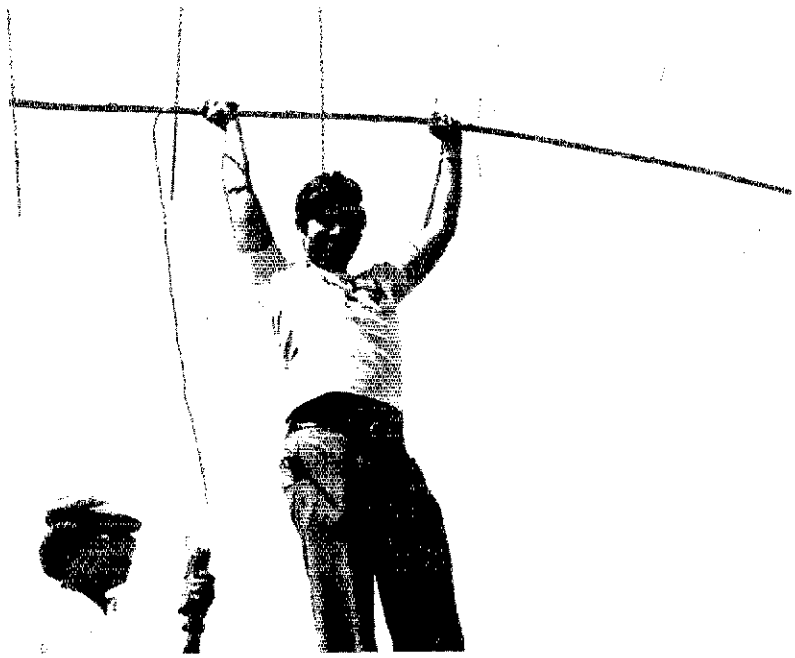
The Bhopal disaster, one of the greatest industrial tragedies of all time, happened just two weeks before my arrival in India. Hams were there to help, as the story in the accompanying sidebar shows.

Cars racing around in the Himalayan Mountains for a week provide another exciting ham activity. The Himalayan Car Rally, a major auto racing and endurance event, is held each year in October or early November. Hams, working 24 hours a day, provide the only communications for the week-long event. The rally is run in four legs with four hours of rest between legs. Using cars provided by rally officials, about 25 hams operate six mobile HF stations, six base stations and a headquarters station. Special frequencies are assigned for this, generally 7.0 and 14.35 on the band edges.

Two-Meter Band Lightly Occupied

Two-meter activity is quite sparse by US standards. Not many hams are active, and to my knowledge there are no repeaters. Pune, the city I spent much of my time in, has about a dozen hams active on the band. The photo shows their first contact with Bombay, 140 km away. Notice the "bamboo beam" with the "armstrong rotator" that made it possible! Vilas, VU2VPR, is standing on a stone wall on Sinhagad, an ancient mountaintop fort near Pune.

Another activity is what must be a unique experiment in conducting college lectures. As reported in *Hindu* (see the sidebar entitled "Education Network Experiment a Success"), the professor gave his lecture via 2 meters and students in several locations could ask questions the same way. VU2MV arranged the experiment, which may be expanded to other areas.



Lokesh, VU2LO, uses Vilas, VU2VPR, as his "armstrong rotator" for their 2-meter bamboo beam while he contacts Ali, VU2ST, and George, VU2GT, on the first contact between Pune and Bombay in March 1981.

Licenses

Licenses come in four grades—Novice, Grade 2, Grade 1 and Advanced. Novice is really an SWL license with no transmission privileges, so it's not used.

Grade 2 requires a written exam and Morse code at five words per minute. With this, the ham can work phone and CW on 40 and 2 meters. Grade 1 requires another written exam and code at 12 WPM. It allows all privileges on all bands with 100 watts PEP maximum.

Advanced-class applicants take a three-hour written test with 12 discussion/problem questions. Each is worth 10 points. The candidate must answer at least 10 of them and must score at least 50. One section is on theory and electronics; the other is on traffic, Q signals, the Geneva convention and regulations. Code at 20 WPM is required. (All code exams require one minute of perfect copy.) For all this work, the ham gets one more privilege—400 watts PEP.

Regulations are not particularly tight, but things don't move rapidly. A simple application can take months. My friend Baji in Pune took the Grade 1 examination in September and received notice of passing in December. He received the call VU2BAJ the following May.

Clubs

There are many Amateur Radio clubs and organizations in India. At the national level, the Amateur Radio Society of India (ARSI) is an organization of individuals (and the member-society of the International Amateur Radio Union). The Federation of Amateur Radio Societies of India (FARSI) is a confederation of clubs.

I attended the annual election meeting of the Madras Amateur Radio Society (MARS, no less!) as a guest of VU2MV, past president of FARSI. They were working to build up funds for a club station, since most younger members cannot afford their own. They discussed possible locations that evening and, as hams do everywhere, were looking for donated space.

Lots of Help

Hams, wherever they are, whatever their culture, are members of the same fraternity. My visit to India was made exciting by all the attention hams gave me. I went to meetings, gave talks, visited shacks and even went glider flying, all because of hams.

VU2VCC and his home-brew rig with an 807 final just finishing a QSO with a Dutch station.

They could use help from us too. Do you have an old but working repeater? They'd love to have it! Contact me and I'll handle it. How about your old *Callbook*? They can use last year's. Wrap it tightly, mark it "Used Book, No Commercial Value," and send it surface mail to someone you talk to. The same goes for last year's *Handbook*.

If You Plan to Go

India is an interesting place to visit, and you can be a ham there. But you must plan farther ahead than you can possibly imagine. Get the paperwork from the ARRL Regulatory Information Branch and send it to a ham contact in India. Six or eight months ahead is barely enough. I took a Kenwood TS-530SP on the promise my license would be ready in Bombay. It wasn't, and the Kenwood was confiscated at the Bombay airport, then returned to me at huge expense *after* I left the country.

But whether you plan to go or not, listen for my VU2 friends. They are most active after their local sunset (1300Z) and around sunrise (0100Z). Look for them around 14.180 to 14.200. You'll be talking to some nice folks. QST

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is given to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in *italics* for each band listing. Initial qualifiers are shown first, followed by those with endorsements, for October 13, 1987 through December 11, 1987. An SASE will bring you the rules and application forms.

6m (50 MHz)
100
269 KD2YB
270 WBØHYV
271 W4CYC
272 KU2A
273 KB4XK
274 WA4NJP
275 WD8OXK
276 N8CCC
277 AA4LB
278 KA8FKY
279 KQØZ
280 KB6OK

WA1TRE 200
W2HRW 250
K2DNR 175
AC3T 200
K4CKS 250
W4CYC 150
WD4FAB 250
AA4FQ 150
N4MW 225
W4OO 300
WB4OOJ 225
KS4S 200
KB4XK 150
K5HYE 150
W5RCI 175
WB6KLL 150
KI6O 300
KB6OK 125
W7HAH 275
W7KYT 150
KN8B 175
N8CCC 175
WB8KAY 225
W8QXO 200
WBØWAO/8 125
KA9LDS 200
WAØDYU 200
KQØZ 125
VE3LNX 125

2m (144 MHz)
100
209 DK2LM
210 WC4G
211 WB4TBF
212 KQØZ
213 KD5RO
214 KB8JI
215 GM4ILS

K4CKS 125
WA4NJP 200
NY4T 175
WA4VCC 175
K5YY 300
W7HAH 175
W8QXO 125
WØJRP 125
NØLL 225

1¼ m (220 MHz)
50
22 K2GK
23 K3HZO
24 WB8KAY
25 VE3LNX
26 W4GJO

70 cm (432 MHz)
50
109 KBØZQ
110 K4CKS
111 W7HAH
112 N4VC

W5RCI 120
KD8SI 90
WB8KAY 70
K8WW 150
W8YIO 90
VE3LNX 60

33 cm (902 MHz)
25
5 WB2NPE
6 VE3CRU

VE3LNX 30

23 cm (1296 MHz)
25
52 KD8SI
53 W3KWH
54 K5UR

K3HZO 35
W4GJO 30
WB5LUA 100
KD5RO 55
VE3LNX 35

2.3 GHz
10
26 W1RIL
27 KØKE
28 W5ASH

WB5LUA 30

3.4 GHz
5
15 WØKJY
16 KØKE

10 GHz
5
24 W2TTM
25 W2VC
26 W6CPL
27 K2GQI

QST

New Books

TRANSMITTER HUNTING

By Joseph Moell, KØOV, and Thomas Curlee, WB6UZZ. Published by TAB Books, Inc, Blue Ridge Summit, PA 17214. Available from The ARRL, Inc. First edition. Soft cover, 7¼ × 9¼ inches, 23 chapters and two appendices, 323 pages. TAB no. 2701, $17.95.

If you're interested in radio "fox hunting," DFing in general or tracking down intruders on Amateur Radio frequencies, your reference library will be complemented by this book. The authors of *Transmitter Hunting* have put together an accurate, comprehensive, easy to read text.

Here are the titles of its 23 chapters, in order: RDF is Born; Getting Started; VHF Mobile Hunting Techniques; VHF Hunting with Directional Antennas; All About S Meters; Knocking Down the Signal; Equipping Your Vehicle; Homing DF Units; Doppler DF Units; Search and Rescue Hunting; Weak Signal Hunting; Sniffing Out the Bunny; Planning for Hunts in Your Community; You're the Fox; The Bunny Box; Hunting Without a Vehicle; Hunting Below 50 MHz; Direction Finding from Fixed Sites; Commercial and Military Direction Finding Systems; Mobile Computerized Triangulation System; Dealing with Mischief and Malice; Other Uses for Your RDF Skills; and Looking Ahead. Appendix A lists manufacturers and organizations, while appendix B contains references.

It was a learning experience for me to read *Transmitter Hunting*. Although I have dabbled for many years with loops and DF gear, I had fallen out of step with the times. Moell and Curlee brought my thinking up to date with their comprehensive coverage of this interesting and important subject. Even though you may not already be interested in RDFing, you should find this book educational in a general sense. Among others, these practical circuits are described: loop antenna; NiCd battery charger; relay driver; transmitter cycler; helical resonator; S-meter circuit (add-on) and S-meter amplifier; and detectors. You will also find such circuits as a bar-graph direction indicator, selsyn hookups and attenuators. The list goes on and on, and it would be impractical to cover each topic in this review.

This book is well made. The paper grade is good, and the print stands out well on the very white paper. The quality of its photographs is very good—a far cry from the muddy reproductions found in some of today's low-cost books. The mechanical line drawings and schematic diagrams are similarly good. A cursory examination of the circuit diagrams did not reveal any errors. The book is contained in a smart-looking glossy cover that is startling at first glance: It shows the rear end of a vehicle at night. The visible, lit taillight stands out as though the book was illuminated from within! Hats off to the cover designer!

Whether or not you want this book for dedicated reference, it will represent a noteworthy addition to your Amateur Radio library. Engineers and technicians will value this volume also.—*Doug DeMaw, W1FB*

ABCs OF ELECTRONICS

By Earl Jacob Waters. Published by Howard W. Sams & Co, 4300 W 62nd St, Indianapolis, IN 46268. Fourth edition, 1987. Soft cover, 8½ × 5½ inches, 220 pages including index, Sams no. 22553, $12.95.

A great many books about basic electronics have crossed my desk in the past 40 years. Some are good, while others are mediocre or downright bad. Our world seems filled with hack writers who try to turn a fast dollar by grinding out "original" books that are founded on rephrased excerpts from the works of others. I am happy to report that *ABCs of Electronics* does not fit this description. Waters has done his homework, and he has the engineering and literary credentials required to write an accurate and meaningful text. This book is definitely *not* an encyclopedia of technical *mis*information.

This volume contains 14 chapters, and an appendix that lists the answers to review questions that are asked at the end of each chapter. The chapter titles are, in order: The Electron; Electricity and Magnetism; Impedance to Electron Flow; Electron Tubes; Solid State Physics; Transistors; Integrated Circuits; Basic Amplifier Circuits; Operational Amplifiers; Radio Frequency Production; Radiation of Radio Frequency Waves; Digital Circuits; and Computer Basics.

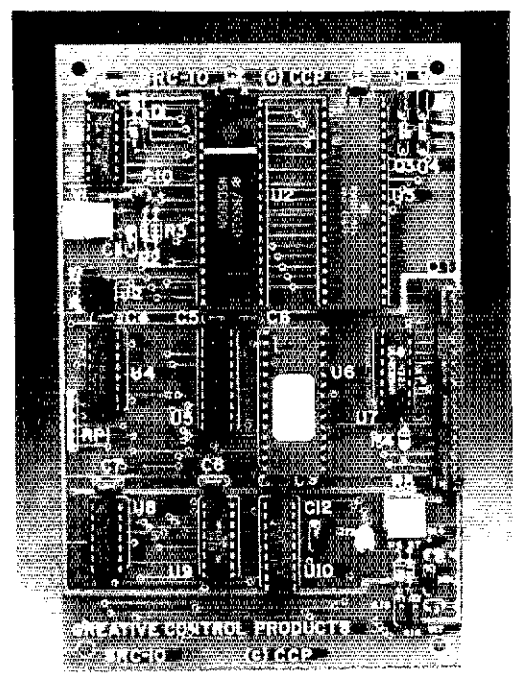
I think this book has a special value for newcomers to electronics and Amateur Radio. The narration is in plain and understandable language, which is vital to keeping the learner from being turned off by slick language and yard-long equations. In fact, only the most basic algebra is used, and it appears infrequently in the book. Rather, Waters uses pictorial and simple schematic diagrams to make his points. Here's a short piece from chapter 3, just to illustrate the simplicity of the author's language: "The opposite of resistance is conductance—the ability of material to pass electrons freely. A resistor has high resistance and hence low conductance, while zero conductance would be the characteristic of a perfect insulator." The entire book is written in this manner, and Waters does not talk down to the reader.

Those who aspire to become licensed amateurs and those planning to upgrade their license class will find this book useful as a primary text, or as a refresher. Certainly, the questions at the end of each chapter will help readers determine how much information they have absorbed from the text. This is a fine book for any ham's library.—*Doug DeMaw, W1FB*

New Products

CREATIVE CONTROL PRODUCTS SRC-10 REPEATER CONTROLLER

☐ The SRC-10 is a microprocessor-based repeater controller featuring up to seven buffered auxiliary function-control outputs that are selected remotely by three-digit DTMF commands. Additional outputs include repeater and link PTT, CW ID, DTMF mute and a CTCSS mode output. Inputs are DTMF audio, link and repeater carrier-operated switches, CTCSS tone and alarm (for monitoring an event such as low voltage). DTMF commands include repeater and link courtesy tones on/off, master reset, DTMF mute on/off, and a command to force a CW ID. The SRC-10 is built on a single 4- × 6-inch PC board. Price class: $150. Manufacturer: Creative Control Products, 3185 Bunting Ave, Grand Junction, CO 81504, tel 303-434-5603.—*Mark Wilson, AA2Z*



Happenings

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

Ralph Haller, N4RH, Chief of PRB

FCC Chairman Dennis Patrick has announced that Ralph A. Haller, N4RH, has been appointed the new Chief of the Private Radio Bureau. Haller has been Deputy Chief of the Bureau since December 1986, and prior to that was Deputy Chief of the Policy and Rules Division, Mass Media Bureau.

The Private Radio Bureau oversees numerous radio services including the Amateur Radio Service.

Haller joined the FCC in 1971 as a Radio Inspector for the Los Angeles District office. In 1976 he transferred to the Washington, DC headquarters, where he held positions in Enforcement Monitoring, Field Operations; Chief of Research, FCC Laboratory; and Chief of the Technical and International Branch, Mass Media Bureau.

Prior to joining the FCC, Haller worked in broadcast engineering in Kansas while earning a BSEE Degree from the University of Kansas.

Haller has published numerous reports and articles, delivered presentations to industrial conventions, and chaired the Federal Advisory Committee for Cable Signal Leakage. N4RH is an Extra-Class amateur and lives with his wife, Mary, in Fairfax, Virginia.

EXECUTIVE COMMITTEE MEETING

The ARRL Executive Committee met December 4 in St Louis. A number of important issues were discussed and acted upon.

The Executive Vice President was authorized to request a one-year extension of the HF packet-radio special temporary authorization (STA). This would allow continued automatic operation of some stations below 30 MHz while passing third-party traffic. The Digital Committee is requested to draft rule changes as may be required to clear up existing problems and permit permanent automatic operation below 30 MHz.

The Committee reviewed the efforts by volunteers and staff to develop Congressional support for retention of the amateur 220-MHz allocation, endorsed plans for ongoing action, and thanked all those who have assisted to this point.

The Committee also reviewed the work done to date in developing an ARRL response in FCC General Docket 87-389, revision of Part 15 (nonlicensed devices), and agreed that the work should continue along established lines with the objective of having a draft of the ARRL response completed for full Board review at its January meeting. The deadline for filing comments in this proceeding has been extended to March 7.

A recommendation of the Administration and Finance Committee was adopted to reestablish a financial reserve designated as the "Fund for the Defense of Amateur Frequencies." As an initial appropriation to this reserve, a transfer of $.70 per Full Member as of December 31, 1987, will be made from the ARRL General Fund. This is an initial step to ensure that adequate resources will exist to defend amateur interests at future international allocations conferences.

The Committee also certified petitions for Director and Vice Director in the Dakota Division. Two candidates were nominated for Director. However, Bruce Humphrys, KØHR, was found ineligible by reason of his occupation, so Howard Mark, WØOZC, was declared elected.

Two valid petitions were received for the office of Vice Director. The Committee, however, had received a letter from John Bellows Jr, KØQBE, withdrawing his name. Thus, Bruce L. Meyer, WØHZR, was declared elected.

Division Director:
Howard Mark, WØOZC

Howard was Vice Director for three years, and has been Director for two years. A radio amateur since 1957, he was first licensed as WN6SQG. He then upgraded to W6SQG. Howard received WØOZC when he moved to the Twin Cities 19 years ago. His initial interest in the hobby was in building, converting and testing equipment. This led Howard to conversion of commercial FM equipment for use on 144 MHz in the early '60s, and conversion of 450-MHz equipment for fast-scan television later in that decade.

Howard takes an active role in public service, having been involved in the Minneapolis Aquatennial, Burnsville Fire Muster, Twin Cities Triathalon, Walk for Mankind, Halloween Watch, Minnesota Sports Spectacular Run, and the Ironman Bike Race.

Howard is an active member of the local chapter of the World Future Society, with special interest and activities in communications technologies, computers and electronics. He taught evening courses in television techniques at Metropolitan State University for two years. Howard holds an MS Degree in Instructional Technology and is presently employed with Control Data Corporation in the Twin Cities.

Vice Director, Bruce L. Meyer, WØHZR

A resident of Bloomington, Minnesota, Bruce was first licensed in April 1946. He presently holds an Advanced class license. A semiretired electrical engineer, Bruce attended the University of Minnesota, served in WW II as a radio technician aboard a destroyer and saw action in Korea aboard a missile evaluation ship.

Bruce has previously been employed by Engineering Research Associates, Remington Rand (UNIVAC), Mobile Radio Engineering, Inc, and Control Data Corporation as a data communications consultant. He is past President of Minneapolis Radio Club, past Vice President of Radio Amateur Teletypists Society, and Radio Officer for the city of Bloomington.

SOUTHERN AND INTERMOUNTAIN REGIONS FEE UPDATES

Last Spring the Southern Region joined other Forest Service Regions in proposing new rental fee schedules for various radio and television services, including amateur, who rent US Forest Service land sites. Under this proposal the fees for amateurs would vary from state to state within the Region, ranging from $300 to $1200.

The ARRL has been notified by the Southern Region that any new fee schedule will not be implemented before January 1, 1989. Fees for 1988 will continue to be based on past procedures.

In related news, the Intermountain Region has extended the comment period on its proposed site-fee schedule. Comments were due by December 14, 1987 but in response to various requests by individuals and groups the comment period has been extended for 60 days. Comments must now be received in writing by

February 14, 1988. The ARRL filed its comments to the Intermountain Region on December 11, 1987, along the lines of previous filings in other regions supporting the contention that since Amateur Radio is a nonprofit, public-service-oriented radio service, it should pay little or no fees.

FCC LOSES COMMISSIONER

Mimi Weyforth Dawson was sworn in as Deputy Transportation Secretary of the US Department of Transportation on December 3. This brings the number of FCC Commissioners down to three, out of five that are authorized. The three are Chairman Dennis Patrick and Commissioners James Quello and Patricia Diaz Dennis.

MEMBERSHIP FIGURES UP

ARRL membership continues to rise, partially due to a spurt in overseas members. Compared to this time last year, membership has increased by 5763 members. Total membership as of November 30 was 148,607.

FCC BROADCAST CALL ASSIGNMENTS

The FCC has reversed itself on the issue of geographical issuance of broadcast call signs.

On February 4, 1987, the Commission had proposed to end the issuance of "W" and "K" broadcast call signs on a geographical basis. Generally radio and television stations east of the Mississippi River were issued call signs beginning with "W," and those west of the Mississippi with the prefix "K."

The Commission, upon examining the comments filed, reversed its position and now feels there is some benefit in maintaining the traditional W and K call-sign assignments. The Commission said there is no shortage of call signs that would require the elimination of the east-west restriction on the assignment of W and K call signs.

FOUNDATION FOR AMATEUR RADIO SCHOLARSHIPS

The Foundation For Amateur Radio, a nonprofit organization representing 50 Amateur Radio clubs in the greater Washington, DC and Baltimore areas, has announced the winners for 25 scholarships.

John W. Gore Memorial Scholarship, $900—David Swiatlowski, KA2KLM, Camillus, NY.

Richard G. Chichester Memorial Scholarship, $900—Richard Westenberger, N9DKR, Springfield, IL.

Edwin S. Van Deusen Memorial Scholarship, $350—Richard Kordick, KEØAS, Creston, IA.

QCWA Memorial Scholarships, $600 each:

Annette Barnhart, N3DKT, Mt Pleasant, MD

Ariel Ben-Porath, 4Z4WJ, Natanya, Israel

Paul Hoffman, KA3PVC, Sinking Spring, PA

Douglas Kleemann, KA9LWN, Shawano, WI

Eric Koester, KAØYWN, Spencer, IA

Douglas Swiatlowski, KA2KMT, Camillus, NY

QCWA Robert S. Cresap Memorial Scholarship, $500, Thomas Larsen, NY7D, Eugene, OR.

Radio Club of America Scholarship, $500, Nathan Willingham, KAØUFO, Bevier, MO.

Edmund Redington Memorial Scholarship, $500, Douglas Benish, N3CXB, Pittston, PA.

Young Ladies Radio League Scholarship, $750, Carol Dunlap, N1ERS, Southwick, MA.

Amateur Radio News Service Scholarships, $600 each:

Michael Krensavage, KA3CUP, Marietta, GA.

Keith Watson, WB9KHL, Galesburg, IL

Columbia Amateur Radio Association Scholarship, $750, Lora Katz, N3DOH, Bowie, MD.

Baltimore Amateur Radio Club Scholarships, $500 each:

Brian Withnell, KB3IU, Federalsburg, MD.

Maurice De Vidts, NE3S, College Park, MD.

Dade Radio Club Tropical Hamboree Scholarships, $500 each:

Scott Cronin, WS4E, Hollywood, FL.

David Tancrell, KB4GIA, Palm Bay, FL.

Richard N. Coan Memorial Scholarship, sponsored by the Goddard Amateur Radio Club, $650, Diane Willemin, KE8DJ, Elyria, OH.

Rose Ellen Bills Memorial Scholarship, sponsored by the Young Ladies Radio League, $500, Lisa Ann Adler, KA1MDT, East Lempster, NH.

Richard Chesney Memorial Scholarship, sponsored by the Bowie (MD) Amateur Radio Club, $500, David Katz, N3DKV, Bowie, MD.

Victor C. Clark Memorial Scholarship, sponsored by the Vienna (VA) Wireless Society, $500, Thomas Foy, N4HAI, Sterling, VA.

Frederick (MD) Amateur Radio Club Scholarship, $1000, Joseph Renard, KA3LVV, Thurmont, MD.

Department of State Amateur Radio Club, $500, Shelby Elborn, NC3A, Dover, DE.

These scholarships were open to all radio amateurs meeting the qualifications and residence requirements of the various sponsors. An announcement concerning applications for the 1988 awards will appear in late spring.

Goldwater Scholarship Contributions

The following have contributed $25 or more to the Goldwater Scholarship fund: Fairfield Amateur Radio Association, in memory of George Coleman, K1PUT, $35; Bolingbrook Amateur Radio Society, $50; Waterbury Amateur Radio Club, $200.

TEN KILOWATT CB AMPLIFIER SEIZED

On December 4, 1987, after conducting a lengthy investigation, the FCC Atlanta office, along with the US Marshal's Service, seized an estimated $10,000 worth of electronic equipment, including a 10-kW linear amplifier, from the residence of Arthur Ford, Ellenwood, Georgia, according to an FCC Public Notice.

The use of illegal equipment is prohibited under section 301 of the Communications Act and Part 95 of the FCC rules. Penalties include fines of up to $100,000 and imprisonment. This is part of an ongoing nationwide program by the FCC to curtail operation of illegal CB equipment.

"INSTANT NOVICE" PETITION DENIED

The FCC denied a petition, RM-5924, by KJ4JE which requested that a Novice examinee begin operating immediately by using a temporary call sign consisting of the call sign of one of the Volunteer Examiners plus a unique numeral. The FCC said that the application processing period is not unreasonable and that the instant licensing proposal appears to be contrary to International Radio Law.

FCC LOS ANGELES OFFICE RELOCATED

Effective January 11, 1988 the Long Beach Office of the FCC will be relocated to Cerritos, California. Public inquiries concerning telecommunications matters, complaints of electronic interference, and nonamateur exam schedules should be directed to the address below. Office hours are 8 AM to 4:30 PM PST.

The new address is:

FCC
Cerritos Corporate Tower
18000 Studebaker Rd, Room 660
Cerritos, CA 90701
(213) 426-4451

ELEMENT 4B QUESTION POOL CHANGES

The new Extra Class question pool, Element 4B, is now in the process of being completed by the VEC Question Pool Committee chaired by Jim Clary, WB9IHH, of the ARRL/VEC. The new question pool will be released March 1; however, it will not be used in actual examinations until November 1, in order to give examinees time to study the new pool.

RUSSELL OHL, N6DJG, SK

Russell Ohl, N6DJG, of San Marcos, California, called the father of the modern semiconductor industry, is now a Silent Key. While working for Bell Laboratories in the 1930s, Ohl undertook exploratory research into the microwave radio field. He discovered that a silicon device with a tungsten contact was the preferred combination to respond to these high frequencies. While working with silicon devices, Ohl discovered and named the "NP junction" where photosensitivity occurred at a junction of two types of silicon. It was this discovery that made the invention of the transistor possible and became the basis of the solar cell.

Ohl was first licensed in 1921 as 2BHN and conducted experiments from his apartment in 1924 on wavelengths as short as 2 meters. He leaves his daughter, Sylvia Wells, WB7VRK, to carry on the family amateur tradition.

AROUND HEADQUARTERS

The "We the People" US Constitution Bicentennial special event "200" call sign program continues to be quite popular. Delaware kicked off the "200" call sign series and many states have enjoyed equal success. A listen on 20 meters reveals many "200" stations working large DX pileups!

ARRL has issued over 700 "We the People" WAS certificates so far and more are being processed.

W1AW's packet BBS is now supporting zip forwarding for all New England states. There will be additional coverage as support of this program reaches the field organization. This will serve to further streamline NTS forwarding.

CHRISTMAS THIRD PARTY AGREEMENT WITH KOREA

During the past Christmas season, the Republic of Korea again authorized amateur stations (prefix HL9) to exchange messages for third parties with US amateurs.

The period of this temporary agreement ran from 1500 UTC December 19, 1987 to 1459 UTC January 4, 1988.

RICHARD RIDENOUR, KBØZL, SK

Richard Ridenour, KBØZL, 61, former Vice Director of the Midwest Division, became a Silent Key December 27. First licensed in 1955, he was a life member of the ARRL and QCWA. Richard was active in Kansas and Missouri traffic and weather nets and in local radio clubs. He previously held the call W5PNU.

He grew up in Ohio, graduated from the US Naval Academy and served in the Navy Supply Corps. Following naval service, he entered the military electronics industry and had been employed by Emerson Electric Company in St Louis as a Project Engineer for communications systems and classified electronics intelligence equipment.

LOCAL CATV PACT INCLUDES HAM OPERATORS

The city of Torrence, California has written protection for Amateur Radio operators into the franchise agreement between the city and the local cable TV company, Paragon, Inc.

The wording of the new agreement is as follows: "Amateur Radio frequencies shall not be used on the cable system unless such channel capacity is needed to provide service to Paragon's customers. In such instances, such channels are to be used solely for alpha-numeric services... If after utilizing such channels for alpha-numeric services...channels are needed to provide other services and there is further need for other video transmissions, Paragon can use these channels after consultation with the city." This agreement was drawn up by the City Manager and the City Attorney.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Illinois, Indiana, Maine, Northern Florida, Oregon, Santa Clara Valley, Vermont and Wisconsin sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

Petition forms (FSD-129) are available on request from the 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...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 Local Time March 4, 1988.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before April 1, 1988. Returns will be counted May 24, 1988. SMs elected as a result of the above procedure will take office July 1, 1988.

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, 1988.

If no such petitions are received for a Section by their specified closing date, such Section will be resolicited in July 1988 *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

SECTION MANAGER ELECTION RESULTS

The following Section Managers will begin a two-year term of office April 1, 1988: Uncontested—Eastern Pennsylvania, Kay C. Craigie, KC3LM; North Carolina, W. Reed Whitten, AB4W; South Dakota, Roland Cory, WØYMB; Virginia, Marquis Witt, NN4I

KOWALSKI LEAVES FCC

Ray Kowalski, former Chief of the FCC Special Services Division, left the Commission staff at the end of 1987. His responsibilities in the Special Services Division included the Amateur Radio Service.

Kowalski is joining the Washington law firm of Blooston and Morkofski, which specializes in communications law.

Moved and Seconded ...

MINUTES OF EXECUTIVE COMMITTEE
Meeting No. 428
St. Louis, Missouri
December 4-5, 1987

AGENDA

1. Approval of Minutes of September 5, 1987 Executive Committee meeting.
2. Certification of candidates for Director and Vice Director, in the rescheduled Dakota Division Election.
3. FCC Matters:
3.1. Review of the ARRL's continuing response to FCC proposals in General Docket 87-14, Amendment of Part 2 of the Commission's Rules Regarding the Allocation of the 216-225 MHz band.
3.2. Determination of the League's position with respect to FCC General Docket 87-389, the proposed rewrite of Part 15 Rules governing incidental and restricted radiation devices.
3.3. Other FCC matters.
4. International affairs:
4.1 Report on the World Administrative Radio Conference for the Mobile Services (MOB-87).
4.2 IARU Matters.
5. Field Organization matters.
6. Local antenna/RFI matters.
7. Review of progress on Board directives:
7.1. By the vice presidents and/or chairmen for the committees.
7.2. By the Executive Vice President, on Board directives affecting Headquarters.
7.3. By the Executive Vice President, on W1AW.
8. Recognition of new Life Members.
9. Affiliation of clubs.
10. Convention matters:
10.1. Approval of division, state and section conventions.
10.2. National Convention matters.
11. Announcement of appointment of Chairmen for:
11.1. Elections Committee
11.2. ANERCOM
12. Date and place of next meeting.
13. Other business.

Pursuant to due notice, the Executive Committee of the American Radio Relay League met at 3 PM, Central Standard Time, Friday December 4, 1987, at the St. Louis Airport Marriott Hotel. Present were President Larry E. Price, W4RA, in the Chair; First Vice President Jay A. Holladay, W6EJJ; Executive Vice President David Sumner, K1ZZ; Directors Frank M. Butler, Jr., W4RH; Paul Grauer, WØFIR; and George S. Wilson, III, W4OYI. Also present were Vice Presidents Leonard M. Nathanson, W8RC, and William J. Stevens, W6ZM; Secretary Perry Williams, W1UED; Directors Edmond A. Metzger, W9PRN, and Hugh A. Turnbull, W3ABC; and Counsel Christopher D. Imlay, N3AKD.

1. On motion of Mr. Butler, the Minutes of the September 5, 1987, meeting were adopted as printed.

2. The Executive Committee next examined nominations for director and vice director in the rescheduled Dakota Division election for the 1988-1989 term. The Secretary presented a letter from John B. Bellows, Jr., KØQBE, withdrawing his name as a candidate for vice director. On motion of Mr. Butler, Bruce Humphrys, KØHR, was ruled ineligible under Article 11 of the Articles of Association for the office of Director by reason of his occupation. On further motion of Mr. Butler, the Executive Committee ratified its mail votes on the eligibility of Howard Mark, WØOZC, as a candidate for director and Bruce Meyer, WØHZR, as a candidate for vice director. Whereupon, they being the only eligible candidates for their respective offices, pursuant to the By-Laws Mr. Mark was declared elected as director and Mr. Meyer as vice director from the Dakota Division for a two-year term beginning January 1, 1988 (Applause).

3. FCC Matters:

3.1. The Executive Committee reviewed the continuing ARRL response to FCC proposals in General Docket 87-14, Amendment of Part 2 of the Commission's Rules Regarding the Allocation of the 216-225 MHz band and without dissent endorsed the plans for ongoing action. Committee members expressed appreciation for the efforts of the consultants, all the volunteers and staff members who had assisted so far.

3.2. With respect to FCC General Docket 87-389, Revision of Part 15 of the rules regarding the operation of radio frequency devices without an individual license, President Price reported that he had asked Counsel Imlay to file a request for extension of time to file comments in the Docket. Counsel Imlay announced that an extention requested by the ARRL and ten other entities not identified by the Commission had been granted in an Order adopted December 2 and released the following day. The new deadline for comments is March 7 and for reply comments May 9. The committee reviewed the studies of the matter to date, and by consensus agreed that a draft of ARRL comments would be presented to the Board at its January 1988 meeting.

3.3. Other FCC matters:

3.3.1. On motion of Mr. Wilson, the committee, in anticipation of the preparation of a petition by others to expand the repeater segment of the six-meter band to read 51-54 MHz, referred the matter to the Membership Services Committee for study in consultation with the VHF-UHF and VHF Repeater Advisory Committees.

3.3.2. The Executive Committee heard reports on recent efforts to obtain early US entry to the 18 MHz amateur band and offered suggestions for additional activities toward that goal. The band was allocated to amateurs by the World Administrative Radio Conference, 1979 (WARC79), but administrations were given until June 30, 1989 to find frequencies elsewhere for displaced services. The committee was in recess for dinner from 4:45 to 8:40 PM. At this point, the only heretofore-absent member of the Executive Committee Meeting, Director Clyde Hurlbert, W5CH, joined the meeting, having been delayed in air transportation en route.

3.3.3. On motion of Mr. Grauer, the committee directed the technical staff and counsel to investigate the technical acceptibility to the amateur community of the Commission's decision in General Docket 87-107, in reference to "A/B" (input selector) switches for television sets. If the Order in this docket provides for insufficient isolation across the switch to protect the amateur and broadcast/cable services from mutual interference, Counsel is instructed to file a Petition for Reconsideration.

4. International matters:

4.1. The President presented a summary of reports regarding the World Administrative Radio Conference on the mobile services (MOB87) received from the International Amateur Radio Union (IARU) observer team (President W1RU, SP5FM, I1RYS and YT7MM). This conference was the second International Telecommunication Union entity to raise the possibility of a world conference with at least some frequency-reallocation authority to be held in the 1992 time frame, thus posing some degree of threat to the continuance of amateur frequencies as we now know them. On motion of Mr. Grauer, the Executive Committee established an appropriation of 1987 net income in the amount of $0.70 per Full Member as of December 31, 1987. The appropriation is to be designated as the "Fund for the Defense of Amateur Radio Frequencies" and will be carried on the financial records as an appropriation from the General Fund. The full Board of Directors is requested to ratify this action at its 1988 annual meeting.

4.2. Mr. Butler, as a member of the IARU Region 2 Executive Committee, reported briefly on the recent meeting of that committee. In response to an invitation from the ARRL, the group has decided to hold the Triennial Convention of IARU Region 2 in the vicinity of Orlando, Florida, beginning on or near October 15, 1989.

5. Field Organization matters:

5.1. On motion of Mr. Butler, the Executive Committee recommended to the Board of Directors that it create a new section made up of ARRL members in the Virgin Islands and Guantanamo Bay, separate from the Commonwealth of Puerto Rico. The Committee was in recess from 9:55 PM CST until 8:37 AM on Saturday, December 5, reconvening with all those hereinbefore mentioned present.

6. Counsel Imlay summarized local antenna cases against amateurs, including some notable recent victories.

7. Review of progress on Board directives:

7.1. By the vice-presidents and/or chairmen for the committees:

7.1.1. Mr. Stevens reported briefly for the Volunteer Resources Committee on its meeting in Hartford November 21. It performed the study of the Volunteer Examiner Coordinator process at HQ mandated by Minute 80, 1987 Second Meeting, and made a number of recommendations for "streamlining" forms and procedures, as well as studies of the topics.

7.1.2. Mr. Holladay reported on the Membership Services Committee (MSC) meeting of November 14 in Denver. He indicated that the band-planning studies assigned to the committee were moving along well and a report should be ready for the January meeting of the Board. On his motion, the Executive Committee ordered that the revised Standard Operating Procedures for the ARRL Awards Committee (adopted by the MSC at Denver) be placed in the Directors' Handbook. The Executive Committee was in recess from 9:30 to 9:45 AM.

7.1.3. Mr. Metzger, as Chairman, presented the report of the Administration and

Finance Committee, regarding its November 20-21 meeting in Hartford. After extensive discussion, on motion of Mr. Butler, the report was unanimously adopted. Mr. Metzger also distributed information copies of the 1988 budget, which will be presented to the full Board at its meeting in January.

7.1.4. Mr. Nathanson, as Chairman, reported briefly for the Legal Strategy Committee, which met in Scottsdale October 10.

7.2. The Executive Vice President presented a summary of action on Board directives affecting the HQ staff. A Discussion Draft prepared by the group leaders at HQ as a preliminary to Long Range Planning for the ARRL was distributed. There was also an Interim Report of the Ad Hoc Committee on Amateur Radio Digital Communications. On motion of Mr. Wilson, the Executive Vice President was authorized to request a one-year extension of the HF packet radio special temporary authorization (STA) to allow stations to continue operation until new rules are in place, and is further requested to work with the Digital Committee to draft such rule changes as may be required to clear up existing problems with packet operation and to permit automatic operation below 30 MHz.

7.3. Mr. Sumner gave an informal progress report on W1AW renovations and on studies of a similar facility in the Western US to extend HQ over-the-air services more conveniently to members residing West of the Rockies.

8. On motion of Mr. Wilson, the names of the 38 newly elected Life Members were recognized, and the Executive Vice President was directed to list their names in *QST*.

9. On motion of Mr. Butler, the following clubs were declared affiliated, all in Category I:

Carroll Novice Enhancement Consortium, Finksburg, MD
Cedar Creek ARC, Inc, Mabank, TX
Contra Costa Communication Club, Inc, San Pablo, CA
Cove Repeater Assn, Copperas Cove, TX
Haines Amateur Radio Club, Haines, AK
Harris Amateur Radio Club, Melbourne, FL
Mayflower Amateur Radio Club, Plymouth, MA
Ray-Clay Radio Club, Kearney, MO
Raytown Amateur Radio Club, Raytown, MO
Seatac Repeater Assn, Seattle, WA
Stewart Lake Amateur Radio Club, Corvallis, OR
Suncoast Amateur Radio Club, Hudson, FL
Thiboudaux Amateur Radio Club, Thiboudaux, LA
Upper Lake Livingston Wireless Association, Trinity, TX
Utah Contest Club, W Valley, UT
Watertown Amateur Radio Club, Watertown, WI
White River Valley ARS, Branson, MO

With the election of these clubs, the League has 1699 clubs in Category I, 14 in Category II, and 123 in Category III.

10. Convention Matters:

10.1. On motion of Mr. Grauer, the following conventions were approved:

Hudson Division, March 13, 1988, Valhalla, NY
Florida State, March 12-13, 1988, Orlando, FL
Kentucky State, March 26, 1988, Elizabethtown, KY
ARRL DX Convention, April 22-24, 1988, Visalia, CA
Alabama State, May 14-15, 1988, Birmingham, AL
Georgia State, July 9-10, 1988, Atlanta, GA
Texas State, August 5-7, 1988, Austin, TX
Roanoke Division, September 17-18, 1988, Virginia Beach, VA

11. Announcement of appointments:

11.1. Mr. Price announced that the Ad Hoc Committee on ARRL Elections will be chaired by Mr. Wilson. Similarly, other members will be named after discussions with the chairman; the membership of this committee is not limited to directors, vice directors or officers.

11.2. The President announced that Jerry Boyd, KG6LF, an active ARRL volunteer and police chief of Coronado, CA, will be Chairman of ANERCOM (ARRL National Emergency Response Committee). Other members will be appointed after consultation with Mr. Boyd.

12. The date and place of the next meeting will be determined at the call of the President, as provided for in the By-Laws. A likely time is early March, 1988.

13. Other business:

13.1. On motion of Mr. Sumner, the 1987 authorization of expenses for the Administration and Finance Committee is hereby increased by $3,000 to a new total of $9,000.

13.2. On motion of Mr. Butler, Richard S. Rigby, Accounting Manager, is added to the checking account at Connecticut Bank and Trust Co. as an authorized signer on behalf of the Treasurer, subject to previous policy with respect to number of signatures and limitations on authority.

13.3. On motion of Mr. Holladay, the Executive Committee recommended to the Board of Directors that it change the second sentence of By-Law 36 to read:

"Each standing committee shall consist of two or three Directors and a Vice President or Vice Director or both."

13.4. On motion of Mr. Grauer, the ARRL endorses and supports the Volunteer Protection Act of 1987, HR 911.

13.5. The President noted that this was the final meeting for 1987, and thus the last for Directors Hurlbert and Wilson, who are completing their service on the Board. He commended them both for their diligence and valuable contributions to the work of the Executive Committee and the ARRL generally (Applause).

There being no further business, on motion of Mr. Wilson, the meeting was adjourned sine die at 12:35 PM.

Respectfully submitted:
Perry Williams, W1UED
Secretary

Life Members Elected December 4, 1987

William W Benjamin, N7EDR; Susan S Booth, AG4H; John C Clements, WB5SAL; Nick Critelli, KØPCG; Monica K Cross, KA5WVI; Charlie Ann Curle, WG4G; Edward H Daneff, N6OPI; Ronald Evett, N1QY; Vincent Febbraio, WB8NWQ; Jay Finn, WD9ENR; John S Fogle, WD7H; Dirk Gastaldo, NO8N; David W Goodman, KF4N; Robert L Gottschalk, K9ZKN; Kenneth Grayson, WA1CWG; Richard M Hambly, WB2TNL; Maurice G Hebert, WJ4S; H A Jefcoat, KD5BM; Michel S Khoury, KG6WH; Michael L Lawrence, KA3ENQ; Peter T Lyman, N6LGV; Craig McCartney, WA8DRZ; Shannon L McGowan, WDØAFP; Paul W McInnish, K4BET; Frank J Melcher, N6BFT; James Hugh Morgan, KA2FIQ; James M Mozley, W2BCH; Conrad E Nasatka, WB3DQD; Emil H Nelson, WBØYID; Douglas R Ohlman, NI2J; Jeffrey E Peters, NR8Y; Andre Pettelat, F9AP; Abigail Ray, N4QIV; George J Schnepf, WB2ROV; M Wesley Wales, N2BSK; Joseph A Walker, III, KA8WJH; James C Wysocki, W9FI; Don Zychowski, KA8MEB.

Strays

***QST* congratulates...**

☐ Aaron Lipsky, KQ1I, on being elected mayor of Keene, New Hampshire. Lipsky practices law in Keene, has been a member of the Keene City Council for 10 years and is an ARRL Volunteer Legal Counsel.

I would like to get in touch with...

☐ anyone who has interfaced a Commodore VIC-20 with Drake C or B line rigs for sending and receiving CW, RTTY, packet, etc. Also software for same. Corey Landrum, KB4YPN, 1524 Gallatin Rd, Nashville, TN 37206.

☐ anyone with technical info, schematic or practical skill in coherent CW transmission. Vincent Velde, KA5SRW/ON4KVV, 27 rue E Hellebaut, 1070 Bruxelles, Belgium.

☐ anyone with info on repairing the PLL frequency synthesizer of National HRO-500. Fred Olte, C3ØLEN, 250 La Plata d'Ordino, Andorra.

☐ anyone who built or used the K2RIW amplifier (*QST*, Apr-May 1972), also manufactured by Arcos. Gerald Rose, KB4QGJ, 524 N Quaker Ln, Alexandria, VA 22304.

☐ anyone who has modified a Dentron GLA-1000B linear amplifier for 160 meters, increased power output or any other modifications for increased performance. Joe Kernaghan, KA2AEY, 182 N Autumn Dr, Rochester, NY 14626.

☐ anyone using the HAL DSK 3100. Howard Bowen, 14135 Puritan Ct, Jacksonville, FL 32226, tel 904-757-3864.

☐ anyone with a manual or operating instructions on the programming and operation of the "Amaz-A-Tron" memory dialer Model AD-1, put out by US Tron, Bohemia, NY 11716. Don Johnson, KD6DT, 3876 Yale Way, Livermore, CA 94550.

☐ anyone with manual for an EICO Model 710 grid-dip meter. Ronald Blocker, K9JON, 40 N Pine Ln, Glenwood, IL 60425.

☐ anyone who has increased the QSK factor of the ICOM 751. Stan Obnitski Jr, WB2TTY, RD 1-Box 458A, Jackson, NJ 08527.

☐ anyone with a wiring diagram or manual for a Superior Industrial Analyzer, Model 630. Howard Wacker, W3BRK, 4513 Cerise St, Pittsburgh, PA 15214.

☐ anyone with experience with radio in Vietnam—AFVR, clandestine, military, amateur and Hanoi Hanna. KA2VYW, 74 Elm St, Tonawanda, NY 14150.

☐ anyone interested in starting a RAILFAN net on 40-meter SSB. Timothy Colbert, WA8MLV, 13609 Colony Ln, Burton, OH 44021.

☐ anyone who is a member of the Society of American Magicians or the International Brotherhood of Magicians and is interested in starting a worldwide net of magicians. Craig Vagell, WB2HJW, 6 Crest Rd, Cedar Knolls, NJ 07927.

☐ Any hams who served in China during WW II, for the China Hands Net (Mon and Thu: 1500Z, 14.257 MHz; other days: 0200Z, 7.254 MHz). Chuck Glanville, KAØULX, 1733 Atwood, Longmont, CO 80501.

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

INSTANT NOVICE TICKETS?—NO!

☐ As a new Novice (since Novice Enhancement), I had to wait about five weeks for my new license, but I do not regret the wait. Anxiously looking forward to that first QSO, that wait gave me time to get more advice from those amateur operators I knew. The wait gave me time to look for gear, plan an antenna and set up the shack. I spent that time listening to the bands on which I would soon be operating. I looked forward very much to that first QSO and I didn't mind the short wait for something that would last a lifetime.—*F. M. Shipp, KB5DKY, Sahiwal, Pakistan*

THE STARS OF A NEW WORLD

☐ I was pleased to see the article relating to the new Amateur Radio video entitled "The New World of Amateur Radio" in October *QST*. As you know, this video was prepared to interest young people in our exciting hobby. To this end, the two young and very bright people featured in the video should have been mentioned in the article.

Considerable effort was expended by the "stars" and their families to provide their services in the taping. I know that you join me in recognizing and thanking Kelly Howard, N6PNY, and Nathan Pyle, KB6PLH, for their part in this fine production.—*Jim Hurd, N6JFX, San Diego, California*

BE PROUD—BE A GOOD OPERATOR!

☐ After nearly 25 rewarding years of Amateur Radio, I have encountered an operating abuse which I find shocking. While bootlegging has probably existed for nearly as long as Amateur Radio itself, I have encountered a particularly abusive form—assuming the call of a Silent Key. In this case, the Silent Key is my brother, W2TV. My family recently received an Official Observer report for failure to identify for nearly 20 minutes and for using borderline language on 3.765 MHz. Subsequently, the W2 QSL bureau forwarded cards from a recent DX contest.

While enforcement against such activity is difficult, I encourage my fellow amateurs to boycott operations with operators who appear suspect due to substandard operating procedures or use of foul language. Those that do not reflect operating pride are likely not to have a license of which to be proud.—*Charles E. Mink, KF2U, Mount Holly, New Jersey*

☐ The good news is that the higher HF bands are once again showing signs of life. The bad news is that certain non-ham parties are also taking advantage of improved propagation in the lower portion of our 10-meter band.

During the weekend of November 7, I found it necessary to work around the nonamateur activity on the 28-MHz band in order to carry on a CW contact. This is by no means my first encounter with this type of activity.

With the influx of radio gear "easily modified for MARS or CAP operation" it seems very likely that this type of encroachment will not only continue, but will probably increase due to the influx of full coverage transmitters. I urge my fellow hams to report such activity to the Amateur Auxiliary. Give them frequencies, times and other helpful information. It would also be helpful to report this interference while it is going on.

I feel that illegal operators are a potentially large and widespread problem. Let's do our best to stop it before our CW allocation in the 10-meter band is lost. —*Joe Vicere, KZ1J, Fairfax, Vermont*

[What does one do when he or she encounters someone who is in violation of FCC rules? If the violation is a case of amateur-to-amateur interference, it can be reported to the Amateur Auxiliary via your Section Manager. If the interference is from nonamateur sources, we recommend contacting the ARRL Interference Reporting System Coordinator at ARRL HQ. Violations should not be reported to the FCC directly since they do not have the personnel to process such reports due to governmental belt-tightening. The Amateur Auxiliary was created following the enactment of the Communications Amendments Act of 1982 (Public Law 97-259) in which Congress authorized the FCC, among other things, to formally enlist the use of amateur volunteers for the purpose of monitoring the amateur bands for rules violations. The Amateur Auxiliary consists of volunteers who work closely with the FCC. Their goal is the identification of possible violators while the goal of the FCC is the actual enforcement of its rules and regulations.—Ed.].

ARRL AT THE HELM

☐ My thanks to the ARRL for the beautiful 50-year membership plaque. I have been trying to find the right words to express my appreciation. I have always felt, and still do, that without "The Old Man" [Hiram Percy Maxim, W1AW—founding President of the ARRL] and the ARRL, with its many thousands of volunteers, Amateur Radio would be very different than it is today.

Many years ago, I needed technical help. It was forthcoming as soon as the mail could turn it around. There has always been that feeling, on my part, that the League maintains an even-keel approach to the always-arising problems that face Amateur Radio, be they such as unreasonable legislation or attempts at "band snatching." What immediately comes to mind is the ARRL's effective efforts to protect amateurs from ill-conceived tower height restrictions. There have been many misguided crusaders during the past 50 years, but the ARRL is still on course and at the helm.—*H. C. Barber, W6GQK, Shingle Springs, California*

PLEASE QSL—COMPLETELY

☐ Since Novice Enhancement went into effect last March, I have been working stations on 10-meters for the WAS [Worked All States] award, with a 10-meter endorsement. After mailing my QSLs with an SASE, I received several cards which were useless for award purposes.

In one case, I received a beautiful, commercially printed card which was complete in every detail except for a return name and address. Another from Rhode Island was received with only a return name and address with no QSO information. A third one from California sent a nice card, but the QSO information was incomplete.

Please take the time to QSL 100% correctly as only complete information on QSLs is accepted by award managers. There will come a time when you will need complete QSLs for your awards. During the last Novice class I taught, a lesson on QSL cards was reviewed. Perhaps other instructors could do the same. See you on the air!—*Frank MacKenzie-Lamb, NG1I, Natick, Massachusetts*

THE LOST EXCLAMATION POINT

☐ W4FOK's suggestion for restoring a lost dimension to CW operation in the December issue of *QST*'s Correspondence column should have been featured on the cover of *QST* and in large type! Dahdahdahdit is simple to send and easy to learn. Using this symbol we can get back to the good old CW rag chewing with exclamation point capability!—*Byron Goodman, W1DX, East Hartford, Connecticut*

☐ The character suggested for the exclamation mark in December *QST*'s Correspondence column shows both the ARRL's and Mr Farrior's ignorance of foreign letters in the international alphabet because the suggestion is actually the German ö.—*George W. Brooks, W2GX, Newburgh, New York*

☐ James Farrior, W4FOK, means well in proposing dahdahdahdit for the exclamation point, however, the airlines and the Weather Bureau used that combination for the "clear sky" symbol in airway weather reports. Similar combinations were used to describe scattered clouds, broken clouds and overcast conditions. The old manual CW weather nets are long gone, but those symbols are still used.—*Theodore Kangas, W8HV, Ishpeming, Ohio*

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

Western Sahara Operation

Following seven busy days of operating and training, the Lynx DX Group expedition to Western Sahara came to an end on October 25, 1987; a happy end representing a beginning, since gear was left in the country for the use of local Saharan operators. (One of them, Naama, should be on the air at this writing, perhaps signing SO1A.)

The expedition netted a total of 11,864 contacts (including over 1200 long-path JAs!). This was accomplished under difficult desert conditions, using a TS-430S, TH3 and dipoles. Europeans accounted for 4674 contacts, the US just behind with 4554. Of the total, 7099 were on phone, 4765 on CW. The Club de Radioaficionados Saharauis (SORASD) was put on the air for the first time, with everyone given a fair chance to make at least one contact with what the group hopes will be a "new one."

The initial concentration of activity on 20/15 was followed by spells of intensive activity on the other bands (even including 160, where 56 contacts—10 with the US—were made with top-band faithful). Electricity was sparse, forcing the operators to run on a jeep battery at night, while a generator was reserved for daytime use. There were other prime commitments (training/social); thus, no round-the-clock operation was possible.

The Lynx group comments highly on the great hospitality and friendship shown by the hosts and local population. Most of the village people turned up for a Sahara Fiesta organized in honor of the visitors. The hosts had the opportunity to demonstrate *their* achievements (agricultural products and irrigation systems), undaunted by a fierce sandstorm.

EA2JG and OH2BH checking the jeep battery charge.

Band	SSB	CW
28	450	48
21	665	672
14	5622	1840
7	177	2013
3.5	148	172
1.8	37	19
Totals	**7100**	**4764**

Major Contacts	
USA	4554
EU	4764
JA	1264
SA	990
Other	292

Very much in line with the unique ability of the radio amateur to foster and enhance international goodwill was the establishment of SORASD, now operating under the auspices of 33-year-old Naama Zeine-Eddine. (He is the local director of telecommunications with a high degree of linguistic fluency and a natural flair for operating.) Naama, SO1A, is also responsible for the RASD broadcasts on 1355 kHz, and would welcome reports on this, as well as the club station SORASD. (Use his manager, EA2JG, or the RASD embassy address: Ministry of Information, P 10 El-Mouradia, Alger, Algerie.)

Whether or not the Arab Democratic Saharaui Republic, RASD, will be accepted as a "new one" for DXCC status, the SORASD group deserves high marks for an exciting operation, leaving fruitful results for the growth of Amateur Radio internationally. *(Special thanks to Martti, OH2BH, for his press release.)*

The SORASD group: (l-r) EA2JG; EA2ANC; Naama, SO1A; and OH2BH.

WORKED SCANDINAVIA ON CW

This new award for noncontest contacts after Jan 1, 1988, featuring a beautiful Scandinavian landscape, commemorates the 10-year jubilee of the Scandinavian CW Activity Group. Non-EU stations work 50 different Scandinavian CW stations, including LA OH OY OZ SM TF (at least 5 should be SCAG members).

Send list (confirmed by two other hams), with usual summary data (and SCAG member numbers!), with fee of 17 IRCs or $7 US, to Rick Meilstrup, OZ5RM, Bavnestien 6, DK-2850 Naerum, Denmark.

HL9 AWARD

This attractive certificate requires confirmations (or a club certified list) along with 4 IRCs or $3 US for return postage. Contacts must have been made after Jan 1, 1987. The award has 5 endorsements, each requiring 5 contacts with HL9 stations (CW, SSB, RTTY, Packet; 5-Band requires 5 per band). Send to: American Amateur Radio Club of Korea, Dependent Mail Section, APO San Francisco, CA 96301.

CHINA

W8RT now has an extensive collection of exotic BY cards. Newt furnishes a few addresses *not* carried in this column in Jan 1987: **BY5RT**—Amateur Radio Station of the Affiliated Middle School of Fujian Teachers University, PO Box 707, Fuzhou, China; **BY7KT**—Amateur Radio Station of CRSA Guangzhou, PO Box 1285, Guang Zhou, China.

GRENADA

K4LTA and N4FKO will be heading up their 9th DXpedition to the Caribbean (to include K4PJ and W5PWG, as well as others). The group will be QRV in the ARRL February DX Contest, hoping for a J34 prefix. This is your chance to finish J3 for 5- or 6-band DXCC.

CIRCUIT

☐ **BY4WNG:** (see photo) The young ops at the Nanjing Institute of Technology became active mid-September and within 3 weeks had worked over 1000 stations in 50 countries, including

BY4WNG ops (l-r): Meng Chao, Chen Xiaosu, Guo Jian, using an IC-735 barefoot, with dipoles on 7 HF bands. See *Circuit.*

W6/W7 on 75 and some JAs on 160 meters (they're the first BY active on top band).

☐ **4X6TT:** Amir continues his year-long DX operation, cards for which go via Amir Bazak, PO Box 36411, Tel Aviv, Israel 61363. N4GNR handles only 4X6TT's home operation.

☐ **TG9AWS:** For 3 years KQ6U tried unsuccessfully to operate from Somalia. Steve Wheelock is now at the American Embassy in Guatemala City operating 10/15, multimode. Cards go most easily via APO Miami, FL 34024.

☐ **NCDXF:** The Foundation has donated a TS-440S to the Egyptian Radio Club in hopes of stimulating additional activity.

☐ **PJ2/W1BIH/PJ9J:** W1AX continues as QSL manager for 1988 operations in John's 22nd year of winter activity from Curacao. Cards via: Roger Corey, 60 Warwick Dr, Westwood, MA 02090.

☐ **9N5YDY:** At year end (on the birthday of the King of Nepal), the Japan UNICEF Ham Club aimed to activate Nepal and do everything possible to encourage ham radio in that country. Cards handled by Toshi Kawanishi, JA8RUZ, Box 166, Asahikawa, 070-91, Japan. (Toshi hoped to make 4S7 and 8Q7 following Nepal.)

☐ **3G87PAX:** During 19 days in early April, the Pope John Paul II special-events Chilean operation resulted in 13,606 contacts (SSB totals of over 10,000). Special thanks to all participants from the DX Committee: CE4EBJ, CE5CFR, CE6COR, CE6DFY.

☐ **J6LRW:** Cards for this now-active station go via W8IMZ.

☐ **DX Nets:** DX Nets Around the World, List 7, is the 1988 edition of OE2DYL's popular list, containing data about more than 100 active DX Nets, $3 US. Orders go via Dieter Konrad, OE2DYL, Bessararabierstr 39, A-5020 Salzburg, Austria.

☐ **SU:** A special welcome to the Egypt Amateur Radio Society (EARS), newest member society of the International Amateur Radio Union.

☐ **GW3AHN:** As a follow-up to our coverage in March '87, note that QRP-maestro Tom has now worked over 100 countries on 12, 17 and 30 meters, making it 8 out of 9 bands for him (the exception, of course, 160).

☐ **Help!:** NA5U needs a route for 9X5MB worked on 15 meters Feb 24, 1983, on the African Safari Net. Contact Mike Thomas, 5717 Puerto Vallarta, N Richland Hills, TX 76180. KE2N hopes someone has the logs for silent key

Troster's Tips for Easy Listening

Nets and List Operations II. Pro & Con

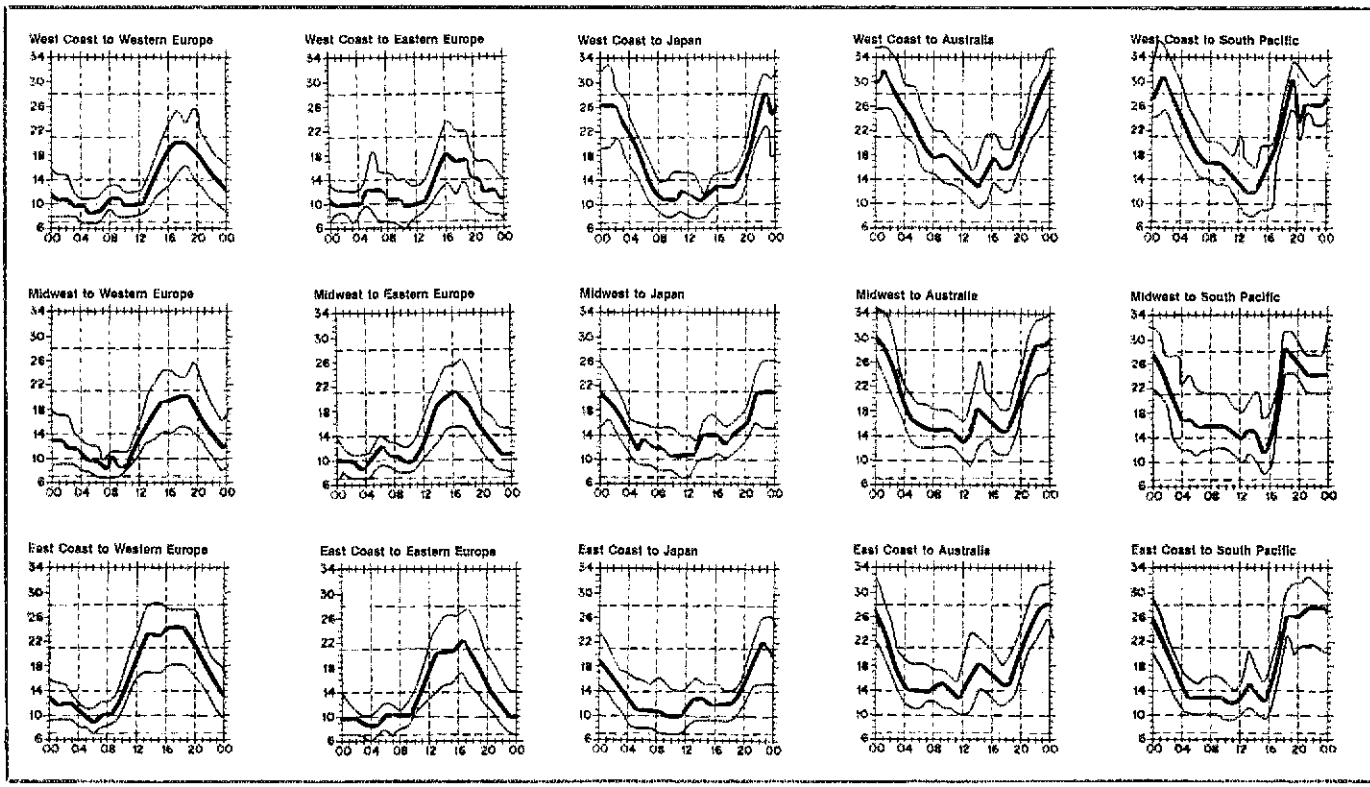
You are a DX station or on a DXpedition. You may or may not wish to work stations on a DX net, ie a controlled list operation run by an MC (master of ceremonies). Question: to work or not to work DX from a list operation?

Pro: Less QRM. Gives the QRPer a chance to work you. In a free-for-all, he might never be heard through the pileup. Easier on the DX operator. Some think a list yields more contacts/hour. The list is better for inexperienced callers and DX stations alike to handle. Many new DXers begin by checking into nets. (Perhaps the DX station doesn't enjoy working pileups, and prefers the "screening" provided by the MC of a well-run DX net.)

Cons: Some DXers refuse to even call an MC for a DX station operating from a list. They consider it a form of "cheating." They prefer to use the various calling skills and techniques of experienced DX chasers (as discussed in this column many times) to break through the pileups. It is considered by them to be a bigger thrill-of-the-chase to work the pileups. Some say that a good DXpedition operator can work many more stations/hour in a free-for-all than on a net list. They claim that there is absolutely nothing satisfying gained by working a DX station from a list—anyone can do it.

Work from the lists or not. It is *your* choice. The rules for DXCC don't say anything about lists. Your card from the DX location will count for DXCC whether you work the call from a list or in a free-for-all.

(More next month from W6ISQ.)



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

G3SUQ's *VS9AWR* stint (info to Gerry Skloot, 2923 Mandalay Rd, Wantagh, NY 11793).

☐ **W6-ZX:** WB6BPA/G8KL wonders if his Oct 31 CW contact with ZS6BMS was a "first" (California to South Africa) on 12-meter CW.

☐ **IOTA:** K3KMO pulled a lot of legs with his 1987 KT4A Islands-on-the-Air operation from Tangier Island (in Chesapeake Bay, VA!). There's more than a little sense of déja vu in this one; KT1 was a very early prefix for the African Tangier Zone.

☐ **Team Scandinavia:** CQWW CW saw those savvy Nordic contesters heading out as follows (QSL routes in parentheses): FY5YE by OH2MM (W5JLU); 5L7U by OH2KI (OH2KI); CR9BZ by OH2BBM (OH2BH); EA8XS by OH5XT (CBA); OHØBH by SMØGMG (OH2BH).

☐ **HAMI 88:** The 1988 Summer Camp of the Finnish Amateur Radio League (SRAL) will take place July 20-24 in Solvalla (about 30 km from Helsinki), managed by club stations OH2s CH TI. Visitors galore expected! Details from: SRAL, Box 44, SF-00441 Helsinki, Finland (358-0-562 5973). Further info as available.

☐ **P4Ø:** During their Oct vacation, N1CIX and WR6M operated 8 bands from Aruba, somehow amassing almost 2100 contacts in 75 countries with lots of time devoted to the beach, sightseeing, casino action and socializing with local hams. Cards via N1CIX, Box 855, Newington, CT 06111.

☐ **7P8DP/DN:** W8JBI now serves as QSL manager for both stations (replacing his brother Al, W8MPW).

☐ **Volunteer:** WA7WOC would like to offer his services as a QSL manager for any DX station. Any takers?

Friedrichshafen 1987, and a pileup of old pros: (l-r) DL1EE, DJ1XP, DL1PM. (*Thanks DK7PE*)

QSL Corner

Administered By Joanna Hushin, KA1IFO

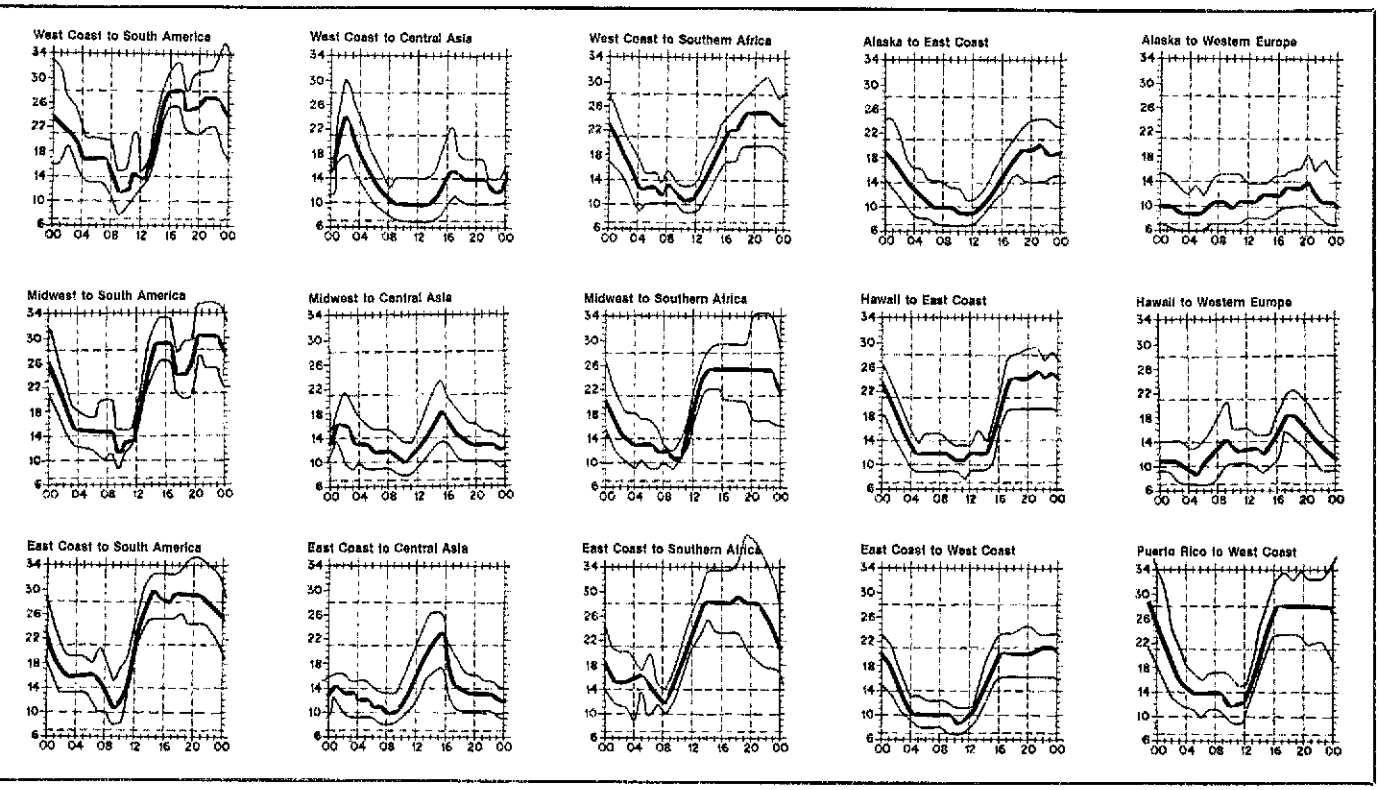
Here is some information for those of you who would like to QSL a QSL manager or direct to the station location. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.

BYØRY	(JG1RUN)
BY1QH	(NS7Z) operator NS7Z only
CR9BZ	(OH2BH)
CT3EU	(G3PFS)
HC5K	(KT1N)
HK1AMW	(KC3EK/KA3GSN)
H5AI	Sten Balk, PO Box 911391, Rosslyn 0200, Republic of South Africa
JD1BDK	Nobuaki Haga, c/o NTT Miyano Hamaichi, Chichijima Ogasawara, Tokyo 100-21, Japan.
KC6CS	(JE1JKL) CQ WW DX Contest only.
N8BJQ/J6	(W8IMZ)
P4OGD	(N2MM)
SO1A	(EA2JG)
TA/KI4PR	James Walsh, American Embassy, APO NY 09254-0001
TL8KH	(NA2K)
TR1G	(AK1E)
UA9MA	Gennady I. Kolmakov, PO Box 341, Omsk 99, USSR.
UV1OO	(UA9MA) Alternate route, Dr Charles H. Emely, W1NW/4 10698 Hampton Rd, Fairfax Station, VA 22039.
VP5W	(WW6F)
YJØAA	(K5BDX)
ZC4DX	(DJ9ZB)
ZD8MAC	PO Box 2, Georgetown, Ascension Island.
5H1HK	(JH4RHF)
5H3BH	(SMOAJU)
8A1IT	(YB6MF)
8P9HT	(K4BAI)
9M2RU	(N6LHN)
9N5YDY	(JA8RUZ)
9N7ITU	(JA8RUZ)
9Q5DA	(KC4NC)

SPECIAL NOTES

WA2LIY is not the manager for S92LB. SU1SK is a pirate station.

☐ QSL Corner, Dec 1987 *QST*, page 57, contains information and addresses for the ARRL Incoming Bureau. QSL Corner, Sep 1987 *QST*, page 63, contains information on the operations of the ARRL Outgoing Service. For additional information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.



Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more-detailed explanation. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Data provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for February 16 to March 15, 1988, assume a sunspot number of 74, which corresponds to 2800-MHz solar flux of 125.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300 and 5-country increments above 300. The totals shown below are exact credits given to DXCC members from November 1 through November 19, 1987. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DL9LL/105	I2KAJ/281	JR6CSY/110	VE3UL/129	NG1S/109	W3MUM/103	N4ZQ/112	KA6TFC/203	K8CZA/102
GØAEQ/107	I2KFW/104	PA3CLP/101	K1ZKM/204	W3HSR/106	K4CE/267	WA4KIL/183	WR6M/107	KA9OIH/115
HA6OS/103	JA4VUQ/186	SM6LJU/178	KB1WH/109	W3HXI/109	N4JMK/102	KE5YU/105	K7LJ/268	KD9KN/197
HAØHN/109	JH6TYD/110	VE3NMS/119						

Radiotelephone

CP5TC/108	EA2AOM/225	IK8BMW/110	PY2ZBO/144	YCØEAQ/103	W2ACC/106	KI4IC/125	N5CFN/110	WA8CAE/281
DF3CB/182	EA5AP/130	JA4VUQ/120	SM6LJU/113	K1ZKM/153	WA2WGJ/101	N4ZQ/106	NT6G/106	KD9KN/193
DJ9EU/134	G2DBT/102	ON6PJ/185	TI2JJP/105	N1CIX/115	KD3CR/101	K5HYB/107	WB6OHH/103	WB9WAZ/109
DL9ZAL/113	IK6AQU/155	OZ1LGF/109	VE3UL/127	KY2O/102	K4CE/258			

CW

DF8PM/101	DJØCP/104	I2OGV/244	JA4VUQ/142	SM6LJU/146	KY2O/102	KQ3S/178	N8EKS/101	KA9TSW/105
DJ9EU/105	DK7JZ/100	IK2GSN/109	OZ1LGF/109	VE3FZW/122	N2AZS/120	KN6J/114	KA9OIH/108	KG9Z/130

RTTY

LX2EL/103

160 Meters

AB1A/102 VE3INQ/100

5BDXCC

DJ9EU GD3AHV WB4CSK

Endorsements

Mixed

DF3CB/270	JA1BLC/335	SM6JHO/252	K1HDO/300	W2NUS/201	K4EJQ/190	W5EFA/313	W6UZ/275	K9MK/314
DJ1XP/339	JN1VNW/205	SM7EXE/332	K1IN/227	W2NY/308	K4FJ/344	WB5ZDP/229	W6YFW/253	K9RHY/307
DJ3TF/306	JA2AH/330	SMØBZH/317	KA1EKR/132	W2YD/329	KC4MK/245	WC5D/199	WA6TJM/225	K9UWA/322
DJ9EU/231	JA2FUJ/294	SV1PL/302	KA1LR/143	WA2MZX/233	KD4YT/153	K6BUU/273	AL7EL/317	KA9JOL/178
DL7WJ/199	JH4GNE/155	VE3FZW/237	KA1MX/176	WA2UWA/319	KE4RX/312	K6DT/342	NN7T/125	KD9BG/280
EA3NA/325	JA8AAJ/290	VE3GS/333	N1CIX/133	WA2UZB/275	KJ4VH/14O	K6TMB/289	WA7CGR/260	KF9M/179
FY7AN/318	JA8IXM/322	VE3HD/354	W1WW/315	K3OX/269	N4OJJ/129	KB6O/229	WB7BWZ/168	KQ9W/301
G3IZJ/271	JA9GPA/303	VE3IMO/260	WA1OIO/187	KI3L/300	W4FLA/329	KB6Q/295	KA8OSS/186	WB9EEE/261
HB9AZO/302	KP4DCR/150	VE3JGC/W4/249	WB1BVO/268	KQ3S/201	WB4MAR/250	N6AW/332	KD8V/297	KØALL/325
I2EAY/164	LA4DCA/230	VE3LDT/306	WB1CTV/200	N3CZJ/155	WF4G/303	N6ZU/153	NJ8O/168	KØZQD/306
I2JR/318	OK1KRS/305	VE4SK/329	K2LS/310	W3YX/325	K5FNQ/309	NG6W/287	W8DN/227	KDØMD/159
IK2BHX/202	OK1ZL/316	XE1CI/301	K2OWE/305	WB3GPR/307	K5HYB/290	W6FWK/151	W8QBA/296	NØOA/330
OK2GNW/176	ON6BC/314	YO9ANV/180	NI2Z/203	AA4DO/212	KA5DOB/234	W6KFV/325	W8RV/298	WØMHK/264
IK2GSN/235	OZ8AE/283	YV5BNR/284	NJ2L/125	AA4FS/180	N5EA/329	W6OK/296	K9LA/250	WAØRUD/205
J88AQ/271	SM5API/338	K1GW/252	W2NJN/309	AJ4X/204	NI5D/202			

Radiotelephone

CX2AAL/251	IK2GSN/217	JA2FUJ/294	KA1EKR/132	KI3L/291	WD4JMC/173	NG6W/273	K7JXR/259	K9LA/204
DF2XE/162	I5PAC/332	JH4GNE/155	KA1LR/143	N3CZJ/155	WF4G/287	W6BWG/305	KC7TO/304	K9MK/305
DJ1XP/328	I5ZJK/293	JA8IXM/319	W1WXZ/310	W3YX/290	WN4KKN/178	W6OK/293	WB7BWZ/167	KF9J/296
DJØCP/235	IK7AFM/272	LU9DAH/353	K2EWB/133	WB3GPR/305	KA5WOO/160	W6UVW/158	K8WWA/259	KQ9W/301
EA5AN/219	I8LEL/323	SM6JHO/177	K2LS/264	AA4DO/131	W5EFA/312	W6YFW/251	KB8CU/227	W9ZTL/250
F2MO/344	I8ZTE/259	VE3FZW/221	KA2ELW/302	AA4TV/152	W5LLU/287	WA6TJM/213	KD8V/294	KØALL/321
I2SBU/298	IT9HLO/315	VE3GS/333	W2FGD/341	K4FJ/336	WB5ROW/299	WB6ALC/175	W8COG/329	KØZQD/305
I1UW/326	IT9KZW/320	VK1ZL/200	W2NJN/249	KE4RX/311	K6DT/325	WE6H/226	WD8MGQ/313	KDØMD/159
I2JR/318	J88AQ/268	XE1CI/300	WA2BGE/291	KI4FW/150	K6TMB/282	AL7EL/278	K9KJS/203	WØQLX/326
I2KAJ/280	JA2AH/328	K1HDO/280	KD3AP/151	KJ4VH/126	N6AW/331	K7EHI/265		

CW

DF3CB/229	I2EAY/129	OZ8AE/275	YV1TO/174	W2NJN/153	AA4DO/153	K5FNQ/266	K6DT/299	KD8V/282
DJ1XP/303	JI1XTZ/160	PA3BWS/203	K1HDO/205	KI3L/266	K4FJ/293	NT5G/182	NG6W/255	K9LA/198
DK5AD/300	JA8AAJ/262	SM6JHO/199	W2FXA/270	WB3GPR/230	KC4MK/182	WC5D/175	K8NN/229	KQ9W/289
DL7WJ/199	LA4DCA/221	SMØBZH/281						

RTTY

I2JR/149 W7KS/126

160 Meters

AA1K/200 W2PN/124

DXCC Notes

New DXCC Country

The ARRL Awards Committee has VOTED unanimously to ACCEPT the recommendation of the DX Advisory Committee to add Aruba (P4) to the ARRL DXCC Countries List. The new Aruba listing, now separate from the Netherlands Antilles listing, is by virtue of Point 1 (Government) of the Country Criteria. Aruba credit will be given for contacts dated January 1, 1986, and after.

