

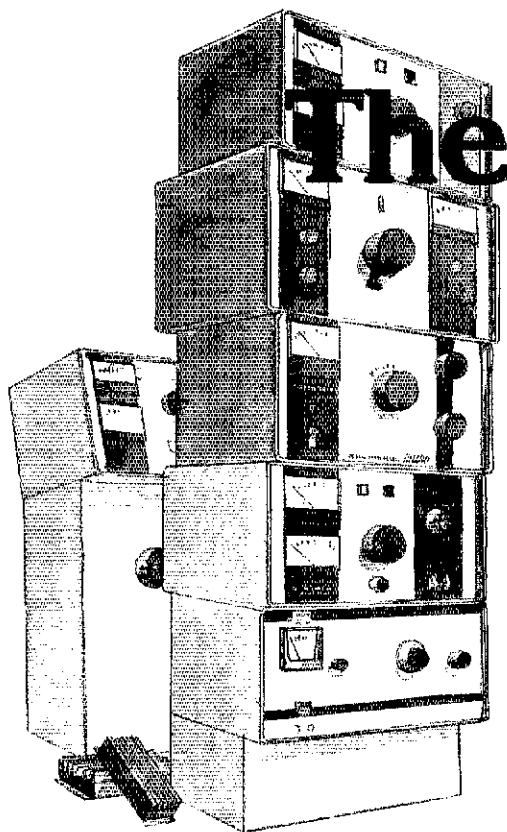
QST

devoted entirely to Amateur Radio



Field Day, 1984

Page 83



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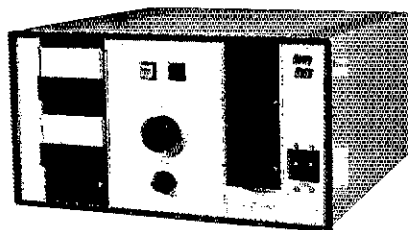
This has always been our aim...the most radio for the least money. Whether you're into amateur communications, industrial RF power, scientific research, or commercial communications we have amplifiers to help you. Two to five-hundred megahertz. Ten to ten-thousand watts.

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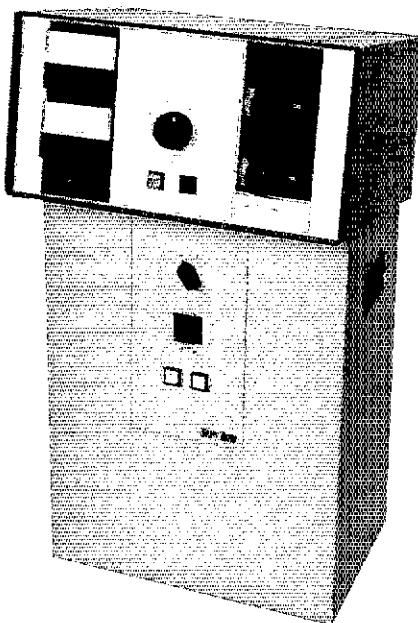
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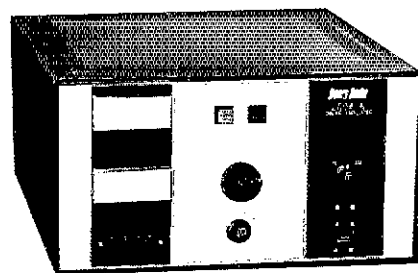
3K Classic...uses the superb Eimac 8877 tube. More than 13db gain. We believe the 3K to be the finest amateur linear available anywhere...the amplifier of every amateur's dreams.



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2002-A...a bright new rework of our popular 2002 2 meter amplifier. Uses the new Eimac 3CX800A7. The RF chassis uses a 1/4 wave length strip line design for extreme reliability. It provides 2000 watts



input for SSB and 1000 watts input for CW. Because this tube is rated at an unheard of 15dB gain, only about 25 watts drive is required for full output.

2004-A is identical to the 2002A except that it is set up for the 430 to 450 MHz band. This amplifier uses a 1/2 wave strip line and offers all of the same specifications as the 2002A.

1002-A A rack mount 2 meter amplifier with the same design as the 2002A, except using one 8874 tube for 1/2 power specifications. Rated at 600 watts PEP output and 300 watts continuous carrier output. It employs the same strip line design as the 2002A.

1004-A...a rack mount half-power version of the 2004A. Covers the 430 to 450 MHz band using a 1/2 wave strip line design.

Henry amateur amplifiers are available from select dealers throughout the U.S. and are being exported to amateurs all over the world. In addition to our broad line of commercial FCC type accepted amplifiers we offer special RF power generators for industrial and scientific users. Call or write Ted Shannon or Mary Silva for full information.

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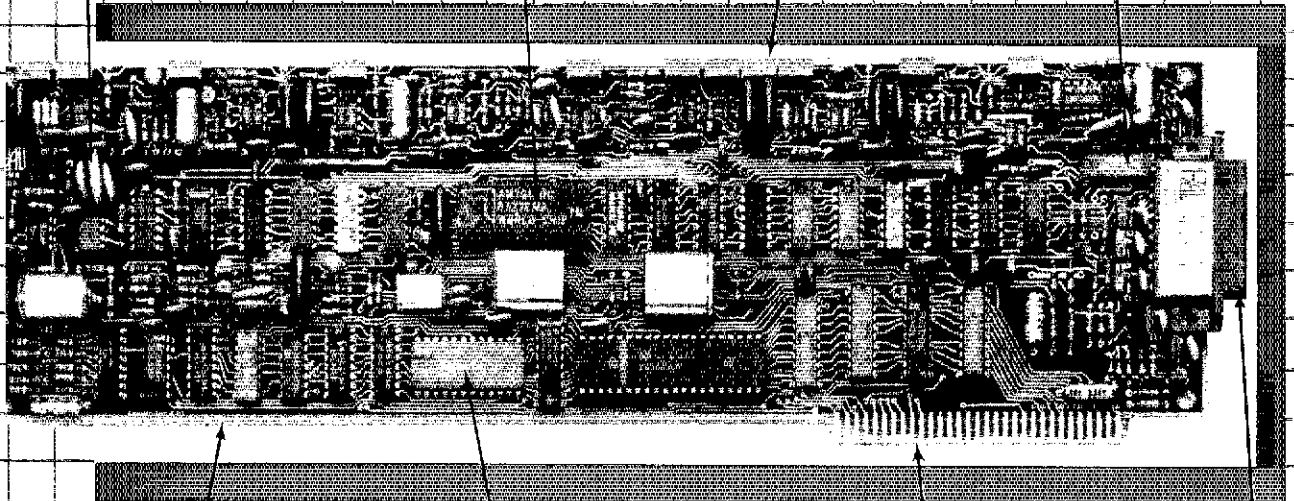
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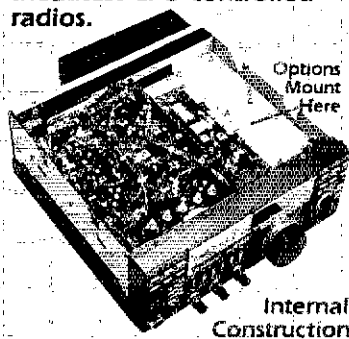
ICOM VHF Transceiver

IC-271H

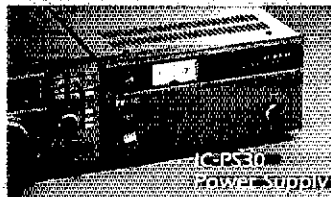


The Versatile 2 Meter Base System

For the ultimate in 2-meter communications, ICOM presents the IC-271H transceiver with a high dynamic range receiver and a 100 watt transmitter...And all the advanced functions of the latest CPU controlled radios.



Internal Construction



IC-PS30 Power Supply

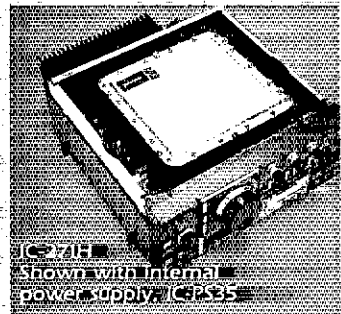
Exceptional Standard Features:

- 143.800 ~ 148.199MHz, expandable for MARS operation
- 32 full-function Memories with lithium battery backup
- 100 Watts, fully adjustable on all modes
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- 32 built-in Subaudible Tones
- High Visibility Display
- S-Meter and Center Meter
- Scanning Systems Memories, Modes and Programmable Band
- IC-HM12 Microphone with Up/Down Scan
- 11 1/4"W x 4 3/8"H x 12 1/2"D

Optional Features: AG-25 switchable preamp, UT-15S CTCSS encoder/decoder, IC-EX310 voice synthesizer, IC-SM8 two-cable desk mic and IC-SM6 desk mic. PLUS! a variety of power supplies... IC-PS30 system power supply, IC-PS15 external or IC-PS35 internal power supplies!

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OUR COVER

Whether you "got high" for Field Day, or just worked a few now and then, you'll want to see how you did — and how some noteworthy stations earned that distinction. The saga begins on page 83.

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MAIN MENU SCREEN

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- Beacon and WRU system, includes QRG check before XMT, won't QRM.
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- Selects command menu.
- Selects options menu.

- + Complete precompose split-screen display with status information.
- + Complete printer control including SELCALL/WRU printer control.

OPTIONS MENU SCREEN

hh:mm:ss

- I. CALLSIGN ??????
- S. SELCALL ????
- T. ARQTIMEOUT 30
- U. USOS ON
- M. MORSE FILL (BT) OFF
- R. RTTY SYNC (NUL) OFF
- A. AUDIO FEEDBACK OFF
- C. AUTO CR ON
- L. AUTO LF ON
- B. BEACON RECORD OFF
- W. WRAP-AROUND ON
- K. CW BREAK-IN OFF
- O. OUTPUT MODE WORD

- 24-hour clock, shows time in hours, minutes and seconds.
- Allows entry of your callsign for auto operations.
- Derived from your callsign automatically, can be changed.
- Sets ARQ phasing calls from 1 to 99 seconds.
- Unshift on space, toggles on or off.
- Transmits Morse idle character during breaks in KBD activity.
- Transmits RTTY idle character during breaks in KBD activity.
- Produces click in monitor audio when any key is pressed.
- Sends carriage return the first space after 65 characters.
- Sends a line feed after each carriage return.
- Allows the beacon to be recorded to the QSO buffer for logging.
- Sends CR/LF if there is a space in the last 5 positions on the line.
- Automatic transmit/receive switching during QSO.
- Transmit in word mode (text sent on space) or character mode.

COMMAND MENU SCREEN

hh:mm:ss

- L. LOAD
- E. EDIT
- M. MOVE
- S. SAVE
- X. SET XMT BUFFER SIZE
- C. SET COLOR
- T. SET TIME

- Allows loading of message or QSO buffers from disk or cassette.
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- Gain, ref 1/4λ whip
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- 360° Coverage
- Integral Tuner with Remote Control Console and Indicator
- 24 Volts To Tuner
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- 75 ft (22.9m) Control Cable Included
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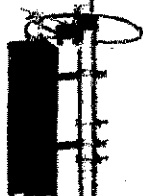
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TS-430S

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KENWOOD'S TS-430S, a revolutionary, ultra-compact, HF transceiver has already won the hearts of radio Amateurs the world over. It covers 160-10 meters, including the new WARC bands (easily modified for HF MARS). Its high dynamic range receiver tunes from 150 kHz-30 MHz. It utilizes an innovative UP conversion PLL circuit for superior frequency stability and accuracy. Two digital VFO's allow fast split-frequency operations. A choice of USB, LSB, CW, or AM, with FM optional, are at the operators fingertips. All Solid-state technology permits inputs of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.

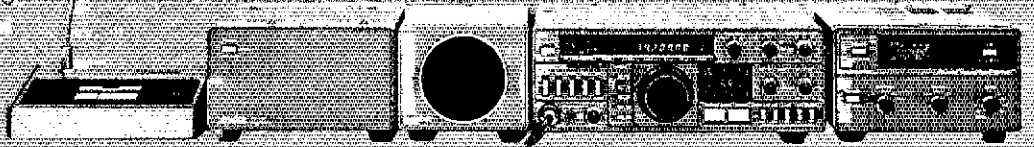
Eight memories store frequency, mode, and band data, with Lithium battery memory back-up. Memory scan and programmable automatic band scan help speed up operations. An IF shift circuit, a tuneable notch filter, and a Narrow-Wide switch for IF filter selection help eliminate QRM. It has a built-in speech processor. A fluorescent tube digital display makes tuning easy and fast. An all-mode squelch circuit, a noise blanker, and an RF attenuator control help clean up the signal. And there's a VOX circuit, plus semi-break-in, with side-tone. All-in-all, it just could be that the expression "Digital DX-terity" is a bit of an understatement.

TS-430S Optional Accessories:

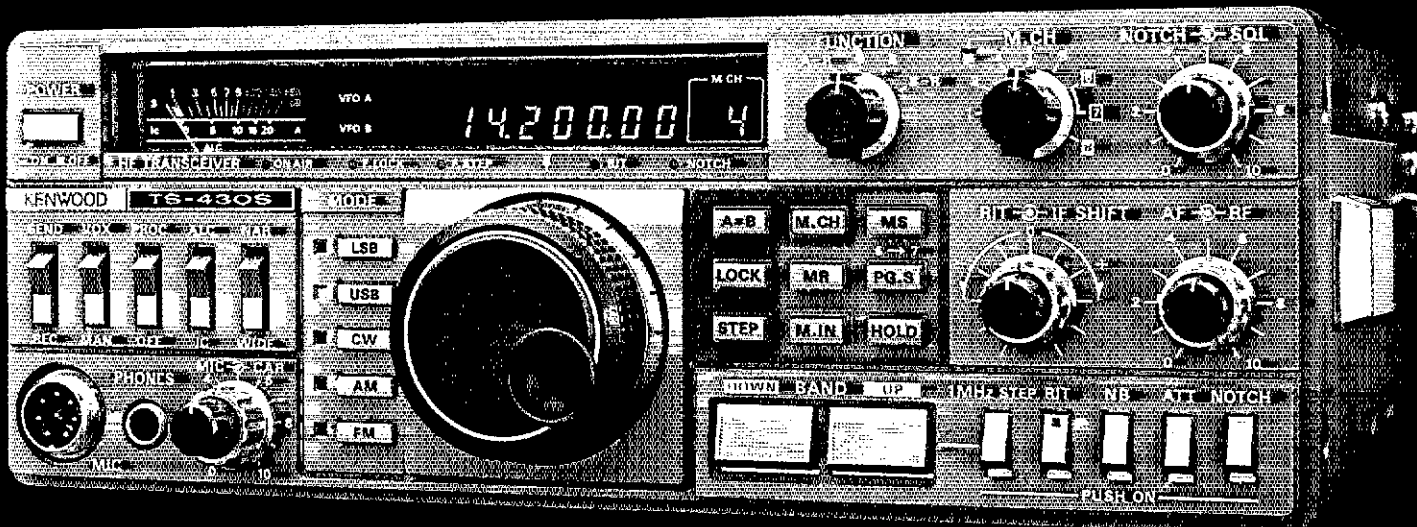
In typical KENWOOD fashion, there are plenty of optional accessories for this great HF transceiver. There is a special power supply, the PS-430. An external speaker, the SP-430, is also available. And the MB-430 mounting bracket is available for mobile operation. The

AT-250 automatic antenna tuner was designed primarily with the TS-430S in mind, and for those who prefer to "roll their own," the AT-130 antenna tuner is available. The FM-430 FM unit is available for FM operations. The YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters, the YK-88SN SSB filter, and the YK-88A AM filter may be easily installed for serious DX-ing. An MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, an MC-42S mobile hand mic., and an MC-55 8-pin mobile microphone, are available, depending on your requirements. TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter 160~6 meter, SW100A SWR/power/volt meter 160-2m, HS-4, HS-5, HS-6, HS-7 headphones, are also available.

More information on the TS-430S is available from authorized dealers of Ico-Kenwood Communications, 111 West Walnut Street, Compton, California 90220.



Specifications and prices are subject to change without notice or obligation.



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TS-830S

TS-830S... a "top notch" field proven performer.

The TS-830S is the HF transceiver that delivers the performance the others can only talk about.

Kenwood's TS-830S offers you every conceivable operating feature built-in for 160-10 meters, including the WARC bands. Key operating features

such as wide receiver dynamic range, variable band width tuning, notch filter, adjustable noise-blanker, IF shift (pass-band tuning), and receive capability of WWV on 10 MHz, have established the TS-830S as the first choice of the serious Amateur.

Two 6146B's in the final assure you of rugged, reliable service. The fluorescent tube digital display, RF speech

processor, narrow/wide filter selection on CW/SSB monitor circuit and receiver (RIT) and transmitter (XIT) incremental tuning, add to the operating base and enjoyment of the TS-830S.

Yes, all these features along with unprecedented reliability have made the field-proven TS-830S truly "top notch".

Optional accessories:

• SP-230 external speaker.

• VFO-230 remote digital VFO with five memories, digital display.

• VFO-240 remote analog VFO.

• AT-230 antenna tuner.

• YG-455C (500 Hz) or

YG-455CN (250 Hz) CW

filter for 455 kHz IF.

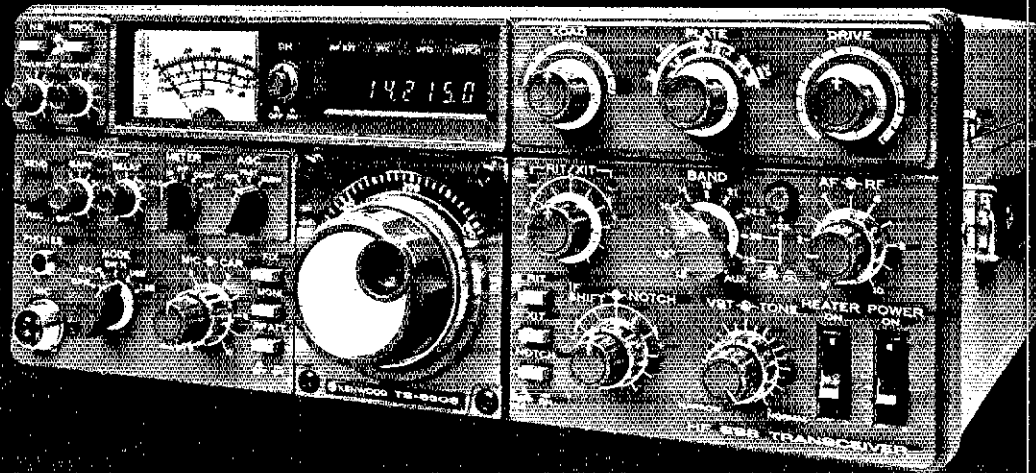
• YK-88C (500 Hz) or

YK-88CN (270 Hz) CW filter

for 8.83 MHz IF.

• KB-1 deluxe heavyweight

knob.



TS-530SP

TS-530SP... "Cents-ational" in performance and value.

No other HF transceiver gives you all these features at such an affordable price.

The TS-530SP covers 160-10 meters, LSB, USB, CW, including WARC bands and it also receives WWV on 10 MHz.

When you turn on your TS-530SP, the IF shift tunes

out interfering signals, and the tunable audio notch filter also helps eliminate QRM. Your frequency is displayed in six digits by the fluorescent tube display, with an analog dial for added convenience. Other key features include wide receiver

dynamic range, narrow/wide filter selection for CW and/or SSB, built-in speech processor for extra talk power, adjustable noise-blanker and RIT/XIT to allow independent fine-tuning

of receive or transmit frequencies. All this along with two 6146B's in the final to allow for lasting, dependable operation.

The TS-530SP, solid dependability at a price everyone can afford!

Optional accessories:

• SP-230 external speaker with selectable audio filters.

• VFO-240 remote analog VFO.

• VFO-230 remote digital VFO.

• MC-50 desk microphone.

• AT-230 antenna tuner/SWR/ power meter.

• KB-1 deluxe VFO knob.

• YK-88C (500 Hz) or TK-88CN (270 Hz) CW filter.

• YK-88SN (1.3 kHz) narrow SSB filter.

More information on the TS-830S and TS-530SP is available from authorized dealers of Inc. Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

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"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 U.S. and Canada.

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"It Seems to Us..."

The Threat to 160

Ever since the FCC began work on implementing the results of the 1979 World Administrative Radio Conference, some four years ago, we've had a fight on our hands over the top half of the 160-meter band. The battle pits us against the offshore oil interests, who use the medium-frequency spectrum to find their way to drilling sites. While our predicament is the result of their stated needs being in conflict with ours, its origins are elsewhere — in an ill-conceived move to expand the AM Broadcasting band.

Regardless of its source, the problem is very real — and it's time for you to take action.

First, some background. One of the more inexplicable features of the U.S. proposals for the 1979 WARC was an extension of the high end of the AM Broadcasting band to 1860 kHz from its present limit of 1605 kHz. The proposal had little support outside the Commission: Many AM stations already were having a hard time competing for revenue, and the need of the public for more media alternatives wasn't exactly obvious. Stations at the top of the dial have a fraction of the groundwave coverage of stations running the same power at the low end, and nighttime skywave interference is horrendous. Also, of course, the couple of hundred million AM radios already in the hands of listeners don't cover the range. The proposal was so flawed technically that it was believed by some to be payment of a political debt by the Carter administration.

Had this expansion been adopted at WARC-79, the impact on our 160-meter band would have been severe. Our allocation would have been reduced to a 40-kHz exclusive segment at 1860-1900 kHz, plus continued sharing of the 1900-2000 kHz segment. We would have shared this segment with several other radio services on a co-equal, primary basis, just as we have for many years. A new sharing partner, which was to be put on a secondary basis to the other services, including Amateur, was radiolocation — an ill-defined service having to do with "radio-determination used for purposes other than those of radionavigation." Radiolocation had to be introduced there, it was said, because of the AM Broadcasting expansion into the existing radiolocation allocations below 1800 kHz.

Fortunately, the wisdom of the Conference prevailed at the 1979 WARC and the entire AM expansion sought by the U.S. did not come to pass. However, in Region 2 (North and South America) U.S. influence was sufficient to garner an expansion to 1705 kHz. In implementing the Conference results, the U.S. government has assumed that this expansion will eventually be implemented.

It would be a mistake to treat even this amount of AM expansion as a foregone conclusion! If anything, there is even less justification today for this relic from an earlier administration than when it was first introduced. A number of important questions must be addressed and answered first. At the international level, the compatibility of AM Broadcasting in Region 2 with other services in Regions 1 and 3 is being addressed in the International Radio Consultative Committee (CCIR). A couple of

Regional Administrative Radio Conferences now scheduled for April 1986 and the third quarter of 1988 must decide on transition procedures and must develop plans for the equitable use of the new segment of broadcasting spectrum by the countries throughout the hemisphere. At the national level, important policy issues must be settled. Are more broadcasting stations needed when there is already sufficient competition to justify deregulation of the Broadcasting Service? Can the new stations be viable economically? Can the impact on other spectrum users be justified? Isn't AM expansion an idea whose time has come — and gone?

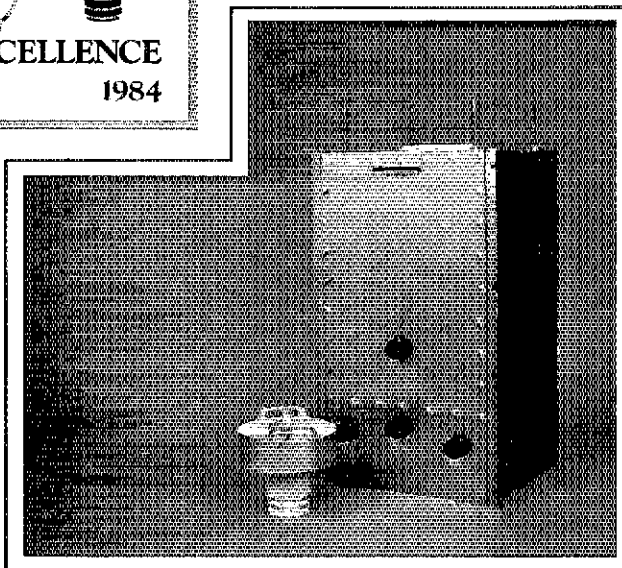
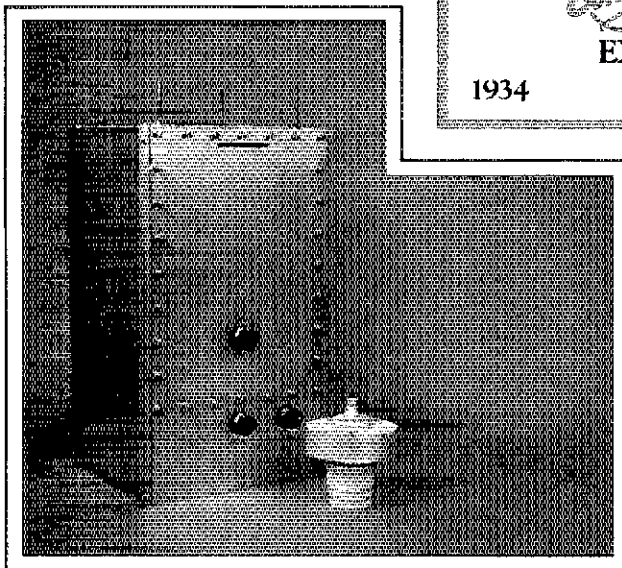
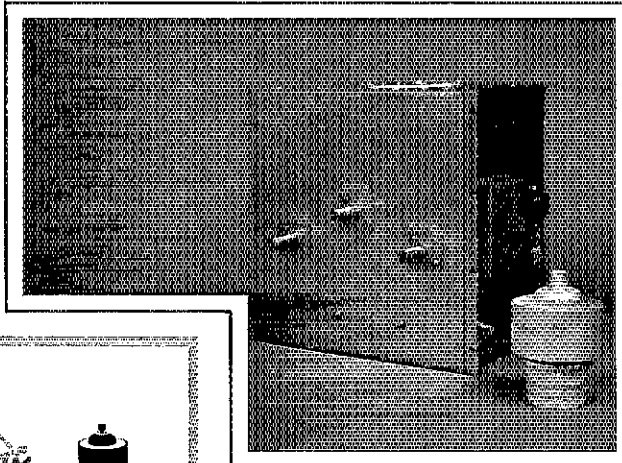
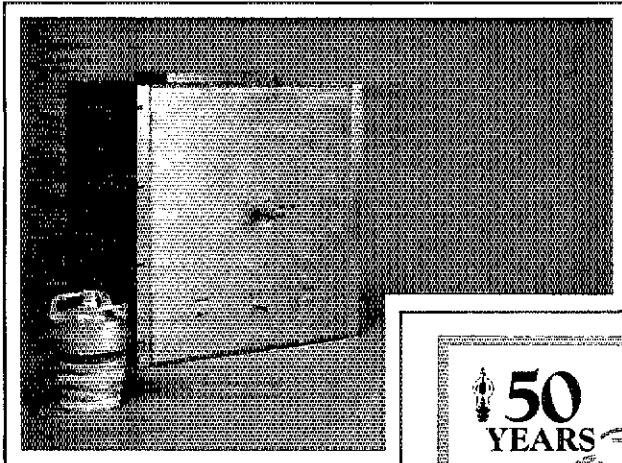
Without AM Broadcasting expansion, there is no apparent justification for introducing radiolocation at 1900-2000 kHz even on a shared, secondary basis. Therefore, it came as something of a rude shock in 1980 to find FCC proposing a primary, exclusive allocation for radiolocation in a band segment which the Amateur Service has occupied since the earliest days of radio regulation. Even with AM expansion, it's not at all apparent that the need cannot be met within the remaining spectrum below 1800 kHz, or by using spread spectrum techniques, or through the use of existing, taxpayer-supported satellite and LORAN-C radionavigation systems. This proposal has been fought at every step by the League, as reported extensively in *QST*. It has been the reason for our efforts to encourage more uniform occupancy of the 160-meter band, as opposed to having everyone crowd on top of one another at the low end out of sheer force of habit.

The latest act in this drama is FCC PR Docket No. 84-874, reported in last month's Happenings. A Notice of Proposed Rule Making in this proceeding looks toward the allocation of the 1900-2000 kHz band to radiolocation on a primary basis, in anticipation of AM expansion.

Some good news finally reached us just before the October Board Meeting, when the Commission, acknowledging that there was no particular hurry to conclude the proceeding, granted a League request for a 90-day extension of time to file comments. We're taking maximum advantage of this extension to supplement our arguments with technical documentation. We urge individual amateurs and clubs to take advantage of the extension as well. The U.S. is almost unique in the world in the degree to which it permits the general public to take part in spectrum allocations proceedings. Make the most of it — file!

The most effective filings will document the public benefit to be derived from maintaining amateur access to the 1900-2000 kHz band, and will suggest practical alternatives to the proposed reallocation. A well-reasoned technical presentation, even if signed by one individual, will carry a lot of weight.

The new deadline for comments is January 24, 1985. Before that date, send an original and 5 copies of your comments to the Secretary, FCC, Washington, DC 20554. Make sure "PR Docket No. 84-874" appears prominently at the top. Oh, and send us a copy, too. We're not above borrowing good ideas! — David Sumner, K1ZZ



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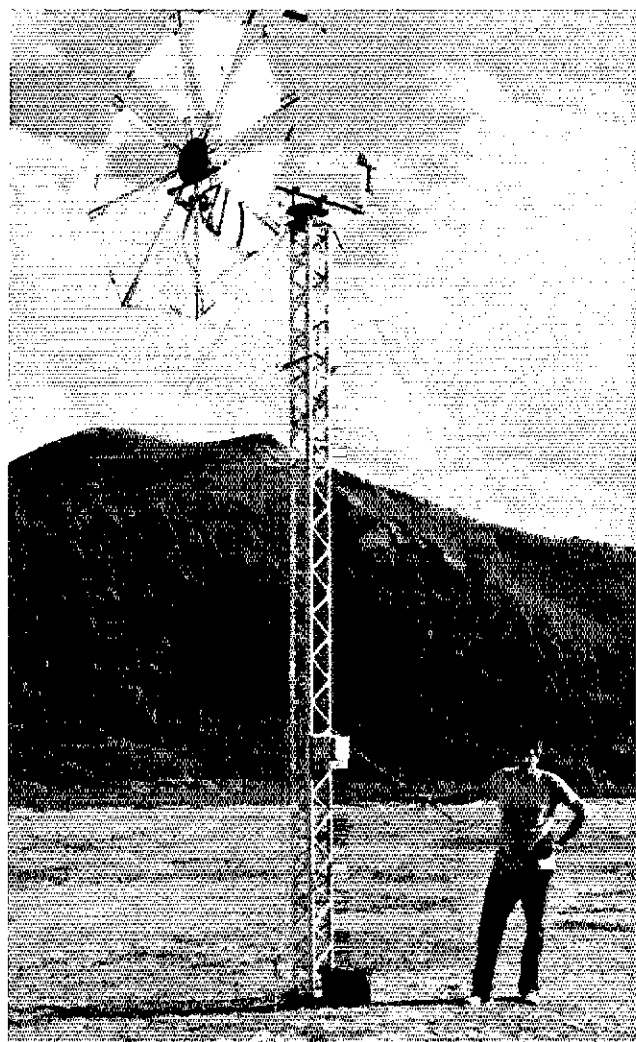
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Pete Demmer, KH6CTQ, has good reason to be proud of the portable windmill he designed and built. Assembled at the KH6IJ Field Day site in less than two hours, the windmill provided all the power needed to run the station — thanks to cooperative Hawaiian trade winds — as operators there racked up nearly 700 QSOs. See the Field Day results in this issue to see how others fared in the June exercise. (KB4P photo)

For Chet Mason, KB4CUC (far right), of Statesboro, Georgia, the spirit of amateur experimentation is alive and well. Because of a very limited budget, it took Chet about 10 months to gather the parts needed to build his version of an Extended Double Zepp antenna. Using the *ARRL Antenna Book* as a guide, he designed and built a ladder line with no. 12 wire and pieces of PVC as insulators. It runs from the Transmatch through the attic and out to the backyard where, with the help of WA1HSZ/4 (shown with Chet) and others, he erected a 40-foot mast. Chet reports good results working U.S. hams and DX with his homemade Double Zepp. Says Chet about his accomplishment: "It shows what a poor man can do with a little time and patience."

VU2RG India's New Leader

Rajiv Gandhi, VU2RG, son of India's slain leader Indira Gandhi, is prime minister of the world's largest democracy. Chosen by his party and sworn in to office only hours after his mother's death on October 31, Rajiv will head the country until at least January, when national

elections must be held. A former pilot with Air India, he entered the political arena in 1981, when he became a member of Parliament. His political future was all but sealed when his mother named him a general secretary of the ruling Congress Party.

Nobel Laureate G3CY A Silent Key

Sir Martin Ryle, G3CY, a recipient of the Nobel Prize in physics and numerous other honors, became a Silent Key October 14 at his home in Cambridge, England. He was 66.

It was in 1974, for his development of aperture synthesis, that Sir Martin received the Nobel Prize, which he shared with Anthony Hewish, a colleague at Cambridge University who was honored for his role in the discovery of pulsars (see Dec. 1974 QST, p. 68). Because of Sir Martin's work, radio astronomers can use many small antennas connected to computers to act as a single large one to detect and observe objects in space several billion light years away. His work in this field was a direct outgrowth of his interest in Amateur Radio. From 1972 to 1982, Sir Martin was Britain's



Astronomer Royal, a title analogous to that of poet laureate. He was knighted in 1966. During WW II, Sir Martin worked at the Telecommunications Research Establishment, which developed ground-based and airborne radar for the Royal Air Force. (Edward Leigh photo)



The Story Behind the Story

Last January, barely a month after Owen Garriott, W5LFL, had completed his history-making amateur operation in space, four hams met at CBS Television City in Hollywood to document the adventure. Roy Neal, K6DUE, conceived of the videotape, wrote the first draft and "made all the things happen" — just the way a producer should. Bill Pasternak, WA6ITF, had traveled with Roy and the tape crews, making sure that the footage from the field was available.

When the production moved into the studio, in the wee hours of a Monday, Alan Kaul, W6RCL, and Frosty Oden, N6ENV, joined the team. A hundred U-Matic cassettes had to be previewed, and potential segments marked. "What goes good with the script?" "That looks good." "Nice footage, but it doesn't seem to fit in conceptually."

Roy and Alan worked on last-minute script changes while Frosty kept the tape equipment humming. Bill picked up the pieces and took care of all those unexpected little things (and a few big ones) that popped up. Bill also arranged for a crew and equipment to be at the Jet Propulsion Lab on

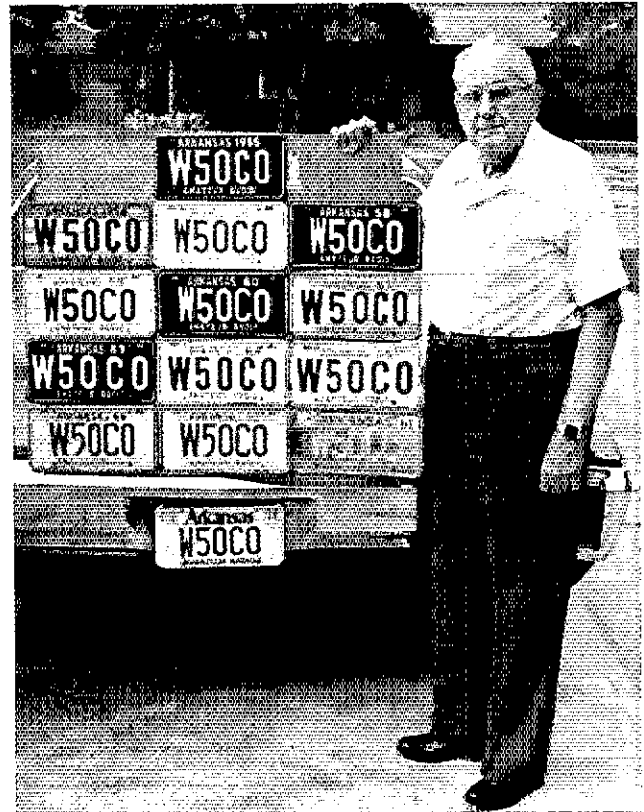
Thursday to shoot additional footage.

On Saturday, work started early — just after the Friday shift ended. This was to be the final assembly of all those 5, 10 and 30-second bits of tape into a coherent video collage. Alan and Frosty worked on past midnight, on past 6 A.M., and around to Sunday noon. When Roy walked into the studio on Sunday, the video portion was ready. Frosty and the other CBS video magicians rolled the tape while Alan directed and Roy read the voice-over with just the right inflection here, a lift there. A CBS soundman added the hammers that banged and the wheels that squealed on touchdown.

Each man took a week's leave from a paying job, worked around the clock and made life "different" for their families in order to volunteer for this project. Through it all they brought Amateur Radio a videotape for under \$50,000 that couldn't be bought off the shelf for \$350,000. They put love into the project that you couldn't buy for any price. Don't be surprised if you get a little misty-eyed the next time you see *Amateur Radio's Newest Frontier*. They earned it. (tnx KB1N)



The makers of *Amateur Radio's Newest Frontier* — W6RCL, K6DUE, WA6ITF and N6ENV (l-r) — receiving ARRL plaques presented by Southwestern Division Director WA6WZO (center).



When he started his collection in 1955, Clyde Chaffin, W5OCO, of Magnolia, Arkansas, had no idea how serious his passion for accumulating Amateur Radio license plates would become.

Another Ham Picked for April Shuttle Flight

The latest word on the proposed April 1985 Amateur Radio operation from aboard the Space Shuttle is that Astronaut Anthony England, W0ORE, will have ham company: Dr. John-David Bartoe, W4NYZ, of the Naval Research Laboratory. Dr. Bartoe will be a payload specialist for the *Challenger* STS-51F mission. Groundwork for the project is proceeding on the assumption that formal notification of acceptance from NASA is forthcoming. Watch *QST* for further developments.

WARC Bands Move Closer

If recent FCC actions are any indication of what's to come in 1985, U.S. amateurs may be enjoying some new bands. Although amateurs have yet to gain full access to all bands gained as a result of amateur efforts at WARC-79, recent Commission actions have moved some of these bands closer to permanent amateur use. Also, in response to a League petition, the FCC has proposed that additional modes be authorized on 160 meters. See *Happenings*, this month, for more details.

Want a Place Up Front in *QST*?

Have a news item, human-interest story or photo that you think other amateurs would be interested in? It may be appropriate for use in *Up Front* in *QST* or perhaps as a *Stray*. Here are some hints to improve your chances of getting that item in print.

- 1) Be sure the information is of interest to most readers.
- 2) Submit your item before deadline — the 8th of the second month preceding desired publication (i.e., must arrive at HQ. before December 8 for February *QST*).
- 3) Photographs may be color or B&W, but good-quality action photos have the best chance of being used.
- 4) Send all material to *QST* Features Editor, ARRL, 225 Main St., Newington, CT 06111.

Follow the above hints and maybe your item will find a place *Up Front* in *QST*.

League Lines...

FCC has granted an ARRL request for an extension of comment time on PRB-1, the League's request for a declaratory ruling delineating the limitations of local zoning authorities over federally licensed ham radio stations. Comments that recount local "horror stories" of hams being harassed by public officials should be most effective. Also, ordinances that would discourage bright young technically inclined youth from becoming hams (such as large filing fees, having to obtain permission of neighbors) should be noted. See November QST, p. 65, for details on filing. This may well be the most important issue facing hams in the last five years. Please file. The new comment deadline is December 24.

As expected, the National League of Cities (NLC) has filed comments against PRB-1. Among its points, NLC says that the FCC doesn't have the authority to meddle in local zoning issues, that there is no need for the preemption since anyone with a complaint can always go to court, and that if the FCC does make the preemption, it lacks the competence to do it in such a manner that it would not result in lengthy court battles on a case-by-case basis.

The 1983 American Radio Relay League Annual Report is available for \$1 from ARRL Hq. If you ever wondered where your yearly membership dues are going, get one of these!

The ARRL Board of Directors met in Hartford in late October. See story and minutes beginning on page 52.

FCC has amended Part 97 to delete 2310-2390 MHz from the Amateur Radio Allocations table effective immediately. See September QST, p. 48.

Additional comment time is available for P.R. Docket No. 84-874, which proposes to amend FCC Part 90 to allow radiolocation on a primary basis between 1900-2000 kHz. (See November 1984 QST, p. 64, for details.) The new comment deadline is January 24, 1985; reply comment deadline is March 11.

"Amateur Radio's Newest Frontier" will be available to your local PBS station via a satellite feed from KUED in Salt Lake City. The videotape will be transmitted at 1530 hours Mountain Standard Time (1730 EST) on December 30 over the Pacific Mountain Network (Schedule C) using WESTAR 4, Transponder 10.

Broadcasters tell us that there is little likelihood of a PBS station "picking up" this program unless they know there is local interest in it. If you would like to see this tape documentary of W5LFL's STS-9 operation on your local PBS affiliate, please call or write them and ask that they "pick up the feed." The more calls and letters a station receives, the greater the chance of them airing the show. If you own a TVRO, this would be a good chance for you to add a copy of "Amateur Radio's Newest Frontier" to your personal library.

An elementary or secondary school teacher will be the first civilian (non-military and non-aerospace industry) Space Shuttle astronaut in late 1985 or early 1986. The requirements are in NASA's Announcement of Opportunity (AO), available from NASA Headquarters, Mail Code ME, Washington, DC 20546. A recorded information telephone number is 202-453-8644. Owen Garriott, W5LFL, has demonstrated that ham radio can be used for back-up communications in space. Will you be teaching ham radio from space?

Because of the heavy input of applications in September, the Annual DXCC List does not appear in this issue. Please be patient -- it will appear in an upcoming issue.

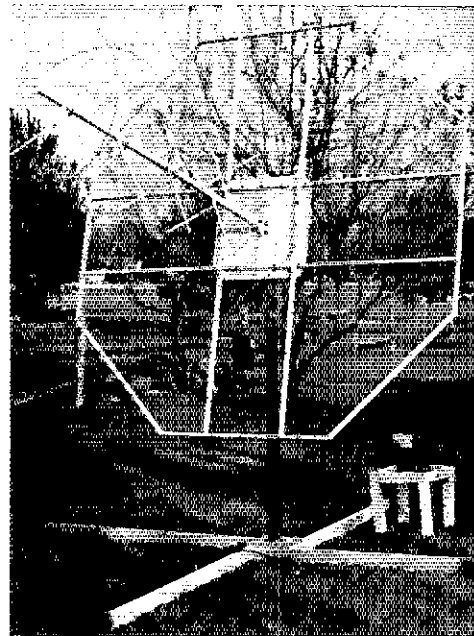
Richard L. Baldwin, W1RU, International Amateur Radio Union President, has returned from a very successful trip to China (BY). A full report will appear in IARU News next month.

The ARRL/VEC maintains a computerized listing of all test sessions known to us, even those handled by some other VECs. Just send a business-size s.a.s.e. to the ARRL/VEC office, 225 Main St., Newington, CT 06111, and ask for a printout of test sessions in your area. Persons living near a state line may ask for the adjacent state as well.

A Helical Antenna for Space-Shuttle Communication

Here's an antenna project that is out of the ordinary. This antenna is designed for rapid assembly and disassembly. It's ideal for operation where portability is a requirement.

By George R. Isely,* WD9GIG and William G. Smith,** W9LRG



The announcement of the space-shuttle flight with Dr. Owen Garriott, W5LFL, operating on 2 meters presented a challenge: Could we work him? Using a good antenna always helps your chances of making a QSO, so we elected to build one. We decided that the antenna had to be right-hand circularly polarized, have high gain, be easily maneuverable, work well at ground level and be affordable.

Helix Design

Helical antennas are impressive performers. A quick calculation showed that a 2-m helix would not be too big to build or maneuver, so a computer program (see Appendix) was written to evaluate designs rapidly.¹ The equations used in this program are from the book by Dr. John Kraus, W8JK.² The symbols used to describe this helix are

- D_λ = diameter of helix
- C_λ = circumference of helix
- S_λ = spacing between turns (center to center)
- a = pitch angle = $\arctan S_\lambda/C_\lambda$
- L_λ = length of one turn
- n = number of turns
- A_λ = axial length = nS_λ

where λ = free-space wavelength

These dimensions are shown in Fig. 1. Fig. 2 shows the relationship between cir-

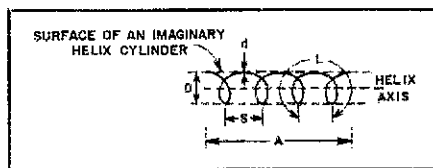


Fig. 1 — The basic helix and associated dimensions.

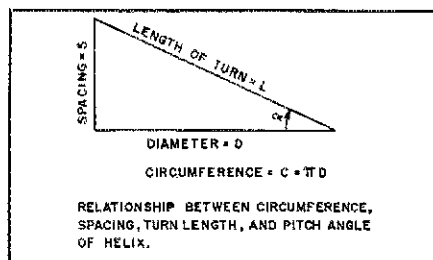


Fig. 2 — Dimensional relationships of the helix.

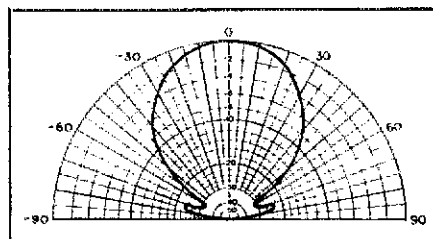


Fig. 3 — Calculated field pattern of the helix.

radiating in the axial mode. The equations used apply to helices with a pitch angle in the range of 12 to 15 degrees. Defining these two parameters trigonometrically defines the balance of the variables. The circumference limits shown in the computer program should be observed so the antenna will have the desired pattern with only minor side lobes. Fig. 3 is a plot of the calculated antenna pattern.

For the axial-mode helical antenna, formulas of interest are

beamwidth ($1/2$ power)

$$B = \frac{52}{C_\lambda \sqrt{nS_\lambda}} \text{ degrees} \quad (\text{Eq. 1})$$

beamwidth (first null)

$$B = \frac{115}{C_\lambda \sqrt{nS_\lambda}} \text{ degrees} \quad (\text{Eq. 2})$$

directivity (gain)

$$D = 15C_\lambda^2 nS_\lambda \quad (\text{Eq. 3})$$

feed-point resistance

$$R = 140C_\lambda \text{ ohms} \quad (\text{Eq. 4})$$

Table 1 lists the antenna parameters produced by the computer program for the 146-MHz helix.

Construction

A rigid helix assembly ensures stable and predictable antenna characteristics. Our major concern was to maintain structural rigidity of the helix assembly while keeping mass and cost low. Also, the antenna had to be easy to assemble and disassem-

¹Notes appear on page 18.

*736 Fellow St., St. Charles, IL 60174

**1004 Kehoe Drive, St. Charles, IL 60174

Table 1
Helical-Antenna-Design Summary

Frequency = 146 MHz
Circumference of helix = 1.1λ
Wavelength = 6.72 ft
Number of turns = 4

Pitch angle = 12 degrees
Axial length = 6.16 ft
Antenna gain = 16 (12 dBI)

	Meter	Feet	Inches
Wavelength	= 2.05	6.72	80.64
Spacing between turns, S_λ	= 0.47	1.54	18.48
Helix diameter, D_λ	= 0.71	2.32	27.84
Length of turn, L_λ	= 2.26	7.41	88.92

Beamwidth (half power) = 48 degrees
Beamwidth (first null) = 108 degrees
Terminal resistance = 154 ohms

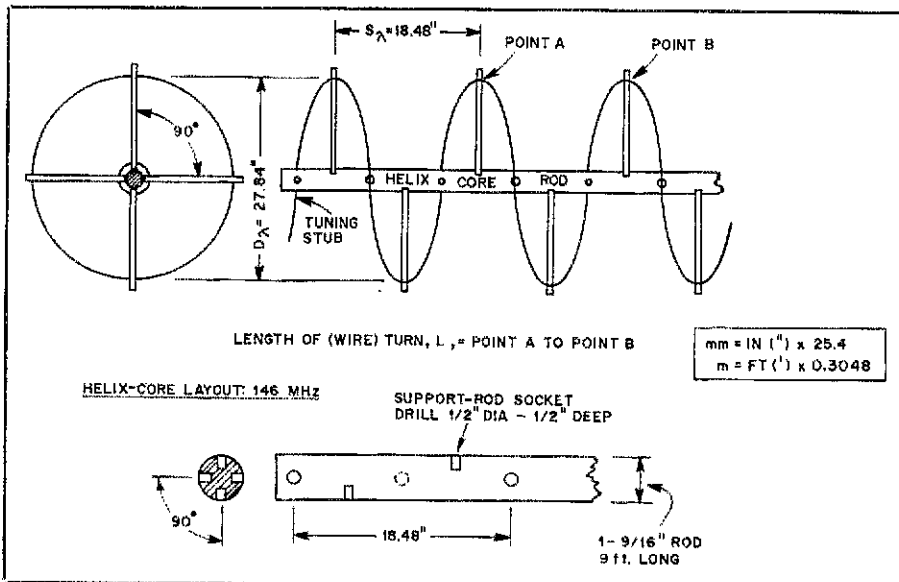


Fig. 4 — Helix for the 146-MHz antenna.

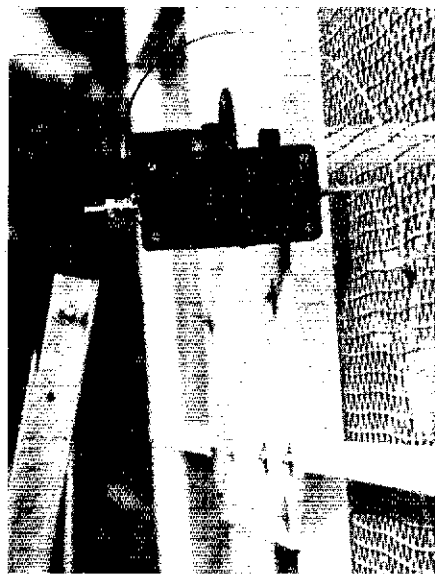
ble without upsetting antenna performance.

Since our antenna is designed for temporary installation, lightweight materials are used. (The design can be adapted easily to a permanent structure by substituting aluminum or steel for the wooden frame pieces, and a heavy-gauge plastic pipe for the helix core and spiral support rods.) This antenna can be stored temporarily as several subassemblies and can be reassembled within 30 minutes. Or, it can be completely dismantled for long-term storage in a minimum of space. The subassemblies consist of the helix, ground plane, counterbalance, yoke, base and matching network.

Helix

A 1-9/16-inch-diameter wooden rod is used for the helix core; it is the most expensive component in this project.³ Do not skimp on the quality of material used here because strength and rigidity are most important to maintain consistent performance. The wire-spiral support rods are made from 1/2-inch hardwood dowels.

The helix core rod is subdivided into four equal quadrants 90° apart around the cir-



Matching-network installation. The wire loop is the ground lead.

cumference (Fig. 4); each of these quadrants is drawn the full length of the rod. A simple scribing fixture made from

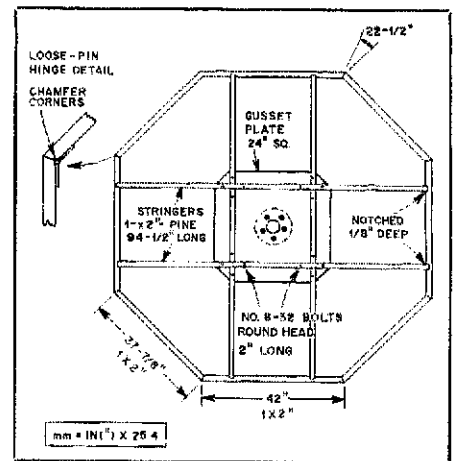


Fig. 5 — Ground-plane assembly. The ground-plane area must be equal to, or greater than, one square wavelength.

two pieces of scrap wood aids in accurately drawing these lines. A drill press makes it easy to drill the support rod sockets to the same depth exactly on the scribed lines so that all the support rods are identical. (Use care when drilling holes, and keep the hole placement such that similar parts may be interchanged easily.)

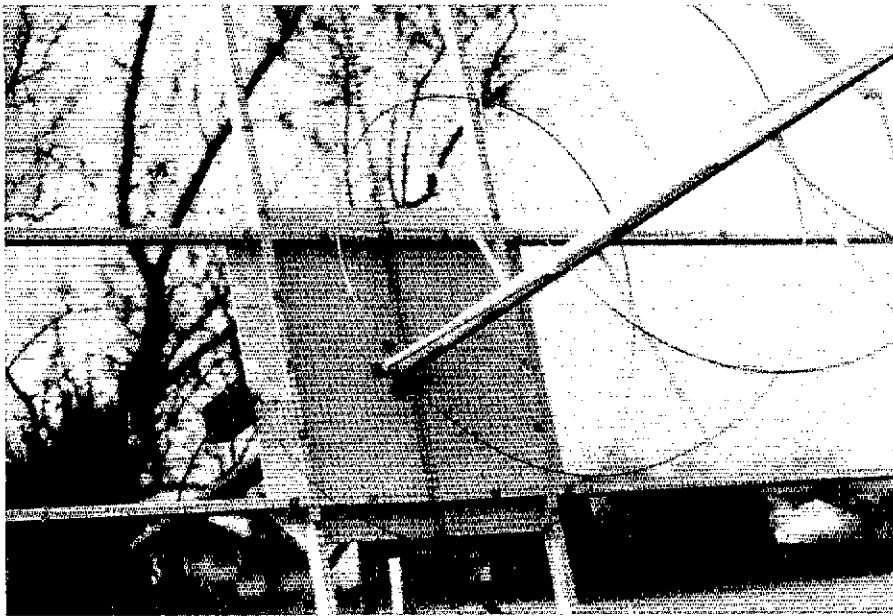
After the sockets are drilled for a press fit, drill a pilot hole through the bottom of the socket. Insert each support rod into its socket, drill a hole into the rod and secure the rods in their sockets with brass screws.

Thread the finished helix support assembly with vinyl-covered no. 8 aluminum clothesline wire. (Copper wire is expensive and gets brittle too fast to make the smooth spiral shape desired).⁴ We coiled the wire around a 30-gallon garbage can to provide a right-hand spiral of roughly the proper dimension. Peen flat the feed end of the wire, and drill a hole into it for attaching the matching network output terminal. When drilling the hole, operate the drill at low speed to prevent splitting the tab.

Ground Plane

Fig. 5 shows the ground-plane framework. It is made of four clear pine, 1- x 2-inch stringers cut to the desired length (allowing for the extra length used in the perimeter notch joints). The ground-plane area should be a minimum of one square wavelength (45 square feet at 146 MHz). We used an octagon 8 feet across, which netted approximately 55 square feet of ground-plane area. The four stringers are notched to interlock and form an inner square slightly smaller than the center gusset plate. When this center plate is bolted to these stringers, the assembly becomes a rigid, lightweight support for the ground-plane octagon.

The octagon perimeter pieces are made of 1- x 2-inch pine with the ends miter-cut precisely at 22.5° to yield the 45° corner joint. Notch the four 42-inch pieces to



The helix feed-point. To the left of center is the matching network.

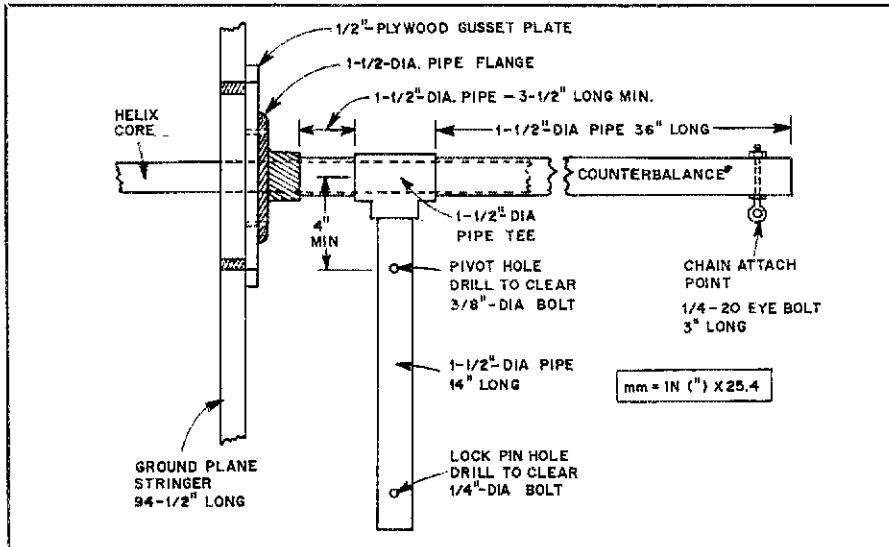


Fig. 6 — Counterbalance assembly, side view.

receive the stringers, and carefully drill clearance holes for the screws used to fasten the pieces together. Loose-pin hinges attach the four 37-7/8-inch perimeter pieces to the ground-plane assembly. (Unless otherwise described, all hardware is galvanized steel.)

One-half-inch galvanized hardware cloth is used for the ground plane. Choose a size that can be cut so the ground plane consists of two halves. Attach the hardware cloth to the frame using no. 8 \times 1/2-inch sheet-metal screws and washers. Cut out a circle of the wire cloth to allow the helix core to slip through the gusset plate and into the counterbalance assembly.

Cut a gusset plate from 1/2-inch plywood and size it to overlap the square area in the center of the octagonal support frame. Clamp the plate to the stringers, and drill

screw holes through the frame pieces using the previously drilled holes as a template. Fasten the gusset plate to the frame with 2 1/4-inch-long no. 8-32 screws.

Counterbalance

This assembly (Fig. 6) consists of 1 1/2-inch pipe and fittings. It is designed to provide a slightly positive (forward) balance moment to permit the antenna to be locked into a fixed azimuth and elevation angle by the restraining chains (described later). If the antenna is to be motorized, an evenly balanced moment should be used to reduce the load on the motors.

Drill a clearance hole through the 1 1/2-inch-diameter pipe nipple between the pipe flange and T fittings. After the helix

assembly is positioned permanently, this hole is used as a pilot hole for drilling through the helix core rod. Use a 1/4-20 hex-head bolt to hold the helix in position.

Yoke

As shown in Fig. 7, the yoke assembly is fabricated from 1-inch galvanized angle iron and strapping, and black iron pipe and fittings. The dimensions are not critical, and can be sized to suit the available material and the size and weight of the antenna you're building.

Base Assembly

Refer to Figs. 8 and 9. This assembly consists of four 2- \times 4-inch stabilizers and a square base plate made from 3/4-inch-thick plywood. These dimensions are not critical as long as sufficient stability and strength are built in.

Screw four eyebolts into the outer ends of the stabilizers to provide for the attachment of the restraining/positioning chains. These chains are used to stow the antenna horizontally or lock it into any desired position.

Pi-Network

The matching network (Fig. 10) consists of two 50-pF air-variable capacitors and a 1-turn, 1-inch-long, 5/8-inch-diameter coil wound on a polystyrene rod. A plastic project box houses the network. Install the input BNC connector at one end of the box, and a 2-inch-long, no. 8-32 brass machine screw at the opposite end of the box to serve as the output terminal. A plastic tube slid over the screw prevents the screw from shorting to the ground plane.

Attach the antenna feed-point tab to the screw using two no. 8-32 brass nuts, two flat washers and two internal-tooth lock washers to ensure good electrical contact between the tab and the terminal. Mount the coil form lengthwise within the box on one side, and secure the two capacitors on the opposite side. Use point-to-point wiring, with the ground side of the input connector wired directly to the ground plane mesh by means of a no. 6-32 brass machine screw and two washers. Mount the box (see the photos) to the back side of the gusset plate by means of a small right-angle bracket screwed to the network case and the gusset.

Assembly and Tuning

After the wooden core is built, thread the helix wire onto the radial support rods, with about 2 feet of wire extending beyond the first (most forward) support rod, and about 4 or 5 feet extending from the last (nearest the ground plane) support rod. Secure the helix core rod so this last support rod is 10 inches from the ground-plane surface. Taper the rear portion of the wire down to the ground plane in a smooth spiral of a diameter slightly larger than the helix. At that point, connect it to a

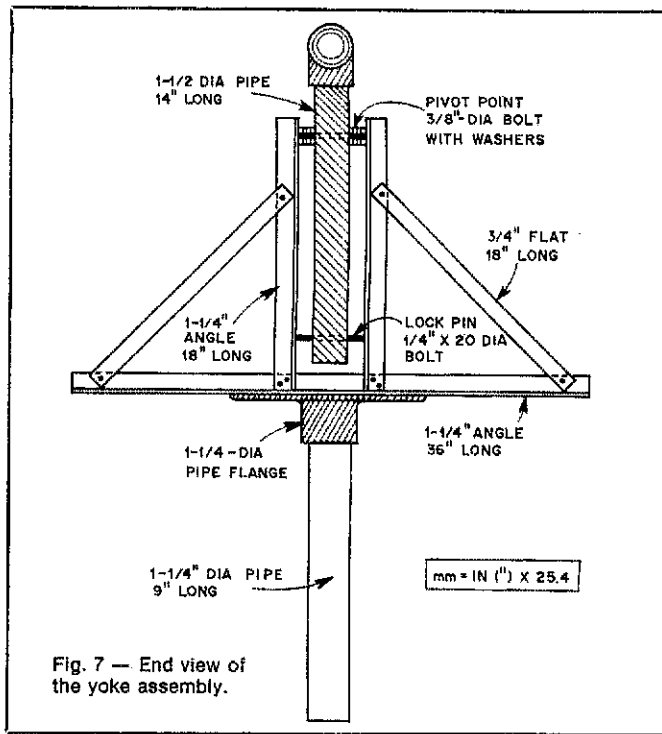
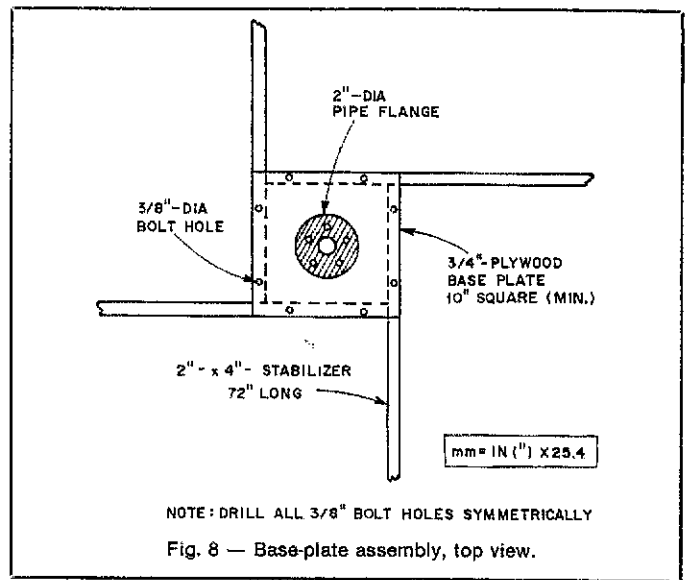


Fig. 7 — End view of the yoke assembly.



NOTE: DRILL ALL 3/8\"/>

Fig. 8 — Base-plate assembly, top view.

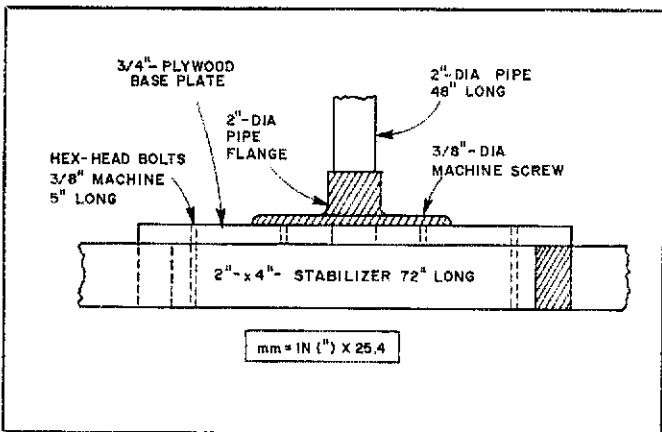


Fig. 9 — Side view of the base-plate assembly.

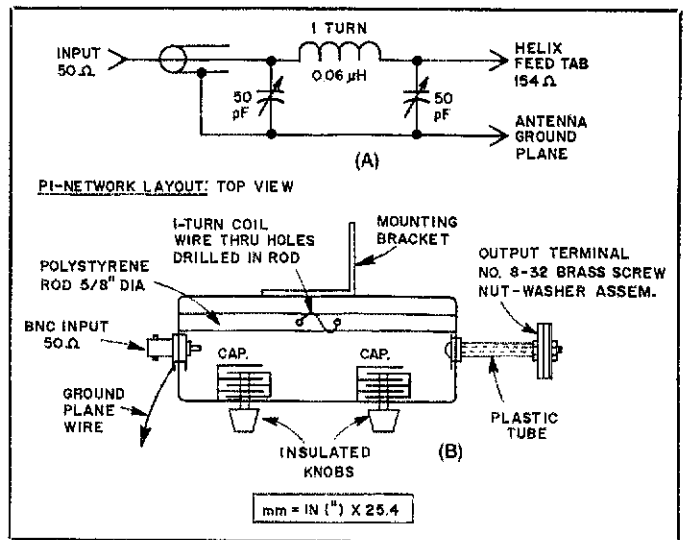


Fig. 10 — At A, a schematic diagram of the impedance-matching network. Typical assembly is shown in the pictorial of B. See text for details.

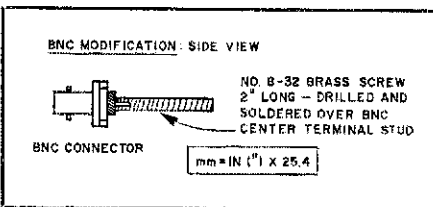


Fig. 11 — Modification of one BNC connector is required.

modified BNC connector (Fig. 11) that extends through, without touching, the ground plane. A piece of RG-58 coaxial cable is attached to the BNC connector, with the other end terminated in a two-turn loop of wire.

A GDO, loosely coupled to the loop, can be used to determine the resonant frequency of the antenna. Because of the extra length of wire on the forward (tuning stub)

Table 2 Materials List

1 — 2-in-dia, 48-in-long black iron pipe	2 — 2-in, wire-link, 6-ft-long lengths of galvanized chain
1 — 2-in-dia pipe flange	4 — 1- × 2-in, 94 1/2-in-long clear pine boards
1 — 1 1/2-in-dia, 36-in-long black iron pipe	4 — 1- × 2-in, 42-in-long clear pine boards
1 — 1 1/2-in-dia, 14-in-long black iron pipe	4 — 1- × 2-in, 37-7/8-in-long clear pine boards
1 — 1 1/2-in-dia, 3 1/2-in-long black iron nipple	1 — 1/2-in-thick, 24- × 24-in plywood board
1 — 1 1/2-in-dia pipe T	1 — 1-9/16 dia, 9-ft-long clear pine rod
1 — 1 1/2-in-dia pipe flange	8 — 1/2-in dia, 3-ft-long maple dowels
1 — 1 1/4-in-dia, 9-in-long black iron pipe	4 — 2- × 4-in, 6-ft-long boards
1 — 1 1/4-in-dia pipe flange	1 — 3/4-in-thick, 10- × 10-in (minimum) plywood board
2 — 3/4-in × 1/8-in, 18-in-long flat galvanized-iron pieces	1 — 50-ft length no. 8 vinyl-covered aluminum clothesline wire
2 — 1 1/4- × 1/8-in, 18-in-long galvanized-iron angle pieces	4 — 1/2-in, loose-pin hinge pairs
1 — 1 1/4- × 1/8-in, 36-in long galvanized-iron angle piece	Misc. — Bolts, screws and other hardware (see text and figures.)
2 — 1/2-in mesh, 48- × 96-in hardware-cloth pieces	

end, the resonant frequency will be low initially. Trim this end a few inches at a time until the helix resonates at 146 MHz.

During our tune-up procedure, a 2-meter transmitter and a Bird wattmeter were attached to the BNC connector with RG-58

coaxial cable. We attempted to match the 50-Ω feed line to the 154-Ω antenna impedance by altering the taper of the wire at the feed end to the ground-plane surface. This is a valid method of impedance transformation, but it did not result in a low SWR. We therefore used the pi-network described previously. With this matching network, we obtained an SWR of less than 1.1:1. With winter weather forcing tear-down and storage, we could only roughly measure the 1/2-power beamwidth, which appears close to 54°.

Summary

This helical antenna meets all of our requirements: high gain, maneuverability, desired polarity, ease of construction and low cost. The total cost of our helix was about \$80; not a bad price for the performance! What started out as a challenge became a fun project that we recommend



The authors and their helical antenna. George Isely is to the left of the antenna, William Smith on the right.

to anyone. The helix antenna should have applications for other amateur work where high gain and reliable performance are required.

What's that? Did we work Owen? Sorry to say, no. But wait till next time!

Notes

- ¹A program listing modified for use on the Apple //e computer is available from Hq. for an s.a.s.e.
- ²J. D. Kraus, *Antennas*, first ed. (New York: McGraw-Hill Book Company, Inc., 1950). [See also M. R. Davidoff, K2UBC, *The Satellite Experimenter's Handbook* (Newington, CT: ARRL, 1984), pp. 6-16 to 6-18 — Ed.]
- ³mm = in × 25.4; m = ft × 0.3048; m² = ft² × 0.0929; l = gal × 3.785
- ⁴[Editor's Note: As stated, this antenna is built for temporary installation. Permanent installation may require some refinements, and the overall project cost may be higher. Copper wire or coaxial cable (don't use foam-dielectric cable) may be substituted for the aluminum clothesline used here, but reliable performance requires the helix be rigid. Electrolysis occurring at the junction of dissimilar metals should also be considered. Another impedance-matching method was described by Joe Cadwallader in "Easy 50-Ω Feed for a Helix," *QST*, June 1981, p. 28.]

Appendix

Helical-Antenna-Design Program for the TRS-80® Microcomputer

```

10 REM DESIGN OF HELICAL ANTENNAS BASED ON
20 REM "ANTENNAS" BY DR. JOHN D. KRAUS, WB6K.
31 REM IF MORE INFORMATION IS DESIRED, IT IS
RECOMMENDED
42 REM THAT CHAPTER 7 IN DR. KRAUS' BOOK BE
STUDIED
43 REM CAREFULLY AND THOROUGHLY.
45 REM THIS PROGRAM WRITTEN BY
H.G. SMITH, W4LRS
40 PRINT "DESIGN OF A HELICAL ANTENNA"
50 PRINT:PRINT
60 INPUT "ENTER FREQUENCY, MHz. = "; F
65 P1 = 3.141593
70 N = (INT((2808./F)*PI*100)/100)
71 W = (INT((1183.2808)*100)/100)
72 W1 = W*PI
73 PRINT
74 PRINT "SELECT A VALUE FOR THE
CIRCUMFERENCE OF THE HELIX, C LAMBDA, IN
77 PRINT "WAVELENGTHS. VALUES NORMALLY RANGE
FROM ABOUT .9 TO 1.20."
78 PRINT
80 INPUT "C LAMBDA (LL) = "; CL
81 CF = (INT((CL*W*100)/100)
85 INPUT "NUMBER OF TURNS, N, = "; N
86 PRINT "SELECT THE PITCH ANGLE OF THE
HELIX, S, IN DEGREES."
87 PRINT "THE NORMAL VALUES ARE BETWEEN 12
AND 15 DEGREES."
90 INPUT "PITCH ANGLE = "; A
91 PRINT:PRINT
100 AK = A/(57.29578)
110 S = CL * TAN(AK)
112 SM = (INT((SM*100)/100)
116 SF = (INT((SF*2808*100)/100)
117 S1 = SF*PI
120 L = (INT((SM/SIN(AK))*100)/100)
131 LF = (INT((L*2808*100)/100)
132 L1 = LF*PI
136 NS = N*SM
141 NF = (INT((NS*2808*100)/100)
145 DN = (INT((DN*100)/100)
146 DF = (INT((DF*2808*100)/100)
147 DI = DF*PI
150 DL = S
160 BF = (INT((BF*1183.2808*(NS*100)))
170 BN = (INT((BN*1183.2808*(NS*100)))
180 B = (INT((B*1183.2808*(NS*100)))
190 R = 140000
225 NN = (INT((NN*100)/(S/LOG(10))))+.5)
230 PRINT "SUMMARY
270 PRINT "FREQUENCY = "; F; "MHz"
280 PRINT "CIRCUM. OF HELIX (C LAMBDA) =
"; CL; "WAVELENGTHS = "; CF; "FEET"
290 PRINT "NO. TURNS = "; N; "PITCH ANGLE =
"; A; "DEGREES"
300 PRINT "AXIAL LEN. = "; NF; "FEET"
310 PRINT "ANTENNA GAIN = "; NN; "DB"
320 PRINT
TAB(32); "METERS"; TAB(42); "FEET"; TAB(52); "INCHES
305 PRINT "WAVELENGTH =
"; TAB(31); N; TAB(41); W; TAB(51); N1
310 PRINT "SPACING BETWEEN TURNS, S, =
"; TAB(32); S; TAB(42); SF; TAB(52); S1
315 PRINT "HELIX DIAMETER, D, =
"; TAB(32); D; TAB(42); DF; TAB(52); D1
320 PRINT "LENGTH OF TURN, L, =
"; TAB(31); L; TAB(41); LF; TAB(51); L1
340 PRINT "BEAM WIDTH (HALF POWER) =
"; B; "DEGREES"
350 PRINT "BEAM WIDTH (FIRST NULL) =
"; BN; "DEGREES"
360 PRINT "TERMINAL RESISTANCE =
"; R; "OHMS"
365 INPUT "DO YOU WANT A PRINTOUT ? (Y/N) "; P
366 IF P = "Y" THEN GOTO 400
367 IF P = "N" THEN GOTO 535
370 END
400 LPRINT "SUMMARY
405 LPRINT:PRINT
410 LPRINT "FREQUENCY = "; F; "MHz"
420 LPRINT "CIRCUMFERENCE OF HELIX (C LAMBDA)
"; CL; "FEET"
421 LPRINT "WAVELENGTH = "; CF; "METERS OR
"; W; "FEET"
430 LPRINT "NO. TURNS = "; N; "
431 LPRINT "PITCH ANGLE = "; A; "DEGREES"
432 LPRINT "AXIAL LENGTH = "; NF; "FEET"
440 LPRINT "ANTENNA GAIN = "; NN; "DB"
450 LPRINT
TAB(31); "METERS"; TAB(41); "FEET"; TAB(51); "INCHES
470 LPRINT "WAVELENGTH =
"; TAB(30); W; TAB(40); W1; TAB(50); N1
480 LPRINT "SPACING BETWEEN TURNS, S, =
"; TAB(31); S; TAB(40); SF; TAB(50); S1
485 LPRINT "HELIX DIAMETER, D, =
"; TAB(31); D; TAB(40); DF; TAB(50); D1
490 LPRINT "LENGTH OF TURN, L, =
"; TAB(30); L; TAB(40); LF; TAB(50); L1
505 LPRINT
510 LPRINT "BEAM WIDTH (HALF POWER) =
"; B; "DEGREES"
520 LPRINT "BEAM WIDTH (FIRST NULL) =
"; BN; "DEGREES"
530 LPRINT "TERMINAL RESISTANCE =
"; R; "OHMS"
535 INPUT "DO YOU WANT TO DESIGN ANOTHER
ANTENNA ? (Y/N) "; P
536 IF P = "Y" THEN GOTO 60
540 END

```

Strays

MOVING, CHANGING CALL?

When you change your address or call sign, be sure to notify the Circulation Department at ARRL Hq. Enclose a recent address label from a *QST* wrapper if at all possible. Address your letter to Circulation Department, ARRL, 225 Main St., Newington, CT 06111. Please allow six weeks for the change to take effect. Once we have the information, we'll make sure

your records are up-to-date so you'll receive *QST* without interruption. If you're writing to Hq. about something else, please use a separate piece of paper for each request.

QEX: THE ARRL EXPERIMENTERS' EXCHANGE

Wonder what you've been missing by not subscribing to *QEX*, the ARRL newsletter for experimenters? Among the features in the November issue were:

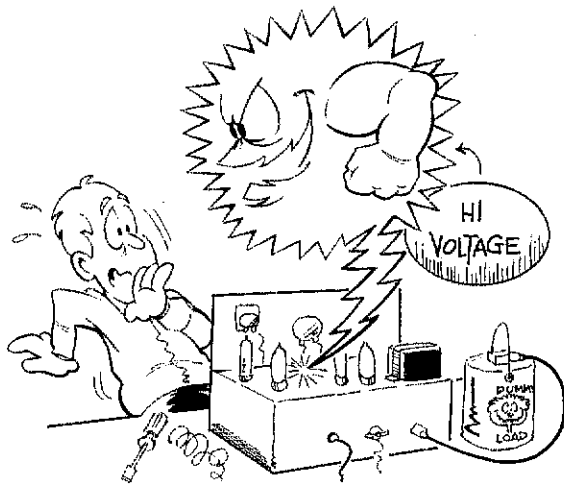
- Part 2 of "Liquid-Crystal Displays: An Established Example of Molecular Electronics," by I. A. Shanks.
- Clint Bowman, W9GLW, gives instruc-

tions on building an "Experimental Two-Meter Converter with Gallium Arsenide Transistors."

• Would you like to transmit a message to your favorite star? An FCC Public Notice exposes an Extraterrestrial Paging Proposal.

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, and is published monthly. The special subscription rate for ARRL members is \$6 for 12 issues; for nonmembers, \$12. There are additional postage surcharges for mailing outside the U.S.; write to Headquarters for details.

The Amateur and Electrical Safety



Part 12: Is your station as safe as it should be? If not, you may be endangering family members and neighbors as well as yourself.

By Doug DeMaw,* W1FB

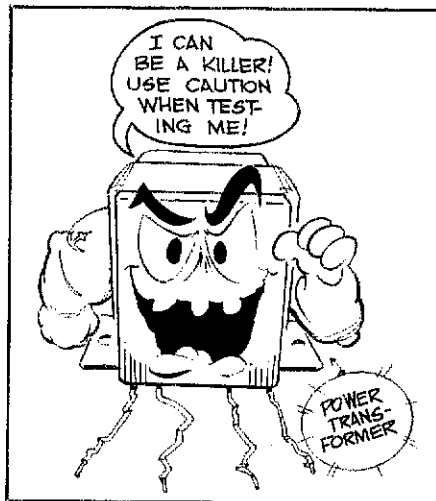
Safety First! may seem a trifle boring. After all, we have heard the expression all of our lives, and we see it in print almost everywhere. In fact, "safety first" is so commonplace that we tend to become oblivious to the warning. It is a sad fact that many of us do not become aware of the dangers of high voltage and lightning until we have had personal experience with it.

We may go on our happy way with hamming for years before having a bad experience, or we may never get hooked into a voltage line that jolts us. But we must always be aware that the danger lurks constantly when we operate an amateur station. Knowledge of some specific safety measures is necessary if we are to minimize the danger of a serious accident (and pass an amateur license examination!), so let's examine the fundamentals of station safety and learn preventive measures that might save our lives.

Where Are the Hazards?

Primary among the causes of danger, or even death, in the ham shack is momentary carelessness. To help illustrate this ever-lurking specter, I will relate a personal experience that nearly cost my life. A friend, W8JEK, came to my house some years ago with a high-voltage transformer that he wanted me to test for secondary voltage. He did not have an ac voltmeter that was capable of measuring more than 1000 volts. We placed the transformer on a wooden base (for insulation purposes), connected one lead of my voltmeter to one of the secondary-winding wires, then plugged the transformer primary into the 117-V ac outlet. All seemed normal, and no smoke

or strange sounds came from the big transformer. My next step could have been my last, had fate not been favoring me. I placed one hand in my pants pocket (a good safety measure) and took the remaining voltmeter test lead in my free hand. I had an alligator clip on that test lead, so decided to attach it to the remaining secondary lead of the transformer, which I did. I woke up some three minutes later on the floor of the radio room, and my mouth had the taste of acid! The last thing I remembered was feeling as though some giant had hold of my arms and was shaking me violently.



Why did this happen? The answer is lack of attention to the conditions that prevailed. First, the insulation on the meter test lead was inadequate for the amount of voltage present. Second, I was wearing shoes with leather soles (rubber is better)

and was standing on a concrete floor that was damp! This is a no-no of the first magnitude! Later, we learned that the transformer secondary was rated at 2500-V, and the current capability was 1/2 ampere!

Needless to say, that experience was a superb teacher, and had I not been young and in good health, I'd probably not be here to write this article today. This event clearly illustrates how important it is to plan ahead — consider every possibility and ensure that every safety measure is followed *before* exposing ourselves to lethal potentials. We should always have another person present when working around dangerous ac or dc potentials: Adopt the *buddy plan* without fail!

Other common hazards are transformers that develop short circuits internally between one of the windings and the metal core and frame of the transformer. When a breakdown of this type happens, it places dangerous potentials on the equipment chassis. For this reason it is vital for us to connect a quality earth ground to all of our station gear. The ground will cause a fuse or circuit breaker to open and eliminate the safety hazard. More on this later.

Proper fusing of power supplies is similarly important to protect people from shock hazards. A fuse with too high a rating may not blow before a person is exposed to dangerous voltages.

Lightning hazards should also be considered at all times. It is unfortunate that we can do little to protect ourselves and our equipment from the tremendous voltage potential of this natural phenomenon. The best safety plan is based on preventive techniques, which we will consider later in this article.

The remaining source of danger lies in RF energy. Severe burns to the flesh can result from accidental contact with anten-

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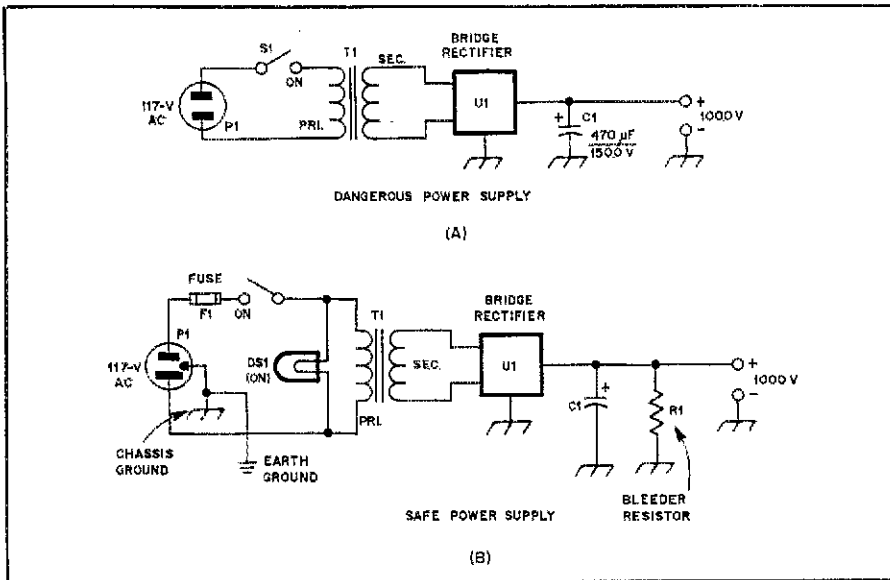


Fig. 1 — The circuit at A shows an unsafe ac power supply (see text). Example B illustrates some important safety features that should be applied to all power supplies.

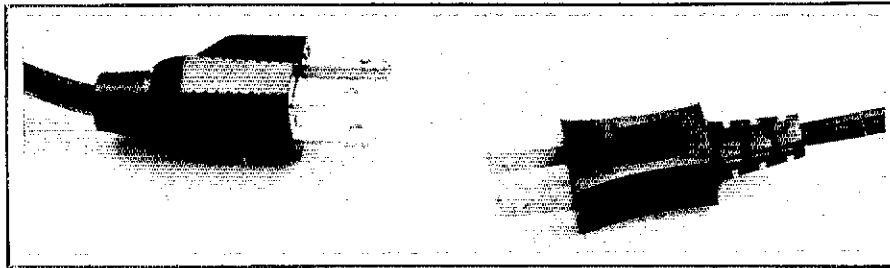


Fig. 2 — Photograph showing the difference between a three-conductor UL-approved ac line-cord plug and a two-conductor plug that is found on older equipment.

nas or transmitter components that carry high levels of RF (ac) voltage. There can even be a threat to animals with regard to RF voltage.

Power-Supply Safety

It matters not whether we use commercial ham gear or operate with homemade equipment. With the exception of mobile and certain types of portable operation, we will find ourselves relying on the ac mains for the primary power source. This dictates the need for some type of power transformer. Specific UL (Underwriters' Laboratory) safety codes should be followed. This includes a three-wire, polarized ac line cord and proper fusing of the primary side of the power supply. There is also a limitation for the distance a power supply can be from the wall outlet unless a specifically approved ac line is used.

Fig. 1 shows two simple power supplies. The first one (A) is typical of what we might find in some early-day ham shacks. Why is it dangerous? Well, first off, it does not have a safe line-cord plug (P1). The plug is not polarized (both pins are the same size and shape) and there is no third pin for automatically grounding the power-supply chassis to the ground

lead in the power service.

The first circuit also lacks a fuse, which means that a breakdown in the transformer, as mentioned earlier, would permit high voltage to appear on the chassis of the equipment. Finally, there is no bleeder resistor between the output dc-voltage line and ground. A bleeder is vital for discharging or "bleeding" a power

supply after it has been turned off. The filter capacitor (C1) or capacitors, depending on the design, are capable of storing a high-potential charge that could be lethal to human beings. The charge could last for hours or days, providing a significant shock hazard to persons working on the power supply or any piece of gear attached to it. The bleeder resistor drains off the stored energy within a few minutes, removing the shock probability. A bleeder resistor will, of course, dissipate some of the available power from the supply, but is a worthwhile trade-off in the interest of safety.

Fig. 1B illustrates a safe power supply. It has a three-wire power plug, a fuse, an on-off indicator lamp (DS1) and a bleeder resistor (R1). Also, as an additional safety measure, we have added a separate earth ground to the power-supply chassis. Note that P1 is polarized by virtue of one pin being larger than the others. This prevents us from plugging the line cord into the wall outlet in an improper manner. One pin goes to the neutral line and the other to the hot line. Make certain that all of your equipment contains all of these safety features. Fig. 2 shows a two-pin and a three-pin line-cord plug.

Developing a Station Ground System

A good earth ground is not a casual thing. Don't rely on a small metal rod driven into the soil. In many regions the conductivity of the soil is so poor (sand and loam) that a ground of this kind offers no effective safety measure. Furthermore, the quality of such a ground system can vary with the season, depending on the moisture content in the soil. In other words, the ground might be fairly effective during rainy seasons, but entirely ineffective in the hot, dry summer months.

How, then, might we develop a more effective earth ground? Step 1 is to connect a large-diameter conductor between the station and the nearest household cold-water line. Copper plumbing offers the best

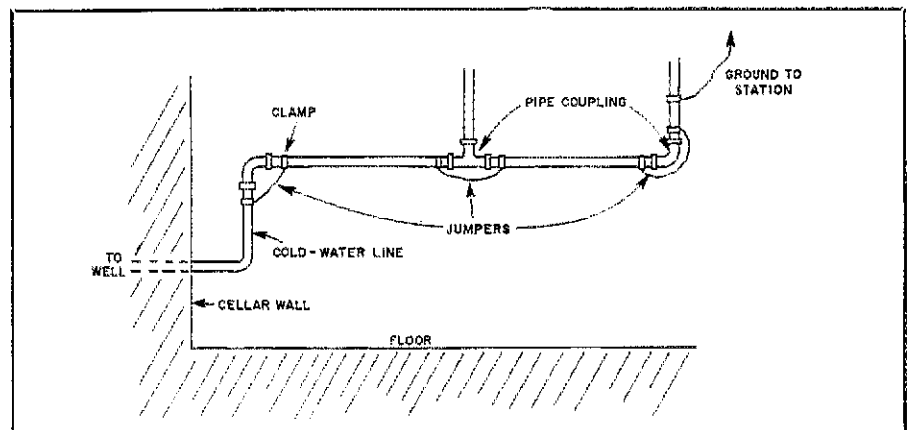


Fig. 3 — Suggested method for ensuring that good electrical continuity prevails along a length of cold-water pipe. Short conductive jumpers are bridged across each pipe joint where adaptors are present.

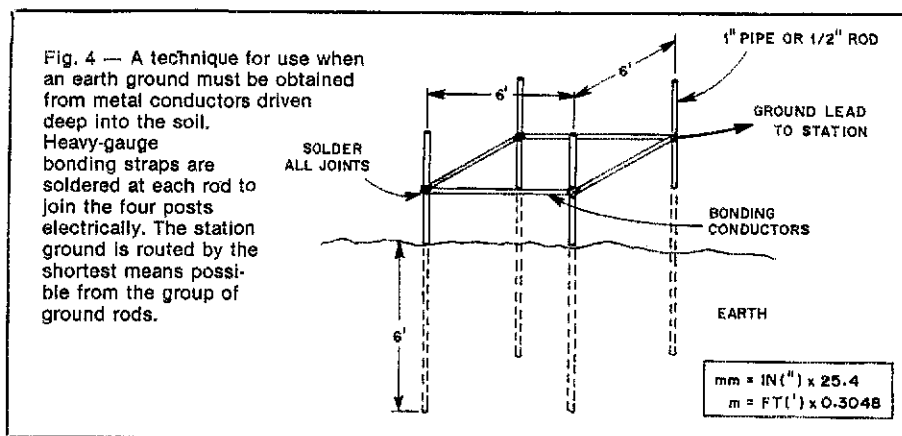
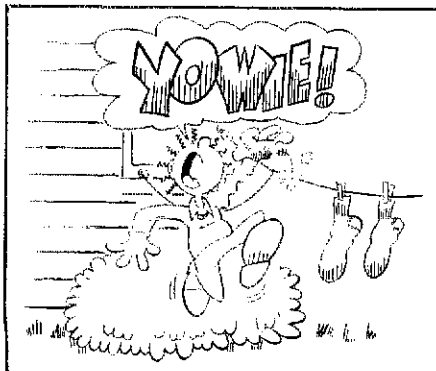
assurance of a quality ground, since the joints are soldered rather than being screwed together with joint compound. If iron pipes are used in your home, the problem can be solved by placing an electrical jumper wire across the pipe unions all of the way to the water source. The shield braid from RG-8/U coaxial cable is good for this purpose, as is flashing copper.

The connections can be made by means of steel cable clamps around the pipes. You can use an ohmmeter to learn if the joints are resistive (bad). A good electrical joint will show a dead short when using the ohmmeter on the low-ohms range. The conductor from the water pipe to the ham shack should be a heavy conductor, such as coaxial-cable braid or similar. See Fig. 3.

Rods driven into the soil can be effective if they are installed properly. They can be used to supplement the cold-water-pipe ground. Fig. 4 contains a sketch of the method I recommend for creating an earth ground with rods or pipes. Notice that the rods (four or more) are driven into the soil to a depth of approximately 6 feet. They are arranged in a square that is 6 feet per side. Heavy conductor, such as RG-8/U cable shield braid, is used to join the pipes above ground. Ideally, it should be soldered to each pipe. A propane torch is handy for this job, since a soldering iron will not develop ample heat to make a solder connection to a rod or pipe. A heavy conductor is then routed from the ground-rod cluster to the radio room. This lead should be as short as possible. Hence, the ground posts need to be placed as close to the ham shack as practicable. Galvanized pipe or copper-plated rod is suggested for the ground stakes in order to retard rusting or corrosion. Copper pipes may be used as ground rods if you can justify the cost. It may not be possible to drive a copper pipe deeply into the soil, however, since copper is relatively soft. Pilot holes could be driven beforehand with iron pipes, though.

My system has a third ground element tied into the master ground network. I have two no. 12 bare copper wires (made from stripped vinyl-covered house wire) buried 6 inches in the soil. They are 60 feet in length. One of them is attached to the base

$1\text{mm} = \text{in} \times 25.4$; $\text{m} = \text{ft} \times 0.3048$.



of my 50-foot tower, which is also grounded by means of rods. It is correct to say that the more extensive your ground system, the better it will be for safety reasons.

There is an additional value for a good earth-ground system: It helps minimize unwanted RF energy on the chassis of station equipment. Too high a level of stray RF energy in the ham station can cause erratic operation of the equipment, and it can "sting" the operator when he or she touches the key, microphone or cabinets of the apparatus.

The Hazards of RF Voltage

Depending on the transmitter output power, thousands of volts of radio-frequency energy can develop in the transmitter amplifier section. The antenna can also carry this high potential. RF energy may cause severe burns to the flesh if someone comes in contact with a conductor that carries it. All of our antennas should, once they are erected, be out of reach to human beings and animals.

I learned this lesson when I lived in an apartment complex where exterior antennas of any description were prohibited for aesthetic reasons. It seemed crafty for me to use the metal clothesline in my back yard for a 10-meter antenna. Each yard had one. Things worked out rather well for a month or more, until my neighbor decided on a summer evening to use the end of my wash line to support himself while he was having a lazy conversation with his wife. He chose the wrong moment, for I was working 10-meter DX at the time with a 100-watt rig! He let out a yell, which brought me to my feet. Upon investigation of the problem I learned what he had done: His hand had a burn mark across all of the palm. Fortunately for me, he understood what had caused the burn, and created no fuss. I ceased using the clothesline for an antenna!

This illustrates what can happen when an amateur antenna is close to the ground. Insulated wire may or may not prevent such a hazard. It would depend on the quality of the insulating material and its characteristic breakdown voltage rating.

RF energy will, indeed, get through some inferior grades of insulation unless it is very thick. From all of this emerges a strict rule: Never work on a transmitter or antenna when the transmitter is in the operating mode.

Damage from Lightning, and Protective Measures

Lightning is the most difficult of all danger sources to deal with. Here we are considering many thousands of high-current volts. The greater the power-source current the more devastating the damage will be. The human body, for instance, can endure only a few milliamperes of current before death occurs. When current is permitted to flow through flesh, it will heat the flesh to a point of no return. This may seem like a grim statement to make in an Amateur Radio article, but it can serve as a warning that is worth remembering.

There is no complete protective means against lightning damage to personnel or station equipment! You should disconnect all antennas and ground them when they're not in use. Similarly, all ac line cords should be removed from wall outlets, since energy from lightning can enter the house via the power mains. Whenever a severe storm is forecast, cease using your ham station and follow these procedures.

Lightning arrestors can be purchased for use in amateur antenna systems, but they are by no means a fail-safe solution. I have seen a number of blown-out arrestors that were used in systems where severe equipment damage resulted. The *ARRL Handbook* shows how to build a lightning arrestor for wire antennas. It is a good idea to add one, even though it may not offer complete protection.


What Have We Learned?

All of us want to protect ourselves, our families and our neighbors against shock hazards. This suggests that we should place considerable emphasis on electrical safety when using radio gear that is powered from the ac line. Slipshod methods of grounding the station may result in getting on the air quickly, but the byproduct may be ir-

reparable. Short, large-area ground leads attached to an effective ground system will provide the margin of safety that all of us must rely on when operating a radio station. It is worth mentioning that the better the ground system the less chance there will

be for interference to nearby TV and FM receivers.

If your ham station must be located in the basement or cellar for practical reasons, use a large rubber, plastic or rubber-backed carpet pad under the area where you sit or

stand near the operating desk. This will ensure additional protection against electric shock. It is best to avoid measuring high voltage until you have the proper equipment and experience. Call in an experienced fellow ham for jobs of that type. 

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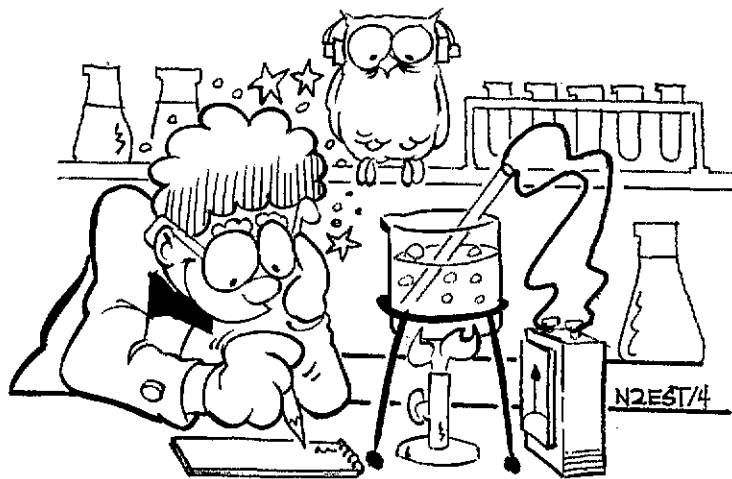
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Heat: Not Always A Foe

Learn some basic physics of heat through simple electrical analogies. Then build a temperature controller to stabilize the temperature in that critical oscillator circuit.



By Tom Thompson,* WØIVJ

Does your VFO drift slowly? How about that cavity oscillator you're using at UHF? Is the time base on your frequency counter or your frequency standard stable enough? What about the zero drift on that high-gain, dc amplifier?

My answer to all of these problems is *temperature control!* A change in ambient temperature usually means an unwanted frequency drift. Even a crystal oscillator has this problem. But if the temperature around the oscillator is held constant, the frequency-stability problem is reduced. Temperature control is not only helpful with oscillators, but also with any circuit that has temperature-dependent parameters. My objective is to explain, in common language and with a minimum of mathematics, how temperature controllers work.

Negative Feedback Is the Secret

A temperature controller employs negative feedback. A good example of negative versus positive feedback is the difference between an amplifier and an oscillator. Negative feedback reduces the amplifier output and helps stabilize the circuit. If positive feedback is used, any instability will increase, causing the circuit to oscillate. Negative feedback brings a device back to a set point when it starts to move away, whereas positive feedback pushes it farther away when it starts to move. In a temperature controller, negative feedback is what controls the heater, to hold a given temperature.

Two common examples of temperature controllers are the heating system in your house and the water heater in a fish tank. These two controllers are electromechanical and use the principle of differential expansion.

Fig. 1 shows two metals with different expansion coefficients bonded together to form a bimetallic strip. When it is heated, one metal strip expands more than the other, causing the composite strip to bend. This action opens the switch contacts, breaking the circuit to the heater. The metal then cools until the circuit is completed again and the heater turns on. The temperature is controlled between the points where the switch opens and closes.

The "Bang-Bang" Controller

An electronic temperature controller works on a similar principle. The sensing

element is a *thermistor* instead of a bimetallic strip. A thermistor is an element that changes resistance as the temperature around it changes. The hotter the surrounding temperature, the lower the resistance of the thermistor. A simple thermistor type of controller is shown in Fig. 2. Resistors R and R_t form a voltage divider at the input of the first CMOS amplifier. These amplifiers are designed as logic switches, so they have very high gain and a switching threshold at the input of approximately half of the supply voltage.

Now suppose we wish to control the temperature of some device at 40°C. Let us assume that we have a thermistor whose resistance is 1 kilohm at 40°C. If R is selected to be 1 kilohm also, the voltage divider will deliver greater than 5 V at room temperature (25°C). Remember that a temperature cooler than 40°C means a higher resistance for the thermistor. Any voltage greater than 5 is a high logic level, whereas anything less than 5 is a low logic level. All of the amplifiers are inverting, and the result is shown by the notation above the amplifiers in Fig. 2 shows the result when the temperature is warmer than 40°C. Q1 is cut off and no current flows in the heater circuit.

The gain through this chain of amplifiers is very high. Therefore small changes in temperature around 40°C cause the heating action to be either full on or full off. This type of controller and the bimetallic strip heater previously described are called "bang-bang" controllers.

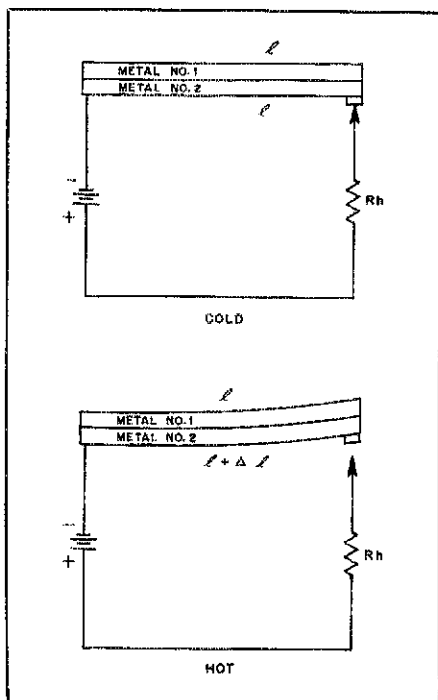


Fig. 1 — Bimetallic-strip temperature controller.

*1340 Bluebell Ave., Boulder, CO 80302

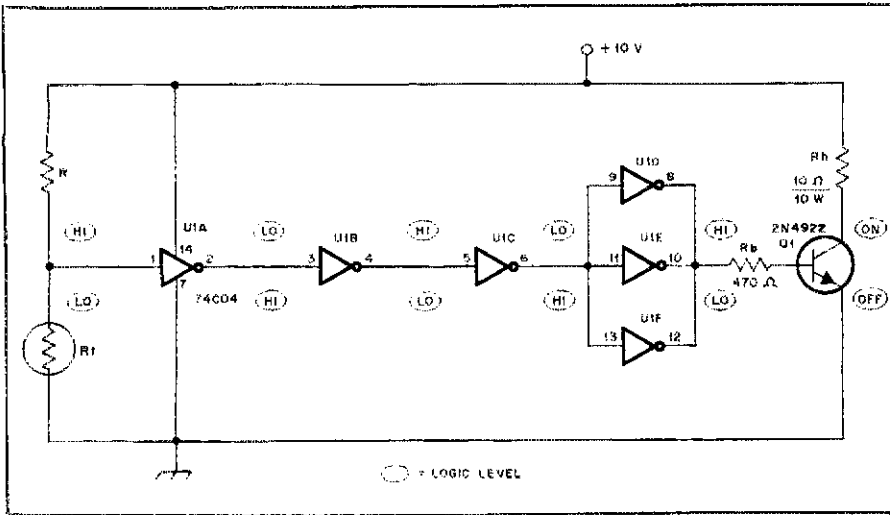


Fig. 2 — Diagram of a simple 'bang-bang' temperature controller. $R = R_1$ at the control temperature.

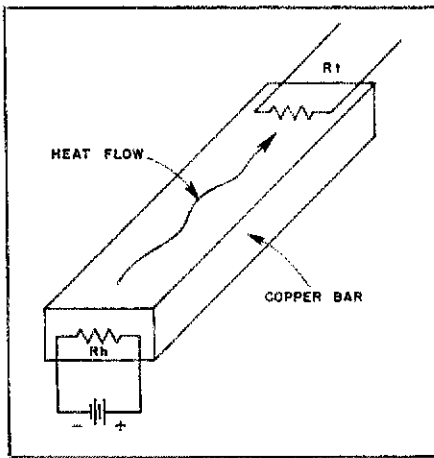


Fig. 3 — Heat flow delay in a thermal conductor.

A4, A5 and A6 are connected in parallel to supply saturation drive current to the power transistor, Q1. The 74C04 gate can source 8 mA. This means that 24 mA of base current is available to Q1 for turn on; so, R_b is approximately 470 ohms. If Q1 has an $h_{FE} = 42$, the saturation collector current of Q1 is 1 A. At 10 V, this means that 10 W of heating power is available. The heating resistor, R_h could then be as low as 10 ohms and should be able to dissipate 10 W.

Although this "bang-bang" controller is simple, it does have some drawbacks. The continual switching of current through the heating element can cause RF noise. This is the last thing you want near your sensitive receiver. Also, the on-off nature of this controller does not always hold the temperature in tight enough control. Fig. 3 helps explain why this is true. The heating element, R_h , and the thermistor, R_1 , are in thermal contact through the copper bar, but a time delay exists between the heat caused by R_h and the detection of that heat by R_1 .

the "bang-bang" controllers, let's derive an electrical analog of the heat systems that we have been discussing. Consider a heat flow problem. Heat flow is given by

$$\Delta T = Q\theta \quad (\text{Eq. 1})$$

where

- Q = the heating power in watts
- ΔT = the temperature difference in degrees between two points
- θ = the thermal resistance between those two points, in degrees per watt.¹

According to Ohm's law, $E = IR$. Since this equation is in the same form as our heat equation, we can make the following analogies. Q is analogous to I, ΔT is analogous to E, and θ is analogous to R. We can now represent our heat problem in terms of a circuit with which we are more familiar.