Please note the following administrative procedure for submitting cards for Aruba credit:

1) Do not submit cards for Aruba credit before April 1, 1988;

2) Before Aruba credit can be given to those who already have credit for the Netherlands Antilles, a Netherlands Antilles card must be RESUBMITTED. Therefore, along with the creditable Aruba card, please also resubmit any card confirming contact with Curacao or Bonaire, or an Aruba card dated December 31, 1985 or earlier. This will bring the current DXCC Country total to 318 on April 1, 1988.

On Line

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

No Contest: the Computer Advantage

Computers have added a new dimension to Amateur Radio contest operating. In any sport, including radio sports, any edge can make the difference between winning and losing. Contest stations that are equipped with computers have an edge over the similar stations that are not computer equipped.

Spotting Stations

Finding new stations and announcing their presence over the air is nothing new. "Spotting nets" have been used by multi-operator contest stations for many years (contest rules require that stations using such nets be entered as multioperator). Until recently, FM repeaters were used almost exclusively to announce the presence of stations that might represent a new multiplier to those contestants monitoring the repeater. Such systems have been successful in cranking up scores, so many serious contest clubs employ such a system. The FM repeater spotting system does have some problems, however.

One problem is that spot announcements can be very distracting while you are intently working another station. Typically, if a spot announcement blasts through in the middle of a contact, you quickly turn off the FM radio and attempt to work the station without the distraction. Maybe you will remember to turn the FM radio back on after the contact is completed and maybe you won't. Another reason to turn off the FM radio (and forget to turn it back on) is that unless the repeater is dedicated to contest operation, there is liable to be other noncontest activity on the repeater to further distract you. While the FM radio is off, for whatever reason, you know you are going to miss an announcement for a new multiplier!

There are other problems, too. What you *hear* is not necessarily what was *said*. As a result, instead of chasing a new multiplier on 14.203, you end up chasing air on 14.302. All spot announcements may not be important to you, but you have to listen to them all. If you are working a single band, announcements concerning activity on other bands are useless. Finally, by the nature of the FM repeater, coverage is limited; the contest club repeater may not encompass all of the territory where the members live.

FM repeaters are often helpful, but things could be better.

Spots Before Your Eyes

Recent advances in packet radio solve many of the problems inherent to spot announcements via FM repeaters.

Normally, one packet-radio station can communicate with only one other packet-radio station at any one time. (Packet radio does have provisions to make general announcements to everyone on a particular frequency, but there are no assurances that all of the intended receiving stations will receive such general announcements.) Now, conference software is available. The software is installed at key packet stations (or "nodes") to permit other packet-radio stations to communicate with more than one station at a time. When a station is connected to a conference node, it is able to communicate with all of the other stations connected to the same conference node. But, that's not all!

Software is also available to link conference nodes together so that a station connected to one conference node can communicate with stations connected to other conference nodes (that are linked to the local conference node). The combination of conference software and node linking software can result in an enhanced contest club spotting network that covers all of the members of the club. But, that's not all!

Pavillion Software (PO Box 803, Amherst, NH 03031), whose "Packet-Cluster" software allows conference nodes to be linked together, also has "Packet Conference Board System" software which may be installed at a packet-radio station to provide packet-radio bulletin-board system (PBBS) operation with multiple-user capability. Up to 26 stations may be connected to the system concurrently and these stations may remain connected to the system and in constant communication with each other. But, that's not all!

The "Packet Conference Board System" provides functions that are specifically designed for spotting announcements. To start the ball rolling, after you have connected to the system, you invoke the CONFERENCE command to enter the conference mode. Once you are in the conference mode, the fun really begins. If you hear or work a station that may be of interest to other stations in the conference, you can use the DX command to make a spot announcement ("DX 14.152 1S1DX LISTENING UP 5," for example). Your announcement is displayed at the terminal or computer of every station connected to the conference. There is no chance of misinterpretation because the announcement is printed clearly for all to read, and there is no chance of distraction because the announcement is printed silently for reading at the monitoring station's pleasure. Even if the announcement scrolls off the display, it is not lost forever because the system has a logging function.

The SHOW DX command displays the last five DX announcements and the SHOW DX *nn* command displays the last *nn* DX announcements. If you are operating a single band and are not interested in activity on other bands, you can invoke the SHOW DX BAND command and the last five DX announcements on the specified *band* are displayed.

To run a packet conference system requires an IBM® PC or compatible computer and a Kantronics KPC-2® (or compatible) TNC (in addition to the conference software). A number of contest clubs are already equipped with such systems. To stay competitive, other contest clubs can be expected to follow their lead.

But, That's Not All!

In the March installment of On Line, this discussion of the contest advantage provided by computers will continue with a look at the latest software offerings that ease the chores of contest logging, duping and reporting.

PX: Commodore Redux

This month's PX consists of four new offerings for the ever-popular Commodore computers.

PX Number 166: CAT control program for the Yaesu FRG-9600 receiver was written by Donald Rasmussen, WB8YQJ, for the Commodore 64 (73 cents postage required).

PX Number 167: CAT control program for the Yaesu FT-757GX transceiver was written by Kjell Strom, SM6CPI, for the Commodore 64.

PX Number 168: Transmission line/load matching program for the Commodore 64 was written by Ron Lile, KØRL.

PX Number 169: Antenna-bearing program for DXCC countries was written by David Bauer, KTØQ for the Commodore 128 (56 cents postage required).

To obtain a listing of any PX program, send a business-size SASE with 39 cents postage (unless noted otherwise) to ARRL, Dept PX, 225 Main St, Newington, CT 06111 (CRRL members can send their SASEs to CRRL, PO Box 7009, Stn E, London, ON N5Y 4J9). Use a separate SASE for each program request and write the PX program number of the desired program at the lower left-hand corner of the SASE. Please do not send correspondence other than PX requests to Dept PX.

A list of all 169 programs in the PX library is also available by sending a *business-size SASE with 22 cents* postage to ARRL, Dept PX, 225 Main St, Newington, CT 06111.

FM/RPT

Conducted By Stan Horzepa, WA1LOU
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CompuServe ID no. 70645,247

The Evolution of the *Repeater Directory*

Seventeen years ago this July, the first edition of the *Repeater Directory* was published by the ARRL. Consisting of seven pages contained on four 8½- by 11-inch sheets of paper bound together with a simple staple, that first *Directory* listed a total of 298 repeaters on all bands in the United States and Canada. In comparison, the current *Directory* lists nearly that many 2-meter repeaters in New York State alone and has 11,954 listings in all. During the past 17 years, the Amateur Radio repeater mode has undergone a lot of changes and the *Repeater Directory* has evolved to reflect those changes.

Mole Hills and Metropolitan Areas

Initially, repeaters were listed alphabetically according to state and province (from Alabama to Wyoming) and within each state/province listing, repeaters were arranged alphabetically according to town, city, mole hill, mountain, etc. There were so few repeaters in the early editions of the *Directory* that the repeaters operating on different bands were listed together. In any state/province listing, you would find that most of the repeaters were of the 2-meter variety, but interspersed throughout the 2-meter majority were 50-, 220- and 450-MHz repeaters.

As repeaters operating on the bands other than 2 meters proliferated, the format of the *Directory* had to change to accommodate them. So, starting in the 1977-78 edition, the repeaters were first divided by band (plus a separate section for ATV repeaters), then by state/province and finally by town, city, mole hill, etc. This division by band continues in the current edition with only two changes. In the 1985-86 edition, a separate "Special Mode" section was added to list RTTY repeaters and packet radio digital repeaters or "digipeaters." In the 1987-88 edition, an exclusive "Packet" section was added (the growth of packet radio has been such that the next edition of the *Directory* will list only those key digital repeaters that operate on a 24-hour basis).

In the undated edition of the *Repeater Directory* (actually published in 1979), the repeaters in the state/province listings were listed alphabetically according to their metropolitan area rather than by city, town, mole hill, etc, to help out-of-town hams who knew which major city they were near, but did not necessarily know all of the towns, mole hills, etc surrounding that major city. For example, if you were driving around the Detroit area, you were probably in range of the Windsor repeater, but you would never know it because, according to the old *Repeater Directory* format, Windsor and Detroit were listed in different states. In the new format that first appeared in 1979, however, you would have dialed up the Windsor repeater because it was listed as part of the Detroit metropolitan area. Makes sense, doesn't it? Although Texas has chosen not use it, the metropolitan area format has been used in all subsequent editions of the *Directory*.

Sources: A Sore Spot

Back in the old days (not necessarily "good" old days), when I edited two editions of the *Directory*, we accepted input from all sources: the frequency coordinator, the repeater owner, the friend of the repeater owner, the enemy of the repeater owner, the brother-in-law of the repeater owner, etc. The problem was that each of these people had different perceptions as to what was the "correct" information for a particular repeater. For example, if the frequency coordinator was the only source of information for a particular repeater and we used his information in the *Directory*, we would subsequently receive complaints from the repeater owner and his friends/enemies/relatives that the information was in error. Problem was that the repeater owner and his friends/enemies/relatives either forgot to inform their coordinator of changes in the information or the coordinator received the information, but forgot to update his files. In either case, since we printed the wrong information, we were perceived as boneheads and received the blame (now you know why those weren't the "good" old days).

Although multiple sources was a problem, and the coordinator may not have been kept current, the frequency coordinator was still the logical choice to supply the information. Coordinators records must be kept up-to-date to provide interference free coordinations. Everyone was made aware that if they wanted the correct information to appear in the *Directory*, they had better keep their coordinator well informed. The FCC helped put some teeth in our cause by way of their policy statement that said that the FCC would rely on the *Directory* to decide controversies between coordinated and uncoordinated repeaters. So, it behooved those who were coordinated to keep their coordinator completely informed on what they were doing.

In January 1986, the ARRL Board of Directors voted to create a National Repeater Data Base to serve as a tool for frequency coordinators in their day-to-day coordination efforts. This data base, which contains all of the information that is needed for the *Repeater Directory*, has become the sole source of information for the *Directory*. It is used exclusively by frequency coordinators, and since they have the only access to the data base, *Repeater Directory* listings are, in effect, provided by the coordinators.

Repeater owners and trustees who wish to have their repeaters listed in the *Directory* must send the information to their area frequency coordinator who will insert the information in the data base. Also, it is recommended that you supply your coordinator with periodic updates to keep him advised of your repeater's status. These steps will insure a proper listing in future Directories. (A list of frequency coordinators may be found in the current edition of the *Repeater Directory*. [Note! The ARRL is not a frequency coordinator, nor does the ARRL certify coordinators.])

Seventeen years of the *Repeater Directory* later...the eighteenth edition has already gone to press and should be available, according to tradition, for the Dayton HamVention® . Any updates sent to your coordinator now will not see the light of day until the 1989-1990 edition which will be available in the spring of 1989 (where did the decade go?) at Dayton.

(My thanks go to Bart Jahnke, KB9NM, the current editor of the *Directory*, for his assistance with this installment of FM/RPT.)

REPEATER LOG

What types of activities may be submitted for inclusion in the Repeater Log? Most often we receive notices of vehicular and medical emergencies. A large number of submissions are of public-safety events, fires and drills/alerts; however, criminal activities and search & rescue activities are frequently reported as well.

Submissions for the Repeater Log may be sent to Luck Hurder, KY1T, at ARRL HQ either by mail or by modem after hours to 203-665-0090. To facilitate Repeater Log submissions by mail, please use form CD-258, which may be requested from ARRL HQ by sending an SASE to the attention of the Field Services Department.

According to October 1987 reports received, repeaters were used in the following public-service events: 450 vehicular emergencies, 18 public-safety events, 15 alerts/drills, 10 medical emergencies, 7 fire emergencies, 2 power failures, 1 criminal activity.

The following repeaters were involved (followed by the number of events): NK2W 15, WA2ZWP 3, W3UER 8, WA4AOS 3, KN4K 3, WA6BJY 15, WD6DIH 60, KA6EEK 54, W6FNO 314, K8DDG 14, WD8IEL 8, N9BHA 5, N9RM 1.

Conducted By Bob Atkins, KA1GT
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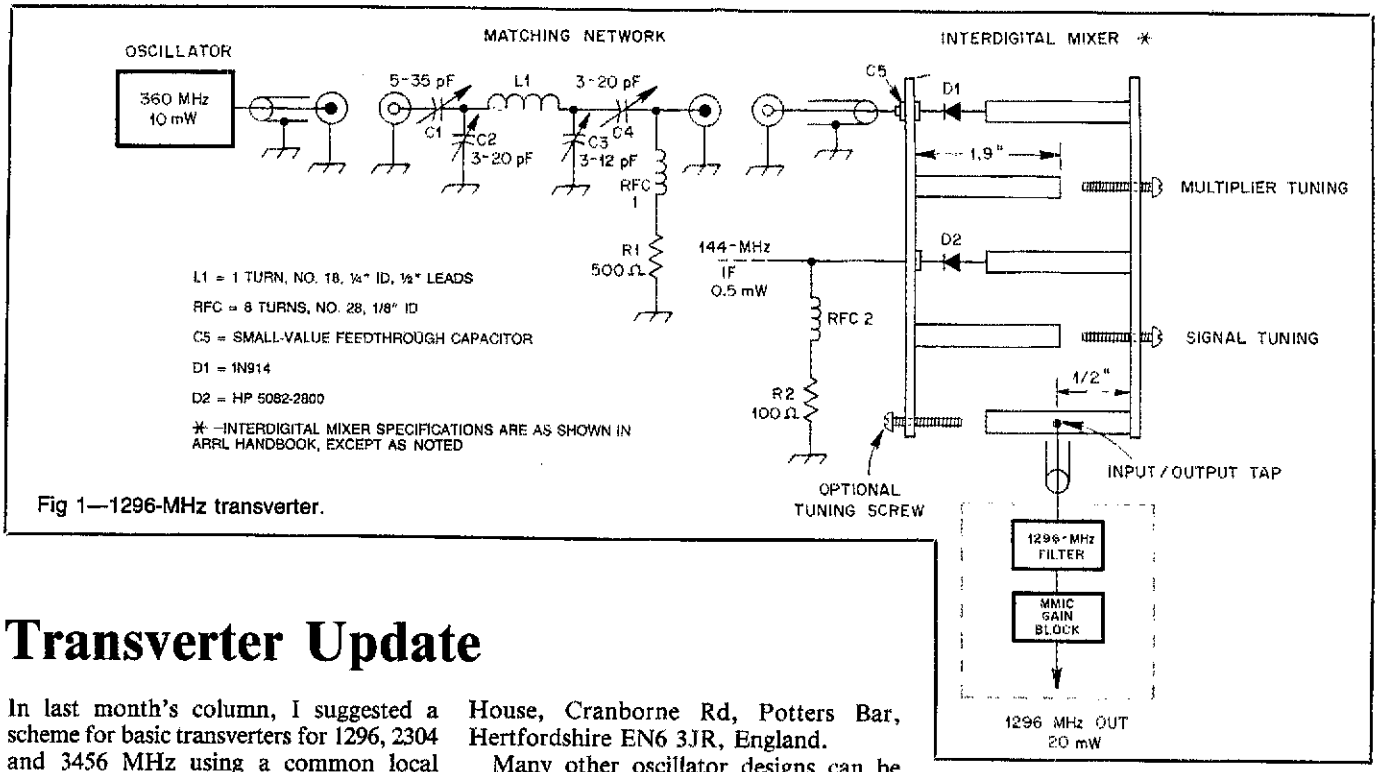

Fig 1—1296-MHz transverter.

Transverter Update

In last month's column, I suggested a scheme for basic transverters for 1296, 2304 and 3456 MHz using a common local oscillator (LO). The first part of this system, the 1296 transverter, has now been completed, though not quite as first suggested. Instead of using 720 MHz as the LO frequency, I used 360 MHz. This was done for two reasons. First, I found that more-than-adequate fourth-harmonic generation at 1440 MHz could be obtained with 100 mW at 360 MHz driving the interdigital mixer/multiplier. Second, a doubler I constructed using a 2N5944, though producing about 200 mW at 720 MHz for 100 mW of 360-MHz drive, was much less stable than the 360-MHz source, and more difficult to tune up without a spectrum analyzer.

The 360-MHz source chosen is described in Feb 1983 *QST*, p 28. This source was chosen for several reasons: It gives clean, low-noise output, is very insensitive to mismatched loads, and is easy to tune up without test equipment. Tuned for maximum power output (about 100 mW), the 360-MHz signal is more than 35 dB stronger than any other output signal. This spectral purity is maintained as the supply is varied between 10 and 14 volts. In addition to these technical reasons, I also had a PC board for this design on hand! These PC boards are available from the RSGB (even to non-members) for about 7 pounds (sterling), which is about $13 at the time of writing. This includes shipping inside the UK. I don't know how much extra is required to ship to the US. The address for inquiries is: Microwave Components Service, RSGB, Lambda House, Cranborne Rd, Potters Bar, Hertfordshire EN6 3JR, England.

Many other oscillator designs can be used in this application. The *Proceedings of the 1987 Mid-Atlantic States VHF Conference* (see last month's column) contains a design by Paul Drexler, WB3JYO, for a 100-mW 404-MHz source that could be tuned down to 360 MHz. *The ARRL Handbook* (1988 edition, p 32-26) has a 5-mW 384-MHz source, designed by Al Ward, WB5LUA, that can be amplified as required. The *Proceedings of the 21st Conference of the Central States VHF Society* has a design by Richard Campbell, KK7B, for a 360-MHz source with 25 mW output. I'm sure that there are many other good designs, as well as surplus oscillator units, that will work; choose the one that most appeals to you.

Most interdigital multiplier designs use a Schottky (hot-carrier) multiplier diode. I chose a 1N914 because it is cheaper and easier to find, and seemed to perform just as well as HP 5082-2800 and -2900 Schottky diodes in this application. If you have HP 5082-2811 or -2835 diodes, by all means use them; but as far as I can judge, the 1N914 performs adequately in this application. The recommended mixer diode is an HP 5082-2817 ($3.10 each, at this writing, in small quantities from HP), which can yield a noise figure under 6 dB. An HP 5082-2835 ($0.44) can also be used with a 3 dB output drop. Since I did not have either of these diodes, I used an HP 5082-2800. This device yields an even poorer noise figure, but with a low-noise, high-gain preamplifier chain, the total system noise figure can be brought to a very low level.

The basic physical dimensions of the 1296-MHz interdigital mixer/multiplier are given in *The ARRL Handbook* (1988 edition, p 32-10). This information is also presented in the *RSGB VHF/UHF Manual* (fourth edition, p 9.2), which also gives a more recent IF amplifier circuit. I made a few changes to improve performance slightly (see Fig 1). I shortened the multiplier tuned resonator from 2.0 inches to 1.9 inches so that it can be tuned to 1440 MHz with the tuning screw inserted about half way. I also moved the antenna input tap on the final interdigital element down from the "hot" end to a point 0.5 inch from the "cold" end to improve the match to 50 ohms. The 360-MHz signal is fed to the multiplier diode via a small-value feedthrough capacitor, rather than the 30-pF unit used in the original design. Finally, I added a tuning screw to the antenna resonator. This did not change the input/output efficiency, but did enable a slightly cleaner output to be obtained. Since a spectrum analyzer is required to adjust for cleanest output, however, this is probably not worthwhile for most constructors. An external interdigital filter should be used to clean up the output, in any case.

Next month, I'll discuss the adjustment of the matching network shown in Fig 1, as well as the details of the MMIC gain block.

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
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or call 301-384-6736 to record late-breaking information.

Why Not a 6-Meter DX Window?

The January column presented the case for a 6-meter DX window in which a portion of the band, such as 50.1 to 50.125, would be set aside for working, or trying to work, DX only. As promised, the points most frequently voiced against the idea, along with a few observations concerning them, will be covered this month.

One argument that this conductor has yet to encounter is the one that might be expected to be offered most frequently. It can be paraphrased as: "Taking away 30 kHz of the prime portion of the band for DX-only operation to benefit the few who want to work DX is depriving the average 6-meter operator of too much space." The fact that this contention does not come up indicates that few believe it to have merit. Besides, with the amount of spectrum we have available on 6 meters, such a claim would be hard to justify. What then are those not favorably disposed to establishing a DX window saying against it? Their comments seem to fall into two general categories. First, they insist that "It won't work because not everyone will abide by it." The second can be summarized as: "Why not solve the problem some other way."

Those espousing the first objection contend that "since few will comply, there is no point in even bringing the matter up." They advise sticking with the status quo and "if DX contacts are lost, that's the way the cookie crumbles." This conductor happens to believe that we can bring about improvements as to how we use our bands by voluntary agreements. It is true that such methods seldom result in 100 percent observance. However, with the right degree of peer pressure, we should be able to significantly improve the present situation. It seems to me that opposing something simply because it won't work perfectly displays a defeatist attitude.

The second group suggests all sorts of measures in place of the one being offered. One of the most often heard of these alternate approaches is: "Move DX operation to some other part of the band not currently heavily used, such as 50.2." The rationale for this point of view seems to be based on the premise that foreign 6-meter operators are fewer in number than are those in the US and Canada, so it should be easier to change the operating habits of the rest of the world than it would be ours. Those fostering this approach fail to specify how they would implement a worldwide education campaign to convince people in many far-flung countries that 6-meter DXing would henceforth take place somewhere other than around 50.110, where it has been for the past 20 years. One wonders also, if we US and Canadian amateurs can't be convinced to change our ways, how can we expect the rest of the world's 6-meter operators to so materially alter theirs? In addition, the premise is undoubtedly wrong. It is quite likely that Japan alone has more 6-meter operators than we do.

A corollary suggestion to "Move DX operation" is "Use CW." Apparently, the rationale for this is that CW operation takes place below 50.1 and that this part of the band is free of QRM. The fact is that, although US regulations prohibit voice operation below 50.1, there are probably more CW contacts made above 50.1 than below it. Most people who take 6-meter DXing seriously are already aware of CW's superiority when the going is tough, and use it extensively. I haven't counted them, but I am sure that at least half of the countries I have worked on 50 MHz were via CW. Very few of them were below 50.1, however. Despite its advantage under conditions involving weak signals and heavy QRM, even CW does not fare well in the presence of 40 dB over S9 sideband splatter. In the light of these considerations, one is hard pressed to see how "using CW" will solve the problem at hand. There is also the problem that many foreign operators, such as UK Class B licensees, either don't know the code or are not equipped for CW operation on 6 meters.

A related comment is "Why not use split frequency?" Here again, the problem is one of communicating to the rest of the world what we expect them to do. In addition, many 6-meter DX stations have old equipment, much of which does not have split-frequency capability. Even if it were decided that this is a practical idea, what frequency would the DX call on, and would many of us monitor it? No matter where above 50.1 we answer, probably without listening first, we would run the distinct risk of clobbering someone's QSO. This is one of the problems with split-frequency operation. I firmly believe that the HF bands are better places to be now than they were in the days of AM when essentially all phone DX operation employed split frequency.

A frequently heard claim is that if we move most of our routine operations to 50.130 and above, all of the action would be there and the DX stations, not being able to attract attention at 50.110, would have to go where we are to work us. This would put them back in the middle of the QRM. This is probably the best argument against the DX window concept that I have encountered so far. However, I do not believe it valid because even if no one is listening between 50.1 and 50.125 and thus does not hear a DX station call, the DX station ought to be able to get someone's attention by calling in the midst of the activity. Once the word is out that DX is coming in, all of those interested in pursuing it will be able to QSY into the DX window. Those wishing to continue domestic contacts can do so without being bothered by QRM from DXers. A related argument is that two calling frequencies will be established with the institution of a DX window: 50.110 for DX and some other, such as 50.130 or 50.2 for domestic use. Many are quite vehement in saying that they want one frequency to monitor. I acknowledge that more than one calling frequency might lead to some confusion and possibly even result in a few openings being missed. However, I contend that the advantage of providing a relatively QRM-free part of the band in which to pursue DX outweighs this disadvantage. Besides, many of us now have radios that can scan programmable segments of the band or sequentially monitor preselected frequencies stored in memory. Thus, I feel that more than one calling frequency does not represent as great a burden as it might have a few years ago.

These are the arguments that I have heard raised against the concept of a 6-meter DX window. There may be others. If so, I would be very interested in hearing them. As usual, this column will attempt to air all sides. So please drop me a note expressing your opinion one way or the other. The time is getting short. If the active 6-meter operators can reach a consensus favoring a DX window, it would be worthwhile to be able to begin it in time for next summer's E, season, not to mention the onset of F2, which will probably produce some DX openings beginning about October.

ON THE BANDS

6 Meters—Most of us must be content to read about how much DX is being worked on 50 MHz in other parts of the world. Not so NE8Z, who most will more readily recognize as HC1MD and HC8VHF. Rick found an SB-110 at a hamfest for $75 and picked it up. Getting the most out of his new purchase was the next order of business. A late October trip with the rig and a "Galapagos Quad" to the

US and British Virgin Islands was his way of putting the rig to good use. The results provide a hint of the exciting times that should be in store for all of us in the next few years. From KP2, beginning at 0152Z Oct 27, Rick worked LUs 2EUZ, 9AEA, 9EHF, 3EX, 7DZ, 3DCA, 8MBL, 1FSE, 7FA, 2FMO, 8AHW, 2DEK, 1DVT, 8DDR, 8YYO, 1DMA and 6DLB; plus CX1DDO, CX8BE, CX6AV, CX4DO, OA8ABT and CE3BFZ along with PY2ZS, PY3BK, PY2DJC PP5SGP, PU5AJI, PY5ZBU, PY5EJ, PY2BBL, PY3CR, PY3AK, PP5WL and PU2INN. Signals ran between S7 and S9. Similar results were obtained a few days later from the British Virgin Islands. Not only is the existence of the propagation which supported these contacts encouraging but the fact that so many South American stations are on the band at this stage of the solar cycle.

According to the South African publication *VHF News*, to which I am indebted for much of the news from that part of the world, a new beacon has been put on the air north of Pretoria. The call is ZS6LW and the frequency 50.022. It runs 50 W to a 6-element Yagi which has been aimed north but is expected to be pointed in other directions at various times of the year. An omnidirectional antenna may also be used eventually.

Also from *VHF News*, the South Africans appear to be taking to grid hunting as we are. A recent issue contains descriptions of DXpeditions to grids not inhabited by resident VHF operators. Also mention is made of a Pretoria VHF Award. Now if only the Australians and the Japanese would begin exploiting the Maidenhead Grid System, it would approach the worldwide acceptance that was the objective of its developers, G4ANB and SM5AGM.

From the Far East, JA1VOK categorizes late-November 6-meter conditions as "fantastic." Hatsuo says that during the fall season JA hams worked C21, HI, FK, KH2, P29, VK, YB and ZL. JA1VOK personally worked C21NI, VK4ZNC and ZL2TPY.

2 Meters—The November issue of the *2 Meter EME Bulletin* includes an interesting account of WD9ACA's quest for WAS. Ken's last two were WA7JUO Arizona and KH6FOO Hawaii. What makes Ken's accomplishment particularly noteworthy was the fact that he did it in just 220 days using a four-Yagi array.

W8NJR, in updating his 2-meter status, mentions that his operating has been taking a back seat to his involvement in the setting up of the Midwest VHF/UHF Society. The group now numbers 50 members and is planning some very interesting programs. For the January meeting KD8SI and KB8RQ will speak on EME. The organization has also taken on the job of running the antenna-gain and noise-figure competitions at the Dayton HamVention® this year.

N9GTA, Muncie, IN reports a very good, albeit short, tropo opening the evening of Nov 16. Dan began by working W4GJO EM74 in northern Georgia about 2040 local time. Then, as he says, "It was a pileup," with WA4LIT EM64, NB4S EM84, WB2OTK/4 EM84, K4CKS EM74, N4FWE EM75, WD4MOB EM74, KX4R EM74, WB4TWX EM95, KD4FQ grid unknown and W2GU/4 EM75 all being worked in 20 minutes. N9GTA runs 170 W to a Boomer at 132 feet.

1¼ Meters—News on this band is quite scarce these days. Is the specter of the FCC taking it away discouraging people from being active? See K1ZZ's editorial in December *QST* for more on what we can all do to try to save this very interesting band.

One of 1¼ meter's stalwarts, WB2IEY, has compiled a list of stations submitting logs in ARRL VHF contests over the past four years. It shows a pattern of increasing activity during the January contests but declining activity during June and July. Tom also reports that he has forsaken the relatively wide open spaces of western New York for the canyons of Manhattan. However, he doesn't plan on letting that stop him from activity on this and several other VHF bands. The new address is 215 E 15th St, New York, NY 10003 tel 212-477-4887. Before leaving western New York, Tom was able to complete his 1¼-meter VUCC by virtue of a trip to FN44 by K1LPS.

From the Pack Rats monthly newsletter *Cheese Bits*, comes an account of several grid expeditions by the team AA2Z and W1XX. In late September, Mark and John journeyed to the tip of Cape Cod and put on FN41 and FN51. From those grids, rare on any band, 33-cm contacts were made with WB2NPE, N3CX and WA3AXV in the Philadelphia area as well as WA1JOF, W1JR and W1RIL. The latter three were also worked on 13 cm.

WB2DNE/3, located between Baltimore and Washington, writes that he is set up on 70 cm and would be interested in schedules. Ed runs a 4CX250B at 200 W to two stacked 19-element RIWs at 35 feet. Address is 11475 Scaggsville Rd, Fulton, MD 20759 tel 301-792-4513.

1¼ Meter Standings

For WAS holders, listing is WAS number, call, state, call areas worked and grids worked. For others, call, state, US states worked, call areas worked and grids worked. Call areas are the 10 US continental call areas plus KH6 and KL7 plus each VE and XE call area plus DXCC countries not located within the continental limits of the US, Canada or Mexico. In order to make the standings a true reflection of stations currently active on 1¼ meters, those not reporting activity within the past two years are subject to being dropped. They will be reinstated upon written presentation of continuing activity. It is not necessary to have worked additional states or grids in order to remain in the standings or be reinstated, merely an indication of continued interest and activity. WAS holders are listed whether they report regularly or not. However, they are encouraged to update their grids and call areas. Compiled December 12, 1987. Deadline for next update is June 5, 1988.

WAS Holders

1	WØVB*	MN	13	—
2	WØSD*	SD	—	—
2	WBØTEM*	IA	—	—
4	K5FF*	NM	14	—
5	W5FF*	NM	13	—
6	WB5LUA*	TX	—	—
7	VE3EMS*	14	—	
8	W3GPY*	PA	—	—
9	K9KFR*	IN	—	—
10	KAØY*	IA	—	—
	W1JR*	MA	45	14	77
	W2SZ/1	MA	23	9	55
	K1FO	CT	23	7	—
	AF1T	NH	21	10	—
	K1PXE	CT	18	6	—
	W1GXT	MA	17	9	—
	W1EJ	NH	15	8	—
	W1QXX	MA	15	5	21
	W1YTW	ME	14	8	—
	W1RIL	MA	13	8	25
	W1HDQ	CT	13	5	—
	K1JIX	MA	13	4	—
	K1LPS	VT	12	6	—
	WA1JOF	MA	11	5	15
	KA1DHO	MA	11	4	14
	K1BFA	MA	10	3	—
	W1AZK	NH	10	3	—
	WB2NPE	NJ	25	10	59
	W2PGC	NY	23	10	39
	W2CRS	NY	21	—	—
	K2GK	NY	20	8	47
	K2CBA	NY	19	7	—
	N2WK	NY	18	10	50
	WB2IEY	NY	17	8	50
	N2BJ	NY	16	7	40
	K2DNR	NY	15	6	—
	W2DWJ	NJ	15	6	—
	K2YCO	NY	14	7	—
	WA2FGK	NJ	14	6	—
	WA2FUZ	NY	14	5	—
	W2WW	NY	13	5	19
	W2SEU	NY	13	5	—
	WA2YWP	NY	6	2	—
	K3HZO	MD	24	9	37
	WA3FYJ	PA	23	10	44
	W3RUE	PA	18	11	22
	N3CX	PA	18	—	—
	W3XO	MD	17	6	19
	KB3QM	DE	16	—	68
	W3UJG	MD	15	8	—
	AC3T	DE	15	6	13
	W3HMU	PA	14	4	—
	W3IP	MD	13	6	—
	WA3JUF	PA	12	5	—
	K3IUV	PA	12	4	—
	KA3B	PA	7	4	9
	KC4EG	KY	34	9	55
	WA4PCS	KY	32	7	—
	WD4DGF	TN	31	9	63
	WS4F	GA	29	9	51
	WA4CQG	AL	26	8	—
	WA4NMA	GA	25	8	—
	W3IY/4	VA	23	10	—
	K4LHB	VA	21	9	—
	WA4SBC	VA	21	7	25
	N3AHI/4	GA	20	8	—
	WD4IIS	GA	18	7	—
	N3AHI/4	GA	16	6	—
	K4GL	SC	14	6	—
	WA4MVI*	SC	12	7	—
	K4CKS	GA	11	2	—
	KC4P	AL	9	2	—
	WA4LYS*	FL	6	6	6
	K4IXC	FL	5	3	—
	W5RCI	MS	32	8	52
	K5UR	AR	27	7	75
	K5SW	OK	26	8	65
	W5HN	TX	23	7	28
	K5CM	OK	22	—	—
	WA5VJB	TX	17	6	—
	N4JS/5	MS	13	7	—
	W5NZS	OK	12	—	25
	N5KW	OK	12	—	—
	WB5AFY	TX	9	4	31
	K5JL	OK	7	4	—
	KE5EP	TX	7	—	9
	WA5DBY	TX	3	1	3
	WB6NMT*		10	6	—
	W6WSQ		6	4	—
	N6AMG*		3	3	—
	W4WD/7*	UT	37	10	25
	W7JF*	MT	17	9	—
	K7NII*	AZ	16	11	—
	W7CNK	WA	6	3	—
	K7ICW	NV	4	2	—
	WB8BKC	MI	31	9	55
	WA8TXT	OH	28	10	—
	W8IDU	MI	26	8	—
	WB8PAT	OH	16	8	—
	K8AXU	OH	12	7	—
	W8VO	MI	11	7	—
	K9MRI*	IN	34	9	—
	K9XY*	WI	28	13	—
	K9HMB*	IL	23	10	—
	WB9SNR	IL	22	9	—
	WB9MSV	IL	19	7	47
	WØUC/9	WI	8	3	10
	KB9NM	WI	5	4	—
	KØDAS	IA	29	10	—
	KØALL	ND	28	10	—
	KØTLM	MO	23	7	53
	KCØQR	NE	21	6	48
	WØPW*	CO	20	8	—
	KFØM	KS	16	5	28
	WØRT	KS	12	5	—
	KBØQR	NE	8	3	8
	WAØNOK	MO	6	2	—
	WBØZKG	IA	5	2	—
	WAØQLP	SD	4	2	—
	KCØW	ND	3	1	—
	VE1UT	NS	7	4	—
	VE2YU		8	3	8
	VE2DFO		7	8	—
	VE2HW		5	2	—
	VE3LNX		17	9	45
	VE3DSS		13	7	—
	VE3AIB		10	12	—
	XE2BC*		2	3	—

*Some states made via EME. —Information not supplied.

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

The IARU Stand at Telecom-87

TELECOM-87 was the fifth in a series of quadrennial world telecommunications exhibitions, and was sponsored and organized under the auspices of the International Telecommunication Union (ITU). It was held from 20 to 27 October 1987 at the exhibition and conference center PALEXPO in Geneva, Switzerland.

TELECOM exhibitions are recognized as prime events on telecommunications exhibition calendars. TELECOM-87 offered a complete overview of products, systems and services to all those concerned in developing faster, larger and more diversified means of communication in their respective countries. For the first time, the computer and data-processing industries were also present, showing the indissoluble marriage between telecommunications and computers.

The FORUM-87 conference, which took place during the exhibition and was attended by 3400 participants, was a "summit" at which one could meet and listen to the leaders of the telecommunications world—representatives of government, finance houses, scientific, technical and economic research institutes, the legal community, industry or user groups.

Under the theme "Communications Age: Networks and Services for a World of Nations," TELECOM-87 brought together 803 exhibitors from all parts of the world and displayed, in some 65,000 square meters of indoor and outdoor space, the state-of-the-art in equipment and technology. Forty countries had National Pavilions and over 260,000 visitors were registered.

The ITU had allocated to the International Amateur Radio Union (IARU) an L-shaped area of 31.5 square meters free of charge. The stand was located next to the main entrance hall of the exhibition center, a very strategic position indeed. IARU Region 1 had again requested the CERN Amateur Radio Club (CARC) to provide for the planning, construction, equipping and manning of an Amateur Radio Stand at this very important exhibition. (CERN is the European Laboratory for Particle Physics, based in Geneva.) CARC members organized Amateur Radio Stands at TELECOM exhibitions in 1975 and 1979. For TELECOM-87 our team consisted of some two dozen active radio amateurs and friends, of seven nationalities. These included F1ALB, PAØNOS/HB9PZT, HE9DKD, F1QY, F6GIK, F6FTA, F6FYI/PAØYJ, F6HYB, F6FYI's YL, F5LK/G3CML, F6DBG, LA9TJ, FC1GKF, F8RU, HB9BCU/SM5ABC, F61MS/OE6FOG, LA2RL/HB9CHL, HB9CHL's XYL, HB9CUY, HE9RMH, HE9JPC, and Horst and Paul Rebmann. In addition, the following overseas visitors, variously representing IARU, DARC and RSGB, helped to construct the stand and man it: N1CIX/JH1VRQ, G3FKM, W1RU and XYL, DF5UG, G3OUF and XYL, YT7MM, SP5FM and I1RYS.

TELECOM-87 being a professional exhibition on a world scale, it was our aim to exhibit various aspects of the high standards of Amateur Radio to a professional audience and to show some of its features to this international environment. The stand was, furthermore, also the meeting point for visiting radio amateurs. During the exhibition, several activities were organized for visiting amateurs from abroad, who were also invited by the president of the International Amateur Radio Club (EA2ADO) to operate 4U1ITU from ITU's headquarters building just a few minutes away.

The TELECOM-87 Amateur Radio Stand under construction. . . .

. . . and in operation.

W1RU shows off the computer information center to a couple of young enthusiasts.

The focal point of the IARU stand was the beautiful full-scale model of the JAS-1 (Fuji-OSCAR 12) satellite, which had been rebuilt so that the interior could be inspected. A nearby color monitor showed the orbits of presently operating amateur satellites in real time and antenna directions computed for the Geneva area. Other exhibits included the now-famous chopstick helical antenna, a computer on which visitors could key up various pages of Amateur Radio information, a large display of Amateur Radio publications from all over the world (including an introduction to Amateur Radio in Braille from Sweden and a guide on Amateur Radio Direction Finding from China), a continuously running video show of the seven most recent tapes about Amateur Radio (visitors could listen to the audio over telephone handsets placed strategically around the stand), and an operating packet-radio station on 2 meters. The back panels of the stand were decorated with enlargements of typical Amateur Radio subjects, with some very attractive pictures from China in particular. Also on display was a collection of some superb amateur-built microwave modules, including transceivers for the 24, 47 and 75-GHz amateur bands. And there was a 1296-MHz preamplifier kit and a packet-radio TNC for home construction. Other exhibits included beginners' items, miniaturized 80-meter transceivers for mountaintopping, ARDF, and a continuously running slide show of Amateur Radio activities from all continents, including the Antarctic.

The stand was manned for 10 days, at least 10 hours a day, by members of CARC and IARU. Hundreds of people visited us, some of them being radio amateurs who were attending TELECOM-87 because of their professional activities, others being officials of various administrations who were either already appreciative of Amateur Radio or who had some questions to ask.

One reason for our being present at TELECOM-87 was to promote Amateur Radio to those individuals, particularly young people, who would be receptive to more information about this fascinating activity and who could be recruited to become radio amateurs. (TELECOM-87 was open to the general public over the weekend at reduced entry fees.)

The other reason for our being present was to demonstrate the value of the Amateur Radio Service to representatives of administrations, to show them that Amateur Radio is an activity

(continued on page 73)

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
500 Riverside Dr, London, ON N6H 2R7
Tel 519-473-1668

430-450 MHz Update

Since mid-summer of last year, CRRL has been working with DOC to find an acceptable frequency for a Wind Profiler, a 1-MW-ERP Doppler-shift radar which Environment Canada plans to locate near Egbert, Ontario to detect tornadoes and other weather disturbances.

DOC's original assignment, 433.5 MHz, made without consulting any Amateur Radio organization, would have resulted in interference to weak-signal and amateur satellite operations near that frequency. CRRL did ask DOC to move the radar out of the 430-450 MHz band altogether. Frequencies in the 403-406 MHz range seemed suitable and were already being used by similar radars in the United States. However, there was concern that the Canadian radar would interfere with the SARSAT (*S*earch-*a*nd-*R*escue *Sat*ellite) system operating on 406.5 MHz. Department of National Defence also objected to use of these frequencies. That meant that the radar would have to be placed in the 430-450 MHz band where Radiolocation operation is primary and, unfortunately, Amateur and Amateur-Satellite operations are secondary. (For those unfamiliar with these terms, this means that a Radiolocation service may be placed anywhere in the 430-450 MHz band without reference to the needs of the Amateur or Amateur-Satellite services.) After consulting with interested parties and studying the alternatives, CRRL reluctantly recommended a frequency in the 441-442 MHz range. Choosing the exact frequency was a real challenge. Going low would adversely affect ATV operations. Going high would displace a number of busy repeater links. The final assignment, made by DOC in consultation with representatives of Toronto-area repeater groups, other Toronto-area users of the 430-450 MHz band, CRRL, CARF and RSO, was 441.0 MHz.

This will likely become the Canada-wide frequency for a number of Doppler-shift radars. Fortunately, Environment Canada is under severe budget constraints, and the first radar, the one to be located near Egbert, Ontario, will not likely be installed for at least two years. And because it will operate intermittently and because there are nulls in the spectrum it will occupy, its potential for creating interference is probably less than was first thought.

This will not be the last nonamateur incursion into the 430-450 MHz band. Such incursions are appearing with alarming regularity (see below). There may very well be a World Administrative Radio Conference (WARC) with reallocation authority around 1992. Given present demands for VHF-UHF spectrum, it is probably unrealistic to expect that the 430-450 MHz band could ever become Amateur and Amateur-Satellite primary. However, a coprimary assignment with Radiolocation is a realistic goal. This would cause DOC and spectrum management authorities around the world to take the Amateur and Amateur-Satellite services into consideration when assigning frequencies to Radiolocation. Something to think about, something to work for.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the Manitoba Section: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Name of the incumbent appears on page 8 of this *QST*. A petition, to be valid, must carry the signatures of five or more Full members of the League residing in the Manitoba Section. It is advisable to have more than five signatures. Photocopied signatures are not acceptable. Petition forms, FSD-129-C, are available from CRRL Headquarters in London, Ontario, but are not required. The following form is acceptable:

(place and date)
CRRL Field Services Manager
Box 7009, Station E
London, ON N5Y 4J9

We, the undersigned Full members of the League residing in the Manitoba Section, hereby nominate...(name and call sign) as Section Manager for this Section for the next two-year term of office....(signatures and call signs)...(addresses including postal codes)

A Section Manager must be a resident of his or her Section and a licensed radio amateur holding a Canadian Amateur Certificate or higher, and have been a CRRL Full member for a continuous term of two years at the time of nomination.

Petitions will be received at CRRL Headquarters until 1600 EST 1988 March 04. If only one valid petition is received, the person nominated will be declared elected. If more than one valid petition is received, a balloted election will take place. Ballots will be mailed from CRRL Headquarters on or just before 1988 April 01. Returns will be counted after 1988 May 24. A Section Manager elected as a result of these procedures will serve for a two-year term beginning on 1988 July 01.

If no valid petition is received, the Manitoba Section will be resolicited in 1988 July and August *QST*. You are urged to take the initiative and file a nominating petition immediately.

Jack Strangleman, VE3GV
CRRL Field Services Manager

CRRL NOTES

☐ CRRL Ottawa Liaison Ray Perrin, VE3FN, represented radio amateurs at a recent meeting of the Cable Television Advisory Committee (C-TAC). At that meeting, Ray expressed concern that present limits on radiation from cable systems do not adequately protect users of the VHF-UHF spectrum, that relaxed limits in the new Broadcast Procedures 23 (BP-23) were a step backwards, and that the ultimate solution to the problem of radiation from cable television systems was fibre-optics technology. Ray's comments were supported by the RCMP who reported problems—some impacting on public safety—right across Canada. Motorola also reported interference problems and noted that frequency congestion in most commercial bands precluded moving to alternate frequencies. All good messages for the cable television industry to hear.

☐ CRRL has learned with regret that the Board of Directors of CARF, the Canadian Amateur Radio Federation, "has concluded that there is no point at the present time in continuing with merger negotiations with the CRRL." CRRL remains on record (see Minute 12, 1987 Annual Meeting of the CRRL Board of Directors, 1987 October *QST*) as willing to work with CARF for the creation of a single Canadian Amateur Radio organization.

NOTES FROM ALL OVER

☐ Skiers on the joint Soviet-Canada Skitrek expedition will know exactly where they are, thanks to a fleet of international search-and-rescue satellites (SARSATs) and Amateur Radio. Each day, skiers will key an emergency locator transmitter (ELT) whose signals will be received by a SARSAT. A special address on the signal will prevent confusion with a signal from, say, a downed plane. Signals received by SARSAT will be analysed and the skiers' location will be determined. That location will be relayed to the University of Surrey in the United Kingdom and transmitted on 2 metres over the digitalker on the university's UoSAT OSCAR 11 Amateur Radio satellite. Skiers (and amateurs around the world who will be following the expedition) will be able to copy the location on an FM transceiver tuned to 145.85 MHz as the UoSAT OSCAR 11 satellite passes overhead.

Amateur Satellite Communications

Conducted By
Vern "Rip" Riportella, WA2LQQ
PO Box 177, Warwick, NY 10990

Introducing Phase 3C: Newest High Flyer Debuts Soon

If all goes well in the next few weeks, Amateur Radio satellite enthusiasts the world over will soon be enjoying the very latest in OSCARs. After a complicated series of launch delays spanning more than a year, AMSAT's newest and most powerful OSCAR ever sits poised and ready for action. What is it all about? How can the newest OSCAR be used? What can you expect from this satellite? These are some of the questions I'll address in a series of columns on the Phase 3C bird beginning this month. Subsequent columns will fill in the details. This first installment will give you a quick overview.

First, the Basics

Phase 3C is an OSCAR, an Orbiting Satellite Carrying Amateur Radio. The Phase 3 series, first conceived in the mid-'70s, comprises long-lived spacecraft placed in high, elliptical orbits. The C version is the third in the series.[1]

The elliptical orbit sought is a slight modification of the Molniya-type orbit used by Soviet communication satellites for years. The Soviets use the Molniya orbit because much of their territory is at high latitudes. Geosynchronous satellites, which by definition must be situated 22,300 miles above the equator, serve extremely high latitudes poorly. This is because from such latitudes, the geosynchronous satellites appear low on the horizon. That poses siting problems, and requires large-aperture antennas to focus on the satellite while rejecting noise and multipath effects from the ground.

Radio amateurs have used Molniya-type orbits for other reasons, however. The Molniya orbit can be thought of as semi-synchronous. For much of its orbit, the satellite is very high, about the same as a geosynchronous satellite. Moreover, its movement across the field of view of well-positioned ground stations is small for much of the orbit, especially around apogee, the high point of the orbit. But as the satellite approaches perigee, the orbit's low point, it quickly sweeps around the earth and out of view.

A series of Molniya-orbiting satellites could serve the Amateur Radio community much as a series of geosynchronous satellites. But, given the economic realities of building satellites, a fleet of coordinated Phase 3 birds is unlikely. And a single Molniya-orbiting OSCAR is far better than a single geosynchronous OSCAR as far as sharing the resource with all amateurs. Depending on the exact orbit attained, Phase 3C should provide hours of great DX daily for hundreds of users.

What Kind of DX?

In contrast to AO-10, which has a

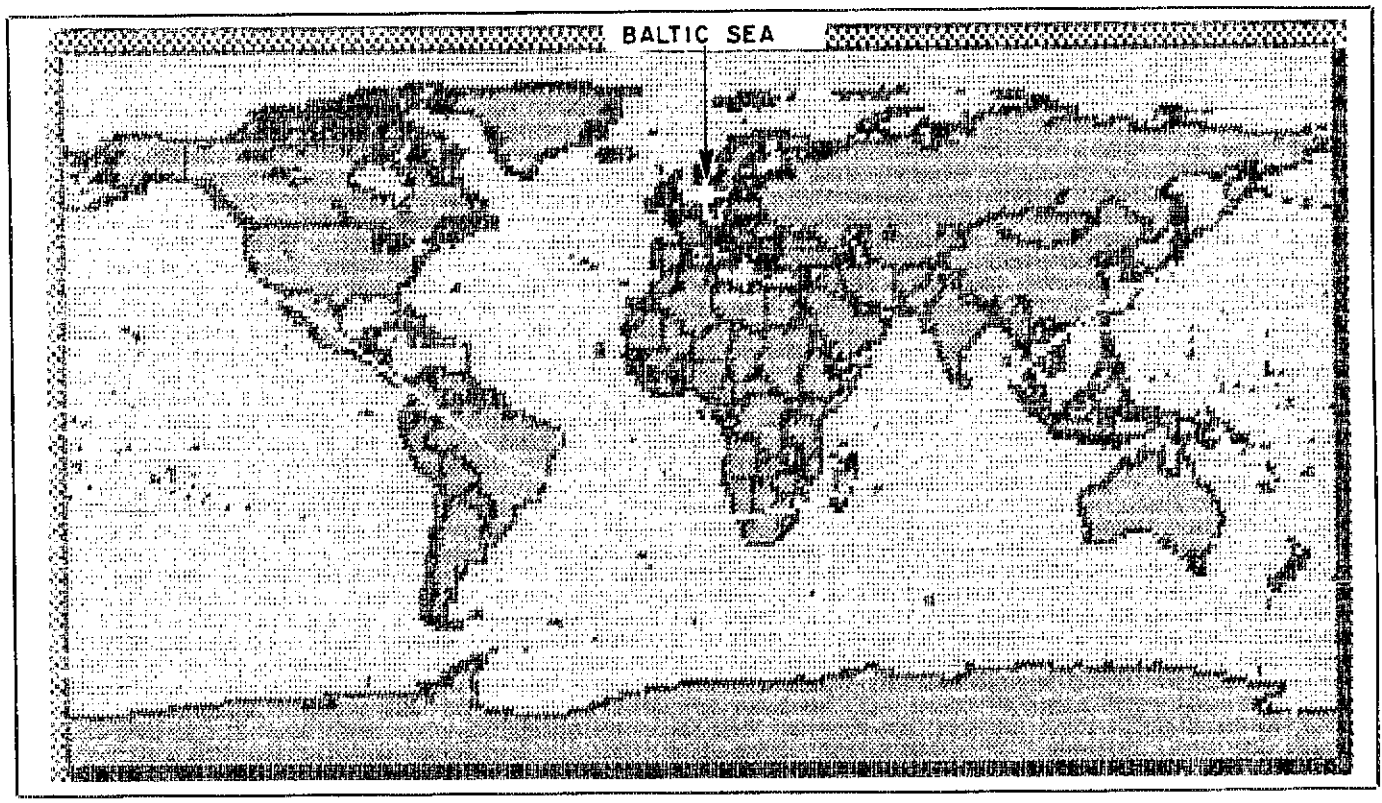


Fig 1—Typical Phase 3C "footprint." The footprint of a satellite includes all locations that can see the satellite, ie, are line-of-sight with it. All stations within the footprint can communicate with each other through the satellite. Here, the footprint is the area above the broad, apparently irregular, curve covering (mostly) the northern hemisphere. In fact, the footprint appears irregular only because of the distortions inherent in a Mercator-projection map.

In this rendering, the satellite is positioned over the Baltic Sea where the white cross is the sub-satellite point, or point directly beneath the satellite. The serpentine curve is the border of the footprint. From the satellite, the curve marks the earth's visible limb.

The footprint diameter varies with satellite height. Phase 3C's height will vary over approximately a 25:1 range in its planned ellipse. On occasion, Phase 3C's footprint will blanket as much as one-quarter of the earth's surface.

This is a section of a printout made using Graftrak II, a commercially available product of Silicon Solutions, which runs on IBM® PC or compatible computers only. For more information, contact Silicon Solutions, PO Box 742546, Houston, TX 77274-2546, tel 713-777-3057.

26-degree orbital inclination, Phase 3C satellites are designed to operate in a 58- to 60-degree inclined orbit. Thus, when apogee occurs over northerly latitudes, a station in the US can expect to work a huge stretch of territory as far east as Indochina (see Fig 1). Apogee will be about 22,000 miles, perigee about 700 miles. DX vistas will vary widely. However, from virtually any spot on earth, communications windows to rare DX locations will appear in long and short cycles.

Phase 3C is a communications satellite. It carries transponders, power-generating and conditioning equipment, attitude-adjustment equipment, a propulsion system and a command/telemetry computer.

Transponders are similar to terrestrial repeaters, but with some important differences. For example, all four transponders on Phase 3C operate cross-band (see Table 1). Cross-band operation is necessary to provide the desired suppression of the transmitted signal in the receive passband when operating a collocated receiver.[2]

Another significant difference between repeaters as used in terrestrial operation and satellite transponders is their bandwidth. Phase 3C will provide a passband several hundred kilohertz wide. Typical repeaters have a passband usually less than 10 kHz wide. Moreover, the Phase 3C transponders are linear repeaters. That means any modulated carrier heard on the input receiver (uplink) will be reproduced faithfully by the transmitter (downlink). Essentially, what goes in, comes out. Terrestrial repeaters usually run class C for efficiency reasons. FM passes through such repeaters very well; SSB not well at all.

For reasons of power conservation, the allowed modes of operation on OSCARs include SSB and CW, but not FM. Various special modes are also permitted. For example, although FSK packet radio is marginally acceptable, a very strong emphasis is being placed on using more efficient packet-radio modulation techniques. Primary among the preferred modulation techniques is phase-shift keying (PSK). PSK is used by AMSAT OSCAR 10's telemetry system, and is used on Fuji OSCAR 12's Mode JD (digital) downlink. Phase 3C's telemetry system will use PSK as well. PSK offers a huge signal-strength (at least 10 dB) advantage over FSK.

SSTV and AFSK RTTY are marginally acceptable for Phase 3C operation. The reason these modes are only marginally acceptable is that they waste so much of the satellite's power compared to the information content. In particular, AFSK RTTY has been thoroughly eclipsed by packet radio as a digital communications mode.

For similar power conservation reasons, FM voice operation is *prohibited entirely* on OSCARs. FM (and full-carrier AM for that matter) expend power even without modulation. Thus, pauses between words during speech *waste power*. In sum, SSB, CW and PSK are the recommended modes of operation on Phase 3C.

Table 1
Phase 3C Modes and Bands

Mode B:	70 cm up; 2 meters down
Mode JL:	24 cm and 2 meters up; 70 cm down
Mode S:	70 cm up; 13 cm down
RUDAK:	24 cm up; 70 cm down
Beacons: (MHz)	Mode B: general beacon 145.8125; engineering beacon 145.975 Mode JL: general beacon 435.650; engineering beacon 435.675 Mode S: 2400.640

A final difference between Phase 3C's transponders and terrestrial repeaters is that the passbands are inverted. That is, a rise in frequency in the uplink results in a fall in frequency in the downlink. Similarly, LSB transmitted on the uplink results in USB on the downlink.[3] Aside from some arcane mixing reasons for designing inverting transponders, this scheme reduces Doppler shift to a small degree.[4]

Next month I'll detail the station equipment you'll need to work any of Phase 3C's four transponders.[5]

Notes

[1]Phase 3A was lost because of a launch-rocket failure on May 23, 1980. Phase 3B was launched successfully on June 16, 1983, and is now known as AMSAT OSCAR 10. Tradition dictates that a satellite takes its name only after becoming operational.

[2]Repeaters typically use duplexers to achieve the required isolation of transmitted and received signals separated only by a percent or two of the operating frequency. The extremely high Q of cascaded cavities is necessary to notch out the transmitted signal from the receiver input. Cavities are bulky and heavy, and are impractical to carry on satellites. This dictates the need for cross-band operation.

[3]Operating convention prescribes that all downlinks should be USB. Thus, uplink signals to inverting transponders must be LSB; uplink signals to noninverting transponders must be USB.

[4]Doppler shift can vary from a few hertz to a few hundred hertz per minute on Phase 3 satellites.

[5]Send an SASE to AMSAT, PO Box 27, Washington, DC 20044 for information on how to get started on Phase 3C and on other satellites, and how to become an AMSAT member.

Strays

***QST* congratulates...**

☐ the following radio amateurs on 50 years as ARRL members:

- Emery Boring, W6IIF, of Klamath Falls, Oregon
- Lars Heyerdahl, LA6A, of Oslo, Norway
- George Myers, W8NXF, of Naperville, Illinois
- Donald Pile, K7EQ, of San Diego, California
- Walter Schmidt, W2EA, of Haddonfield, New Jersey
- Theodore Burmeister, W8BSS, of Cleveland Heights, Ohio

☐ the following radio amateur on 60 years as an ARRL member:

- Larry Kleber, K9LKA, of Naples, Florida

Mini Directory

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

Advisory Committee Members	Jun 1987, p 51	License-Renewal Information	Jan 1988, p 77
ARRL International EME Competition	Sep 1987, p 85	Major ARRL Operating Events and Conventions—1988	Jan 1988, p 78
Club Contest Rules	Jan 1988, p 86	Novice Enhancement Report and Order	Apr 1987, p 64
Considerate Operator's Frequency Guide	Jan 1988, p 13	Packet-Radio Frequency Recommendations	Sep 1987, p 54
Constitution Bicentennial WAS	Sep 1987, p 14	QSL Bureaus Incoming	Dec 1987, p 56
DX Contest Awards Program	This issue, p 86	Outgoing	Sep 1987, p 63
Element 2 Question Pool, New and Revised Questions, Answers	Apr 1987, p 23	Reciprocal-Operating Agreements	Jul 1987, p 51
Frequency/Mode Allocations	Jan 1988, p 77	Tech and General Written Exams	Apr 1987, p 29
Golden Jubilee of DXCC Award	Sep 1986, p 60	Third-Party-Traffic Agreements	Jul 1987, p 51
Hamfest Calendar Rules	Sep 1986, p 84	*VUCC Annual Listing*	*Dec 1987, p 68*
Landline BBSs	Oct 1987, p 56	What is Amateur Radio?	Dec 1987, p 75
		220-MHz Band NPRM	Apr 1987, p 16

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

If We Can Do It, So Can You Myrtle, NOØA

"If I can do it, anyone can," says Myrtle Jones of Bushnell, Nebraska. She is referring to her Extra Class license which she earned in October 1985. "My Extra Class call is very special to me and as near as I know, I was the third YL in Nebraska to earn an Extra. It was sure worthwhile. Now I can just enjoy radio—no more studying!"

Myrtle was first licensed in 1978. "We lived 25 miles from the nearest town of any size, and I knew it was going to be very lonely when our two daughters went to college and were on their own." Myrtle knew about Amateur Radio from her uncle (WØFCT) who had been on the air for years and was enthusiastic about radio's many activities. Myrtle decided that obtaining a license might be just what she needed now that the children were home less.

Paul Love (NNØC), in nearby Kimball, Kansas, offered a licensing class and since Myrtle and her OM were the only two who signed up, Paul gave them "semi-private" coaching in his home. "My OM and I were in our 60's at the time and for us, it wasn't very easy. In fact, I gave up twice before I earned my Novice ticket. Too many Q signals to learn! The second time I couldn't learn the theory but Paul said, 'If you quit now, it will make me look bad as a teacher.' I hadn't thought of it that way, so instead of quitting, I buckled down. Woody and I got our first tickets in 1978 with the calls KAØBWN and KAØBWM, respectively." An upgrade to Tech was earned in 1979, and General class in 1980.

Myrtle's enthusiasm for Amateur Radio was infectious. During the hot summer of 1983 Myrtle, with daughters Beth and Jane plus granddaughter Kathy, sipped gallons of ice tea as together they prepared for more radio exams. At the FCC field office in Denver, Colorado, Jane received her first ticket, a General class; Beth also earned the General, and Myrtle and Kathy upgraded to Advanced. "After that I started studying for my Extra ticket just to see if I could do it. And in October 1985 I became NOØA."

Now with "no more studying to do," Myrtle checks into five traffic nets daily on 80 and 40 meters. "I love the nets because I have made so many special friends there." Soon after she received her Extra, a friend in Greeley, Colorado, KØOJ, introduced her to the Geratol group, a WAS net which meets on 3.767 weekend evenings from October through April. "The first time I checked in, I was very surprised to hear so many different states and learn how quickly contacts were made. It was a thrill to hear stations in Hawaii, Alaska and Canada on the net almost every night." Now Myrtle is a regular check-in and waxes enthusiastic about the efficiency of the net, the professionalism of the net controls and the pride in earning her Geratol certificate number 997. "It was a real thrill to earn it and now it is a challenge to see how many endorsements I can add to it. I would encourage all YLs to go for their Extra Class ticket and join all of us on the Net. It is a lot of fun and very rewarding to be a part of such a fine group."

Sandra, WC5T

Sandra of Shreveport, Louisiana first learned about Amateur Radio from her sister Betty who was a shortwave listener. Betty's interest in listening to amateur transmissions led her and Sandra to a local hamfest in August 1981 to see what the hobby was all about. From there it was Novice classes for both YLs and by January 1982 they had their licenses. Because Sandra was a newcomer to Shreveport, Amateur Radio was the vehicle for meeting people and making new friends.

Why did Sandra decide to go for the Extra Class? "Pride of accomplishment, I suppose. Achieving an Extra Class license was one of the most re varding experiences of my life. The final upgrade requires a dedication and perseverance and when that ticket arrives in the mail, the pride in oneself is overwhelming," Sandra enthusiastically exclaims. "And now I can tell others that if I could do it, so can they!"

WC5T is currently one of the NCS for the Geratol Net and through the many friendships has found a "home" on 80 meters. "I suppose one could call this a duty, but it is a great pleasure for me to act as NCS on the Geratol Net. I look forward to opening the net and then taking over when another NCS becomes tired."

Sandra first came across the 80-meter group quite by chance one evening during the fall of 1985. She listened to the net operation for several weeks but waited until her Extra Class call arrived before she checked in (an Extra Class call is not required). "The NCS that particular evening asked if anyone in the state of Louisiana was listening who would like to check in. 'WC5T,' said I, and that did it. I was hooked. Now I feel like a part of a family of really neat people."

Even though net operations do not appeal to all amateurs, Sandra finds the Geratol Net and its endorsement program challenging and fun. "I check into the Net as often as possible for three reasons: to help others attain their 2-letter WAS certificate, to continue my quest to complete the 13 endorsements, and to meet with many dear friends."

Aside from the Geratol Net, Sandra is active on 40 and 10 meters, and plans to participate in more YL radio activities. She holds memberships in the Shreveport Amateur Radio Club, United Radio Amateur Club of Mansfield (LA), Radio 6909, ARRL, Ten-Ten and YLRL.

Gerry, NF1C

Gerry considers herself fortunate to be a Vermont amateur. "There is always someone out there who needs a confirmation from this state and I have no problems making contacts. How well I remember my Novice days on CW when I would put in a CQ and 10 QSOs (or three hours) later someone would tell me he or she had been waiting years for a Vermont QSO and QSL. My early years as a student in a one-room schoolhouse must have given me excellent concentration skills for working CW through QRM!"

Like so many others Gerry learned about Amateur Radio from local friends. When she first laid eyes on the station of Don, W1HXE, she had no idea how much interest she would have in Amateur Radio and how far it would take her. When Don offered to help Gerry get started, Ann, his XYL, remarked, "If you're going to do it, Gerry, so will I." Years later, Gerry says, "I think that says it all; you have to have the opportunity, a desire and the incentive and finally a challenge that is rewarding."

In 1978 Gerry became KA1AKI. Two years later she had her General license, was a regular on the Triple H Net and a charter member of the Old Man International Sideband Society. Even though her OM did not follow Gerry into Amateur Radio, he nonetheless was most supportive. "When I passed my Advanced he told me to go for the Extra. I quickly informed him that I had no incentive to try for the impossible but a time came when those thoughts changed!"

In the meantime Gerry learned what it was like to be a YL in a family in which there were no licensed OMs. "This situation was not without its frustrations, especially when the nearest amateurs lived 20 miles away, there was no radio club within a reasonable distance and the closest radio store was and still is so far away you don't have time to drive to it."

Gerry's work schedule as a registered nurse allowed her to be on the air at various hours of the day and night and as a result she has enjoyed a multitude of amateur activities. Aside from OMISS, Gerry checks into YLISSB, the MWB-Rooster, ECAR, the Yankee Lassies Net, the Vermont Sideband Net, Green Mountain Net and Cracker Net, as well as the Century Club. A year ago she realized that all the phone activity had caused her CW to slide, so out came the key, the books and in April 1986, through the VEC program, she passed her Extra and became NF1C. "This wonderful event was one year to the date of the death of my OM and I felt that the upgrade was my greatest tribute to his memory."

Having earned Extra Class privileges, Gerry soon discovered the Geratol Net and became a regular check-in. During the winter of 1987 she finished the basic WAS Geratol certificate and is now working on the many endorsements. "I have been delighted on numerous occasions to meet old friends on the Geratol Net, people whom I had worked years ago, who had upgraded and joined the net. Even though I have earned my Extra Class ticket, the feeling of accomplishment and achievement doesn't stop there. I strongly advise YLs to take an interest in this hobby because there are so many challenges and wonderful things you will never know about until you get involved with Amateur Radio."

IARU News

(continued from page 68)

which deserves their support not only in terms of adequate domestic legislation but also at international telecommunications conferences. Only time can tell how successful we were, but from the nature of the audience which visited our TELECOM-87 stand, and from the nature of the remarks that many of them made to us personally and in the visitors' guest book, we believe that the stand was a successful effort.

Many people participated in this effort. Previously we have mentioned the call signs of those who were most directly involved at the site, but there are many others who contributed ideas, publications, slides, photographs and equipment. Support came not only from individuals but from IARU societies. Last but not least, we are indebted to ITU Secretary-General Richard E. Butler for his continuing support of the Amateur Radio Service. In his words, he promotes "the Radio Amateur Service as an instrument of peaceful technological cooperation among radio enthusiasts from nations all over the world, also as an instrument of technological education in many of the Member countries of the Union."

We extend a hearty vote of thanks and appreciation to all of those who made this volunteer effort possible and successful. Their contribution of time and energy was truly outstanding,

ITU Secretary-General Butler visits the Amateur Radio Stand, and gets briefed by IARU Region 1 Secretary G3FKM on the left and CARC member F6IMS/OE6FOG on the right.

and without the leadership provided by the CERN Amateur Radio Club and its president, PAØNOS, this project could never have been successful.

[Editor's Note: This summary of TELECOM-87 was prepared largely by Jaap den Herder, F6FYI/PAØYJ, the driving force in the CERN Amateur Radio Club behind the organization of the Amateur Radio Stands at this and other TELECOMs, with a few editorial additions by W1RU.]

The TELECOM-87 design team (left to right): Yves Favereau, F6GIK; Frank Malthouse, F6DBG; Fritz Szoncso, OE6FOG; Bengt Sagnell, SM5ABC; and Jaap den Herder, F6FYI/PAØYJ.

Public Service

(continued from page 78)

receiving station (you) who establishes the exact frequency and calls the operator who will be transmitting the message. After you have received the message, do not be afraid to ask for fills if you missed something. The important thing is to get it all, and to get it correct. A message is no good to anybody if words are garbled or parts are missing.

The real payoff in traffic handling is delivery. This is the function that provides good public relations for Amateur Radio. Most of your deliveries will be by telephone. When calling, introduce yourself as an Amateur Radio operator and state that you have a message for that person. After reading the text (Don't bother with the preamble or address), offer to originate a reply. Explain that this is a free public service provided by Amateur Radio.

Occasionally, you will be unable to call the person for whom the message is intended. Their phone may be out of order or they have an unlisted number. In this case, copy the message onto an ARRL radiogram form and mail or deliver it personally. Make every effort to deliver the message in a timely fashion. If unable to reach someone by telephone, I mail the radiogram. However, this is not a requirement when handling traffic. It is expected that messages will be delivered by telephone. If you are unable to deliver the message, don't throw it in the wastebasket. After exhausting all possible means of delivery, send a return message to the originating station advising the reasons for nondelivery.

Join the Net Community

The equipment required to handle traffic is minimal. All that is needed is your rig, a good antenna, pencils, paper and the willingness to involve yourself. The time required can be as much or as little as you want to make it. Check into the net at least once a week; this will require about 30 minutes of your time every seven days. If possible, try to check in on the same day each week. Regular, systematic participation is the key to becoming an effective traffic handler. As you become more proficient (and more relaxed), you will become more involved and begin checking into other traffic nets. When you feel ready, volunteer to act as a liaison station. This will involve carrying traffic between your slow net and other section or region nets.

Those of you who are contesters or chase DX already possess many attributes of a good traffic handler; you have the learned ability to work stations in spite of QRM or QRN and have better-than-average CW ability. In addition, you have often invested heavily in superior equipment and antennas that maximize your signal.

Since this article is intended only to get you started, you will want to acquire more information. At least two publications should be in your library: the *Net Directory* (FSD-50, costing $1) and the *Public Service Communications Manual* (FSD-235, free of charge). Send a 10" × 13" SASE (two units of first class postage for each Net Directory) to ARRL HQ. In addition, request forms FSD-3 and FSD-218, which list standard ARL texts and QN signals.

Without question, the best source of additional information on handling traffic (and any other operating specialty, for that matter) is the *ARRL Operating Manual*. For a cost of $15, you get 688 pages of interesting and informative instruction and advice from the experts on how to best utilize your station.

So, if lethargy has settled into your keyer or you're growing tired of weather-report QSOs or have nothing to do between contests, listen in on—and check into—a slow-speed net. It will provide you with a painless introduction to the handling of message traffic. You will find yourself involved with one of the most satisfying facets of our hobby. Not only will you be able to work with some of the best operators in Amateur Radio, but you will experience the intense camaraderie that binds traffic handlers nationwide. These nets present a real opportunity to share yourself and your radio with family, friends and community.

Exploring Ham Radio

Conducted By Rosalie White, WA1STO
Assistant Manager, Club Services Department

Amateur Radio's Rewarding Facet: Teaching

Amateur Radio is multitudes of hobbies within the hobby. If you're looking for a new challenge within our great hobby, check out one of the most rewarding areas. Teach! Helping others to earn their license or upgrade their privileges is an aspect of Amateur Radio well worth exploring. Paula Uscian's (WB9WNN) favorite aspect of Amateur Radio is communicating, "the interaction/camaraderie with others, local or DX."[1] Going hand in hand is her wonder at this accomplishment using a "small gray box that can do so much." She decided to keep the mystique alive by recruiting prospective hams. Her club, Northwest ARC (IL), realized the potential of Novice Enhancement, which spurred them on to teach a Novice class. (In earlier years they held only informal sessions.) Paula wanted to be the "point position person, the organizer, getting the class off and running." She did this and then decided to teach, too. Her attitude: "*I'm* going to do it."

Who can teach? "Anybody who likes their hobby; anyone who exudes enthusiasm, someone animated." Paula stresses the "Amateur" in Amateur Radio. Don't be intimidated by technology; when there are two instructors, if one doesn't know a topic exactly, the other usually will. "If not, say 'I'm not sure, but I'll find out.'" Some hams have delved so deep into theory that they can't rise to the simple teaching level and shouldn't be teaching.

Organize

Paula sees teaching the Novice-level class as a "juggling act." Prospective Novices range widely in their abilities. She encourages comments and questions after each session to better know these abilities. Did we cover the material too fast tonight? (Students voted to change the length of the classes from two to three hours.) Did you get bored? Did you understand the analogies we presented? "There are many side trails to get on and often you must say 'we'll discuss that after class,' if it's of no interest to, or not needed by, the rest of the class." Organization is the key to Paula's teaching success. "Everyone's time is limited so you must organize materials before the first class." Reorganize after several sessions, if necessary, concentrating on what is most difficult for the majority. If you are organized, the class will feel it. If you're confused, they'll be confused.

[1]Paula Uscian holds a BS in Communications Studies from Northwestern University (IL) and a JD from Loyola University (IL).

Involve the Club in the Class and the Class in the Club

Northwest ARC hopes for new blood/members drawn from the class. From the start of the class, members were paired with students. Accomplishments included one-on-one code practice, some questions better understood than at the class session, assistance with trimming a dipole, a less shaky first QSO with a shoulder to lean on. (Paula recalls apprehension at tuning up her TS-520 as a new licensee until club members demonstrated the techniques.) Not just the instructors sell Amateur Radio fun and enthusiasm, but the whole club. Students were personally invited to the club meetings at the start of the class and associate membership was explained. The students relate to on-the-air contacts halfway around the world or via 2 meters. So, every two or three class meetings, club members brought various transceivers and mobile radios and made live QSOs. Paula planned to reemphasize the need for effective Elmering to members at the end of the class—she is also NARC president. And the club is organizing a Tech/General followup class in January, with a team-teaching approach.

In class Paula and club members relate anecdotes and "war stories" to illustrate points. *Tune in the World* is the basic text and reference manual. "Students don't flounder after they have their license because everything is in *Tune in the World*." Everything from "What is capacitance?" to "What is WAS?" is there.

Code

Class experiences proved code the most difficult aspect to teach. For future classes Paula plans more emphasis on code and will more actively address the way it's taught. Presently, *Tune in the World* tapes are used with supplemental QSO tapes (members with computers find it easy to generate these) and actual in-class QSOs. She wants more sharing of class members' best and worst solutions to learning problems and their mnemonic devices. (Some said "5-letter/number random groups frustrate and bore.") She wants to give more advice ("There is no magic way—for some it is not easy"). And more advice ("Train yourself to move on if you miss a letter—don't break your concentration").

Evaluation

Paula learned as much during the class as she did setting up the course—learned about people, about learning, about relearning technical topics in order to convey the knowledge to newcomers. "The first time around is the hardest, but it really isn't that hard. In fact it's fun." Students evaluated the course at the end of the term, answering such questions as: "How did you hear about the class? How would you change code teaching; theory presentations? Too slow? Fast? Will you upgrade?"

Sell Amateur Radio

Teaching is a challenge, but a rewarding one. As an Amateur Radio instructor you're as much a salesperson as a teacher, throughout the class session. Sustain their enthusiasm. Organize well. Involve your club in the class and your students in your club. Emphasize those areas needing the most work and evaluate progress continually.

The ARRL offers several useful tools should you want to explore teaching ham radio. Find out about our new *Novice Instructor Guide*—an excellent teaching resource completely redone to cover public relations, detailed lesson plans with graphics for overhead projectors, quizzes, etc, thoroughly encompassing Novice Enhancement. *Instuctor Guides* are also available for Technician, General and Advanced/Extra classes. Find out what other aids we have available, such as sample Novice exams, through our Registered Instructor Program. Contact the Club Services Department at HQ.

Strays

***QST* congratulates...**

☐ Charles Bodson, W4PWF, of Arlington, Virginia on being elected Executive Vice President of the IEEE. Bodson is a *QST* author (his series, "Electromagnetic Pulse and the Radio Amateur," appeared in Aug, Sep, Oct and Nov 1986).

☐ Ted Rappaport, N9NB, of West Lafayette, Indiana on receiving a PhD in Electrical Engineering from Purdue University. He will be joining the Virginia Tech EE faculty in March 1988.

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.

Florida (Brooksville)—Feb 27. *Sponsor:* Hernando County ARA. *Time:* 8 AM. *Place:* Hernando County Fairgrounds Auditorium. *Features:* Exams, swap tables. *Talk-in:* 146.115/715. *Admission:* Advance $2, Door $3. *Tables:* $8. *Contact:* SASE to HCARA, Hamfest Chairman, PO Box 1721, Brooksville, FL 34601. Exams contact, Regis Kramer W4ILE tel 904-796-6802.

Georgia (Dalton)—Feb 27. *Sponsor:* Dalton ARC. *Time:* 9 AM-3 PM. *Place:* North Georgia Fairgrounds. *Features:* VE exams. *Contact:* Tom Smith, 1700 Vann Way NW, Dalton, GA 30720.

†**Illinois (Sterling)—March 20.** *Sponsor:* Sterling Rock Falls ARS. *Time:* 7:30 AM-3 PM. *Place:* Sterling High School Field House, 1608 Fourth Ave. *Features:* VE testing (contact Jim Buikema, 512 N Genesee St, Morrison, IL 61270 or tel 815-772-7874), concession stand, space to accommodate self-contained campers overnight. *Talk-in:* 146.25/85 *Admission:* Advance $3, Door $4. *Tables:* $5. *Contact:* Susan Peters, tel 815-625-9262.

Indiana (Indianapolis)—March 13. *Sponsor:* Morgan County Repeater Assn. *Time:* Dealers 6 AM-8 AM, Public 8 AM. *Place:* Indiana State Fairgrounds Pavilion Building. *Features:* VEC exams, women's programs. *Talk-in:* 145.25. *Admission:* Door $5. *Tables:* 8-ft flea-market table (including space) $8 each. *Contact:* SASE before Feb 26, 1988 to Aileen Scales, KC9YA, 3142 Market Pl, Bloomington, IN 47401, tel 812-339-4446.

Indiana (LaPorte)—Feb 28. *Sponsor:* LaPorte ARC. *Place:* LaPorte Civic Auditorium. *Features:* Forums, Midwest Microwave Society's construction exhibit and seminar (bring SHF projects). *Admission:* $3. *Tables:* $3 reserved in advance. *Contact:* SASE, LPARC, PO Box 30, LaPorte, IN 46350.

Indiana (Winchester)—March 6. *Sponsor:* Randolph ARA. *Time:* 8 AM-3 PM. *Place:* Winchester National Guard Armory. *Features:* Electronics exams, refreshments and free parking. *Talk-in:* 147.90/30 and 224.04. *Admission:* $3 advance, $4 at door, children 12 and under free with an adult. *Tables:* 3 × 8-ft table and space $5 (tables limited) space only $3, set up March 5 6 PM to 8 PM, March 6 6 AM to 8 AM. *Contact:* RARA, Kedrick Robbins W9QUH, RR 1 Box 389, Parker City, IN 47368, tel 317-468-6568.

Iowa (Davenport)—Feb 28. *Sponsor:* Davenport Radio AC. *Time:* 8 AM-3 PM. *Place:* Davenport Masonic Temple. *Features:* flea-market, VE testing, food. *Contact:* For flea market tables and advance tickets, Davenport Radio Amateur Club, 2131 Myrtle, Davenport, IA 52804.

Massachusetts (Chicopee)—March 6. *Sponsor:* Mt Tom ARA. *Time:* Vendors 7 AM, Public 9 AM. *Place:* Knights of Columbus, Council 69, Granby Rd. *Features:* Refreshments, computer, electronic and amateur vendors, exams (applicants must bring check for $4.55 payable to ARRL/VEC, positive ID, original and photocopy of license and any interim certificates). *Talk-in:* 146.94, 223.82 repeaters, 146.52 simplex. *Admission:* $2, non-ham spouse and children under 12 free. *Tables:* Advance $8, Door $10. *Contact:* Marvin Yale, N1CDR, 6 Laurel Terr, Westfield, MA 01085, tel 413-562-1027 (N) or (D) 413-532-6411 or 413-532-4891.