Look again at the copper bar in Fig. 3. We can represent the heat flow in this copper bar with the circuit in Fig. 4A. The current source represents Q in our heat terms, whereas the two resistances represent θ_b , the thermal resistance between the two ends of the bar, and θ_a , the thermal resistance between the bar and the air. The "voltage drops" across the two resistors

R_h will overheat the bar at the heater end before R_1 detects the rise in temperature. If the power to R_h is switched on and off, this has the effect of a temperature "ripple" on the R_h end of the bar that is filtered out at the R_1 end.

The Linear-Proportional Controller

A solution to both of these problems is the linear-proportional controller. To understand this controller with respect to

¹Notes appear on page 42.

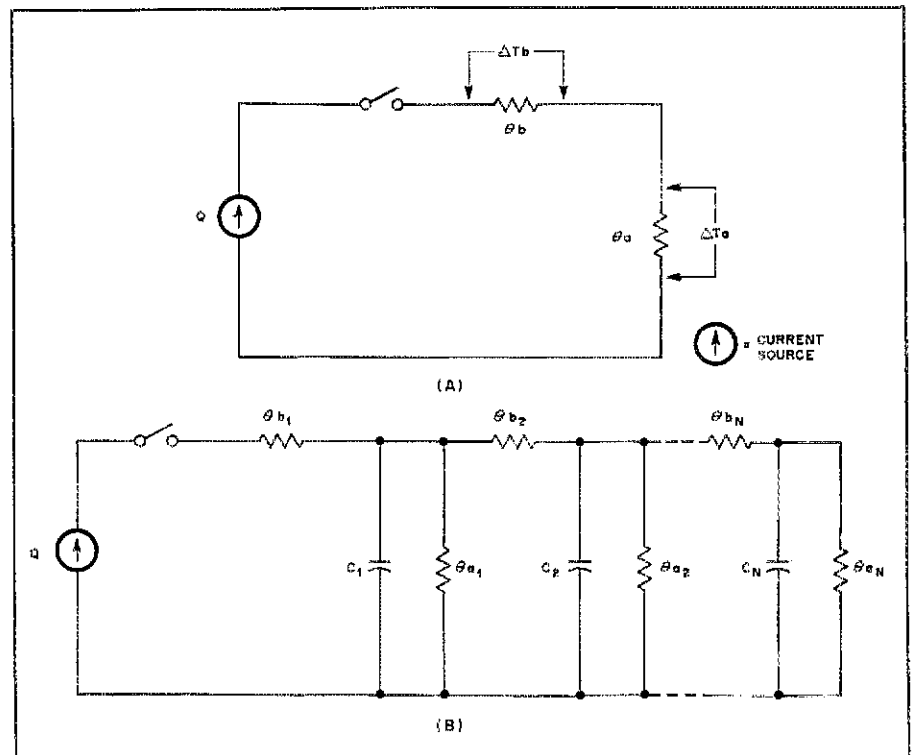


Fig. 4 — Electrical-equivalent circuits showing heat flow and thermal delay. A is the equivalent of heat flowing in a circuit without heat capacity. B represents a circuit with distributed thermal resistance, heat capacity and heat loss.

- θ_a = thermal resistance of the insulation
- T_a = temperature drop between conductor and ambient air temperature
- θ_b = thermal resistance of the conductor
- T_b = temperature drop between conductor ends

represent the difference in temperatures. Since copper is a much better heat conductor than air, θ_b is much smaller than θ_a . This is certainly true if the copper bar is insulated so that it is surrounded by still air.

Our analogy may not be completely accurate. If the current source is switched on in the circuit in Fig. 4A, the ΔT terms would appear immediately. That certainly is not the case for our heat circuit, since we know that it takes time for a temperature difference to develop. Well, all is not lost! Since ΔT is analogous to voltage, and since we have a circuit element that voltage cannot develop across immediately, let's carry our analogy a bit further. Consider capacitance to be analogous to heat capacity. Now Fig. 4B more accurately represents our copper bar. The series resistors are the thermal resistances along the bar. The capacitors represent the distributed heat capacity along the bar, and the shunt resistors represent the distributed heat loss to the surrounding air.

Now you can see why the "bang-bang" controller does not always hold the temperature in tight control. If the thermistor is placed down the line from the heat source, the temperature excursions get larger as you move back toward the heat source that is being switched on and off. The temperature at the greatest distance from the heat source is relatively stable because of the filter effect.

If the current source is switched on and left on? the capacitors will eventually charge to some value, and an equilibrium voltage will exist across each shunt resistor. In our heat-flow analogy, an equilibrium temperature is maintained as long as the ambient temperature is constant. If the ambient temperature changes, the same

equilibrium temperature can be maintained if the current source is varied to compensate for the change in ambient temperature. This is the basis of the proportional controller.

Fig. 5 shows a proportional controller. The only essential difference between the "bang-bang" controller and the proportional controller is the amplifier gain. If the gain is reduced on the "bang-bang" circuit until control is maintained within the linear region of the amplifier, proportional control is achieved. The CMOS gates are designed for logic switching, however, so the operational amplifier is a much better choice for a linear amplifier. Let's take a close look at the circuit in Fig. 5 and see if we can understand how it works.

The Bridge

First of all, the thermistor in this circuit is in one leg of a bridge. A bridge is used to avoid *common mode* problems. If the power-supply voltage changes in the circuit of Fig. 2, the voltage at the junction of R and R_t moves just as if the temperature had changed. The bridge output in the circuit of Fig. 5, on the other hand, does not have this problem. Since the power supply voltage is common to both legs of the bridge, and the voltage that is being measured is a differential voltage between the two legs, a change in power-supply voltage will not affect the amplifier system. A difference voltage is measured only if the bridge is unbalanced, and that occurs for resistance changes in one leg with respect to the other. Therefore, a change in R_t unbalances the bridge.

The Amplifiers

The quad LM324 op amp is ideal in this application because it is designed to work

from a single supply, and an *instrumentation amplifier* may be constructed easily from it. Three sections of the IC form the instrumentation amplifier. The first two serve as high input impedance buffers, while the third is a differential amplifier with gain. The fourth section serves as a buffer amplifier, which includes the pass transistor in the feedback loop. The voltage gain of the system is given by

$$A_v = \frac{R_f}{R_s} \quad (\text{Eq. 2})$$

The pass transistor is a Darlington power transistor. It is included in the feedback loop to provide additional linearity and a unity voltage gain from the input of the buffer to the output of the Darlington. The current gain of the buffer/Darlington combination is approximately 1000. Therefore, heater power up to tens of watts is possible.

The Heating Element

The heating element in this controller can be any resistive substance that dissipates power in the form of heat. Resistors fall into this category as does a length of nichrome wire. For amateur applications, resistors serve very well. The resistor value is given by

$$R_h = \frac{(V_{o \max})^2}{P} \quad (\text{Eq. 3})$$

where

P = the maximum heating power
 $V_{o \max}$ = the operational amplifier power supply voltage

The maximum heating power is generally twice the power needed at the control temperature. $V_{o \max}$ can never be as high as the op-amp power supply because of the drop through the op amp and the

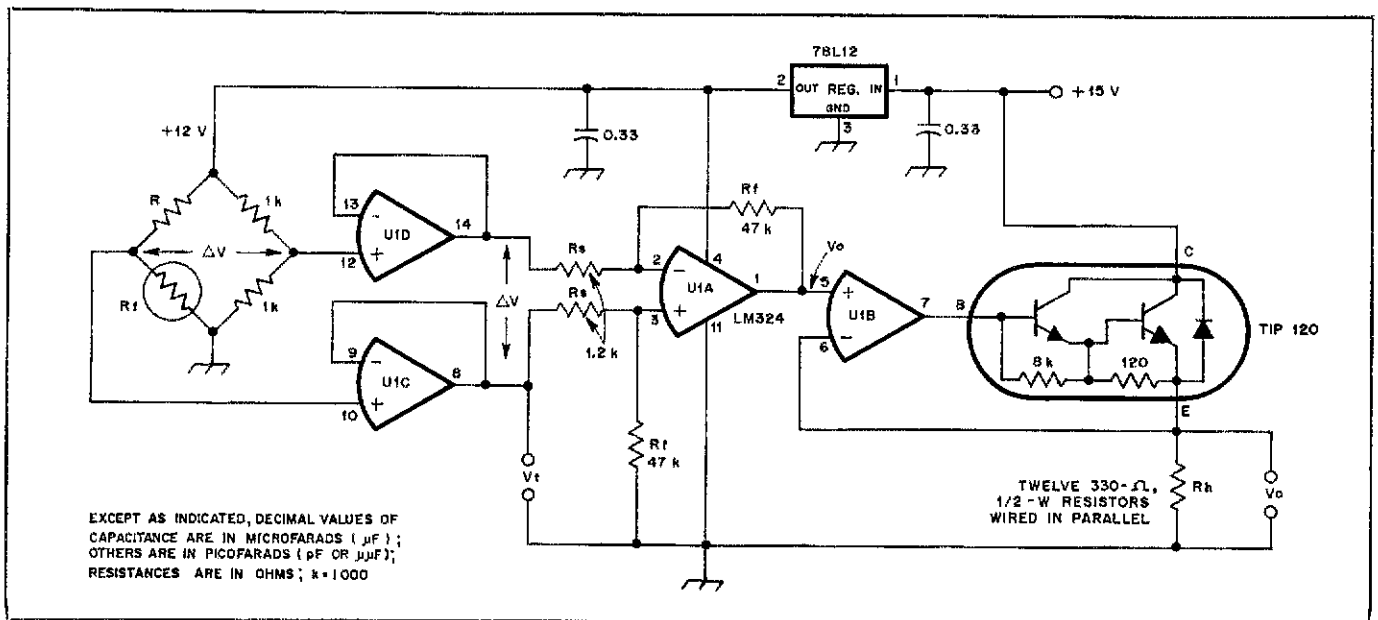


Fig. 5 — Schematic diagram of a linear-proportional temperature controller: $R = R_t$ at the set-point temperature. R_h and R_t are thermally coupled to the enclosure.

Darlington, but the calculation gives an upper limit of power dissipation. The actual dissipating capability of the resistor should exceed the maximum heating power.

When the voltage across the heating element is half the supply voltage, half the total power is dissipated in the pass transistor and half is dissipated in the heating element. If the pass transistor is included as part of the heating element, this power is not wasted. Including the pass transistor as part of the heating element has another advantage. If R_h alone is used as the heater, the heating power is found using Eq. 3:

$$P_h = \frac{V_o^2}{R_h}$$

Therefore, R_h is a *nonlinear* function of V_o , where V_o is the voltage derived from a temperature change sensed by the thermistor. If the pass transistor is included as part of the heating element, however, an interesting thing occurs. The current through R_h is given by

$$I_h = \frac{V_o}{R_h} \quad (\text{Eq. 4})$$

This same current flows through the pass transistor, which has a voltage equal to the supply voltage minus V_o across it. The power dissipated by the pass transistor is

$$P_t = (V_{cc} - V_o) I_h \quad (\text{Eq. 5})$$

Substituting for I_h :

$$P_t = (V_{cc} V_o / R_h) - (V_o^2 / R_h) \quad (\text{Eq. 6})$$

We already know the heater-resistor power is $P_{rh} = V_o^2 / R_h$. Since the total power is the sum of these two powers, it is given by

$$P_h = P_t + P_{rh} \quad (\text{Eq. 7})$$

$$P_h = (V_{cc} V_o / R_h) - (V_o^2 / R_h) + (V_o^2 / R_h) \quad (\text{Eq. 8})$$

$$P_h = V_{cc} V_o / R_h \quad (\text{Eq. 9})$$

Since V_{cc} and R_h are constants, the total heating power is now a *linear* function of V_o . Also, if the pass transistor is included as part of the heater, you don't have to worry about it getting too hot since it is now temperature controlled.

How It Works

Now that we have analyzed the individual elements of the proportional controller, let's put it all together and see how it works. The bridge is balanced by choosing R equal to the thermistor resistance at the *set temperature*, or the temperature we would like our controller to hold. If the temperature varies from the set temperature, the bridge is unbalanced, providing a difference voltage, ΔV , to the

amplifier. This voltage is amplified by an amount given by Eq. 2, and this output controls the current through the heating element, thereby varying the heat. The heat equation predicts how much heat is necessary to hold a temperature, ΔT , above the ambient temperature in a container with thermal insulation, θ . Solving Eq. 1 for Q gives

$$Q = \frac{\Delta T}{\theta} \quad (\text{Eq. 10})$$

where Q = the heater power in watts.

The temperature inside the container will be slightly lower than the set-point temperature, in order to unbalance the bridge enough to produce the heating power. This slightly cooler temperature is called the *control-point* temperature. It differs from the set-point temperature by an amount that depends on the gain of the system.

We can represent the thermistor resistance as

$$R_t = R + \Delta R \quad (\text{Eq. 11})$$

where

ΔR = some small resistance that reflects the temperature change necessary to generate the heater power

ΔV = the voltage at the bridge output, which ultimately creates the heater power

Analyzing the bridge and solving for ΔR in terms of the voltage output yields

$$\Delta R = \frac{(4 \Delta V R)}{(V - 2 \Delta V)} \quad (\text{Eq. 12})$$

ΔV can be written in terms of V_o :

$$\Delta V = \frac{V_o R_s}{R_f} \quad (\text{Eq. 13})$$

V_o can be written in terms of the heater power, P_h , as

$$V_o = \sqrt{P_h R_h} \quad (\text{Eq. 14A})$$

if the pass transistor is not part of the heater, or as

$$V_o = \frac{P_h R_h}{V_{cc}} \quad (\text{Eq. 14B})$$

if the pass transistor is part of the heater. In any case, P_h is simply Q , as given by Eq. 10. Substituting terms from Eqs. 13 and 14 into Eq. 12 yields:

$$\Delta R = \frac{(4 R R_h R_s \Delta T)}{(V V_{cc} \theta R_f - 2 R_h R_s \Delta T)} \quad (\text{Eq. 15A})$$

when the pass transistor is included in the heater, or

$$\Delta R = \frac{(4 R R_s / R_f) \sqrt{\Delta T R_h / \theta}}{V - (2 R_s / R_f) \sqrt{\Delta T R_h / \theta}} \quad (\text{Eq. 15B})$$

when the pass transistor is not included as part of the heater

where

- R = thermistor resistance at the set temperature
- R_h = heater resistance
- R_s = source resistance in the amplifier circuit
- R_f = feedback resistance in the amplifier circuit
- V_{cc} = heater power-supply voltage
- V = regulated bridge voltage
- θ = thermal resistance of container insulation.

ΔT = set temperature - ambient temperature

We have already noticed that the control temperature and the set temperature are slightly different, but to simplify the calculations using ΔT , we will assume them to be equal. To use this equation, we need to know what ΔR means in terms of temperature for our thermistor. When we know this, we can calculate how far the control temperature is offset from the set temperature in order to produce enough power to maintain a given ΔT . We can then vary the ambient temperature, which changes ΔT , and calculate a new control-point temperature. The difference between these two control points gives an idea of how well the controller will work.

An Actual Case

Whew! At this point you're probably thinking that I have departed from my objective to keep this simple. Well, we've covered quite a bit, but we now have a circuit with only a few components and an understanding of how it works. So far, we've only considered the static control situation. There are some dynamics involved, but I will cover them by means of an example.

My use of a temperature controller involved controlling a time base oscillator for a frequency counter that I built. International Crystal Co. will grind a 10-MHz crystal that is calibrated at 60°C. Consequently, the set temperature is 60°C.

How Much Heat Do I Need?

The necessary heater capacity depends on the volume you want to control and the amount of insulation around that volume. The thermal resistance, θ , of a material is given by

$$\theta = \frac{\lambda}{K \alpha} \quad (\text{Eq. 16})$$

where

- λ = the length in inches through which the heat is conducted
- α = the cross sectional area of the material in square inches
- K = the thermal conductivity of the material in watts/inch/°C.

This is shown in Fig. 6. Table 1 shows the thermal conductivity for some common materials.²

I constructed this temperature-controlled

Table 1
Thermal Conductivity for Common Materials

Material	Thermal Conductivity (W/in ² °C) at 100°C
Metals	
Aluminum	5.5
Copper	10.0
Gold	7.4
Iron	1.7
Silver	10.6
Stainless steel 321	0.37
Stainless steel 410	0.81
Insulators	
Still air	0.0007
Epoxy	0.005
"Thermal conducting" epoxy	0.02
"Heat sink compound"	0.01
Mica	0.018
Mylar	0.005
Phenolic	0.005
Teflon	0.005

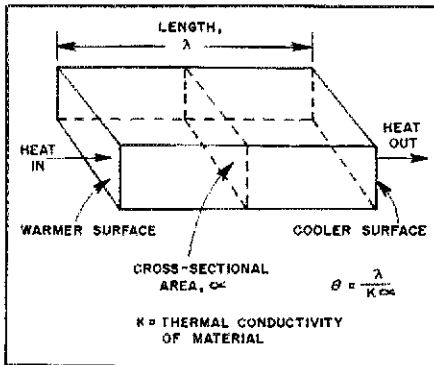


Fig. 6 — Thermal resistance of the material.

crystal oscillator on a 3- by 1.5-inch piece of perforated copper-clad board. This includes the oscillator circuit and 12 0.5-W resistors (6-W maximum heating power) around the perimeter of the board. With $V_{o \text{ max}} = 12 \text{ V}$, the heating resistor is given by Eq. 3 as $12^2/6 = 24 \text{ ohms}$.

I used 12 330-ohm resistors in parallel, so $R_p = 27.5 \text{ ohms}$. Placing the heating resistors, the board and the thermistor in good thermal contact is important. You might even want to epoxy the resistors to the board using thermal epoxy if you have some. Since the heat loss for a flat surface is perpendicular to the surface, and there are two surfaces (the top and bottom of the board), α in the above equation is simply the area of the board times 2, or $3 \times 1.5 \text{ inches} \times 2 = 9 \text{ in}^2$. From Table 1 the thermal conductivity of still air is 0.0007 W/inch/°C. Since there is some heat loss parallel to the board, however, and since I used cotton balls for insulation, I increased the conductivity by making $K = 0.001$. Let's assume that a half inch of insulation is reasonable. We can use Eq. 16 to calculate the thermal resistance, using $\lambda = 0.5 \text{ inch}$.

$$\theta = 0.5/(0.001)(9) = 50$$

The temperature in my house is normally about 20°C, so $\Delta T = 60 - 20 = 40^\circ\text{C}$. From Eq. 1 we find

$$Q = \Delta T/\theta = 40/50 = 0.8 \text{ W}$$

A heater power of 0.8 W is necessary to maintain a temperature difference of 40°C with 0.5 inch of cotton insulation. This calculation is not exact, but it gives a ballpark number for the power needed.

Calibrating the Thermistor

I used a Fenwal JA35J1 thermistor that has a nominal value of 5 kilohms at room temperature. They are available from suppliers such as Newark for about \$1.50 each. This thermistor is not calibrated, so you must go through a calibration procedure.

We need an ohmmeter (preferably a digital multimeter), a stove, a flame-proof glass pot, a thermometer that measures from the freezing point to the boiling point of water and some distilled water. The glass pot and distilled water are used to keep the electrical resistance of the liquid high (around 100 megohms). The glass pot must be washed very well in order to prevent contamination from ionization, which lowers the resistance of the water.

Pour the distilled water into the glass pot and bring it to a boil. Attach the leads to the ohmmeter probes, and place it into the water next to the thermometer. Stir the water as it cools. Record the readings from the thermometer and the thermistor at several points, until the temperature has stabilized. You might want to calibrate several thermistors at once by switching the ohmmeter among them. I took a reading every 10°C, and I also checked the water resistance periodically by inserting the ohmmeter leads, which were spaced about 0.25 inch apart, into the water. The calibration values shown in Table 2 were then plotted to produce a curve similar to the one shown in Fig. 7.

Testing the Theory

Once we have epoxied the thermistor to the copper board, so that it maintains good thermal contact with the board, we are ready to mount the circuit in its insulated container. The thermistor should be placed physically away from the heaters.

I bought a small plastic box from Radio Shack, lined the bottom with cotton balls, and placed my circuit inside. I then placed cotton balls over the top of the board and secured the box top. I have four shielded cables running from inside the box: oscillator power, oscillator output, heater power and thermistor output. The shields provide the common connection. Wires from inside the box should be as small as possible to prevent conducting heat out of the box. Since the oscillator power is negligible compared to the heater power, I didn't bother to turn it on during the tests.

Going back to Fig. 4B, remember that

Table 2
Thermistor Calibration Values

Temperature (°C)	Thermistor Resistance (Ohms)
69	900
65	980
60	1160
55	1310
51	1580
46	1930
40	2520
35	3130
30	3660
25	4840
18	6310

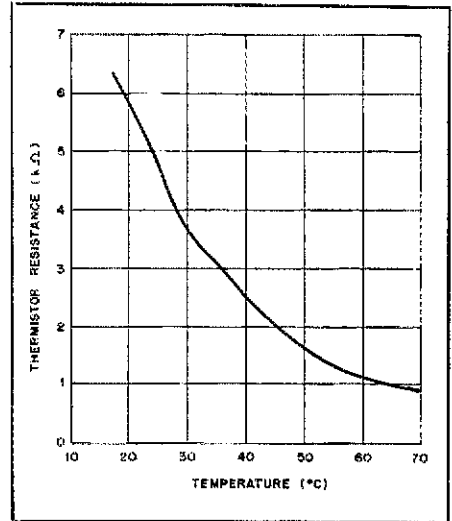


Fig. 7 — Sample thermistor calibration curve.

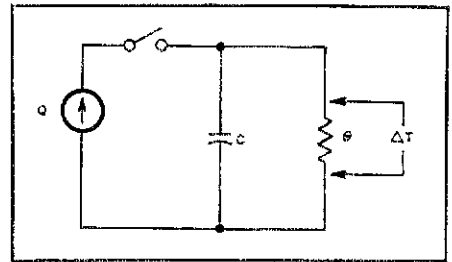


Fig. 8 — Equivalent circuit showing the heating of a thermal conductor surrounded by insulation with a thermal resistance, θ .
 $Q = \text{heating power}$
 $C = \text{thermal capacity of the conductor}$
 $\theta = \text{thermal resistance of the insulation around the conductor}$
 $T = \text{temperature drop between inside and outside of container}$

the series resistors, which represent the thermal resistance of the material we are heating, are small. If we have thermally bonded the heater, board and thermistor, we can assume that these resistors are zero. This allows us to lump all of the thermal capacitance into one capacitor and all of the loss resistance into one resistor. The analogous circuit is shown in Fig. 8. The inside of the box, which is at room

temperature when the heat is applied, is analogous to the capacitor being discharged when the switch is closed. The voltage across the capacitor, which is like the temperature difference between the inside and outside of the box, is given by the familiar equation

$$E = I R (1 - e^{-t/RC}) \quad (\text{Eq. 17})$$

or, in heat terms,

$$T = Q\theta (1 - e^{-t/\theta C}) \quad (\text{Eq. 18})$$

where t = time in seconds. You can see that at $t = 0$ the exponential term is 1, which makes $\Delta T = 0$. When a lot of time has passed, the exponential term is 0, so Eq. 18 reduces to $\Delta T = Q\theta$, which is the equilibrium heat equation (Eq. 1).

After equilibrium has been reached, the switch is opened and the capacitor is discharged by the shunt resistor. The voltage across the capacitor is given by

$$E = I R e^{-t/RC} \quad (\text{Eq. 19})$$

or, in heat terms,

$$\Delta T = Q\theta e^{-t/\theta C} \quad (\text{Eq. 20})$$

A composite curve is shown in Fig. 9. The rising portion of the curve reflects the heating rate, whereas the falling part reflects the cooling rate. The dynamics of the proportional controller are improved if the heating and cooling rates are more or less equal. This only occurs at a temperature that is equal to half the maximum heat equilibrium temperature. So the maximum heating power should be adjusted to give an equilibrium temperature that is twice the desired set temperature for a nominal ΔT and selected θ .

Now that we know what the heating and cooling curves look like and understand their significance, we are ready to make our first measurements. We connect an ohmmeter to the thermistor leads and apply a voltage to our heater. We then record thermistor readings as a function of time. The voltage applied is arbitrary, but it should produce enough power to raise the inside temperature to at least the desired set temperature. Note the time that the voltage is applied and record the thermistor readings, along with the corresponding time, until the thermistor readings do not change significantly. Now disconnect the voltage from the heater and again record times and readings until the thermistor returns to the room-temperature value. Convert the thermistor readings to temperature by using the calibration curve in Fig. 7 and plot temperature against time. The resultant curve should resemble the one in Fig. 9.

The equilibrium temperature, ΔT , and the heating power, Q , are now used to calculate the actual thermal resistance of

our box. In my test, the applied voltage was 6.42. Since $R_h = 27.5$ ohms, $Q = V^2/R_h = 1.5$ W. The equilibrium temperature was 60°C , and the ambient temperature was 18°C . The actual thermal resistance of the container is found by Eq. 1 as $\theta = \Delta T/Q = (60 - 18)/1.5 = 28^\circ\text{C}/\text{watt}$, which compares to a calculated thermal resistance of $50^\circ\text{C}/\text{watt}$. Apparently, the cotton ball insulation is not as efficient as expected, but it is perfectly adequate. Since the heating power needed to hold 60°C at room temperature is 1.5 W, in order to place the control temperature at a point of equal heating and cooling, the maximum heating power should be 3 W. This implies a $V_{o \text{ max}}$ of 9.1 V. In my controller, $V_{o \text{ max}} = 9.8$ V when the drops through the op amp and the Darlington transistor are subtracted from 12 V. This is close enough, but if a lower voltage were needed, a Zener diode could be placed at the base of the Darlington transistor. The maximum power does not have to be exactly twice the desired power, but it does provide for better control dynamics.

Closing the Feedback Loop

Finally, we are ready to connect the controller to the heater and thermistor and see how it works. The bridge resistors are selected to equal the thermistor resistance at the set-point temperature. In my particular case, 60°C implies that $R = 1100$ ohms from Fig. 7.

If we measure V_t (Fig. 5) during operation, we can infer the temperature inside the box. From Fig. 7, a linear approximation of the change in resistance with respect to the change in temperature may be calculated. Table 2 shows that at 55°C the resistance is 1310 ohms, and at 60°C the resistance is 1160 ohms. This is a -150 ohm change in resistance for a $+5^\circ\text{C}$ change in temperature, so $D = -30$ ohms/ $^\circ\text{C}$. The minus sign just means that the resistance decreases as the temperature increases. This approximation is only valid around 60°C , but that is acceptable since most temperature measurements will be centered about this value. The thermistor resistance is calculated by

$$R_t = \frac{V_t R}{(V - V_t)} \quad (\text{Eq. 21})$$

$$R_t = \frac{(V_t)(1100)}{(12 - V_t)}$$

The control temperature is then given by

$$\begin{aligned} T_c &= T_s + [(R_t - R)/D] \\ T_c &= 60 + [(R_t - 1100)/-30] \end{aligned} \quad (\text{Eq. 22})$$

By measuring V_t , we determine how far the control-point temperature differs from the set-point temperature.

The voltage gain of the system is set by adjusting the ratio of R_f and R_s . The LM324 op amp dictates a maximum value of 1 megohm for R_f and a minimum value of 1 kilohm for R_s . A gain of 100 is probably a good place to start, so let's set $R_s = 1$ kilohm and $R_f = 100$ kilohms.

While measuring V_t , apply power to the system. Since the thermistor is at room temperature, R_t will be greater than 1100 ohms, so V_t will be greater than 6 V. The heater should be full on at this point. As the temperature rises inside the box, V_t will start to drop. When V_t approaches 6 V, it indicates that the temperature inside is approaching the set temperature. As soon as the inside of the box becomes hotter than the set-point temperature, the control system will turn off the heater. This is indicated by a sharp drop in the power-supply current. V_t will probably continue to drop, overshooting the set temperature. Finally, V_t will reach a minimum as the temperature peaks, and then V_t will start to rise as the inside begins to cool.

Observe several cycles of this oscillation. If the excursions are wide and the heater is going from full on to full off each cycle, the gain is much too high. On the other hand, if there is no overshoot, the gain may be too low. In any case, the gain should be adjusted by changing the value of the two feedback resistors (R_f) until the heater just reaches full on and full off. When this occurs, the gain is set at the maximum limit

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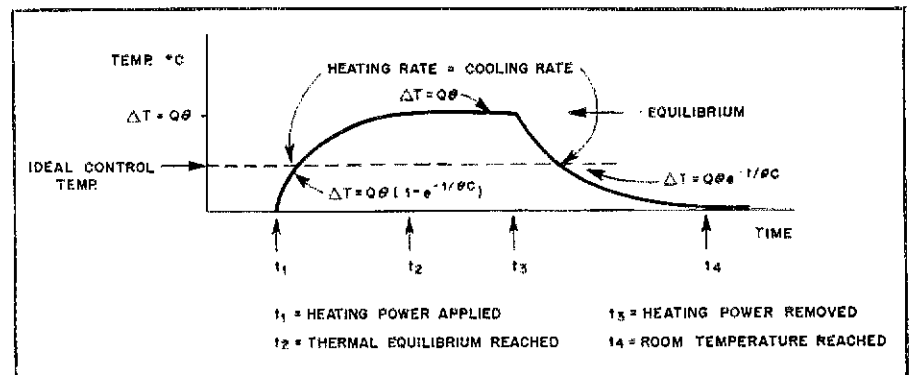
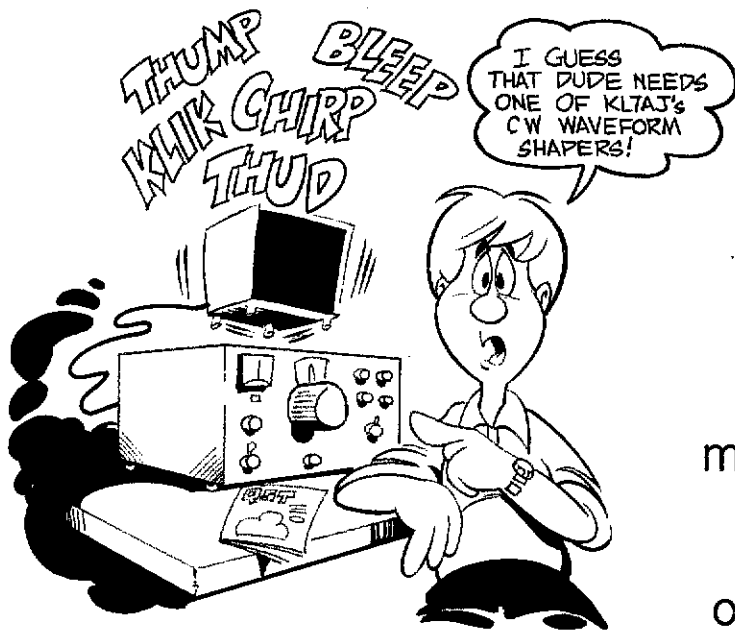


Fig. 9 — Dynamics of the heating and cooling of a thermal conductor inside a container with insulation of thermal resistance, θ , when heated with power, Q .



Try This Versatile CW Shaper

The CW waveform shaping of many rigs may not always meet your needs. This circuit will enable you to shape your rig's output waveform to your tastes.

By Eric P. Nichols,* KL7AJ

Are you dissatisfied with your CW signal quality? You say your new rig just doesn't "chop it"? Well, many dedicated CW operators feel a twinge of despair because they think the CW feature of many new transceivers was thrown in by the designer as an afterthought. To be sure, the state of the art has taken us to the point where drift, chirp and ac hum no longer plague us as they did with earlier CW rigs; a T9 signal is now the rule rather than the exception.

One thing that can set an excellent CW signal apart from a mediocre one is something over which we have little control in a modern rig: the wave shape. In most transmitters it is adjusted for a compromise, or so it would seem, under ideal conditions at moderate keying speeds. This is fine for the occasional CW operator, but not for a bona fide "ditty bopper." After all, the output waveform is the only voice we CW operators have!

But there is more to the wave shape than the simple matter of taste. What happens to an ideal wave shape when we pass our signals through an amplifier that is not perfectly linear in performance? More than likely the waveform will become "harder," and key clicks might occur. An even more dramatic result may occur when using a nonlinear amplifier (class C) after the exciter. Class-C amplifiers harden a well-shaped excitation signal. Unfortunately, the average rig has no provision for softening the keying to compensate for the use of class-C amplifiers.

Hard Versus Soft Keying

Let's backtrack to the matter of taste. It is well recognized that moderately hard

keying (presence, if you will) is best for weak-signal work, for it is easier to copy this type of note through noise. But for local work and ragchewing, a hard signal can become tiresome to listen to, even if it is not clicky. By having a moderately hard attack characteristic and an extra long waveform tail (soft decay), one can make the rig impart a note that has a bell-like

quality. I can listen for hours to a signal that is shaped in that fashion, especially when the signal is exceptionally loud. On the other hand, a soft attack and a hard decay make the note sound mushy and clicky.

A Practical Shaping Unit

I will describe a versatile wave shaper

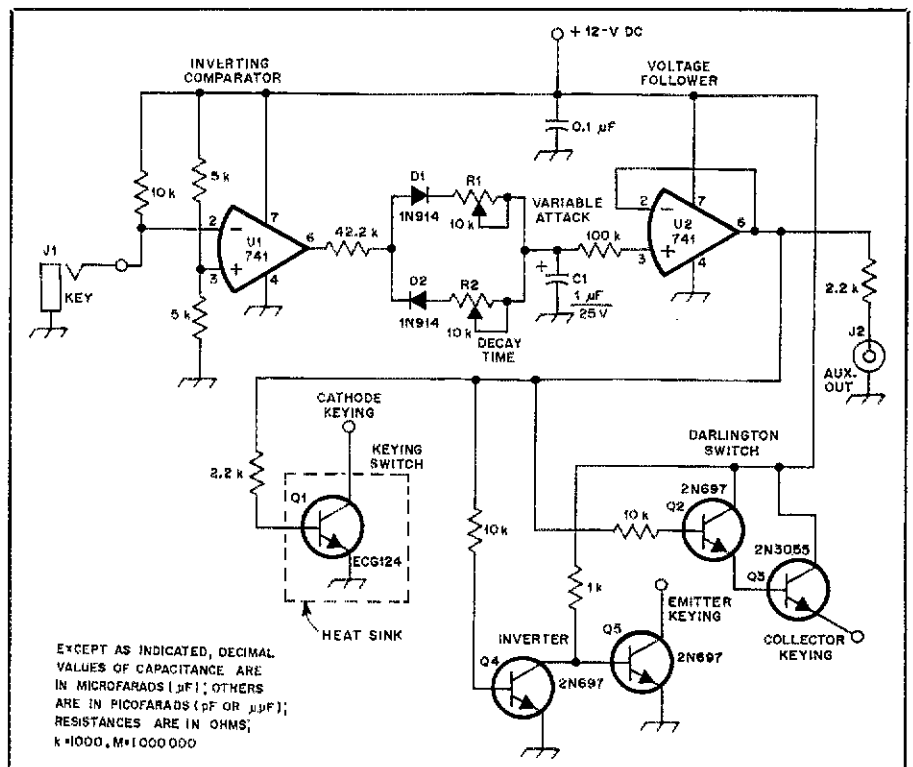


Fig. 1 — Schematic diagram of the CW shaper. Fixed-value resistors are 1/4- or 1/2-W carbon-composition types. C1 is electrolytic or tantalum. The dashed-line box indicates a heat sink at Q1. J1 and J2 may be of the operator's choice. R1 and R2 are linear-taper controls that are panel mounted for operator convenience.

*P.O. Box 0, North Pole, AK 99705

New Products

that has independent control over the attack and decay times (Fig. 1). The continuously variable adjustments have enough range to compensate for any nonlinearities you are likely to encounter in your transmitter. There will be some latitude for your personal CW voice, too! Three outputs are provided to allow keying of different transmitter circuits.

The circuit operates as follows: U1 is an inverting comparator. It isolates the key from the ensuing circuitry and provides a +12-V source with the key down, and a solid ground when the key is up. When the key is down, the U1 output is +12 V, causing D1 to be forward biased. C1 is then charged through R1, the variable-attack control. The process reverses when the key is up, and C1 discharges through the decay-time control, R2. During this period, D1 is reverse-biased, so R1 has no effect on the decay-time constant.

U2 of Fig. 1 is a voltage follower that merely "reads" the voltage of C1 and applies it to the keying transistors. Q1 is an open collector, high-voltage transistor we can use to key the cathodes of tube-style transmitters. Q2 and Q3 comprise a Darlington pair that may be used for keying the collector supply of typical crystal-controlled portable transmitters. Q4 is an inverter that drives the open-collector transistor, Q5; a "backwards" output (emitter keying) is needed for certain SSB/CW rigs.

Considerable tracing of wiring and perusal of the schematic diagram may be necessary to learn exactly how your modern rig is keyed. But once you find the spot and method, the circuit of Fig. 1 should do the trick. If you need an output device not included in this shaper, you may drive it from J2, labeled AUX OUT. Keep in mind that the device must be an *analog* unit. A switching transistor, for example, would negate the effectiveness of the shaper.

Construction

The layout of this circuit is not critical. But, it is wise to keep the leads short and direct. Perforated board can be used as a foundation, or you may choose to lay out a PC board for the unit. A grounded metal cabinet is recommended to help keep unwanted RF energy from entering the unit. Ferrite beads can be used at the input and output terminals (inside the box) to aid RF isolation.

Once you have effectively interfaced your shaper with that rig, your CW operating will never be dull. Keep your signal in shape with this shaper!

Eric Nichols was first licensed as WN6TEE, in 1972. He obtained his KL7 call in 1976, and passed the Extra Class examination in 1977. He is director of engineering at KJNP, a religious broadcasting facility at North Pole, Alaska. He also holds a Radiotelephone First Class ticket and a Radiotelegraph Second Class license. His favorite activities involve homemade gear and experiments with short antennas for 160 meters. □

AMIDON ASSOCIATES RFI-SUPPRESSION FERRITES

□ Today's RFI problems are much worse than most amateurs experienced even five years ago. The average ham must contend with a host of electronic devices every day, many of which interfere with receivers or become inoperative in RF fields. One example of an RFI-susceptible device is a personal computer. Although capable of providing many useful functions around the shack, a computer placed close to Amateur Radio equipment is likely to require extensive RFI-prevention measures. Otherwise, digital computer noise may mask received signals, and intense RF fields from the transmitter might "crash" the computer system.

To help the amateur/computer hobbyist combat RFI problems, Amidon Associates has introduced a variety of RFI-suppressing ferrite devices. The new components come as "super jumbo" beads, rectangular split cores with a cylindrical center hole, and flat ferrite bars with rectangular center openings. These materials are provided in high-permeability factors of 43, 72 and 77 nomenclature. With μ_i (initial permeability) ratings of 850, 2000 and 2000, respectively, the μ_i for the 72 and 77 materials is the same, but the 77 stock is better suited for work up to 30 MHz. The 72 material is rated to 500 kHz for the upper optimum Q limit.

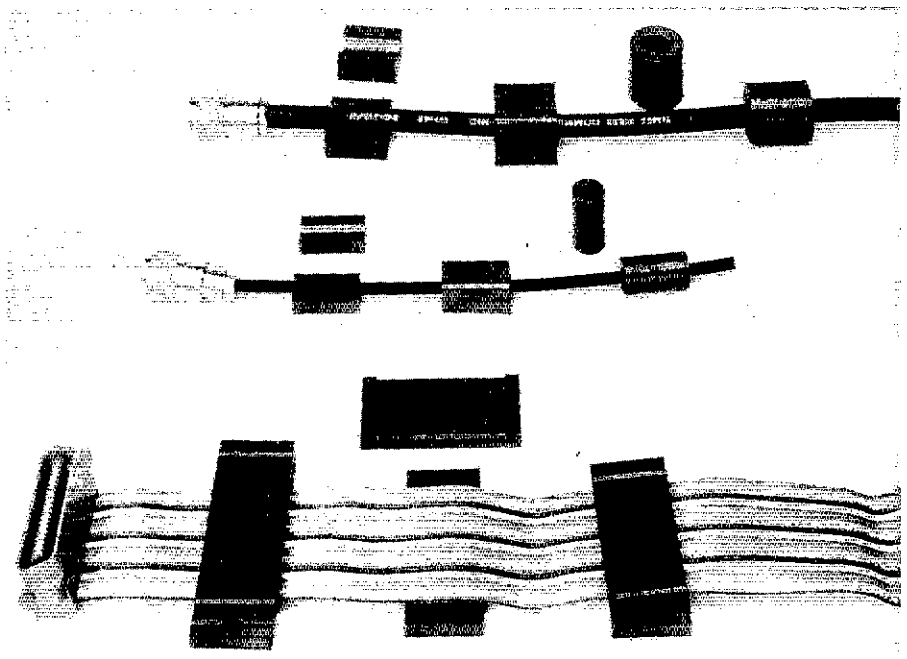
What can you do with these components? Some application ideas are shown in the accompanying photo. The flat bar halves with the rectangular inner channel are made especially for decoupling flat

ribbon cables of the type used with computers. They can be installed without removing end connections, and may be placed close to the equipment case to prevent RF energy from affecting the computer. The presence of the ferrite block will also help to minimize the radiation of spurious energy from the computer. Two types having different center-groove widths (2.04 and 2.57 inches are available).¹

The very large beads are available in diameters of up to 1 inch, with a maximum length of 1.12 inches and an inner diameter of 0.5 inch. These larger beads can be slipped over coaxial cables such as RG-8 for transmission-line decoupling. Another version (0.526-inch OD, 0.25-inch ID, 1 inch long) may be used with RG-58 and RG-8X cables. They can be used as replacements for coaxial decoupling coils of the type used on many HF-band Yagis. If you already have connectors on the cable and do not wish to remove them to add the ferrite sleeves (beads), you may purchase the Amidon 2X-43 units, place one half of each block on each side of the cable, then tape the halves together.

Large ferrite toroids are also available from Amidon for use in decoupling ac line cords, hi-fi lines, speaker cables, and so on. These toroids are made in diameters of up to 2.4 inches in types 43 and 72 material. A catalog and price list are available from Amidon Associates, 12033 Otsego St., North Hollywood, CA 91607. — Doug DeMaw, W1FB and Gregory M. Bonaguide, WA1VUG

¹mm = in × 25.4.



Practical RF Filtering

Improve reception and clean up transmitter output energy by using simple external filters.

By Doug DeMaw,* W1FB

The techniques of filtering are "old hat" to many amateurs, but if you're new to radio it's likely that you are interested in ways to clean up the output from your transmitter or increase the front-end selectivity of your receiver. Why might you want to "launder" or "sanitize" the output from a transmitter? Some older transmitters — HF or VHF — are fairly "dirty," with regard to output purity, and many homemade transmitters (even QRP rigs) are laden with harmonic output currents. This condition can raise havoc with nearby TV and FM sets, and may lead to FCC citations for out-of-band radiation.

The most practical solution, short of redesigning the workings of your transmitter, is to add external filtering of the band-pass variety. Low-pass and high-pass filters may also resolve certain problems with spurious output. The filter chosen will depend on the nature of the spurious energy.

A filter used at the input of a receiver is useful for rejecting out-of-band energy that may overload a receiver. The need for filtering will depend mainly on how well the receiver front end is designed in terms of dynamic range and selectivity. An example of an overloading problem can be stated by envisioning a 160-meter operator trying to operate physically close to a powerful AM broadcast station. No matter how well designed a receiver might be, the overwhelming strength of an AM station on, say, 1590 kHz, could overload the front end of a ham receiver tuned to 1.8 MHz. This brute-force situation can usually be improved by adding a high-pass filter that permits the passage of 160-meter signals while rejecting all signals below 1.8 MHz.

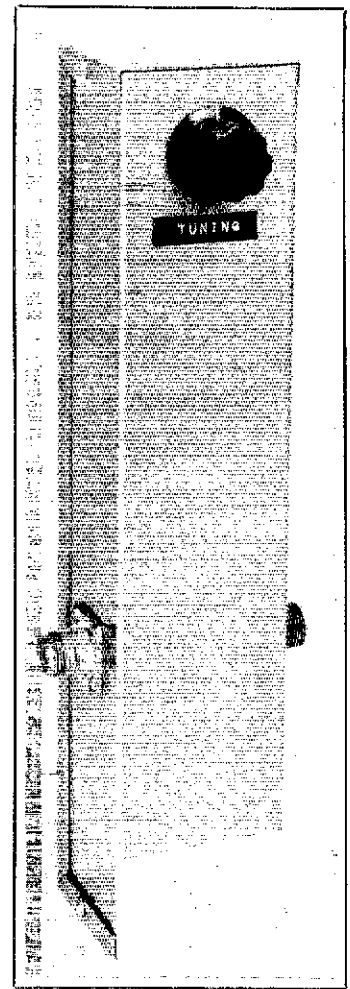
A band-pass filter is called for if there happens to be strong commercial signal energy above and below the ham band of

interest. A band-pass filter will reject unwanted energy above and below the frequency of interest. Finally, a low-pass filter can reject unwanted RF energy above the operating frequency, while passing all frequencies below the design cut-off frequency of the filter. Typical response curves for all three filter types are presented in Fig. 1.

Filter Circuits

Once we understand the nature of the filter-response curves of Fig. 1 we can decide which characteristic will best serve our needs. The design techniques are not casual if we desire a filter of high performance. Fortunately, a great deal has been written on this subject by two of the ARRL Technical Advisors,¹ and the ARRL *Handbook* contains a handy section on this subject, including design tables. Therefore, we

*Notes appear on page 34.



won't get involved here with specific designs or design methods. Our workshop project will, however, center on a 2-meter stripline band-pass filter.

For HF and MF (high frequency and medium frequency) work we may elect to

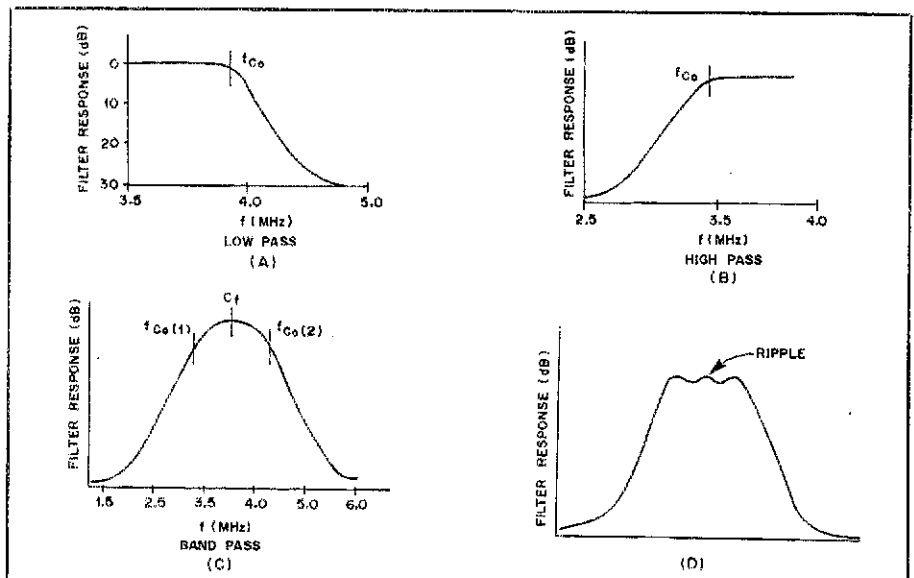


Fig. 1 — Response curves of the general nature obtained from a low-pass (A), high-pass (B) and band-pass filter (C). The filter cutoff frequency is f_{co} , and the filter center frequency is f_c . Ripple is shown at D.

*ARRL Contributing Editor, P.O. Box 250, Luther, MI 49656

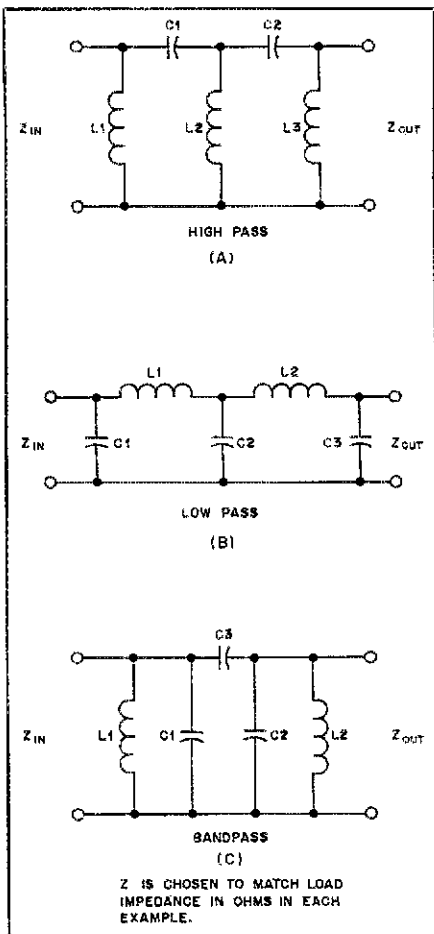


Fig. 2 — Typical circuits found in simple LC filters.

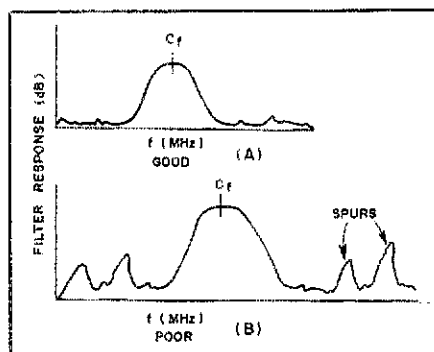


Fig. 3 — Curves that illustrate good ultimate attenuation (A) and poor ultimate attenuation (B).

build a tunable band-pass type of filter. By making the unit tunable we can cover all of a band and maintain narrow response at the frequency of interest. Filters of this type also have the ability to reject strong signals *within* an amateur band, provided they are several kilohertz away from the frequency to which the receiver is tuned. This can be helpful if you live close to another ham who shares a band with you.

Tunable filters are not used extensively at the output of transmitters. Rather, a fixed-tuned, broadband filter is the more

practical solution to filtering. Basic configurations for high-pass, low-pass and band-pass filters are shown in Fig. 2. A complex filter may contain a number of additional L and C elements in the interest of a sharper response and greater attenuation of unwanted energy.

One thing we must always keep in mind is that any filter, if indeed it *is* a filter, will have what is known as *insertion loss*. This is specified in decibels of power lost from one end of a filter to the other when both ends of the filter are correctly matched to the load impedances. In some designs, the loss is substantially less than 1 dB, while certain designs may have intended losses as great as 6 dB. The usual reason for a highly lossy filter is to introduce very light coupling in and out of the filter. This leads to very high loaded Q (Q_L), which yields a very sharp filter response (selectivity). Also, we may take a number of filter-design approaches, such as Butterworth and Chebyshev. Each provides a different response characteristic, especially across the so-called "nose" of the curve. The nose is the relatively flat part of the response curve where no attenuation occurs. An ideal filter has no humps and bumps across the nose of the curve, but all practical filters have some. These are related to a term called "ripple." Normally, the ripple dips are less than 1 dB. I have seen poorly designed filters that had dips as large as 10 dB! These improper-ripple dips will attenuate the signal greatly at the frequency at which they occur. Fig. 1D illustrates the ripple principle.

Another matter of importance is "ultimate attenuation." This relates to how well the filter maintains its attenuation many kilohertz or megahertz away from the maximum attenuation point near the cutoff frequency (f_{co}) or center frequency (c_f). Fig. 3 shows examples of good and bad ultimate attenuation. There are some low-amplitude spurs in the range above and below the main response curve at A of Fig. 3. This indicates acceptable ultimate rejection. On the other hand, we see several high-amplitude spurs above and below the main response area in the curve of Fig. 3B.

The exact nature of the ultimate attenuation of a filter depends on the design ap-

proach and the physical layout of the filter. The better the isolation of the various filter elements, the greater the ultimate attenuation. This means that we need to physically and electrically separate the filter elements by minimizing stray coupling. Shield compartments are often used to aid in achieving proper ultimate attenuation. In other cases, we may need only to string out the filter elements on a PC board to minimize stray coupling between them. This method works at HF and lower, but is not recommended at VHF and higher. This filter quality is highly important for the IF filter in receivers: Poor ultimate attenuation will permit responses from signals up or down the band from where the receiver is tuned.

Tunable Filters

Earlier we touched on the subject of tunable filters for HF receiver front ends. A typical circuit is shown in Fig. 4. C1A/C1B is a two-gang tuning capacitor for peaking the filter. C2 and C5 are trimmers for making the filter track across the desired tuning range. These trimmers can be deleted if variable inductors are used for T1 and T2.

The center coupling capacitor (C_c) is small in value (such as 10 pF at 1.8 MHz) in order to prevent over-coupling between the pair of tuned circuits (resonators). Too great a degree of coupling will cause what is known as a *double-hump response* — two points of maximum filter response with only a small frequency difference between them. This can be observed while watching the S meter and tuning across a calibrator signal or other steady carrier. C_c should be reduced to a value that eliminates the double-hump characteristic.

The input and output links of T1 and T2 can be tailored (number of turns) to create a fairly high insertion loss. The fewer the turns, the greater the loss in decibels, but the sharper the filter response. I like to design this type of filter for a loss of 4 to 6 dB. The amount of loss can be noted by feeding a steady, low-power signal into a receiver, minus the tunable filter. An S-meter reading is taken, then the filter is installed and the meter is again observed. This will indicate the approximate filter

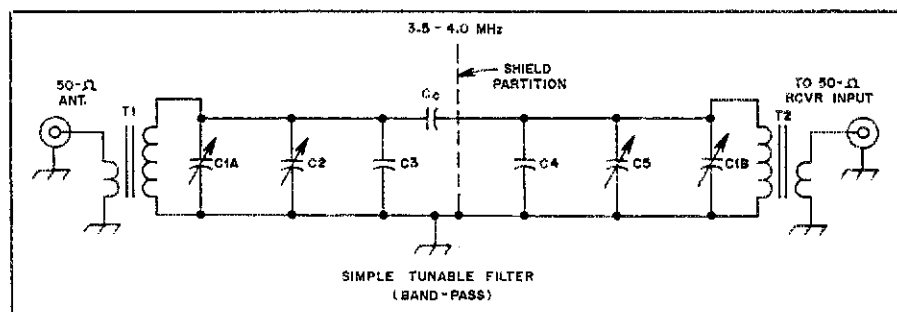


Fig. 4 — Circuit example of a tunable filter for use at the front end of a receiver. C_c is the coupling capacitor that connects the two resonators. See text.

loss. If your receiver has more than ample sensitivity and gain, the small loss in received signal may be of no concern. If you wish to make up the lost gain, however, you may add a simple preamplifier after the outboard filter unit.

An example is given in Fig. 5. This broadband class-A RF amplifier is one developed by Wes Hayward, W7ZOI, and it appears also in *Solid State Design for the Radio Amateur*, an ARRL book. The gain can be controlled to some extent by changing the value of R1. The larger the resistor value, the lower the gain. This amplifier has a rather poor noise figure, comparatively speaking. It is not recommended for use above 15 MHz when dealing with weak signals. T1 is a toroidal transformer made with an Amidon Associates FT-50-43 ferrite core. The primary winding contains 15 turns of no. 26 enameled wire. The secondary has seven turns of no. 26 enameled wire. This amplifier is suitable for use from 1.8 to 30 MHz, taking into account the noise-figure matter at the high end of the HF range.

VHF and UHF Filters

The general practice when building VHF and UHF filters is to use the band-pass response. Although effective filters can be made from lumped inductances and capacitances (coils and fixed-value capacitors), cavity or stripline filters offer easy construction and effective performance. The negative feature of this approach is the size of the filter compared to that of a smaller lumped-constant filter. The latter variety is difficult to deal with in terms of ultimate attenuation, and calculating the correct number of coil turns is no easy task when inductance values are substantially less than 1 μ H.

Fig. 6 shows some arrangements for VHF stripline filters. The example at A shows a stripline format that is suggested for use from 50 to 220 MHz. The inner line, L2, is resonant as a $\frac{1}{4}$ -wavelength circuit. L1 and L2 are adjusted in length and spacing from L2 to permit the amount of coupling desired. The tighter the coupling (closer to L2) the lower the insertion loss and the greater the filter bandwidth. Light coupling is preferred to keep the Q, and hence the selectivity, high. Acceptable Qs are available when the insertion loss is less than 1 dB. The filter is bilateral, which means the input terminal will reflect the same load impedance to the output terminal, assuming both coupling links are of the same dimensions and spacing from L2.

We may encounter some problems when attempting to use the $\frac{1}{4}$ -wave format above 220 MHz. First, the stripline becomes quite short and hard to manage. Also, the smaller enclosure may have its own resonance as a cavity, somewhere in the tuning range of the filter. I experienced this problem at 432 MHz, and the anomaly completely ruined the filter performance.

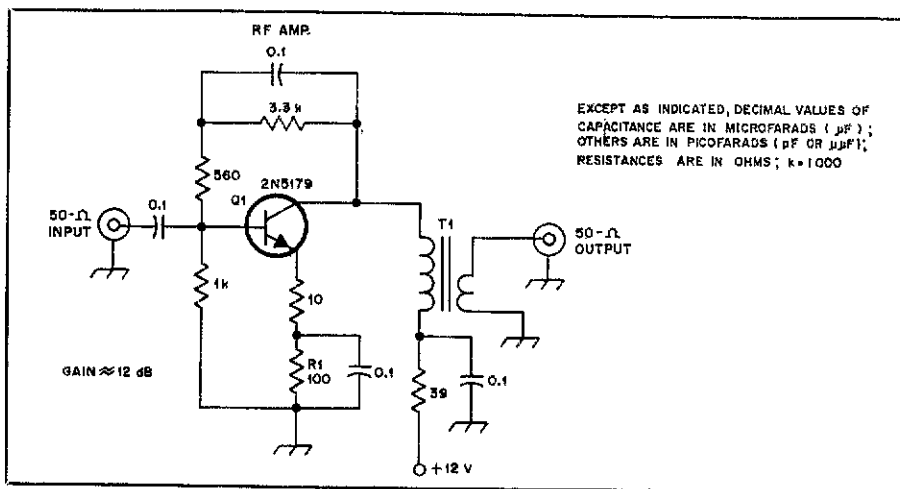


Fig. 5 — Practical circuit for a preamplifier that operates as a linear class-A amplifier. This circuit may be used after the circuit of Fig. 4 to compensate for losses through the filter. It may be used ahead of the filter if a low-pass filter precedes the amplifier.

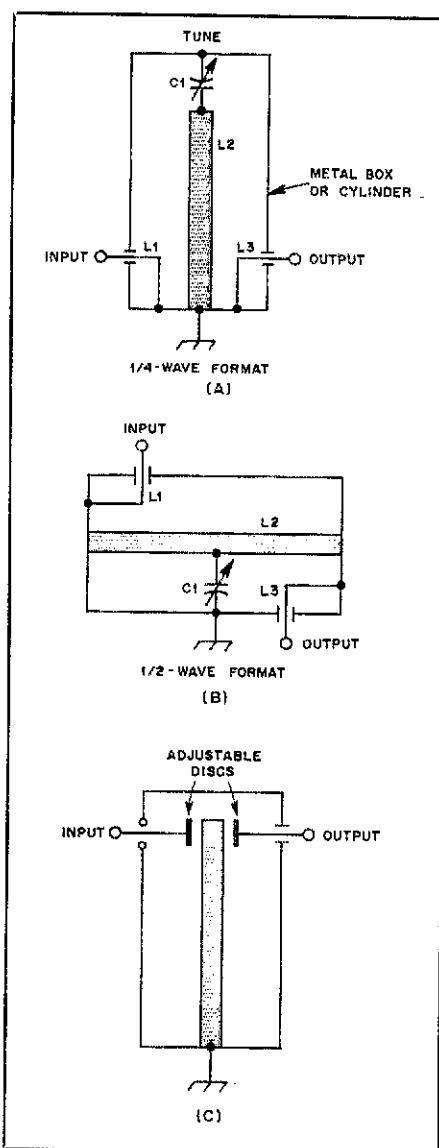


Fig. 6 — Hybrid pictorial/schematic diagram examples of VHF stripline filters. A $\frac{1}{4}$ -wavelength line is shown at A, and a $\frac{1}{2}$ -wavelength version is at B. Probe coupling in and out of a filter is depicted at C.

Changing to the $\frac{1}{2}$ -wavelength filter of Fig. 6B will make construction and tuning much easier, and should eliminate problems with box resonance.

The probe-coupling method of Fig. 6C is frequently used by amateurs. Small discs are mounted on screw-adjust rods to permit changing the amount of input and output coupling. With this technique, it is easier to set the amount of coupling than when using fixed-position links (Fig. 6A and B).

A stripline filter is essentially a section of coaxial transmission line with air dielectric. The common design impedance for this piece of line is 75 ohms, and it is not critical. *The ARRL Electronics Data Book* contains equations for designing stripline filters.

Stripline filters can be used ahead of VHF and UHF receivers to minimize image responses. Similarly, they may be installed at the VHF or UHF transmitter output to attenuate spurious responses that might cause interference to other services. Additional rejection, owing to steeper sides on the response curve, may be had by cascading two or more identical stripline filters. The insertion loss will increase in proportion to the number of resonators used.

A Practical 2-Meter Stripline Filter

Fig. 7 shows the inside of a homemade 2-meter band-pass filter. The circuit is that of Fig. 6A. The enclosure is a 12 × 2 × 2¼ inch Minibox. The inner line (L2) is a 10-inch section of $\frac{1}{2}$ -inch copper pipe that has been silver plated (not necessary, but desirable). An aluminum end plate has been added at the ground end of L2. This permits attaching L2 to the end of the box by means of two no. 6 spade bolts. Coupling links L1 and L3 are made from no. 12 solid copper wire. Each link is 3½ inches long and is spaced 5/8 inch away from L2. C1 is a 15-pF capacitor with

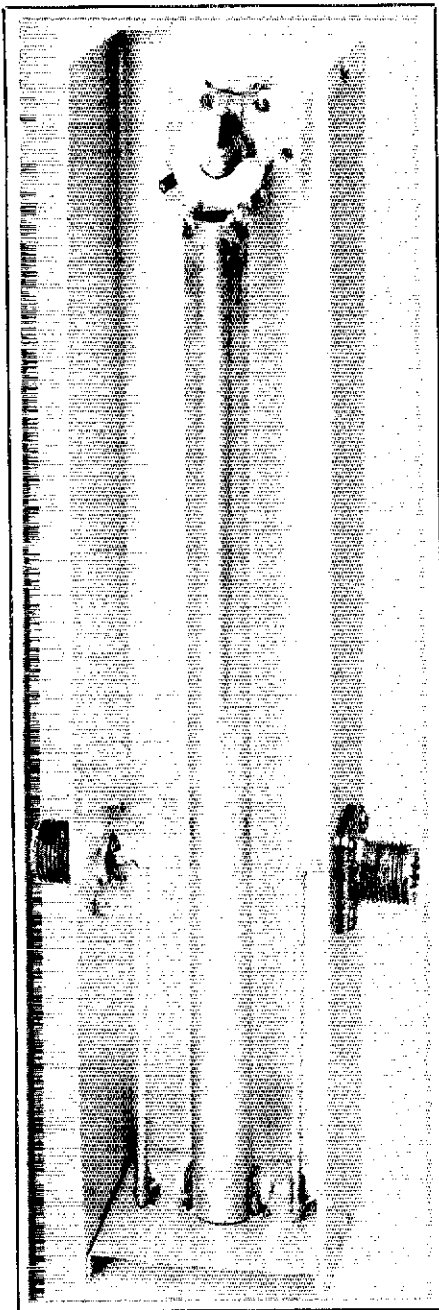


Fig. 7 — Interior view of a homemade stripline filter for 144 to 148 MHz. Construction data may be found in the text.

double plate spacing (Hammarlund HF-15X).

The construction of this filter does not follow ideal methods. Best filter Q and power-handling ability will result when a seamless box is used as the outer conductor. The end plates should be soldered to the main box, as should the ground ends of L1, L2 and L3. This suggests the use of copper or brass tubing (silver plated to reduce corrosion and to elevate the Q) as the outer conductor of the line. Losses through heating will be substantially lower when all components are soldered or brazed in position. The completed unit can then

be silver plated. Normally, this will cost a few dollars at a plating shop. If you can obtain your own silver anode and plating solution, the job can be done at home. The phone book Yellow Pages should list a supplier of these materials.

Best filter performance will result when L2 is as long as possible and C1 has the least capacitance for establishing resonance. The physical length of L2 must always be less than $\frac{1}{4}$ wavelength, and less than $\frac{1}{2}$ wavelength in the case of the circuit of Fig. 6B. Many stripline filters use a tuning disc (two round plates) for C1. A collet with fine threads is necessary on the box end wall at the high end of L2 to provide smooth adjustment of C1 when disc tuning is used. A large-diameter tuning screw is recommended if you follow this design technique. A locking nut will be needed to secure the tuning disc in position. Iron parts are not recommended in this type of unit; brass or copper should be used.

Despite the less than ideal construction method I used for this filter, performance is good and the insertion loss is on the order of 0.3 dB. There is some heating at the ground end of L2 when 75 to 100 watts is run through the filter. This would decrease with brazed or soldered filter elements. The HF-15X capacitor will tend to flash-over at powers above 100 watts. Therefore, for higher power on 2 meters you should use disc tuning and a larger inner and outer line. A diameter of 1 inch is suggested for L2 at power levels in excess of 100 watts. The outer conductor (box) would then be somewhat larger than that of the filter under discussion.

Filter Adjustment

When the filter of Fig. 7 is used ahead of a receiver, it is necessary only to adjust C1 of Fig. 6A for peak signal response. For transmitter applications we can tune the filter for maximum power output, or for minimum SWR. Both conditions should coincide.

Closing Comments

It was not the purpose of this article to teach you how to design filters. Instead, I wanted to explain what filters can do and how they appear in schematic-diagram form. The ARRL literature and past articles in *QST* contain the nitty-gritty you need to get into the design aspects of filters. I hope you will develop your knowledge and skills in this broad area, for filters are an important part of Amateur Radio.

Notes

¹Ed Wetherhold, W3NQN, and Wes Hayward, W7ZOL. They may be consulted concerning filter design. Include an s.a.s.c. with your letter.

²mm = in \times 25.4; m = ft \times 0.3048.

New Products

DATAK CORPORATION ELECTROLESS TIN PLATING

□ Electroless tin plating has usually meant a dull, gray plate with marginal solderability, poor adhesion and a four-month solution shelf life. Most formulas also require the addition of a strong acid to the solution.

DATAK solves these problems with Tinnit™, a dry chemical mix that can be stored for years without deterioration. When mixed in water, it plates a shiny layer of pure, solderable tin over copper, brass and nonalloy steels. No acid is added, and there is almost no odor. Plating is done at temperatures of 110-130°F.¹ The metal should be reasonably clean, but cleaners in Tinnit prepare the metal for a perfect plate. A maximum plating thickness of 0.0004 inch is reached after 15 minutes in a fresh solution.

Tinnit is designed to plate bare copper circuit boards, but it can also be used for general cosmetic plating. Although the resistivity of tin is slightly higher than gold, Tinnit works successfully as a protective plate on edge-card-connector fingers when gold is not available.

Tinnit is supplied in a 1-pint size for \$3.50. This amount will plate approximately 600 in². Bulk quantities are available on an individual quote basis. The product bears the DATAK catalog number ER-18, and is available from your DATAK products distributor or from DATAK Corporation, 65 71st St., Guttenberg, NJ 07093. For more technical information, contact Barry D. Brown at 702-359-7661; for sales information, call Terry Pflueger at 201-869-2200. — Paul K. Pagel, N1FB

¹°C = (°F - 32) \times 5/9; mm = in \times 25.4;
mm² = in² \times 645.16; l = pt \times 0.4732.

Next Month in QST

What's on tap at the start of what promises to be another banner year for Amateur Radio? To begin with, there's an overview of what's in store for hams on the new 900-MHz band in the way of antennas, surplus equipment and a proposed band plan. Elsewhere, you'll find an in-depth explanation of solar winds and aurora, and a construction project for a simple 10-meter FM receiver. Beginners (and old-timers, too) will enjoy a basic explanation of how HF radio signals travel. On a related subject, there will be an expanded report on the September VHF QSO Party, conditions for which were outstanding. Catch all this, and more, in January *QST*.

ARRL Board Approves AX.25 Packet-Radio Link-Layer Protocol

Adoption of a standard link-layer protocol sets the stage for global growth of amateur packet radio.

By Paul L. Rinaldo,* W4RI

On October 26, 1984, the ARRL Board of Directors voted for approval of a link-layer protocol for amateur packet radio. This was the culmination of three years of work by numerous volunteers and the ARRL Board-created Ad Hoc Committee on Amateur Radio Digital Communication. (A protocol is simply a format and a procedure describing how to handle the things called for in that format.) While the link-layer protocol is only one of seven protocol layers eventually needed for packet radio, it is the crucial one that ensures basic communications compatibility throughout the world. In recognition of the pioneering done by North American amateurs, the International Amateur Radio Union (IARU) has named the ARRL as the international clearinghouse for information relating to packet radio, with a view to encouraging common standards and regulations.

What is Packet Radio?

Like AMTOR or Baudot RTTY, packet radio is a mode of digital communications. With packet-radio techniques, data is sent from one station to another in bursts, or *frames*. In addition to carrying data, each of these frames contains addressing information, error-checking information and control information.

The addressing information in a frame tells what amateur station sent the frame, what station the frame is being sent to and what stations should relay the frame. Using this addressing information, many packet-radio stations may share the same frequency. By examining frame addresses, a station can tell which frames are for it and which frames are for other stations on the frequency. To monitor a frequency, a station may look at all of the frames it receives, regardless of to whom they are addressed.

The error-checking information in a

frame allows the receiving station to determine whether the frame contains any errors. If the frame is error-free, the receiving station accepts it and sends an acknowledgment to the station that sent it. If the frame contains errors, the receiving station ignores the frame and waits for it to be retransmitted by the sending station. Checking frames for errors, and having the sending station correct errors by retransmission, makes packet-radio communications error free.

The protocol approved by the ARRL Board of Directors formally specifies the format of a packet-radio frame and the actions a packet-radio station must take when it transmits or receives such a frame. Since this protocol deals with two linked stations, and does not touch the topic of multistation networks, it is called a link-layer protocol.

The link layer is level 2 in a 7-level conceptual model developed by the International Organization for Standardization (OSI). Each layer is assigned a specific type of function.

- Level 1. The *physical layer* is responsible for moving *bits* (1s and 0s) from one station, through a communications channel, to another station.

- Level 2. The *link layer* organizes the data into *frames* and ensures that they arrive without error at the other end of the radio link.

- Level 3. The *network layer* makes the frame into a *packet* by inserting information needed by a network to get the packet to its ultimate destination, perhaps through many links.

- Level 4. The *transport layer* lines up information (called messages) to be transmitted in packets and sorts out received packets so that messages are assembled in the right order.

- Level 5. The *session layer* decides when your station needs to have a QSO with another one to exchange data.

- Level 6. The *presentation layer* does the housekeeping chores for your computer; code interpretation, display and file management are some of its functions.

- Level 7. The *application layer* runs the programs that make the computer do something you want it to do.

Breaking these different functions into separate modules has several advantages. One is division of labor, meaning that different people can work on different modules. It simplifies and divides up the tasks. It also permits replacement of, or individual variation in, modules, as long as they obey certain rules. There is no reason you can't have a smorgasbord of protocols for different purposes, and certainly that will be the pattern of future packet radio.

But for now, we have an agreed way of exchanging frames at the link layer of packet radio. Some work has been done on the other protocol layers, but there is not yet any substantial agreement. The next important hurdle is the network layer — the ARRL Ad Hoc Committee is actively developing a network-layer protocol.

Link-Layer Format

The structure of the link-layer frame is shown in Fig. 1. For purposes of discussion and operation, the frame is divided into *fields*. Each frame starts and ends with a *flag*. The flag has a peculiar bit pattern: 01111110. The pattern appears only at the beginning and end of frames. If this pattern accidentally shows up somewhere else in the frame, a zero is inserted by the sending station then removed by the receiving station. This technique is known as *bit stuffing*.

The second field is the *address field*. In the protocol adopted by the ARRL Board, the address field uses the Amateur Radio call signs of the stations in the link. The first of these is the call sign of the destination station at the other end of the radio link. The second is the source call sign — the originator of that frame. If the two stations are in direct contact, that's all there is to the address field. If not, the call signs of one to eight packet-radio repeaters can appear. Each call sign takes up six character spaces; shorter call signs are padded with ASCII spaces. A seventh

*Chairman, ARRL Ad Hoc Committee on Amateur Radio Digital Communications; ARRL Senior Technical Editor

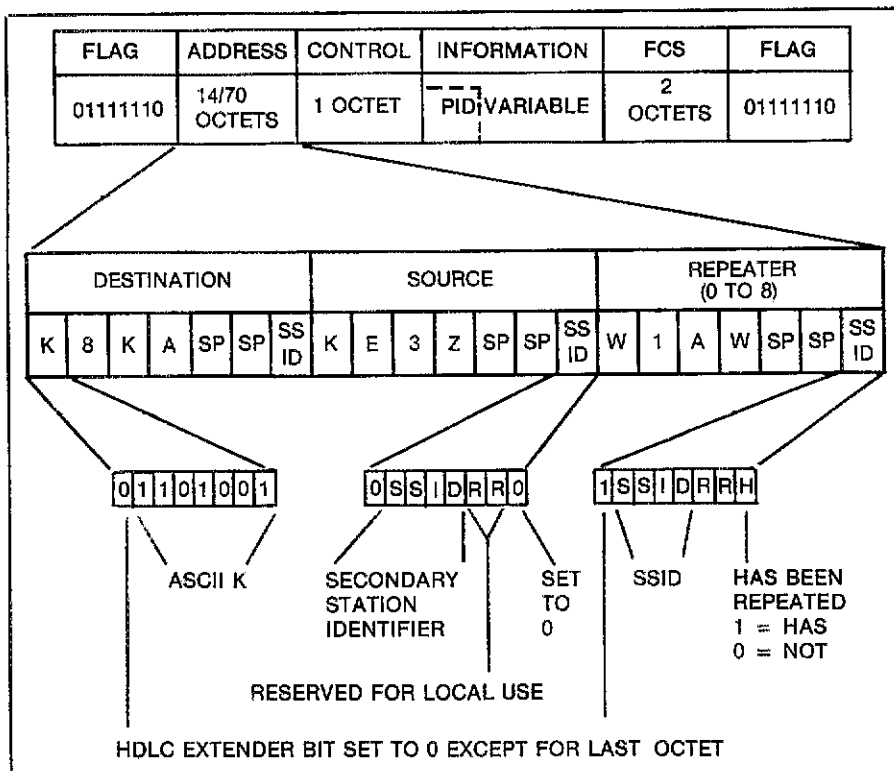


Fig. 1 — AX.25 frame format. The repeater address subfield is optional and may contain as many as eight repeater call signs.

character, called a *secondary station identifier* (SSID) is added to permit up to 16 different packet-radio stations to operate under one radio call sign. For example, W1AW 5 is a repeater, while W1AW 4 is a bulletin board at a different location. The SSID also keeps track of which repeaters have repeated, and which have yet to repeat, the frame.

Next is the *control field*. It contains a bit pattern that tells what kind of frame it is (information or supervisory) and a frame number (0 to 7) for acknowledgments. Following that is the *protocol identifier* (PID), which signifies the network-layer protocol in use, if any. Then comes the *information field* for frames that contain data to be transmitted. This field can have up to 256 octets of information. (An octet is a group of eight bits.)

Following the information field is the *frame check sequence field* (FCS). The FCS is there to allow receiving stations to detect transmission errors. The sender generates a pattern of 16 bits according to an algorithm published by the OSI. Upon receipt of a frame, the receiver calculates the FCS on the basis of the received data then compares the answer with the FCS calculated by the sender. If the two match, that frame is then acknowledged. The frame is ended by a flag.

Procedure

Recall that a protocol includes both format and procedure. Packet radio protocols are generally executed in a microprocessor-based device called a terminal-node controller (TNC). The TNC carries out the

procedures without need of operator intervention.

Disconnected State

When power is applied, packet-radio TNCs are normally in the disconnected state or monitor mode. This permits displaying all activities on the channel. The TNC also looks for any connection requests from other stations and will respond by establishing the connection or ignoring the connection request, depending on circumstances.

Connection Establishment

When one station wishes to connect with another, it sends a command frame to the other station and starts a time-out timer. If the other station is on the air and able to connect, it sends an acknowledgment frame. If the called station doesn't respond before the timer runs out, the calling station will reinitiate the request a number of times. The number depends on the signaling speed and radio propagation medium (for example, terrestrial VHF or satellite).

Information Transfer

After the link connection is established, the TNCs will enter the information-transfer state. In this state, the two stations may exchange information and supervisory frames.

Disconnection

While in the information-transfer state, either station may send a request to disconnect. The disconnection occurs after a response from the other station or if the

timer, mentioned earlier, times out.

Connectionless Operation

This is a procedure that permits round tables and bulletin transmissions via packet radio. The normal method of connection between two amateur stations is not practical when multiple stations are involved. The protocol allows this type of operation by using unnumbered information frames. Without frames being numbered, however, the TNCs do not automatically request retransmissions of bad frames as they do when connected.

Acknowledgments

The control field of each frame sent includes the number (0 to 7) of the last frame correctly received from the other station. If the sending station had sent frame number 5 but received acknowledgment for frame number 4, it knows to repeat frame number 5.

More Detail

If you're interested in the details of the link-layer protocol, a booklet entitled, "Amateur Packet-Radio Link-Layer Protocol, AX.25" will be available from ARRL Hq. in late December for \$8 U.S., \$9 Canada and elsewhere, postpaid (U.S. funds). The booklet gives the complete protocol specification in sufficient detail for those wishing to write software to implement the protocol. It also summarizes the history of the protocol development. A tutorial based on an earlier version of the protocol appears in the proceedings of the Second ARRL Amateur Radio Computer Networking Conference, also available from ARRL Hq., for \$9. The proceedings of the First and Third conferences are priced at \$8 and \$10, respectively.

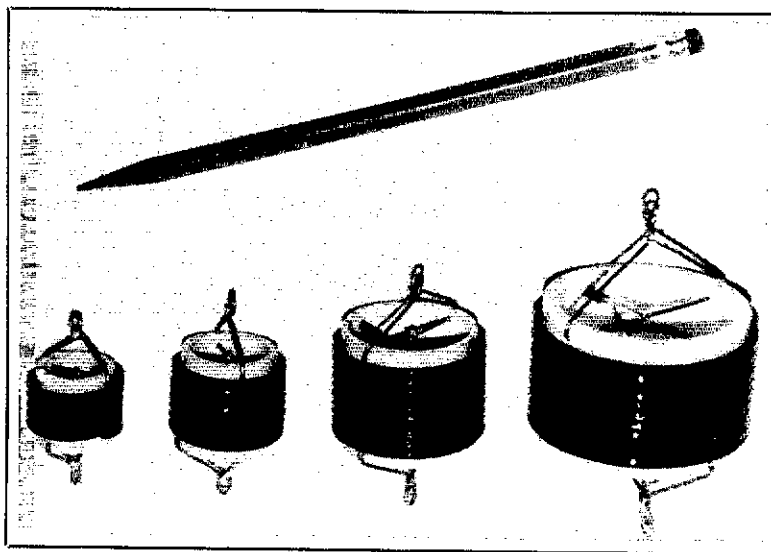
Acknowledgments

Thanks go to Terry Fox, WB4JFI, who authored the protocol specifications through several stages of development, and to the members of the ARRL Ad Hoc Committee on Amateur Radio Digital Communication. Committee members at the time of approval of the protocol were Paul Rinaldo, W4RI (Chairman); Marshall Quiat, AGØX (Board Liaison); Den Connors, KD2S; Terry Fox, WB4JFI; Lyle Johnson, WA7GXD; Wally Linstruth, WA6JPR; Doug Lockhart, VE7APU; Hank Magnuski, KA6M; Paul Newland, AD7I; and Eric Scace, K3NA. The Committee also wishes to acknowledge the support, in the form of contributions to the protocol and development of implementing software, of the following organizations: Amateur Radio Research and Development Corporation (AMRAD), The Radio Amateur Satellite Corporation (AMSAT), Ashby and Son, GLB Electronics, Pacific Packet Radio Society (PPRS), Radio Amateur Telecommunications Society (RATS), Richcraft Engineering and Tucson Amateur Packet Radio Corporation. (TAPR).

Optimizing Coaxial-Cable Traps

Effective high-reactance antenna traps provide good performance and increased effective bandwidth. Author Sommer supplies detailed data for coaxial-cable traps, along with design curves for two types of cable.

By Robert C. Sommer,* N4UU



The clever concept of using the same length of coaxial cable to form both the coil and the capacitor of a parallel-resonant antenna trap first appeared in an amateur publication in 1981.¹ Coaxial-cable antenna traps have been found to be broadband, inexpensive, easy to construct, stable with respect to temperature variations and capable of operating at surprisingly high levels of power. Furthermore, these traps can be made small and lightweight.^{2,3}

This article shows an optimum diameter for such a trap, which permits a specified resonant frequency to be obtained with a minimum length of cable. Minimizing the length of cable not only reduces the cost, weight and the losses associated with the cable, but also achieves the maximum bandwidth over which the parallel-resonant impedance remains high. These are all desirable characteristics. The data for constructing optimized traps, for each of the HF bands, can be found in the figures.

Mathematical Background

Fig. 1 shows a cutaway view of a coaxial-cable antenna trap. Suppose the thickness of the cable (the outside diameter) is t inches, and that the cable is wound on a cylindrical form with an outside diameter of d inches, in order to produce a coil containing n turns. Assume the coil is close wound, with no spacing between the adjacent turns, so as to obtain the greatest inductance with a given number of turns.

Assume, also, that one-half inch of shielded cable is used at each end of the coil as a pigtail to penetrate the coil form.⁴ The total length of the shielded cable under those conditions is approximated closely by $\pi n(d + t) + 1$ inches. If the distributed capacitance of the cable is C_0 pF per foot, then the total capacitance of the cable is

$$C = \frac{C_0[\pi n(d + t) + 1]}{12} \text{ pF} \quad (\text{Eq. 1})$$

Using the standard formula for inductance, the inductance of the coil formed by the coaxial cable can be expressed as

$$L = \frac{(d + t)^2 n^2}{18(d + t) + 40nt} \mu\text{H} \quad (\text{Eq. 2})$$

since the mean diameter of the coil is $d + t$ and the length of the close-wound coil is πn .⁵ When the inner conductor at one end of the cable is connected to the braided

shield at the other end of the cable, as shown in Fig. 1, a parallel-resonant circuit is formed. The resonant frequency is given by

$$f_0 = \frac{1000}{2\pi\sqrt{LC}} \text{ MHz} \quad (\text{Eq. 3})$$

where L is expressed in microhenrys and C is expressed in picofarads. For any selected set of trap parameters (d , t , n and C_0), equations 1 and 2 are used to determine C and L , respectively, and equation 3 predicts the resonant frequency accurately.

Optimum Trap Parameters

As described above, it is easy to determine f_0 once the parameters of the trap have been selected. In practice, however, a value of f_0 is selected, and then the parameters are determined in order to

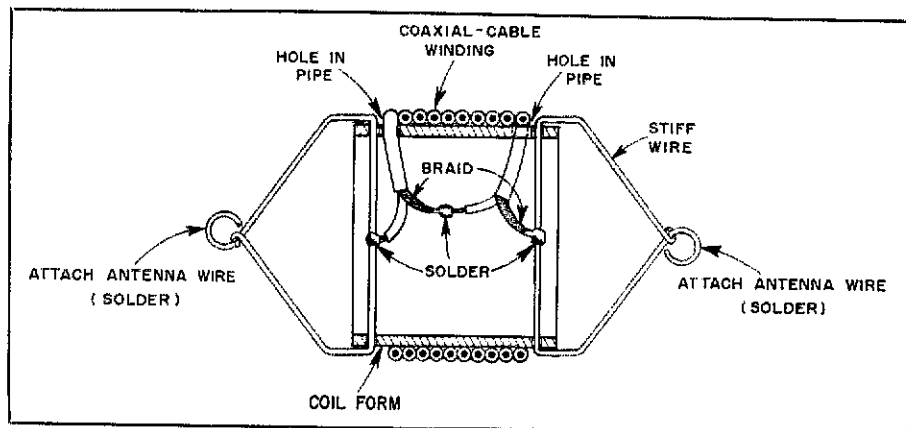
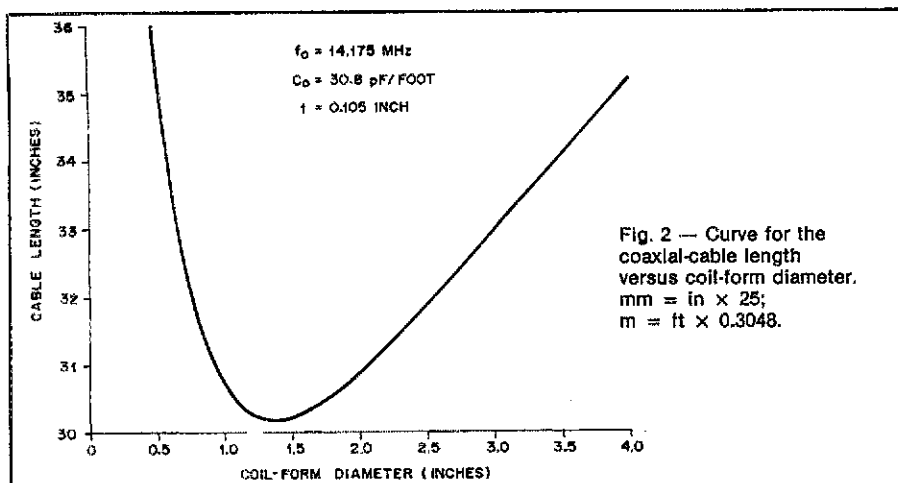


Fig. 1 — Cutaway view of a coaxial-cable antenna trap built on PVC tubing.

¹Notes appear on page 42.

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tions 4 and 5 were evaluated for several different values of d , and the results (which show the required cable length, ℓ , as a function of the outside diameter of the coil form, d) are presented in Fig. 2. It is interesting that there is a minimum length of cable that permits resonance to be achieved at the selected resonant frequency. Here an optimized trap is defined as that which requires a minimum length of cable in order to achieve resonance at a specified frequency. Consequently, Fig. 2 shows that a trap that is resonant in the 20-meter band and made with RG-174/U cable, will be optimized if the cable is wound on a form that is 1.4 inches in diameter.

achieve the selected value of f_0 . This can be accomplished by placing the right members of equations 1 and 2 into equation 3 and performing some algebraic manipulations to arrive at the cubic equation

$$a_3 n^3 + a_2 n^2 + a_1 n + a_0 = 0 \quad (\text{Eq. 4})$$

where

$$a_0 = -216,000,000 (d + t)$$

$$a_1 = -480,000,000 t$$

$$a_2 = (2\pi f_0)^2 (d + t)^2 C_0$$

$$a_3 = (2\pi f_0)^2 (d + t)^3 \pi C_0$$

Thus, one selects parameters d , t , f_0 and C_0 , computes the coefficients a_0 , a_1 , a_2 and a_3 , and then solves equation 4 to find the proper value of n . Once n is determined, the total length of shielded coaxial cable required can be calculated from

$$\ell = \pi n(d + t) + 1 \text{ inches} \quad (\text{Eq. 5})$$

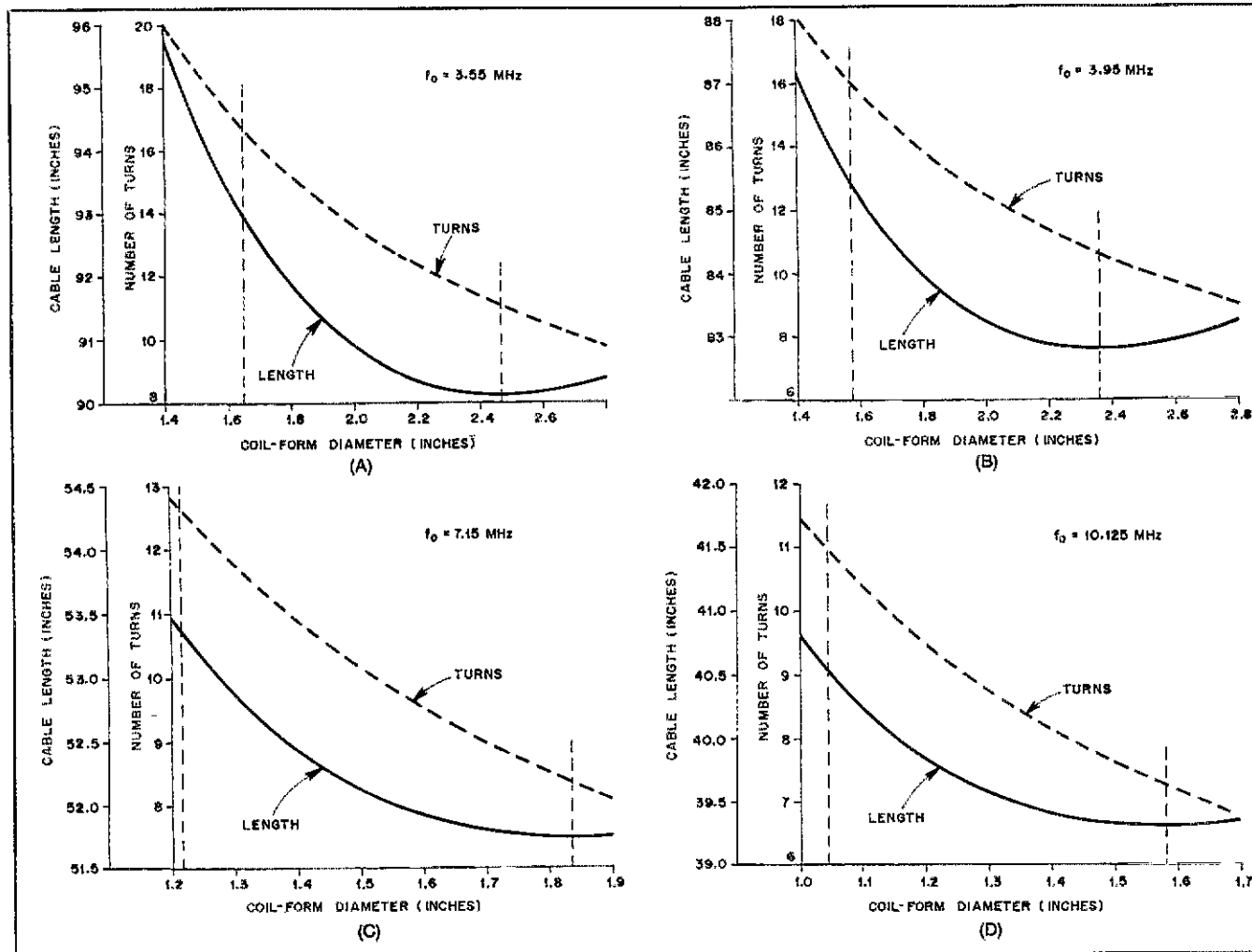
Using miniature RG-174/U cable and $f_0 = 14.175 \text{ MHz}$ as an example, equa-

Design Charts

Equations 4 and 5 were used to generate the design charts that are shown in Fig. 3, which pertains to RG-174/U cable, and Fig. 4, which pertains to RG-58/U cable. The nominal cable parameters used in these calculations were

RG-174/U: $t = 0.105 \text{ inch}$,
 $C_0 = 30.8 \text{ pF/foot}$
 RG-58/U: $t = 0.200 \text{ inch}$,
 $C_0 = 28.5 \text{ pF/foot}$

Each chart shows the length of the cable and the number of turns required for



resonance in one of the HF amateur bands through a narrow range of diameters for the coil form. The dashed vertical line at the right indicates the precise value of d that minimizes ℓ . This point is found by using differential calculus and solving a fifth-order equation.

The results show that an optimized coaxial-cable trap is characterized by a coil configuration in which the length of the coil, nt , is equal to 0.450 times the mean diameter of the coil, $d + t$. This causes the two terms in the denominator of equation 2 to be equal. The dashed vertical line at the left indicates that value of d that gives rise to a square coil configuration, in which the length and diameter of the coil are equal. Generally, square coils exhibit a relatively high Q . It is probably unwise to choose a diameter less than that of the square coil configuration.

To maximize the trap performance, the diameter of the coil form should be such that the length of the cable is minimized. Since this might not always be possible because the proper size of material is not available, a smaller diameter should be acceptable; but a diameter larger than that, which gives rise to a square coil should be selected. In all cases, the range of diameters

between the optimum and square configurations is broad enough that suitable material should be available.

Design Examples

Suppose a 15-meter trap is going to be made from RG-174/U coaxial cable. From the dashed vertical lines in Fig. 3F it is apparent that the diameter of the coil form should be greater than 0.75 inch, with a diameter of 1.14 inches being optimum. A local hardware store should have $\frac{3}{4}$ -inch polyvinyl chloride (PVC) tubing that has an outside diameter of 1.10 inches (close to the optimum diameter). Fig. 3F shows that with a coil-form diameter of 1.10 inches, the trap will require 22 inches of cable, wound into a $5\frac{1}{2}$ -turn coil.

As a second example, suppose a 20-meter trap is going to be made from RG-58/U coaxial cable. From the dashed vertical lines in Fig. 4E, it is apparent that the diameter of the coil form should be greater than 1.3 inches, with a diameter of 2 inches being optimum. In this case, a piece of $1\frac{1}{4}$ -inch PVC pipe that has an outside diameter of 1.68 inches serves nicely. Fig. 4E shows that the trap will require $35\frac{1}{2}$ inches of cable, wound into a $5\frac{3}{4}$ -turn coil.

As a final example, consider the design

of a 75-meter trap that is to be made of RG-174/U and will be resonant at 3.825 MHz. Since the 75/80 meter band is relatively broad, two design charts are presented: one for $f_0 = 3.55$ MHz, which can be used accurately for the lowest 100 kHz of the band, and one for $f_0 = 3.95$ MHz, which can be used accurately for the highest 100 kHz of the band. Refer to Fig. 3A. It is clear that the optimum diameter of the coil form for the low end of the band is about 2.47 inches, and, from Fig. 3B, that the optimum diameter for the coil form for use near the high end of the band is about 2.36 inches. In this case, a pair of PVC pipe couplings with an outside diameter of 2.25 inches were used to make a pair of traps for use in a 75/160 meter inverted-V antenna.

Coincidentally, the lengths of these coupling units were perfect. Figs. 3A and 3B show that, with a diameter of 2.25 inches, 12 turns are required for resonance at 3.55 MHz, and 11 turns are required for resonance at 3.95 MHz. Since the desired resonant frequency is near the high end of the band, $11\frac{1}{4}$ turns was chosen. Equation 5 shows that the required length of cable is about $84\frac{1}{4}$ inches. Since it is much easier to shorten a length of coaxial cable than

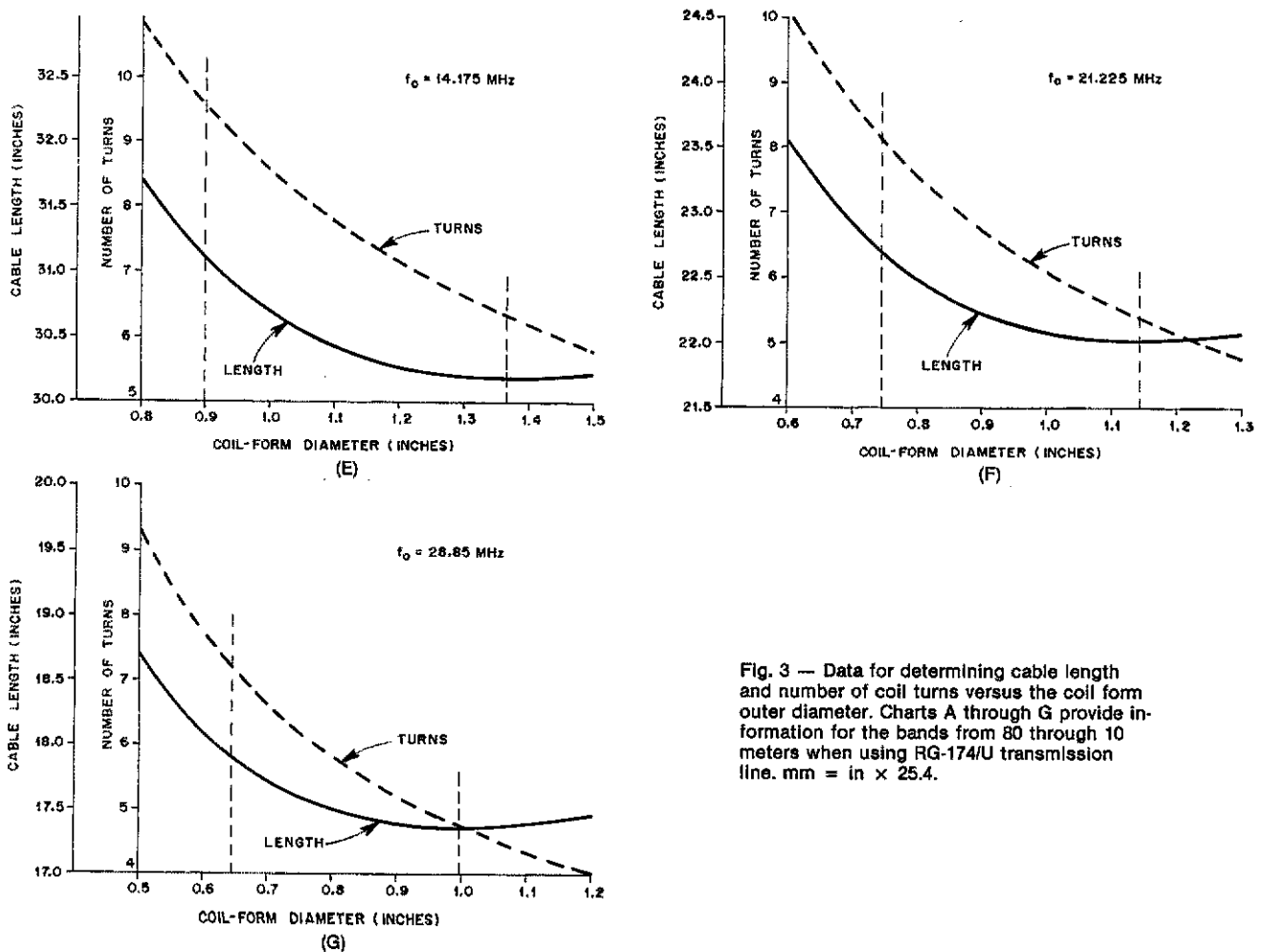


Fig. 3 — Data for determining cable length and number of coil turns versus the coil form outer diameter. Charts A through G provide information for the bands from 80 through 10 meters when using RG-174/U transmission line. $\text{mm} = \text{in} \times 25.4$.

to lengthen it, these traps were wound initially using 86-inch lengths of cable, and the ends were then shortened slightly in order to raise the resonant frequency to 3.825 MHz.

Tuning Information

My experience shows that traps constructed with close adherence to the data in Figs. 3 and 4 are usually resonant within one percent of the design frequency. Small variations in C_0 and t do occur from one batch of cable to another, and among cables produced by different manufacturers. Stray capacitance can also become significant at the higher frequencies. In order to compensate for such variations, and to provide for the fine adjustment of resonant frequency to a favored segment of the band, some suggestions for tuning are presented next.

The values of ℓ and n , which are read from the design charts, will leave a half-inch pigtail of shielded cable at each end of the coil. One should start with an extra inch or two of cable that has been dressed to make the connections. If some additional length of shielded cable is left inside

Table 1
Electrical Characteristics of Coaxial Cable Antenna Traps

Freq. (MHz)	RG-174/U			RG-58/U			
	Minimum Length (kHz/inch)	Sensitivity (ohms)	Reactance (ohms)	Minimum Length (kHz/inch)	Sensitivity (ohms)	Reactance (ohms)	
3.550	19.5	193.8	18.9	16.7	178.7	16.1	172.7
3.950	23.6	189.6	22.9	20.2	174.8	19.5	168.9
7.150	68.1	167.7	66.1	58.3	154.7	56.2	149.1
10.125	126.4	155.8	122.6	108.2	143.8	104.3	138.4
14.175	229.2	145.0	222.5	196.6	133.9	189.0	128.7
21.225	466.2	132.7	452.7	400.9	122.7	384.5	117.8
28.850	796.2	123.8	773.7	686.2	114.7	656.7	109.6

the coil form, the capacitance is increased; consequently, the resonant frequency will be lowered. This sensitivity of the resonant frequency to the length of the cable has been computed, and is given in Table 1 in units of kilohertz reduction in f_0 per inch of additional coaxial cable.

To achieve resonance near 7.050 MHz with RG-174/U, for example, Table 1 shows that an additional 1-inch length of coaxial cable inside the coil form will lower the f_0 by about 66 to 68 kHz. An addi-

tional 1½ inches will lower it by about 100 kHz, thereby dropping the f_0 from 7.150 to 7.050 MHz. To raise the resonant frequency, the coaxial cable inside the coil form can be dressed back in order to reduce the capacitance, and the turns on the coil can be spread slightly to reduce the inductance.

Bandwidth

The useful bandwidth of a trap is that over which the parallel-resonant impedance

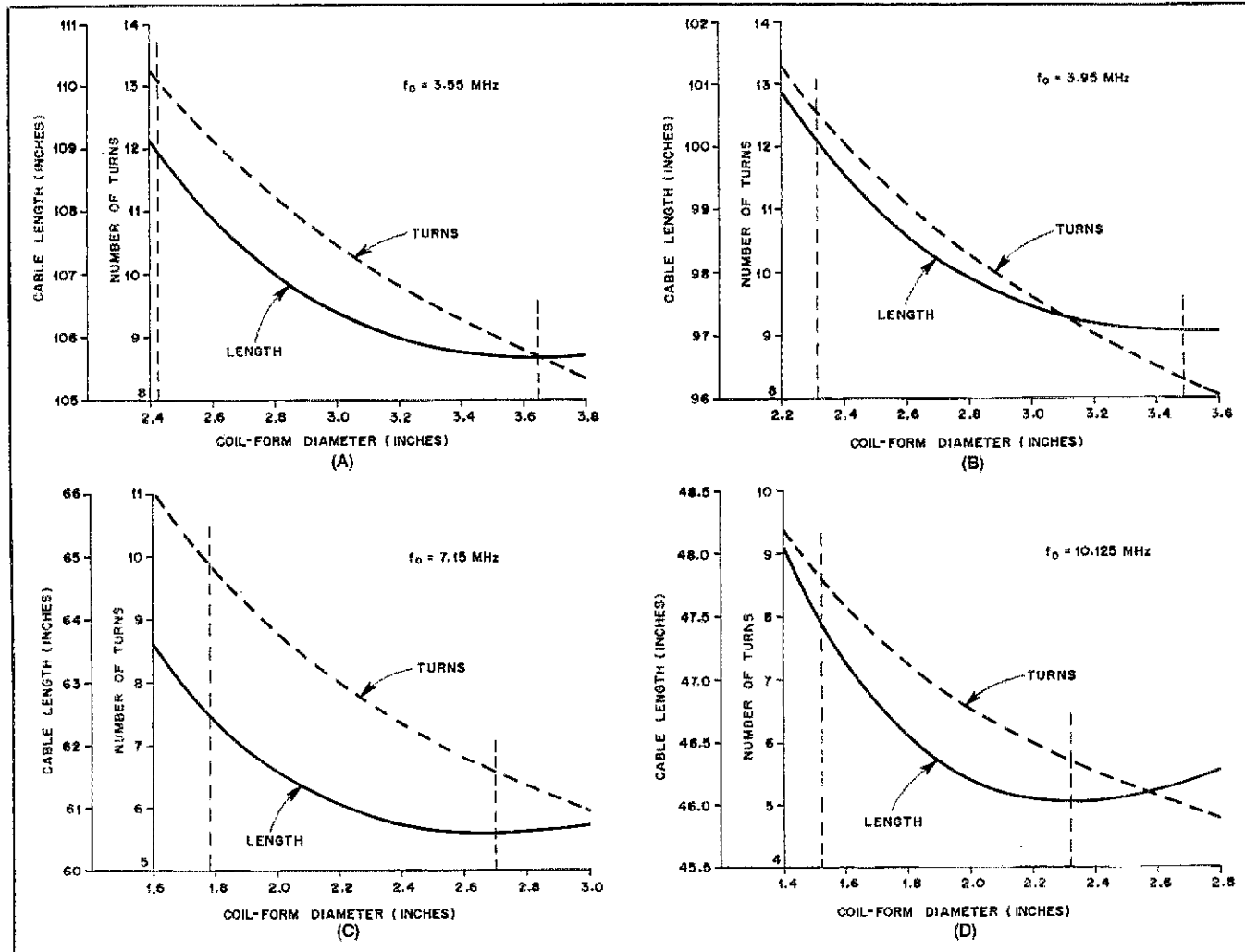


Table 2
Characteristics of Some Miniature Traps Using RG-174/U Coax

Resonant Band (meters)	Coil Form Diameter (inches)	Number of Turns (n)	Total Weight (ounces)
75	2.250	11.25	2.7
40	1.500	10.00	1.2
20	1.100	7.75	0.9
10	0.875	5.25	0.5

remains high enough to isolate or trap the outer sections of the antenna. Ignoring losses, it can be shown easily that the impedance of a parallel-resonant circuit can be expressed as

$$Z(f) = -j \frac{X_o}{(f/f_o) - (f_o/f)} \quad (\text{Eq. 6})$$

where X_o is the reactance of each element (both C and L) at the resonant frequency, f_o ; and f is the operating frequency. It can be seen that $Z(f)$ is proportional to X_o . Consequently, a large value of X_o should provide a relatively large operational bandwidth.

The minimum length of cable is equiva-

lent to the maximum X_o . The values for reactance shown in Table 1 are the values of X_o for coaxial cable traps. Based on these data, traps made from RG-174/U have a slightly greater operational bandwidth than those made with RG-58/U. In either case, the optimized traps will have the greatest operational bandwidth.

Construction Techniques

The construction technique described by Carter (illustrated in Fig. 1) provides lightweight traps when made with RG-174/U.* A "family" of traps for use in dipoles made by the author are shown on the first page of this article. Their characteristics are summarized in Table 2. Alternative configurations for dipole traps were described by DeMaw and by Johns, who also considers the construction of coaxial-cable traps for use in vertical and rotary-beam antennas. In all cases, the design charts and other data given in this article are applicable.

Power Ratings

Coaxial-cable antenna traps are able to

operate at surprisingly high levels of power. An inverted-V antenna for operation on the 40/80/160-meter bands was constructed with miniature traps made with RG-174/U, similar to those shown on the first page of this article. There were no problems when operating at 1 kW average input power on 40 and 80 meters. Subsequent operation at 1.4 kW output power on 160-meter CW produced the complete failure of one of the 80-meter traps. This was caused by excessive heating, which brought about an internal short circuit between the inner and outer conductors of the coaxial cable. The remaining traps show signs of overheating, but did maintain their electrical integrity.

Based on this experience it appears that miniature coaxial-cable antenna traps made with RG-174/U can be used safely if the average power to the antenna is approximately 500 watts or less. For higher levels of power the larger traps made with RG-58/U should be employed.

Acknowledgments

I wish to acknowledge the assistance pro-

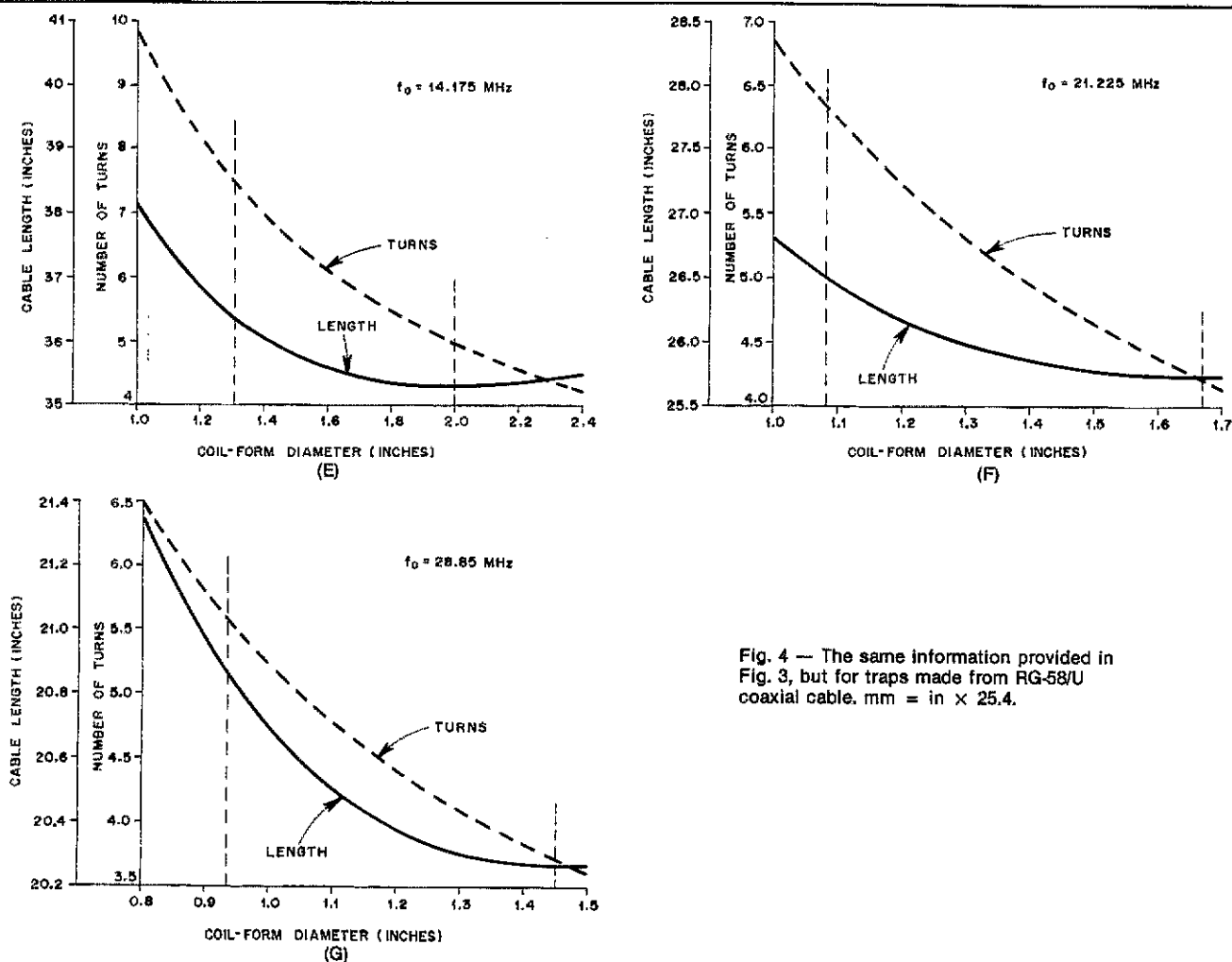


Fig. 4 — The same information provided in Fig. 3, but for traps made from RG-58/U coaxial cable. mm = in × 25.4.

vided by Mr. Nicholas Perriello, who produced the illustration shown in Fig. 1; Mr. Steven Van Weddingen, who performed much of the required "number crunching" on a programmable calculator; Dr. F. A. Burkle-Young, who also assisted in the numerical calculations and edited the manuscript as well; and Ms. Diane Weeks, who prepared the typescript.

References

- ¹R. H. Johns, "Coaxial Cable Antenna Traps," *QST*, May 1981, pp. 15-17.
²D. DeMaw, "Lightweight Trap Antennas — Some Thoughts," *QST*, June 1983, pp. 15-18.
³E. D. Carter, "Small Lightweight Traps for a 40/80 Dipole," *Potomac Valley Radio Club News Letter*, Nov. 1983, p. 2.
⁴mm = inches × 25.4; m = feet × 0.3048.
⁵*The 1985 ARRL Handbook for the Radio Amateur*, 62nd Ed. (Newington, CT: ARRL, 1984), p. 2-11.
⁶See note 3.
⁷See notes 1 and 2.

Robert C. Sommer was first licensed in 1952 as KN2BHE. Later he was assigned K2BHE and W4CRW. He upgraded to Extra Class in 1968. Mr. Sommer holds an MSEE degree (1961) from New York University, and has been employed by New York University (electrical engineering research), RCA and Computer Sciences Corp. He is presently a senior scientist with American Systems Corporation in Virginia. He has published 20 technical papers, has one patent and one patent pending. A life member of the ARRL, he is also a senior member of IEEE.

(Continued from page 28)

of stability. The period should be recorded and the gain halved by reducing the feedback-resistor values by a factor of 2. This should allow the controller to hold temperature without oscillating. In my case, the final gain from Eq. 2 is $A_v = 47$ kilohms/1.2 kilohms = 39.

The required gain depends on how well the thermistor is thermally coupled to the heater — the better the coupling, the higher the gain can be. There is a temptation at this point to mount the thermistor right on the heater. Resist! With the thermistor next to the heater you have no insurance that the heat is being coupled to the circuit that you are trying to temperature control. It is much better to have the thermistor away from the heater and in close proximity to the most temperature-sensitive component in the circuit.

After the final gain adjustment has been made, the actual control temperature can be measured via V_t . In my situation, $V_t = 6.14$ V. Using Eqs. 21 and 22:

$$R_t = \frac{(6.14)(1100)}{(12 - 6.14)} = 1153 \text{ ohms}$$

$$T_c = 60 + [(1153 - 1100)/-30] = 58.2^\circ\text{C}.$$

The control temperature and set temperature only differ by 1.8°C.

On my controller, the pass transistor was not included as part of the heater. We can use Eq. 15B to see how well the theory agrees with the measurement:

$$\Delta R = \frac{4(1100)(1200)}{47,000} \sqrt{\frac{(42)(27.5)}{28}}$$

$$12 - \left[\frac{2(1200)}{47,000} \sqrt{\frac{(42)(27.5)}{28}} \right]$$

$$\Delta R = 61.8 \text{ ohms}$$

For our thermistor, the change in resistance with respect to the change in temperature is -30 ohms/°C; therefore, the change in temperature needed to produce ΔR is $61.8 / -30 = -2.1^\circ\text{C}$, which yields a control temperature of $60^\circ\text{C} - 2.1^\circ\text{C} = 57.9^\circ\text{C}$. We measured a control temperature of 58.2°C , so the difference between the calculated and measured temperatures is only 0.3°C using the measured θ .

Since the agreement is quite good, we can now pick a new ΔT and see how much the control temperature varies. This is called a *sensitivity* calculation. We will determine how sensitive the control temperature is to a change in ambient temperature. Let's assume that the ambient temperature decreases by 10°C . That means $\Delta T = 52$. Then

$$\Delta R = \frac{4(1100)(1200)}{47,000} \sqrt{\frac{(52)(27.5)}{28}}$$

$$12 - \left[\frac{2(1200)}{47,000} \sqrt{\frac{(52)(27.5)}{28}} \right]$$

$$\Delta R = 69 \text{ ohms}$$

This translates to a -2.3°C change, which produces a new control temperature of 57.7°C . If we assume the ambient

temperature increases by 10°C , the control temperature becomes 58.2°C . A $\pm 10^\circ\text{C}$ change on the outside of the box causes only a plus or minus 0.25° change on the inside of the box!

For the Purist: The PID

Even though the proportional controller holds the control-point temperature fairly well, there is one small flaw. To generate the heater power, the control temperature must always differ from the set temperature. There is an answer to this problem. It is called the PID controller.³ This controller has a proportional term, an integration term and a derivative term. Whereas, in our proportional controller, the heat is a function of the difference between set and control temperatures, in the PID controller the heat is a function of the temperature difference plus the integral over time of this difference plus the derivative of this difference. The integral term will reduce the control-point and set-point temperature difference to zero over a period of time.

I feel that the straight proportional controller is adequate for my purpose. The world of temperature controllers is fascinating. Believe me, they can be a lot of fun to experiment with!

Notes

- ¹A. W. Scott, *Cooling of Electronic Equipment* (New York: John Wiley and Sons, 1974), p. 17.
²Scott, pp. 17-19.
³R. C. Dorf, *Modern Control Systems* (Reading, Mass.: Addison-Wesley Publishing Co., 1980), p. 380.

Yaesu FT-757GX Transceiver

The current trend in HF rigs is toward miniaturization, packing a maximum of features into a minimum of space. The Yaesu FT-757GX is one of the more recent contributions to this genre, and is a fine representation of its class of fully solid-state rigs.

The FT-757 is capable of all-mode transmission and reception on all of the HF ham bands (including the WARC-1979 bands), and is equipped with a general-coverage receiver. Powered by 13.5-V dc, the '757 can produce 100 W output on SSB, CW and FM, and 25 W on AM. Full CW break-in operation is possible, and an internal keyer minimizes the need for external attachments. A duct-flow cooling system ensures long life for the discrete components.

It Appears to Be Complex ...

And it is. The front panel has 31 separate knobs and buttons. In addition to the multifunction meter and frequency display, the front-panel controls turn on and off the VOX, MOX, POWER, RF AMP, ATTENUATOR, speech PROCESSOR and Noise Blanker. They also select the desired METER scale and AGC speed. The various knobs include the MODE selector, AF and RF gain, main tuning, SHIFT, WIDTH, SQUELCH and noise-blanker thresholds, and MICROPHONE and DRIVE level controls. Ten buttons alter the frequency, VFO in use, scan feature and memories. A CLARIFIER and Dial LOCK are also on the front panel.

The rear-panel provides access to an external PTT line, the ANTENNA connector, PATCH/AFSK input, RF OUT, EXT SPEAKER, AF OUT, KEY, GND and 13.5 V-dc. Other rear-panel features are:

- the power connector,
- VOX controls,
- data connector,
- LINEAR amplifier select switch,
- speech COMPRESSION LEVEL adjust,
- AM CARRIER adjust,
- 25-kHz MARKER generator on/off switch,
- REMOTE Molex connector for interfacing with an external microcomputer,
- FWD-REV switch for the front-panel meter,
- FWD SET for the front-panel meter,
- EXTERNAL ALC for controlling outboard amplifier, and
- +8-V dc.

The top cover hosts the keying controls. One switch selects full- or semi-break-in, and another activates the internal keyer. A sliding potentiometer adjusts the internal-keyer speed. A built-in speaker is also located on the top cover.

Four hard-rubber feet are mounted on the bottom of the rig, as is a bail for elevating the rig's front. The main tuning knob torque adjustment screw is also accessible from the bottom. One side of the radio has a carrying strap; two flat rubber pads are mounted on the other.

Operation

Frequency control: When the radio is turned on for the first time, the default frequency, 7,000.0 MHz, appears on the blue-fluorescent digital display. Two VFOs, A and B, are

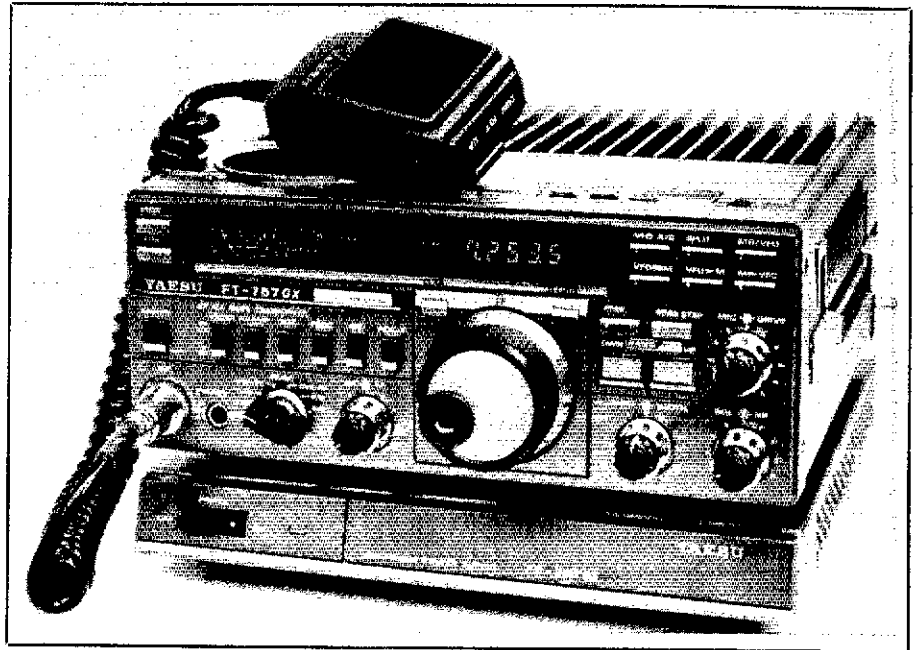


Table 1

Yaesu FT-757GX, Serial No. 3N040531

Manufacturer's Claimed Specifications

Frequency coverage: Receive — 500 kHz to 29.9999 MHz; transmit — 1.5-1.99999, 3.5-3.99999, 7.0-7.49999, 10.0-10.49999, 14.0-14.49999, 18.0-18.49999, 21.0-21.49999, 24.5-24.99999, 28.0-29.99999 MHz.

Modes of operation: CW, SSB, AM, FM.
kHz/turn of knob: Not specified.

Tuning steps: 10 Hz and 500 kHz.

Backlash: Not specified.

S meter sensitivity (μ V for S9 reading):
Not specified.

Transmitter power output: 100 W — SSB/CW/FM;
25-W AM.

Third-order IMD: Less than -35 dB.

Spurious suppression: Better than 50 dB.

Receiver sensitivity: (1.5-30 MHz) less than
0.25 μ V for 10 dB S+N/N.

Measured in ARRL Lab

Receive — as specified;
transmit — as specified.

As specified.

10 kHz.

As specified.

Nil.

RF amplifier out/in: 160 m, 220/14.5; 80 m,
220/13.5; 40 m, 220/16; 30 m, 280/25; 20 m,
235/26; 17 m, 220/25; 15 m, 250/30; 12 m,
170/22; 10 m, 220/25.

110-W, all bands; 25-W, AM

-33 dB.

58 dB.

Receiver dynamics measured with RF
amplifier out/in:

	80 m	20 m
Noise floor (MDS)		
dBm:	-121/-140	-120/-137
Blocking DR (dB):	Noise limited	Noise limited
Two-tone 3rd-order		
IMD DR (dB):	91/90	91/89
Third-order intercept		
(dBm):	-5/+15.5	-3.5/+16.5

Receiver recovery time: Not specified.

Color: Gray.

Size (HWD): $3\frac{3}{4} \times 9\frac{1}{2} \times 9\frac{1}{2}$ in (93 x 238 x 238 mm).

Weight: 11.5 lb (5.2 kg).

available to change the operating frequency in either 10-Hz or 500-kHz steps. These can be accessed in a variety of interesting and novel ways, allowing the operator to master almost any frequency demand encountered. To flip between VFOs, press the VFO A/B button. The main

tuning dial, which has a recessed finger hole for rapid tuning, tunes the active VFO. Torque, or dial resistance, is adjusted by varying a screw set in the bottom of the radio. The BAND/CH paddle serves two purposes: It moves the active VFO to the next higher or lower ham band, or, if the

*Assistant Technical Editor

500K STEP button has been pressed, the VFO will move in 500-kHz steps up or down from the displayed frequency.

Operating split frequency is easy; press the SPLIT button. The displayed frequency (on the active VFO) stays the same and is your receiver frequency, while the other VFO will control the transmitter frequency. A green SPLIT appears to the left of the operating frequency to indicate the rig status.

Memories: The FT-757 has eight programmable memories. A host of variations on the memory theme are easily performed by pressing the memory-selection keys. These allow you to write a specific frequency into one or more of the memories (VFO > M) or cause a memory frequency to become the operating frequency (M > VFO). Another key, VFO <> M, exchanges frequency and mode information between the operating VFO and the most-recently-accessed memory. Pressing it a second time exchanges the information again. If you've changed the memory frequency while it was on the operating VFO, that new frequency will be the one stored in the memory channel.

This function is useful for quickly checking a memory frequency, scanning around that frequency and then returning to the original VFO frequency once your curiosity has been satisfied. There is no indication of which memory channel has been accessed when this feature is used; you must remember the channel from your last operation on that channel.

Pressing the MR/VFO key flips between the operating VFO and the memory channel. This displays the memory frequency while suppressing the former VFO frequency, but, unlike the VFO <> M key, the memory frequency is inviolate — spinning the main tuning dial has no effect. The memory-channel number is indicated to the right of the frequency display. In this mode, you're able to scan through the eight memory channels. To do this, press the BAND/CH UP or DWN buttons. Pressing the MR/VFO key again returns the VFO frequency to the display and suppresses the memory. All of the memory keys, plus the SPLIT and VFO A/B keys, cause a "beep" to sound whenever they are pushed.

Variations on the Frequency Theme: Yet another frequency control on the FT-757 is the CLARifier. This is another name for Receiver Incremental Tuning, but in this radio it lets you continuously tune the receive frequency as far away from the transmit frequency as you like. Acting somewhat as a third VFO, the CLAR control works only when a VFO is being used; it won't change a memory frequency that has been called up. Pushing the CLAR button a second time returns the receiver frequency to where it was before CLARification was used.

A programmable memory scan (PMS) can be implemented by pressing the PMS button. Here, the receiver scans from the last selected memory frequency to the frequency in the next higher memory channel, looking for signals strong enough to break the squelch threshold. An interesting feature of the PMS is that if the next highest memory channel holds a frequency below the previously used memory channel, the scan will search from the lower frequency to the higher one, regardless of their order in the two memory channels. This prevents the scan from going "all around the mulberry bush" — all the way through the receiver range until it gets to the memory channel frequency.

The 8-pin microphone plug has provisions for a scanning microphone. Optional microphones,

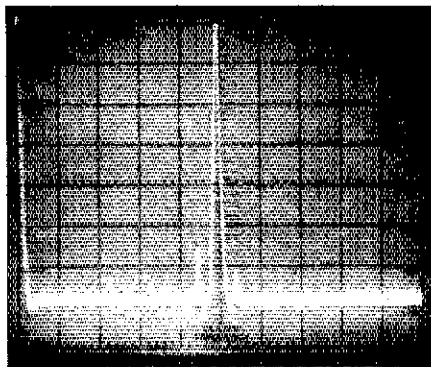


Fig. 1 — Spectral display of the FT-757GX. Vertical divisions are each 10 dB; horizontal divisions are each 5 MHz. Output power is approximately 100 W at a frequency of 24.7 MHz. All spurious emissions are at least 55 dB below peak fundamental output. The FT-757GX complies with current FCC specifications for spectral purity.

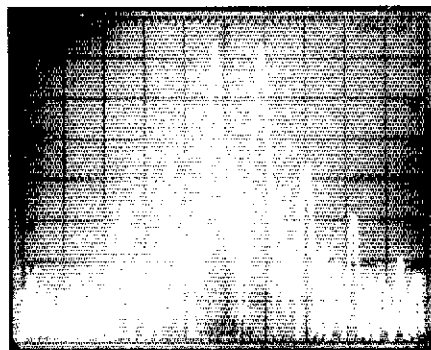


Fig. 2 — Spectral display of the FT-757GX output during transmitter two-tone IMD test. Third-order products are 34 dB below PEP. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transceiver was being operated at rated input power on the 20-meter band.

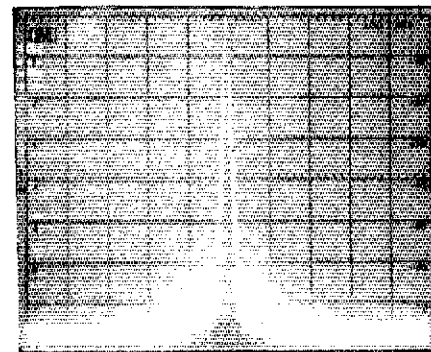


Fig. 3 — Synthesizer noise about the carrier. Vertical divisions are each 10 dB; horizontal divisions are each 20 kHz. The transceiver was being operated at rated input power on the 20-meter band.

the Yaesu MD-1 B8 (desktop) or MH-1 B8 (hand-held), allow normal and FAST tuning up and down the bands. The D. LOCK button disables the main tuning knob by disengaging the photo-interrupter on the tuning knob shaft. Pressing the D. LOCK also disables the microphone tuning controls.

Operating frequency can be changed via a microcomputer. Optional microcomputer interface units must be used in this application. Yaesu provides their FIF-65, for interfacing with an Apple®, or the FIF-232C, an EIA RS-232-C connection.

Receiver

A slew of operating aids are built into the '757. These include IF SHIFT and WIDTH controls, SQUELch and a variable noise blanker (NB). The NB control varies the time constant of the noise blanker AGC, changing the width of the blanking pulse. Thus, the noise blanker can be set to eliminate noises of different duration — ignition type noise, lightning or the Woodpecker. The IF WIDTH decreases one side of the receiver passband at a time. By simultaneously manipulating the IF SHIFT and WIDTH controls, the passband can be reduced as required — especially useful for CW reception on a crowded band.

An RF AMPLIFIER and/or ATTENUATOR can be placed in line with the receiver front end. The attenuator reduces sensitivity approximately 20 dB. AGC is switchable from slow to AGC-FAST. The meter shows relative signal strength calibrated in S units during reception. A 25-kHz marker generator can be switched on for calibration purposes. The headphone jack will handle both monaural and stereo headphones.

Transmitter

Yaesu has equipped this rig with all the transmission aids considered standard these days, such as VOX and a speech processor. A few extras have been included as well. In addition to SSB and CW transmission, the '757 operates FM and AM. The carrier is adjustable if you run A3E (amplitude modulation). The front-panel meter shows relative power output, ALC level and forward and reverse SWR.

CW Transmission

A feature not seen often enough these days is full break-in, or QSK. The FT-757 has this feature, as well as the more common semi-break-in. A built-in keyer with variable speed control and dot memory rounds out the code complement of this rig — all you have to do is connect a 3-conductor plug to the KEY jack. You can, if you wish, connect a straight key to the KEY jack, or use an outboard keyer through the same input. Sidetone volume is adjustable.

RTTY operation

To operate RTTY, connect the modem output to the rear-panel PATCH jack and switch to LSB, keeping the MIC gain control to reasonable levels. Use the AF OUT jack on the rear panel to provide audio to the modem. Another rear-panel jack, PTT, can be used for automatic switching from receive to transmit. Yaesu recommends using the heavy-duty power supply (FP-757HD) for extended RTTY communications. The switching power supply, FP-757GX, should be used only when RTTY transmissions can be kept under 30 seconds. The squelch control is useful in RTTY reception: If you're tuned to the proper frequency for a Bulletin-Board System (BBS) or a commercial RTTY transmission, you can keep the squelch closed until it is broken by the desired station. This minimizes attempts by the modem to demodulate the ever-present static on the bands.

Frequency Control

The main VFO knob tunes continuously

through the general-coverage receiver frequencies. If you want to jump to a higher or lower ham band, press the appropriate BAND/CH paddle. When the 500K STEP button is depressed, the BAND/CH paddles allow rapid scanning through the high-frequency spectrum.

Antenna Tuner

Yaesu markets a fully automatic antenna-matching network, the FC-757AT, which mates with the FT-757. The "tuner" is approximately the same size as the transceiver, and the two physically complement each other. The FT-757 automatically controls the antenna tuner through a control cable that plugs into the rear panel of each box. The antenna coaxial cable connects to the tuner (which has only SO-239 connectors on the rear panel), and a short cable connects the tuner to the transceiver.

Operation is simple: Make sure the antenna tuner is turned on, and change bands on the transceiver. A yellow WAIT LED will light, and you'll hear a clicking and whirring as the tuner's 8-bit microprocessor looks for the best impedance match. You can watch the SWR increase and decrease on the built-in meter as the tuner goes through its search. After several seconds (never more than 20 for the rhombic antenna I matched; a dipole took slightly longer), the noises stop and the green READY LED lights up.

You can use the manual TUNE and LOAD controls to match an antenna yourself, but I always found the automatic matching satisfactory. Together with the band-pass or no-tune-up feature of the FT-757, I had a great time on 80 and 160 meters, not being limited to repeated tuning procedures of any sort as I moved up and down the band. Occasionally, when I began to transmit after tuning around, the WAIT LED would go on, and I would wait, as directed. Adjusting the sensitivity control minimizes these WAIT periods. After a few seconds the READY LED would turn on and I could proceed.

Other Interesting Features

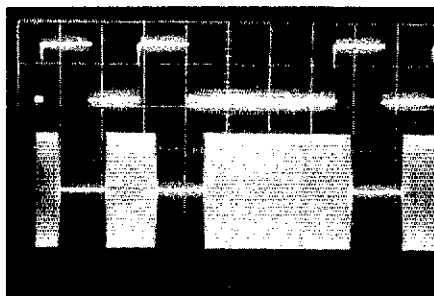
Yaesu uses a "Duct-Flow Cooling" system to force air through the transceiver. The resulting thermodynamic efficiency of this design results in a smaller-sized transceiver. Air flows in the bottom and middle rear of the rig, drawn by the fan mounted directly behind the front panel. The air flowing to the fan cools the Local Oscillator and RF boards, and the air flowing from the fan, at a higher pressure, flows past the PA unit and heat sink. The fan isn't always on, cycling in response to the radio's internal temperature.

Ten-meter FM repeaters can be accessed using the two VFOs in a SPLIT configuration in the FM mode.

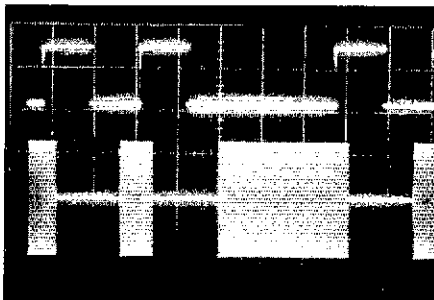
The general-coverage receiver works well, and is an enjoyable plus to my everyday hamming. I was easily able to pick up parts of conversations made over local cordless phones on the frequencies below 2 MHz.

The AF gain control is mounted to the lower left of the main tuning dial, an excellent location for mobile use — close to the driver's right hand. The front-panel controls are sufficiently far away from each other that I never inadvertently hit a wrong control. I'd prefer the CLARIFIER to be on the right side of the VFO knob, but only because I'm right-handed and found that feature to be an oft-used one.

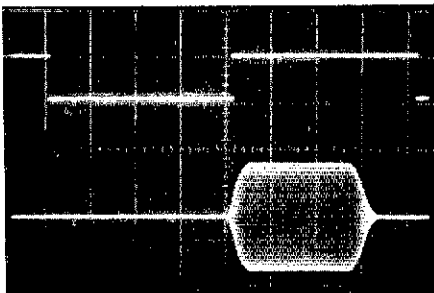
The final-output transistors are protected against antenna mismatch — when the SWR is 3:1, only 75% of the rated output power is available. The LOCK button is a helpful addition, especially during CW operation. A lithium bat-



(A)



(B)



(C)

Fig. 4 — CW keying waveforms of the FT-757GX. In all cases, the upper trace is the key closure; lower trace is the RF envelope. Horizontal divisions in A and B are each 50 ms; in C, 5 ms. An external keyer was used to key the transceiver. For A, semi-break-in was being used; full break-in was used for B. Note the decreased weighting effect of full break-in operation. Except for break-in method selection, all other control settings at A and B are equal. The 20 ms delay between key down and generation of the RF output waveform, and the continuation of the RF waveform after key up can be seen in A and B, but is more readily noticed in photo C.

tery with an estimated life of five years backs up the memory channel information and ensures that the operating frequency isn't lost when you turn the rig off and on. Small LCD letters to the left or right of the operating frequency indicate when the PMS, LOCK, SPLIT or memory channels are used.

Comments

Though the QSK is a step in the right direction, as is the built-in keyer, both have limitations that decrease their effectiveness. The break-in stops working at higher keying speeds; the receiver AGC just doesn't recover fast enough to receive signals between the dots. The weighting on the built-in keyer is unfortunately not adjustable, and the fixed dot/dash ratio is a hindrance at higher speeds. The keyer also has

a very nonlinear speed adjustment. When the slide potentiometer is advanced, the CW speed jumps suddenly from about 16 WPM to 28 WPM — careful adjustment is needed to get the speeds in between.

I was surprised to find the CW narrow position uses a 600-Hz filter. Although the CW pass-band can be reduced through manipulations of the WIDTH and SHIFT controls, 600 Hz is not enough selectivity for today's crowded HF bands. In addition, there's enough leakage around the filter ("blowby") to be annoying. The WIDTH and SHIFT controls help to some extent, but their use reduces audio fidelity. The AM filter, too, is uncomfortably broad. I had to use upper or lower sideband to tune in any desired signals while scanning through the broadcast bands.

The cooling fan has a habit of turning on and off with keying, whenever a high SWR is present. While I admire the ducted-cooling system, one of the results is that the guts of the rig are open to the outside through fairly large spaces — large enough for a paper-clip to fall inside and short out something.

Two steps are needed to stop the PMS (memory scan). Not only does the squelch control level have to be decreased, but also the M > VFO button has to be pushed. If the M > VFO is not pressed, the transceiver stays locked on the last scanned frequency. Also, there is no function to scan through the eight memory channels. When entering information into the memory channels, you have to remember what the last memory channel was or enter one of the memory modes to get the channel indicator to the right of the frequency display. Though it saves front-panel space to incorporate the memory channel selector as a secondary function of the BAND UP/DWN paddles, the loss of a constant indication of the latent memory channel is significant.

Another result of the limited front-panel space is the positioning of several crucial controls on the rear panel. These include the VOX GAIN, TRIP and DELAY. Other oft-used, but hard-to-reach, controls include the speech processor COMP LEVEL, the FWD-REV FWD-SET switches for the built-in SWR meter and the 25-kHz MARKER switch.

While the unit was being tested in the ARRL Lab, an interesting anomaly was noticed: When the RF AMP is put in line in the receiver, the transmitter output power drops almost 3 dB when the rig is tuned to 40 or 30 meters; this is somewhat less noticeable on other bands. This power output decrease can be compensated for by increasing the drive level.

The switching power supply is not without its glitches. When the transceiver is in receive, severe radio-frequency interference (RFI) occurs. Cordless telephones in the same house are wiped out, as is Channel 3 on a black-and-white television set, which experienced a high degree of diagonal cross-hatching, rendering the screen unreadable. The TV was plugged into the same outlet as the rig. If you have a computer in your ham shack, for example, and it uses a television monitor, you may be out of luck. Channel 8 on the same TV showed minor cross-hatching.

The Manual

While satisfactorily describing the rig's features, the manual lets the reader down where explanations are most needed. The directions for use of the frequency and memory controls, especially important considering their complexity, are confusing. An uninformative

diagram illustrates the relationship between the VFOs and memory channels. Use of the memory options is explained through a series of five examples, each of which proposes a typical operating situation and then shows how the memory features aid and enhance that situation. The section on installing the FT-757 in a mobile setting is inadequate; no explanation is given on actually mounting the rig, although good detail is given in the section on power requirements.

Operation

Operating the FT-757, once the frequency controls are mastered, is a pleasant experience. I took the rig, power supply and antenna tuner with me to the 1984 Field Day operation at N3KZ. Even with four transmitters on constantly within 500 feet of each other, no disturbing intermodulation occurred as long as the attenuator was placed in line. The automatic antenna tuner was the final touch to a no-tune-up rig, and the gentle whirring and clicking of the internal components was comforting during the early A.M. The lightweight power supply proved adequate for all my uses, both at home and during FD.

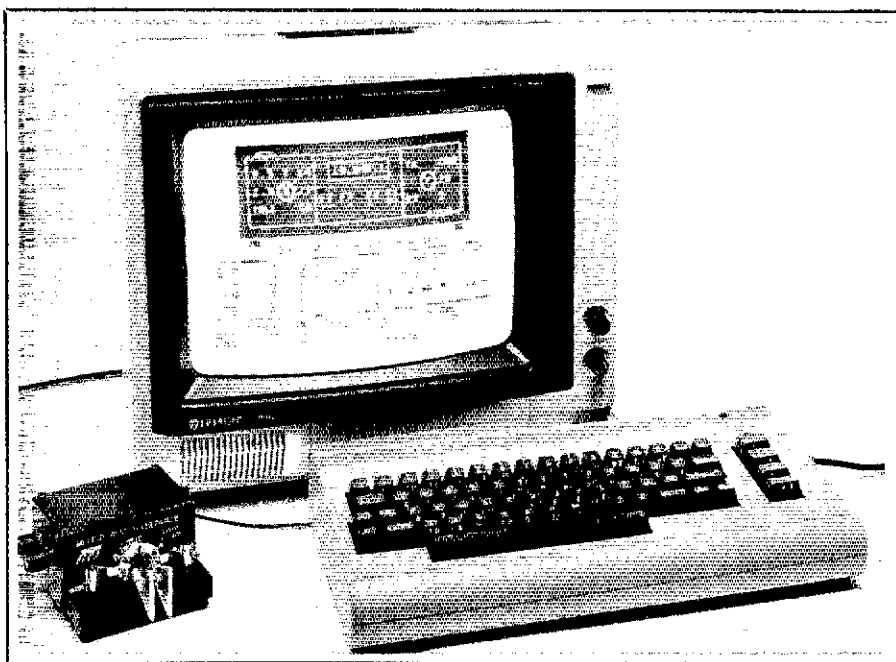
The speech processor does its job well, and the scanning microphone is a boon to mobile and armchair operation. Having an RIT with unlimited tuning range and "automatic cancel" is an excellent aid, too.

The Yaesu FT-757 is a pleasant rig, and works well in all but the most demanding amateur applications. Enhanced with many useful features, this tiny transceiver is excellent for the ham who can't often use a permanent station. The Yaesu FT-757 is available from Yaesu Electronics Corporation, 6851 Walthall Way, Paramount, CA 90723, tel. 213-633-4007. Price classes: FT-757, \$860; FP-757GX, \$170; FP-757HD, \$200; FC-757AT, \$260. — *Leo D. Kluger, WB2TRN*

AEA DOCTOR DX™ MORSE CODE CONTEST TRAINER FOR THE COMMODORE 64™ COMPUTER

When the rotators have been greased and the radio equipment readied for action, what more can a contester do to prepare for the fall/winter contest season? What does it take to get prepared for the QRM on 40 meters, the cutthroat multiplier chases on 20 and the high-speed CW ops on the low ends of the bands? As you might imagine, there are several avid contesters who work at ARRL Hq., among them, Mark Wilson (AAZZ), Bob Halprin (K1XA), Mike Kaczynski (WIOD) and myself. Until recently, we thought the only way to train operators for contests was to have them work real contests, on the air. Then we saw Doctor DX — a program for the Commodore 64 that simulates the CQ Worldwide CW contest. Boy, does it simulate! An hour after Doctor DX was delivered to the lab for testing, K1XA was "running" JAs at 190 QSOs per hour from a "QTH" somewhere in the Caribbean. This review draws from comments and observations made by many CW operators who tried Doctor DX while it was here.¹

Doctor DX comes with a read-only memory (ROM) program cartridge for the C64, a cable to connect between your keyer and the cartridge and 30 pages of documentation. To use Doctor DX, you must plug the cartridge into the C64



and plug your keyer into the phono jack on the back of the cartridge. When you turn on the C64, Doctor DX starts automatically. If you use a TV set as a monitor with your C64, Doctor DX will send audio to the TV speaker. If you use a video monitor that does not have a speaker, you will have to make a cable to carry audio from the C64 to a speaker. The documentation that comes with Doctor DX gives complete directions for audio hookup. Even if you have to make an audio cable, you should have Doctor DX running in well under an hour.

When the program starts, you see a transceiver front panel on the screen, and you will hear noise coming from your speaker. Before you can begin "contesting," you have to tell Doctor DX your latitude and longitude, the length of time you wish to operate and the time (UTC) you wish to begin operation. In the Doctor DX documentation, there is a list of latitudes and longitudes for DXCC countries and a page of listings for U.S. cities. Using this list, you should be able to correctly set your QTH anywhere from Botswana to Winston-Salem, North Carolina. One of the advantages of Doctor DX is that contests no longer have to be a taxing 24 or 30 hours long. You can select any duration for your simulated contest, from one hour to 24 hours. Once you have selected a QTH and a duration, you must set a starting time, in UTC. Then press the return key, and you are "on the air."

What will you find when you start tuning up and down the bands (with the C64 function keys)? You will hear realistic band noise — more on the lower bands than on the higher ones. There will be stations calling CQ, and stations working each other. If you listen to any station for a long time, that station will work others, just as it would in a real contest. Occasionally, you will hear a DX station working a station you can't hear, a station within your skip zone. Doctor DX simulates the propagation that you might find at your selected location and time, on a day at the peak of the sunspot cycle. (After all, who would want to simulate the propagation that we have to endure this year?)

There's a lot of DX to be heard. The

documentation states that "prefixes are weighted according to population density, with the guarantee that for each of the 304 countries, there is at least one station represented." Even with this guarantee, we were unable to work all of the DXCC countries, but some more persistent person might. If you work a long contest, or try several different times of day from the same QTH, propagation will change as you would expect it to.

Contest Training

Working stations with Doctor DX follows the format used during the CQWW CW contest: you must exchange calls, signal reports and CQ zones. A list of CQ zones is provided, along with the latitude and longitude list in the documentation. You must send the zone number that matches your latitude and longitude, or else you will not be credited for your contacts. Your score will be computed after each station is worked, and it will be posted, along with other statistics, on the display. After 15 minutes of operation, your QSO rate, in contacts per hour, will also be shown.

Doctor DX is a well-constructed simulation. Most CW operators would be unable to distinguish between a tape recording of Doctor DX and the real thing. We have been told that Doctor DX, disguised as a transceiver, fooled a lot of good operators at the Dayton Hamvention. Doctor DX has the flavor of real contesting: Fast stations are at the low end of the band, slow stations at the high end; each station is on a slightly different frequency, and signals vary in tone and strength depending on propagation; if you stay on one frequency for a while, another station will try to steal "your" frequency; if you are persistent, he may go away.

The only ways you might begin to tell Doctor DX from the real thing are if (1) you don't recognize any of the calls, (2) you hear countries you know are not on the air and (3) you feel that conditions are a little too good. But this is a smart program — each contact is different from the one before. Within the limits of what is realistic for contests, you will hear many

¹For other observations on Doctor DX, see October 1984 How's DX?

operating styles as you tune around the bands. In order to be an effective training tool, a simulation must be realistic, and Doctor DX is.

Doctor DX is a great aid for breaking-in the neophyte contest operator, and warming-up the experienced operator who may be out of shape. If you call CQ, stations will come back with regularity. If propagation is in your favor, and you have not worked all the stations on the band, you will get into a full-fledged "run." It is quite possible to work 150 (or more) stations per hour. This gives valuable training in how to work under pressure, how to log quickly, how to get fills and how to do two or three things at once. The stations on Doctor DX use common CW abbreviations, and getting used to these abbreviations before the contest can be helpful to new operators. What do you do when someone tries to steal "your" frequency? A few hours with Doctor DX, and you will have some idea when to fight, and when to switch. Doctor DX will increase the level of competition found in CW contests.

Unfortunately, you can "cheat" with Doctor DX, and such cheating will detract from the training value of the simulation. You need only to answer a station with two correct letters from the suffix of his call. This may be realistic, but, unless you force yourself to use complete calls, you can increase your QSO rate artificially. And, if you are working lots of stations on one frequency, you seldom have to send your call. This is a time-saving measure that might not work so well in a real contest. Another thing about Doctor DX that is not realistic is that the other operators are all very good. If you send correctly, they copy, and they always send correctly. We don't expect the program to simulate "lids," but newcomers should be aware that there are those who miss reports no matter how well you send them! Despite these minor flaws, if you force yourself to play clean and keep a log sheet, Doctor DX will certainly prepare you for contesting, and will probably increase your scores.

As a CW Trainer

Does Doctor DX have anything to offer those who are not interested in contesting? If you want to increase your CW proficiency, the answer is "yes." While not designed specifically for that purpose, Doctor DX is a great CW trainer, with an endless supply of new calls and contacts. If you need some slow CW, you can tune to the high end of any band to find stations sending below 13 WPM. As your copying ability increases, you can tune down the band, and work faster and faster stations. Unfortunately, the only way to check your copy is to see if the other station comes back to you, and this means only that you got at least two letters in his suffix correct. But as you learn the code, you know when you have copied something wrong, and you know at which speed you feel comfortable, so this is not a great problem.

Doctor DX is good for teaching CW sending. Characters must be well formed, or stations will keep asking for repeats. You will learn quickly that a "5" must have 5 dots and not 4 or 6.

Doctor DX is a CW teacher that never gets tired and doesn't repeat itself. It is a tool for increasing the speed at which you copy CW, while simultaneously getting training in operating practices and precise sending.

The Hardware

Doctor DX is not simply a ROM cartridge. The plug-in unit also contains the circuit needed for Doctor DX to read your keyer. After about

a week of heavy use, our copy of Doctor DX went permanently key-down. It is very likely that a loose wire in a keyer put 12-V dc on the input to Doctor DX. When we opened up the cartridge to replace the blown IC, we were surprised to find that the numbers had been filed off the ICs, and the ICs had been painted for identification. Since we could not identify the blown chip, we could not fix the unit. It is unfortunate that pirates have forced AEA to take such protective measures. People who make unauthorized copies of products have now made it impossible for the rest of us to maintain our own equipment. Fortunately, AEA was happy to exchange our damaged Doctor DX for a new one. The replacement is still operating in the ARRL laboratory.

Conclusion

Doctor DX is not flawless, but it is a well-executed, revolutionary training aid. The highest

praise should go to the programmer or programming team that brought us this software. There are other features, like the switchable power levels, multicolored display and variable sidetone pitch, that ensure that it will be a long time before anyone gets tired of Doctor DX. It would be nice if the authors had included a mode in which you would be forced to answer each station with its complete, correct call. But as it stands, Doctor DX is one of the first Amateur Radio products to really take advantage of a home computer. If you have worked all of the bugs out of your contest station, you will want to "work out with Doctor DX" to improve the most important piece of equipment in your shack — the operator.

Doctor DX is available from Advanced Electronic Applications, Inc., P.O. Box C-2160, Lynnwood, WA 98036, tel. 206-775-7373. Price class: \$150. — Jeff Ward, K8KA

New Products

DX ENTERPRISES DX-1/DX-2 SOFTWARE

□ These programs are designed to aid you in optimizing your DX operating conditions. To use them, you need an Apple II, II+ or //c computer with 64 kbytes of RAM and one disk drive. If you have a printer, you'll be able to obtain hard copy of the results. These programs enable you to forecast with reasonable accuracy: base sunrise/sunset times; target minimum, average and maximum sunrise/sunset times; long-/short-path great-circle bearings; long-/short-path beam heading; sunspot number; quality factor of the path; MUF; FOT; and the grayline sunrise/sunset (DX-1 only) times. Printed output of the grayline (DX-1 only) and a printout of the screen are also available.

The grayline is the twilight zone covering some part of the earth at any given time. The condition favors communications paths where stations at both ends of the zone are within a few minutes of local sunrise and sunset. Enhanced DX operating conditions often occur at sunrise and sunset.

The programs contain a data base of 433 unique radio locations. Their presence is meant to eliminate the need to know the latitude and longitude of a specific target country to extract the information you're seeking. If you enter a country name, the program responds by selecting the closest match between your input and its list of 433 countries. Unfortunately, there's no listing of the 433 countries in the manual, so you'll have to discover what they are through use of the program.

An instruction manual accompanies the software. It measures 5¼ × 5½ inches (133 × 140 mm) and is 19 pages long. The manual contains several example program runs to help you get the feel of using the program. (A useful instruction it does lack is mention of how to get out of the program!) There are brief descriptions of

the DX parameters calculated by the program, and how to use WWV to obtain certain information (such as the solar flux number) required as operator-entered data.

The DX-1 disk 1 used is copy protected and can't even be CATALOGed. In fact, the protection scheme extends so far as to not allow any means of exiting the program by keyboard command; you have to remove the disk from the drive and boot your next disk.

While the software will automatically recognize that you're using an Apple //c and place the computer in 80-column mode, the screen format is obviously configured for the 40-column screen — when in 80-column mode, the information appears at the left-hand side of the display; it isn't centered.

Program loading time is protracted; the manual warns you of this. There are two program-loading phases. The first consumes approximately one minute, the second phase takes about two minutes. If you have two disk drives, the second is accessed momentarily during the program-loading phases; the manual contains no explanation of why this occurs. Data entry required is minimal, and the input routines have built-in error-detection routines to exclude out-of-range data. The program offers no way to save information to disk. If you're going to calculate grayline data, there's a five-minute wait.

Also, should you decide to dump the information to the printer, you'll have a 12-25 second pause before "all systems are go." "DXing by Computer," *Ham Radio*, Aug. 1984, was written by the program authors. Refer to this article for more information.

The DX-1 and DX-2 are available from DX Enterprises, 5861 Bridle Way, San Jose, CA 95123. Price classes: DX-1, \$40; DX-2, \$20. Add \$2.50 for shipping and handling charges. California residents must add 6.5% sales tax. — Paul K. Pagel, N1FB

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

TUNING WIRES FOR MOBILE ANTENNAS

□ After adjusting and readjusting the whip portion of my Hustler mobile-antenna coils for various CW and SSB frequencies, I finally realized that there is an easier way to change the resonant frequency. I made a tuning wire, as shown in Fig. 1A, from no. 12 copper-clad steel wire. A straight length of wire with an alligator clip on the end attaches to the bottom of the antenna whip. A second piece of wire is twisted around the first, a few inches from the alligator clip.

The wire is then bent into an L shape, with a loop twisted into the free end. This loop is made so the wire will twist around the whip, slipping around it. Then the alligator clip is attached to the whip. In this way, the top wire prevents the tuning wire from falling off, while the alligator clip makes the electrical connection.

Fig. 1B shows how the wire attaches to the antenna whip. With the antenna adjusted for 3980 kHz, the tuning wire shown in part A brought the resonant frequency down to 3505 kHz. I made other tuning wires, as shown in

Fig. 1. The one at C places the antenna in the 80-meter Novice band, and the one in part D is for use with the 40-meter resonator. It changes the frequency from 7200 kHz to 7010 kHz.

I was pleased to discover that this tuning wire would also bring the 80-meter coil down from 3980 kHz to 3790 kHz. The dimensions shown in part E are for 20 meters. With the antenna set for 14,225-kHz operation, the tuning wire resonates the antenna at 14,010 kHz.

I also made a capacitance hat to add to the 20-meter resonator, for operation on the 30-meter band. See Fig. 1F. A 14-inch-diameter wire circle forms the basis for the hat.¹ Then I added 12 radial wires. These will have to be long enough to allow you to wrap the wire around the outer circle and make a 90° bend at the center. You should have about an inch of wire from each radial extending downward at the center to attach the capacitance hat to the antenna whip. I added a second, smaller circle of wire, to add strength and help tune the system. Solder all of the wires at the crossover points. The minimum SWR on 30 meters was about 2:1, but my transmitter produces about 60 W of output

power with that load. During my first week of mobile operation on 30 meters, I worked quite a few U.S. and European stations. I even worked four VK stations and a 5Z4 station. So I guess the antenna does work! There seem to be more amateurs working mobile CW all the time, so why not give it a try? — R. J. "Whitey" Doherty, K1VV, Lakeville, Massachusetts

FILTER SELECTION WITH THE KENWOOD TS-430S

□ Robert A. Witte, KBØCY, has described an IF filter-switching modification for the Kenwood TS-430S transceiver.² Being able to select the narrow CW filter while in the SSB mode is an excellent means of reducing the adverse effects of QRM and QRN during RTTY reception. The shortcoming of his modification is that the narrow CW filter will *always* be selected when the NARROW/WIDE front-panel filter-selection switch is placed in the NARROW position in the SSB/AFSK RTTY modes. If you have the optional narrow SSB filter installed in your

*R. A. Witte, "TS-430S IF Filter Mod," The Ham Notebook, *Ham Radio*, May 1984, p. 125.

*Assistant Technical Editor

¹mm = in × 25.4; m = ft × 0.3048.

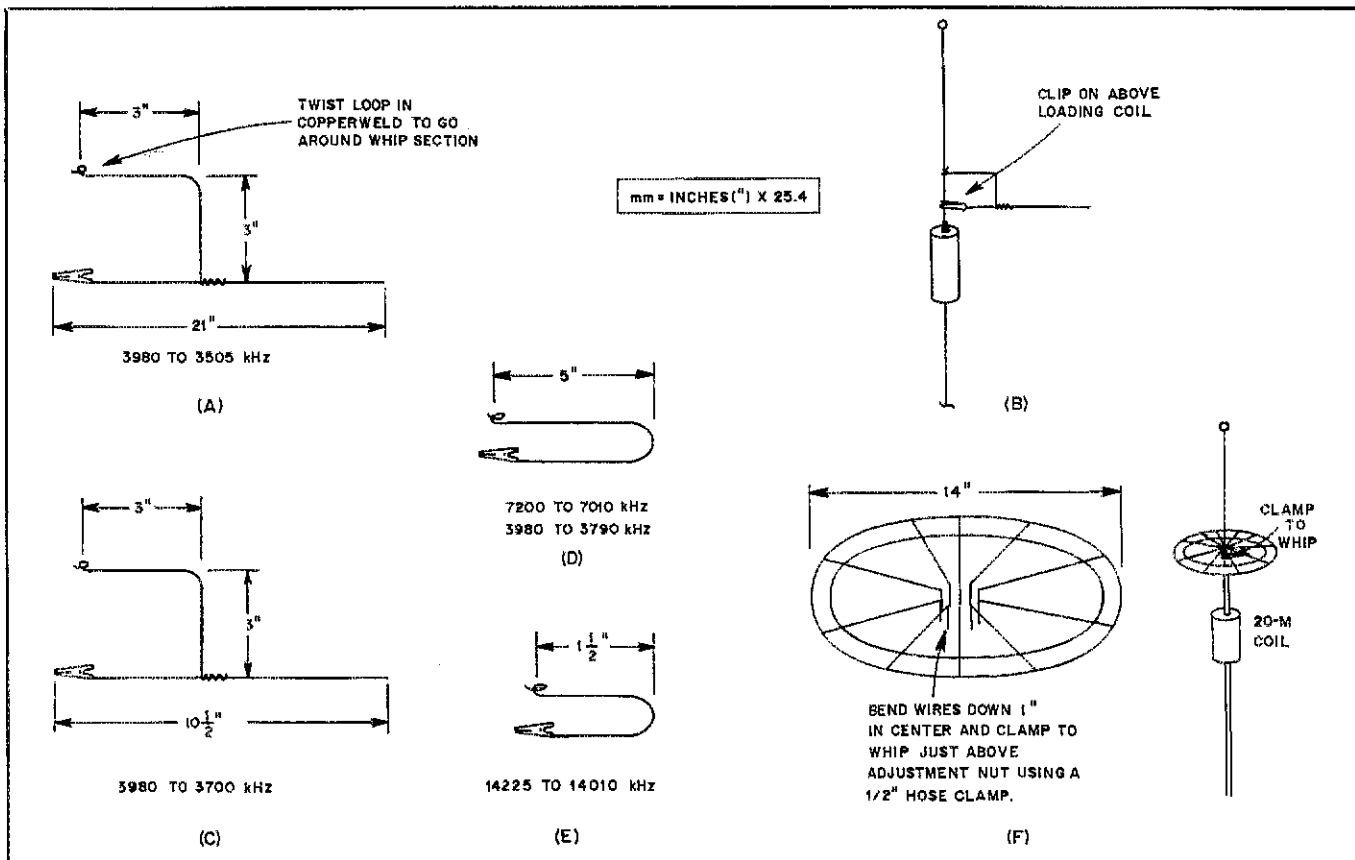


Fig. 1 — Construction details for mobile-antenna tuning wires used to adjust the operating frequencies from the voice end of the bands to the CW portion. A tuning wire for 80-meter CW operation is shown at A. B shows how the wires attach to the antenna whip. An 80-meter Novice band tuning wire is shown at C. Construction of a 40-meter wire that also works on 80 meters is shown at D. E shows a small attachment to move the 20-meter resonator from the SSB portion of the band to the CW portion. F shows a capacitance hat that can be added to the 20-meter resonator for operation on the 30-meter band.

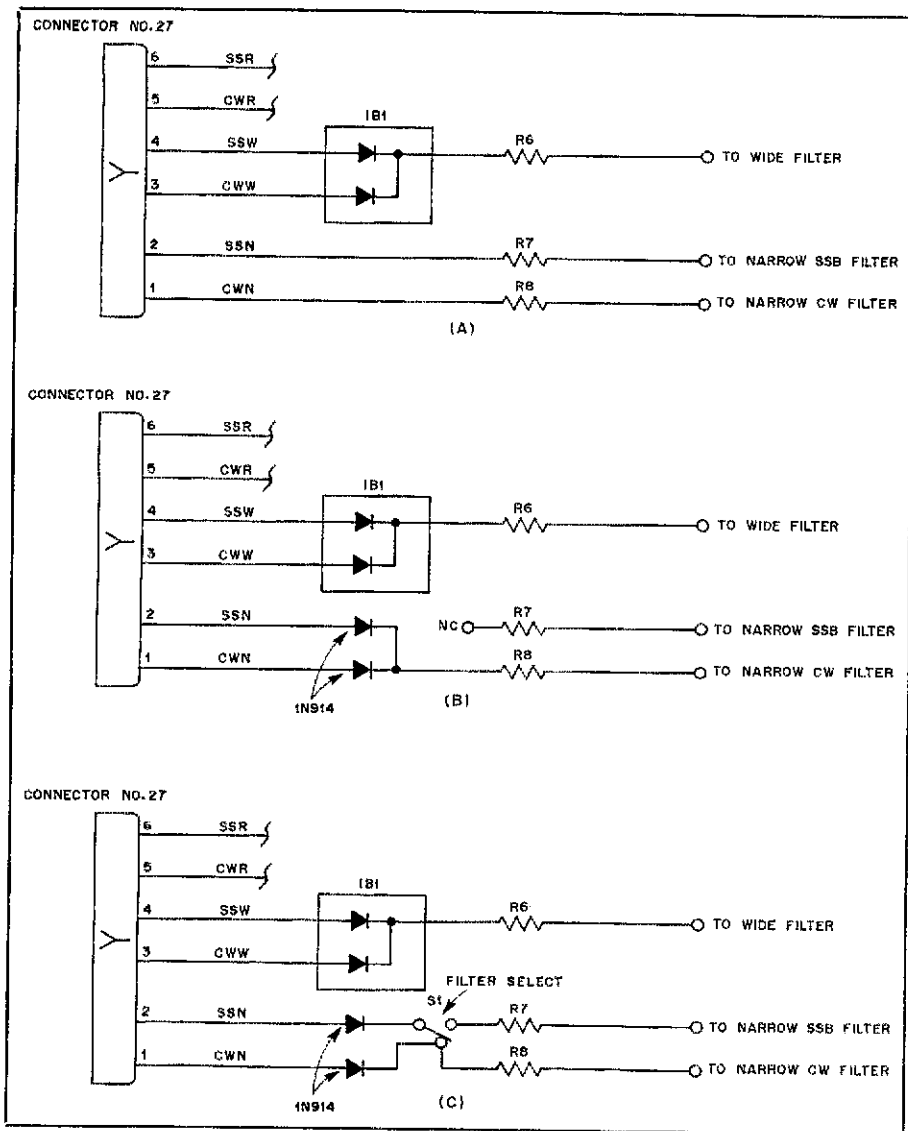


Fig. 2 — The original Kenwood TS-430S transceiver filter-switching diagram is shown at A. B shows a modification that always selects the narrow CW filter with the NARROW/WIDE filter-selection switch in the NARROW position. The optional narrow SSB filter will never be selected with this modification. By adding an SPDT switch, as shown at C, any one of the three filters may be selected in the SSB mode.

TS-430S, it will never be selected.

A portion of the original Kenwood IF filter-switching schematic diagram is shown in Fig. 2A. The two diodes connected to the ssw (Single Sideband Wide) and cww (CW Wide) lines from connector 27 on the IF board are contained in a narrow, black module (IB1) on the board. To implement Witte's circuit change (Fig. 2B), diodes must be added to the ssn (Single Sideband Narrow) and cwn (CW Narrow) filter-switching lines. I modified this circuit to allow selection of the narrow SSB filter, or the narrow CW filter, during SSB operation. The "modified modification" (Fig. 2C) requires the installation of an SPDT switch to choose the appropriate filter-selection line.

Probably the most difficult part of installing any modification in a compact transceiver such as the TS-430S, is finding room to mount the parts! (You'll also find access to switch and potentiometer lugs difficult because there are PC boards attached to these panel-mounted components.) I elected to install S1 at the bottom right-hand side of the transceiver. Deciding not to disturb the PC-board traces or unsolder com-

ponents from the board, I chose to mount the diodes (1N914s) on a miniature five-lug terminal strip at the rear of the IF board. Using a terminal strip provides easily accessible tie points, too.

Refer to section 6.2, *Installing the Optional Filters*, in the TS-430S instruction manual. About 4 inches from the right-hand side of the rear of the IF-unit mounting bracket (with the front of the transceiver facing you) is a small hole. Using this hole as a guide, carefully drill another hole, large enough to pass a no. 2-56 machine screw (Radio Shack 64-3010; no. 2-56 hardware assortment), through the heat sink attached to the bracket. A miniature terminal strip can then be attached to the heat sink at this point.

A mounting hole for a miniature SPDT switch can be made in the transceiver bottom cover. Locate this hole about 3/4 inches from the right-hand side of the transceiver and about 2 inches behind the front panel. Check to ensure that the switch placement will not interfere with existing components when the bottom cover is in place.

Pins 1 and 2 (cwn and ssn, respectively) are the first and second pins at the left-hand side of connector 27. In my transceiver, the wires leav-

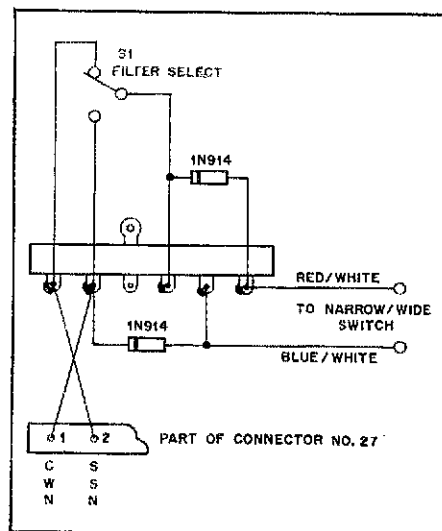


Fig. 3 — Pictorial diagram of the filter-switching modification.

ing this connector are color coded blue/white (pin 1) and red/white (pin 2). Cut these wires at a point approximately 3 inches from the connector. Connect the switch and diodes as shown in Fig. 2C and the pictorial drawing of Fig. 3. Use color-coded wire to easily identify the different leads, and use heat-shrink or insulated tubing to cover the wire splices. The wires from the terminal strip to S1 should be routed to follow the wire harness along the right-hand side of the IF board. Nylon cable ties (Radio Shack no. 278-1632) can be used to secure the wires to the existing wiring harness. Pass the wires leading to S1 behind the front-panel FUNCTION and M.CH switches.

With the narrow single sideband filter installed, you now have a choice of three filter widths in the SSB mode: single sideband wide (ssw), single sideband narrow (ssn) and CW narrow (cwn). The selectivity of the narrow CW filter significantly enhances RTTY reception, and the benefits of the filter-switching modification far outweigh the small time and parts investments. — Paul K. Pagel, N1FB, ARRL Hq.

CORRECTING CHIRP IN THE YAESU FT-102

□ At times, I received reports of chirp on the CW signal from my Yaesu FT-102. This rig uses the VOX circuit for semi-break-in CW operation. The circuit is activated by the first part of the first character being sent each time the rig has gone back to receive. As the VOX circuit keys the transmitter, a rising tone chirp is heard.

There is a simple circuit modification to correct this problem. The chirp is caused as capacitor C153 charges when the VOX circuit is activated. This 3.3- μ F capacitor is located on LOCAL UNIT BOARD 2345. You will have to remove the bottom cover from the radio to gain access. C153 is a tubular capacitor, standing on end on the board. Simply cut or unsolder one capacitor lead. You don't even have to remove the capacitor. This component has been eliminated recently by Yaesu, so if you have a newer FT-102, you may not experience the chirp. — Carl Zelich, AA4MI, Merritt Island, Florida

[The author wrote similar articles for *Florida Skip* in March 1984 and for *Worldradio* in April 1984. — Ed.]

Technical Correspondence

Conducted By
Bob Schetgen,* KU7G

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

POWER TRANSFORMER INRUSH CURRENT

□ A recent reference to ac variable-voltage autotransformers brings to mind an inrush-current problem I have had with Variacs™.¹ The problem may also show up in any transformer using high-quality transformer steel. This discussion also shows why a transformer feeding a half-wave rectifier needs a much larger core than one feeding a full-wave rectifier. Here is a simplified explanation.

Ideally, the relationship between transformer

¹J. E. Magnusson, J. E., "A Variable AC-Voltage Source," Aug. 1984 QST, p. 29.

*Technical Editorial Assistant

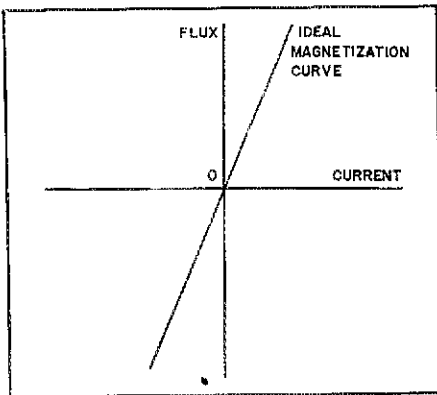


Fig. 1 — The ideal case where magnetic flux in a transformer is directly proportional to the current. This is only approximated when a magnetic core is used.

primary current and core magnetic flux is as shown in Fig. 1. If losses are excluded, the primary voltage is exactly proportional to the flux rate of change. A sine wave of applied voltage causes a sine wave of current to flow.

The current and flux relation of Fig. 2 is typical of a transformer with medium-grade core steel. The current is not a sine wave (from A to B to C to D to A), as odd harmonics are needed to make a sine wave of voltage. Also, the enclosed area, ABCD, represents wasted "hysteresis" power that generates heat in the core. Additionally, if the current path is opened at point E (or higher), an amount of magnetic flux equal to F is left in the core. This flux decays over time, but may not seem to change for days or weeks, or longer.

Use of a low-loss grain-oriented steel for the core results in a situation similar to Fig. 3. The smaller ABCD area indicates lower loss, even when the material is operated nearer flux saturation. Unfortunately, the residual flux, F, may be much greater than that of a medium-grade core.

Residual flux acts like a bias. If primary-supply voltage is applied near a time when the supply voltage is passing through zero (worst case) in the direction to increase the residual flux, the core may be driven into saturation during that half cycle. In an effort to create the necessary flux change, transformer primary current rises to the outer curve and increases in the direction of point G.² The following half cycle

²Inductive reactance is a result of magnetic flux change. When the core is saturated, flux production is severely reduced. This causes a similar reduction of reactance and, consequently, a large increase in current flow — Ed.

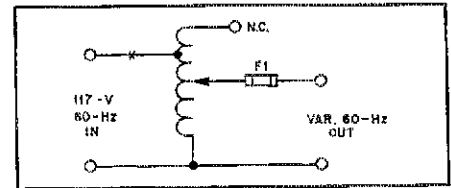


Fig. 4 — A suggested location for a single closely rated fuse. The text discusses currents in a fuse located at X.

reduces the flux bias somewhat, but the third half cycle still shows a reduced surge. Thirty to 40 cycles may be required to effectively eliminate the surges.

Current surges on the forward-biased cycles may exceed 10 times the normal full-load current, even when the transformer is not loaded.³ The effect is more severe with better transformers, and Variacs are very good ones. Current-sensing devices, such as meters or fuses, may be damaged if located at point X (Fig. 4).

Thus, a fuse at point X should be generously rated: perhaps a slow-blow fuse at two times the rated load current. A closely rated fuse (F1) in the output line limits both overload and brush damage.

³Fink and Beaty, *Standard Handbook for Electrical Engineers*, 11th ed. (New York: McGraw-Hill Book Co., 1978), p. 10-4. Reference therein (given to Specht) carries back on this subject to 1892. My limited Variac experience showed severe inrush current about one time out of each 20 off/on cycles.

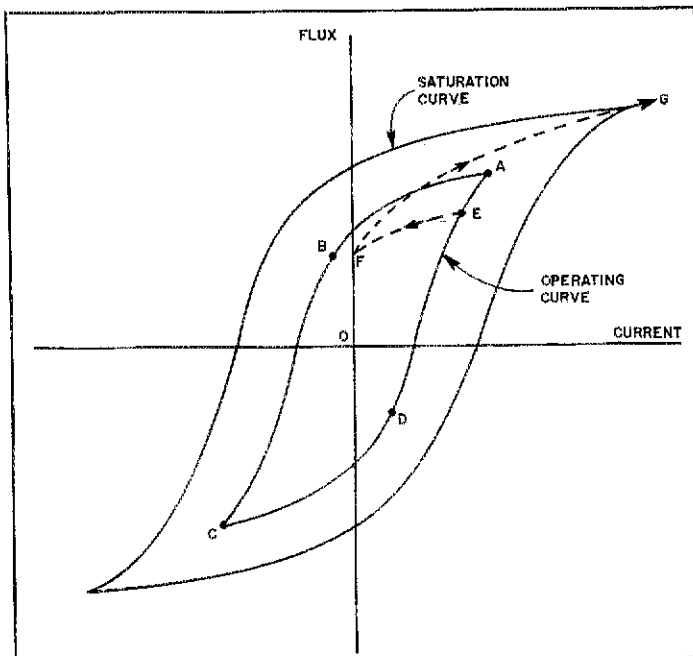


Fig. 2 — Use of a medium-grade-steel core results in a hysteresis curve requiring harmonic currents to complete a sine wave. The inner curve is assumed to be the operating curve, with the outer curve showing more saturation for the same material. These curves are illustrative only.

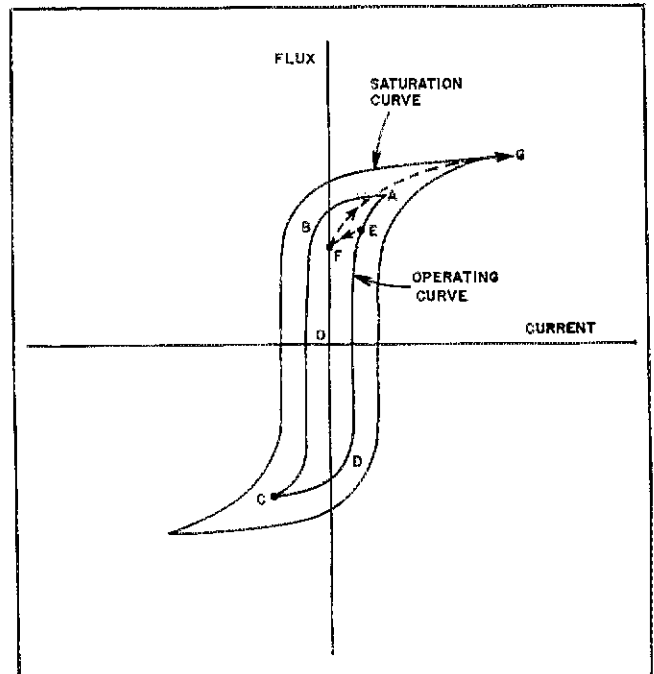


Fig. 3 — A core of better steel results in less losses but a potentially higher inrush current. This curve approximates the character of grain-oriented silicon steel.

A similar effect results when a transformer is used to feed a half-wave rectifier. When loaded (as in battery charging), the secondary dc current severely biases the core flux on every other half cycle. Extra core material must be provided to avoid odd-cycle core saturation and corresponding odd-cycle current peaks. — David T. Geiser, WA2ANU, ARRL Technical Advisor, New Hartford, New York

VERTICAL ANTENNA GAIN

□ In Part 4 of "The Effects of Real Ground on Antennas" (Aug. 1984 QST), an error appears to have been made in the calculation of current and gain for a $\lambda/4$ vertical antenna. Since power = I^2R , the current-increase factor (for a constant power level, when radiation resistance is reduced from 70 to 35 Ω) is the square root of two, not two. Because of the ground reflection, the $\lambda/4$ vertical antenna looks (in the hemisphere above ground) like a $\lambda/2$ dipole in free space with its power level doubled. Hence, it has a 3-dB gain over a $\lambda/2$ dipole in free space. This is 3 dB below the maxima for a $\lambda/2$ dipole above perfectly conducting ground as stated by James Rautio, AJ3K.

To be fair to the $\lambda/4$ vertical antenna, we should consider a pair of them fed out of phase and separated by a distance, $2H$, large enough to ignore mutual coupling. The comparison antenna is a $\lambda/2$ dipole at a height, H . If we supply 70 W of RF to the horizontal dipole and 35 W to each of the $\lambda/4$ vertical elements, each element will have 1 A of RF current at the customary feed point. What happens? Each antenna has a gain of 6 dB over a $\lambda/2$ dipole in free space. The difference is that the horizontal dipole has its lobes in the vertical direction, while the pair of $\lambda/4$ vertical antennas has lobes in the horizontal direction. (See Fig. 5.)

Mark Bacon, KZ9J (Technical Correspondence, Aug. 1984 QST), brought up a point that is overlooked by many amateurs. Page 2-18 (Figs. 24 and 25) of *The ARRL Antenna Book* (1982 edition) shows the gain of a horizontal dipole $\lambda/8$ high shrunk by 3 dB with respect to the same antenna mounted $\lambda/4$ high. Since, by inspection, one can see that the patterns have about the same shape, "Conservation of Energy" requires that each of these antennas has the same gain. Fig. 39 (p. 2-20) of the *Antenna Book* shows that the radiation resistance is 70 Ω for the antenna $\lambda/4$ high and 35 Ω for the $\lambda/8$ -high version. Hence, the antenna current in the lower antenna is greater by the square root of two, compensating exactly for the 3-dB gain reduction shown in *Antenna Book* Fig. 24. Fig. 6 illustrates how this "factor" is obtained by adding the direct and reflected rays without regard to mutual coupling effects.

Those amateurs who must use a low antenna should take courage from the fact that the total radiation pattern for very low antennas doesn't shrink when all factors are considered (for perfect ground conductivity). They may, however, experience problems coupling to low input impedance, and large ohmic losses in real antenna elements and ground of finite conductivity. — Leonard O. Hayden, W3FX, Hughesville, Maryland

It is possible to blow the primary fuse of the power-company pole transformer by using a direct-connected half-wave rectifier to charge a storage battery. It is likely that the branch fuses (15 A) will not blow. My neighbors convinced me that this is a poor practice 50 years ago.

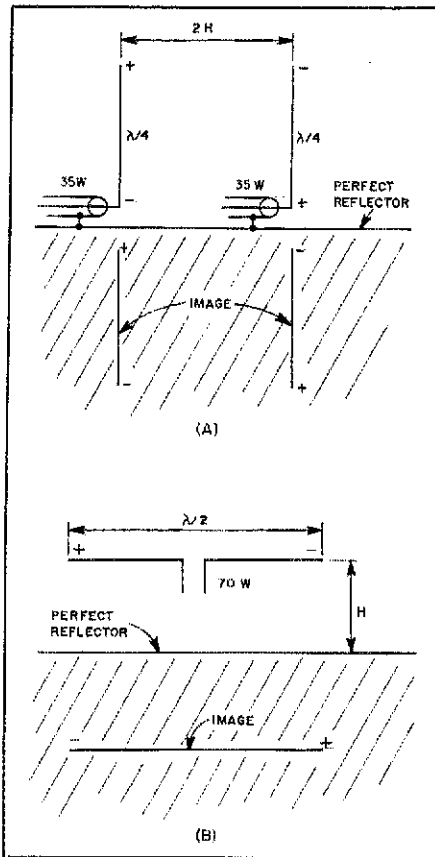


Fig. 5 — A pair of vertical antennas (A) fed with 35 W each, and a horizontal dipole (B) fed with 70 W produce the same radiation pattern, except for orientation, when placed, as shown, over perfectly reflecting ground.

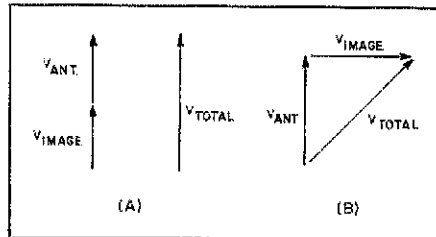


Fig. 6 — Phase relationships for the vertical wave when a horizontal antenna is $\lambda/4$ (A) and $\lambda/8$ (B) high.

TROPOSPHERIC PROPAGATION EVENT

□ During the evening of September 9, 1984, good tropospheric propagation occurred on 2 meters in the East-Canadian Maritimes and extended southwestward into Maine. TV signals on Channels 6 and 7, from Maine, were noticeably affected. Repeaters from Halifax, some 180 miles away were strong enough to produce full-quitting on my IC-2AT with only a "rubber duck" antenna.¹

At the time, the Maritimes were dominated by a large, slow-moving, high-pressure system. This system was quite elongated, with the axis in a northeast/southwest direction. In an attempt to

¹km = mi \times 1.6093; mi = km \div 1.6093.

verify some VHF-propagation information presented in earlier articles, I performed some calculations to determine the radio refractivity, N , and the radio-refractivity lapse rate, dN , in the lower kilometer of the atmosphere at the time of the opening.^{6,7}

In order to do this, a slightly modified form of the equation presented by Miller was used:

$$N = \frac{77.6(p)}{T} \left(1 + 7733 \frac{w}{T} \right) \quad (\text{Eq. 1})$$

where

- p = pressure in millibars
- T = temperature in Kelvins ($^{\circ}\text{C} + 273$)
- w = mixing ratio of water vapor in kg water/kg air

This equation yields N for any level in the atmosphere. (The mixing ratio is easily obtained from standard meteorological data and a chart known as a tephigram.)

There is a radiosonde station located in southern Nova Scotia, at Shelburne. Using data from the 0000Z September 10 sounding, I calculated that the surface value of N was about 343 at the time of the tropo opening. At the same time, N at 850 mbar was 249. This gives a radio-refractivity lapse rate of $-94/\text{km}$.

According to Miller, this value would correspond to Mode R propagation, in which the distance to the VHF radio horizon is extended. The observation of distant signals confirms that this was indeed the case.

Similar calculations were carried out for Caribou, in northeastern Maine. The value for the lapse rate on that path was only -48 , which should yield standard propagation. Signals were heard from southern Maine, but not from the northern part of the state, which seems to be in good agreement with this calculation.

In conclusion, it is apparent that calculations of this type can be useful in predicting both where and when tropospheric propagation may occur. — John Connor, VE1BHA, Fredericton, New Brunswick

⁶E. Pocock, "The Weather That Brings VHF DX," QST, May 1983.

⁷R. Miller, "VHF Propagation and Meteorology," QST, March 1984.

⁸A tephigram is a chart of atmospheric characteristics. The plotted characteristics vary among weather stations that make the charts. Similar information appears on a pseudo-adiabatic chart, which is more common at U. S. weather stations. Pressure, temperature and mixing-ratio figures are usually not available from weather-information and flight-service stations, but only from forecasting stations. Mixing ratio is often stated as mg water/kg air, which is equivalent to ppm. Such figures should be divided by 1 million for use in Eq. 1. — Ed.

Strays

I would like to get in touch with...

□ anyone operating or interested in operating 10-meter beacons for propagation references, especially DX stations, John Mahagan, WB4JHS, 333-8 U.V.S., Gainesville, FL 32603.

Board Fine-Tunes Some Programs, Begins Others

The October 25-26 meeting in Hartford produces action in the areas of League membership, on-the-air activities, Volunteer Examining, packet radio and repeater operations, and CRRL autonomy.

By W. Dale Clift,* WA3NLO

The Second 1984 Meeting of the Board of Directors of the American Radio Relay League was held at the Sheraton-Hartford October 25-26. Representatives from each of the 16 regional ARRL divisions considered and voted on matters affecting Amateur Radio and the League. (You can look up your Director's name on page 8 of this QST.)

Among the highlights of this meeting were several actions that will directly affect on-the-air operations. Actions recognizing and encouraging packet radio, directives to study VHF/UHF contest scoring, how decisions pertaining to DXCC are made and UHF band plans were among the many matters considered by the Board. Other Amateur Radio operational matters on which the Board acted call for the League to file several petitions with the Federal Communications Commission. The Board directed the Staff to petition for automatic control of amateur digital communications on amateur frequencies above 30 MHz, and for access by U.S. radio amateurs to the new Amateur Satellite Service allocations granted at the World Administrative Radio Conference (WARC) in 1979. See the chart elsewhere in this article summarizing these actions under the heading "Amateur Radio Operations."

Volunteer Examinations

The Board directed the League's General Manager to permit "walk-in" amateur examinations at ARRL-coordinated test sites. The actual decision, however, of whether a particular testing session will accept "walk-in" examinations will rest with the volunteer examining team administering the test (Minute 47). This policy will be put into effect during the early part of 1985.

Another Board action directly affecting the Volunteer Examination Program is an instruction that the League petition the FCC to permit an applicant to retake a failed test element within 27 days. The

present rule does not permit a failed test element to be retaken for 30 days. For those sites that give an exam every 28 days (for example, on the fourth Saturday of every month), an applicant would have to wait nearly two months to retake a failed examination. This rule change will help those applicants who, under these circumstances, miss the next exam session by only a few days (Minute 65).

The Board also called for an investigation of ways in which the Advanced class operator could play a greater role in the Volunteer Examination Program (Minute 78). The League is also to study the feasibility of its assisting the FCC in maintaining amateur license records, especially in the administration of call signs (Minute 100).

Recruitment, 40-Meter-Band Survey and Frequency Coordination

The centerpiece of the reports to the Board by ARRL President Larry Price,

W4RA, and General Manager David Sumner, K1ZZ, was an ambitious program to increase the numbers of radio amateurs and League Members. At Minute 44, the Board gave its approval of these intentions by instructing the General Manager to develop a program designed to increase the number of U.S. Amateur Radio licensees by 50,000 per year for the next five years. Then, at Minute 45, the Board instructed the General Manager to develop a program designed to increase ARRL Membership by 25,000 by the end of 1985 and by approximately 20% per year thereafter.

The Board also directed that a postcard survey be sent to all U.S. ARRL Members to learn what the membership reaction would be to SSB operation below 7.1 MHz on the 40-meter band. No editorial comment will precede or accompany the survey (Minute 84). While there is no plan to even study the possibility of a field appointment for frequency coordinators (see Minute 71), the directors favored studying the practices

ARRL Organizational (Regarding Articles of Association and Bylaws)

Minute	Purpose	Disposition
42	Change reference to officers of CRRL contained in Articles of Association	Adopted
43	Recognition of Life Member obligations to Canadian Members.	
	Amendment of Bylaw 1 regarding Life Membership for CRRL Members	Adopted
60	Study possible relocation of Headquarters from Newington, Connecticut, to alternate site	Adopted
46/61	Study possible application of applying recall provision for Directors to Section Managers	Adopted
73	Amend Article 11 pertaining to disqualifications that prevent a person from seeking office of ARRL Director, Vice Director	Tabled
83	Amend Rules governing club affiliation to provide for discretionary consultation with Affiliated Club Coordinator	Adopted

Other ARRL Organizational Matters

Minute	Purpose	Disposition
16	Interest-free loan to CRRL	Adopted
17	ARRL assume financial responsibility for all administrative expenses of ARRL Foundation	Adopted
25	Registration of League Officers, Directors and Vice Directors on MCI Mail	Adopted
37	Approval of Fourth ARRL Amateur Radio Computer Networking Conference	Adopted
38	Supplemental appropriation of \$3000 for 1984 Ad Hoc Digital Committee	Adopted
41	Delete RFI function from OO/RFI Coordinator Guidelines. Rename this position OO/AAS Coordinator. Add RFI function to Tech. Coord. Guidelines and create Asst. Tech. Coord. position	To Committee
44	Gen. Mgr. to develop program to recruit 50,000 new hams per year for next five years	Adopted
45	Gen. Mgr. to develop program to increase ARRL membership by 25,000 by end of 1985, and increase 20% per year thereafter	Adopted

*Assistant to the General Manager, ARRL

Minute Purpose

47	Implement procedures to permit walk-in exams, as a local option, at ARRL-coordinated volunteer-examination sessions
50	Results of Ad Hoc Committee on VHF/UHF Contesting be reviewed by Contest Advisory Committee
53/107	Funds allocated to ARRL Advisory Committees be increased to \$1000 per year for one "in-person" meeting each year
56	Standard Operating Procedure to resolve tie vote of an advisory committee
58	ARRL ID badge for League officials
71	Study possible ARRL field appointment of frequency coordinator
74	ARRL Logo stickers
75	Study improving communications effectiveness between ARRL Hq. and field organization
86	Study advisory committee concept
90	Executive Committee to review all aspects of ARRL's spectrum-management activities, especially above 30 MHz
96	ARRL Hq. to be made available for visitors on certain weekends
97	Study feasibility of charging for all DXCC pins
99	ARRL Packet Radio Development Program
106	Detailed description of Affiliated Club Coordinator

Disposition

Adopted
Tabled
Tabled
Tabled
Adopted
Defeated
Tabled
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted

Amateur Radio Operations

36	AX.25 Amateur Packet definition document approved
40	Study feasibility of a more geographically neutral scoring system for VHF/UHF contests
54	23-cm Band Plan returned to committees for further study
62	33-cm Band Plan approved as interim plan. Study to continue
64	Petition FCC to permit F2 emission on 10-meter band for ID of repeaters
68	Briefing paper on DXCC country status of 4U1VIC
70	Petition FCC to permit automatic control of amateur digital operation above 30 MHz
76	VRAC requested to study Band Plan for 420-450 MHz
77	Study possibility of DXCC awards on new 24-MHz band
84	Survey U.S. ARRL Members regarding SSB operation on 40-meter band below 7.1 MHz
88	Decisions of Ad Hoc Committee on VHF/UHF Contesting be reviewed by Contest Advisory Committee. No changes in rules permitted unless Board action
101	Written record of decisions taken with regard to DXCC
102	Study and redefine, as necessary, purpose and role of ARRL Field Day
103	Study feasibility of adding deletion criteria to DXCC Countries List Criteria
104	Petition FCC to add new frequency allocations for Amateur Satellite Service
105	Study process by which application for separate DXCC country status are reviewed
108	District of Columbia recognized as separate multiplier from that of Maryland for ARRL DX and 10-Meter Contests

Disposition

Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted
Adopted

Legal and Regulatory (Non-Operating)

52	Petition FCC for 45-day extension of time to file comments in PRB-1
65	Petition FCC for change in waiting period after a failed examination element
69	Pursue issuance by FCC of Public Notice to manufacturers of videocassette recorders of obligations regarding proper RFI shielding
78	Investigate means by which Advanced class operator could play greater role in Vol. Exam. process
100	Study feasibility of ARRL assisting FCC in maintaining amateur license records, especially in administration of call signs

Disposition

Adopted
Adopted
Adopted
Adopted
Adopted

Publications/Media

39	ARRL Repeater Directory to continue to be annual publication
48	Future editions of Repeater Directory designate difference between a coordinated and an uncoordinated repeater
49	Technical Excellence Award to W0IYH
63	FM/RPT column in QST be on a monthly basis
93	Frequencies between 147.40 and 147.49 MHz be listed in Repeater Directory to indicate local assignment as repeater input for 1-MHz splits or simplex use
94	Study concept of ARRL director newsletter insertion in QST
95	Only members of ARRL, CRRL or non-residents of U.S. or Canada be listed on rolls and honor rolls for DXCC and VUCC

Disposition

Adopted
Adopted
Adopted
Adopted
Tabled
Adopted
Defeated

Miscellaneous

51	Rules regarding conduct of code contests
59	Study development of course programs for use of Amateur Radio in teaching social studies
67	Study feasibility of establishing data bank for assisting repeater frequency coordinators
72	Study practices of frequency coordinators and draft "Standards of Frequency Coordination Practice"
79	Determine ingredients of successful 2-meter coordination for basis of study to develop standard data base for use by coordinating groups
80	Resolution honoring W3OKN
87	Resolution according recognition to WA2NNT, WA6QQQ, WA6QZY, WB6MRZ, KN6H, W6PGM, K6LAE, WA6NRB and N6IU for work during 1984 Olympics
91	Send newsletter to frequency coordinators
92	ARRL jewelry
98	Commendation for Ad Hoc Committee on Amateur Radio Digital Communication, packet radio clubs and packet radio experimenters
109	Resolution thanking staff for assistance during current Board Meeting

Disposition

Adopted
Adopted
Tabled
Adopted
Adopted
Adopted
Adopted
Adopted
To Committee
Adopted
Adopted

of frequency coordinators and consider establishing a data base for use by coordinating groups (Minutes 72 and 79).

Changes in Articles and Bylaws; Possible Relocation of Hq.

There was some fine-tuning of the ARRL Articles of Association and Bylaws in several respects. Among them are changes that provide for continued progress toward eventual autonomy for the Canadian Division as the Canadian Radio Relay League (Minutes 42 and 43). There will be a study of whether the present recall provisions applicable to Directors should apply to Section Managers (Minute 61). Another study is one directed at whether it would be desirable to move ARRL Hq. from Newington, Connecticut, to an alternate site (Minute 60). Such a move would require a change in the Articles of Association.

QST and Other Publications

The Directors voted that the FM/RPT column in QST be published on a monthly basis. The Directors also voted that future editions of the Repeater Directory designate whether a repeater has been coordinated by the Area Frequency Coordinator. William Sabin, W0IYH, was given the Technical Excellence Award for 1983 for his July 1983 QST article, "Spread Spectrum Applications in Amateur Radio." It was confirmed that the ARRL Repeater Directory will continue to be an annual publication.

Legal and Regulatory

The Board also authorized the filing of a request with the FCC for a 45-day extension of time in which to file comments in PRB-1. This will permit more radio amateurs to tell the Commission of any problems they have faced from state and local authorities while attempting to erect effective Amateur Radio antennas. The League is also to pursue the issuance by FCC of a Public Notice warning manufacturers of videocassette recorders of their obligations regarding proper RFI shielding.

Following This Article

Charts summarizing the actions taken by the ARRL Board of Directors appear elsewhere in this article. These charts are only thumbnail descriptions of what happened, and we urge you to read the whole text in the official Minutes, especially if a subject particularly interests you.

The ARRL Board of Directors acts in your interest and establishes the policies of the League. If you would like to see who represents you on the Board, please turn to the list of names and addresses on page 8 of this issue. There is a lot of information on the following pages. We hope this article has served well as a key in helping you follow the workings of your organization, the American Radio Relay League.

Moved and Seconded...

MINUTES OF THE 1984 SECOND MEETING OF THE BOARD OF DIRECTORS THE AMERICAN RADIO RELAY LEAGUE, INC. OCTOBER 25-26, 1984

AGENDA

- 1) Roll Call
- 2) Moment of Silence
- 3) Consideration of the agenda for the meeting
- 4) Approval of Minutes of 1984 Annual Meeting
- 5) Written and Supplementary oral reports by the officers
- 6) Receive reports and consider recommendations of the committees
- 7) Acceptance of reports
- 8) Directors' Motions

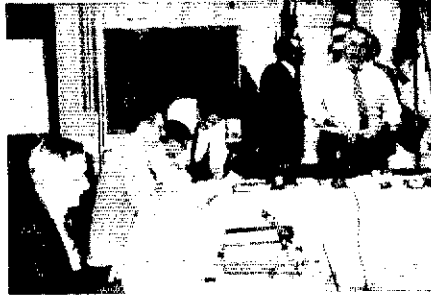
1) Pursuant to due notice, the Board of Directors of the American Radio Relay League, Inc. met in second session at the Sheraton-Hartford Hotel, in Hartford, Connecticut, on October 25, 1984. The meeting was called to order at 9:08 A.M. EDT, with President Larry E. Price, W4RA, in the Chair and the following directors present: Thomas B.J. Atkins, VE3CDM, Canadian Division; Frank M. Butler, Jr., W4RH, Southeastern Division; Lys J. Carey, K0PGM, Rocky Mountain Division; George A. Diehl, W2IHA, Hudson Division; Paul Grauer, W0FIR, Midwest Division; Fried Heyn, WA6WZO, Southwestern Division; Clyde O. Hurlbert, W5CH, Delta Division; Mary E. Lewis, W7QGP, Northwestern Division; Edmond A. Metzger, W9PRN, Central Division; Gay E. Milius, Jr., W4UG, Roanoke Division; Tod Olson, K0TO, Dakota Division; William J. Stevens, W6ZM, Pacific Division; John C. Sullivan, W1HHR, New England Division; Hugh A. Turnbull, W3ABC, Atlantic Division; Raymond B. Wangler, W5EDZ, West Gulf Division; George S. Wilson, III, W4OYI, Great Lakes Division.

Also in attendance as members of the Board without vote were Leonard M. Nathanson, W8RC, First Vice President; Garfield A. Anderson, K0GA, Vice President; Jay A. Holladay, W6EJJ, Vice President; and David Sumner, K1ZZ, General Manager. Also in attendance at the invitation of the Board as non-participating observers were the following Vice Directors: Thomas W. Comstock, N3TC, West Gulf Division; Kip Edwards, W6SZN, Pacific Division; Evelyn D. Gauzens, W4WYR, Southeastern Division; M. L. Gibson, W7JIE, Northwestern Division; John C. Kanode, N4MM, Roanoke Division; Howard Mark, W0OZC, Dakota Division; Stephen A. Mendelsohn, WA2DHF, Hudson Division; Wayne Overbeck, N6NB, Southwestern Division; and Marshall Quiat, AG0X, Rocky Mountain Division. There were also present President Emeritus Harry J. Dannals, W2HD; Honorary Vice President Robert York Chapman, W1QV; Counsel Christopher D. Inlay, N3AKD; Canadian Counsel Robert Benson, QC, VE2VW; Assistant to the General Manager W. Dale Clift, WA3NLO; Technical Department Manager Paul Rinaldo, W4RI; Club and Training Department Manager Stephen C. Place, WB1EYI; and Perry Williams, W1UED, Washington Area Coordinator. The Chair communicated to the group the regrets of International Affairs Vice President Richard L. Baldwin, W1RU, and Treasurer James E. McCobb, Jr., K1LLU, at their inability to attend: Mr. Baldwin owing to travel to China as President of the International Amateur Radio Union, and Mr. McCobb owing to business commitments.

2) The assembly observed a moment of silence in recollection of amateurs who have passed away since the Annual Meeting of the Board.

3) Item 3A, consideration of the designation of the parliamentarian was added to the agenda. Whereupon, on motion of Mr. Metzger, seconded by Mr. Butler, it was unanimously VOTED that the agenda be adopted. On further motion of Mr. Metzger, seconded by Mr. Milius, it was unanimously voted that the president appoint a parliamentarian. Completing the action, the president named Mr. Sullivan to the post.

4) Coming now to consideration of the Minutes of the 1984 Annual Meeting, Minute 119 was amended by the addition of the phrase, "Mr. Nathanson resumed his seat at the table." Minute 62 was amended so that the first sentence would read, "Mr. Nathanson,



At ARRL Board Meetings, even the "break" times aren't wasted. This is when a lot of the language that later surfaces in formal motions gets worked out. (photos courtesy John Kanode, N4MM)



Directors Sullivan, W1HHR (New England) and Lewis, W7QGP (Northwestern) listen intently.

as chairman, presented the report of the Task Force on Federal Preemption." Whereupon, on motion of Mr. Atkins, seconded by Mr. Milius, it was unanimously VOTED that the Minutes of the 1984 Annual Meeting are approved as amended.

5) Written and supplementary reports and oral reports of the officers were presented here. President Price welcomed, as first time attendees at the meeting, Vice Directors Edwards and Overbeck, and welcomed President Emeritus Dannals to his first Board Meeting in that capacity. The President, in oral remarks, amplified on the written report which called for a membership campaign to add 25,000 new members in 1985. There was also a need for growth in the Amateur Radio Service; he proposed a program to increase the number of amateurs by 10% per year through 1990. Mr. Price also called for increased participation by ARRL, on its own behalf, in the affairs of the International Amateur Radio Union, in addition to its altered role as the International Secretariat. The report also called for continued attention to the effective representation in Washington. During the course of the above, the Board was in recess from 10:30 to 10:52 A.M.

6) First Vice President Nathanson reported on his work with the Executive Committee, the Management and Finance Committee, and as Vice President of the International Amateur Radio Union. Executive Committee work included discussions of VEC implementation, volunteer monitoring, spectrum problems, simplex autopatch and the monitoring of local legal problems. As Vice President of IARU, Mr. Nathanson attended the Administrative Council Meeting in Paris, where he nominated Richard Baldwin, W1RU, as

IARU President, Carl Smith, W0BWJ, as Vice President, and David Sumner, K1ZZ, as Secretary. He also attended the meeting in Cincinnati of the Association of Public Safety and Communications Officers (APCO), with which the ARRL has a memorandum of understanding.

7) Continuing Agenda Item 5, Vice President Anderson presented his written report, covering his chairmanship of the Ad Hoc Committee on Volunteer Examining; the work of this committee led to ARRL being certified as a Volunteer Examiner Coordinator for all 13 regions. The program is "off and running" in excellent fashion, Mr. Anderson said. His assignments also include liaison with the Membership Affairs Committee, which will have a number of motions to be presented at the Meeting.

8) Vice President Holladay singled out as most significant his involvement with Amateur Radio support for the 1984 Summer Olympics. There was attendance at emergency communications meetings, an ARRL night, a frequency coordination and spectrum management meeting, hamfests, a banquet and the Southwestern Division Convention. The report concluded with a call for increased attention to administration of the new ARRL Field Organization, particularly the way in which we communicate with and make use of our volunteer workers.

9) The Vice President for International Affairs, Mr. Baldwin, was unable to attend because of a trip to China on behalf of IARU. His written report, placed on file, covered attendance at the Region 1 Conference in Cefalu, Sicily, as recounted in the July issue of QST; attendance at the Annual Meeting of the Belgium Society; the IARU Administrative Council Meeting in Paris, first under the new constitution; and attendance at a hamfest in Windsor, Maine, and the New England Division Convention at Boxboro, Massachusetts. A strong plea for greatly increased participation in the affairs of IARU by ARRL in its own right concluded the report.

10) General Manager Sumner presented an extensive written report, with two annexes, to the meeting. The report discussed at length ARRL participation in the Volunteer Examiner Coordinator's Program; expansion of the phone subbands; withdrawal of the amateur secondary allocation at 2310-2390 MHz by FCC, in favor of aeronautical flight-test telemetry; a Notice of Proposed Rule Making that would reallocate 1900-2000 kHz to the Radiolocation Service; two petitions to the FCC involving the 220-MHz band; and a proposed rule making to implement the 24 and 902-MHz bands, to make permanent the allocation to the Amateur Service at 10.1 to 10.15 MHz and to withdraw routine amateur operation along the Canadian border in the 420-430 MHz band. Other matters in the written report included the work of the Task Force on Federal Preemption; the Volunteer Monitoring program; publication activities at headquarters, including a major rewrite of the Handbook for 1985 and production of a new Emergency Coordinator's Handbook; and new amplifiers for W1AW.

11) Other sections of the report covered a summary of actions taken on items arising from the 1984 Annual Meeting of the Board; personnel matters; finances; and finally, a plan for the future. The latter included details of programs to promote Amateur Radio, and to increase membership in ARRL. Like other officers before him in the meeting, the General Manager urged greater participation by ARRL in the International Amateur Radio Union. Annexes to the report covered code competition guidelines, and the packet radio development program including a proposal for adoption of AX.25 as the link-layer protocol for amateur packet radio.

12) Attention of the meeting next was turned to the report of Counsel Inlay. First, there was a summary of actions taken in response to Board motions; a highlight of this section was an extensive discussion of federal preemption. The FCC allocations actions mentioned in the General Manager's report were discussed in greater detail here. Other paragraphs covered biological effects of RF energy, rebroadcasts of amateur communications by broadcast stations and the use of 7100-7300 kHz by nongovernment HF broadcast stations in Region 3. Counsel Inlay also discussed the Bates and Goldwater bills, which would amend the Communications Act to make willful and malicious in-



From the left: Honorary Vice President Chapman, W1QV, Atlantic Division Director Turnbull, W3ABC, Vice Directors Hippiisley, K2KIR and Mark, W0ZC, Central Division Director Metzger, W9PRN, and Dakota Division Director Olson, K0TO.

interference by radio a statutory offense. There was then a summary of local antenna and RFI matters. Mr. Imlay then called on First Vice President Nathanson for additional information on the Federal Preemption matter, PRB-1. During the course of the above, George W. Hippiisley, K2KIR, Vice Director of the Atlantic Division, joined the meeting at 12:21 P.M. The Board was in recess for lunch from 12:28 to 1:57 P.M., reconvening with all persons hereinbefore mentioned in attendance.

13) The reports of Officers, Agenda Item 5, continued with the report of Candian Counsel Benson. Topics included municipal bylaw amendments; an attempt to get Second Class mailing privileges for *QST* in Canada; and advice to members on customs duty, antenna and tower, and radar detector problems. There was work on amendments to the radio regulations, trademark activities and routine corporate activity. Counsel Benson yielded to Director Atkins for details on Canadian Government proposals to deregulate

Amateur Radio by abolishing mandatory mode restrictions.

14) Honorary Vice President Chapman, in his role as President of the ARRL Foundation, presented its report. Nearly \$30,000 had been raised for the Goldwater Scholarship Fund, and the first grant (in the amount of \$5,000) from that fund was made to Paul B. Sargis, K16U, at the Pacific Division Convention in September. Other scholarships were awarded to WB0YKG, KK0X, N2EHM, KA2INN and KA2HTV. The Foundation also established the Victor C. Clark Youth Incentive Program, to support youth programs, in memory of our late President, W4KFC. The report concluded with a proposed budget for 1985.

15) The report of the Management and Finance, Agenda Item 6, was presented by its chairman, Mr. Metzger. Its work was summarized by a series of motions to follow. It was moved by Mr. Metzger, seconded by Mr. Olson, that Bylaw 25 be amended by deleting the present two sentences and substituting

therefor the following: "The Annual Meeting of the Board of Directors shall be held in the vicinity of Newington, Connecticut, beginning on the fourth Thursday of January. The second meeting shall be held in the vicinity of Newington, Connecticut, beginning on the fourth Thursday of July." It was moved by Mr. Carey, seconded by Mr. Stevens, that the motion be amended to become effective in 1986, but the motion to amend was lost. Whereupon, a roll call vote being required, the question was decided in the affirmative, with all Directors voting in favor except Mr. Carey, Mr. Stevens and Mr. Wilson who voted opposed, and Mr. Heyn who abstained. Accordingly, the Bylaw was amended.

16) On further motion of Mr. Metzger, seconded by Mr. Turnbull, it was unanimously VOTED that the General Manager is authorized to make an interest-free loan of \$10,000 available to the Canadian Radio Relay League to finance the purchase of a microcomputer to maintain membership records and perform other functions essential to the transition of CRRL to autonomous status, and to finance an initial inventory of ARRL publications which CRRL will purchase on the same terms as are available to any dealer, with repayment to be made over a period of time acceptable to CRRL, but not to exceed five years.

17) Again on motion of Mr. Metzger, seconded by Mr. Olson, the following resolution was unanimously ADOPTED:

WHEREAS, the ARRL Foundation is a subsidiary corporation to the ARRL, and

WHEREAS, the ARRL Foundation is chartered to provide a means to finance educational, scientific and charitable activities related to amateur radio and

WHEREAS, the ARRL Foundation in the process of doing "good works" incurs administrative expenses, now therefore,

BE IT RESOLVED that the ARRL assumes financial responsibility for all administrative expenses of the ARRL Foundation, it being understood that expense authorization shall be in accordance with ARRL standing policies with respect to travel, accounting procedures, and auditing. During the course of the above, the Board was in recess from 3:06 to 3:35 P.M.

18) The report of the Membership Affairs Committee was presented by its chairman, Mr. Butler. In response to Minute 71 of the 1984 Annual Meeting, the Committee studied the Advisory Committees and found that they were performing a useful service and should be continued. However, adoption of standard operating procedures would make the committees more effective. Other work of the Membership Affairs Committee will result in a series of motions later in the meeting.

19) Mr. Sullivan, as chairman, presented a brief oral report for the Plans and Programs Committee.

20) Mr. Price, as chairman, presented reports of Executive Committee studies. Concerning simplex autopatches, the Committee recommended resuming efforts to establish proof of license requirements for the purchase of transmitting equipment; continued urging of simplex autopatch manufacturers to explain legal restrictions in literature and operating instructions; continuation of *QST* information on proper uses of autopatches; clarification of on-frequency control of autopatches above 220.5 MHz; retention of the *QST* advertising policy toward the devices adopted at the May 25 meeting of the Executive Committee and continued monitoring of the subject by the Executive Committee.