Massachusetts (Marlboro)—Feb 14. *Sponsor:* Algonquin ARC. *Time:* 10 AM-2 PM, sellers 8 AM. *Place:* Marlboro Middle School Cafeteria, Union St, off Rte 85, wheelchair accessible. *Features:* Electronics, flea market. *Talk-in:* 146.01/61, 146.52. Admission: $2. Tables: Advance $8, Door $10. Contact: Dan KB1WW at 617-481-1587 or AARC, Box 258, Marlboro, MA 01752.

Michigan (Traverse City)—Feb 13. *Sponsor:* Cherryland ARC. *Time:* 8 AM-1:30 PM. *Place:* Immaculate Conception Middle School gymnasium, 218 Vine St. *Talk-in:* 146.85 rpt. *Admission:* $3. *Tables:* $5. *Contact:* Mick Glasser N8DBK, 4102 Peninsular Shrs Dr, Grawn, MI 49637 tel 616-276-9203.

†**Minnesota (Medina)—Feb 27.** *Sponsor:* Robbinsdale ARC. *Time:* 7 AM-3 PM. *Place:* Medina Ballroom, 10 miles west of Minneapolis on Hwy 55, 4 miles west of Interstate 494. *Features:* VEC testing. *Talk-in:* 147.60/00. *Admission:* Advance $3.50, Door $4. *Contact:* Bob Zeidlik WAØSUA, 5933 Decatur Ave N, Minneapolis, MN 55428 tel 612-533-7354.

†**North Carolina (Elkin)—Feb 21.** *Sponsors:* Foothills ARC and Briarpatch ARC. *Time:* 8 AM-5 PM. *Place:* National Guard Armory, two miles west of I77 from Exit 85. *Features:* Exams. *Talk-in:* 144.77/145.37 and 146.52 simplex. *Contact:* Ed Mulholland, KA4WWV, Rt 4, Box 424-H, North Wilkesboro, NC 28659, tel (D) 919-838-2171 ext 2427, (N) 919-667-4568.

Ohio (Cuyahoga)—Feb 28. *Sponsor:* Cuyahoga Falls ARC. *Time:* 8 AM-3 PM. *Place:* Akron North High School, call Bill Sovinsky (below) for directions. *Talk-in:* 147.87/27. *Admission:* Advance $3, Door $4. *Tables:* Advance $5, Door $6, sellers may bring own tables. *Contact:* Bill Sovinsky K8JSL, 2305 24th St, Cuyahoga Falls, OH 44223, tel 216-923-3830.

†**Ohio (Lorain)—Feb 7.** *Sponsor:* NOARS. *Time:* Dealer 6:30 AM, Public 8 AM. *Place:* Gargas Hall, ¼ mile west of Rt 57 on North Ridge Rd. *Features:* swap and shop, food, exams. *Talk-in:* 146.70 *Admission:* Advance $2.50, Door $3. *Contact:* John Jones, WA8CAE, 41751 North Ridge Rd, Elyria, OH 44035, tel (D) 216-277-7600, (N) 216-282-4256 or 282-2123.

†ARRL Hamfest

†**Ohio (Mansfield)—Feb 14.** *Sponsor:* Inter City ARC and MASER Inc. *Time:* 7 AM-4 PM. *Place:* Richland County Fairground, off of US 30. *Features:* Food, forums, packet, DX, ARES. *Talk-in:* 146.94. *Admission:* Advance $3, Door $4. *Tables:* Advance $5, Door $6. *Contact:* Dean Wrasse, KB8MG, 1094 Beal Rd, Mansfield, OH 44905, tel after 4 PM 419-589-2415.

Oregon (Salem)—Feb 20. *Sponsor:* Salem and Oregon Coast Emergency Repeater Assn. *Time:* 9 AM. *Place:* Polk County Fairgrounds. *Features:* VEC testing, flea market, exhibits, commercial dealers. *Talk-in:* 146.26/86. *Admission:* Advance $4, Door $5. *Contact:* Salem Repeater Assn, PO Box 784, Salem, OR 97308.

†**Texas (Harlingen)—Feb 20-21.** *Sponsor:* South Texas ARS. *Time:* Sat 9 AM-5 PM, Sun 9 AM-3 PM. *Place:* Hwy 77 to Fair Park Blvd exit, then east approx 1 mile to Municipal Auditorium and Casa de Amistad. *Features:* International conference ARRL/LMRE and FCC/SCT swapfest, women's activities, dealer/exhibitor display, banquet, refreshments. *Talk-in:* English 147.39 repeater, Spanish 146.700 repeater. *Admission:* Advance $5, Door $6. *Contact:* STARS, 2210 S 77, Harlingen, TX 78550, Bob Tichenor, tel 512-423-6407.

†**Texas (Port Arthur)—Feb 6-7.** *Sponsor:* Texas VHF-FM Society. *Time:* Sat 8 AM-5 PM, Sun 9 AM-12 PM. *Place:* Holiday Inn Park Central, 2929 75th St. *Features:* flea market, seminars, business meeting. *Talk-in:* 145.47 and 224.00. Admission: $5. Contact: B. Brown KD5CR, 2330 Friar Tuck Ln, Groves, TX 77619.

†**Virginia (Vienna)—Feb 28.** *Sponsor:* Vienna Wireless Society. Time: 8 AM-4 PM. *Features:* Food available. *Talk-in:* 146.085/685 (VWS rpt). *Admission:* $4. *Contact:* Mitch Amos AA4WV, 11601 Vale Rd, Oakton, VA 22124.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

Coming Conventions

OHIO STATE CONVENTION

February 27-28, Cincinnati

The Ohio State Convention is sponsored by The Committee for Amateur Radio/Hamilton County ARPSC. It will be held at the Cincinnati Gardens Expo Annex, 2250 Seymour Ave. Time is 8 AM-6 PM both days. Forums, meetings (both ham radio and non-ham alternative), FCC license exams, large flea market, commercial exhibitors, banquet, hot food served on premises, handicapped facilities. Talk-in on 145.21. *Admission:* in advance $4.50, at the door $6. Contact for flea market, Lynn Ernst, WD8JAW, 4553 Patron Ct, Cincinnati, OH 45238, tel 513-921-4882. Commercial exhibitors and vendors, Joe Weinle WD8JGB, 6060 Dryden Ave, Cincinnati, OH 45213, tel 513-731-3208.

February 6-7
Southern Florida Section, Miami, FL

February 26-28
Ohio State, Cincinnati, OH

ARRL NATIONAL CONVENTIONS

Sept 9-11, 1988—Portland, Oregon
June 2-4, 1989—Dallas-Ft Worth, Texas

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.

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

N1AQW, Frank R. Goodwin, Waterboro, ME
N1BYW, Benedict Orlando, Medford, MA
W1DXL, Edward V. Moran, Norwalk, CT
WA1EFO, Larry R. Douglas, Ballardvale, MA
KA1ETH, Philip Ostroff, Fall River, MA
W1HQ, Frank B. Hawley, New Haven, CT
K1IDP, George M. Oberg, Bridgton, ME
W1MME, Burgess H. Rudderham, Hull, MA
W1SHZ, Arthur W. Lundeen, Sharon, CT
W1VMD, Raymond G. Low, Concord, NC
W2ACB, Lyle H. B. Peer, Horseheads, NY
W2AQT, Robert H. Powell, River Vale, NJ
WA2BUA, John A. Caswell, Owego, NY
WA2DTF, Leslie R. Schelling, Delmar, NY
W2FPX, Lester L. Van Patten, Schnectady, NY
WB2FXL, Clifton R. Potter, Leroy, NY
N2FYC, Raymond A. Putman, Redwood, NY
WB2GAU, Purcell J. Brownell, Brookview, NY
W2GCB, Frank R. Canning, Knoxville, TN
W2GDP, Philip J. Eastman, Port Orange, FL
WA2HIS, Edward J. Chmielewski, Schenectady, NY
K2KAM, Paul R. Noye, Tonawanda, NY
W2LGE, William K. Harman, Williamsville, NY
K2QOV, Herbert B. Baynon, Stony Brook, NY
K2REV, Ernest Black, Hurley, NY
KC2VW, Robert G. Farrell, Hamburg, NY
KA2WJI, Everett M. Stevens, Schenectady, NY
N3AXH, James O. Plummer, Jr, Dover, DE
K3BI, Leo C. Levitt, Washington, DC
W3BJW, Leonard R. Owings, Glen Rock, PA
W3GWY, Wilmer J. Zember, Leesport, PA
W3HL, Milton W. Hickman, Crisfield, MD
W3KAL, Thomas A. Pendleton, Fulton, MD
W3LZD, Frederick W. Tuckerman, Dunmore, PA
W3PSV, Roy N. Boorse, Philadelphia, PA
K3WGI, Raymond R. Schwartz, York, PA
K4BTD, Robert C. Menking, Annandale, VA
*K4CGV, Stewart J. Baker, Tallahassee, FL
W4EAB, John L. Morgan, Sr, Fort Walton Beach, FL
W4FLY, Joseph M. Bruner, Nashville, TN
K4FSJ, William M. Nash, Dayton, TN
KA4GIV, William E. Rigley, Tequesta, FL
KB4HJR, Richard A. Cleveland, Sr, Gold Hill, NC
K4IJR, Norman F. Sendelbach, Lynn, NC
K4IKK, Gordon L. Davy, Harrisonburg, VA
K4IXI, B. Calvin Droke, Trinity, AL
K4MOA, James A. Holder, Clinton, TN
W4MUH, Fred H. Finger, Clinton, TN
N4QX, Harold R. Robinson, Manassas, VA
KA4QXL, Prime A. Beaudoin, St Augustine, FL
W4SWT, Fred J. Daniels, Mabank, TX
W4UQS, Harry L. Appleby, Atlanta, GA
KA4VHQ, Daniel B. Scoggins, Stone Mountain, GA
W4ZZZ, Roland O. Akre, Miami, FL
W5BAR, Robert V. Freeland, Tulsa, OK
W5BFI, Alexander Clarke, Jr, Midland, TX
WA5CZF, Michael W. Mayer, Jr, New Orleans, LA
AF5E, Donald C. Gordon, Los Lunas, NM
W5FJE, Cedric H. Senter, Albuquerque, NM
KF5GF, Jerry W. Terrell, Kerrville, TX
WB5HRC, Clyde R. Nelson, Oklahoma City, OK
KT5I, Arthur M. Hoffman, Hobbs, NM
W5IT, Earley M. Shook, Dallas, TX
W5IWZ, Marvin E. Barnes, Alvord, TX
WA6CGZ, B. C. Noel Marshall, Fullerton, CA
N6DJG, Russell S. Ohl, Vista, CA
W6JF, Benjamin B. Jackson, Capistrano Beach, CA
W6KZF, William J. Ray, Mill Valley, CA
K6MDY, Monte L. Brink, Belmont, CA
W6PXP, Joseph R. Foristiere, Fresno, CA
K6QBF, Clarence Fred Inniss, Camarillo, CA
K6QO, Henry F. Schreiber, Santa Barbara, CA
W6SAQ, Kenneth R. Turnbaugh, Covina, CA
W6SY, Donald W. P. Larnach, Ithaca, NY
W6UQQ, Edward Sassaman, Lakewood, CA
N7AST, Andy E. Schaefer, Hackensack, MN
WL7AZY, Thomas L. Auer, Seattle, WA
KD7EU, John Eriksen, Richland, WA
KA7KQB, F. M. Hendricks, Jr, Idaho Falls, ID
W7LLB, Charles S. Goodrich, Coupeville, WA
WB7ULJ, David W. Reeves, Vancouver, WA
W8ANP, Joseph R. Desch, Kettering, OH
K8CYW, Roland Dean Sturm, Huntington, WV
W8DQV, Theodore C. Hasselquist, Minerva, OH
WB8EDO, Earl W. Adey, Marion, OH
W8FQT, John Chromick, Bellbrook, OH
WB8JJR, Harold R. Carter, Dolan Springs, AZ
W8MC, Thomas R. Cornett, Dayton, OH
W8MFX, Harry C. Blackburn, Dayton, OH
W8NEE, James A. Canter, Englewood, OH
WD8RGJ, Philip P. Joseph, Charleston, WV
KA8RHP, Verna P. Sokolowski, Mount Clemens, MI
K8SPI, Carl Nelson, St Helen, MI
W8YFI, Dickson M. Decker, Fort Pierce, FL
W9JTX, Louise M. Beringer, South Bend, IN
W9OEV, Lonnie O. Ester, Wickenburg, AZ
K9PUE, John S. Dzielski, Chicago, IL
WB9RZW, Ronald J. Skinner, Fayetteville, GA
W9SP, Harold E. Blough, Orange City, FL
W9VNG, Dolores V. Leiser, McHenry, IL
WØFS, William F. Smith, Denver, CO
WØGAZ, David F. Stodden, Kansas City, MO
KAØOAW, Ben Q. James, Jr, Aurora, CO
WØPOX, Leonard F. Ziegler, Omaha, NE
WØYCD, Charles Cunningham, Lamar, CO
VE3FX, Leo Boyer, North Bay, ON
VE3UC, Al A. Cumming, Orangeville, ON
VE4DL, Reg V. Durie, Winnipeg, MB
VE7EH, Vern J. Read, Langley, BC
VE8BZ, Dennis Inks, Inuvik, NT
G6IF, Morris E. Tapson, High Wycombe, Bucks, Great Britain

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ. Canadian reports should be sent to the CRRL HQ address on page 9.

Correction: The January 1988 issue of *QST* listed Daniel Benard, AB1Q, as a Silent Key. We are very happy to report that this was a clerical error.

50 Years Ago

February, 1938

☐ Ross A. Hull has been named Editor of *QST*, formally recognizing the tasks he has already been performing for some time. His management of the "technical development program" to prepare amateur radio for the Washington convention restrictions of 1929, and his pioneering work in u.h.f. DX, are only two of his outstanding accomplishments.

☐ The Kennelly-Heaviside layer is still somewhat of a mystery in the ways it provides us long distance communication, but George Grammer attempts to explain the intricacies of sunspots, the eleven-year cycle (currently near a peak) and the prospects for DX on u.h.f.

☐ Seventeen nations at the first Interamerican Radio Conference in Havana showed a "complete willingness to assign our frequency bands to us exclusively, and a whole-hearted pledge to support our bands at the (coming) Cairo conference."

☐ Not so in other quarters. Japan has proposed deleting our 160-meter band entirely, allocating only 100 kc. each at 80 and 40 meters, and only 200 kc. at 20 meters shared with fixed and mobile services! Nothing at all above 28 Mc.

☐ The second part of W1JFN's treatise on "Cairo" is mildly reassuring, however, giving considerable detail on past conference actions and how the League is preparing in depth for the forthcoming battle.

☐ W1JEQ produces a neat little 100-watt transmitter for the three major bands, using a pair of the new 809s in the final.

☐ A tuned-r.f. receiver in these days of progress to superhets? Messrs. Gager and Graham of Boston College developed an acoustical filter dubbed the "Selectosphere" which they claim competes well with higher-selectivity circuits.

☐ Prompted by the high cost of 250 feet of commercial coax, W2BZR decided to build his own low-loss low-impedance line from thin-walled brass tubing, Isolantite beads, and hard-drawn #12 bare copper wire for the center conductor.

☐ W8QBW named his 6L6 crystal rig the "QSL Forty" because the chassis is the size of a QSL card and the output is 40 watts. (Little did Fred know he was starting a coterie of devotees to the low-power, small-rig craze.)

☐ Again this year the DX contest will have separate voice and telegraphy sections, each running a full nine days.

☐ Ten meters is hot and occupancy is heavy, so W1HRX and W1BZR built preselectors to combat the QRM, one being a deluxe model with acorn tubes.

☐ W2FZQ and W2GNL tried "center-tap" (cathode bias) modulation for their simple 56-Mc. rig and were pleased with the results.

25 Years Ago

February, 1963

☐ Should we have restricted voice bands again? The Editor finds that many amateurs believe the 1952 deletion of the Class A license and opening all bands to the standard license has bred mediocrity and resulted in deterioration of the general level of our technical knowledge. He solicits views on whether we should upgrade amateur standards by a revised system of incentive licensing.

☐ K8WYU thought the popular quad should work as well on v.h.f. as on the lower bands, and so built an interlaced 50- and 144-Mc. setup light enough to be handled by a TV rotor.

☐ The speech compressor constructed by W3ZVN amplifies weaker voice passages more than strong ones, so the average modulation level is higher—more "talk power."

☐ W1QMN and W2BVU are working with pulse techniques on our 2300-Mc. band, and DX results are comparable with those on v.h.f. Using 4-foot parabolic dishes, the theoretical range is nearly 200 miles.

☐ The T18 (ARC-5) surplus unit sells for as little as $5, and Novice mentor W1ICP describes a conversion to make it a 160- and 80-meter rig, voice or telegraphy, at 100 watts. It can be used as a v.f.o. as well.

☐ With two highly-successful amateur satellite launches behind them, the Project Oscar crew is looking to #3—but this time with a full translator system instead of just a beacon. Bill Orr relates the progress to date in breadboarding the unit, and how some of the problems are being solved.

☐ Hidden transmitter hunts in the U.S.A. normally involve riding in motor vehicles, but in Europe it is all done on foot. The second European foxhunt was held in Yugoslavia last August and involved four hidden rigs on 3.5 Mc. and three on 144 Mc.

☐ The legislature on Guam adopted a resolution commending amateurs for their emergency communications performance during typhoon Karen.

☐ W2AOE has made extensive studies of band occupancy, and *QST* presents the statistical results to stimulate general discussion, without taking sides. Dana's first conclusion is to outlaw a.m. on the lower bands.

☐ Inflation, inflation! The price of a first-class postage stamp has gone up to five cents.

☐ More than 250 stations were active in the second world-wide RTTY Sweepstakes, but only a fourth of them bothered to submit logs.

☐ The trend to sideband use for v.h.f. work puts additional stress on receiver performance, and W1EYM finds that a double-conversion converter with a single oscillator improves stability and image rejection.—*W1RW*

Slow-Speed Nets: Learning the FUNdamentals of Handling Traffic

By Bradley Wells, KR7L,
ARRL Section Manager, Washington

The ARRL National Traffic System provides a means for all Amateur Radio operators to send messages for family, friends and the general public. NTS does this by making available a structure for an integrated traffic facility designed to achieve the utmost in two principal objectives: (1) the rapid movement of traffic from origin to destination, and (2) the training of amateur operators in both the handling of written traffic and—equally as important—the proper method of participation in directed traffic networks. Here, ARRL Section Manager Wells provides some welcome insight into the easy path to traffic handling proficiency—the slow-speed traffic net.

Sooner or later, many amateurs reach a stagnation point in their hobby; firing up the rig seems to lack purpose or direction. The thrill of instantly communicating across states or continents no longer raises our blood pressure. The spectre of another name-rig-weather QSO creates indigestion and tends to keep us off the air. However, there is a specialty within Amateur Radio that can bring back the old excitement, broaden our horizons, and give us a new perspective on our hobby—traffic handling.

Handling traffic is one of the oldest and most enduring aspects of our hobby. It provides a direction and reward found nowhere else. Handling message traffic puts real meaning in the term "Amateur Radio Service." It is the most visible form of Amateur Radio and has done more for our public image than any other operating specialty. It is, for most citizens, the only positive contact with Amateur Radio operators and their hobby.

The primary problem for most of us is determining where to start. How can we painlessly acquire a working knowledge of this specialty? Slow-speed nets provide an entry level to the world of traffic handling. In addition to providing a public service, they function as a training ground for neophyte traffic handlers. The primary purpose of these nets is teaching the correct procedures for handling formal, written message traffic. Hopefully, the term "formal, written message traffic" will not scare you away; it is simply a descriptive term for the type of messages you will send and receive.

Slow-speed nets, as their names imply, are CW nets. CW is, perhaps, the best mode to learn traffic handling. In these days of instant voice and digital privileges, it is refreshing to note that "pounding brass" is a superior teaching and learning tool. If you learn to handle traffic using CW, the transition to voice, RTTY or packet is much easier. The advantages to CW are ease of operation, reception under poor conditions and streamlined transmission of messages. This last is the most significant; messages sent via CW are free of superfluous information and comments that often accompany messages sent by voice or other modes.

Slow nets typically operate at speeds of 10-13 words per minute. If you are a new Novice or "rusty" old-timer, don't let this scare you away; any of these nets will slow down to whatever speed is required to accommodate you. Most often, they operate on a frequency within the 80-meter Novice band. Thus, these nets are available to all amateurs regardless of license. Surprisingly, Novices do not form the bulk of a slow net's members. There are people of all ages and license class who are new to traffic handling. The membership of a typical net consists of ⅓ Extra Class, ⅓ Advanced or General, and ⅓ Novice or Technician. In many cases, those operators with higher class licenses stay with slow nets in the desire to teach traffic handling to the newer operators.

The geographic area covered by these nets is normally a single state, but will vary depending upon the population of the service area. No traffic net functions as an independent entity; thus, slow-speed nets have ties with both section and region nets to facilitate the routing of their traffic.

Net Procedures

Slow-speed nets, like other traffic nets, follow a set routine each and every time they are on the air. At the appointed time, the NCS (Net Control Station) begins that evening's session with the preamble. A preamble is nothing more than a short statement of the net's function. While it is designed to attract new members, the primary purpose of a preamble is to let everyone find and zero beat with the Net Control Station. A cardinal rule of net operation is that the NCS establishes the exact net frequency. This rule applies to all nets, regardless of mode. You must learn to properly zero-beat with the NCS, which means being exactly on the same frequency as he is. With a transceiver, a received tone of between 500 and 1000 Hz will get you reasonably close. If you fail to do this, you may end up transmitting outside the NCS' receiver passband and will never be heard as you try to check into the net.

A typical preamble goes thus:

WCN WCN DE KD7ME WEST COAST SLOW SPEED NET MEETS ON 3702 KHZ AT 0300 UTC X WCN IS A TRAINING NET IN THE PROPER HANDLING OF MESSAGES AND NET PROCEDURES X ALL ARE WELCOME TO CHECK INTO WCN DE KD7ME PSE QNZ AND QND AR.

One of the first things you have to learn is some special Q signals. There are 26 QN signals that are reserved for net use. For example, QNZ means "zero beat my signal." Remember that the NCS is a busy person and doesn't have time to tune around looking for people who are not on his frequency. QND means "the net is directed." When a net is in directed session and you have a question or traffic to list, your transmissions must be directed to the NCS. At no time may you transmit to another station unless specifically directed to do so by the Net Control Station. The time for pleasant chatter is not until the NCS sends QNF (the net is free).

With these preliminaries out of the way, the NCS will transmit ANY QNC? QNC means "I have a message for all net members." This is CW shorthand for the voice equivalent of "Any bulletins or announcements?" Often a Net Manager will use this time to send a message to all members concerning some of the finer points of handling traffic.

Next the NCS will transmit ANY RN7 QTC? In this example, the West Coast net, the NCS is asking, "Is there any traffic to list for the Region 7 Net?" This is the call for traffic going outside of the geographical areas covered by the WCN. All traffic nets are arranged in a geographical hierarchy. Messages for destinations outside one net's service area are always passed to the next higher net. A region net accepts all messages passing out of section or slow-speed nets. Those members with out-of-area traffic will check in at this time. A typical check-in would be DE KR7L QTC RN7 3 AR. This tells the NCS that KR7L has three messages for destinations outside the service area of the West Coast Net. It does not matter that one message is for a destination in California and two are bound for Florida. They are all out-of-area. The NCS will acknowledge and have KR7L standby until all stations have listed their RN7 traffic. Then the NCS will transmit something like KR7L QNY DN TEN RN7 KB7CYD AR. This means that KR7L is to drop down 10 kHz and pass all of his RN7 traffic to KB7CYD, who is going to the regional net later in the evening. Note that DN TEN means approximately 10 kHz, and that it is KB7CYD, the receiving station, who establishes the exact frequency. The NCS will clear all out-of-area traffic in this fashion by pairing stations above and below the net frequency.

Then the NCS will transmit ANY WCN QTC? At this time, stations with traffic bound for destinations within the net's service area will check in and list their traffic by destination. For example, DE K7CLL QTC 1 SEATTLE 2 PORTLAND AR. As with the out-of-area traffic, the NCS will pair up stations off-frequency to pass their messages. After these functions are underway, the NCS may send QNA and begin a call-up from the membership roster. This is to determine which members are present with no traffic to list. Checking in at this time is both simple and quick: DE N7CAK GE QRU AR, meaning "This is N7CAK. Good evening. I have no traffic." If there is still local traffic to be handled, the NCS may ask these stations, as they check in, to receive it. This expedites the flow of messages and helps to involve all members in the operation of the net.

With all members checked in and messages flowing smoothly, the NCS will then send QNI QTC (Report into the net and list your traffic.) It's at this point that all non-member stations, including yourself, check in. As with all other things in traffic, there is a correct procedure for doing this. Attract the attention of the NCS by sending one letter, such as M. The NCS will then send the same letter. This is your cue to check in and you transmit: DE

(YOUR CALL) GE QRU AR, meaning "Good evening—I have no traffic." The NCS will acknowledge your QNI and if you're new to the net, will ask for your name and location. Receiving this, he will then send something like: WELCOME TO THE NET AND PSE QNI OFTEN. The NCS then moves on and picks up other check-ins.

When all stations have checked into the net, the NCS will send ALL QRU STNS MAY QNX AT WILL. You are then free to leave the net if you have no traffic to send or receive. Remember that once you check in, even without traffic, you are not free to leave the net until directed to do so by the NCS. Nothing is more disconcerting for an NCS than to call somebody who has checked in, only to discover they have left the net.

These examples of net procedures are followed by the West Coast Slow Speed Net. Most other slow nets follow similar procedures. However, each net has its own individual variations, so listen a few times before taking the big plunge and checking into the net. Nothing will make you more unpopular than jumping into a net out of turn and disrupting the proceedings. Also, the time for questions is not when you check in. Most Net Control Stations will be more than happy to provide you with answers when the net is finished for the evening.

There is one other rule of net operation that you should never forget: The NCS is the absolute boss while the net is in directed session. His method of operation and judgment is not open to question. The NCS must have the absolute obedience of all net members at all times. Nothing disrupts an operation faster than a few members trying to "help" the Net Control. In other words, do not transmit unless specifically requested to do so by the NCS.

Handling Messages

After checking in a few times, you may want to send a message. The standard message format is shown in the accompanying sample message. Limit your message text to a maximum of 25 words. Use ARL texts whenever possible to save words. Remember too, that speed of transmission is far less important than accuracy. Send clearly and correctly.

If you check in on a regular basis, you will eventually be asked to receive traffic for delivery in your area. When this happens, give a simple yes or no answer. If it's "no," don't bother with long-winded explanations of a sudden personal problem, impending lightning storm or dinner on the table. This only ties up the net and delays the NCS in finding a receive station to take the traffic. Also, remember that when you QNY, it is the

(continued on page 73)

Sample Message

4 R KR7L ARL 13 PORT ORCHARD WA NOV 24

BILL KRATT, WD6FYJ	AA	
299 JUANITA DRIVE	AA	Prosigns to separate the parts
PACIFICA CA 96325	AA	of the address
876 1345	BT	Prosign to separate address
ARL FIFTY X HOPE YOU FIND TIME TO HANDLE SOME TRAFFIC X 73	BT	Prosign to separate text from signature
BRAD KR7L	AR	Prosign for "end of message"

This is message Number 4 Routine, originated by station KR7L. "X" is used in lieu of punctuation and is counted as a word. The prosigns are included each time the message is transmitted and sent as two letters run together. The text of the message contains 13 words, including one ARL radiogram. The delivering station would read the text as follows: "Greetings by Amateur Radio. Hope you find time to handle some traffic. 73. Signed, Brad, KR7L."

ARL Numbered Radiograms

The letters ARL are inserted in the preamble in the check and in the text before spelled out number, which represent texts from this list. Note that some ARL texts include insertion of numerals.

Group One—For Possible "Relief Emergency" Use

ONE	Everyone safe here. Please don't worry.
TWO	Coming home as soon as possible.
THREE	Am in ____ hospital. Receiving excellent care and recovering fine.
FOUR	Only slight property damage here. Do not be concerned about disaster reports.
FIVE	Am moving to new location. Send no further mail or communication. Will inform you of new address when relocated.
SIX	Will contact you as soon as possible.
SEVEN	Please reply by Amateur Radio through the amateur delivering this message. This is a free public service.
EIGHT	Need additional ____ mobile or portable equipment for immediate emergency use.
NINE	Additional ____ radio operators needed to assist with emergency at this location.
TEN	Please contact ____. Advise to stand by and provide further emergency information, instructions or assistance.
ELEVEN	Establish Amateur Radio emergency communications with ____ on ____ MHz.
TWELVE	Anxious to hear from you. No word in some time. Please contact me as soon as possible.
THIRTEEN	Medical emergency situation exists here.
FOURTEEN	Situation here becoming critical. Losses and damage from ____ increasing.
FIFTEEN	Please advise your condition and what help is needed.
SIXTEEN	Property damage very severe in this area.
SEVENTEEN	REACT communications services also available. Establish REACT communications with ____ on channel ____.
EIGHTEEN	Please contact me as soon as possible at ____.
NINETEEN	Request health and welfare report on ____. (State name, address and telephone number.)
TWENTY	Temporarily stranded. Will need some assistance. Please contact me at ____.
TWENTY ONE	Search and Rescue assistance is needed by local authorities here. Advise availability.
TWENTY TWO	Need accurate information on the extent and type of conditions now existing at your location. Please furnish this information and reply without delay.
TWENTY THREE	Report at once the accessibility and best way to reach your location.
TWENTY FOUR	Evacuation of residents from this area urgently needed. Advise plans for help.
TWENTY FIVE	Furnish as soon as possible the weather conditions at your location.
TWENTY SIX	Help and care for evacuation of sick and injured from this location needed at once.

Emergency/priority messages originating from official sources must carry the signature of the originating official.

Group Two—Routine Messages

FORTY SIX	Greetings on your birthday and best wishes for many more to come.
FIFTY	Greetings by Amateur Radio.
FIFTY ONE	Greetings by Amateur Radio. This message is sent as a ifree public service by ham radio operators here at ____. Am having a wonderful time.
FIFTY TWO	Really enjoyed being with you. Looking forward to getting together again.
FIFTY THREE	Received your ____. It's appreciated; many thanks.
FIFTY FOUR	Many thanks for your good wishes.
FIFTY FIVE	Good news is always welcome. Very delighted to hear about yours.
FIFTY SIX	Congratulations on your ____, a most worthy and deserved achievement.
FIFTY SEVEN	Wish we could be together.
FIFTY EIGHT	Have a wonderful time. Let us know when you return.
FIFTY NINE	Congratulations on the new arrival. Hope mother and child are well.
*SIXTY	Wishing you the best of everything on ____.
SIXTY ONE	Wishing you a very Merry Christmas and a Happy New Year.
*SIXTY TWO	Greetings and best wishes to you for a pleasant ____ holiday season.
SIXTY THREE	Victory or defeat, our best wishes are with you. Hope you win.
SIXTY FOUR	Arrived safely at ____.
SIXTY FIVE	Arriving ____ on ____. Please arrange to meet me there.
SIXTY SIX	DX QSLs are on hand for you at the ____ QSL Bureau. Send ____ self-addressed evelopes.
SIXTY SEVEN	Your message number ____ undeliverable because of ____. Please advise.
SIXTY EIGHT	Sorry to hear you are ill. Best wishes for a speedy recovery.

*Can be used for all holidays

ARL numbers should be spelled out at all times

Field Organization Reports November 1987

ARRL Section Emergency Coordinator Reports

Twenty eight SEC reports were received, denoting a total ARES membership of 12,685. Sections reporting were: AB, CO, CT, IA, ID, KS, MDC, MN, MO, MT, NFL, NH, NLI, NM, NTX, NV, OH, SD, SDG, STX, VA, VT, WA, WI, WMA, WNY, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	108	90.00	771	1554
TCC Central	92	99.00	377	382
TCC Pacific	111	92.50	699	1305
Summary	311	93.83	1847	3241
Cycle Three				
TCC Eastern	54	90.00	25	50
Cycle Four				
TCC Eastern	113	94.17	718	1148
TCC Central	613	88.00	582	1195
TCC Pacific	107	89.17	703	1389
Summary	833	90.44	2003	2343

TCC Roster

KB1AF KB1AJ K1BA W1CE K1EIC W1EFW WA1FCD KN1K W1NJM KT1Q W1QYY KW1U WA2FJJ W2FR W2GKZ NN2H NQ2H KB2HM N2IC KA2UBD WA4JDH W4JL W2LWB W2RQ KA2UBD N2XJ N3COY N3EMD KK3F N3FM WB3GZU W3OKN W3PQ KQ3T NJ3V AA4AT N4EXQ N4GHI WB4PNY W4UQ K4ZK N5BT W5CTZ N5DFO W5GHP K5GM AE5I WB5J W5JOV AJ5K W5KLV KD5KQ K5MXQ WZ5N KD5RC W5QVK ND5T N5TC N5TL W5TNT KB5UL W5VMP KB5W NQ5W WB5YDD KU6D W6EOT W6INH N6LHE K6LL WF6O K6UYK W6VZT KN7B KA7CPT NR7E W7EP W7GHT NN7H W7IGC W7LG KA7MUL K7OVK KF7R W7TGU W7VSE KA8CPS N8GJO W8PMJ W8QHB NJ8S K8TPF AF8V KA8WNO KD8WX N8XX WB8YDZ W9CBE W9EHS KA9FEZ W9JUJ NN9M KA9RII WB9UYU AD0A KC0D K0DJ KA0EPY K0EZ W0FRC KJ0G N0HFZ N0IA NX0J KE0NI AI0O KS0U VE3FAS VE3GSQ

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area	
Cycle Two							
Area Nets							
EAN	30	1174	39.16	.844	98.3		
CAN	30	1062	35.40	.834	100.0		
PAN*	60	723	12.05	.657	99.4		
Region Nets							
1RN	60	409	6.82	.498	88.0	100.0	
2RN	57	452	7.92	.479	95.1	100.0	
3RN	30	221	7.36	.500	91.0	100.0	
4RN						100.0	
RN5	60	784	13.06	.552	84.0	100.0	
RN6	51	284	5.56	.367		100.0	
RN7	60	373	6.21	.397		100.0	
8RN	60	461	7.68	.343	98.3	100.0	
9RN	60	340	5.66	.340	93.7	100.0	
ECN						90.0	
TEN	60	1921	32.00	1.040	87.0	100.0	
TWN	51	406	7.96	.460	76.8	98.3	
TCC							
TCC Eastern	108	1554					
TCC Central	92	382					
TCC Pacific	111	1305					
Cycle Three							
Area Net							
EAN	30	248	8.26	.549	79.5		
Region Net							
1RN	30	90	3.00	.266	85.7	86.6	
2RN	30	169	5.63	.463	90.6	93.3	
3RN	19	20	1.05	.141	47.0	83.3	
4RN						90.0	
8RN						96.6	
ECN						73.3	
TCC							
TCC Eastern	54	50					
Cycle Four							
Area Nets							
EAN	30	1334	44.47	1.323	98.5		
CAN	30	1616	53.87	1.570	100.0		
PAN	30	870	29.00	.981	91.6		
Region Nets							
1RN						100.0	
2RN	49	220	4.50	.452	76.3	100.0	
3RN	58	228	3.93	.294	99.4	100.0	
4RN	60	683	11.38	.440	100.0	100.0	
RN5	60	697	11.61	.660	100.0	100.0	
RN6	60	437	7.28	.740	100.0	100.0	
RN7	60	375	6.25	.525	86.4	100.0	
8RN	54	406	7.52	.411	86.0	100.0	
9RN	60	439	7.32	.489	95.4	100.0	
TEN	60	642	10.70	.652	75.4	100.0	
ECN	56	120	2.14	.308	71.4	100.0	
TWN	55	369	6.71	.492	92.7	93.3	
ARN	30	74	2.40	.082	100.0	90.0	
TCC							
TCC Eastern	113	1148					
TCC Central	613	1195					
TCC Pacific	107	1389					

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, DE, EMA, ENY, GA, IA, IL, IND, KS, MDC, ME, MI, MN, MO, NC, NFL, NLI, NTX, OH, OK, ONT, OR, ORG, RI, SC, SD, SFL, STX, UT, VA, VT, WA, WMA, WNY, WPA, WTX, WV.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, upon sending notification of qualifying months to ARRL Public Service Branch, will be awarded a special PSHR certificate from HQ.

154
N4GHI
KA8TIK
140
W2QNL
135
NG1A
134
WA4QXT
129
VE4AJE
KA9FFO
128
WB2ZJF
127
K2YQK
126
N6MCY
WA2SPL
125
W2RRX
121
VE4LB
120
KB4WT
119
WA9VND
KA3DLY
KA1EXJ
KA2F
118
WX4H
117
N0DPF
W7VSE
N2XJ
116
KT1Q
115
W9YCV
KE0NI
113
WA2VJL
112
WB5YDD
KB5ADE
111
W4ANK
WD4COL
K9CNP
KW1U
110
WF6O
W9CBE
WB2VUK

109
WA4PFK
WR5O
NQ2H
WB1HIH
107
N9BDL
K5MXQ
AA4TE
106
N3EMD
W9FZW
105
W9JUJ
W5YQZ
KD7ME
WA4JDH
104
WB6DOB
W9EHS
103
N0FOO
WA9VLC
WA1FCD
102
K4ZK
KA9RNY
KA1GWE
WB4KSG
KB1AF
101
WA4EIC
WB4WII
K8TVG
WD8QXT
WG7H
WA2ERT
K2VX
100
K8UQY
NC9T
99
KI4YV
KA1IFC
KA7ZAG
98
W6INH
WD8KQC
97
WB4ZTR
96
AA4HT
N1EDD
N5AMK
K2ZVI
95
W3FA

W4JLS
WB4HRR
94
WA4RUE
KA4TLC
W9DM
W4PIM
93
WA4RLV
N2HIF
WA2EPI
92
K6UYK
VE3ORN
WB4DVZ
WB1CBP
91
N7GGJ
WB8JGW
W1KX
90
WA3UZI
N3COY
WB4WQL
W2AHV
W1RWG
89
NO0A
KA0KPY
N4EXQ
VE3DPO
KA7AID
KA7EEE
88
WD0GUF
WA0TFC
KA0ARP
W4CKS
87
NB1A
K0ERM
AA4AT
KD8WX
AA4MP
86
K3JL
W5CTZ
WA4LLE
85
WA1JVV
W0OYH
K4MTX
KA8WNO
W6VOM
KT9I
WB8SYA
84
N3EGF

NM1K
K4JST
83
W3YVQ
AA4ZV
KD0CL
82
KC3Y
NJ9S
N6EQZ
81
WB4PNY
K5UPN
WA6WJZ
KB2AYD
80
WD5GKH
VE3WV
N4NLK
N0CLS
N8GPU
79
W0UCE
KN1K
78
KB4LB
KB4OPR
N3AZW
N8EFB
N7BGW
77
WA3UNX
WB5J
W5VMP
KI4QH
76
N4KSO
K4IWW
75
NV5L
N8FXH
N9BDL
WB2FTX
KA9RII
N8AEH
74
KA4FZI
KJ9J
WA4LTO
KA4MTX
VE3GT
WD8RHU
WA1TBY
73
WD4KBW

KC4VK
W4HON
NK1Q
72
WB4HXS/T
KA0SBY
N8FWA/T
71
W0OUD
K0SI
KD0NH
W7LG
N2AKZ
N8IBS
70
WB6QBZ
VE4IX
W6RNL
N2GQS
K2MT
69
WA6QCA
AJ5F
KF4FG
KB2BKE
68
KJ3E
WB9PFZ
WZ5N

KB0Z
KF8J
67
WD6BZQ
WA4RNP
66
K3NNI
NY0J
W0MZI
K4BGZ
KB5CKQ
N0HWD
N1CVE
65
AI0O
KK4FV
KA4TWI
N2GPA
K8JDI
64
K0PCK
WA0HTN
W0FRC
WA8DHB
WB8KWC
KA1LIH
WB2QMP
63
N1DHT

KA0BCB
KD0YL
K4VWK
KA2INC
KB4BZA
KB4JPN
KA7MUL
N0IAN
62
N4PL
KQ3T
AJ5K
VE3POJ
N4KRA
WB0WNJ
N2HLZ
KD8KU
N2DXP
61
WA3YLO
VE3GSQ
W7LBK
K2TWZ
K4ZN
WA8HGH
K1ABO
60
W0YMB
KA5UVY/T

N4OZB
WA4MNR
KD8WI
K8ND
58
W1YOL/T
54
N4MMM/T
N2HLU/T
52
KA6HJK/T
51
KA2JMA/T
46
N8HRW/T
45
KA1QFV/T
KA1NOI/T
44
KA6TND/T
KA9CTW/T
41
KA2UIU/T
40
N6FWG/T

The following stations qualified for PSHR during October 1987, but were not listed in last month's column.

NB1A, N2AKZ, KA1EXJ, N1FJ, WB1HIH, KA1IFC, WA1JVV, KT1Q, KA1QFV, AE1T, W2AHV, KB2BKE, N2DXP, WA2EPI, KA2F, WB2FTX, N2GPA, N2GQS, N2HLZ, KA2INE, KA2JMA/T, W2RRX, WB2QMP, W2QNL, WA2SPL, K2TWZ, N2XJ, K2YQK, WA2ZYM, KA2ZYX, W4ANK, KB4BZA, W4CKS, KP4DJ, WA4JDH, W4PIM, WA4RNP, KA4YEA, K4ZN, KB5ADE, KB5CKQ/T, AJ5K, K5MXQ, KA5QYV, K5UPN, W5VMP, W5YQZ, N6EQZ, N7ELF, N7GGJ, W7LBK, KD7ME, N8AEH, WB8BGY, N8CDN, WA8DHB, WA8DYS, N8EFB, N8FWA, N8FXH, N8GPU, N8HRW/T, KD8HB, N8IBS, KF8J, WD8KBW, WD8KQC, KD8KU, WB8KWC, WB8JGW, K8KT, K8ND, WD8RHU, WD8QXT, WB8SYA, KA8TIK, KA8TNT, K8TVG, K8UQY, KD8WX, K9CNP, WD9DZU, W9EHS, NC9T, WA9VLC, KE0NI, KA0WIE, KA8WNO, KB0Z, VE7ANG, VE7BNI, VE7EJU, VE7EJW.

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	680	989	1403	103	3175
WB9YPY	0	818	90	515	1423
WD4IIO	520	151	543	49	1263
W3VR	315	323	342	49	1029
WA4JDH	0	487	510	4	1001
K4DOR	37	445	482	7	971
W9JUJ	—	—	—	—	804
N4GHI	60	349	337	48	794
WB0WNJ	235	75	427	3	740
WA4QXT	73	278	329	33	713
WF6O	1	330	362	14	707
KT1Q	3	359	333	10	705
W3IWI	0	321	332	0	653
KA7MUL	2	302	319	9	632
KA1IFC	2	302	298	30	631
KE0NI	43	234	273	61	611
WX4H	0	330	264	8	602
N4PL	118	174	298	8	598
WB5YDD	3	290	252	28	598
N3AZW	55	234	280	24	593
W6CUS-1	0	296	296	0	592
K6UYK	42	281	265	3	591
N6LHE	10	279	276	9	574
WA2SPL	0	249	268	37	554
W7VSE	52	242	210	11	515
KA9RII	41	219	237	11	508
WB4PNY	1	268	237	1	507
KD8WX	9	231	251	12	503

BPL for 100 or more originations plus deliveries:

N0DPF	336	W5AS	111

Independent Nets

Net Name	Sess	Tfc	Check-ins
Amateur Radio Telegraph Society	26	318	219
Clearing House Net	30	415	617
Empire Slow Speed Net	30	48	356
IMRA	25	909	1650
Mission Trail Net	30	80	795
New England Novice Net	20	18	34
NYSPTEN	30	85	583
Southwest Traffic Net	30	216	1628
West Coast Slow Speed Net	63	63	375
20ISSBN	26	787	338
7290 Traffic Net	48	817	2937

Results, 2nd IARU HF World Championship

Fun in the sun!

By Billy Lunt, KR1R
Contest Manager, ARRL

and

Rus Wilson, KC1GX
Contest Assistant, ARRL

Despite the "eccentricity" of mid-July activities known to modern man, such as picnics, vacations, swimming, horse-back riding and just lying around in the sun, the IARU HF World Championship has been earmarked a world-class contest. Even though this is the time of year more suited for outside activities and we were plagued with poor conditions and low sunspot numbers, this second annual event amassed 1333 entries, just shy of the total entries received (1397) for the first IARU HF World Championship. Of the four different entry classes, CW-only was the most popular around the world with 469 entries. The second most popular was the phone-only class with 298 entries, followed by mixed mode and multioperator.

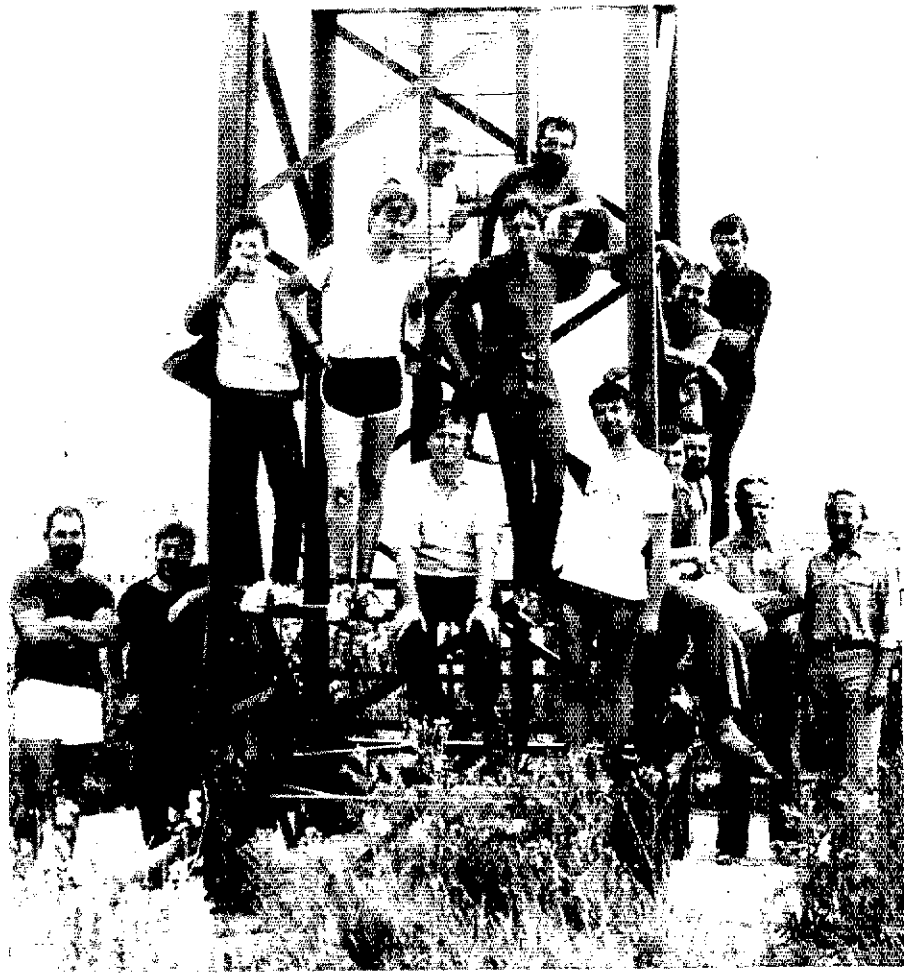
Again this year, IARU member-society HQ stations enjoyed the luxury of counting as multipliers along with ITU zones. Twelve HQ stations joined the fierce competition in their category and sent their logs to Box AAA for checking. The top scorer was HQ9R with 2.49 million points. YQØA was right on their heels with 2.44 meg. Check the boxes for the full details.

Activity was plentiful this year with a grand total of 549k QSOs and 65k multipliers reported as worked on all bands from all entrants, representing 46 different ITU zones, 74 DXCC countries and 65 ARRL Sections. Not bad for a 24-hour period. The Contest Branch did a bit of figuring and came up with an average score per entry of 106,812 points and an average of 412 QSOs and 49 multipliers. Compare your score with these figures to see how you fared.

The USSR claimed the top three spots amidst the entries in the mixed-mode category. First place went to George, UA1DZ, with 838k points followed closely by Vlad, RB5IM, with 830k points from the Ukraine, and Ivan, UA9TS, in third place with 791k points from Asiatic RSFSR. Rich, K1CC, took stateside top honors and also managed to finish 5th place worldwide. Second-place W/VE was Eric, K3NA, with 391k.

The 1st place phone winner for 1987 was H25MF (5B4MF, op) from Cyprus with 962k and second place world phone was Luis, ZP5JCY, with 754k. Jerry, WB9HAD, was the only statesider to make the world top ten, finishing in 9th place worldwide and 1st place W/VE. Second-place W/VE was Glenn, WA4JXI (WA4SVO, op).

Veteran brass pounder Jorge, LU8DQ, remained as world winner for the CW-only category this year, scoring 774k points. Trying to oust Jorge as king of CW was 4N4A (YU4UE, op) with 764k for a fine 2nd-place finish. Dan, K1TO, finished in 3rd place worldwide and was the 1st-place W/VE finisher with 542k. WØZV, N2IC/Ø and WA6VEF fought it out for 6th, 7th and



The crew from Y61HQ pose for a photo at the base of their 40-meter tower after finishing in 3rd place among the IARU member-society HQ stations. Atop the tower is a rotatable 3-element 40-meter quad.

Top World Scores

Mixed

Call	Score
UA1DZ	838,510
RB5IM	830,592
UA9TS	791,028
YU3EO	646,875
K1CC	582,400
OH6EI	523,584
UW9CO	515,260
RA9JX	500,112
OF8AC (OH6AC,op)	490,104
UT4UZ	404,178

Phone

Call	Score
H25MF (5B4MF,op)	962,388
ZP5JCY	754,696
OK2JS	583,836
UA9YX	562,275
HA5NP	514,215
K4YT/4D8	479,450
UQ2GM	454,440
UT5DK	350,921
WB9HAD	325,234
RB5IA	312,132

CW

Call	Score
LU8DQ	774,520
4N4A (YU4UE,op)	764,272
K1TO	542,646
UL7CW	540,388
UW3AA	489,154
WØZV	481,440
N2IC/Ø	467,415
WA6VEF	462,618
UAØSAU	459,200
UP2BW	458,316

Multioperator

Call	Score
UB4MZL	2,644,480
UZ9WWH	1,298,700
HA6GN	1,222,155
HG5A	1,214,640
LZ9A	1,167,905
UB3IWA	1,132,620
UP1BWW	1,086,448
UA9AYA	1,055,502
OK5R	965,172
HG1S	936,763

Top W/VE Scores

Mixed

Call	Score
K1CC	582,400
K3NA	391,625
N5IVF	378,200
KM9L	331,078
WB5BIR	322,047
KZ5D	293,809
WZ4F	226,336
WD8IXE	220,416
W6UQF	218,376
NI8L	131,340

Phone

Call	Score
WB9HAD	325,234
WA4JXI (WA4SVO,op)	233,398
N4UH	192,192
VE3XN	168,483
K6SVL	164,362
KY2J	153,370
WA5IGD	129,948
VE1CBF	104,370
KW6C	72,050
W5PLN	65,340

CW

Call	Score
K1TO	542,646
WØZV	481,440
N2IC/Ø	467,415
WA6VEF	462,618
AA1K	419,594
W1WEF	353,970
N4ZC	334,476
KZ2S	300,722
K3IPK	244,839
KG5U	233,500

Multioperator

Call	Score
N5RM	652,065
K6JYO	620,620
K5RX	497,028
WB8JBM	450,870
KM3T	438,900
K8AZ	417,252
K4VX/Ø	396,700
WØKEA	306,336
N8CXX	305,096
AG8W	292,928

IARU Headquarters Stations

HG9R (13 ops)	2,491,360-	5306-184
YQØA (YO2BV,YO2GZ,YO3ABL,YO3AC,YO3APJ/9, YO3CD,YO4AVR,YO4BEX,YO4CEM,YO4HW, YO4PX,YO4PZ,YO8BQO,YO8DDP,YO9BQN, YO9WZ,ops)	2,445,156-	5516-186
Y81HQ (Y21YK,Y22TK,Y23EK,Y24UK,Y25ZO, Y31OA, Y32JK,Y33VL,Y37XJ,Y42LK,Y42MK,ops)	2,287,371-	4750-177
OF1C (OH1s EB,EH,CN,HS,KA,LA,NDA,NSJ, OH6LK,ops)	1,819,323-	4215-141
CX1AA	1,536,892-	2413-131
OE5XXL (OE5s CA,DI,JDL,JTL,KE,ops)	996,768-	2787-144
BY1PK (7 ops)	676,568-	1968-92
W1AW (NG1J,N1CIX,W1OD,NJ2L,NT2X,WA4CMS, KJ4KB,WØPAN,ops)	490,864-	2268-88
JA3RL (JA3AQF,JG3RPL,JI3ERV,JI3OYM,JN3OTE, JR3FRF,JH4NMI,JR4ISF,ops)	232,651-	1276-73
HBØFL (HBØLL,HB9ASJ,OE9OYT,ops)	3,497-	125-13
PT2AA (PT2CW,op)	3,111-	40-17
EIØRTS (EI2CL,op)	1,760-	36-2

8th places worldwide and 2nd, 3rd and 4th places W/VE. Fine going, guys!

In the multioperator class, UB4MZL blew everyone away with 2.6-million points resulting in a commanding 1.4-meg margin over 2nd-place winner UZ9WWH. Eight of the top ten multiop crews finished over the 1-meg mark! First-place W/VE was a fierce battle resulting in a win for N5RM with 652k points and 2nd place going to K6JYO with 620k points.

This 24-hour contest is catching on fast and turning out some dynamite scores. If you haven't tried it yet, you should. It is great fun and there is a lot of participation from around the world. So, if it's DX you're looking for, there is plenty of it to work! See you for the Third IARU HF World Championship on the weekend of July 9-10, 1988. Thanks to Mark R. Burke, KA1MIS, for help in preparing this report.

SOAPBOX

Lost five hours at the beginning of the contest due to power loss. Rather poor conditions (UW1BM). I'm sorry to say that propagation was very bad (RV6AF). Best regards to all hams in the contest (UA3QJC). Thanks for a FB contest (UA3DJG). Many thanks for the good contest (UZ3TG). Working conditions were very poor in Kallinin (UA3ICJ). It was great! The kids here in the Tel-Aviv Scouts Club had a very good time. We worked 40 countries and the 24-hour period was a very good idea (4Z61Z). Thank you for the contest (EA5BZS). Too many people in the contest. You'd better make a single-band group (EA3FWE). Good participation from radio clubs in different countries. Poor participation in South America (CT1BWW). Let's wait for better propagation (OK5R). Biggest thrill was to work VE1BNN on E-skip (double hop) (DL8PC). Very nice contest. Too bad I missed the 80- and 40-meter possibilities. I sure hope to work the HQ stations next year on 80. CX1AA was a very welcome surprise (PAØVLA). Conditions were generally poor (PAØYN). Nice contest. Conditions were very strange. Just short openings to stations outside of Europe (PA3EMN). Work, sleep and thunderstorms limited my participation. Please hold the contest again and I will take a day off! (GM4HQF). I lost a 3-500Z in the amp only two days before the contest. No spare was available so I had to "barefoot it." The big OHØW antenna farm helped out. I was able to hold a frequency with 150 W output (K8MN/OHØ). Bad conditions on the band, but those three Chinese stations were a very nice surprise (OF7XE). My professional activities kept getting in the way. I am a doctor. The contacts came very slow (YW5M). My first IARU Con-

Masaki, JH4UYB, a university medical student, moved up from 3rd place last year to 2nd place in Japan this year.

Looking very relaxed is H25MF (5B4MF,op) after taking 1st place phone-only worldwide. The microphone probably is not cool yet!

test and it won't be my last! For my short time, I really enjoyed myself (KO9Y/5). Between a VE exam and taking the XYL out, I could only spend a little time in the contest (KA7T). Thanks for a FB contest (UO5OBT). Thanks for a nice contest (UQ2GN). Bad propagation (UQ2CR). Enjoyed the contest very much and CU next year (UP1BWW). Sorry, poor conditions (UP2OU). Many thanks for a nice contest (UO5OJM).

Scores

Scores are listed by ITU zone and then by country within that zone. The line score (example—NL7P 98,903-363-71-A) indicates the call sign used, the total score, the number of valid contacts, the number of multipliers and the entry class. The entry class letters indicate: A—single operator, mixed mode; B—single operator, phone only; C—single operator, CW only; D—multioperator, single transmitter.

ZONE 1

Alaska

NL7P 98,903- 363- 71-A
NL7HT 5,339- 83- 19-B
NL7HI 2,862- 41- 18-B
KL7UR 114,944- 456- 64-C

ZONE 2

Alberta

VE6DZ 81,951- 395- 59-A
VE6APN 21,384- 177- 33-C

British Columbia

VE7IQ 300- 25- 4-A
VE7HG 8,220- 68- 30-B
VE7QO 95,084- 401- 68-C

ZONE 3

Saskatchewan

VE5AAD 13,195- 142- 29-C

ZONE 4

Quebec

VE2XL 3,390- 82- 15-B

Ontario

VE3OEQ 4,592- 108- 14-A
VE3XN 168,483- 673- 71-B
VE3KP 138,512- 811- 64-C

ZONE 6

W6

East Bay

KS6Q 1,120- 80- 8-B
K6CSL 5,620- 82- 24-C
K6ZM (+KI6EZ) 237,978- 839- 81-D

Los Angeles

N6IPB 16,020- 172- 30-A
K6SVL 164,362- 826- 62-B
KI6BN 45,210- 266- 55-B
WS6V 13,300- 139- 28-B

Orange

NX6M 4,947- 101- 17-A
W6SX 1,690- 73- 13-A
NM6L 11,118- 120- 28-B

Santa Barbara

WA6FGV 92,664- 567- 52-A
AA4Q/6 7,560- 107- 24-C

Santa Clara Valley

N6NF 45,838- 404- 41-A
KW6C 72,050- 439- 55-B
WA6VEF 462,618- 1094- 117-C
WW6Z 1,833- 45- 13-C

San Diego

W6UQF 218,376- 608- 108-A
WN6L 34,400- 276- 43-B
KB6PJU 2,070- 163- 5-B
AA6EE 1,260- 37- 12-C
K6JYO (+KI6MS,NI6W,W6KUT,K9VV) 620,620- 1422- 124-D

San Francisco

KU6J 110,305- 529- 65-A
K6LRN 9,126- 129- 26-A

San Joaquin Valley

WW6O 22,356- 186- 38-B
WB6ITM 45,216- 271- 48-C

Sacramento Valley

N6JV 128,673- 398- 87-C
N6JM 2,898- 38- 21-C

W7

Arizona

KC7V 10,380- 185- 20-C
N7HJM 5,772- 168- 17-C

Idaho

KA7T 11,826- 128- 27-C

Montana

KW7I 4,880- 82- 20-B
KS7T 64,450- 404- 50-C
WA6ALQ 3,582- 44- 18-C

Nevada

WB7VVH 539- 27- 7-B

Oregon

AD7T 33,367- 123- 61-C
KA7FEF 3,582- 76- 18-C

Utah

KE7KF 27,224- 207- 41-B

Washington

KT7G 20,746- 154- 41-A
KR7L 968- 30- 11-B
K7LXC (NL7GP, op) 224,190- 725- 90-C
NK7V 4,416- 48- 24-C

ZONE 7

W5

Arkansas

KA5OGA 14,688- 195- 27-B
W5EIJ 1,695- 35- 15-C

Louisiana

KZ5D 293,809- 368- 101-A
WA5IGD 129,948- 622- 68-B

New Mexico

NC5O 86,671- 499- 59-C
AI9X 42,065- 307- 47-C
N5EPA (+AG5S,NM5S,WA8OTU) 146,964- 622- 74-D

North Texas

W5PLN 85,340- 390- 55-B
N5IET 16,272- 154- 36-B
KY5N 18,116- 168- 34-B
NX5H 14,300- 180- 26-B
W5UDA 46,128- 291- 48-C
WQ5W 31,198- 284- 38-C
W5BOX 15,990- 165- 30-C
KB5ADE 832- 41- 8-C
K5RX (+KR0Y,KM5R) 497,028- 1270- 122-D

Oklahoma

KF5DA 30,927- 264- 39-A
N6CL 19,600- 192- 40-A
NW5H 29,480- 475- 22-B

South Texas

N5IVF 378,200- 931- 124-A
WB5BIR 322,047- 1178- 99-A
KG5U 233,500- 714- 100-C
KO9Y/5 42,210- 322- 45-C
W5NR 4,284- 52- 21-C
N5RM (K2TNO,K5GN,KE5IV,N5DU, WB6N,ops) 652,065- 1383- 145-D
N5EA (+W5ASP,WX5S,K5RVF,K5XI) 326,880- 1045- 96-D

W9

Wisconsin

WA9SBP 25,628- 198- 43-A

W0

Colorado

K0JVZ 535- 26- 8-B
W0ZV 481,440- 1108- 120-C
N2IC/0 467,415- 1177- 117-C
K4VX/0 (AH2U,KA0YBS,ops) 396,700- 1265- 100-D
W0KEA (+K9MWM) 306,336- 1002- 96-D

Iowa

NU0P 19,602- 334- 22-B
W0PPF 1,848- 42- 12-B

Kansas

K0VGB 27,511- 253- 41-A
NW0F 19,010- 254- 29-C

Minnesota

W0RXL 2,142- 36- 21-A
WB0GFV 153- 23- 3-B
K0WYI 19,344- 219- 31-C
WA0QIT (+N0EOB) 16,800- 264- 24-D

Nebraska

AK0G 16,456- 302- 21-A
WB0SYV 20,940- 268- 30-C

ZONE 8

W1

Connecticut

K1CC 582,400- 1302- 126-A
KB1XD 9,541- 131- 29-A
KA1YP 44,574- 341- 46-B
K1TO 542,646- 1268- 117-C
W1WEF 353,970- 1028- 95-C
N4XR 71,775- 319- 75-C
KA1CV/M 9,022- 135- 26-C
W1VH 1,500- 50- 10-C
NJ2L 684- 28- 9-C

Eastern Massachusetts

WB2DND 18,084- 115- 44-A
WB1GEX 51,304- 502- 44-B
WA1NPZ 31,680- 240- 44-B
N6EK/1 40,066- 351- 46-C
W1OPJ 357- 19- 7-C

Maine

K1SA (+KA1PCM,KQ1V,N1AFC) 24,010- 252- 35-D

New Hampshire

W1END 6,783- 79- 19-C
W1LQQ 4,238- 100- 22-C

Rhode Island

K1PLX 20,514- 311- 26-B

Vermont

NB1A 2,772- 88- 14-A
KB1UE 2,800- 75- 16-B

Western Massachusetts

N1CQ 208,845- 837- 65-C

W2

Eastern New York

KC2QF 33,855- 391- 37-A
KY2J 153,370- 811- 70-B
N2GUV 223,082- 865- 71-C
N2AZS 42,768- 357- 48-C

New York City-Long Island

W2GKZ 3,300- 54- 15-A
KS2G 5,382- 75- 26-B
K2RYI 581- 41- 7-B
K2SX 64,428- 384- 59-C
W2AFM 1,140- 41- 12-C

Northern New Jersey

KT2D 4,715- 75- 23-A
K3FNW 27,132- 174- 51-B
W1GD 39,050- 331- 50-B
KC2NF 1,780- 66- 10-B
N2GSE 658- 47- 14-B
KZ2S 300,722- 920- 106-C
N2FVP (+KA2YDZ) 19,203- 157- 37-D

Southern New Jersey

AB2E 65,436- 458- 42-A
N2FJQ 812- 58- 7-B
W2GTN 2,925- 84- 15-C

Western New York

KW2J 64,792- 377- 56-C
W2TZ 27,108- 291- 36-C
W2FTY 17,864- 210- 28-C

W3

Delaware

AA1K 419,594- 986- 119-C

Eastern Pennsylvania

W3BGN 81,988- 420- 61-A
W3ARK 41,407- 311- 47-A
K3ZPG 1,470- 32- 14-B
K3IPK 244,839- 765- 89-C
K3ZLK (+KA3s DSW,DSX,PKN,N3s CHL, EUK,KQ3V,WB3s EPW,FYL) 73,700- 593- 50-D

Maryland-District of Columbia

K3NA 391,625- 1068- 125-A
W3HXI 53,664- 392- 52-C
KM3T (+WB2EKK,WB3JRU,KC8C) 438,900- 1297- 105-D
W3GG (+K3YGU,KA3PGL) 242,283- 1042- 79-D

Western Pennsylvania

WB3CQA 4,140- 81- 20-B

W4

Alabama

WZ4F 226,336- 1020- 88-A

Georgia

W4GLS 17,538- 231- 37-A

Kentucky

KB4WQO 6,499- 111- 19-B
AA4RX 1,674- 100- 9-B
WA4MXD 960- 36- 10-B
N4XM 72,360- 392- 60-C

North Carolina

W4VP 17,212- 115- 52-A
N4UH 192,192- 1054- 77-B
KA4RVS 65,230- 497- 55-B
KJ4TI 14,256- 192- 33-B
N4ZC 334,478- 964- 108-C
K4PB 53,390- 278- 45-C

Northern Florida

N4BP 81,100- 593- 47-A
WD4IIO 3,052- 90- 14-A
WA4JXI (WA4SVO,op) 233,098- 894- 103-B
W4WKQ 34,787- 350- 43-B

Southern Florida

WK4F 16,492- 148- 38-B
WD4AHZ 70,776- 389- 72-C

Tennessee

K4PR 39,200- 268- 56-A
K4JHT 19,425- 181- 37-B
K3CQ 9,342- 171- 18-C
NU4B 3,502- 103- 17-C
KS2X (+KA2PGW) 12,220- 252- 26-D

Virginia

K4FPF 20,313- 197- 37-A
WU4G 1,410- 55- 10-A
W4XD 10,550- 164- 25-C

W8

Michigan

NI8L 131,340- 763- 80-A
N8CXX (K8JM,N8BTU,NE8T,ops) 305,096- 1228- 88-D
AG8W (AI8D,K8MJZ,ops) 292,928- 1234- 92-D

Ohio

WD8IXE 220,416- 958- 84-A
N8BJQ 78,012- 602- 66-A
N8BC 56,108- 331- 52-C
K8JT 45,900- 386- 51-C
WB8KKI 39,300- 286- 50-C
WD8AUB 25,284- 265- 42-C
W8BJBM (NZ4K,KD8NS,KU8E,N8ATR, N8DCJ,KW8N,KC8MK,N8DMM,WB8PHI, ops) 450,870- 425- 133-D
K8AZ (+K8s MR,NZ,N8AA,W8HSK) 417,252- 1197- 116-D

W9

Illinois

KM9L 331,078- 1314- 101-A
WD9DGE 15,147- 253- 27-A
WB9HAD 325,234- 1347- 91-B
KG9Z 18,576- 285- 27-B
NJ9Q 5,236- 146- 27-C
KA9IMX 3,036- 112- 11-C
K9SD (+W9NNE,WB9SBO,K0FU, KA8GGI,ND8F) 160,451- 893- 81-D

Indiana

K9JS 4,536- 102- 21-B
N2BVJ/9 52,076- 478- 47-C

Wisconsin

KA9VOK 6,348- 185- 19-B

ZONE 9

Maritimes-Newfoundland

VO2AC	1,221-	58-	11-A
VE1CBF	104,370-	409-	70-B
VO1AW	6,310-	61-	30-C

Quebec

VE2LJ	58,440-	351-	40-C

ZONE 11

Dominican Republic

HI3AMF	44,884-	317-	44-B
WT4G/HI3 (+HI3JEI)	70,608-	365-	48-D

St Vincent

W8KKF/J8	87,928-	567-	48-B

Netherland Antilles

K2KTT/PJ7	9,512-	92-	29-B

Costa Rica

TE5T	8,736-	168-	24-C

British Virgin Islands

VP2VEN	88,800-	516-	50-B

Bermuda

WB4IUX/VP9	9,592-	516-	56-A
AF1U/VP9	1,404-	52-	9-C

Cayman Islands

ZF2AH	1,826-	52-	11-A

ZONE 12

French Guiana

FY4EE	4,820-	51-	20-C

Venezuela

YV1DWQ	126,336-	477-	56-B
YV3BKC	77,636-	401-	52-B
YW5M	6,128-	79-	16-B

ZONE 14

Chile

CE3BFZ	76,045-	243-	67-B

Argentina

LU6EJP	4,992-	65-	16-B
LU8DQ	774,520-	1174-	134-C

Paraguay

ZP5JCY	754,696-	1338-	116-B

ZONE 15

Brazil

PP2ZDD	60,956-	444-	37-B
PY2RRG	24,882-	290-	29-C

ZONE 17

Iceland

KA3KIW/TF	405-	81-	5-A
TF3DC	2,964-	40-	19-C

ZONE 18

Svalbard

SP5EXA/JW	24,457-	207-	37-A

Norway

LA2GN	55,401-	306-	59-B
LA1XDA	40,720-	326-	40-B
LA2AD	2,541-	71-	11-B

Finland

OH8EI	523,584-	1498-	108-A
OF6AC (OH6AC,op)	490,104-	1430-	108-A
OF3GD	141,886-	653-	61-A
OF7NW	24,696-	208-	36-A
OF6NEV	65,763-	432-	47-B
OF7XE	46,470-	476-	30-B
OH2PM	452,500-	1081-	125-C
OF6YF (OH6YF,op)	259,634-	1021-	86-C
OH5NFS	97,674-	390-	73-C
OH7EU	68,880-	358-	60-C
OF3NM	23,328-	198-	32-C
OH9TD	6,424-	88-	22-C
OH6NVC	1,014-	28-	13-C
OH5MX	1-	1-	1-C
OF4RH (OH4s OO,RH,ops)	439,701-	1361-	97-D
OF2BAH (OH2s BAH,BMD,ops)	310,230-	1124-	81-D
OH6AM (OH6s OS,UI,ops)	309,120-	1230-	90-D

Aland Island

K8MN/OH8	336,184-	1388-	77-A

Denmark

OZ1APA	43,656-	174-	83-A
OZ1CAH	44,712-	266-	18-B
OZ5EV	29,248-	153-	64-B
OZ1ASP	23,736-	208-	43-B
OZ1ESB (OZ1IOC,op)	40,589-	383-	37-C
OZ1JVN	30,870-	219-	45-C
OZ1DXX	21,788-	264-	26-C
OZ1DPW	17,520-	132-	10-C
OZ4CG	15,631-	174-	29-C
OZ8SW	13,547-	149-	31-C
OZ1JHM	2,500-	87-	10-C

Sweden

SM5GMG	9,180-	68-	34-A
SM5ARR	1,352-	49-	8-A
SM5ARL	55,250-	404-	65-B
SM2NTU	3,696-	74-	24-B
SM6JY	168-	20-	4-B
SM3LIV	90-	14-	3-B
SM3CCM	99,684-	558-	54-C
SK6AW (SM6DED,op)	76,482-	580-	63-C
SM1BVO	40,740-	315-	60-C
SM7CVU	14,240-	172-	40-C
SK4EA (SM4RRF,op)	11,098-	168-	31-C
SM7LAZ/6	6,412-	115-	28-C
SM6DUA	1,908-	51-	18-C

ZONE 19

European Russian RSFSR

UA1DZ	838,510-	1769-	142-A
UN1CD	17,280-	144-	36-A
RA1AA	208,516-	838-	77-B
UW1BM	22,645-	203-	35-B
RA1OAK	14,140-	149-	28-B
UA1OMW	8,144-	151-	16-B
UA1OAM	48,167-	292-	49-C
UA1ZFT	34,928-	293-	37-C
UA1OLL	24,440-	164-	47-C
UA1OML	17,670-	202-	31-C
UA1OB	5,280-	101-	15-C
UA1YR	1,320-	88-	15-C
UZ1AWO (+ops)	265,115-	1052-	85-D
UZ1OWR (UA1s OFT,OIQ,113-17,ops)	101,472-	563-	56-D

ZONE 20

Asiatic RSFSR

RA9XB	154,269-	580-	61-A
UA9XR	339,420-	839-	90-C
UA9XHT	159,957-	515-	69-C
UA9XBD	76,293-	360-	49-C
UA9XHJ	47,034-	338-	39-C
UA9CAQ	11,946-	123-	22-C
UZ9XXM (UA9s XDG,XF,099-404,099-473,ops)	367,316-	1012-	79-D
UZ9GWG (RV9CAB,UA9s CPL,CVF,ops)	189,356-	582-	66-D
UZ9XWH (UA9s XBQ,XBV,099-966,ops)	67,074-	376-	42-D

ZONE 21

Asiatic RSFSR

RA9JX	500,112-	1240-	92-A
UA9KF	27,870-	217-	22-B

ZONE 22

Asiatic RSFSR

UA0BEO	48,675-	336-	33-C
UA0SZ	108-	18-	6-C

ZONE 24

Asiatic RSFSR

UA0QO	110,325-	373-	75-A

ZONE 26

Asiatic RSFSR

UA0KAV	69,816-	366-	44-A
UA0KCL	43,146-	353-	27-C
UA0KAT	11,726-	123-	25-C
UA0KO	1,500-	39-	12-C

ZONE 27

Ireland

EI5CRC (EI1CS,EI2GN,EI4EC,EI6AK, EI7FK,EI9FT,EI646,EI911,ops)	107,726-	598-	61-D
EI7DJ (EI8AU,EI868,ops)	37,366-	268-	44-D

France

FE1JDG	6,545-	226-	11-A
F6BVB	97,812-	485-	66-B
FE6DRP	5,664-	152-	12-B
F6EPQ	7,380-	112-	18-C

England

G4VGO	4,970-	125-	14-A
G8AEV	130,220-	509-	85-B
GB6AR (G4XKR,op)	99,432-	425-	72-B
G0/DL2DN	1,664-	104-	16-B
G3ESF	120,225-	489-	75-C
G4/KB4GID	49,068-	276-	58-C
G3DFV	33,920-	252-	40-C
G3TXF	24,440-	256-	26-C
G8/WC6U	3,822-	68-	21-C
GB4DX (G4BWP,G4GIR,ops)	851,072-	1947-	122-D

Scotland

GM4WEW	13,975-	159-	25-B
GM4HQF	10,120-	142-	22-B
GM3CFS	58,024-	312-	56-C

Wales

GW4RHW	21,141-	251-	27-A
GW4BLE	55,067-	304-	53-B

Belgium

ON6CR	24,395-	199-	41-B
ON5KI	22,075-	370-	25-B
ON6JG	784-	38-	8-B
ON4XG	11,872-	128-	28-C

Netherlands

PA2GER	42,462-	625-	42-A
PA3EOB	12,206-	126-	34-A
PA3CAU	4,260-	124-	12-A
PA/DL1SBF	1,320-	50-	10-A
PA0DUO	58,930-	272-	71-B
PA3EMN	39,054-	285-	46-B
PA0YN	5,480-	92-	20-B
PA2NJN	3,066-	146-	21-B
PA3CAZ	2,820-	78-	10-B
PA0GT	52,536-	171-	88-C
PA0VLA	19,024-	158-	41-C
PA3BTH	18,600-	143-	40-C
PA0LOU	14,859-	121-	39-C
PA0PUR	13,130-	153-	26-C
PA0LKR	10,619-	121-	31-C
PA3BNT	2,052-	38-	18-C
PA0KHS (+PA0s AHO,NZH,PA3s ADJ, AIR,AWN,DQW,ENJ,PE1LBX)	421,176-	1283-	92-D

ZONE 28

Federal Republic of Germany

DF2RG	3,020-	56-	20-A
DK8AX	1,017-	55-	9-A
DL8PC	272,636-	868-	107-B
DK7ZT	31,360-	195-	35-B
DL1RDG	29,596-	257-	49-B
DJ4FU	25,245-	239-	45-B
DK5DS	22,644-	251-	37-B
DJ0MW	4,992-	122-	16-B
DL3ECC	4,524-	156-	13-B
DJ8QO	630-	21-	10-B
DL4SBO	68,288-	461-	44-C
DL1TH	52,325-	315-	65-C
DL1EK	38,661-	385-	33-C
DL1ZQ	26,524-	282-	38-C
DK8KC	9,951-	119-	31-C
DF3QN	5,750-	99-	25-C

Hungary

HA2KMR	118,455-	1027-	53-A
HA5HH	98,142-	607-	66-A
HA3NU	42,750-	263-	50-A
HA6ZV	42,484-	365-	43-A
HA1SL	33,660-	254-	51-A
HA5ARR/8	30,288-	379-	28-A
HA5NP	514,215-	1385-	135-B
HA5WU	11,370-	278-	15-B
HA5LZ	168,920-	480-	103-C
HA7UI	138,645-	857-	79-C
HA7JP	97,024-	576-	64-C
HA0HG	17,356-	173-	38-C
HA6KZS	4,597-	163-	22-C
HA6GN (HA6s ND,NF,NQ,NY,ON,OQ,ops)	1,222,155-	2383-	165-D
HG5A (HA5s FM,GF,HO,LN,MK,ML,OM, WE,HA7s RY,SU,ops)	1,214,840-	2236-	180-D
HG1S (HA1s DAC,TD,TJ,TV,099,ops)	936,763-	2174-	149-D
HG7B (HA5WA,HA7s UG,UO,HA8s FM, IE,HA0DU,ops)	670,889-	1747-	137-D
HG6V (6 ops)	511,212-	1561-	116-D
HA3KNA (HA3s NS,NU,OU,OV,ops)	479,164-	1368-	109-D
HA0KLE (HA0s LC,MK,VI,VN,VO,ops)	351,840-	1254-	96-D
HA5KFL (6 ops)	248,094-	1211-	77-D
HA8UNX (4 ops)	153,519-	770-	73-D
HA1KZV (HA1s CA,DRJ,DRP,DRQ,DRT, ops)	83,631-	559-	61-D
HA6KNI	76,408-	860-	33-D
HA6KVA/P	41,100-	256-	60-D
HA6KQD (HA6s QD,VV,XE,ops)	39,028-	256-	44-D
HA7KMP (+ops)	25,327-	223-	43-D

Switzerland

HB9DDZ	11,850-	143-	30-A
HB9AAA	83,454-	386-	54-B
HB9AGA	159,896-	800-	79-C
HB9DX	38,400-	314-	48-C
HB9AGH	26,840-	226-	40-C
HB9RE	2,015-	71-	13-C
HB9DFY (+HE9WIV)	72,624-	450-	88-D

Italy

I8KHP	37,422-	345-	54-A
I4UFH	141,372-	832-	63-B
IK0AZG	100,140-	571-	60-B
IK0FEX	40,656-	466-	28-B
I4CSP	28,404-	260-	54-B
IK2DZN	28,035-	267-	45-B
I0KHY	27,588-	269-	47-B
IK2JEX	7,920-	225-	20-B
I6YEF	711-	31-	9-B
IO8RFD	169,244-	1109-	58-C
I8ZUT	61,712-	348-	58-C
I2VXJ	14,112-	224-	24-C
IK4GNK	3,072-	62-	16-C
I5ECW (+I5JHW,I5OVS)	171,612-	894-	84-D
I4EFK (+IT9RYJ)	123,717-	617-	69-D