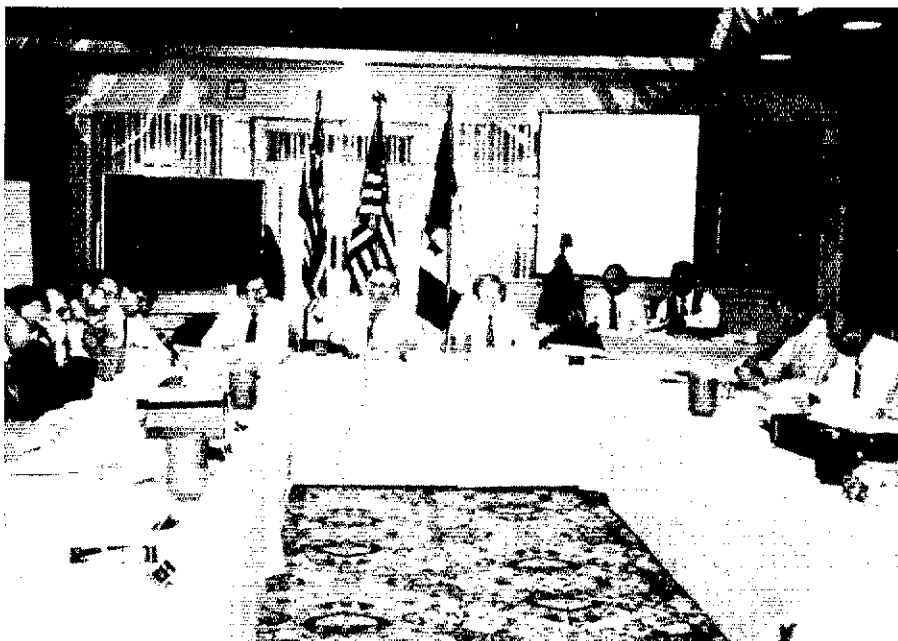
21) An Executive Committee study of nets reached the conclusion that new specific regulations regarding net operation are not required and should be neither proposed nor supported by ARRL; that there is an unrealistic expectation developing among amateurs that communication ought to be free of interference; that the ARRL should try to educate the amateur community in reference to interference; that the ARRL should formalize the process of developing and modifying volunteer band plans to encourage amateurs to abide by them; and that the League should continue its support of the Volunteer Monitoring Program as a partial answer to the problem of willful and malicious interference. An Executive Committee study of Board committee structure continues, with a report expected for the next Meeting of the Board.

22) Mr. Turnbull, as chairman, presented a brief report of the Ad Hoc Committee on a More Continuous Washington Presence.

23) Mr. Atkins, as chairman, presented a report of the Ad Hoc Committee on the Strengthening of CRRL. Its work would be carried on by motions later in the meeting.

24) The Report of the Ad Hoc Committee on Volunteer Monitoring was presented by its chairman Mr. Wilson; the report outlined progress in starting up the amateur auxiliary, including distribution of a training handbook.

25) Mr. Olson, as chairman, presented the report of the Ad Hoc Committee on Computer Based Message Systems. Upon his motion, seconded by Mr. Metzger,



At the head table, from the left: First Vice President Nathanson, W8RC, President Price, W4RA and Secretary-General Manager Sumner, K1ZZ. Two of the three directors' tables are on the left and right.

it was unanimously VOTED that Directors' use of the HIRAM computer based message system be discontinued; that the General Manager register all Directors, Vice Directors and Officers with MCI Mail; that the charges incurred by Directors and Vice Directors be charged to the Division account; and that the Ad Hoc Committee on Computer Based Message Systems be discharged.

26) Mr. Turnbull, as liaison, presented the report of the Ad Hoc Committee on the Goldwater Scholarship, already mentioned in the report of the ARRL Foundation.

27) Mr. Turnbull, as chairman and Board liaison, also presented the report of the Radio Frequency Interference Task Group. The Group has participated actively in the work of the American National Standards Institute Ad Hoc Committee C.63, looking toward voluntary standards for radio frequency immunity, and with the technical committee of the National Cable Television Association. The ARRL lab has developed a simple standard signal source for comparison purposes on Channel E, which will be written up for publication in *QST*. Group member Harold Richman, W4CIZ, continues to update the RFI assistance list.

28) Mr. Wangler, as chairman, presented an extensive report of the ARRL Committee on Biological Effects of RF Energy. The chairman reported on measurements made at his own amateur station, all of which fell substantially below the 1-milliwatt-per-square-centimeter level. The committee examined a University of Washington report which led to a sensational headline in *Microwave News*; the report does not support the headline. Finally, a draft RF energy regulation being circulated by State OSHA officials in Massachusetts would exempt Amateur Radio.

29) Mr. Nathanson, as chairman, presented a brief report of the ARRL Task Force on Federal Preemption. The ARRL filed with FCC a request for federal preemption in antenna matters, which has been designated as PRB-1. It was circulated to all Directors and is available to members upon request, accompanied by a self-addressed envelope with 88¢ postage.

30) Mr. Rinaldo, as chairman, presented a brief report of the Ad Hoc Committee on Amateur Radio Digital Communications. The report urged adoption of the packet radio development program contained in the report of the General Manager. The Board was in recess from 5:13 P.M. to 8:36 P.M., reconvening with all persons hereinbefore mentioned present.

31) Mr. Kanode, as liaison, presented the report of the DX Advisory Committee covering additional endorser DXCC awards, revision of DXCC country criteria, country status for the Pribilof islands (still under consideration after an 8 to 8 tie), denial of country status to the Vienna International Center of the United Nations, 4U1VIC, and provision of a sticker for the DXCC certificate indicating honor roll status.

32) Mr. Mendelsohn, as liaison, presented the report of the Public Relations Advisory Committee. ARRL press kits have been widely distributed; a new version of the pamphlet, "Amateur Radio: A National Resource," has been produced; and an abbreviated version of the pamphlet for mass distribution is in process. Work continues on a slide tape presentation and new approaches of advertising ARRL membership.

33) Mr. Butler, as liaison, presented a report of the VHF Repeater Advisory Committee. Motions for band plans will be presented later in the meeting.

34) Mr. Overbeck, as liaison, presented an extensive report of the VHF/UHF Advisory Committee which recommends review of the band plans for the 420-450 and 2300-2450 MHz amateur bands. The Committee advises the study of "exchange" practices and procedures for immediate meteor scatter and earth-moon-earth communications. There was also discussion of the band plans to be presented later on.

35) Turning now to Agenda Item 7, on motion of Mr. Stevens, seconded by Mr. Milius, it was unanimously VOTED that the reports are accepted and placed on file.

36) As the first matter under Agenda Item 8, on motion of Mr. Carey, seconded by Mr. Heyn, it was unanimously VOTED that the AX.25 Amateur Packet definition document be approved as submitted by the Ad Hoc Committee on Amateur Radio Digital Communication; that the Committee be authorized to approve incremental changes to the protocol to keep it up to date; and that the Committee refer any major changes to the Board for approval.

37) Mr. Carey yielded the floor to Mr. Stevens. On his motion, seconded by Mr. Sullivan, it was unanimously VOTED that the Fourth ARRL Amateur Radio Computer Networking Conference be held in San Francisco on Saturday, March 30, 1985.

38) On motion of Mr. Carey, seconded by Mr. Butler, it was unanimously VOTED that a supplemental appropriation of \$3000 be approved for 1984 for the Ad Hoc Digital Committee.

39) On motion of Mr. Butler, seconded by Mr.



The Board took a time-out to honor one of its members. President Price presents Pacific Division Director Bill Stevens, W6ZM, with a 50-year membership plaque.

Carey, it was unanimously VOTED that the ARRL Repeater Directory continue to be an annual publication with established editorial cutoff and publication dates.

40) On motion of Mr. Heyn, seconded by Mr. Butler, it was unanimously VOTED that the Contest Advisory Committee be directed to study the feasibility of establishing a geographically neutral scoring system for at least one of the ARRL-sponsored VHF/UHF Contests. Among other alternatives, the committee shall consider the system used in European VHF contests, in which actual distances worked (as determined by the six-digit grid locator system) rather than multipliers form the basis for scoring.

41) It was moved by Mr. Wangler, seconded by Mr. Heyn, to delete the RFI function from the OO/RFI Coordinator Guidelines, renaming this position as OO/AAS Coordinator. On motion of Mr. Stevens, seconded by Mr. Sullivan, it was unanimously VOTED that this matter be referred to the Membership Affairs Committee. It was further MOVED, by Mr. Wangler, seconded by Mr. Heyn, that the RFI Function should be added to the Technical Coordinator Guidelines with the generation of the appointee position titled Assistant Technical Coordinator to perform duties under the TC program to resolve RFI Technical problems. The Assistant Technical Coordinator would have the prime function of (1) Investigating and resolving interference complaints due to the susceptibility of home entertainment equipment (this may be in conjunction with an existing club RFI Committee Chairman); (2) Aiding Novice licensees and others in curing technical problems (this duty will be directed by the Technical Coordinator when the AAS Coordinator needs assistance in resolving a report from the regional monitoring station or a certified monitoring station); and (3) Preparing a comprehensive report of the finding and route it to the ARRL Technical Department through the Technical Coordinator for recommendations for correction when needed. On further motion of Mr. Stevens, seconded by Mr. Milius, it was unanimously VOTED that this matter be referred to the Membership Affairs Committee.

42) It was moved by Mr. Atkins, seconded by Mr. Butler, that Article 5 of the Articles of Association (in reference to officers of the Canadian Radio Relay League) is amended by striking the word "Secretary" from the third sentence and substituting therefor, "Vice President." A roll call vote being required, the question was decided in the affirmative, with all Directors voting aye, so the article was AMENDED.

43) It was moved by Mr. Atkins, seconded by Mr. Butler, that the following resolution be adopted:

WHEREAS, the League's Life Members in Canada constitute a source of strong support for organized Amateur Radio in that country, which has been an integral part of the ARRL organization since 1920, and

WHEREAS, the League is embarked on a five-year plan to establish the Canadian Radio Relay League as an autonomous national organization in Canada having sufficient resources to be a strong and effective representative of Amateur Radio in that country, and

WHEREAS, present Life Members in Canada are entitled to receive membership services and to be members of the League, for the rest of their lives, and

WHEREAS, ARRL recognizes its obligation to these Life Members, and

WHEREAS, after some future date membership dues paid by Canadian members will be retained by CRRL with ARRL to be reimbursed for those membership services which continue to be provided from the United States, and

WHEREAS, at that time CRRL may wish to

establish its own Life Membership program for new applicants, without prejudicing in any way the rights of present Life Members, now therefore,

BE IT RESOLVED by the Board of Directors of the American Radio Relay League in meeting assembled that the rights of Life Members in Canada to membership services are hereby guaranteed in perpetuity, and

BE IT FURTHER RESOLVED that Bylaw I is amended by appending the following note following paragraph (b): [Note: Effective December 31, 1984, new Life Membership applications will not be accepted from Canada pending the establishment of a Life Member program by the Canadian Radio Relay League.] A roll call vote being required, the question was decided in the affirmative with all Directors voting in favor, so the Bylaw was AMENDED.

44) On motion of Mr. Olson, seconded by Mr. Hurlbert, it was unanimously VOTED that the General Manager is instructed to (a) Develop a program designed to increase the number of U.S. Amateur Radio licensees by 50,000 per year for the next five years; (b) Make the fullest use of volunteers and the Amateur Radio industry in the development and implementation of the program; (c) Submit the proposed program to the Executive Committee at its November 19 meeting for review; and (d) Propose a reserve in the 1985 budget for funding the program following approval by the Board.

45) On further motion of Mr. Olson, seconded by Mr. Hurlbert, it was unanimously VOTED that the General Manager is instructed to (a) Develop a program designed to increase ARRL membership by 25,000 by the end of 1985 and by approximately 20% per year thereafter; (b) Plan the appropriate use of volunteers and professionals in the implementation of this program; (c) Propose a reserve in the 1985 budget for funding the program after approval by the Board; (d) Present a detailed program proposal at the first 1985 Executive Committee Meeting for review; (e) Present the program at the first 1985 Board Meeting for approval.

46) It was moved by Mr. Hurlbert, seconded by Mrs. Lewis, that the Membership Affairs Committee study the advisability and feasibility of applying the recall provision of Bylaw 24, now providing a procedure of recall for Directors, to the offices of Section Manager and Vice Director, and report the findings and recommendations of said committee study to the next regular session of this Board. After discussion, the motion was withdrawn. The committee was in recess at 10:02 P.M., reconvening at 9:10 A.M. on October 26 with all persons herein before mentioned present.

47) Moving now to the continuation of Item No. 8 on the Agenda, Directors' Motions, on motion of Mr. Wilson, seconded by Mrs. Lewis, it was unanimously VOTED, Mr. Atkins abstaining, that the General Manager devise and implement procedures to permit walk-in examinations at ARRL-coordinated Volunteer Examiner exam sessions, as and to the extent that the particular VE Team deems appropriate.

48) On Motion of Mr. Diehl, seconded by Mr. Butler, after discussion it was VOTED that future VHF-UHF Repeater Directories published by the ARRL include within the directory a designation to show the difference between a repeater that has been coordinated by the Area Frequency Coordinator and one that has not.

49) On motion of Mr. Grauer, seconded by Mr. Sullivan, it was unanimously VOTED that the Technical Excellence Award for 1983, an engraved pewter bowl, be presented to William Sabin, W6IYH, for his article in July 1983 *QST*, "Spread-Spectrum Applications in Amateur Radio."

50) It was moved by Mr. Sullivan, seconded by Mr. Grauer, that the results of the Ad Hoc Committee on VHF/UHF Contesting be reviewed by the Contest Advisory Committee prior to any implementation of committee proposals. After discussion, it was moved by Mr. Nathanson, seconded by Mr. Metzger, that this matter be laid on the Table, but the motion to Table was LOST. After further discussion, on motion of Mr. Wilson, seconded by Mr. Butler, it was VOTED that the motion be laid on the Table until after the lunch recess.

51) On motion of Mrs. Lewis, seconded by Mr. Butler, it was unanimously VOTED that the set of rules outlining methods of conducting code contests at ARRL-sanctioned conventions as prepared by headquarters staff be adopted and that notice of their availability be included with the prepared guidelines for conducting ARRL conventions.

52) On motion of Mr. Stevens, seconded by Mr. Sullivan, it was unanimously VOTED, Mr. Atkins abstaining, that Counsel file a request for a 45-day extension of time in which to file comments in PRB-1, ARRL's Request for Issuance of Declaratory Ruling to establish limited Federal Preemption over amateur antennas and supports.

53) Moved by Mr. Milius, seconded by Mr. Butler, that the funds allocated to the ARRL Advisory Com-

mittees be increased to \$1000 per year to permit the Advisory Committees to hold one "in-person" meeting each year. After discussion, it was moved by Mr. Heyn, seconded by Mrs. Lewis, that this matter be laid on the Table. A tie vote being found to exist, the Chair voted in favor, so the motion to Table was ADOPTED.

54) On motion of Mr. Butler, seconded by Mr. Atkins, after discussion it was unanimously VOTED that the 23-cm Band Plan submitted to the Board by the VUAC and VRAC at this meeting by returned to those committees for further study. The VUAC and VRAC are requested to attempt to resolve differences in two proposed plans and present a report at the next Board Meeting.

55) It was moved by Mr. Heyn, seconded by Mr. Wilson, that the General Manager shall, with the assistance of Counsel, pursue the issuance by the Federal Communications Commission of a public notice advising manufacturers of their obligation pursuant to the Communications Amendments Act of 1982 to incorporate satisfactory RF filtering and shielding features in videocassette recorders and other home electronic equipment. After discussion, it was moved by Mr. Turnbull, seconded by Mr. Grauer, that this matter be laid on the Table, but the motion to Table was LOST. After further discussion, on motion of Mr. Sullivan, seconded by Mr. Grauer, it was VOTED that consideration of this matter is postponed until after the luncheon recess.

56) It was moved by Mr. Wangler, seconded by Mr. Sullivan, that the Membership Affairs Committee is requested to ensure that the Standard Operating Procedure for Advisory Committees now in preparation include a procedure for resolving a tie vote of a committee. After discussion, moved by Mr. Milius, seconded by Mr. Butler, that this matter be laid on the Table. A tie vote being found to exist, the Chair voted in favor, so the motion to Table was ADOPTED.

57) The Board was in recess from 10:15 A.M. until 10:50 A.M., reconvening with all present except for Mr. Chapman, who left the Meeting to attend to ARRL Foundation matters.

58) On motion of Mr. Atkins, seconded by Mr. Carey, it was unanimously VOTED that the General Manager is directed to have prepared for Board approval a sample of an ARRL identification badge for use at hamfests and other events. This badge would: (1) contain the appropriate name, call, title and ARRL logo; (2) be red, black and white, similar to the ARRL QSL card; (3) be authorized for wear by Officers, Directors, Vice Directors, Section Managers, and Headquarters staff members; and (4) be provided free-of-charge to each present and newly elected official.

59) On motion of Mr. Metzger, seconded by Mrs. Lewis, it was unanimously VOTED that the General Manager study the development and publishing of curriculum activity books for use in correlating Amateur Radio with social studies and other areas, specifically in the Junior High levels of school and the support of teacher presentations at social studies conventions with educational information and display materials.

60) On motion of Mr. Olson, seconded by Mr. Hurlbert, after extended discussion, it was VOTED that the Management and Finance Committee study the desirability and feasibility of relocating Headquarters from Newington, Connecticut, to an alternate site. The Committee will be charged to identify potential alternate sites, a timetable and plan for moving, the economic cost of relocation, and the operating, political and psychological impact of relocation. In considering this matter, the committee shall consider this motion a mandate to study all aspects of the matter, including, but not limited to, the following:

1. The need and desirability of such a move;
2. The cost of the move and the financial ability of the League to sustain the move;
3. Any change in membership perception of the League;
4. The impact on League Staff;
5. The degree of increased effectiveness to be gained by ARRL in implementing its goals and serving its membership.

The Committee will be charged with reporting to the Board at the January 1986 meeting. Mr. Sullivan and Mr. Diehl asked to be recorded as voting opposed to this motion.

61) On motion of Mr. Hurlbert, seconded by Mr. Sullivan, it was VOTED that the Membership Affairs Committee study the advisability and feasibility of applying the recall provision of Bylaw 24, now providing a procedure of recall for Directors, to the office of Section Manager, and report the findings and recommendations of said committee study to the July session of this Board. The committee is empowered to study and report to the Board on all facets of the "recall" question.

62) On motion of Mr. Wilson, seconded by Mr. Butler, it was unanimously VOTED that the 33-cm Band Plan as proposed by the VUAC be approved as the interim plan, and that the VUAC continue its study

of same involving all identifiable potential users' interests. This band plan will be identified as "interim" whenever it appears in League publications.

63) On motion of Mr. Grauer, seconded by Mr. Sullivan, it was VOTED that the FM/RPT column in QST be on a monthly basis. Mr. Heyn asked to be recorded as abstaining.

64) On motion of Mr. Sullivan, seconded by Mr. Grauer, it was unanimously VOTED that the General Manager be instructed to petition the Federal Communications Commission to permit F2 emission on 10 meters for identifying Amateur Radio repeaters. Mr. Atkins abstained.

65) It was moved by Mrs. Lewis, seconded by Mr. Sullivan, that the ARRL Legal Counsel is directed to prepare, with the assistance of the General Manager, and file with the FCC, a petition for rule making to change the present "30-day" rule to a "27-day" rule in Section 97.26(h), thereby permitting an applicant who has failed an Amateur Radio examination test element to retake that test Element 27 days thereafter. After discussion, it was moved by Mr. Carey, seconded by Mr. Butler, to amend the motion by adding at the end, "but not in the same month." After discussion, the motion to amend was withdrawn. Whereupon the question being on the same, the original motion was ADOPTED. Mr. Atkins abstained.

66) The Board was in recess from 11:53 A.M. until 1:15 P.M., reconvening with all present as previously noted except for Mr. Chapman and Mr. Mendelsohn.



President Price, Rocky Mountain Division Director Carey, K0PGM and Southeastern Division Vice Director Gauzens, W4WYR.

67) It was moved by Mr. Stevens, seconded by Mr. Milius, that the General Manager with the Plans and Programs Committee study the feasibility of establishing a data bank for assisting local repeater coordinating committees and that the League not become involved in frequency or repeater coordination on a local basis. The committee is to report to the Board no later than the Annual Meeting of 1985. It was moved by Mr. Butler, seconded by Mr. Carey, that the matter be laid on the Table. A tie vote being found to exist, the Chair voted in favor, so the motion to Table was ADOPTED.

68) On motion of Mr. Milius, seconded by Mr. Stevens, the following resolution was unanimously ADOPTED:

WHEREAS, ARRL has received from representatives of the amateur radio club at the Vienna International Center, 4U1VIC, as well as from representatives of the Austrian amateur community, a request that the Vienna International Center be added to the DXCC Country List, and

WHEREAS, the circumstances surrounding previous considerations of DXCC status for the United Nations entities have been complex, and do not provide a clear precedent; and

WHEREAS, the international legal status of the territory controlled by the United Nations is even more complex; and

WHEREAS, it appears that the background material submitted to the DXAC on this matter may not have been sufficient to permit the committee to give the question full consideration;

BE IT RESOLVED that the General Manager is instructed to prepare a briefing paper on the status of the Vienna International Center, and to submit this paper to the DXAC by December 1; and

BE IT FURTHER RESOLVED that the DXAC is instructed to reconsider the 4U1VIC question no later than January 20, 1985, in light of the facts set forth in the briefing paper.

69) The Board now returned to consideration of a postponed matter. On motion of Mr. Heyn, seconded by Mr. Butler, it was unanimously VOTED that the

General Manager shall, with the assistance of Counsel, pursue the issuance by the Federal Communications Commission of a Public Notice advising manufacturers of their obligation pursuant to the Communications Amendments Act of 1982 to incorporate satisfactory RF filtering and shielding features in video cassette recorders and other home electronic equipment.

70) It was moved by Mr. Carey, seconded by Mr. Butler, that the Draft Petition to the FCC to permit automatic control of amateur digital communications be approved in substance with such editorial modifications as counsel may deem necessary. After discussion, Mr. Olson moved to amend the motion so that the petition's effect would be limited to amateur digital communication applications at 220 MHz and above, but there was no second, so the motion to amend was lost. On motion of Mr. Wilson, seconded by Mr. Butler, it was VOTED to amend the motion so that it applies only above 30 MHz. The question now being on the motion as amended, the same was ADOPTED.

71) It was moved by Mr. Carey, seconded by Mr. Milius, that the Membership Affairs Committee study and recommend or not recommend an ARRL field appointment for a frequency coordinator position. After discussion, the motion was LOST.

72) On motion of Mr. Butler, seconded by Mr. Heyn, it was unanimously VOTED that the General Manager be directed to send a letter to all VHF repeater frequency coordinators known to the League, requesting copies of their frequency coordinating policies and practices. Upon receipt of a sufficient number of policy statements, the ARRL staff is to prepare a draft for submission to the Executive Committee, "Standards of Frequency Coordination Practice," such to then be submitted to the Frequency Coordinators for comments. An accompanying letter will make it clear that ARRL is not trying to impose standards on the individual coordinators, but only to aid in arriving at a uniform policy.

73) It was moved by Mr. Heyn, seconded by Mr. Atkins, that the last two sentences of Article 11 of the Articles of Association shall be amended to read as follows: "... Should any person seek the office of Director, Vice Director, President, or Vice President whose business connections are of such nature that he could gain financially through the shaping of the affairs of the League by the Board or by the improper exploitation of his office for the furtherance of his own aims or those of his employer, such connections shall be fully disclosed in advance of his election. In the case of candidates for Director and Vice Director, such disclosure shall occur prior to the issuance of election ballots, and the candidates' statements that accompany the ballots shall include that information. No Director, Vice Director, President or Vice President shall participate in discussions or vote on any issue before the board or any committee on which he may serve if his participation or voting on that issue would create an apparent or actual conflict of interest." On motion of Mr. Metzger, seconded by Mr. Hurlbert, it was VOTED that this matter be laid on the Table; Mr. Heyn asked to be recorded as voting opposed.

74) It was moved by Mr. Heyn, seconded by Mr. Butler, that the staff is directed to provide small ARRL logo stickers (about one and one half inches high) for the membership. On motion of Mr. Wilson, seconded by Mr. Sullivan, it was VOTED that this matter be laid on the Table. Mr. Heyn asked to be recorded as voting opposed.

75) On motion of Mr. Heyn, seconded by Mr. Wangler, it was unanimously VOTED that the Management and Finance Committee is directed to report at the January 1985 Board Meeting its proposals for improving the communications effectiveness between the field organization and the ARRL Headquarters. During the course of the above, the Board was in recess from 2:18 to 2:25 P.M.

76) On motion of Mr. Wangler, seconded by Mr. Butler, it was VOTED that the VRAC be requested to study the band plan for 420-450 MHz with the intent of recommending a standard for repeater in/out frequency relationships, either high-in/low-out or vice versa. Mr. Heyn asked to be recorded as voting opposed.

77) It was moved by Mr. Wangler, seconded by Mr. Milius, that the ARRL DX Advisory Committee study what existing and/or new DXCC awards, if any, should apply to the 24-MHz band and what special considerations should apply to such awards. On motion of Mr. Wilson, seconded by Mr. Hurlbert, it was unanimously VOTED that the motion be amended to read as follows: "That the ARRL Plans and Programs Committee study what existing and/or new DXCC awards if any should apply to the 24-MHz band and what special considerations should apply to such awards. No contest or awards credits would be permitted prior to Board action." The question thereupon being on the motion as amended, the measure was unanimously ADOPTED.

78) On motion of Mr. Wangler, seconded by Mrs.

Lewis, it was unanimously VOTED that the General Manager investigate and report to the Board at the next Board meeting a means by which the Advanced class license holder could have a more involved role in the Volunteer Examiner Program.

79) On motion of Mr. Turnbull, seconded by Mr. Olson, it was unanimously VOTED that the General Manager contact one or more successful 2-meter coordinating groups to determine the ingredients of their data bases and any additional recommendations, these to form the basis of a study to develop a standard data base for the use of coordinating groups supplying information for the ARRL Repeater Directory.

80) On motion of Mr. Turnbull, seconded by Mr. Atkins, the following resolution was unanimously ADOPTED:

WHEREAS, E. Merle Glunt, W3OKN, contributed so much to the successful outcome at the 1979 World Administrative Radio Conference for the Amateur Radio Service, and

WHEREAS, Mr. Glunt has served over the several years leading up to and including WARC-79 as the League's chief consultant on telecommunications conference preparation, and

WHEREAS, Mr. Glunt served the League over the last several years, without thought of personal gain or glory, in the finest traditions of the Amateur Service, having only recently retired from active service to the ARRL, now

BE IT RESOLVED, that on the Fifth Anniversary of WARC-79, the Board of Directors of the American Radio Relay League extends its congratulations and deep appreciation to E. Merle Glunt, W3OKN; and BE IT FURTHER RESOLVED that a suitable plaque, along with a copy of this RESOLUTION, be presented to Mr. Glunt at such time and place as would accord an appropriate opportunity to honor him.

81) At 2:44 P.M., on motion of Mr. Metzger, seconded by Mr. Butler, it was VOTED that the Board resolve itself into a Committee of the Whole to discuss personnel matters. The Board rose from the Committee of the Whole at 3:58 P.M. and then was in recess from 3:58 P.M. until 4:13 P.M. Messrs. Benson, Clift, Dannels, Imlay, Place, Rinaldo, Sumner and Williams were absent from the room during the meeting of the Committee of the Whole.

82) On motion of Mr. Nathanson, seconded by Mr. Stevens, it was unanimously VOTED that the Report of the Committee of the Whole is accepted.

83) It was moved by Mrs. Lewis, seconded by Mr. Olson, that paragraph 2, sentence 2 of the Rules and Regulations Concerning Affiliated Societies in the Bylaws of the ARRL be modified to read, "... who, in discretionary consultation with the respective Affiliated Club Coordinator and Section Manager, ..." A roll call vote being required the question was decided in the affirmative. All the Directors voted in favor, except Messrs. Carey, Grauer and Wilson, so the amended rule was ADOPTED.

84) It was moved by Mr. Hurlbert, seconded by Mr. Butler, that the General Manager cause a survey of United States members of the ARRL to be taken, making use of the new QST mailing-cover opportunity, upon the question of United States amateur SSB mode operation in the 40-meter band, below 7.1 MHz. Further, that the survey be taken by post card insert, postage to be supplied by member-respondents, and that the survey format be as follows: [respondent a format was presented]. Further, that no editorial comment precede or accompany the survey; that is, no influence be exercised which might directly or indirectly bias this poll. It was moved by Mr. Heyn, seconded by Mr. Turnbull, that the matter be laid on the Table, but the motion to Table was LOST. After further discussion, a roll call vote being requested, the question was decided in the affirmative. All the Directors voted except Messrs. Diehl, Heyn, Olson and Wilson, who voted nay, and Messrs. Atkins, Grauer and Turnbull, who abstained. Accordingly, the motion was ADOPTED.

85) At 4:33 P.M., Messrs. Atkins, Olson, Benson and Mark left the meeting.

86) On motion of Mr. Hurlbert, seconded by Mr. Milius, it was unanimously VOTED that the Plans and Programs Committee review and study the entire advisory committee concept and determine what changes, if any, are necessary to increase the effectiveness of said committees, and report its findings and recommendations to the Board of Directors.

87) On motion of Mr. Heyn, seconded by Mr. Grauer, the following resolution was unanimously ADOPTED:

The Board of Directors of the American Radio Relay League hereby extends special recognition to the following individuals for their outstanding service to Amateur Radio in support of the Games of the XXIII Olympiad, Los Angeles, 1984: Steve Simek, WA2NNT; Bob Gonsett, WA6QQQ; Bill Carpenter, WA6QZY; Terrie Maguire, WB6MRZ; Chuck Lobb, KN6H; Jim Michaels, W6PGM; Dick Mannheimer, K6LAE;

Wayne Curley, WA6NRB; and Ted Harris, N6IU. The Board also commends the hundreds of radio amateurs who volunteered their time and talents to help make the Olympics a success through Amateur Radio. Whereupon at 4:40 P.M., Mr. Heyn left the meeting and Mr. Overbeck took Mr. Heyn's seat at the Table.

88) On motion of Mr. Wilson, seconded by Mr. Overbeck, it was unanimously VOTED that the motion regarding the Ad Hoc Committee on VHF/UHF Contesting be lifted from the Table. On motion of Mr. Sullivan, seconded by Mr. Wilson, it was VOTED that the motion be amended to read as follows: "No changes in contest or DX rules may be implemented except in a manner prescribed by the Board to be effective 1 January 1985." The question now being on the motion as amended, the measure was unanimously ADOPTED.



Hudson Division Director Diehl, W2IHA, breaks away from a "planning huddle," apparently happy with a decision.

89) On motion of Mr. Wilson, seconded by Mr. Sullivan, it was VOTED that the motion dealing with data banks for assisting local repeater coordinating committees be lifted from the Table. It was moved by Mr. Sullivan, seconded by Mr. Stevens, that the General Manager and the Plans and Programs Committee study the feasibility of establishing a databank for assisting Frequency Coordinators, the Committee to report to the Board no later than the First Meeting in 1985. The Chair ruled the motion out of order, in that an earlier motion by Mr. Turnbull, to seek information on databanks, had already been adopted. Whereupon, the motion was withdrawn.

90) On motion of Mr. Diehl, seconded by Mr. Overbeck, it was VOTED that the Executive Committee review all aspects of the ARRL's spectrum management activities with special emphasis on frequencies above 30 MHz, and make appropriate recommendations to the Board at the Second 1985 Meeting.

91) On motion of Mr. Diehl, seconded by Mr. Butler, it was unanimously VOTED that the General Manager send out an occasional newsletter to all frequency coordinators, perhaps quarterly.

92) It was moved by Mr. Diehl, seconded by Mr. Wangler, that a new item of ARRL jewelry be made available to members, in the form of a tie bar with the ARRL diamond logo affixed to it. After discussion, on motion of Mr. Sullivan, seconded by Mrs. Lewis, it was unanimously VOTED to refer this matter to the Membership Affairs Committee.

93) It was moved by Mr. Diehl, seconded by Mr. Overbeck, that the General Manager is directed to see that all frequencies between 147.40 and 147.49 MHz shall be listed in the ARRL Repeater Directory with an asterisk to indicate local assignment as repeater input for 1-MHz split repeater usage or simplex. On motion of Mrs. Lewis, seconded by Mr. Hurlbert, it was VOTED that this matter be laid on the Table.

94) On motion of Mr. Grauer, seconded by Mr. Sullivan, it was VOTED that the Plans and Programs Committee study the concept of each Director's being permitted to utilize QST and the "blow-in" technique for the insertion of one 8 1/4" x 11-inch sheet, not more than four times per year, for distribution of Division information or newsletters.

95) It was moved by Mr. Grauer, seconded by Mr. Wilson, that effective January 1, 1985, only members of ARRL and CRRL or nonresidents of the U.S. or Canada will be listed on the rolls and honor rolls for DXCC and VUCC. After discussion, the motion was ADOPTED.

96) On motion of Mr. Sullivan, seconded by Mr.

Grauer, it was unanimously VOTED that the General Manager make the ARRL Headquarters available for visitors on a Saturday or Sunday once each quarter with advance arrangements necessary. Sufficient notice of suitable tour dates shall appear in QST.

97) On motion of Mr. Sullivan, seconded by Mr. Grauer, it was unanimously VOTED that the Membership Affairs Committee study the feasibility of charging for all DXCC pins.

98) On motion of Mrs. Lewis, seconded by Mr. Holladay, it was unanimously VOTED that the Ad Hoc Committee on Amateur Radio Digital Communication, packet-radio clubs and packet-radio experimenters are commended for their work to date and, in particular, for their reaching agreement on the AX.25 link-layer protocol.

99) On motion of Mrs. Lewis, seconded by Mr. Sullivan, it was unanimously VOTED that the Proposal for Packet-Radio Development Program as described in the General Manager's report be adopted.

100) On motion of Mr. Stevens, seconded by Mr. Milius, it was unanimously VOTED that the Plans and Programs Committee study the feasibility of ARRL offering its assistance to FCC in the area of maintaining amateur licensing records in general, but especially in the administration of special call sign requests of clubs and individuals.

101) On motion of Mr. Stevens, seconded by Mrs. Lewis, it was VOTED that the ARRL Awards Committee and the DXAC maintain a written record covering DXCC countries decisions. This record shall describe the general rationale behind each decision, including precedents, other arguments and dissenting opinions. This record shall be made available to League members, nonmembers for a nominal fee.

102) It was moved by Mr. Stevens, seconded by Mr. Overbeck, that the Contest Advisory Committee examine and redefine as necessary, the purpose, function, role and organization of Field Day. On motion of Mr. Wilson, seconded by Mr. Carey, it was unanimously VOTED to lay this matter on the Table.

103) On motion of Mr. Stevens, seconded by Mr. Wilson, it was VOTED that the DX Advisory Committee be directed to study the feasibility of adding deletion criteria to the DXCC Countries List criteria.

104) On motion of Mr. Holladay, seconded by Mr. Wangler, it was unanimously VOTED that the Headquarters staff is instructed to prepare, for filing by League Counsel, a petition requesting that the Federal Communications Commission amend the rules governing the Amateur Satellite Service to add the new frequency allocations granted at WARC-79. A draft petition shall be prepared for review by the Executive Committee prior to filing with the Commission.

105) On motion of Mr. Milius, seconded by Mr. Stevens, it was unanimously VOTED that the Membership Affairs Committee conduct a study of the process by which applications for separate DXCC country status are reviewed by the DX Advisory Committee and the ARRL Awards Committee and recommend changes to the Board, the objective of any changes to be: (1) To make the process one that will be fully understood and supported by the participants in the DXCC Program, in the U.S. and Canada, as well as overseas; and (2) to ensure that the necessary resources are available for a full and impartial review of such applications. The Committee shall report to the Board at its January meeting.

106) On motion of Mr. Milius, seconded by Mrs. Lewis, it was VOTED that the Staff prepare a detailed description of the Affiliated Club Coordinators' role in all of ARRL's Affiliated Club programs, the format to be such that it can be inserted, with an appropriately labeled divider, in ACC's copies of Special Service Club Manuals.

107) It was moved by Mr. Milius, seconded by Mr. Butler, that the motion to make \$1000 available to Advisory Committees each year be lifted from the Table, but the motion was LOST.

108) On motion of Mr. Milius, seconded by Mr. Wilson, it was VOTED that in the annual ARRL DX contests and the annual ARRL 10 Meter Contest the District of Columbia shall be recognized as a separate multiplier from that of Maryland. Mr. Carey asked to be recorded as being opposed.

109) On motion of Mr. Metzger, seconded by Mr. Sullivan, it was unanimously VOTED that the Board of Directors now in session thanks Mr. Stephen Place for his efficient assistance during the current two-day meeting. Also thanks to Mr. Perry Williams, Mr. Dale Clift and Mr. Paul Rinaldo for their assistance.

110) There followed an opportunity for all present to make final comments. There being no further business, the Board adjourned *sine die* at 6:08 P.M. Total time in session as a Board: 12 hours, 36 minutes; as a Committee of the Whole: 1 hour, 14 minutes; total direct authorizations: \$3000.

Respectfully submitted,
David Sumner, K1ZZ
Secretary

due. The Team gives the code exams first — 5, 13 and 20 WPM in order. It grades each test as it is completed. Then, same goes for the written elements — the VET grades each test on the spot, and fills in the appropriate boxes in the VET report. If the applicant fails to upgrade, the application is returned. If he or she passes, the VET enters the name of the VEC in Item F of the VET report. The place and date of the examination must be entered as well.

QST: How does the VET member fill out II-B?

610: Actually, all three VET members get involved in this section. Each must put in the information that qualifies them to be VEs in the first place. It's a way the FCC can keep tabs on who's giving exams.

QST: Where can folks find out more about the new Volunteer Examiner Program?

610: You should know that! Check out *The FCC Rule Book* published by you folks. It's all there: all the rules for examiners, applicants and volunteer examiner coordinators. Some rule modifications did come up recently, though, and hams should check out your September and October 1984 Happenings column in *QST*.

QST: Yes, of course. We also ran an article on the ARRL's own Volunteer Examiner Program in the September issue. We're very proud of our role in the evolution of this exciting new program.

610: Good show! My job is to make the record-keeping aspects of the VEP as simple as possible.

QST: Is there anything else you'd like to say in closing?

610: Yes, two things. One, hams will be glad to know that we've removed the often-confusing

antenna question on my predecessor, and decided to hire a new cousin of mine, the FCC Form 854, to take care of this issue. If your antenna will be erected over 200 feet high, or 1/100 of the minimum distance between the antenna site and any aircraft landing area, you should get together with a Form 854, available from any FCC field office or from ARRL Hq.

Finally, it's been a pleasure working with hams. Lots of folks don't like the fact that there are so many of us form types here in D.C., but hams have been good with me. I think my new format will help everybody understand and appreciate the Commission's exam and license procedures much more fully. Thanks for stopping by for this nice chat!

QST: Don't mention it. Thank you for your time. ◻

Washington Mailbox

Conducted By Katherine Hevener,* WB8TDA

Licensing: The First Step

This month, we will examine the types of Amateur Radio licenses, eligibility requirements, license terms and the procedure for obtaining and/or modifying an existing one, as well as other matters of importance.

Q. Reference is constantly being made to the terms "station license" and "operator license." What's the difference?

A. The ticket that is issued to every amateur by the FCC, upon successful completion of appropriate examination elements, consists of an operator license and a station license. Section 97.3(d) defines an operator license as "The instrument of authorization including the class of operator privileges." It gives the license holder the FCC's permission to operate an Amateur Radio station.

The station license, on the other hand, is defined as "The instrument of authorization for a radio station in the amateur radio service." It contains the station call sign (97.3[d]).

Q. Who is eligible for an Amateur Radio license?

A. According to Section 97.9, "anyone except a representative of a foreign government is eligible for an amateur operator license." Although FCC no longer asks on the Form 610 if an applicant has been convicted of a felony, the FCC does screen out applicants who have had their amateur licenses revoked. Such people may be barred from a new license for a year after the expiration of the revoked ticket. FCC also screens applicants who have been disciplined for CB offenses.

Q. So, how do I get an amateur license?

A. You must complete a Form 610 (available from ARRL Hq. or any FCC field office) and submit it to Volunteer Examiners prior to administration of the test for the class of license you desire.

Q. How long will my license be valid?

A. Ten Years. The term was changed from 5 years earlier this year.

Q. My Novice license was issued in 1980. When will it expire?

A. Your ticket will expire in 1985, since all licenses, regardless of the class, become invalid on the date shown on the ticket. When you renew or otherwise modify it, however, both your operator and station license will be valid for 10 years, rather than five (97.59[a][b]).

Q. How do I go about renewing my license?

A. You must submit a completed Form 610 with a photocopy of your license to the Commission's office at Gettysburg, Pennsylvania. According to Section 97.13(c), "Application for renewal of unexpired licenses must be during the license term and should be filed within 90 days, but not later than 30 days, prior to the end of the license term. In any case in which the licensee made timely and sufficient application for renewal of an unexpired license, no license with reference to any activity of a continuing nature shall expire until such application shall have been finally determined."

If your license has already expired, you must immediately terminate your operating activities and concentrate on obtaining a valid ticket. You must submit an application for reinstatement of a license that was issued prior to January 1, 1984 at any time during a five-year grace period. But your station will be assigned a new call if you wait more than two years. In other cases, you can have your license reinstated within two years of its expiration. Section 97.13(d) states that "A license renewed during the grace period will be dated currently and will not be back dated to the date of its expiration."

Q. What procedures must our club, The RATS, follow to obtain a special-events call to commemorate the invention of generic brand rat killers?

A. The FCC no longer issues special-event station call signs. Thus, you will have to use a valid club call or that of a member to celebrate this memorable occasion.

Q. A club in a neighboring state has its own call sign. Why can't we get one?

A. Because the FCC stopped issuing new club, RACES and military-recreation station licenses. The club in your neighboring state may continue to apply for renewal of its station license, however, since the FCC still renews club, RACES and military-recreation group station licenses.

Q. How do we go about renewing our club license?

A. Simply have the station trustee complete Form 610-B and send it to the FCC office in Gettysburg, Pennsylvania, along with a Form 610 for renewal of his or her primary station license. Note: Your club license is bound by the same terms that exist for operator and station license renewals.

Q. My license was stolen. Can I get a replacement?

A. Yes. You may obtain a replacement bearing the same date as the original by submitting a statement to the FCC office in Gettysburg explaining the circumstances under which the license was lost. If you later find your original license, you must return it or the duplicate to the Commission's Gettysburg office (97.57 and 59[c]).

Q. What will happen to my license if I intentionally or unintentionally violate an FCC rule?

A. The FCC does not distinguish between intentional and unintentional offenses. Thus, if you are found in violation of a rule, you will receive an official notice of violation from the FCC. Upon receipt of such notice, you will have 10 days in which to submit a written response explaining the cause and solution to the problem directly to the office of the Commission originating the official notice. You will be allotted additional time to respond to a notice of violation if illness or other unavoidable circumstances prevail. Failure to respond will most likely result in the implementation of revocation and suspension proceedings (97.137). ◻

*Membership Services Assistant, ARRL

- **More Modes On 160**
- **Ham/Radiolocation Faceoff On 160**
- **Maxim Award 1984: Call For Nominations**

FCC Proposes New Amateur Bands

Although the WARC Final Acts allocated additional frequency bands to the Amateur Radio Service, amateurs cannot operate on the new bands until the FCC implements the allocations domestically through the rule-making process. On October 10 the FCC released a *Notice of Proposed Rule Making*, in PR Docket No. 84-960, seeking to allow amateur occupancy, on a permanent basis, of 10,100-10,150 kHz, 24,890-24,990 kHz and 902-928 MHz.

This NPRM results, in part, from petitions filed by the ARRL (RM-4784) and Stuart D. Cowan, W2LX, M. F. DeMaw, W1FB, Robert P. Haviland, W4MB, William I. Orr, W6SAI, and A. Prose Walker, W4BW (RM-4781). The petitioners sought access to the three new bands at the earliest practical date. RM-4781 also sought early access to the 18.068-18.168 MHz band.

In addition, the FCC is proposing to bring Part 97 of its rules into conformity with Part 2 and disallow amateur operation along the Canadian border on 420-430 MHz except through a waiver.

Here is a band-by-band update:

• **10,100-10,150 kHz:** Amateurs were authorized temporary use of this band (with the exception of 10,109-10,115 kHz) in October 1982. The NPRM would authorize the *entire* 50 kHz for use by General, Advanced and Extra Class licensees with A1 or F1 (including A2J) emissions on a permanent basis. No special power limitation would be imposed. *Effective immediately*, and until an outcome is reached in this proceeding, amateurs may use the *entire* 10,100-10,150 kHz band. Present restrictions

must be adhered to, which means that A1 and F1 (including A2J) emissions are allowed subject to a peak-envelope-power output limitation of 200 W.

• **18,068-18,168 kHz:** The ARRL did not request early access to his band since it was known that the FCC was not in a position to release it. In its NPRM, the FCC states that government fixed operations have priority in the band and would preclude any access by amateurs prior to 1989.

• **24,890-24,990 kHz:** The FCC is proposing to allocate this band to General, Advanced and Extra Class licensees in accordance with the band plan recommended by the ARRL (based on the worldwide IARU band plan): A1 and F1 emissions would be permitted on 24,890-24,930 kHz; A1, A3, A4, A5, F3, F4 and F5 emissions would be permitted on 24,930-24,990 kHz. There would be no special power restriction, but the rules would make it clear that amateur operation would be on a secondary basis to international fixed and mobile operations, which could not be moved until a later date.

• **420-430 MHz:** The FCC proposes to implement the part of its *Second Report and Order* in General Docket 80-739 that prohibits amateur operation on 420-430 MHz along the Canadian border without a waiver. Amateur operation above "Line A" would be prohibited, although waivers could be obtained, based on appropriate technical considerations. While this proceeding is pending, only those stations already operating north of Line A in the 420-430 MHz band are authorized to continue to operate. These stations must discontinue operation if the Government

of Canada objects to their continued operation, and they must cease operation at the termination of this proceeding unless they have received a written waiver from the FCC by that time.

Line A begins at Aberdeen, Washington, running by great circle arc to the intersection of 48 degrees N. 120 degrees W.; thence along parallel 48 degrees N. to the intersection of 95 degrees N.; thence by great circle arc through the southernmost point of Duluth, Minnesota; thence by great circle arc to 45 degrees N. 85 degrees W.; thence southward along meridian 85 degrees W. to its intersection with parallel 41 degrees N.; thence along parallel 41 degrees N. to its intersection with meridian 82 degrees W.; thence by great circle arc through the southernmost point of Searsport, Maine, at which point it terminates.

• **902-928 MHz:** The FCC proposes to allocate this band for use by all U.S. amateurs except those in parts of Colorado, Wyoming and U.S. possessions in Region 3. Amateur operation in this band would be secondary to the operation of Government stations, Automatic Vehicle Monitoring (AVM) systems, and industrial, scientific and medical (ISM) devices. Additionally, U.S. amateurs would be required to avoid causing harmful interference to authorized fixed, mobile and broadcasting operations in Regions 1 and 3. There would be no subdividing of the band by mode of operation and no special power limitation. All classes of amateurs above Novice would be authorized use of the band.

The deadline for comments in PR Docket 84-960 is December 17, 1984; reply comments are due by January 16, 1985.

FCC PROPOSES ADDITIONAL MODES ON 160 METERS

The FCC has released a *Notice of Proposed Rule Making*, in PR Docket No. 84-959, that would amend the amateur rules to authorize A4, A5, F1, F3, F4 and F5 emissions in the 160-meter band in addition to the currently authorized A1 and A3 emissions. This is in response to an ARRL petition seeking to authorize F1 emissions in that band. The League cited two factors in support of its request. First, there has been a rapid growth of radioteletype (RTTY) activity

during the past five years; this growth will continue because of the availability of inexpensive personal computers, which can be readily adapted to this emission mode. Second, the downturn in the sunspot cycle is compressing sky-wave communications into the lower part of the HF bands and making the 160-meter band essential at night for certain paths. Some of those filing comments on the League's petition asked that additional modes be authorized in addition to F1, resulting in the FCC's generalized proposal.

With the discontinuance of Canadian Loran A radiolocation operations in the 1900-2000 kHz band, the FCC feels there is no reason to continue to limit emission modes in the 160-meter band. As a result of the proposed changes,

amateurs would be able to experiment with several emission modes. The FCC is not proposing to subdivide the 160-meter band by emission modes; amateurs would be on their own to come up with a volunteer band plan.

The FCC warns that there is currently a proceeding, PR Docket No. 84-874, that proposes to reallocate 1900-2000 kHz on a primary basis to the Radiolocation Service. Investment in equipment by Amateur Radio licensees to operate with the additional emission modes should be made with full awareness of the fact that action in this proceeding could affect the status of amateur operation in the 1900-2000 kHz band.

Comment deadline is December 20, 1984; reply comments are due by January 22, 1985.

*Acting Manager, Membership Services, ARRL.

Be a Contributor to the Goldwater Scholarship Fund

Here's your opportunity to thank Barry, K7UGA, for his long-term staunch support of the Amateur Radio Service and to let him know of your appreciation. Send in your contribution now.

If your contribution is \$25 or more, we will list your name and call in QST. If your contribution is \$100 or more, in addition to your name and call appearing in QST, you will receive a signed photograph of the Senator, suitable for display in your hamshack. And for contributions of \$1000 or more; in addition to the above, we'll put your photo in QST and you'll receive a personal thank you call from Robert York Chapman, W1QV, President of the ARRL Foundation, which is administering the Goldwater Scholarship Fund.

We welcome all contributions, regardless of size. Please help us achieve our goal of building an endowment sufficient to fund the Goldwater Scholarship in perpetuity. What better way to honor a great amateur, a great statesman and a great human being? Please make your check payable to the ARRL Foundation Goldwater Scholarship Fund, and send to ARRL Foundation, 225 Main St., Newington, CT 06111.

Recent contributors of \$25 or more include: Fred W. Albertson, W4BD; David B. Arnold, Jr., KA1CPL; Loren F. Ashwood, W9DH; Buster B. and Sandra M. Boatman, N0CK and N0DPX; Branch County Amateur Radio Club; William G. Buckner, W0VZK; Thomas Clements, W11CH; Ester E. Frost, KA4IFF; in memory of James E. Jones, KC2II; Dave Maier, K8BGZ; John J. Mulhern, KA2OYY; Oak Park Amateur Radio Club; Jacob Smit, AA4DC; Carl Smith, W0BWJ; Jack Speer, N1BIC; Judy Speer; Alphonsus Stankus, KA3CVC; Joseph Warshawsky, KA5NXV; Mark Yoder, KA9MQS; Robert Yoder, WD9GSU; Guedon E. Zakotnick, N3C8Y.

Are You a Lawyer?

Amateur Radio Wants You!

Your legal expertise is needed in the Amateur Radio community to help build and maintain the legal foundations for our hobby. The League has initiated a Volunteer Counsel Program, designed to help stem the tide of overly restrictive regulations on Amateur Radio. You can help. If you have an interest in this exciting area of communications law, are a reputable member of the bar of at least one state and are a League member, please contact us. As a Volunteer Counsel, you will be kept well informed about areas of law affecting Amateur Radio. For further information, write to the ARRL Volunteer Counsel Program, 225 Main St., Newington, CT 06111.

delegation led the fight to keep this segment strictly for Amateur Radio in Region 2, even though it is allocated to the Broadcasting Service in Regions 1 and 3. As far as the League has been able to determine through its contacts within the International Amateur Radio Union (IARU), all countries in Region 2 permit their amateurs primary and exclusive use of this band segment. ARRL notes that the band has unique propagation characteristics for amateurs and has been quite valuable during emergency situations, but that broadcasters already enjoy several bands with similar propagation characteristics.

ARRL points out: "While the U.S. does represent interests outside Region 2, it is first and foremost a Region 2 country and is viewed as such by the other countries of the Americas. While the authorizing of non-government broadcasting from U.S. territory in Region 3 at 7100-7300 kHz clearly is permitted by the International Radio Regulations, such would be inconsistent with overall U.S. policy concerning 7 MHz. It might also be regarded as a breach of faith by the other countries of the Americas, who willingly followed the lead of the U.S. in 1979 in defending the amateur allocation."

Should the FCC be so unwise as to proceed with this course of action, ARRL then recommends that broadcasters be forced to meet stringent technical criteria designed to minimize interference to amateur operation in the Americas.



New Jersey Governor Kean (far right) discusses Amateur Radio Week in New Jersey with Ken Liddanz, WB2GWD, Cherryville Repeater Association President, as ARRL PIO Charlie Kosuan, WB2NQV, and State Assemblyman Dick Zimmer look on.

LEAGUE DRAWS FIRE FROM ONI

As reported in this column last month, the FCC has proposed (PR Docket No. 84-874) to allocate the 1900-2000 kHz band to the nongovernment Radiolocation Service on a primary basis because of an anticipated expansion of the AM broadcast band, which would cause certain radiolocation stations to move. The ARRL filed a Motion to hold this proposal in abeyance pending the resolution of an ARRL petition filed the day before the FCC released its proposal. The League had filed a *Petition for Initiation of Inquiry Proceeding* asking that the Commission initiate an inquiry into the present use of radio-frequency spectrum in the medium-frequency band by nongovernment radiolocation users. Now, Offshore Navigation, Inc. (ONI) has filed an opposition to ARRL's motion to hold FCC's proposal in abeyance or alternatively to treat the rule making as a Notice of Inquiry.

ONI, a company that provides radiolocation services to the offshore oil industry and others, argues that the League's petition addresses ques-

tions that have been settled in earlier proceedings related to WARC implementation. ONI also asserts that an inquiry such as requested by the ARRL must necessarily consider not only the Radiolocation Service requirements but also the Amateur Service requirements inasmuch as competitive uses of spectrum cannot be considered in a vacuum. *Note: Comment deadlines in the 160-meter Radiolocation proceeding have been extended to January 24, 1985; reply comments to March 11.*

40-METER SW BROADCAST UNWANTED

ARRL has filed comments in Mass Media Docket 84-706 opposing the FCC licensing of any shortwave station outside Region 2 (the Americas) in the band segment 7100-7300 kHz. ARRL admits at the outset that FCC would be within its legal rights to do so, but it would not be a good idea.

ARRL points out that at WARC-79, the U.S.

PALOS VERDES POSTSCRIPT

Rancho Palos Verdes is an upscale suburb of Los Angeles that enacted a restrictive antenna ordinance shortly after it became a city in 1975. When that happened, local amateurs launched a public relations campaign to educate the people of this community — and their elected leaders — about ham radio.

As a result, the antenna ordinance was greatly liberalized, and in the process several hams became civic leaders in Rancho Palos Verdes. A QST article described how this was accomplished ("PR in Palos Verdes," Nov. 1980, p. 56).

In the mid-1980s — more than five years after the antenna battle was won — the long-term benefits of the hams' public relations campaign are more evident than ever.

Today, two licensed hams are members of the Rancho Palos Verdes City Council: Mayor John McTaggart, WD6GBG, and City Councilman Mel Hughes, K6KSY, who will be the mayor next year. The Planning Commission (the second most powerful body in city government) includes among its five members Peter Von Hagen, WA6HXM, and Louella Wike, whose husband

Pending Dockets Affecting Amateur Radio (as of October 31, 1984)

Docket	Subject
78-369†	RFI Docket; further NOI released. (See Happenings, Feb. 1979 QST; also see March 1979 QST, pp. 9 and 48, Sept. 1981 QST, pp. 9 and 58, and Dec. 1981 QST, pp. 70-71.)
79-144†	NPRM to solicit comments on effects of RF exposure standards on radio services and equipment, and FCC proposal to adopt regulations to protect health of employees and the public exposed to radiation in excess of national standards. (See Happenings, March and Aug. 1980 and April 1982 QST.)
81-413†	NOI-NPRM to allow use of spread spectrum above 70 MHz for low-power devices under Part 15.
81-414†	NOI-NPRM to allow use of spread spectrum in amateur bands. (See Happenings, Sept. and Dec. 1981 and May 1982 QST.)
83-26†	Proposal to establish a personal radio service at 900 MHz. (See Aug. 4, 1983 ARRL Letter.)
83-114†	NOI-NPRM to reexamine technical regulations. ARRL requests that 24-35 MHz amplifier ban be lifted. (See Happenings, Oct. and Dec. 1983 QST.)
84-706†	Proposal to authorize the use of 7100-7300 kHz by international broadcast stations in Region 3 under the jurisdiction of the FCC. (See Happenings, Sept. 1984 QST.)
84-874	NPRM proposing to allocate 1900-2000 kHz to the nongovernment Radiolocation Service on a primary basis. (See page 61.) Comments due Jan. 24, 1985; reply comments due March 11, 1985.
84-959	NPRM to allow A4, A5, F1, F3, F4 and F5 on 160 meters. (See page 61.) Comments due Dec. 20, 1984; reply comments due Jan. 22, 1985.
84-960	NPRM to allocate 10.1 to 10.15 MHz and 24.89 to 24.99 MHz to the Amateur Service on a primary basis. Also proposes to make 902-928 MHz available except in parts of Colorado, Wyoming and U.S. possessions in Region 3. Proposes to require advance coordination for operation near the Canadian border. (See page 61.) Comments due Dec. 17, 1984; reply comments due Jan. 16, 1985.
79-47	NPRM to amend Parts 73 and 97 of the FCC Rules concerning commercial radio and television broadcasts of messages transmitted by nonbroadcast radio stations. (See Happenings, Sept. 1984 QST.) Reply comments due Nov. 23, 1984.
PRB-1	Request For Issuance of Declaratory Ruling requesting limited federal preemption of state and local regulation of amateur and other radio station installation and operation. (See Happenings, Nov. 1984 QST.) Comments due Nov. 9, 1984; reply comments due Dec. 13, 1984.

†Comment deadline passed. Awaiting Commission action.



Hiram Percy Maxim, W1AW, ARRL founding president.

NOMINATIONS OPEN FOR MAXIM MEMORIAL AWARD

Nominations are hereby solicited for the 1984 Hiram Percy Maxim Memorial Award (see Aug. 1983 QST, p. 54). The Award is to be given annually to the licensed radio amateur under the age of 21 whose accomplishments and contributions are of the most exemplary nature within the framework of Amateur Radio activities, including, but not limited to, the following:

- 1) participation or leadership in organizational affairs at the local or national level
- 2) technical achievement
- 3) operating record
- 4) recruitment and training of new amateurs
- 5) public relations activities.

In keeping with the tradition of the award when it was first established in 1936, formal nominations will be made by the respective ARRL Section Managers (see list on page 8 of this issue). Suggestions and supporting information, including the endorsement of ARRL affiliated clubs and elected or appointed League officials, should be submitted to your Section Manager by March 1, 1985 with a copy, if possible, to: Chairman, Maxim Award Panel, c/o Secretary, ARRL, 225 Main St., Newington, CT 06111.

In consultation with the appropriate ARRL Division Directors, an Award Panel consisting of five distinguished amateurs will review the nominations received from Section Managers and select a winner. The winner will receive a cash award of \$1000, a suitably engraved plaque, and travel and accommodations expenses to enable him or her to attend an ARRL convention at which a formal presentation will be made.

Nominations must be received by March 1, 1985, and should document as thoroughly as possible the Amateur Radio achievements and contributions of the nominee during calendar year 1984. Additional information concerning the character of the nominee is welcome. The initial nomination should be as complete as possible; owing to time constraints, it will not be possible for the Award Panel to engage in correspondence to gather missing information.

The Hiram Percy Maxim Memorial Award is intended to provide encouragement, and a tangible reward, for outstanding young amateurs. It should also provide an opportunity for Amateur Radio, and its many benefits for young people, to be brought to the attention of the public. Your assistance in finding qualified nominees will help make the program a success! GEM

is W6GPE. Still another ham, Dick Mills, WA6MLL, is chairman of the city Traffic Committee.

Councilman Hughes says that the antenna controversy of the late 1970s was never raised as an issue during his and Mayor McTaggart's election campaigns. Amateur Radio is a respected part of community life.

Much of the credit for this belongs to the Palos Verdes Amateur Radio Club, which is deeply involved in community-service projects — many of them high-profile activities. For example, the club provides video coverage of important civic events, including meetings of the city council itself, for the city's cable television system. The club also does videotapes of charitable events, such as the National Horse Show and the Music Fair, and provides radio communications for the Palos Verdes Marathon. The club has just begun videotaping school board meetings for the local cable system.

Aside from the satisfaction the Palos Verdes hams receive from their civic activities, there are important benefits for Amateur Radio. That's what Joe LoCascio, K5KT, discovered in 1984 when he applied for permission to put up a new antenna system at his Rancho Palos Verdes home.

An avid DXer (and the president of the Southern California DX Club), K5KT sought — and was granted — the city's blessing to put up an 84-foot crankup tower with a "Christmas tree" of stacked Yagi beams on top. Joe's highest beam will be 99 feet above the ground — in a city that once required a special permit even for

a 35-foot-high inverted V! — Wayne Overbeck, N6NB

AIRS UPDATE

The ARRL Interference Reporting System is continuing to watch the HF bands for nonamateur stations that cause harmful interference. September monitoring data sent to the FCC's Treaty Branch consists of the following cases of harmful interference: 3586 kHz (J3E emission, thought to be YVK 946 in Venezuela); 14,002 kHz (F1B emission, location thought to be USSR); 14,115 kHz (F1B emission, no ID); 14,160 kHz (F1B emission, no ID); 14,218 kHz (F1B emission, location thought to be USSR); and 14,226 kHz (F1B emission, location thought to be USSR).

The latest AIRS Alert covers the 14,110-14,118 kHz range. Headquarters has 9500 AIRS reports on magnetic disk, to date.

REPEAT SECTION MANAGER NOMINATING SOLICITATION

Since no petitions were received for the West Indies Section by the petition deadline of June 8, 1984, as a result of notices in the April and May QST, nominating petitions for this Section are herewith resolicited. The closing date for receipt of petitions is December 7, 1984. See the notice in November QST for details on how to nominate.

Correspondence

Conducted By Peter R. O'Dell, K81N

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

BIAS AND GRID CURRENT

□ Your October "It Seems to Us" editorial so disturbed me that I am impelled to write what is for me only about the second letter to the editor in a long life. Your phone bias is no news of course; what upsets me is that you have the temerity to boast and be proud of the "accomplishment." Do you not know that what you gained for SSB was at the expense of a large segment of the membership? It is clear that you have written off as inconsequential the feelings and needs of the CW portion of our fraternity.

CW operators are crowded, too, and need more room. I have been a League member most of the time since 1934, and I do not recall an instance when the League ever tried to get wider CW subbands. I used to believe naively that the League would look after me!

How did we get in this fix? I suggest two reasons: One, we have carelessly allowed phone enthusiasts to gain control of the Board of Directors and, two, we have a headquarters staff, most of whom cannot copy CW. Each time we have been raided, we devised cleaner transmitters with better signal purity, 300 cycle bandpass receivers, audio filters, etc., plus the ability to follow the desired signal in the presence of three or four others. We just took our lumps. A political solution would have been better.

The word "relay" should be dropped from our name. I have received numerous messages which had been relayed through fone channels; I have yet to receive one free of errors. One can relay more information in five minutes by code (and near error free to boot by some techniques) than can be accomplished in an hour by SSB. But my bias shows. Let me try to be objective.

The Morse Code was a century ahead of its time. Samuel Morse (1791-1872) and George Boole (1815-1864) were contemporaries, but Morse saw his ingenious idea accepted and used almost immediately, while Boole did not live to see the same for his. Only with the advent of the computer era did Boolean Algebra come into its own. Morse code is an elegant hybridization of the binary on/off with pulse length modulation. It is truly alphanumeric. Instead of being antiquated and out of date as single sidebanders seem to think, it is as modern as tomorrow.

The wave of the future and the fastest growing segment of our hobby is that of computer generated and video displayed codes. In a few years SSB will join AM and the Dodo. History will be hard pressed to explain the current myopia. Old Hiram Percy must be incredulous at what is happening. — *Truett Blackmon, W5ETM, Lovington, New Mexico*

ADS ADD ADDITIONAL ADHERENT

□ Upon seeing my first copy of *QST*, I was convinced that I wanted to be a ham operator. The ads were enticing. I taught myself at home and am licensed now. — *Earl G. North, KA5UAA, Leesville, Louisiana*

IS THERE A DOCTOR ON FREQUENCY?

□ It's really amazing how modern technology solves problems. Just when the contesters and certificate hunters have made the DX bands almost useless for real QSOs, we now have the solution. They can now stay off the air and send their "599" (what else?) to a computer. Wonderful! The computer figures their QSOs per hour and even issues awards!

Now that there is no further excuse for cluttering up the bands with this nonsense, I am looking forward to some real DX QSOs. — *R. V. McGraw, W2LYH, Riverhead, New York*

BIGOTRY

□ This evening I sat down to talk to my friends on 75 meters. Hoping for a pleasant time with a nice bunch of people, I was shocked by what happened. Some other people felt that we were conducting our QSO on their frequency — not an unusual situation. But before we could resolve anything, we were showered with a torrent of abuse. Our colleagues managed to cover a broad spectrum of bigoted obsessions: Easterners (actually, we cover about a quarter of the country), the League (about half are members), the aged (range from 21 to 80), Jews and Catholics (we represent all major groups including clergy and agnostics), and a long list of racial and ethnic groups. We were accused of technical incompetence (a number are EEs) and general stupidity (several of us have doctoral degrees). And on it went.

Most of us scattered. I stayed on, trying to talk with one of these people. I hoped that if they met one of us as we are, they might be less likely to attack all of us as stereotypes. But this was not to be, for they gave me neither a reply nor even a call sign. And not long after, they left. It was as though, without us there to abuse, they had no reason to be present themselves.

Of course, I was angry. I get on the air to get away from these things. I work as a psychiatrist in a children's hospital and I often see abuse, rejection and hatred. I suppose, as I tell parents, that one cannot always escape these things, that there is no totally safe shelter. Still it hurts. Like most feeling people, when I hear this abuse, I become a member of all the groups being demeaned. I wish that these bigots could realize how much pain their vitriol causes. Perhaps then, if they still possess some scintilla of humanity, they would desist.

Finally, I was and am concerned. This type of bigotry, which festers in certain segments of our bands, is a disgrace that few of us wish to acknowledge. I wonder what would happen if certain civic or political leaders, say an FCC Commissioner or two, were to overhear these antics. It might be hard for us to convince them that these operations represent only a small subgroup, that they were a deviation from our traditions of fraternity and good will. The real world has become much less acceptant of this garbage, much less willing to look the other way. Likewise, we amateurs, both as individuals

and as League members, must summon the courage to recognize this problem — and fight it. — *William M. Klykylo, M.D., WA8FOZ, Cincinnati, Ohio*

OLD RADIO, NEW FEATURES

□ Just a short note on Amateur Radio equipment being used for the wrong purpose on a television show. Tonight I watched a new television show called "Jessie." The first scene concerned a hostage situation where the police used "sophisticated equipment" to patch into a telephone near the criminal. Upon close examination I noticed the equipment was actually a Kenwood TS-520 transceiver! They attached a telephone headset to the front of the rig. My Kenwood manual never said anything about this option! — *Jonathan C. Kummer, WA2OJK, Great Neck, New York*

NAME THAT TUNE

□ I have spent the last two evenings trying to listen to 40 meters. The problem has not been international broadcast stations but my neighbor's new musical synthesizer. This is no joke! Every 2 kHz there is a frequency modulated signal about S9 on 40 meters that is also present but weaker on 20 and 15.

A few weeks ago while listening to the 6 meter FM call channel 52.525 MHz, I heard the foulest language. This signal seemed almost like a telephone call. The next day it again appeared and I traced it to my neighbor (not the same one). The signal was his slightly off frequency (1694 kHz) cordless phone on the 31st harmonic.

I wrote this letter not just to complain, but to tell other hams to be prepared to put up with or fight these new "bootleggers." With the trend of the Federal Communications Commission towards deregulation, what's next? — *Mark S. Logsdon, K9ML, Indianapolis, Indiana*

MEANINGFUL FIRING SQUAD QSO

□ I have read several letters in *QST* during the past months regarding "meaningful DX QSOs." It seems that many American amateurs are unaware of the regulatory realities of life in many foreign countries, and think that all DX stations share the same freedoms that we enjoy.

In many of the countries which do not have third-party agreements with the U.S., postal and telecommunications services are tightly controlled by the government, and amateurs are not allowed to transmit anything other than call sign, name, QTH and station technical details. Any further ragchewing by an amateur under these circumstances would be cause for receipt of his country's equivalent of a "pink slip" or worse.

We should not place ourselves in the position of encouraging another amateur to break his country's laws. Keep this in mind when you attempt to engage a DX station in a ragchewing QSO. — *J. B. Burke, K1NCD, Glastonbury, Connecticut*

*Public Information Coordinator, ARRL

How's DX?



Conducted By Ellen White,* W1YL/4

DX Power

DXers, we've come into our own! What better evidence than the continuing proliferation of salable commodities tailored to our particular interest in the Amateur Radio field! A new Tab book, *DX Power: Effective Techniques for Radio Amateurs*, by K5RSG, should be hitting the market momentarily. This new title is a hefty compilation of secret tricks and tactics used by experienced DXers, on-the-air techniques and realistic advice on "hardware." Tab's flyer notes that this title is replete with "total honesty spiced with humor and understanding." Gosh, reading the book almost amounted to a therapy session — someone out there knew what I was thinking while cruising the bands in search of an elusive addition to my own countries compilation! Good heavens, does K5RSG read minds? The author is totally honest, and not apologetic, about DXers' motives and actions. If you've got over 200 countries, you'll be chuckling silently about the DX truths that comprise the DX State of Mind. What really set the hook in this author was the following introduction to Chapter 2.

Scene: New York City production studios of the CBS show, 60 Minutes.

Voice on intercom: "OK, Mr. Rooney, 30 seconds to tape."

"Right."

From the director: "Andy, turn to your left a little."

"This alright, Maurie?"

"Fine, Andy, OK, Roll tape! Five seconds, four seconds, three seconds, two, one . . ."

"Hello, this is Andy Rooney. You know what bothers me? DXers. Yeah, those hams that you hear so much about. You can't even understand what they're doing. I heard one fellow saying that he had contacted YU, DU, VU and TU but still needed XU. His friend said he had G, F and W but had not contacted I. What are these guys talking about? The alphabet? How can you contact the alphabet? And I thought Californians were weird.

"Then one day I heard one of them say that he had 248 in the fist. What does this mean? Is he physically grasping the number two hundred forty eight? I looked in his hand and I didn't see anything.

"And regular hams at least say 'hello' when they speak to others on the radio. DXers only say something like 'five-nine.' What is this? A perverse code? Is this the signal to take over Poughkeepsie? Is Washington, DC next?

"But the strangeness doesn't stop there. I heard a DXer once say, 'You're five and three, five and three, that's fifty-three, QSL?' My goodness, five and three is *eight*, not fifty-three. Can't they add? These fellows must be deficient in math.

"Yes, DXers are strange. They're like those

toothpaste tubes that don't roll up right, a constant annoyance. I went to a DXer's shack once. *Shack* is a good word for even though his house was nice this room was utter chaos. Wires and equipment and stacks of papers and cards were everywhere. I wonder what the divorce rate of DXers is?

"Then another DXer wanted to show me his finals. I thought he means exams or something. He straightened me out quick. He meant tubes. Well, I thought tubes were no bigger than beer bottles, but he showed me something that looked like a couple of five gallon water jugs. When he turned it all on the room sort of glowed. I thought we were going to evaporate. But this DXer just stood there calmly with a strange smile and a peculiar gleam in his eyes. He wasn't worried — he was happy. He was possessed.

"There are other things that bother me about DXers. They remind me of paper clips that bend too easily or postage stamps that don't stick — you know, the kinds of things that really get under your skin. For example, I saw a DXer get a 'sorry, not in log' QSL response once. He got very upset and bit his dog. Another got squeezed out of the BY pileup and he sacrificed his daughter to 'appease the gods.' Goodness, these fellows are crazy! I'd hate to see what would happen if one of them lost all his QSL cards collected over the years. Well, that's it. That's enough of DX and DXers. Good night from Andy Rooney."

Brief silence.

Then, the director: "OK. That's a wrap. Put it away guys. Thanks, Andy."

"OK, Maurie. Good night, fellas. Oh, Maurie. Close the door behind you."

"Right, Andy."

The crew's footsteps shuffle away. It is quiet in Rooney's office. A few buttons are silently switched on, a microphone is grasped and a crusty, familiar voice calls, "CQ DX, CQ DX, this is Whiskey Alpha 2 . . ."

What's covered in this book? It might be easier to list omissions! K5RSG (305 CW/F) details pileup techniques, peripherals, equipment, repeaters, nets, lists, bulletins, awards, clubs, maps, beam headings, country counting, award applications, etc. What is hit repeatedly, and with right, is the true art of listening. "When getting ready to work a DX station, be sure to find out what is going on! It is infuriating to hear the questions on frequency from idiots who just won't take the time to listen carefully and put together what is happening. Is the DX station operating transceive? Is he operating split? Is he calling by districts? Is he identifying himself and giving out QSL info? The way to answer these questions is to listen, not to ask them yourself, which just furthers the confusion and brings out

hours — two-way CW at 1800-2000 kHz. Valid contacts are Pacific to other, Pacific to Pacific, Exchange RST and zone (CQ Zone system). The contest permits contacts with stations "first time on 160" — not stations worked and confirmed before. You may *not* count stations in your own country or with 4U prefixes. Score equals contacts times zones plus countries.

Be brief in exchanges. Do not send name, location and a lot of extraneous information during peak conditions — which might cause the DX station to miss

hundreds of 'policemen' who make it even worse. Once again the key word is *listen*. It can't be emphasized enough.

"Prolonged calling makes the DXer blind to what is happening on frequency. He misses the rhythm of the DX operator — he'll lower his QSO rate. If it's a transceive operation he will interfere with others; he may antagonize the DX station who will not count him; and finally he may antagonize others, who will QRM him in return. There simply is *no* benefit to prolonged calling, as it actually reduces your chances of getting through. I have even heard — not infrequently — people still calling while the DX station is answering them; these operators miss their own QSO, winding up 'not in the log.' This is truly amazing.

"Develop the habit, *early* in one's DX career, of letting up on the mike or key frequently. Concentrate on a style of transmitting that allows you to stop, listen quickly (with experience one learns just how long) and then resume transmitting in the same basic rhythm, only to pause again and again as necessary. As soon as you recognize that the DX station is talking, stop completely and ascertain what is happening. And, if pause after pause results in never hearing the DX station, one must again stop altogether. It is possible that your transmit sequences are out of sync with the DX station's listening time."

A special note to the beginner. "DXers are cool, man. When you meet them at club dinners or conventions they radiate confidence with broad smiles and authoritative voices. They represent the upper echelon of discipline, strength and calmness. Right? Wrong! DXers are calm *after* the fray, not before or during same. In truth, DXers seem to prefer to be miserable (like duck hunters). It's not all that much fun when the quarry is not in hand. In fact, DXers ask themselves if they're not wasting time when long hours on the DX trail have produced nothing. These silly feelings vanish *instantly* once the contact has been made. There is vindication and pride for the carefully honed skills. The DXer is sure — and he will loudly tell you so — that it's all worth it.

Caveat emptor: This book (nor any advice, for that matter) will not deliver DX into your lap. There is a necessity for *personal involvement* in DX work. The book isn't a shopping list of dos and don'ts, but it is a long-term thoughtful approach to DXing. It is a management approach to problem solving in general and DX operation in particular.

(*DX Power: Effective Techniques for Radio Amateurs* by Eugene B. Tilton, M.D., K5RSG, Tab Books, Box 40, Blue Ridge Summit, PA 17214, Order No. 1740, 224 pp., 10 illustrations, \$10.95 paperback, \$18.95 hard cover.)

weaker and more-distant callers. Save 1825-1830 and 1905-1915 for split windows.

Certificates to each amateur making one or more valid Pacific contact over 5000 miles. Submit test log and 3 IRCs (or equivalent) by March 1 to Roger Mace, W6RW, 8600 Skyline Dr., Los Angeles, CA 90046.

BIG DEAL

"Last week I worked FO8IK on 20-meter CW. No big

O'BRIEN PACIFIC 160 TEST

Honoring the 160-stalwart, W2EQS, this event is to give small, distant stations the greatest chance of making top-band QSOs using a marathon period in which optimum conditions will occur.

0001Z Dec. 15 to 2359Z Jan. 15, 1985, unlimited


*19620 SW 234 St., Homestead, FL 33031



K5KG with HZ1HZ (left photo) and members of the Dhahran ARC with many notables — G3ZSS G3VVT OD5CL HZ1HZ G8ECI and G4FTC (see first item in The Circuit).



DXCC ANNUAL LIST DELAYED

Normally, the DXCC Annual List would follow How's DX? and QSL Corner. Because of the unexpectedly large number of applications, we've had to delay its appearance. 

QSL Corner

Administered By Joan Hushin, KA1IFO

The ARRL DX QSL Bureau System (Incoming)

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

How it Works

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

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

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

Claiming your QSLs

- 1) Send a 5- x 7½-in s.a.s.e. to the bureau serving

deal! My rig is an HW-8 with a 66-ft wire antenna. Output: 2 W. No big deal! I have been using CW QRP for 48 years! No big deal. The local big-gun DX hunter is rather sensitive about my QRP DX. Big deal! He runs a California kW with a big beam way up there. That's a big deal.

"Now, Ellen, I have a personality problem. Should I run QRO and, therefore, avoid personality problems with the big guns and small pistols? Or, should I continue with my philosophy that 'Much with little' is the true essence and spirit of ham radio?"

"QRP, the only way. That's a big deal!"
— Anonymous

THE CIRCUIT

□ HZ: The accompanying photos (thanks to K5KG) were taken at a get-together the Dhahran Amateur Radio Club had in honor of Sheikh Ahmed M. Zaidan, HZ1HZ. Sheikh Ahmed has been an active amateur in Saudi Arabia since the 1940s, and today is still very active, especially on CW. His most recent endeavor is to get a station operating on OSCAR.

□ First JA licensees in Panama: JA7ARW notes that

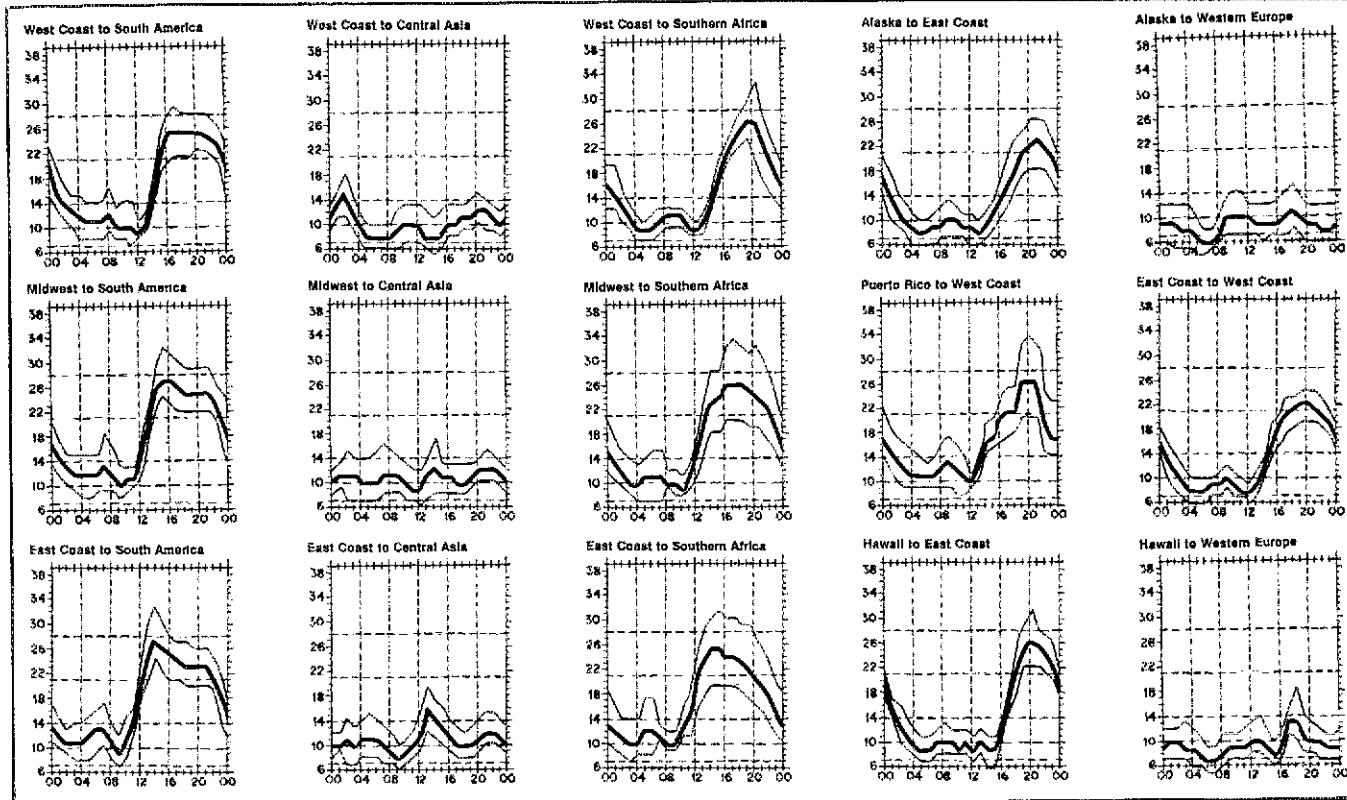
he is now HPIXKR, his XYL JA7HLO holds HPIXKT, and another JA is HPIXYJ. QSLs for these stations go to Box 10783, University of Panama, Republic of Panama.

□ WB6GFJ tour: Ross has just returned from this year's tour through the South Pacific, and passes along the following: FO0FB, VK4BZZ, 3D2FB, ZL0AKO and ZK1XE (the latter for contacts after July 1, 1984) via WB6GFJ, Box 1, Los Altos, CA 94022.

□ OK1FF: Mirek, OK1FF, joined Silent Keys on July 31. Licensed about a half-century ago, he led the H-R Czechoslovakian contingent, and was widely known and respected. He'll be missed.

□ VP9L: The September, 1984, issue of *Splatter*, the journal of the Radio Society of Bermuda, is a special one. It marks the 25th anniversary of the RSB's official newsletter and pays special tribute to the ham who created it, VP9L. "CY" moved to Virginia in 1980 and can still be heard on HF as VP9L/W4.

□ Background material: KA4RPS/2 suggests that *Sailing Directions*, published by the U.S. Government, makes interesting research material. Available volumes cover all areas of the globe. Thanks, Cap.



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for 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

your district.

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

3) A preferred way to send envelopes is to affix a 20-cent stamp. If you expect to receive more than 1 oz of cards, please affix postage accordingly.

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

Some incoming bureaus sell envelopes or postage credits in addition to the normal handling of s.a.s.e.'s. They provide the proper envelope and postage upon prepayment of a certain fee. The different stages of presorting and sorting cards take time. A period of six to eight months, or longer, may take place before you receive your cards.

Helpful Hints

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

DOs

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

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

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

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

Do include an s.a.s.e. with any information request to the bureau.

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

Do be appreciative of the fine efforts of these volunteers.

DON'Ts

Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many

cards coming from overseas bureaus are over a year old.

Don't send your outgoing DX cards to this bureau (see "ARRL-Membership Overseas QSL Service" in this column in March 1984 QST.)

Don't send envelopes to your "portable" bureau. For example, WAISQB/2 sends envelopes to the W1 bureau, not the W2 bureau.

ARRL DX QSL BUREAU SYSTEM

First Call Area: all calls* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

Second Call Area: all calls* — NJDXA, P.O. Box 599, Morris Plains, NJ 07950.

Third Call Area: all calls — C-C.A.R.S., P.O. Box 448, New Kingston, PA 17072-0448.

Fourth Call Area: single-letter prefixes — Mecklenburg ARS, P.O. Box DX, Charlotte, NC 28220.

Fourth Call Area: two-letter prefixes — Sterling Park Amateur Radio Club, Call Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls* — ARRL W5 QSL Bureau, P.O. Box 44246, Oklahoma City, OK 73144.

Sixth Call Area: all calls* — ARRL Sixth (6th) District DX QSL Bureau, P.O. Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls — Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.

Eighth Call Area: all calls — Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.

Ninth Call Area: all calls* — Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls* — W0 QSL Bureau, Ak-Sar-Ben Radio Club, P.O. Box 291, Omaha, NE 68101.

Puerto Rico: all calls* — Radio Club de Puerto Rico, P.O. Box 1061, San Juan, PR 00902.

U.S. Virgin Islands: all calls — Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St. Thomas 00801.

Canal Zone: all calls — I.P.R.A., P.O. Box 9A-175 Panama 9A, Republic of Panama.

Hawaiian Islands: all calls* — John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls* — Alaska QSL Bureau, 4304 Garfield St., Anchorage, AK 99503.

Guam: AH2, KH2, WH2 and KG6 calls — MARC, Box 445, Agaña, Guam 96910.

SWL — Mike Witkowski, WDX9JFT, 4206 Nebel St., Stevens Point, WI 54481.

CRRL DX QSL BUREAU SYSTEM

QSL Cards for Canada (VE and VO) may be sent to CRRL Central QSL Bureau, Kennebecasis Valley Amateur Radio Club, Box 51, St. John, NB E2L 3X1. Or, QSL cards may be sent to the individual bureaus.

VE1* — L. J. Fader, VE1FQ, P.O. Box 663, Halifax, NS B3J 2T3.

VE2 — A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H3R 2E3.

VE3 — The Ontario Trilliums, P.O. Box 157, Downsview, ON M3M 3A3.

VE4* — Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.

VE5 — c/o B. J. Madsen, VE5ADA, 739 Washington Dr., Weyburn, SK S4H 2S4

VE6* — CRRL Incoming Bureau, N. F. Waltho, VE6VW, General Delivery, 9714-94th St., Morinville, AB T0G 1P0

VE7* — Burnaby ARC, Box 80555, South Burnaby, BC V5H 3X9.

VE8* — Rolf Ziemann, VE8RZ, 2888 Lanky Ct., Yellowknife, NT X1A 2G4.

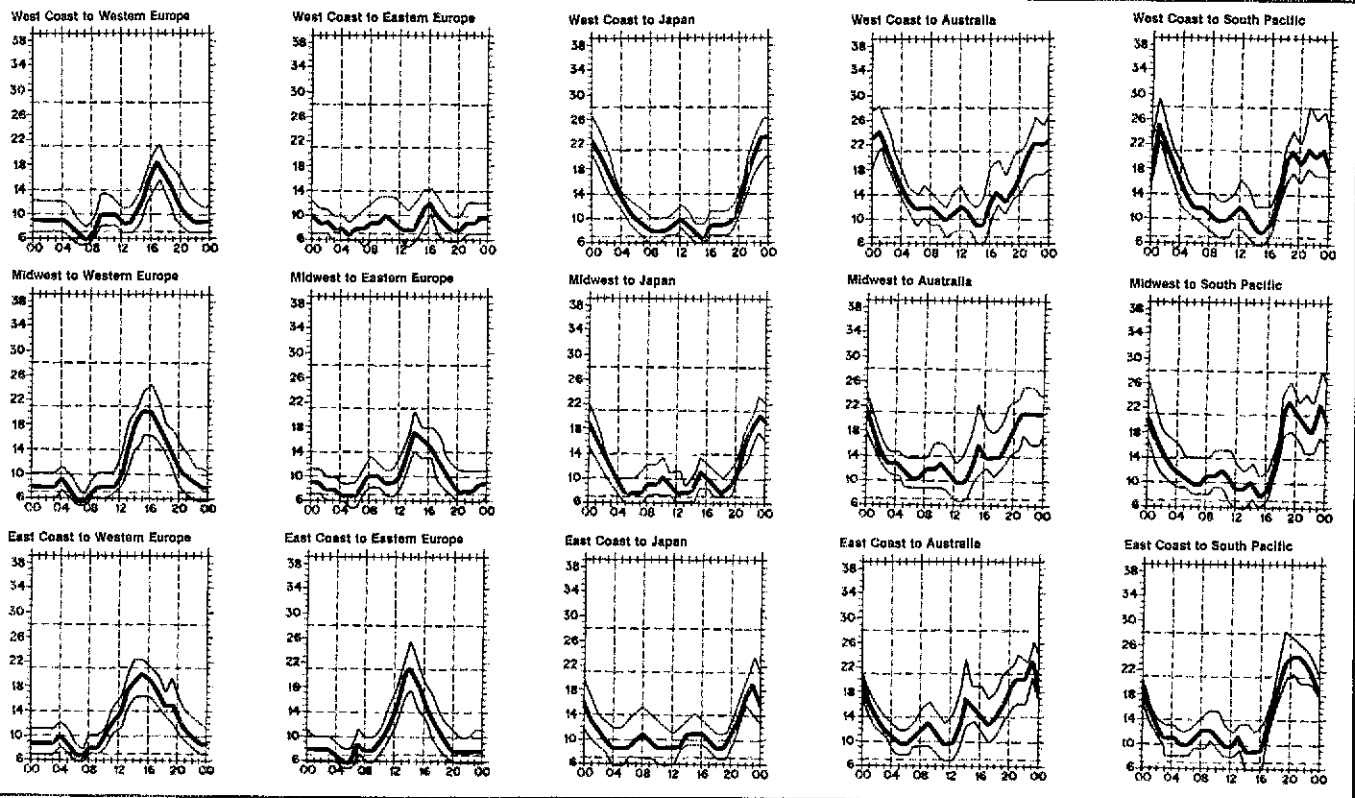
VO1, VO2 — CRRL VO QSL Bureau, P.O. Box 6, St. John's, NF A1C 5H5.

VY1 — ARRL QSL Bureau, W. L. Champagne, VY1AU, P.O. Box 4597, Whitehorse, YT Y1A 2R8.

*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

Special Notes

□ Sept. 1984 QSL Corner, page 53, contains information on the operation of the ARRL Membership Overseas QSL Service. For information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.



the lowest curve (optimum traffic frequency, or FOT). See April 1983 QST, page 63, January 1977 QST, page 58, September 1977 QST, page 35 and January 1979 QST, page 11 for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for December 15, 1984 to January 15, 1985, assume a sunspot number of 37, which corresponds to a 2800-MHz solar flux of 91.



CRRL Officers and Directors

President: Thomas B. J. Atkins, VE3CDM
Vice President and Secretary: Harry MacLean,
VE3GRO

CRRL, Box 7009, Station E, London, ON N5Y 4J9, Tel. 519-451-3773
CRRL Outgoing QSL Bureau, Box 113, Rothesay, NB E0G 2W0

Honorary Vice President: Noel B. Eaton, VE3CJ

Directors: G. Andrew McLellan, VE1ASJ
Albert G. Daemen, VE2IJ
Raymond W. Perrin, VE3FN
A. George Spencer, VE6AW
William Kremer, VE7CSD

Counsel: B. Robert Benson, Q.C., VE2VW

Representation and Service

What have your CRRL reps and workers done for you and Canadian Amateur Radio over the past year? Let's take a look.

Representation

- 1) Held a full CRRL Board Meeting in Toronto in August;
- 2) Represented you at ARRL Board meetings in Hartford in March and October;
- 3) Represented you and all Canadian amateurs at the IARU Region 2 Executive Committee meeting in Mexico City;
- 4) Contacted DOC on the following issues: removal of power and frequency restrictions on 160 metres, expansion of phone privileges on 75 metres, reinstatement of RTTY privileges on the 7.05-7.1-MHz portion of 40 metres, transmissions for the ARRL Antenna Design Competition on 17 and 12 metres, new commercial pressures on the 220-MHz band, additional modes for the 902-928 MHz band, problems created by strict interpretation of "one year" on DOC exams, and more;
- 5) Worked on RABC with representatives of CARF and the cable-television industry to establish guidelines for solving cable-television interference.

Service

- 1) Expanded the work of the CRRL Headquarters office in London, Ontario, and laid the groundwork for keeping membership lists and Canadian League members' dues in Canada next year;
- 2) Expanded the CRRL bulletin service.

Bulletins are now sent to 60 stations and 240 clubs across the country;

- 3) Changed the names of the League-sponsored QSL bureaus in the provinces and territories to CRRL VE/VO/VY Incoming QSL Bureaus; maintained the CRRL Central Incoming Bureau in Saint John, New Brunswick; sorted and forwarded some 450,000 cards; and expanded the CRRL Outgoing QSL Bureau;
- 4) Provided legal support for amateurs in Saskatoon, North York and elsewhere, fighting restrictive antenna and tower by-laws;
- 5) Established a foreign-licensing information service;
- 6) Published a 1984 *Canadian Repeater Directory*.

Organization

- 1) Conducted Canadian Section Manager elections in Canada;
- 2) Held the first balloted CRRL Regional Director elections. Seven candidates sought office in three CRRL regions, and over 3000 CRRL members were eligible to vote;
- 3) Laid the groundwork for a CRRL affiliated-club program. Guidelines and charters of affiliation are in preparation;
- 4) Promoted the growth of CRRL by a membership mailing to all Canadian amateurs.

Training

- 1) Revised the *Canadian Amateur Radio Licensing Manual* to conform with the new TRC-24 and cover material for both the Amateur and Advanced Amateur exams. By November,

800 had been sold;

2) Arranged with DOC to have the revised *Manual* translated into French at their cost, and to have the federal Minister of Communications supply an introduction for both the English and French versions;

3) Laid the groundwork for a new *Questions and Answers Book* and *Digital Licensing Manual*. The *Questions and Answers Book* will use the headings in TRC-24 and contain material on diagrams and digital communications.

Operating

- 1) Laid the groundwork for a national ARES program and established the ARES Canada Net;
- 2) Assumed responsibility for the Can-Am Contest, now known as the CRRL Can-Am Contest.

As a member of CRRL, your dues are \$36 a year. Of that amount, about one-third pays for *QST*. Another third pays for the cost of bringing *QST* into Canada. (Canada Post sets the rate by charging the U.S. Postal Service what are called "terminal dues.") The last third pays for everything listed above and a lot of good things that come from ARRL: WIAW code practice and bulletins, support material for the field organization and special-interest groups, the technical information service, and more. We think it's money well spent. We hope you think so, too.

Right now, we're in the middle of a membership campaign. There is a lot of good work going on. Please, tell your friends who are not yet CRRL members.

CRRL NEWS

- The ARES Canada Net still meets on Sundays at 2000 UTC, but on 14.115 MHz instead of 14.130 MHz. Net business and requests for the CRRL Headquarters office in London, Ontario, are now being handled as formal traffic. The net got a real workout during the Simulated Emergency Test. Over a dozen test messages were passed from coast to coast — often relayed by stations in between — under the most adverse propagation conditions, in two one-hour sessions on October 21 and 22. Shades of the 1923 Trans-Canada Relay!
- In the U.S., the 220-MHz band is under considerable pressure from commercial interests that want to see all or part of this band turned over to the Land Mobile Service. CRRL has written to DOC asking them to oppose this move in any discussions with the U.S. FCC. CRRL pointed out that while the 220-MHz band is allocated to Amateur, Land Mobile and Fixed Services throughout Region 2 on a co-primary basis, in Canada this band is allocated only to amateurs. CRRL also pointed out that only a few years ago, DOC gave 2 MHz of this band a special place in the Amateur Service, setting it aside for packet-radio communications.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the Ontario 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*.

*163 Meridene Crescent West, London, ON
N5X 1G3, Tel. 519-433-1198

A petition, to be valid, must carry the names of five or more Full Members of the league residing in the Ontario Section. Photocopied signatures are not acceptable. Signatures must be *on the petition*. It is advisable to have more than five signatures on the petition.

Petition forms (CD-129-C) are available from the CRRL Headquarters office in London, Ontario, but are not required. The following form is suggested:
(Place and date)

The Secretary, CRRL
Box 7009, Station E
London, ON N5Y 4J9

We, the undersigned Full Members of the League residing in the Ontario Section, hereby nominate ... as Section Manager for the next term of office.
(Signatures ... Calls ... Addresses, including postal codes ...)

A Section Manager candidate must be a resident of the Section, a licensed amateur holding a Canadian Amateur Certificate or higher, and a Full Member of the League for a continuous term of at least two years immediately prior to the receipt of nomination at the CRRL Headquarters office.

Petitions must be received at the CRRL Headquarters office on or before 5:30 P.M. EST December 7, 1984.

If only one valid petition is received, the person nominated will be declared elected. If more than one valid petition is received, there will be a balloted election. Ballots will be mailed from the CRRL Headquarters office on January 2, 1985. Returns will be counted on February 19, 1985. A Section Manager elected as a result of these procedures will serve for a two-year term that will begin on April 1, 1985.

If no petition is received by December 7, 1984, the Ontario Section will be resolicited in April 1985 *QST*. A Section Manager elected after resolicitation will serve for 18 months.

Vacancies in Section Manager offices will be filled by appointment made by the CRRL Secretary, acting on advice from the CRRL Board.

You are urged to take the initiative and file a nominating petition immediately.
Harry MacLean, VE3GRO
CRRL Secretary

NOTES FROM ALL OVER

□ Congratulations to CRRL President Tom Atkins, VE3CDM, who was named Radio Society of Ontario Amateur of the Year for his many years of service to the Society, CARF and CRRL.

□ In February, a Vancouver amateur seeking relief from cable-television interference appeared before CRTC, the Canadian Radio-television and Telecommunications Commission, to intervene in the relicensing of a local cable company. In its recent decision, CRTC did renew the company's licence, but indicated that it expected the company to initiate discussions with the amateurs to resolve interference problems. CRTC also asked the cable company to supply a progress report within two months of the CRTC decision, and a second report within six months of the decision.

□ On behalf of CRRL Officers and Directors, and the whole gang that makes CRRL "go," best wishes for a happy holiday season. May 1985 be your best year ever.

World Record Set at 24 GHz

Mark Goldfarb, WB2ELF, of Microwave Associates, sent in the following item on the new world record.

Nicola Sanna, I0SNY, and a group of Italian amateurs have established contact at 24 GHz over a 331-km path. Using 30-mW transceivers provided by M/A-COM (Burlington, Massachusetts) and a two-foot parabolic dish, an MCW (F2) QSO was made from Mt. Epomeo on the island of Ischia, off the coast of Naples, to Montalto, in the Calabria region of Italy.

Nicola, you may remember, is the current holder of the 10-GHz world record of 1663 km set in February 1983. The transceivers, provided as part of the prize for breaking the 1000-km barrier at 10 GHz, consisted of a varactor-tuned, 30-mW Gunn oscillator; a waveguide circulator; and Shottky detector mount.

An analysis of the equipment used and atmospheric conditions at the time of the contact indicates that the contact was made using a duct, a section of the atmosphere where the water vapor density varies with altitude so that the path of transmitted signals remains concentric with the center of the earth. The difficulty of making a contact over a great distance at 24 GHz is that the same condition that establishes the duct — a high water vapor gradient — also causes tremendous signal absorption as the atmospheric attenuation coefficient varies between 0.15-0.30 dB/km, depending on humidity. Italy is a particularly attractive area for microwave en-



I0SNY, IC8SQS, IW8ASD and I0VVQ (l-r) on Mt. Epomeo, Ischia.

thusiasts, as the water surrounding it is very calm and encourages the formation of ducts.

The free-space propagation loss at 24 GHz is higher by approximately 3.8 dB than that at 10 GHz. The combination of higher path loss and atmospheric absorption was considered by M/A-COM in setting an award distance of 250 km. (The award also stipulates that the record may

not be broken using the above mentioned transceivers, as this would give an unfair advantage.) Even with the high-performance transceivers, it took almost two years to achieve the record breaking contact.

Congratulations, Nicola!

More Details

Nicola sent along more details of the contact: On August 11, I0SNY and I0VVQ left southern Italy at 3 A.M. for the island of Ischia (about 25 km offshore from Naples), where they met IC8SQS, IW8ASD and IC8HN. After a 3-km walk to the top of the mountain (788 m above sea level), the group set up equipment and aimed it for Montalto, in Calabria (southern Italy), where I8YZO, I8NKA, I8CQN, I8NAW and I8YAR were set up at a height of 1956 m asl.

Signals were initially very weak, with a lot of QSB. After several hours, signals became more stable, but attempts at a phone QSO proved unsuccessful. An attempt was made at an MCW (F2) contact, and at 1114 GMT the contact was made, with reports of 519 at each end. Attempts were made at a phone QSO until 1800 GMT, with no luck. Nicola comments that the weather was good: Wind was light and shifting, the sea was very calm, and the temperature was high. An analysis of the topographic nature of the path shows that it was very close to line of sight (the path was 331 km, and the line-of-sight path between stations at 1956 m and 788 m asl would be around 290 km).

2304-MHz NEWS

Paul Wilson, W4HHK, writes to say that he worked WA4HGN on 2304-MHz EME starting at 0316 GMT September 12. "O" reports were exchanged (for those unfamiliar with EME, an O report indicates a good signal: full call signs of both stations and signal report being copied in one sequence). W4HHK's only other contact on 2304 MHz was with W3GKP — 14 years ago!

Paul also reports copying a signal on 2304.000 MHz from a satellite (this report also appears in the *ARRL Letter* of October 11) and wonders what it might be. My best guess, at present, is that the signals originate from COSMOS 1217, a Russian early-warning satellite. COSMOS 1217 was reported about two years ago to be transmitting on that frequency with either a steady carrier or FM telemetry (see *New Frontier*, Feb. 1982, p. 71, and April 1982, p. 74). If anyone has any other ideas as to the origin of these signals, I would be interested in hearing of them.

SURPLUS EQUIPMENT

Dave Pedersen, N7BHC, has called with information that he has some surplus microwave and VHF/UHF equipment for sale, including waveguide parts and attenuator. He has about 200 items, and invites inquiries with an s.a.s.e. for a listing of available parts. His address is 4382 Cherryview Dr., West Valley City, UT 84120. He can be reached by phone at 801-967-5896.

Strays



QST congratulates...

the following radio amateurs on 50 years as a member of ARRL:

- Fred D. Armes, K4RX, of Lockport, New York
- Wally Bernath, K4UAS, of Winston-Salem, North Carolina
- E. Paul Crossno, W5HT, of Dallas, Texas
- Ed Van Gasbeck, W1DS, of Largo, Florida
- George H. Goldstone, W8AP, of Bloomfield Hills, Michigan
- Elizabeth M. Groves, W5DUR, of Odessa, Texas
- Gene Roderick, W7ZH, of Sun City, Arizona

the following radio amateurs on 60 years as a member of ARRL:

- Garnett Bryan, W8AZL, of Sedalia, Missouri
- James B. Rives, W5JC, of San Antonio, Texas

The Virginia Fone Net on celebrating 50 years of continuous operation on the 75-meter band, handling traffic into and out of the state.

Wayne Manning, W0FI, of Unity Village, Missouri, on being appointed assistant vice president and board member of Unity School of Christianity board of trustees.

Robert Beach, W8LCZ, of Springfield, Ohio, on receiving the Silver Beaver award, the highest award given by a local Scout council to an Adult Scouter.

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	March 1984, p. 80
Board Standing Committees (Minute 65)	May 1984, p. 60
Call Sign Assignment System	June 1983, p. 61
Contest Guidelines	July 1984, p. 88
License Renewal Information	Jan. 1984, p. 51
Major ARRL Operating Events and Conventions — 1984	Jan. 1984, p. 52
MARS Information	April 1984, p. 86
Pending Dockets	This issue, p. 63
QSL Bureaus	
Incoming	Dec. 1984, p. 66
Outgoing	Sept. 1984, p. 53
QST Abbreviations List	Jan. 1984, p. 53
Reciprocal-Operating Countries	Nov. 1983, p. 71
Third-Party-Traffic Countries	Oct. 1984, p. 73
U.S. Amateur Frequency and Mode Allocations	Sept. 1984, p. 47
10-Meter Contest Rules	Nov. 1984, p. 87
160-Meter Contest Rules	Nov. 1984, p. 87

*103 Division Ave., Millington, NJ 07946

Beacons — A Promise Not Yet Fulfilled

Two years ago — January 3, 1983, to be exact — a change was made to our rules that should have brought a significant improvement in our operations above 28 MHz. On that date, unattended automatically controlled beacon operation was permitted for U.S. amateurs. For years prior to that, we in this country and hams throughout the world benefited from the presence of 10- and 6-meter beacons outside our borders. However, we could not legally provide similar signal sources for our own use and that of overseas amateurs in detecting the presence of unusual propagation conditions. On the higher bands, virtually no one had the use of beacons to warn of band openings except those located close enough to beacons operating in eastern Canada.

In this column for January 1983, I announced the FCC decision and summarized the provisions of the new rules. Five months later, in May, I challenged the VHF community to construct a nationwide network of beacons and offered a set of suggestions for potential locations and power levels, etc. Recently, several have written asking for lists of 2-meter and 70-cm beacons similar to those I made available for 10 and 6 meters a year and a half ago. Unfortunately, I have not received information on a sufficient number of beacons for these bands to put together such lists, nor have I been provided with enough information to warrant updating the 10- and 6-meter beacon lists. Many individuals and groups have made promises, but only a few have come through and actually put automatically controlled, continuously operating beacon stations on the air. The few that have been built have not

been given sufficient publicity so as to be useful to many outside their immediate areas. In order for beacons to be effective, sufficient information about them must be available to permit those at distances, which the particular band might be capable of producing, to know where to look for indications of enhanced propagation.

In an attempt to rectify this situation, the Central States VHF Society has resolved to gather all information it can on beacons operating in North America. Barry Buelow, WAØRJ, the organization's secretary, has accepted the charge of compiling the information. It will then be disseminated either directly by the Society or through this column. If you have information on one or more beacons on the air in your area, drop Barry a line at 4110 Emerson, N.E., Cedar Rapids, IA 52402. Provide details such as location (preferably in longitude and latitude or complete [six-character] grid designator), frequency, power, type and height above ground of antenna, its polarization, pattern and direction of major lobe, method of keying (i.e., on/off CW or FSK), any time sequencing and what message is sent.

For those contemplating the construction of one or more beacons, a few words about equipment may be helpful. First, as was stated in the January 1983 column, the power level need not be high. FCC rules permit a maximum of 100 W for Beacon Operation. The term "Beacon Operation" refers to unattended operation under automatic control, so this power limitation is not applicable to those who run their keyers while in the shack. A cast-off land mobile transmitter, modified for FSK or, better yet, on/off key-

ing, makes an ideal basis for a beacon setup. The all-solid-state type should provide superior reliability to the tube or hybrid variety. In this application, reliability is of paramount consideration. Another approach, now that so many VHFers have gone to fancy multimode radios, is the use of no-longer-needed solid-state transmitting converters or transverters. This approach requires merely the construction of a low-power source of keyed 28-MHz energy to drive several converters or transverters to provide keyed outputs on the various VHF and UHF bands. The same source can be connected to an amplifier to provide output for a 10-meter beacon. Of course, crystal frequencies must be selected appropriately to provide outputs at the proper points within the various bands. The January 1983 column lists the frequency ranges in which Beacon Operation is permitted. It also discusses several ramifications of beacon operation, including suggestions on specific frequency selection, power levels, antenna height and site selection. The May 1983 column adds thoughts on general location and contemplates what a nationwide system of beacons might look like.

The revised FCC rules, which went into effect two years ago, give us the opportunity to provide a worthwhile service to those who operate the higher-frequency bands. Let's not miss the chance to take advantage of it. Please report any beacons already on the air to WAØRJ and get to work building additional ones in areas not presently served. When completed, and in operation, report them also to Barry. I will stay in touch with him and make arrangements to make up-to-date lists available to all desiring them.

BOX UPDATE SCHEDULE

In December 1983, I announced a regular schedule for updating the various boxes as well as the deadlines for submission of information for each. So far, I have managed to keep to this schedule. Now, however, a modification seems to be in order. The main reason for this is that a new feature has been added: the VUCC list. I did plan to update the EME Annals and publish the VUCC roster this month, but found that space does not permit including both. Two other factors have convinced me to delay publication of the EME Annals. One is that only a few active moonbouncers have reported. In order to get up-to-date totals, I have been forced to go through newsletters and reports to me on other subjects. Perhaps, with this plea, enough additional reports will come in to make the list more current. Remember: For this box, it is the total number of different stations worked, not QSOs with the same station; the number of U.S. states worked via EME, not the total states by all modes; and the total number of DXCC countries worked on moonbounce. I have concluded that when one call is worked from entirely different locations, each location should count as an additional station. Thus, if you work WØSD from four different state lines, it counts as four stations and eight states. I will modify my former position and not ask that all stations worked be listed. You can do so if you wish, but all that is really needed are the totals for your EME stations, states and countries. Please continue to list one station per state and call area for the states

worked box, however. Forms for this are available for an s.a.s.e. to the address at the bottom of this page. The other reason for delaying the publishing of the EME Annals is the timing of the ARRL EME contest. By moving publication back a few months, I can update the Annals to totals racked up during those high-activity weekends. Because of these considerations, I have decided on May. That means that inputs must be in by March 1, in order to be sure of making the update. Current plans are to publish the EME Annals only once per year, but that position is subject to review based on comments from readers and how large it becomes.

The schedule announced last December will remain as is for the other boxes, with the VUCC roster to appear each December. The following is a summary of the schedule along with dates for input information:

Box	Publication Month	Update Deadline
2 meters	Jan./July	Nov. 10/May 10
1 1/4 meters	Feb./Aug.	Dec. 10/June 10
70 cm	March/Sept.	Jan. 10/July 10
23 cm/13 cm	April/Oct.	Feb. 10/Aug. 10
6-meter DX	Nov.	Sept. 1
VUCC	Dec.	Updates come from Hq.
EME Annals	May	March 1

Note that a 13-cm standings box is included. This is in recognition of the rapidly increasing activity on that band and is in response to the many who voiced their support for it following the questions presented in the October column. Of those expressing an opinion, all were in favor of adding a 13-cm standings box. On no other question was there such unanimity. For the time being at least, this box will be published along with the 23-cm box. It's hard to believe that when I began

editing this column, almost 10 years ago, the 1 1/4-meter and 70-cm standings were published together. The world above 50 MHz has come a long way since then, both in terms of the number of people active and in use of the higher bands.

Let's keep it up.

ON THE BANDS

6 Meters — The 6-meter news this month comes from the other side of the earth, and is passed along by KZMS of SMIRK fame. Ray posted a message on the answering machine announcing the first 6-meter operation from the Peoples Republic of China. It took place between August 13 and 19 from Fuzhou, about 450 miles up the coast from Hong Kong, when a group of 11 JAs, including JA1UT, JA1HQG and JA3UB, operated under the call BT5RA. This was a special VHF call used in conjunction with the establishment of what is said to be a new permanent station, BY5RA. During the six days of operation, the group racked up 513 6-meter contacts, all with Japanese stations. They even had one QSO on 2 meters with a JR6. Further details, such as the permanency of the VHF equipment at the stations, are not known. Imagine the excitement that could be generated by large-scale operation from China during the next solar peak! We can dream, can't we?

A group of mostly East Coast 6-meter operators has been getting together for several years each Tuesday evening at 3821 kHz. Recently, word has come back from Europe that some over there had been hearing them and would like to join in, but cannot because the net is outside their band. Consequently, the frequency has been changed to the vicinity of 3782 kHz. Start time is 2000 EST or 0100Z Wednesday. All interested in 6 meters are invited to check in or just listen, if that is their desire or the limit of their license.

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

VUCC Awards Issued

6 Meters (100 grids for basic award)

1	K8WKZ	225
2	KB4CRT	175
3	W1QXX	150
4	N4MM	225
5	WB8WXZ	125
6	WB7OHF	200
7	WB1FVS	
8	WD4FAB	175
9	WA3DMF	150
10	WA8BYA	150
11	W4OO	150
12	KA1DHO	125
13	W3WFM	200
14	N3COG	125
15	N2DXP	
16	K1TOL	200
17	WA1OUB	150
18	W3EP/9	
19	N5DDB	225
20	W1WHL	125
21	WB4LSM	
22	N2CE	150
23	W8MVE	125
24	N8LL	175
25	K13L	
26	WB4NMA	125
27	K0TLM	175
28	K8TGC	150
29	W1JR	125
30	K0C0S	
31	WB4OOJ	
32	K07QY	
33	KA2BT	
34	WA4UAS	
35	N8EDL	
36	W5JME	
37	WA6CRA/4	
38	N9CEX	
39	K0US	
40	WB8BKC	125
41	N6GRH	
42	KA8JGH	
43	N9ANO	
44	WB8ZKG	200
45	K8YAH	
46	KA9MGR	150
47	KY9P	
48	AK4T	
49	N2BMN	
50	N8DBB	
51	A2Z73	
52	W5SICC	
53	WA1AYS	
54	KB2XJ	
55	N2WK	

2 Meters (100 grids for basic award)

1	K9MRI	175
2	WB8MSV	150
3	WA8ZHE	150
4	N9KC	
5	N8LL	
6	WB4NMA	
7	WA4NJP	125
8	K2WLR	
9	KF6M	125
10	W4GJO	
11	N9AO	
12	SM4GVF	
13	WA8MGZ	
14	K8SMR	
15	K5SIW	
16	K5WE	
17	K0CGR	
18	WA3HMK	
19	K7CW	
20	W8SUS	
21	W3EP/9	
22	K8WVZ	
23	N4AR	
24	K5YI	
25	WD4DGF	
26	K4CAW	

1 1/4 Meters (50 grids for basic award)

1	W1JR	110
2	W0SD	90
3	WB0TEM	
4	WB8BKC	70
5	W4GJO	
6	W2VC	
7	WA9JFM	
8	K8SMR	
9	WB4NXY	

70 cm (50 grids for basic award)

1	W1JR	110
2	K8WVZ	90
3	WB3ESS	
4	WB8BKC	70
5	W4GJO	
6	W2VC	
7	WA9JFM	
8	K8SMR	
9	WB4NXY	

23 cm (25 grids for basic award)

1	WB8BKC	30
2	K8WVZ	
3	N8CA	
4	WB5LUA	
5	W8YIO	
6	W1JR	
7	W2UC	

As of October 1, 1984. Numbers listed after calls refer to endorsements.

2 Meters — This fall has been exceptionally good for tropo, especially in the Eastern part of the country. I reported on the goings-on during the September VHF QSO Party last month, reports on that weekend continue to come in. Just to illustrate that conditions were not super in all parts of the country, K5SW writes from eastern Oklahoma that no signals were heard from more than the normal distance; but activity was quite high, nevertheless. On 2 meters, Sam worked 10 states and 51 grids during the contest, with similar performance being turned in on 1 1/4 meters and 70 cm. Another data point comes from W3EP/9 Bloomington, Indiana. Emil notes no unusual conditions at all, except a short E, opening on 6 meters. Incidentally, he will henceforth be signing W3EP/4 from the Atlanta area. Two weeks after the contest, the evening of September 22, also produced outstanding tropo conditions along the East Coast. If anything, signals were stronger on this occasion than during the contest, although the maximum distance available did not appear to be as great. This conductor had the pleasure of exchanging very strong signal reports with a number of coastal New England stations, such as K5MA/1 on Cape Cod, Massachusetts; W2MCF/1 Carolina, Rhode Island; W1FVY Block Island, Rhode Island; and K1PXE Milford, Connecticut on Saturday evening. The next morning, stations to the south seemed predominant as illustrated by QSOs with K4MSK in western North Carolina (EM85); WA4RHW Garden City, South Carolina (FM03); WB4EFZ Newberry, South Carolina (EM83); N4HTX Sumter, South Carolina (EM93); and K4AGV High Point, North Carolina (EM96). W3EP/4 reports that several Atlanta-area stations worked into New England Saturday evening and Sunday morning. With high pressure again covering the Eastern part of the country and another hurricane off the coast, the weekend of October 12 through 14 also seemed quite good. W31WI noted that he was directly accessing

packet stations in the Boston area on Saturday evening on the 145.01-MHz frequency being used for that mode along the East Coast. From the perspective of the Atlantic Seaboard at least, this fall has been one of the best in years for coastal tropo. WB2CUT New Jersey agrees, and notes that the tropo conditions somewhat make up for the poor E, showing this past summer. Rich says that South Carolina, in the form of WA4RHW, represented state number 36 for him.

The single Yagi EME champ has finally turned in his jersey, after racking up a record 18 stations and 28 QSOs. No, W5UWB has not given up moonbounce, but he has made it a lot easier for himself and those he works by installing four of the new KLM LBX Yagis. The first weekend of the EME contest, John worked 27 stations with the new array. VE3DSS seems to be picking up where John left off, at least temporarily. After first trying a lash-up consisting of two 14-element boomers vertically polarized, and experiencing difficulty from a local police radio, Dana went to a single KLM 16-element LBX and a Microwave Modules converter using a high-level mixer and boasting a 1-dB NF along with a third-order intercept of +15 dBm. With this, he listened for his own echoes on the rising moon and was able to detect a weak response. Next, he heard YU3UV calling "CQ" and went back to him. Although the station answered his call, conditions faded before a contact could be completed. Twenty-five minutes later, Dana heard YU3UV again, and they made a quick exchange. Not bad for a first time on moonbounce and a single Yagi! Naturally, VE3DSS's interest is piqued and he is already planning a six-Yagi array.

N9KN says that he would like to establish Geminids schedules with Mississippi, Nebraska, Arizona, Idaho or any VE1. Lou comments that he is available for skeds with anyone needing Illinois or grid EN52. Interested parties may address requests to 403 Fairlawn Ave., Round Lake Park, IL 60073. Another available for skeds is K5YY in western Arkansas. Sam would have a kW going by the time this appears, and is prepared to hand out his state or the EN35 grid to all comers. Although a relatively recent convert from DX chasing on the HF bands, he already has 30 states on 2 meters and nine on 70 cm. Address is Box 188, Paris, AR 72855.

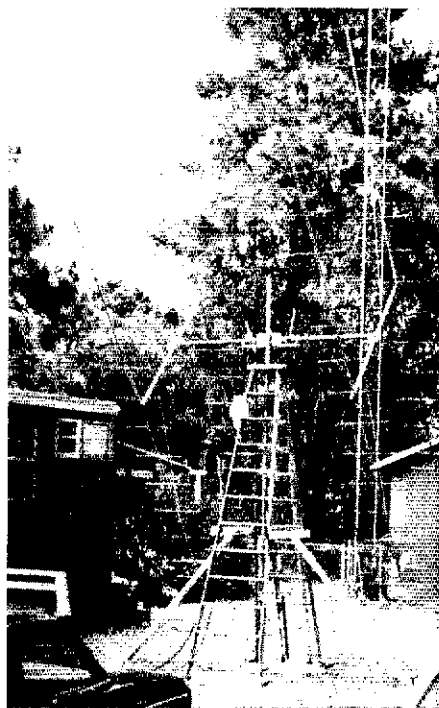
The new *SWOT Newsletter* editor is K1PLR. I would like to join the rest of the members of Sidewinders On Two in wishing Harry success in this venture. Address inputs to H. A. Arsenault, 603 Powell Ave., Erie, PA 16505.

On a sad note, the October *SWOT Bulletin* quotes a report from WD4FAB that W4YYS of Maitland, Florida, passed away September 8. Bob was well known on the VHF scene in that part of the country and will be missed. A similar piece of somber news is provided by WB5JAR. Kenn writes that K4VPK, who was active on both 2 and 6 meters in the Memphis area, became a Silent Key September 7.

1 1/4 Meters — This band seems to be populated by roving ambassadors, and September saw another of the well-traveled 220 operators at it again. This time it was W5FF with gear lent by K7N11 loaded in and on the Subaru heading for the Jacksonville, Florida, QTH of WA4LYS. Paul had contrived a temporary arrangement on which to mount the four W0EYE Yagis that made the trip lashed to a ski rack perched on the roof of the little car. He called the thing "step ladder moon bounce" (see photo), but it worked. During the two days of Fred's visit, nine stations were contacted: VE3EMS, KA0Y, K9XY, WB0TEM, W3GPY, W4WD/7, W0SD, W1JR and WA3G00. For VE3EMS, it was state number 50, so Peter joins the exclusive but growing ranks of 1 1/4-meter WAS holders. Making Florida available for him was one of the prime purposes of the operation. Note the absence of one call that appears on almost every list of 1 1/4-meter stations worked. K5FF is not to be seen anywhere. The reason is simple. Among the equipment carried by Fred was the relay box out of his and Lee's station. Without it, she was off the air for the weekend. The event was quite exciting for WA4LYS, who had been considering 220 EME and terrestrial capability prior to W5FF's visit. Paul should be a regular on the band soon.

N3CX writes from the Allentown, Pennsylvania, area that, on September 18, he was able to check into the 1 1/4-meter net run each Tuesday evening at 2200 Eastern Time by Kentucky station KC4EG. Signals ran 529. Dave now has 18 states worked on the band.

The Higher Bands — It's hard to believe, but the majority of the news for this end of the spectrum this month concerns 13 cm. There hadn't been any moonbounce news for this band since 1970 when W4HHK and W3GKP completed an exchange after months of preparation — until now, that is! Once again, W4HHK is an active participant. Paul has been busy sprucing up his station, which is basically the same as that used in his record-breaking EME QSO 14 years ago. The same 18-foot dish is in place, and the transmitter still



Ladder moonbounce: four 4.2-wavelength Yagis and a homebrew azimuth/elevation mount atop a 12-foot step ladder provided the radiated portion of the 1 1/4 EME station used during a September visit of W5FF to the QTH of WA4LYS. The ladder-mounted preamp can be seen just below the top step.

employs a VA-802B Klystron to produce about 400-W output. The big change is on the receive side. Thanks to a modern GaAsFET preamp supplied by VE4MA, W4HHK's receiving capability is up to today's state of the art. This improvement has already paid off in a number of tropo QSOs, including one with WB5LUA at a distance of over 500 miles. It paid off again on September 12 when Paul made an EME exchange with WA4HGN Savannah, Tennessee, about 80 airline miles away. The two had worked many times over the terrestrial path, but this was the first time via the earth-moon-earth route. The set-up at WA4HGN also has its roots in the 1970 EME work. Bill's 28-foot dish is the one used by W3GKP, having been acquired from Smitty's widow after his unfortunate passing in 1975. Like W4HHK, WA4HGN also has a VA-802B Klystron. W4HHK and WA4HGN worked again off the moon on September 19 and 20. Then, on the 22nd, WA4HGN succeeded in contacting DF0EME for the first 13-cm QSO between this hemisphere and Europe. Signal levels in this historic linkup ran up to 549. The contact is particularly interesting in that WA4HGN transmitted on 2304 MHz while DF0EME was on 2320. Since we seem destined to lose 2310-2390 and the Europeans are to be restricted to above 2320, some have said that EME between stations here and in Europe will be very difficult. WA4HGN and DF0EME have demonstrated that this is not the case, with proper preparation by the participants. Attempts to work OE9XXI and YU2RGC have not been successful as of this writing, but I am sure that it is just a matter of time before these stations and others are worked by both WA4HGN and W4HHK. The schedule sheet sent by W4HHK indicates that, in addition to the stations already mentioned, LX1DB, OK1KIR and G3WDG are also QRV on 13-cm EME.

N4MW reports his third 13-cm DXpedition, this one in the company of W4HHK across the Alabama/Tennessee state line to give a new state to WA4HGN. He had previously visited Mississippi to provide contacts for both stations with that state.

In other 13-cm news, N3CX writes that it is expected that four or five Pack Rats will be on the band by January. The list of prospects includes (in addition to himself) W3HQT, WA3JUF, WA3AXV, WA3NUF and WA3IET.

We may be getting a new band! FCC released a Notice of Proposed Rule Making October 10 that will implement the allocation of additional frequencies, including the 33-cm (902-928 MHz) band. See Happenings, this issue, for details.

You Know You're Hooked When

The junk room becomes a shack!

The junk becomes the rig!

The tower and stuff becomes a tri-band beam with an inverted V antenna on a sixty-foot stick.

All that noise becomes QRM or QRN.

And, you're no longer a wife but an XYL.

So wrote Cameron Warren, K5BEH, in a story about his wife Doris, who is now NSCFP. Doris made the name transition twice. The first time took seven years; the second time took another year. Cam's story, "The Visitor's Chair," is the tale of how the visitor's chair in his radio shack changed hands. In the beginning, that's where Doris sat. With the passage of time, the chair became Cam's. Much of this article was made possible by the willingness of Cam to share his story.

The First Time

Doris was born in Stuttgart, Germany, in 1931, where she grew up during WW II, graduating from high school in 1946. She had studied English for four years. The next four years she worked for a custom seamstress as an apprentice. Her knowledge of English played a significant role with her next employer, the U.S. Army. In 1956, she moved to the United States. In 1970, she married Cam Warren. Cam's work took them to the outback of Australia for the next two years. They returned to their home base in Garland, Texas, for two more years. Cam's next assignment took them to Germany.

Prior to their German trip, Doris quite often sat in the Visitor's Chair in Cam's radio shack and would participate in many of his QSOs using a shared microphone. This all came to an abrupt halt in Germany because of third-party-traffic rulings. Doris, who had thoroughly enjoyed talking with hams around the world in either German or English, was no longer allowed this privilege.

Cam and Doris both realized that the time was right to move the Visitor's Chair from the ham shack into the study. And study she did, but it was taking longer than Doris hoped. She jumped at an opportunity to join a three-week, intensive study course for aspiring amateurs being offered at the Aschberg youth hostel near Kiel. Cam drove her to the youth hostel, which was beautifully situated on Aschberg mountain in the state of Schleswig-Holstein, in northern Germany. The panoramic view from the top of the wooded mountain was indeed awe inspiring. Convinced that the location afforded great tranquility and well being, and that the hostel was comfortable, plus all that was promised, Cam left Doris in good hands and drove back to Bremerhaven.

Five days passed before Cam heard from Doris. He hardly recognized her voice on the telephone. The weather had turned unusually bad on Aschberg — miserably cold, wet and

windy. Doris had a terrible cold. The classes on theory, rules and regulations, operating procedures and code started at 0730 hours and continued well into the night. Homework was completed well past midnight. Doris felt miserable; the weather was the same, and the courses were too fast and furious. Totally frustrated, Doris wanted to come home. After a rather-lengthy phone call, they concluded it would be best for Doris to drop the code portion of the course and concentrate on the other studies. Passing the written portion of the test would result in a "C" license, and would allow her to operate on the higher-frequency bands, beginning with 2 meters. Doris continued her studies. In April of 1977, she was one of 37 students who left for Kiel to take the examination. All students passed. In short order, Doris became addicted to 2 meters. It was a long while before code speed was given any thought again.

Before Cam and Doris returned to the United States, she mastered the code and upgraded her license. She held the calls DD5BK to DJ0XS. They departed for Texas in May 1979 with promises to all their German friends of being back on the air and resuming contact by July, or as



A September day to remember was spent at the QTH of W1CTF by (l-r) VK4VSF (ex-P29NSF), W1UKR, K1IJV and KG1F.



A memorable meeting in Texas of Siegi Freymadl, VK4VSF (left), and Doris Warren, NSCFP.

soon as they were again settled back in Garland, Texas.

Promises, promises! It wasn't until Doris contacted the FCC's Dallas office that she and Cam learned that the rules of the reciprocity agreement did not apply to American citizens who received their licenses in a foreign country. Once again, it was study time.

The Second Time

Truth is, at this point Doris resigned herself to never again operate a ham rig. No way was she again going to go through the mental and physical anguish of exam taking. Home beautification became her top priority. One of their rooms was still a ham shack — it was Cam's. It had a Visitor's Chair, but Doris did not sit in it. And then one day, Cam contacted a radio amateur in Stuttgart, where Doris had lived for 25 years. Doris came back to the ham shack. By nightfall she was studying once more.


On June 17, 1980, Doris not only took the exam for her U.S. amateur license, but she passed it with a near perfect score. Her first contact, as NSCFP, was with Heinz, DL3UH. To date, she has logged more than 500 QSOs with Heinz. Another standing sked is with Bing Day, W1CTF, with whom she has logged over 200 contacts.

Doris has earned DXCC, WAS, DLD100, DLYL, DXYL and WAC/YL. She is a member of YLRL, ARRL, ALARA, X-10 International No. 29,432 and YLISSB. She loves to ragchew, to find out what others do both in radio and in other activities.

QSL Manager

November 9, 1980 is a memorable date for Doris. It was on that day that she managed to contact Siegi, P29NSF (see April 1984 YL News and Views). During the short contact made through a tremendous pileup, Doris suggested a sked at a later date. One successful sked led to another; they are working toward their 200th contact. Doris also became Siegi's QSL Manager.

It wasn't conditions but excitement that prompted Doris to telephone Siegi in Brisbane, Australia, this past April. Doris had just received word that Siegi, now VK4VSF, and her OM planned to visit the United States in September. Their travels would take them to Germany to visit relatives. Then, a first trip to the United States would follow, with plans to visit Erika Broehl, KA2CKS, on Long Island, New York; Bing, W1CTF, and Ruby Day in Suffield, Connecticut; then on to the Warrens in Garland, Texas. A new dimension to the meaning of Amateur Radio has been added for all fortunate enough to have had an eyeball QSO during Siegi and Gerd's stay.

What might have looked like junk in 1970 is definitely called *the rig* now. Cam and Doris are equally thrilled that the transition occurred. What was once called the Visitor's Chair is now very happily shared. 

*Country Club Dr., Monson, MA 01057

Forbidden Planet and Other Fruit

Robby the Robot. Remember him? He was the R2D2 of the baby-boom generation. Back in 1956, when I was still a kid, Robby starred in a science-fiction motion picture entitled *Forbidden Planet*, but you did not see Robby's name up on the movie theater marquee. Stars like Walter Pidgeon, Anne Francis and Leslie Nielsen got top billing, but we kids were not interested in the real flesh-and-blood stars of *Forbidden Planet*; we were interested in Robby.

That summer, my folks piled my kid sister and me into the back of the black 1950 Buick Special and took us to the drive-in on "Buck Nite" (\$1 per car) to see *Forbidden Planet*. The movie had great special effects, including an invisible monster that screamed like a banshee and scared the living daylights out of the two kids in the back seat of the Buick.

Imagine a five-year-old and a four-year-old sneaking peeks at the movie flickering between the shoulders of their parents sitting in the front seat, hoping to avoid glimpsing the monsters lurking up on the silver screen. If by chance a monster was sighted, the frightened kid would reel back and cower among the potato chip crumbs in the darkness of that vast canyon between the front and rear seats of the Buick. And the poor kid could not turn anywhere for comfort. He did not dare look out the side or rear window of the Buick; the monster might be inspecting empty popcorn containers outside! So the poor kid had no choice but to get up and sneak another peek at the action on the other side of the windshield.

Under those adverse circumstances, I saw *Forbidden Planet* for the first time; and it left an impression on me. For one thing, I avoid invisible monsters and screaming banshees like the plague. When I read in the newspaper that the invisible monster is coming to town, I pack my bags and leave for the duration. The other thing is that after seeing Robby the Robot, I became fascinated with gadgets. For Christmas, my folks

bought me a foot-high, battery-operated (but batteries-not-included) replica of my favorite robot. Eventually Robby and gadgets like him led me down the path to radios and computers.

To Serve Man

Back in 1956, Robby could perform tasks that the men and the woman on *Forbidden Planet* could not perform (at least not without a great deal of sweat). For instance, if Anne Francis needed a ton of zircon moved from here to there, Robby moved it for her.

Today, Joe and Jo-Ann Ham have computers in their radio shack to perform tasks that would otherwise require a lot of time and effort. If Jo-Ann needs the antenna bearings of every DXCC country for her DXpedition to Bora Bora, she enters Bora Bora's coordinates into her Big Mac computer, and Big Mac spits out the antenna bearings as fast as the line printer can print them.

A few years ago, my Model 28 teleprinter might have received a message that read something like, "NAME HERE IS MR. MXYZTPLK." I could either try to figure out what the station at the other end sent or ask him to send it again. Hits and misses made RTTY difficult.

Today, when I hook my computer up to my packet-radio equipment, I can be sure that when I receive a message that reads "NAME HERE IS MR. MXYZTPLK," the guy's name at the other end is Mr. Mxyztplk. Microprocessor-controlled packet-radio equipment rejects messages that are sprinkled with hits and misses and only prints perfect copy, so I don't have to scratch my noggin trying to figure out what the other station sent.

Robot Radio

The diehards in ham radio land are worried. They believe that soon flesh-and-blood ham radio operators are going to be replaced by com-

puters. They feel that the day is at hand when all you have to do is switch on a computer and it will man the radio dials to work contests, exchange traffic, chase DX, etc. They fear that soon ham radio will become robot radio.

If this is true, then I've come full-circle . . . a robot was the spark that got me into ham radio, and a robot will get me out of ham radio. That will give me some free time to study seed catalogs and paint the house while my computer works my way to the top of the Honor Roll. Some fun, eh?

One of the tenets of our hobby is to communicate efficiently and effectively. Throughout the history of Amateur Radio, the hobby has changed to achieve this goal. As the state of the art of communications progressed, hams applied the changes to ham radio. (Sometimes the shoe was on the other foot; advances in the art of communications were made in ham radio and adopted by the communications industry!)

Today, there are many areas of ham radio that reflect the state of the art. Certainly, much of our equipment — stuffed with LSIs and microprocessors — is state of the art. And some of our modes of operation are also attuned with the times; AMTOR, packet, repeater and satellite communications are examples.

Do we stop now (or worse, do we go backwards)? Do we decide that ham radio from hereafter shall reflect the state of the art as of December 1, 1984 . . . or December 1, 1974 . . . or December 1, 1934? Of course not.

If a computer makes ham radio communications more efficient, then the computer deserves a place in the ham shack. But that does not mean that a computer must be in every ham shack. Just as some hams shun the use of repeaters or radioteletype, they can shun the use of computers. But they should not prevent others from using computers on the air and trying to advance the state of the art of communications. The ham radio pioneers of today will be the leaders of the ham bandwagons of tomorrow.

ON THE AIR

Commodore users' net meets each Sunday at 0900 PST/PDST on 7162.5 kHz. If propagation is poor, the net moves to 3830 kHz.

The new Pepperill, Massachusetts, message storage operation (MSO) has coverage of northeastern Massachusetts and southeastern New Hampshire via the 085/685 repeater. MSOVTP. accesses the system; .HELP lists the system's commands; and .EXIT deactivates the system. The MSO operates at 60 WPM using the standard DS3100 format; however, it can be booted up to 100 WPM by sending .100BAUDOT or .100ASCI.

All hams are encouraged to check into the MSO. Traffic handlers may leave First Region Net reports (to W1TN) and New Hampshire Section News reports on the system.

ON THE PHONE

Atari bulletin board system (BBS) has been placed on line in the greater New York City area by Alfred O. Krumm, K2BSM. Call 212-380-3864 for programs of interest to hams and utilities of interest to all Atari users.

*75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247

PX

TI-99/4A Circuit Designs and Calculations

Five new TI-99/4A programs, written by the TI-guru of the Tarheel State, John S. Davis, WB4KOH, are now available via the On Line program exchange (PX):

Program number 59 calculates coaxial-cable attenuation (TI BASIC).

Number 60 calculates coaxial-line loss (TI BASIC).

Tank circuits for the VHF/UHF spectrum may be calculated with program number 61 (TI BASIC).

T-networks for solid-state RF power amplifiers may be calculated with program number 62 (Extended BASIC).

Number 63 is the *crème de la crème*, it is a program that allows you to draw schematics on the TI (Extended BASIC, 16k RAM).

To obtain a listing of any PX program, send an s.a.s.e. (preferably no. 10, business-size) with 37 cents postage to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Use a separate s.a.s.e. for each program request and write the PX program number of the desired program at the lower left-hand corner of the s.a.s.e. Please do not send correspondence other than PX requests to Dept. PX, ARRL Hq.

Ham Radio Net is a new BBS that may be accessed 24 hours daily by dialing 203-665-1114. Run by Ed Raso, WA2FTC, the system supports several message areas (for example, ARRL, packet radio, DX). Similar areas for downloading files are also available. Ham Radio Net is part of FidoNet, which provides automatic message and file transfer between other FidoNets

located throughout the U.S. (See page 357 of the October 1984 issue of *Byte* for a full description of FidoNet.)

Louisiana's new BBS, "The Connection," has sections that provide Amateur Radio news, information on flea marketeering and forums for computers. Telephone 504-834-2544 to make the connection.

Affiliated Clubs in Action

Conducted By
Steve Place,* WB1EYI

BATTING 1000 — ARRL's 100% CLUBS COME THROUGH AGAIN!

Each year, a number of your fellow Affiliated Clubs stand out from the crowd. Every one of their members is also a member of the ARRL. They are our "100% Clubs."

Observing these clubs from time to time, we've noted a common theme. Amateur Radio is important to each of their members. Consequently, so is the ARRL. To members of these clubs, the ARRL and Amateur Radio go hand in hand. Of course, those with whom we've spoken don't always agree with "the League"; they make that abundantly (but constructively) clear. But they also know that when you get to the bottom line, *they are the League.*

As a League member, each has accepted a responsibility: to work to make the League as robust and vital a force as possible for the benefit of the Amateur Radio Service. Thus, these 100% Clubs have demonstrated time and again a sense of pride and commitment to ARRL. Their members won't be found sitting on the sidelines — they're players, participants who match their responsibility with dedication. Do they ask, "What's in it for me?" Yes. But their answers reflect their commitment. What's in it for them is the opportunity, as League members, to shape their Amateur Radio future and protect their interests. They're "insiders" who not only care what happens, but who also know that as ARRL members they can make it happen.

League Officers, Directors, Local Officials and staff in turn are proud to be associated with them. We salute the following ARRL 100% Clubs — thanks for your support and inspiration:

Acadiana DX Assn., LA (16); Alamo DX Amigos, TX (33); Albuquerque DX Assn., NM (38); Arkansas DX Assn. (49); Central Florida DX Assn. (16); Central Kansas ARC (65); CHARRO, TX (23); Chicago Radio Traffic Assn., IL (11); Cleveland Wireless Assn., OH (20); Committee for Amateur Radio, OH (5); Communications Club of New Rochelle, NY (45); Connecticut Wireless Assn. (14); Delta DX Assn., LA (40); Dixie DX'ers, GA (46); Dunsmuir ARC, CA (4); Eastern Iowa DX Assn. (48); FDR VA ARC, NY (5); Flambeau ARC & Repeater Assn., WI (12); 4-Landers VHF Group, GA (7); Greater Lansing DX Group, MI (8); Hams of Green Swamp, FL (21); Hilltop Seekers ARC, NJ (12); Lake Superior DX Assn., MN (12); Michigan State University ARC (27); Mid-South DX Assn., TN (12); Morton Area DX Assn., IL (12); National Capitol DX Assn., MD (56); Nevada ARA (18); New Mexico Big River Contesters (9); Norfolk RC, NE (10); North Alabama DX Club (52); North Augusta Belvedere RC, SC (33); North Jersey DX Assn., NJ (64); Northeast Nebraska RC (32); Northern Illinois DX Assn. (46); Nutley ARS, NJ (40); Ohio Valley ARA, OH (41); Order of Boiled Owls, NY (11); Phoenix ARTS, NY (20); Pickens ARC, GA (3); Polytechnic ARC, NY (3); Potomac Area VHF Society, MD (19); Red Stick DX Assn., LA (6); Rochester DX Assn., NY (37); Rockaway ARC, NY (26); San Diego DX Club, CA (60); Selma ARC, AL (9); Shasta Cascade ARS, CA (12); Sheboygan County DX Assn.,



WI (15); Shelby ARC, NC (61); Skagit ARC, WA (45); Skokie Six Meter Indians, IL (15); Smoky Mountains ARC, TN (20); South Florida DX Assn. (58); South Milwaukee ARC, WI (25); Southern California Contest Club (35); Southern Nevada ARC (3); Southside ARA, VA (10); Texas DX Society (60); Tri-City ARA, NJ (23); Tri-State International DX Assn., TN (25); Twin City DX Assn., MN (39); United Radio Amateur

Club, LA (7); University of Hartford ARC, CT (10); Vermillion ARC, MN (11); Vermont Technical College ARC (3); Virginia DX Century Club (50); W/K ARC of Greater Milwaukee, WI (18); Wapsi Valley ARC, IA (9); Ward Melville High School ARC, NY (7); West Jersey DX Group, NJ (19); Western Kentucky DX Assn. (13); Westside ARC, LA (18); Wildcat ARS, CA (3); Wisconsin Nets Assn. Ltd. (18).

Special Service Clubs

A growing number of ARRL-Affiliated Clubs have pledged to serve their communities and Amateur Radio more actively as Special Service Clubs in the coming year. We welcome our newest SSCs and encourage you to get in touch with them. (Number of members is in parentheses.)

Amador County Amateur Radio Club (102)
14155 Brandan Rd., Pine Grove, CA 95665

Austin Amateur Radio Club (317)
Box 13473, Austin, TX 78711

Granite State Amateur Radio Assn. (42)
250 Exchange Ave., Manchester, NH 03104

Northeastern Indiana Amateur RC (25)
P.O. Box 745, Auburn, IN 46706

Tri-State Amateur Radio Society (118)
8505 Whetstone Rd., Evansville, IN 47711

For information on ARRL's Special Service Club program, contact the Affiliated Club Coordinator in your ARRL Section, your Section Manager (page 8) or HQ, has the address.

*Manager, Club and Training Dept., ARRL

In Training

Conducted By
John Foss,* W7KQW

SOMETHING EXTRA FOR EXTRAS?

A squirmy problem has been troubling us for some time here at League headquarters: continuing educational advancement among all licensees, including those who have earned their "Extras." Several years ago, the Long Range Planning Committee recognized the need

for continuing education. The committee believed it to be necessary if amateurs were to fulfill their primary functions: communications research and development, and readiness and ability to provide emergency communications in time of disaster.

In partial response, the League instituted a new program to publish increasingly comprehensive License Manuals, one for each step up the ladder of amateur licensing. Next year, new License Manuals will be

available for Technician/General, Advanced and Extra levels. Also, there will be four new instructors' guides, one keyed to each of these manuals, and one to *Tune In the World*, the League's introductory guide for Novice candidates. None of these publications, however, is likely to be of much aid to the Extra Class licensee who wants to increase his knowledge of Amateur Radio and its relevant electronics beyond that required for Extra Class.

*Manager, ARRL Training Programs

This need was further addressed in the Special Service Club (SSC) Program when that program was introduced last year. Each ARRL-affiliated club that wishes to apply to become an SSC must renew its commitment to "Technical Advancement" among its members. Many SSCs have developed an ongoing program of continuing education.

But obviously, as more and more radio amateurs earn their Extra Class licenses, more and more would benefit from some kind of structured program that will keep them abreast of state-of-the-art developments. Constantly updated editions of the ARRL *Radio Amateur's Handbook*, the *Satellite Experimenter's Handbook* and other ARRL publications will provide much new information directly supplying the Extra's need for study material. But none of these publications gives the Extra an objective means of evaluating his progress. It seems reasonable that such a progress-measuring meterstick should be available.

We are exploring, therefore, some new possibilities.

Among them is a joint venture with a professional scientific organization. In one scenario, that organization might prepare several examinations at increasing levels of difficulty. ARRL would administer these examinations to those Extras interested in taking them, probably at recognized League functions, such as hamfests and conventions.

The examinations would be returned to the professional organization for scoring. Amateurs who passed would receive some form of recognition from the League for their achievement, such as handsome certificates attesting to their increased level of understanding and knowledge. No additional Amateur Radio privileges, of course, would be accorded holders of the certificates.

Many questions are as yet unanswered. For instance, should additional code speed (beyond 20 WPM) be required for any or all the awards? Should an examinee be required, in addition to answering the questions, to write an essay on a specified topic?

The proud possession of even the highest certificate,

needless to say, would not indicate perfection of knowledge. One could acquire a Ph.D. degree from every university and technical institute in the world and still not have achieved perfection. But the mere fact that such certificates are available might challenge many Extras to "go get them." As a famous mountaineer replied, when asked why he felt it necessary to climb the world's highest mountain, "Because it's there!"

The possibility always exists that possession of such a certificate would open the door to higher-level careers in the electronics industry. But, whether it does or not, its availability would offer strong evidence that Amateur Radio is indeed striving to fulfill its primary purpose; to constantly increase the level of competence among its licensees, regardless of license class.

Have you any thoughts or comments on this concept? Now's the time to let us know — pro or con — while the matter is still in the planning stage. We'd like to hear from you, regardless of what level of license, if any, you hold now.

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

AMSAT-OSCAR 10 HAS NEW OPERATING SCHEDULE

The interim schedule mentioned in last month's column has been revised. This new schedule is effective immediately, and should not require any modification until mid-January.

Remember that OSCAR-10's orbit of 699.5 minutes is measured in 256 divisions, with zero starting at perigee. This measurement is called Mean Anomaly.

Mean Anomaly	Mode	Time
0-99	B	Mon-Sat.
100-117	L	Mon-Sat.
100-117	B	Sun.
118-218	B	Daily
219-234	OFF	Daily
235-256	B	Daily

Marshall Amateur Radio Club Experiment Launched

Liftoff of the MARCE 007 experiment took place on schedule, at 1103 UTC October 5, 1984. The cannister containing the experiment was carried in the STS-41G cargo bay. At an appropriate time during the mission, the experiment was to be activated by a remote-control device called an APC Controller. The Controller indicated that power was applied to the experiment; however no signals were ever received from the beacon.

The MARCE cannister was removed from the Orbiter's cargo bay on October 18 and taken to the mock-up simulator at Kennedy Space Flight Center. When power was applied to the experiment, it started to operate immediately and all telemetry was nominal.

Ed Stuka, W4QAU, reported to ARRL that it appears there was an in-flight power-up anomaly. He further stated that when Astronaut Kathryn Sullivan activated the APC Controller to turn the experiment off, the Controller indicated that it was already off. This anomaly was recorded in the in-flight log.

The Goddard Space Flight Center was assigned the task of finding the cause of the power-up anomaly. It is hoped that if the anomaly was external to the 007 cannister, NASA might allow a reflight on a future mission.

Even though many listeners strained their ears to hear the MARCE beacon, all was not lost. One of the advantages of flying on the Space Shuttle is that you get the equipment back and find out why it did not work.

The NASA, AMSAT and ARRL volunteers who worked on this mission are to be congratulated for their exceptional professional performance. It is a very special, warm feeling to know that when the time comes to add another page of history to the Amateur Radio

space program, there will be a volunteer, somewhere ... "getting the job done."

AMSAT Satellite SET

ARRL officials in Newington received the following messages from AMSAT Bulletin station WINU:

1R K8OCL 26 DEARBORN MI 1400Z OCT 20
BERNIE GLASSMEYER W9KDR
ARRL HQ

AMSAT SATELLITE EMERGENCY COMMUNICATION SYSTEM ACTIVATED FOR 1984 SET ON OSCAR 10 SSC HI. ASECs WILL BE AVAILABLE FOR ALL FUTURE DRILLS AND EMERGENCY SITUATIONS.

JOHN CHAMPA K8OCL
EXECUTIVE VICE PRESIDENT, AMSAT

102 R N4AZI 26 BATON ROUGE LA 1530Z OCT 20
JOHN LINDHOLM W1XX
ARRL HQ
(Same text)

DAVE EANES N4AZI
AMSAT EMERGENCY
COMMUNICATION MANAGER

103 R N4AZI 26 BATON ROUGE LA 1530Z OCT 20
BOB HALPRIN K1XA
ARRL HQ
(Same text)

DAVE EANES N4AZI
AMSAT EMERGENCY
COMMUNICATION MANAGER

AMSAT-OSCAR 10 can be an effective communication tool for emergency traffic. If you would like to participate, please contact Dave Eanes, N4AZI, 4866 Drusilla La., Baton Rouge, LA 70809.

WAS Via Satellite

The WAS/Satellite Roster featured in October *QST* ASPN was for the ARRL award *only*. It was not intended to include the AMSAT-OSCAR 6 WAS list. We are sorry if anyone who received recognition from AMSAT prior to the implementation of the ARRL WAS Satellite award was offended.

Using the ARRL WAS rules as a guide, AMSAT waived Rule 3 prohibiting contacts through repeater devices. The ARRL WAS Satellite award program was not implemented until its formal notice appeared in *QST*, February 1975, page 96.

The only records ARRL has of the AMSAT-OSCAR 6 WAS awards were published in *QST* — April 1974 (p. 82) and June 1974 (p. 62) — and in a letter from AMSAT stating 15 awards had been issued. Those stations who were recognized by AMSAT to have OSCAR 6 WAS are W3TMZ, K4TI, W9OII, W5VY, DJ9RD/W9, W8DX, W0LER, K2GUG, W6EJJ, W9TGB, W0NQQ, K2KNV and W0QIN. Two call signs of the 15 are missing. If anyone has documented proof of the AMSAT-OSCAR 6 WAS award, please

forward the information to this column conductor, ARRL HQ.

The ARRL WAS Satellite roster in October 1984 *QST*, page 65, has a typo. Please change the call sign of number 56 to read K4UAS.

Monthly Listings

ASR (Amateur Satellite Report) is available for \$22 (\$30 overseas) for 26 issues (1 year) from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

AMSAT Membership is available for \$24 per year (\$26 outside North America). Life Membership is \$600. Subscription to six issues of *Orbit* magazine each year is inseparable from membership. Write to or call AMSAT Hq., P.O. Box 27, Washington, DC 20044, tel. 301-589-6062. VISA/MC cards accepted.

ARRL members only send a 4- x 9-in s.a.s.e. with your call sign to ARRL for a complete, monthly orbit schedule for all operating Amateur Radio satellites. Please mark the s.a.s.e. with the month needed, to help us ensure that the envelopes are filled properly. A year's supply of s.a.s.e.'s may be sent in at one time, but be sure to affix 2 units of postage to each s.a.s.e.

The OSCARLOCATOR package second revision is now available for \$8.50 U.S., \$9.50 elsewhere. This package and *The Satellite Experimenter's Handbook* contain all the information you need to get started using the Amateur Radio satellites.

A free package of information about AMSAT and the Amateur Satellite Program is available from ARRL Hq. This package is intended for those with no knowledge of the program.



Kennedy Space Center participants in the STS-9 AMRAD effort were (l-r): WB4BNQ, NASA; KC4YS, RI; WA4FER, RI; W4GNC, NASA; K4ATV, RI; WA4ZEE, RI; AF4N, RI; WB4OMD, NASA; KA4KHR, RI; K4GCC, RCA; AA4MI, CSC. Not shown: W4BME, RI; W4NOV, RI. Organizations identified are Rockwell International (RI), the National Aeronautics and Space Administration (NASA), the Radio Corporation of America (RCA) and the Computer Science Corp. (CSC).

*Satellite Program Manager, ARRL

It is with deep regret that we record the passing of these amateurs:

NIANC, Laurence A. Barker, Nashua, NH
 W1DG, W. Howard Goffard, Darien, CT
 WBIEKC, Angelo L. Gazzaniga, Sr., North Adams, MA
 KA1EX, Arthur E. Rehm, Meriden, CT
 WA1GOR, Leo Seidman, Plainfield, CT
 W1JQS, Anthony G. Fasano, Wilton, CT
 W1LMB, Harold O. Dahlberg, North Billerica, MA
 *W1VAP, Leslie W. Phipps, Holliston, MA
 W1YIX, Peter J. Donneau, Cumberland, RI
 K2ABU, William R. Spahr, Palisades Park, NJ
 K2CX, Albert C. Embrechts, Ancram, NY
 W2HEP, John R. Dugan, Wharton, NJ
 K2LFB, Elmer R. Fuller, McGraw, NY
 W2MTD, Ernest C. Mann, Brooklyn, NY
 *WA2NFB, Ralph W. Roehrich, Wayne, NJ
 W6W2, Martin J. Letich, North Bergen, NJ
 KC2PO, Lee F. Mattson, Swedesboro, NJ
 WA2PQF, Richard C. McNeely, Sr., Rodman, NY
 W2QBE, Leonard D. Sabin, Phelps, NY
 W3BV, Paul C. Peterson, Sr., Drexel Hill, PA
 W3DAL, John C. O'Connell, Arlington, VA
 K3GLD, Glenn R. Washburn, Jarrettsville, MD
 W3KUZ, Robert R. Godard, Uniontown, PA
 W3VLR, Francis R. Friedrichs, Bowie, MD
 K4AHF, Edward L. DeLoach, Liberty, MS
 W4CMM, Clarence A. Owen, Hawthorne, FL
 KA4CUC, Edward W. Heintz, Edgewater, FL
 W4CXD, Paul F. Murray, Union Grove, NC
 W4EXX, Jesse O. Clamp, Salisbury, NC
 *K4FY, Oscar L. Prestell, Cape Coral, FL
 WA4GKG, Lawrence H. Buhrman, Chattanooga, TN
 WB4KOE, Archie C. Burghdoff, Ellenton, FL
 W4KT, David W. Gould, Thomasville, GA
 WD4LDJ, Henry W. Underwood, East Point, GA
 W4MTZ, Albert E. Wallen, Winston Salem, NC
 K4QQ, Luther "Luke" Herndon, Richmond, VA
 KA4QVR, Anderson F. Trimn, Atlanta, GA
 W4RZL, Robert H. Glenn, New Brockton, AL
 W4TOV, Johnny F. Jordan, Preston, GA
 WB4YGA, Ingram S. Douglas, Eight Mile, AL
 WD5AAO, Bruce F. Stewart, Colorado Springs, CO

K5BAK, Mason S. Camp, Starkville, MS
 N5BKA, C. J. Taylor, Denton, TX
 W5CSD, George Echelson, Dallas, TX
 W5HEL, Thomas E. Garrard, McAlester, OK
 W5IXL, Milton Berke, New Orleans, LA
 W5MMH, Ernest L. Detwiler, Wagoner, OK
 *K5YNI, Alfred O. Shaw, Houston, TX
 W5NPW, Harvey Renger, Sr., Hallettsville, TX
 W5QIT, Claire S. Jones, Des Arc, AR
 K5STG, Harold E. "Smitty" Smith, Eugene, OR
 W5TA, Robert E. Steiner, New Orleans, LA
 W5VRK, Estle E. "Ellis" Elder, Zapata, TX
 W5ZLT, Herbert P. Schumann, Sugar Land, TX
 K6BCA, Henry J. Console, Watsonville, CA
 K6EUB, Richard A. Thompson, San Jose, CA
 N6FYE, William E. Vorhies, San Diego, CA
 W6H2O, Hadley M. Curtis, La Habra, CA
 WA6LYB, Laird L. Bell, Bakersfield, CA
 W6MGC, Clayton E. Murdock, San Diego, CA
 WA6QVV, Raymond C. Olson, Sacramento, CA
 KA6TNY, Alvin W. Loomer, San Lorenzo, CA
 W6TYP, Arthur H. Child, San Jose, CA
 W6UKT, Dearnold E. Bottemiller, Linden, CA
 WB6YAU, Jack B. Wade, Simi Valley, CA
 W7JLU, William C. Guthrie, Kingman, AZ
 W7JLD, Maynard W. Dreeszen, Billings, MT
 W7YV, Philip N. Partridge, Las Vegas, NV
 W8AZP, Edson L. Hart, Jr., Salineville, OH
 W8CKK, Pete T. Gossett, Springport, MI
 *W8ENJ, Zaidan A. Zainoon, Moundsville, WV
 W8LEH, Roland G. Allgower, Dayton, OH
 W8TAY, Anita C. Bien, Cleveland, OH
 KA9AAH, Evelyn E. Nelson, Silver Lake, WI
 WB9CBZ, Charles B. Preston, Indianapolis, IN
 W9CGD, Donald E. Winegardner, Huntington, IN
 W9FGH, Robert E. Latimer, Arlington Heights, IL
 K9FNT, William Melcher, New Albany, IN
 W9GKT, Robert G. Turner, Milwaukee, WI
 KA9GRJ, Esthetal Ford, Milwaukee, WI
 W9IFV, Robert A. Alwood, Butler, IN
 W9HIO, Herman A. Dumlner, Naperville, IL
 KA9ITN, Alfred C. Boorman, Jr., Cary, IL
 WB9NHP, Norman R. Nielson, Ingleside, IL
 WB9QMX, Harold A. Nelson, Silver Lake, WI

W9YPP, Elwyn D. Harris, Prairie du Sac, WI
 W9ZUF, William F. Stemler, Cloverdale, IN
 KA8CBI, Howard L. Gallion, Sr., Barnhart, MO
 KV0E, Michael G. Mutnick, Denver, CO
 W0EIT, Kenneth Everhart, Cedar Rapids, IA
 KA0FAP, Clarence H. Monfore, Yankton, SD
 W0FHA, Harold D. Wetzel, Omaha, NE
 W0IYR, Charles F. Hardman, Salina, KS
 KA0KJA, William B. Dawson, Hot Springs, SD
 WB0MKI, Denzel R. Begley, Wichita, KS
 W0MOK, Jack L. Delmore, Jr., Roseau, MN
 W0PRT, George W. Petty, Minneapolis, MN
 W0PUV, James L. Goddard, St. Louis, MO
 KA0QJA, Howard R. Hood, Kansas City, MO
 WB0RAP, Allan E. Longstreet, Jr., Arvada, CO
 W0YSZ, Ernest D. Byers, St. Joseph, MO
 K0ZZR, Felton Jenkins, Minneapolis, MN
 KH6CA, Warren Birkenhead, Haleiwa, HI
 *KH6OA, J. Dean Paterson, Naalehu, HI
 VE1BBY, Norman Bowers, Caledonia, NS
 VE3BEW, Robert J. Renison, Hamilton, ON
 VE3ETR, Benedict "Red" Kelly, Goderich, ON
 VE3KPH, Peter T. Taylor, Guelph, ON
 XE1FN, Robert W. Burnet, Guadalajara, Jalisco, Mexico
 ZS2ER, Joe Kirsner, Selborne, Cape Town, South Africa

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the reporter as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in QST.

50 Years Ago

December 1934

- Responding to complaints of "too much u.h.f. in QST," the Editor points out that a similar situation occurred years back when almost every ham was on 80 meters and our journal had to plug hard to get anyone down on the "u.h.f." of 40 meters! Actually, only 4% of reading matter in the past year has dealt with that portion of the spectrum.
- Ever in the forefront, Ross Hull reports that a Hartford-New York circuit on 5 meters is now working, with W2CUZ, W2AG and W2JM in contact with W1AL at R8 signal levels. Ross is intrigued with apparent effects of weather on 5-meter performance.
- C.C.I.R. is the technical branch of international radio regulation. Secretary Warner and Technical Editor Lamb attended the autumn session, contributing much in the areas of receiver selectivity and frequency standards. They also blocked an attempt by some countries to exclude amateurs from 160 meters.
- The largest body of hams ever congregated at one time — 1300 of us — came from 30 states, Canada and Mexico to the housewarming hamfest at W9PZ, station of the Lakeside Radio Club, just north of Chicago. (Your scribe recalls being met at the railroad station by the local fire truck for transportation to the site!)
- Try your c.w. skills under the A.R.R.L. Copying Bee. Five stations — W1MK, W2AYN/9, W6AM, W6ZF and W9UZ — will each transmit different texts (send in only your best copy) consisting of trick words, misspellings, abbreviations, etc.
- Your theoretical antenna field pattern may be considerably affected by the use of steel masts, as W3AKU reports from his experiments.
- Crystal control is becoming more and more

common. A welcome article by J. M. Wolfskill starts with fundamentals of piezo-electric action and takes us through modes of vibration, equivalent circuit constants and temperature effects.

- With W8BAH in general charge, members of the Lakewood and Cleveland traffic clubs provided pyion-to-pylon and grandstand communications for the National Air Races in that city.
- Much-improved performance from a regenerative detector is possible using ideas developed by Rinaldo DeCola. A separate heterodyne oscillator permits the detector to operate at maximum regeneration without actually spilling over.
- The Japanese Amateur Radio League is a new member of the International Amateur Radio Union.

25 Years Ago

December 1959

- Not much is known of the phenomenon of trans-equatorial propagation, discovered shortly after World War II through unexpected 6-meter contacts between Mexico and Argentina. ZE2JV reports on similar performance of that band in his hemisphere, through regular contacts with amateurs in France and England.
- The low drive requirements of some of the newer power tubes can pose a problem of excess exciter output. W9ERU combines a flock of resistors in H, T and L pad configurations to comprise a step-type attenuator.
- Developed during extensive work with meteor-scatter communications, W2AZL's 2-meter converter design has become about the ultimate for best obtainable sensitivity. One key is the 417A tube in r.f. amplifier circuits.

- "Two-Element Three-Band Beam and Mast for the Lean Purse" aptly describes W3PMV's bamboo pole beam structure and pipe mast, which can be lowered with block-and-tackle pulleys.
- Most war-surplus receiver units do not include S meters, so W3BLC built an outrigger package for his BC-348.
- The weight of a beam is not the only consideration in choosing a tower design. W4DQZ presents some useful data on wind pressure and torsion.
- Coax, open wire, twin lead — which transmission line to select? W1ICP helps the Novice through this confusing area with basics on line losses and standing-wave ratios.
- More than 13,000 amateurs — a new record — participated in the June Field Day activity. Tri-County Radio Association's W2LI/2, using 12 transmitter setups, made top score of some 22,000.
- The Editorial describes a few characters in our midst — e.g., Highpower (more than legal) Harry, Greedy (cheats on the exam) Greg and Moneybags (expensive station, minimum technical knowledge) Mike — who spoil our operating fun and, more important, wreck our reputation as a public-service group.
- Subcommittees and working groups at the world radio conference in Geneva have reached tentative agreements (though subject to change later by the full committees) that will maintain amateur bands in our hemisphere with no practical change. Elsewhere, however, inroads are being made by broadcasters at 7 Mc., as well as fixed and mobile interests at 10 meters, above 29 Mc.
- Substantial variations of battery voltage in mobile installations can produce instability in frequency sensitivity of transistor circuits. W6ZNM finds that a variable base bias control, instead of a fixed resistor, goes a long way to solve the problem.
- Four 811As in parallel constitute W4DWU's "medium power" kilowatt, using a separate, switchable tank circuit for each major band. — W1RW

Tactical Communications

"Put a number on it and I'll roger your message." How many times have you heard that one on the airwaves?

Well, stand by for shock therapy: Chances are that the message didn't need a number, because it was what is termed "tactical communications." As fine as the official ARRL radiogram format may be for formal written third-party traffic, it has not yet earned a place in Heaven. St. Peter does not open the pearly gates to hams because they can recite the message preamble from memory. Does this mean that we can chuck all the print that has been devoted to promoting written third-party-message traffic? Of course not. But let's give the "other" forgotten type of message equal time. Step right up and introduce yourself: the tactical message.

The ARRL *Operating Manual* defines tactical communications as meeting the need to get information into or out of an area in a time frame of minutes or even seconds. The exchange is point-to-point, with information usually in the form of instructions or inquiries. The use is generally local in nature and pertains to incidents such as automobile accidents, lost-person searches, fires, train or plane wrecks, tornadoes or local flooding. Such traffic is often in behalf of local government, disaster-associated agencies or law-enforcement agencies. In such activities as disaster assessment, the "shadow" concept may be employed: The amateur follows the local government official to whom he has been assigned to provide direct communications to the

emergency operating center (EOC). In such cases, the official may do the actual talking while the amateur, armed with a hand-held radio, acts as control operator. Tactical call signs may even be employed for convenience and ease of identity.

Somewhere along the line, many amateurs got the impression that such conduct was too much

like CB and, therefore, a "no-no." The "put a number on it" mentality has too often prevailed, even when such was clearly not the most efficient mode of communication. To jog the memories of the QST faithful, remember the well-publicized incident of the now-retired Fredonia Section Manager, Larry Lunchbucket. While bleeding profusely in his overturned

W1AW Schedule

October 28, 1984 — April 28, 1985

MTWThFSSn = Days of Week

Dy = Daily

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0300, 1400; TThSSn: 0000, 2100; Sn: 0300
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300; Sn: 0000
	CW Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 A.M., 7 P.M.; TThSSn: 4 P.M., 10 P.M.
	Fast Code Practice	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.
	CW Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Teleprinter Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
CST	Slow Code Practice	MWF: 8 A.M., 6 P.M.; TThSSn: 3 P.M., 9 P.M.
	Fast Code Practice	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.
	CW Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	Teleprinter Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
MST	Slow Code Practice	MWF: 7 A.M., 5 P.M.; TThSSn: 2 P.M., 8 P.M.
	Fast Code Practice	MWF: 2 P.M., 8 P.M.; TTh: 7 A.M.; TThSSn: 5 P.M.
	CW Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Teleprinter Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	Voice Bulletins	Dy: 7:30 P.M., 10:30 P.M.
PST	Slow Code Practice	MWF: 6 A.M., 4 P.M.; TThSSn: 1 P.M., 7 P.M.
	Fast Code Practice	MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M.
	CW Bulletins	Dy: 2 P.M., 5 P.M., 8 P.M.; MTWThF: 7 A.M.
	Teleprinter Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.

Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

On Monday, Wednesday and Friday, 1400 through 2200 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.

Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from QST, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from July 1984 QST, pages 9 and 81," indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 81.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Wednesdays at 2330 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America. The 2300 UTC Teleprinter Bulletin transmission is also beamed south on Wednesdays.

W1AW bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. Look for CW on 145.840 MHz and SSB on 145.972 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1600 UTC transmissions, and 2300 UTC on TThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8:30 A.M. to 1 A.M. EST and on Saturday and Sunday from 3:30 P.M. to 1 A.M. EST. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 P.M. Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on December 24 and 25, January 1, February 18 and April 5.

*Communications Manager, ARRL

AMATEUR RADIO EMERGENCY SERVICE QUICK-MESSAGE FORM

TO: _____ (Person) _____ (Agency)

FROM: _____ (Person) _____ (Agency)

Reply: _____

Signed: _____

To be completed by radio operator

Time Sent _____ Received _____ Answered _____
(Please use local time, 24-hour format)

WA40PA4/84 Amateur Call _____

The ARES Quick Message Form, or "Tac-Gram," developed by the Orange County, Florida, ARES.

12-cylinder Firecracker 500, his call for help was met with the eternal: "Put a number on it" (see Dec. 1982 QST, p. 11).

By definition, such tactical communications are normally conducted on 2-meter FM and repeaters, usually within a directed network operation. Not only is FM made for high intelligibility, but the compactness and availability of 2-meter hand-held equipment is ideally suited for local communication. When the amateur performs the actual exchange of information, care must be taken to keep the information accurate and simple, since a written text may not be in evidence. This calls for close cooperation and high confidence between the amateurs and the served officials. This is where amateurs must really earn their stripes as communicators.


Some tactical communication needs lend themselves to a written text, but not necessarily

formal traffic. The ARES "Tac-gram," or "Quick-Message Form," shown here has been developed and used with great success by the Orange County, Florida ARES. Your ARES group may wish to adapt it to your local use. It was produced in an easy-to-use 4 x 5½-inch message-pad format.

The ability to conduct tactical communications is not something that the amateur inherits at birth. There is a tendency to feel that such communications "come natural" like ragchewing. Unfortunately, unless one does practice, tactical communications will become just that: ragchewing. Thus, training conducted by the local ARES unit is a must to perfect tactical-communications skills. The newly published *Emergency Coordinator's Handbook* (which was sent to all ECs) has some interesting "Readiness Improvement Exercises" to develop and hone those skills.

An update: After Lunchbucket recovered from his ill-fated injuries and became a moving

force in the established amateur volunteer community, he eventually began to bemoan the general "sacrifice" it was to devote so many weekends away from the family and business. His attitude became steeped in negativism, even to the point that he begrudged those who would "rather be hamming." With that type of attitude, it was certainly a blessing to the amateurs in Fredonia when he ran away with an 18-year-old girl in his Novice class and became a beach bum riding the surf in California.

The very essence of any public-service communications, tactical or otherwise, is that it is "hamming." That expression connotes having fun. If your Amateur Radio activities have become a drudgery, go play golf or something. Life is too short to waste on unpleasantness. Those who are really dedicated to public-service communications do it for one main reason: They enjoy it. What better way to serve the public? 

IARU News

Conducted By Richard L. Baldwin, * W1RU



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The International Amateur Radio Union — since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

Ready, Willing and Able

As these words are being written, a full moon is shining on the ocean waters east of here. A golden shaft of moonlight stretches out from the shore, back toward the moon. Bright and shiny at first, where the water is undisturbed, the moonlight soon turns diffuse as it hits a patch of water ruffled by an evening breeze. As the evening wears on, the moon will trace a path across the sky toward the southwest, taking its shaft of moonlight and its reflections with it. Tomorrow night the scene will be repeated, a little bit later in the evening, and the water patterns will be much the same, except for where they are distorted by a cloud or by the wake of a boat heading down the bay.

The path of the moon, as with most astronomical objects, is predictable to the highest degree of accuracy. Our celestial mathematicians can tell us precisely where the moon is tonight and where it will be 10 years from tonight. Would life be as exciting as it is if we could predict human events with such accuracy? Would you like to know when the next general World Administrative Radio Conference (WARC) is going to be held,


and what will be the results of its deliberations? Oh, it would make it easier to implement courses of action that are dependent on the results of the WARC, and there'd be no uncertainty about what to do in preparation for the WARC, but where would be the element of challenge?

We do know that someday there will be another general WARC, one which (among other things) reviews and modifies, as appropriate, the table of frequency allocations to the several radio services. Why do we know this? Because the technology changes, the needs of countries change, the needs of the services change. All of these developments have to be weighed against the existing list of frequency allocations, and at some point it becomes necessary to modify the frequency allocations to the various services. In 1964, ARRL and IARU, thanks to the vision and leadership of the ARRL President Herbert Hoover, Jr., W6ZH, began to prepare for the next WARC. Those knowledgeable in the business of frequency management were, in the 1960s, predicting that the next WARC would be in 1980. In 1964, some 15 years in advance of the conference, that was a pretty accurate guess. As you know, the conference turned out to be WARC 79 — the point is that it was inevitable, just as the next one is inevitable.

When will there be another? ITU officials have suggested it may be as early as 1992. Others say

1995, or maybe 1999. Except for the 1992 figure from ITU, there isn't any official word yet — it's too soon for a firm date.

Although we began our preparation for WARC-79 a lot sooner — a whole lot sooner — than we are starting this time, we don't have quite so far to go. We have an IARU membership that is more aware of its responsibilities in the preparation for telecommunications conferences. We have the experience of the 1970s to guide us in "selling" the Amateur Radio Service worldwide and in developing a common set of goals for the conference so that we can present a united front. We have a new IARU administrative structure that is geared specifically to forceful representation of the Amateur Radio Service prior to and at ITU conferences. We have many more Amateur Radio leaders worldwide who have gained invaluable IARU and ITU experience over the past decade or two, and who will be playing key roles in the preparation for and participation in the next WARC.

And so the preparation is beginning. We cannot predict with mathematical certainty when the next conference will take place. We cannot predict with certainty what pitfalls will beset the Amateur Radio Service on its way to the conference. But we can be prepared and do all the things we think are worth doing. We can be ready, come what may. And we will be. 

*President, IARU

Special Events

Conducted By Edith Holsopple,* N1CZC

Bullhead City, Arizona: The Western Arizona Radio Club, in conjunction with Bullhead City, is offering a certificate to any station working a member of the club on any band during *November* and *December*. Send your QSL and s.a.s.e. to WARC, P.O. Box 416, Bullhead City, AZ 86430.

Victoria, Australia: The Wireless Institute of Australia and its affiliated clubs are sponsoring station V13WI as part of the 150th Anniversary celebration of European settlement in Victoria. Activity will be on the DX bands on all modes until *April 30, 1985*. QSL via the bureau or directly for a commemorative QSL.

Bethlehem, Connecticut: The Hen House Gang ARC will operate W1FHP throughout the month of *December*. Work any four Bethlehems around the world, any time, band or mode. QSL to Hard Hill Rd., Bethlehem, CT 06751.

Liverpool, England: Eleven members of the Merseyside Special Event Group will operate from 0000Z *Dec. 1* to 2400Z *Dec. 31* to celebrate the opening of the Beatle City Museum. The call signs used will begin with GB0, 1, 2, 4, 6 or 8; and end with the suffix BCL (Beatle City Liverpool). Operation will be on all HF bands, 2 meters and 70 cm, all modes. QSL card available via QSL Manager G4VKV, c/o Beatle City, P.O. Box 12, Liverpool, England.

Santa Claus, Indiana: The Pike County ARC will operate W9CZH from 1700Z *Dec. 1* until 1700Z *Dec. 2*. Frequencies: phone — 3.925 7.265 14.265 21.395; CW — 7.133; and 146.52 FM. QSL/XMAS

card for s.a.s.e. to W9CZH, RR 1, Box 311, Winslow, IN 47598.

Flamingo, Florida: The Everglades ARC will operate W4SVI from 1300Z to 2300Z each day, *December 1* and *2*, to commemorate the 37th anniversary of the Everglades National Park. Operation will be on the lower edge of the 10- to 40-meter General phone bands and 146.52 FM. Certificate for large s.a.s.e. to Everglades ARC, 14511 S.W. 287 St., Leisure City, FL 33033. QSL cards received will be displayed at the Miami Hamboree.

Christmas, Florida: The Coronado Wireless Assn. will operate K4HML from 1400Z to 2200Z *Dec. 15* and *16*. Frequencies will be 5 kHz up from the low end of the General bands. QSL and a large s.a.s.e. to K4HML, P.O. Box 1, Edgewater, FL 32032.

Bethlehem, West Virginia: The Triple States Radio Amateur Club will operate WB8ZTY from 1400Z to 2300Z daily on *December 15* and *16*. Approximate frequencies: CW — 7.110 14.075 21.110 28.110; phone — 7.275 14.325 21.425 28.550. Certificate via s.a.s.e. to 42 Willow La., Bethlehem, Wheeling, WV 26003.

Farmington, Maine: The Sandy River ARC will operate to honor Chester Greenwood, the inventor of the earmuff. Operation will be from 1500Z *Dec. 21* to 2100Z *Dec. 23*, 10 kHz up from the lower edges of the General portions of 80, 40 and 20 meters. QSL and 8 x 10 s.a.s.e. to KA1CNG via *Callbook* address.

Bethlehem, Pennsylvania: The Delaware-Lehigh ARC, in conjunction with Bethlehem, Pennsylvania, will operate W3OK as an expression of the warmth of the season. Operation will be from 1500Z to 0200Z *Dec. 21, 22* and *23* on the following frequencies: 3.990 7.229

14.225 21.325 and 28.525 MHz. For a certificate, send a large s.a.s.e. to DLARC, W3OK, Greystone Building, Gracedale, Nazareth, PA 18064.

QSLing Special Events Stations: To get your QSL or certificate from any of the special-events 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 stamped, self-addressed envelope. If sending for a certificate, use a 9 x 12-inch envelope if you want an unfolded certificate, or a business-sized envelope if folds are okay. Include enough postage for return of your envelope. If the special-events station is DX, include 3 IRCs. (3) Mail both your QSL and your s.a.s.e. to the address listed or to the address given on the air by the station you QSO. Be patient. Special-events stations will often print their cards and certificates after the operation is over so they will know how many to order.

Note: The deadline for receipt of items for this column is the 15th of the second month preceding the publication date. For example, your information would have to reach Hq. by December 15 to make the February issue. For the convenience of those wishing to operate, 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.

*Communications Assistant, ARRL

Hamfest Calendar

By Marjorie C. Tenney,* WB1FSN

[Attention 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. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes.]

Indiana (South Bend) — January 6: The South Bend Swap & Shop at the Century Center downtown, on U.S. 33, one-way north between St. Joseph Bank Bldg. and river, will be sponsored by the Repeater Valley Hamfest Committee. Half acre on carpeted floor. Industrial history museum in same building. Four-lane highways to door from all directions. Talk-in on 52 and area repeaters. Contact Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46616, tel. 219-233-5307.

Michigan (Oak Park) — January 6: The Oak Park ARC presents its annual Swap & Shop at the Oak Park High School, Coolidge and Oak Park Blvd., from 8 A.M. to 3 P.M. Admission is \$2.50. Electronic/computer swap & shop. Novice exams given at 11 A.M. FCC table, food and plenty of parking. Talk-in on 52. For further information, write to OPARC, 14300 Oak Park Blvd., Oak Park, MI 48237.

Virginia (Richmond) — January 13: The Eighth Annual Richmond Frostfest will be held at the Virginia State Fairgrounds, 8:30 A.M. to 3:30 P.M. General admission \$4. Flea market spaces \$3 without table; \$7 with 8-foot table. Booths with side curtains and backdrops available to dealers and exhibitors. Entire show indoors; no outside tailgating. Deadline for booths December 30, for flea market January 10. Building open Saturday afternoon for setup. Armed security at all times. Sponsored by the Richmond Amateur Telecommunications Society. Write Richmond Frostfest, P.O. Box 1070, Richmond, VA 23208, or call Bill Scruggs, N4DDM, tel. 804-272-8206.

Wisconsin (Waukesha) — January 12: The "ORIGINAL" Annual Midwinter Swapfest will be held at the Waukesha Co. Expo Center Forum beginning at 8 A.M. Directions: I-94 to Co. F, south to FT, west to Expo. Bigger buildings and fine food served at our usual low prices. Admission: \$2 in advance, \$3

at the door. Tables (4-foot) \$3 reserved (Dec. 31 deadline), \$4 at door. Sponsored by the West Allis Radio Amateur Club. For tickets write WARAC SWAPFEST, P.O. Box 1072, Milwaukee, WI 53201 (s.a.s.e., please).

Note: Sponsors of large gatherings should check with League Hq. for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance.

Coming Conventions

February 2-3
Southeastern Division, Miami, FL
March 9-10
Louisiana State, Lafayette
March 16-17
Roanoke Division, Charlotte, NC
March 30-31
Nebraska State, Kearney

ARRL NATIONAL CONVENTIONS
October 4-6, 1985
Louisville, Kentucky
September 5-7, 1986
San Diego, California
July 10-12, 1987
Atlanta, Georgia

*At press time, Amateur Radio exams are scheduled to be given at this convention. For other exam opportunities see Hamfest Calendar.

How to Register for Upcoming Exams

February 2, Southeastern Division Convention/Tropical Hamboree (Miami, Florida). Amateur exams — Technician through Extra Class — will be given. You will receive an appointment card notifying you of time to be at exam site, Flagler Dog Track. Bring the appointment card for admission to the exam site. Mail a check for \$4 (payable to ARRL/VEC), the completed 610 Form and a copy of your present license to: William Miller, N4EFO, 9910 Collins Ave., Bal Harbour, FL 33154. *Deadline for exam applications is December 31, 1984.*

*ARRL Hamfest

*Convention/Travel Coordinator, ARRL

Operation Santa Claus: Hams Endure Cold to Warm Kids' Hearts

Twas the night before Christmas, when all through the hospital, not a creature was stirring — except Operation Santa Claus. Operation Santa Claus? Sure, it's a public service event, now in its ninth year, where Milwaukee Amateur Radio operators provide communications to help hospitalized children talk to Santa on Christmas Eve.

Here's the procedure: Hospital administrators escort hams to a child's hospital room. A nurse enters the room and asks if the child wants to talk to Santa. If everything is in order, two hams are asked inside. At least one of the pair has been on Operation Santa before, so from experience they smile but make sure not to ask, "How do you feel?" or other questions about illness. No other strangers enter. The child listens to other children on the radio, is shown the microphone, and is asked to speak loudly when talking to Santa. Hams operate the transceiver and microphone, transmit the youngster's first name and age, and then let the child make initial comments to Santa. Santa responds and, after exchanges with the child, turns the operation back to Net Control.

Hand-held radios might scare kids, so cord-type microphones are desirable, connected to 5- or 10-W, battery-powered portable 2-meter transceivers. Low power minimizes TVI and ensures that there will be no interference with medical electronics. Operators use magnet-mounted antennas on metal radiators near a window. As backup, some take along an AC-extension cord, a small power supply and an extra transceiver.

A preliminary net is called up to give advance instructions and final assignments to 20 participating stations. Although around 50 children are expected at 16 hospitals, Net Control reports that there are only 22 children at five hospitals. This reduction is a blessing in disguise.

On this day before Christmas, not only is the temperature 22 degrees below zero, but 30-MPH winds are swirling up a windchill factor of minus 80 degrees — one of those days when it's warmer inside a refrigerator than it is outdoors. Yet on this special day, hams endure the cold to warm the hearts of children.

It's 3:30 P.M. — amateurs are at the hospitals in time for the Milwaukee Santa Claus Net to provide two-way radio communications for children wishing to talk to Santa, and to guide and assist Santa during his trip to Milwaukee. Net Control W9ZAG, at ARRL Amateur Radio Emergency Service (ARES) station W9WK, radios through the repeater for Santa. There is a long pause, but no answer. Hams, nurses, patients and children listen more intently as Net Control gives another call: "Calling Santa Claus

— Sierra Alpha November Tango Alpha. How do you copy, Santa? Are you ready to talk to some children in Milwaukee?" Then what should be heard, but the sounds of sleigh bells, blowing wind and a jolly, old, but familiar voice: "Milwaukee Net Control, this is Santa — Sierra Alpha November Tango Alpha. I read you loud and clear, and I would certainly love to talk to the children. Go ahead. Over." Listeners are relieved and gladdened to hear Santa's voice: "We're right on schedule, barring any storms, and, of course, we always do run into a few of those. We should be arriving in the Milwaukee area somewhere around 10:30 tonight." Contact with Santa is established at 3:55 P.M.

WD9GRI stops in front of an enthusiastic child, four-year-old Lemandre. Those listening at home can't see that the boy, a burn victim, sits in a wheel chair with his head completely covered in bandages except for eyes, ears and mouth. "Hello," he excitedly says. "Hello, Lemandre," Santa joyfully replies. "Have you been listening to us up to now?" Lemandre exclaims, "Santa, won't you come over here?" "Oh, you bet," assures Santa. "I'll be in Milwaukee at Children's Hospital late tonight. I can't tell exactly how my schedule's going to go. It depends a lot on the weather, and you might be asleep by then." As amateurs leave for more contacts, W9ULA, with a backup transceiver, remains with the child in the wheelchair. As they listen together a few extra moments, little Lemandre whispers, "Merry Christmas Santa."

Andre, age 12, says "Hi, Santa Claus." Santa replies: "Hello Andre. It's nice to talk to you on this Christmas Eve. Is there anything you'd like to talk to Santa about especially?" Andre thinks for a moment, then says, "I'd like to go home." "Well, I'd like for you to be home, too," encourages Santa, "and maybe in the near future that will be possible. Oh, my goodness, off to the right I see a big group of lights, and our lead reindeer seems to be tiring a bit. I think what we're going to do is land in the middle of that village down there and see if we can't get them some hay."

There's an old saying: "A good many things go around in the dark besides Santa Claus." Well, there isn't a dull moment today for the hospitalized children listening to Santa's trip. A sleigh runner has minor damage during a snowstorm landing at Reindeer Lake, Saskatchewan, where the tired reindeer stop to rest and drink water. Santa's old compass ices up, his pack shifts, and he flies off course, but is quickly guided back by a friendly pilot. He even sees the dazzling spectacle of the Northern Lights. Communications are periodically interspersed with Santa sightings, Milwaukee County Sheriff reports and National Weather Service forecasts.

WB9NNJ coordinates Santa Claus sightings: "Net Control, this is Santa Sighting Station. We

have a sighting of longitude 150 degrees west, latitude 62 degrees north. That would put him near Anchorage, Alaska, at this time. Back to Net Control." Sightings prove invaluable, and put Santa back on course several times during his trip from the North Pole, through Alaska, British Columbia, Alberta, Saskatchewan, Manitoba and Minnesota, and finally into Wisconsin.

The Milwaukee County Sheriff makes an announcement: "Net Control, this is the Sheriff. The Red Cross has reported a severe shortage of milk and cookies available for Santa to eat when he arrives in Milwaukee tonight. Therefore, by the powers vested in me as Sheriff of Milwaukee County, I'm declaring an official critical milk and cookie shortage. I'm asking all the boys and girls to help by putting out a little something for Santa and the reindeer when they arrive tonight. I'm sure Santa and the reindeer would really appreciate it." The Sheriff also commands all squads to give Santa any assistance he may need, has chimneys and rooftops inspected for safety, and activates special computers to determine which boys and girls have been naughty and which nice (all have been nice!).

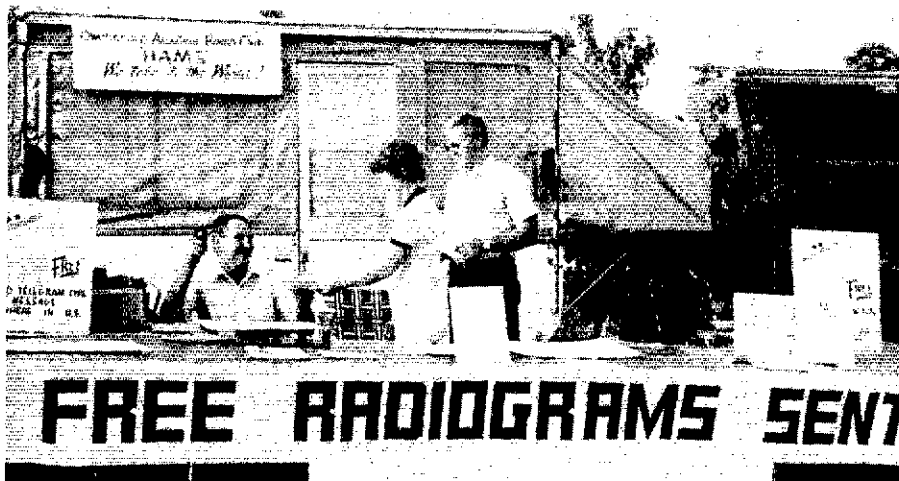
Net Control relays weather reports to help guide Santa: "The National Weather Service has just advised that a severe winter storm has developed in the Hudson Bay area in Northern Canada. Please advise Santa to change his course to avoid the storm."

Some children are shy, but others — who may not have spoken to parents, nurses or doctors for days — suddenly ask plenty of questions. "Where is Mrs. Claus? How do you get down a chimney? What if there's no fireplace? Do reindeer get cold? How do you remember to bring the right gifts?" The question, "How can you talk and fly at the same time?" reminds Santa of the time his microphone cord got caught in his beard! By far the most popular questions for Santa are requests for certain gifts. "I think I've got some of those back in the pack. I can't reach back there right now to make sure, but if the Elves did their jobs right this year, I'm sure I've got everything I need." No one questions Santa about static-free transmission from his sleigh, but I guess it's not unusual to make long-distance communications on 2 meters. After all, some net operators heard an astronaut on a Space Shuttle a month before!

Next, children of amateurs at home stations talk to Santa. Santa continues loud and clear: "Yes, Amy, I want to wish you a Merry Christmas, too. To all the boys and girls in all the hospitals and in the Milwaukee area who may be listening in, Merry Christmas to all of you." Contact with Santa continues for nearly two hours.

Despite the frigid cold, all hams who volunteered for the duty weeks before reported to their assigned hospitals to take part in the

*Deputy Communications Manager, ARRL



Owensboro (Kentucky) Amateur Radio Club members WD4IYI, WD4IYH and KA4BCM had fun providing a radiogram service at the Daviess County Fair this summer. (WD4IYI photo)

event. Parents and hospital personnel are grateful to all the dedicated Amateur Radio volunteers who made Operation Santa possible. Furthermore, we know Christmas wouldn't be possible without Santa, as portrayed superbly by WITI-TV personality Jack DuBlon, who promises to return next year ("Santa never misses Christmas"). But most importantly, the children in the hospitals will long remember Operation Santa Claus as a very special Christmas present. — *Richard Regent, K9GDF, ARRL Section Manager, Wisconsin*

HURRICANE WATCH NET

One of the many Amateur Radio public-service networks that has survived the test of time is the Hurricane Watch Net (HWN) on 14.325 MHz. Started by K4CRU in 1965, the HWN has served the public during every hurricane since then on the Atlantic side of the Western Hemisphere. (Last year, service to the Pacific side was initiated.) Net officers feed weather information to the Maritime Mobile Service Net on 14.313 MHz until a tropical storm becomes a hurricane and is a threat to populated areas. Then, net officers move to 14.325 MHz and establish the Hurricane Watch Net, staying on that frequency as long as there is a need and propagation permits. The net functioned in this manner this season for 12 hurricanes and four tropical storms off the West Coast, and for three tropical storms and one depression off the East Coast, before Diana formed off the Florida coast on September 8.

The Intertropical Convergence Zone (ITCZ) is the battleground for opposing winds from the Southern and Northern hemispheres. The most active months, June through November, find this imaginary boundary over waters warm enough to cause the formation of tropical storms that might become hurricanes. Hurricanes are a source of rain water, but are also a serious threat to life because they may cause tidal surges, very high winds and tornadoes. Net officers monitor the ITCZ throughout the season, and keep the maritime community informed of pending conditions.

The storm system that became Hurricane Diana was no exception. Diana became a tropical storm the afternoon of September 8, became a hurricane on the 10th, moved up the East Coast and then went ashore near Wilmington, North Carolina, the night of the 12th. After touring southeastern North Carolina, Diana went back to sea over Pamlico Sound the afternoon of the 14th, heading for certain breakup in the North Atlantic near the Maritimes. From the first advisory to the last, storm information was published upon receipt, usually well ahead of any news service, by members of the Hurricane Watch Net.

While the domestic news services in the affected areas all along the East Coast did an exceptional job of keeping the local populace informed of Diana's progress, they did not do as well for those folks not in the affected areas, but with interests there, such as family or property. These folks kept up to date with information gleaned from the HWN. More important,

however, was the ability of the HWN to give advisories and bulletins considerably quicker than the news services, and to provide direct point-to-point communications between the National Hurricane Center and stations in or near the affected areas. When propagation failed on 20 meters between the Hurricane Center and affected areas, the Center moved to state nets on 75 meters for continued direct contact.

In addition to the many amateurs who served as net control, who manned the National Hurricane Center station in Miami (comprised of the Dade County ARES group) and who provided local "ground-truth" weather observations, hundreds of others assisted in one way or another — by relaying, by helping keep the frequency clear by simply listening. Everyone is anxious to check in and announce his presence and availability, but this is precisely what most emergency nets do not want. However, on a busy band, there is no easy way to tell well-meaning volunteers that while we are saying "No thanks," we are taking time away from the folks in affected areas that might need the help of the net. On the other hand, we do wish to log in the official agency stations representing the Red Cross, FEMA, the military or other relief agencies.

Another type of interference came from those who insist on trying to determine the welfare of people or property in affected areas. This writer would like to hear from anyone with a solution to the problem of how to deal with amateurs who insist on asking such questions of someone with absolutely no way to handle the request, especially during the height of the disaster. What few headlines are available in a disaster area should be left free for those in peril. No ham in a disaster area has any way of checking on the welfare of Aunt Minnie when hurricane winds are blowing down the back of his neck (and perhaps his power lines, telephone lines, antennas, roof, etc.). Leave him to the business at hand — that of surviving. Welfare traffic must originate in the disaster area and should flow from the area over established nets. Stations in a disaster area do not exist to serve those not in the area. Those of us not in a disaster area exist to serve those who are less fortunate. Amateurs familiar with SKYWARN operations are also familiar with the fact that the National Weather Service depends heavily on eyewitness accounts ("groundtruths") from places affected by storms. Some of the hams in the areas affected by Diana were there to provide groundtruths and to learn of the advance of the storm; they were not there to satisfy natural anxieties.

The Hurricane Watch Net handles the publication of bulletins and advisories, and provides a path for communications to and from the National Hurricane Center. Information available on HWN is direct from the Hurricane Center, and is not a personal version of what we think the Center meant, nor what we think it should have said. Some will attempt to announce what "Gus Glamour" from the local TV station thinks will happen, but that has no place on an emergency net trying to help people learn the truth from the NHC. There have been others who monitor all sorts of RTTY frequencies and announce their evaluations of what will happen. They have no place on our net, and we take no responsibility for what they believe or what they say. We will contradict them on our net if they personalize or change the official advisories. On the other hand,

we have been known to abbreviate advisories in the interest of saving time, but we do read the entire texts, verbatim, at regular intervals.

After a hurricane, should there be a need for disaster relief agencies to communicate with stations in the affected area — as was the case following Hurricane Camille for instance — the HWN will assist. Otherwise, we secure operations, leaving the Welfare traffic for other nets established for that purpose.

Since the Diana episode, the net officers have been kept busy (as of this writing) by Edouard, Fran, Gustav, Hortense and Isidore on the East Coast, and by Norbert, Odile and a tropical depression on the West. Should there be other tropical storms in the Western Hemisphere, look for advance notice on the Maritime Mobile Service Net, and hurricane information on the Hurricane Watch Net. For an information sheet and net membership application, or to obtain answers to your questions, send a business-sized s.a.s.e. to K8YUW, 1615 Orchard Grove Ave., Lakewood, OH 44107. A great big thank you to all the many amateurs who helped out during Hurricane Diana from all of us on the Hurricane Watch Net. — *Jerry Murphy, USN (Ret.), K8YUW, Net Manager*

HAMS AT DEMOCRATIC CONVENTION

A request for help from the Democratic National Committee with their complex communications needs at the mid-July national convention in San Francisco brought a response from nearly 100 radio amateurs. Communications services were coordinated by the San Francisco Radio Club, with its president, N6GBM, as the chief coordinator, aided by WA6DDM. Two thirds of the volunteers, however, came from other clubs and communities in and around the Bay Area. Two-meter FM simplex (hand-held and mobile transceivers) were used to provide most of the links, with club repeater W1PW being used as needed, with backup circuits on 440 MHz, using the nearby waterfront-based repeater, KB6XW. To ensure reliable communications and to minimize jamming, the portable W1PW repeater was set in operation by WA6DQP and N6IMS atop the Meridian Hotel (Mondale Campaign Hq.), just two blocks from the convention center.

The complicated logistics of moving some 3000 delegates, party officials and important visitors to and from a score of different hotels, the Moscone Convention Center and any of several other meeting places demanded reliable communication among all points. Hams with hand-held rigs rode in the nearly 50 limousines, sedans and vans chartered for this work, and maintained stations at the principal sites of convention activity. We believe that this is the first time that radio amateurs have ever provided this kind of public service, which was offered to all three of the major Democratic candidates (Mondale, Jackson, Hart).

When it was over, participating amateurs agreed that despite the long hours and demanding shifts, it was always interesting and a lot of fun. Walter Mondale, Democratic Party presidential nominee, sent N6GBM a gracious letter thanking amateurs for their "extremely valuable services . . . which allowed for quick and effective disposition of large numbers of vehicles, thereby aiding public safety during the period of high traffic congestion in the downtown area . . . This is a wonderful example of why service organizations exist. The city of San Francisco and the entire metropolitan area should be proud of the efforts of these citizens, and can point to their attributes in attracting events of this scope in the future." — *Robert Franklin, K6TP, San Francisco, California*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

□ For September, 39 SEC reports were received, denoting a total ARES membership of 22,934. Sections reporting were: AB, AK, AZ, CO, CT, ENY, EPA, IN, KS, ME, MI, MN, MO, MS, NE, NC, NFL, NTX, OH, OK, ON, ORG, PAC, SV, SDG, SJV, SCV, SC, SD, SFL, SNJ, TN, UT, VA, WA, WMA, WNY, WV and WI

NATIONAL TRAFFIC SYSTEM

Welcome to K6UYK, who takes over the helm of RN6/c2 from WA6LVO. K5DUV was forced to resign as manager of TWN/c4 because of heavy work responsibilities. (Yes, even net managers have jobs outside of NTS.) K7HLR is filling in until a permanent manager is appointed. RN6/c4 certificates were earned by WB6DOB, KM6I, W6INH and WA6KRA.

Transcontinental Corps

1	2	3	4	5
Cycle Two				
TCC Eastern	112	90.2	1228	576
TCC Central	90	85.6	791	393
TCC Pacific	120	78.3	1166	534
Summary	322	84.7	3185	1503.
Cycle Four				
TCC Eastern	80	90.0	807	293
TCC Central	124	93.5	1738	883
TCC Pacific	184	91.8	2345	1176

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL

4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (September) — Cycle Two — Eastern Area (KW1U, Director) — AA4AT N1BHW K1CB WA4CCK K8BCPS WB2EAG K3KF WD4FTK N4GHI WB3GZU KB2HM K4JST WDBLRT K010 K8OZ W8PMJ W8QHB W1QVY KW1U KB3UD AFBV W2VY N2XJ W1XX W8BYDZ. Central Area (N5AMK, Director) — N5AMK K9AZS N5BT W5CTZ N5EFG KA0EY WDSFCE KA9FEZ NG5G KW9J W4JL WA4JTE W9UJ W5KLV K05KQ W89NVN W8OXE K05RC K5UPN W4X W85YDD. Pacific Area (W8HYB, Director) — K76A VE6CHK N0CXI K06D K6EY WDS5EV K87FE K87L K06ME WA0VY KF7R ND5T NV6T W7TGU K6UYK W8VWOW. Cycle Four — Eastern Area (W2CS, Director) — AA4AT VE3AW E K1BA W3BBN K13C WA4CCK N3COY W2CS N8CW KA3DTE WB2EAG W1EWF W2FR WD4FTK W2GKZ VE3GOL WB3GZU KB2HM W89IHH W150 K4JST KN1K N4KB AH2M W2MTA W1NJM W8PMJ W4PNY W3PQ W9QHB W1QVY W2RQ K3RZR KAT1 KW1U KB3UD W84JHC W4JQ W2VY VE1WF W2XD N2XJ W1XX N8XJ W8BYDZ K4ZK K2ZM W2ZJQ. Central Area (K5GM, Director) — W8AM W8CXU W5GHP K5GM W0HI K5OAF W5N5 N5TC W5TFB K5TL K05U W89YU K89X KV5X. Pacific Area (K7N7, Director) — AD9A K08N KAT0PT K09D W7DX W8EOT W7EP W7GHT N2IC W8INH W5JOV W7LG W7LYA W87NHR W8QGH ND5T W7VSE W6V2T KM7Z VE7ZK.

September Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	30	349	28.3	549	87.9	
CAN	30	677	29.2	597	100.0	
PAN*	59	925	15.7	348	96.1	
Region Nets						
1RN	59	529	8.9	378	88.9	96.7
2RN	54	239	4.4	234	78.3	100.0
3RN	30	304	10.1	532	94.2	96.7
4RN	60	522	8.7	415	75.5	100.0
8RN	80	787	13.1	461	96.2	100.0
9RN	58	469	8.1	—	—	95.0
RN7	60	755	12.6	575	95.0	98.3
9RN	60	245	4.1	320	96.1	86.7
9RN	60	313	5.2	294	100.0	100.0
TEN	60	505	8.4	368	74.8	100.0
ECN						46.7
TWN	67	298	6.2	269	70.3	95.0
TCC						
TCC Eastern	101 ¹	576				
TCC Central	77 ¹	393				
TCC Pacific	94 ¹	534				
Cycle Four						
Area Nets						
EAN	30	1801	30.0	1530	97.8	
CAN	30	803	26.8	964	99.4	
PAN	30	1173	39.1	892	98.9	
Region Nets						
1RN	60	835	13.9	598	94.2	96.7
2RN	86	587	6.8	539	93.1	93.3
3RN	60	270	4.5	486	97.8	100.0
4RN	56	647	11.6	414	90.7	96.7
RN5						100.0
RN6	30	715	23.8	632	97.9	100.0
RN7	60	755	12.6	748	90.7	98.3
8RN	52	352	6.8	423	80.0	100.0
9RN	60	477	7.9	590	94.6	98.3
TEN	60	283	4.7	340	66.5	100.0
ECN	60	274	4.8	579		100.0
TWN						98.3
TCC						
TCC Eastern	54 ¹	293				
TCC Central	118 ¹	883				
TCC Pacific						
Sections ²	6881	28,616	4.2			
Summary	7906	42,493	5.7			
Record	8955	51,307	15.2			

*PAN operates both cycles one and two.
¹TCC functions not counted as net sessions.
²Section and local nets reporting (243): APSN ATN (AB), AENB AEND AENR AENW AENX AENZ ATNM TMEN WAEN (AL), ATEN (AZ), SWN (AZ/NM), BCEN (BC), NCG RTTY/V SCN/1 SCN/2 SCN/V (GA), CN CPN NTVN RSN WCN (CT), DEPN DTN SEN (DE), CFRN ENMC FAST FBSN FMTN FPON FPTN GCVTN GN LSTTN NFPN PBTN PEN QFN QFNS SEFTN SPARC SVR LN SWFTN TPTN VEN WMN WMTN WSN (FL), OGVN GCN GSBN

RAEN (GA), 175EN 175NN IGN TLON (IA), IMN (IDMT), ILN ISN ITN (IL), ION IRN ITN QIN (IN), CSTN KMVN KPN K8BN KWN QKS QKS-SS (KS), GARES 7ARES 17ARES BARES CARN KNJN KTN KYN KYPON MKPN NKARC TSTMN WTEN (KY), CITN EM2MN EMRIPN EMRIS HHTN NEEPN WMFN (MA/RI), AEN CMEN MPN UPN (MI), RACES SQN (ME), MACS MITN MNN QMN UPN (MN), MNAMWVXNT MSN MPN MSSN PAW (MN), ARESN CMEN HBN JCCC LARN LOZCV LOZFM MEOW MOFON MON MOSSB MTTN PHD PTN RRARA SARH (NC), MTN (MT), CNCTN NCEN NCMN PCTN RARS (NC), CN CSN (NC/SC), BRARES BVARES C02MN EN2MN MINARES PARC PV2MN SBARES NCHN NCPN NNNN NE40 NE75 NMPN NSN WNN (NE), GSFM GSPN M0EN NHH (NH), JSARS MCN MSWWARC NJM NJN NJPN OBTN SJVN SJVN (NJ), NSN (NV), BSN CNYTN EPN MFN NYSPTN NYJPN NYS NYS/M OCTEN Q-NET TN WDN (NY), ALERT BN BNR BRTN BSSN COARES COTN MCTN Q6MN OSN OSSN TSARC WCTN (OH), CARA OCWV OLZ ONON OPEN OTWV OCWA-83 STN (OK), KTN OLN OPN OSN OSND TIN (ON), BSN LBLARES OARES OHNN OSN PDXARES PTTN SOFM THN (OR), NWPATMTN WPA2MTN WPA WPA2TN (PA), PTN (PA), QSN (PQ), GPD2MN LC2MN SCNTN SCSSBN (SC), BHN PDN SDEN WCEN (SD), TNCTN TNPN TNVN TSNR (TN), DFWNET TEX TSN TTN (TX), BUN QCN (UT), VTN (VT), EWTN NTN NWSSBN PSTS WARTS (WA).

1 — NET
2 — SESSIONS
3 — TRAFFIC

4 — AVERAGE
5 — RATE
6 — % REP.

7 — % REP.
TO AREA NET

Public Service Honor Roll September 1984

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. 5; (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 are listed in the Public Service Honor Roll for 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from Hq.

212	W3YYQ	W6VOM	88
K7VW	W9YCV	98	WB0TED
206	K2GCE	KA4BCM	K05FR
WA5LHL	WB2OWO	KJST	KD7ME
190	113	N1CPX	KW1U
WB7OGA	KB4WT	WB1HH	W9UJ
182	K7GXZ	K2BQ	W3VR
KK1A	110	WB8DOB	W7VSE
167	W2VY	97	WB7OGA
WB8MIO	KB5EK	87	K8JAN
164	109	WB21KL	K7LRD
N8FCQ	WB4WYG	WB2MCO	N4GHI
108	108	KC4VK	KB5W
WD8LRT	96	W0KTK	86
W9FZW	107	KA2MYJ	K0RXX
152	W9JUU	KR4V	KA9FEZ
WB7WOW	W7VSE	W4CKS	W7TGU
144	N2XJ	W6RNL	K7GXZ
KA0EY	N16A	N5BT	KB0MB
KD7ME	106	N2AKZ	WB8PMJ
141	KM9B	95	WB5YDD
KK3F	WA4JDH	WA8TFC	
134	104	85	
K85V	AA4AT	KF8J	
133	KB2HM	KA0BCB	
K4SCL	WDBLDY	WB2EAG	
K5CXP	KTSY	W1TN	
103	103	84	
KC9CJ	WA2JBO	W84J	
127	WD4ALY	W8QHB	
WB1GXZ	WA7VTD	WB4HRR	
124	KA2F	K5OAF	
KB0Z	K4ZK	KA4EYF	
122	102	83	
WF4Y	W2MTA	K8AARH	
121	WAACCK	K03P	
WF4X	KB4OZ	KA7GQP	
K4JST	W1KK	N4PL	
120	WAACCK	82	
AL7W	KC2IF	N1AJJ	
119	KB6TF	N2BGP	
KA1EXJ	101	81	
N4GHI	W2PKY	WA8MAZ	
118	W8UE	WD8OUD	
KB7FE	100	WDSGKH	
117	KA8GJV	K2YA1	
WD6BZQ	WA4PK	VE3GT	
WAQXT	N1AKS	KA2N	
116	W1AQP	80	
KW1U	K8SI	WA1YNZ	
99	99	W6NL	
WB4WH	99	AG9G	
N5AMK	99	KA4MTX	
W2ERT	99	WA4LXP	
W85YDD	99	N00N	
VE3DPO	99	78	
		WA3DUM	
		K8BKY	
		ND2N	
		K8CPS	
		N8AEH	
		78	
		WA3DUM	
		K8BKY	
		ND2N	
		KJ3E	

77	W1RWG	WD4PBF	KX2T
K2VX	71	WA4RNP	WB8MTD
K3JL	W0LAE	WB5MMI	KA8GOA
76	K2ZYI	KB4BZA	KA1T
KG2D	VE3GOL	65	WD4BSC
N7DOC	WB2IDS	KB5W	K1CB
VE3KK	KB5W	KW9D	WLXB
WD4AWN	70	N2EQM	K01K
75	KB9LT	W8IFL	KA2DOA
KA9FFO	K4VWK	KA5AZK	KB3NNI
KL7JG	KB4OG	K8TVJ	WB2QIX
KR7L	WA2KQJ	WB8KQC	N8EVC
K7LRD	K4VWK	WD4HBP	WLXB
K2YQK	WA1DXT	64	KA4SKV
AF3S	W1KRV	60	N80D
W7TGU	WB9ZQE	60	WD4KVB
A100	KA8DDQ	60	K8TP
74	W5KLV	KA4BBA	KA4YHS
AK2E	WB6QCA	K8UXO	KA3DTE
KB1PA	W7LNE	W4FMZ	N4HMD
WD9DNQ	N8CXI	K8PCK	K0C0O
68	WB5SYA	63	WB9HOX
AE1T	NDZDA	63	KA3DTE
73	67	63	WB8EIB
WA1TBY	K2ZM	63	W2GJ
WB9HOP	N1BYS	63	WB2BNA
N7BGW	N6FWG	62	WAHON
K8JDI	KB4LB	62	KN1K
72	N5EZM	62	KI4LO
WD0BOX	WA4JTE	62	WA8JTE
KA2OPG	K7OVK	62	K14LO
K8PQH	KI4LO	62	K1TM
N8CVF	61	61	WB8NHVT
K3EPO	68	61	41
KC3AV	VE2FMQ	61	WB0AID
KA4GUS	KU2N	61	WB0UD
		61	KA8GGZT
		61	WB4TZR

Brass Pounders League September 1984

BPL Medallions (see April 1979 QST, page 77) have been awarded to the following amateurs: WA1YZN, WB2OWO, KC4VK, K4WJR, KW9J and K6CY.

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SM a message total of 500 or a sum or 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 standard ARRL form.