Sardinia

IS0OMH	39,368-	520-	38-B

Bulgaria

LZ1KZM (LZ1UF,op)	6,855-	85-	35-A
LZ1UDP	284,752-	1092-	134-B
LZ2QV	63,714-	355-	74-B
LZ1RN	62,699-	502-	53-B
LZ2KEF	12,787-	694-	19-B
LZ2KK	263,200-	845-	100-C
LZ2VP	166,002-	679-	73-C
LZ1TA	83,997-	535-	61-C
LZ1MG	65,727-	380-	67-C
LZ2AG	36,765-	328-	43-C
LZ9A (LZ2s CC,DF,HE,PO,ops)	1,167,905-	2239-	185-D
LZ1KOZ (3 ops)	424,438-	1272-	99-D
LZ1KVZ (3 ops)	89,900-	672-	58-D
LZ2KSQ (3 ops)	28,905-	405-	47-D

Czechoslovakia

OK1AJN	138,980-	575-	90-A
OK2RU	102,102-	480-	77-A
OK1KZ	65,826-	517-	67-A
OK1KDZ	61,714-	452-	58-A
OK3TEW	58,311-	341-	57-A
OK1JJB	47,475-	370-	45-A
OK1DZL	45,506-	315-	61-A
OK2BOB/P	26,275-	261-	39-A
OK1OTA	7,755-	95-	33-A
OK1DXS	5,868-	149-	14-A
OK2JS	583,836-	1263-	132-B
OK3CDZ	24,428-	237-	36-B
OK1KQJ	20,250-	237-	30-B
OK3YK	18,600-	202-	40-B
OK2HBY	14,424-	216-	24-B
OK3KV	7,740-	136-	20-B
OK2BQP	2,750-	82-	11-B
OK1AMF	195,738-	612-	102-C
OK2PCF	83,820-	495-	66-C
OK2HI	67,725-	382-	63-C
OK1KT	36,873-	205-	51-C
OK3CEL	33,320-	253-	49-C
OK1MNV	29,412-	275-	38-C
OK3CWF	28,880-	308-	38-C
OK1MZO	21,063-	146-	51-C
OK1MHI	20,387-	189-	37-C
OK3CVF	20,376-	212-	36-C
OK3CWJ	20,220-	224-	30-C
OK3TAY	15,801-	243-	23-C
OK2KPS	14,430-	206-	28-C
OK3RDP	12,331-	276-	19-C
OK1MKU	9,021-	105-	37-C
OK1MIZ	8,487-	137-	23-C
OK3CSQ	5,653-	197-	23-C
OK3CDN	5,360-	100-	20-C
OK1AII	4,012-	42-	34-C
OK2PFP	3,660-	95-	12-C
OK1DHJ/M	2,860-	80-	20-C
OK1MVT/P	2,314-	74-	13-C
OK2PZZ	1,463-	42-	11-C
OK2PBG	1,290-	49-	10-C
OK3TUM	902-	44-	11-C
OK2PKN	584-	41-	8-C
OK1FBH	567-	23-	7-C
OK3CXS	560-	38-	10-C
OK3ROS	470-	29-	10-C
OK2BDI	184-	9-	8-C
OK5R (OK1s ADS,ALW,AWZ,RI,ops)	965,172-	2342-	138-D
OK1OAZ (OK1s BLN,DFP,ops)	420,630-	1317-	105-D
OK3KEE (+ops)	307,944-	1137-	84-D
OK1KLV (OK1s DVZ,FDT,ops)	141,008-	654-	71-D
OK1ORA (OK1s AYD,223B,ops)	48,508-	421-	46-D
OK2KOD (OK2s BVA,WAZ,ops)	13,330-	93-	43-D
OK1KNC (+ops)	11,040-	138-	24-D
OK1KAY (+ops)	840-	34-	10-D

Poland

SP6CZ	79,134-	345-	66-A
SP2ZHB/2	78,498-	756-	42-A
SP9BRP	26,496-	245-	46-A
SP8KEA/8	2,595-	73-	15-A
SP5ELA/6	2,134-	100-	11-A
SP9LJD	227,304-	945-	82-B
SP1PBW	98,234-	439-	86-B
SP4HKN	15,960-	173-	38-B
SP6MLF	8,256-	116-	32-B
SP8MQD	6,175-	87-	25-B
SP8NVK/1	4,832-	132-	16-B
SP9AVZ	4,251-	140-	13-B
SP1DTG	3,430-	100-	14-B
SP5EMM	1,668-	89-	8-B
SP3JHY	1,485-	31-	15-B
SP8DVP	231-	19-	7-B
SP9MDY	186-	17-	8-B
SP6HEK	110,174-	583-	62-C
SP3HC	70,528-	412-	64-C
SP2NA/2	39,260-	169-	65-C
SP8CJQ	34,228-	322-	43-C
SP8TQ	26,381-	251-	37-C
SP7DTP	16,660-	200-	34-C
SP3LPR	392-	21-	8-C
SP5PBE (SP5s BYY,FKW,JTM,ops)	203,952-	826-	84-D
SP2ZFJ/8 (SP2s FAP,NW,ops)	122,128-	694-	88-D

German Democratic Republic

Y52WG	287,332-	919-	118-A
Y23CO	284,926-	880-	109-A
Y41RM	238,640-	850-	95-A
Y35VM	205,744-	894-	77-A
Y53ED	87,408-	547-	64-A
Y58WA	84,079-	369-	75-A
Y34SG	82,625-	392-	85-A
Y45RN	77,077-	368-	77-A

Y32PI	74,022-	430-	73-A
Y32VN	73,150-	387-	70-A
Y22WK	65,104-	563-	52-A
Y27FN	57,728-	359-	74-A
Y46WA	57,536-	400-	58-A
Y66YF	55,715-	405-	55-A
Y31NJ	55,420-	306-	68-A
Y35WF	52,274-	315-	62-A
Y21WI	48,654-	367-	53-A
Y43RF	43,648-	283-	62-A
Y21BE	34,960-	308-	46-A
Y51TG	33,524-	228-	58-A
Y26WL	29,980-	199-	56-A
Y22WD/A	25,774-	194-	49-A
Y52TF	25,197-	273-	37-A
Y49OF	14,858-	200-	38-A
Y47YM	12,447-	736-	29-A
Y24SK/A	11,972-	121-	41-A
Y67UL	11,904-	150-	32-A
Y24GB/A	11,515-	125-	35-A
Y23RJ	11,319-	150-	33-A
Y27BN	8,536-	157-	22-A
Y22OF	6,531-	182-	21-A
Y23HE/A	6,293-	65-	29-A
Y26JD	5,800-	129-	20-A
Y62SM	4,250-	61-	25-A
Y22HF	4,060-	145-	28-A
Y27ML	3,933-	53-	19-A
Y23CM	2,800-	46-	20-A
Y53OF	2,175-	57-	15-A
Y26MO	1,862-	66-	14-A
Y31PE	384-	18-	8-A
Y64UF	192-	12-	6-A
Y36SG	125,624-	621-	82-B
Y46IF	107,848-	705-	61-B
Y38YK	49,664-	330-	64-B
Y41JH	47,530-	363-	49-B
Y28SO/A	26,498-	240-	48-B
Y49YC/P	24,336-	222-	52-B
Y22VI	22,218-	258-	42-B
Y55KA	18,352-	214-	37-B
Y51XO	15,007-	135-	43-B
Y31LA	9,425-	147-	29-B
Y43XE	8,580-	114-	33-B
Y54SF	*3,000-*	*75-*	*20-B*
Y44WA	2,880-	80-	16-B
Y21HB	2,397-	57-	17-B
Y39VK	2,275-	71-	13-B
Y25GH/A	1,482-	44-	13-B
Y25DW	1,216-	32-	16-B
Y48ZA	288-	18-	6-B
Y47ZM/P/Y62VM	224-	39-	4-B
Y47ZM/P/Y62UM	168-	15-	6-B
Y21XI	168-	23-	4-B
Y51XE	341,061-	1053-	109-C
Y33YA	70,800-	455-	80-C
Y42OA	59,598-	340-	66-C
Y88ZA/Y65XA	19,762-	185-	41-C
Y24SH/A	19,550-	161-	48-C
Y27NM/A	15,876-	104-	54-C
Y23WF	15,428-	205-	28-C
Y21DG/A	14,352-	115-	48-C
Y21CL	14,268-	130-	41-C
Y37ZE	9,504-	118-	36-C
Y22UB	8,968-	102-	26-C
Y21EA	5,125-	90-	25-C
Y22IC	4,752-	98-	18-C
Y23GB	4,050-	109-	15-C
Y24SP	*2,955-*	*89-*	*15-C*
Y32XF	2,652-	60-	17-C
Y53XM	1,830-	63-	10-C
Y25TG	1,548-	75-	9-C
Y26VG	756-	42-	9-C
Y25XA	630-	34-	9-C
Y22DK/P	518-	40-	7-C
Y21HE	451-	7-	5-C
Y21FL	375-	25-	5-C
Y31PA	306-	21-	6-C
Y26EH	184-	27-	7-C
Y23TL/A	12-	4-	2-C
Y35L (Y26IL,Y33s UL,ZL,ops)			
	604,044-	1534-	141-D
Y38I (Y44s UI,XI,ZI,ops)			
	534,865-	1569-	115-D
Y37I (Y23FI,Y62s WI,XI,ops)			
	520,910-	1388-	130-D
Y61ZF (Y41s UF,ZF,Y61UF,ops)			
	407,184-	1091-	137-D
Y56ZF (Y24VF,Y56s VF,YF,ops)			
	327,635-	1057-	115-D
Y43ZO (Y21RO,Y22XO,Y43GO,ops)			
	230,289-	1069-	87-D
Y47ZN (+Y47s MN,YN)			
	147,030-	738-	78-D
Y55ZJ (+Y56TJ)	142,560-	664-	61-D
Y53ZN/P (Y53s ZN,YN,XN,ops)			
	131,638-	626-	83-D
Y36ZM (+Y36VM)	124,394-	514-	82-D
Y44ZN (Y44s SN,TN,ZN,ops)			
	93,660-	572-	70-D
Y33ZJ/P (Y33s PJ,UJ,11-J,ops)			
	78,736-	489-	64-D
Y42CB (Y22YB,Y23UB,Y42VB,ops)			
	35,391-	314-	47-D
Y68SF (+Y68RF)	30,400-	333-	38-D
Y87GST (Y23NF,Y27MF,Y65ZF,ops)			
	10,108-	155-	28-D

Romania

YO2AB	113,472-	626-	72-A
YO6DMV	46,305-	78-	21-A
YO3BDP	24,930-	220-	45-A
YO6KBM	15,072-	211-	32-A
YO9HG	8,556-	156-	22-A
YO3YC	56,940-	401-	60-B
YO6AJI	44,858-	291-	57-B
YO5AVN/3	43,310-	275-	61-B
YO6BQT	31,442-	272-	39-B
YO2BZV	18,970-	260-	35-B
YO9HH	11,550-	208-	21-B
YO2LAL	10,759-	181-	29-B
YO4US	10,426-	173-	26-B
YO4AEQ	8,569-	133-	19-B
YO9AHX	7,700-	142-	22-B
YO6RBU	5,440-	138-	17-B
YO9BXE	*4,945-*	*107-*	*21B-B*
YO2ARV	3,292-	317-	46-B
YO2LBC	3,276-	114-	14-B
YO3FGG	56-	8-	4-B
YO4ZF	48,617-	336-	61-C
YO9FR	38,736-	353-	48-C
YO3AAQ	36,771-	287-	51-C
YO6EZ	23,347-	260-	37-C
YO4BNQ	21,552-	164-	48-C
YO2DFA	19,116-	252-	35-C
YO3BWK	8,460-	80-	30-C
YO5ALI	6,890-	111-	26-C
YO2ASY	6,342-	114-	21-C
YO3BFJ	6,308-	119-	23-C
YO2CJX	6,136-	127-	26-C
YO4DCF	4,440-	111-	15-C
YO5ALH	3,878-	107-	14-C
YO8CHH	3,840-	119-	16-C
YO2CGU	1,826-	85-	11-C
YO2BEO	426-	21-	6-C
YO9HG	392-	21-	8-C
YO6BTY	144-	24-	4-C
YO4AAC	112-	12-	4-C
YO6QBK	96-	12-	4-C

Yugoslavia

YU3EO	646,875-	1671-	125-A
YU2TY	41,418-	337-	54-A
YU3HR	292,020-	1120-	93-B
YU3BU	153,180-	696-	74-B
4N4A (YU4EU,op)	764,272-	1821-	148-C
YU3EA	403,068-	1076-	94-C
YZ9IX	252,448-	862-	98-C
YU7SF	132,618-	532-	93-C
YU7KM	39,256-	274-	56-C
YU5BV	36,720-	353-	40-C
YU7FY	22,260-	196-	*40-C*
YU1AT	11,418-	182-	22-C
YT8UNI (YU2s HO,MM,MY,ops)			
	456,015-	1556-	101-D
YT2B (YU2NK,YU2VR,YU2RSs ops)	891,865-	1906-	106-D
4N4B (4 ops)	288,052-	1022-	101-D
YZ9CAH (3 ops)	107,200-	653-	64-D
YT3L (7 ops)	96,408-	641-	52-D
YU4EKK (+YU4s MH,XA,YT4WSE)			
	34,768-	306-	41-D

ZONE 29

Kaliningrad

UZ2FWN (UA2s DC,125-574,ops)			
	46,397-	472-	43-D
UZ2FWK (3 ops)	6,768-	200-	16-D

European Russian RSFSR

UA3RAR	283,240-	941-	97-A
RW3AU	264,330-	914-	99-A
UA6LAM	185,920-	736-	80-A
UV3WT	107,365-	375-	109-A
UA3ZFE	70,701-	446-	57-A
RA1OQ	63,918-	524-	53-A
RA3AOD	62,075-	315-	65-A
RA3DX	57,810-	246-	82-A
UA3RA	49,672-	324-	56-A
RA3DNC	31,261-	278-	43-A
UA4NE	29,180-	272-	45-A
UA4LAF	*26,575-*	*323-*	*31-A*
RA6AF	24,725-	196-	43-A
UA3DQS	22,525-	235-	53-A
UA3TS	17,030-	264-	42-A
RV6AF	10,434-	90-	47-A
RW6AC	9,750-	103-	30-A
RW3DR	9,338-	98-	29-A
UA6LIQ	9,325-	131-	25-A
UA4UBC	7,832-	134-	22-A
UA4ANZ	5,200-	72-	25-A
UA3XDF	280-	24-	4-A
UV6AH	278,700-	900-	100-B
UA6LQ	262,815-	768-	105-B
UA6ADC	153,728-	744-	64-B
UA4LM	136,948-	664-	73-B
RA4CC	128,468-	515-	78-B
RA3RK	125,424-	583-	72-B
RW3DW	111,904-	591-	64-B
UZ4AWB	73,500-	343-	75-B
UA4NC	69,704-	438-	62-B
UA4CO	67,379-	303-	73-B
RA6LW	66,150-	366-	63-B
UA3TN	39,904-	218-	58-B
UA4CZ	38,868-	267-	47-B
UA6LBH	*31,650-*	*352-*	*30-B*
UA3ZIJ	25,308-	271-	36-B
RA3DKE	20,812-	294-	22-B
UA3ZU	16,948-	154-	38-B
UA4CX	9,735-	99-	33-B
UA3QND	7,546-	264-	28-B
UA3QJC	4,123-	65-	19-B
UW3AA	489,154-	1243-	131-C
UA4ANO	401,955-	1011-	127-C
UA3RZ	236,205-	899-	67-C
UA3TU	226,800-	814-	90-C
RW3AX	124,920-	610-	72-C
OK3IA/UA3	112,400-	486-	80-C
UA3DIJ	103,247-	579-	67-C
UA3DPX	98,070-	599-	65-C
UA6BPM	86,664-	427-	69-C
UA6AX	86,213-	337-	73-C
RA3RN	83,496-	301-	84-C
UA3XDB	76,128-	423-	78-C
UA4YJ	74,499-	402-	57-C
UA4AGP	73,020-	410-	80-C
UW6OE	72,072-	328-	83-C
UA3AAJ	63,660-	350-	60-C
UA1AFF	60,738-	434-	53-C
RA3VA	60,208-	373-	53-C
UA3DJG	55,593-	257-	71-C
UA4NEJ	53,010-	351-	57-C
UA4YA	*52,022-*	*451-*	*57-C*
UA4AHA	47,859-	392-	43-C
RA6AR	41,470-	274-	55-C
RA3NB	39,072-	1056-	37-C
RA3RD	38,650-	285-	50-C
UA4NZ	35,460-	290-	45-C
UA3YAO	31,832-	326-	36-C
UA6AMC	31,185-	297-	33-C
UZ3TG	30,150-	399-	25-C
UA1AUA	29,233-	284-	41-C
UA4QK	26,829-	304-	33-C
UA3AQO	25,823-	285-	31-C
UA3XN	23,446-	227-	38-C
UA6LTC	23,026-	314-	29-C
UA3TAM	18,816-	194-	32-C
UA4SSS	18,432-	284-	32-C
UZ3DYF	17,952-	200-	28-C
UA3YBJ	17,197-	275-	29-C
UA3EDF	15,088-	270-	41-C
UA3PB	8,990-	106-	29-C
UA3CGR	8,888-	121-	22-C
UA3ICJ	6,894-	129-	18-C
UA1QCC	5,014-	95-	23-C
UA3PFW	4,394-	175-	13-C
UA3MED	3,631-	126-	76-C
RW3AN	2,904-	120-	11-C
UV6HFK	215-	27-	5-C
UW4CN	63-	7-	3-C
UV6AGR	25-	13-	6-C
UZ1AWT (UA1ANA,UW1AE,ops)			
	491,832-	1208-	132-D
RW4LYL (UA4s LU,LAH,LDE,LDL,YO, YDZ,164-221,ops)			
	483,747-	1617-	107-D
UZ6LWZ (UA6s LUQ,159-1463,156-140,ops)			
	231,315-	707-	105-D
UZ3XWA (UA3s XCH,-127-67,-127-56,ops)			
	229,162-	645-	84-D
UZ6LXZ (RA6LVA,UA6LRP,UV6LGP,ops)			
	178,622-	930-	67-D
UZ6LWU (RA6LUX,UA6s LCW,158-141S,ops)	157,148-	827-	68-D
UZ3AWR (RW3AO,UA3AO,UW3s AO,GC, UV3GT,ops)	134,940-	714-	65-D
UZ3RXU (3 ops)	133,054-	790-	71-D
UZ6XWC (UA6s XT,087-315,087-316,ops)			
	102,672-	511-	72-D
UZ1QWL (UA1s QBV,QL,ops)			
	94,416-	634-	58-D
UZ4FWZ (3 ops)	89,854-	592-	58-D
UZ3QWM (UA3s QAO,QDW,121-3106,ops)			
	83,147-	465-	67-D
UZ1WWA (3 ops)	77,550-	536-	50-D
UZ3RWZ (RA3RQT,UA3s 157-665,157-681,ops)	64,296-	422-	57-D
UZ6EWF (UA1-169-33/UEE,UA6s EN,169-414,ops)	63,840-	440-	57-D
UZ3XWW (3 ops)	56,657-	381-	53-D
UZ1AWV (3 ops)	46,500-	422-	50-D
UZ3PWJ (UA3s PLS,PNN,PNO,ops)			
	37,179-	729-	51-D
UZ3DWX (UA3s DEE,DLW,176-998,ops)			
	32,192-	320-	32-D
UZ1CWQ (RA1s CL,CT,UA1CGW,ops)			
	24,030-	343-	30-D
UZ6AWJ (3 ops)	7,308-	514-	58-D

Ukraine

RB5IM	830,592-	1599-	168-A
UT4UZ	404,178-	1303-	108-A
RB5TU	301,790-	1148-	103-A
UB5MLP	176,851-	679-	101-A
UB5ITW	131,364-	490-	82-A
UB4LZA	115,441-	579-	67-A
UY5TE	98,640-	536-	68-A
RB8GG	94,656-	420-	68-A
RT5UO	62,280-	329-	90-A
RB5AE	33,558-	271-	42-A
UB4MF	26,970-	317-	29-A
UB4JA	19,349-	305-	43-A
RB5MP	13,394-	130-	37-A
UB5AFI	10,752-	140-	28-A
UT5UDI	3,486-	127-	40-A
UT5DK	350,921-	1177-	103-B
RB5IA	*312,132-*	*891-*	*111-B*
UT5RY	67,203-	439-	57-B
RB5FF	58,368-	336-	57-B
RB5NT	58,350-	357-	50-B
RB4JF	36,482-	212-	58-B
RB5IQ	26,973-	265-	37-B
RB5AL	26,862-	310-	37-B
UB5LRS	18,772-	173-	38-B
RB5HT	8,723-	73-	61-B
UB5KEG	7,225-	141-	17-B
RB5RA	2,910-	69-	15-B
UB5ZHQ	300-	36-	5-B
RB5EX	347,490-	1015-	110-C
RB5BA	309,600-	928-	120-C
UT5UIW	219,474-	910-	89-C
UB5WF	195,614-	700-	94-C
UB5ITU	150,529-	656-	81-C
UB5IJA	149,118-	545-	87-C
UB5QJI	122,134-	517-	79-C
UB5IAN	109,270-	578-	70-C
UB5IHQ	92,470-	457-	70-C
UB5PAG	91,140-	534-	62-C
UB5CCP	87,110-	501-	62-C
UB5FAN	79,670-	482-	62-C
UB5LUY	78,820-	293-	68-C
UB5BZ	73,440-	314-	80-C
UB5QKO	70,448-	450-	58-C
UB5WJ	69,264-	288-	74-C
UB5WAB	68,320-	361-	61-C
UT5UCD	64,736-	296-	68-C
UB5ILW	60,829-	366-	59-C
UB5VKO	51,244-	400-	46-C
UB5QJA	47,432-	274-	56-C
UB5QJN	*38,688-*	*348-*	*39-C*
UB5VK	31,185-	321-	35-C
UT6UCK	29,218-	289-	32-C
RB5QR	28,557-	209-	49-C
UB5JS	26,159-	971-	29-C
UB5CN	27,918-	170-	47-C
UB5FCE	27,720-	291-	36-C
UB5CDX	26,985-	306-	35-C
UB5JNW	26,740-	293-	28-C
UB5AJP	26,522-	314-	27-C
RB5WR	26,412-	274-	31-C
UB5FGI	26,236-	353-	28-C
UB5IPH	23,445-	193-	45-C
UB5QGD	22,626-	268-	27-C
UB6YZ	22,127-	358-	94-C
UB5MMP	21,240-	168-	45-C
UB4IM	19,440-	164-	40-C
UY5WA	18,600-	254-	25-C
UB5ZFB	16,781-	321-	37-C
RB5AT	16,568-	152-	38-C
UB5IDG	13,560-	237-	24-C
UB5WDD	11,136-	124-	29-C
UB5EF	10,464-	206-	32-C
UB5BDC	10,416-	62-	62-C
RB5JS	4,160-	82-	20-C
UB4IWR	3,645-	70-	15-C
UB5IF	3,186-	90-	31-C
UB4LDD	2,292-	116-	12-C
UB5EKQ	1,908-	41-	16-C
UB1RR	558-	53-	6-C
UB5CDM	504-	58-	9-C
UB4MZL (RB4s MB,MF,RB5MT,UB4ML, UB5s MIF,059-12,ops)			
	2,644,480-	2822-	258-D
UB3IWA (RB5II,UB5s IFZ,IML,INO,IOK,ops)			
	1,132,620-	1973-	172-D
UB3JWW (RB5JD,UB4JFR,UB5JMR,ops)			
	847,740-	1963-	142-D
UB4MWA (+ops)	381,825-	948-	125-D
UB4IZZ (+ops)	319,750-	805-	125-D
UB4QWW (UB5s QO,064-866,ops)			
	310,960-	1020-	92-D
UB4EYJ (RB5EEU,UB5s EFW,EPU,ops)			
	187,488-	834-	72-D
UB4WZA (+ops)	186,833-	819-	83-D
UT4ZWB (+ops)	159,610-	803-	70-D
UB4FWC (+ops)	148,400-	826-	70-D
UB4TWA (3 ops)	124,245-	821-	74-D
UB4RWW (RB5s RW,RZ,UB5RU,ops)			
	114,088-	744-	52-D
UB3GWG (3 ops)	72,210-	427-	58-D
UB4CWA (3 ops)	56,988-	558-	36-D
UB4IWI (RB5ICY,UB5s INT,IOB,ops)			
	56,848-	436-	44-D
UB4VWA (+ops)	50,016-	360-	48-D
UB4MZA (3 ops)	44,792-	315-	44-D
UB4FXX (RB5FK,UB5s 070-072,076-721,ops)	35,055-	335-	45-D
UB4TWL (UB5s TBN,TBS,UK5-079-2,ops)			
	32,445-	349-	35-D
UB4IYK (3 ops)	*9,336-*	*88-*	*29-D*
UB4NWA (UB5s 057-558,057-557,ops)			
	7,560-	144-	21-D
UB4IUM (+ops)	1,629-	53-	9-D

Byelorussia

UC1AWC	245,832-	1033-	84-A
UC2OM	101,304-	639-	56-A
UC2AIU	77,292-	446-	57-A
UC2AS	77,292-	446-	57-A
UC2OS	36,830-	319-	45-A
UC2ACT	28,050-	370-	25-A
UC2AB	13,478-	190-	23-A
RC2AF	103,415-	417-	65-B
UC2AAD	75,776-	342-	74-B
UC2AFA	43,104-	357-	48-B
UC2ODW	68,675-	388-	67-C
UC2WAZ	60,950-	352-	60-C
UC2WG	51,450-	419-	50-C
RC2AU	30,315-	284-	43-C
UC2WO	390-	28-	5-C
UC1WXE (+ops)	12,576-	244-	19-D

Azerbaijan

UD5DKW	*17,669-*	*631-*	*28-A*
UD7DWZ (3 ops)	190,592-	992-	64-D

Armenia

UG6LQ	248,900-	917-	76-B
UG7GWB (3 ops)	14,896-	329-	16-D

Moldavia

RO4OA	11,991-	233-	17-A
UO5OOC	11,088-	234-	18-B
UO5OJM	69,412-	525-	37-C
UO5OBT	318-	32-	6-C
UO4OZZ (3 ops)	38,250-	389-	34-D

Lithuania

UP2OU	137,788-	729-	74-A
UP1BWR	57,950-	349-	50-A
UP2ND	22,880-	302-	27-A
UP3BH	240,361-	969-	87-B
UP2AV	*35,280-*	*270-*	*49-B*
UP2PAZ	17,073-	277-	21-B
UP2BNE	5,760-	79-	24-B
UP2PCK	5,115-	113-	15-B
UP2BOQ	553-	31-	7-B
UP2BW	458,316-	1145-	116-C

UP3BU 184,212- 833- 84-C
UP2BIC 117,150- 584- 75-C
UP2BZ 111,680- 648- 64-C
UP2BLQ 104,299- 541- 71-C
UP2PAQ 98,973- 596- 63-C
UP3BA 19,536- 268- 33-C
UP2PCF 9,082- 132- 23-C
UP2BB 7,463- 125- 17-C
UP2BNF 1,125- 71- 9-C
UP2BNL 1,098- 71- 9-C
UP1BWW (UP2s BAS,BIJ,BKW,BMW,BO, PX,038-892,038-1052,ops) 1,086,448- 1986- 176-D
UP1BZO (UP2s BDQ,BMX,038-346,038-1751,038-1787,ops) 612,294- 1554- 131-D
UP1BZG (UP2s BCO,BCW,ops) 125,256- 603- 65-D
UP1BYC (+ ops) 102,541- 547- 61-D

Latvia

UQ2GFU 65,876- 573- 43-A
UQ2GMR 43,680- 422- 39-A
UQ2GHB 3,516- 135- 12-A
UQ2CR 8,738- 303- 41-A
UQ2GM 454,440- 1330- 105-B
UQ2GD 390,302- 1203- 113-C
UQ2GN 68,508- 427- 66-C
RQ2GIG 5,090- 175- 14-C
UQ2GEC 1,456- 36- 14-C
UQ1GWX (+ RA3DUU,UQ1GXX,UQ2-037-1028) 252,350- 885- 103-D
UQ1GWT (UQ2s GFB,037-509,037-379,ops) 74,690- 339- 97-D
UQ1GYT (UQ2s GLZ,GOB,GQN,ops) 13,916- 510- 32-D

Estonia

UR2RIY 74,948- 662- 41-A
UR2RMI 344- 13- 8-B
RR2RN 114- 18- 3-B
UR2RND 74,152- 294- 92-C
UR2RKQ 16,120- 248- 26-C
UR1RWX (UR2s RJ,RNJ,063-165,ops) 13,520- 168- 28-D
UR1RXT (3 ops) 11,469- 325- 29-D

ZONE 30

European Russian RSFSR

UA4WEJ 135,415- 585- 71-C
RA4NBG 39,728- 298- 52-C
UA4PJP 6,210- 136- 18-C
UZ4WWB (5 ops) 358,530- 1095- 102-D
UZ4WWG (UA4s 095-683,095-722,095-754,ops) 302,511- 1012- 63-D
UZ4WWF (UA4s 095-528,095-759,095-760,095-825,ops) 70,290- 567- 55-D

Asiatic RSFSR

UA9TS 791,028- 1396- 126-A
UW9CO 515,260- 1003- 111-A
UW8UWB 126,750- 396- 75-A
RA9FA 126,453- 494- 61-A
UZ9CWP 76,228- 470- 34-A
UA9FAR 42,254- 266- 37-A
UA9MR 19,175- 87- 65-A
UW9LA 102,024- 536- 36-B
UV9WB 86,281- 257- 17-B
UA9CE 80,190- 396- 45-B
UW9CL 80,080- 361- 52-B
UA9CAW 32,736- 234- 33-B
UV9FR 19,120- 174- 24-B
RA9SVT 353,632- 964- 86-C
UA9ACV 226,561- 691- 71-C
UA8CM 81,600- 315- 60-C
UA9FGJ 78,008- 350- 49-C
UA9SGN 72,545- 311- 55-C
UA9CGL 67,595- 300- 55-C
UA9SAW 66,768- 390- 39-C
UA9JH 65,312- 507- 28-C
UA9MII 59,031- 367- 42-C
UW9AZ 48,831- 261- 41-C
RA9AE 35,280- 374- 21-C
UW9CZ 33,220- 226- 35-C
UA9AKS 29,295- 301- 21-C
UA9CPC 25,498- 264- 30-C
UA9AOV 8,640- 120- 15-C
UA9AMF 975- 21- 13-C
UZ9WWH (RA9s WR,WW,RV9WA,RW9s WA,WW,UA9WD,UV9WR,UW9WK,ops) 1,298,700- 1912- 150-(
UA9AYA (UA9-064-422,UM8NR,UW9s AA,AN,AR,AW,AX,ops) 1,055,502- 1798- 126-D
UZ9CWW (UA9s CDC,CHR,CIR,CIV,ops) 853,993- 1367- 133-D
UZ9CXE (RA9CGE,UA9s CMC,COB,CPJ, CSS,UV9CP,ops) 818,748- 1572- 114-D
UZ9WWS (5 ops) 710,991- 996- 153-D
UZ9FWR (UA9s FF,FM,FAL,FKX,ops) 685,462- 1228- 118-D
UZ9CYP (UA9s CKF,154-2185,ops) 76,228- 470- 34-D
UZ9MWJ (UA9s MAC,MGX,ops) 67,804- 317- 44-D

Turkmenistan

UH8BBG 11,132- 225- 22-B

Uzbekistan

UI8ZAA 146,594- 479- 74-B
UI8AFN 27,482- 241- 26-B
UI8BI 255,240- 793- 72-C
UI8AHA 19,166- 357- 34-C

Tadzhikistan

UJ8JA 139,386- 380- 78-C
UJ8AQ 11,725- 118- 25-C
UJ9JWA (UJ8s JW,JCW,UA9SA,ops) 323,831- 1027- 71-D

Kazakhstan

UL7IBQ 135,415- 451- 73-A
UL7OB 253,332- 632- 93-B
UL7CW 540,388- 1132- 106-C
UL8LYA (UL7s LEG,LEN,LER,LEZ,826-576,826-733,ops) 775,224- 1575- 108-D
UL8CWW (+ ops) 399,368- 899- 99-D
UL8LWU (RL7LCU, UL7s LBK,LDR,LGT, 826-513,ops) 148,600- 658- 50-D
UL8PZZ (UL7s PCU,PEA,PEO,823-88, 823-578,ops) 130,572- 636- 52-D

Kirghizia

UM8MO 303,620- 757- 94-B

ZONE 31

Asiatic RSFSR

UA9YX 562,275- 1230- 105-B
UA9YIE 84,387- 307- 69-C
UA9OA 57,708- 360- 36-C
UA9UPG 26,004- 274- 22-C
RA9YG 11,664- 174- 16-C
UZ9OWD (UA9s -145-168,-145-294,-145-338,UA9-163-554,ops) 280,080- 816- 72-D
UZ9HWW (3 ops) 240,968- 1132- 52-D
UZ9YXO (+ ops) 176,469- 566- 59-D

Kazakhstan

UL7QF 4,118- 77- 12-A
RL7JA 16,038- 130- 33-B
UL7DA 14,450- 101- 34-B
UL8GBI 36,050- 339- 25-C
UL8GBV 31,314- 318- 34-C
UL8GWC (UL7s -198-28,-198-51,-198-53, ops) 5,811- 105- 13-D

Kirghizia

UM8MIZ 74,462- 336- 52-C

ZONE 32

Asiatic RSFSR

UA0WW 43,227- 356- 27-A
UA0SAU 459,200- 942- 112-C
UA0BL 58,535- 319- 45-C
UA0SY 6,678- 142- 17-C
UZ0AXX (UA0s AMA,AGI,103-216,103-235, 183-712,183-729,ops) 608,894- 1350- 99-D
UZ0OWA (UA0s OCK,OCS,-095-144,ops) 57,365- 270- 55-D

ZONE 33

Asiatic RSFSR

UA0OHP 41,000- 218- 50-C
RA0JD 29,550- 170- 50-C
UA0FB 23,622- 180- 31-C
RA0JJ 1,500- 34- 15-C

ZONE 34

Asiatic RSFSR

UW9LI 37,088- 285- 32-A
UA0FF 80,150- 335- 70-B
UV0EX 11,286- 109- 27-B
UW0LT 411,584- 886- 116-C
UA0LGK 92,460- 405- 60-C
UB5FDG(UA0), 90,790- 361- 70-C
UA0LJ 60,354- 266- 63-C
UA0LT 5,044- 66- 28-C
UZ0FWI (UA0s FFM,FFT,FM,ops) 218,996- 740- 78-D
UZ0IWA (3 ops) 31,188- 192- 46-D

ZONE 35

Asiatic RSFSR

UA0ZF 171,836- 555- 76-A
UA0ZDD 116,504- 367- 82-B

ZONE 36

Canary Islands

EA8AMX 13,440- 88- 32-B
EA8TE 4,500- 90- 10-B
EA8BIE 52,128- 218- 48-C
EA8BJU 8,551- 105- 17-C

ZONE 37

Portugal

CT1AEO 5,985- 93- 21-A
CS5QF 23,288- 180- 41-B
CT1BWW 22,473- 175- 33-B
CT1DIZ 9,792- 100- 34-B
CT1BBY 2,720- 57- 17-B
CT1CWT 9,982- 160- 23-C

Spain

EA3FWE 6,517- 115- 19-A
EA1BGT 90,740- 573- 52-B
EA2CR 23,256- 189- 57-B
EA3DRO 21,960- 223- 30-B
EA5CPH 20,372- 143- 44-B
EA5JC 13,767- 115- 39-B
EA3FHT 12,798- 159- 27-B
EA5EFV 11,256- 88- 42-B
EA5FYE 10,415- 256- 30-B
EA5BZ$ 10,048- 108- 32-B
EA3FNI 8,988- 105- 28-B
EA3ELZ 3,666- 99- 13-B
EA1AHA 2,464- 56- 16-B
EA7BYM 968- 88- 11-B
EA3FXU 364- 20- 7-B
EA5FWU 19,872- 255- 27-C
EA3EGV 10,110- 226- 15-C
EA7AZA 1,752- 38- 12-C

ZONE 39

Israel

4X1IF 106,737- 477- 47-A
W3FYT/4X 40,185- 199- 45-A
4Z4HS (4X6I + 5 ops) 91,400- 392- 50-D
4X5QQQ (4X5DK + 3 ops) 4,781- 139- 7-D

Cyprus

H25MF (5B4MF,op) 962,388- 1544- 134-B

ZONE 41

India

VU2TJW 19,390- 140- 35-A
VU2UR 14,404- 138- 26-A

ZONE 44

Korea

HL1ABR 53,550- 395- 42-B
HL9HP 41,514- 248- 51-B
HL0J (HL1AYE,op) 8,424- 222- 13-B
HL9EP 60,444- 354- 46-C
HL0K (HL1AXK,HL2IDN,HL3EAT,HL4CGI, ops) 65,773- 395- 53-D

ZONE 45

Japan

JH1YDT (JH4UTP,op) 257,670- 673- 90-A
JE1AER 78,462- 389- 54-A
JA0EZP 63,232- 282- 52-A
JA2UOT 56,560- 262- 56-A
JA6RPU 10,952- 332- 77-A
JN1AIF 7,130- 182- 23-A
JH7BMF 6,440- 78- 28-A
JA6NKZ 5,321- 83- 17-A
JA1AAT 4,905- 79- 15-A
JA3UWB 3,872- 54- 22-A
JA2QVP 1,404- 24- 13-A
JO1LDY 648- 20- 9-A
JH3DPB 81,484- 345- 52-B
JH4UYB 65,464- 359- 56-B
JA2BNN 34,732- 222- 38-B
JA0AD 14,616- 122- 29-B
JA1BUI 10,230- 99- 30-B
JA2BEY 8,004- 68- 29-B
JA1LSO 6,960- 58- 30-B
JH1UUT 5,640- 100- 20-B
JI2LCE 3,213- 51- 21-B
JL1MWI 3,008- 98- 16-B
JF1OZD 1,350- 32- 15-B
JG6LGE 1,335- 27- 15-B
JE7SLC 1,084- 29- 12-B
JE1FEV 480- 24- 8-B
JO1MCC 264- 14- 6-B
JA6ODU 222- 9- 6-B
JR3KAH 150- 10- 5-B
JM1WBE 84- 5- 4-B
JG3DOR 84- 9- 4-B
JE1TTO 44- 6- 4-B
JH7WKQ 385,700- 799- 116-C
JR3BOT 156,384- 512- 72-C
JA9CWJ 78,616- 290- 62-C
JE7JZC 51,600- 260- 60-C
JA3ARM 32,148- 146- 57-C
JA6BCV 24,860- 132- 44-C
JA2FJP 23,256- 380- 19-C
JR7OMD/2 20,835- 119- 45-C
JH6TYD 19,823- 133- 43-C
JA1WYQ 15,293- 107- 41-C
JR3XEX 9,860- 132- 17-C
JH3JYS 8,694- 113- 18-C
JA3EEM 8,550- 81- 25-C
JA7ASD 6,652- 63- 24-C
JA1QR/M 5,552- 56- 28-C
JA8EJO 6,432- 66- 24-C
JA8AJE 6,210- 62- 27-C
JO1QZI 5,824- 54- 24-C
JA5AF 5,148- 68- 18-C
JG2LGM 4,532- 54- 22-C
JA4FMS 3,971- 49- 19-C
JS1OSP 2,520- 36- 18-C
JG3SVP 1,740- 86- 10-C
JR4ISK 1,391- 29- 13-C
JA6BWH 1,352- 26- 13-C
JA4GXS 1,241- 24- 17-C
JA2WF 1,001- 23- 11-C
JA7MWC 803- 19- 11-C
JA2SAP/1 748- 18- 11-C
JA1NYV 708- 15- 12-C
JE3CH 640- 16- 10-C
JA1AAV 448- 14- 7-C
JA2KPV 189- 7- 7-C
JK1LUY 100- 7- 4-C
JA3YBF (JE3YAP,JE6BXJ,JH9s GRK, GRM,JFH,JO1IPS,JR9AWR,ops) 628,201- 1213- 119-D
JA1YWX (JQ1BMV,JI2GUT,JN3PYQ, JA6-9330,ops) 507,596- 1040- 113-D
JA9YBA (JA9VDA,JH9VSF,JA9-10148,ops) 174,133- 587- 67-D
JR1ZTT (JL2ALL,JN1MSO,JP1MWB, JR4MWB,JR6PMI,ops) 75,110- 291- 70-D
JA4YJA (JJ3LJU,JM3ILK,JE4DNQ, JF4BNH,JG8PAF,ops) 43,038- 231- 54-D
JA2YKA (JG2VTD,JI2UHH,JJ2NJF,JK2s CZL,PNY,JE4LJK,ops) 36,285- 234- 41-D
JA3YQP (JA3PIA,JE3s KAM,PRX,JF3s DAW,LGY, JG3s KIE,KIV,ops) 30,756- 276- 33-D
JH4YYW (+ ops) 3,111- 43- 17-D

ZONE 50

Philippines

K4YT/4D8 479,450- 1193- 86-B
DX2F (WA7COE,op) 157,320- 714- 46-B
N7ET/DU7 75,296- 302- 52-C
DX9HT (DU6AF/9,DU9s AA,AU,BW,CV, DQ,ops) 92,548- 556- 34-D

ZONE 51

Solomon Islands

H44JA 39,933- 175- 51-B

Indonesia

YE9X (YB0s PR,SY,DPZ,YC0EMJ,YC9s VX,VGJ,ops) 543,508- 1133- 94-D

ZONE 52

Zaire

9Q5NW 259,923- 762- 69-A

ZONE 54

Indonesia

YC2CTW 5,440- 68- 17-A
YC2BKJ 2,561- 43- 13-B
YC5ODQ 240- 20- 12-B
YB2FEA 53,855- 239- 49-C
YC3HCM 20,048- 149- 28-C

ZONE 55

Australia

VK8AV 86,832- 270- 67-C
VK4TT 3,230- 77- 10-C

ZONE 58

Australia

VK6AJ 34,440- 207- 35-C

ZONE 59

Australia

VK2KL 78,572- 315- 62-B
VK2CXX 1,568- 46- 7-B
VK1LF 215- 9- 5-B
VK2APK 205,540- 504- 77-C

ZONE 61

Hawaiian Islands

AH6N 357- 11- 7-C

ZONE 64

Guam

KH2/KY6M 221,160- 490- 95-C

ZONE 65

Nauru

C21XX 23,188- 159- 34-A

ZONE 67

Antarctica

4K1A 10,020- 167- 12-C
4K1D 2,380- 34- 14-C

Checklogs

DL9NCW, EA1AW, EA4EAP, EA5DIT, EA8AKQ, GI5TK, HA9DD, HA2EOA, HA2KMO, HC2AA, HC4YK, IK6MJW, KO4D, KZ1O, LA8CE, LA9VDA, LU4ETN, LZ1EO, LZ1IA, LZ2KAD, N5KAE, NX8G, OF5FA, OF5OZ, OK1AEH, OK1AYU, OK1DWJ, OK1US, OK2BSG, OK2BW, OK2PLH, OZ1EUO, OZ2JI, OZ4NA, OZ4RS, OZ5PA, PT2TF, PY2LMA, PY4ZO, RA0JR, RA3ALA, RA3DOL, RA3DR, RB5DX, RB5GW, RB5HB, RB5IOV, RT5UE, RW6AF, RZ3DM, SM5FBL, SP1AEN, SP2KFV, SP3BVI, SP3CDQ, SP4EAK, SP5BNB, SP5ILO, SP5ML, SP8GSC, SP8JMA, SP9NSV, SP9ODY, UA0KBC, UA0KCJ, UA0KDH, UA1AJ, UA1AKT, UA1OGU, UA3AFG, UA3AHA, UA3DNV, UA3DPH, UA3IAK, UA4ALI, UA4CDL, UA4NCI, UA4WH, UA4YCJ, UA6ANZ, UA9CBO, UA9OS, UB4IE, UB4JO, UB5ACP, UB5CAL, UB5FBX, UB5IMD, UB5MQ5, UB5ZBG, UF6FDS, UL7YAO, UM8MAU, UM8MIG, UP2BAI, UP2BRJ, UP2DM, UP2FBN, UP3PP, UR2RCU, UT5CF, UV3AAN, UV3DN, UW0GN, UW3HY, UW3RR, UW6HS, UY5GG, UZ1OWZ, UZ6HXK, UZ6LWA, VE1ACK, Y22AN, Y22LL, Y23UB/A, Y24MJ, Y24PM/A, Y24XJ, Y24YU, Y25GH, Y27HL, Y32KI, Y38ZM, Y53ULP, Y53VL, Y54WM/P, Y54XA, Y54ZA, Y64ZL, YB1ZH/P, YO3CDN, YO4CAH, YO5BLA, YO6KET, YO7LAI, YU4ELI

ARRL International DX Contest Awards Program

Listed below are all of the plaques that will be awarded in the 1988 ARRL International DX Contest. Sponsors as of October 16 are shown adjacent to the corresponding category. If you are interested in sponsoring one or more of these awards that have not been sponsored, contact 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 is available before sending payment. We salute all who have helped make the Awards Program such a success!

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	Dave Thompson, K4JRB
14 MHz	Dayton Amateur Radio Assn
21 MHz	Kenwood USA Corporation
28 MHz	Windsor Amateur Radio Club VE3OW
QRP	Marlis, N4MZJ, Woodbridge Wireless Inc

W/VE Phone—Multioperator

Category	*Donor*
Single Transmitter	Kenwood USA Corporation
Two Transmitter	Kenwood USA Corporation
Unlimited	Western New York DX Assn—W2RR

W/VE CW—Single Operator

Category	*Donor*
All Band	Frankford Radio Club
1.8 MHz	Billy Lunt, KR1R
3.5 MHz	Dayton Amateur Radio Assn
7 MHz	Northern Arizona DX Assn
14 MHz	Fox Cities Amateur Radio Club—W9ZL
21 MHz	Carl Luetzelschwab, K9LA
28 MHz	W5MYA
QRP	David Newkirk, AK7M

W/VE CW—Multioperator

Category	*Donor*
Single Transmitter	Northern Illinois DX Assn
Two Transmitter	Kenwood USA Corporation
Unlimited	

DX Phone—Single Operator

Category	*Donor*
World	North Jersey DX Assn
Africa	Kenwood USA Corporation
Asia	Acadiana DX Assn
Europe	Gerald Griffin, MD, W8MEP
North America	Chod Harris, VP2ML
Oceania	Doc Sayre, N7AVK
South America	Kenwood USA Corporation
1.8 MHz	Fred Race, W8FR in Memory of Charlie O'Brien, W2EQS
3.5 MHz	Kenwood USA Corporation
7 MHz	Central Arizona DX Assn
14 MHz	Don Wallace W6AM Memorial, Central CA DX Club
21 MHz	Ray Mofony W2NCL Memorial, Long Island DX Assn
28 MHz	
QRP	Gerald Griffin, MD, W8MEP

DX Phone—Multioperator, Single Transmitter

Category	*Donor*
World	Gloucester County ARC
Africa	Kenwood USA Corporation
Asia	Kenwood USA Corporation
Europe	Metro DX Club
North America	Society of Midwest Contesters
Oceania	Society of Midwest Contesters
South America	Kenwood USA Corporation

DX Phone—Multioperator, Two Transmitter

Category	*Donor*
World	Kenwood USA Corporation
Africa	
Asia	Kenwood USA Corporation
Europe	Tom and Joy Middleton, WB4CKY-KB4OMW
North America	George Schultz, WØUA & John Brosnahan, WØUN
Oceania	
South America	Kenwood USA Corporation

DX Phone—Multioperator, Unlimited

Category	*Donor*
World	Phil Sager, WB4FDT, in Memory of John Wilson, K4YF
Africa	
Asia	Kenwood USA Corporation
Europe	
North America	
Oceania	
South America	

DX CW—Single Operator

Category	*Donor*
World	North Jersey DX Assn
Africa	
Asia	Alamo DX Amigos
Europe	Clarke V. Greene, K1JX
North America	Vic Clark W4KFC Memorial Award—PVRC
Oceania	Robert J. Halprin, K1XA
South America	Herbert Hoover W6ZH Memorial
1.8 MHz	Jim Dionne, K1MEM and Bill Poellmitz, K1MM
3.5 MHz	Mad River Radio Club
7 MHz	Dr W. R. Staples—W4SME
14 MHz	Bencher, Inc.
21 MHz	Southern New England DX Assn
28 MHz	N4PW
QRP	Rick, KZ2E, Woodbridge Wireless Inc

DX CW—Multioperator, Single Transmitter

Category	*Donor*
World	John Brosnahan, WØUN
Africa	
Asia	Kenwood USA Corporation
Europe	
North America	Kenwood USA Corporation
Oceania	
South America	Kenwood USA Corporation

DX CW—Multioperator, Two Transmitter

Category	*Donor*
World	Tom Frenaye, K1KI
Africa	
Asia	Kenwood USA Corporation
Europe	Kenwood USA Corporation
North America	
Oceania	
South America	

DX CW—Multioperator, Unlimited

Category	*Donor*
World	H. Stephen Miller, NØSM
Africa	
Asia	Kenwood USA Corporation
Europe	Texas DX Society
North America	
Oceania	
South America	

Special Plaques

Single Operator

Category	*Donor*
W/VE S/O Combined Score	National Contest Journal
W/VE Low Power, Combined Score	Rochester (NY) DX Assn
World S/O Combined Score	Mike Manato, K3UOC, P46S, 4M4A
Africa, Combined Score	Tom Gregory, N4NW, Tom Brown, KC4NC and Tom Harrell, AL7EL
Atlantic Division (CW)	K2NY Memorial—Salt City DX Assn
Great Lakes Division (Phone)	Livonia Amateur Radio Club, Livonia, MI
Great Lakes Division (CW)	Livonia Amateur Radio Club, Livonia, MI
Hudson Division (CW)	W2AO Memorial—Order of Boiled Owls
Japan, S/O, L/P, All Band (CW)	Western Washington DX Club
Seventh Call Area (Phone)	Willamette Valley DX Club
Single Op Under 18 (Phone)	Virginia A. Greene, WB1AVA
Single Op Under 18 (CW)	Virginia A. Greene, WB1AVA
USSR All-Band (Phone)	K1KI, W2FG, NT2X, W4MOM, W5BOS, AA6BB, KA6V, KI8M
USSR All-Band (CW)	K1KI, K1ST, W2NC, WB4TDH, W5BOS, AA6BB, KA6V, SVØAA

Multioperator

Category	*Donor*
Caribbean Multi-Single (Phone)	W5MYA
Caribbean Multi-Single (CW)	The YASME Foundation
Multi-Multi Combined World	W2PV Memorial—Schenectady ARA

Contest Corral

Conducted By Billy Lunt, KR1R
Contest Manager, ARRL

Jan 30-Feb 7

ARRL Novice Roundup, Jan *QST*, p 83.

FEBRUARY

2

West Coast Qualifying Run, 10-35 WPM, at 0500Z Feb 3 (9 PM PST Feb 2). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL HQ for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

6

AGCW-DL Handasten Party (Straight Key Party), sponsored by the AGCW-DL, from 1600Z until 1900Z Feb 6. Frequencies: 3510-3560 kHz. Only straight keys (no bugs). Exchange RST, QSO no., class, name and age (YLs use XX); example 579001/A/JOHN/23. Classes: A = 5 W output, B = 50 W output, C = 150 W output, D = SWL. Scoring: class A with class A = 9 points, with B = 7 points, with C = 5 points; class B with A = 5, with B = 4 points, with C = 3 points; C with C = 2 points. Certificates. Send logs by Feb 28 to Friedich Fabri, DF1OY, Von dem Steintor 3, D-3017 Pattensen 1, Fed Rep of Germany.

6-7

Vermont QSO Party, Jan *QST*, p 87.

Crazy 8s HF, VHF and UHF Contest, Jan *QST*, p 87.

New Hampshire QSO Party, Jan *QST*, p 88.

Ten-Ten International Net Winter Phone QSO Party, sponsored by the Ten-Ten International Net, from 0000Z Feb 6 until 2400Z Feb 7. Open to all amateurs but only paid-up 10-10 members are eligible for awards. Single operator only. SSB, AM and FM. Work stations once on 10 meters only. Contacts must be in the phone subband. Exchange call, name, state and 10-10 number (if member). Count 2 points for each QSO with a member, count 1 point for each QSO with non-member. Final score is total QSO points. Awards. Send logs along with cover sheet and dupe sheet before Mar 1 to City of Lights Chapter, c/o Jerry Frieders, W9ZGP, 1501 Molitor Rd, Aurora, Il 60605.

7

North American Sprint, CW, Jan *QST*, p 88.

8

W1AW Qualifying Run, 10-40 WPM, at 0300Z Feb 9 (10 PM EST Feb 8). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.55 MHz. See Feb 2 listing for more details.

13-15

YL-OM Contest, phone, Jan *QST*, p 88.

14

North American Sprint, phone, Jan *QST*, p 88.

19

W1AW Qualifying Run, 10-35 WPM at 2100Z (4 PM EST) Feb 19. See Feb 8 listing for more details.

20-21

ARRL International DX Contest, CW, Dec *QST*, p 81.

22-26

Operation Search Contest, sponsored by the Ad Hoc Committee for the Advancement of Amateur Radio in the New York School System, in association with the ARRL Hudson Division Educational Task Force, from Feb 22-26, 1300Z-0100Z each day. All mode. Operate no more than 24 hours and mark off-times in log. Categories: I—single op; C—non-school club or group; S—school club (K-12). Exchange call, RST, class (I,C or S), state or DXCC country. Work stations once on phone and once on CW (packet and RTTY count as CW). No repeater contacts except satellite and real-time packet. Score one point per phone QSO and two points per CW QSO. The total multiplier is the sum of the number of states plus DXCC countries plus 2 times "C" class QSOs plus five times "S" class QSOs. Final score equals QSO points times total multiplier. Awards. Mail entries to Operation Search Contest, c/o Martin Smith, KA2NRR, 1021 E 81 St, Brooklyn, NY 11236.

26-28

CQ World Wide 160-Meter DX Contest, phone, Jan *QST*, p 87.

Feb 27-Mar 1

YL-OM Contest, CW, Jan *QST*, p 88.

MARCH

2

West Coast Qualifying Run, 10-35 WPM at 0500Z Mar 3 (9 PM PST, Mar 2). See Feb 2 listing for more details.

5-6

ARRL International DX Contest, phone, Dec *QST*, p 81.

8

W1AW Qualifying Run, 10-35 WPM, at 0300Z Mar 9 (10 PM EST Mar 8). See Feb 8 listing for more details.

12-13

Iowa QSO Party

13

Zero District QSO Party

15

W1AW Qualifying Run, 10-35 WPM, at 1400Z Mar 15 (9 AM EST). See Feb 8 listing for more details.

19-20

YL-ISSB QSO Party, phone, Jan *QST*, p 87.

19-21

Virginia State QSO Party, sponsored by the Sterling Park ARC from 1800Z Mar 19 until 0200Z Mar 21. Exchange QSO number beginning with 001 and QTH (county for VA stations; state, province or DX country for others). Score one point per phone QSO; two points per CW, RTTY and SSTV QSOs. No cross mode QSOs. VA stations multiply QSO points total by the sum of states, Canadian provinces, DX countries and VA counties worked. Others multiply total QSO points by number of VA counties worked. Work the same station on each band and mode for QSO credit. VA stations may contact in-state stations for both QSO and multiplier credit. Mobile stations may be worked in each county they operate for both QSO and multiplier credit. County-line stations count for only one QSO. CW frequencies are 60 kHz up from the low end of 10-80 meters, anywhere on 160 meters and Novice bands. Phone frequencies are 3.930 7.230 14.285 21.375 28.375 28.575, and anywhere on 160 meters except DX windows and in accordance with the ARRL band plan. Other modes in usual frequencies. Follow ARRL Standard Contest logging guidelines. Plaques and certificates will be awarded to the top scoring stations. Mail logs by April 1 to Virginia QSO Party, c/o Abbey Ray, N4QIV, 1007 Tuscarora Dr, Leesburg, VA 22075.

Wisconsin QSO Party, sponsored by the West Allis RAC, from 1800Z Mar 20 until 0100Z Mar 21. CW and phone. 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 1 point per phone QSO, 2 points per CW QSO. WI stations multiply by total WI counties, states and provinces worked. Others multiply by total WI counties worked (max 72). WI mobiles may add 500 points to their score for each county outside of their home county that they make at least 15 QSOs from. Mail logs by April 15 (include large SASE for results) to WARAC, PO Box 1072, Milwaukee, WI 53201.

BARTG Spring RTTY Contest

26-27

CQ World Wide Prefix Contest, phone

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **Mar 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.

Standard Contest Guidelines

1) Make sure your log details the date, time, band, call sign and complete exchange sent and received for each QSO claimed for contest credit.
2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.
3) Crossband, crossmode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.
4) Your log should be checked carefully for duplicate QSOs, and if more than 200 QSOs are made, dupe sheets should be included with your entry.
5) Your log may be considered a checklog or disqualified if it is incomplete or if too many errors are detected by the contest committee.
6) Avoid standard net frequencies.
7) International contests generally offer awards to top scorers from each US call area and each country, state QSO parties to each state/province.
8) Your summary sheet should include the following statement: "I have observed all competition rules as well as all regulations established for Amateur Radio in my country." The declaration should be signed and dated.

Strays

WE'RE GLAD YOU LIKED IT

We've heard some nice comments about that striking cover on January *QST*. Graphic Design Supervisor Sue Fagan was responsible for the overall design. Nao Akiyama, N1CIX, supplied four of the six photos. Jay Holladay, W6EJJ, supplied the "Golden Gate" shot. —*David Sumner, K1ZZ*

Special Events

Conducted By Billy Lunt, KR1R
Contest Manager

Punxsutawney, Pennsylvania: Special-event station WA3LVU will commemorate Groundhog Day on **Jan 31** starting at 1400Z. Operation will be on 20- and 40-meter phone. For certificate, send SASE to Doug Hunter, WA3LVU, Rockland Ave, Punxsutawney, PA 15767.

Calgary, Alberta: Employees of ABC's Wide World of Sports will operate K6ELX/VX6 and KB6IUA/VX6 during the **month of Feb.** Operation will be SSB and CW on 10-80 meters and FM on 2 and 1¼ meters. For a special Olympics QSL, send a no. 10 SASE to Elliot Block, K6ELX/VX6, PO Box 486, Hollywood, CA 90028 or to Chuck Pharis, KB6IUA/VX6, 9604 Hillhaven Ave, Tujunga, CA 91042.

Tampa, Florida: The Tampa Bay Repeater Assn will operate KJ4XP **Feb 6-7,** 1300Z-2300Z each day, in conjunction with the Gasparilla Celebration. Suggested frequencies: 14.325, 21.325 and 28.325. For certificate, send QSL, QSO number and large SASE to Bobby Jones, KB4HEQ, 8600 W Knights-Griffin Rd, Plant City, FL 33566.

Vienna, Virginia: The Vienna Wireless Soc will operate K4HTA from 1300Z **Feb 6** until 2400Z **Feb 7** in celebration of their 25th anniversary. Suggested frequencies: phone—28.400 and lower 25 kHz of the 80-15 General bands; CW—14.025; FM—146.085/.685. For commemorative QSL, send SASE to K4HTA, PO Box 418, Vienna, VA 22180.

Decatur, Illinois: The Cenois ARC will operate K9HGX **Feb 12-13,** 1400Z-0200Z each day, in honor of Abraham Lincoln's birthday. Suggested frequencies: phone—3.875, 7.250, 14.250 and 21.325; CW—7.125. For certificate, send QSL and large SASE to K9HGX, Box 4595, Decatur, IL 62521.

Savannah, Georgia: The ARC of Savannah will operate W4HBB from 1200Z **Feb 12** until 0500Z **Feb 13** celebrating Georgia Day. Operation will be in the 10-160 phone bands. Send QSL to ARCS, PO Box 13342, Savannah, GA 31416.

Newburgh, New York: The Orange Co ARC will operate WB2SON **Feb 13,** 1500Z-2200Z, from Washington's Headquarters, to commemorate George Washington's birthday. Suggested frequencies: 3.860, 7.230, 14.260, local 2-meter repeaters and packet. For certificate, send QSL and 9- × 12-in SASE (39 cents) to OCARC, c/o Barbara Christopher, N2AWI, RFD 2 Box 447, Wallkill, NY 12589.

Loveland, Colorado: The Loveland Repeater Assn will operate a special-event station **Feb 14-15,** 1300Z-0700Z, in conjunction with the Loveland Valentine's Activities. Operation will be 25 kHz from the lower edge of the General phone bands and Novice 10-meter band. For QSL, send SASE to Michael H. Walker, KAØVFF, 3816 Ash Ave, Loveland, CO 80538.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **Mar 1** to make the **May** issue. Please include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

Exam Info

ARRL/VEC
225 Main St, Newington, CT 06111

ARRL/VEC TESTING PROCEDURES

Locating a Test Session: Sessions are advertised publicly via local Amateur Radio club newsletters and repeaters. A computer-generated printout of sessions scheduled in any state and several overseas locations is available from ARRL HQ for an SASE.

Registering to Take an ARRL/VEC-Coordinated Test: A completed FCC Form 610 application and a check or money order for the test fee should be sent to the local VE Team where you intend to be tested. "Walk-in" candidates are allowed at most of our sessions, but registering in advance helps. If you write to a VE Team for information, send an SASE to cover postage and handling.

Test Fee: For ARRL/VEC-coordinated sessions held during calendar 1988, the test fee is $4.55. Checks or money orders are preferred and should be made payable to "ARRL/VEC."

What to Bring to the Session: Bring the *original* plus a photocopy of your current *signed* FCC-issued Amateur Radio license, and the *original* Certificate of Successful Completion of Examination (CSCE) that was issued by any VE Team, regardless of the Team's VEC affiliation, within one year prior to the date of the test session. Also bring along two forms of positive identification (including a photo ID, if possible) and at least two pencils and a pen. Scratch paper, answer sheets and all other test materials will be provided at the test session. Licensed candidates who cannot provide their current amateur licenses to the administering VEs can still be tested at ARRL/VEC sessions. However, in such cases the administering VEs can issue CSCEs for credit only for those elements that were passed at the session; CSCEs cannot be issued for upgrades. Such candidates must then provide the ARRL/VEC with a copy of the missing license in order that any upgrade that would otherwise have been earned at the session can be processed properly.

Calculators: Nonprogrammable and "scientific" calculators are welcome. Pocket computers that store words and/or formulas are not allowed. Programmable calculators will be allowed only at the discretion of the VE Teams; be prepared to demonstrate that the calculator memories have been properly cleared.

Exam Format: Written-element exams are four-choice multiple-answer tests. A score of 74% or more is required to pass a written-element exam. Most VECs assemble their tests based on the ARRL/VEC-issued multiple-choice question pools. Code test transmissions are played from an audio tape prepared by the ARRL/VEC with message contents similar in format to an ordinary Amateur Radio QSO. The code test may be passed by correctly answering at least 7 out of 10 comprehension questions *or* by copying on paper at least one continuous minute of perfect copy from the code test transmission. Based on the FCC's recommendation, the ARRL/VEC does not require a code sending test. Code tests may be copied on typewriters, but prior arrangement with the VE Team is required so that other candidates will not be disturbed.

ARRL/VEC Retest Policy: A candidate who fails an element may be retested at that same session *if* the administering VE Team has a *different* version of the failed element and *if* they determine that they have the time and resources available to accommodate the retest. A candidate for retest is required to pay another test fee, and may be required to complete a fresh application Form 610 at the Team's request. The administering VE Team has the right to deny a candidate the opportunity of retesting at that session.

Special Tests: Candidates who require special assistance, materials or equipment because of physical disability must attach to the application a signed and dated physician's statement certifying the nature of the disability, plus a letter explaining what special assistance, materials and/or equipment must be used to conduct the examination. (See Section 97.26{g} of the FCC Rules.) Be sure to notify the VE Team well in advance so that special arrangements can be made. If tape-recorded written tests or special-pitch code tapes are needed, contact the ARRL/VEC at least one month in advance to ensure materials will be available. Further questions about testing persons with disabilities should be addressed to the ARRL Program for the Disabled at HQ.

How to Become an ARRL/VEC-accredited Volunteer Examiner: Qualified Advanced or Extra Class licensees (see Section 97.31 of the FCC Rules) are invited to notify the ARRL/VEC of their interest in becoming accredited VEs. Send us your name, call sign, license class and full mailing address for additional information.—*Jim Clary, WB9IHH, Manager, ARRL/VEC*

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, Bill Gillespie, VE6ABC—A/SM: VE6AMM. SEC/TC: VE6AFO. OO: VE6TY. SM/DEC/STM: VE6ABC. Calgary amateurs provided communications for car rally in the Pincher Creek area. Calgary getting prepared to operate a special events station for the coming Olympics. Station will be manned about 12 hours per day under the call sign VX6OCO. Special certificates to be awarded for contacts. Details to be laid out later. Final activity on antennas as winter but moments away. Traffic: ASPN QNI 1298, QTC 20, Informal 118. ATN: QNI 208, QTC 73. Personal traffic: VE6GUS 18, VE6ABC 13, VE6AMM 4.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—British Columbia Public Service Net meets nightly on 3729 kHz, 0030 UTC NM Jim Wallace, VE7BLO reports high 243, low 112—total 5394. British Columbia Emergency Net (BCEN) 3650 kHz nightly at 0300 UTC. NM Ferdi, VE7EJU, reports he is hoping for many Christmas QTCs for the net. QNI 918, QTC 314, otherwise things are OK. VE7JN, Jim, fell out of a tree and broke an ankle. VE7XH, Bill, is not well also. He has shingles. From the Marine Net, VE0MC, reports a disaster off Fraser Island near Queensland. Crew is OK, and vessel was salvaged. 73. Traffic: VE7BNI 400, VE7EJU 155, VE7ANG 144, VE7EJW 86, VE7FME 58, VE7CCJ 55, VE7FB 49, VE7EGM 14, VE7XA 14, VE7BZI 10, VE7BVZ 10, VE7BNH 4, VE7EIR 4.

MANITOBA: SM, Jack Adams, VE4AJE—For those who are traveling north on No. 10 Hwy toward Flin Flon, make use of the "Pas 147.27 + 600" repeater located north of Mateking in the Porcupine Mountains. This repeater owned by yours truly is a convenience to Northern travelers and is monitored by a good friend VE4PO. Paul has a tourist camp at the Overflowing River. Stop in and see Paul and his xyl, Hazel. You may even get a free coffee. Attended a club meeting with the Thompson Amateur Radio Club November 24 in Thompson, Man. They are presently upgrading their repeater (146.94 -600) with help of Rick, VE4RF, who will be installing a voice ID along with a few other goodies. Most areas are blessed with these technical individuals. The Thompson club will be putting on a presentation at the RD Parker Collegiate on Amateur Radio. Thanks to Bob, VE4AR, and xyl for the hospitality and lunch. Section reports CRRL Phone Net 30 sessions, 1094 QNI, 12 QTC, MTN-30 sessions, 239 QNI, 38 QTC. MMWX 30 sessions, 543 QNI, 21 QTC. Individual traffic: VE4AJE 40, VE4LB 36.

MARITIME-NEWFOUNDLAND: SM, Leigh Hawkes, VE1GA—BM: VE1BQO. If 1988 is like most years, we are probably having our worst winter weather about now. Hope all your ants are holding out. Since a QTH change last Fall, the SMs ants are all indoors! VO1GE has received the Bob Lewis Award. Hfx and Dart ARCs are preparing for their Annual Flea Market in May. More details on this will follow. Regret to report the following Silent Keys: Newt, VE1UE; Bill, ex VE1AX; and Ron, VE1SH, who was serving as CRRL Director at the time of his death. I was especially privileged to have served as Assistant Director to Ron during his office. Hopefully the fortunes of time will permit his work to be carried on. DOC is studying band usege, and changes are possible. Stay in touch with and support your local clubs. Traffic: VE1BKM 47, VE1VX 16, VE1BPM 9, VE1BTV 6, VE1CYS 4, VE1ALU 3, VE1AJF 2, VE1CAL 2.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3GSA. SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. I am pleased to announce the appointment of Dave, VE3GSA, as our new Bulletin Manager. Please contact him if you are interested in an Official Bulletin Station appointment. VE3ITT is the new EC for Oakville; VE3MB, new EC for Belleville and area. Kingston area ARES participated in a major emergency exercise dubbed "Autumn Leaf." A total of 20 members took part and some 118 messages were handled during the successful exercise. A debriefing session identified a number of items that will be stressed in future training sessions. VE3BUO has replaced his G5RV antenna with a windom antenna, and is pleased with the results. The Ottawa ARC sponsors the National Capital Award, an attractive certificate for contacting stations located in the National Capital Region of Canada. Stations located in Canada and the lower 48 United States require 20 contacts, all others require 10. Contact the Club for details. South Pickering ARC's Bulletin, "SPARC-GAP" recently received an "excellent" rating from the Amateur Radio News Service in the United States. Ratings were made on format, contents, club information, etc. Their ranking was just under the highest rating of "superior." Congratulations to editor VE3BFS and publisher VE3KZE. Using the call VE3BPC, the Rideau ARC placed first in the 2A (battery) Field Day class in Canada for the third year in a row. VE3AWE, one of the terrible trio and long-time NTSer, is enjoying the good life in Santa Barbara, California, for the next few years and expects to be back on the traffic nets from his location 400 feet above the Pacific Ocean—our loss is their gain. The Niagara-Peninsula ARC's membership totals 148 as the Club celebrates their 40th anniversary and the Welland Co. ARC celebrates their 20th—congratulations to both. The first QSO on repeater VE3OOO on 224.660 MHz was between VE3ACY and VE3EZJ. Triple "O" is located on the west side of Windsor about 150 feet + elevation. Traffic: VE3GSQ 227, VE3FAS 218, VE3ORN 147, VE3GNW 108, VE3DPO 95, VE3CYR 81, VE3GT 76, VE3WV 60, VE3DCX 53, VE3BUO 45, VE3WG 45, VE3BCZ 39, VE3NVJ 24, VE3BDM 22, VE3EAM 22, VE3POJ 22, VE3AJN 19, VE3KCZ 18, VE3MCO 14, VE3KXB 12, VE3BAJ 7, VE3FGU 6, VE3WM 6. (Oct.) VE3POJ 28, VE3BAJ 20, VE3MCO 16.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. Appointments for ORS and OO are open, if interested please contact your SM or STM. Gilles, VE2GEJ, is very active on the traffic nets and handling traffic from Donnacona. VE2AV, VE2AUW et VE2AIM ont ete occupes avec les scouts de l'Outaouais lors du trentieme edition du Jamboree-sur-les ondes. Avec regret j'ai a vous annoncer le deces de Gaston, VE2GC. Prompt retablissement a Adeoda, VE2ABO, qui est hospitalise. Traffic: VE2GEJ 80, VE2BP 62, VE2WH 47, VE2EC 25.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—Welcome to our new SM, KC3TI. Good luck, Bob, on your term of office. SARA, KARC, FSARC and DARC were authorized to operate using the 200 calls, celebrating the ratification of the constitution by the State of Delaware. KARC has newsletter now and welcomes new members N3FSU and KA3SGV. DARC changed meeting to 2nd Tuesday of month, and welcomes new member KA1MRZ. FSARC and AWARE will sponsor VE exams every month of 1988. For info contact K3DX at FSARC or K3WAJ at A & A. 147.225 and 224.00 now crosslinked. PSHR K3JL. DTN stations 345 tfc 50 in 21 sessions. DEPN stations 50 tfc 14 in 4 sessions. SEN stations 62 in 4 sessions. Traffic: W3QQ 97, WB3DUG 30, KA3GRQ 27, WA3WIY 27, KC3TI 24, K3JL 20, K3YBW 20, W3PVO 16, W3FEG 12, KC3JM 7, KC3FW 2. Seven months late reports from W3PQ.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KA3A, KO3B, K3ZFD. SEC: KB3YS. ACC KC3OB. OOC: W3IS. SGL: WA3IAO. STM, BM: KB3UD. PIO: W3ZXV. TC: W3FAF. This month's salute goes to our Technical Coordinator John Thomas, W3FAF, and his Assistant TCs. They're ready to answer questions, solve problems, help form TVI committees, and speak at your club or license course. To get the current list of ATCs or an application to join up, please contact W3FAF at his CBA. We need more Official Bulletin Stations around the Section. If you give a regular on-air bulletin, the SM or Bulletin Mgr KB3UD can tell you about the appointment. It'll mean added sources of interesting information for you. York's new Winterfest is scheduled for March 6 in Dover. 73 to Delaware's new SM, KC3TI. Amateur Radio will provide public service communications at a re-enactment marking the 125th anniversary of the Battle of Gettysburg in June. We hope a special event station and ham radio publicity booth will also be possible. Plans are being developed by Penn-Mar RC and Adams Co. ARS in cooperation with District 9 ARES. This event will place real demands on our ability to organize and cooperate. So far, things are progressing well. We thank all the individuals and radio organizations involved. Speaking of publicity, our newest PIA is WB3DCL. OOC W3IS spoke about the Amateur Auxiliary at a South Mtn Rptr Assn meeting. KC3LM enjoyed Marple-Newtown ARC's hospitality. Thanks to you club leaders and Affiliated Club Coordinator KC3QB, we did well with our Annual Reports last year: over 80%. We hope to do better in 1988. These reports help ARRL serve our Affiliated Clubs through updated addresses and other current info. Please don't QSB! Return your club's report form to HQ promptly. Special "200" call signs were authorized for Central PA DX, Central PA Rptr Assn, Harrisburg RAC, Keystone AR Group, Murgas, Penn Wireless, Phil-Mont, Suburban, Susquehanna Co., Tamaqua Transmitting, Warminster, and West Branch. In ARES news, N3ECL is our new DEC9, KA3NRA is EC Adams, and N3CRS is EC Lancaster. SEC KB3YB and KC3LM had a meeting with the National Weather Service on their winter sked. DEC2 WB2OOB is the Section's SKYWARN coordinator. December *QST* brought the news that OES K3BWE is a Silent Key. On the NTS circuit, KA3RGF is now an ORS. NETS (November QNI/QTC): EPAEPTN 593/194, MARCTN 198/76, D3ARES 105/23, DBARES 65/0, MARCARES 96/23, SEPATN 52/11, D6ARES 21/69; EPA PBBS: AG3F 154, K3RLI 208, WA7SSO 42, KB3UD 164. Traffic (Nov.): N3AZW 593, N3COY 239, N3DRM 208, KD3AO 160, W3IPX 110, W3KAG 86, W3JKX 81, KA3DLY 78, N3CD 76, WB8KPE 72.

MARYLAND-DC: SM, Philip Battey, W3FZV—The torch has been passed; your new SM has taken over from Al, KJ3E. I want to express our thanks to him for the time and enthusiasm put into this job over the past two and one-half years. Now he steps down, but will remain active from his fine ham shack. One of my goals will be to delegate authority, and I'm counting on section appointees to take charge in their own fields of interest. To All: Don't forget to send monthly reports! KN3U continues to get his emergency systems into top shape. The SM recently met with KN3U, W3DQI and several other ECs, with Al, W3YVQ, and with KJ3E, all in an attempt to bring himself "up to speed." N3RO, et al., in Frederick Co. do good public service work. KN3U is active in the SKYWARN program. WA1QAA writes nice EC reports. The Antietam Radio Club of Hagerstown supplied comms. for the JFK 50-mile run along the C&O canal. Recent appointees include KX3U as ASM, W3VVN as TC, WB3EFG as OOC, NC3V as ORS, and NJ3Y as OO. N3EGF continues as STM. Do YOU want an official ARRL appointment? Contact the SM for details. There are several ARRL videos and films available which provide a very good introduction to various phases of ham radio. If you're interested, write to me and I'll send you details. The same goes for copies of the comic book, "Archie's Ham Radio Adventure." Tom, W3IWI, made BPL in Nov. using Packet Radio, an up-and-coming mode on the bands. KC3Y is doing a very FB job of training new CW ops on MSN. NI3F and K3CHP are avid monitors. In celebration of the Bicentennial, the following clubs will sign with "200" call signs during the period April 23-29: RCARA, CARA, ARA, AARC, and NBS BRASS. KW3X has written a nice article about monitoring state and local governments in the HAM ARUNDEL NEWS. With the Nets: Net/Mgr QND/QTC/QNI: MSN/KC3Y 30/48/452, WRPON/WB3BFK 21/28/222, MDD/W3FA 60/202/432 (TOP BRASS W3QQ/109, W3FA/82, NC3V/73) MEPN/N3EGF 31/161/968, HOCARES/K3NNI 2/3/19, BCN/N3EGF 4/1/38, MAVEN/W3YVQ 1/3/7 PSHR: W3FA 95, WA3UZI 90, N3EGF 84, W3YVQ 83, KC3Y 82, KJ3E 68, K3NNI 66, WA3YLO 61. Traffic: W3IWI (PBBS) 653 (BPL), KK3F 374, W3LDD 132, KJ3E 117, W3FA 116, WA3UZI 101, KC3Y 89, N3EGF 76, WA3YLO 63, NB3P 58, W3YVQ 56, NC3Z 51, NC3V 51, N3DE 38, K3NNI 34, K2EB 26, WB3BFK 24, KT3T 21, WA3GYW 20, W3DQI 18, KX3U 16, KC3ZJ 14, W3FZV 11, KC3DW 11, NF3X 7, K3ORW 4, WA1QAA 4, W3ZNW 3, WA2WDT 1.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—ASM: N2CER. SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: N2BQT. PIO: VACANT. SGL: VACANT. BM: WB2UVB. OOC: WA2HEB. ATC's K2JF, KA2RJA and WB2MNF. I have just received from League Headquarters a copy of the excellent video, "The New World of Amateur Radio." As the League states, this video is a great recruitment tool. I am going to make this tape available to our local clubs in the section who might be able to use the film for recruitment purposes. The copy I have is in VHS format and runs 28-1/2 minutes in duration. Please have your club president get in touch with me to make arrangements on borrowing the tape. VE testing third Thursday of EACH MONTH is conducted at the Bellmawr Community Bldg., Bellmawr, starting at 7 PM sharp. No pre-registration is required. For further information, please contact Bill Helmetag, WA2VQG, at (609)546-7710 or 939-3032. Any other groups in SNJ that are holding VE sessions and want them listed in this column should send the information to me at the address listed on page 8 of this *QST*. Until next month, 73. Traffic: WB2ZJF 299, N2CER 54, WA2HEB 8.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—Public Service Honor Roll: N2ABA N2EIA N2EVG WA2FJJ W2FR W2GJ NN2H W2MTA WB2OWO WB2RBA ND2S KA2UBD NJ3V K2YAI KA2ZNZ. Nov BPL: W2MTA KA2UBD NJ3V. Appointments: (ATC) KE2DI (former KA1YE), KB2MB. Club Officers: Drumlins ARC Ltd N2DIT N2JC WA2SOK WA2KIN; Oqdensburg KA2JXI KA2CEO N2FSX; RAWNY KA2NYS WA2FKV KA2EXI KD2V. NYSPT&EN Officers: KA2Q KC2IW KA2VCR KD2V. Congratulations! Certificates of Merit were awared to N2AGO WA2AIV NE3B W2BCH N2EH WB2HLY KB2KW K2KWK WB2NAO WB2OWO and WA2PUU at recent Leadership Officials meeting in Rochester. Also, W2ABV received QCWA Golden Anniversary Award 55 year endorsement this month—and WB2EID feted as Ham-of-the-Year in Jefferson County. Field Day standings—Class (entries): 1A (169) WB2ELW#15; 2A Battery (5) W2LZ#10, K2ECQ#13; 2A (458) W2FR#6, W2TZ#16, K2IQ#63, W2UXC #86, N2HR#91, W2SB#107, N2BU#177, NR2B#260, NQ2I#263, KC2UB #277, WD2ADX#307, KD2A#314, NR2S#333, NC2C#346, W2SAM#425; 3A (275) K2SA#40, K2MP#57, K2QR#100, W2DRN#120, NW2O#177, W2ZJ#187, N2AX#189, NW2X#229, N2DM#238, N2EVZ#244; 3A Commercial (12) W2PE#3; 4A (100) W2RCX#40, W2OFQ#70, 5A (57) AI2W#44; 2D-2 ops (21) WA2TMC#8. On to FD 1988! HAMFESTS CALENDAR: Horseheads 2/27, Auburn Winterfest 3/19, Drumlins 3/26, STARC 5/7, Rochester 5/21-22, Rome 6/5, Batavia 7/10. More to come. Bulletin Manager K2KWK has outlined current bulletin schedule for section and W1AW generated information. Sundays 845 PM 146.88 or 146.79 via Monroe County FM Info Net. Tuesday 730 PM 145.31 Attica. Tuesday 815 PM on the following frequencies: 29.6, 146.76, 145.19, 223.5, 224.68 and 440.8 MHz.