1	2	3	4	5	6
W3CUL	781	1104	1611	144	3640
N0BOP	33	1535	130	943	2641
KA8CPA	51	1141	95	771	2058
WD8MIO	365	375	499	78	1317
WA8HJZ	0	794	22	495	1311
N4EXQ	513	158	514	27	1212
KD7ME	1	471	566	36	1074
KW1U	1	556	473	15	1045
W9UJ	0	424	426	1	851
W3VR	297	221	305	19	842
W7VSE	0	439	380	5	825
WB7OGA	49	146	510	37	742
K8JAN	0	413	30	268	714
K7LRD	374	19	296	17	706
N4GHI	48	313	319	24	704
KB5W	16	344	281	12	653
WB7WOW	15	303	291	16	615
K0RXX	0	291	13	304	608
KA9FEZ	2	251	297	13	553
W7TGU	30	237	257	21	545
K7GXZ	0	297	218	29	544
KB0MB	163	114	246	18	541
WB8PMJ	7	272	244	0	523
WB5YDD	1	272	207	30	510

BPL for 100 or more originations plus deliveries:

W1EYR	149
W9FZQ	113
KK1A	104
1 — CALL	4 — SENT
2 — ORIG.	5 — DLVD.
3 — RCVD.	6 — TOTAL

Independent Nets (September 1984)

1	2	3	4
Amateur Radio Telegraph Society	30	306	214
Central Gulf Coast Hurricane	30	181	2688
Clearing House	30	139	299
Early Bird	30	921	—
Empire Slow Speed	30	67	466
Golden Bear	30	174	1673
Hit and Bounce Traffic	30	502	603
IMRA	25	718	1343
Midwest RTTY	30		

Field Day 1984

Field Day — Definition: An organized, yearly effort by Amateur Radio operators in North America, designed to test patience, perseverance and the laws of Murphy! (KA4LKH, 1B-Battery)

By Michael B. Kaczynski,* W1OD

Field Day 1984, held June 23-24, marked the 51st running of Amateur Radio's most popular operating event. Activity was down slightly from last year, with 1441 entries received. Decreasing activity didn't seem to dampen the spirits of the participants, however. FD '84 was a resounding success!

Don't forget: It's never too early to start planning for next year's FD, to be held June 22-23, 1985. See you then! The following are excerpts from comments we received.

Enclosed are the results of our first Field Day — an experience that we shall never forget. No, we are not going to get first place, and we probably won't even place in the top 50%, but the sense of accomplishment, participation and endurance will be with us for the rest of our lives. (NN55)

We decided not to make FD '84 a contest. Instead, we concentrated on the educational/social aspects. Two budding "terminal techs" made their first low-band CW contacts, and a YL passed her Novice test on the air during an extended QSO with a Novice station a few miles down the road. (She passed the theory test 4 days later. A Novice op for FD-85!)

Also we made ours a CW-only effort. Microphone, what's that? (W8BI)

K5CFA 2A

West Texas conjures up visions of hot, flat, treeless desert, occasioned by violent thunderstorms or sand storms guaranteed to fry the front end of any ham equipment. How, you may ask, could it be possible for anyone to even hope to operate Field Day from such an inhospitable place? It's easy, if you are in Midland, Texas: an area responsible for one-fifth of the oil and natural gas produced in the U.S. It also helps if there hap-

pens to be a manufacturer of oil-drilling rigs nearby with two of the structures standing in its yard waiting to serve as antenna supports for your Field Day operation.

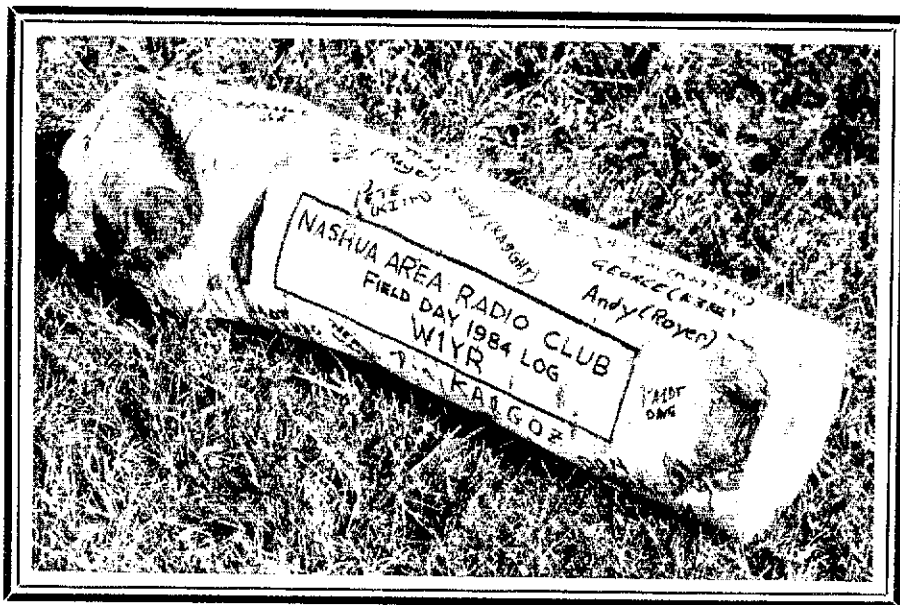
Such was the case for the Midland Amateur Radio Club during FD-84. Thanks to the cooperation of OIME, Inc., the drilling-rig manufacturer for Parker Drilling Company. Two of their rigs served as the antenna towers for two triband beams and multiband dipoles. The beams and

rotators were mounted atop the 180-foot derricks and the dipoles were supported from the "racking board" at the 100-foot level. Two OIME derrick hands volunteered to climb the rigs and install the antennas. What luck!

The club used a Kenwood TS-130S on SSB with a Moseley CL-33, a Ten-Tec 540 on CW with a Hornet TB-1000, and an Icom 745 with a Cushcraft vertical on the Novice bands. The club-owned generator provided emergency power for the equipment. Our class was 2A, and we operated under the call of Don McCarty, K5CFA. The Novice station operated under the call of Don's wife, KA5SET. Logging was accomplished by

two TRS-80 portable computers and one Apple II, programmed to log and dupe by locals W5STC and KC5DL. The stations were set up in air-conditioned portable office huts skidded into position at the base of each rig (temperature on Saturday was 98°).

The sight of two drilling rigs in West Texas is not unusual. But, mount triband beams on top, send out a press release, and watch out for the news media! During the two days, two TV stations gave a combined total of over four minutes airtime during their news segments. Both the Midland and Odessa newspapers ran almost ¼ of a page each with photos, and six radio stations told the story of ham radio and its emergency preparedness. Anyone around during Field Day weekend should now

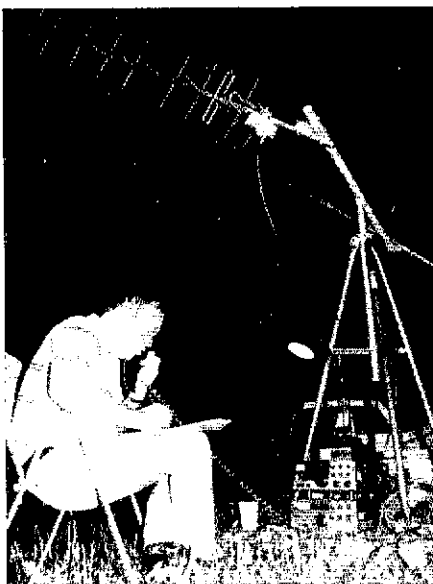


The Nashua Area RC sent in the biggest FD log this year. Now you know why we only require dupe sheets! (W1YR, 15A).

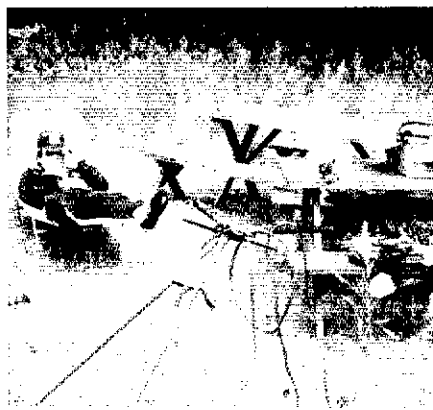
*Assistant Communications Manager, ARRL



Paul, N4BYQ, and son Keith of the Kerr Lake Campers, N4SW (2A).



Satellite op WA5NFC logs another one from NG5M (2A).



You'd never guess that KH6WZ is a Californian... Wayne's "laid back" approach to FD rubbed off on other members of the K1ET/3 group, but they may get in gear in time for FD '85.

know what ham radio is all about.

Raiders of the Lost ARC, N5HD 1A

The Raiders of the Lost ARC have been at it again. Using three generators, we fulfilled the 100% Emergency Power bonus. A 5-kilowatt gasoline-powered generator provided power for the HF station and the small air conditioner in the camper trailer/sleeping quarters. A 2.5-kW generator handled the OSCAR station. A 1.5-kW unit was used as a backup to the HF gear.

KCEN-TV, Channel 6 of Temple, Texas, came out on Saturday morning. The reporter interviewed all of us, and the cameraman shot some footage of the tower work in progress, since the contest had not yet begun. The film was aired on Sunday's 10 P.M. newscast, for our Publicity Bonus credit.

We originated a message to our SM, K5PC, to fulfill our Message Origination bonus. Ten messages were relayed during the operating period to meet the Message Handling requirement.

The OSCAR bonus proved to be quite a plus. We worked a total of 95 stations on OSCAR. OSCAR 10 was in effect a free band, and we got a boost from the extra QSOs. Antenna pointing and tracking was performed with the aid of an Apple II computer and a modified version of the AMSAT tracking program.

The 2.5-kW generator runs quite well on ethyl alcohol. For our Natural Power bonus, we powered the generator on "Everclear" grain alcohol. The corn squeezins got 13 QSOs per pint on 20-meter phone!

Our HF station was situated inside a Chevrolet van, parked in the shade and cooled with a 3-foot box fan. The breeze not only kept the ops cool, but it also kept the insects at bay. Rig was a Kenwood TS-930S. Our primary HF antenna was a 2-element quad on a 50-foot tower. The secondary antenna was a TA-33 Jr. side-mounted on the 40-meter tower. The 40-meter antenna was a "Hardware Store Special" full-size dipole, mounted on a 10-foot mast atop the other 50-foot tower. Both the quad and the 40-m dipole were rotatable.

The OSCAR station was set up under a nylon canopy approximately 100 feet from the HF station. A TS-520S was used for 10-m receive, and a TS-700SP for 2-m uplink. A TS-930S and

Table 1

Entries per Field Day Class

1A — 219	17A — 1
2A — 443	21A — 1
3A — 305	2B — 22
4A — 118	1C — 25
5A — 76	2C — 2
6A — 27	1D — 83
7A — 19	2D — 4
8A — 11	3D — 2
9A — 4	1E — 47
10A — 1	2E — 12
11A — 2	
12A — 3	Checklogs — 8
15A — 1	Incomplete — 5

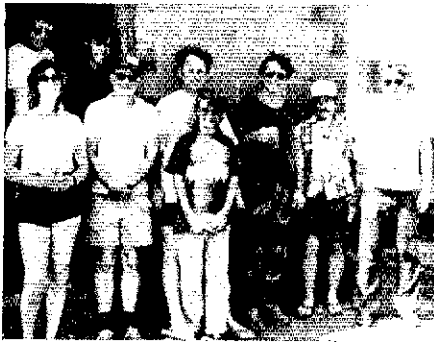


Rick, WB5FJU, prepares to cast off his yacht, named after his wife, Kay. The "dah di dah" was the site of N5IB (1C).



KA2MTS, WP4XP and KR2K hauled in points for the Submariners ARG.

Lunar transverter with a 75-W amplifier were the OSCAR 10 uplink. A TS-430S and a 2-meter receive converter were used on receive. The antennas were phased 10-element 2-meter Yagis and a circularly polarized 12-element 432-MHz Yagi, all mounted on az-el rotators. The software and hardware to control the rotators and track the satellite were each working separately,



Some of the Maui ARC cooling themselves in the shade after making 800 QSOs for KH6RS, 1A.



Hamfester Ron, KA9MKW, operated W9AA (4A) on the VHF bands.



Jim Reed, K5KUX, lower left, helps guide the Midland ARC tribander atop OINE Inc.'s drilling rig in West Texas.

but they refused to work together. As a result, all antenna positioning was done manually with the rotator control boxes after reading the satellite position information from the computer.

To keep cool in the 102° heat, we made frequent visits to a cattle trough that was constantly filled with cool, windmill-pumped well water. Although handfulls splashed in the face were sufficient for most of us, Bill, K15K "took the plunge" on Saturday night. The cows weren't too much bother, except for the one calf that escaped and had to be herded back into the

pasture by three weary FD operators. The only other problem was the distress that George, WB5VZL, suffered when he found that his VW gas tank was all but dry after it was discovered as the easiest tank to siphon gas from for the generators. All the duping after the event was done with an IBM-PC.

The Lincoln County ARC, K7PQ 5A

We began setting up antennas, ground systems, etc. on Friday, June 22. Operation began at 1100 PDT on Saturday, with transmit-

ters on 75, 40, 20 and 2-meter phone, and on the 15-meter Novice band with one of the phone rigs alternating to CW. Power was all furnished by deep-cycle batteries with recharging by generator and/or chargers operated by generator power. Operation ceased at 1100 PDT on Sunday.

An interesting addition to our operation was Hans Lohrengel, DJ7HL. Hans is from Hamburg, Germany, and happened by on a bicycle tour of the west coast. He saw our antenna party in action and was welcomed to join in the fun. He did so readily, and was a great help throughout the operation.

While our nice ground plane location near the ocean was great for the HF bands, it did us no good on 2 meters. Not a single simplex contact was made, thus no report is included for that band. We tried RTTY on 40 m, but the computer would not receive with all the RF floating around. That has been added to the list of things to try differently next year.

The publicity this year was much better than in previous years. While we are a little "out of the way," the tourists apparently read some of the advance publicity and saw our signs, because we had more than a few visitors. A fine time was had by all, and included an excellent pot-luck following teardown and packing up. DJ7HL stayed on Sunday night and we arranged accommodations for him on the route south to San Francisco.

(Thanks to Edith Holsopple, N1CZC, Bruce Hale, KB1MW and Ted Beilman for help in the preparation of this report.)

Feedback

Please refer to November 1983 QST, pages 92-103, for the following corrections. WA5ZUP did not win 2D, they scored second in class 1D. Pocono AR Klub, W3PM, should have been listed under class 3A Battery. The St. Louis ARC, NØIS, made 4706 points, not 700. Blue Valley ARC, WAØHOU, should have been listed under class 3A, 897-B-23-2332. The second operator with NØEJZ should have been listed as WØVGX, not WØVGZ. The call used by the Manchester RC was WIKKS, not W7KKS. Westchester Emergency Comm. Assn. should have been listed under class 3A, not 4A. The Somerset Co. RC operated AK3J, class 4A Commercial. Their score line should read 896-B-20-2222.

Scores

Class A stations are clubs or groups operating portable with more than two operators. Score listings are grouped according to the number of transmitters in simultaneous operation. The listings show club or group name, call(s) used, total number of QSOs, letter indicating highest power output used (A is less than 5 W; B is less than 150 W; C is more than 150 W), number of participants (if known) and total score including bonus points. Scores are listed from highest to lowest in each class.

Class B stations are portables manned by one or two operators. These may have one or two transmitters in simultaneous operation. Class 1B stations manned by one operator are listed first, followed by those with two ops, followed by Class 2B stations. When there are two operators, the other operator's call is listed in parentheses, if it is known. Numbers following the calls indicate QSOs, power and final score.

Class C stations are mobiles. They are listed by call (number of operators) QSOs, power and final score.

Class D stations are home stations using commercial power. Line scores are the same as for Class C.

Class E stations are home stations using emergency power. Line scores are the same as for Class C.

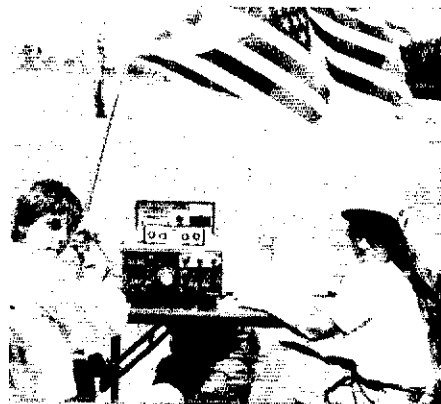
Club/Non-Club Portable

Callaway ARL WBDD	691-A-15 -7510	Virgin Islands ARC KV4IE	856-A-12 -5790	Meriden ARC W1NRG	453-A-12 -5030	East Alabama ARC KE4T	533-A-18 -3805
The Euphoric Amateurs K1EA	843-A-7 -8875	Michigan QRP ARCI Crew K8IF	568-A-3 -5780	Texas Chiggers FD Group AA5C	441-A-3 -4810	Falkner Island Radio Group KM1RI	330-A-3 -3700
1A-Battery		Non-Club Group NSAF	516-A-3 -6655	Point Loma ARC K6ZH	458-A-8 -4875	Panama City ARC WARYZ	485-A-11 -3555
Northern Illinois FD Assn K9HS	806-A-7 -7900	Central North Carolina DXers N4DAZ	888-A-6 -5030	Maricopa Minnis, Barthelow and Goldman WB9ITM/G	556-A-5 -4335	Non-Club Group WA6YEU	315-A-6 -3550
		Loose Individuals DX Soc., Ltd. KB7G17	1018-A-6 -8140				

Bass Min. Skirts and Hats K3GJ	350-A-3-3815	Grand Rapids ABA W3RC	1089-B-15-3084	Hastings ARC W3WVY	565-B-14-1412	Engle Point Amateurs K0DFX	167-B-5-477	North ARK ARS K5LG (+ KAS6GE)	2079-B-15-4644
Ulan Code Net KN7U	297-A-6-3370	Radio Amateur Megacycle Society K9CJU	882-B-4-2988	Solvwave Techniques ARC KKZE	406-B-7-1408	St. Mary ARS K4SLMZ	36-B-4-392	Midland ARS K0SFA (+ KASSET)	2025-B-23-6356
Northern New Mexico ARC NM5S	959-B-26-3306	Captain America's Legal Manoeuvre NN50	910-B-6-2912	Ausable Valley ARC W9GP	347-B-12-1406	Eaton County ARC AF8J8	199-C-8-389	Soothing Libations Consumer Corps W8FN (+ KAAPLH)	1709-B-8-4278
SCORE KD2I	1304-B-2-3258	IITRI/ECAC FD Group W3MHR	931-B-5-2842	Radio Amateurs of Texas Tech. W8SYAZ	467-B-8-1394	Lake ARA K4FC	241-C-8-341	Montrose ARC KJ0G (+ KASLPT)	2081-B-23-6100
PGA ARC N9RJ	546-A-12-3110	Tucson IBM ARC K7CZ	1068-B-11-2736	Hays ARC W8RBO	548-B-15-1392	491 Simplex Crew W8TFW	31-B-8-502	Mecklenburg ARS W4BFE	1988-B-26-6010
Gumball ARC K7FD	410-A-3-2890	The Gumbo Net W4XSE	861-B-10-2718	Tennessee Transmitting Soc. W8TH	313-B-7-1378	Sequola High ARA NBHC	18-A-8-290	SoCal CA Amateur Net & McDonnell Douglas Astronautics ARC W8VLD	2032-B-14-6808
Mountain Madness K8BP	1050-B-11-2850	Denton County ARC W8NGU	951-B-12-2716	West Volusia ARS N4DOT	566-B-14-1332	IA-Commercial V2CAR	312-B-8-618	Mid-Mo ARC N8SS (+ KA8DL)	1561-B-12-5694
River City Contesters KF6A	960-B-5-2836	The Motley Crew ARC K8YH	1204-B-15-2676	U.S. Center ARC K8UEU	305-B-11-1310	Chateaugay ARC V2CEV	199-C-5-498	Central Kansas ARC A8DS	1739-B-15-5852
Fort Lauderdale Hamlets N4FL	1085-B-25-2774	Lebanon ARC K8DEW	625-B-8-2656	Hamilton County ARPSC K8YOJ	279-B-12-1298	Non-Club Group V2CEV	199-C-5-498	WK ARC of Greater Milwaukee N8AW	1624-B-12-5540
Gunnison Valley ARC W8YVY	921-B-12-2704	South Maryland ARC K6EW	982-B-40-2622	Cacha ARC K8CJH	174-B-4-1270	2A Battery K8JVC	570-A-17-4845	Wilson Jct. RC/IBEM Burlington K10GJ	1832-B-11-5458
Oak Park ARC W8MB	948-B-21-2658	Wisconsin Valley Rptr Assn W8S9	939-B-9-2592	Cacha ARC W4MXZ	174-B-4-1270	Arapahoe RC K8NA (+ KAS6RO)	1835-A-18-14345	Battelle Ark. ARC N8GM (+ NSFGD)	1888-B-17-5424
University ARC W7SE	597-B-30-2680	USAR MARS - Hawaii K8HJUKH6	674-B-14-2580	Queen Anne School ARC W4JVP	340-B-8-1296	Conti. Wireless Assn. W8IRM	1413-A-14-13,090	Escondido ARS N8WB	1641-B-10-5414
Nocturnal Emissions QRP FD Group W4ZHSQ	252-A-3-4360	Ozarks ARC K8FA	1117-B-16-3534	Albuquerque W.B. ARS K8BI	414-B-12-1230	SUXA K8WD (+ N8FED)	1001-A-24-7375	San Angelo ARC W8QX (+ KASSWF)	1642-B-28-5324
Middlesex ARC W1HEB	717-B-18-2644	Mauli ARC K8HRS	800-B-23-2522	Butte ARC W7FO	707-B-25-1208	Western KY DX Assn. W8M4	966-A-7-4620	Mobile AL ARC W8AO (+ KA4PMQ)	1750-B-20-6270
Low Power Hams N8BLN	328-A-8-2310	Ill. City Rptr & Ottawa ARC W8YK8	972-B-13-2522	Imposal Valley ARA N8NR	440-B-12-1196	Berry Mt. ARC W8TB	597-A-4-8370	Oakridge ARC K4PJ	1301-B-22-5264
Diamond Bar ARS K7CP	335-A-13-2300	Anoka County RC W8ES	803-B-8-2500	Roscoe Valley ARS K8ACVW	216-B-9-1196	Northern Ohio ARS K8KRG (+ KASUD)	542-A-56-5695	Crofton Mountain ARC N8LL (+ N2EYV)	1458-B-18-6258
Non-Club Group K17L	303-A-5-2155	Canon Lake Universal Transmitting Soc. K8SV	1136-B-3-2472	ON-2 K8G8X	545-B-23-1190	Walton RA W8LZ	512-A-10-8720	Kanawha ARC W8GK (KASDZD)	1745-B-40-5228
Jefferson Co. ARC W8SSV	437-B-16-2104	ARA of the Tonawandas W8SDX	715-B-5-2480	Manitoba DX Group Y4CAT	431-B-8-1188	Sticky and the QRP BaySide Bombers N8RI (+ KA2CAQ)	543-A-4-5905	Non-Club Group W8TABI	654-B-4-5274
The Utah Liquor Commission K67D	1018-B-6-2094	Pikes Pike ARC W8J	542-B-7-2442	Lima Area ARC W8EQ	357-B-11-1166	Free State ARC K8IVC	570-A-17-4845	Owensboro KY ARC K4HY	1694-B-20-6134
Messillon ARC W8NP	454-B-12-2090	Orangeburg ARC A8DU	802-B-18-2424	Los Alamos ARC W8PDD	315-B-10-1166	Finland Area ARA W8YA	1494-B-20-4900	K8BL Benzie County K8RL	1614-B-4-6016
Albemarle ARC N84R	510-B-20-2006	Sevier County ARC K4KU	771-B-6-2382	Trent Hills ARC W8HT	478-B-4-1158	In-State ARS W8OG (+ K8HWP)	381-A-23-4505	IL RACES K8SA (+ W8DIEV)	1373-B-35-4984
Lincoln City ARC K8WPH	271-A-11-4600	Rodney's Rangers K8ST	1134-B-3-3388	3 D Contesters K8SH	423-B-3-1140	Green Min. Wireless Soc. N1VT	436-A-25-3970	Stallone RC of NY & NJ K2LSA	1569-B-25-4910
West Park Radios W8VM	438-B-8-1936	Collins (Salt Lake City) RC AC7H	1024-B-15-3348	Waka Tech College ARC W84TOP	383-B-22-1132	Kerr Lake Campers N8SW	1650-B-8-3500	Ham Assn. of Mesquite K8TCK (+ N8AIB)	1207-B-25-4728
CATS K41VH	738-B-9-1948	Keybeepers of Sedro-Woolley HS K77I	956-B-7-2220	Saskatoon ARC W5AA	800-C-10-1124	Oreonta ARC N8CJ (+ M2CZ)	424-A-10-3765	K8TCK (+ N8AIB)	1207-B-25-4728
Non-Club Group K3YNY	138-A-6-1780	Staubenville-Weriton ARC N8RH	906-B-22-2212	Federation of AR Transmitters K8EES	329-B-3-1094	Carroll County ARC K8PZN (+ N8DUE)	847-B-12-3692	St. Louis ARC K8JLR (+ K8NLIQ)	1433-B-20-4728
Neonosa's Gopher Munchers A56C	658-B-4-1758	Sisax ARA K4JL	625-B-15-2712	Kennedy's Key Clicks W7JIE	254-B-10-1092	Cypress Min. Boys K8FI	348-A-3-3669	Blue Ridge ARS N8AN (+ K84ET)	1308-B-45-4708
Ontario PD Assn. Y83FOXZ	450-B-6-1834	Lookout Mountain ARC N8HP	730-B-8-2178	Hopkins County ARC W84JRO	273-B-10-1088	Southwestern VA Wireless Assn. A8AU	945-B-9-3400	NDAN (+ K84ET)	1308-B-45-4708
Collins ARC K5CQ	140-B-35-1680	Independence ARC K6PUX	571-B-15-2108	U.S. Navy USMC MARS III Area K8H	401-B-5-1084	The A Team W8RRW	358-A-5-3400	Sussex Co. ARC N8WVA (+ K82NF)	1287-B-22-4698
Upper Crab Creek Propagatorists W7JBN	221-A-6-1830	Muskogee ARC W8EJK	851-B-20-2102	Rough It Bunch NA7O	996-C-3-1068	Hendricks Co. Ham Club N8RF (+ K8MBS)	1001-B-12-3168	Cedar Valley ARC W8GQ (+ K84FHA)	1304-B-25-4570
Hiawatha Valley ARC K8FT	357-B-8-1610	Skylands ARC W8ZCCN	522-B-7-2076	Jefferson County RAC W4ZWW	552-B-24-1008	Elmer Red Cross ARS W8KD	914-B-10-3202	Garland ARC W8JAN (+ N8DUC)	1317-B-20-4610
Colorado Trailers W8ETTJ	295-A-3-1525	Fireside ARC K8QBD	850-B-10-2064	West Alabama ARS W84E	403-B-20-1034	Walker Co. ARC K84DX	373-A-13-3185	Anderson ARC W4FX (+ K84FHA)	1304-B-25-4570
Non-Club Group K8RN	417-B-4-1432	Memor County ARC W3LIF	554-B-14-2042	Eastern Nevada ARS W8W7S	359-B-14-1026	Napalomo ARA W8NA7	848-B-10-2920	W8GQ (+ K84FHA)	1304-B-25-4570
The Principia College ARC W8VM	115-A-7-1360	IBM ARC - San Jose N8KL	590-B-13-2020	Mason County RC K8DXF	401-B-18-1004	Peel ARC W8SPRQ3	137-B-22-2814	W8GQ (+ K84FHA)	1304-B-25-4570
Catalabogie Buglers Y83JRT	308-B-6-1314	Aether Tweakers K8DIA	639-B-5-1962	Winoma MN ARC W8NE	485-C-12-869	Brush Mountain ARA K8VJ	293-A-4-2740	W8GQ (+ K84FHA)	1304-B-25-4570
Northern Panhandle ARC W8ZG	662-B-15-1212	Indy Five W8LNG	517-B-5-1930	West Carleton ARC W8JQR	335-B-12-960	San Andreas Fault Line Survivors K8GZ	726-B-13-2392	W8GQ (+ K84FHA)	1304-B-25-4570
Richland Raiders K8TBR	376-B-9-1150	M O T H E R S W8VJ	592-B-4-1924	Northeast Miss. ARC K8DGL	350-B-10-968	Idyl Bridge RA K2SC	516-B-17-2158	W8GQ (+ K84FHA)	1304-B-25-4570
Sacramento Wireless RC N8ESV	136-A-5-1000	IA City ARC W8VJ	561-B-18-1910	Eastern AZ ARS N7XL	386-B-5-932	Butler ARC W8VFS	670-B-10-2118	W8GQ (+ K84FHA)	1304-B-25-4570
Huron ARC W8NOZ	568-B-12-936	Douglas County ARS K4PI	687-B-18-1890	Gregg's Group W8WKP	416-B-3-932	Great River ARC W8UST	327-A-24-1935	W8GQ (+ K84FHA)	1304-B-25-4570
Magic Valley Chp. of ID Soc. of RAAs K87FS	381-B-12-924	Minneapolis RC W8KCF	706-B-14-1898	Bonner County ARC W87DA	304-B-12-906	Fort Armstrong Wireless Assn. N8CI (+ K82M)	291-A-14-1925	W8GQ (+ K84FHA)	1304-B-25-4570
Non-Club Group K87CZ	122-A-3-810	R A Club of Knoxville W4BBB	510-B-10-1868	Green Bay Island Operators K2BO	367-B-8-934	N8CI (+ K82M)	291-A-14-1925	W8GQ (+ K84FHA)	1304-B-25-4570
Alexandria RC W4HFF	37-A-1-730	Duke City Amateur Group K85F	787-B-10-1634	Lawrence County ARA K8FZD	182-B-17-686	Pecon Valley ARC K8LWU (+ K8LMMU)	474-B-10-1852	W8GQ (+ K84FHA)	1304-B-25-4570
Novatec ARC W8NCOV	186-B-7-764	L'Aasen Radio-Amateur Du La Mauricie Y82MO	587-B-56-1794	Benton County ARC W8GTV	271-B-17-874	Fern River Valley ARC W8TN	592-B-10-1874	W8GQ (+ K84FHA)	1304-B-25-4570
Yimingo ARC W4EB	138-B-6-702	Livingston ARC K8GQ	835-B-20-1780	Ellis County ARC K8PG	333-B-15-866	Field Day Fanatics W84C	529-B-7-1768	W8GQ (+ K84FHA)	1304-B-25-4570
Chestnut Hill ARC A8IQ	210-B-4-638	607 Field Day Group W8BULW	681-B-3-1782	Lower Yakima Valley RAAs W7ACA	191-B-7-684	Midford ARC W8YDK (+ K8RJS)	577-B-12-1728	W8GQ (+ K84FHA)	1304-B-25-4570
Georgian Bay ARC Y83WF	156-B-14-412	Central Wisconsin CW ARC N8BBN	504-B-17-1740	NET - BARS - SARC W8VJ	302-B-17-626	Kearnsage ARS K8IR	275-B-18-1370	W8GQ (+ K84FHA)	1304-B-25-4570
1A		Univ. of Sask. ARC K8SA	308-B-7-1730	Humboldt ARC N84Y	734-C-15-835	Treasure Valley RA N7AA	509-B-6-1356	W8GQ (+ K84FHA)	1304-B-25-4570
Raiders of the Lost ARC N8SD	1564-B-7-5598	Black Hills ARC W8ELK	144-B-35-1688	ICARES W8LCU	178-B-6-830	Communications Club of New Rochelle K8DNZ	393-B-10-1026	W8GQ (+ K84FHA)	1304-B-25-4570
Adriatic Radiotelegraphers RC K84H	1368-B-4-5672	Wood Ticks K8ND	364-B-3-1656	Red River Valley ARC W8SRDUS	437-B-15-1646	Western PA FD Assn. K83N	520-B-4-1240	W8GQ (+ K84FHA)	1304-B-25-4570
Father Leon's Group N9AG	1838-B-4-5459	Theodore Roosevelt ARC K8ND	590-B-31-1602	Kaplain & Krew K8ID	624-B-18-1584	Rolla Regional ARS W8G3 (+ K8RQU)	301-B-40-1240	W8GQ (+ K84FHA)	1304-B-25-4570
Bozo and the Lids W8TQ	1069-B-6-4878	Edin ARC W8NN	567-B-8-1580	Medina Two Meter Group K8TY	713-C-21-1530	Lockport ARC W8RUI (+ KA2CAQ)	323-B-15-1096	W8GQ (+ K84FHA)	1304-B-25-4570
Contest Oriented Operators N8QB	1011-B-4-4544	W8NN	567-B-8-1580	Ramsey County ARC N8AO	515-B-12-1530	Sherrill ARC N8TEC (+ N7FSD)	219-B-6-880	W8GQ (+ K84FHA)	1304-B-25-4570
Idaho Contest Conspiracy Group K7MM7	582-B-5-4924	Gopher Creek Group V8EQM	607-B-5-1514	North Augusta-Belvedere RC K4FR	405-B-14-1512	The 3 Generators W8SU (+ K8GUDZ)	158-B-8-838	W8GQ (+ K84FHA)	1304-B-25-4570
The ARC of Ohio State Univ. W8LT	1089-B-3-4302	ARC of Carrollton K8SA	453-B-15-1608	ARC of Carrollton K8SA	453-B-15-1608	Penny Pines Brass Pounders N8FMR	96-A-5-800	W8GQ (+ K84FHA)	1304-B-25-4570
W8LT	1089-B-3-4302	Rainbow Canyons ARC N7KM	1300-C-12-1500	ARC of Carrollton K8SA	453-B-15-1608	Bellevue AR Foundation W8BGLD	965-B-3-4240	W8GQ (+ K84FHA)	1304-B-25-4570
Bellevue AR Foundation W8BGLD	965-B-3-4240	Bell System of Ind. ARC W9ZW	417-B-10-1490	ARC of Carrollton K8SA	453-B-15-1608	Midnight Mine ARC K8LRW	399-A-7-4190	W8GQ (+ K84FHA)	1304-B-25-4570
Midnight Mine ARC K8LRW	399-A-7-4190	Yale University ARC W1YU	472-B-7-1488	ARC of Carrollton K8SA	453-B-15-1608	Yonk County ARS K4YTZ	1185-B-15-4184	W8GQ (+ K84FHA)	1304-B-25-4570
Yonk County ARS K4YTZ	1185-B-15-4184	Lockheed E.R.C. ARC W8LS	382-B-8-1470	ARC of Carrollton K8SA	453-B-15-1608	Thibodaux ARC W8YFL	1294-B-20-4088	W8GQ (+ K84FHA)	1304-B-25-4570
Thibodaux ARC W8YFL	1294-B-20-4088	Sabine Valley ARA K8SA	554-B-10-1454	ARC of Carrollton K8SA	453-B-15-1608	Radio Free Streamwood N8AGD	1121-B-8-4006	W8GQ (+ K84FHA)	1304-B-25-4570
Radio Free Streamwood N8AGD	1121-B-8-4006	San Houston AR Klub K8XN	438-B-4-1434	ARC of Carrollton K8SA	453-B-15-1608	Richardson Wireless Klub K8RWK	1156-B-25-3812	W8GQ (+ K84FHA)	1304-B-25-4570
Richardson Wireless Klub K8RWK	1156-B-25-3812	SROC/FMFC W9EJ	571-B-82-1434	ARC of Carrollton K8SA	453-B-15-1608	Aimons County ARC W8CBV	1341-B-15-3800	W8GQ (+ K84FHA)	1304-B-25-4570
Aimons County ARC W8CBV	1341-B-15-3800	Non-Club Group N4ES	337-B-8-1428	ARC of Carrollton K8SA	453-B-15-1608	Donan Radio ARC W84D	1372-B-12-3578	W8GQ (+ K84FHA)	1304-B-25-4570
Donan Radio ARC W84D	1372-B-12-3578	ARC of Carrollton K8SA	453-B-15-1608	ARC of Carrollton K8SA	453-B-15-1608	Dr. Loomis Memorial Jr. Mechanics' League N4EM	1033-B-8-3482	W8GQ (+ K84FHA)	1304-B-25-4570
Dr. Loomis Memorial Jr. Mechanics' League N4EM	1033-B-8-3482	ARC of Carrollton K8SA	453-B-15-1608	ARC of Carrollton K8SA	453-B-15-1608	Porter Heights Independent Team N8RO	806-B-5-3482	W8GQ (+ K84FHA)	1304-B-25-4570
Porter Heights Independent Team N8RO	806-B-5-3482	ARC of Carrollton K8SA	453-B-15-1608	ARC of Carrollton K8SA	453-B-15-1608	Delta DX Assn. W8RU	1013-B-14-3356	W8GQ (+ K84FHA)	1304-B-25-4570
Delta DX Assn. W8RU	1013-B-14-3356	ARC of Carrollton K8SA	453-B-15-1608	ARC of Carrollton K8SA	453-B-15-1608			W8GQ (+ K84FHA)	1304-B-25-4570



The N3DQ crew kept their heads above water on this tiny island.



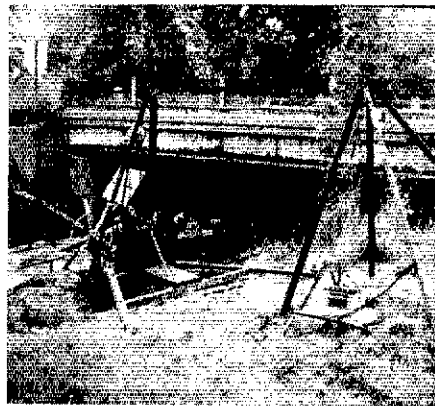
KA8UXM and KA8USA operated a patriotic Novice station for the Stu Rockefeller ARS.

Putnam Emergency & Amateur Repeater League K2AV (+ N2EGS) 1043-B-19 -3634	Non-Club Group N2AE 708-B -3 -2912	Cochise ARS AATD 800-B-14 -2330	Wichita ARC W8SOE (+ KA8SQW) 541-B-30 -1950	Great Plains ARC W8BCP 568-B-15 -1600
Tampa ARC & Hillsborough ARS KR4X (+ WD4REX) 1028-B-40 -3606	Calumet ARES KN9P (+ KA8NVL) 795-B-14 -2908	No Chance to Talk Group NC2T 765-B-20 -2928	Montreal ARC VE2BG 691-B-12 -1940	Borderline ARC KA78PB 474-B-15 -1592
Gwinnett ARS NG4IA 862-B-11 -3574	Intercounty ARC K2QMF 848-B -9 -2900	Central Wis. RAAs, Ltd. W9NN (+ KA8AGE) 710-B-21 -2328	Sperry ARS KN9Q 702-B-10 -1838	Lake Huron ARC W8JC 548-B-17 -1590
West Georgia ARS N4DX (+ KB4AET) 1038-B-15 -3558	Annapolis RC W3HVC 883-B-13 -2898	Yolo ARS A16P 705-B-18 -2318	Athens ARC W8CR 658-B-15 -1930	Suburban RC-St Louis W8DCW 638-B-72 -1598
Yellowstone RC K7EFA 1043-B-20 -3542	Sandy River ARC KI1B (+ KA1IGD) 734-B-21 -2892	Knox Co. ARC W8SFD 604-B-25 -2308	ARS of Tennessee Tech W4AUCJ 574-B -7 -1920	UAMARC N8EI 559-B-12 -1578
Roper Min Weight Lifting & Libations Soc. N4IQ 1186-B -3 -3524	Parsons Area ARC WB9RCZ 803-B-10 -2890	Sweetwater ARC K9TL 892-B -2308	Woodson Co. Kansas Amateurs KCBW 745-B -7 -1898	Hollywood ARC W84TON 388-B-12 -1570
KRCOSHG Co-op K8AEU 863-B -3494	Bankhead ARC N4AKW (+ KB4EEK) 1288-B-13 -2888	Albany County RACES/ARES W4ZYBM/2 838-B -8 -2302	Detroit Metropolitan RC W8LXE 518-B -8 -1888	Lake Co. ARS N6CP 797-B-30 -1560
Cathoun County ARS NN4R 1343-B-50 -3422	Gulf Coast ARC W4D 823-B-40 -2886	GARC K4JMC (+ KB4FAI) 577-B-21 -2302	Arrowsmith ARC VE5FMJ 533-B-18 -1886	Golden Crescent ARC W5DUJ 616-B-15 -1558
Morgan Co. Rptr Assn. Club K9XC 1034-B-20 -3416	Southern Counties ARS K2BR 812-B-50 -2866	Rowan ARS W4EXU (+ KB4HJP) 615-B-17 -2288	Strait's Area ARC W8GON 457-B-15 -1879	The Columbus ARC K9RXX 462-B-20 -1550
Dulancers KR8I 1380-B -8 -3414	Central Washington ARC W7GB7 828-B -7 -2844	Old Post ARS W8EOC 982-B-22 -2284	Three Rivers ARC W8BRN/B 644-B-21 -1874	Huan Hill Gang KC3AQ 487-B -5 -1544
Kingsmere Park Gatineau ARS VE2QJ 979-B-11 -3390	Wilong ARS K8RVN 748-B-12 -2836	Volunteer ARC N14N (+ KB4FMZ) 648-B-12 -2254	Great Falls Area ARC K7ABV 562-B-15 -1858	Central VT ARC W19BD (+ KA1KAO) 649-B-20 -1538
Tuscola ARC K8DU 880-B-12 -3372	Northeast MO ARC W8CBL 741-B-14 -2818	Gonzaga Prep Ham RC KCF7J (+ KA7RCS) 872-B-15 -2250	ShyWw RC W7FT 815-B -8 -1850	KH8LG 1006-C-28 -1538
Muscle Amateur Contest Soc K8CNO 989-B-12 -3320	Fontana Jr. High ARC W8A6ZF (+ KA6ULW) 1018-B-12 -2818	Walton ARS W8RG 813-B-10 -2234	Manatee ARC K4GG 724-B-35 -1640	Salem Field Day Team W4ISOT 458-B -6 -1622
American Red Cross Emergency Communications N2MH 1181-B-20 -3310	Agawam Quadruphant ACIT W4E 1002-B-12 -2776	NCOS 640-B-10 -2220	Waldo Co. ARC K1BZ 498-B-10 -1832	TRW ARC W8WBS 412-B -8 -1514
Southwest Dallas Co. ARC K8HJ 1490-B-80 -3280	Central Carolina ARS W4E 1002-B-12 -2776	Rip Van Winkle ARS W2FSL (+ KA2OYG) 756-B-16 -2182	McDonnell Douglas ARC St. Louis W4OCV 507-B-15 -1824	Extra Efforts NSAX 487-B -7 -1500
Millford ARC K8CNO 1001-B-20 -3270	Texoma ARC K5GDD (+ KA5SLI) 840-B-15 -2768	Lakes Area ARC, Inc. W4W0E/B (+ KA8JJK) 590-B -9 -2188	84-24 Signal Corps. W4LE 584-B-12 -1818	NSAX Neptune ARC N2GT 435-B-14 -1496
River Cities ARS K2AG 1030-B-29 -3266	Racine Megacycle ARC W9UDU 1277-B -8 -2754	Bullitt ARS N4ICU (+ KA4MIS) 785-B-50 -2178	Sub Sig. ARC K1WEV 572-B-12 -1814	Livingston ARS W5ACKF 558-B-36 -1492
Moms & Palsak Cos. ARES W2UH 925-B-31 -3252	West Palm Beach ARC W4JAW (+ KB4KJG) 1056-B-15 -2746	Greater Bridgeport ARC K1AP (+ KA1BOX) 666-B-20 -2158	Whitk W8HTK 448-B-12 -1810	Livingston ARS N6SH 616-B-12 -1490
Beaumont ARC W5RN 881-B-50 -3242	Sandhills ARS W8MI 904-B-25 -2698	Miami County ARC W8FW 741-B-14 -2140	New Ulm ARC N8BA 422-B-12 -1808	Camp Joy Expedition W9RVP 469-B -4 -1484
Rochester ARC W8MXW (+ KA8PIC) 1935-C-35 -3226	Central Louisiana ARC K5MS (+ KA5SYU) 949-B-20 -2688	Fresno ARC, W8TC 736-B-36 -2134	Granite State ARC K1RD 509-B-10 -1802	Big Island ARC K8SCC 330-B-12 -1486
Southwest MO ARC W8EBC (+ N8FLJ) 896-B-36 -3212	Naperville ESDA N8RF 691-B-10 -2688	Teton Co. ARES/RACES N7NG 720-B-10 -2124	Hamilton Co. Amateur Assn K8KWJ 684-B-21 -1788	Kansas Nebraska RC W8BBM 310-B-18 -1456
The Granite State Hill Toppers AF1T (+ KA1LBM) 1233-B -7 -3196	Williamson Co. ARC K5SP 786-B -4 -2670	Opjensburg ARC K2JPM (+ KA2CCU) 491-B-26 -2122	New Trier H.S. ARC W9EDC 432-B -8 -1786	Tippeschno AR W9REG 493-B-26 -1436
Arlington ARC K8SLD5 (+ KA5SPT) 1384-B-20 -3196	KY Colonel ARC W4A1GS (+ WB4YXW) 699-B-25 -2612	Casper Outlaws N4TR 600-B-12 -2118	Carnegie-Mellon RC W3VC 402-B -4 -1780	Skeeter Slappers N8ID 319-B -5 -1436
Ottumwa ARC N8SM 912-B-14 -3182	Lake of the Ozarks ARC K5GV 865-B-20 -2608	Central Pennsylvanix DX Club K4JLD 774-B-11 -2108	Delaware Co. ARS W3UER 787-B-22 -1774	Harrison Co. ARC K1BS 356-B-12 -1436
Canadian Police College ARC VE3CP/3 915-B-17 -3176	Broken Arrow ARC W5DRZ (+ N5EPE) 1161-B-25 -2596	Brightleaf ARC W4AMC (+ N4KJM) 683-B-25 -2100	Shuswap ARC VE7RW 496-B-20 -1768	Delta ARC N8FCI 465-B -7 -1420
Des Moines RA Assn. W8AK 852-B-15 -3156	Canton ARC W8AL 727-B-15 -2596	Scotland RA Repeater Assn. K8AAR 725-B -8 -2092	Laurine Emergency ARC & Western IL W4V1P 1300-C-18 -1749	Shore Points ARC K2VJ 347-B-19 -1412
4A Radio Club N4EZ 1032-B -9 -3152	Mountain ARC W9JAW (+ KN2CMD) 881-B-20 -2576	Saline County ARC K8NE 550-B-20 -2066	East Kootenay ARC VE7IP 1300-C-18 -1749	Ottawa ARS W8QW 374-B-10 -1406
Metro Atlanta Telephone AE4Q 848-B-22 -3142	Faulkner Co. ARC W8L 771-B-15 -2572	Better Luck Next Year ARS K8TRK 758-B -4 -2052	Non-Club Group W8NSL 892-C -6 -1748	Kings ARC N8WK 427-B-41 -1402
Farmington ARC W8RC (+ N8ANR) 1063-B-22 -3128	Utah ARC W8SP 1345-C-20 -2567	Flambeau ARC N8WV 646-B-11 -2042	Non-Club Group W8NSL 892-C -6 -1748	Northwoods ARS AA5Y (+ KA8RQH) 337-B-41 -1402
El Paso ARC W8ES (+ KA8TQP) 981-B-21 -3100	Clackamas ARC KX7T (+ KA7OAH) 664-B-36 -2564	Puener ARC (Ottawa) VE3NA 715-B-18 -2040	Central Georgia ARC W24M 524-B-15 -1742	Huntington ARS K9ZLU 601-B-12 -1402
Glymont High School K3WJV 975-B -8 -3100	Eastern Shore ARC W84R (+ KA4MJT) 878-B-12 -2552	Bastrop ARC K8EB 524-B-10 -2040	ARC of Savannah W4HBB (+ KB4LV) 473-B-28 -1724	Hardee Co. AHES W4AKWB 358-B -8 -1392
Brandon ARS K4TN (+ KB4FLH) 898-B-25 -3088	JPL ARC W8VIO (+ KB8DVL) 683-B-20 -2550	Centralia ARC N04N (+ N4IUY) 562-B-35 -2038	Panna-Mar RC W3MUM 561-B-20 -1694	Xenia Weather AR Net K8URB 560-B-19 -1390
Johnson City RA K4SE 968-B-25 -3068	Alpoma ARC VE3SOO 643-B-18 -2536	Red Dog Contest Club NE2W 616-B-15 -2012	Campbell Co. ARC W7HNI (+ KA7TBB) 612-B -9 -1880	Meado-Breck FD Group W4DU 370-B-16 -1388
Kanose Co. ARC K4KAN 981-B-12 -3068	St. Paul RC K6AGF 743-B-20 -2528	Submariners AR Group K8ZK (+ KA2MIS) 606-B-14 -2028	Hub City ARC K4JFF (+ KA8NNU) 350-B-20 -1884	Piano AR Klub N4SK (+ KA5RYF) 275-B-78 -1388
Wilderness Ham Radio Operators K8SG (+ KA8OGL) 764-B-11 -3068	Regina ARS VE5NN 726-B-17 -2520	VA Amateur Communication Assn. W84VE (+ KB4IRP) 661-B-16 -2002	Chicago Citizen's RL N8CHT 506-B-15 -1864	Painesville ARC K8BT 385-B -8 -1378
Laurel ARC W5NA (+ N5DWU) 838-B-30 -3028	Denver ARC W8TX 708-B-11 -2502	Raleigh AR Society W4WV 709-B -8 -1990	Clark County ARC W8WWT 506-B-70 -1660	Mt. Baker ARC K7SKW (+ KA7IY) 376-B-40 -1366
Delaware ARC N8BU (+ N8FES) 901-B-25 -3020	Ogden ARC N47M 709-B-20 -2462	Glynn ARS K4TVE (+ KA4OTR) 441-B-12 -1984	Isaacson ARC W4AAHP 655-B -9 -1658	Petaluma DX & Experimenter Soc. W8EGE 315-B-11 -1366
Fauquier ARS K4MZ 640-B-10 -2990	Green County Chapter of N5FER (+ KA5UCW) 640-B-15 -2446	Las Vegas ARC K7LUG 780-B-20 -1960	Non-Club Group NSCHA 577-B-13 -1622	Staten Island AR Communicators N8CGV 473-B -9 -1314
Oklahoma City Autopatch Assn. K8NK (+ KA55VA) 648-B-40 -2988	Finlay RC W8VST (+ KA8TOK) 690-B-25 -2440	Montachusett ARC W1GZ (+ KA1HNA) 535-B-15 -1958	Amateurs For Better Communications K8AKOL 512-B -4 -1630	Long Island DX Assn. K2BS 782-C-15 -1359
Tri City ARC K8M1G (+ W4IWWY) 640-B-20 -2968	Easton Westlake Village ARS W8GBOB/6 828-B -4 -2418	Chesapeake Bay RA, Inc. K83D (+ N3CWX) 644-B-18 -1956	Non-Club Group NSCHA 577-B-13 -1622	Iola Radio Amateurs W8GHH 385-B -7 -1306
Tandem RC K6BN 1088-B-15 -2964	PHD ARS W8WGU 873-B-31 -2418	Non-Club Group W6PIY (+ N6JXV) 1080-C-10 -1952	Wolfeley ARS W1TKZ 482-B-20 -1302	
Smoky Valley RC W8CR 893-B-23 -2948	73 Magazine ARC W1XU 690-B-11 -2404			
Shenandoah Valley ARC K4RKC 878-B-20 -2830	Marymeeting ARS N1MA (+ KA1EL) 809-B-17 -2398			
Lake Co. ARC W9LJ 803-B-28 -2920	Bay Area ARS K8MJ (+ KA3HKBJ) 710-B-11 -2334			

Cumox Valley Wireless Club VF7CW	391-B-10	-1258	Maryland/DC Navy-Marine Corps MARS K3VPZ	136-B-4	-556	Enfield Radio Amateurs Group N1SR (+ KA1LTI)	1892-B-18	-6958	Stockton ARC W8SF	962-B-35	-3280	Appalachian Repeater Assn. KDBX	057-B-8	-2188
Hoop Pole Ridge Runners KCBAT	425-B-5	-1250	Rockport Ham WB5OLT	75-B-11	-536	North Shore Repeater Assn. W1ND (+ KA1LSB)	1624-B-34	-5946	Amateur Radio Caravan Club K1BAM (+ KA5SUN)	1100-B-27	-3244	South Bay ARA K9CII (+ NK1LV)	723-B-46	-2180
WAWA Group VE3DVI	310-B-3	-1248	Chilihuac VE7AFA	232-B-20	-528	West Texas ARC W5NW (+ KASPV5)	2434-B-45	-5690	Old Bamey ARC N2CO (+ WB2JPY)	963-B-20	-3204	Intercity ARC W5WE (+ KA8GED)	575-B-26	-2146
ARC Laval Laurentides VE2CFA	451-B-16	-1236	Hammer Hill Hill W1ZAD	160-B-4	-520	Boulder ARC K80K (+ KA8OPT)	1550-B-45	-5884	KN9Kare K9NK	954-B-9	-3194	Highland ARA N8BY	858-B-17	-2146
Lake Country Area AF5B	381-B-10	-1236	AH Explorer Post #159 W4WVJ	105-B-5	-510	W5AU (+ KAS5WV)	1577-B-49	-5856	Orange Hill Contesters N16W (+ N6JKR)	1758-B-12	-3189	FCARC W1XA (+ KA1LK)	505-B-14	-2104
Grand Island ARS W8CUO	372-B-26	-1236	Branch County ARC W8SKAF	120-B-15	-502	The Schaumburg ARC N9EP1 (+ KA9NPT)	1889-B-25	-5768	Non-Club Group N6CO	2400-C-4	-3147	Georgelown ARC W8AF	843-B-4	-2102
Bethel Middle School FD Group K81FW (+ KA1KPT)	364-B-23	-1234	Vernon North Okanagan ARC VE7NOR	178-B-15	-472	Spill Rock ARA K2RF	1466-B-64	-6690	Aroostook ARA K1JK (+ KA1KAC)	851-B-37	-3098	Golden Empire ARS W8HGC (+ KB8AEK)	823-B-26	-2092
CFB Gagetown ARC VE1JO	395-B-10	-1228	King's Co. ARC VE1EMO	125-B-10	-450	Action Boxborough ARC W1UC	1500-B-20	-5672	Monsanto ARA W8DY	890-B-30	-3084	Oxley Co. ARC VE3JO	855-B-12	-2080
Copper Country RAA W8CDZ (+ KA8UO)	264-B-35	-1228	King's Co. RC W8RAK	113-B-26	-428	Central Illinois RC W9AML1 (+ KA9RDM)	1801-B-17	-5648	West Jersey Radio Amateurs W2ZE (+ N2EWW)	1013-B-17	-3062	Parkland RC VE5PRC	838-B-8	-2086
Prince Georges Wireless K3CEZ	208-B-12	-1184	Society for Preservation of AR in Kodlak K17AF	151-C-12	-368	Puerto Rico ARC K94ID	1803-B-15	-5562	Orange Co. ARC W0ZE (+ KB8EZT)	931-B-15	-3040	Peninsula Radio Operators Soc. K83MT (+ KA3MPY)	631-B-19	-2044
St. Cloud ARC W8V9	401-B-6	-1182	Redcomseven WB47ZF	69-B-7	-340	Northern Ohio DX Assn. K8WW	1904-B-12	-5502	North Shore ARC VE3NSR	847-B-15	-3004	Oakland Co. ARS W8TNO (+ KA8GEM)	575-B-20	-2062
Mesabi Wireless K8MK	323-B-10	-1182	Wheatstraf W8A5PE	51-B-3	-302	Columbus ARA W8TO	1599-B-21	-5188	Calgary ARA VE8NQ	914-B-20	-2956	Echo Repeater Assn. K9BTB	638-B-20	-2046
The League's Lids AR Field Day Group K1ET	438-B-8	-1180	Cass County ARC W9VWV	49-B-10	-298	Harvard FM Repeater W1XJ	1455-B-35	-5140	Shiawassee ARA W8CQQ (+ KA8IXC)	1005-B-15	-2962	Key West ARC W8YV (+ KA8JN)	430-B-8	-2030
Adronckd ARU K8EQZ	211-B-13	-1170	VHF Group LARC N4IMD	47-B-5	-294	Dept. of State ARC W3DOS	1658-B-15	-5124	IBM Boca Raton RC N4TL	1049-B-9	-2924	Kalamazoo Co. RACERS K9BD	508-B-16	-1952
Kalamazoo Repeater Assn. K9BA	321-B-20	-1142	2A-Commercial Radio Amateur Tech Soc W9RW	2137-B-6	-6098	Westchester Emergency Communications N2SF (+ KA20VU)	1371-B-45	-5010	Hub Heights ARC N8TO (+ W8SKYY)	812-B-21	-2920	ML Tom ARA W1NPL	658-B-15	-1944
Hamilton K7CLK	378-B-12	-1122	Order of Boiled Owls-NY W2AO	2562-C-12	-3833	Billerica ARS K1TO (+ KA1LNM)	1378-B-27	-4892	Red Rose Repeater Assn A13L	843-B-38	-2906	Wanliang ARC W2VA (+ KA20PO)	593-B-17	-1928
Cape Ann ARA W1RK	372-B-25	-1112	Spartanburg ARC K4JLA	826-B-30	-2590	Trident ARC N4EE	1638-B-25	-4864	Albany ARA K2CT	777-B-36	-2888	Cambridge ARC W8VP	657-B-15	-1916
Data General Research Triangle Park ARC K4PV	343-C-8	-1107	Sumner ARA W4AJUJ	805-B-20	-1982	TRI-County ARC K89O	1522-B-13	-4858	Poway ARS K8CD	952-B-30	-2850	Great Bay RA W8ICAG (+ KA1LJH)	493-B-19	-1914
Muskegon Area ARC W8ZHO	340-B-14	-1094	Twin Lakes ARC K8DWD	764-B-15	-1744	Suburban Cincinnati ARS K82E	1528-B-12	-4834	Greater Fairfield ARA W8ICAO (+ KA2QCC)	803-B-30	-2842	Boonville ARC W8ZASX	457-B-10	-1900
Bartle ARC VE3GCB	335-B-29	-1094	Peard River Co. ARC W5UO	802-B-21	-1734	MGARA W5CH (+ KA5SMN)	1425-B-21	-4788	Blackstone Valley ARC W1DD (+ KA1LRA)	1037-B-20	-2836	Estero ARC W8KW	468-B-23	-1894
Stewart and Hendrick N4HKJ	303-B-2	-1080	Rappahannock ARA K4MR	407-B-19	-1344	Alamance ARC K4EG	1503-B-28	-4762	7213 Group W8NT	849-B-50	-2826	Marshall RC W8WJ	528-B-21	-1892
Orleans Co. ARC K2ZR	289-B-15	-1070	Symth Co. & Washington NM4L	905-B-9	-1268	Band Dit-Daha K2MP	1479-B-15	-4744	Arrow UMACR-HVAFRA FD Group W8UM	1035-B-25	-2824	Cheslea Communication Club A1JX	424-B-10	-1892
Henny Co. ARC K8TIB	333-B-23	-1068	Lakes Area ARC W5APX	361-B-7	-722	Humboldt ARS Group N8PH (+ KA8TFQ)	1241-B-29	-4698	Vero Beach ARC W4OT	1158-B-15	-2804	Montgomery ARC W4AP	381-B-10	-1878
Yucapae Valley ARC W8VCY	561-A-12	-1031	Keesee towaway ARC W4AMV	222-B-4	-666	Norfolk ARS W8TFQW	2007-B-21	-4626	Union Metropolitan Dea Sonia Filittes W8UMS	572-B-25	-2798	Southern Michigan ARS W8DF (+ KA8TCT)	1097-B-9	-1872
Goshen ARC K9TSM	352-B-14	-1028	Non-Club Group N8DDU	254-B-2	-806	Coastside ARC W4STO	1367-B-16	-4612	Star-LPA N1NS	978-B-25	-2784	Blairclark ARC N4VL	697-B-10	-1870
Moore Horn ARC K17EJ	138-B-10	-1004	Streator ARC K9CAU	174-B-12	-476	Skyview Radio Society K3MJW	1387-B-16	-4612	Cherryland ARC K8XX	978-B-28	-2780	Bloomfield ARA W8MAI (+ W8SAQA)	462-B-12	-1844
Sumnerland ARC VE7SRC	201-B-10	-974	Comorant Lake Radio Expedition W8GUEMN	188-B-6	-346	Paso Robles ARC W8LKF	1281-B-25	-4584	Allegany Highlands ARC W2SAM	795-B-16	-2780	Mike RAC W8RH	608-B-25	-1830
Three Rivers RC K8BA	329-B-26	-958	Big Thicket ARC N5EMG	144-B-7	-288	Conyers ARS Group N4CI	1414-B-12	-4578	Harlan Co. ARC N04Y (+ KB4ELF)	741-B-10	-2744	Cimaron ARA K1SP	380-B-23	-1820
Kansas City K8OKI	237-B-26	-954	2A-Battery Chokaw ARS K4HAV (+ KA4UGE)	1629-A-17	-18,810	Codex Chapter of Motorola N1CC (+ N1DDR)	1448-B-10	-4528	N04Y (+ KB4ELF) Holand ARC	894-B-17	-2732	Central Mass. ARA W8BMJ	515-B-12	-1806
North Suburban Wireless and North Star HI Banders K9VPM	310-B-10	-952	Bamesville Area ARC W8FYF (+ N8EKR)	1364-A-48	-15,280	General Dynamic RC K8JLA (+ KA5TKF)	1691-B-82	-4522	Champlain Valley ARC W2UJX (+ KA2MLQ)	835-B-15	-2722	North Shore ARS K8HAI	505-B-24	-1802
Elmwood Park ARC K9YHB	215-B-5	-960	Best of Mt. Baldy N8U	731-A-32	-6375	Rome RC W2QFD (+ KA2TAX)	1103-B-10	-4520	West Island ARC VE2QWI	721-B-16	-2706	Parma RC K8UZW (+ KA8TQR)	521-B-25	-1794
The Key Kiltie K7THW7	139-B-2	-950	Bellflower ARA W8SFM	774-A-4	-5750	Santa Barbara ARC K6TZ (+ KA6EPF)	1338-B-15	-4502	York ARC K0DD	837-B-25	-2686	Midland ARC W8KEA (+ KA8MLH)	599-B-18	-1794
Enterprise ARS W4ROJ	273-B-10	-948	Poccano ARS Klub W13PM	1174-B-18	-3048	Ozark RC W9WQ (+ KA9PZH)	1291-B-19	-4344	North Hills ARC W3OX	679-B-26	-2684	Rock River RC W8TCH	465-B-10	-1790
Whitewater Hills ARC W898B	298-B-10	-934	Associated Amateur Wireless Assn N9JW	289-A-6	-2740	Eight ARS W8IKN (+ KA9RBI)	1144-B-20	-4304	East Bay ARC W8CUS	590-B-23	-2678	Klamath Basin ARA W8YV (+ KA8SEV)	810-B-11	-1784
Moose Horn ARC K17EJ	138-B-10	-904	Naval Post Graduate School ARC K8LY	906-B-18	-2704	IARC N8BI	1252-B-18	-4292	W8CUS Magilla's Gorillas K82MG	603-B-12	-2664	Miami Co. ARC K9ZEY (+ KA8ERQ)	435-B-8	-1772
Auburn ARA K82J	231-B-8	-892	Algonquin ARC N1BHI	724-B-13	-2308	South Georgia ARC W14F (+ KA4OTQ)	1217-B-6	-4258	Cow Pie Hill Gang K8BO	1161-B-4	-2622	Clinton Co. ARC K9DGS	458-B-10	-1764
Non-Club Group K2RBR	285-B-4	-890	Monroe Co. Radio Comm. Assn. W4WXY	478-B-15	-1928	Ocean Monmouth ARC K82Q	1234-B-15	-4084	Port City ARC W1WQM	562-B-37	-2622	Glays Harbor ARC W7ZA	522-B-12	-1762
Scranton Pocono ARK K3CSG	335-B-8	-870	FD AR Telegraph Society W8ELZ	673-A-4	-1295	Kishwaukee W9GJN (+ KA9RJK)	1127-B-27	-4032	Tri-Town RAC K8JL (+ KA8ROZ)	898-B-16	-2614	Eagle Rock ARC KA7DUI (+ KA7QAG)	532-B-8	-1760
Chestnut Hill Hams AC1J	228-B-12	-864	Ramapo Mountain ARC W8ZSNA (+ N8ovic)	297-B-12	-1000	CRANCO VE2EUS	1205-B-18	-4016	Portland ARC W7KYC	708-B-21	-2582	Mammoth Cave ARC K8AS5	542-B-8	-1758
Burlington ARC W1KOO	225-B-8	-860	Bellevue Farm FD Group K4UA	56-B-4	-480	Pikes Peak Radio Amateur Assn. K8JL (+ KA8ROZ)	938-B-8	-4008	Great South Bay ARC K1VZ (+ KA2UWQ)	713-B-35	-2528	Lima ARS Klub N8KN	525-B-21	-1716
RALAC CX4AKW6	293-B-5	-846	2A Texas DX Society K8DX (+ KA8SBS)	3756-B-17	-17,194	Surety ARC VE7SAR	1098-B-12	-3960	Watertown ARC K8SC	645-B-20	-2498	Wildemess Trail ARC K14B (+ KA4OKQ)	478-B-20	-1714
Stauben Co. RAs K9FZG	321-B-14	-842	Mile Hi DX Assn. N8FR	3484-B-12	-16,424	San Mateo RC W8LNM	1107-B-29	-3974	Watertown ARC K8SC	645-B-20	-2498	North Peninsula Electronics Club W8PMK8	412-B-8	-1710
Granite State ARA W1VTP	20-B-8	-840	Cherryville Repeater K2NJ (+ KA2OEE)	2840-B-18	-10,384	Chattanooga ARC W4AM	1418-B-45	-3922	Columbia ARC N4WR	794-B-20	-2492	Lincoln Trail ARC W8EJ	487-B-39	-1688
Hookack AR Group K42DR	145-B-5	-828	Ashabula Co. ARC W8CY (+ N8EUC)	2874-B-14	-9690	Amplex Employees ARC K8OZE	987-B-11	-3880	N4WR Teak ARC	796-B-19	-2490	Pawnee ARC K1FN	429-B-26	-1686
Fort Madison ARC K8KWV	336-C-11	-827	Albuquerque DX Assn. N5RR (+ KA5RDX)	3109-B-15	-9640	RVRC K4TS	1052-B-12	-3860	South Bay ARC W8ANL	700-B-9	-2468	Eastern Oregon ARS W1NFW (+ KA7SID)	565-B-10	-1684
Madewaska ARC V81QJ	414-C-16	-826	Columbia ARA K3EF (+ KA3WPC)	2694-B-30	-9036	Conichan Valley ARC VE7CVA	1088-B-18	-3830	Oroville ARS W8AF	758-B-35	-2482	GARC N88L	374-B-10	-1682
Collier ARC K4FA	154-B-18	-804	Poughkeepsie ARC N2YL (+ KA2SMO)	2587-B-40	-8860	Sioux Falls ARC W8ZY (+ KA8RWA)	1095-B-38	-3828	Pine State ARC K1CZ	685-B-10	-2460	Telephone Employees AHA K2RB	359-B-12	-1664
Camp Whattheheck W8AWCY	190-B-3	-780	NCCO Volunteers N8TV	2915-B-8	-8514	Chautauque Co. Amateur FM Assn. K2HE	1533-B-15	-3826	Rich Ross ARC W84B	801-B-34	-2430	Hen House Gang W1FHP	477-B-16	-1664
RITV Club W8TWT	234-B-9	-776	HFEA ARC K8GEH	2430-B-15	-7800	Dupage ARC W8DUP	1441-B-40	-3782	North Ollawa ARC K8BP (+ KA8UIM)	772-B-15	-2410	Atchison ARC N8E2 (+ KA8RP)	311-B-10	-1662
Lake Success RC W2YKO	289-B-10	-744	Redwood Empire DX Assn. AE9H (+ KB8FRJ)	2197-B-19	-7466	Montgomery ARC K89BE	1259-B-25	-3748	New River Valley ARC K14Y (+ KB4IRZ)	828-B-15	-2396	Milwaukee School of Engineering ARSHX	825-G-12	-1650
Non-Club Group N7DHL	190-B-18	-804	Fort Wayne Radio Club W8TE	2630-B-45	-7298	Hot Springs ARC W5SBRF	1129-B-25	-3748	Wise Co. ARS K8ST (+ KA8KFN)	828-B-15	-2398	Fullerton RC W8JLL	426-B-40	-1640
Radio Amateurs of Greater Elbridge N2DM	218-B-3	-736	Fairfield AR Tuners & WTI W4C	2412-B-30	-7082	Colorado Repeater Assn. W8XR	1305-B-15	-3740	Silvercreek ARA W8BPNF	797-B-28	-2378	Nicholas Co. ARC W8V	895-B-8	-1632
Non-Club Group W8HFP	658-C-7	-729	Dallas ARC W8RD	2412-B-30	-7082	Huntingdon Co. ARC W3VI	900-B-20	-3716	H2ARA N4US (+ KB4BEX)	525-B-33	-2368	Prince Edward Island ARA CX1PEI	1182-C-20	-1632
Silke ARC K7L7BS	292-C-12	-698	Delaware-Lanigh ARC W3CK (+ KA3LAT)	2183-B-32	-6756	MARCOM K3RY	1147-B-7	-3686	Ephraim Area Repeater Soc. W3AO	772-B-16	-2348	Pioneer ARC W8RCH	423-B-8	-1604
Non-Club Group VE2CRG	145-B-15	-694	Jackson ARC W5PFC	2107-B-22	-6312	Framingham ARA W1FY (+ N1BRM)	973-B-32	-3682	George ARC VE7FS	268-A-15	-2340	In County ARC K8SBI (+ KA8KBD)	512-B-12	-1598
Rock Point ARC VE5TT	250-B-4	-644	Non-Club Group W8OK (+ KA8VOC)	1914-B-4	-6230	Argonne ARC W9QVE (+ KA9PVE)	909-B-15	-3376	Everglades ARC W8SV1 (+ KB4JEJ)	689-B-12	-2304	General Electric Evendale ARS K8LUC	449-B-10	-1588
Idaho 5Es Group K8D7H	211-B-5	-634	Northwest ARC W9LM (+ KA9RAO)	1931-B-32	-6170	Smoky Mountains ARC W4OLB (+ KB4KOC)	1127-B-25	-3342	Chas. E. Newton Jr. ARC K4HYB (+ KB4HJ)	748-B-18	-2294	Beach Cities Wireless Soc. K8MJ	380-B-5	-1542
Warham ARC K8IAGM	163-B-10	-624	Southern Peninsula AR Klub W4PRO (+ KA4DSB)	2054-B-78	-6138	Loveland Repeater Assn. W0DZ	847-B-30	-3332	Pike Co. ARC W8CZH	602-B-14	-2288	B. Gremillion Memorial RC K4SEX	297-B-27	-1572
Contender Signal Corps W8YTA	385-C-12	-605	Springhill ARC N5II (+ KA5QIS)	2121-B-21	-6001	Baltimore ARC W3FT	1049-B-29	-3288	SHERHAM VE2WJ	685-B-12	-2256	Vancouver ARC W8V7AR	459-B-25	-1590
Arlington Civil Defense N1CID	146-B-7													



Murgas ARC ops take CW seriously — K3YTL (8A).



Paddle Power was used at KA8T (3A).



KD8KU pushed the pedals for the K8SCH team.

Pymatung ARC W3LNA (+ KA2LUH) East Whittier RC W6VB	497-B-9 -1462 400-B-9 -1450	Delaware Valley OMik ECA W3FGA Squaw Island ARC KA2X	405-B-5 -977 249-B-12 -974	Providence RA W1OP (+ KA1LMX) Hamleters RC W9AA (+ KA9QKZ)	2184-B-14 -5842 1582-B-38 -5462	Western Piedmont ARC K4VLY Mankato Area RC W9VCL (+ KA8RVB)	624-B-12 -2528 724-B-25 -2524	Hispanic ARS and Rep. of the Rio Grande ARC N5QDD	83-C-19 -483
NH Seacoast CAP W5JCE (+ WA3PJZ) Bayonne Emergency Management ARC W2ODVIZ	416-B-9 -1438 408-B-17 -1432	Western Arizona RC KV7P Cranford ARS W9CGLW	306-B-7 -970 272-B-6 -958	Two Rivers ARC WJUS (+ KA3LBT) Lincoln ARC K8KKV	1406-B-40 -5432 2008-B- -5408 1740-B-18 -5234	San Fernando Valley ARC W8SD (+ KA8UTY) Valley RC of Eugene W7PKL	685-B-97 -2466 756-B-15 -2448	4A-Commercial Radio Assn. of Western NY W2PFE	850-B-20 -2668
Mid-Atlantic ARC W5JCE (+ WA3PJZ) Iron Range ARC NEBY	15-B-15 -1424 426-B-7 -1420	CRAB St. Georges VE2CBP Little Cypress-Mauriceville ARC AA5P	244-B-12 -902 211-B-19 -866	Sturdy Memorial Hospital ARC K1ZZI Metuchen ARC K2YNT (+ KA2QWP)	2008-B- -5408 1740-B-18 -5234 1079-B-28 -5166	Lower Columbia ARA W7DG (+ KA7IDX) Southern Sierra ARES K6RL	546-B-25 -2346 574-B-12 -2258 668-B-25 -2228	Fellowship ARC ND4E	407-B-36 -1148
Anchorage ARC KL7AA Umpqua Valley ARC W7YNE	315-B- -1410 276-B-12 -1408	Brazos Valley ARC ND5F AK-SAR-BEN ARC W8EQU	279-B-14 -858 175-B-3 -850	Palomar ARC W8NWC Arizona ARC W7IO	2065-B- -5164 1769-B-40 -4906 1856-B-20 -4908	Monterey Park ARC K8JIP Goodrich HS ARC W89PNL (+ KA9RET)	803-B-9 -2200 817-B-12 -2134 598-B-7 -2130	5A-Battery Anne Arundel RC W3VPR (+ KA3MQS)	2495-A-49-26,570
Santa Fe ARC W5FKP (+ KA5RZH) Mesa Grande Mosquito and Moth Mashers W6BIG	266-B-17 -1398 310-B-3 -1382	Henry Co. ARC K9VNB Drumline ARC Ltd. W2AAZ	382-B-25 -822 207-B-8 -814	Valley Forge Mtn. FD Gang N3KZ Xeroids KD5SQ	1856-B-20 -4908 1469-B-21 -4792 1311-B-25 -4724	Bay City ARC K8JY South Waterloo ARC VE3SWA	607-B-15 -2092 602-B-8 -2036	Northern Ohio ARS W8J/BM (+ WD8OTY)	1973-A-55-17,005
Fulton Co. ARC K8BXQ Pennroyal ARS WA4VZL (+ Novice)	301-B-8 -1382 332-B-5 -1374	Blshop ARC NW6C (+ KA6HII) Sierra ARC N8KEP	96-B-12 -804 238-B-6 -792	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1254-B-12 -4660 1489-B-30 -4652	South Central Indiana ARC WD9EME South Bay ARS K6HQZ	602-B-8 -2036 554-B-9 -1978 454-B-23 -1978	Northern Ohio ARS W8J/BM (+ WD8OTY)	1973-A-55-17,005
ML Vernon ARC K8EEN Gratiot ARA W8AWIE (+ KA8PFC)	325-B-7 -1356 308-B-10 -1356	Catalina RC/Hughes Aircraft Co. Tucson W7JQM Cleveland ARC N4DAD (+ KQ4N)	153-B-15 -740 177-B-28 -716	Reservoir ARA K8QYL Bryan ARC N6TC (+ KA5OBS)	1489-B-30 -4652 1271-B-30 -4814 1397-B-18 -4578	Victor Valley ARC K6QWR Southeastern Michigan ARA K8NY	671-B-20 -1942 998-C-17 -1927	Genesee Co. RC W8ACW	477-B-75 -9000
Wabash Valley ARA W9UJU Clearwater Valley ARC KY7J (+ KA7MED)	408-B-24 -1356 233-B-6 -1838	W2AZAZ Blshop ARC NW6C (+ KA6HII) Sierra ARC N8KEP	273-C-9 -623 573-B-10 -612	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Birmingham ARC W4CUE (+ N4KGG)	2630-B-83 -8844
Ebonaire ARS NF2N (+ KA2MSG) Tioga Co. ARC W8JIPW	496-B-19 -1328 412-B-31 -1322	Evangelin ARS W1UC7 3A-Commercial Pottstown Area Repeater Team K13S	137-B-4 -580 187-C-7 -560	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1311-B-25 -4724 1254-B-12 -4660 1489-B-30 -4652	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Stu Rockafellow ARS W8LH (+ KA8USA)	2419-B-60 -7480
Adams Co. ARC K8UR (+ KA8SAM) Panoramaland ARC W7JTR	379-B-15 -1310 405-B-11 -1310	Libby ARC KD7LY Evergreen ARS W1UC7	273-B-16 -546 36-B-8 -472	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Schenectady ARA K2AE (+ KA2QPF)	2034-B-90 -7446
Cape May Co. ARC NF2C Fossil Creek Wireless Soc. KF5N (+ N5GGI)	440-B-10 -1302 388-B-10 -1292	Madison Co. ARC W8VCF (+ KA8SBK) Ottawa Valley Mobile RC VE8AM	440-B-10 -1302 388-B-10 -1292	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Virginia ARA K64W	2412-B-35 -7084
Hazel Park ARC W8JXU (+ KA8PEH) Dick's Den K3ICE	392-B-28 -1260 530-B-11 -1260	Jefferson Barracks ARC K8ZFK Hartford Co. ARA W1NEM (+ KA1LHU)	392-B-28 -1260 530-B-11 -1260	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Grumman ARC W2ALQO (+ N2DYE)	1900-B-58 -6778
Grant Co. ARC W8EBN Quebec RC K3CHDD	347-B-10 -1256 346-B-7 -1256	Madison Co. ARC W8VCF (+ KA8SBK) Ottawa Valley Mobile RC VE8AM	347-B-10 -1256 346-B-7 -1256	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Mt. Diablo ARC K8YTT	2196-B-15 -6786
Ballimore RATS N3LN Madison Co. ARC W8VCF (+ KA8SBK)	636-C-40 -1252 387-B-20 -1242	Punxsutawney ARC KQ3Z 4A-Battery Oregon Tualatin Valley ARC KOTB (+ KA7HOJ)	636-C-40 -1252 387-B-20 -1242	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	FAIRFIS W84S	1945-B-7 -6626
Ottawa Valley Mobile RC VE8AM Jefferson Barracks ARC K8ZFK	408-B-10 -1216 398-B-12 -1196	Alameda Co. Repeater Club W8HOR (+ KA8LVA) VE7-QRP ARC	408-B-10 -1216 398-B-12 -1196	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Anahelm ARA K8SYU (+ KA6DAB)	1982-B-30 -6392
Hartford Co. ARA W1NEM (+ KA1LHU) Playground ARC W4ZBB	343-B-16 -1168 250-B-19 -1156	Alameda Co. Repeater Club W8HOR (+ KA8LVA) VE7-QRP ARC	343-B-16 -1168 250-B-19 -1156	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Pi. Myers PD CW Ops W4LX	1705-B-51 -6986
Meridian ARC K5BFN Vancouver ARC VE1WRC	284-B-14 -1134 222-B-20 -1106	Alameda Co. Repeater Club W8HOR (+ KA8LVA) VE7-QRP ARC	284-B-14 -1134 222-B-20 -1106	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	RCA Astro ARC W2DU (+ KA2SSS)	1483-B-22 -5520
VE1BRC VE6BRC Illiana Repeater System K59A	214-B-15 -1104 307-B-11 -1102	Alameda Co. Repeater Club W8HOR (+ KA8LVA) VE7-QRP ARC	214-B-15 -1104 307-B-11 -1102	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Rockford ARA W8AXD (+ KA9OYS)	1598-B-28 -5488
Island Co. ARC W7PN Highlands Co. ARC W84M	225-B-8 -1094 394-C-4 -1077 361-B-15 -1062	Alameda Co. Repeater Club W8HOR (+ KA8LVA) VE7-QRP ARC	225-B-8 -1094 394-C-4 -1077 361-B-15 -1062	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Joliet ARS W9QFR (+ KA9RKE)	1480-B-28 -5456
Border ARS W5LFG Cedar Mountain ARC NE7D	264-B-18 -1042 220-B-9 -1030	Alameda Co. Repeater Club W8HOR (+ KA8LVA) VE7-QRP ARC	264-B-18 -1042 220-B-9 -1030	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	New Providence ARA W2EME (+ KA2JGR)	1435-B-25 -5208
Shoreline ARC W1BOG Solma Dallas Co. ARC K4COV (+ NA1OI)	138-B-10 -1030 219-B-18 -1014	Alameda Co. Repeater Club W8HOR (+ KA8LVA) VE7-QRP ARC	138-B-10 -1030 219-B-18 -1014	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Watkinsville ARS W8GK	1489-B-50 -5284
Clark Co. W8OS National Trail ARC K8UZK	214-B-6 -1006 254-B-17 -980 226-B-7 -988	Alameda Co. Repeater Club W8HOR (+ KA8LVA) VE7-QRP ARC	214-B-6 -1006 254-B-17 -980 226-B-7 -988	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Toledo Mobile RA WBHFF	1426-B-25 -5232
Just Friends N8GLL	185-B-8 -978	Alameda Co. Repeater Club W8HOR (+ KA8LVA) VE7-QRP ARC	185-B-8 -978	Stonewall Jackson ARA K8DF (+ KA8RYG) Double Cheese No Onion W8MRE	1064-B-12 -4516 1311-B-25 -4724 1254-B-12 -4660	Delaware ARC W8SI Juneau ARC K1L7GP (+ KL7OM)	628-B-10 -1904 815-C-25 -1896 488-B-14 -1824	Tioga Co. Combined ARCS K2QR	1496-B-20 -5158

Rules, January VHF Sweepstakes

On the weekend of January 12-13, the VHF/UHF bands will come to life, marking the 38th ARRL January VHF Sweepstakes. This year's rules differ considerably from last year's, so look them over carefully. Official entry forms are recommended, and are available from Hq. for a business-size s.a.s.e. with one unit of First Class postage. The proper forms will make it easier to calculate your score.

Don't forget that there is competition between ARRL-affiliated clubs in the VHF SS. Check with your club secretary to see if your club is going to make an aggregate entry. If your club is not ARRL affiliated, contact the ARRL Club and Training Department to find out how to join the ranks. *Club secretaries note:* See January *QST* for rules governing affiliated-club competition. Each affiliated club wishing to enter the club competition must submit a current club roster showing the calls of all club members eligible to submit their scores for the club. Now is the time to start planning for successful participation in the VHF SS.

Good luck!

Scoring Example

Band (MHz)	QSOs	QSO Points	Grid Squares
50	25 (x2)	50	10
144	40 (x2)	80	20
220	10 (x4)	40	5
432	15 (x4)	60	10
1296	5 (x8)	40	2
2300+	1 (x16)	16	1
Totals	96	286	48

Final score = (QSO Points) x (total no. grid squares) — (13,728 = 286 x 48).

Rules

1) **Object:** To work as many amateur stations in as many different $2^{\circ} \times 1^{\circ}$ grid squares as possible using authorized amateur frequencies above 50 MHz. Foreign stations work W/VE amateurs only.

2) **Contest Period:** Begins 1900 UTC Saturday, January 12, and ends 0400 UTC Monday, January 14.

3) Categories:

(A) **Single Operator, Single Band** — one person performs all transmitting, receiving, spotting and logging functions. All QSOs for score listing in *QST* must be made on one band. *Single-band entries may, however, submit QSOs made on other bands for credit in ARRL-affiliated club competition.*

(B) **Single Operator, All Band** — one person performs all transmitting, receiving, spotting and logging functions.

(C) **Multioperator** — those obtaining any form of assistance, such as the use of relief operators, loggers or spotting nets. All equipment (including antennas) must be located within a 300-meter-diameter circle.

4) **Exchange:** grid square locator (see Jan. 1983 *QST*, page 49). Example: W1AW in Newington, CT, would send FN31. Exchange of signal reports is optional.

5) Scoring:

(A) **QSO Points** — count two points for complete two-way QSOs on 50/144 MHz; four

points on 220/430 MHz; eight points on 1215 MHz; and 16 points on 2.3 GHz or higher.

(B) **Multiplier** — total number of different grid squares worked per band during the contest. Each different $2^{\circ} \times 1^{\circ}$ grid square counts as one multiplier on each band it is worked.

(C) **Final Score** — multiply the total number of QSO points by the total number of multipliers. See scoring example.

6) Use of FM:

(A) **Retransmitting either or both stations, or use of repeater frequencies, is not permitted.** This prohibits use of all repeater frequencies. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) **Use of the national simplex frequency, 146.52 MHz, is prohibited.** Contest entrants may not transmit on 146.52 for the purpose of making or soliciting contest QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) **Only recognized simplex frequencies may be used, such as 144.90 to 145.10; 146.49, .55, .58; and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band.** Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory* may be used for contest purposes.

7) Miscellaneous:

(A) **Stations may be worked only once per band for credit, regardless of mode.** Crossband QSOs do not count.

(B) **Partial QSOs do not count.** Both calls, the full exchange and acknowledgment must be sent and received.

(C) **Fixed, portable or mobile operation under one call from one $2^{\circ} \times 1^{\circ}$ grid square only is permitted.** A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC); one operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(D) **Only one signal per band (6, 2, 1 1/4, etc.) at any given time is permitted, regardless of mode.**

(E) **While no minimum distance is specified for contacts, equipment should be capable of real communications (i.e., able to communicate over at least 1 km).**

(F) **Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz.** Even then, a complete, different station (transmitter, receiver and antenna) must exist for each QSO made under these conditions.

(G) **A station located precisely on a dividing line between grid squares must select only one as the location for exchange purposes.** A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) **Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using**

coherent radiation on transmission (e.g., laser) and employing at least one stage of electronic detection on receive.

8) Reporting:

(A) **Entries must be postmarked no later than 30 days after the end of the contest.** Use ARRL VHF SS forms or a reasonable facsimile.

(B) **Logs must indicate time in UTC, bands, calls and complete exchanges.** Multipliers should be numbered clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include cross-check sheets (dupe sheets).

9) Awards:

(A) Single Operator

(1) **Top single-operator score in each ARRL Section.**

(2) **Top single-operator on each band (50, 144, 220, 432, and 1296-and-up categories) in each ARRL Section where significant effort or competition is evidenced.** [Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers. For example, if WBØTEM has the highest single-operator all-band score in the Iowa Section and his 50- and 220-MHz scores are higher than any other IA single op's, he will earn a certificate for being the single-operator Section leader and endorsement stickers for 50 and 220 MHz.]

(B) **Top multioperator score in each ARRL Section where significant effort or competition is evidenced.** Multioperator entries are not eligible for single-band awards.

10) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels — unlimited, medium and local. Details will be listed in January *QST*.

11) Condition of Entry:

(A) **Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.**

(B) **Disqualifications:** For excess duplicates and call sign/exchange errors. See January *QST* for complete details.

Strays

I would like to get in touch with . . .

any amateurs interested in animal welfare who want to start a net. James Bronstrup, WB8OTS, 1732 Fostersmaine Rd., Morrow, OH 45152.

any amateurs who served with U.S. Navy Patrol Squadron VP-94. John B. Sargent, W4PHY, 1129 Dove La., Winter Springs, FL 32708.

anyone who has a repeater control program for a VIC 20 or a C64. Gerald Gomes, WB8RNY, 35741 Ronald Rd., Romulus, MI 48174.

Contest Corral

A Roundup of Upcoming Operating Events



Conducted By
Edith Holsopple,* N1GZC

DECEMBER

1-2
ARRL 160 Meter Contest, Nov. *QST*, page 87.
TOPS Activity Contest, Nov. *QST*, page 88.
Telephone Pioneers QSO Party

4
West Coast Qualifying Run, 10-35 WPM, at 0500Z Dec. 5 (9 P.M. PST Dec. 4). W6OWP prime, W6ZRI alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e. will help expedite your award or endorsement.

7
WIAW Qualifying Run, 10-35 WPM, at 0300Z Dec. 8 (10 P.M. EST Dec. 7). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Dec. 4 listing for more details.

8-9
ARRL 10 Meter Contest, Nov. *QST*, page 87.

23-25
Brasil Halasz/Pinheiro QSO Party, sponsored by Brazilian Chapter of International Amateur Radio Hosts, from 0001Z Dec. 22 until 0300Z Dec. 25. Use all bands and all modes, including VHF (except repeater frequencies). See how many stations you can contact, local and DX, using noncommercial power. Commercially powered QSOs are permitted. Ragchewing is encouraged. Send logs by Dec. 27 to P.O. Box 4402, Recife, PE 50.000, Brasil.

27
WIAW Qualifying Run, 10-35 WPM, at 1400Z (9 A.M. EST) Dec. 27. See Dec. 4 and 7 listings for more details.

30
Canada Day Contest, sponsored by the Canadian Amateur Radio Federation, from 0000Z to 2400Z Dec. 30. Everyone works everyone. 160-2 meters, phone and CW. Entry classes: single op, all bands; single op, single band; multiop, all bands. Work stations once per mode on each band. No crossmode QSOs allowed. Exchange RS(T), serial number starting with 001, and province/state/country. VE1 stations must also send their province. Count 10 points per VE QSO, 4 points for other countries. 10-point bonus for any CARF station using TCA or VCA suffix. Multiply by total VE provinces worked per band on each mode (VO1/VO2 VE1-PE1 VE1-NB VE1-NS VE2-8 VE0 VY1). Suggested frequencies: 1.810/1.840 3.525/3.775 7.025/7.070/7.155 14.025/14.150 21.025/21.250 28.025/28.500 50.040/50.110 144.090/146.520 MHz. Suggest phone on the hour and CW on the half hour. Mail logs within 30 days (include s.a.s.e. or s.a.e./IRC for results) to CARF Contest, c/o N. Walther, VE6VW, General Delivery, Morinville, AB T0G 1P0, Canada.

31-Jan. 1
ARRL Straight Key Night, 24-hour period UTC (from 7 P.M. EST Dec. 31 until 7 P.M. EST Jan. 1). This is a friendly meeting on the air using straight keys. Suggested areas of operation of 80, 40 and 20 meters are 60 to 80 kHz from the lower band edges and 10 kHz from the lower Novice band edges. When participating in SKN, use SKN instead of RS1 preceding the three-digit report to clue in passersby. Following SKN, send a list of stations worked plus your vote for best fist heard (not necessarily one you've worked) during that period. This is not a contest; quick contest-like exchanges are discouraged. Vote also for the most interesting QSO. Mail your report by Jan. 10 to ARRL Hq.

*Communications Assistant, ARRL

JANUARY

2
West Coast Qualifying Run, 10-35 WPM, at 0500Z Jan. 3 (9 P.M. PST Jan. 2). See Dec. 4 listing for more details.

5-6
ARRL QSO Party, CW, this page.

12
WIAW Qualifying Run, 35-10 WPM, at 0300Z Jan. 13 (10 P.M. EST Jan. 12). See Dec. 4 and 7 listings for more details.

12-13
ARRL January VHF Sweepstakes, this issue, page 91.

12-14
Hunting Lions in the Air Contest, sponsored by Lions Clubs International, from 1200Z Jan. 12 until 2400Z Jan. 13. Open to all radio amateurs worldwide on 80-10 meters (excluding WARC bands), phone and CW. Phone and CW count separately. Categories are single op and multiop, single transmitter. Exchange signal report and serial number. Lion, Lioness and Leo club members will also send their club name. Work stations once per band and mode. QSOs with stations on the same continent count 1 point; QSOs with stations on other continents count 3 points. Bonus points: 10 points for QSOs with Lion, Lioness or Leo club members from different countries; 5 points for members in the same country. 20 points for QSOs with Rio de Janeiro Arpoador Lions Club members. No multiplier. Mail logs by Feb. 15 to Rio de Janeiro Arpoador Lions Club Contest Committee, Rua Sao Francisco Xavier no. 246, Apt. 407, 22551 Rio de Janeiro, RJ, Brazil.

World 40 Meter and 75 Meter SSB Championships, sponsored by 73. 40-meter contest 0000Z-2400Z Jan. 12, and 80-meter contest 0000Z-2400Z Jan. 13. Contests are separate. Work stations once in each contest. No crossmode QSOs. Single op, single transmitter and multiop, single transmitter classes. Single ops may operate 16 hours max.; off-times must be at least

30 minutes each and clearly noted in the log and on the summary sheet. Multiops may use the entire period. Exchange signal report and QTH (state, province or territory for W/VE stations; DX country name for others, including KH6 and KL7). Count 5 points per W/VE QSO, 10 points per DX QSO. Multiply by number of states (48 max.), VE provinces/territories (13 max.) and DX countries worked. Stations in the District of Columbia count as Maryland for multiplier purposes. Official entry forms are available from the sponsor. Mail entries by Feb. 12; 40-meter contest entries go to Dennis Younker, NE6I, 43261 Sixth Street East, Lancaster, CA 93535; 75-meter entries go to Jose A. Castillo, N4BAA, 1832 Highland Dr., Amelia Island, FL 32034.

19-20
ARRL QSO Party, phone, this page.
160 Meter World SSB Championship
HA-DX Contest
Texas QSO Party

21-27
45 Magazine WAS SSTV Contest

22
WIAW Qualifying Run

26
15 Meter World SSB Championship

26-27
REF French Contest, CW.
West Virginia QSO Party

26-Feb. 3
Novice Roundup

27
20 Meter World SSB Championship

27-28
Classic Radio Exchange

ARRL QSO Party Rules

Attention ARRL members and appointees! Start 1985 off right by participating in the operating activity just for you — the January ARRL QSO Party. Official entry forms are available from ARRL Hq. for an s.a.s.e. Everyone sending in a log will receive a copy of the results, and everyone making more than 200 QSOs will be listed in *QST*. Deadline for receipt of the logs is Feb. 13, so mail early.

ARRL QSO Party Facts and Figures

CW	Phone
Starts: 1800Z Jan. 5	Starts: 1800Z Jan. 19
Ends: 0600Z Jan. 6	Ends: 0600Z Jan. 20

Eligibles: Member, Life Member, Charter Life Member, President, Vice President, Past President, President Emeritus, Past Vice President, Honorary Vice President, Director, Past Director, Director Emeritus, Vice Director, Assistant Director, Counsel, Canadian Counsel, Volunteer Counsel, Treasurer, Secretary, Advisory Committees, Technical Advisor,

Intruder Watch, QSL Manager, NTS Official, Section Manager, Asst. SM, SEC, STM, ACC, BM, OO/RFI Coordinator, PIO, SGL, PGL, TC, DEC, EC, NM, OBS, OES, OO, ORS, PIA, Hq. Staff.

Rules: Exchange "status" (MBR, ORS, SM, etc.) and ARRL Section. Overseas members may participate and should send dx for their Section. You may work stations once per band. Operate a maximum of 10 hours; off-times must be at least 30 minutes each and must be marked clearly in the log. Log times must be in UTC, not local time. Number new Sections as worked. Phone and CW contests are separate. Include dupe sheets with entries of 200 QSOs or more total. Entries must be mailed in time to reach ARRL Hq. by February 13, 1985.

Scoring: Final score equals number of QSOs times number of different ARRL Sections plus VE8/VY1 worked (max. 74). dx does not count as a multiplier.

Suggested Frequencies: Phone — 1.865 3.830-3.870 7.200-7.245 14.235-14.265 21.290-21.310 28.600-28.630; CW — up from 1.815 3.535 3.715 7.035 7.115 14.035 21.035 21.115 28.035 28.115. Try 10 on the hour from 1800-2100 UTC and 160 at 0430 and 0530 UTC. Check the Novice bands frequently. Don't forget 6 and 2 meters.

Section News

The ARRL Field Organization Forum

Coordinated by Jim Clary, WB9IHH

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XG — SEC: VE6XC, A/SM: VE6AMM, STM/DEC/NM (APSN & ATN): VE6ABC. Communications for the Pope's visit was a larger job than expected but was handled very well by Alberta hams with capable leaders. A full report by VE6AFF on how it was done will follow later. Plans are forming for the SET. The AARCS net is on the air again with VE6AMM as NCS and is a liaison net with the Govt so is worthy of our support. Traffic: VE6CHK 252, VE6ABC 31, VE6CPE 12, VE6EO 4, (Aug.) VE6CHK 85, VE6ABC 21, VE6CPE 7.

BRITISH COLUMBIA: SM, Ernie Savage, VE7FB — Fall is settling in as all nets are showing an increase in check-ins. BC phone net reports high 206, low 123, total 4696. BCEN 3650 CW, welcomed new members. Net speed is 10 to 15 WPM to encourage new members. VE7FJ's home was struck with lightning and his transceiver was hit as well as much other electronic equipment. VE7CBK won the big prize at Tacoma Hamfest, an IC-745, VE7WT in hospital and very poor condition. VE7SH was in hospital for five days. The month has been hearing of many in and out of hospital for couple of days with flu. VE7ZK has his 50-foot tower up and a forty meter beam is on it. 20 meters coming up later. Traffic: VE7BN1 304, VE7ZK 186, VE7CDF 114, VE7CCJ 57, VE7FPM 14, VE7ZB 19, VE7DSN 5, VE7FSP 5.

MARITIME/NEWFOUNDLAND: SM, P. R. Welling, VE1WF — We are sorry to hear that Gus, FD8P, is in the hospital in St. John's. VE1OC will be reading bulletins on the Mar. Phone Net on Wed. evenings. VE1AD and VE1WV, Amateur Radio's Newest Frontier. This film is available in a VHS VCR format. Clubs wishing to borrow a copy should contact either ASJ or WF. NB amateurs assisted with communications during the Pope's visit to Moncton. WF reports the CRRL O/G QSL Bureau is picking up again. Nfld Phone Net now under direction of VO100. APN 30 sess., QNI 89, QTC 67. Traffic: VE1WF 265.

ONTARIO: SM, Larry Thivierge, VE3GT — BM: VE3LST, PGL: VE3AR, SEC: VE3GV, A/STM: VE3GT, TC: VE3EO. Congrats to the Ottawa ARC who hosted the 18th annual Radio Society of Ontario Convention in Ottawa. There was quite a bit of activity around the CRRL booth and I was able to meet and chat with VE3AP, VE3AJN, VE3BAJ, VE3BC, VE3BT, VE3CJ, VE3CV, VE3DY, VE3EQE, VE3FOJ, VE3GNW, VE3GP, VE3KLA, VE3LNL, VE3NWP among many others. Following will laid out battle plans, well known Greely DXer VE3BGX will lead this year's Bermuda contest and spend an enjoyable week on the island. Congrats Gib, VE3DUO and VE3JMT are new members of CARTG. With the US phone band expansion now in effect, especially on 75 meters, a number of US amateurs can be expected to be checking into some of our phone nets. Let's make them welcome — remember we all share a common bond, we're radio amateurs. Oxford Co. ARC now has 28 members. VE3BMV is hoping to start a new Amateur Radio magazine called Radiosporting. It will be for active radio amateurs. One of the columns will be devoted to RTTY, AMT and Packet Radio. VE3BCO is now VE3AP while VE3BUO is now VE3JU. VE3HXY has settled into the Lindsay area and is now VE3NWP. There is a nightly net in St. Thomas on repeater VE3STR (147.93/33) at 2200 local. Visitors to a recent Ottawa ARC meeting were VE3s NPZ, OSY, JIL, MOZ, IMT, E15DA and E16BX. VE3MX is the new president of the Welland Co. ARC. Regrettably I report that VE3CGK has become a Silent Key. Repeater VE3KSR is now equipped with auto patch. New OBS: VE3MGO for repeater VE3MGI. New advanced amateurs are: VE3OGZ, VE3NSG, VE3NTL, VE3EQE and VE3LGV are new life members of the Ontario Trilliums. VE3IDL, junior op of VE3AJN and VE3GNW, is now a program director for a radio station in Sussex, NB. A very Merry Christmas and a Happy New Year to all. Traffic: VE3KK 267, VE3GT 120, VE3DPO 107, VE3AWE 89, VE3KXB 68, VE3KZJ 63, VE3GOL 52, VE3GFN 50, VE3BDM 41, VE3BAJ 21, VE3WV 21, VE3FGU 20, VE3KXL 16, VE3WV 11, VE3EWD 10. (Aug.) VE3GOL 74.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2EO, BM: VE2ALE, PLO: VE2YW, TC: VE2ED, NMS: VE2FSA VE2EO. Stations from Quebec City, Trois-Rivières and Montreal were active during the Papal visit. Three of the five amateurs who were delegates at the National Convention of the Canadian Council of the Blind, held at Saint John, New Brunswick, were VE2s. I have been re-elected your SM, for a term of two years starting Jan. 1. I hope that I can still count on your support. Season's greetings to all. Avec regret! La saison informelle le décès de VE2AXD. A tous les meilleurs souhaits de la saison. Traffic: VE2EC 42, VE2BP 28, VE2EKC 3.

SASKATCHEWAN: SM, W. C. Munday, VE5WM — STM: VE5HG, SEC: Vacant, TC: VE5GF, NMS: VE5EH, VE5HG, VE5NJ, VE5AEJ, VE5EAM, VE5BAF. Net reports received: MJARJ 230 sess., 251 QNI; PWXN 30 sess., 584 QNI; RARA 230 sess., 492 QNI, 1 QTC. With summer winding down thoughts are turning to the start of Amateur Radio classes. The Regina club got things under way on Sept. 29th with an Amateur Radio demonstration in two shopping malls. HF, VHF, RTTY, computers, fast scan TV and audio/video displays captured the public's interest. It is hoped other clubs were as successful in launching their classes. Traffic: VE5BAF 28, VE5UX 17, VE5AGM 6, VE5WM 5.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI — STM: W3DKX, SEC: W3PC, PLO: N3DIF, PSHR: WA3DUM, K3JL, W3DKX, Kent Co. ARC covered the DOVER BIATHLON on Sept. 30. SARA handled communications for SENIOR CITIZENS DAY in Rehoboth Beach, with over 3,000 senior citizens attending. SARA also helped with the Lewes CROP WALK on Oct. 6, keeping track of 128 walkers. VE exams were given by SARA Nov. 3, and AWARE Nov. 17. Good luck to all. Congrats to new Novices KA3NSJ, KA3NCS and KA3NFN, also to KA3DZL upgrade whose new call is KC3PF. DTN: QNI 401, QTC 38 in 23 sessions. DEPN: QNI 77, QTC 13 in 5 sessions. SEN: QNI 45, QTC 9 in 4 sessions. Traffic: W3QQ 109, W3PC 91, W3DKX 88, W3BDU 65, WA3ZBI 19, K3JL 17, WA3DUM 12, N3AXH 10, WA3WV 9, K3ZXP 9, KA3IXV 8, K3CJM 7.

EASTERN PENNSYLVANIA: SM, James B. Post, KA3A — ACC: KB3NE, PIO: W3AMQ, SEC: WA3PZO, SGL: N3CJP, STM: KA3GJT, DECA: K3QXK, AASC: W3EER, KB3UD, N3BFL, KB3LR, W3AQN, N3AIA.

Net	Time	Freq.	QNI	QTC	Sess.
EPA	7:10 P.M. Dy	3810	414	163	59
EPAEPTN	8 P.M. Dy	3917	433	158	30
PTTN	8:30 P.M. Dy	3810	204	66	30
PaPN			151	65	30

Local and VHF net reports (QNI/QTC/Sess.): MARCHVHF (246/34/13); Anth. Traffic Net (39/8/8); Dist. 5 Emerg ser. (62/6/5). OO reports W3KEK & N3BFL. Since this is my first month for this report please excuse any omission errors. Thanks to Mark Pierson, KB3NE, for his help in the transition period. Also thanks to Bob, WA3PZO, for continuing with the K3E effort. Congrats to both Bob, KA3DZY, and Bob, KA3MU, for their appointments as ECs. Welcome to our new STM, Dan Finegan, KA3GJT. In reviewing the section DECs, it seems that Dist. 6 (Lackawanna, Luzerne, Wyoming); Dist. 8 (Columbia, Montour, Northumberland) and Dist. 9 (Perry, Snyder, Union, Juniata Cos.) are in need of DECs to handle these areas. We also need some ECs in a few areas. If you would be interested in information in becoming involved, contact the SEC Bob Josuweit, WA3PZO, 9 Darwin Dr., Havertown 19083. Thanks to all who have given their offers of support, help and good luck wishes.

MARYLAND-DISTRICT OF COLUMBIA: SM, Karl R. Medrow, W3FA — KG3MV has his electronic bulletin board running well on 144.91 MHz, 110 ASCH. It covers both B and C bulletins. W3CVE advises that WB3IVO sends 20 to 60 WPM code practice 7080 kHz at 2000Z Sun, Mon, Thu and Sat; on 14060 kHz at 2000Z Tue and Fri. K3E had enough month left for PSHR. WA2ERT on TDY sweat out DIANE. W3YVO/NC8 with W3HWW W3LDD K3GUX W3FA W3VBM NY4X and WB3JRW held one emergency session, but it was not needed. OO K3GHP had his eye on the 20-meter DX Contest. WA3UMI and the SMARC had a station on at the Prince Georges Fair. W3ABC surprised 'em with extra handouts: The FAI sponsored Gaithersburg Hamfest had 4500 plus 545 tailgaters. WA3JHW of the MEPN won a hand-held; congrats! The Frederick CUP Walk commo was furnished by N3AGM W3FOA WA3PJP N3RQ and W3UT. N3ADL was first to report the 80-meter. WB3BFK is not exactly pleased with 80-meter daytime propagation. W3DFW is getting the Allegany Co. alerting system revamped. W3LDD says no excitement this time. KC3DW uses various paths to submit his reports. WB3FUE is our funnel to the eastern shore. KA3CDQ has 6 acres for his new digs. KA3EWW is a keyboard virtuoso! K3Y hops in to help many of us who get caught short. K3NNI is a lot louder with everything turned on! W3JUT is winding down summer. W3YVG is pleased to announce the state approved RACES plan with 2-meter emphasis. KC3AV is looking for recruits. K3MF is ready when you are! W3DQJ is senior director MEPN. W3FZY is in the section and will be a candidate for the 80-meter dipole. With the nets (Net/magazine, session/traffic/QNI average frequency, time): WC 2-Mtr Net/KC3DW 40/15.5, 146.34/30 1000 local Tue; MDC PON/W3OYY 41/12.5; WR PON/W3BFFK 20/22/10.6 PONS 3905 kHz 1700 local daily except Sun; MEPN/K3E 32/150/27 3920 kHz 1800 local daily; MSN/KC3AV 30/70/8.8 3917 kHz at 1930 local daily; MDD/W3PQ 3643 kHz at 1900 and 2200 local daily. Top V: W3FA KA3CDQ 188, KC3DW 183, K3CY 165, K3NNI 147, K3JE 146, W3YVO 127, K3KF 115, KC3AV 104, KA3EWW 72, WA2ERT/3 46, N4DLA/3 35, W3DQJ 32, W3UT 25, W3BFFK 24, W3LDD 21, W3FZY 16, W3BFEU 7, KC3D 4, K3MF 1.

SOUTHERN NEW JERSEY: SM, Richard Blair, WA2HEB — SEC: K2QJL, STM: WB2UVB, ACC: K2JX, TC: W2JY, BM: WB2UVB, PIO: WB2RVE, SGL: W2XQ. From our SGL W2XQ comes word that NJ Assembly Bill A-2393 modifying NJS 2A-127.4 has been introduced by Assemblymen Zimmer, Haines and Weidel. This is the so-called "scanner bill" that, if enacted, will allow licensed radio amateurs above the Novice class to have receivers capable of monitoring police frequencies in their vehicle without a permit from the local chief of police. This bill is similar to the one that Governor Byrne vetoed several years ago at the urging of the State Police. If you are in favor of this bill's passage, please let your legislators know your feelings. I understand that strong opposition from the State Police can be expected again. If I keep you posted. Since this is the holiday season, please set a little time aside and help out on our local and section nets. As usual, there will be many holiday greeting messages coming in and out of our section and not enough stations to handle the flow. For information on a net in your area, contact our STM. Very happy holidays to each and every one of you. 73. Traffic: WB2IKL 132, KC2PB 51, WA2HEB 47, W2IU 10, KA2ANJ 8.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — SEC: W2BCH, ACC: N2EH, PIO: WA2PUU, OORFI: W2AET, TC: K2OR, BM: W2GLH, SGL: K2OX. Appointments: EC — W2GLH, Jefferson; N2EB, Seneca. OBS Reports: WA2ZPE W2BDSR, PSHR KG2D KA2DQA VE2FMQ W2GJ WB2IDS WA2KQJ W2MTA KU2N WB2OWO WB2QIX WB2RBA ND2S KX2T K2YAL. Club Of-

ficers: Squaw Island ARC-K2ZU N2EIB KA2JUY WA2VUB; LARC-WA2MGM W2GLN KD2CC WA2FWW KA2TFPI; Rome RC-N2FAO KA2NUL KA2UBC KA2JXA N3DLL; GRAM-WB2DFC WB3JSU KA2ATA WA2IA; ARATS-W2VCI K2LRL K2JD. Novice Classes sponsored by ARATS, LARC, RAGS, RAWNY and RARA. Section League membership holds at 2833 with 52 affiliated clubs.

Net	Freq.	Time	QNI	QTC	Sess.
NYS/1*	3677	1000/Dy	WB2EAG	332	171-30
WDN/1*	04/64	1100/Dy	WB2OWO	660	092-30
Mike Farad	3925	1300/M-S	VE2FMQ	177	040-25
NYFON	3913	1700/Dy	WA2KQJ	767	332-30
NYSPTEN	3925	1800/Dy	WB2HJK	483	071-30
ESS	3590	1800/Dy	W2WSS	463	067-30
OCTENE/*	34/94	1830/Dy	WB2HLY	654	091-30
Q Net	31/91	1830/Dy	KA2CMQ	339	012-30
WDN/E*	04/64	1830/Dy	WB2OWO	527	136-30
Blue Line	93/33	1900/Dy	WA2SEF	257	025-29
NYS/4*	3677	1900/Dy	WB2MCO	471	198-30
JCAPCN	10/70	2000/Dy	WA2WAX		
OARGN	25/85	2000/Wed	K2VTT	051	000-04
BRVSN	056/655	2100/Dy	WB2OFU	319	008-30
CNYTN*	90/30+	2115/Dy	WA2PUU	338	048-30
OCTEN/L*	26/88	2130/Dy	WB2HLY	277	031-29
SAR	89/8	2130/Dy	FB		
WDN/L*	04/64	2130/Dy	WB2OWO	568	115-30
NYS/5*	3677	2200/Dy	WB2MCO	427	257-30

*NYS Net. ARES: CDECN WNYECC LGARES NARA SLVARES. Traffic Handers Info Net 1600 Sundays 3913 kHz. COMMS: Oneonta/Otsago Clubs Glimmerglass Triathlon at Cooperstown-WB2PEE; SIARC at ADA Bikeathon-N2EIB, KA2EXI filling vacancy as RAWNY Secretary. Rome RC fiftieth anniversary Officers Installation Dinner was FB affair; TNX for invite. VE EXAMS: MONTHLY by RARA without appointment call K2NC 716-225-3626. Ham-O-Rama, RAGS and Rome also held VE tests. Elmira club members sure can pick weather days a beautiful hamfest day at County Fairgrounds. The Official Amateur Auxiliary program is drawing interest. If you wish to learn more, write to WA2ET, Official Observer/RFI Coordinator for Western New York. ARES still needs county Emergency Coordinators in ERIE, FRANKLIN, HERKIMER, SCHOHARIE, SCHUYLER, STEUBEN and WYOMING Counties. Interested? Contact Section Emergency Coordinator, SEC, W2BCH. Seasons Greetings to all. Traffic: WB2OWO 395, W2MTA 227, WA2HSB 202, WB2IDS 201, VE2FMQ 171, WB2QIX 167, ND2S 124, W2FR 80, KG2D 78, KX2T 72, W2GJ 70, WA2KQJ 66, K2YAI 66, KA2DDB 65, AF2K 61, WB2RBA 60, WA2NKC 57, K2JN 53, W2UYE 45, WA2SMZ 40, N3DPE 34, WB2JAB 30, K2ZKJ 28, K2OKW 28, KA2DIX 25, WB2KC 22, WB2NAO 22, W2PSS 20, KA2DIA 18, WB3CJF 12, K2GJT 12, K2JUT 12, WA2OEP 12, KC2SJ 4.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K5SMB — SEC: AB3Q, STM: AC3N, ACC: N3EE, OORFI: K3NB, PIO: WB3JZL, TC: W3PFE, BM: W3NVA, SGL: K3HWL.

Net	QNI	QTC	Sess.	kHz	TD
WPACW	368	168	30	3585	7 P/D
WPAPT	449	122	30	3983	6:15/D
WPA2MTN	447	46	30	3983	6:15/D
NWPA2MTN	395	3	29	145.13/53	0200UTC/D

Upgrades N3GMV to Advanced, W3KYN to Extra. Congrats. W3NVS will have been amateur for fifty years in 1985, visited with the Pymatuning ARC presented the club with its ARRL Chapter, and had a very enjoyable evening with their members very gracious hosts. Also spent another fine evening with the members of the Foothills ARC and their families celebrating their Silver Anniversary. Hugh Turnbull, W3ABC, and his XYL were there and we had the pleasure of congratulating them on their 42nd anniversary. It was another evening of fine fellowship spent with fine hosts. Manned the ARRL booth at the Butler Hamfest with the assistance of AC3N and K3NB. We spoke to many amateurs and answered many questions about the League, the third call district new and former QSL bureaus. Asked for more participation in various nets. Congrats to the Triple "A" ARA of Beaver Co. for its acceptance as a member of the Penna Blue Ribbon Committee of Beaver Co. for outstanding emergency and public service. Of note W3CYD has 19 grandchildren if he could get them all to be hams, would his son WB2ZAV is also a grandfather. WB3ERA of Quad Co. ARA has been promoted to Captain in the U.S. Army. He is stationed at Ft. Devens, Mass. Congrats. Traffic: W3EGK 293, KQ3T 176, AC3N 105, W3OKN 91, N3FM 90, WA3QNT 79, W3NGO 75, W3SMB 73, WA3UNX 73, KC3CJ 53, W3NVA 50, K3SMB 46, W3XZ 39, KQ3M 36, N3CYV 27, W3MML 18, W3KUN 16, W3KML 15, K3LTV 15, KA3COO 10, W3SN 8, K3BNV 7, KC3HR 6, K3NXP 4, W3TTN 4. (Aug.) W3XZ 10.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WB9EJO — SEC: W9QBH, STM: KB9X, OORFI: W9JY, BM: K8ZDN, PIO: W9SEED, SGL: WBKPT, ACC: WB5FT, ASM: K9ORP.

Net	Freq.	Time	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	630	212	60
ITN	3705	0100 Dy	317	90	30
ILPN	3915	2230 Dy(X Sn)	788	64	30
NCNP	3915	1300 Dy(X Sn)	400	60	25
NCPN	7270	1815 Dy(X Sn)	236	42	24
LEN	3940	1500 Sn	118	2	5
IARES	3915	2230 1 + 3 Sn	23	1	1
ISN	3905	0000 Dy	505	134	30

Illinois was represented 97% to 99% by stations K9AZS K9VE W9DR W9EM KA9EYV KA9EY (K9GZK K29J KW9J KB9K K9JL W9BNVN W9NWX K9EVE K9EVE W9BZAV) and KB9X. Illinois was represented 100% to DBRN by stations W9HOT K9EHP KW9J W9BNVN W9BQDN W9NWX and K9AZS. DBRN was represented 100% to DBRN by stations W9HOT K9EHP KW9J W9BNVN W9BQDN W9NWX and K9AZS. DBRN was represented 100% to CAND by stations K9EHP K9EHP W9HOT KW9J W9BNVN W9NWX and WA9NZF. I was asked by a new reader of this column why the above calls are singled out each month in the above manner, and thus the following explanation... The stations that occupy the lines at the top of the column each month are those stations who faithfully represent the

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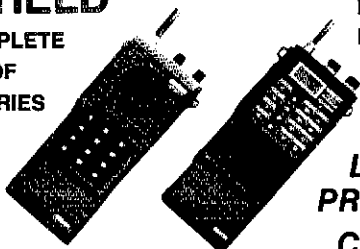
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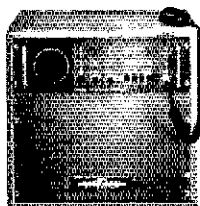
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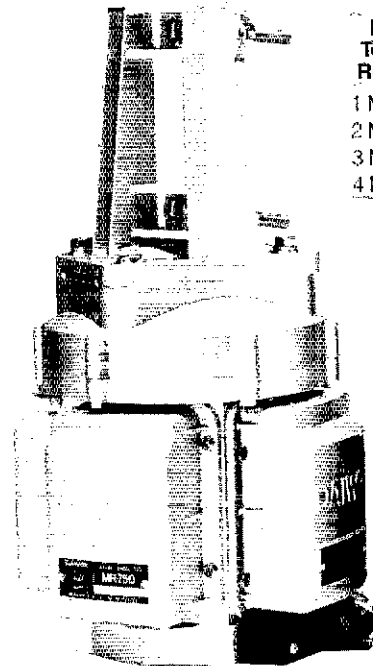
New Multi Torque

Check These Features:

1. The rotator frame can house up to 4 motors to increase the torque and load capacity of your antenna system.
2. Each motor is equipped with a Super Wedge and Clutch brake system which works independently from the main frame gear train.
3. Maximum brake power is 18,300 lbs/in when 4 motors are installed. The main frame and reduction gear train have been designed to withstand maximum wind loading.
4. The motor unit can be dismantled easily for maintenance if required.
5. A 1½" to 2½" diameter can be installed and aligned easily with the rotator center.
6. Low voltage (24VAC) motors are used to ensure safety during installation work on the antenna tower.
7. Low cost 6-wire control cable can be used for the low voltage motors.
8. The control panel can be removed easily for calibrating the direction indicator.
9. Balanced type control knobs have quick lock mechanisms on both sides.
10. The advanced Super Wedge and Clutch brake system (Slip clutch type) provides exceptional holding power and protects the rotator mechanism from excessive torque.
11. Lower mast bracket MS-1 is available (optional).

MR-750E/MR-750PE

Multi Torque Rotator	Output Torque lbs/in	Brake Power lbs/in
1 Motor	610	5,200
2 Motors	1,200	9,600
3 Motors	1,800	13,900
4 Motors	2,400	18,300



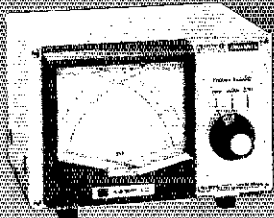
MR 750E Rotator
Standard Model
(58 sec/rotation)

MR 750PE Rotator
For use with
Pre-Set Controller
(58 sec/rotation)

MR-300E
High Speed Model

For rotating VHF/UHF
antennas at high speed

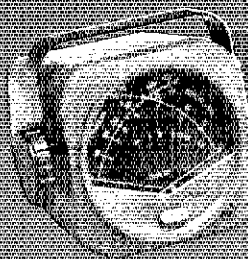
SWR & POWER CROSS NEEDLE METERS



Top Quality

GN-720B

Frequency Range 1.8-150MHz
SWR Detection Sensitivity 4 W/min
Power 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)
Dimensions 180 X 120 X 130 mm
7.12 X 4.75 X 5.12 in.

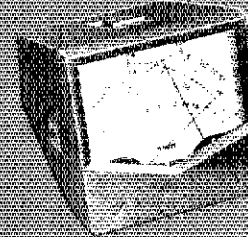


GN-410M GN-480M GN-485M

Frequency Range 3.5-150MHz 140-480 MHz 140-480 MHz
SWR Detection Sensitivity 3 W/min 3 W/min 3 W/min
Power Range Forward 10 W/150 W 15 W/150 W 15 W/150 W
Reflected 5 W/75 W 5 W/75 W 5 W/75 W
Dimensions 71 X 28 X 100 mm 2.8 X 3.1 X 3.9 in.
All Models Back Lit. with mobile bracket.

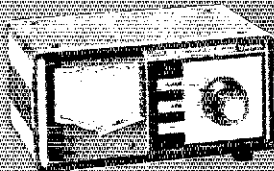
GN-520B

Frequency Range 1.8-150 MHz
SWR Detection Sensitivity 4 W/min
Power 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)
Dimensions 185 X 75 X 97mm
6.6 X 2.9 X 3.8 in.



GN-520 GN-540 GN-550

Frequency Range 1.8-60 MHz 60-150 MHz 144-250 MHz
Power Range 200/2000 W 20/200 W 20/200 W
Dimensions 72 X 72 X 85 mm 2.83 X 2.83 X 3.74 in.



GN-630

Frequency Range 140-450 MHz
SWR Detection Sensitivity 4 W/min
Power 2 Ranges (Forward, 20/200 W)
(Reflected, 4/40 W)
Dimensions 180 X 85 X 120 mm
7.12 X 3.37 X 4.75 in.

ANTENNA TUNERS



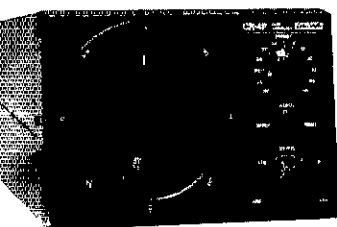
GNW-518
Frequency Range 3.5-30 MHz (8 bands)
Power Rating 1 kW CW (50% duty)
Output Impedance 10-250/25-100 ohm
ICR 3-5 MHz
Dimensions 225 X 90 X 245 mm
8.9 X 3.5 X 9.6 in.

GNW-419
Frequency Range 1.8-30 MHz (17 bands)
Power Rating 200 W CW (1.5-30 MHz)
100 W CW (1.8-3.4 MHz)
Output Impedance 10-250 ohm
Dimensions 225 X 90 X 245 mm
8.9 X 3.5 X 9.6 in.

CL-680
Frequency Range 1.8-30MHz (17 bands)
Power Rating 200W CW (1.5-30MHz)
100W CW (1.8-3.4 MHz)
Output Impedance 10-250 ohm
Dimensions 185 X 75 X 97mm
6.5 X 2.9 X 3.8 in.

Antenna Rotator (Pat. Pend.)

Up To Four Motors For Extra Torque and Braking

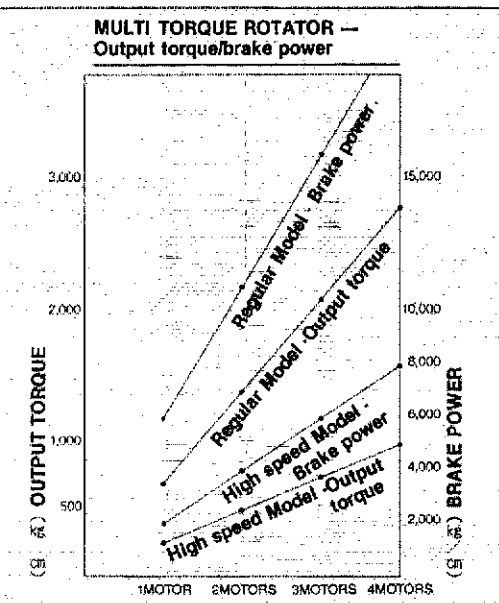
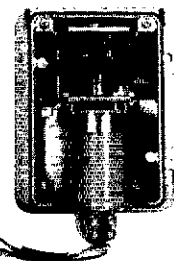


CR-4 Manual Controller for use with MR-750E and MR-300E Rotators

CR-4P Controller with Pre-Set function for use with MR-750PE Rotators

MR-750U Motor For use with MR-750E and MR-750PE Standard Rotators

MR-300U Motor For use with MR-300E High Speed Rotator



SPECIFICATIONS

■ CONTROLLER UNIT

	CR-4 (for MR-750E/MR-300E)	CR-4P (for MR-750PE)
Power source	117 V AC (50/60 Hz)	
Power consumption	200 W (with 4 drive motors)	
Motor running voltage	24 V AC	
Dimensions	180 mm (W) × 125 mm (H) × 175 mm (D)	
Weight	9 lbs (4 kg)	
Operation	Manual	Manual/Pre-set

■ ROTATOR UNIT

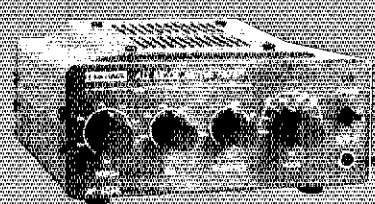
		MR-750E/PE	MR-300E
Rotation time	60 Hz	58 seconds (60 Hz input)	
	50 Hz	70 seconds (50 Hz input)	
Output torque Brake power	1 motor	610 lbs/inch (700 kg/cm) 5,200 lbs/inch (6,000 kg/cm)	220 lbs/inch (250 kg/cm) 1,700 lbs/inch (2,000 kg/cm)
	2 motor	1,200 lbs/inch (1,400 kg/cm) 9,600 lbs/inch (11,000 kg/cm)	440 lbs/inch (500 kg/cm) 3,500 lbs/inch (4,000 kg/cm)
	3 motor	1,800 lbs/inch (2,100 kg/cm) 13,900 lbs/inch (16,000 kg/cm)	650 lbs/inch (750 kg/cm) 5,200 lbs/inch (6,000 kg/cm)
	4 motor	2,400 lbs/inch (2,800 kg/cm) 18,300 lbs/inch (21,000 kg/cm)	870 lbs/inch (1,000 kg/cm) 7,000 lbs/inch (8,000 kg/cm)
Rotation angle		375 degrees	
Permissible mast size		1-1/2 ~ 2-1/2 inch (38 ~ 63 mm) < diameter >	
Control cable		6-wire cable 0.5sq ~ 1.25sq (AWG16/18/20 etc.)	
Continuous running		5 minutes Max. permissible	
Unit weight		16.5 lbs (7.5 kg) < with 1 motor unit fitted >	

COAXIAL SWITCHES

PAT. No.59-000803



	CS-201	CS-201G	CS-401	CS-401G
Position	2-position	2-position	4-position	4-position
Frequency	600 MHz	1.3 GHz	800 MHz	1.3GHz
Connectors	SO-239	N type	SO-239	N type
VSWR	Below 1:1.2			
Insertion Loss	Less than 0.2 dB			
Isolation	better than 50 dB at 300 MHz better than 45 dB at 450 MHz adjacent terminal.			



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ELECTRONIC KEYS DK-210

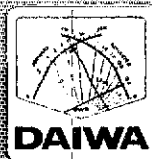
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Band	144-148 MHz	144-148MHz	144-148MHz
Input Power	0.5-3 W	0.5-3 W	0.5-5 W
Max. Output Power	30 W plus	30 W plus	60 W plus
Power Consumption	13.8 VDC, 4.5 A max	13.8V DC, 5A max	13.8V DC, 8A max
Dimensions	100×35×125 mm 3.9×1.4×4.9 in.	100×35×125mm 3.9×1.4×4.9 in.	122×45×175mm 4.8×1.7×6.9 in.
		Pre-Amp. Built-In	Pre-Amp. Built-In



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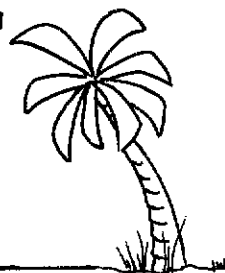
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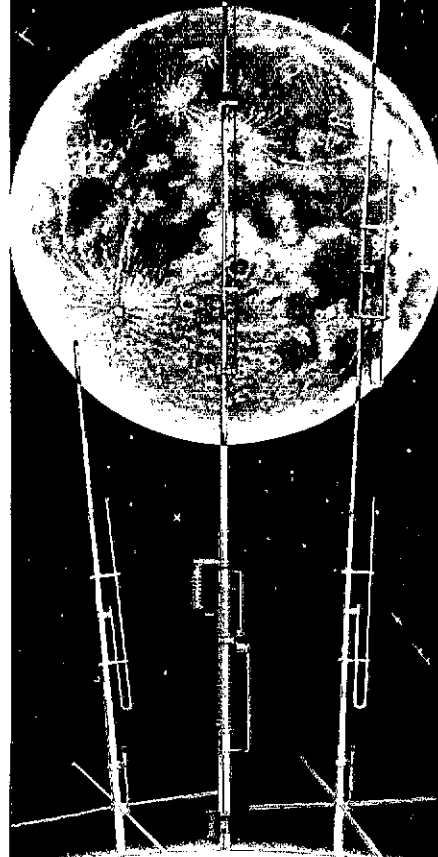
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 NWTN 34/94 6:30 P.M. W9JSF 437-34-30
 Traffic: KA9GPA 2058, K9GDF 266, W9CXY 283, WD9HID 240, W9WNY 240, W9CBE 171, KA9BHL 156, KC9CJ 153, W9UCV 143, W9CIV 133, W9CIB 141, KA9BDI 92, N9DHT 84, W9DFY 83, W9IEM 82, W9BICH 73, W9BESM 54, A9G8 81, W9DND 80, K9UTO 57, W9ASTY 52, KA9AFB 50, K9AKG 49, K9FHI 48, W9IHW 44, W9LDO 42, W9WVC 38, W9S9FW 36, N9DCF 34, K9LGU 32, W9JSF 30, K9BBD 29, WD9DQ 28, K9JPS 24, W9BGE 17, K9ZV 14, KA9BHK 14, W9ODV 14, K9YP 12, W9SRK 11, W9LW 8, KA9RFN 8, W9BZW 4.

DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WB0HOX — ASM: KC0T, SEC, KA9ARF, STM: KD0CI. Hello again! It's good to be back following the time off. I know many of you recall why I was gone, and I can assure you the time off was well spent. My new bride (KA9AF) and I would like to thank those of you who thought of us, either by correspondence or by actually attending our wedding ceremony. We deeply appreciate all of you. Now it's back to business! It seems that the transition of power is going smoothly between outgoing SM WB0HOX and incoming SM KC0T. The change was effective Oct. 1st. The Arrowhead RAC provided communications for the Walk, Run or Jog for Eilepsyn on Sept. 22nd. Participating stations were N9ANV, N9BDM, N9BKL, N9BNG, N9FKR, K9BQX and A9FT. The New Ulm and Mankato ARCs are joining forces to sponsor the first VEC testing session in the Mankato area. The exams will be given at the Mankato Law Enforcement Center on Sat., Dec. 15th. NET NEWS: KA9JUX has submitted his resignation to me as net mgr of the Noon Phone Net. He has managed MSPN/N for 2 years and did an outstanding job. At present, I'm acting as net mgr while we search for a replacement. If you are an ARRL member and have some experience in traffic nets, we can use you to help us on the Noon Net. Hopefully by the time you read this, a new manager will be named. Piconet resumed a full schedule Oct. 1st. Dakota Division Director K9TD has appointed two additional assistants. K9BLD will provide liaison with the cable TV operators, especially in the Twin City Metro area. W9TN will coordinate the packet radio group. I hope to have a complete list of section appointments soon to be put in this column FYI. The second annual Mille Lacs Lake Rptr Comfeed was a huge success. This year's event was hosted by KC0QL near Garrison on Aug. 19th. Congrats to N9CLS and her husband on their recent 50th wedding anniversary. Our best wishes go to W9DM who recently underwent surgery. Plans are to start a limited RTTY net sometime this fall on 75 meters. Finally, our best wishes to each of you for the upcoming holidays. I will be a busy time for all of us, and hopefully enjoyable.

Net	Freq.	Time	GM	OTC	Sess.
MSN/1	3685	6:30P	278	64	30
MSN/2	3685	10:00P	314	58	30
MSSN	3710	7:00P	145	12	27
MSPN/N	3929	12:05P	609	79	30
MSPN/E	3929	5:30P	1069	175	29
MNAMWXNT	3929	8:15P	380	232	22
PICONET	3925	9:00A	2297	183	25

Traffic: KB0MB 541, WA0TFC 341, KA0EPY 254, KA0ARP 172, W0EHI 172, W0HZU 167, W0MFW 113, K9RI 92, WB0HOX 60, W0WJN 60, KC0T 56, N9CLS 54, KD0CI 53, W9DM 50, K9TOR 46, W0WJN 32, W0BGS 30, KA0CQ 29, W0CJF 24, W0GRW 22, K0CGI 20, KA0JF 14, K0CVD 12, N9CVD 12, N9P 12, K9S9 8, K9SU 8.

SOUTH DAKOTA: SM, Fredric Stephan, KC800 — Traffic reports from home from W0BOMF, N9B0D, KC0OD, WA0RE, W0YME, KB0MB, W0B0T, and KC9AF. Our section needs more help in handling traffic or we will simply have to drop our affiliation with DTEN and obviously with the entire National Traffic System. We have not received any indication yet from anyone willing to assist those of us who are already overworked. If you want all the traffic to be handled by the "independent" nets, that will be FB with our STM and our SM, and free them up for more important duties. A substantial number of people have raised the question of the current "validity and reliability," in effect, of "handled" traffic, whether formal or informal. The basic concern is this: Most of the messages sent are of such extremely low importance to everyone involved and are so slow being delivered that even the public is left with an unfavorable impression outside of the novelty of it all. "Those who regularly handle traffic already have the needed practice for emergency operations; those who do not have the traffic experience rarely if ever, volunteer the proper skills anyway." "Maybe someday the electronic mailbox will save us all." If you really feel touched by all of these statements made by your fellow hams, THEN PLEASE respond in writing to me now. I will be more than happy to place your comments in this column immediately. The odds given at this time are 1000 to 1.678 that no one will reply at all within the next nine weeks. Any takers?

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB4IGF — SEC: NSBPU, STM: AE5L, TC: W5FD, ACC: AD5M, PIO: K5DW, SGL: W5LCI. Repeater Coordinator: WB5FDP. The Section Manager's newsletter is being mailed to all field appointees and clubs in the state. If you would like to receive one let me know. Merry Christmas to all. I hope each of you have a very safe and prosperous holiday season. Let's all pitch in and give a hand. Arkansas Nets: Ark. Phone Net - 3885 kHz Sat. - Ozark CW - 445 kHz, 7 P.M. Dy: Razorback - 3895 kHz; 6:30 P.M. Div. - 3895 kHz; 3928 kHz; 4:30 P.M. Mon-Fri. 73 to all. Traffic: W5DFCE 107, W5TUM 60, W5SIGF 20, AE5L 19, W5UAU 17, W5KLL 8, KA5DFT 4.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR — ACC: K5DPG, SGL: KD5SL, OO/RFI: WB5TPG, TC: N5JM (former SM for Louisiana). The Louisiana World Fair station, K5WF, will be long and proudly remembered as an outstanding Amateur Radio display and special event ham station. John Uhl, KV5E, the organizer and president, presented special awards to Patricia Tusa (YL of K5EP), Ray Crain, K5GA, Leon Lessard, WB5ZED and Tom McGraw, W5FM, with the comment: "Many participated and helped make it a success but the folks provided that extra and untiring effort that made it possible. Better than ever describes the recent New Orleans Hamfest and Delta Division Convention in the new location. Lotsa "attaboys" to General Chairman Roy Clay, W5HVS, and Bill Bushnell, WA5MJM, long-time organizer, for their superb performance in putting it together. Have you noticed the Southern Wireless Society is making their presence felt with a several page monthly news? Mary, W5LBR, has taken over as net manager of the LAN CW Net owing to the departure of Frank, N5BFV who left because of his employment. Traffic: W5GHP 448, WA4LHL

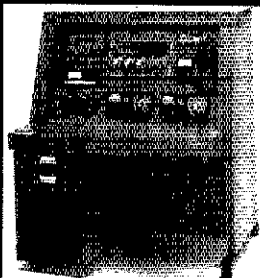
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Contesters:

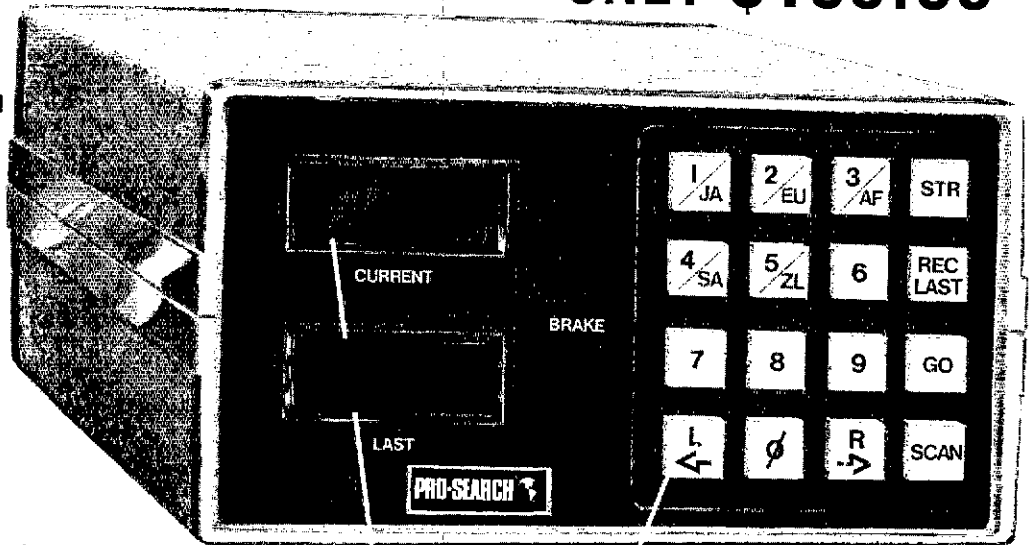
Pro-Search Rotor Controls handles your Rotor for you! No Mods to your Rotor just connect your present 8 wire cable to our unit and it will allow you Hands Off Operation while brightly displaying your Rotors position on 1/2 inch LED's.

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MISSISSIPPI: SM, Paul C. Kemp, KW5T — STM: KB5W. SEC: N5DDV. VHF Coord.: NF5C. Congrats on new calls: SEEJ, now N5FF, KA5OC, now N5G, CAJ, now N5HD, KA5TF, now K5RO, W5JHS has new ICA 30, tx to GC5BN. Excellent hamfest at Blox, tx to MCAFA and W5LKC. K15V winner of main prize Sun and AJOB on Sat. W5BEV, KA5LOG and K5IUE missed during this stay in the hospital. W5VMC apt OORFI coord. N5DDV apt O. Still need to fill some key appointments. If you are interested in contributing, let me know. CAND (W5KLV) 30 sess., QTC 877, DRNS (W5YDD) 60 sess., QTC 787, MTN (K5OAF) 30 sess., QNI 142, QTC 43, MSBN (KW5T) 30 sess., QNI 2068, QTC 53, MMN (W55RMW) 29 sess., QNI 545, QTC 8, GC5BN (W5JHS) 30 sess., QNI 963, QTC 24, MLVN (K5YXV) 5 sess., QNI 85, QTC D. Traffic: K55W 653, NS5AMK 413, K5OAF 227, W5WZ 39, W5LSG 30, KW5T 28, K5SK 4.

TENNESSEE: SM, John C. Brown, NO4O — ASM/ACC: WA4GL3, QORFI: W9FZW, PIO: WK4V, SEC: WA4GZO, SGL: WA4GZZ, STM: NG4J, TC: WA4HK. It was mentioned some time back about getting on 2304 MHz (13 cm) and doing some work. Well, WA4HGN has done it again on that frequency. He made first DX contact via EME with a station in West Germany. A distance of about 5,982 nautical (6,888 statute) miles. I think that is a first for the section by that mode. That was with the 28-foot dish. Congrats on the job. It bears mentioning again that whenever you change locations, owners or power to any degree on your repeater, you should re-coordinate this change with the section frequency group headed up by W54HAP. W54HAP, WA4RMC, WA4XA, WA4YX. This fine group is doing a much needed and thankless job, but is the only official way in the section. Your Section Manager would also like to remind all to please let him know when we have any of our TN amateurs become Silent Keys, along with date of such. CW net Honor Roll for this period is: WV4E K9IMI and W4DDK. Good work and congrats to each. The new "Radio Amateur's License Manual" is now out from ARRL with all the questions used at this time for each grade. You will need to take a look if upgrading is in the future. The new Callbook and Handbook (with over a thousand pages) are both available. Net activity for this period is as follows: F sessions 83, QCA 3181, QTC 53, QNI 326, QTC 84, RTTY sessions 29, QNI 106, QTC 7. Not bad for this time of the year. There are many out there with much activity that your SM would like to include in this report. So give him a call during first five or so days at the first of the month. Traffic: W9FZW 300, KA4RSC 191, K4WOP 101, K4WWQ 91, W4DDK 90, NN4S 30, W4YPO 28, W4PPP 18, K4UMW 11, WV4E 11, K4JGW 10, W4EWR 7, KE4LS 6, WA4HKU 6, W4PSN 4. (Aug.) W4ZJY 24, WA4GZQ 11.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Jackson, KA4GFU — in view of the ominous predictions of an earthquake along the New Madrid Fault, the Director, SEC and STM are drafting an EARTHQUAKE COMMUNICATIONS PLAN to coordinate with State Disaster Emergency Service planners. Suggestions are invited. Send to the STM at 1611 Chapel Ln., Owensboro 42301. ECs in counties west of KY Lake should develop local plans; clubs west of I-65 to equip and staff HF stations in the disaster area within the first four hours; Louisville to maintain the American Red Cross Station; Lexington to support the Frankfort EOC for continuous operation; all others to provide relief operators and VHF search-and-rescue teams as needed; maintain the nets, relay to other relief organizations statewide. Send your capabilities to the SEC at 2021 Mark Ave., Lexington 40511. Traffic: WA4JTE 252, KA4SA 82, KA4BGM 77, KB4OZ 72, WD4IY 57, WB4ZDU 37, KA4SKV 30, KA4MTX 28, WD4BSC 22, WA4SWF 21, W4WQV 20, WD4PBF 16, K4MHL 14, WA4AVV 13, N4GD 12, K4HOE 11, WA4JAY 11, WA4NOG 11, WD4CJF 9, WD4IXS 8, KA4GBZ 7, WA4AGH 6, WD4CJQ 6, KA4YIV 6, WK4D 5, WA4YPO 5, WD4IYH 4.

MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB, SEC: WA8EFK, STM: WD8RHU, ACC: K8SB. PIO: KC8K, SGL: N8CNY, TC: N8BBG, BM: K2BV. Net: 1800 Dy* 658 84 57. QMN* 3953 1900 Dy* 634 174 30. MITN* 3953 1100 Dy** 427 102 29. MACS* 3932 2100 Dy 816 64 30. GLETN 3922 1700 Dy 703 59 35. UPN* 3935 1900 Dy 714 34 30. WSSBN 3722 1700 Dy 210 34 60. MNN* 11 rpts 1120 33 71. VHF nets 11 rpts 1120 33 71.

*NTS nets. Times local. **QMN late net, 2200; MN late net, 2000; MACS Sn, 1300. ARES net Sn, 3932, 1730. ARRL Info Net, Sn, 3953, 1500. Traffic Workshop Sn, 3933, 1600. 3932 is MI HF emer. freq. Silent Key, with deep regret: K8YXJ. New manager for MNN is KA8TPX, replacing K8BNCR, resigned for personal reasons after many months of fine service. Thanks, Jeff and Welcome, Steve. New club officers: Copper Country ARA — N8FMB, pres.; N8FHF, v.p.; K8BUZ, secy.; K83W, treas. Delta Co. ARS-WB8QJZ, pres.; N8BX, v.p.; WA8DHB, secy.; K8BJL, treas. Mich-a-con — N8FMB, pres.; WD8LVN, v.p.; K8LDS, secy.; WB8EBS, treas. MCRC — WD8KZX, pres.; K8BIKA, v.p.; K8BX, secy.; K8BNV, treas. By the time you read this I will have a new address and phone number; see pg. 8. The annual ARPSC Workshop in Lansing was well attended and judged worthwhile by all concerned. In the 1984 MI QSO Party, L'Anse Creuse ARC (MI, Clemens) scored an impressive and decisive 75,671 points, led by WA8QJF with 39,358. LCARIC sponsors this annual event, one of the best-known state contests going. Their efforts are highly commendable. GMM, AR's first spot-frequency traffic net, celebrates its golden anniversary in 1985. There will be special recognition, special events. Stay tuned for further info as plans are developed. At the September meeting, QMN members re-elected the incumbent officers: W8UE, general mgr; W8TW, secy./treas.; WB8SIW, W8SCW and W8YIC continue as air managers, and K8KMQ continues as NM for 8RN liaison. Special thanks to WD8OUO for watching the store during the summer months as air mgr for the early sessions. Traffic: K8CPS 362, WB8IB 260, WB8E 121, WD8RT 125, WA8VNH 107, WD8OUO 108, WB8YDZ 88, K8CPC 78, WB8MTD 68, K8GXV 66, WB8SYA 66, WA8DHB 63, AF8V 48, WD8ET 47, K88GT 40, K9UPE 36, N8CNY 32, W8BEZ 31, N8EBE 28, W8IHX 28, WD8KQC 26, W8YIC 26, WB8IT 25, K8BC 21, KA8OID 20, N8EBN 18, K8BNCR 16, K8ZJU 16, W8YZ 15, WB8BHP 14, K8EQO 13, W8VIZ 13, W88SIW 11, W8YI 10, KA8POH 9, W8SCW 9, W8BYRY 9, WD8MJB 6, K88TD 6, W8URM 2, WB8WJV 2, K8DD 1.

OHIO: SM, Allan L. Severson, AB8P — SEC: K8AN, STM: K8OZ, ACC: K8US, PIO & SGL: N8CVK, TC: K88MU. Net: QNI QTC Sess. Time (local) Freq.

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- COMPUTERS
- OSCAR
- RTTY-RTTY
- OPERATING COURTESY
- RULES AND REGULATIONS
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- AMATEUR RADIO PRACTICE
- ELECTRICAL PRINCIPLES
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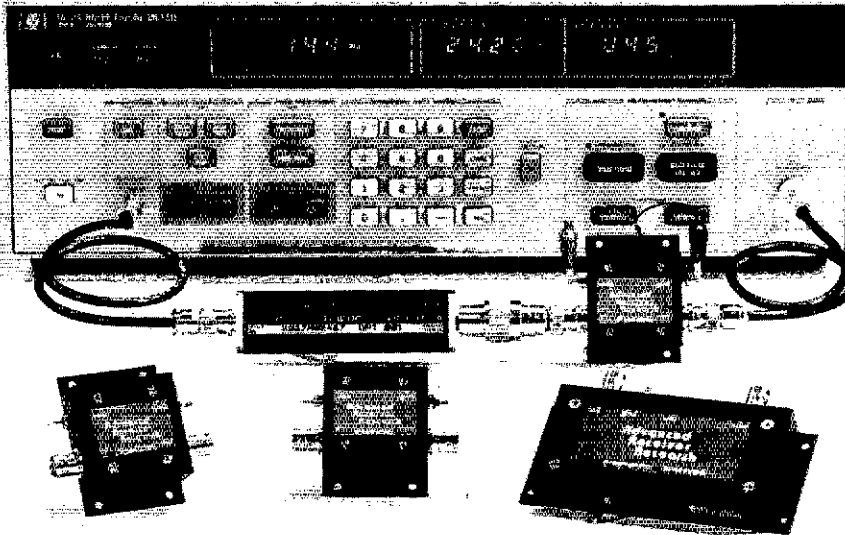
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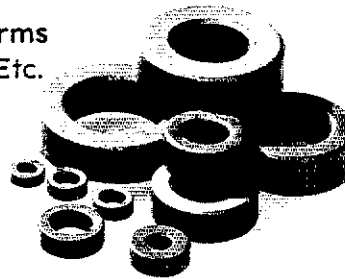
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BNR	365	217	60	6:45/10 P.M.	3.577
BNR	343	96	30	6:00 P.M.	3.605
BSSN	376	158	57	9:45 A/7:15 P	3.885
ONN	119	26	26	6:30 P.M.	3.708
OSN	302	131	30	6:10 P.M.	3.577
OSSBN	1777	1023	90	10:30 A.M.	3.9725
				4:15 & 6:45 P.M.	
OSSN	125	50	30	6:45 A.M.	3.577
O6MN	305	22	30	9:00 P.M.	50.160

I'm glad to have this opportunity to congratulate the folks in Louisville on their handling of the Great Lakes Convention and Louisville Hamfest last weekend. A great time was had by all including those who participated in an excellent volunteer exam program. We all learned from Walt Bowman, WD4RAK who must have set a new record for exam efficiency. Good to see and talk with my Ky. counterpart, KA4GFU, Director W4OYI, and 1st VP WB8FC, among others. Hope to see you all at next year's National Convention at the same place. And with that hope, I'll wind down my 48th and final column as SCM and SM for the Ohio Section by thanking each and every member of this outstanding area for the cooperation, trust, affection and fellowship that has been given to me in abundance since Oct. 1, 1980. I wish I could answer each recent message of thanks — whether by radiogram, newsletter mention, personal note or comment — individually, but perhaps this is a better way, and you know who you are. I deeply appreciate your kind words. If you give my successor, KBND, one half of the aid, cooperation, and devotion to the section I have received, he can't help but carry the Ohio section even higher in every way. My heartfelt thanks to all section appointees who have labored for us with so little reward. As I leave my position, I feel enriched for having experienced the last four years. I hope you all view your participation in League section affairs in the same light. 73 to you all and CU wherever hams gather.

Local Nets QNI	QTC Sess.
ALERT	79
BRTN	287 68 30
COARES	109 10 3
COTN	62 31 9
MASER	95 3 4
NCTW	20 8 4
TSHAC	1024 79 42
VWCEN	19 1 3
Wayne Co.	171 28 29

Traffic: WB8MIO 1317, WB8PMJ 523, K8JDI 323, N8FCQ 282, WD8KFN 267, WB8QZK 243, WB8O 230, K8OZ 173, KA8GJV 154, AB8P 149, KBND 144, KF8J 128, WB8JGW 120, WB8KWS 111, KA8QGF 104, WB8DMF 104, WA8SSI 101, N8KIS 94, N8AEH 85, N8EVC 82, N8CW 78, WB8EK 76, K8CMR 72, N8XB 64, K8TVG 53, WB8MEK 52, WB8HGH 47, K8AN 46, WD8KRW 44, K8EF 42, K8ICB 33, K8KHS 33, K8VOY 31, WD8RGP 30, K8DKY 29, K8BQ 29, WD8IKG 27, K8BSS 25, N8FPX 24, WD8RIB 24, WB8HL 21, WB8MRL 21, K8DXZ 20, W8BYX 19, N8DZA 18, W8AGMT 18, W88RM 18, WB8RSM 18, N8C8O 18, WB8HHZ 13, K8CKY 12, K8LQM 11, WD8RGS 11, K8BXT 10, WB8NHV 10, N8CJS 9, W8ZJ 5, N8AJU 5, WD8EKI 5, K88GGZ 4, WB8NTR 4, WD8CSP 2. (Aug.) W8LZE 12, W8ZM 10, K8BXT 3.

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NYS	0000/0300Z	3.677	WB2MCO
NYS/M	1500Z	3.877	WB2EAG
NYPON	2200Z	3.913	WA2KOJ
NYSPTEN	2300Z	3.925	
CDN	2300Z	146.34/94	WB2ZCM
HVN	0030Z SMT	144.535/135	N2BDW
HVN	0030Z W-S	146.37/97	N2BDW
SDN	0230Z	147.66/06	K2ZVI
SCRN	0100Z	147.735/135	KV2U

Net Reports: AESN QNI 47, QTC 2; ATEN QNI 12, QTC 4; CDN QNI 804, QTC 59; EPN QNI 126, QTC 84; ESS QNI 466, QTC 67; NYPON QNI 787, QTC 332; NYS/E QNI 471, QTC 198; NYS/L QNI 427, QTC 257; NYS/M QNI 332, QTC 171; SDN QNI 290, QTC 112; SARA 2M Net QNI 44, QTC 2. CLUB NEWS: Albany Area new members KA2VAR N2FBD, W2KZN, N2C8C, KA2PXC, KA2SDN, KA2TJ, also Silent Key WB2ESZ. SARA has new officers: WB2WHD, pres; W1GP, 1st; WB2MJJ, Treas; WB2VJC, sec. They are now a VEC. WARA had interesting meeting on loop antennas. WECA is holding hamfest March 3rd in White Plains. New tech info, contact KC2ZO. Best of holidays. PSHR: WB2KCR, WB2JBO, KC2TF, W2PKY, WB2MCO, KC2ZO, WB2VUK, W2BIW, KA2MYJ, WB2EAG, WB8MAZ, AK2E, KA2OPG, K2ZVI, K2ZM, N2EQM. Traffic: KC2TF 295, K2ZM 263, KC2ZO 244, WB2MCO 192, WB2VUK 184, WB2EAG 167, WB2KCR 134, W2PKY 120, K2ZVI 75, W2BIW 74, WA2JBO 67, KA2MYJ 60, WB8MAZ 49, N2AYW 37, N2EQM 37, N2BFJ 31, KA2OPG 29, AK2E 22, WA2YBM 17, AA2Y 16, W2YJR 10, WA2CJY 6. (Aug.) WA2YBM 16. NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2IZ — SEC; KA2RGI, PIO; WB2IAP, Asst. SM/ACC; WB2IAP, COOR/FF; NB2T, TC; W2JUP, PIO; W2IYX, NLI CW* 3630, 1900/2200, N2AKZ, NCVHF 6.145/745, 1930 M-F, K2MT, SCVHF 4.775/37, 2030 M-F, W2GZD, BAVHF 6.07/67, 2000 M-F, WB2BNA, ESS 3590, 1800, W2WSS, NYS/M 3877, 1000, WB2EAG, NYS 3877, 1900/2000, WB2EAG

*Denotes section net; all times are local; please try and help out by checking in whenever possible. On behalf of my XYL, the 4 jr. ops and myself, we want to wish everyone a very merry Christmas and a happy and healthy New Year. My thanks also to WA2BNA for the job he did as SEC. WB2IAP has been appointed as Asst. SM. Woody will be around to the clubs among his many duties. If you hold an OO appointment and you have not taken the exam given by the ARRL for the volunteer monitor program, your appointment will be cancelled as of 1/1/85. Please try and get it done ASAP. The annual Grumman-Sperry RC picnic was held at the Great River plant with 54 people in attendance. Suffolk Co. ARC held their annual clambake in Aug. Wantagh ARC started their radio classes again in Oct. WB2YXB gives the following info for his Bulletin Board System (BBS) to get ARRL Official Bulletins. The tel. # is 718-347-0227. Once you have logged on, go to the magazine section and select the bulletin they wish to read. The system is 24 hours a day. The equipment used is a Radio Shack Computer using a Hayes 300 modem. Congrats to N2BGP on upgrading to Advanced. New Novices at Rockaway Beach JHS as reported by teacher KE2N are KA2VLG, VLF (YLA) and KA2VKR. Gerry also asks: is there anyone with code cassettes, books or an old

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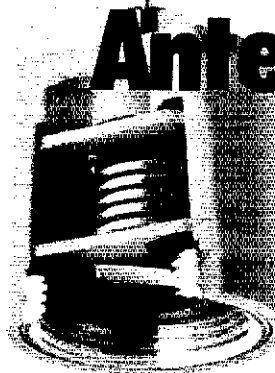
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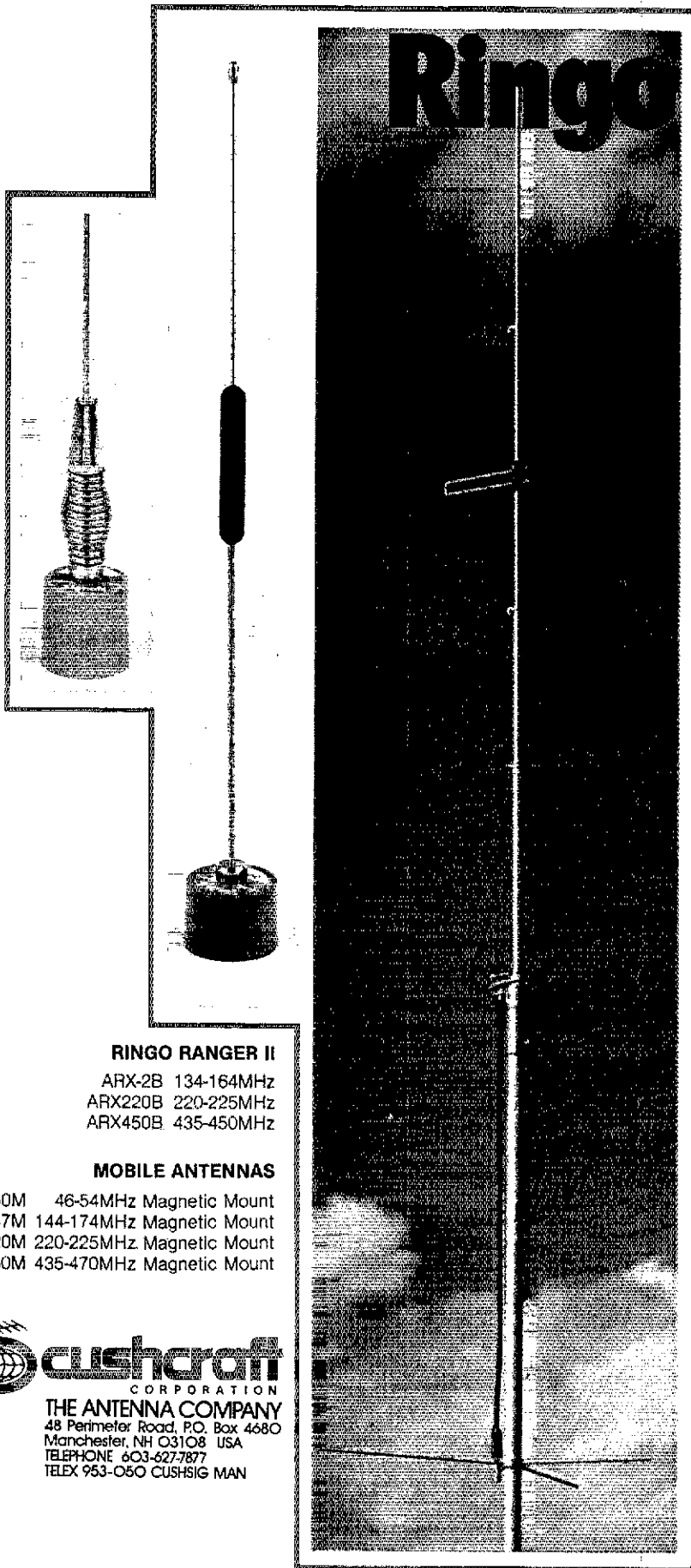


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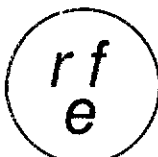
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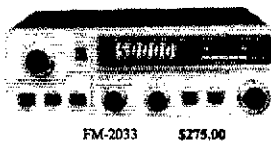
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HT to donate to JMS 180. Staten Island RARS sponsors a computerized bulletin board called HAMNET. It can be reached 24 hrs a day by calling 1-718-698-7875 (Note: Remember that 718 is the new area code for Staten Island, Brooklyn and Queens). Tu-Boro will be affiliated with the ARRL 50 years this year and 51 years as a club. If you can give any help to DART (Defend Amateur Radio Towers) which has been set up to help K2RIW, the address is P.O. Box 2851, Huntington Station 11748. Traffic: N2AKZ 290, K2GCE 145, K2YQK 133, W2GKZ 72, N2BGP 52, W2DBG 48, W2BNA 27, W2IDP 22.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI - SEC: W2VUF. STM: W2XD. BM: N2BOP. RCC: W2CC. SGL: W2KB. PIO: W2NOV. TC: AD7I. ACC: KK2U KY2S. NMS: W2CC KB2HM W2RMJ W2ANK W2IQJ W2QMP N2XJ W2PSU.

Net	Freq.	Time	Sess.	QNI	QSP
NJM	3695	1800 Dy	30	196	91
NJPN	3950	1800 Dy	35	343	105
		0900 Su			

NJUN	3735	1830 Dy	30	315	216
NJNE	3695	1900 Dy	30	213	130
NLN/L	3695	2200 Dy	30	230	117
TCETN	147.255	1930 Dy	24	96	49
OBTTN	147.12	2000 Dy	30	135	129
NJVN	494.9	2230 Dy	30	228	99
NJRTTY	147.51	Autostart			

Bayonne Emergency Management ARC reports participation in the October SET and doing it in conjunction with NJ Essex Co. Emergency Medical Technician's disaster training along with the Newark Fire Training Academy. I hope the SET came off super. The club also has a VE team and will shortly be able to give FCC exams to the Bayonne area. OO report from KJ2O. Mt. Spark GAPSS New Providence ARC reports their Christmas Dinner date to be Pearl Harbor Day. Particulars may be obtained from WA2KRZ. They had a successful "Fox Hunt" Oct. 14th. Feedback, the NNJ QCWA newsletter, was packed with the following info: July picnic was rained out! They had an excellent booth at the National ARRL convention with 180 QCWA members logging in. National QCWA President W2GHK will speak at the annual dinner Oct. 26th at the Robin Hood Inn in Clifton. The "Eimer-of-the-Year" award will be announced at this time. Two "Eimer" class upgrades, W2D and W2GHK, are going to participate in the NY Marathon. N2CZE is attending the University of Hartford. N2XJ, our NM of NJM, is now an accredited VE. You people who are Extra Class hams should be volunteering to become VEs so as to help out on giving "ham" license exams. We still need more volunteers for the "OO" program. Drop me a note if you are interested. Traffic: N2XJ 291, KB2HM 288, W2VY 260, KA2F 139, WA2OPY 108, W2RFX 88, W2ZEP 60, K2VX 59, KA2SPH 51, W2XD 49, W2QMP 46, KD2BE 30, KA2OIV 22, W2CC 21.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, K8CY - SEC: WA4VWV. STM: KA8X. PIO: KB0ZP. SGL: AK8Q. BM: K0IIR. TC: KD8AS. I wish to thank the Ft. Madison/Burlington group for the fine hospitality during the Annual Radio Rodeo. It was enjoyable and an informative event. I wish to thank the 3900 Club as well as the SAARA for their sponsorship of the First Iowa State ARRL Convention. I consider it a great success and appreciate your participation in the Iowa Seminar. Congrats to KA0MKV and KA0BMM for recent upgrades. New officers in Davenport are K9AYK W6FBF K9AGL & WA0QEW. I wish to welcome N2CB as the new NM for the ICN. He has big shoes to fill replacing K0DI. Good luck to both. Please continue to support ICN.

Net Freq. UTC Day QNI QTC Sess.
75M Phone 3970 1830/0000 M-S 1830 133 52
TLCN 3560 0030/0400 Dy 338 143 60
ICN 3713 7 P.M. M-F 114 53 19
I wish to congratulate WA4VWV for winning the IOWA CONTEST AWARD. Many of you want it, so watch for the Iowa QSO party coming soon. Be sure to get your annual reports in promptly, many good SET reports. Let's equal or beat last year. The SECTION LEADERSHIP extends heartfelt wishes to the holidayers for a new year. Traffic: W8SS 139, WA0AU 136, K6GP 127, WA4J 83, ND0VW 81, NCRB 73, W0LY 61, KA0X/AE0R 61, KQ0I 56, KA0AD 46, K0XK 45, W8BAVW 43, K8CY 33, W0HTP 31, W8BQAC 23, W8BW 15, KA8GOA 14, W8BFF 12, K0BBG 8, K0C8C 6, N0EFG 5, N0EP 3.

KANSAS: SM, Robert M. Summers, K0BXF - SEC: W0KL, Ottawa. STM: W0OYH, Shawnee. PIO: KD0JM, Olathe. SGL: N0BLD, Topeka. BM: K0JDD, Garden City. ACC: K0BXF, K.C. NMS: CW-WB0ZEN, Overbrook; Phone-W0FRIC, Clay Center; Slow Speed-W0MYM, Wichita. I was pleased to see the interest in our traffic nets operating in the state at the Wichita Hamfest.

Ka. Sideband Net K8BN	Dy	8:30 P.M.	3920
Ka. Phone net KPN	MWF	8:30 A.M.	3920
	S-S	8 A.M.	3920
Central States CSTN	M-S	12:30 P.M.	7253
	Su	8:30 A.M.	3920
Ka CW Tic Net QKS	Dy	7 & 10 P.M.	3810
Ka Slow Speed QKS-SS	MWF	7:30 P.M.	3735
Ka. Emerg. Co-D	Tue	7 P.M.	3920

The new Net Directory from ARRL is out and available. Reach for pen and paper to write the League Hq. for your copy. Sorry the traffic totals for the month are not complete; I left on vacation the 6th and there must be a few reports waiting for me when I return. They will be mentioned next month. Is your club exchanging bulletins with the Smokey Valley RC? If not, write K0CBK, RR Box 400, Junction City 6644. Congrats to Ron Hoeg, K0COH and to Bob Summers, K0BXF, on being named KANSAS AMATEURS OF THE YEAR for 1984. Traffic: W0FIR 108, K0BXP 61, W0QMT 52, N0BZ 26, W0MYM 15, W0BP 13, W0NYG 6.

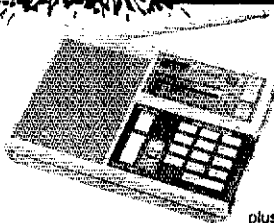
MISSOURI: SM, Ben Smith, K0PCK - New club officers for the Zero Beaters ARC are: WA0NUJ, pres.; W8BQBS, v.p./treas.; W8MNP, secy.; K9OCU, publicity. W8BZP has passed the certification exam and is now a member of the Amateur Auxiliary to the FCC's Field Operations

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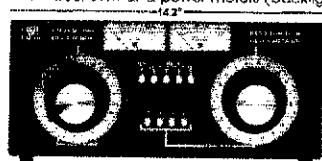
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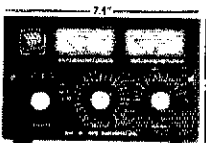


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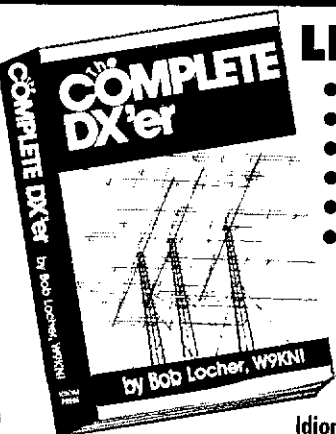


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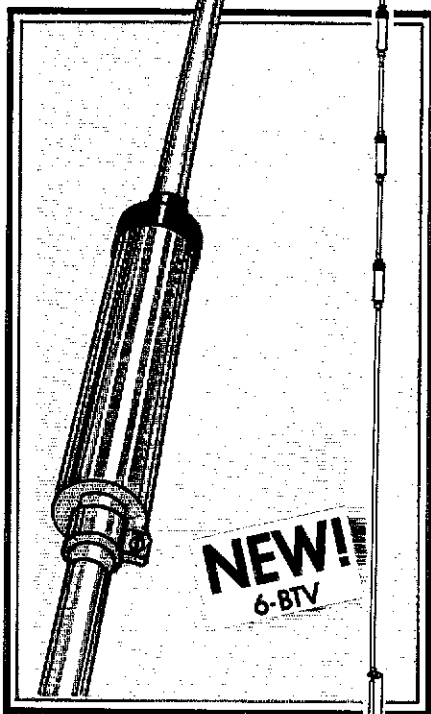
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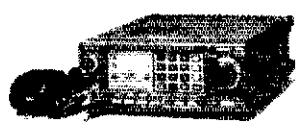
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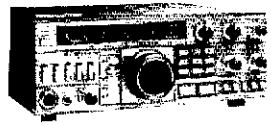
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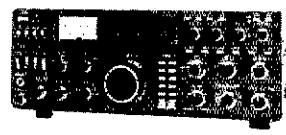
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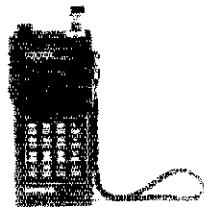
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RS-20A	16	20	115.95	89.95
RS-20M	RS-20A w/switchable volt and Amp meter		137.95	109.95
RS-35A	25	35	174.95	139.95
RS-35M	RS-35A w/switchable volt and Amp meter		194.95	159.95
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- BP-2 425mA 7.2V NICAD Battery 39.50
- BP-3 250mA 8.4V NICAD Battery 29.50
- BP-4 Alkaline Battery Case 12.50
- BP-5 425mA 10.8V Battery 49.50
- BP-7 425mA 13.2V NICAD Battery 67.50
- BP-8 800mA 8.4V NICAD Battery 62.50
- HM-9 Speaker Mic 34.50
- CP-1 Cigarette Lighter Cord 9.50
- DC-1 DC OP Pack 17.50
- Leather Case for IC-02AT 34.95
- HS10 Headset for HTs 19.50
- HS10A VOX Unit for IC-02A & Hdst. 19.50
- HS10B PTT Switch Box for Headset 19.50



IC-745 PACKAGE DEAL

Order your IC-745 with: Astron RS20A 20A power supply, ICOM SM-6 desk mic and ICOM FL-52A, 500Hz CW filter installed.

A Super Buy at \$979
You Save \$245!



IC-271A/H

2 meter all mode with many new features. Available with higher power.

IC-271A Sug. Ret. \$699
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IC-730

80-10M in a very compact package. Ideal for mobile applications.

Sale Priced at \$549.95
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IC-471A/H

All mode, 430 - 450MHz continuous coverage. Now available with higher power.

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IC-R71A

Perhaps the best receiver at any price!

Sug. Retail \$799

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NEW ICOM VHF/ UHF MOBILES



- IC-27A (25W, 2M, FM) Sug. Ret. \$369
- IC-27H (45W, 2M, FM) Sug. Ret. \$409
- IC-37A (25W, 220MHz, FM) Sug. Ret. \$449
- IC-47A (25W, 70cm, FM) Sug. Ret. \$469

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IC-02AT IC-04AT

New full-featured 2M, and 440MHz handhelds! Scanning, 10 memories and programmable subaudible tones are just a few of the MANY features of these terrific new radios. AND THEY ARE COMPATIBLE WITH ALL ICOM HT ACCESSORIES!

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IC-04AT Sug. Ret. \$379

Available at Reduced Price!

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Still the most popular, low cost/ top performing handhelds around.

IC-2AT 2M Sug. Ret. \$269.50
IC-3AT 220MHz Sug. Ret. \$299.95
IC-4AT 450MHz Sug. Ret. \$299.95

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W7GAB Dale

K7DS Frank

KG7D Bob



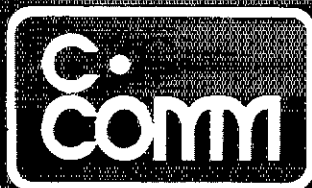
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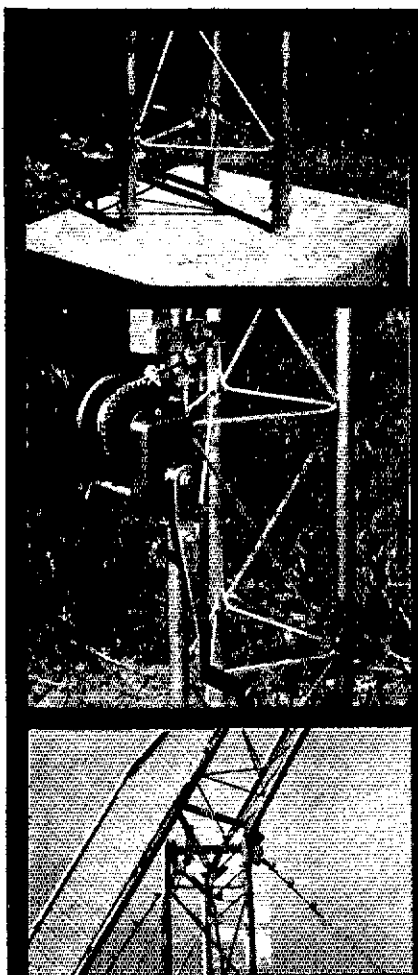
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PACKET! AX.25

AMATEUR PACKET-RADIO LINK-LAYER PROTOCOL

This booklet gives the complete protocol specification in sufficient detail for those wishing to write software to implement the protocol. It also summarizes the history of the protocol development. This protocol, which was approved by the ARRL Board of Directors, formally specifies the format of a packet-radio frame and the actions a packet-radio station must take when it transmits or receives such a frame. This protocol allows us to have an agreed way of exchanging frames at the link layer of packet radio. Available for \$8.00 in the U.S., \$9.00 in Canada and Elsewhere (U.S. funds.)

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RG8X 92% Shield (mini 8)	\$14.95/100 or 17¢/ft.
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**Belden No. 9913	58¢/ft.

ROTOR CABLE & HARDLINE

1/2" Aluminum 50 ohm	1.25/ft.
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8 Cond. 2-18, 6-22 burial jacket	19¢/ft.
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U.S.A.

Bureau, Amateurs from Northeast Missouri assisted at the dedication of the Clarence Cannon D. Bk. on Sep. 8th. They provided communications for the 10K run and operated a special event station that made 220 contacts. Amateurs that assisted in the project were: KANLO N0FOW KA0SLW KA0SUF KB9QX WB0SEN N0EHU KA0LUE KA0JQE KK0P N0BPA W0RTY and WA0KGT. Whenever your club or any group of amateurs take part in events such as this send me the information to use in the "Section News." On behalf of all the ARRL Leadership Officials of the Missouri Section we want to wish all amateurs and their families a very happy Holiday Season and a great 1985 coming up. We have enjoyed the opportunity to meet and work with many amateurs in the Missouri Section during my first term as SM. We are looking forward to serving the amateurs again in another two years. With club elections coming soon please report your new officers to me.

Net	Sess.	QNT	QTC	Mgr.
MON	60	378	173	K0SI
MOSSB	30	550	80	KT5Y
MEOW	30	442	32	K0DSQ
HBN	20	289	27	K0DSQ
MTTN	25	115	25	KA0PGN
PHD	4	91	16	WA0KUH
PTN	13	43	12	WB0ROQ
RRARA	23	296	4	KA0BKR
MOFON	4	17	4	A10C
LOTFM	4	95	0	W0RTO
COEN	4	95	0	K0PCK
ARESN	5	85	0	N0EHU
SARN	4	50	0	W0ENW
JCCC	4	41	0	W0ORI
LARN	4	36	0	WB0RHC
LOZCW	4	19	0	W0RTO

Traffic: K0SI 170, W0BMA 156, KT5Y 147, KC0AS 136, N0DN 108, A10C 81, K0PCK 54, K2ONP 35, W0UJD 34, K0DSQ 34, K0ORB 26, N0EVC 25, WB0HOP 20, K9OCQ 17, WA0HDQ 15, WA0YJX 14, WB0CJB 10, WA0KUH 9.

NEBRASKA: SM, Vern J. Wirka, WB0GQM — Holiday Greetings to everyone! Two new net managers have been named: Glen May, KA0DJA, of Grand Island is the Morning 75-Meter Phone net manager; Jim Parks, WB0GPM, of Kearney is the net manager of the newly formed Scotts Bluff ARES 6-Meter Net. The first full-fledged member of the Amateur Auxiliary to the FCC's Field Operations Bureau in the Nebraska section is Dennis Wing, KC0GF, of Grand Island. The Nebraska section Novice Net meets nightly at 0200Z. Please help and encourage novices to take advantage of the Novice net control stations that are eager to help out newcomers. Volunteer exams are scheduled for Torrington, WY Dec. 18. WB0BQG of Scottsbluff is helping out, along with KT7V K07AR and N7CG of Torrington. The Ak-Sar-Ben RC will give exams Jan. 5 at the Omaha Red Cross building. The Omaha exams are being organized by N1AZF with help from K10Y, K0STP and W10CQM. Traffic: K0DIA 103, W10CQM 103, K0BCE 43, K0IXY 39, W0BKK 39, KA0BWM 12, WB0BQD 10, WB0GMQ 8, WA0PCB 8, WA0BOK 4, W0B0X 4, W0NIK 2, W0WZR 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Bob Koczur, K1WGO — 6TM: K1EIC. SEC: KA1ECL. BM: K3ZJJ. ACC: KG1M. OOR/RF: KA1ML. TC: W1HAD. PIO: WB0TDA. SGL: K1AH.

Net	Freq.	Local Time	QTC	QNT	NM
CN	3640	1900/2200	278	242	K1EIR
CPN	3869	1800 M-S/1000 Sn	180	325	KA1BHT
NVTN	22/88	2130	48	263	WA1EMI
WCN	78/18	2030	179	454	WB1GXZ
RTN	13/73	2100	72	242	KA1JAN

This is my first column as SM. I hope you all will enjoy it. Your comments and suggestions are welcome. Happy Christmas and Hanukkah to all. New call KW1V/WA1HFE. Congrats to the new section appointees, KA1ECL, KG1M and a big tks and well done to N1AZF for his help as ACC. Also well done to the N.W. CT. ARES, KU1Q DEC for the emergency net and services rendered to Waterbury on Sept. 1 for the SNET telephone outage. Another fine job was done by N1SA, EC of Southington ARES, and the 16 participants covering it at Appleton Street Festival Parade, the police station, Bradley Hospital and the first aid station were provided with communications to insure the safety of the 120,000 people that turned out for this event. New nets-FVRA/HCARA emer net 146.04/64 Mon 8 P.M. -Waterbury ARC, contact KA1YP for details. The Norwalk Oysterfest was a spectacular success. The FARA, Greater Norwalk ARA, and Stamford ARA gave excellent publicity to our hobby by handling over 220 pieces of tlc. Congrats to the following for their continuing efforts in keeping us informed of section news: FARA NEWS, SINE POSTI, WAVE LENGTH, 7/1 CITY FEEDBACK, THE SQUELCH BURST. Also I wish to thank all who extended their vote of confidence to me at the Appleton Street Festival. The NE convention was a complete success. The NE Specimen Management Committee is active to develop an overall policy for coordination of frequencies. Your rep is WA1DCP, Port Barlow. Please help in any way you can in supporting this committee. Have a good month, 73. OBS Reports: K1V0K 12, W1LUH 6, KA1XG 4, W1GDZ 4, KW1V 3. Traffic: WB1GXZ 477, KA1GWE 438, W1EWF 328, KA1JAN 216, K1EIR 186, K1UQE 135, KA1BHT 100, KA1XG 88, K0K179, KA1EGE 52, W1BDN 44, K1AGE 36, N1B0V 35, K3ZJJ 24, KA1FYS 22, W1YOL 17, N1BPD 14, WA1LVU 9, W1CUH 8.

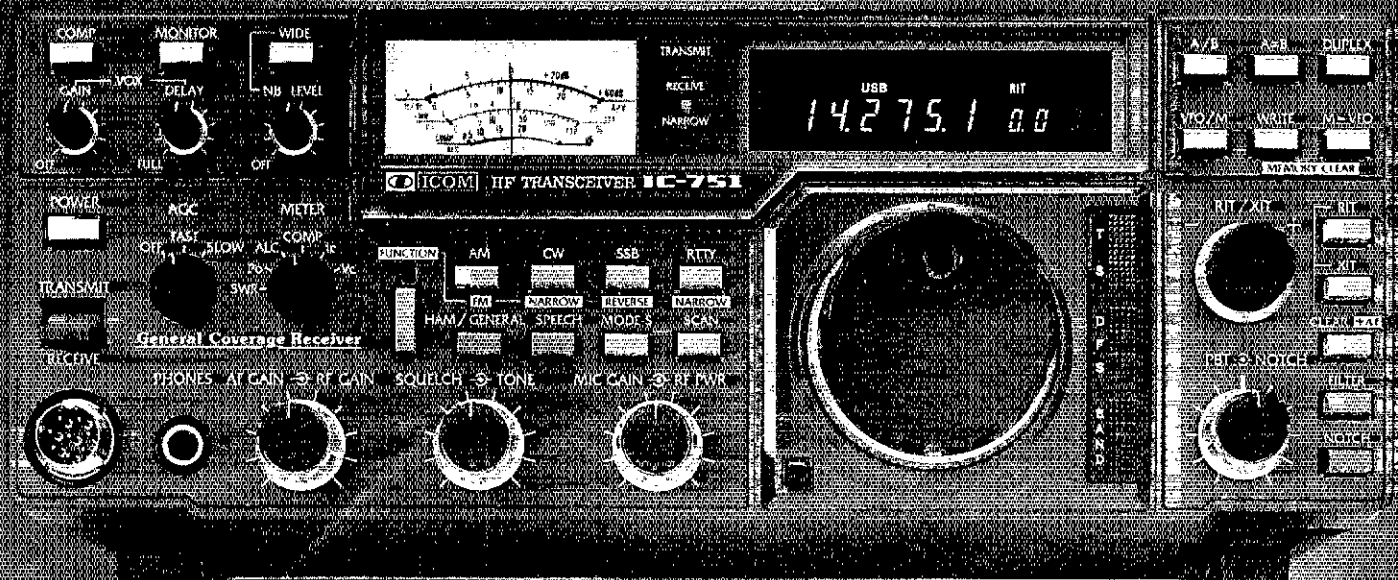
EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: KA1GB. SEC: W1AY. ASM: K0H1. ACC: K1AZE. OOR/RF & BM: WA4STO. TC: KA1UI. PIO: WA1IDA. SGL: K1BGN.

Net	Mgr	Freq.	Time (loc)/Dy	QNT	QTC
EMRIPN	N1BVG	3.880	1730/Dy	332	280
EM2MN	KA1AMR	23/63	2000/Dy	495	157
NEEPN	K1BZD	3.945	0830/5n	87	7
HHTN	WB1CMQ	04/64	2230/Dy	402	219
EMRIS	N1AJJ	3.715	2030/Dy	284	121
C12MN	N1BYS	045/845	1930/Dy	284	99

The Foxboro Convention is history. It was great to see so many of you there. Congrats to KB1DJ and his VEC crew for a job well done in administering over 250 exams. The forums seemed well attended and the ARRL booth was quite busy. On Sept. 15, we had a repeater frequency coordination meeting. It seems that we were in need of a frequency coordinator for 2M FM. A committee was formed at that meeting where over 60 repeater owner/operators were present. AG1F from the NSRA is the committee chairman. CEMARC has come out with a repeater map of Southern New England. Contact K1AZE for details and club discounts. Norwood club has started a Novice class. Billerica club had a talk by the local cable TV company. NEPA (packet radio group) had a meeting and demo in Foxboro. N1DDO was surprised at his first meeting as v.p. of the Framingham club when he had to

ICOM HF Transceiver

IC-751



The Standard of Excellence in HF Base Stations

The IC-751 is the most advanced transceiver available today. It's a competition grade ham receiver, a 100KHz to 30MHz continuous tuning general coverage receiver AND a full-featured all mode solid-state ham band transmitter. The IC-751 also covers the new WARC bands, MARS frequencies, and is AMTOR compatible.

Important Standard Features. Compare these important standard features in this "top of the line" base station:

- 100KHz - 30MHz Receiver
- 105dB dynamic range
- QSK - full break-in CW

- FM Mode Standard
- High-grade FL-44A 455KHz SSB filter
- 32 tunable Memories with lithium battery backup
- 100% Duty Cycle Transmitter
- Passband Tuning
- 12V DC operation
- Adjustable AGC
- Adjustable Noise Blanker
- RIT/XIT with separate readout
- IC-HM12 Microphone with Up/Down Scan
- Continuously adjustable transmit power

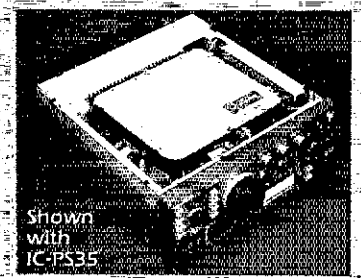
Options: IC-EX310 speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic,

IC-SM6 desk mic, RC-10 external controller, and a variety of filters.

FILTER SPECIFICATIONS

Filter	Model	Center Freq. (KHz)	-6dB Width (KHz)
STANDARD FILTERS			
AM Ceramic	CFV 455 IT	455	6.0
SSB (PBT) XTAL	FL-30	9011.5	2.3
PM Filter	90115A	9011.5	1.5 (-3dB)
SSB Narrow (Hygrade Crystal)	FL-44A	455	2.4
OPTIONAL FILTERS			
CW Narrow	FL-52A	455	0.500
CW Narrow	FL-53A	455	0.250
SSB Wide	FL-70	9011.5	2.8
CW Narrow	FL-32	9010.6	0.500
CW Narrow	FL-63	9010.6	0.250
AM	FL-33	9010.0	6.0

Operating From 12V; the IC-751 is also available with an optional internal AC power supply, the IC-PS35, for the winning edge in field day competition.



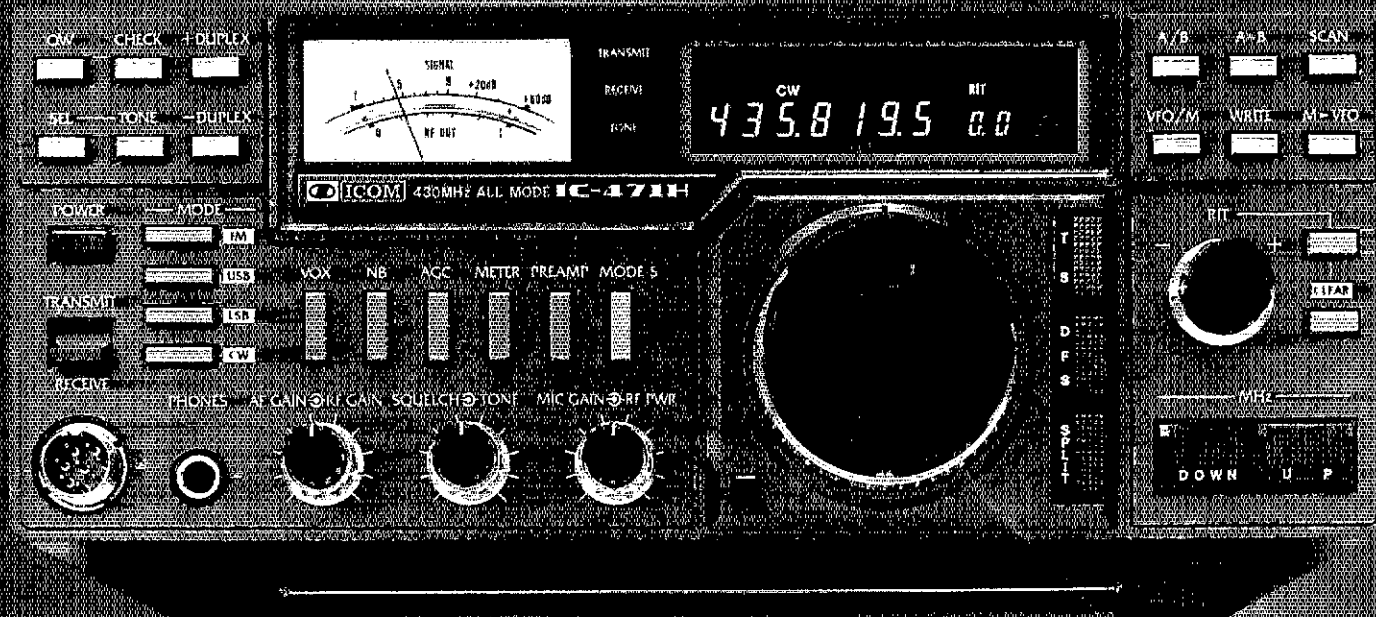
The IC-751 provides superior performance for all amateur radio operators...from novice to extra class. See the IC-751 at your local ICOM dealer.



First in Communications

ICOM UHF Transceiver

IC-471H



For Maximum UHF Base Station Performance

Whether your interest is simplex, repeater operation, or satellite work, the IC-471H 430-450MHz base station transceiver will give you maximum UHF operation.

75 Watts. The IC-471H provides 10 to 75 watts of adjustable power in all modes. This enables adjusting the drive level to a linear amplifier for higher power uses such as moonbounce. For a portable UHF station, the optional IC-PS35 internal power supply is available.

Compare these exceptional Standard Features:

- 430 - 450MHz
- Variable tuning steps, FM 5KHz and 1KHz, SSB 10Hz, 50Hz and 1KHz
- 32 full-function Memories with lithium battery backup
- 75 Watts, fully adjustable on all modes
- 32 built-in Subaudible Tones
- High visibility display
- Scanning systems, Memories, Modes or Programmable Band
- RIT/XIT with separate readout
- S-Meter and Center Meter
- IC-HM12 Microphone with Up/Down Scan
- 11 1/4" W x 4 3/8" H x 12 5/8" D

Optional Features, AG-35

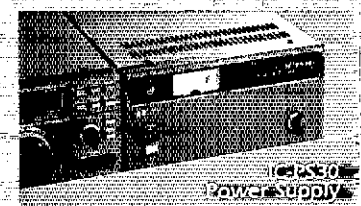
- switchable mast-mounted GaAsFET preamp, UT-155 CTCSS Encoder/decoder (encoder is standard), IC-EX310 voice synthesizer, IC-SM8 two-cable desk mic and IC-SM6 desk mic. PLUS a variety of power supplies... the IC-PS35 internal power supply, the IC-PS30 system power supply or the IC-PS15 external power supply.



AG-35 Mast Mounted GaAsFET Preamplifier

features as the IC-471H, plus an optional IC-PS25 internal power supply for portable operation.

To complete your VHF/UHF base station, the IC-471H's 2-meter companions, the 100-watt IC-271H and the 25-watt IC-271A are also available.



IC-PS35 Internal Power Supply



IC-471H With IC-PS35 Internal Power Supply Installed

The IC-471A. The 25-watt IC-471A is also available and has the same outstanding fea-

See the IC-471H and other ICOM equipment at your local authorized ICOM dealer.



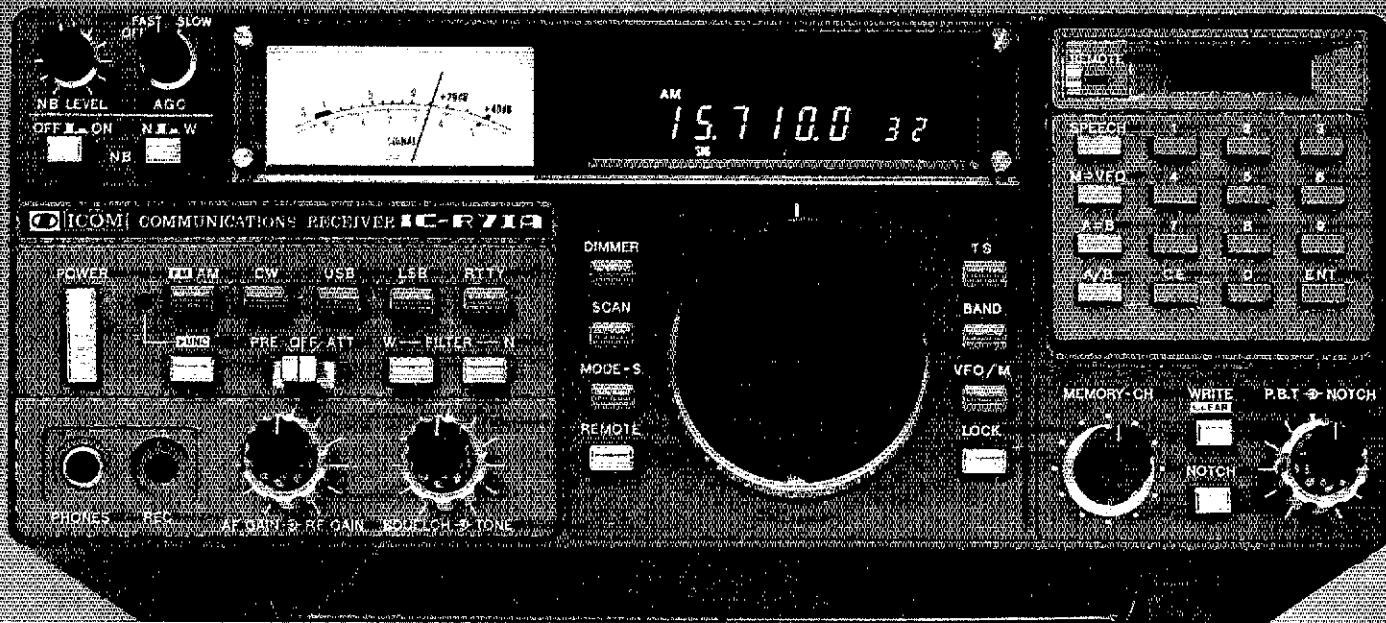
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ICOM HF Receiver

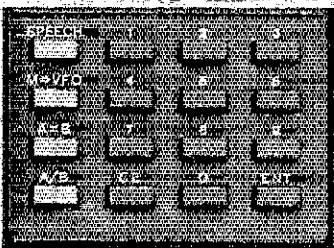
IC-R71A



The World-Class World Receiver

ICOM introduces the IC-R71A 100KHz to 30MHz superior-grade general coverage HF receiver with innovative features including keyboard frequency entry and wireless remote control (optional).

This easy-to-use and versatile receiver is ideal for anyone wanting to listen in to worldwide communications. With 32 programmable memory channels, SSB/AM/RTTY/CW/FM (opt.), dual VFO's, scanning, selectable AGC and noise blanker, the IC-R71A's versatility is unmatched by any other commercial grade unit in its price range.



Keyboard Entry. ICOM introduces a unique feature to shortwave receivers... direct keyboard entry for simplified operation. Precise frequencies can be easily selected by pushing the digit keys in sequence of frequency. The frequency will be automatically entered without changing the main tuning control.

Superior Receiver Performance. Passband tuning, wide dynamic range (100dB), a deep IF notch filter, adjustable AGC (Automatic Gain Control) and a noise blanker provide easy-to-adjust clear reception even in the presence of strong interference or high noise levels. A preamplifier allows improved reception of weak signals.

32 Tunable Memories. Thirty-two tunable memories, more than any other general coverage receiver on the market, offer instant recall of your favorite frequencies. Each memory stores frequency, VFO and operating mode, and is

backed by an internal lithium memory battery.

Options. FM, RC-II wireless remote controller, synthesized voice frequency readout, IC-CK70 DC adapter for 12 volt operation, MB-12 mobile mounting bracket, two CW filters, FL32-500Hz and FL63-250Hz, and high-grade FL44A crystal filter.



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ICOM 144, 220 and 440MHz

MOBILES



The World's Most Compact Mobiles

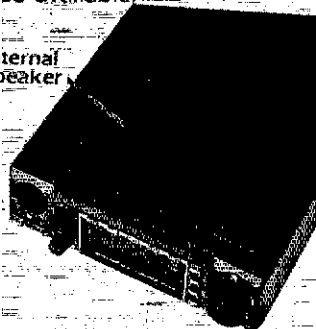
— ICOM's three ultra compact mobiles...the IC-27A 2-meter, the IC-37A 220MHz and the IC-47A 440MHz... are the smallest mobiles available.

Even in such a small package the 25 watt mobiles contain an internal speaker which makes them fully self-contained and easy to mount.

Size. The ICOM compacts measure only 5 1/2" W x 1 1/2" H x 7" D. (IC-37A is 9" deep) which allows them to be mounted in various "compact" locations. Yet the compacts have large operating knobs which are easy to use in the mobile environment.

More Features. Other IC-27A/37A/47A standard features include a mobile mount, IC-HM23 DTMF mic with up/down scan and memory scan, and internally adjustable transmit power. An optional IC-PS45 slim-line external power supply and IC-SP10 external speaker are also available.

Internal Speaker

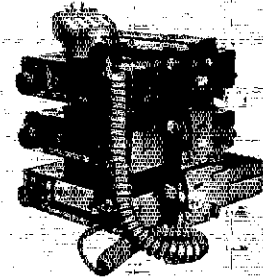


32 PL Frequencies. The IC-27A/37A/47A come complete with 32 PL frequencies.

9 Memories. The compact mobiles have 9 memories which will store the receive frequency, transmit offset, offset direction and PL tone. All memories are backed up with a lithium battery.

Speech Synthesizer. To verbally announce the receive frequency, an optional UT-16 voice synthesizer is available.

Scanning. The ICOM compacts have four scanning systems...memory scan, band scan, program scan and priority scan. Priority may be a memory or a VFO channel...and the scanning speed is adjustable.



Stacking Mobile Mounts. The IC-27A/37A/47A can be stacked to provide a three-band mobile station. Each band is fully featured and will operate even when another band is in use.

The IC-27A/37A/47A provide superb performance in the mobile radio environment. See them at your local ICOM dealer.



ICOM

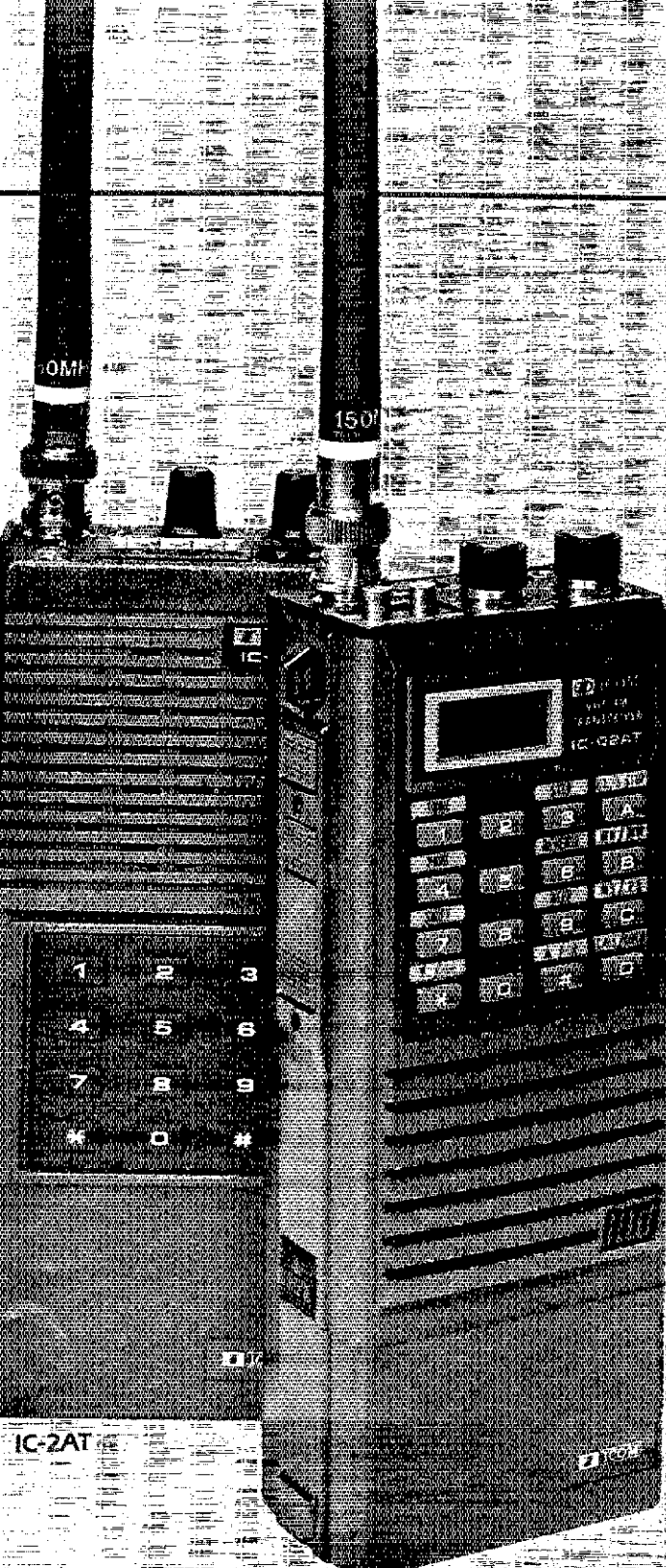
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IC-02AT

ICOM 2-Meter Handhelds



If you want a 2-meter handheld with exceptional features, quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

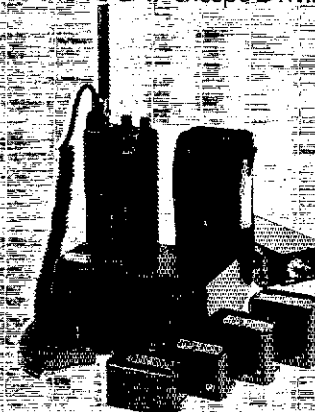
Frequency Coverage. The IC-02AT covers 140.000 through 151.550MHz and the IC-2AT, 141.500 through 149.994MHz...both include frequencies for MARS operation.

IC-02AT Features. ICOM's top-of-the-line IC-02AT handheld has the following outstanding features:

- DTMF direct keyboard entry
- LCD readout
- 3 watts standard 5 watts optional (with IC-BP7 battery pack)
- 10 memories which store duplex offset and PL tone (odd offset can be stored in last 4 memories)
- Frequency dial lock
- Three scanning systems: priority, memory and programmable band scan (selectable increments of 5, 10, 15, 20 or 25KHz)

IC-2AT Features. The IC-2AT is ICOM's most popular handheld on the market. The IC-2AT features a DTMF pad, 1.5 watts output and thumbwheel frequency selec-

tion. The IC-2A is also available and has the same features as the IC-2AT except DTMF.



Accessories. A variety of slide-on battery packs are available for the IC-02AT and IC-2AT, including the new long-life 800mAh IC-BP8 which can be used with both handhelds.

Other accessories include the HS-10 boom headset, HS-10SB PTT switchbox, HS-10SA VOX unit (for IC-02AT) and an assortment of battery pack chargers.

The IC-02AT and IC-2AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug. See the IC-02AT and IC-2AT 2-meter handhelds at your local ICOM dealer.



First in Communications

ICOM 220MHz

IC-37A Mobile / IC-3AT Handheld

ICOM is proud to present the IC-37A mobile and IC-3AT handheld 220MHz radios. The IC-37A mobile is a 25-watt mobile, and the IC-3AT handheld is a 3-watt handheld.

The IC-37A mobile is a 25-watt mobile, and the IC-3AT handheld is a 3-watt handheld.

The IC-37A mobile is a 25-watt mobile, and the IC-3AT handheld is a 3-watt handheld.



Selecting PL Tone

The IC-37A comes complete with 32 PL frequencies installed. Each PL frequency is selected by turning the

PL tone dial. The IC-37A mobile is a 25-watt mobile, and the IC-3AT handheld is a 3-watt handheld.

The IC-37A mobile is a 25-watt mobile, and the IC-3AT handheld is a 3-watt handheld.

The IC-37A mobile is a 25-watt mobile, and the IC-3AT handheld is a 3-watt handheld.

The IC-37A mobile is a 25-watt mobile, and the IC-3AT handheld is a 3-watt handheld.

The IC-3AT handheld is a 3-watt handheld, and the IC-37A mobile is a 25-watt mobile.

The IC-3AT handheld is a 3-watt handheld, and the IC-37A mobile is a 25-watt mobile.



Handheld Accessories

The IC-3AT handheld is a 3-watt handheld, and the IC-37A mobile is a 25-watt mobile.

The IC-3AT handheld is a 3-watt handheld, and the IC-37A mobile is a 25-watt mobile.



IC-3AT
220MHz Handheld
3 Watts

Also Available: IC-27A and IC-27H 2 Meter Mobiles and the IC-47A 440MHz 25 Watt Mobile.
Other Handhelds Available Include: The IC-2AT, IC-02AT for 2 Meters; IC-4AT and IC-04AT for 440MHz.

IC-37A
220MHz Mobile
25 Watts
Compact Size
Internal Speaker



The World System

1.2 GHz!

Explore the world of 1200 MHz FM
with ICOM's new IC-120 Mobile!



Now you can move out of the crowded 144 and 440 MHz bands into the wide spectrum of 1200 MHz because ICOM gives you the opportunity to explore the spectrum from 1260 to 1300 MHz... 40 MHz... with all the features found on popular 2 meter and 440 MHz rigs plus some:

Memories. Six memory channels plus 2 VFO's provide storage of most used frequencies in this wide band. Each memory allows memory of frequency, offset direction, offset frequency, and tone encoder frequency. Internal memory backup available.

Scanning. Scan the memories, scan all 40 MHz or program a segment to be scanned. All scanning has the option of scanning for a busy or open channel.

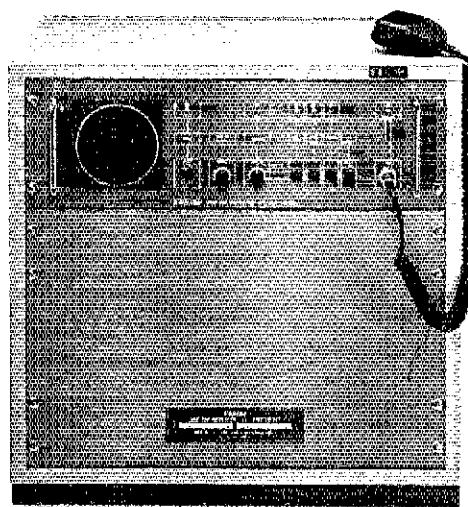
Duplex. Be able to work different repeater offsets, with ICOM's programmable offset system, as they become available.

3 Tuning Rates. Tuning increments of 10 KHz, 20 KHz or 1 MHz are available for rapid or slow tuning of the band.

RIT. RIT on FM? Yes, ± 5 KHz on either side of the transmit frequency allows you to tune signals offset from yours.

Readout. Four digit green LED readout for easy visibility day or night.

The ICOM IC-120 gives you all of this plus a very quiet PLL circuit, with excellent signal to noise ratio, high sensitivity and a stabilized power amplifier to provide full power over its temperature and voltage ranges, and the IC-120 is small, only 2"H x 5 $\frac{1}{2}$ "W x 8 $\frac{1}{4}$ "D.



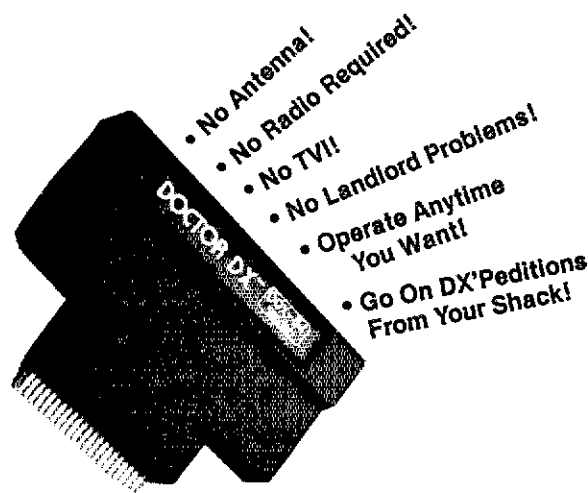
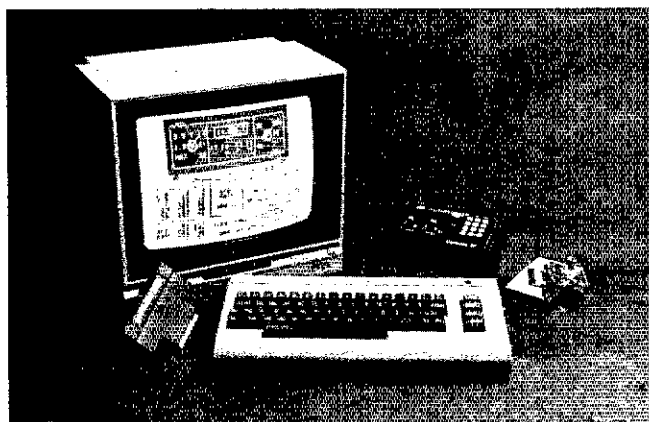
Complete your system with the IC-RP1210 repeater.

- PLL frequency selection (198 channel, 10 KHz steps, DIP switch)
- High stability PLL (0.5PPM/-30" to +60°C)
- Repeater access via CTCSS
- DTMF control functions
- Selectable hang time
- ID'er.

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- Go On DX'peditions From Your Shack!

For the active CW operator, there is nothing more fun than operating with the "Doctor DX" CW DX simulator. For the person who has never liked CW, Doctor DX will show you what real fun is. Doctor DX has something for everyone from the aspiring Novice to the experienced Amateur Extra Class licensee. And you need no FCC license to operate Doctor DX!

With Doctor DX, all you need is a Commodore-64 computer, a key (or keyer), and a TV set. There is no need for an expensive transceiver, amplifier and antenna farm to enjoy the thrill of working "rare DX." No more TVI or dead bands! Doctor DX is more than the most sophisticated CW trainer ever developed, it is your DXpedition ticket to anywhere in the world at a very affordable price.

Doctor DX simulates real H.F. CW band conditions. All the stations you will work are generated by the computer. As you tune up and down the particular band you have selected, you will hear realistic sounding stations in contact with other stations (some within your skip zone). There is also the normal QRN and QRM one would expect to hear in the real world. All call letters heard are totally random (subject to the country's callsign assignment rules). The prefixes are weighted according to the Amateur Radio population density, with 304 possible countries represented. The speed of stations operating in the lower portion of the bands is much faster than those operating in the upper band segments. The "operators" are also more polished in the lower portion of the bands.

Radio propagation (programmed for each band) represents what you would expect to hear on a good propagation day at the peak of the sunspot cycle. The propagation follows the internal real-time clock that you set before beginning operation. All the simulated stations you hear (with proper prefixes) are at distances you would expect to hear for the time of day and band selected.

You can learn and enhance your CW operating skills with Doctor DX. Doctor DX will not reward bad habits. AEA even offers an awards program to owners of Doctor DX that work all zones, 100 countries, 5 band Dr DXCC, or Doctor DX Honor Roll.

The Doctor DX CW trainer is a totally new concept in Amateur Radio. See what all the excitement is about. Send for full details, and see your dealer for a demonstration.