NY RACES	SSB	171-010-05	NYSR	CW	015-005-05
NYS/M*	CW	345-276-30	NYS/E*	CW	385-256-30
WDN/M*	FM	356-134-30	BRVSN	FM	266-009-30
NYPON*	SSB	694-433-30	BlueLine	FM	----
Empire SS	CW	356-048-30	JCRACN	FM	283-012-29
LCARES	FM	054-001-05	VHF THIN	FM	037-000-04
NYSPTEN	SSB	583-085-30	OCTEN/L*	FM	196-073-30
OCTEN/E*	FM	608-101-30	CNYTN*	FM	316-247-30
Q Net	FM	447-001-30	WDN/L*	FM	394-125-30
STAR*	FM	393-054-30	NYS/L*	CW	336-197-30
WDN/E*	FM	471-162-30	*NTS Net		

COMMS: Wineglass Marathon saw 23 operators active throughout Chemung and Steuben Counties during the race with three repeaters "slaved" for control, dispatch and pickup 2-way capability. Good show all! SUPER "DF": On December 4, an EMS primary channel remote XMTR hung up with 1477 Hz tone, with wide area coverage from the mountaintop . . . MANY THANKS to efforts in Broome, Chemung, Cortland, Yates and other neighboring counties for the rapid sleuthing and de-activation of the "spook" from WA2WNI. Traffic (Nov.): KA2UBD 801, NJ3V 604, W2MTA 545, WB2OWO 454, WA2FJJ 393, N2EIA 379, WB2QIX 202, WB2IJH 186, NN2H 182, ND2S 165, W2FR 134, KA2ZNZ 127, N2ABA 117, KA2QOO 116, WB2RBA 101, KA2DBD 99, K2YAI 87, W2UYE 83, WB3CUF 50, NE2W 47, N2EVG 42, NE3B 38, K2OR 23, W2GJ 16, KA2TWY 15, NY2V 15, K2IUT 8, WA2OEP 8. Have a prosperous New Year 1988!

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. STM: N3EMD. BM: KC3ET. TC: N3EFN. OOC: KX3V. ACC: AK3J. SGL: W3DTW. PIO: N3DOK.

NET	QNI	QTC	SESS	kHz	T/D
WPAXW	244	124	30	3985	7:00P/D
WPAPTN	415	96	30	3983	6:00P/D
KFN	151	41	21	3985	1:30P/D
PFN	156	135	30	3958	5:00P/D
WPA2MTN	307	82	30	146.28/88	8:00P/D
NWPA2MTN	487	50	28	144.53/145.13	9:00P/D
WPARTTY	5	5	5	3840	9:00P/Su

Butler County ARA Officers for 1988 are Pres, WB3BPC, VP NC3W, 2nd VP KA3DBH, Sec WB3ITS, Treas WB3H, trustees K3HJH, W3DMB, WA3BVQ, KA3ROX and NG3H. Steel City ARC Officers for 1988 are Pres. N3EQF, VP KA3KSD, Treas AK3J, Rec. Sec. KA3OYI, Corr. Sec. W3UUH, Triple "A" Officers for 1988 are Pres. K3NPX, VP KD3BZ, 2nd VP KA3MTV, Sec. N3EJL, Treas. K3NPW, Chief Eng. N3ALL, Trustee W3VRZ. Congratulations to all and may they have a good term, and may their clubs flourish. Beaver County has a search and rescue team. It is called Search I Search and Rescue Disaster Response Team and is registered with the National Assn. Amateur Radio will be the main means of communications. The team has about 34 amateurs registered. K3NPX and N3EXM are Directors. The team is affiliated with the Triple "A" club. As of Jan. 1, 1988, N3EJL will be the Radio Officer for Beaver County. Tim Shane, WA3ZJE, has resigned to spend time on his new position. He will be supervisor of the control tower at Beaver County Airport. Congratulations on the new position, Tim. We need more ORS stations for traffic handling on the traffic nets. It is a very interesting activity. Write to or get in touch with Jan, N3EMD. She can guide you. Traffic: KQ3T 291, N3EMD 285, N3AES 131, N3CZW 120, KA3NVP 107, WA3UNX 102, N3FM 83, W3NGO 74, WA3DBW 65, K3SMB 52, W3RUL 41, KV3L 36, WB3AFL 36, KC3GO 28, W3KUN 28, KD3AC 27, KA3OEM 26, WA3QNT 14, K3LTV 14, KA3GXP 12, KA3EGE 10, KC3JQ 6, WA3CWA 4.

CENTRAL DIVISION

ILLINOIS: SM: David E. Lattan, WD9EBQ— SEC: W9QBH. STM: K9CNP. OOC: W9TT. BM: K9EUI. SGL: W9KPT. PIO: N9EWA. ACC: WB9SFT. TC: N9RF. ASM: AA9D.

(continued on page 104)

The Challenge of Low Frequency DX'ing

Low frequency DX'ing is an increasingly popular interest among today's radio amateurs, and with good reason. The challenge and excitement of working the world on 160 or 80 meters reflects an admirable blend of skillful operating technique, outstanding antenna installation, and superb equipment performance. Each of these areas must be top-notch and work in tandem, especially when operating near the AM broadcast band range of 160 meters. Deficiencies in one area place a high compensating responsibility on another area. Yet, with a good understanding of gray line DX'ing, a quarter-wave sloper or quarter-wave vertical and a transceiver with separate transmit/receive antenna connections, adjustable noise blanker, and variable selectivity, working 100-plus countries on low frequencies is a thrill beyond comparison.

The prime times for low frequency DX'ing typically coincide with daily ionospheric changes, or when one end of a path is near dusk/dawn and the other end is experiencing cool evening propagation. As the leading edge of those brief openings are influenced by the sun's early/final daily rays **distant signals rise above a band's noise level and intercontinental communications are optimum.** Advantageously using that phenomenon is often described by serious DX'ers as being on the right frequency at the right time. Improving the odds in that game of chance includes following DX bulletins plus exchanging notes with other DX'ers. Transceivers with fully tunable and independently reprogrammable memories are also extremely beneficial for these times-conscious activities. You can tune a particular range, snap a received station into one memory, select another memory, and continue the search while awaiting your opportunity to contact the previous station. **A "DX window"** and split frequency operating concept is often utilized on 160 meters. By Gentleman's Agreement, non-U.S. stations transmit without QRM in the range of 1825 to 1830KHz while listening on a separately announced receiving frequency. Dual VFOs are thus highly desirable.

Popular antennas for serious low frequency DX'ing are slopers and shunt-fed towers for transmitting, and long wire beverages for receiving. The sloper consists of a quarter-wavelength of wire connected to a coax feedline's center conductor with the coax shield usually connected to the station's tower. When space is limited, the sloper is used for both transmitting and receiving. Shunt-feeding a beam antenna's tower involves installing a long gamma-matching rod and feedpoint tuning unit. A network of 12 to 120 quarter-wave radials creates a vital and very effective ground system, and heavy copper strapping is used for interconnecting indoor/outdoor station items. The high noise susceptibility of vertical receiving antennas is sidestepped by using a one to four wavelength-long wire erected at a constant height of two to ten feet above ground, and terminated with a 500Ω carbon resistor. A 1:9 ratio matching transformer is utilized at the (opposite) feed point end for matching this receiving antenna to 50Ω coax.

Understanding the previously discussed criteria, **a rear panel socket is included on ICOM HF transceivers for bypassing T/R switching circuits and connecting a separate antenna directly to the receiver's input.** Transmitting and receiving antennas should be positioned for minimum cross-induction, and a "front-end protection" circuit should be included near the receiver's input socket.

A suggested protection circuit is shown in Figure 1. The silicon diodes are type 1N914 or equivalent, and serve as a basic limiter to clamp high RF energy levels at the receiver's input. The pilot lamp is a low-current type (number 47 or similar) and acts as a fuse to avoid high induction current damage. The overall circuit encourages confident and smooth low frequency DX'ing.

While older style transceivers might initially seem fine for low frequency DX'ing, such is not necessarily the case. Passband tuning, IF level notch, and a continuously adjustable noise blanker, for example, are vitally important for combatting the unique types of low-band interference. A panel-selectable receiving preamp for beverage use and balanced RF/mixer circuit designs also support high sensitivity, wide dynamic range, and low noise floors. **ICOM's industry-leading designs in these areas are a world-recognized standard of reference.**

The classic amateur radio proverb, "If you can't hear them, you can't work them," is especially true in low frequency DX'ing, and the cornerstone to that success is operating flexibility with superb performance equipment. ICOM's innovative HF transceivers stand proud in this area with professional performance, superb reliability, and incomparable customer support. You're free to chase the "rare ones" with maximum confidence. Ready to experience the challenge and excitement of low frequency DX'ing in top style? Tune in with ICOM and enjoy DX'ing with a winning edge!

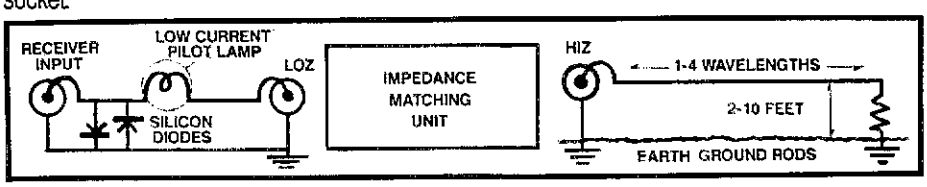


FIG. 1: Front end protection circuit and beverage receiving antenna for low frequency DX'ing.

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BK-IN
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BASS
MICROPHONE

ICOM IC-781

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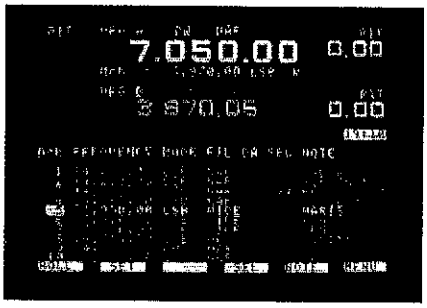
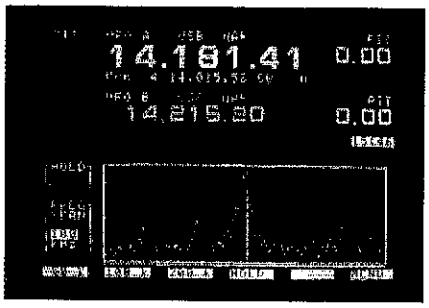
Once in a lifetime, a transceiver is introduced that's so extraordinary and innovative that it opens a totally new era in HF communications. ICOM's pacesetting IC-781 proudly exhibits that hallmark achievement with futuristic designs and features of true legendary proportions. Whether DX'ing, contesting, pioneering new interests or enjoying unquestionable top-of-the-line performance, the IC-781 is indeed today's standard of excellence!

Multi-Function Five Inch CRT. Displays frequencies, modes, memory contents, operating notes, RIT, two menu screens, plus a panoramic view of all signals in a selected range. A portion of the screen also serves as a display for data modes like RTTY, AMTOR, and PACKET.



Unique Spectrum Scope. Continuously indicates all signal activities and DX pile-ups with your operating frequency in the center. Selectable horizontal frequency spans of ±50, ±100, and ±200KHz for each side of the frequency you're listening to. Vertical range indicates relative signal strengths. A contester's dream!



Dual Watch. Simultaneously **receives two frequencies in the same band!** Balance control adjusts VFO A/B receive strength levels. You can check additional band activity, even tune in your next contact, while in QSO without missing a single word!

DX Rated! 150 watts of exceptionally clean RF output. Easily drives big amplifiers to maximum power.

Twin Passband Tuning with **separate controls for second and third IF stages!** Increases selectivity and narrows bandwidth, independently varies low and high frequency response, or functions as IF shift. **It's DX'ing Dynamite!**

Dual Width Noise Blanker includes MCF filter plus **level and width controls** to eliminate pulse and woodpecker noise with minimum adjacent-signal interference.

Incomparable Filter Flexibility. Independent selection of wide and narrow SSB filters plus CW filters. Second and third CW IF filters independently selectable!

A Total Communications System! Includes built-in 100% duty AC supply, high speed automatic antenna tuner, iambic keyer, semi-automatic, or full QSK CW break-in to 60 wpm, Audio Peaking Filter (APF), RF speech processor, multi-scanning, 105dB dynamic range, all-band/all-mode receiver with general coverage, and much more!

ICOM Dependability. The phenomenal IC-781 is built for action and backed with the most extensive warranty in the industry.

See the IC-781 at your local ICOM dealer.

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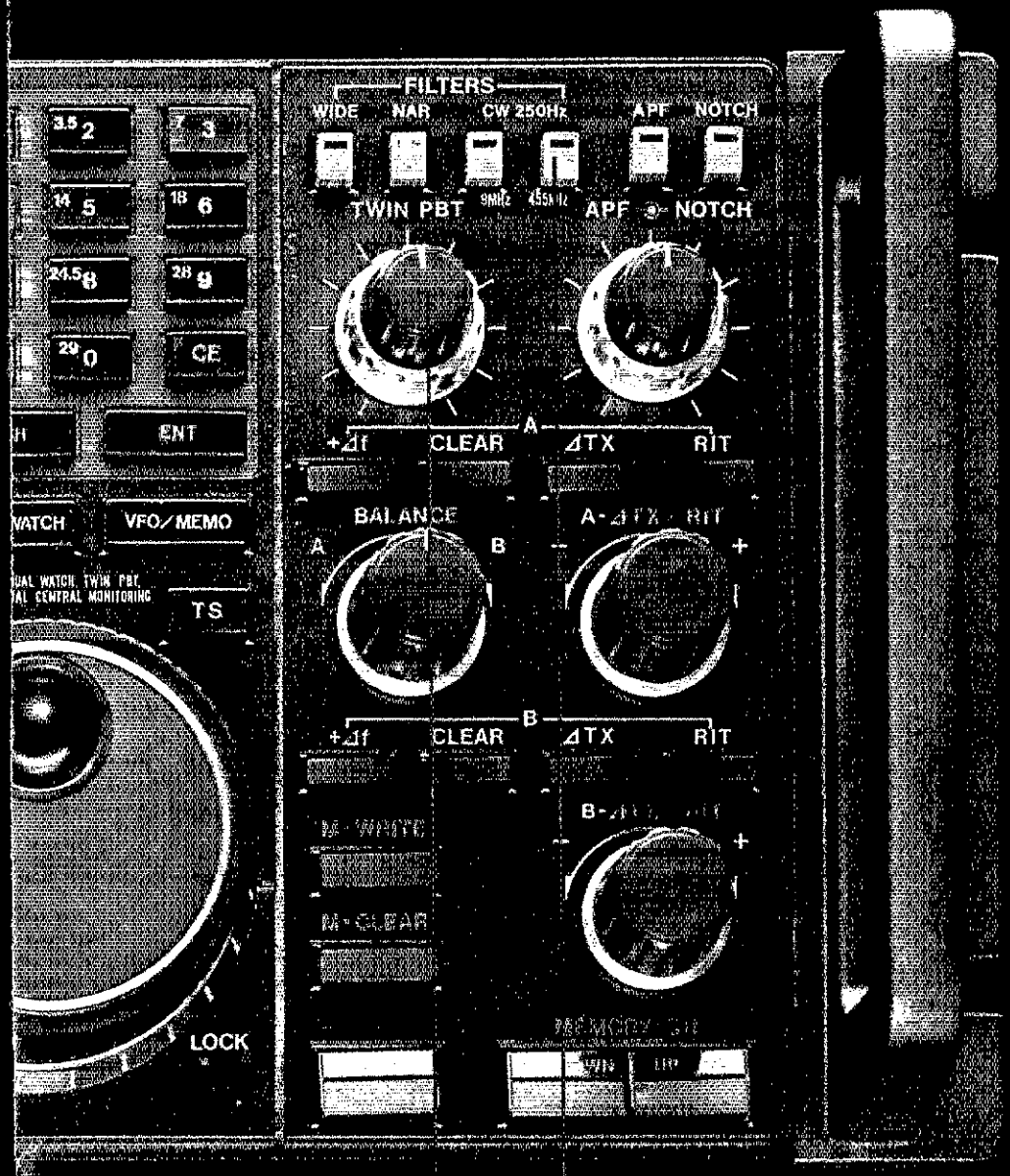

ACTUAL SIZE

KEYBOARD ENTRY

Access frequencies directly or memory contents.

TWIN PASSBAND TUNING

Electronically control one or both the bandwidth & the receiver's center frequency.

INDEPENDENT FILTER SELECTION

Up to four optional filters can be independently selected for the sub receiver.

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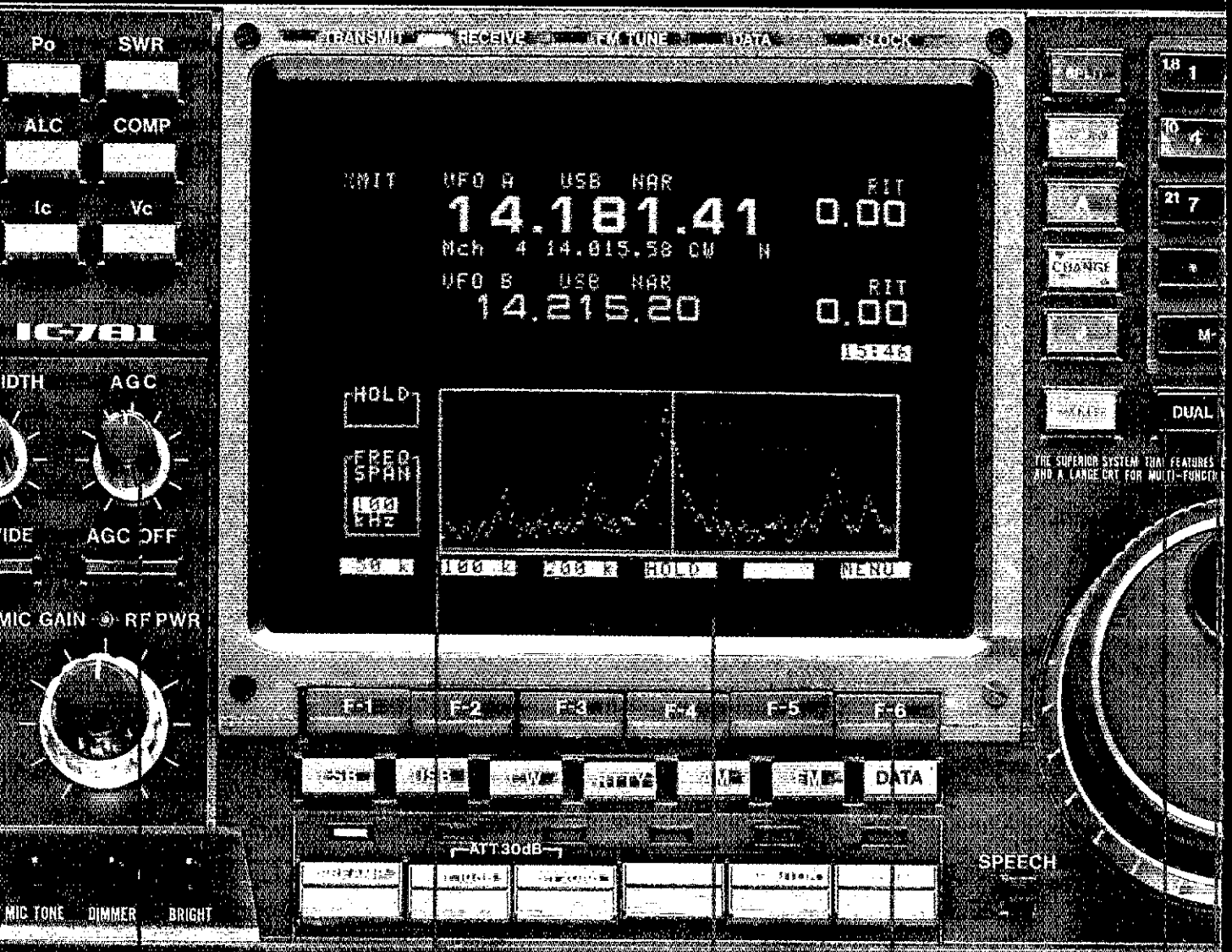


SPECTRUM SCOPE
Monitors the spectrum activity in terms of frequency and signal strength.

MULTI-FUNCTIONAL CRT DISPLAY

DUAL WATCH

HF ALL BAND TRANSCEIVER (SSB•CW•RTTY•AM•FM)

ICOM IC-781

FEATURES

Dual Band Watch

Simultaneous dual receive with A/B balance control. Perfect for split frequency DX'ing or monitoring contest activity.

Spectrum Scope

Separate RIT tuning for each VFO frequency. Panoramic display of all signals in a selected range. A single view shows you all the action "hot spots."

Multi-Function CRT

Includes a subdisplay for data modes like RTTY, AMTOR, and PACKET. External TU required. Interfaces via "data In" port on IC-781.

Full Coverage Receivers

Continuously tunes 100KHz to 30MHz. A SWLing fantasy come true! Listen to two frequencies in the same band!

Twin Passband Tuning

Independent control of second and third IFs! Cuts QRM like a knife. Adjust separately to vary each IF skirt, or combined adjustments give IF shift effect.

Continuously Variable AGC

Adjust to suit operating and band conditions. Fast, slow, or anywhere between!

Superb Filter Flexibility

Front panel selection of all filters. Independent control of second and third IFs for unequalled DX'ing under any band conditions.

150 Watts Output

"No strain" drive for any high power linear amplifier. Output continuously adjustable down to five watts.

10Hz Readout

Accurately tune to any frequency.

All Bands, All Modes Included

A total communications system! Easily modified for MARS operation.

99 Fully Tunable Memories

They can be retuned, even reprogrammed independent of VFO A or B. They're like 99 additional VFOs!

SPECIFICATIONS

General

Receive Frequency	100KHz-30MHz
Transmit Frequency	1.8-30MHz (Amateur Band)
Transmit Mode	SSB, CW, RTTY, AM, FM
Tuning Steps	10Hz/1KHz
Operation	110V AC
Frequency Stability	± 0.5ppm (10°C to +60°C) Less than ±15Hz

Transmitter

RF Output Power	150W (SSB/CW/RTTY/FM) and 75W (AM)
Compressor	RF Compressor
ΔTX/(XIT)	±9.99KHz
Antenna Tuner	Built-in
Transmit Duty Cycle	100% Continuous
Carrier Suppression	More than 40dB below peak power output
Spurious Response	More than 60dB (CW) below peak power output
Third Harmonic IMD	More than -38dB

Receiver

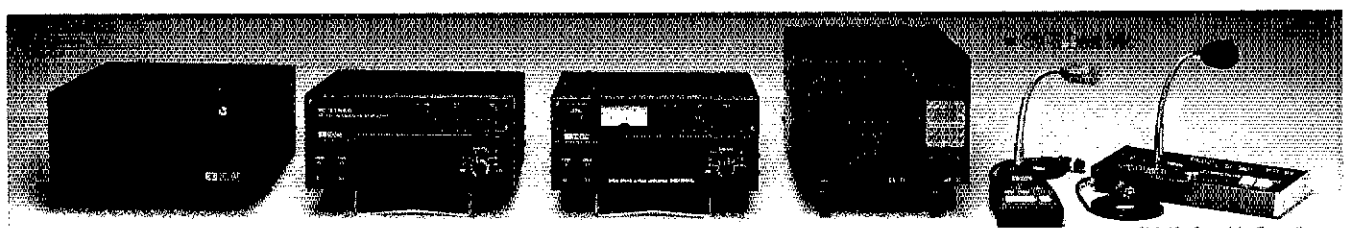
Sensitivity	PREAMP ON: SSB 0.16μV; AM 1μV (wide filter); FM 0.3μV; SSB/CW/AM/RTTY for 10dB S/N; FM for 12dB SINAD at 28MHz band
Image Ratio	More than 80dB (1.8-30MHz)
Squelch Sensitivity	Less than -10dBμ (0.32μV)
Selectivity	SSB/CW (wide)/RTTY (wide)/ AM (narrow) 2.4KHz at -6dB; CW (narrow)/RTTY (narrow) 250Hz at -6dB; AM (wide) 6.0KHz at -6dB; FM 15.0KHz at -6dB
Dynamic Range	105dB (CW, 500Hz/-6dB - Preamp On)
Dual (RIT)	±9.99KHz

SENSITIVITY

MODE	FREQUENCY 0.1MHz to 0.5MHz	0.5MHz to 1.8MHz	1.8MHz to 30MHz
SSB, CW, AM (Narrow)	Less than 0.5μV	Less than 1μV	Less than 0.16μV
FSK, RTTY AM (Wide)	Less than 3μV	Less than 7μV	Less than 1μV
FM	—	—	Less than 0.3μV

- MB-19 19" EIA Mounting Rails (Optional)

OPTIONS



- IC-2KL Power Supply
- AT-500 Antenna Tuner
- IC-2KL Linear Amplifier
- SP-20 External Speaker
- SM-10 Graphic Equalizer Desk Mic

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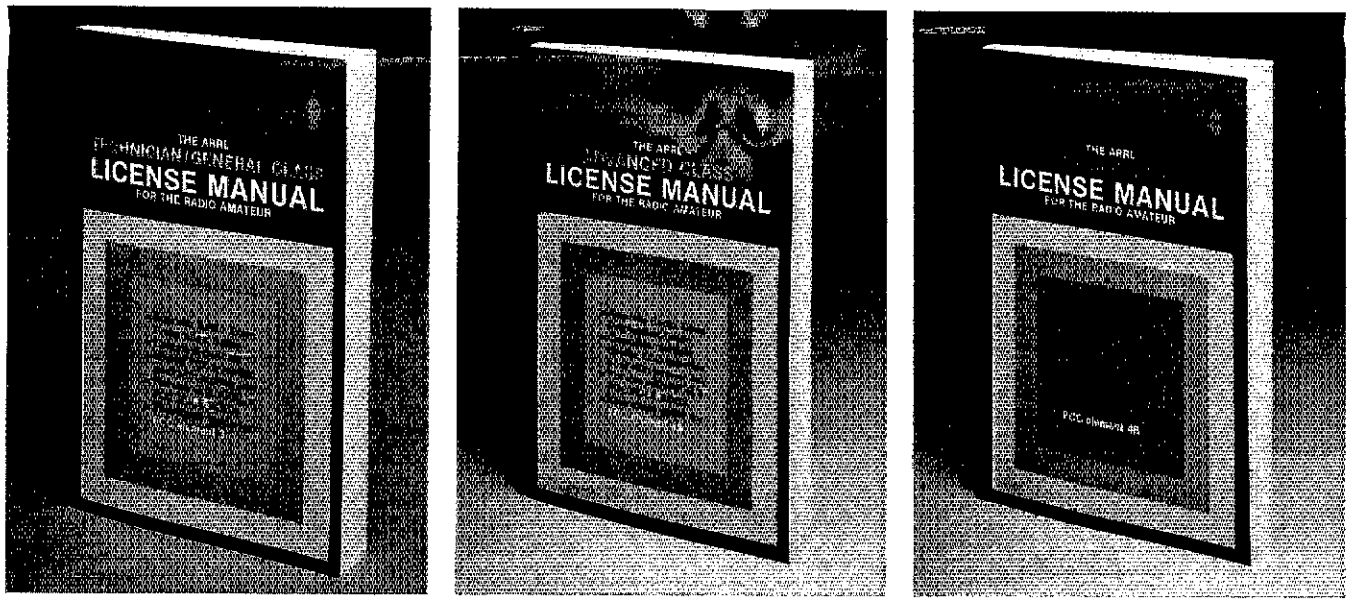

The popular **ARRL License Manual Series.** *The ARRL Technician/General Class License Manual* separates the study material for the Element 3A (Technician) and Element 3B (General) exams for easy study. The material covering the Technician Class is good for exams given through Oct. 31, 1989; the General Class material is good through Oct. 31, 1990. *The Advanced Class License Manual* is good through Oct. 31, 1990 and *The Extra Class License Manual* is good through Oct. 31, 1988.

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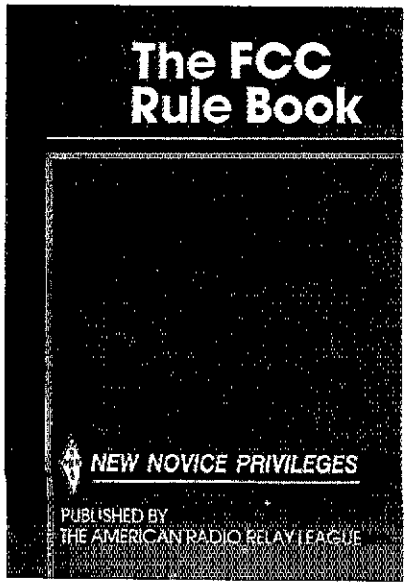

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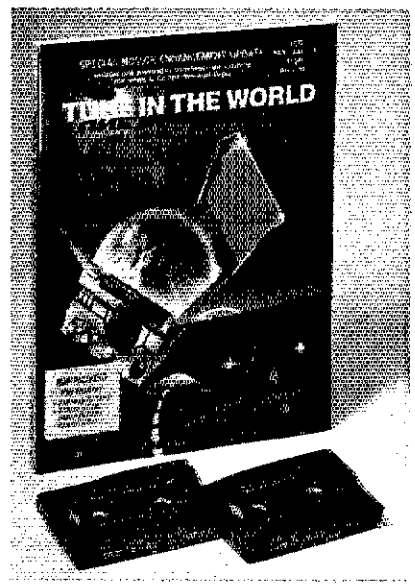

The New 688-page ARRL Operating Manual is HOT...

On July 8, 1986, a railroad tanker carrying toxic phosporous derailed and caught fire near Miamisburg, Ohio. The success of the Monsanto Amateur Radio Association's emergency plan in helping local authorities deal with this potential disaster is documented in November 1986 *QST*. The photograph above which was taken over the scene by Mike Carter, WD8BSI, shows what could happen in your backyard! Would you be ready for such a situation? The Emergency Communications chapter by Richard Regent, K9GDF, in the new *ARRL Operating Manual* tells how to prepare for such an eventuality. Emergency Communications and efficient message handling go hand-in-hand. Maria Evans, KT5Y, tells all about this subject and how you can become a part of the National Traffic System in the expanded Traffic Handling chapter.

Over forty percent of the radio amateurs licensed today were at one time or still are shortwave listeners. With modern transceivers, it's possible to hear what is going on outside our ham-bands. David Newkirk, AK7M, adds his enthusiasm for this closely related hobby in the SWL chapter. On a related subject, Paul Rinaldo, W4RI, tells us about the characteristics of the Amateur Radio Spectrum and how our bands are assigned.

Most hams are interested in just getting on the air and talking to someone. Even so, ham radio is a lot more than talking into a microphone or pounding a telegraph key. Carol Smith, AJ2I, and Bill Jennings, K1WJ, have prepared a chapter on Basic Operating. It is just what the newcomer needs in order to get started, and it's good review for some of us who have been away from ham radio for a while. Almost everyone can qualify for the Rag Chewer's Club Certificate, but do you realize that there are hundreds of Amateur Radio awards from throughout the world? Well you can see dozens of these awards in *full color* along with their requirements in the Awards chapter by Bob Halprin, K1XA.

Clarke Greene, K1JX, tells all about competitive operating. Clarke has won almost every major contest, HF, VHF/UHF, from home and away, using full power and QRP. Now he tells how it's done!

Almost everyone seems to be interested in digital communications these days. Stan Horzepa, WA1LOU, covers Packet Radio in detail; while Larry Wolfgang, WA3VIL, covers RTTY and other digital modes in a separate chapter. If you find SSTV or ATV of interest, Bruce Brown, WA9GVK, has put together a fantastic chapter on Image Communications.

If you still need to work the countries represented by the QSLs below, you're not alone; but you can pickup some good tips on working DX from well-known DXer and author Bob Locher, W9KNI. DX-peditioner Carl Henson, WB4ZNH, gives advice on how to operate from the "rare ones" without catching malaria or worse! You can find out when to work DX at anytime during the sunspot cycle by referring to the propagation tables which were newly incorporated in this edition. You'll also find sunrise-sunset tables for working DXCC countries around the world, and there is a great chapter on Antenna Orientation by *ARRL Antenna Book* editor Jerry Hall, K1TD.

Besides "packet," WA1LOU tells what is new in the area of FM and Repeater operation. This chapter is "must" reading for Novices who want to use repeaters for the first time or for those who want to upgrade their existing repeater operations. There is a lot doing these days on weak signal VHF/UHF work and Mike Owen, W9IP, shows how it's done from moonbounce to meteor scatter. Will you be ready for the OSCAR launch that may take place later this year? Dick Jansson, WD4FAB, captures us with his satellite operating techniques.

You'll also find numerous handy tables and charts in the third edition of *The ARRL Operating Manual*. It is edited by Robert J. Halprin, K1XA, Deputy Manager of Membership Communications at ARRL HQ. The new edition is available at your dealer or from ARRL for $15. (Please add $2.50, $3.50 for UPS for shipping and handling.)

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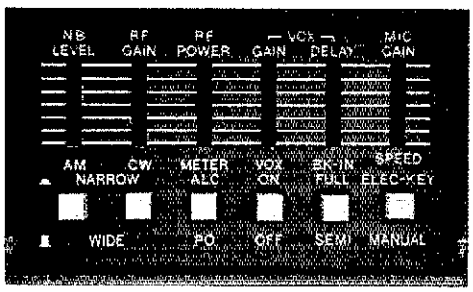

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ILLINOIS SECTION NETS

NET	FREQ	TIMES	(LOCAL ILLINOIS)
ISN	3905	1800	DAILY
ILN	3690	1830	+ 2200 DAILY
ITN	3705	1900	DAILY
CTN	147.69/09	2100	DAILY
ILARES	3905	1630	1ST + 3RD SUNDAYS
	ILLINOIS INDEPENDENT NETS		
IEN	3940	0900	SUNDAYS
ILPN	3915	1630	M-F, 1430 SUNDAY
NCPN	3915	0700	MONDAY - SATURDAY
NCPN	7270	1215	MONDAY - SATURDAY

WA7MAD has sent a good report on continuing PACKET activity in the state, specifically reporting on NETROM. He has a NETROM node map which is quite complete and very well done. The print quality and coding of the map are such that it cannot be transmitted via packet, but it is available from Clif for an SASE at his callbook address. Clif can be reached as WA7MAD @ KJ9L. KA6A is preparing the combined exam list for the 1988 exams in the Central Division. If you have exam sessions scheduled, or know of them, please drop Jim a note with (1) city; (2) date; (3) contact person; (4) telephone number for contact. The information should be sent to: Jim Coleman, KA6A, Rt 1 Box 55A, Ivesdale, IL 61851. The "unsung hero of the month" award goes to TC N9RF and his gang of ATCs who have been active in solving problems and doing presentations at an outstanding rate over the last few months. Especially appreciated is Ed's TC/ATC monthly report letter which keeps everyone up on what the rest are doing. Keep up the good work! As many of you have known for some time, it has been my intention not to seek a fourth term as SM for Illinois when my current term expires on July 1st, 1988. The reasons for this are many and varied, but revolve around two young sons, and a desire to pursue some projects at the local rather than section level. After announcing this intention to the section level appointees in July of 1987, an ad hoc nominating committee gelled from that group in order to insure that there would be a candidate for the next SM term who had experience in and a dedication to the mission of the ARRL section field organization in Illinois. I am pleased to announce that David Carlson, AA9D, of South Elgin has responded favorably to the call and will run for SM next term. Dave has been licensed since 1970 and has been an ARRL member for all but his poorer ($$) college days. He has been active in the field organization formerly holding the OVS and Asst. EC (Jackson Co.) appointments, and currently holding OES, EC (Kane Co.) and ASM appointments. He has been active in the leadership of the Chicago Area SKYWARN Assn. and was one of the two amateurs responsible for early sighting of the Marion Illinois tornado of 1982. He has many ham awards and accomplishments too lengthy to note here. I think that we can all be glad that someone with Dave's interest and experience has stepped forward to run for the upcoming term. Traffic: W9HLX 245, W9EHS 186, WA9VLC 17, KA9FEZ 174, NN9M 151, NC9T 150, W9HOT 98, N7DOY 93, K9CNP 82, KA9BBV 76, W9LWH 70, WA7MAD 69, WB9TVD 31, W9HBI 26, W9NXG 21, KA9CTW/T 19, WD9DZU 19, W9KR 18, K9WMP 14, W9RTD 11, W9VEY/9 9, WD9HQW 9, WA9RUM 7, WB9JTK 6, W9IL 2.

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UMH, KD9ER. SEC: WD9AVQ. STM: W9JUJ. ACC: K9ZBM. TC: K9PS. PIO: KA9LQM. SGL: WA9VQO. SECTION NMs: ITN KD9DU, QIN KJ9J, ICN KD9ER, VHF W9PMT, IWN KA9ERC.

NET	FREQ	TIME	DAILY	UTC	QNI	QTC	QTR	SES
ITN	3910	1330/	2130/	2300	3007	483	2230	83
QIN	3656	1430/	0000/	0300	531	265	1402	90
ICN	3705		2315		131	36	621	29
VHF NETS					2668	1719	5005	104

Appt: WD9AVQ, SEC; K9ZBM, ACC. OO report rcvd from K9LSB, K9FW, N9CJT, KA9BYN, WA9VLK, KA9DZM, WA9VQO. BPL: W9JUJ Orig 2; Rcvd 409; sent 388; Dlvd 4. This month we report two significant appointments in the section. WD9AVQ, has been appointed to be our SEC. He replaces WB9ZQE, who resigned due to other duties. WB9ZQE, served as SEC for many years and set up a first rate emergency preparedness system in Indiana. His professionalism, dedication and sense of service will be missed. The other significant appointment is K9ZBM as our new ACC. This important position requires a person who enjoys working with clubs, promoting the SSC program and, in general, helping affiliated clubs to grow and to serve their members. Jim has been very active in helping the Northeastern Ind. ARC grow into one of the state's most active SSCs, so he fits the bill to a tee! Don't forget to send me your exam schedules for 1988 so that your sessions can be circulated and promoted. February 28 is the LaPorte Winter Hamfest. See you there! Listen up for K200LSB, W200AB and N200DLN, three Hoosier stations taking part in the Constitution Bicentennial Celebration. Indiana's week is December 3-9, 1988. Several Indiana counties are in need of an Emergency Coordinator. Contact me for info on becoming an EC. WA9VQO, our acting-OOC, has laid out a plan to establish Interference Task Forces around the state, working with our ATCs, to provide an outstanding resource to help solve interference problems. For more info, contact WA9VQO. Affiliated Clubs, please make sure your 1988 papers have been filed with Hqtrs. Now's a good time to consider upgrading your club to a Special Service Club! Contact me for details. Congratulations to K9LSB who is the new Indiana Air Force MARS Director! Station reports for November: W9JUJ 804, KJ9J 221, NJ9S 142, NR9K 133, KA9FFO 125, K9TKE 95, KA9RNY 89, N9HZ 67, WA9QCF 55, WB9IHR 49, KA9QMI 49, N9FMO 48, KD9ER 46, K9WWJ 43, WB9OZZ 31, WB9PFZ 30, KB9HH 28, K9OUP 28, W9ZGC 26, WD9DWD 18, N9DTG 14, AB9A 12, W9KT 10, W9XD 10.

WISCONSIN: SM, Richard R. Regent, K9GDF—West Allis Radio Amateur Club Member of the Year is hard-working Ron, N9AU, and the Club's new officers are: Pres. W9YCV; V. Pres. NF9P; Sec. N9AU; and Treas. WA9POV. New officers Green Fox ARC: Pres. KB9WC; V. Pres. N9QVY; Treas. N9ALZ; Sec. WB9RBC, and we welcome the Green Foxes as Club subscribers to the Badger State Smoke Signals. QCWA Chapter 162 in southeast Wisconsin now has 13 members with new officers: Pres. K9ZL; V. Pres. W9BIH; and Sec./Treas. W9WLN. The Constitution's Bicentennial Special event week is May 14 through 20 in Wisconsin with the following clubs using special 200 call signs: Four Lakes ARC, W9JZ; Madison DX Club, NB9C; Central Wisconsin RA, WB9QFW; Greater Milwaukee DXA, NK9G; W/K ARC of Greater Milwaukee, AJ9U; Green County ASA, K9WMV; Shawano Schools RC, WA9BZW. Stan, WB9RQR of the Ozaukee RC has prepared a snappy practical standard operating procedure for his Club's emergency communications activities. Watch for word on the ORC Post Everything Party. George, W9MDP, new Public Relations Director of the Fox Cities ARC, recommends magnetic signs be stuck on cars driven by amateur communicators at public events. Dave, KJ9I, achieved 7-band DXCC by completing contacts on 10 MHz and will next work on 12 meters. Lloyd, N9BBQ, worked 100th plus country on 160 meters. Jerry, N9AW, proudly displays his certificate for high-score single-operator Wisconsin 20-meter ARRL International DX CW contest. Jerry also helps Scouts learn about hamming. Greater Milwaukee DX Association is looking for some "fresh blood" in their club. contact K9CJK for trans-

performance.

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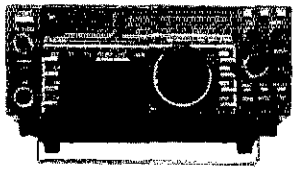

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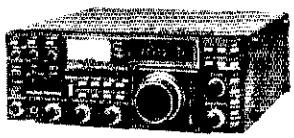

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fusion details. Badger Examiners February 20th exam, 1 PM at St. Nicholas Parish in Milwaukee, reservations with KB9G. K9BED and W9UM are now on packet radio. Steve, WB9ZRE, manager of pre-press operations in the Speed Queen Printing Department reports, "There are plenty of other amateurs here, besides me. There's KC9EY, KE9EJ, N9EDV and KA9CXF." Scott Young, N9FZS, Hiram Percy Maxim winner brought fellow students to the Friendly Fest and introduced them to an exciting aspect of ham radio. Scott's new address is Johnson Hall, Room 1206, Milwaukee School of Engineering, PO Box 353, Milwaukee, WI 53201. Traffic: WB9YPY 1423, KA9RII 508, W9CBE 285, N9GJI 262, W9YCV 257, K9GDF 191, WA9WYS 145, N9BDL 141, W9UCL 116, KA9BHL 113, W9CXY 104, W9DND 97, WB9ICH 80, WD9IID 74, WB9NRK 70, K9EP 68, K9AKG 58, W9NGP 58, W9NK 57, K9UTQ 49, N9BCX 48, W9ODV 48, K9FHI 34, K9JPS 34, KA9JJY 30, WD9JID 26, K9BED 19, KA9USV 17, W9PVD 12, W9UW 12, WD9DNQ 6.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—Thanks to all for the great job of moving traffic during the Holiday Season. Many I know worked the "Extra Board" doing double and even triple duty, especially in liaison spots and as NCSs. Thanks, Gang, now we can look forward to Valentine's Day! The Amateur-of-the-Month for November is Carl Port, NØIAN of Buhl. Congratulations Carl, and thanks to everyone for the great work. Then we have Mel, NØFOO, of Brainerd, who reported "3-1/2 inches of wind" at his QTH. He later clarified that to say that he meant, "In his boat." (???) All of which leads us to believe that we are about ready for Mid-Winter Madness. Mark your calendars now. The 7th Annual Mid-Winter's Hamfest and Flea Market, with VE Exams, will again be at the Medina Ballroom on Saturday, February 27th, 1988. Watch for further information, and hope to see you there. Until next time, 73, Jim Swisher, KAØEPY, STM. MN EMERGENCY FREQ 3860 kHz, BULLETINS 3860 kHz

NET	TIME	FREQ	QNI/QTC/SESS	MGR
MSN/1	6:30P	3685	429/217/30	WØUCE
MSN/2	10:00P	3685	287/62/30	KDØNH
MSSN	6:00P	3710	359/44/30	KAØSBY
MSPN/N	12:05P	3860	488/262/30	WBØWNJ
MSPN/E	5:30P	3860	1053/243/30	KCØT/KDØCI
MNAMWXNT	6:00P	3860	457/352/29	KØOGI
PICO	9:00A	3925	4306/496/123	WDØBAC

Traffic: WBØWNJ 740, WAØTFC 416, KAØEPY 411, NØFOO 328, WØUCE 267, KAØARP 257, WØGRW 248, KDØCL 187, NØCLS 154, KAØSBY 121, KTØI 116, W9DM 105, WAØONE 98, NØIAN 83, NØJP 70, KØOGI 62, WDØGUF 62, NØHSR 61, KCØT 48, KAØVII 55, KDØNH 48, KØCSE 27, KDØCI 26, KAØPDM 23, NØHWD 18, WØKYG 13. Total traffic: 4,044.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—As you see, your SM has a new call, and I have been having a harder time getting used to it than anyone else. The video, "The New World of Amateur Radio" has been making the rounds, and has been well received. Congratulations to NØJR NØGUV KBØACO and KAØTKH on upgrading to General; also to KAØQFN KAØNUA KAØAPC and KAØAEB to Tech. FORX Radio Club is going to use WA200JXT during the week of Oct 29 until Nov 4, 1988. Some RRRA members have been busy helping get the Barsville, MN, repeater 147.05 +600 and digi 145.01 going. (It should be a good one.) Final work on the super link is in progress, and should be on by the time you read this. Also many Novice classes are planned this winter. Traffic: KAØFSM 95.

NET	FREQ	TIME	SESS/QNI/QTC	MGR
Goose River	1.9 kHz	9 AM Sun	5/156/8	WØCDO
DATA	3.385	6:30 Da	28/532/47	KAØFSM
Wx Nets	3.385	9 AM, 12:30, 5 PM Mon thru Fri	62/805/42	WØGFE
Storm Net	3.885	as needed		
North 40	146.64	2:00 Z Sat	5/49/0	NSØH

SOUTH DAKOTA: SM, R.L. Cory, WØYMB—ASM: NØABE, WAØFPR. SEC: KAØKPY. STM: KDØYL. South Dakota Callbooks are now available from the Lake Area Radio Klub, P.O. Box 642, Watertown, SD 57201 for $3.65 by mail or may be picked up at Burghardt Amateur Center for $3.00. The format of the LARK Novice net has been changed. The net now meets only on Sunday at 7 PM CST on 3.750 MHz. LARK member WBØCVS had a fatal heart attack on Nov. 3rd. Black Hills Amateur Radio Club is planning a State Convention to be held at the school of Mines at Rapid City on July 4th weekend. Black Hills ARC, S. Dak. School of Mines and Tech., at Rapid City, and Hub City ARC at Aberdeen and Mobridge Area ARC have all received FCC authorization for the 200 call sign to be used Oct 29 to Nov 4, 1988. Updated Packet information is available from NØABE for an SASE. S. Dak. total traffic for Nov. was 1704. Traffic: NØDPF 725, KØERM 361, KØZBJ 157, KØAIE 108, WØHOJ 75, WØMZI 57, KAØKPY 46, WAØVRE 45, KDØYL 41, KAØUEQ 36, WBØOMF 35, WØYMB 18.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF—ASM: K5UR. SEC: N5BPU. STM: W9OK. ACC: NI5D. SGL: W5LCI. TC: W5FD. OOC: NR5Q. BM: W5LL. PIO: K5TML. Repeater Frequency Coor. WB5FDP. In April, 1983, I was honored to become your Section Manager in Arkansas. A big job lay ahead, as the new ARRL Field Organization went into effect at that time. Each of you gave your unselfish support and assistance in any way you could, and it has been an asset to the ARRL in the state. Now, an expanded task lies ahead for me. As you know, I was honored to be elected your ARRL Director for the Delta Division. I want to take this opportunity to thank each and every one of my appointees for their assistance. You have dedicated your service to our great hobby, and the rewards and benefits of your work have been seen. I pledge my continued service as your representative, and anxiously look forward to discussing matters with each of you. I extend my sincere thanks and appreciation to each of you.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. SEC: N5ADF. ACC: K5DPG. SGL: KD5SL. TC: W5RWF. OOC: KE5QK. Packet: NE5S. Congratulations to Joel Harrison, WB5IGF, of Searcy, Arkansas, who was elected as the ARRL Delta Division Director and to Joe Butler, K5OS, of Ocean Springs, Mississippi, as the Vice Director. 1988 officers of the Twin City Ham Club in West Monroe are: Pres: "Buddy" KF5HN. Vice Pres: Jimmy, N5DMX. Sec. & Treas: Henry, WB5SOT. Their 1988 Hamfest will be at the West Monroe Convention Center on Nov. 5. El Charlton—W5MD president of Baton Rouge QCWA Chapter 109 was appointed as a Board Member of QCWA. What an excellent choice. Elected Officers of Baton Rouge QCWA Chapter 109 for 1988-89 are: Pres: El- W5MD. V.Pres: Bill-W5URR. Sec/Treas: Warren- K5DVQ. Many thanks to the members of the Central La. ARC that assisted the American Red Cross during the Nov. 6 flooding by providing base stations, mobile units and a maritime unit with a bass boat. Who says hams can't do it all? Hams assisting were Joe, N5JWA; Louis, WG5W; Frank, WG5X; Tony, W5BWA; Ed, KB5CX; Mark, N4NXO, David, WD5JUD with XYL Vickie; John, N5JMO and Bill, WD5JKG. The Central La. election of 1988 officers are: Pres: Louis.

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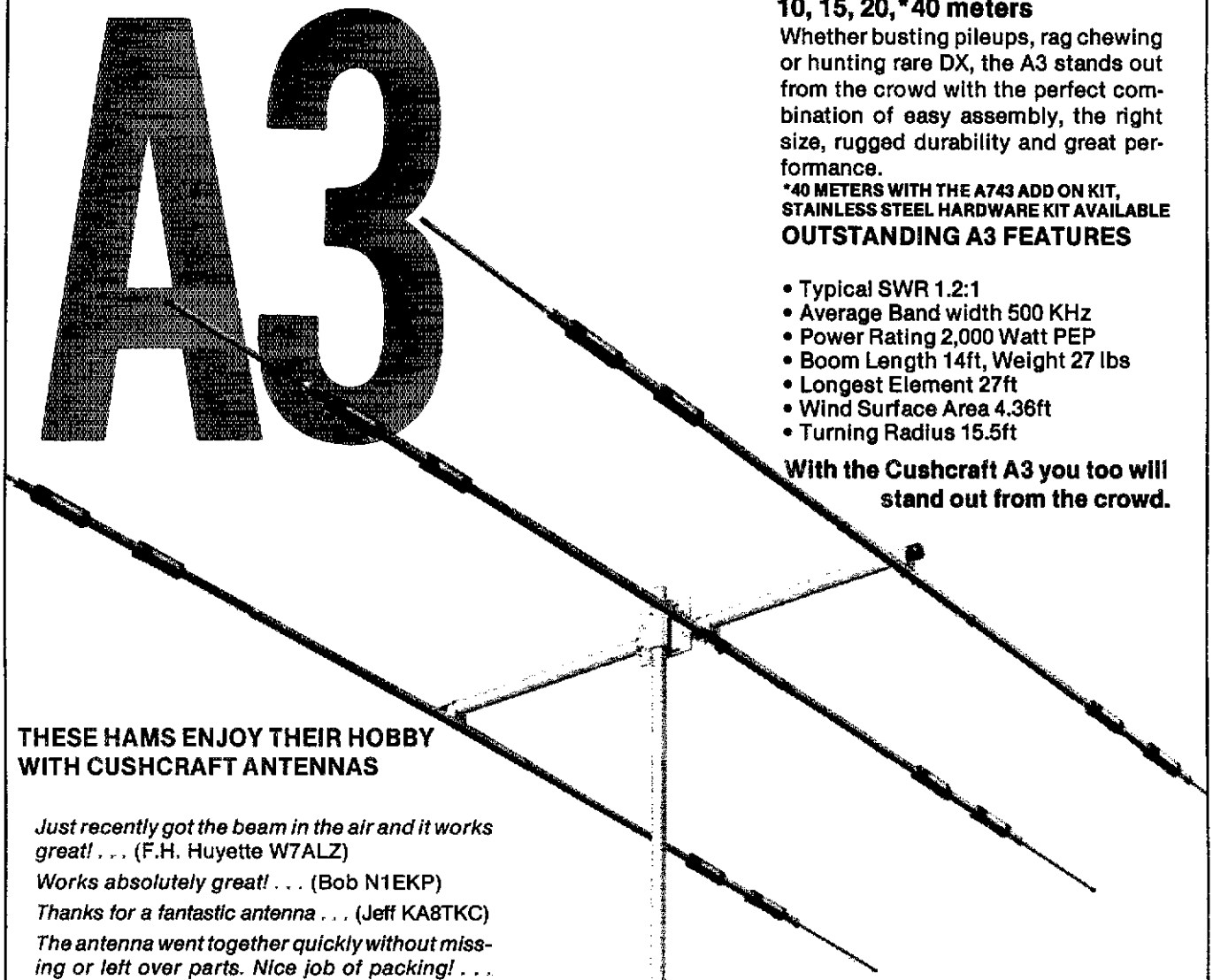

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Works absolutely great! . . . (Bob N1EKP)

Thanks for a fantastic antenna . . . (Jeff KA8TKC)

The antenna went together quickly without missing or left over parts. Nice job of packing! . . . (Ray KE7RO)

A fine antenna! . . . (Joe KA3MMJ)

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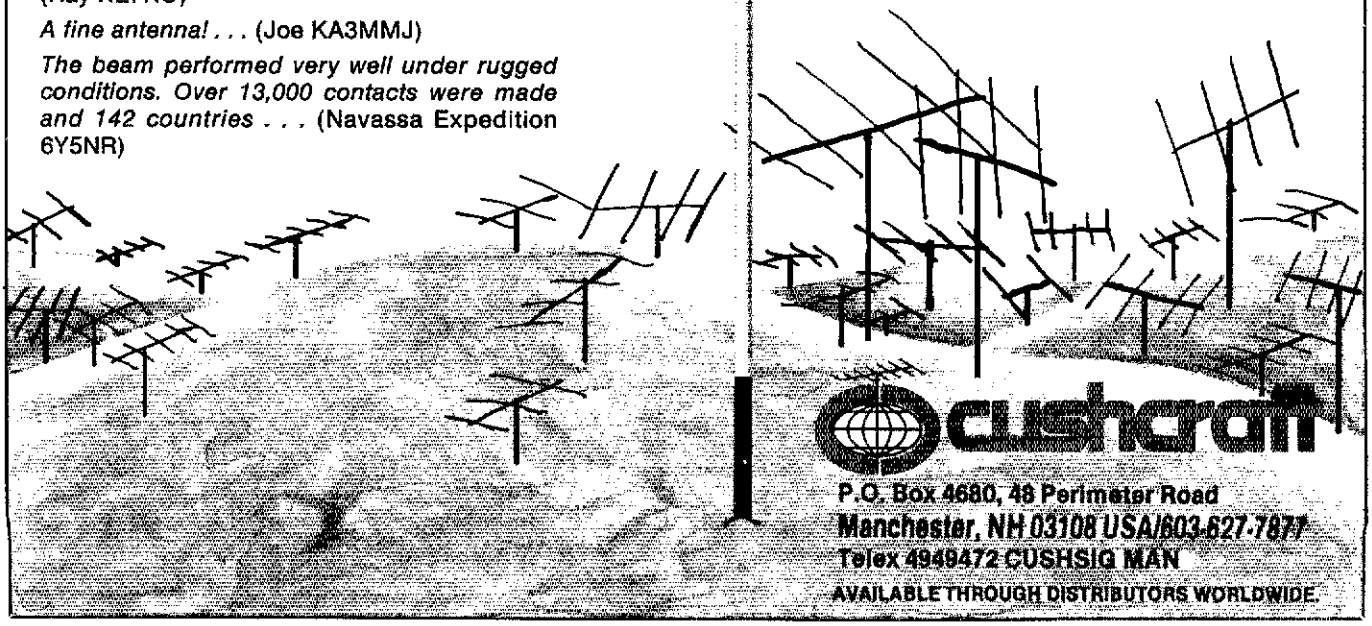

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WG5W. V Pres: John, N5JMO. Sec: Mary, WA5CRU. Treas: Ed, KB5CX. The banker, the treasurer? It figures. Traffic: CAND Nov 87. 1062 msg in 30 sessions. DRN-5 represented 100% by WA5V and KF5VW. DRN-5 for Nov 87. 748 msg in 60 sessions by K5WOD, WA5WBZ, WA5V, KF5VW and WA5TQA.

MISSISSIPPI: SM, Jim Davis, KK5Z. ASM: W5TRD. SEC: WD5IKD. PIO: WN5M. ACC: K5VXV. OOC: KK5Z. TC: KF5DE. BM: W5EPW. STM: KB5W. VHF/UHF COORD: N5DWU. Congrats to following upgrades: To Tech: KB5EOU. To Gen: WB5GUD. To Adv: N5JRG, WB5UVT. To Extra: KA5WPM. The Rankin County ARES Wx Net activated 16 Nov 87 by N5JPX on KF5IZ/R and K5DZE activated NWS sta on packet: Tornado! On ground south of Jackson; heavy damage, many injuries, no fatalities. Power lines down. Roofs gone, trailer trucks overturned, buildings destroyed. Info quickly relayed to CD HQs. News very complementary of ARES efforts, which saved lives!!! Jackson NWS relays "well done" to: KB5BCF, KA5SBK, KA5WRX, KA5SVV, KA5HGT, WD5CRE, AL7GQ, W5LHA, AA5CI, KA5TAP, N5KFP, N5BRL, WA4ZTG, KB5JN, KF5IZ, N5JPX, and K5DZE. Great job by all concerned. DEC badly needed in Meridian area. Contact WD5IKD. KA4PKA getting ball to rolling on Gulf Coast as DEC. MISSI/LOU/EMERG NET (N5EZX), SESS 5, QNI 217, QTC 109. MISS/SLO/NET (W5YRX) SESS 15, QNI 35, QTC 18. MSBN (KF5DE) SESS 30, QNI 1716, QTC 46. NE MISS 2MTR FM NET (NS5M) SESS 30, QNI 210 QTC 11. NESHOBA ARC 2MTR EMERG NET (N5VPP) SESS 5, QNI 61. ARRL INFO NET (KK5Z) SESS 4, QNI 48. COAST ARES (KA4PKA) SESS 4, QNI 87, QTC 6. MAG SEC NET (NS5M) SESS 30, QNI 473, QTC 10. PINE BELT EMER NET SESS 2, QNI 23. GULF COAST SB NET (W5JHS) SESS 30 QNI 789, QTC 12. DRN5 SESS 60, QTC 784. MISS represented 98% by N5AMK, KB5W, KT5Z, W5HKW, WB7CQQ, W5VKR. Traffic: N5AMK, R 211, S 274, Total 485; WQ5H, R 68, S 67, O 2, D 1, Total 138. W5JDF, R 68, S 72, O 4, Total 144; KB5W, R 254, S 241, O 2, Total 501. PSHR: N5AMK (96).

TENNESSEE: SM, John C. Brown, NO4Q—ASM: WA4GLS. ACC: WA4GLS. OOC: W9FZW. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. There is another assistant section manager named as of 1st of October and that is W4YXA. He was previously a net manager of the packet program. His title has been upgraded to the new title and called the packet program or affairs manager. It is noted the activity on this mode is still growing and a good bit of traffic is being passed. I would suggest that those of you who operate on that mode properly remove the traffic for your area and take it to the phone or CW nets for delivery. Please remove it, and show that you are delivering the traffic to its destination. It can reach its destination when properly handled very quickly or slowly depending on how it is processed. Let's get in there and assist as a worker in the new mode of traffic handling. W4YXA will be looking for a "FEW GOOD OPERATORS." Talking about net managers as above, it is with *sorrow* that I pass along the passing of NN4S. He was very active on the CW nets and phone nets in the traffic work. He had been the mainstay of the CW net. Our condolences to the family, and *he will* be missed on the various nets and by his *many* friends as well. Your new Section Manager called the other night, and he indicated that he also WILL BE LOOKING FOR A FEW GOOD OPERATORS for the various staff positions in the Tennessee Section. *HE IS NOT LOOKING for POSITION HOLDERS.* He is looking for staff workers. Contact him IF you fit that category. I am sure that he will consider your qualifications to do the job for him. You will see one more report from NO4Q before W4MI takes over. The new Delta Division Director will be installed at that time also. "Good Luck to the Two of Them." Traffic for this period is as follows: LF - Sessions-72, QNI-3876, QTC-87; VHF - Sessions-49, QNI-562, QTC-321; CW - Sessions-38, QNI-201, QTC-54. The CW net honor roll for this period has W4LVP and N4OZB getting the honors. The individual station activity for this period is as follows: W9FZW 188, WA4FMR 121, K4WWQ 115, W4DDK 41, W4TYV 37, KA5KDB 24, W4PFP 21, N4OZB 20, KE4LS 18, KI4V 15, KB4UQ 12, WA4HKU 10, W4PSN and W4EWR both with 6 each. Many thanks to all of you for your reports. C U L

GREAT LAKES DIVISION

KENTUCKY: SM, John Thernes, WM4T—SEC: WB4NHO. STM: KA4MTX. PIO: WA4SWF. KC4WN has been appointed as OO Coordinator. The River Cities ARA will be signing KD200SN during the week of May 28-June 3, 1988. The Pioneer Amateur Club of Winchester provided communication for the annual Downtown Christmas Parade on November 21st. New BARS President is KF4NB; New NKARC President is N4GNL. Congrats to both! Sincere thanks to outgoing Director Wilson for an outstanding job; many Ky. amateurs appreciate what you have done!

NET	QNI	QTC	SESS	MGR
MKPN	1454	178	30	WD4RWU
KTN	822	45	28	WB4LBG
KNTN	222	75	39	KB4OZ
KYN	368	144	59	K4AVX/KZ8Q
TSTMN	375	35	30	KZ8Q

SAR (NOV): WD4RWU 167, K4VHF 166, KI4QH 147, N4GNL 80, K4AVX 42, KA4MTX 38, KB4UJA 34, WA4SWF 24, WD4CQF 8, WB4AUN 5, N4PEK 5, PSHR: KI4QH 77, KA4MTX 74.

MICHIGAN: SM, James R. Seeley, WB8MTD—Silent Key with deep regret: WD8JHK. New EC appointment, for Gratiot County: W8GI. NBAHA has resigned as NM of MITN. Thanks for your efforts, Jeff. STM WD8KQC will be appointing a new manager shortly. Meanwhile, he and Assistant NM K8UPE are keeping things running. My heartiest congratulations to George Race, WB8BGY, on his election as SM for MI. We can look forward to good times under this leadership. Which means, of course, that this is my last column. It's time for some reflection. I've been your SCM/SM for eight years, after holding the post of STM for two years and an EC slot for four years before that—14 years in leadership one way or another. It's been enjoyable overall, and satisfying in many ways. I've found friends I never could have found any other way. And I was privileged to do it all during a period of some of the most dramatic changes for our service in its history and for that of your League: deregulation, the VE program, the restructured Field Organization that by now most of you take for granted, etc. I feel that in some way, I've "paid back" some of the debt accrued for all the pleasure and enjoyment I've taken from the hobby. More than anything, I've been a volunteer working with volunteers in a sincere effort for the continuance and betterment of Amateur Radio. Whatever measure of success I have achieved owes largely to the marvelous spirit of cooperation demonstrated by most everyone with whom I've been involved. It's a spirit I have never seen in any other organized human group activity, not to the extent and depth that we know it. As I've pointed out so many times, without the concerted efforts of our dedicated volunteers at all levels of service and leadership, your League simply would not exist, nor would the hobby, at least not as we know it today. To all of you, my friends, my most sincere thanks. And now? I honestly don't know. For a while, I intend to enjoy a period

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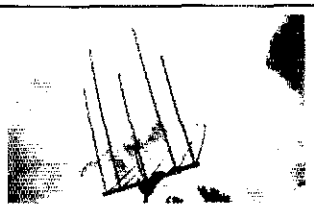

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- DL 1015: 5 el. duobander $489.00 3 el. 10m.-2 el. 15m., 9 ' boom
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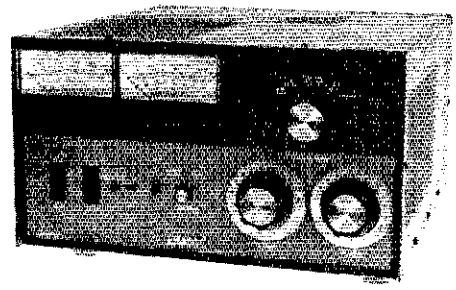

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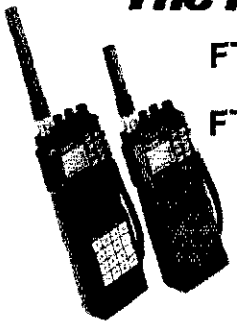

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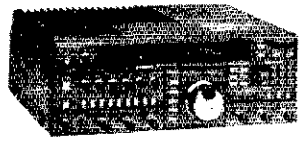
FT-73R



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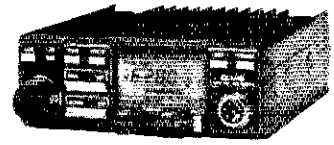

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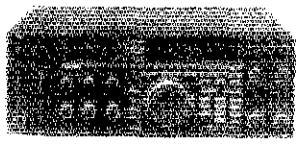

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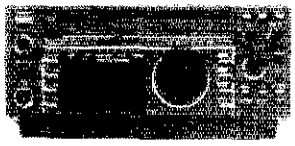

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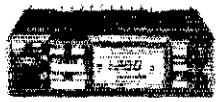

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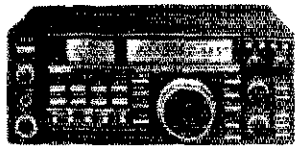

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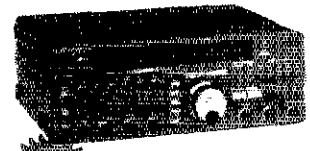

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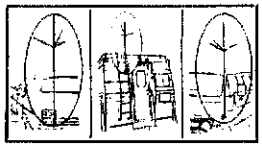

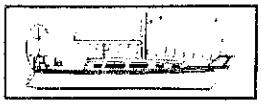

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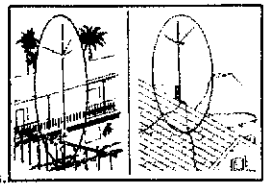

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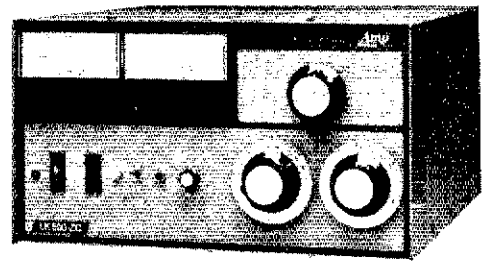

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CHARLOTTE HAMFEST, P. O. BOX 221136, CHARLOTTE, NC 28222-1136

TALK-IN FREQUENCY — 145.29 MHz — W4BFB

EXHIBIT BOOTH: Robert Starling, N4GVF, 7921 Holly Hill Rd., Charlotte, NC 28212, (704) 568-7611
FLEA MARKET CHMN: Jeff Blythe, KA4WYC, 634 Northway Drive, Charlotte, NC 28208, (704) 393-7140
PRE-REGISTRATION: Andy Hawkins, G4GKK, 426 Greystone Road, Charlotte, NC 28209, (704) 523-4463

of "retirement," but I'm certainly not planning on disappearing altogether. Who knows—I might even start chasing DX! Nov. net summary (net, QNI, tfc, sessions): MITN 654 214 30; QMN 991 194 90; SEMTN 392 85 30; MACS 428 82 30; UPN 1138 56 35; VHF activity 270 6 22. Traffic: WD8KQC 220, AF8V 166, WB8YDZ 155, WB8YPG 120, W8QHB 100, N8EGK 99, WD8RHU 80, WB8SYA 67, K8GXV 62, WA8DHB 55, W8YIQ 53, N8FTY 34, K6HAP K8UPE 33, WB8MTD 31, N8CNY 28, K8OCP 27, WB8BGY 26, W8IHX 25, WB8WJV 21, KA8PWM W8URM 18, WD8MJB NY8W 17, KC8TU 16, KI8Q 15, W8EOI 14, K8ZJU 12, W8YZ 11, W8BEZ 10, K8RDN 9, W8IDT W8VIZ 6, N8EXS NX8S 5, KA8VDX 4, W8CUP 3.

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: N8AUH. SEC: WD8MPV. STM: KF8J. BM: W8ZM. ACC: KJ3O. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK.

NET	QNI	QTC	SESS	TIME(LOCAL)	FREQ	MGR
BN(E)	303	176	30	1845	3.577	N8EVC
BN(L)	198	120	30	2200	3.577	K8TVG
BNR	335	105	30	1800	3.605	W8EK
BSSN	230	128	39	0945,1900	3.873	KD8FW
ONN	117	31	27	1825	3.708	WD8KBW
OSN	305	81	30	1810	3.577	N8AEH
OSSBN	2212	1076	90	1030,1615,1830	3.9725	WB8JGW
OSSN	208	105	30	0645M-F	3.577	KA8GJV
				0800S-Sn	3.577	KA8GJV
OHIO SECTION ARES NET				1700SUN	3.875	WD8MPV

VE exam session for February and March: Dayton 2/13; Maumee 2/13; Lisbon 2/20; Maumee 3/11; Beavercreek 3/12; Columbus 3/12; Zanesville 3/26. Contact me for details. The Ohio State ARRL Convention will be held February 26-28 in the Cincinnati area: hope to see you there! As of this writing (December), I have not received confirmation on any 1988 hamfests, as requested in previous columns. The hamfest information below represents my best guess of dates in February: see *QST* for confirmation or contact the sponsor. NOARS Winterfest, 2/7; Mansfield Mid-Winter Hamfest 2/14; Cuyahoga Falls 2/21; Circleville 3/6. I'm sorry to report W8DQV of the Canton area as a Silent Key. Congratulations to the Alliance ARC, who has qualified to become Ohio's newest ARRL Special Service Club (SSC)! As I've said in the past, SSCs are the most active, best organized, and most interesting Amateur organizations in the Section! Here's a club idea for your group: several clubs in the Section purchase new Callbooks each year from club monies and entrust them to a volunteer. The members of the club can call the volunteer keeper-of-the-books for addresses as needed! Certainly a valuable club benefit! The Dayton ARA organized a club trip to the Ft. Wayne (IN) hamfest on November 8, with 44 club members boarding the bus. Hamfests are more fun when attended with a friend or two. Several Dayton area Amateurs traveled to St. Lucia (J6L) in the Carribean for the CQWW CW DX Contest, using the call J6DX. The DXpeditioners included: W8RKL, K6GXO, NC8Q, WD8IXE, W8PR, W8ILC, WB8ENR, KA8CFU, W8WPV, and N8BJQ. The Celebration of the Bicentennial of the U.S. Constitution reaches Ohio during the week of February 27-March 4, with at least 15 Ohio club stations replacing the "8" in their call with the special "200." Look for: WB200SMC, W200NCK, W200FO, KC200IG, W200RSW, N200BC, K200ORW, WD200PHL, K200YOJ, KD200EU, W200YX, W200UMD, W200DZ, K200SCH, and AK200Y. There may be others authorized by the FCC after this writing. QSL via the routes published in *QST* or to their normal "8" callsign address. Congratulations to Len Nathanson, W8RC, who narrowly defeated incumbent George Wilson, W4OYI, to become Great Lakes Division Director for the 1988-89 term. The margin was only 20 votes! You will remember that Len has served previously as Director, prior to his election by the Board to two successive ARRL Vice President terms. It has been my distinct pleasure to have worked with George Wilson, who has served the Division and the Ohio Section well, and I trust that the League will benefit from his continued activity in League affairs. K8ND is now on packet: direct messages to K8ND @ W8CQK. The 110 station listed below have reported a total traffic count of 7302 radiograms during the month of November 1987: W8PMJ 359, KD8KU 355, K8JDI 301, W8BO 289, K8DHD 287, N8IBS 254, W8ZOL 237, K8TVG 230, WD8KFN 228, WB8JGW 214, KD8HB 206, N8AKS 180, KV8Q 171, K8ND 169, N8GEC 168, W8QZK 162, K8IOW 161, WD8QXT 155, N8XX 151, KF8J 139, WA8SSI 129, WB8BWY 128, N9AUG 121, KA8GJV 105, W8CXM 104, WA8HGH 101, W8EK 94, N8FWA/T 85, N8EFB 82, W8SKP 76, W8LDU 70, N8GPU 68, KC8JV 66, WA8HED 65, NE8X 65, KA8YIT 64, K3RC 63, WB3LHI 59, KD8FW 57, N8AEH 53, KC8TW/BBS 52, WD8JYE 51, KA8CGF 42, WD8IKC 42, W8FPA 39, KC8YV 38, KA8RIX 37, K8CMR 36, NW8E 36, K8ES 36, WB8HHZ 35, WB8KWC 35, N8GOB 34, KE8CV 32, K8LQM 32, WA8DYS 31, WD8JAW 27, W9SWM 27, N8IIP 26, WD8MIO 25, KA8HBN 24, KD8IC 24, KC8JN 24, W8JLW 20, K8ALV 19, N8CEI 19, KC8UZ 19, NØCB 18, KA8DNQ 18, WD8CTX 17, KE8DQ 17, KA8DRR 16, W8RG 16, KD8WI 16, WB8YYS 16, NQ8K 15, KA8TNT 15, N8HRW/T 14, N8AJU 12, WB8KWD 12, WB8MRL 12, KA8SOM 12, K8VOY 11, WB8GDM 10, WD8DKQ 9, KB8CMW 8, N8CW 8, N8GIY 8, NU8H 8, KA8OQF 8, WA8CYE 7, WA3EZN 7, N8FPH 7, N8HBF 7, NF8A 6, NF8B 6, K8CKY 5, WD8PWG 5, WD8ATN 4, W8GDQ 4, N8GIO 4, KC8WH 4, N8HIL 2, K2RJ 2, WA8RLB 2, W8ZM 2, KA8CBO 1, NU8I 1, N8IBW 1, KA8VYT 1. (Oct.) KV8Q 138, NE8X 18, N8GKK 4, N8HIL 3. (Sept.) K8VOY, 7.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM & STM: K2ZM. SEC: WA2ZYM. BM: WB2IXR. PIO: KB2TM. TC & OO/RFI: KC2ZO. ATC: WA2VGM. SGL: KB2HQ. NEWSLETTER EDITOR: WB2NHC. NET REPORTS FOR NOVEMBER (QNI/QSP): AESN 49/2 CDN 569/51 ESS 356/48 HVN 344/85 NYPON 694/433 NYS/E 385/256 NYS/L 336/197 NYS/M 345/276 SDN 223/138. CLUB NEWS: Albany ARA held elections at December meeting—results next month. They report new members WA2EDL N2GXH WA2EQV and upgrades N2HQS and WB2QGU. Communications Club of New Rochelle members got some hands-on practice in working the world with Dr. DX. Crystal Radio Club had a program on active antennas. Overlook Mtn ARC elected officers for '88, Pres-N2FS VP-W2XL Sec-K2UR Treas-KA2QYL Dir-KC2IW plus already elected directors KU2Q and WB2H. Putnam Emergency Amateur Rptr League is looking towards updating the packet radio facilities. Rip Van Winkle ARS report that their repeater ran for 8 days on battery backup after the storm on Oct. 4th. They report upgrade KA2KTH to N2HRC. Saratoga RACES had their holiday party on Dec. 19th. Schenectady ARA heard Father Tom Phelan talk on the Industrialization of the Upper Hudson. They welcome new member KA2JHX. WECA previewed "The New World of Amateur Radio." Jack, WA2YBM, reports those who helped with the Pumpkin Patrol were W2CJO KA2MBA WA2YBM KD2TD WA2QHD WB2UXS KA2VAR KB2CV KA2MJL WB2ZCM WB2BEJ WA2GGI WB2SBO W2CDQ WB2FMB WA2WQZ WB2VXS NC2G WB2VJC. Now is the time to be thinking of getting new ham radio classes organized for the new year. Get the word around and start with the publicity for it now! It is not too early. Oct. PSHR WA2ZYM. Oct. Traffic:

WA2ZYM 63. Nov. PSHR: WB2VUK NQ2H K2ZVI N2HIF KB2AYD N2HLU. Nov. Traffic: N2HIF 308, WB2VUK 219, KB2AYD 134, NQ2H 112, W2YJR 106, K2ZVI 99, K2ZM 50, N2FTR 47, WA2YBM 24, N2HLU 21, K2HNW 15, KA2NGJ 5.

NEW YORK CITY-LONG ISLAND: SM/SEC: Walter M. Wenzel, KA2RGI— ASM: K2IZ. ASM VE: W2NL. ACC: KA2WIJ. STM: K2MT. OOC: NB2T. TC: WA2YNH. BM: W2JUP. PIO: N2GQR. The following are traffic nets in and around the section that handle NLI messages:

NET	FREQ	TIME	DAY	MGR	SES	QNI	QTC	QSP
BAVHF	146.850/R	2000	DLY	K2YQK	—	N/A	—	—
NCVHF	146.745/R	1930	M-F	K2HPG	—	N/A	—	—
SCVHF	145.370/R	2000	S-F	KA2JMA	—	N/A	—	—
NYPON	3913 kHz	1700	DLY	KA2UBD	—	N/A	—	—
NYS/M	3677 kHz	1000	DLY	N2EIA	—	N/A	—	—
NYS/E	3677 kHz	1900	DLY	KU2N	—	N/A	—	—
NYS/L	3677 kHz	2200	DLY	KU2N	—	N/A	—	—
NLT	28450 kHz	2100	WED	KB2BKE	—	N/A	—	—
ESS*	3590 kHz	1800	DLY	W2WSS	—	356	—	48
PNS	145.01	24HR	DLY	AI2Q	—	N/A	—	—

*Independent Net, recognized by NTS, all times are local. Access AI2Q-4 (Packet Node Station) via WB2QBP-2 Net-Rom Node. Please check into the NYC-LI Ten Meter Net (NLT) for additional traffic handling training. Novices please take note that this net is designed for your participation. EXAM SESSIONS: LIMARC-second Saturday of each month at NY Inst. of Technology, Old Westbury- contact Joe, W2NL 516-541-2450; SUFFOLK COUNTY VE TEAM-second Saturday of each month at Suffolk County Community College, Selden-contact George, WA2VNV 516-751-0894; GRUMMAN ARC-second Weds. of each month at Bethpage High School, Bethpage-contact Howard, W2QUV 516-354-6861; GREAT SOUTH BAY ARC- every even month on Sunday in Babylon-contact Jim, W2DUK 516-957-5287. If your group holds regularly scheduled license exam sessions and/or classes, let me know at least three months in advance so they can be added to the column before the printing deadline. EC/DEC reports: K2TWZ WA2UJI N2GQS WB2WKV KA2JMA KA2UIU. On Nov. 11 members of the Radio Central ARC assisted the St. Charles Hospital in Port Jefferson when they had a telephone system failure. Operators handled communications (internal and external) on behalf of the doctors. Some operators where stationed in ICUs and the emergency room. Those that assisted were: KA2ELW, W2GZA, N2DIA, WB2ZKA, KF2K, K2VYD, K2YYM, KC2OJ, KA2MUM, NV2O, and WB2FXN. Congratulations to the new officers of the Grumman Radio Club: Pres. W2MFN; V. Pres. W2IVA; Sec. WB2QDT; Treas. N2CRD; Board Mems. WB2MPP, KB2UB, K2DOD, NN2C, N2GCW. Are you interested in helping your fellow "Ham" and being used to your maximum potential then please contact me and see if there is a position in the Section Leadership that will fit you. The section needs more Official Observers, Assistant Public Information Officers, Official Bulletin Stations and Emergency Stations. If you think you can fill one these positions or just want to learn more about them then contact me. Traffic (Nov): N2AKZ 283, K2YQK 250, KB2BKE 167, W2AHV 90, N2HLZ 81, NB2D 70, N2GQS 53, K2MT 51, W2GKZ 50, N2GPA 50, KA2UIU 46, K2HPG 38, K2TWZ 36, WA2JKM 28, N2GNQ 27, KA2RGI 18, KA2JMA 17, NF2N 5.

NORTHERN NEW JERSY: SM, Robert R. Anderson, K2BJG—ASM (VE Liaison): N2XJ ASM (FO Info): NW2L SEC: N2BMN. STM: KA2F. CO/ACC: KA2BZS. AAC: KY2S. SGL: W2KB. TC: K2BLA. BM: N2CXX. and PIO: WB2NQV (PH 735-8550). As a result of the NJ Traffic contab held on 12/5/87 the following NNJ NM appointment changes were effective 01/88: NJN/E KA2F to NZ2R, OBTTN K2SC to KA2F, NJSN WB2PKG (SNJ) to KA2INE, and WD2AHD cancelled since the TCETN is no longer active. NZ2R was also appointed ORS effective 01/88. Appointment endorsements for the next two year term starting 2/88 are EC (City of Passaic) N2DXP. OES KA2SPH and N2DXP. ORS KA2SPH and WB2ANK. On instructions from the FCC, five NNJ clubs were authorized to operate using special 200 call signs during the week December 19-25, 1987 as part of the Bicentennial of the US Constitution celebration. Electronic Technology Society KA200BZS, Fort Monmouth ARC K200USA, Garden State ARC W200GSA, Englewood ARA W200CC, and the JANET club N200ATT. Congratulations to the following who were newly licensed or upgraded during November sessions conducted by: NNJ VE Board, Major Armstrong ARC, and Bergen ARA. Novices: D Tempesta and R Derelanko. Technicians: KB2EGH, KB2ENE, KB2RVC, KA2WAW, J Jackson, KB2DIL, KA2TMF, KA2TMS, KB2BLE, KB2BWC, KB2CJD, KB2ENS, and KA2VTN. General: KA2QML, N2HIE, and WB2GYK. Advanced: N2DHL, KA2YQO, KA2ZOU, N2HDY, and KB2EKN. Extra: N2OKF, KA2YCV, and N2GHO. STM KA2F has been working with Monmouth county ARES in message handling and NTS procedures. Some 36 ARES members have received NTS information packages so far. KA2F will present this material to the Hudson county ARES group at the February meeting of Bayonne Emergency Management and during 1988 plans cover as many of the other NNJ counties as he can. His planned schedule will also include the ARRL Hudson Division Convention on March 13th. John Ross, N2GSE is the 1st place winner from NNJ in the NJ QSO Party. Packet net liaison manager W2QNL reports packet ORS station activity for November: 7 ORS (WA2EXX, WB2FTX, KA2HNQ, KR2J, KC2YG, KA2F and W2QNL), RX 53, TX 7. 4 of 60 orig to PBBS, 33 entered NTS nets, 18 Term. Traffic Nets and Statistics for October, 1987.

NET	MGR	FREQ	TIME	SESS	SES	QSP	QNI
NJM	WB2ZJF	3695	1000	DY	31	92	192
NJPN	W2CC	3950	1800	DY	35	85	325
NJN/E	NZ2R	3695	1900	DY/P	30	93	177
NJN/L	WA2EPI	3695	2200	DY/P	21	56	83
NJVN/E	WB2FTX	146.895	1930	DY/P	31	38	211
NJVN/L	WB2ANK	146.49	2230	DY/P	24	56	280
NJTTTN	WA2EPI	223.88	2100	DY	28	40	90
NJSN	WB2PKG	3735	1830	DY	31	31	118
NNJ/PL	W2QNL	145.01	24HR VIA WA2SNA		1	65	—

SAR/PHSR: WB2QMP /61, N2DXP 112/61, W2RRX 96/101, N2XJ 234/105, WA2EPI 72/83, KA2F 118/123, W2QNL 199/116, WB2FTX 47/75, KA2INC 51/63, WA2W 33/, W2CC 25/, W2XD 13/.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—ASM: WBØAVW. SEC: KDØBG. STM: KCØXL. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. The ARRL Midwest Division will be held May 20 - 22 in South Sioux City, Nebraska this year. Plan to attend. The Des Moines Radio Amateur Assoc. has been authorized to operate their club station as W200AK during the week of December 17-23, 1988 as part of the Bicentennial of the US Constitution celebration. The Zero District QSO Party is once again being sponsored by the Davenport Radio Amateur Club and will be run between 1800Z and 2400Z on March 13, 1988. New officers of the Fort Dodge Amateur Radio Club are Pres. WBØCAD, VP WBØOJT, Sec. KØARA, Treas. KØTDO and of the Northeast Iowa Amateur Radio Association are Pres. KDØTH, VP WBØVEX, Sec. KCØMX, Treas. WAØEEY and directors KCØX and NØFSL. Congratulations to NØEFD,

NØGIV, WBØNMW, KA5TQE, and KAØYVV who all upgraded from Technician to General in November. Regretfully, NØDRA became a Silent Key this past month. The number of licenses in Iowa held essentially constant last year while our percentage of the total US licenses dropped slightly. The general trend was down in eastern and central Iowa, but up in the west. The largest overall increase was in Burlington with 42 more licenses. Traffic: KAØADF 257, WØSS 226, KØGP 111, WØYLS 100, KØIPT 88, WBØAVW 61, WBØMCX 59, KØBRE 38, AEØR 16, WØFQ 15, KAØSTB 8, KCØKZ 6, WØBW 5, KAØVBA 5.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: WØCHJ. STM: WØOYH. The re-zoning of ARES/KS is now complete, and where does this put you?? Here follows the districts and zones. This will be a three-part effort so watch this column closely for the next three months. District 1: Zones 12A, 12B, 13, 14, 15. District 2: Zones 16, 17, 18A, 18B, 19, 20, 21. District 3: Zones 36, 37, 38, 39 and 40. District 4: Zones 5, 6, 7, 8, 9, 10 and 11. District 5: Zones 22, 23, 24, 25, 26, 27 and 28. District 6: Zones 29, 30, 31, 32, 33, 34 and 35. District 9: Zones 1, 2, 3 and 4. Note the districts are the same as the KS State Highway Patrol districts. District Emergency Coordinators (DEC) are Dist 1: WBØYJT, John Wallis. Dist 2: WØFRC, Clay Robinson. Dist 3: NKØV, Ralph Gamble. Dist. 4: WAØCVR Robert Brown. Dist 5: WØEB, Jim Sheldon. Dist 6: WØOAG, Sam Gardner. Dist 9: vacant. Next report will list the counties by zones followed with Emergency Coordinators. Net Reports Oct: KSBN QNI 1444 QTC 109. KPN 479/34. KMWN 668/586. KWN 871/583. CSTN 2299/39. QKS 310/70. QKS-SS 35/6. Looks like RTTY net has folded until another volunteer steps forward to manage it. Are there any volunteers willing to accept?? Traffic: WØFRC 192, KØBXF 149, KSØU 118, KXØI 76, WØOYH 76, WØQMT 57, NZØM 52, WBØZEN 50, WØCHJ 28, NØBDG 16, NBØZ 14, WØMYM 14, WØRBO 5, NØDJT 3.

MISSOURI: SM, Ben Smith, KØPCK—The Southwest Missouri ARC provided communications for the Springfield Bicycle Club Fall Century Ride. Club members assisting were: NZØX, WBØYIU, KØUA, NEØB, WAØJ, WAØH, WBØDFV, WB5JDZ, KDØUD, WAØLKF, KBØAJX, KCØYS, and WBØZCZ who was the organizer of the amateur operation. The Heart of America ARC assisted with the Armour Hills 5K Run. Using 2-meter simplex, they gave reports and condition of the runners to the race officials. Members helping were: KMØE who was in charge of the amateur operations. KØUAA, NØEBR, KØORB, WØAIB, KMØL, and KM5L. The Ozark Regional Hamfest for 1988 will be held Saturday August 13. Clubs reporting their new club officers for 1988 are; Kansas City ARC: Pres. WAØFMB, Sec. NØAI and Tres. KØYLY, from the Missouri Valley ARC: Pres. KØJZI, VP. NZØX, Sec. KAØIKS, Tres. WBØHNO and board member elected was KAØAY. Congratulations to Kenneth Wessel, WØQAU on celebrating his 50th year as an amateur in August. The Heart of America ARC provided communications for the Prime Health Marathon and the Walk for the Hungry. The FCC has authorized five clubs to use Bicenntenial club call signs. The clubs and their calls are; Indian Foothills ARC of Marshall, WB200WMM, the Mid-MO ARC of Jefferson City, K200ETY, the Carthage ARC, W2000LF, the Kimberling City ARC, NQ200G and the CMRA of Columbia, WD200DVG. All of these clubs can use their special call signs August 6-12, 1988. WAØYJX, of Adrain, and NQØG, of Kimberling City, invited the residents of the Nursing Homes in their communities to send holiday greetings to friends and relatives via Amateur Radio during Thanksgiving. The response was very good. Many who sent messages from the Nursing Homes received replies back via Amateur Radio. Great idea, George and Jim. Perhaps others in our Section can make this offer. On November 18 and 19 the State Emergency Management Agency conducted "Operation Shakedown" a statewide earthquake drill. This involved both state agencies and volunteer groups. Early reports show that over three hundred amateurs in Missouri took part in the exercise. Modes on SSB, Packet, RTTY and CW were used to send earthquake messages to different EOCs around the state. A great job by the amateurs in Missouri and a lot of work by our SEC, K9OCU to coordinate the amateur participation. New Field Appointments; KM5L, ORS and KBØXA OO. Silent Key reported, WØGAZ.

NET	SES	QNI	QTC	DAY	TIME(PM)	FREQ	MGR
MEOW	33	721	206	DLY	5:30	3.963	KØDSQ
MON	60	341	168	DLY	7:00/9:45	3.585	KØSI
MOSSB	30	744	127	DLY	6:00	3.963	KØORB
HBN	21	275	22	MON-FRI	12:05	3.980	KØDSQ
KARES	8	98	21	SAT	8:00AM	146.37/.97	KØJAA
RRABN	29	378	11	DLY	8:00	146.19/.79	KAØLLN
PHD	5	141	11	MON	9:00	146.43	WAØKUH
SLAN	5	358	7	MON	8:00	146.31/.91	KØWEX
KCBAR	5	78	5	MON	8:00	145.41	KAØSSE
TCN	5	53	5	THU	9:00	147.69/.09	NZØF
MOFON	3	28	4	WED	8:15	222.42/4.02	AIØO
ZAEN	4	50	3	TUE	8:00	147.84/.24	NOØE
OMEN	4	57	2	WED	9:00	146.16/.76	KØPCK
CARL	4	24	2	WED	8:30	146.46	WBØWLU
CMYL	5	20	2	MON	8:00	147.16/.76	NØHVO
ARESN	5	46	1	THU	9:00	147.855/.255	NØFQW
SWARC	4	64	0	TUE	7:00	146.31/.91	KDØUD
LOZBC	25	78	0	MON-SAT	6:00AM	146.13/.73	NØHVO
HARCM	4	71	0	THU	9:30	146.34/.94	KØRWL
LOZFM	4	56	0	FRI	9:00	146.13/.73	NØHVO
SARN	4	40	0	TUE	9:00	146.43/7.03	WØENW
MORAT	4	24	0	SAT	8:00AM	3.630	NOØE
MMARN	4	15	0	SUN	8:00	28.325	NSØB

Traffic: WAØYJX 356, NQØG 302, WCØAAG 271, WØBMA 240, AIØO 192, KØSJ 135, WAØHTN 124, KØPCK 119, K2ONP 113, KCØAS 92, KØORB 87, NDØN 85, KGØL 57, K9OCU 57, WØOUD 53, WØRR 38, WBØCJB 37, WAØKUH 14, KT5Y 9, KDØAJ 8, KØUAA 3.

NEBRASKA: SM, Vern Wirka, WBØGQM—STM: Jerry Kohn, WDØEGK. SEC: Michael Ruhrdanz, NØFER. The new district emergency coordinator for eastern Nebraska is Jim Barner, KAØVKJ, of Lincoln. Now the Nebraska section has three DECs to cover all of the state. Dennis Wing, KCØGF, of Grand Island, is the Central Nebraska DEC and Jim Parks, NYØJ, of Gering, is the DEC for western Nebraska. Our Section Public Information Officer, Michael Lennen, KDØEV, of Omaha reports he is most willing to assist anyone in the section with public relations. Contact Mike if you or your club are looking for some help in the area of public relations. More net control stations are needed for the evening Nebraska Storm Net which meets at 0300 UTC, during standard time and at 0000 UTC during daylight time on 3.982 MHz everyday. Just check in and volunteer. The current net control stations would welcome the Lincoln Amateur Radio Club newsletter, "The Lincoln Log" reports Steve May, WAØASM, of Lincoln, has written a computer program that helps keep the paperwork straight for amateur volunteer exams. The computer program provides a data sheet on each candidate for the volunteer exam session. This information becomes a working note pad that keeps track of what exam elements are to be given to which candidate, and then allows the VE's to note the results. The program is especially useful since the new Form 610 does not indicate what class the candidate wishes to upgrade to. The Lincoln ARC, the Lincoln Salvation Army and radio station KLIN conducted the 19th Annual Toyathon December 5, 1987. The Toyathon collects toys for the needy youngsters who otherwise would not get any type of toys for Christmas. Traffic: KØDKM 263, WDØEGK 46, WBØTED 36, NYØJ 23, KAØBCB 19, WAØBOK 12, WBØGQM 10, WDØDMS 7, NCØA 6, KAØKPT 3.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KZ1Z—ASM: KB1H. STM: K1EIC. SEC: N1DCS. OOC: NA1I. ACC: NK1J. PIO: WA1CMF. TC: W1HAD. SGL: K1AH.

NET	NM	SESS	QTC	QNI
CN	WB1GXZ	59	236	310
CPN	NK1J	30	110	340
WCN	N1EDD	30	158	311
CSN	WB1GXZ	22	57	115
NVTN	K1CE	27	110	185
CSTN	K1CE		227	
RTN	KA1JAN	9	83	3

Greetings all. Congratulations to K1XA upon passing his Bar Exam. W1ODY placed 1st in N.E. in the recent 10-10 QSO Party. KA1MPG and KA1KPT have been inducted into their respective schools' National Honor Society. FARA's new address is P.O. Box 486, Southport 06490. Two new repeaters have become operational in the section: K1HSN/R on 224.68 from West Peak in Meriden and WA1YQH/R on 223.74 in Milford. GNARC is busy getting everything in place for their new 440 repeater. Southington ARA Flea Market has been scheduled for April 17th. KA1ECL has moved to AZ. The Cricket Wireless Association has been busy assisting the Glastonbury C.P. with their siren tests. The ICRC has been very busy developing packet activities within the section. Their dual-ported digi and NET/ROM work have been of benefit to many in the region. Does anyone know of any 220 Packet activity for Novices within the section? Interested individuals or clubs might wish to consider digis or bbs-s on this band. Bethel C.P. is the first C.P. office in the state to have a full time packet station. SARC is sponsoring technical discussions for their members on the third Thursday of the month on 145.29, at 1930 EST. CARA is conducting on-air meetings Wednesdays, at 2000 EST, on the 147.12 machine. A BIG TNX to all the hams who assisted local Cub Scout Packs with their November Communications Month activities. SARC provided assistance to the Westbrook YMCA for their Applecore Run. KA1YP is enjoying his new tower. Traffic: N1DMV 427, WB1GXZ 254, N1EDD 199, W1EFW 168, KA1GWE 122, K1CE 93, K1EIR 80, NK1J 75, KY1F 74, W1YOL 68, NK1N 53, WA1NLD 47, NM1K 44, K1AQE 39, WB2SGI 29, N1BOW 26, W1BDN 14, KA1OCZ 10.

EASTERN MASSACHUSETTS: SM, Barry Porter, KB1PA—ASM: K9HI. STM: KW1U. ACC: KA1KCU. PIO: K1HLZ: BM: KA1KF. OO/AA: AG1F. SGL: K3HI. TC: KA1IU. EMass Hotline: 437-0111; Westlink: 449-2226

NET	MGR	FREQ	TIME(Local)	DAY
EMRI	N1AJJ	3658	1900/2200	DY
EMRIPN	WA1FCD	3880	1730	DY
EM2MN	NK1Q	53/23	2000	DY
NEEPN	K1BZD	3945	0830	SUN
HHTN	NG1A	04/64	2230	DY
EMRISS	N1CVE	3715	1600/2030	DY
CITN	KB1AF	745/045	1930	DY

November started out quite busy. I visited the Mayflower Club in Plymouth, The MITRE Club in Bedford, and the Algonquin Club in Marlboro, participated in a RACES drill in SE Mass, participated in the EMass SET drill, and went to an MMRA meeting. It was enjoyable to visit some clubs and find out what the concerns of hams are in EMass. The most common concern is the increase in RFI from poorly shielded consumer electronic devices. ANSI is studying the matter. The FCC is looking into modifying the standards, known as part 15, hopefully with an eye toward tightening the standards. The SET was better than anticipated. There were 40 participants on 2 meters, and 270 (that's right!!) participants on the 220/440 repeater networks. Quite a bit of interesting data were collected, and packet got a good test. The most important lesson learned was the need for hams to learn how to pass message traffic. When you have a large group together for a net operation, messages need to be passed in the most efficient method possible, with a minimum of effort. We also learned that packet equipment is very prone to RF intermod and really needs a good outside antenna. This month many clubs are having their annual holiday parties in lieu of a regular meeting program. I hope everyone has a good time and doesn't eat too much! Double congrats to the Wang ARC for putting a new 440 MHz repeater on the air (443.825/448.825 PL 77 Hz (XB)) and for being allowed to be ND200R the week of February 6-12 1988. The Cape Ann Club now has a 220 MHz repeater on 223.30/224.90. Judging from the results of the SET, it seems more and more Hams are migrating to the VHF/UHF bands other than 2 meters. These freqs seem to have a bright future. This month the section loses two very active hams, W1IAY, Mel and N1DVZ, Ellie Briscoe. They have moved to the Washington, DC area and will be missed by many. Mel is an Ex-SEC in EMass. Good luck to both of you. I would also like to thank Allen Leigh, W7RCP for all the work he has done as EC in Pepperell. He had to give up the appointment because being a scoutmaster has been taking up all his time. Den Conner, KD2S, will replace him. In the Kingston area NE7O, Chet and KB1TA, Anita Mitchell will take on the appointment as ECs. Welcome aboard to all. If anyone else is interested in giving something back to our hobby by taking on a Field Organization appointment, please contact me. We can always use an eager volunteer. HR-911 has 200 co-sponsors in the US House. K3HI reports keeping an eye on a few antenna ordinances in EMass. TC KA1IU reports visiting the Wellesley Club and giving a talk on the status of the OSCARs. A very busy month. Happy Holidays to all. May the New Year bring all of us peace and good propagation. Have you expressed your opinion to the Section Manager or Division Director lately?? Traffic: KW1U 497, KN1K 372, WA1TBY 366, KB1AF 343, NG1A 273, WA1FCD 254, W1CE 173, NK1O 169, W1ZHC 154, K1ABO 122, NN1Y 92, NK1Q 83, N1AJJ 76, WA1FNM 66, N1CVE 56, KA1EID 48, KA1LIH 37, K1BZD 36, KA1NOI 34, K1SEC 29, KA1AMR 24, KA1KCU 15, KA1EDY 4, WA1GNH 3.

MAINE: SM, Cliff Laverty, W1RWG—ASM: Bill Mann, W1KX. SEC: KA8UVQ. STM: WA2ERT. BS: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: KQ1L. Phil Young, W1JTH, Bulletin Manager, reports 43 transmissions by 7 bulletin stations comprising 8 ARRL, 3 Maine bulletins on CMEN SGN MPSN and MENET PBBS. The Maine Cabinet comprising field leadership appointees continues to meet first Sunday morning each month on 3940 kHz at 9:30. At the end of each session the cabinet members act as panel for comments and questions from the amateur community. Copies of "The New World of Amateur Radio" are available on VHS for club and other group showings from WA2ERT, STM, and W1RWG, SM.

NET	SESS	CHECKINS	TRAFFIC	MGR
SEA GULL	25	954	138	K1GUP
PINE TREE	30	310	98	ND1A
AROOSTOOK EMERG	4	89	6	WA1YNZ
MEPUBSVC	NO REPORT			KA8UVQ

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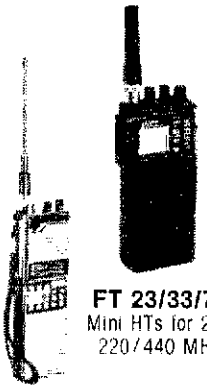

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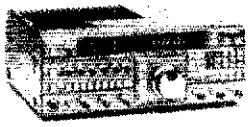

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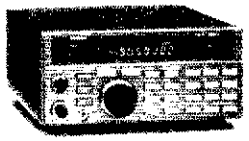

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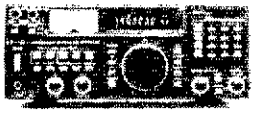

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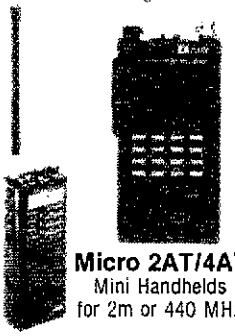

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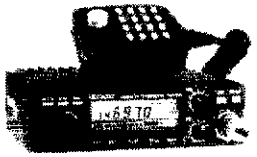

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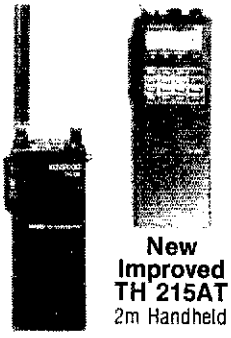

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PSHR: WA2ERT 101, WB1CBP 91, W1KX 91, W1RWG 90. Traffic: KA1JOJ 98, WA2ERT 93, W1KX 66, W1VEH 46, WB1CBP 42, W1RWG 39, W1JTH 29, KA1ODT 26, AK1W 24, N1BJW 21, W1OTQ 16, W1BMX 9, WA1YNZ 4, N1FFN 4, KA1ENM 3. We need more reports of Amateur Radio activities in the Maine Section.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—OOC: N1NH. PIO: WA2MBQ. It seems that each month the stack of input I get for this column gets a little bigger and this month is no exception! We started with an awards banquet for Hams who provided comm support for the Manchester air show. W1VTP set up a great program with a guest speaker from the airport and certificates of appreciation for all participants. The next evening, I attended the NARC meeting and was presented with a new club coffee cup with the club logo- a nice touch and good promoting! (tnx, NARC). Ham activity in schools is growing. KE1E, K1LGQ, and N1FGP did a presentation at Fairgrounds Junior HS in Nashua this month and now have about 10 students in a Ham Radio program. John, N1FGP, is a student at the school, and he is working on his upgrade to General. Another article by a Section member—Dave, WA1FHB, had a packet article in Dec QST. It was geared for promoting holiday msgs and I got notes from WB1GXM and WB1HBB who are both issuing news releases and promoting packet messages over the holidays. And Butch, WB1GXM, sent me a sample of the new Amateur Radio book-marks that he has had printed! They are great handouts for libraries and schools and include a place to put your contact person and tel number. Contact Butch to order some for your club. Butch also did an Amateur Radio promo on Vermont Public Radio recently. VPR covers western NH and most of VT. This was also a month for changes in club and state organization officers. At the Nov meeting of NHARA, our state organization, new officers were elected: Warren, WB1HBB as president, Chan, KA1OU, as secretary, Daryl as treasurer. Many tnx to KI1M and WA1PEL for their years on the NHARA board. New CVFMA officers: pres, Tom, K1VNE; vp, Jeanne, KA1BGT; sec, Sandra, KY1U, treas Rudy, W1GUA, and dir at lg, Leigh WB1EAE. Thanks for your willingness to provide leadership and support. Dot and I have attended the WRONE meeing this month and saw many NH folks there including Johnny, W1JY, and Helen, WB1AOB. This month saw another NPRM on the street—this one proposing a complete overhaul of Part 15. Serious concerns about proposed emission levels exist and we participated in a New England-wide mini-Teleconference on the 220 NE network. Gene, WA1UXA was NCS and we had a good discussion of the NPRM and related issues. Both GBRA and Port City AA have been authorized use of the "200" call sign for the US Constitution Bicentennial next year. Shouldn't your club be participating?? Got a note from Mark, KB1KJ (EC for Manchester)-the Manchester Emerg Net meets weekly on Sunday at 6:30 PM local on the 147.93/33 rptr. Fred, K1ACL, our SEC, has established an ARES "packet evening" on Thursday evenings on his PBBS on 144.97. Send him a burst! Got a note from Dale, AF1T, who is completing his eighth band (2 M) for WAS. He also worked 29 stations in the recent ARRL EME contest including the 140 ft dish at the Greenbank Observatory in WVA on 432! Dale sent me a "how to" article on moonbounce. If you are interested in a technical and operating challenge contact Dale for more info. The Souhegan Valley ARC encourages "show and tell" at each meeting so members can display and discuss current build projects of interest or new toys. Peter, N1DYL, put on a live demo of satellite comm via RS10/11 at the last CNHARC with a portable install at the meeting site! (WOW) FLASH—this space reserved for YOUR club. Drop me a note, newsletter, packet burst—whatever! Traffic activity is high with more new calls showing up on the report. Congrats to Dan, W1PEX, who made BPL again and to WB1HBB, KA1HPO/T, N1CPX, and W1PEX for making PSHR for Nov. Remember-your support makes NTS work! Finally, we had 100% on FRN/2 in Nov. Traffic: GSFM 172, GSPN 122, NHN 58, NHNTN 16. W1PEX 735, N1CPX 369, K1TQY 149, W1ALE 123, W1FYR 109, N1NH 94, KK1E 80, N1ALM 69, WB1HBB 64, W1UBG 50, KA1LBH 48, WA1YZN 46, W1TN 45, WB1GXM 30, KA1LMR 30, KA1QWT 16, KA1HPO 16, K1OIQ 15, KA1OU 13, KV1S 11, KI1M 10, KA1PFS 10, KA1JOU 7, KA1KPX 1.

VERMONT: SM, Frank I. Suitor, W1CTM—ASM: AE1T. STM: KT1Q. SEC: W1KRV. PIO: WA1YOY. Xmas came early last year as the following upgrades were recorded: Extra: KB1UE; Advanced: KA1ETG, QBK, N1EUQ, FEB; Technician: KA1OHR, OIN, OIO, OIP, PAW, PKO, PKP, QOC & KA7ZAF. Congratulations to GMWS/BARC on above upgrades plus 6 brand new hams. Notification has been received from ARRL that the following club stations are authorized to use W200 call signs— CVARC (W200BD) and BARC (W200KOO) during the week of 3/12-18. Attention all packeteers: U are requested to provided WA2SPL (Joe) at KD1R-1 with ur packet info (call, emergency pwr capability, home mail box, etc.). This information will be used to help Joe & Pete (AE1T) to organize packet capability in order to support section ARES activity. W1FN (Dick) is new trustee of Twin State Radio Club. Dick also was featured speaker at TSRC's 12-87 meeting. Future meetings will be held on 1st Monday of each month at 1930 local at the Montshire Museum in Hanover, NH. ARES activity continues with W1KRV (Joe) working with VT Yankee to obtain funds to set up a Red Cross emergency station in Brattleboro. VT Yankee has offered a 2 mtr repeater site on one of their microwave towers in Marlboro. The latest VT Yankee full-scale test indicated that AR played a big role in providing communications during the exercise. GMWS repeater (WA1DPA/R) 147.045 MHz is back up to full power. KA1VKN/R on 146.895 MHz has moved from Berkshire to St. Albans. KD1R/R on 223.68 MHz is now in residence at KA1LEX. Westlink Radio News is available on K1VT/R (146.85 MHz) at 1700 & 2030 L on Mondays. Don't forget Milton Hamfest on 2-27 at Milton High School. It was my pleasure to present both CVARC & BARC with community service awards at their last meetings. Pete (AE1T) is transitioning into a new section job as ASM for packet radio and Official Observer Coordination. STM (KT1Q) indicates 100% section NTS participation in 1RN cycle 3. Nov. Traffic: KT1Q 705, WA2SPL 552, KD1R-1 172, N1DHT 108, AE1T 88, WA1JVV 58, NB1A 37, W1KRV 33. Nov Nets: VTN 30-164-147, BARCSEN 5-78-2, CVFMN 5-110-7, Tristate FMEN 5-68-15, Tristate EN 4-60-1, VTPHN 5-78-8, GMN 25-430-32, CAR 25-558-27.

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/RFI: N1CM. PIO/ACC: K1BE. SEC/SGL: WB1HIH. TC: KA1JJM. STM: KA1EXJ. KG1C and W1OJ reported that a non-scheduled emergency test was held on the New England Network Saturday November 28th. FEMA observed the operation in which 265 stns. participated. Stations representing all the counties in the six state area reported in. My congratulations to the organizers as well as the participants. For those of you that are contemplating packet operation, Jim Mullen, WA1ZUH, has an excellent article in MTATA's "INTERMOD" publication. Jim takes you through the setup of the equipment to the initial QSO. I'm sure as SASE to Jim

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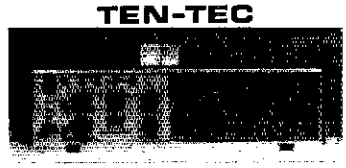

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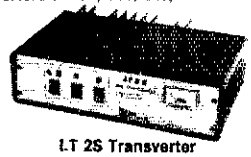

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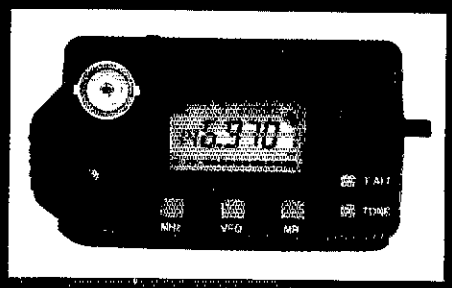
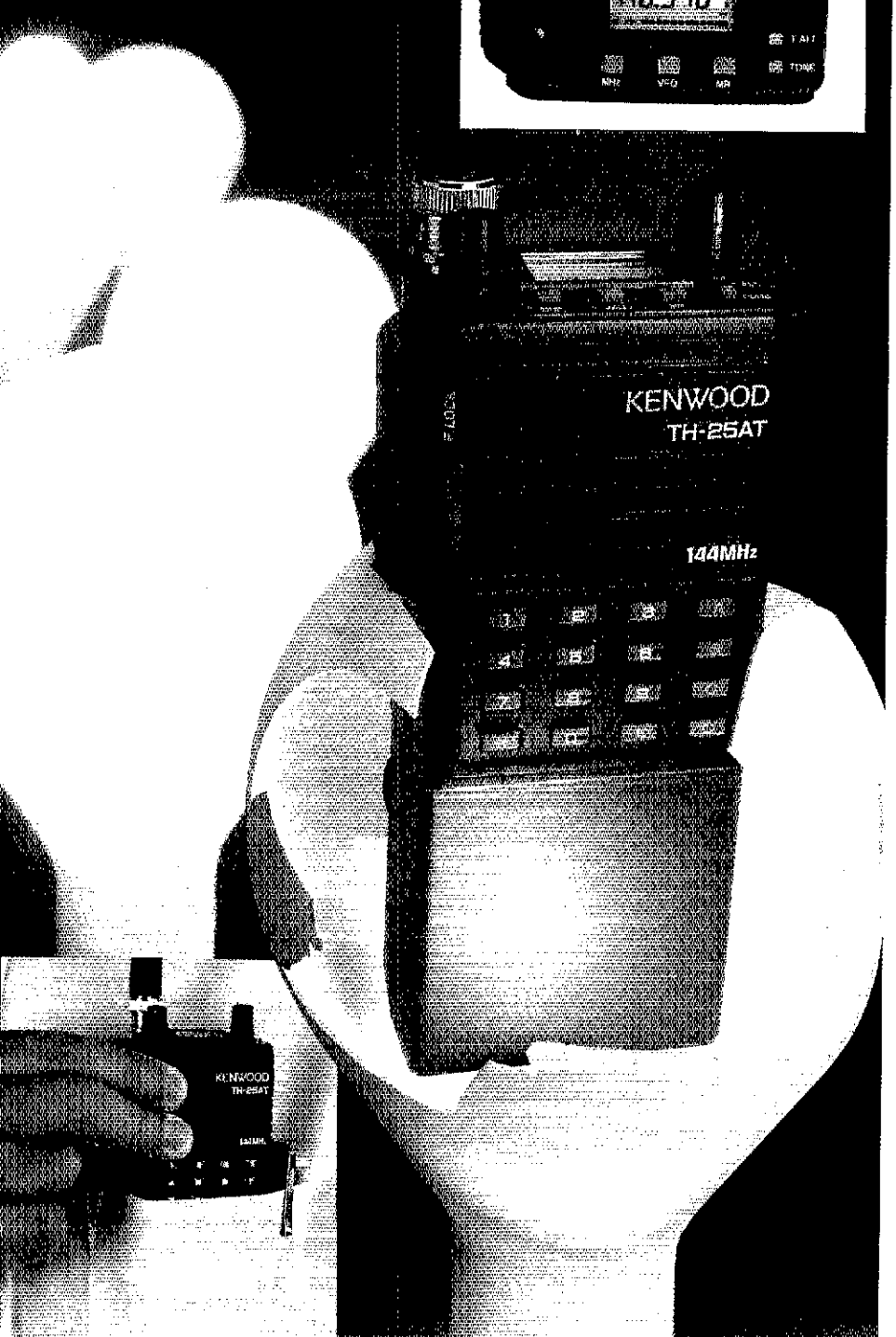


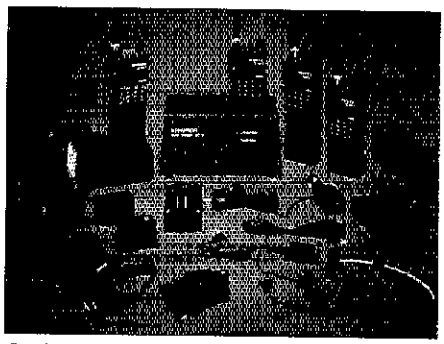


TH-25AT/45AT

New Pocket Portable Transceivers

The all-new TH-25 Series of pocket transceivers is here! Wide-band frequency coverage, LCD display, 5 watt option, plus...

- Frequency coverage. **TH-25AT:** 141-163 MHz (Rx), 144-148 MHz (Tx). (Modifiable for MARS/CAP. Permits required.) **TH-45AT:** 438-450 MHz.
- Automatic Power Control (APC) circuit for reliable RF output and final protection.
- 14 memories; two for **any** "odd split" (5 kHz steps).
- Automatic offset selection (TH-25AT).
- 5 Watts from 12 VDC or PB-8 battery pack.
- Large multi-function LCD display.
- Rotary dial selects memory, frequency, CTCSS and scan direction.
- T-ALERT for quiet monitoring. Tone Alert beeps when squelch is opened.
- Band scan and memory scan.
- Automatic "power off" circuit.
- Water resistant.
- CTCSS encoder/decoder optional (TSU-6).
- **Supplied accessories:** StubbyDuk, PB-6 battery pack for 2.5 watts output, wall charger, belt hook, wrist strap, water resistant dust caps.



Optional accessories:

• **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 • **BC-10** Compact charger • **BC-11** Rapid charger • **BT-6** AAA battery case • **DC-1/PG-2V** DC adapter • **HMC-2** Headset with VOX and PTT • **SC-14, 15, 16** Soft cases • **SMC-30/31** Speaker mics. • **TSU-6** CTCSS decode unit • **WR-1** Water resistant bag

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will bring you a copy of this excellent article. Jean, KA1IFC, has earned a BPL certificate each month for the last three and is working diligently on another. Congratulations! Most hams that give traffic handling a try find they enjoy it. Give it a try, you might surprise yourself and like it. ARES EMERGENCY NET (WMEN) Sunday 8:30AM 3937 kHz. WEST. MASS. TEC. NET (CYCLE 2) M-F 1:00PM 146.901. WEST. MASS. PHONE NET 6:00PM M-F 3937 kHz. WEST. MASS. CW NET DAILY 7:00PM 3562 kHz. Traffic: KA1IFC 631, KA1CRX 404, KA1EXJ 155, NM1U 103, WA1YYK 72, WB1HIH 46, KA1EKQ 45, K1JHC 45, KA1QFV 14, KA1OFC 8, W1KK 89, WA1OPN 13, N1FJ 14, W1UD 177.

NORTHWESTERN DIVISION

IDAHO: SM, Don Clower, KA7T—SEC: K7REX. STM: W7GHT. OOC: WB7CYO. ACC: N7BI. PIO: WB7PFQ. The Pocatello ARC has new officers: KE7WJ-Pres, KA7BOB-VP, KB7AYX-Treas., WA8DYU-Sec. The Univ. of Idaho ARC also has new officers: KF7CN-Pres, W7EKB-VP, KA7ZWO Sec. Twin Falls ARC has a portable repeater for emergencies on 146.06/66. Twin also has an ARES net on Wed. at 7 PM on 146.06/66. N7HQT led a group of local hams who helped with communications during the Holiday Parade in Boise. Traffic: W7GHT 399, NW7K 77, WB7CYO 2.

NET	SESS	QNI	QTC
FARM	30	1742	27
CD	21	679	34
NWTF	30	862	39
IMN	30	286	163

General: We are going to start a Novice class for teens; if interested call me. 73, Don

MONTANA: SM, Ken Kopp, KØPP—Several MT clubs now have "200" call signs for coming Bicentennial activities. Sept. *QST* details "We the People" WAS. New packet organization (PROM) meets Sat. on 3880 kHz at 10 AM. Helena's CCARC sent election ballot in newsletter for members unable to attend election meeting. KA7MMY, KA7IZU, K7AEZ elected by YRC (Billings). List or find VE exams on MSN, Sun, 3920 kHz, 9:30 AM. PIO N7HAZ has AR video tapes and PSA's available. Most club Christmas dinners on same weekend—state too large to attend all—Rose and I invited to join in GHRC's (Bozeman). KF7R has handy traffic info avail for SASE. Catch training sessions on MTN Traffic: WA7TUW 4, N7HKW 1.

NET	SESS	QNI	QTC	MGR
IMN	30	286	163	KA7EEE
MSN	5	83	0	KØPP
MTN	30	1856	106	KF7R

OREGON: Randy Stimson, KZ7T— ASM: KM7R. STM: W7VSE. SEC: W7FBP. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. RFI: AK7T. OO: KA7HJT. STC: N7ENI. The end of the year is here and it has been a good one. We have a local interference committee in the Portland area that has handled some problems successfully. If anyone would like to start an interference committee in their area, please contact me. We need them down the valley and east of the Cascades. There is a statewide RACES net on HF daily at 8:30 AM on 3993.5, better known as the weather net. Bren, KM7R has done a great job getting a network of packet stations established in the Willamette Valley and she is now looking east of the Cascades. There are some new net roms or nodes up in the valley which really make packet easier to use. If anyone is interested in packet or has a mountaintop that might be used, please contact Bren, KM7R her address is good in the call book. We also have Lynn Apperson, WA7OWM, working on a statewide linking system on two meters. If anyone is interested in helping Lynn, WA7OWM, his address is good in the call book. More on the linking later when we get some more information. Traffic: (PiPacket W7VSE 515, N7BGW 222, WG7H 175, WB7VSN 141, KA7EEE 138, W7ODG 53, N7DRP 46, KA7AID 39, N7APC 37, KA7ZAG 30, KZ7T 4P, W7DAN 1. Late Oct. N7ELF 77, W7DAN 2. Very Late KM7R 63P.

WASHINGTON: SM, Brad Wells, KR7L—STM: KD7ME. SEC: KA7INX. TC: W7BUN. OOC: N7DVR. SGL: KD7AC. BM: N7CAK. PIO: N7FKV. ACC/ASM: KC7PH. ASM: KD7G. ASM: KA7CSP. ASM: W7UOF. ASM: K7CLL. Two contests of note this month. The Novice Roundup is designed to introduce both Novices and Technicians to the sport of radio contesting. This contest is unusual since higher class licensees cannot submit scores. However, all of us should pitch in and give some needed contacts. The ARRL DX contest (CW) is also this month. Since conditions are improving, this should be a fun weekend with lots of DX for all. Don't forget that you can operate this one QRP. Registration information for the 1988 National Convention (Sept. 9-11) is available from NARC, PO Box 25088, Portland, OR 97225. Remember the article entitled "Ham Radio Operator Throws 'Monkey' Wrench at Gulf Ships" in the Nov. 12 issue of the *Seattle Times* and other newspapers? In response to your letters of protest, the *Times* and *Everett Herald* both printed a retraction for the misleading headlines. I also received a personal letter from Michael Fancher, Executive Editor of the *Times*, apologizing for the incorrect terminology of their headline. All of which goes to prove that a carefully written letter can get results. Nets for Novices: Sleepy Hollow Net on 28.325 daily at 9 PM (CW) and 10 PM (SSB). Puget Sound Novice Net Sunday at 8:30 PM on 224.38. Congrats to Evergreen Amateur Radio Services and CUBA ARS of Sedro Woolley H.S. both which renewed as a Special Service Club. Mark your calendar—The Mike & Key Annual Flea Market is March 12. This is the first get-together for the year and a chance to pick up good deals on used equipment and meet old friends. Need information on tower ordinances, PRB- 1, or legislative updates? Contact Frank Price, KD7AC, our State Government Liaison. Sometimes the Simulated Emergency Test is the real thing: LCARA members N7CFA, NU7D, KB7AYY, KA7QOX, KA7QOY, and KA7ADO were called out at midnight October 17 to search for an active ELT (Emergency Locator Transmitter). After five hours of RDFing in the "wee" hours of the morning, the device was located on the tugboat "Astoria" tied up at a terminal in Portland. It had been accidentally activated by a crew member during an inspection. King County, Pierce County and Kittitas County ARES groups have been active during the past several months with lost-person searches. Congratulations to W7AY, KA7MCP, N7GDW, and KA7JEX on their appointments as Emergency Coordinators for various sections of King County. King County ARES meets 145.33 Sunday at 8 PM. The Section has two copies of "The New World of Amateur Radio" video for loan to individuals and clubs. Congrats to WA7TWB for 13 consecutive years as EC of San Juan county. The Lower Columbia ARA and Mike & Key ARC will operate as W200DG and K200LED, on Nov. 5-11, as part of the US Constitution Bicentennial celebration. ARES PUBLIC SERVICE HOURS; Benton 30, Franklin 30, King 192, Pierce 72, Walla Walla 30, Yakima 4. Traffic: W7IGC 368, N7GGJ 255, N6EQZ 183, K7GXZ 175, W7LG 168, WA7CBN 117, W7GB 91, WA7PIN 90, K7SUX 76, K7UQH 36, WA7YEN 34, KA7PMD 32, W7LBK 27, KA7TTY 27, K7AJT 25, W7APS 14, W7IEU 13, WA7TWB 12, N7DIP 2, N7FXM 2, KD7ME, KR7L.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, N6DHN. SEC: W6LKE. STM: K6APN. OOC: NY6Z. TC: N6AMG. Not

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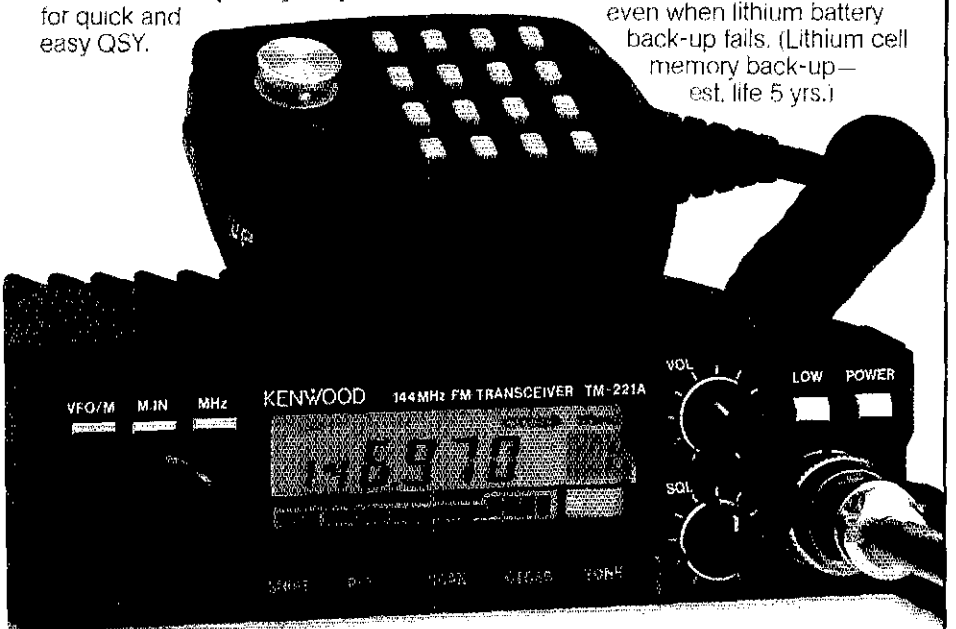
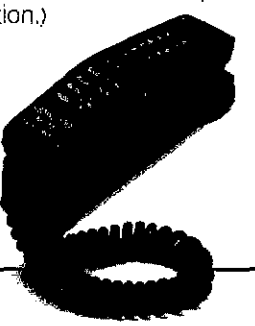
- **TM-321A covers 220-224.995 MHz. The TM-421A covers 438-449.995 MHz.**
- **Built-in front panel selection of 38 CTCSS tones.** TSU-5 programmable decoder optional.
- **Simplified front panel controls**—makes operating a snap!
- **16 key DTMF hand mic., mic. hook, mounting bracket, and DC power cable included.**
- **Kenwood non-volatile operating system.** All functions remain intact even when lithium battery back-up fails. (Lithium cell memory back-up—est. life 5 yrs.)
- **Packet radio compatible!**
- **14 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2 m is automatically selected.** There are **two channels** for "odd split" operation.
- **Programmable band scanning.**
- **Memory scan with memory channel lock-out.**
- **Super compact:** approx. 1-1/2"Hx5-1/2"Wx7"D.
- **New amber LCD display.**
- **Microphone test function on low power.**
- **High quality, top-mounted speaker.**
- **Rugged die-cast chassis and heat sink.**



RC-10 Remote Controller

For TM-221A/321A/421A. Optional telephone-style handset remote controller RC-10 is specially designed for mobile convenience and safety. All front panel controls (except DC power and RF output selection) are controllable from the RC-10. One RC-10 can be attached to two transceivers with the optional PG-4G cable. When both transceivers are connected to the RC-10, **cross band, full duplex repeater** operation is possible. (A control operator is needed for repeater operation.)



Optional Accessories:

- **RC-10** Multi-function handset remote controller
- **PG-4G** Extra control cable, allows TM-221A/TM-421A full duplex operation
- **PS-50/PS-430** DC power supplies
- **TSU-5** Programmable CTCSS decoder
- **SW-100A** Compact SWR/power/volt meter (1.8-160 MHz)
- **SW-100B** Compact SWR/power/volt meter (140-450 MHz)
- **SW-200A** SWR/power meter (1.8-150 MHz)
- **SW-200B** SWR/power meter (140-450 MHz)
- **SWT-1** Compact 2 m antenna tuner (200 W PEP)
- **SWT-2** Compact 70 cm antenna tuner (200 W PEP)
- **SP-40** Compact mobile speaker
- **SP-50B** Mobile speaker
- **PG-2N** Extra DC cable
- **PG-3B** DC line noise filter
- **MC-60A, MC-80, MC-85** Base station mics.
- **MC-55** (8-pin) Mobile mic. with gooseneck and time-out timer
- **MA-4000** Dual band antenna with duplexer (mount not supplied)
- **MB-201** Extra mobile mount

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too much mail received this month. Everyone must be busy getting ready for the holidays. MDARC welcomes new members KB6KCV and KI6YF, and congratulations to the following on your upgrades: George Jones and Raymond Parker to Extra, and R. Robinson to General. EBARC's educational chairman, WD6DLR, is looking for students for their latest Novice/upgrade class. Their W6CUS-1 BBS station on 7.093, 144.97 and 220.90 handled over 2100 messages this month, 592 of which were in NTS format! K6APW reports that since N6EEG-1 moved from 30 meters to 14.111 (the 2 meter frequency is still 144.97), the traffic count has increased. November traffic: W6CUS-1 592, W6VOM 169, WB6DOB 124, K6APW 91, NI6A 37, WB6UZX 36.

NEVADA: SM, Joe Lambert, W8IXD—SNARS reports K7AZ, WB7BYR, NZ7G, N7GXI, K7HRW, K7KLT and K7WYC as directors for 1988. Reno area VEC tests for 1988 will be 2/20, 4/16, 6/18, 8/20, 10/22. Contact K7HRW for details. LVRA reports new officers for 1988: KC7HF, Pres.; W8IXD, VP; W8HXT, Secty; KD7OY, Treas. Thanks to KA7KOH for an excellent letter in response to the Forest Service fees for use of mountains where many hams have their repeaters. The Boulder City Council appointed W8IXD to the Planning Commission. K7HRW and his team are preparing for an excellent Hamfest to be held on August 20 in the California Bldg. at Idylwild Park in Reno. If you can help, please contact K7HRW. In any case, PLAN TO ATTEND! It should be a very good event. The event is being sponsored by SNARS, NARA and WADG. LVRAC is holding a Swapmeet the first Saturday of all even-numbered months, starting at 8 AM in front of AES, L.V. The National Weather Service is seeking Ham support throughout the state for the SKYWARN system. For info, contact K7HRW.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—Congratulations to our Section EC, Deane Coats, NR6A. He has found an Emergency Coordinator for Alpine County, the first ever, as far as I know. He is Rob't Andrews, W6ITR. He *is in the Sheriff's office for Alpine County, and has close* contacts with adjacent Douglas County, NV. Welcome, Bob, it is good to have you aboard. The important slot of District Emergency Coordinator for the Sacramento Metro District is still open. Deane, NR6A is the man to contact if you can fill the spot. Best wishes to Bob, KB6JPZ, Past-president of the El Dorado County ARC. He has started a new job as a *Communications Technician for the U.S. Forest Service.* The River City ARCS has asked for Special Service Club status. With all they have been doing, I say—it's about time. But, maybe they have been so busy doing things they haven't taken the time to ask for recognition. They will join the Amador County ARC, and the Sierra Foothills ARC to become the third SSC in the Section. If your club wants to join the SSC ranks, *contact our Affiliated Club Coordinator, Jettie Hill, W6RFF,* 306 St. Charles Ct, Roseville, CA 95678. Don't forget the Section Net the first Sunday evening of every month. It is on the Yuba/Sutter Repeater on 146.085, input up .600, at 8 p.m. If you can't miss "Murder She Wrote," record it for later viewing as I do. CU there. Traffic: WA6WJZ 237, N6LUY 231, K6SRF 109, WD6BZQ 87, N6CVF 60, W6RFF 22.

SAN FRANCISCO: SM, Bob Smith, NA6T— *HAPPY NEW YEAR TO ALL, MAY 1988 BE A LOT BETTER THAN 1987* IN A WHOLE LOT OF WAYS. VOMARC is really progressing with packet in the police station, and in the emergency van. This is what happens when the local amateurs and the city officials cooperate for the common good. ACS had a good article about RFI- TVI and how To Protect TV's & VCR's from US. Drop Nets, N6AQY a letter and get a reprint, it is a MUST READ for everyone. SCRA is up to 195 members. If you live in Sonoma County it is well worth your time to attend their meetings on the 1st Wed. at the Sonoma County EOC. Get Well Soon is sent out to NK6Z, Dean, in C City, hope the tests go well. New Pres of DNARC is K6DIA, Al. A hearty TNX goes to Tom, W6GGR, for the YEARS of editing the RAIN NEWS-LETTER for Humboldt County. Now it's PETE's KE6LF, job, good luck Pete. SHARC is on the move again, more equipment for the clubhouse, new antennas, and public service. REDXA is even into packet, well almost, maybe a DX packet BBS in the works, now they need to network like the NE USA *is during contests. SFRC has W6VV as new Pres. I hope* everyone takes ART's comments to heart. As YOU can see the Section Clubs are very Active. Why don't YOU make your new years resolution to get out and support YOUR local Club and AMATEUR RADIO?

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U. STM: N6AWH. TC: WA6EXV. ACC: W6DPD. Asst SMs: W6TRP and K6YK. Appointments renewed : OES N6CDD; STM N6AWH; ORS N6MCY and W6DPD. WA6NSK is EC for Tuolumne Coutny. Thanks to WA6EWR for serving as EC for a number of years. The 1988 officers of the Kings ARC are: Pres. KI6OR; VP WB6VFZ; Sec KB6PIQ; Treas KB6FUA. The 1988 officers of the Fresno ARC are Pres WB6ITM; VP WS6X; Sec KB6LBS; Treas KA6LAC. The club meets the second Friday at Manchester School in Fresno. The 1988 Officers of the LODI ARC are: Pres. K6PJV; VP KB6UW, Sec KB6LSE, and Treas K6URI. The 1988 officers of the Central California DX Club are Pres. WA6OUR; 1st VP N6DTB; 2nd VP K6DT; S/T open; Directors W6YO and W6MUS. N6GGY and WA6LUT are Advanced. KB6UBL and KB6TOI are Tech. K6URI has an FT 767. WA6IDO has a TS 430S. The Fresno Hamfest is sometime in May, probably the first weekend at the Airport Holiday Inn of Fresno. Traffic: N6MCY 445, WA6YAB 16, N6MXG 6, W6JPS 3.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: WA6OCV. TC: WA6PWW. STM: N6JLJ. PIO: WB6OML. ASM: N6JQJ & NS6N. ACC: W6MKM. BM:(vacant) OOC:(vacant) For those of you who are interested in "helping out" during local disasters . . . when the balloon goes up and, HT in hand, you sally forth to do your public service thing, how will you know where to go and how will you know what to do? Consider your own job, if you became "real busy," and someone came in off the street "to help," what would you do? . . . Uh huh, that's just what a public agency would do. Now, consider, if this person who came in was someone you knew and had trained to help you during "the crunch," what would you do now? Do you see how important it is, not only to get to know the agencies we serve, but to become trained in whatever skills they (not we) think are important? Now, how do we get this training? We are fortunate in our section to have a person who has been appointed as our Assistant Section Manager for Training, Dave Larton, N6JQJ. Dave has a Training Forum net every week where he has guests from the various agencies to both tell us what they think we need to know and also to answer questions from those participating in the net. The net meets every Tuesday night at 8:40PM on several linked repeaters, including KB6FB/145.45, WB6ADZ/146.115, N6ITW/440.10, W6ASH/145.27/224.36, and possibly others as well. Everyone is invited and welcome to participate. Dave also is honchoing the second annual Emergency Response Institute (ERI) this year on March 26 and 27. Among other agencies, the California State Department of Emergency Services will be presenting a RACES Officer certification class. Dave has done an excellent job as ASM for training and deserves your wholehearted support. If there is any subject that you would like to hear covered on the Training Forum, send a message to Dave N6JQJ @ AA4RE or to me, WB6W @ N6IIU, or to my address, found on page 8 of this very issue of QST! See you next month!

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. TC: K4ITL. SGL: KE4ML. This month will open the Hamfest season in NC at Elkin on Feb 21. Exam Schedule: Kernersville Feb 6. Lexington Feb 20, Apr 16, June 18, Aug 20, Oct 15, Dec 17. KB4NWX now AB4EO. WD4NYS now AB4EP. N4ERY now AB4EQ. Good to see you at the Greensboro Hamfest. Extremely good meeting on packet radio was well attended as reported by KB4IVV. There is a high degree of interest in this new mode of operation. KK4EV NM of RARS Ten Meter Training Net now meets on 28.384 on Mon, Tues, Thurs, Fri and invites all Novices/Techs to join the fun of traffic handling and check in and participate. New officers of the Lenoir ARC *Pres N4FAX, VP N4AVU, Sec/Treas N4JOL, Editor N4EUX.* Forsyth Co. EC N4MBI and Nash Co. EC KF4R report very good SET test and good participation. That's what practice is all about. I have been advised by HQ that several clubs in the section have been approved by the FCC to use 200 in their call sign during NC's week of operation for Bicentennial of the US Constitution celebration, and the calls are W200DW, *W200EXU, W200TOP and K200EG.* Spring *is around the* corner so get your HF and VHF gear ready for traveling fun. Now is also the time to start the Spring Novice Classes. Advertise and promote Amateur Radio, and get your classes started NOW. Our Section will host the 88 CPM and will be held in Charlotte in May the weekend after Mother's Day. SILENT KEY: WD4NWA. This SM would like to say a sincere THANK YOU to everyone who participates in nets and handles traffic. You are dedicated amateurs and very proficient in this public service. A special THANKS to K4NLK, STM for his guidance and direction and dedication. This is truly a team effort. *NOVEMBER reports as follows: Traffic: K4NLK 354,* AA4ZV 223, KI4WW 203, AA4TE 202, KA4EYF 172, WD4HTE 165, WB4HRR 161, NJ4L 145, AA4MP 107, KA4TLC 101, WB4WII 88, KI4YV 76, KB4FWL 66, N4MMM 57, K4DDY 52, K4SWN 48, WB4N 43, N4TN 42, WD4MRD 39, WA4MNR 33, WA2EDN 30, N4LFT 27, W4EHF 24, AJ5F 23, WD4EQK 20, WD4B 14, AK1E 13, N4JRE 11, AB4EO 10, KA4STJ 9, N4CJJ *8, WB4TOP 8, NT4K 7, NT4K(OCT) 12. Totals: 34 SARs 2,593* QTCs. Get well wishes to WB4CYN and W4BNU who have been under the weather. KE4ML SGL advises that nothing is pending in legislature concerning Amateur Radio in Section in the upcoming short session of General Assembly.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ— Special Temporary Authority (STA) — SKIPNET — NTS Designators — ZIP Addressing!!! If you don't know any of these terms, you are missing an important chapter in Amateur Radio — PACKET-RADIO and AUTOMATIC MESSAGE-FORWARDING. The STA issued by the FCC allowing automatic message-forwarding on HF has generated discussions and development for automatic routing of radiograms and user interface with the emerging PBBS forwarding network. In October, our Eastern Area Staff passed two motions recommending ZIP code addressing and to conduct a study by EAS Region Packet Managers of the RATS proposal for NTS user interface to the PBBS auto-forwarding network. PACKET-RADIO is alive and kicking in the Section. Every month more and more NTS traffic and ARRL bulletins are passed throughout SC by PACKET. In addition, amateurs have successfully used PACKET during emergency drills in SC. Are You ready to use your PACKET station in an emergency? Can you input, separate, edit and printout messages without removing your station from operation? Do you have a printer attached? Can you operate your station on emergency power? A NO answer to any of these questions says YOU DO NOT PRESENTLY HAVE THE CAPABILITY to process the amount of traffic or operate in the environment required of a PACKET station during an emergency. GET PREPARED — we need you during an emergency!!! Traffic: N8GJO 250, K4ZN 204, W4ANK 153, KB4BZA 112, KA4YEA 57, KA4LRM 42, WB4UDK 42, W4DRF.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC: N4EXQ. ACC: NT4S. OOC: W4HU. BM: AB4U. TC: WB4MAE. SGL: W4UMC. PIO: AA4VP.

VTN	1PM	3907	KB4NGO
VSBN	6PM	3947	KI4BR
VSN	6:30PM	3680	N4KSQ
VN(EARLY)	7PM	3680	N4GHI
VN(LATE)	10PM	3680	WB4KSG
VLN	10:15PM	3947	KA4TWI
SVEN	7:15PM	146.82	NT4S
STARES	9PM	146.97	KJ4VT

Please note the change in managers for the VLN. KA4TWI has taken over for KJ4MF who resigned due to the heavy workload as Program Mgr. for Radio WKEZ. Congrats to the Shenandoah Valley ARC and the Roanoke Valley ARC on being named by the ARRL and the FCC to operate using special "200" callsigns the week of June 25-July 1, for Virginia's celebration of the Bicentennial of the U.S. Constitution. Also, N4GHI has been selected by the ARRL to act as the collection point for messages that are sent to the Bicentennial Commission in Wash. D.C. between now and Dec. 31, 1988. KB4PW, EC for the Roanoke area submitted an FB report of the activities of the Roanoke ARES during the recent forest fires. He along with N4DSY, WB4QOJ, KB4VCK and KE4HI logged over 24 hours of communication service to the Red Cross and other fire fighting agencies. AA4VP has appointed KB4FVJ as a PIA in the Richmond area and N4KET for Northern Virginia. Some of you may know N4KET as David French, a news anchorman for the CNN TV operation. Other new appointments are: NJ3H as OBS and AB4CG as OO. Follows some early 1988 VE exam schedules: Jan 9, Chesapeake DX Assoc, contact KC4YX—Feb. 6, Hampton Roads Radio Assn, contact N4BDH, Feb. 6, Shenandoah Valley ARC, contact NC4B—Mar. 5, South Peninsula ARC, contact N4IIC. Traffic is beginning to mount with the message total of 5718 for the month with 42 stations reporting. By this time, I am sure most of you are aware that Mark, NN4I, will serve as our Section Manager for 1988-1989. I want to thank all of you for the FB support you have given me for the past 4 years. If anything good has been accomplished, the credit goes to the fine leadership people, namely *KB4WT, N4EXQ, NT4S, WB4MAE,* AB4U, W4UMC, W4HU, and AA4VP along with all the Net Managers and especially you appointees who have performed your individual responsibilities so well. It was good seeing many of you at the Frostfest, and I hope to see more at the Vienna Winterfest on Feb. 21. Traffic: K4DOR 971, N4GHI 794, WB4PNY 507, N4EXQ 338, W3ATQ 322, K4MTX 310, *AA4HQ 231, W4JLS 203,* KB4WT *200, KB4NGO 186,* WB4KSG 176, WD4OCW 145, AA4GL 117, KA4TWI 102, WD4MIS 94, WB4ZNB 94, K4JST 92, KB4TRI 92, WB4ZTR 69, KI4BR 69, N4KSO 61, K4BGZ 61, KK4FV 58, WB4EDB 50, WA4LTO 48, NT4S 39, W4TZC 36, NW4O 33, KB4OPR 18, WB4KIT 16, K4VWK 14, KI4W 14, K4GR 12, NN4I 11, K4AXF 10, K4MLC 9, KA8TNF 9, N4FNT 6, W4YE 6, N3RC 4, WA4TVS 3.

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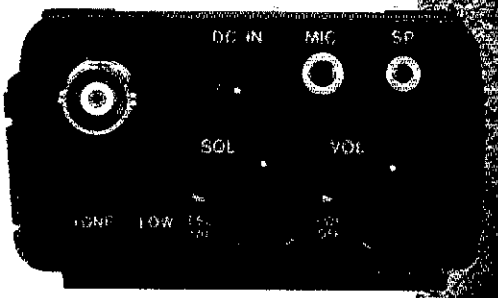
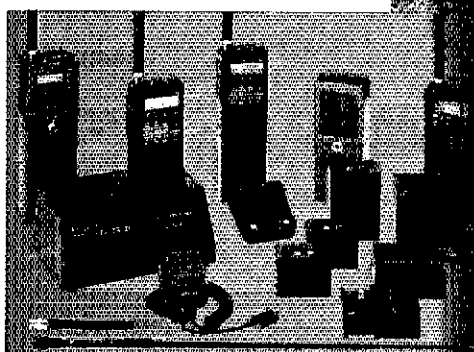
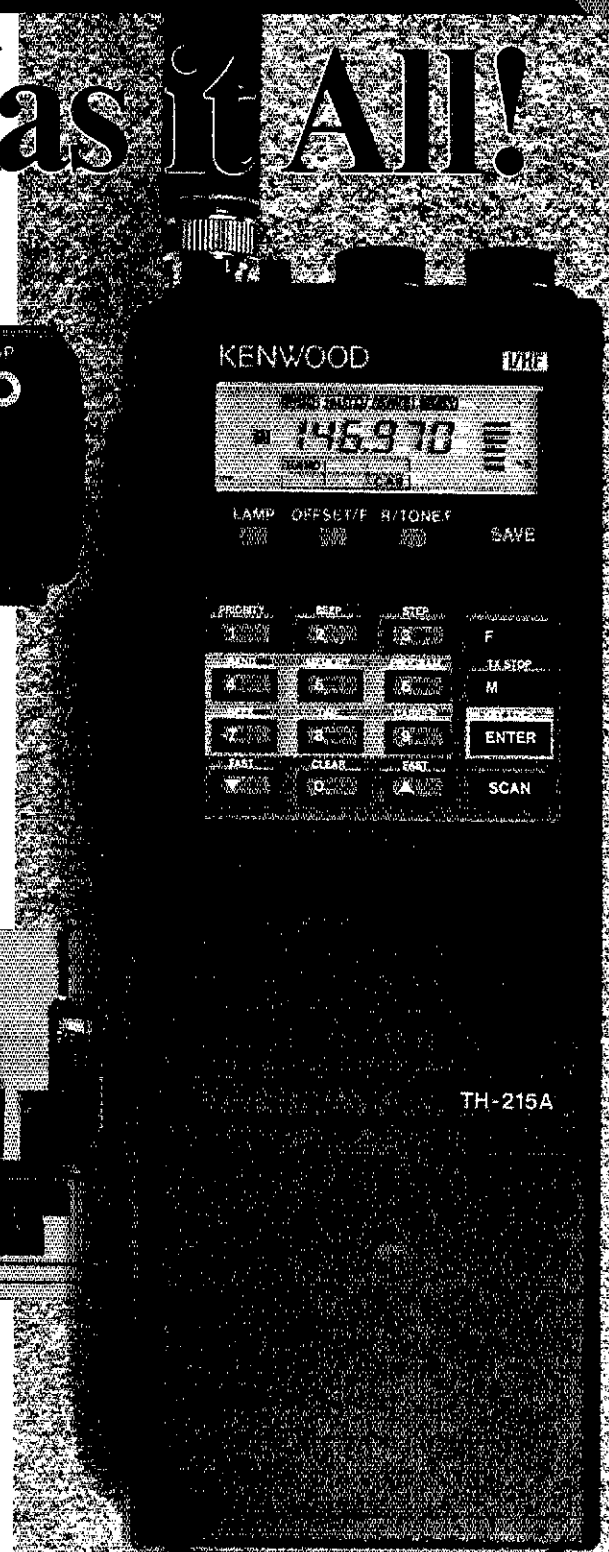


- **Wide receiver frequency range.** Receives from 141-163 MHz. Includes the weather channels! Transmit from 144-148 MHz. Modifiable to cover 141-151 MHz (MARS or CAP permit required).
- **TH-315A covers 220-225 MHz, TH-415A covers 440-449.995 MHz.**
- **5, 2.5, or 1.5 W output, depending on the power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



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



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WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. ACC: WA8CTO. Rpt. Coord. WD8OZT. New KARC officers are: Pres. KD8TC, V Pres. WD8AEW. Sec: KA8ZGY. Treas: KA8TIK. Publicity: KA8MLP. Prog. Dir. WD8OZT. KD8WX made BPL this month. Good work, Jim. Chas. area H.F. will be 4-9-88 at Civic Ctr. New Chairman is N8AJC.

NET	FREQ	TIME	QNI	QTC	Sess	NM
WVFN	3865	6:00	1183	166	30	W8YP
WVMD	7235	11:45	808	35	30	W8FZP
WVN	3567	7:00	308	116	30	KZ8Q
WVRN	3640	6:30	361	27	30	K8LG
Hillbilly	14290	Noon su	164	22	5	W8YP

Traffic: KD8WX 503, KA8WNO 436, W8YP 183, KA8TIK 174, KE8FT 126, K8TPF 98, K8UQY 85, W8FZP 76, K8QEW 66, N8FXH 44, WD8DHC 41, KA8ZXP 34, K8KT 30, KA8OGF 16, NC8G 11, WD8LDY 8.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KØJ—ASM: KAØMQA. SEC: WBØTUB. STM: KBØZ. OOC: KCØUD. ACC: WBØOUV. SGL: WBØFQB. PIO: NØDZA. TC: WØLJF. BM: KØWOP. A recent meeting was held with my Section Appointees, and it proved very fruitful with many ideas for the coming year. All Section Leaders seem in agreement that packet radio is one of the fastest growing technologies in Amateur Radio today with most of the technical questions being handled by the TC are in regards to packet radio operation. Much of the Section and NTS traffic is flowing by this mode. The SEC would like to incorporate a good plan of packet radio into the Colorado ARES program, and there has been some experimenting of holding an ARES net on packet on 145.07 here in the Metro area. All of the Section Appointees are looking for anyone who is interested in a Station appointment of ORS, OES, PIA, OBS and ATC. Let your Section Leader know if you are interested in some of this public- service work. Many of the clubs in the Section are beginning this year with new officers, and I would like to wish all the best of luck in your future club endeavors for the year of 1988. 73, KØJ. NETS: CWN: QNI 90, QTC 54, QNF 352, 27 sess. COL: QNI 1876, QTC 72-179, QNF 1230, 30 sess. HNN: QNI 2128, QTC 144-681, QNF 1436, 30 sess. NCTN: QNI 95, QTC 86, QNF 233, 14 sess. SCTN: QNI 100, QTC: 38, QNF 190, 15 sess. Traffic: KEØNI 611, NØHFV 314, KØHOA 258, WDØBSZ 185, KBØZ 116, KAØWIE 108, NØHMR 84, WBØFFV 79, WBØBLV 74, KØINI 67, KEØBI 14, WØNFW 7.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO K6LL W5QNR. TC: W8GY. ACC: KA5BEM. Southwest Net meets daily, 3583 at 0230 UTC, handled 226 msgs with 218 checkins. New Mexico Roadrunner Net meets daily, 3939 at 0100 UTC, handled 96 msgs with 1416 checkins. NM Breakfast Club meets daily, 3939 at 6:30 AM, handled 150 msgs with 1025 checkins. Yucca 2-mtr Net, 78/18, handled 26 msgs with 507 checkins. Caravan Club 2-mtr Net, 66/06 with 136 checkins. SCAT Net, 66/06 handled 10 msgs with 547 checkins. Info Net 13/73, with 86 checkins. Welcome WB5AZP for short stay in ABQ. Tnx to you all for ur support in 1987. Still have some good ARRL appointments available for anyone interested. So very sorry to report the passing of NO5F and WB5NNG. They will be missed by all. Traffic: ND5T 717, KB5UL 193, KN5D 120 and W5DAD 104.

UTAH: SM, Jim Brown, NA7G. SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. SET went well this year, with a high amount of participation. An extra session of BUN and UCN was held (we haven't had extra SET sessions for the past several years), and they helped with in-Section traffic. Packet was used for traffic as well—both for SET exercise traffic and for Thanksgiving traffic. The Shriner's Hospital in SLC is getting antennas installed by hams—80 through 10, and 2 meters. WA7ADK's son is taking a Novice class. AC7H and NU7X have installed pv solar power at their homes, for HF and packet. 73 de NA7G. Traffic: WA7KHE 122, WA7MEL 61, N7JLC 49, NS7K 35, N7IUN 29, NA7G 28, W7OCX 7, N7BQE 1.

WYOMING: SM, Jim Raisler, N7GVV—ASM: Steve Cochrane, WA7H. SEC: Jim Anderson, W7TVK. I am pleased to announce that Duane Shillinger, NN7H, has been selected for membership in the A-1 Operator Club, which he earned through the continuous observance of the highest operating standards. Traffic: NN7H 245, KC7AR reports Cowboy Net held 21 sessions with 809 QNI and 8 QTC. ARES reports W7TSJ, Area 4 — 9 sessions, 72 QNI; WB7K, Albany — 5 sessions, 49 QNI; W7ILL, Area 5 — 5 sessions, 51 QNI, Jay Ostrem, WC7M, has been appointed EC for Campbell County. Dale, W7TZK, reports that 11 operators are now listed on the Crook County ARES roster. KE7NT-2 on Pumpkin Buttes is now operating and KE7NT-1 at Wright is off the air. Your SM is now on packet, and you will need to digi thru KE7NT or WG7Y.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/A Aux: AA4BL. TC: N4AU. ATC: WB4BYQ. ACC: WA4RNP. "act" SEC: WA4RNP. I have enjoyed serving all of you as Alabama Section Manager for the last 51 months, and I hope that James Spann, WO4W, works as hard at serving you and the League as I have. Please give him your support. I will still be active on the nets, and hope to see all of you at the hamfests as usual. One Silent Key rpt: WB4OCU, Catherine Reeve of Mobile. She will be missed. Traffic: CAND reports 1062 messages in 30 sessions with DRN5 rep 100% by WA4JDH and W4CKS. DRN5 reports 784 messages in 60 sessions with Alabama rep 83% by WA4JDH, W4CKS, NW4X, W4PIM, and W4IBU. RN5 reports 697 messages passed in 60 sessions with Alabama rep 100% by WX4I, W4CKS, W4QAT, WA4ZPZ, WA4LLQ, WA4JDH, N4RT, W5PNT, and W4PIM. AEND reports 31 messages passed in 29 sessions with other nets rep by WA4JDH, W4CKS, and N4DCS. AENB reports 123 messages passed in 60 sessions with RN5 rep by WA4JDH, W4CKS, WX4I, N4RT, WB4LLQ, WA4ZPZ, W4PIM and W4QAT. AENM reports 104 messages passed in 35 sessions. Brass Pounders League: WA4JDH. PSHR: WA4JDH, W4CKS, W4PIM, and WA4RNP. Totals: WA4JDH 1001, W4PIM 246, W4CKS 88, WA4RNP 54, K4HJX 32, W4DGH 10, K4AOZ 9 and WB4TVY 4. So long, and very Seven Three—Joe.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & ACC: WA4ABY. SEC: NC4E. STM: WB4WQL. ASST STM (PACKET): W4OO. BM: WB4ZOJ. OOC: NA4I. PIO: WB4DEB. SGL: WB4UVW. TC: WD4PAH. U FB Hams in the GA SECTION really had a banner year in the many PUBLIC SERVICE EVENTS that u participated in. If I were to name them, I'm sure some wud accidentally be left out. So on behalf of the many organizations that u took time out to furnish communications for TNX from all of them. This is why AMATEUR RADIO exists: "PUBLIC SERVICE" let's not forget it. PSHR reports in Nov increased & the following sent me their totals: WD4COL, WA4LLE, WB4DVZ, WB4WQL, W4HON, KF4FG & KB4JPN. Tnx to all the clubs & groups that sent me invitations to their Christmas parties, but I couldn't except due

DAYTON Hamvention®

April 29, 30, May 1, 1988

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• Giant 3 day flea market • Exhibits
• License exams • Free bus service
• CW proficiency test • Door prizes

Flea market tickets and grand banquet tickets are limited. Place your reservations early, please.

Flea Market Tickets
A maximum of 3 spaces per person (non-transferable). Tickets (valid all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. Vendors MUST order registration ticket when ordering flea market spaces.

Special Awards
Nominations are requested for "Radio Amateur of the Year", "Special Achievement" and "Technical Achievement" awards. Contact; Hamvention Awards Chairman, Box 964, Dayton, OH 45401.

License Exams
Novice thru Extra exams scheduled Saturday and Sunday by appointment only. Send FCC form 610 (Aug. 1985 or later) - with requested elements indicated at top of form, copy of present license and check for $4.35 (payable to ARRL/VEC) to: Exam Registration, 8830 Windbluff Point, Dayton, OH 45458

Hamvention Video
VHS video presentation about the HAMVENTION is available for loan. Contact Dick Miller, 2853 La Cresta, Beavercreek, OH 45324

1988 Deadlines
Award Nominations: March 15
Lodging: April 2
License Exams: March 26
Advance Registration and banquet:
USA - April 4 Canada - March 31
Flea Market Space:
Orders will not be processed **before** January 1

Information
General Information: (513) 433-7720
or, Box 2205, Dayton, OH 45401
Flea Market Information: (513) 898-8871
Lodging Information: (513) 223-2612
(No Reservations By Phone)

Lodging
Reservations received after Housing Bureau room blocks are filled will be returned along with a list of hotel/motels located in the surrounding areas of Dayton. The reservation will then become the responsibility of the individual.

HAMVENTION is sponsored by the Dayton Amateur Radio Association Inc.

Lodging Reservation Form

Dayton Hamvention - April 29, 30, May 1, 1988
Reservation Deadline - April 2, 1988

Name _____
Address _____
City _____ State _____ Zip _____
Phone _____
Arrival Date _____
[ ] Before 6 pm [ ] After 6 pm
Departure Date _____

Rooms: [ ] Single [ ] Double (1 bed, 2 persons)
[ ] Double Double (2 beds, 2 persons)

Deposit required - Room deposit must be paid directly to the hotel or motel by date shown on the confirmation form sent to you. Use canceled check for confirmation.

Mail to - Lodging,Dayton Hamvention, 1880 Kettering Tower, Dayton, OH 45423-1880

(PLEASE SEPARATE)

Advance Registration Form

Dayton Hamvention 1988
Reservation Deadline - USA-April 4, Canada-March 31

Name _____
Address _____
City _____ State _____ Zip _____

	How Many		
Admission (valid all 3 days)	_____	@ $8.00*	$_____
Grand Banquet	_____	@ $16.00**	$_____
Women's Luncheon (Saturday)	_____	@ $6.75	$_____
(Sunday)	_____	@ $6.75	$_____
Flea Market (Max. 3 spaces)	_____	$23/1 space $50/2 adjacent	
Admission ticket must be ordered with flea market tickets		$150/3 adjacent	$_____
		Total	$_____

* $10.00 at door ** $18.00 at door, if available

Make checks payable and mail S.A.S.E. to -
Dayton Hamvention, Box 2205, Dayton, OH 45401

to the promise I made to my former employer on helping close out a Dept during the month of Dec. Many TNX anyway. Only received one Silent Key report in Nov: Edgar Wright, W4PEC. Our sympathy to his family and to those that I'm not aware of. Well here it's Feb, and it won't be long before the 1988 Hamfest circuit begins. Now that I'm retired, I hope to make many this year. As I mentioned in last month's column regarding the best newsletters in the GA SECTION, all clubs and groups will be receiving a letter from me in the near future as to the three categories etc. All ARRL full members are eligible for appointments. Some are restricted, but if u desire an application please contact me. Probably one of the best things all of us can do is to get somebody interested in this great hobby of ours. Take a youngster under your wing, and guide him properly. Don't forget our Novices. If they need help, steer them in the right direction. Remember when u needed help? We have many Asst Technical coordinators in the section who are glad to help if there's a problem u can't solve. Keep ur noses dry—the spring rains will be coming. Traffic: WD4COL 139, WB4WQL 91, WA4LLE 74, WB4DVZ 53, KF4FG 50, N4MWR 36, KA4HHE 25, K4NM 25, W4HON 22, W4QO 22, N4UZ 21, WB4ABE 21, K4LDI 19, K4EV 8, K4BAI 5.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—ACC: GIFF, WD4RIQ. ASM: BILL, KB4LB. BM: DAVE, N4GMU. OOC: JOHN, AB6I. PIO: PETEY, WA4PUO. SEC: RUDY, WA4PUP. SGL: JOHN, KC4N. STM: RIP, AA4HT. TC: ED, W8RAO. We have added our Official Observer Coordinator this month. John, AB6I, has been an OO for some time, and we hope he can pull our OOs together and get the Amateur Auxilliary in good working order. The WDWARC was presented its Charter of Affiliation by me at a recent meeting. Their officers for 1988 are: Lee, N4CNF, Pres.; Richard, KA4WDA VP; and Randy, KJ4BG Sec/Treas. LMARS officers for 1988 are: Mort, WA2ARS, Pres; Bruce, KL7IV, VP; Carol, N4OWW, Sec.; and Virginia KJ4HS, Treas. NOFARS has Billy, N4UF, Pres.; Pete, W4PTT, VP; Bob, WD4PFN; and Bob KB4NTI as Treas. We wish all these officers the best for 1988, and that they keep their clubs moving forward in the advancement of Amateur Radio and to provide the service to their local communities as they have in the past. The OARC honored two club members at their December Dinner Meeting. Jack, KF4WM, was selected the HAM OF THE YEAR, and Roy, N4ADI, as the Elmer of the Year. The SSRC celebrated the 40th birthday of K4SGO with a Special Events station and sent out certificates to all stations they contacted. WDWARC also ran a Special Event on the 15th anniversary of WDW, with over 500 + contacts on June 6 and 7. Thanks to SSRC for their copy of the Oracle. They join many other clubs that send me their club newsletters each month. Traffic: WD4IIO 1263, WA4OXT 713, WX4H 602, N4PL 598, AA4HT 415, K4CY 336, WD4IUI 256, KC4VK 199, N4GMU 119, WC4D 114, KB4LB 109, AA4QC 96, N4JAO 84, WA4EYU 82, KA4YLH 81, W4KIX 78, N4ADI 58, N4JHI 48, KI4CQ 48, WB1EKV 47, KB4FIY 46, W7YWF 41, KA4AKH 39, NF4O 38, N4DY 37, W4DTV 27, WB4TZR 25, WA4PUP 19, NQ4P 18, WA4SXW 18, KJ5HS 15, KI4NN 13, N2AOX 10, NS4C 9, WD4FJY 8. KB4WPI 8, WB4AWG 7, WD4EQB 7, W8IM 6, (Oct. 1) W8IM 9.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OOC: W4TAH. ACC: K4EUK. Information from Headquarters indicates that the South Brevard Amateur Radio Club, Inc. is authorized to operate station KI200TD and the American Radio Club is authorized to operate WQ200D during the week March 5-11, 1988. Details of the Bicentennial of U.S. Constitution celebration can be found on pp. 14-16, September 1987 *QST*. Thanks to WB5YDD who sends net reports each month for RN5 and CAN Cycle 2 activities. WA4HDH hopes to have his book on the history of QFN ready for publication on the near future - many thanks to Doc for this valuable undertaking. W4JM writes that his antennas are ready for some rare DX and so is he — Jim also observes that he would like to see SSB on a part of 30 meters. ALERT — see December, 1987 *Florida* Skip for the letter sent by John Hills, KC4N State Government Liaison, to the Chief of the Bureau of Local Planning, Department of Community Affairs in Tallahassee. It deals with a very important topic — the gist of it is that as a result of Chapter 163.3161 of Florida Statutes each county and municipality in Florida must develop a comprehensive local-usage zoning plan. In some cases these plans will include regulation of such things as outdoor antennas. News this month sort of sparse — holiday traffic in full swing and everyone busy! Traffic: W3CUL 3175, W3VR 1029, WA4PFK 381, WA9VND 354, K4IA 310, K4SCL 255, KA4FZI 238, W4NFK 237, WA4RUE 233, WA4EIC 226, WV5Z 219, WB4WYG 182, AA4BN 169, K4ZK 169, WA4RLV 155, KB4MON 155, W4TAH 137, W3TLV 123, WD4KBW 120, W4DL 108, WD4CHO 104, N4KFU 103, K4EUK 98, KA4YHS 97, KA4NXF 92, KJ4WJ 79, WB4AID 78, N4ET 75, N4MML 65, KI4ZW 62, KA0GYF 55, KA4SIH 52, N4OIA 47, KY8Y 43, N4ORZ 41, KB4LPL 39, WB4GCK 34, N1EGN 30, AA4CH 29, KB4UIA 28, WD4NXK 27, KB4FO 27, N4RLN 26, K4JI 25, WT4F 25, N2GOI 23, W4SME 22, K4FQU 22, N4QEH 19, KF4RL 17, KB4YJF 14, KD4GR 14, W3IJR 13, W4VQE 13, K9EHP 12, W4WYR 11, K4GVI 10, KB4EWO 9, K9ALX 9, KA0RUL 9, W4DWN 8, WA4PIL 7, W4UIO 7, W4MFD 6, W4MPV 6, KB4TIU 5, KA4GDU 5, WA4VWJ 4, N4PSV 4, WK4F 3, K4OVC 3, NX5Q 3, WA4LGT 3, N4PFO 3, N4LLZ 3, KA2KNZ 3, W4MCJ 2, W4NSY 2, AA4WJ 2, AA4IF 1, (Oct.) NK8O 23, K4OVC 5, KF4JA 3, KB4TIU 2, AA4IF 1.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NMs: K6LL, WB7CAG, K7POF. KQ7T reports FB SET exercise carried out by members of the Verde Valley ARA on Oct. 17: A simulated earthquake in village of Oak Creek was reported knocking out power and telephone communications in towns of Oak Creek, Sedona, Cottonwood, Clarkdale, Jerome, Bridgeport, Camp Verde, and Lake Montezuma. The following hams using emergency power radios responded and operated during the drill: KQ7T, N7EBT, N7DUR, N7AJH, W2EJ, NZ7I, KA7TOU, KA7TOT, KA7EZY, W7KAU, WA6KHX, W0WLE, KC2EN, KT7L, W7GCJ, KA6RCM, and WI6S. Congratulations. KA7MUL personally delivered his monthly activity report to the SM at the Superstition ARC hamfest. W7YS reports ARES net is alive and well in Coconino Co. In spite of a few early morning rain showers, the outdoor Superstition ARC hamfest Dec 5-6 in Apache Junction was a great success. Bill, WA7SUF, Marge, K1YCZ, Nelson, KA7SWD, and Larry, WB7CRK all worked very hard to make it go. Estimated crowd about six hundred and lots of "junque" changed hands. WA0NNC reports the next "biggie" will be the ARCA South Mountain Swapmeet in Phoenix early in March. Exact date won't be firm until January 1st, so watch your local bulletins. A Repeater Owners meeting will be held at this affair. While in the Phoenix area, your SM attended the CADXA annual holiday awards banquet. Mike, KC7V, was installed as new prexy and received an "Outstanding Service" award. The "DXer of the Year" award went to Jim, N7US, the outgoing President. WA6WZO presented the ARRL *QST* "Cover Plaque" to Dave, N7RK, for his best feature article in March 1987. Terry, W6MBK, entertained the audience with his FB

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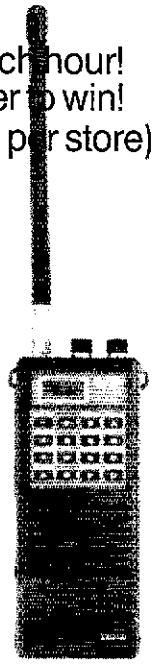

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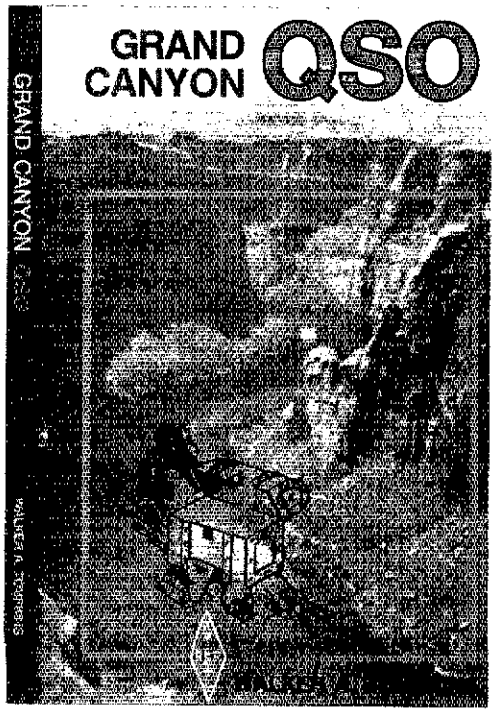

By Walker Tompkins, K6ATX

You'd think that Tommy Rockford would take a break after all that happened to him in *Death Valley QTH*. Not so! This darling young amateur radio operator and his over-the-air friend, Dr. Antonio Bonilla, EA7BK are on the trail of Aztec Gold hidden somewhere in the Grand Canyon near Lake Mead. The hams have clues to the location of the treasure, but they are being followed by the notorious museum bandit, Duke Hollister, who has sworn vengeance against Dr. Bonilla. Can amateur radio save the day against Hollister and his heavily armed compatriots? Will Tommy find the hidden treasure? To find out, pickup a copy of *Grand Canyon QSO* today!

Walker Tompkins bases his Tommy Rockford adventures in areas familiar to the author. This latest book was inspired by runs down the rapids of the Colorado River by K6ATX. (For more information about the author see May, 1986 **QST** page 60.) *Grand Canyon QSO* like the four adventures that preceded it (*SOS at Midnight, DX Brings Danger, CQ Ghost Ship*, and *Death Valley QTH*) is $5.00. All five adventures are available for $20.00. Please include $2.50 ($3.50 for UPS) for shipping and handling.

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slide show on the 1986 DXpedition to JY land during the CQ WW DX contest. He also showed slides and gave construction details of his famous antenna tower installation in San Diego Co. While in Arizona recently, our Div. Dir. WA6WZO and XYL WA6WZN visited club meetings of the Coconino ARC, Flagstaff; Navajo Co. ARC, Holbrook; and Tonto ARC, Payson. Your SM solicits more monthly activity reports from individual operators. If you need report cards to send in, give me a shout, and I'll gladly supply them. TNX and 73 de JIM.

NET	QNI	QTC	SESS
SWN	218	226	30
ACN (HF)	752	68	30
ACN (VHF)	345	136	31
ATEN	1108	210	30

Traffic: KA7MUL 632, W7AMM 414, W7EP 198, WE7G 124, K6LL 123, W7KCM 123, KE7EO 110, WB7CAG 87, N7ETP 81, K7JKM 66, W7OIF 47, K7POF 35, W7KXE 26.

LOS ANGELES: SM, Phineas J. Icenbice, Jr, W6BF—It is my pleasure to receive all of the club bulletins. Please mark items that you would like to see in this column. This is your column, so send the news items to W6BF before the 3rd of each month. Amateur Radio is a NATIONAL RESOURCE. Help promote good friendly relationships!!! The FCC now has authorized additional club "200" call signs. Recent call signs in the LA Section are LOCKHEED/W200LS, PALISADES/W200GAA, SAN FERNANDO VALLEY/W200SD and the MOUNTAIN REPEATER/K200VE on Mount Wilson. ARRL will notify clubs of this action by mail with a copy to the Section Managers. Questions will be answered by ARRL HQ—CLUB SERVICES. HF Packet activity is increasing—please listen—3.607/7.093/10.147/14.103/14.105/14.107/14.109 MHz for activity according to W6LS Bulletin. The latest revised ARRL *Operating Manual* is excellent for Packet information as well as DX, Awards, sunrise/sunset, ITU and CQ zones and even lists of countries and oblasts. Sat. March 26/88 an important meeting in San Jose at the Emergency Response Institute is scheduled for RACES/ARES members; please consider attending if possible. Reference RACES bulletin is 43/87. The Southern California AR Computer Club president is WA6PMX Dave. Their bulletin is *Ham Byte* and it is a great publication. Ron Boan, AK6J, is the ARRL SEC; please contact him if you can and will contribute to our emergency organization. The Volunteer Monitor program (Volmon) is the ARRL program for amateur self-regulation. This program is working very well according to all reports. Please report all serious on-going problems to your Section Manager. The official Local Interference Committee (LIC) is used to locate chronic law violators using FCC-approved RDF procedures. August QST 1984 page 11 has a very good article on the ARRL and the FCC Field Operations Bureau joining to form the AMATEUR AUXILIARY, thus maintaining over a half century of amateur self-regulation and insuring the future of good Amateur Radio. Regional Monitoring Stations (RMS) are appointed by the ARRL President. They serve the Division Directors and Section Managers anonymously for HF and other problems that need special assistance. The real solution is consideration for others—even when driving an automobile. Competition often requires a degree of aggressive action but often due consideration has greater rewards. News from STM: Thanksgiving is over and considerable traffic was handled via regular nets and packet. Sorry to report that N7CZF will be inactive for a while, due to traffic accident that left him with an injured arm and leg. Good luck, Bryan. Section BPL this month made by K6UYK and N6LHE. Congrats and thanks fellows. Traffic: K6UYK 591, N6LHE 574, W6TH 303, W6INH 244, WB6VPY 74, KI6A 42, K6YBV 24.

ORANGE: SM, Joe H. Brown, W6UBQ—ASM: Bob, W6LKN, (714-686-3823). Riv Co, ASM: Ralph, WB6JBI, (714-776-9272). ORG Co. ASM: Tony, WB6QHB, (714-981-1836). Alex W6RE has resigned as Orange Section OOC. He has taken the FCC Aux Program from the individual OO doing his thing to the FCC agreement, to setting up an LIC structure to administer the program in the four counties of the Section. Nick, KA6GVY, was selected by LIC selection board and appointed by the Org. SM. His job will be to comply with ARRL and FCC guidelines in the matter of amateur to amateur interference. ARES/RACES news. Words of wisdom from Art, N6GDM (EC & Asst Dir); The recent earthquake was just another warning that we must not take this reality so lightly. It is abundantly clear that the City, County and State are going to need all of the assistance they can get. We need an all-hands effort in planning, managing and doing what the Amateur Radio Community does best. Come on! Let's work this thing out together, OK! SB Co. West End RACES was activated after the 1st Oct Quake. Pilot W6GVR went airborne for a survey of the area. NO damage was reported and nets were closed down. Ground contact to county comm was by Tim, N6LIX. Org Co. ARES, Dave WA6PMX Rpt, amateurs provided comm for the Cancer Society Great American Smokeout. (Smoke Busters?) DEC Corky N6HQI on a policy change to allow central coordination and amateur operator affiliation. This idea will result in more effective resource management. ACC Sandy, WA6WZN advises the Special Service Club Program is off and running. Just think, your club can now have its own AWARDS MANAGER. Call 714-549-8516 for information. TC John, KD7XG has a question. Are today's hams merely "appliance operators"? What kind of things do hams homebrew today? Major areas come to mind: antennas, computer software, network systems, and accessories for the shack. Of those, the two most likely to survive are software and system networking. Why? Building one's own hardware that can compete with the price and capability of off-the-shelf gear will continue to diminish. What's left? How we link the hardware together and program it to do what we want it to do. Replace the junk-box and chassis punches with imagination, perseverance, and willingness to try your hand programming and systems design (how to link things together). Is it easy? No, but neither was homebrewing in the past! Is "rolling your own" a thing of the past? No way! It has been and will continue to evolve with our technology. You just have to look in a different direction to find who's doing it and what they're doing. Club News Officers: Western ARA, Pres, Glen K6RUB, 2nd VP Jeff KB6SRM. Riv Co ARA, Pres, Chuck KN6U, VP Al WC6E. Yucaipa Valley ARC, Pres, Jack Prather VP, Bob Aul, Lee De Forest RC, Pres, Willie WA6BAN VP, Vic N6AHB. The SW Div Convention Sept 2,3 & 4, 1988. Mark your Convention Calendar. OU there. STM: Dan WF6O. Report, PSHR WF6O, KA6HJK, WB6QBZ, WA6QCA, KA6TND. Traffic folks have been very busy.

NET	FREQ	TIME	SES	QNI	QTC	MANAGER
SCN1	3598	0230Z	30	337	368	AD0A
SCN2	3598	0415Z	20	87	41	AD0A
SCNV	147.645	0500Z	30	330	347	WA6QCA

Zip forwarding has been implemented on section BBS and is working great. Helping with NTS TFC WA6BRI, and KA6SOP. PACKET RACKET ASM: Mike N6KZB. Exciting things have occurred within Orange Section. Thanks to a major effort by the "NORCAL" BBS OPS, Orange and LA Sections. All major NTS traffic BBSs have fully implemented the 5 digit ZIP code for Message routing. This has made the volume and accuracy of delivery within the combined HF/VHF digital world fantastic. If an area has not yet "ZIPPED" within CA, we strongly recommend it. The ARRL field organization has allowed the Packet Community to develop this. Thanks to "ZIPS," over 700 pieces of NTS traffic have passed or been delivered to "Orange Section." Special thanks to WF6O, NI6A, AJ6F, K6IYK, N6MVS, and N6OKS for data base.

SAN DIEGO: SM, Arthur R. Smith, W6INI—PIO: KG6LF. TC: N6JZE. STM: N6GW. SEC: W6INI. ECs: WD6CSS (424-5785), K7DCG (748-9046), W6INI (273-1120), WF6K (746-4017), WK6M (344-4158), N6NKJ (444-5465). Earthquakes continue to rattle southern Calif counties. The number of operators who have committed themselves to emergency communications is woefully small compared to the "worst case" needs. It is estimated that the city of San Diego alone will need 600 operators to maintain 24-hour communications for three or more days. Double this figure for the entire county. Active ARES members are approximately 200. Licensed amateurs in San Diego and Imperial counties total 6200. This means about 3% of us are committed to action. If you are one of those who say "not interested now, but call me if you really need me" now is the time. We really need you. Contact one of the ECs above and join up now. There is a job waiting for all of you. We need you N-O-W for planning and training. ARES-CW 5 sessions, 15 ck-ins. Traffic: N4KRA 140, KU6D 62, N6GW 59, WA6IIK 1.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—November and early December were exciting times in SBAR Section. November kicked off with SBar. County DEC N6AJA, going into Cottage Hospital for surgery. Tony is doing fine, and starting to get back to work. By the time you read this, we hope he's 100 percent recovered. Nov. 14 was the date of an all day Section Cabinet meeting, attended by KB5AH, WB6BYU, N6FOU, KB6HGB (representing N6AJA and KI6XG), WB6IIY, W6KFV, W2KVA, WB6RVA and N6WP. The meeting was most interesting, and we all left with action items and goals to accomplish before the next (spring) meeting. All our thanks to SBar Red Cross for providing the meeting space, and to KB5AH for making the arrangements. This is also the time for many clubs to elect their officers for the coming year. Elections at the Conejo Valley, Paso Robles and Satellite (Vandenberg AFB) ARCs were reported to your SM. Conejo Pres. is N6JMI (sorry, other officers not listed in the CVARC bulletin). PRAC officers: Pres-W7CB; VP- W6MUS; Treas-N6JQE; Sec-KB6TAY. SARC officers: Pres-N6QEA; VP1-KB6KZL; VP2-N6KOI; Sec-KB6DUH; Treas-KB6FHP. Board Member at Large: AH6ES. Congrats to all the new officers, and good luck with your club endeavours. At the end of the month, a hardy contingent from SLO County trekked to KP2 land to test their skills against the world in the CQ Worldwide DX Contest/CW. Not content with an impressive worldwide win in 1986, the goal this time was no less than a CQWW/CW record. Joining WZ6Z and others at KP2A were W7CB, Larry, and KB6AWM, Char Miller; W6MUS, Bob Horton; W6QUL, Jim Robb & Sherry Robb and KB6TAY, Jon Dalton. Their efforts proved worthwhile, and they came home with very probably a new WORLD RECORD with an estimated 27.8 million points. CONGRATULATIONS! Congratulations also to Jon (KB6TAY) and Jan (KB6TAZ) Dalton on the birth of 2nd Jr. Op Kathleen. Finally, a Search and Rescue symposium was held at Vandenberg AFB on Dec 5. ARES was ably represented by WB6IIY and KA6KGF who spoke about ARES capabilities and our role in SAR. SBar ARES was also there in force, bringing the ever popular and impressive Mobile Comm Van, and participating with Los Padres SAR in other demonstrations. The interest expressed in ARES and Amateur Radio by SAR and other emergency personnel was very gratifying. We hope to see a greater appreciation of the ARS and more opportunities to be of service as a result of the contacts made. (Other Section leadership officials attending were: WB6BYU, KI6XG and W2KVA.) 73 for now.

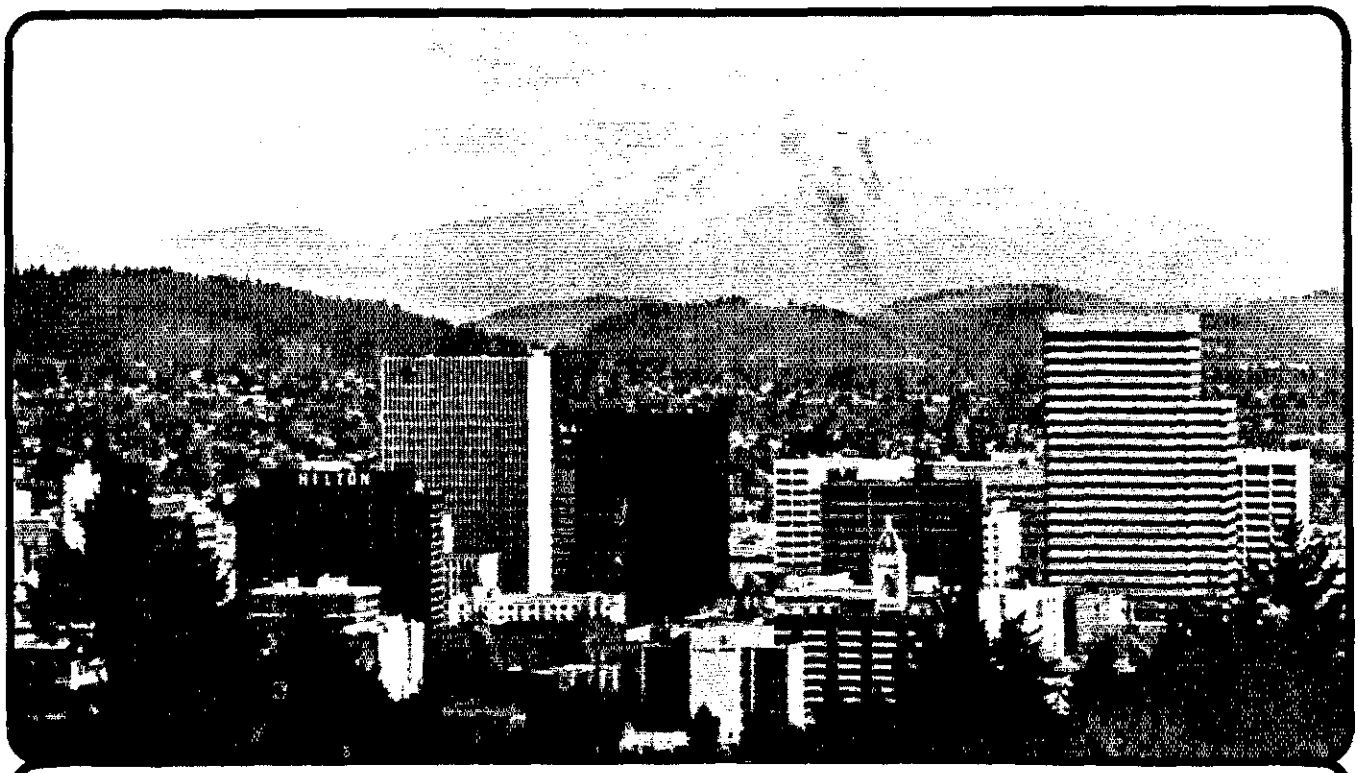
WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst SM: K5MXO. SEC: W5GPO. STM: W5VMP. PIO: K5HGL. BM: W5QXX. TC: W5LNL. OOC: WB5JBP. ACC: W5URI. One of the first things you learn in SKYWARN school is that tornadoes can occur any month of the year. A major outbreak happened right here in our Section on Nov. 15th, causing major damage in many areas of East Texas, along a path over 200 miles long. Most of the ARES activity has been submitted to HQ for possible use in the Public Service column of QST. N5BGL and KA1CWM, Red Cross volunteers from the Ft. Worth Chapter were dispatched to Palestine in their ERV's (Emergency Response Veh.) with 2 m radios, which provided reliable communications into the Tyler Red Cross office. W5URI manned the HF and VHF stations at Red Cross Hq. in Ft. Worth, handling H&W tfc. as well as keeping tabs on the ERV activity in the field. W5URI is coordinator of the drivers for the ERV vehicles. The 7290 Tfc. Net, on request of SEC W5GPO, was activated in an emergency session at 1400Z on Nov. 16 and 17, and remained in session until propagation shifted at dusk both evenings. Night operations were conducted on the Texas Tfc Net on 3873 kHz. Also, through unusual ducting and inversion phenomena, almost Section wide communications were possible on 2mtrs, with excellent voice and packet coverage into the stricken areas. Several hundreds H&W messages were passed during the first 48 hours, until telephone service was restored. Gregg Co. EC AA5BY activated his ARES unit Sunday, setting up Red Cross communications as tornadoes were ripping through Palestine, Jacksonville, Whitehouse, New Diana, and Ore City. This 2 m net allowed the Red Cross to respond early-on with the proper manpower and equipment to assist storm victims in the affected areas. Sunday evening, a request came from the Red Cross to set up a 2 m link between Longview and Ore City, due to telephone outages. Monday activities included providing communications between Red Cross Hq. and the damage assesment teams in the field and also H&W tfc. By the end of the day on Tuesday, activities began to wind down. Congrats to all who were involved in this operation for a job well done! These types of emergencies remind us to be prepared at all times for a quick reponse to any contingency, as the first few hours of a disaster are the most critical for the saving of lives and protection of property. New Temple ARC officers: WA5EQQ/Pres. K5BIT/V.P. N5HQR/Sec. KA5IIA/Tres. and KA5IHY/Dir. On Nov. 15, Carrollton ARES/RACES units were activated to provide back-up communications for the fire dept. after intense rain knocked out their system. Within 30 minutes, all stations were covered. A breakfast was held Nov. 28 to honor Al Brinkerhoff, WB5PMR, who is moving to Fla. KO5I presented Al with an award from AMSAT for his many years of service and PR work. KA5QYV has resigned as EC/ATC in Hill Co. as he recovers from surgery in Dallas. Thanks for all your good work, Jim! Your appointments will be waiting for you when you are ready! PSHR for November: KB5ADE, K5MXQ, W5YQZ, K5UPN, W5VMP, KB5CKQ, WZ5N, and AJ5K. Traffic: N5BT 408, W5TNT 376, AJ5K 300, K5UPN 241, K5MXQ 232, W9OYL 230, W5YQZ 216, KD5RC 208, WZ5N 196, KB5ADE 149, KA5AZK 111, N5GFZ 107, W5VMP 96, KC5NG 60, KB5CKQ 35, WA5EZT 21.

OKLAHOMA: SM, Bill Goswick, K5WG—Congratulations to James Lear, N5LNR, who has been appointed the Emergency Coordinator for Texas County. This county was previously without an EC, and Jim's efforts to organize an emergency response team are sincerely appreciated. There are several other counties without ECs: anyone interested in an appointment as an EC or Official Emergency Station please contact me and/or the Section Emergency Coordinator, Bennett Basore, W5ZTN. The spring storm season will soon be here, so let us prepare now to bolster our resources for the emergency situations that are sure to come. Enid's 444.4 MHz repeater is working fantastically with more improvements soon to come, and their 34/94 machine should be operational again as you read this. New club officers for 1988: So. Canadian ARS Pres- Andi Wolfe, WU5W; VP- Dave Medders, K5PL; Tr-Monte Bateman, WB5RZX; Sec- Dorlinda Skaggs, N5IUA. Cimmaron ARS Pres- Ray Barnes, AB5Z; VP Leo Peil, WZ5H; Tr- Nadine Painton, N5FMH; Sec- Denny Painton, WK5V. Edmond ARS Pres- Phil Wolfenbarger, N5FIP; VP- Dee Mize, WD5FHR; Sec- Gloria Guinn, KB5BGM; Tr- Edith Vaughn, KA5YPX. CORA Pres- Gary Skaggs, WB5ULK; VP- Lee Ward, N5HIR; Sec- Yvonne Warriner, WB5TYW; Tr- Mark Kleine, N5HZR. Traffic: W5AS 223, N5IKN 107, WA5OUV 104, KF5RD 92, K5GBN 68, W5RB 53, N5FEM 31, WA5ZOO 27, W5VLW 25, KV5X 22, W5VOR 21, K5WG 8.

SOUTH TEXAS: SM, Arthur R. Ross, W5KR—ASM: N5TC. STM: K5QEW. SEC: K5DG. PIO: WA5UZB. ACC: WB5YDD. BM: K5CVD. OOC: WA2VJL. TC: NZ5U. SGL: K5KJN. PIA N5FIX reports Northwest ARS ops KB5AEJ and N5ZR helped out in Juvenile Diabetes Walkathon; KB5AEJ worked in the Lions Club Eye Bank bikathon; BSA Troop 1332 sent 5 Scouts and a Scoutmaster to shack of KF5ZL for BSA Jamboree on-the-air (JOTA) where many contacts were made; NARS ops W5BKK, KB5AEL, N5GQW, WA4FGH, WA5REJ, KA5DNP and KC0LM meet weekdays to participate packet communications procedures. Proud papa OOC WA2VJL announced that son KA5UVY has been named to National Honor Society; congratulations to both. Asst NM WB5YDD reports CAND passed 1062 messages in 30 November sessions; DRN5 represented 100%; STX stations helping were KE5ZV, KD5KQ, WB5YDD, N5DFO, NX5V, WB5EPA, WB5FQU. Brazos County EC N5ETD turned in excellent report on ARES activity following tornado strikes; 104 Ham-hours contributed by AA5DH, N5BZI, KF5LN, W5DJO, KD5EV, KA5RCT, N5GWY, KA5SLG, K5PSH, KF7EM, AA5AV, N5ETD, N5JQS. The Disaster and Communications Team (D-CAT), Houston, planning big team effort in ARRL 10-meter contest; PIO WA5UZB is event coordinator; D-CAT replaced and relocated antenna system for handicapped Hams WB5EPA and WB5FQU to provide "clean" system and now seeking donation of automatic antenna tuner for those dedicated and sightless traffic handlers. PIA NZ5J, Seguin, reports the club has presented a "New World of Amateur Radio" VHS tape to the local library; KF5MK is new EC for Guadalupe County; ARES group prepared for Civil Defense exercise in December; Central Texas Traffic Net going great. The Hill Country ARC bulletin, Kerrville, reports K5MFJ and K9UVM were super-salesmen as auctioneer at the club's annual fair; KA5SOX is chairman of the Christmas party. DRN5 NM WB5YDD reports 784 messages passed on 60 November sessions; STX represented 100% by W5CTZ, N5DFO, KD5KQ, K5QEW, W5SHN, NX5V, WB5EPA, W5FQU, WB5HZO, KE5ZC, WB5YDD. The Bexar (bare) Wire, San Antonio ARC bulletin, reports WA5JDU is No. 1 in 10-10 International contacts worldwide; also reported SAARC has an all-time-high 439 members (GREAT!); KA5AWP active in training at Austin School for the Blind. Hot Hog News, Brady, reports KB6AUM, WU5D, WV5F, WD5H, N5HQF, N5KAD, KO5R, K5RLL, WM5S, KA5YGR, and WQ5Z installed VHF and HF antenna systems on the Brady Law Enforcement Bldg.

WEST TEXAS: SM, Milly Wise, W5OVH—ASM: KA5PTG. ASM: KO5D. ASM: WD5EFJ. ASM: WF5E. ASM: N5DO. SEC: W5MVJ. PIO: KE5ZW. ACC: K5IS. OOC: KD5FL. BM: K5VRF. TC: K5CU. STM: AE5I. Key City ARC of Abilene held their SET exercise during the Boy Scout Jamboree Sept 17. On Sept 27, ARES/RACES Abilene amateurs provided communication for a search party for a lost teacher. Am very proud of the ARES/RACES group in Pampa, who after the big gas explosion in Pampa handled all the messages from police, City of Pampa and American Red Cross in an expeditious manner. It took 2 minutes to send a message to Austin and back. NOTICE: The West Texas Section Manager's Net will be on 3.931 MHz the first Thursday of every month, starting Jan. 7, 1988 at 8 PM CST. I now have my full quota of ASMs in my 5 districts. Raford Dunagan, WD5EFJ of Big Springs is District 3 ASM, Midland ARC will be holding VE exams the 2nd Sat. of every month at 9 AM in the Red Cross Bldg., KA5WMO, Max Shider is new pres. of Snyder ARC. Big Spring ARC held their SET on Nov 21. Packet Radio in West Texas has new digipeaters on the air in Lamesa, Double Mt. Big Spring, Abilene and Ft. Davis, naming just a few. Nov. 13, Abilene's SET was held with 14 hams. ASM & EC Glen, KA5PTG, was awarded Amateur Radio Operator of the Year at Panhandle ARC dinner. 73, SM, Milly Wise, W5OVH. Activity reports: (Oct) 7290 Traffic Net, 49 sess, 2987 QNIs; (Nov.) 48 sess, 2937 QNIs. Traffic: AE5I 173, W5ERT 22, N5KUC 15, KE5VH 10. QST



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The Paragon Model 585 is a full featured, synthesized transceiver. General coverage all mode receiver tunes from 100 kHz to 29.999.99 MHz. Transmit at 100 watts output on all authorized frequencies from 1.8 to 29.999.99 MHz. SSB, CW, FSK and optional FM. Noise blanker and speech processor are standard equipment. Dual VFOs, RX offset, TX offset, QSK with a changeover time of less than 30 ms, five I-F filters (standard 6 kHz AM and 2.4 kHz SSB, optional 1.8 kHz, 500 Hz and 250 Hz) that are front panel selectable independent of mode, selectable tuning rates with automatic speed-up at rapid tuning knob rotation, passband tuning, audio bandpass filtering, tone control, squelch, notch filtering and more!

Sixty-two programmable memories that include frequency, mode, filter selected, channel number and a 7 character alpha-numeric tag for entering a net name, call sign or I.D. of your choice. As the memory channels are scanned, all of the information is displayed (what a light show!) and the receiver automatically sets up mode, filters, tag and frequency as stored in each channel. Channels scanned are totally controllable with global lock-out, global reset and individual lock-out and reset.

The construction is impressive too. All circuit boards are glass epoxy (G-10) and all of them can be removed without desoldering. The front panel is hinged to provide access to all sections of the chassis. All aluminum construction keeps the weight of the rig reasonable too. And of course, the front panel is a spacious arrangement which makes the critical controls easy to use.

Frequency selection can be made using the main tuning knob, keypad direct entry or up/down buttons that can shift one MHz or to the next ham band. Frequency readout is selectable to display to 100 Hz or 10 Hz. Front panel clock is in 24 hour format. Rear panel input and output provisions keep the all-mode operator in mind too. Fixed level audio out and FSK keying (170 Hz shift), auxiliary dc jack, amplifier control circuits plus all the other connections that you could possibly need, including RS-232 computer interface option.

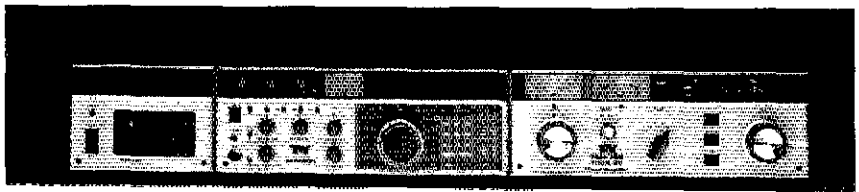
The Paragon is the end result of a three year engineering effort. Much of that effort was invested in improving the receiver performance and controlling the phase noise inherent in a PLL oscillator. We are proud of the performance of the Paragon and we think it has set new standards of excellence in synthesized rigs. All we ask is that you take the time to check it out. We think that you will share our pride in the Paragon.

GENERAL SPECIFICATIONS

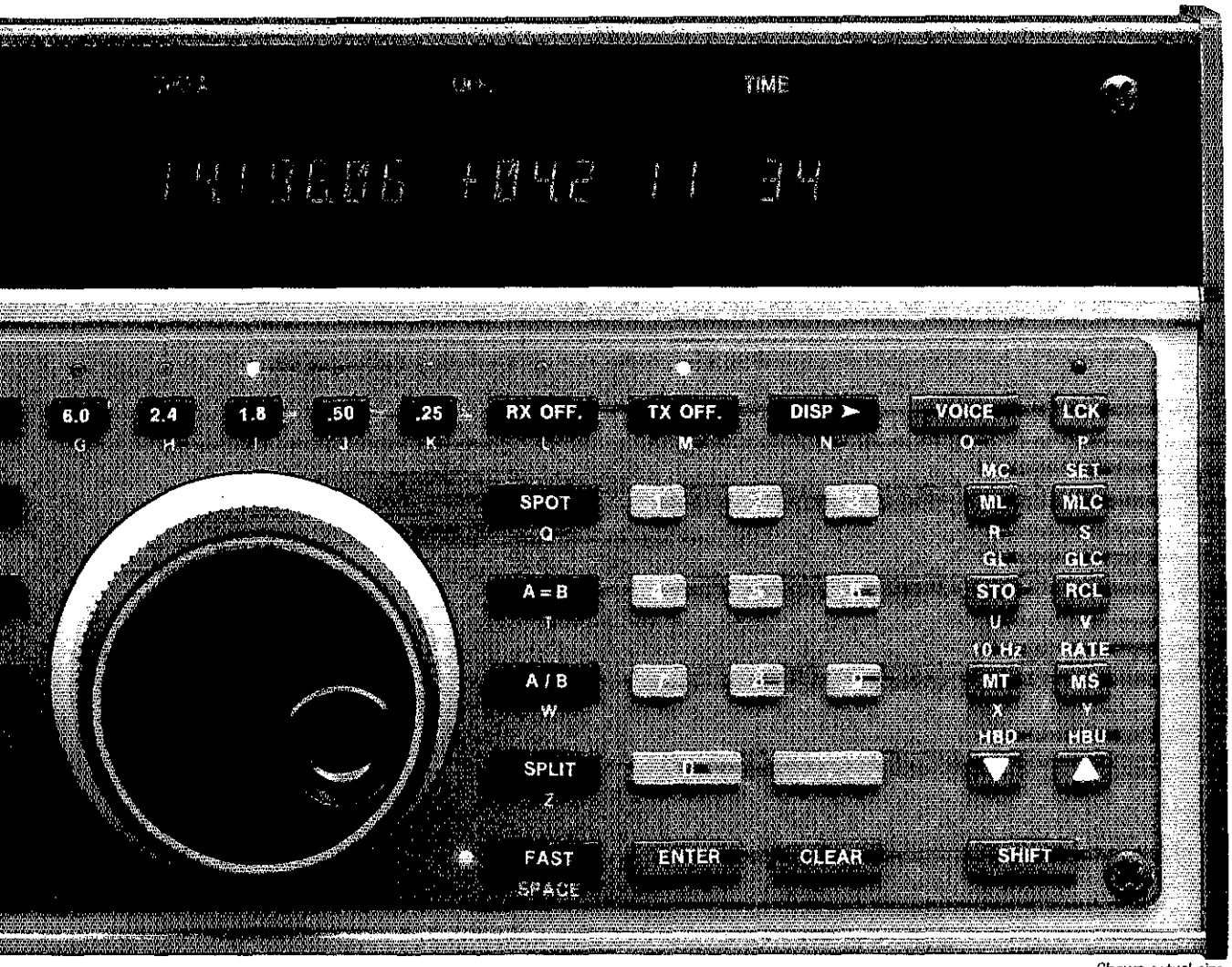
Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.8 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer, 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C. at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Tuning Rate:

	Normal	Normal Shifted
CW/USB/LSB/FSK	10 Hz 3.8 kHz per turn	20 Hz 9.6 kHz per turn
AM/FM	50 Hz 24 kHz per turn	100 Hz 48 kHz per turn
	Fast	**Fast Shifted**
CW/USB/LSB/FSK	20 Hz 9.6 kHz per turn	50 Hz 24 kHz per turn
AM/FM	100 Hz 49 kHz per turn	200 Hz 240 kHz per turn

Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062" glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¼" x 14¾" x 14¼", 13 x 37 x 36 cm.
Net Weight: *16 lbs. 7.25 kg*



Paragon Station with Model 960 Matching Power Supply ($229), and the Mighty Titan Amplifier ($2685).



Shown actual size.

with the Paragon.

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Typical 200 watts.
RF Power Output: ALC stabilized, adjustable, 10 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1 - 1.6 MHz	1.6 - 29.999 MHz	
SSB/CW/RTTY	.5 uV	.15 uV	10 db S/N@ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

	-6 dB BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.25 kHz	1.875:1
Standard SSB	2.4 kHz	3.36 kHz	1.67:1
Opt. 1.8 kHz SSB (Model 258)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 255)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 252)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: + 16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: + 18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms, 5% distortion max.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

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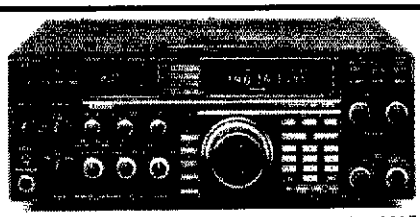
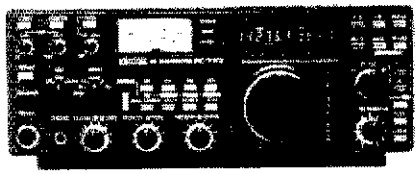
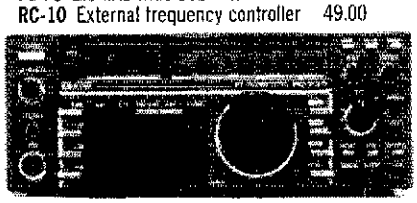


HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	**2149**
HM-36 Scanning hand microphone	47.00	
SP-20 Ext. speaker w/audio filter	149.00	**139.95**
FL-101 250 Hz 1st IF CW filter	73.50	
FL-53A 250 Hz 2nd IF CW filter	115.00	**109.95**
FL-102 6 kHz AM filter	59.00	
EX-310 Voice synthesizer	59.00	



IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	**1449**
PS-35 Internal power supply	219.00	**199.95**
FL-32A 500 Hz CW filter (1st IF)	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	**109.95**
FL-53A 250 Hz CW filter (2nd IF)	115.00	**109.95**
FL-33 AM filter	49.00	
FL-70 2.8 kHz wide SSB filter	59.00	
RC-10 External frequency controller	49.00	



IC-735 HF transceiver/SW rcvr/mic	999.00	**869.95**
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	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	**1699**
PS-15 20A external power supply	175.00	**159.95**
PS-30 Systems p/s w/cord, 6-pin plug	319.00	**289.95**
MB Mobile mount, 735/751A/761A	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal for 751A	79.00	
PP-1 Speaker/patch	179.00	**164.95**
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	**139.95**
AT-100 100W 8-band auto. antenna tuner	445.00	**389.95**
AT-500 500W 9-band auto. antenna tuner	589.00	**519.95**
AH-2 8-band tuner w/mount & whip	659.00	**589.95**
AH-2A Antenna tuner system, only	519.00	**449.95**
GC-5 World clock	91.95	**89.95**

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1235.00	**1079**
IC-275H 100W 2m FM/SSB/CW	1389.00	**1229**
IC-375A 25W 220 FM/SSB/CW	1399.00	**1249**
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	**1249**

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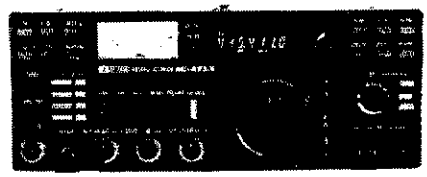
IC-475H 75W 440 FM/SSB/CW	1599.00	**1429**
IC-575A 25W 6/10m xcvr w/ps	1399.00	**1249**



IC-471A* 25W 430-450 **CLOSEOUT**	979.00	**749.95**
PS-25 Internal power supply	125.00	**114.95**
AG-1* Mast mounted preamplifier	99.50	
IC-471H* 75W 430-450 **CLOSEOUT**	1399.00	**989.95**
PS-35 Internal power supply	219.00	**199.95**
AG-35* Mast mounted preamplifier	99.75	

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Accessories common to 271A/H and 471A/H		
SM-6 Desk microphone	47.95	
EX-310 Voice synthesizer	59.00	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder intertace	33.95	
UT-15S UT-15S w/TS-32 installed	96.00	

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM **CLOSEOUT**	639.00	**549.95**
IC-490A 10W 430-440 **CLOSEOUT**	699.00	**399.95**

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	**379.95**
IC-27H Compact 45W 2m FM w/TTP mic	459.00	**399.95**
IC-37A Compact 25W 220 FM, TTP mic	499.00	**439.95**
IC-47A Compact 25W 440 FM, TTP mic	549.00	**489.95**
PS-45 Compact 8A power supply	145.00	**134.95**
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, TTP mic	469.00	**409.95**
IC-28H 45W 2m FM, TTP mic	499.00	**439.95**
IC-38A 25W 220 FM, TTP mic	489.00	**429.95**
IC-48A 25W 440-450 FM, TTP mic	509.00	**449.95**
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-900A Transceiver controller	589.00	**529.95**
UX-29A 2m 25W unit	295.00	**269.95**
UX-29H 2m 45W unit	339.00	**309.95**
UX-39A 220MHz 25W unit	349.00	**319.95**
UX-49A 440MHz 25W unit	339.00	**309.95**
UX-59A 6m 10W unit	339.00	**309.95**
IC-3200A 25W 2m/440 FM w/TTP	649.00	**579.95**
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	39.00	
AHB-32 Trunk-lip mount	35.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	
IC-1200A 10W 1.2GHz FM Mobile	699.00	**629.95**
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AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	125.00	**114.95**
EX-310 Voice synthesizer	59.00	
TV-1200 ATV interface unit	139.00	**129.95**
UT-15S CTCSS encoder/decoder	96.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1529.00	**1349**
RP-2210 220MHz 25W repeater	1499.00	**1329**
RP-3010 440MHz 10W FM repeater	1299.00	**1149**

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IC-2AT with TTP	319.00	**279.95**
IC-3AT 220 MHz, TTP	349.00	**299.95**
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IC-02AT/High Power	409.00	**349.95**
IC-03AT for 220 MHz	449.00	**389.95**
IC-04AT for 440 MHz	449.00	**389.95**
IC-u2AT with TTP	329.00	**289.95**
IC-u4AT 440 MHz, TTP	369.00	**329.95**

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IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	473.00	**419.95**
A-2 5W PEP synth. aircraft HT	499.00	**449.95**
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Accessories for all except micros	Regular
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BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8	21.25
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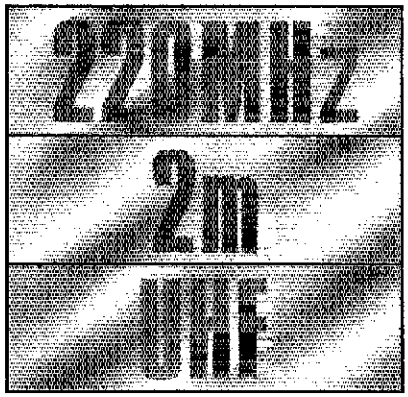

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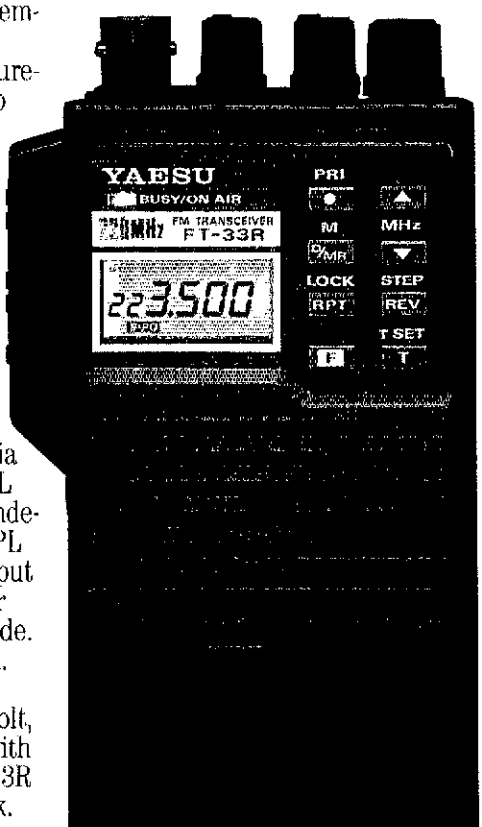

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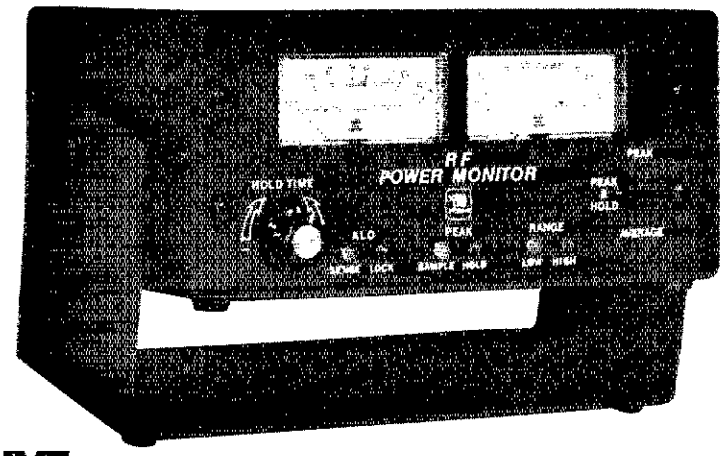

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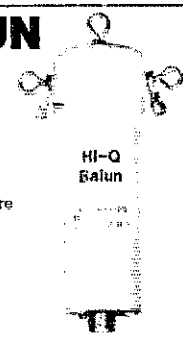

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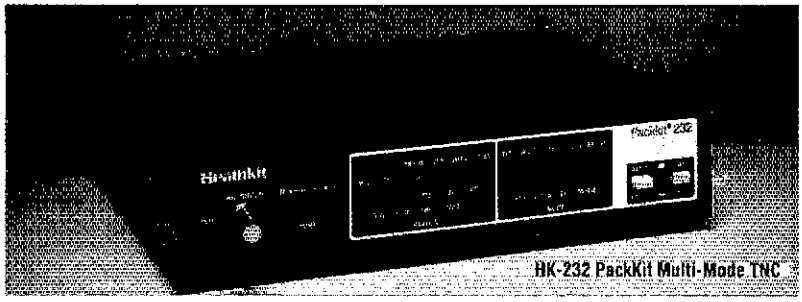

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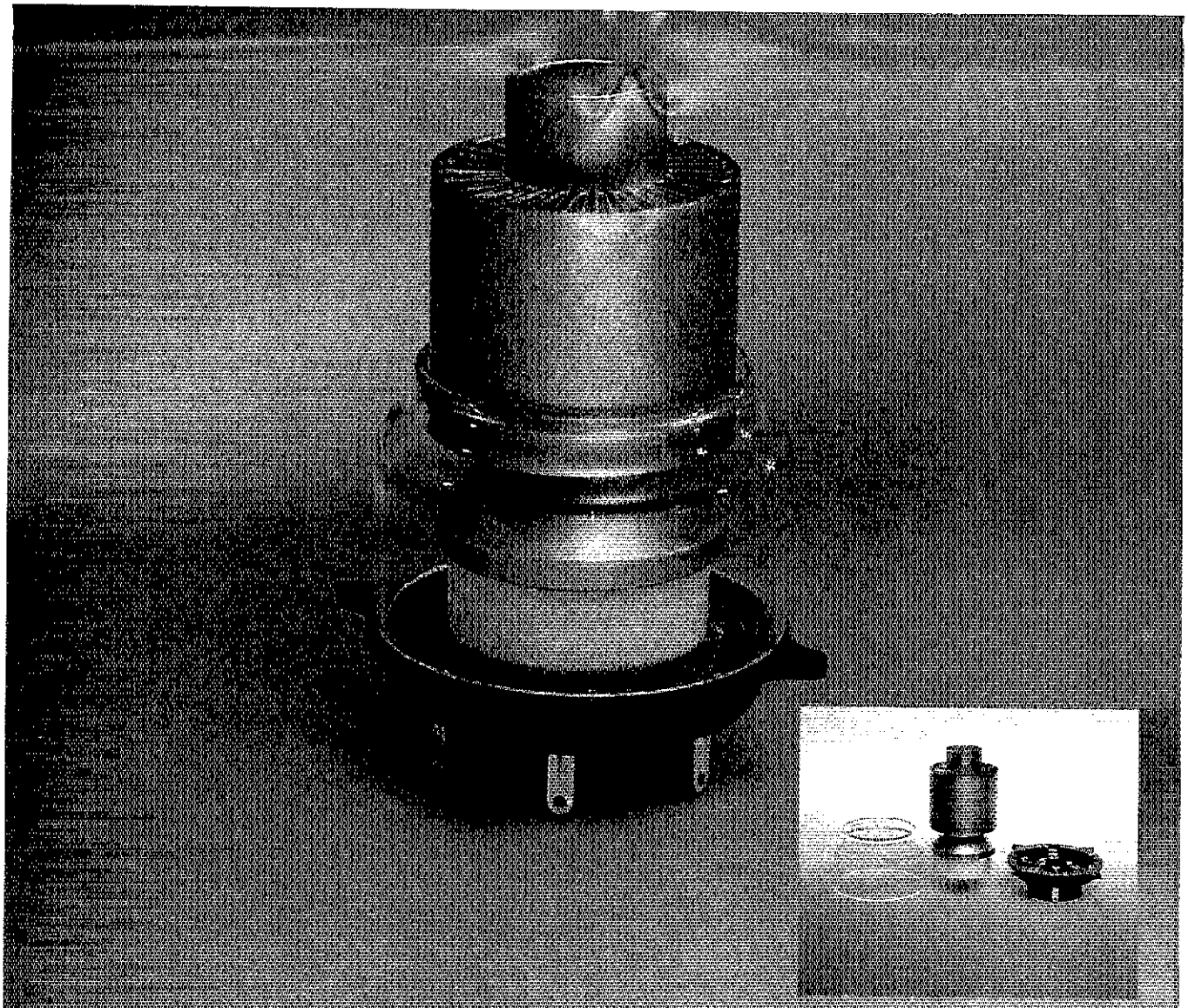

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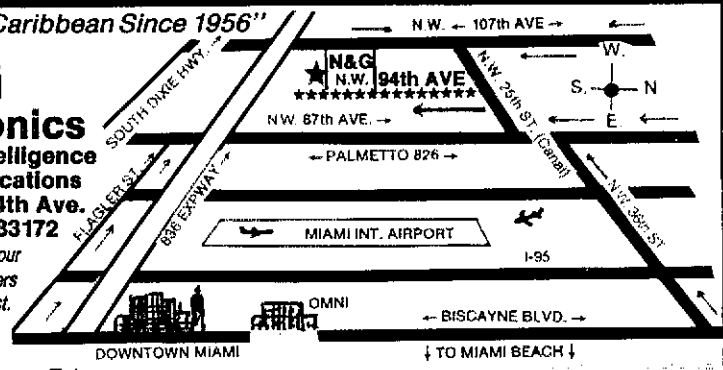

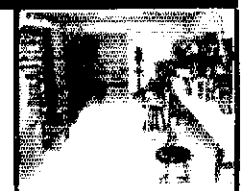

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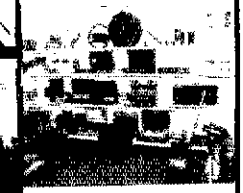

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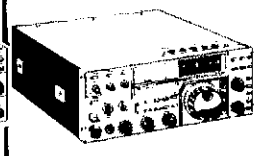

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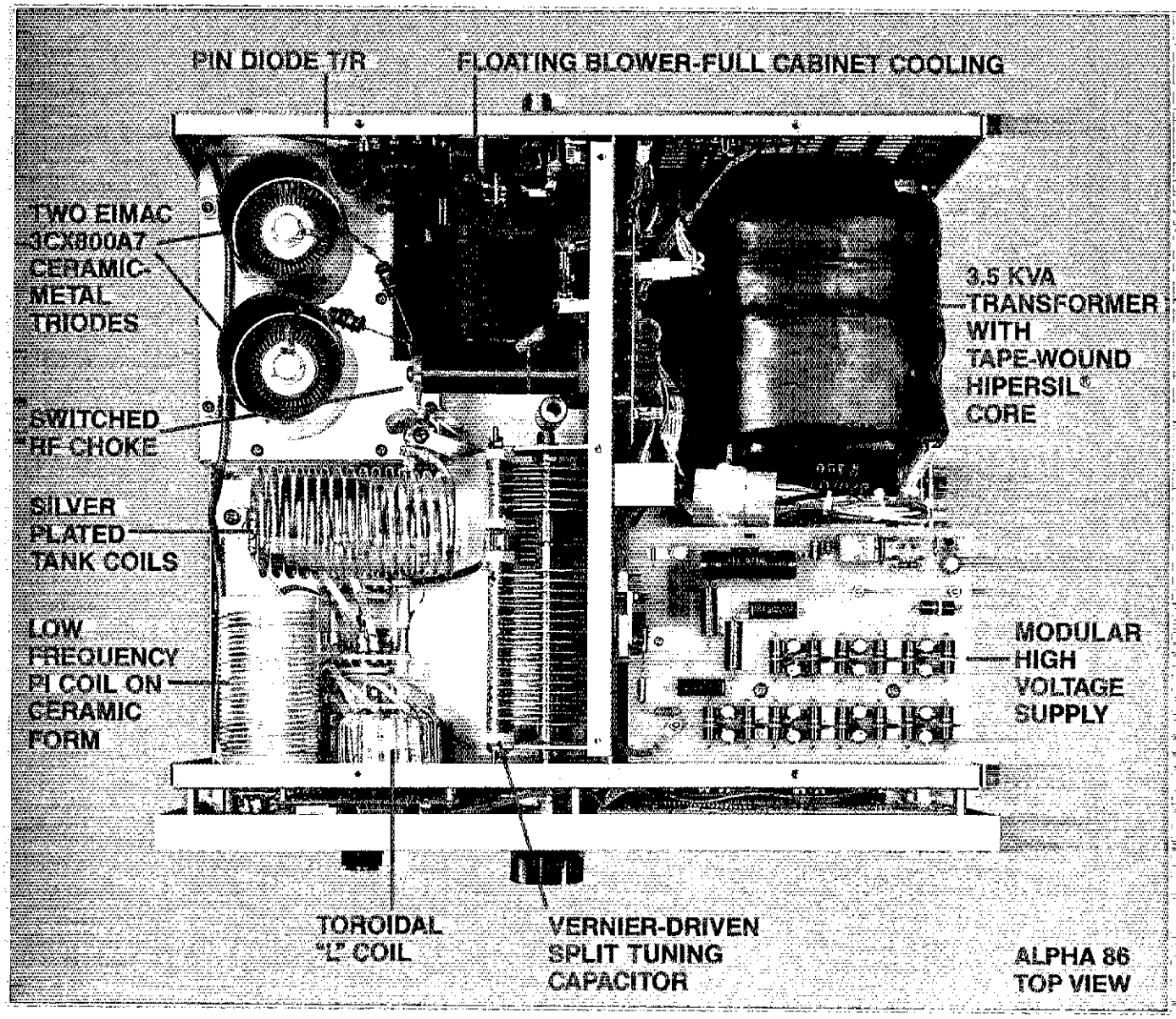

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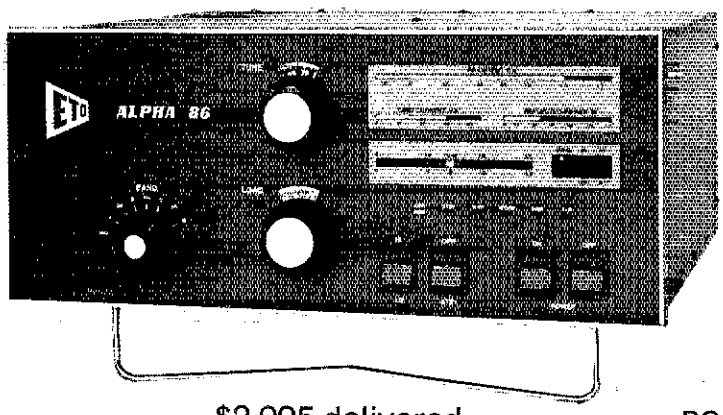

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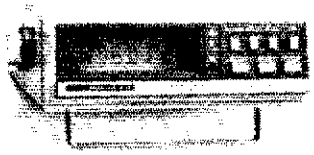

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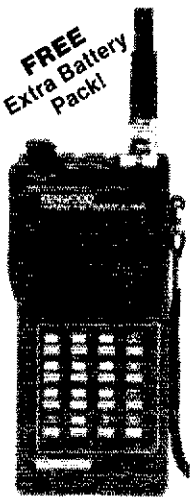

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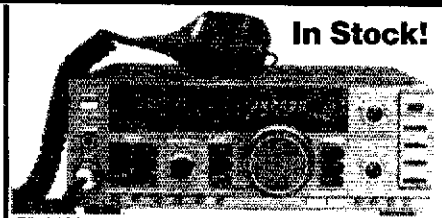

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TRAP DIPOLES

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	55'	$64.95
D-52	10/15/20/40/80	2	105'	69.95
D-56	10/15/20/40/80	6	82'	114.95
D-68	10/15/20/40/80/160	8	146'	149.95

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VS-41	10/15/20/40	1	28'	49.95
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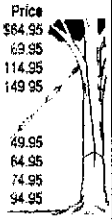
VS-53	10/15/20/40/80	3	42'	74.95
VS-64	10/15/20/40/80/160	4	73'	94.95



*Can be used without radials
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ALL TRAP ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with, Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

SINGLE BAND DIPOLES (Kit form):

Model	Band	Length	Price
D-10	10	16'	$17.95
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D-20	20	33'	19.95
D-40	40	66'	22.95
D-80	80/75	130'	25.95
D-160	160	260'	34.95

Includes assembly instructions, Deluxe center connector, 14ga Stranded CopperWeld Antenna wire and End insulators.

●Any single band, or Trap antenna with "Pro-Balun" instead of Deluxe Center Connector; Add $8.00 to antenna price.

COAX CABLE: (Includes PL-259 connector on each end)

Type	Length	With antenna purchase	Separately
RG-58	50'	$8.00	$11.95
RG-58	90'	12.00	16.95
RG-8	50'	20.00	25.95
RG-8	100'	33.00	39.95

ALL BAND--LIMITED SPACE ANTENNA

- Sealed, weatherproof lightweight shorteners utilize NO rust terminals
- Perfect match for your Antenna Tuner with balanced line output
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- Works with all transmitters, transceivers, receivers, etc.
- Completely Factory assembled—Ready to Install— NO adjustments necessary
- INCLUDES 100 feet of 450Ω Feedline
- Feedline can be shortened
- Only 70 feet overall length!
- Works ALL Bands 160 thru 10 Meters
- Perfect for ALL classes of Amateurs
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- Shorteners provide full 135 feet electrical length; with only 70 feet physical length
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Model AS-2 **$49.95** (U.S. Postpaid)

DELUXE CENTER CONNECTOR

- NO RUST Brass Terminals
- NO Jumper Wires Used
- NO Soldering
- Built-In Lightning Arrestor
- With SO-239 Receptacle
- Handles Full Power
- Completely Sealed & Weatherproof
- Easy Element Adjustments
- Commercial Quality

CE-1 $8.95

"PRO-BALUN" PB-1 $17.95

- 1:1 For Dipoles, Beams & Slopers
- Handles Full legal power
- Broadband 3 to 35 Mhz.
- Lightweight, Sealed & Weatherproof
- Deluxe connectors require NO soldering
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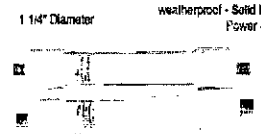
Completely Sealed & weatherproof - Solid brass terminals - Handles Full Power - NO jumpers - NO Soldering. Instructions included. For 4-band Dipole Ant. 40/20/15/10 $36.00/pr. For 5-band Dipole Ant. 80/40/20/15/10 $38.00/pr.

1 1/4" Diameter



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	FT-101ZD/107/901 2 1 1 8k 8 98/5	$ 60	30%
	FT-980/726 CW (500Hz) 455	$ 75	25%
	FT-200 (Tempo I) CW (500Hz) 9M	$ 60	25%
	FT-301/7 (250Hz 2 1, 2 4kHz) 9M	$ 60	25%
	FT-560-401 SSB (1 8/2 4kHz) 3.18	$ 70	33%
ICOM	IC-740/745/750 CW (500Hz) 455	$ 85	20%
KENWD	TS520 (250Hz/1 8/2 1kHz) 3 395	$ 60	30%
	TS830 (only) CW (400Hz) .4557	$110	30%
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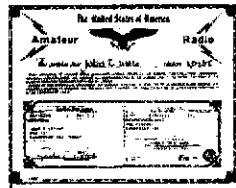

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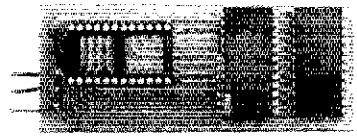

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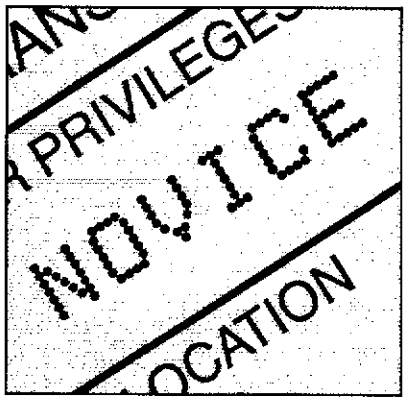

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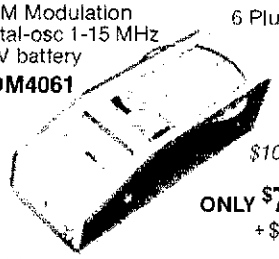

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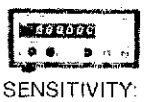

- 10 Hz to 150 MHz.
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- Gate 1s & 6 sec.
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$169.95 Value **ONLY $129.95** + $4 UPS
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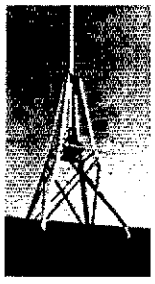
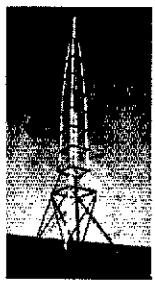
ROOF TOWERS



CR-18

CR-30



CR-45

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CR-30	9'10"	27 @ 90 MPH	39"	1,322	33	
CR-45	14'9"	23 @ 90 MPH	39"	881	57	
#303	Thrust Bearing For CR-18, CR-30 and CR-45 Maximum Acceptable Mast Diameter 2"*					

*GUYING IS REQUIRED ON ALL ROOF TOWERS.

ROHN

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435-18C	70cm satellite	
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V2S	2mt omni-direct	
V4	70cm omni-direct	
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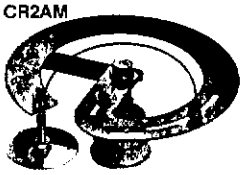
M5	5' mast	5.95
CS3G	3-way switch	26.95
LAC2	Blitz Bug	7.50
4UU	4' jumper	8.95

UNTENNA

CR2AM



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CR4A	140MHz Mag MT	34.00
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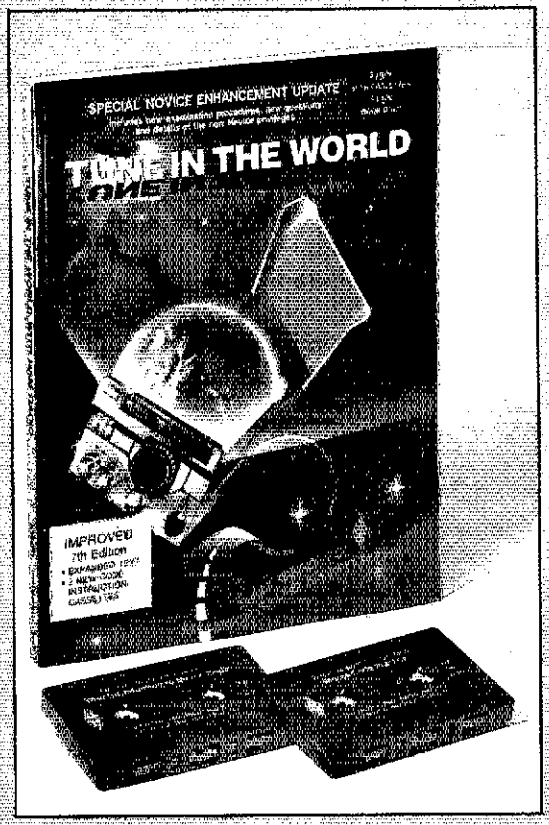

Imagine being able to personally communicate with an astronaut as the Space Shuttle circles the globe. Perhaps you would like to become a friend over the airwaves with someone on a remote island in the South Pacific or on an ice-flow in the Arctic. There are hams everywhere!

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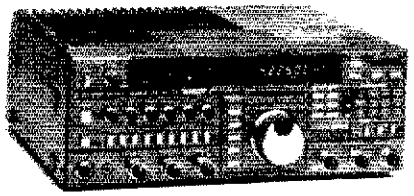

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430/767 430-440 module	219.95
440/767 440-450 module	219.95
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FT-70G* MANPACK HF xcvr (*Special Order)	1069.95
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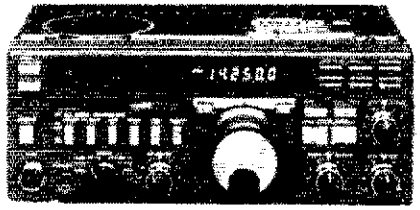
FC-70M* Manual antenna tuner	199.95
FC-70P* Preset antenna tuner	199.95
RSL-70* Whip antenna for FC-70P	27.95
MH-17* Speaker/microphone	31.95
YA-70* Tripod antenna	269.95
YH-70* Telephone-type handset	59.95



FT-757GX MkII 9-band Xcvr/SW Rcvr/mic	$1079.95
FP-757HD Heavy duty supply with fan	249.95
FP-757GX Compact power supply	235.00
FRB-757 External relay box	10.00
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MMB-20 Mobile mount	25.95
FIF-65A Interface; Apple IIe	59.95
FIF-232C for VIC-20/TI/most RS-232	79.95
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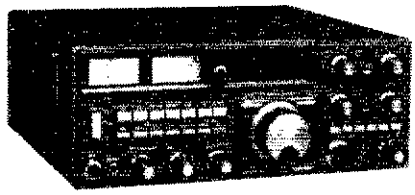

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FT-2311R 10w 1.2GHz FM w/autodialer mic	559.95
FT-290R MKII 25w 2m FM/SSB xcvr	579.95
FT-690R MKII 10w 6m FM/SSB xcvr	569.95
FBA-8 Holder for C-cell Nicads	26.95
NC-26B Wall Charger for FBA-8	16.95
CSC-19 Soft case	10.00
MH-10F Speaker/Microphone	27.95
MH-10E Hand Microphone	21.95
FTS-7 Encoder/decoder	49.95
FT-2700RH 25w 2m/440 FM w/TTP mic	599.95
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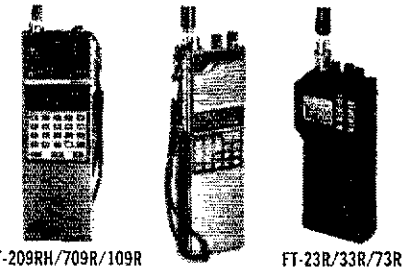

FT-209RH/709R/109R FT-727R FT-23R/33R/73R

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FRV-8800 118-174 MHz VHF converter	129.95
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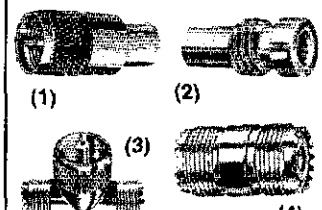

Fig.	Description	Cat. No.	Only
1	PL-259 Plug	278-205	2/1.99
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	Reducer for RG58	278-206	2/.99
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Complete Novice License Exam Package

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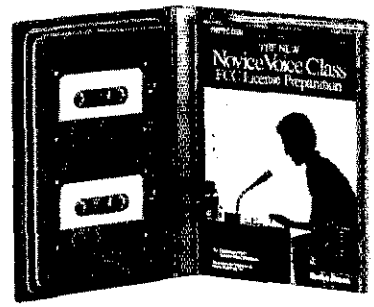
Everything You Need to Prepare for the New Voice Class FCC Exam



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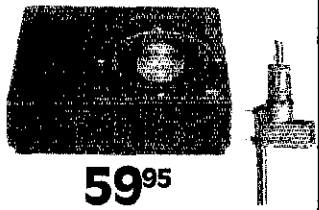

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3-Conductor Rotator Cable. 100 feet. #15-1150, **7.95**

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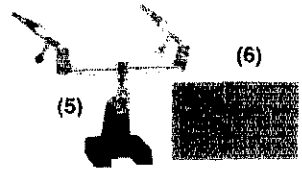

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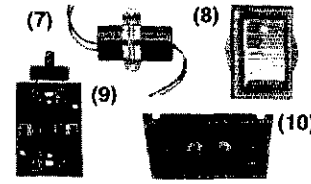

(7) Deluxe 10-Amp Filter. Two L-C sections. #270-051 . . . . . **12.95**

(8) SPST Rocker Switch. Rated 6A at 125 VAC. #275-690 . . . . . **1.89**

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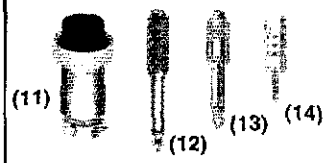
Audio Hookup Values



(11) 8-Pin Mike Plug. Fits most popular transceivers. #274-025 . . . **2.19**

(12) Headphone Adapter. 1/8" stereo plug to 1/4" mono jack. #274-348 . . . . . **1.89**

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(14) HT Speaker Adapter. 1/8" stereo plug to 3/32" mono jack. #274-381 . . . . . **1.79**

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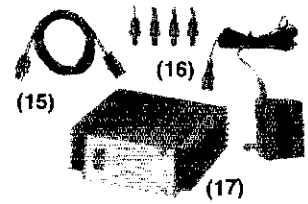

(15) AC-to-CEE Power Cord. UL listed AC. #278-1257 . . . . . **3.99**

(16) 120 VAC to 12 VDC Adapter w/ Plugs. 500 mA. UL listed. #273-1652 . . . . . **10.95**

(17) Regulated 2.5A 13.8 VDC Power Supply. UL listed AC. #22-120 . . . . . **39.95**

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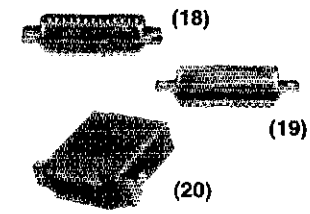

Fig.	Type	Pos.	Cat. No.	Only
18	D-Sub Male	25	276-1547	1.99
19	D-Sub Female	25	276-1548	2.99
20	Hood for Above		276-1549	1.99
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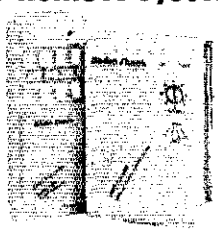

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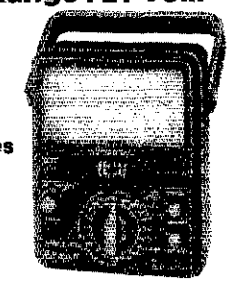

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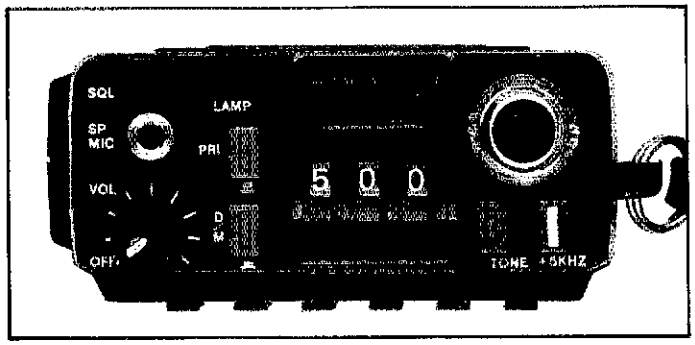

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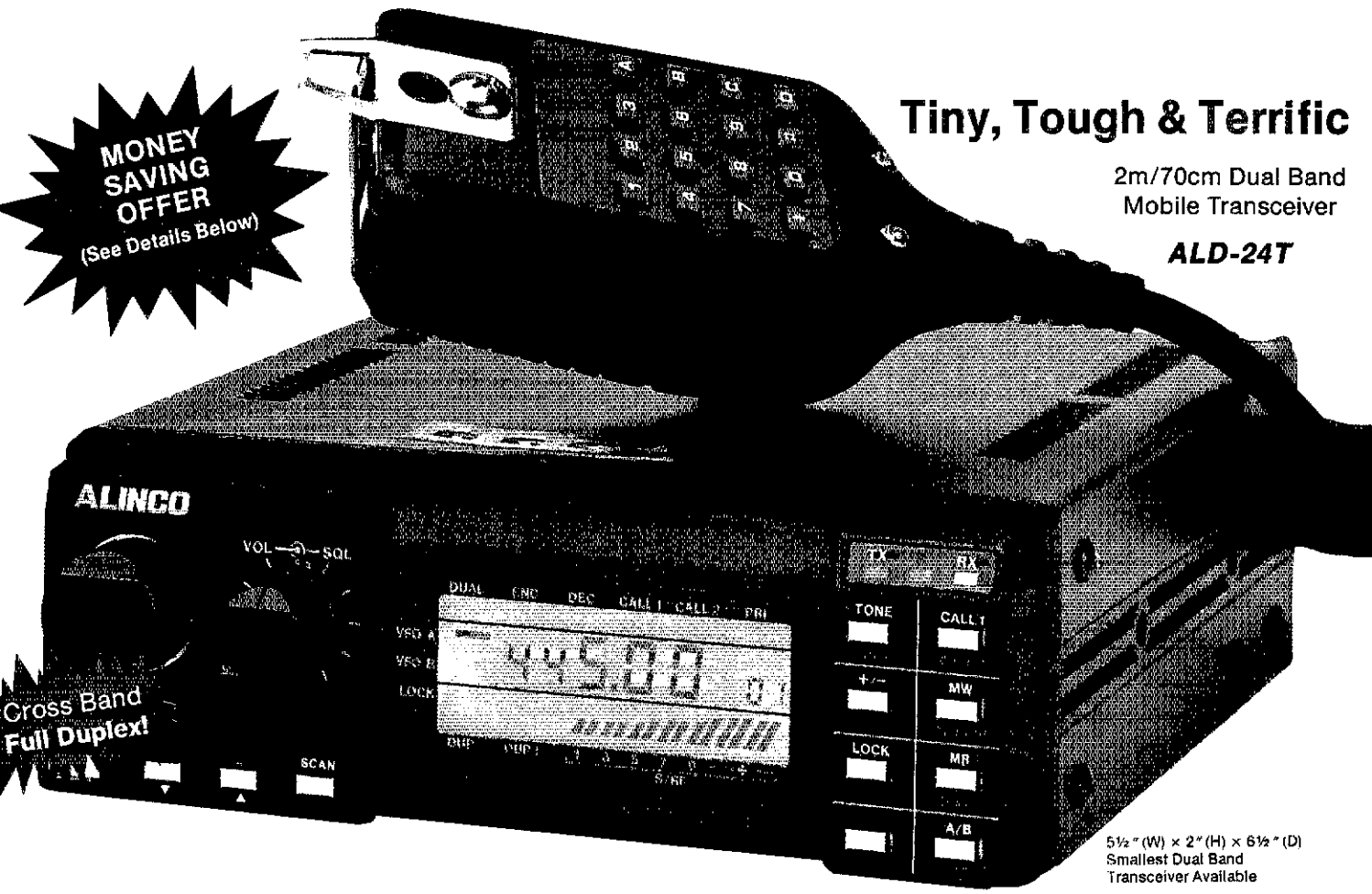

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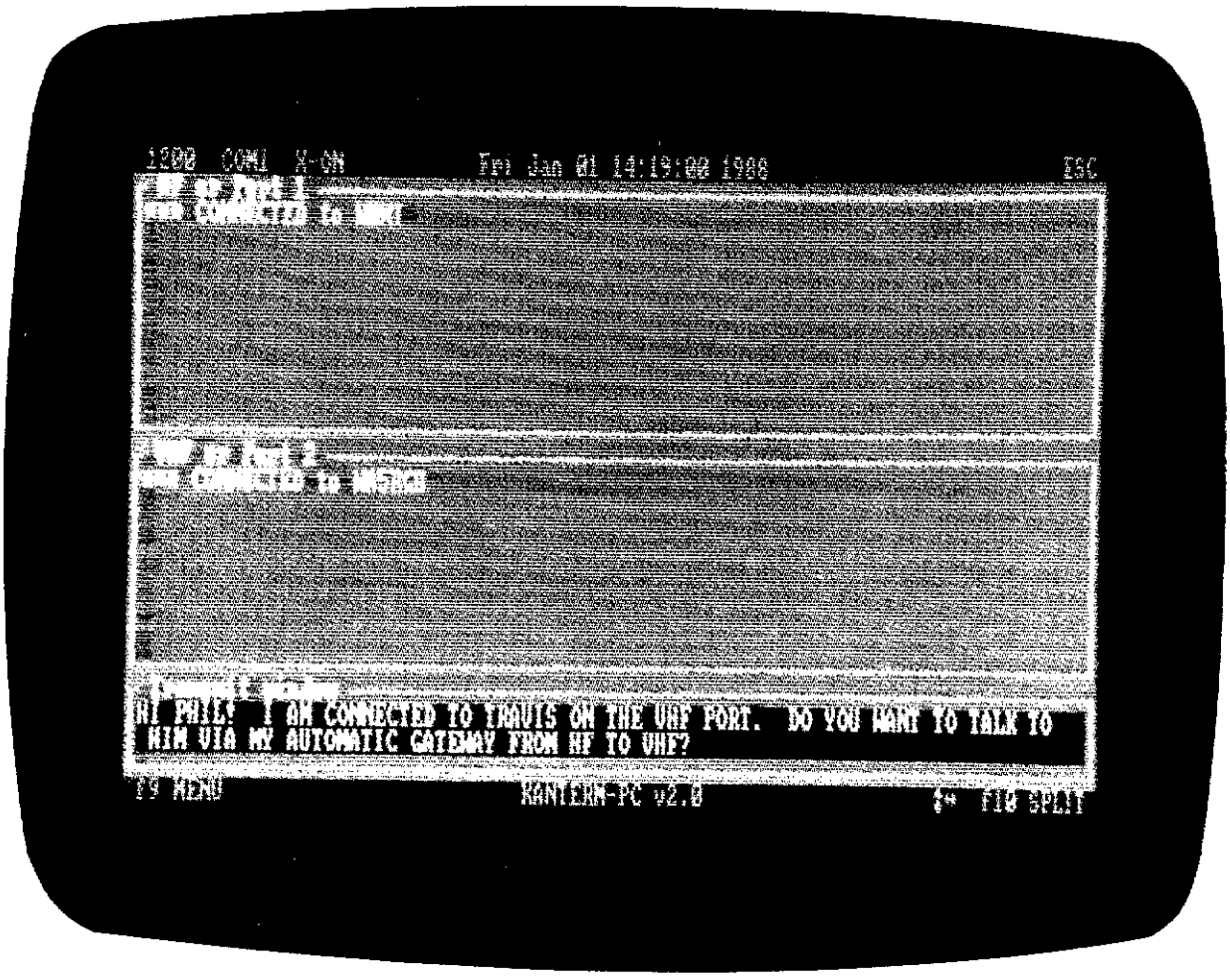

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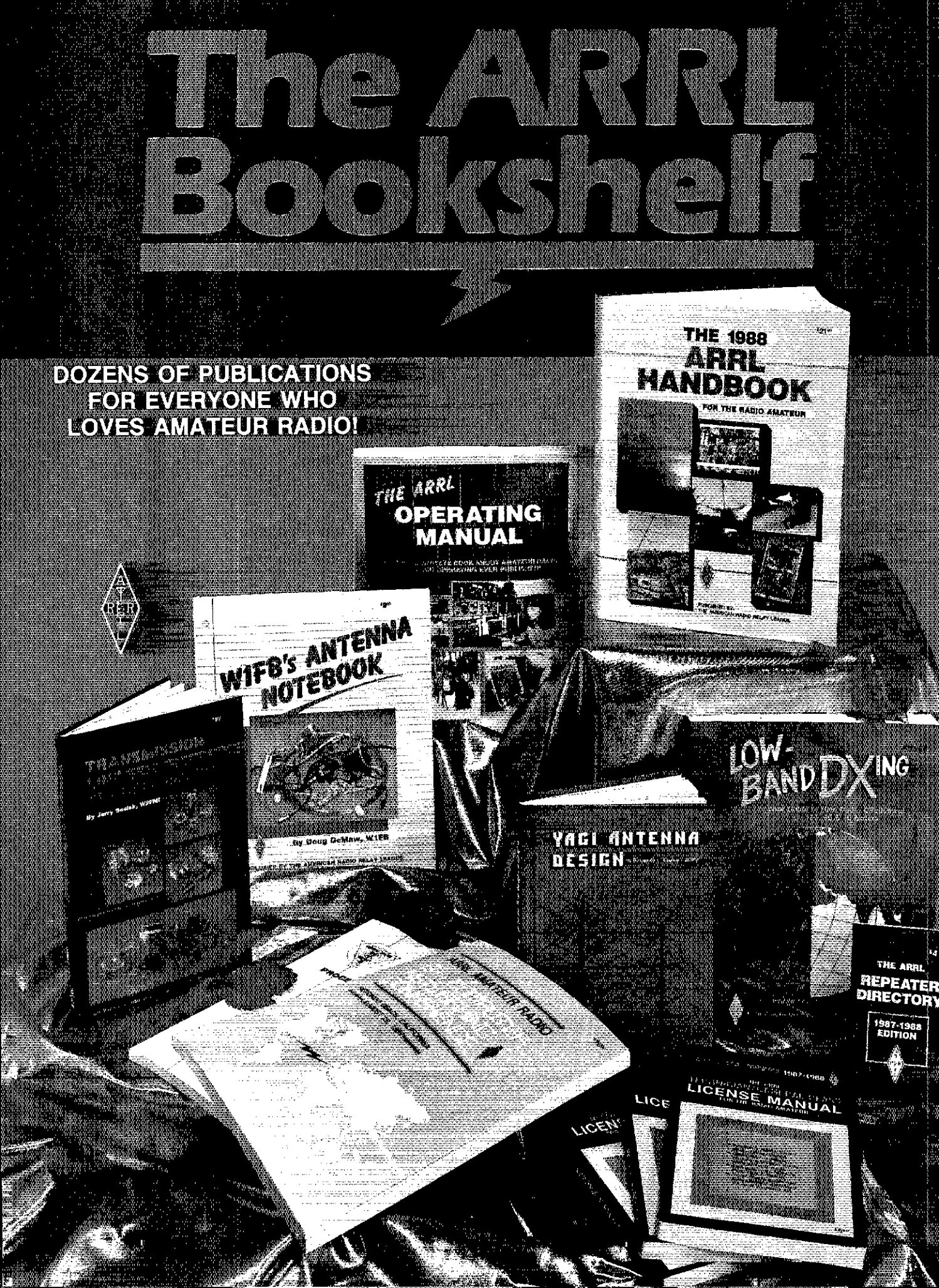

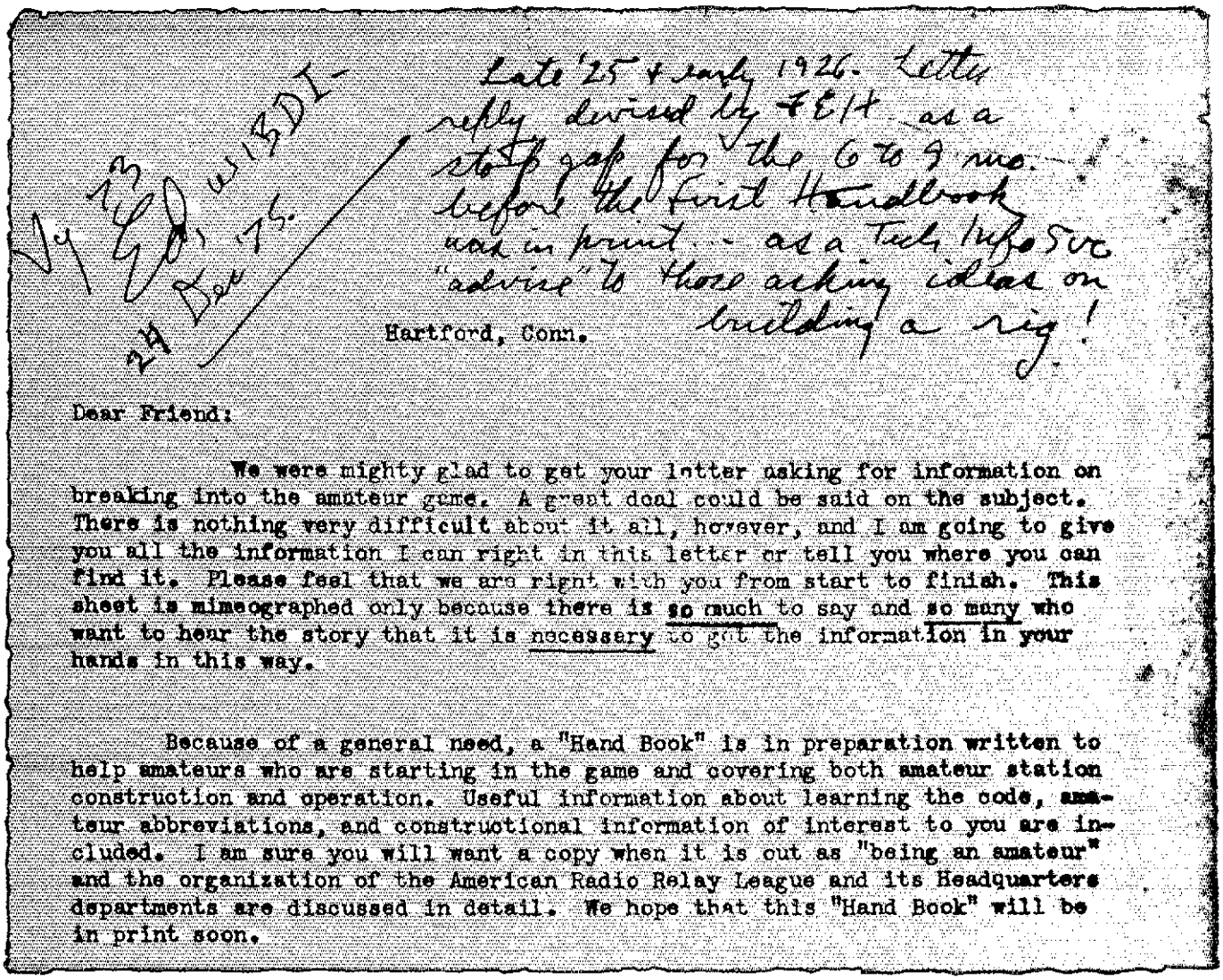

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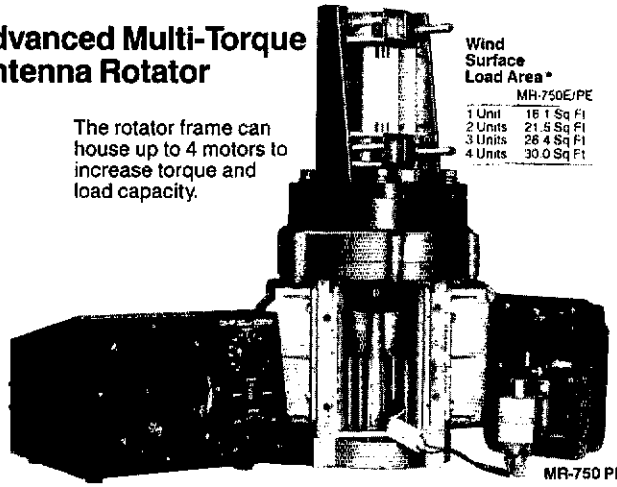
Advanced Multi-Torque Antenna Rotator

The rotator frame can house up to 4 motors to increase torque and load capacity.



MR-750 PE

Wind Surface Load Area*

MR-750E/PE	
1 Unit	16.1 Sq Ft
2 Units	21.5 Sq Ft
3 Units	26.4 Sq Ft
4 Units	30.0 Sq Ft

Each motor is equipped with a Super Wedge and Clutch brake system (Slip clutch type) that works independently from the main frame gear train and protects the rotator mechanism from excessive torque.

Low voltage (24VAC) motors...low-cost 6-wire control cable...can be installed on the same base as a TEXEX unit.

Specifications

■ Rotator Unit

		MR-750E/PE
Rotation time	60 Hz	58 seconds (60 Hz input)
	50 Hz	70 seconds (50 Hz input)
Output torque Brake power*	1 motor	610 inch/lbs 5,200 inch/lbs
	2 motor	1,200 inch/lbs 9,600 inch/lbs
	3 motor	1,800 inch/lbs 13,900 inch/lbs
	4 motor	2,400 inch/lbs 18,300 inch/lbs
Rotation angle		375 degrees
Permissible mast size		1½ - 2½ inch (38 - 63 mm) < diameter >
Control cable		6-wire cable 0.5sq—1.25sq (AWG16/18/20 etc.)
Continuous operation		5 minutes Max. permissible
Dimensions		15.6" H x 8.43" W x 8.43" D (397 mm x 214 mm x 214 mm)
Unit weight		16.5 lbs (7.5 kg) < with 1 motor unit fitted >

■ Controller Units

Models	CR-4 (for MR-750E)	CR-4P (for MR-750PE)
Operation	Manual	Manual/Pre-set
Power source	117 V AC (50/60 Hz)	
Power consumption	200 W (with 4 drive motors)	
Operating voltage	24 V AC	
Dimensions	4.9" x 7.1" W x 6.9" D (125 mm x 180 mm x 175 mm)	
Weight	9 lbs (4 kg)	

* When estimating your antenna load and rotator torque and brake power requirements, include a 25--50% safety factor.

COAXIAL SWITCHES

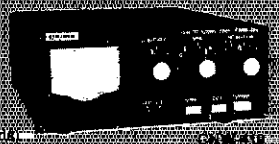
	CS-201	CS-201G	CS-401	CS-401G	CS-4
	2position	2position	4position	4position	4position
Frequency	500 MHz	1300 MHz	500 MHz	1300 MHz	1300 MHz
Connectors	SO-239	N type	SO-239	N type	BNC type
Watts	500 W				
Insertion Loss	Less than 0.2dB				

POWER SUPPLIES

PS-210M

Model	Watt(cont.)	Variable Output VDC
PS-210M	8 AMPS	9-15
PS-120V	12A/18A	9-15
PS-230V	20A/30A	9-15

ANTENNA TUNERS

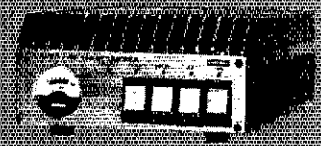


CNW-419

	CNW-419
Frequency	3.5-30 MHz/117-54 MHz
Power	200 W
Connectors	SO-239
Matching	50Ω (CW)/8.3-30 MHz 50Ω (CW)/1.8-3.5 MHz
Output impedance	10-200 ohm

POWER AMPLIFIERS

One-Amp Gain (16dB)



LA-2155H

	LA-2035R	LA-2045R	LA-2080R	LA-2155H
Input Power	0.5-3W	0.5-4W	0.5-8W	1-20W
Output Power	40W	70W	80W	150W

DK-210

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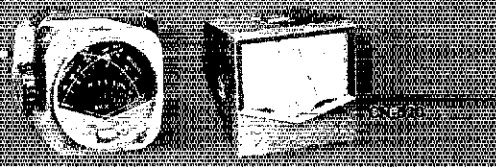
Solid-state — full-wave bridge

Cross Needle SWR/Power Meters for All Bands

NS-660A

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-720B	1.8-150 MHz	20/200 W/2 KW	SO-239
NS-660A/PA*	1.8-170 MHz	30/300 W/3 KW	SO-239
NS-660A/PA**	140-525 MHz	3/30/300 W	SO-239/N type
NS-666	800-3000 MHz	1/5/25/50 W	N type
NS-668	1200-2500 MHz	0.5/5/50 W	N type

*Built in with remote sensors available. NS-660A/PA Peak Power Reading NS-663A(N) type connector



CN-480M

MOBILE/BASE CROSS NEEDLE SWR/POWER METERS

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-410M*	144-148 MHz	15/150 W	SO-239
CN-480M*	140-450 MHz	15/150 W	SO-239
CN-485M*	140-450 MHz	15/150 W	SO-239
CN-520M**	1.8-60 MHz	200 W/2 KW	SO-239

*Back in with mobile bracket
**Optional mobile bracket available

ACCESSORY ITEMS

Model RX-100DX Preamplifier, 144-148 MHz/15 dB Gain/300 W Max.

Model CP-10 Heavy Duty Cigarette Lighter Plug

Model SP-100 5W Monitor Speaker

SP-100

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HAM LAB Project. Want several pieces HP G-382A variable attenuator. Will consider any repairable condition. K6GOX, P.O. Box 10, O'Neals, CA 93645, 209-868-3548 collect.

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AYN RAND Net sked to discuss ideas presented in her novels "The Fountainhead" and "Atlas Shrugged". Send address to K1UKQ, RR 4, Box 119, Scituate, RI 02857.

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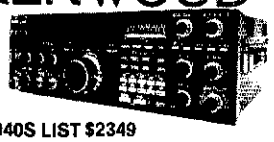

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TM 221A (45W)	LIST $419

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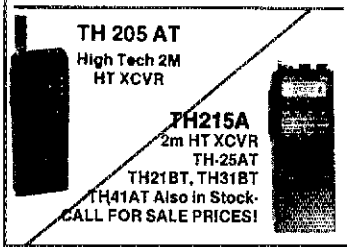

TH 205 AT
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TH41AT Also in Stock-
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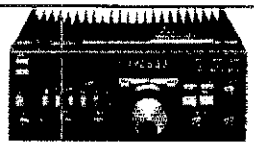

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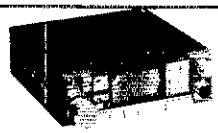

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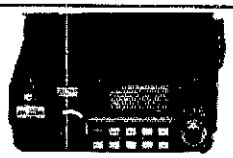

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Model	'Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
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960 Power Supply	$219.95
229 2KW Tuner	$319.95
425 Titan Amplifier	$2,299.95

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Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$289
B23A	2M	Yes	2W	30W	$129
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$269
B3016	2M	Yes	30W	160W	$229
D1010N	440	No	10W	100W	$319

rfconcepts

rfc 2-317 2M
30W In = 170W out
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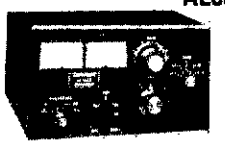
Model	Band	In-Out	List Price
2-23	2M	2-30W	$112.00
2-217	2M	2-170W	$299.00
2-117	2M	10-170W	$299.00
3-22	220	2-20W	$112.00
3-211	220	2-110W	$299.00
3-312	220	30-120W	$264.00

Call For Sale Prices

AMERITRON AL80A



AL80A	$985.00	ATR10	$325.00
AL84	479.00	ATR15	380.00
AL1200	1825.00	RCS4	134.50
AL1500	2370.00	RCS8V	134.50

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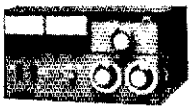
AMP SUPPLY



Model	List	Model	List
LK-450	$899	LA 1000 NT	$ 579
LK500ZC	$1395	LK 500 NT	$1595
LK 800 A	$2695	LK 800 NT	$2995
LK550	$1895	AT 3000	$ 499

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PK-232 Packet Controller.....$299.95
144 MHz Isopole.....$49.95
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ELH-230G	CALL	ALR-22T	CALL
ELH-230D		ALR-22HT	
ELH-260D		ALR-72T	
		ALD-24T	

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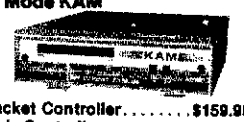
$289.95



KPC II Packet Controller.....$159.95
KPC 4 Node Controller.....$299.95
UTU-XT/P Terminal.....$269.95

MFJ

1270B/1274 TNC Units	$129.95/159.95
1224/1229 Interface	$89.95/$159.95
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DENTRON 1000B - Linear Amplifier, Manual, used 3-years. Works great. Warranty. $300. Converted Swan 500CX to 700CX. Manual, Warranty. $300. Visa/MC. WA3RGH, evenings 703-471-5444.

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CODE Programs. Apple/C64-128. 37 Modes, Graphics, Lessons, Wrdprcsr, 1-100 WPM, etc. Laresco, POB 2018-QS, Calumet City, IL 60409, 1-312-891-3279.

FOR SALE: Henry 2-K, KWS-1, Jennings Variable Vacuums, 52 and 75 Ohm Non-Inductive Resistors, Filter Capacitors, Linear Parts. Send one dollar for a 20 page list. Bill, KA7VJO, P.O. Box 2030, Upland, CA 91785, 714-986-3515.

WANTED: Western Electric Tubes, Amps, Speakers, Caps, etc. Andy Bouwman, 616-454-3467 after 5 PM.

SOLDERING Station and Tools, European and American. Free catalog. Robert Mink Import-Export, Box 6437Q, Fair Haven, NJ 07704, 201-758-8388.

DRAKE RV75 $250; Hal DS2000 $200; MR2000 $100; DS2050 $300; WA8CZS, 1-614-452-7971.

QUALITY Test Equipment, General Radio, Hewlett-Packard, Tektronics, others, send SASE for list. Ritch, 2810 Camino Iturbide, Green Valley, AZ 85614, 602-648-0163.

FL QTH with antenna farm 3/2 1650 sq. ft. exc. condition. W4AFS, Pompano Beach, FL, 305-782-4898.

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WANTED: Cushcraft R-3 Vertical Antenna. W2GVK, 9 Rothwell Drive, Cranbury, NJ 08512.

WANTED: Metron MA1000B linear amplifier with 10 meter conversion. Carl Vincent, KA5MXX, 2317 Rio Grande, Orange, TX 77630, 409-886-3243.

8875 Tubes needed. Advise condition and price. Bill, KDØHG, Box 1456, Lyons, CO 80540.

COMMERCIAL Linear Amplifier, continuous coverage 2.0 thru 32 MHz. Gates Radio HFL-1000 requires one (1) watt drive of SSB, CW or FSK for 1500 watts output. Checked-out ready to operate six units available. Price $3500. Export inquiries invited. J.S. Betts, 1231 Harbor Town Circle, Melbourne, FL 32940, 305-259-0512.

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IC-751A Gen. Cvg. Xcvr	1649.00	Call $
IC-575A 10m/6m Xcvr	1399.00	Call $
Receivers		
IC-R7000 25-1300 + MHz Rcvr	1099.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	949.00	Call $
VHF		
IC-275A All Mode Base w/PS	1199.00	Call $
IC-275H All Mode Base 100w	1389.00	Call $
IC-27A FM Mobile 25w	429.00	Call $
IC-27H FM Mobile 45w	459.00	Call $
IC-28A FM Mobile 25w	429.00	Call $
IC-28H FM Mobile 45w	459.00	Call $
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IC-02AT FM HT	399.00	Call $
IC-μ2AT Micro HT	329.00	Call $
IC-900 Six Band Mobile	589.00	Call $
UHF		
IC-475A All Mode 25w	1399.00	Call $
IC-47A FM Mobile 25w	549.00	Call $
IC-48A FM Mobile 25w	459.00	Call $
IC-4AT FM HT	339.00	Call $
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IC-μ4AT 440 FM HT	369.00	Call $
IC-3200A FM 2m/70cm 25w	599.00	Call $
220 MHZ		
IC-375A All-Mode, 25w, Base Sta.	1399.00	Call $
IC-38A 25w FM Xcvr	459.00	Call $
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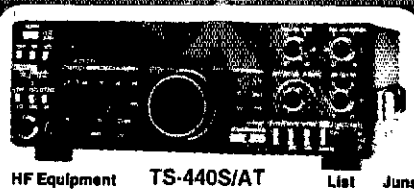

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TS-940S Gen. Cvg Xcvr	2119.95	Call $
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TS-430S Gen. Cvg Xcvr	899.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1299.95	Call $
TS-440S Gen. Cvg Xcvr	1099.95	Call $
TS-140S Compact, Gen. Cvg Xcvr	899.95	Call $
TS-680S HF Plus 6m Xcvr	999.95	Call $
TL-922A HF Amp	1599.95	Call $
Receivers		
R-5000 100 kHz-30 MHz	949.95	Call $
R-2000 150 kHz-30 MHz	699.95	Call $
VHF		
TS-711A All Mode Base 25w	999.95	Call $
TR-751A All Mode Mobile 25w	629.95	Call $
TM-221A Compact FM 45w	419.95	Call $
TM-2530A FM Mobile 25w	459.95	Call $
TM-2550A FM Mobile 45w	489.95	Call $
TM-2570A FM Mobile 70w	589.95	Call $
TH21-BT FM, HT	279.95	Call $
TH-205 AT, NEW 2m HT	279.95	Call $
TH-215A, 2m HT Has It All	359.95	Call $
TH-25AT 5w Pocket HT NEW	329.95	Call $
UHF		
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TR-851A 25w SSB/FM	729.95	Call $
TM-421A Compact FM 35w	439.95	Call $
TH-415A 2.5w 440 HT	379.95	Call $
TH-41BT FM, HT	299.95	Call $
TH-45AT 5w Pocket HT NEW	349.95	Call $
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TR-50 1w 1.2GHz FM	599.95	Call $
220 MHZ		
TM-3530A FM 220 MHz 25w	479.95	Call $
TH-31BT FM, 220 MHz HT	299.95	Call $
TM-321A Compact 25w Mobile	439.95	Call $
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FT-980 9 Band Xcvr	1795.00	Call $
FT-757 GX II Gen. Cvg Xcvr	1079.95	Call $
FT-767 4 Band New	1895.00	Call $
FL-7000 15m-160m Solid State Amp	1895.00	Call $
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FRG-8800 150 kHz - 30 MHz	699.95	Call $
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FT-290R All Mode Portable	579.95	Call $
FT-23 R/TT Mini HT	299.95	Call $
FT-209RH FM Handheld 5w	359.95	Call $
UHF		
FT-711RH FM Mobile 35w	479.00	Call $
FT-770RH FM Mobile 25w	479.95	Call $
FT-73 R/TT Mini HT	314.95	Call $
FT-709RH FM HT 4w	359.95	Call $
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440/726 440-450 MHz	329.95	Call $
SU-726 Sate Duplex	129.95	Call $
FT-690R MKII, 6m, All Mode, port.	569.95	Call $
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FT-2700RH FM 2m/70 cm 25w	599.95	Call $
FT-727R 2m/70 cm HT	479.95	Call $
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FT-109 RH New HT	379.95	Call $
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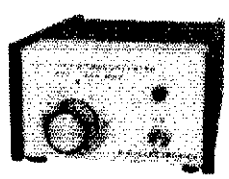

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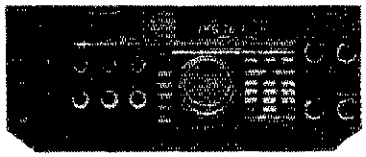

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Minimum order $10.00. Mastercard, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. All items full factory warranty plus Madison warranty.

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PACKET Packet. Build a $25 interface and operate packet radio with your Commodore 64 or 128. Schematics and information packet $6. Free program disc. Nona M. Norman, N8CKS, 41991 Emerson Court, Elyria, OH 44035.

MOBILE Home in Tampa's best adult park. 3/2 CHA waterfront dock privileges. Includes tower, beam, rotor $17,500. W4PPI, 813-645-7681.

FOR SALE: Yaesu FT-270RH. Like new in original box, $275. Cushcraft ARX-2B 2-meter vertical, $25. Call Dave, N6FMA 314-946- 0374 evenings.

YAESU FT-102 with 2.1 kHz and 250 Hz optional filters, FV-102DM digital VFO, FC-102 antenna tuner and SP-102 matching speaker. Looks like new, must sell, son in college. $995. I will ship. WB3JMA, 301-686-4023.

YAESU FL-7000 Amplifier/Tuner, $1295. FAS-1-4R Remote Selector, $70. F.O.B. K1LEC, 802-886-8121.

TEK. 536 Dual Trace Osc., $85. Precision E310 Sine - Square Wave Generator, $45. Precision Sweep Generator, $45. 2 - Tek Typewriters, $35. Com. Terminal - Ramtec/Omron, $65. W1KOT, 203-268-9775.

COMMODORE Chips. Factory Fresh, Low, Low Prices (eg. 6510-$9.55, 6526-$9.95, 6567-$14.75, 6581-$12.85, 82S100-$12.50, 325572- $10.95, 325302-$12.95, 8721-$12.50, 8722-$14.75, 901 Series $10.95 and many others). We are an Authorized Distributor for Commodore Semiconductors .... Visa/MC .... Kasara Inc., 32 Murray Hill Drive, Spring Valley, NY 10977. 800-248-2983 (outside NY) or 914-356-3131.

KENWOOD Sale: R-820 Communications Receiver w/all filters, cables, manuals, absolutely mint, $375. TR-7930 two-meter 25W, mobile, TTP, memory, scan, U/D mike, as new, $249. Viewstar 2KW antenna tuner, roller inductor, antenna switch, wattmeter, balun, mint, $249. Bob, KD4ZN, 305-654-1156 eves.

ANTENNAS Antennas Austin VHF/UHF Tri-Banders. Yagis. HF antenna experimenters kit, books. SASE brings lists. Ed Nolt, W3FQJ, POB 75, Chalfont, PA 18914.

WANTED: Late model 220 mobile radio with PL; Yaesu FT-77. Contact WB6REO, 714-870-6024.

KENWOOD 530 SP, Ten-Tec Tuner, D104 Silver Eagle Microphone. $650. KE2BZ, 788 Columbus Avenue, N.Y.C. 10025, 212-666-2933.

WANTED: Collins KW1 Transmitter and Johnson Desk Kilowatt. Kenneth Dounar, 414-481-6104.

SELL Mint Corsair II Transceiver, 960 Power Supply, Manual $500. Plus UPS charge. W2EZM, 431 Oakland Avenue, Maple Shade, NJ 08052, 609-663-8137.

TIMEX Sinclair 1000, 2400 Printer, 1016 Expander, Power Supplies $75 + UPS. KC0ZK, 1209 Cedar Ridge Drive, St. Louis, MO, 314-878-3668.

CUSTOM Rack Mounting Adapter units in matching grey 19' panel mounting of Collins S/Line, KWM-2 and accessories. A supporting shelf holds the equipment securely. Satisfaction guaranted. Order AFS-R1 for 75S-3B-3C, 32S-3, KWM-2, 30L-1, 62S-1 OR 51S-1. Order AFS-R2 for 516F-2, 312B-4 and 312B-5. $48 ea + shipping. Romad Enterprises Inc., 4040 E. McDowell Road, Suite 101, Phoenix, AZ 85008.

WANTED: K2R W Amplifier and Power Supply (QST, Apr-May, 1972). Gerald Rose, KB4QGJ, 524 N. Quaker Lane, Alexandria, VA 22304, 703-370-1880.

KENWOOD TS830S, 2 CW filters, mint $650 you ship. N5DGS, 512-576-4951.

KENWOOD TM-2570A with tone decoder, never used, in original box $350. Yaesu FRG-9600 VHF/UHF receiver new in original box $375. Microwave Modules 1691/137.5 down-converter and preamp both new $400. Scott, 608-231-2144.

WANTED: Collins 51J4 rcvr.: set of 3 mechanical filters for 51J4. 6 KC filters for 75A-4. Hallicrafters S-35 panoramic rcvr. Sam Thompson, W6HDU, 1031 San Antonio Avenue, Alameda, CA 94501, 415-521-1429.

HENRY 2KD3 Linear desk model like new, $800 or trade for TS-930. K6KZT, 805-528-3181.

WANTED: Basic Heath station, with DX60, HR10B, and matching VFO. All in good working condition and appearance. Returning back to HF with an eager 9-year old son. Also, am looking for a basic, but decent 6-meter rig. Write or call KD8LF at 419-726-2467.

WANTED Hallicrafters Panoramic Receiver, S-35. Peter Dal Corobbo, 18650 Marshfield Avenue, Homewood, IL 60430, phone 312-799-7837 or 312-353-1318.

HF5B "Butterfly" Beam. Complete, never assembled with instructions. $145 plus shipping. WB5MHA, 11123 Holworth, Houston, TX 77072.

FOR SALE: New gov't surplus isolation transformers. Dual voltage primary 110/220 volts. Secondary is tapped at 105, 110, 115 volts. Shipping weight 17 pounds. (48 states only.) Output rating 500 VA. $12.50 plus UPS fee for 17# to: L.F.C. KB3OE, 105-A South Balt. Street, Franklintown, PA 17323.

30A/12V Regulated Supply $100. 30 ft. Rohn Tower $100. You move. Details: W1OLP, 82 Frazier Way, Marstons Mills, MA 02648.

WANTED: Measurements Corp. Model 59 Grid Dip Meter W/Coils. Call Bill, N8BKF, 313-673-6609 after 2300 UTC.

WANTED Oscillator - Multiplier Assembly for T368D/URT Transmitter. Lloyd, KA4BQO. Call Sundays 2400 UTC.

WANTED: Collins KWM-2A (AN/FRC-93) complete less 30-L1 linear. Need rack & mobile mounts, VHF converters, manuals, shipping cases, xtals, all accessories. Will pick up or pay for shipping. Must be complete & good condx. Prices to RM Inc., Box 5502, Arlington, VA 22205-0002.

FOR SALE: Packet Radio, MFJ-1274 (new) $135, Tennatest Noise Bridge (new) $39, Electronic Cordless Mic $24, 10 mtr FM Transceiver (synthesized) Mobile or Base $69 with Mic, Cushcraft A 147-11 11el. 2 mtr. Beam $39. K1JVJ.

COMPLETE Heathkit Microprocessor Course ET3400A, unmarked; trainer assembled. $304 new, $95. Ned, W1RAN, 203-447-1255, 5 PM.

WANTED: Equipment and Related Items. The Radio Club of Junior High School 22 NYC, Inc. is a non-profit organization, granted 501(c)(3) status by the IRS, incorporated under the laws of the State of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your property donation would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Please contact WB2JKJ using the callbook or telephone 516-674-4072, 24 hours, seven days a week. Thank you!

NEW Receiving Tubes - Half Price. Send any advertisement, brochure, etc; circle tubes wanted; if I have, price is 1/2; all SASE's answered. Bob, 65 Aleta, Rochester, NY 14623.

WANTED: Kenwood TR2500. WA6AIZ, 805-259-3485.

FOR SALE: Heathkit HD-1410 Electronic Keyer. Minibeam HQ-1 complete with installation parts. Philmore FS-45 SWR and F/S Bridge. All new. Best reasonable offer takes all. H. Weintraub, 414 Benedict Avenue, Tarrytown, NY 10591, 914-631-9421.

WANTED: Heathkit QRP Transceiver. WA9APW, 922 Monticello Drive, Naperville, IL 60540.

REPLACE Rusted Metric Screws and Bolts with Stainless Steel. Small Quantities, Free Catalog. Elwick, Dept. 668-M, 230 Woods Lane, Somerdale, NJ 08083.

WANTED: Azden PCS 2800 10 meter FM in good condition. KA4AIY, 4750 S. Arlington Blvd., Arlington, VA 22204.

CLEANING House - Transmitting & Receiving Variable Condensers, Plate & Filament Transformers, B & W Coils & Assemblies, New & Old Tubes. Sockets & Many other items since the early days of radio. R.W. Parkinson, W3QJ, 1415 Main Street #77, Dunedin, FL 34698, Tel. 813-734-4626.

DRAKE: TR-4, AC-4 with MS-4 Speaker xlnt condx. $300. Prepaid U.S. W6KMB, T. Cole, 4143 W. Kelley, Fresno, CA 93722.

WANTED: Hallicrafters PM-23 Speaker, 1987 Callbook, K5TVC.

INTEGRATED Circuits Data Books For Sale. Business size SASE, seven page list. C. Frazier, Box 972, Windermere, FL 32786.

WANTED Inexpensive QRP Transceiver Argonaut, HW-9, HW-8, or similar. KB7Y, 801-225-6685.

220 HAND-HELD Transceiver. Kenwood TH-31AT; like new. With extra PB21 battery pack, soft case and PL board. Also includes two homebrew DC-DC adapters; one for the car and one for 12 Vdc power supply, $225. Bruce Hale, KB1MW, 203-666-1541 extension 279 Mon- Fri 8-4 EST.

CLEANING Out Shack. Yaesu FT-2700RH 25w 2m/440 FM w/TTP, never mobile, mint $430. Sony 2010 $290, Regency Scanner HX2200 Air, VHF, UHF and Cellular Frequencies $165. KD4AJ, 404-396-6760.

ATLAS: 200PS $50. 220CS AC Console $125. 10XB Crystal Oscillator $50. ICOM IC230 $50. Murch 2000AT $250. Al, VE3HTV, Box 0852, Miami, FL 33233 or 416-265-2201.

WRITTEN Exams Supereasy. Memory aids from psychologist/engineer cut studytime 50%. Novice, Tech, Gen: $5 each. Advanced, Extra: $10 each. Moneyback guarantee. Bahr, 2549-G1 Temple, Palmbay, FL 32905.

ROSS' $$$$ New Opened Box Specials: Kenwood TS-811A $939.90, TH-31AT $209.90, TS-140S $749.90, ICOM IC-1271A $999.90, IC-471H $1045.90, Yaesu FT-70G $749.90, Cubic VHF-RPT (Repeater) $1279.90, Bird 4304 $319.90. Send $1 for price list of more opened box specials. All L.T.O. Phone or send SASE for pricing on popular items. Over 8777 ham-related items in stock for immediate shipment. MENTION AD. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830, P.O. Box 234.

COMPLETE deluxe two-meter station. ICOM IC-271H, AG-25 preamplifier, Cushcraft 215WB Boomer, all like new in original cartons, $995. W7LJI, 503-686-8879.

CRYSTALS-Build Something: Remember the New Year is passing and you resolved to build a QRP rig or low power 'AM' phone or reactivate or convert that old rig etc. Do it! FT-243's made to your ordered frequency. 30M $2.95, five or more $2.50. 40M fundamentals and multipliers to 20M, 15M, 10M, $2.50, five $1.95 each. 80M $2.95, five $2.50. 160M $3.95, five $2.95. 10M, 12M overtones $4.95. Sockets 75 cents. Air-mail 35 cents per crystal. Stamps or long SASE for listings-circuits. 1700—60,000 kilocycles. "Crystals Since 1933", W6LPS, C-W Crystals, Marshfield, MO 65706.

WANTED: 8877 new or used, TS130, 30L1, S-Line, ICF2002, W9ZR, 1-414-434-2938.

WANTED: Dead or Alive Azden 2000 or Yaesu FT-227R in mint condition. SALE: 203BA 20M Beam, good condition, pick-up only. KB2IV, 201-879-4438.

SELL: Heath HW-101 Transceiver, HP-23 Power Supply, HS-1661 Speaker, SA-2040 Ant. Tuner $450. KE9BV, 5 Twin Oaks, Belleville, IL 62221, 618-632-5718.

NEW 6' Alcoa perforated parabolic micro-wave antennas with Az El mount $149. Ken, 206-486-2794.

ROSS' $$$$ Used February Specials: Kenwood TR-2400 $169.90, VB-2530 $79.90, ST-1 $49. Yaesu FV-101DM $165.90, FT-726R $689.90, FT-290R $249.90, FC-901 $169.90, Drake R-4A, T-4X, MS-4, AC-3 $449.90, P-75 $65.90. Phone or send SASE for used items list. Over 8777 new ham items in stock. MENTION AD. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830, P.O. Box 234.

KENWOOD TS-930S/AT and SP-930S in original cartons. Perfect condx. Used only for CW. Both $1500. W4NXL, 703-379-1534.

MFJ TUNERS

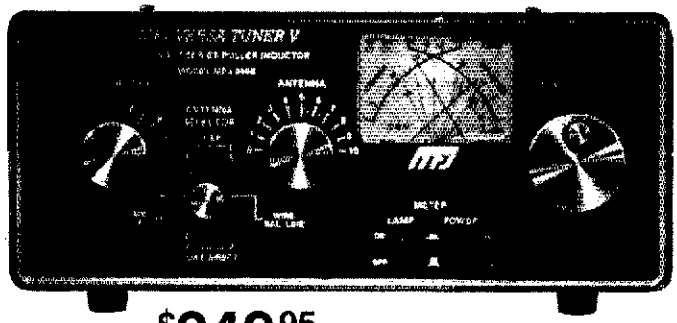
This may be the world's most popular 3 KW roller inductor tuner because it's small, compact, reliable, matches virtually everything and gives you SWR/Wattmeter, antenna switch, dummy load and balun — all at a great price!

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs-only 10¾"Wx4½"Hx14 7/8"D.

Matches coax, balanced lines, random wires—1.8 to 30 MHz. 3 KW PEP —the power rating you won't outgrow (250pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.



MFJ989B $349.95

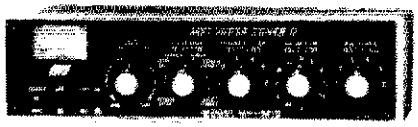
Lighted Cross-needle Meter reads SWR, forward and reflected power all in one glance. Has 300 and 3,000 watt ranges. Meter light requires 12 VDC.

6 position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ's Fastest Selling TUNER

MFJ-941D **$99.95**



MFJ's fastest selling tuner packs in plenty of new features. New styling! Brushed aluminum front. All metal cabinet. **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.

New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 RF power output.

Matches everything from 1.8 to 30 MHz! dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ's 1.5 KW VERSA TUNER III

MFJ-962B **$229.95**

Run up to 1.5 kw PEP and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire.

Lighted Cross-needle Meter reads SWR, forward and reflected power in one glance. Has 300 and 3,000 watt ranges. 6 position antenna switch handles 2 coax lines, wire and balanced lines. 4:1 balun. 250 pf, 6 kv variable capacitors. 12 position ceramic inductor switch. New smaller size matches new rigs: 10¾ × 4½ × 14⅞ inches. Flip stand for easy viewing. Requires 12V for light.

MFJ's Best VERSA TUNER

MFJ-949C **$149.95**

MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

2 KW COAX SWITCHES

MFJ-1702 **$19.95**

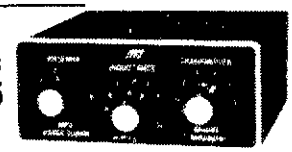
MFJ-1702, $19.95. 2 positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

$29.95 MFJ-1701

MFJ-1701, $29.95. 6 positions. White markable surface for antenna positions.

MFJ's Smallest VERSA TUNER

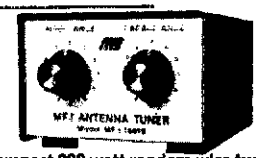
MFJ-901B **$59.95**



MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines continuously from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier for proper matching. Efficient airwound inductor gives more watts out. 4:1 balun for balanced lines. 5 x 2 x 6 inches. Rugged black all aluminum cabinet.

MFJ's Random Wire TUNER

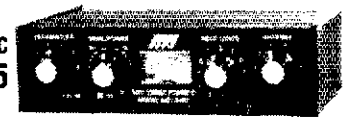
MFJ-16010 **$39.95**



MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

MFJ's Mobile TUNER

MFJ-945C **$79.95**



Designed for mobile operation! Small, compact. Takes just a tiny bit of room in your car. SWR/dual range wattmeter makes tuning fast and easy. Careful placement of controls and meter makes antenna tuning safer while in motion.

Extends your antenna bandwidth so you can operate anywhere in a band with low SWR. **No need to go outside and readjust your mobile whip.** Low SWR also gives you maximum power out of your solid state rig—runs cooler for longer life.

Handles up to 300 watts PEP RF output. Has efficient airwound inductor, 1000 volt capacitor spacing and rugged aluminum cabinet. 8x2x6 inches. Mobile mounting bracket available for $5.00.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT SATISFIED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (less shipping).
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• Add $5.00 each shipping/handling • Call or write for free catalog, over 100 products.

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MFJ multi-mode data controller

MFJ *shatters* the 6 mode barrier *and* the price barrier with the MFJ-1278 and gives you . . . Packet, RTTY, ASCII, CW, WEFAX, SSTV and Contest Memory Keyer . . . 7 digital modes . . . for an affordable $249.95

Amateur radio's newest multi-mode data controller -- the MFJ-1278 -- lets you join the fun on Packet, RTTY, ASCII, CW, Weather FAX, SSTV and gives you a full featured Contest Memory Keyer mode . . . you get 7 modes . . . for an affordable $249.95.

Plus you get high performance HF/VHF/CW modems, software selectable dual radio ports, precision tuning indicator, 32K RAM, AC power supply and more.

You'll find it *the most user friendly of all multi-modes.* It's menu driven for ease of use *and* command driven for speed.

A high resolution 20 LED tuning indicator lets you *tune in signals* ***fast*** *in any mode.* All you have to do is to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

All you need to join the fun is an MFJ-1278, your rig and any computer with a serial port and terminal program.

You can use the MFJ Starter Pack to get on the air instantly. It includes computer interfacing cable, terminal software and friendly instructions . . . everything you need to get on the air fast. Order MFJ-1282 (disk)/MFJ-1283 (tape) for the C-64/128 and VIC-20 or MFJ-1284 for the IBM or compatible, $19.95 each.

Packet

Packet gives you the fastest and most reliable error-free communications of any amateur digital mode.

With MFJ's super clone of the industry standard -- the TAPR TNC-2 -- you get **genuine TAPR** software/hardware plus more -- not a "work-a-like" imitation.

Extensive tests published in *Packet Radio Magazine* ("HF Modem Performance Comparisons") prove the TAPR designed modem used in the MFJ-1278 gives better copy with proper DCD operation under all tested conditions than the other modems tested.

Hardware DCD gives you more QSOs because you get reliable carrier detection under busy, noisy or weak conditions.

A hardware HDLC gives you full duplex operation for satellite work or for use as a full duplex digipeater. And, it makes possible speeds in excess of 56K baud with a suitable external modem.

Good news for SYSOPs! New software lets the MFJ-1278 perform flawlessly as a WORLI/WA7MBL bulletin board TNC.

Baudot RTTY

You can copy all shifts and all standard speeds including 170, 425 and 800 Hz shifts and speeds from 45 to 300 baud. You can *copy not only amateur RTTY but also press, weather and other exciting traffic.*

A high performance modem lets you copy both mark and space for greatly improved copy under adverse conditions. It even tracks slightly drifting signals.

You can transmit both narrow and wide shifts. The wide shift is a standard 850 Hz shift with mark/space tones of 2125/2975 Hz. *This lets you operate MARS and standard VHF FM RTTY.*

You get both the American Western Union and the international CCITT character sets, Autostart for unattended reception and selectable "Diddle".

A receive Normal/Reverse software switch eliminates retuning and Unshift-On-Space reduces errors under poor receiving conditions.

ASCII

You can transmit and receive 7 bit ASCII using the same shifts and speeds as in the RTTY mode and using the same high performance modem. You also get Autostart and selectable "Diddle".

CW

You get a Super Morse Keyboard mode that lets you send perfect CW effortlessly from 5 to 99 WPM, including all prosigns -- it's tailor-made for traffic handlers.

A huge type ahead buffer lets you send smooth CW even if you "hunt and peck".

You can store entire QSOs in the message memories, if you wanted to! You can link and repeat any messages for automatic CQs and beaconing. Memories also work in RTTY and ASCII modes.

A *tone Modulated CW mode turns your VHF FM rig into a CW transceiver* for a new fun mode. It's perfect for transmitting code practice over VHF FM.

An AFSK CW mode lets you ID in CW.

The CW receive mode lets you copy from 1 to 99 WPM. Even with sloppy fists you'll be surprised at the copy you'll get with its powerful built-in software.

You also get a random code generator that'll help you copy CW faster.

Weather FAX

You'll *be fascinated as you watch WEFAX signals blossom into full fledged weather maps on your printer.* Other interesting FAX pictures can also be printed -- such as some news photographs from wire services.

Any Epson graphics compatible printer will print a wealth of interesting pictures and maps.

Automatic sync and stop lets you set it and leave it for no hassle printing.

You can save FAX pictures and WEFAX maps to disk if your terminal program lets you save ASCII files to disk.

Pictures and maps can be *printed to screen in real time or from disk* on IBM and compatibles with the MFJ-1284 Starter Pack.

You can transmit FAX pictures right off disk and have fun exchanging and collecting them.

Slow Scan TV

The MFJ-1278 introduces you to the exciting world of slow scan TV.

You'll not only enjoy receiving pictures from thousands of SSTVers all-over-the-world but you can send your own pictures to them, too.

You can print slow scan TV pictures on any Epson graphics compatible printer. If you have an IBM PC or compatible you can print to screen in near real time or from disk with the MFJ-1284 Starter Pack.

You can transmit slow scan pictures right off disk -- there's no need to set up lights and a camera for a casual contact.

You can save slow scan pictures on disk from over-the-air QSOs if your terminal program lets you save ASCII files.

The MFJ-1278 transmits and receives 8.5, 12, 24, and 36 second black and white format SSTV pictures using two levels.

Contest Memory Keyer

Nothing *beats the quick response of a memory keyer during a heated contest.*

You'll score valuable contest points by completing QSOs so fast you'll leave your competition behind. And you can snag rare DX by slipping in so quickly you'll catch everyone by surprise.

You get iambic operation with dot-dash memories, self-completing dots and dashes and jamproof spacing.

Message memories let you store contest RST, QTH, call, rig info -- everything you used to repeat over and over. You'll save precious time and work more QSOs.

You get automatic incrementing serial numbering. In a contest it can make the difference between winning and losing.

A weight control lets you penetrate QRM with a distinctive signal or lets your transmitter send perfect sounding CW.

More Features

Turn on your MFJ-1278 and it sets itself to match your computer baud rate. Select your operating mode and the correct modem is automatically selected.

Plus . . . printing in all modes, threshold control for varying band conditions, tune-up command, lithium battery backup, RS-232 and TTL level serial ports, watch dog timer, FSK and AFSK outputs, output level control, speaker jack for both radio ports, test and calibration software, Z-80 at 4.9 MHz, 32K EPROM, and socketed ICs. FCC approved. 9x1½x9½ inches. 12 VDC or 110 VAC.

Get yours today and join the fun crowd!

MFJ

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WANTED for Collins 32S-3 tubesters. VE7BXG, P.O. Box 3840, Blaine, WA 98230 or call 604-596-1318.

FOR SALE: Cushcraft R-3, used three months, $225. Two 4 X 150A/4010, make offer. Roger J. Jones, 7735 Country Club Drive, Athens, OH 45701.

MICROLOG ART-1 RTTY $100, National RTTY Monitor Scope $20. W6XM, 619-459-5527.

SUPERFAST Morse Code Supereasy. Subliminal cassette. $10. Learn Morse Code in 1 Hour. Amazing new supereasy technique. $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, 2549-G1 Temple, Palmbay, FL 32905.

DEAD Battery Pack ??? Nicads/Inserts/Rebuilding. Replacement inserts, less wires/plugs; ICOM BP2 $17.95, BP3(std.) $16.95, BP5 $23.95, BP7 $29.95; Kenwood TR2400 $19.95, TR2500/2600 $24.95; Tempo S1/270mah $21.95, S1, 2, 4, 5, 15/450mah $22.95; Azden 300 $19.95; Ten-Tec 2991 $24.95; Santec 142/1200 w/plug $21.95, for rebuilding; Add $3 and we install inserts in ICOM & Kenwood, (send your packs). For others/info., SASE. In PA add 6%. Add $2 S&H/order. Cunard Associates, RD 6, Box 104, Bedford, PA 15522.

HY-GAIN 18 AVT/wb. Multiband HF Vertical Antenna. Very clean. Complete $75. Jerry, N2HN, 173 Mt. Pleasant Road, Smithtown, NY 11787, eve 516-361-3449.

WANTED: Santec ST-5BC Base Charger. Michael Taylor, Box 1108, APO NY 09860.

LINEAR Builders - B W RF Choke FC 15A; Eimac - 400 Z; Vacuum Variables. W2EZM, 431 Oakland, Maple Shade, NJ 08052.

McKAY-DYMEK DR33 Receiver, DP40 Preselector, DA100 Active Antenna, all documentation: $850. Yaesu FRG7700 Receiver, memory option: $300. Looking for good Drake R7 Receiver. John Black, KB5AG, 330 S. Main Street, Wake Forest, NC 27587, 919-556-2445.

FOR SALE: McKay-Dymek DR-22 general coverage receiver. $500 or best offer. Call Scott, KN1I at 401-434-8655 after 4 PM EST.

PARTS, Parts, Parts, Quality New Components for the Home-Brew Radio Amateur. Two F.C. Stamps for Catalog. Small Parts Center, 6818 Meese Drive, Lansing, MI 48911.

HEATHKIT HW101 with Power Supply, Mic. $275. Call 702-739-7151, N7GQR, Marty.

KENWOOD TS830S with external VFO, Fox Tango Filters, External Speaker, $550. Call Bob 617-793-5435 days (Mass).

COLLINS Wanted: 516F-2 AC power supply, SM-1, SM-2 station microphone. Contact G. Hawrysko, K2AWA, P.O. Box 568 Boro Hall, Jamaica, NY 11424.

ICOM 735 still in box $750. Astron RS20M $90, Yaesu 208 & 708 mint condition with PL, Charger, Mic, PA3 mobile PS and 2M 30W Mirage Amp, $375. Will consider trade. Call 702-739-7151, Marty, N7GQR.

MUST SELL: Absolutely new ICOM IC-micro2AT, used only 4 hrs, with BC-50U charger, BP-23 and BP-22 battery packs, HM-46L mini spkmike, carrying case, belt clip, sales slip, warrantees, and my guarantee, $395. Also sell: like new AEA PK-64A with HF modem, extra cable, manuals, $250. Want: Stancor A-3310 audio xfmr; Collins F-455J-120, F-455J-100, F-455J-80 mechanical filters; 810 and 4-400A tubes. Chuck, WA1IIE, RFD 1, Box 1630, Vassalboro, ME 04989, 207-923-3994.

SALE - FT-102 $700; FC-102 $170; MD-1B8 $74. All unused - as is. K5RCB, 409-295-0245.

I'M looking for technical details as to how to add band scanning to the Kenwood TR-2400 2M Handheld. Steve, KK5V, 7011 Narrow Oak, Austin, TX 78759.

MACKET: Full-Featured Macintosh Packet Program. For details write to S. Fine Software, P O.B. 10629, State College, PA 16805.

FT101E, TR2500, Test Equip, SASE Brings List. W8OAJ, RR 1, Elmwood, NE 68349.

WANTED - Mint Century 21. Will pay cash or take as partial for my loaded IC745. Dick Downey, 99 Florida Avenue, Amsterdam, NY 12010, 518-842-8847.

PACKET - Televideo 912C, Perkin-Elmer 1251 and Dec VT-52 Computer Terminals. For Sale $40 each. WA4RAK, 615-494-8154.

PACKET HF Teleport, Harris/RF Comm HF SSB Radio. Two to 30 MHz, one kilowatt, ten crystal controlled channels, wireline remote control. Service manual included. $850 or offer. Rich Osman, WB8HUQ, P.O. Box 40056, San Antonio, TX 78229, 512-699-1302 (answering machine) or 512-699-1292 evenings.

WANTED - Swan 160X Transceiver. Frank, KB9GI, 1518 Spencer, Appleton, WI 54914.

HOSS-TRADER Ed says "Shop around for the best price then telephone the Hoss last for the best deal." New Amp Supply Linear 2500 watts / tubes, hypersil transformer regular $1199: cash $1079, new display Azden PCS-5000 $269; new ICOM 2AT Handy Talkie $235, ICOM 02AT 5 watt Handy Talkie $329; ICOM 735 Transceiver regular $999: cash $798; new Wm Nye 3 KW antenna tuner MBV-A regular #625: cash $509; ICOM 2 meter 28-A regular $429: cash $329; new Mosley Pro 57 7 element beam regular $708: cash price $419. Visa/Mastercard Accepted!!!!! Moory Electronics, P.O. Box 506, Dewitt, AR 72042, tel: 501-946-2820.

SELL: TMC GPR-90, $175; B & W 5100, $85; 75A1, $175; Brand new ICOM 3200A, 2M & 440, Larsen Mag-Mount Dual Band Antenna, $500; Ameco PCLP, $45; Hammarlund HX50, 160-10, $150; 75A4 Speaker, $40; R46B, $35; New 450TH, $45; Old Vibroplex with Japanned Base and Gold Leaf, $75; Carbon Mike, $45; Heil Speaker, $50; Mims Rotor, $75; 50 Foot Windmill Tower, $125; 100 Foot Mast on Trailer, $1500; 215 KW Out Rig, 160-20, $1500; KLM 10-30 Log Periodic, $425; Hy-Gain 13-30 Log Periodic, $725; F.O.B. Want New Eimac 8875's, RG-17. K8CCV, 216-427-2303, 6-9 PM EST weeknights.

432 MHz Arcos KW Amplifier w/PR 8930's and Blower, mint, $600; PR RCA 7213 Tubes; Arcos 28-432 Transmitting Converter; other 432 MHz Gear. R.C. Beerman, N4EL, 201-889-1873.

KENWOOD TS530SP, Both manuals as new, $595. Back-up rig min. use. Gene, K6GLJ, 805-398-2111.

MANUALS for test equipment. 1000's in stock. Write for availability and price. JBM Electronics, 7061 Hayvenhurst #207C, Van Nuys, CA 91406.

WANTED: Xerox Model 400 FAX Machine. Call Steve, WA9IDZ, 219-324- 2706.

HARRIS/RF Comm Model RF-102 Courier HF SSB Radio. Two to 30 MHz, one kilowatt, ten crystal controlled channels, wireline remote control. Service manual included. $850 or offer. Rich Osman, WB8HUQ, P.O. Box 40056, San Antonio, TX 78229, 512-699-1302 (answering machine) or 512-699-1292 evenings.

TENNATEST **** Antenna Noise Bridge. Outperforms others. Accurate. Costs less. Compare 1-40 MHz. $44. 1-150 MHz. $72. Satisfaction guaranteed. Send stamp for details. W8URR, 1025 Wildwood Road, Quincy, MI 49082.

AZDEN Service by former factory technician. Fast turnaround. PCS-300 NiCads $34.95. Southern Technologies Amateur Radio Inc., 10715 SW 190 Street #9, Miami, FL 33157, 305-238-3327.

DX BLUEBOOK, 20 Pages, 140 City Bearing's selection, instant Prefix ID, Locator Grid Map, DX time, Zones, QSL & QTH info. Alpha country list. $7 Satisfaction guaranteed. SASE city bearing's list. Customized bearings available. W4UYZ, J/C Enterprises, 4920 Mayflower Street, Cocoa, FL 32927.

APARTMENT Dwellers/Portable Antenna System: Simple. Inexpensive. SASE for information. Burk Electronics, 35 North Kensington, La Grange, IL 60525, 312-482-9310.

JOBS FOR HAMS

WANTED For Summer of 1988: Instructors in Electronics, Ham Radio, and Computers. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, PA 18451.

USAF MARS: The Military, with a long history of support for Amateur Radio, is continuing expansion of existing USAF MARS CW NETS and need volunteer proficent CW operators. Requirements include USA citizenship, a qualified FCC amateur license and 12 hours minimum quarterly participation. This is a unique opportunity to contribute your talents to a significant and worthwhile activity without military obligation in support of an official Military operation. Interested parties are requested to provide a brief CW background profile to: Louis Skipper, W6KF (AFN6CW), Mgr., 725 North "O" Street, Livermore, CA 94550-2059.

ADVERTISING DEPARTMENT STAFF

Bruce O. Williams, WA6IVC,
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203-667-2494 is a direct line, and will be answered only by Advertising Department personnel

Index of Advertisers

ANTENNA/TOWER SALE!

hy-gain

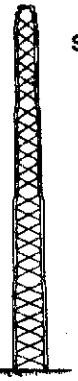
CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



ROHN
Self Supporting Towers On SALE!
FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	228	$379
HBX48	48 ft	10 sq ft	303	$489
HBX56	56 ft	10 sq ft	385	$569
HDBX40	40 ft	16 sq ft	281	$459
HDBX48	48 ft	16 sq ft	353	$559

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

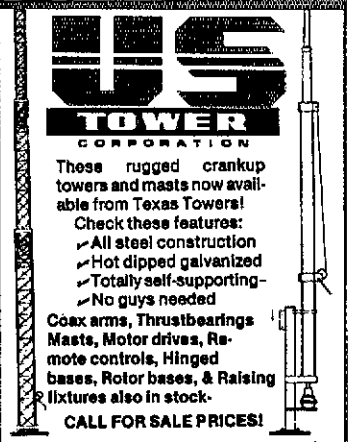
ROHN
Guyed Tower Packages

- World Famous Rohn Quality and Dependability
- Rugged high wind survival-provides safe installation
- Multi purpose towers satisfy a wide range of needs
- Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.

Packages shown below are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

	Model 25G	Model 45G	Model 55G
50'	$ 699	$1239	$1529
60'	769	1399	1719
70'	829	1539	1879
80'	989	1719	2079
90'	1069	1999	2249
100'	1149	2179	2439
110'	1359	2329	2839
120'	1429	2499	3039

US TOWER CORPORATION



These rugged crankup towers and masts now available from Texas Towers!

Check these features:
- All steel construction
- Hot dipped galvanized
- Totally self-supporting
- No guys needed

Coax arms, Thrustbearings Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock.

CALL FOR SALE PRICES!

Model	Min.Ht.	Max.Ht.	Ant.load*	Sale price
MA40 mast	21'	40'	10 sq ft	$ 649
MA550 mast	22'	50'	10 sq ft	899
TX43B	22'	38'	18 sq ft	829
TX455	22'	55'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2059
HDX555	22'	55'	30 sq ft	1879
HDX572	23'	72'	30 sq ft	3229

Note-US Towers Shipped Freight Collect From Visalia, CA Factory

**Note-towers rated at 50 mph to EIA specifications*

RG-213U

$.29/ft $279/1000 ft
Up to 600 ft via UPS
- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

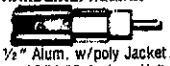
RG-8X

$.19/ft $179/1000 ft
- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086

$.39/ft $379/1000 ft
- Same specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HARDLINE/HELIAX®



Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft.
⅞" LDF4-50 Andrew Heliax®	$1.79/ft
7/8" LDF5-50 Andrew Heliax®	$3.99/ft

select connectors below.
Heliax® is a Registered Trademark of the Andrew Corp.

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE & HELIAX® CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
⅞" Heliax®	$25	$25	$25	$25
7/8" Heliax®	$49	$49	$49	$49

COAX CONNECTORS

Amphenol Silver PL259	$1.25
UG21B N Male	$2.95
9086/9913 N Male Connector	$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga	$.10/ft.
¼ mile 18ga copper-clad steel wire	$30
Dog bone end insulator	$.79 ea.

Van Gorden

1:1 Balun $11 Center Insulator $6
Dipole Kits D80 $31.95/D40 $28.95
Short Dipole Kits SD80 $35.95/SD40 $33.95
All-band Dipole w/ladder line $29.95
G5RV all band antenna $49.95

ALPHA DELTA

DX-A 160-80-40 Sloper	$49

CUSHCRAFT

A3 3-el Tribander	$229
A4 4-el Tribander Beam	$299
A743 & A744, 30/40 mtr KIT for the A3 & A4 ea	$79
AP8 80-10 mtr Vertical	$139
AV5 80-10mtr Vertical	$109
D40 40mtr Dipole	$159
40-2CD 2-el 40 mtr Beam	$299
A50-5 5-el 6 mtr Beam	$85
215 WB NEW 15-el 2 mtr Beam	$85
230 WB NEW 30-el 2 mtr Beam	$229
4218 XL 18-el 2 mtr Beam	$105
3219 19-el 2 mtr Beam	$99
220B 17-el 220MHz Beam	$99
424B 24-el 432MHz Beam	$85
ARX2B 2 mtr Vertical	$39

hy-gain

CALL FOR SPECIAL PRICES!

- Discoverer 2-el 40-mtr Beam
- Discoverer 3-el Conversion Kit
- EXPLORER-14 SUPER-SPECIAL
- QK710 30/40 mtr. Add-On-Kit.
- V2S 2-mtr Base Vertical
- V4S 440MHz Base Vertical
- TH5MK2S Broad Band 5-el Triband Beam
- TH7DXS 7-el Triband Beam
- TH3JRS 3-el Triband Beam
- 205BAS 5-el 20-mtr Beam
- 155BAS 5-el 15-mtr Beam
- 105BAS 5-el 10-mtr Beam
- 204BAS 4-el 20-mtr Beam
- 64BS 4-el 6-mtr Beam
- 12 AVQ 20-10 mtr vertical
- 14 AVQ 40-10 mtr vertical
- 18 AVT/WB 80-10mtr Vertical
- 18HTS 80-10 mtr Hy-Tower Vertical
- 23BS 3-el 2 mtr Beam
- 25BS 5-el 2 mtr Beam
- 28BS 8-el 2 mtr Beam
- 214BS 14-el 2-mtr Beam
- 2BDQ 80/40 mtr Trap Dipole
- 5BDQ 80-10 mtr Trap Dipole
- 8N86 80-10 mtr KW Balun W/Coax Seal

HUSTLER

6BTV 80-10 mtr Vert	$129	5BTV 80-10 mtr Vert	$109
4BTV 40-10 mtr Vert.	$89	G7-144 2-mtr Base.	$119
G6-144B 2-mtr Base.	$89		

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

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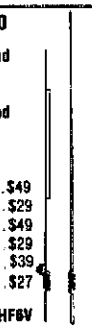

HF6V 80-10m Vertical $129 Delivered
- Full Legal Power
- Highest Q Tuning Circuits

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- Full Legal Power
- Automatic Band Switching

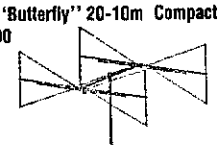
Accessories:

RMK II Roof Mtg. Kit	$49
STR II Stub-Tuned Radials	$29
TBR160 160m Coil Kit	$49
30m Add-on Kit	$29
20m Add-on Kit	$39
17/12m Add-on Kit	$27

HF6V HF2V

FREE UPS on ACCESSORIES when purchased w/antenna

HF5B "Butterfly" 20-10m Compact Beam $199.00



- Unique Design Reduces Size
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FREE UPS Shipping in Continental USA

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KT34A 4-el Broad Band Triband Beam	$398.95
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ROTORS

Daiwa MR 750 PE (16.1 sq ft rating)	$289
Additional Motor Units	$89
Alliance HD73 (10.7 sq ft rating)	$119.95
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (2Q sq ft rating)	$Call
Tetex HDR300 Heavy Duty (25 sq ft rating)	$Call
Kenpro KR500 Heavy Duty Elevator Rotator	$189
Kenpro KR5400 AZ/EL Rotor Package	$319

ROTOR CABLE

Standard 8 cord cables $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS
10 FT. STACKED SECTIONS

20G	$48.00	45G	$133.00
25G	$56.00	55G	$165.00

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	$1049.
FK2558	58 ft.	13.3 sq. ft.	1099.
FK2568	68 ft.	11.7 sq. ft.	1149.
FK4544	44 ft.	34.8 sq. ft.	1389.
FK4554	54 ft.	29.1 sq. ft.	1469.
FK4564	64 ft.	28.4 sq. ft.	1579.
25G Double Guy Kit			$279.
45G Double Guy Kit			$299.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$ 15/ft
1/4 EHS Guywire (6650 lb rating)	$ 18/ft
5/16 EHS Guywire (11,200 lb rating)	$ 29/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$ 15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2 × 9" Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2" 12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
5/8 × 12EJ (5/8" × 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy insulator (5/32" or 3/16" Cable)	$1.69
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5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$ 29/ft
HPTG4000 Guy Cable (4000 lb rating)	$ 49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$8.95
9902LD Cable End (for 6700 cable)	$9.95
Socketfast Potting Compound (does 6-8 ends)	$14.95

GALVANIZED STEEL MASTS
Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	$29	$49	$69	$89
.18 in Wall	$49	$89	$129	$149
.25 in Wall	$69	$129	$189	$249

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(Prices & Availability Subject To Change Without Notice)

(Antenna/tower product prices do not include shipping unless noted otherwise)

Introducing the only mobiles that double as answering machines.

Now you can stay in touch—even when you're away from your radio.

With Yaesu's 2-meter FT-212RH and 70-cm FT-712RH, an optional, internal digital voice recorder serves as a convenient answering machine for you and your friends. And that's just the beginning!

High performance mobiles. The FT-212RH features wideband receive coverage of 138-174 MHz (144-148 MHz Tx), while the FT-712RH covers 430-450 MHz. An oversize amber display includes an innovative photo-sensor which increases the display brightness during the day. The function buttons are arranged in a chromatic musical scale—ideal for visually-impared operators. You get 45 watts output on 2 meters, 35 watts on 70 cm.

An autodialer DTMF microphone with 10 memories, each ready to store telephone numbers up to 22 digits long.

And, like our FT-211RH Series mobiles, you'll enjoy surprisingly simple controls, yet highly sophisticated microprocessor-based flexibility. Including 18 memories that store frequency, offset, PL tone, and PL mode (CTCSS unit optional). Band or memory scanning. Offset tuning from any memory channel. Memory channel lockout for scanning. High-low power switch.

All in an amazingly small package, shown actual size below.

Digital voice recorder option. Only Yaesu brings you the advanced technology found in our digital voice recorder option.

You can store messages or your call sign—in your own voice, not a synthesized replica—or give your friends a private code for leaving messages on your radio. All they need is a DTMF microphone! Then you can play back your messages either in-person, or remotely by using another radio with a DTMF microphone. And you've always got security because you can command your radio to respond only to in-person playback requests.

Visit your Yaesu dealer today. And test drive Yaesu's FT-212RH and FT-712RH mobiles. The only radios with the power to keep you in touch. Always.

YAESU

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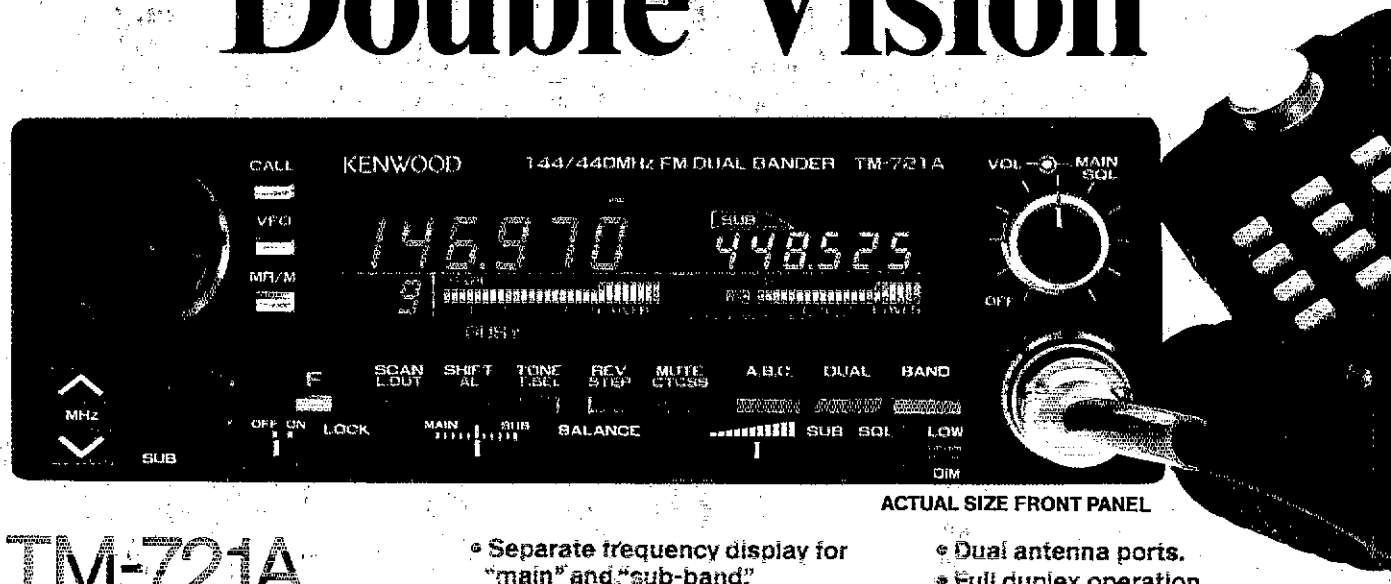


ACTUAL SIZE FRONT PANEL

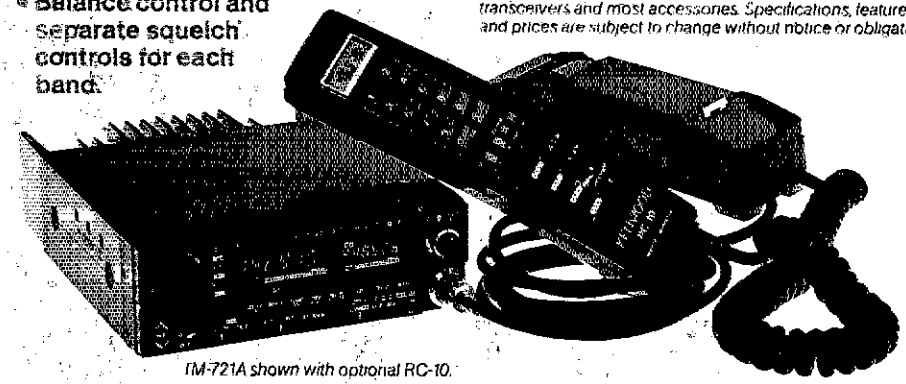
TM-721A

Deluxe FM dual bander

The Kenwood TM-721A re-defines the original Kenwood "Dual Bander" concept. The wide range of innovative features includes a dual channel watch function, selectable full duplex operation, 30 memory channels, extended frequency coverage, large multi-color dual digital LCD displays, programmable scanning, and more with 45 watts of output on VHF and 35 watts on UHF. TM-721A—Truly the finest full-featured FM Dual Band mobile transceiver!

- **Extended receiver range** (138.000-173.995 MHz) on 2 meters; 70 cm coverage is 438.000-449.995 MHz. (Specifications guaranteed on Amateur bands, only. Two meter transmit range is 144-148 MHz. Modifiable for MARS/CAP. Permits required.)
- **30 multi-function memory channels.** 14 memory channels and one call channel for each band store frequency, repeater offset, CTCSS, and reverse. Channels "A" and "b" establish upper and lower limits for programmable band scan. Channels "C" and "d" store transmit and receive frequencies independently for "odd splits."
- **Separate frequency display for "main" and "sub-band."**
- **45 Watts on 2 meters, 35 watts on 70 cm.** Approx. 5 watts low power.
- **Call channel function.** A special memory channel for each band stores frequency, offset, and sub-tone of your favorite channel. Simply press the CALL key, and your favorite channel is selected!
- **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.**
- **Dual antenna ports.**
- **Full duplex operation.**
- **Programmable memory and band scanning, with memory channel lock-out and priority watch function.**
- **Each function key has a unique tone for positive feedback.**
- **Illuminated front panel controls and keys.**
- **Dimmer control.**
- **16 key DTMF mic. included.**
- **Handset/remote control option (RC-10).**
- **Frequency (dial) lock.**
- **Supplied accessories:** 16-key DTMF hand mic., mounting bracket, DC cable.

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



TM-721A shown with optional RC-10.

Optional Accessories:
• **RC-10** Multi-function handset/remote controller • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SW-100B** Compact SWR/power/volt meter • **SW-200B** Deluxe SWR/power meter • **SWT-1** 2m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-40** 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-4000** Dual band 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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