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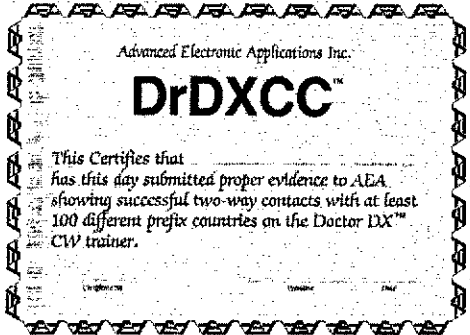
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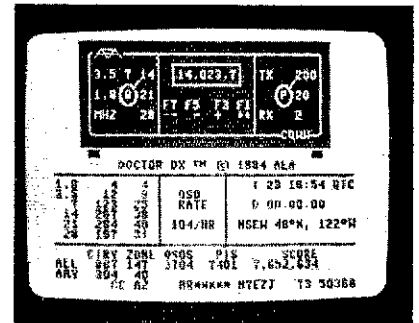
BY 



DOCTOR DX CONTEST BOX

TOP SPRINT SCORES	TOP MARATHON SCORES
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____

WILL YOUR CALL APPEAR HERE?



For good clean, competitive fun, Doctor DX™ shows your score and QSO rate for continuous monitoring of your improved CW operating skills. The DDX-64 can be a vehicle for fairly settling those club rivalries by competing with your friends under identical operating conditions.

AEA also has two on-going CW contests that you can enter with Doctor DX as your own schedule permits. The AEA SPRINT CONTEST is a timed non-stop eight hour event and the AEA MARATHON CONTEST is a timed 24 hour non-stop event. The top 5 contest scores will be published in our future advertisements and upgraded periodically as new higher scores are achieved.

In addition to the two AEA contests, we are offering award certificates for achieving certain milestones. You will be automatically alerted when you have achieved these milestones by a display at the bottom of the monitor screen.

AEA DrDXCC is achieved when you have worked 100 different countries, regardless of the frequency band or the amount of time operated. DOCTOR DX WAZ can be earned by working all 40 CQWW zones of the world, without regard to the band or duration of operating time. The DOCTOR DX HONOR ROLL is reserved for top notch operators capable of working 250 countries without regard for band or operating time. Additional endorsement awards are available for each additional 10 countries worked up to 300 (out of 304 possible) countries. AEA 5 BAND Dr DXCC is a very difficult award to achieve. It requires working 100 countries on each of five different bands, without regard for the amount of operating time.

Each award can be obtained by filling out a photocopy of the award application form (supplied) along with the score information and qualifying check sum from your screen display. Please enclose \$3.00 to cover handling costs for each certificate (\$1.00 for Honor Roll endorsements). Awards will only be granted to owners having a Doctor DX warranty card on file.

There is no need to ever be bored with your hobby again just because the bands are dead or you are apartment bound. Try Amateur Radio's own version of Solitaire - DOCTOR DX.

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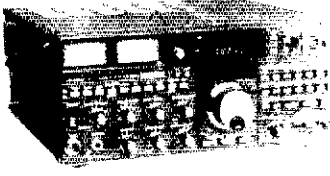
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FT-726R, FT-77, FT-230R

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FT-208R/708R IC2AT Midland/Standard
FT-209RH IC3AT Wilson Mini-Com II
FTC-1903 IC4AT Yaesu FTC-2203, FT-4703
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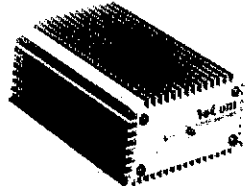


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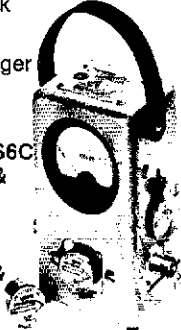
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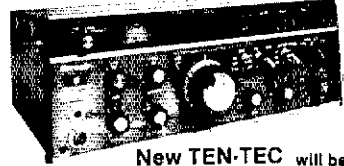
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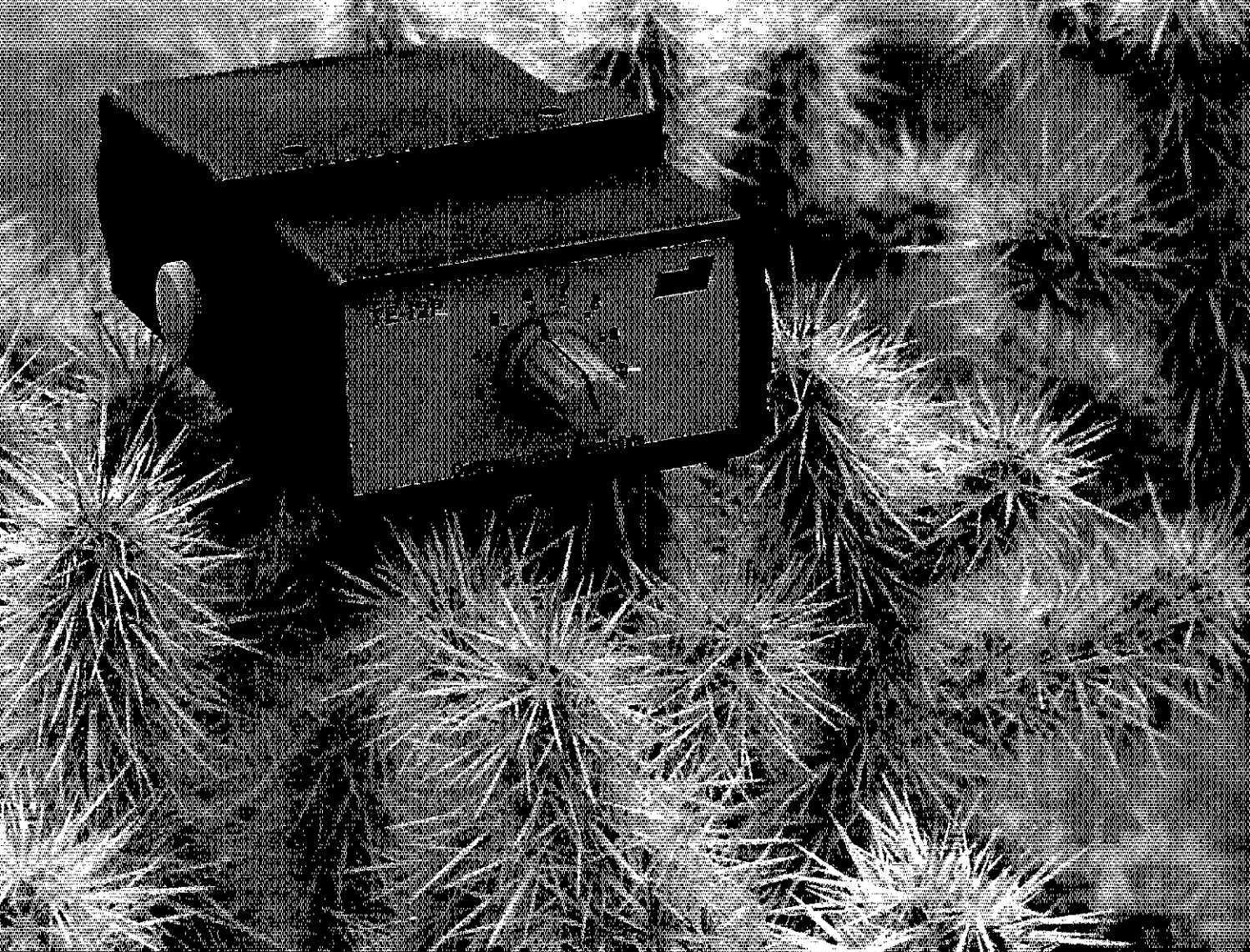
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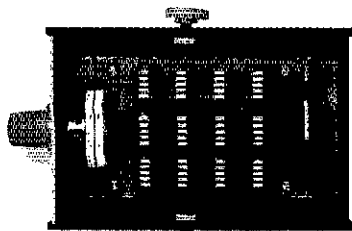
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Stuck with a problem?

Our TE-12P Encoder might be just the solution to pull you out of a sticky situation. Need a different CTCSS tone for each channel in a multi-channel Public Safety System? How about customer access to multiple repeater sites on the same channel? Or use it to generate any of the twelve tones for EMS use. Also, it can be used to access Amateur repeaters or just as a piece of versatile test equipment. Any of the CTCSS tones may be accessed with the TE-12PA, any of the audible frequencies with the TE-12PB. Just set a dip switch, no test equipment is required. As usual, we're a stickler for 1day delivery with a full 1 year warranty.

- Output level flat to within 1.5db over entire range selected.
- Immune to RF.
- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak.
- Instant start-up.



TE-12PA

67.0 XZ	85.4 YA	103.5 1A	127.3 3A	156.7 5A	192.8 7A
71.9 XA	88.5 YB	107.2 1B	131.8 3B	162.2 5B	203.5 M1
74.4 WA	91.5 ZZ	110.9 2Z	136.5 4Z	167.9 6Z	
77.0 XB	94.8 ZA	114.8 2A	141.3 4A	173.8 6A	
79.7 SP	97.4 ZB	118.8 2B	146.2 4B	179.9 6B	
82.5 YZ	100.0 1Z	123.0 3Z	151.4 5Z	186.2 7Z	

- Frequency accuracy, ± 1 Hz maximum -40°C to $+85^{\circ}\text{C}$
- Frequencies to 250 Hz available on special order.
- Continuous tone

TE-12PB

TEST-TONES:	TOUCH-TONES:	BURST TONES:			
600	697 1209	1800	1850	2150	2400
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1500	852 1477	1700	1950	2250	2500
2175	941 1633	1750	2000	2300	2550
2805		1800	2100	2350	

- Frequency accuracy, ± 1 Hz maximum -40°C to $+85^{\circ}\text{C}$
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

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The fact that the Computer Patch Interface unit by Advanced Electronic Applications, Inc. is known as the best value on the market is no accident. The CP-1 was designed by Al Chandler, K6RFK (PHD-E.E.), an active RTTY user since 1963.

Given a cost per unit budget for the CP-1, Al designed as much performance as possible into the Computer Patch, including a unique new tuning indicator, referred to by one of our customers as the "Dead Eye Dick" tuning indicator. This indicator is ideal for RTTY and CW, in that it is both fast to tune and (within 10 Hz) as accurate as scope tuning. It also performs under poor signal to noise conditions in which other indicators provide no useful data.

Al's variable shift tuning was designed to move the space filter center frequency from 2225 Hz to 3125 Hz without changing the bandwidth (by varying the Q of the filter). All this is accomplished using a precision ganged potentiometer to assure proper tracking of the multiple filter stages. We could have used a pot costing a tenth as much by simply using a two-pole filter design, but we feel the advantage of a sharper filter reduces the noise bandwidth significantly and allows the variable shift control to be used like passband tuning for extra elimination of adjacent channel interference.

Some manufacturers are concerned that amateurs might try calibrating their own equipment and, therefore, have used non-adjustable components, which results in sub-optimal performance. Although more costly, trim pots used in AEA equipment allow factory adjustment for performance to design specifications. Competently designed active filter circuits need not be adjusted after leaving the factory; however, for specialized use the owner can easily change filter parameters.

Mindful of the fact that many of our customers are new to RTTY, Al made the CP-1 tuning as forgiving as possible, while providing the most critical operator a piece of equipment in which he could be proud. Even old "pro's" are surprised at the poor signal conditions under which the CP-1 will still provide good copy.

You can now experience the BEST RTTY, CW, and AMTOR offered. Couple the CP-1 with our new AEASOFT™ software packages designed for the MARS, SWL, or amateur radio operator, and you will feel a pride reminiscent of what "made in U.S.A." brought in years gone by. Please do not hold the low price of the CP-1 against us. This is one case where you get much more than you pay for relative to any of the competitive units. For more information send for our FREE catalog. Better yet, see your favorite dealer.

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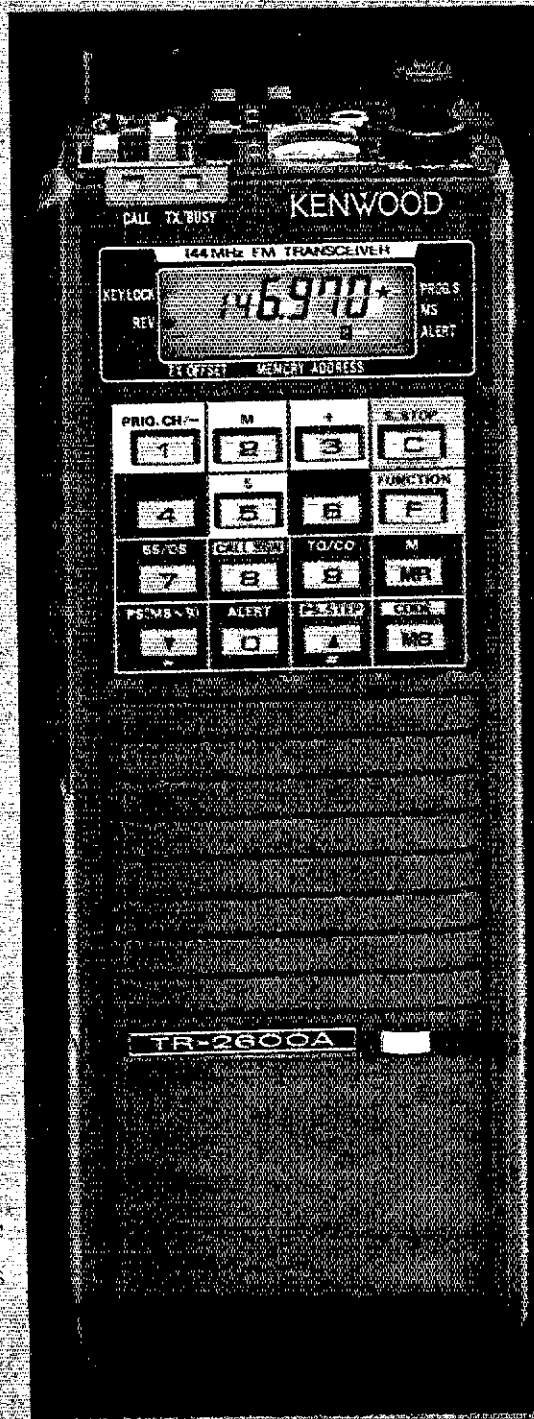
KENWOOD

pacesetter in amateur radio

Digital Code Squelch...

TR-2600A

Kenwood's TR-2600A introduces DCS (Digital Code Squelch) circuitry, a signaling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different 5-digit ASCII code combinations possible. You can program in call signs up to 6 digits in the ASCII code. When operating in the DCS mode this information can then be automatically transmitted each time the transmit key is depressed. This revolutionary feature is only the beginning! The TR-2600A also sports a high impact plastic case, that is extra rugged and scuff-resistant. The molded-in color adds to the attractive appearance. The large L.C.D. display is easy to read in direct sunlight or in the dark with a convenient lamp switch. It displays transmit/receive frequencies, memory channels, and five arrow indicators for "F LOCK" frequency lock, "REV" repeater reverse, "PROG S" programmed scan, "MS" memory scan, "ALERT S" alert scan. A star indicates "MEMORY LOCK-OUT" is activated, and repeater offset indicated by "+", "-", "S" and "M". The TR-2600A has 10 memories, nine for simplex or transmit with frequency offset ± 600 kHz and one (memory 0) for non-standard split frequencies. Memory scan and programmable band scan have the added convenience of "Time Operated Resume" that stops on busy channel and holds for approximately 5 seconds, then resumes scanning, or "Carrier Operated Resume" that stops on busy channel and resumes when signal ceases. Memory scan scans only those memories in which data is stored, and memory lock-out allows you to skip selected memory channels



Without loss of data previously stored! Manual Scanning UP/DOWN in 5-kHz steps and programmable automatic band scan are also useful features. The TR-2600A has a built-in "S" meter on the top panel which also indicates battery level when in transmit mode. Extended frequency coverage, 142,000-148,995 MHz allows transmit capability in 5-kHz steps for simplex or repeater operation on most MARS and CAP frequencies. Receive frequency coverage includes 140,000-159,995 MHz. These features only tell part of the story. The TR-2600A also has keyboard frequency selection, built-in 16-key autopatch encoder, "TX STOP" switch HI (2.5)/LOW (300 mw) power switch, REV switch, "SLIDE-LOC" battery pack, high efficiency speaker, BNC antenna terminal, and all of this in an extremely compact and lightweight package!

Kenwood's TR-2600A, with D.C.S., leads the way in high technology handheld transceivers!

Optional accessories:

- TU-35B built-in programmable sub-tone encoder
- ST-2 Base Stand
- MS-1 Mobile Stand
- PB-26 Ni-Cd Battery
- DC-26 DC-DC Converter
- HMC-1 Headset with VOX
- SMC-30 Speaker Microphone
- LH-3 Deluxe Leather Case
- SC-9 Soft Case
- BT-3 AA Manganese/Alkaline Battery Case
- EB-3 External C Manganese/Alkaline Battery Case
- RA-3, 5, Telescoping Antenna
- CD-10 Call Sign Display

More information on the TR-2600A is available from authorized dealers or Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

Specifications and prices are subject to change without notice or obligation.

KENWOOD

pacesetter in amateur radio.

TM-211A DCS... a new turn in 2 meters/70 cm.

TM-211A/411A

The TM-211A 2 meter and the TM-411A 70 cm mobiles combine ultra compact size with the added feature of a 7 position adjustable front panel, allowing your maximum flexibility in both home and automotive installations! These compact transceivers also feature Kenwood's innovative DCS (Digital Code Squelch) circuit, that allows you to program your transceiver to respond only to transmissions from stations whose radios transmit a pre-selected digital code. Both radios deliver 25 big watts of R.F.

power on HI and 5-watts (approximately) on LO power. Dual digital VFO's, built-in, highly visible yellow LED display, five memories plus COMM Channel add to this impressive array of features. The TM-211A and TM-411A each boast high performance receive and transmit specifications and an external high quality speaker that provides unsurpassed sound quality. Mounting flexibility is also a feature. Yes, all these features, plus priority watch, memory and programmable band scan, microphone test function, audible "beeper" for operation confirmation, repeater offset switch and reverse switch. The TM-211A and

TM-411A offer you the best in 2 meters and 70 cm operations!

Optional accessories:

- CD-10 Call Sign Display
- PS-430 D.C. Power Supply
- KPS-7A Power Supply
- MC-55 Mobile Microphone with Time-Out Timer
- MA-4000 Dual Band Mobile Antenna with Duplexer
- SW-100A/B SWR/Power meters
- PG-3A Noise Filter

More information on these products is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

CD-10/DCS

The optional CD-10 helps maximize your use of Kenwood's revolutionary new signalling concept, DCS (Digital Code Squelch). DCS uses digital code information to open squelch on a receiver that has been programmed to accept the specific code being transmitted. Up to 100,000 different 5-digit codes are possible, allowing each station to have its own "private call" code or



to respond to a "group call" or "common call" code. Program your call sign (up to 6 digits) in the ASCII code and it is automatically transmitted when the transmit key is depressed. The CD-10 stores the calling station's call sign in its memory

for future reference, and it is also displayed on the L.C.D. readout. The CD-10 can store call sign data of up to 20 stations, allowing you to quickly check for calls if you have been absent from your station, and review your contacts for logging purposes. The DCS/call sign data transmission system uses mark and space frequencies within the normal speech band width (compatible w/most repeaters).



TM-201A/401A

The extremely popular TM-201A 2 meter FM (25 watts, 142.000 to 149.000 MHz) and the TM-401A 70 cm FM (10 watts, 440-450 MHz) ultra compact mobile transceivers are also available.

Specifications and prices are subject to change without notice or obligation.



KENWOOD

progress in amateur radio

TS-711A/TS-811A

Multi-function all-mode 2 m and 70 cm transceivers.

The TS-711A 2 m (142-149 MHz) and TS-811A 70 cm (430-450 MHz) all-mode transceivers are perfect base station units, designed to complement your present HF station. Both feature Kenwood's innovative D.C.S. circuitry. Built-in dual digital VFO's provide commercial-grade frequency stability through the

use of a TCXO (Temperature Compensated Crystal Oscillator). The new fluorescent multi-function display shows frequency, RT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, call sign code, and memory channel. 40 multi-function memories store frequency, mode, repeater offset, and tone. They have programmable scan, memory scan, and mode scan. The Auto-mode

function automatically selects the correct mode for the frequency being used. When a mode key is depressed, an audible "beeper" announces mode identification in international Morse Code.

The TS-711A/TS-811A also feature all-mode squelch, noise blanker, speech processor (SSB, FM), IF shift, RF power control, alert, and a unique channel Quick-Step tuning that varies tuning characteristics from conventional VFO test to stepping action when CHO switch is

depressed.

Combine all these features with built-in AC power supply and a hefty 25 watts RF output power and you have your ideal base station.

Optional accessories:

- CD-10 Call sign Display
- TU-5 CTCSS Tone Unit • VS-1 Voice Synthesizer • MC-60A Deluxe Desk Mic • MC-80 Desk Mic • MC-85 Desk Mic
- SP-430 External Speakers
- MB-430 Mobile Mount
- PG-2J DC Cable



TS-670

TS-670 All-mode "Quad Bander"

The TS-670 "Quad Bander" is a unique all-mode transceiver that covers the 6 meter VHF band and the 10, 15 and 40 meter HF bands. FM operation may be added with the optional FM-430. Key features include dual digital VFO's, 80 memory channels, memory scan, and programmable band

scan. Direct keyboard frequency selection allows you to enter a frequency to either VFO or to a memory channel using the 10-button key-pad on the front panel. The 2-color fluorescent tube display indicates frequency to the nearest 100 Hz (10 Hz modifiable) and includes LED indicators that signal the specific functions in use. The optional GC-10 general coverage receiver unit allows continuous tuning from 300 kHz to 30 MHz. The VS-1

voice synthesizer unit is another popular option available. All this plus IF shift, all-mode squelch, CW semi-break-in with side tone, narrow wide filter selection, noise blanker, and RF attenuator make the TS-670 "Quad Bander" the next transceiver you should own!

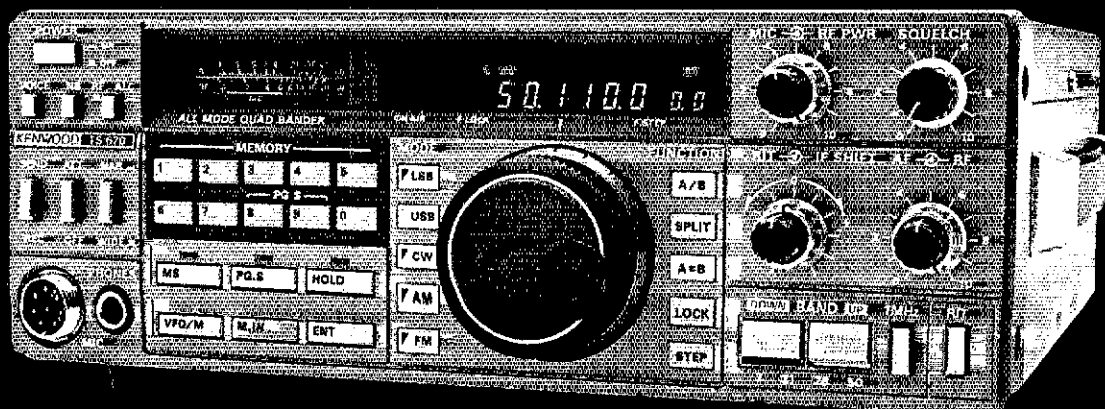
Optional accessories:

- GC-10 General Coverage Unit, 500 kHz to 30 MHz • VS-1 Voice Synthesizer • FM-430 FM Unit • YK-2BC 500 Hz CW

- Filter • YK-88CN 270 Hz CW Filter • YK-88A 6 kHz AM Filter
- PS-430 DC Power Supply
- KPS-7A DC Power Supply
- MC-60A Deluxe Desk Mic
- MC-80 Desk Mic • MC-85 Multi-Function Desk Mic
- VOX-4 VOX Unit

More information on the TS-711A/TS-811A and TS-670 is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut St., Compton, CA 90220.

Specifications and prices are subject to change without notice or obligation.



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Kenwood's advanced electronic technology brings you a new standard in pocket/handheld transceivers! The TH-21A/41A features a high impact molded case and is designed to deliver convenient, reliable performance in a package so small, it will slip into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and only weighs 260 g (0.57 lb) with batteries. In typical Kenwood fashion these transceivers provide superior transmit and receive performance.

Both the 2 meter and 70 cm versions deliver one watt R.F. output on HI power and 150 mW low, for really extended battery life! Functional design includes three digit thumb-wheel switch for easy frequency selection along with a built-in 5 kHz UP-Shift switch and repeater offset switch. (± 600 kHz or simplex, 2m version and ± 5 MHz or simplex 70 cm version.)

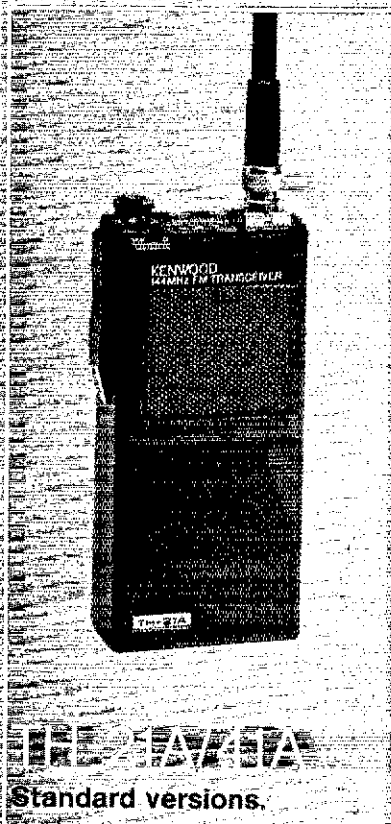
Both the 2 meter and 70 cm pocket/handheld transceivers are available in standard or 16-key autopatch DTMF encoder versions. Kenwood thread-loc. antenna connector is also provided.

See your authorized Kenwood dealer and take home a pocket full of 2 m or 70 cm performance today!

Optional accessories:

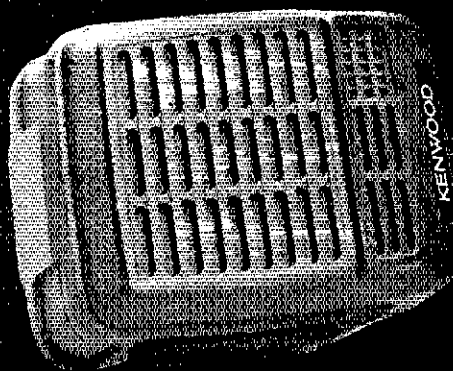
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- PB-21 Ni-Cd 180 mAh battery
- DC-21 DC power supply
- BT-2 battery case
- EB-2 external C manganese/alkaline battery case
- SC-8 soft case for TH-21A/41A
- SC-8T soft case for TH-21AT/41AT
- TU-6 programmable sub-tone unit
- AJ-3 thread-loc to BNC female adapter

More information available from authorized dealers of Trio-Kenwood Communications, 111 West Walnut Street, Compton, CA 90220.



Standard versions.

TH-21AT/41AT
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AEA TI-1	retail.....	149.95
AEA MBA-TOR software	retail.....	149.95
AEA AC-1 12VDC PS	retail.....	19.95
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MIC Connector, 4 or 8 pin	retail.....	4.95
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CT-2200 terminal	retail.....	745.00
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run the meeting because the pres. was called out of town. North Shore Repeater and Cape Ann clubs are cooperating in holding regular exam sessions. Study Memorandum has a chance to meet tonight to Tuesday. Massachusetts newsletter reports that the Tri-City flea market as a big success. Quannapowitt club member W1PL placed first in the WPX CW contest in the single xmt multi-op class while operating from HB9-land. W1MJ and members of the 04/64 repeater are in the initial stages of planning a hamfest at the Topsheld Fairgrounds for July 20 and 21. The Acton-Boxboro club is favoring an improved FD score this year. The Wellfleet Club is in the process of purchasing a new repeater with generous donations from its members. Traffic: KW1U 1045, KN1X 424, KA1EXJ 262, WA1TBY 264, K1CB 10, KA1EPO 167, WA1JY 142, K1ZYW 109, WA1WV 10, KA1MR 11, WA1AZ 10, KA1WZ 10, N1ER 72, WA1FGD 82, K1BA 60, WA1DXT 60, WA1PM 54, KB1PA 43, N1BYS 40, WA1SNH 35, K1BZD 33, N1DDC 30, K1ABO 27, WA1FNM 24, KA1DJV 16, KA1EID 15, W1QLL 14, K1LQO 6, N1CKN 4, (Aug.) KN1X 492, K1BA 44, (July) K1BA 89, (June) K1BA 81.

MAINE: SM, Cliff Lavery, W1RWG — SEC: KL7JIG, STM: AK1W, PIO: KA1TJ, TC: KQ1L, OO/RFI: W1KX, BM: W1JTH, ACC: KB1JF, SGL: K1NIT, Windsor Hamfest successful, with 550 attending. First in New England Division Volunteer Exams were given in conjunction with hamfest. Ronald Dishman, N1CMZ, was elected chairman 1985 Windsor Hamfest. KQ1L appointed 2-meter frequency coordinator for Maine repeaters. PSHR: WB1GLH WA1YNZ KL7JIG W1RWG

Net Sess.	Checks	Traffic	NM
Sea Gull	25	934	210
Pine Tree	30	260	105
Pine Tree (late)	19	102	23
PTN (Aug.)	31	219	113
Gen ME Emer	8	193	22
RACES	4	38	10
Aroostock Emer	4	71	—
ME Pub Svc	5	89	—

Traffic: KA1J0J 22, W1ISC 134, W1RWG 123, WB1GLH 107, WB1YR 73, AK1W 67, WB1CBP 65, N1BLZ 65, KL7JIG 59, W1KX 53, KA1AVU 47, N1BJW 45, WB1M32 45, W1JTH 26, W1JTH 24, W1EZR 16, KA1U 16, W1RPH 15, W1W 15, N1BZ 9, N1BZ 8, KA1FTL 8, KB1P8 5, W1CTR 3, KA1ENL 3, WA1JCN 2, (Aug.) WB1BY 74

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — STM: W1TH, SEC: Open, New Hampshire's first AR exams by volunteer examiners were given at King Ridge. Following upgraded: KA1JFY KA1QHN KA1PKJ KA1KRU KA1KJG KA1JVS K1QJ KB4IND N1AQU WB2MTT W1KJ5 N1DCT K1HK1, plus new hams Lisa Adler, Alfonso Izzo & Joa Alvin. Congrats to all. VE team was WB1GXM KA1ID W1LTD W1GUA KA1KAS KA1RW & OT N1CB, all of the Conn. Valley FM Group. KB1NX & K1OIQ will represent NH on the freq. coordination committee. K1OIQ W1LQO W1OKU K1ACL WA1PEL & KB1Z provided communications for the Mt. Washington Bicycle Road Race. WA1PEL is new scribe of GBRA newsletter. The very best of good wishes to all. Traffic: K1CPX 359, K1K1 270, W1EYR 215, K1IM 182, N1AKS 141, K6UXO 128, K1POV 119, W1TN 114, K1UWB 89, N1NH 88, K1V18 80, W1GUX 79, W1ALE 67, K1TOY 41, W1CUE 37, W1MHX 35, W1VTP 29, KA1HPQ 21, KA1GOZ 9, K1OIQ 8, N1ALM 7, W1NH 2, (Aug.) W1MHX 49.

VERMONT: SM, Ralph T. Stetson, KD1R — Season's greetings and a wish for a very Happy Holidays to all amateurs and SWLs in VT and rest of the world. Hope Santa brings just the right toy for each and every one of you. Congrats to the newly formed Mt. Ascutney Packet RA: W1LTD, pres.; N1CB, secy/treas. Their digipeater on Mt. Ascutney is on 145.01 (VA1TLN/1) and has been heard in Burlington area. Congrats out to the very best of good wishes to the net 2 NEW SLO SPEED net on 3.707 M.W.F. @ 1730 EDT starting on 5. Remember it is a slow-speed net. New officers for BARC are: WA1OZE, pres.; WA1QGR, v.p.; WB1CZC, treas.; WA1SVR, rpt. chmn.; K1OAJ W1CTM, board members at large. Sorry to report that W1RCZ is hospital in St. Albans. N1CBT in Burlington Med Center. WA1DKW was in Fanny Allen for surgery, and that W1COW is going in for surgical repairs in about two weeks. I hope that all of you are soon home and will enjoy a short recovery time. Traffic: W1KRV 135, AET 120, N1ARI 80, N1COB 46, W1OAK 26.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T — TC: KA1JJM, OO/RFI: N1CM, PIO: WB1CJH, SEC: WB1HH, STM: W1UW, Welcome to W1S as the new W1M1Nex2 Net Manager. December is a good time to send holiday hellos to our friends throughout North America via the traffic nets. Annual HCRA Auction is Nov. 2 at 7:30 P.M. in Feeding Hills. KA1JJM is our Section Rep to the new committee which is to work out a permanent repeater coordination policy and implementation plan. This subject has often been frustrating in the cross-border and dense coverage areas. Talk to Ray with your ideas and information. Register with K1BXE before December 14 if you are going to take the license exams through HCRA in January. All the gang at KA1T wish you and yours a very happy holiday season. PSHR: W1KWB1HH KA1T1. Traffic: W1UD 133, W1SLV 10, KA1 103, KA1EKQ 96, W1KK 80, WB1HH 78, K1JHC 32, WA1OPN 28, W1ZPB 10.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB — STM: KL7T, SEC: KL7OE, PIO: OO/RFI: Walter Nesley, WA5AH 4933 Wastley Anchorage 99054 is the Alaska Repeater Coordinator. Please send updates and frequency requests to Walter. Del, KL7JKW, reports five more net certificates have been given out for twenty five check-ins in a calendar month on Snipers Net. The ARRC Volunteer Exams are held the last Thursday of each month. Rodger Hanson, KL7HFQ, is responsible for checking and issuing "THE ALASKA DX AWARD." Ten contacts throughout four regions of Alaska and four being AARC members are the requirements. Traffic: KL7VL 82, AL7FJ 40, KL7HK 6.

IDAHO: SM, Lem Allen, Jr, W1JMH — SEC: KD7HZ, STM: WG7HT, PIO: WB7PFC, OO/RFI: KUTY, ARRL MATTERS: The Boise Club was addressed by Joe Winter, W1RWK, who visited Boise in his campaign for NW Div. Director. This reminds us that it is the duty of every ARRL member to vote in the upcoming election. People and Things: W1WU and wife made a three-week trip down the Oregon Coast, visiting friends and places of interest, and maintained radio contact during the trip. W1JMH and N7DYU visited relatives at a hunting camp near Juntura, OR, using ham radio to keep in touch. W1RYI is home from the hospital, and is doing nicely. WA7PT is also home, recovering from knee surgery and is also doing well. W1JMH has a TS-820S for use on 160 meters this winter.

NET REPORTS:
Net Freq. Time Sess. QNI QTC

FARM 3935 8 P.M. 30 1711 60
ICD 3980 8:10 A.M. 20 611 23
IMN 3635 9 P.M. 20 223 75
GENERAL: All ARCs are urged to develop a VE Team and schedule regular FCC Exams in their areas, based on the needs of the local group. If any clubs do not know how to proceed, please let the SM know. We can send out materials, instructions, and even make a visit to your area to help get things started. Get going, gang — give your local hams a chance! Traffic: W7GH 196, W7JM 103, KA7GQP 37, KA7KAI 32, K7TM 8, KA7HO 8.

MONTANA: SM, Les Belyea, N7AIK — Another first for the Butte ARC "I believe" the only club in Montana with an official chaplain, W7ROE was recently ordained a minister in the Methodist Faith. A new CW flow speed net will be on the air on 7.15 kHz Tue & Thu at 0330Z. N7EPT operated as ZL7EPT on a trip to New Zealand. W7GYA from Lawistown spent some time in Russia, Mongolia and China. WA7PHB KA7LLJ W7VOS K7GL WB7WCM & W7ZKA of the Flathead Valley ARC were active in last summer's Glacier Park Crystal Creek forest fire and were commended by Kallispell's Director of Civil Defense. The Treasure State Chapter #104 of the OCWA held their annual fall meeting on Oct. 20 in Great Falls, hosted by W7BOZ, PSHR: W7TGU, BPL: W7TGU.

Net Sess. QNI QTC Mgr.
MTN 30 1433 173 K8T5E
IMN 20 123 75 K8T5E
MSN 9 4 0 K8PP
Traffic: W7TGU 545, K7AF 78, WB7WVD 69, KA7NMA 60, N7AIK 48, WA7TUW 42.

OREGON: SM, William R. Shrader, W7QMU — STM: W7VSE, SEC: N7CPA, PIO: K07YN, SGL: KA7KSK, ACC: WB7WTD, RFI: AK7T, OO: N7SC, TC: N7ENI, Upgrades: WB7TWN (General); N7GFX (Tech); KA7SIK KA7TGH KA7TOI (Novice); WB7PIL is newest FCC Auxiliary member, and WA8KLA is the newest Official Observer in Oregon. KA7SOQ has a new bride, OTVARC received "Newsletter of the Month" award from 73 magazine. N7CPA was number 1 in the OTVARC May "Happy Hour" contest. For further info on that one, contact OTVARC members. K7ZJG is the new Oregon section net manager. KA7KNG was on KA7U 26 as a new CW flow speed net. There is a new Emergency Coordinators net on 3935.5 MHz at 8 P.M. on the first Monday of each month. The net is to coordinate and encourage activities pertaining to ARES or emergency operations. At 9 P.M. on the same night by the NW Division ARRL Net which is open for all ARRL members to learn about and discuss new happenings in NW Division. This net meets on 3893 MHz. Any clubs desiring info on Special Service status or info on the NW Amateur Radio Council of Clubs should contact WB7WID. OSN report: QNI 491, QTC 315. Traffic: W7VSE 825, KN7B 412, AL7W 175, K7OVK WA7YU 121, WB7EX 72, K7ZT 62, K7ZB 68, N7BGW WA7AI 38, W7LNE 21, K7ZT 20, W7DAN 15, (Aug.) KA7AD 48.

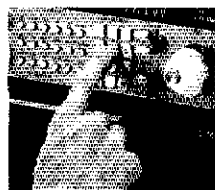
WASHINGTON: SM, Joe Winter, WA7RWK — STM: K7GVS, SEC: WB1IC, PIO: SGL: W7KZC, TC: K7UJ, OO/RFI: Coord.: K7CFA, BM: KD7G, ACC: WB7ONS.

Net	Freq.	Time(Z)	QNI	QTC	Mgr.
WARTS	3970	0200	2946	547	W7SFT
WSN	3590	0245/0545	562	318	N7CSP
PSTS	145.33	0130/0630	196	158	W7IEU
NTN	3970	2000	1098	58	W7UJ
EWTN	148.04	0130/0530	70	51	WA7FN
NWSSB	3945	0230	95	10	W7HFN

Father Marshall Moran, SJ, 9N1MM while visiting DX clubs throughout the US and Canada, visited the W7DX Club Sept. 21-23. He was in his element, and in attending to this famous DXer, tell about his experiences of 40 years in Katmandu, Nepal, was a rare delight. The Dec. 2nd Telconference Net will be heard in the Puget Sd. area on 145.33 rpt. and on 145.43 in Eastern Wash. The subject is "Packet Radio, Overview and Perspective." IVEHF Radio Amateurs: This years Spokane Interstate Fair marked the third consecutive year that a ham station was on the air handling traffic. N7BGG gave talk at the Sept. mtg. on ham radio in Australia after his recent trip there. West Seattle ARC is starting a novice class in early Jan. N7APN N7DIP N7AJO and K6Z7 are instructors. Contact Pres. N7AJO, Clallam Co. ARRC report: Involvement in numerous activities this summer such as triathlon, parade, a ridge run, and a bike race. W7LG assisted with comm. in a successful search in the Olympic Mountains. K8AH entered ARRL's antenna contest with a 10 thru 40M directional and rotatable design and made it to the finals. The best to you, Gene! KR7M gave a club program on "Packet Radio." K7GCO has been giving talks on his simple, effective and economical circuits for ant. tuners and tuned inputs for amplifiers. If owners of solid state xmtrs have problems driving their amps see Ken, Radio Club of Tacoma. Dr. Fred worked the ham radio booth at the Western Wash. Fair where each year more visitors are interested in ham radio. N7BXJ was in charge. 627 pieces of traffic were originated. KD7ME devised a standard message which made it easier to handle the traffic over the 17 day event. The RCT created a "Radio Club of Tacoma Memorial Scholarship." It was started with funds raised at Hamfair and a donation by mbr. K7LHB and family in memory of his late wife. There will be awarded two separate two-year scholarships at two local Voc. Tech. Institutes each year. Herb Posner, K7CFA, replaces KB7WC as OO/RFI Coord. on his resignation. I thank Ron for the fine work he has done, and wish Herb much success in his new job. His address is P.O. Box 72, Port Orchard 98386. Bob 378-3488 is also contact Herb and join the Auxiliary to help our fellow hams with their on-the-air operating. Traffic: KD7ME 1074, WB7OGA 742, K7LRD 705, WB7WOW 615, K7GZC 544, W7VZ 258, KR7L 128, KD7TJ 128, W7HNA 99, W7GB 97, N7DDP 46, W7UJ 40, KD7WMM 36, W7APS 31, K7AJT 26, K7CTP 26, W7LUP 26, WA7BDD 25, KD7G 14, K7OXJ 7, N7FXM 7, N7CT 2.

PACIFIC DIVISION

EAST BAY: SM, Bob Wally, W6RGG — SMs: WBZF N6DHN, SEC: WB6LKE, STM: N6BA is now active on OSCAR 10 and Packet Radio. NW Div. PSHR: Ken at B. and I. N6BA members WB6YA W6GEP N6IIP N6JUS WB6TR WB6ZF WB6FV N6GHR N6DRS K6UJS WB6JW & WA6TTD provided comms for the Vallejo Aquatic Club's "Carquinez Straits Swim." Continuing on their neutral ways, members WA6AUC N6GHR N6DRS WA6EFP K6BOPW W6DFV K6UGS & prospective member N6HYF did likewise for the VIP Bathub Regatta. LARK welcomes new members WA12Z & W7V41. Their J. K. Murphy award was presented to Carl & Leona Wallace at a special pizza get-together. EBARC had Lloyd & Iris, W6KG & W6QL, of YASME DXpedition fame as their featured speakers. Member W6DFRP successfully upgraded to General at the Pac. Div. Conv. MDARC mourns the loss of former



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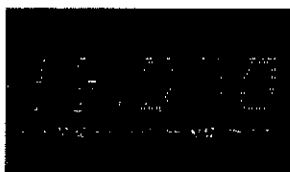
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THE AMERICAN RADIO RELAY LEAGUE
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president WA6OJT. WA6JSO, KA6OLK & N6IA raised a new 2-meter antenna donated by W6HWZ at the Richmond Red Cross, Contra Costa Co., emer. test ops were KF0GH WA6JCO WA6KTL ABWHD W6CPO N6GA W6LKE KA6VFF KE6BS & KA6OZ. Traffic: N6IA 249, WB6DOB 212, W6WOM 160, NV6T 81, WB6UZX 26.

NEVADA: SM, Leonard M. Norman, W7PBW, Seasons Greetings to all. KA7TIB is new radio amateur in Las Vegas. K6PVS WD6AUP & WA7JUC operated M-10 Gig VHF contest from Utah. NNARA has new club badges. N7AXY active all bands on RTTY. WA7JUC active 432/2M EME. K7ZOK active on RTTY and in VHF contest. NNARA club booth won a red ribbon and secured nine candidates at Tri-County Fair. W7NCR out of hospital, doing FB. K7HRW reports 297 stations checked into NV weather net. KA7EUA NCS. N7CLK new VP of LRAC. TARA officers: NX6W, pres.; W6CSP, v.p.; N6ELY, secy.; WA6VKL, treas.; AF71 N6IPA, W7KJU, N6H5W, WA6P5Z, dirs.; WA6SIM, special events; N6H5W, editor; WA6VKL, printer of TARA News. Traffic: W7BS 71, W7BPA 18.

PACIFIC: SM, James Wakefield, AH6CO — HARC annual meeting will be held on Jan. 17 at the Club in Honolulu. VECs are active with BIARC holding tests on 11/3 and HARC on 11/3 and 11/17. HARC schedules 1st Sat. of the month and Koolau on the 3rd Sat. of the month. Seen at Pacific Division Convention at Santa Clara were KH6FD, KG6ZD with wife and son, and AH6CO. Off island guests at bash for NH6AT were KH6JJ KH6EM KH6WG KH6US WH6AZI KH6FMS NH6BO W6NFE WA6J KG6JHH & WA6KR. A sad report of Silent Key of KH6CA on Aug. 18. The Pac Traffic Net skeds three nights a week into Region Six Northern Cal Net. Slow speed once a week into Kauai, Molokai, Maui and Big Island are needed. Contact KH6HJJ AH6P is new EC for Big Island. Request your appointment. Traffic: KH6B 94, KH6HJJ 65, KH6S 55, KH6H 38, KH6RQ 17 (Aug.), KH6B 8.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB — SGL: WB6WFC, QO/RP, Coord. VZC. STM: KYQ. SEC: WA6ZUD. Amador Co. ARC has become the first club in our section to apply for and receive Special Service Club status. Congrats. Volunteer administrator exams are being given in a number of areas throughout the section and nearby. For information, contact your nearest affiliated club or any of those listed above. It appears that many more opportunities to take examinations will result from the program. My sincere thanks to all of you VEs. If you have an exam scheduled under a VEC other than the League, please let me know about it. By this time next month, we hope to announce the name of the new STM for the section. Although we found no upgrades to report this month, some achievements were noticed but only names were given, no calls. Please include call signs in your reports. Traffic: WD6BZQ 188, N6CVF 121, WB6SRQ 26, WA6ZUD 8, N6EPG 4. (Aug.) N6CVF 112. (June) WA6ZUD 9.

SAN FRANCISCO: SM, Bob Smith, NA6T — The newest addition to the SPECIAL INTEREST newsletters published by the ARRL is GATEWAY. It is Packet Radio oriented and very informative. DNGARC Rptr. on 147.78/18 is up and working at Camp 6 with good coverage of Hwy 199, etc. HARC is planning amateur exams in EUREKA area in Jan. Check FWRA Rptr System for details. "DX IS" was revived at MARC with Hugh Cassidy, WA6AUD, as their featured speaker. The Marquee Theater program was a grand success with the help of co-managers Chuck, N6DDK, and Hank, W6DTV, and a host of others. This is very exciting fundraiser for SCRA. Another fundraiser for SCRA was this year's FLEAMARKET and AMATEUR TESTING, which was the first VE program in the SF section. Carl, KK1A, can handle traffic as well as watermelons as demonstrated at SFRC picnic. The printers are installed at Red Cross and amateur positions for Packet Connections in SF, tnx to N6ECT. Seven amateurs on PSRR this month, a new record. Tnx to all. Traffic: W6PL 350, W6NL 310, KK1A 246, W6RNL 210, K6TVJ 120, N6FWG 83, WA6QXV 2.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB, STM: N6AWH, TC: WA6EXV, Asst. SMs: W6TRP K6VIA, KH6AB is the new EC for Merced Co. Thanks to N6AYI for his many years of service. Appointment renewed: ORS WA6YAB. New officers of the Turlock ARC are KD6QA, pres.; K6SJV, v.p.; N6JXJ, secy.; W6SQR, treas. The club meets the 2nd and 4th Tuesdays in Turlock. They will soon have a packet repeater in operation. W6WZM is secy. of the Central Cal. SSB Assn. The Clubs of W. Kern Co. had another successful hamfest. N6KJQ is back to KH6GBX. N6EIG is WB6V. KB6MQ is WC6D. K6XJ has an IC-471A and a TR-2600. WB6VAF has a TR-2600. WA6PRE has an Azden PCS-300. WA6RPT has an Azden PCS-4000. WA6FPB has an IC-751. The 1985 Fresno hamfest is May 3-5, at the Tropicana Inn. Merry Christmas and Happy New Year to all. Traffic: N6AWH 109, WA6YAB 18, W6SX 11, W6DPD 6.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV — STM: W6PHT, SEC: K6ITL, ACC: W6MKM, PIO: N6BIS, TC: K6HLE, WA6OCV, EC for Santa Cruz Co., reports that Santa Cruz ARES members worked on two separate fire incidents recently to help the Calif. Div. of Forestry with communications. First, DCF required help on a 550-acre fire in the Aromas area. Within 1 1/2 hours, the Felton CDF office and the Aromas fire camp were staffed with amateurs. ARES members manned their radios for over 24 hours. Ten days later, CDF again requested ARES help, this time for several fires caused by a lightning storm. During the second operation, N6IYA took his 2-meter radio aeronautical mobile in a CDF aircraft and was involved in reconnaissance flights in the Santa Cruz mountains to determine the number and extent of the lightning fires. The following amateurs participated in the operations: N6IYA WA6OCV K6HJU KH6PP K6GHA K6GHS K6BEE K6BVVG K6BRU N6RZ K6BUAM W6BDF K6RFZ. The training that the above amateurs receive on the ARES Training Net on Monday nights at 8:30 P.M. (local) on the K6BJ repeater (146.79) no doubt helps their emergency communications preparedness. The net is used to review formal message handling procedures by handling both practice messages and "real" traffic for entry into the NTS. On the inland side of the Santa Cruz Mountains, CDF asked for amateur assistance with communications in the Santa Clara Co. area. Fire watch patrols were activated by mobile amateurs to start off early in the evening to the lightning storm. Amateurs participating included: WB6UGG N6HJJ WB6WLE WB6OML N6EJG W6LTX N6JQA K6BYRK K6SXW WA6WBN K6GTG N6GA W6HPA WA6PWW K6BYMD WA6QAZ W6PLT W6GKY. WB6ADZIR was used for a resource net for the operation and for coordination of the firewatch mobile patrols. Now that the fire season is behind us, we have the approaching winter with its often heavy rains. Now is the time to check your emergency communications gear to make sure it's ready for use on a moments notice. All ECs and AECs are reminded to check into the emergency communications

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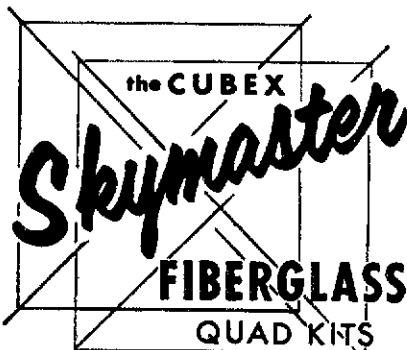
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Europe: Le Bonaparte—Office 711, Centre Affaires Paris-Nord, 93163 Le Blanc-Mesnil, France.



Yaesu HF radios rely on state

Some people feel the name that goes on a radio is more important than what goes into it.

At Yaesu, we let our technology speak for itself: a unique blend of engineering know-how and user suggestions that make our HF products superior.

But don't take our word for it. Take a look at our transceivers and make up your own mind.

The economical FT-757GX. A mobile transceiver that might never leave your shack.

You told us what you wanted in an HF rig that operates both in the car and at home. We've answered with the FT-757GX: a compact 12-volt transceiver with all the extras built in. Features you'd normally pay a lot more for:

As standard equipment you get AM and FM modes, electronic

keyer with dot-dash memory, 600-Hz CW filter, noise blanker, AF speech processor and 25-kHz marker generator. All at no extra charge.

The FT-757GX's high-performance general coverage receiver lets you listen from 500 kHz up to 30 MHz. The transmitter covers 10 to 160 meters, including the new WARC bands. Dual VFOs and single-button VFO/memory swap make split-frequency operation easier than ever before.

Use the 8 memories to store your favorite frequencies on any of the bands. Then touch a button to jump to any programmed frequency without worrying about a bandswitch.

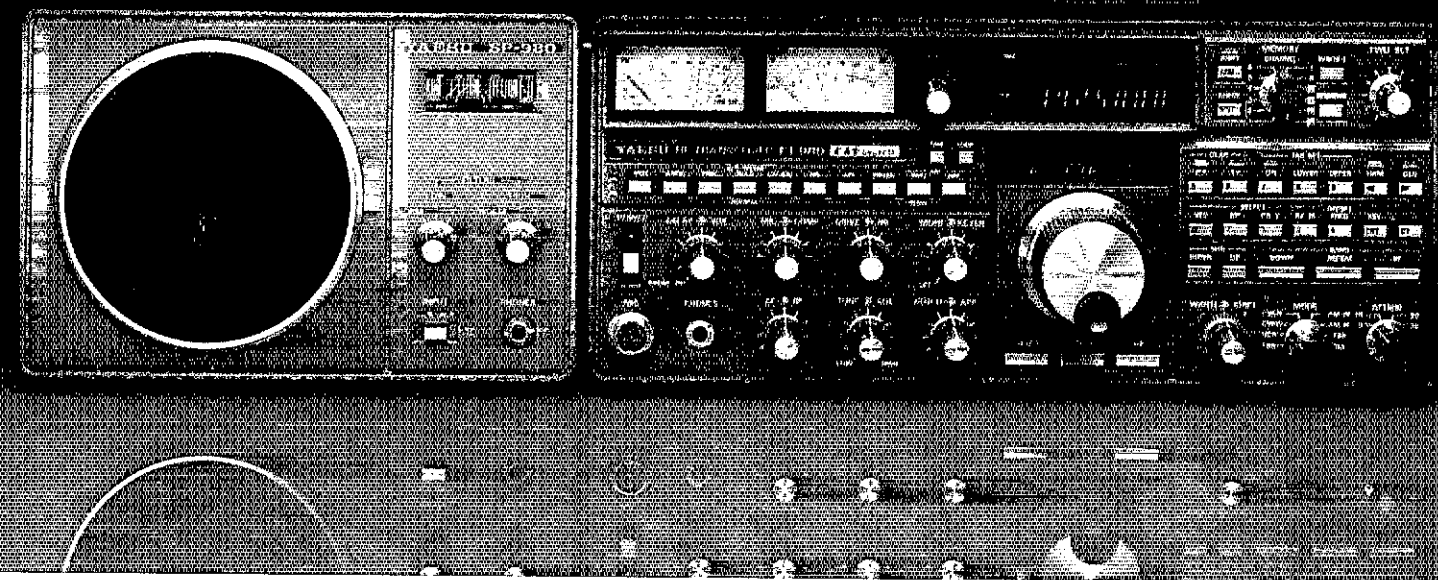
For base-station use, the space-saving FP-757GX flatpack power supply shown in the photo is ideal. With this supply, the rig delivers

100 watts output on sideband, FM and CW.

In addition, a massive heatsink permits continuous RTTY operation at full power output for up to 30 minutes. Full power for long periods does require the use of the FP-757HD heavy-duty supply.

To the right of the transceiver is the FC-757AT, a fully-automatic antenna tuner designed especially for the FT-757GX. This optional tuner stores in its memory the antenna selection and matching network settings for each band. When you operate that band again, the tuner automatically recalls the matching network settings and chooses the proper antenna.

With an optional interface unit, you can control VFO frequency and memory functions via your personal computer.



f-the-art, not state-of-mind.

The FT-980.

The cleanest signal on the air

We know that the quality of the signal you put out is a reflection on you.

So when we designed the FT-980, we took clean output seriously. So seriously in fact, that you won't find a cleaner transmitter on the market.

Featuring a conservatively designed final amplifier that loads at a fraction of its rated power output, the FT-980 cuts distortion levels to new lows. So you get a signal you can really be proud of.

We designed the FT-980 with complete operating flexibility in mind. But not at the expense of fundamental performance.

You can set and forget about 50% of the front panel controls.

Store your favorite frequencies and operating mode independently

in each of the 12 memory channels. Review the contents of any memory location, without disturbing the QSO in progress, by using the checking function.

Going from one programmed frequency to another is simple and fast. Just touch a button to recall any channel.

You'll find the FT-980 tolerant of imperfect antennas. There's essentially no power turn-down with an SWR of 2:1 and just 25% turn-down at 3:1.

There's lots of flexibility built into the triple-conversion receiver. For one thing, there are separate front ends for ham and general coverage reception. So ham band operation is not compromised.

Multiple levels of IF filtering assure outstanding rejection of unwanted signals close to your operating frequency. And armchair

copy under really brutal conditions.

The FT-980 comes ready to hook up to your personal computer. You can control operating mode, IF pass-band, frequency, and memory functions from a remote location. A variety of computer interfaces are available. See your Yaesu dealer for details.

State your mind.

When you visit your dealer, tell him you want the latest in HF technology. A radio built by Yaesu.

YAESU

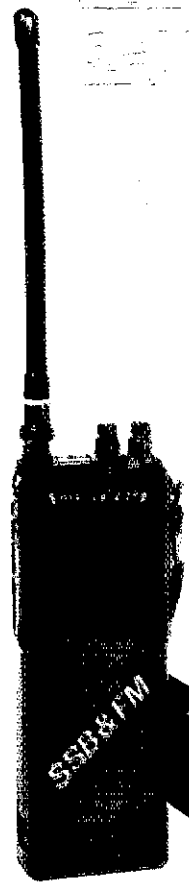
Yaesu Electronics Corporation

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(213) 633-4007

Yaesu Cincinnati Service Center

9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100.

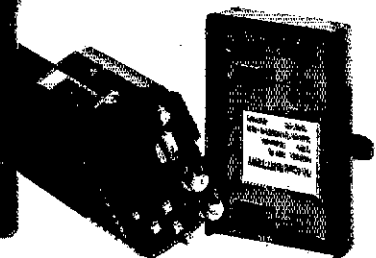
HAPPY HOLIDAYS HAPPY HOLIDAYS



Single-sideband really works in nonrepeater situations and has over 5 times the battery life per battery charge according to the engineers who developed the LS-202A. The slide-on, locking battery pack can contain either Ni-Cd 'AA' cells or 'AA' alkaline-type batteries, or a special higher voltage Ni-Cd pack can be purchased as an option. The special VXO and RIT circuits add flexibility to the 5 kHz step synthesizer to provide continuous tuning for Upper or Lower SSB. High (2.5 W PEP) or Low (0.5 W PEP) is selectable by a switch. Lighted receive 'S-Meter' with Transmit battery level display and thumb-wheel switch lighting make using the LS-202A more comfortable.

FM mode is still the FUN MODE to many people, and the LS-202A works all the repeater frequencies from 144 to 148 MHz with the normal ± 600 kHz offset. Good, crisp audio comes from the internal mic, and there is the capability of using an external speaker mic of the popular variety.

Santec and SSB simply just got better. See one today at your Santec dealer.



Technical Talk

SPECIFICATIONS SSB/FM

Freq. Range	144.000-147.995 MHz
Synthesizer	5 kHz Steps + VXO
Modes	USB (A3J), LSB (A3J), FM
Voltage Range	6-12 VDC
Current Drain	30 mA RX Standby 750 mA TX Peak
Power Output	2.5 W PEP (9 V) 3.5 W PEP (10.8 V)
Receiver	2.4 kHz (-6 dB) SSB
Bandwidth	15 kHz (-6 dB) FM
Sensitivity	0.25 μ V (12 dB S/N) SINAD
IF Frequencies	10.695 MHz SSB, 10.695 MHz and 0.455 MHz FM
Spurious	-60 dB

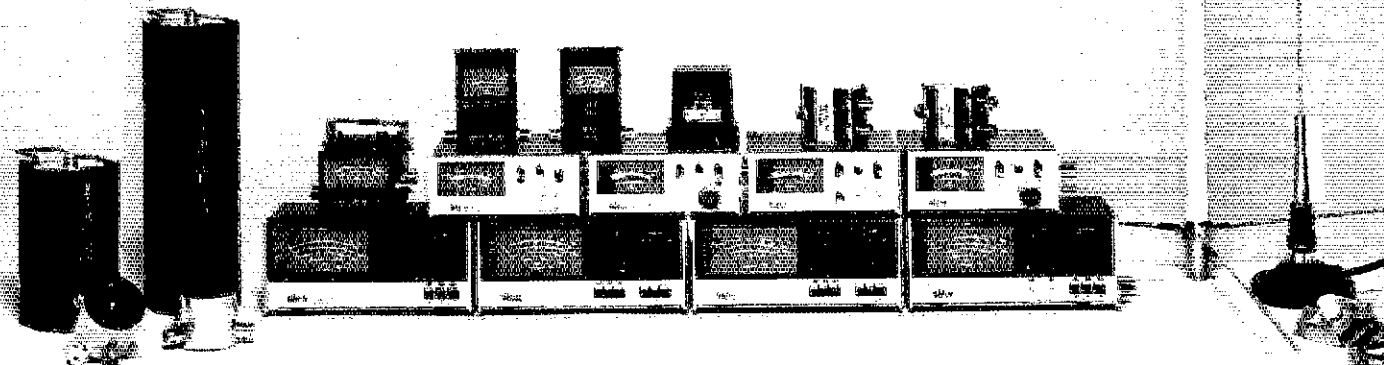
WELZ CORPORATION

THE WELZ CORPORATION LINE OF STATION ACCESSORIES

WELZ specializes in WATTS. Measuring Watts and switching Watts, radiating Watts and dissipating Watts is what the WELZ line of winners is all about. Welz is the source for top quality, superior performing, affordable products to compliment your mainframe radio equipment from any source. Increase the versatility of your measuring capability with WELZ WIDE-Z Sensor (TM) power and V.S.W.R. meters, precision 50 ohm terminations. Conserve your coax dollars with the dual band Diamond Antennas for 144/430-440 MHz for base and mobile applications. Welz dual band duplexers let you feed two antennas on two different bands with one feed line with no switching or two transmitters onto one dual band antenna simultaneously. WELZ has wattmeters and V.S.W.R. bridges from 200 mW to 2000 Watts from 500 kHz to 500 MHz frequency range. When you need to measure in RF Watts WELZ has a winner for you. The full line of Wattmeters encompasses many different models, some of which are shown in this family portrait. In addition to both in-line and terminating type wattmeters the WELZ line of Winners includes several high quality dummy loads for testing and tuning plus applications requiring precision 50 Ohm terminations. Frequency ranges of the WELZ loads are typically wider than similarly priced items from other sources. WELZ has winners in the economy circle also. The performance value of the economy line of Wattmeters from WELZ is really superior. The instruments from WELZ are extremely well built and very easy to view. The portable units such as the SP-10x and the SP-380 provide reliable service in the field as well as in the fixed station. Send QSL type card for complete catalog of WELZ products.

WELZ CORP

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HAPPY HOLIDAYS HAPPY HOLIDAYS

USER FRIENDLY

- SOFTWARE
- FEATURES
- VALUES



Smart enough to be user friendly means the newest Santec radios are more useful in your hands. Without sacrificing features and functions you really want, you can have an easier to use, yet smarter handheld from the broad line of models for the most popular VHF and UHF bands 144, 220, and 440 MHz. Plenty of accessory items are available for the Santec radios to make your personal application of Santecology (TM) the smoothest yet. And don't forget the transistor and semiconductors in all Santec products are guaranteed for two full years.

Santec's smarter handhelds help the user by providing widest frequency coverage for MARS and CAP operations as well as amateur radio. Any value of offset on 10 KHz steps can be set and stored in any memory location, thus requiring only one memory per transceive frequency pair. Single stroke memory recall of all 10 memories and the required offset means no more switch flipping when repeater frequencies are changed. Because lower power output from the transmitter helps the user to get longer service times on each battery charge, Santec provides three switchable power levels from the full power level of 4 watts plus down to a midrange of around one watt and a battery conserving 100mw. The Santec user gets plenty of helpful information from the complete display on the large size LCD frequency display using six digits plus the offset direction and memory number. Mode of scan, PLL lock and the receiver and transmitter indicator are all usable at the same time without any extra effort. All the neat features you expect plus a good, solid performing transceiver section with excellent sensitivity and high quality audio make Santec your best choice for a handheld transceiver.

For specifications and a full catalog of Encomm, inc. products send us a QSL. Specifications subject to change without notice or obligation. Information in this ad does not constitute warranty.

144 MHz • 220 MHz • 440 MHz



THL CORP.

AMPLIFIERS • PREAMPS • COUPLERS

ANTENNA COUPLERS

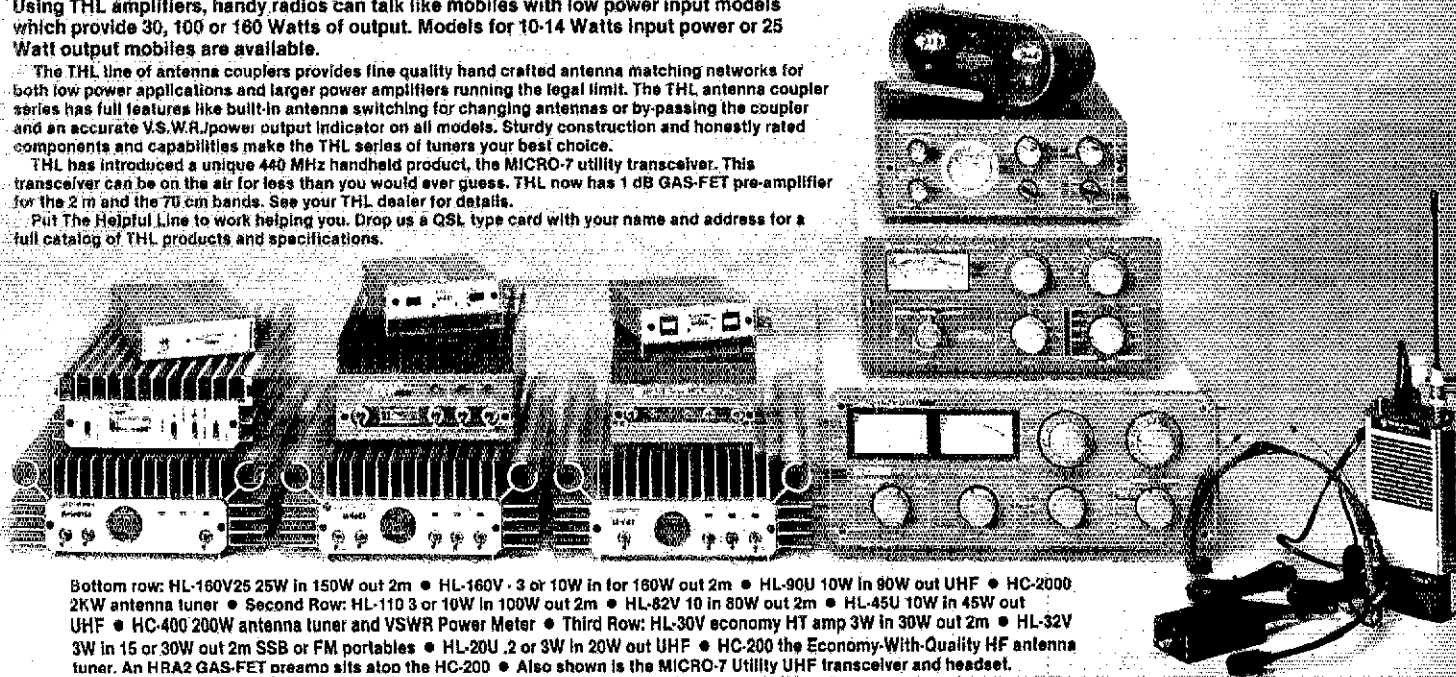
The helpful line of handsome products.

The THL line of amplifiers, pre-amps, antenna couplers and transceivers provides a broad line of solutions to help solve life's problems of needing "just a little more." Whatever it might be, look to THL helpful products to aid in solving the problem. THL can make your signal stronger, your receiving better and can make your HF transmitter happier with the match to the antenna. THL amplifies to a level of 160 Watts on VHF and 90 Watts on UHF. Using THL amplifiers, handy radios can talk like mobiles with low power input models which provide 30, 100 or 180 Watts of output. Models for 10-14 Watts input power or 25 Watt output mobiles are available.

The THL line of antenna couplers provides fine quality hand crafted antenna matching networks for both low power applications and larger power amplifiers running the legal limit. The THL antenna coupler series has full features like built-in antenna switching for changing antennas or by-passing the coupler and an accurate V.S.W.R./power output indicator on all models. Sturdy construction and honestly rated components and capabilities make the THL series of tuners your best choice.

THL has introduced a unique 440 MHz handheld product, the MICRO-7 utility transceiver. This transceiver can be on the air for less than you would ever guess. THL now has 1 dB GAS-FET pre-amplifier for the 2 m and the 70 cm bands. See your THL dealer for details.

Put The Helpful Line to work helping you. Drop us a QSL type card with your name and address for a full catalog of THL products and specifications.



Bottom row: HL-160V25 25W in 150W out 2m • HL-160V .3 or 10W in for 160W out 2m • HL-90U 10W in 90W out UHF • HC-2000 2KW antenna tuner • Second Row: HL-110 3 or 10W in 100W out 2m • HL-82V 10 in 80W out 2m • HL-45U 10W in 45W out UHF • HC-400 200W antenna tuner and VSWR Power Meter • Third Row: HL-30V economy HT amp 3W in 30W out 2m • HL-32V 3W in 15 or 30W out 2m SSB or FM portables • HL-20U .2 or 3W in 20W out UHF • HC-200 the Economy-With-Quality HF antenna tuner. An HRA2 GAS-FET preamp sits atop the HC-200 • Also shown is the MICRO-7 Utility UHF transceiver and headset.

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THE STANDARD OF EXCELLENCE

The world of CW, RTTY, and new DUAL AMTOR is as close as your fingertips with the new brilliantly innovative state-of-the-art microcomputer controlled EXL-5000E.*

Automatic Sender/Receiver: Due to the most up to date computer technology, just a console and keyboard can accomplish complete automatic send/receive of Morse Code (CW), Baudot Code (RTTY), ASCII Code (RTTY) and new ARQ/FEC (AMTOR).

Code: Morse (CW includes Kana), Baudot (RTTY), ASCII (RTTY), JIS (RTTY), ARQ/FEC (AMTOR).

Characters: Alphabet, Figures, Symbols, Special Characters, Kana.

Built-in Monitor: 5" high resolution, delayed persistence green monitor — provides sharp clear image with no jiggle or jitter even under fluorescent lighting. Also has a provision for composite video signal output.

Time Clock: Displays Month, Date, Hour and Minute on the screen.

Time/Transmission/Receiving Feature: The built-in timer enables completely automatic TX/RX without operator's attendance.

Selcal (Selective Calling) System: With this feature, the unit only receives messages following a preset code. Built-in Demodulator for High Performance: Newly designed high speed RTTY demodulator has receiving capability of as fast as 300 Baud. Three-step shifts select either 170Hz, 425Hz or 850Hz shift with manual fine tune control of space channel for odd shifts. HIGH (Mark Frequency 2125Hz)/LOW (Mark Frequency 1275Hz) tone pair select. Mark only or Space only copy capability for selective fading. ARQ/FEC features incorporated.

Crystal Controlled AFSK Modulator: A transceiver without FSK function can transmit in RTTY mode by utilizing the high stability crystal-controlled modulator controlled by the computer.

Photocoupler CW, FSK Keyer built-in: Very high voltage, high current photocoupler keyer is provided for CW, FSK keying.

Convenient ASCII Key Arrangement: The keyboard layout is ASCII arrangement with function keys. Automatic insertion of LTR/FIG code makes operation a breeze.

Battery Back-up Memory: Data in the battery back-up memory, covering 72 characters x 7 channels and 24 characters x 8 channels, is retained even when the external power source is removed. Messages can be recalled from a keyboard instruction and some particular channels can be read out continuously. You can write messages into any channel while receiving.

Large Capacity Display Memory: Covers up to 1,280 characters.

Screen Format contains 40 characters x 16 lines x 2 pages.

Screen Display Type-Ahead

Buffer Memory: A 160-character buffer memory is displayed on the lower part of the screen.

The characters move to the left erasing one by one as soon as they are transmitted. Messages can be written during the receiving state for transmission with battery back-up memory or SEND function.

Function Display System: Each function (mode, channel number, speed, etc.) is displayed on the screen.

Printer Interface: Centronics Para Compatible interface enables easy connection of a low-cost dot printer for hard copy.

Wide Range of Transmitting and Receiving: Morse Code transmitting speed can be set from

the keyboard at any rate between 5-100 WPM (every word per minute). AUTOTRACK on receive. For communication in Baudot and ASCII Codes, rate is variable by a keyboard instruction between 12-300 Baud when using RTTY Modem and between 12-600 Baud when using TTL level. The variable speed feature makes the unit ideal for amateur, business and commercial use.

Pre-load Function: The buffer memory can store the messages written from the keyboard instead of sending them immediately. The stored messages can be sent with a keyboard command.

"RUB-OUT" Function: You can correct mistakes while writing messages in the buffer memory. Misspellings can also be erased while the information is still in the buffer memory.

Automatic CR/LF: While transmitting, CR/LF automatically sent every 64, 72 or 80 characters.

WORD MODE operation: Characters can be transmitted by word groupings, not every character, from the buffer memory with keyboard instruction.

LINE MODE operation: Characters can be transmitted by line groupings from the buffer memory.

WORD-WRAP-AROUND operation: In receive mode, WORD-WRAP-AROUND prevents the last word of the line from splitting in two and makes the screen easily read.

"ECHO" Function: With a keyboard instruction, received data can be read and sent out at the same time. This function enables a cassette tape recorder to be used as a back-up memory, and a system can be created just like telex which uses paper tape.

Cursor Control Function: Full cursor control (up/down, left/right) is available from the keyboard. Test Message Function: "RY" and "QBF" test messages can be repeated with this function.

MARK-AND-BREAK (SPACE-AND-BREAK) System: Either mark or space tone can be used to copy RTTY.

Variable CW weights: For CW transmission, weights (ratio of dot to dash) can be changed within the limits of 1:3-1:7.

Audio Monitor Circuit: A built-in audio monitor circuit with an automatic transmit/receive switch enables checking of the transmitting and receiving state. In receive mode, it is possible to check the output of the mark filter, the space filter and AGC amplifier prior to the filters.

CW Practice Function: The unit reads data from the hand key and displays the characters on the screen. CW keying output circuit works according to the key operation.

CW Random Generator: Output of CW random signal can be used as CW reading practice. Bargraph LED Meter for

Tuning: Tuning of CW and RTTY is very easy with the bargraph LED meter. In addition, provision has been made for attachment of an oscilloscope to aid tuning.

Built-in AC/DC: Power supply is switchable as required; 100-120 VAC; 220-240 VAC/ 50/60Hz + 13.8VDC.

Color: Light grey with dark grey trim — matches most current transceivers. **Dimensions:** 363(W) x 121(H) x 351(D) mm: Terminal Unit.

Warranty: One Year Limited

Specifications Subject to Change



Everything built in — nothing else to buy!

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*Dual Amtor: Commercial quality, the EXL-5000E incorporates two completely separate modems to fully support the amateur Amtor codes and all of the CCIR recommendations 476-2 for commercial requirements.

hy-gain®

“Heavy Duty is Relative!”

In our lineup of rotators, the CD45 II is rated as medium duty. Some of our worthy competitors offer similar rotators which they rate as “heavy duty” and, within their product line, they are. But if you compare all rotators, it’s a different picture. Here is a comparison of our CD45 II, our HAM IV and the Alliance HD73 (Specifications as stated by the manufacturer).

	HD73	CD45 II	HAM IV
Output Torque	400 in. lbs.	600 in. lbs.	800 in. lbs.
Gears	Plastic and Steel	All Steel	All Steel
Control Box Weight	3.8 lbs.	6.8 lbs.	6.8 lbs.
Rotor Unit Weight	6.5 lbs.	8.5 lbs.	10.5 lbs.
Direction Indicator	Carbon	Precision wire wound	Precision wire wound
Potentiometer			
Rotation Limiter	Mechanical stop only	Limit switches with mechanical stop	Limit switches with mechanical stop
Braking Power	1600 in. lbs. “Windmilling”	800 in. lbs. “Holding”	5000 in. lbs. “Holding”
Antenna Size Rating	10.7 sq. ft.	8.5 sq. ft.	15 sq. ft.

Wind load rating is an important specification too. Unfortunately, there is no standard method of measurement. For example, a long boom antenna with an unbalanced wind load is a much tougher problem than the calculated square area of the antenna would suggest. So we take a conservative “worst case” approach and rate the CD45 II at 8.5 square feet. Yet, the HD73, a lighter unit, is rated at 10.7 square feet. You be the judge.

Here is a complete listing of Hy-Gain rotators and the typical antenna systems that each will comfortably and reliably manage.

AR40—Primarily used for small to medium size VHF and UHF beams. Can also be used with a 10 or 15 meter, 3 element Yagi.

CD45 II—Recommended for a 3 element tribander such as our Explorer 14. Will also manage a medium sized VHF stack and is a good choice for the Azimuth rotator on a good sized satellite system.

HAM IV—A favorite for long boom tribanders such as our TH7DX. Would also be a good choice for an Explorer 14 stacked with a VHF DX antenna or a satellite system.

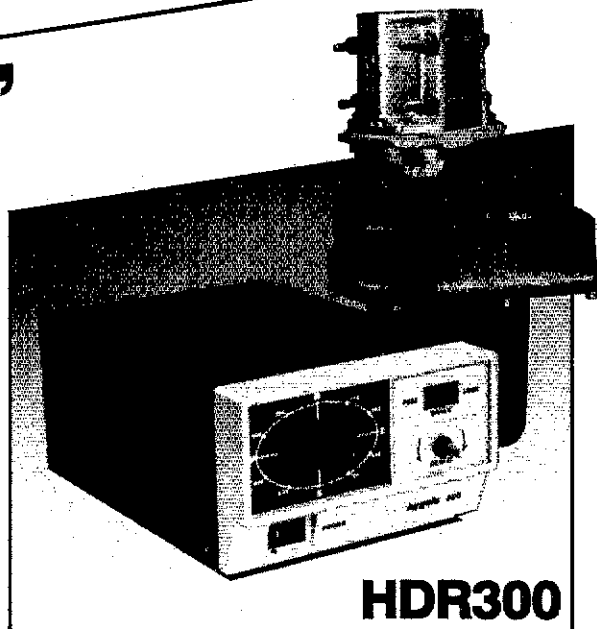
HAM SP—A modified Ham IV with a special control unit for a blind operator. Single knob directional control system includes a compass rose with braille markings. An audible beep indicates rotator start and stop.



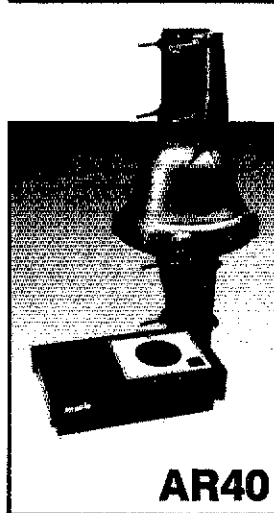
T2X—The well-known Tall Twister manages combinations such as a TH7DX stacked with a small 2 element 40 meter beam. Also a great choice for a substantial VHF “weak signal” array. Of course, the ever popular stack of 3 or 4 element 10, 15, and 20 meter monobanders is a safe match for the T2X.

HDR300—This 5000 inch pound torquer is our idea of heavy duty. This is the choice for stacked HF “Long Johns” or the full sized 3 element 40 meter monsters. A favorite too for the giant VHF “weak signal” systems where the 1° rotator control and indicator accuracy is a must.

CHOOSING THE RIGHT MODEL—The mistake most commonly made is selecting a rotator for the antenna being installed at the time and not looking forward to the antenna system that you ultimately plan. A rotator that is not over-loaded will deliver many years of reliable service. So, when you choose yours, plan ahead and buy the model that will handle the ultimate load. If in doubt, drop us a note. We will share our experience with you. Long term, you will save money.



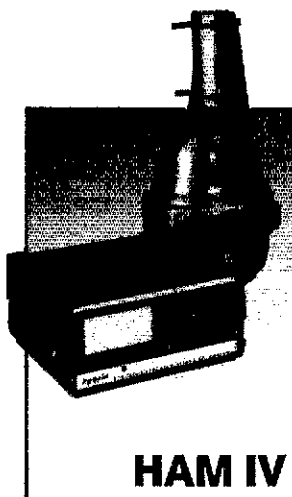
HDR300



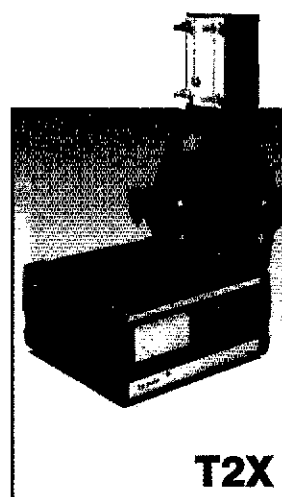
AR40



CD45 II



HAM IV

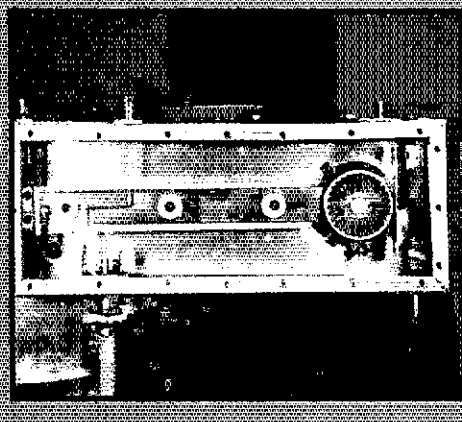
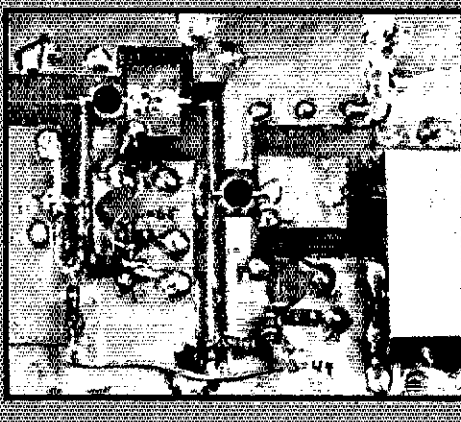
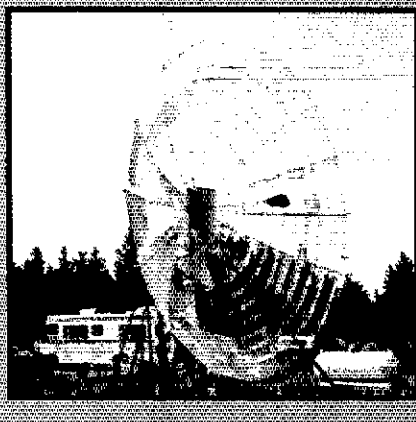


T2X

TELEX hy-gain®

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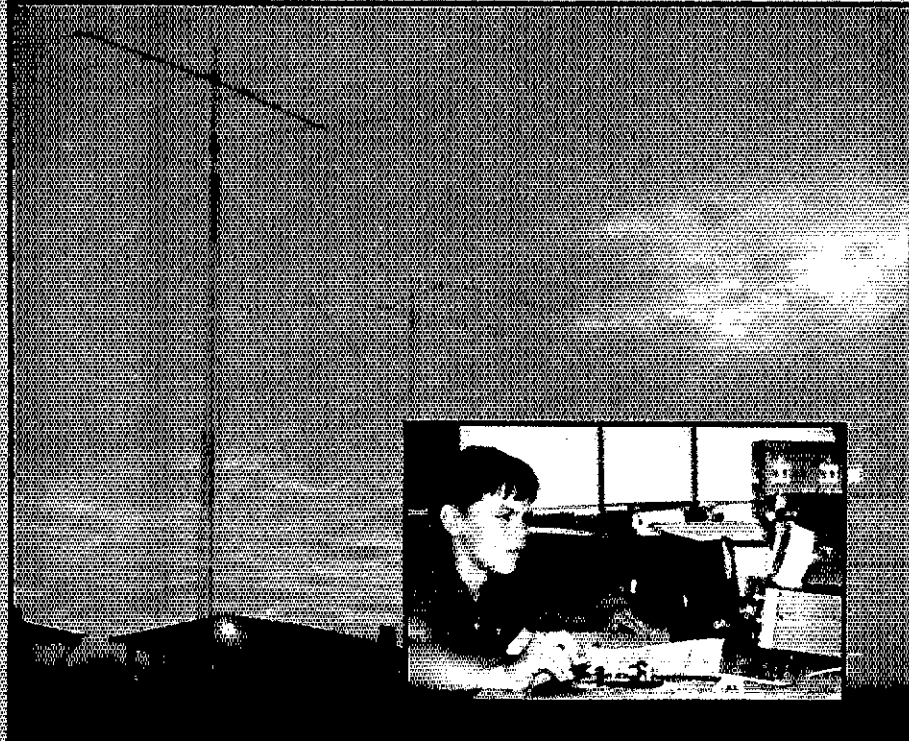
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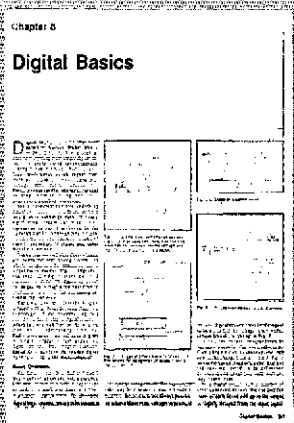
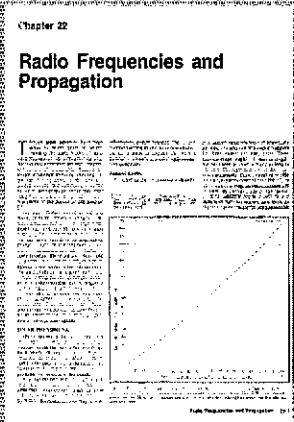
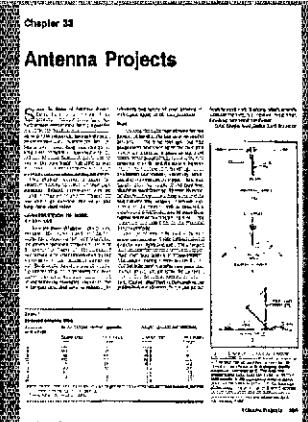
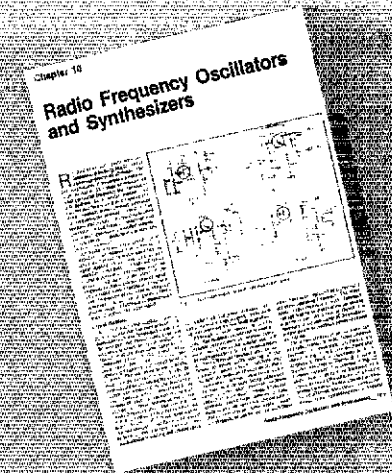


THE ARRL

1985 HANDBOOK

FOR THE RADIO AMATEUR





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1984

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3. Radio Design Techniques and Language
4. Solid State Fundamentals
5. Vacuum Tube Principles

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ETCHING PATTERNS

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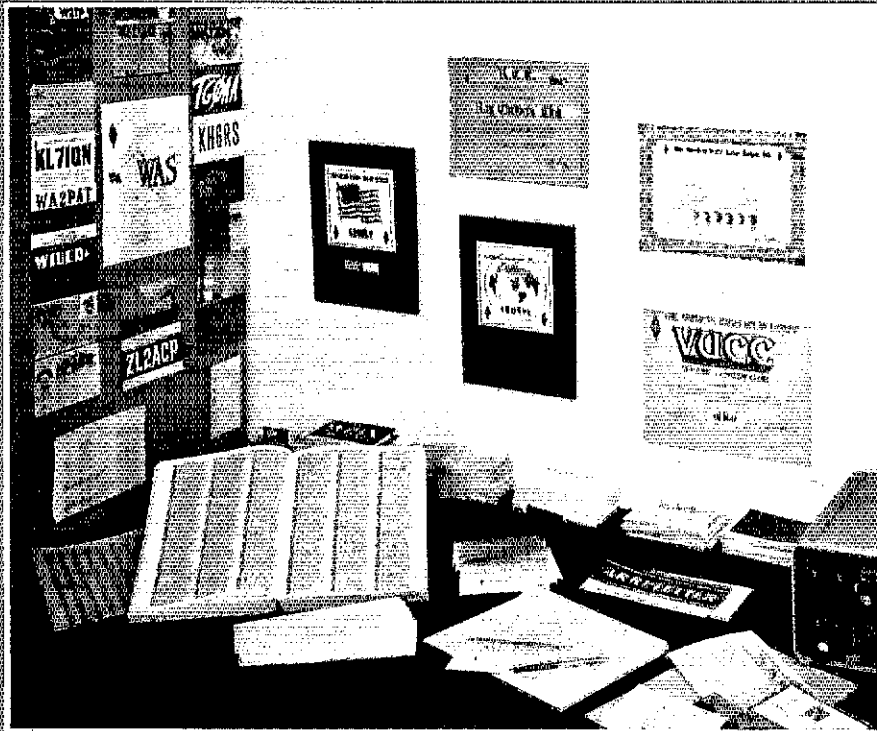
1. Amateur Radio
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648 PAGES

The 1985 Handbook will be available in November. Paperbound prices are \$15.00 in the U.S., \$16.00 in Canada and elsewhere. Cloth prices are \$22.50 in the U.S. and \$24.00 elsewhere. Prices in U.S. funds. Foreign remittance should be in the form of an international money order or a check drawn on a bank account in the U.S.

Photo credit: The photograph at the beginning of this section is of XE2FU operated by The Texas DX Society during the ARRL DX Test. Photo by K5RC and AA5Y.

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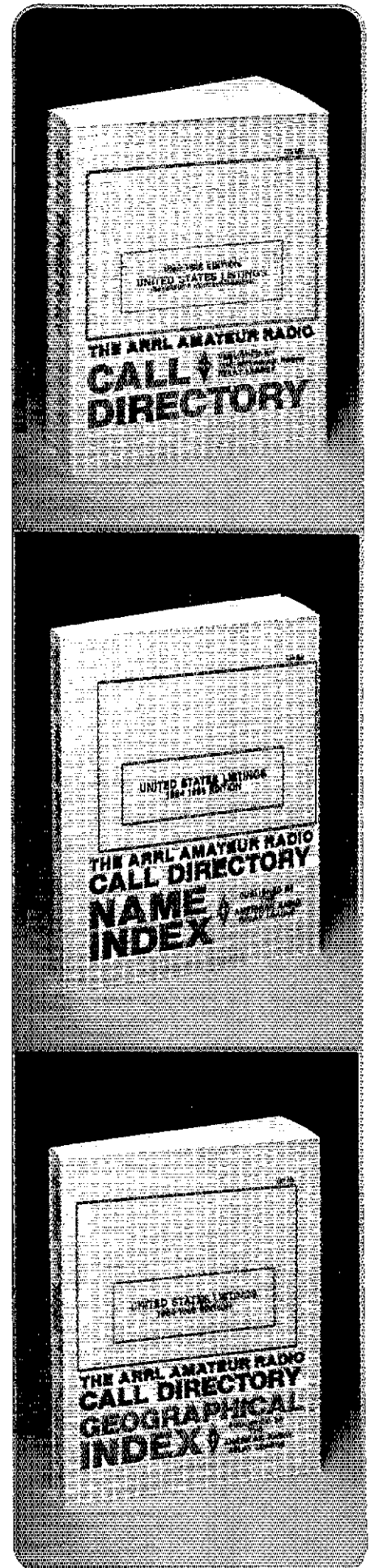
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nets running throughout the section to make sure they keep up with the latest developments. A listing of the major nets is as follows:

Day	Time	Freq.	Net
Monday	8 P.M.	145.27	SPECS
Tuesday	8 P.M.	146.715	SVECS
Wednesday	7 P.M.	145.45	ARES SECTION

Two amateurs have recently qualified and have been appointed Official Observers under the new ARRL OO program. They are W6OKK and K6WR. If you are interested in becoming an OO, please let the Section Manager know and the paperwork for qualification can be initiated. At the recent Pac. Div. Convention in Santa Clara in September, NS6N was in charge of the VEC testing session. The testing went very well and NS6N has accepted the task of trying to get regular testing sessions going in the section for those who wish to upgrade. Other VEs helping out at the convention testing session were WA8C WB4WNO A6Z W7SX WB6WKM & NV6D. N6IYA and K6J, although not VEs yet, did help with the testing. One of the successful applicants at the testing at the convention was KA6YUP, NS6N's 10-year-old son. He upgraded to Tech. About 60 people turned out for the Williams Hill ARA Annual "Smoked Hamfest" in King City. WB6ZF reports that everyone had a fun time and ate lots of BBQ's and steak. I recently attended the Southwest Division Convention in Santa Maria. Excellent convention. The sponsors are to be congratulated on their worthwhile effort. If you attended the World's Fair in New Orleans this year, were you as impressed with the K5WF Amateur Radio display as I was? It was a very professional looking exhibit that all amateurs can be proud of. W6ZM is still looking for a group to step forward and sponsor the 1985 Pacific Division Convention. Please contact him if your club would like to become involved in that event. Official Relay Stations, please be sure to send your monthly traffic reports to STA W6PHT. Traffic: W6YBV 269, W6KZJ 153, K6GHA 12, W6CF 2, W6PHT 2.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN — SEC: AB4W, STM: K4NLK, BML K4IWW, ACC: WC4T. PIO: WA4OBR. SGL: AB4W. I would like to introduce the newest member of the SECTION staff: WC4T, our new ACC. She will be coordinating League affiliation, SSC applications, and VEC coordination with clubs in our section. Congrats! New officers of Cary ARC: KA4HAM, pres.; WB4DAR, v.p.; AB4S, secy.; NAUE, treas. Upgrades: WB2SMK to Extra, KB4KQH to Tech. CFARS sponsoring first ARRL VEC exam in section on Dec. 15. Check with K4MN for details. New spots: W4DJA, EC Cleveland Co.; KB4EQC, EC Davie Co.; K4GBW, EC NCM; WB4HRR WA4MOK, DEC; WB4DAR, NM NCM. City of Apex lost all telephone service and amateurs provided communications for over 24 hours. Officials were very impressed. Does your club have a PIA (Public Information Assistant)? Does your club or group have a working relationship with public officials? Are you getting publicity in your local newspaper or radio/TV station? Write PIO: WA4OBR for details. He needs your help. Remember: Part 97 of the FCC Rules set forth that we are the Amateur Radio SERVICE. Our commitment is to Public Service. Thanks W4BFB. The SECTION staff would like to wish each of you a MERRY CHRISTMAS and a HAPPY NEW YEAR. Section expects a lot of Christmas traffic. Great opportunity to have HAM RADIO traffic booth at shopping malls. Silent Key: W4LTL. Three month (July-Sept.) cumulative traffic reports:

NTS-Nets	QNI	QTC	QND	Sess.	NM
NCMN	1217	424/349	1552	92	WB4WII
NCEN	2036	752/650	2256	91	K4NLK
CSN	771	1185	3400	92	W0IKT
CNCTN	2822	343/295	1600	92	WA4MNR
PCTN	1188	272/175	919	92	NE4J
FARS	587	73/73	1077	91	K4ABJ

Non-NTS Nets:
 THEN 964 92/73 1842 89 WD4LRG
 PETN 669 142/120 836 90 WD4CEB
 CFARS 1192 56/56 1468 92 KE4HW
 M2MEN 1874 88/88 1328 92 KD4JC

1984/85 Net Directory now available. Write League Hq, and please include 86 cents for postage. Traffic: K4NLK 321, KA4EYF 294, WB4WII 168, N4JL 81, WB4HRR 134, WA4MNR 103, WA4OBR 91, KB4FWL 69, WD4LRG 80, K4JHF 74, K4SWN 67, WB4DAR 64, K4IWW 53, WB4CYN 39, WD4HTE 35, NAUE 33, WA4PID 32, WD4CEB 31, NE4J 2, K4DDY 25, N4CJJ 24, KA4KJ 24, KB4IVV 21, K4GI 18, K4FVY 15, K4KAL 13, KA4YMY 12, WA4TTS 11, WB4EQK 6, WA4SRD 5. (Aug.) WA4SRD 65.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — Hurricane Diana forced SC amateurs to provide what the FCC mandated in 97.1(a) for the second time this year, and all should be proud of the response and teamwork shown during the wait for Diana to come ashore. The Red Cross setup HQs in Florence and brought with them numerous amateurs from other parts of SC. Local VHF nets provided direct communication from shelters throughout eastern SC to the Red Cross EOC. SC HF net officials decided to combine operation with NC on 3907, and NSBCD provided NWS Charleston phone-patch communication. Forecasters were able to get on-the-spot info to supplement their radar observations. Amateurs were able to get up-to-the-minute weather reports. Thanks to everyone that helped during Diana — you are PROFESSIONALS. May-Sept.: SCSSB 4982/654, SCNT 848/136, Blue Ridge 7028/321, Greater Pee Dee 4782/425, Lancaster 654/76, Anderson 1099/52, York 230/19, Carolina State Line 57/2. Traffic: K4ZN 280, K4WJR 166, W4FMZ 117, W4NTO 109, W0IKT 76, KB4BZA 59, K4ZB 48, KA4LRM 47, K4FRX 39, WB4UDK 38, WD4JP 20, KA4AUR 10, W4DRF 3.

VIRGINIA: SM, Claude Felgley, W3ATQ — STM: WD4ALY. SEC: WB4UHC. ACC: WD4KQJ. OOR/RF: WAHU, BM: AB4U. PIO: WN4VAU.

Virginia Sideband Net (VSBN) 3947 6 P.M.
 Virginia Slow Net (VSN) 3680 6:30 P.M.
 Virginia Net (VN) 3690 7:10 P.M.
 Virginia Late Net (VLN) 3947 10:15 P.M.
 Virginia Traffic Net (VTN) 3907 1 P.M.

Congrats to the Tidewater group for fine Roanoke Division Convention at Virginia Beach. Over sixty people appeared for the exams held under the ARRL VEC program. Many other clubs are planning for examination sessions. It is hoped that all will coordinate their efforts to keep conflicts to a minimum and with exams spaced about a month apart in the highly populated areas. Exams will be given at the Frostfest and Winterfest hamfests. KB4KPY is a new OBS in the Wytheville area. W4LJ and the Rockbridge club originated 156 messages at their community festival. N4EXQ and WB4UCI and the Richmond hams set up a station at the Va. state fair, originating over 500 messages. WB4KIT back on the air after major surgery. New ORs are K4GR WA4TVS

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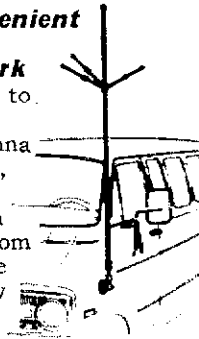
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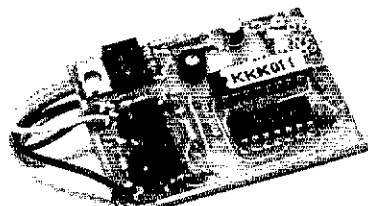


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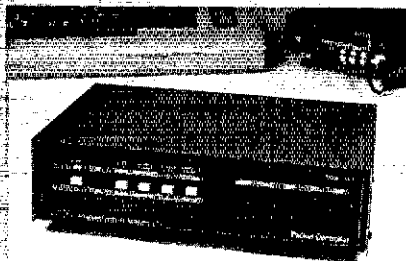
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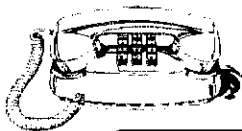


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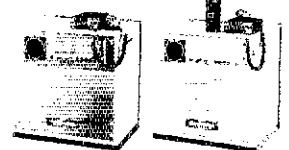
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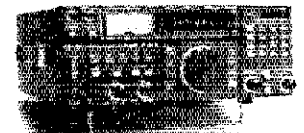
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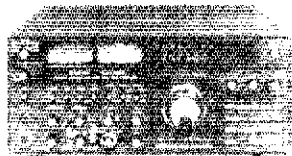
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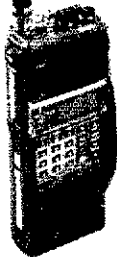
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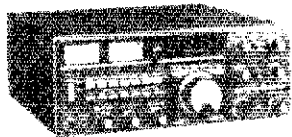
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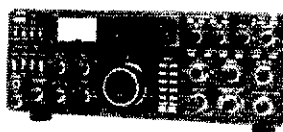
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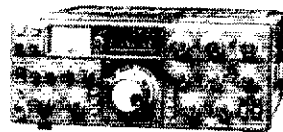
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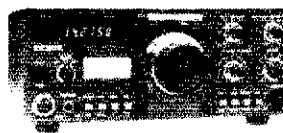
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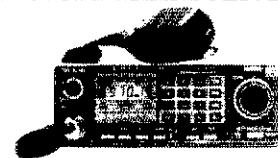
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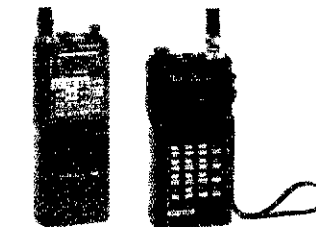
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Editing * Receive Message Storage * Variable Buffer sizes * Diddle * Word Wraparound * Time and Text Transmission.

Hamssoft/Amtor — Includes all features of Hamssoft plus communication in all three modes of AMTOR.

Amtorsoft — Includes all the features of Hamtext but is for use with AMTOR ONLY. The Apple program is available only as a Hamtext/Amtorsoft combination.

Supertap — Receive Only CW, RTTY, ASCII, AMTOR * Decode inverted, bit inverted, and unusual bit order * Multiple line display * "SCOPE" feature for baud rate measure.

Specifications

Input Filter — Four pole Switched Capacitance Filter with 170Hz Shift RTTY bandwidth of 260Hz nominal. Copies any shift.

Audio Input — Minimum level 5mVRMS. Input impedance is 600 ohms unbalanced. Accepts baudot or ASCII code up to 300 baud. Max input level is 12VRMS.

AFSK Output — Crystal controlled. Mark-2125Hz; Space-2295Hz (170 shift). Level 100mvpp (35mVRMS) standard. Optional 500mvpp (175mVRMS). Output impedance 600 ohm unbalanced.

FSK Output — Open Collector +40 VDC Max. Polarity can be reversed.

Scope Output — 10K ohm output impedance.

PTT Output — Open Collector +40 VDC Max.

Computer Connection — TTL Compatible. Inputs also RS232 level compatible.

Power Requirements — 11 to 15 VDC (12VDC nominal) 75ma

Construction — Precision Extruded Aluminum Alloy Case

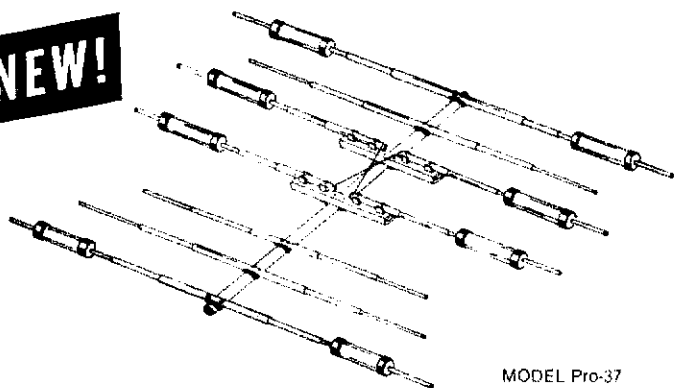
Dimensions — 1.9"H x 5.9"W x 7"D

Weight — 1 $\frac{3}{4}$ lbs.

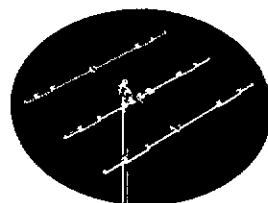
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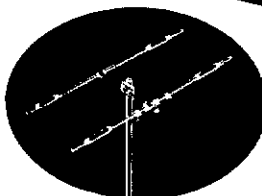
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MODEL Pro-37



TA-33 Jr.
Three element
rotary beam
aerial.
10-15-20M.
Rated to 300W.



Two element
rotary beam
aerial.
10-15-20M.
Rated to 300W.
MODEL TA-32 Jr

The Pro-37 follows in the Mosley tradition of high performance, dependability, and quality construction. The Pro-37 is pre-drilled for easy assembly. No adjustments or measuring. Average assembly is about 1½ to 2 hours. As with all the Mosley antennas we use stainless steel hardware throughout. Rugged construction makes our antenna the cleanest, strongest of its class, no cluttered elements or boom to cause electrical and mechanical problems down the road. Put it up and leave it up. In performance it has no peers...It is as broadbanded or broaderbanded than any antenna made. Its gain and front to back is as good or better than other antennas in its class, even those with longer booms. Mechanically we feel it's the best built.

The Pro-37 has 7 elements on a 24 foot boom which needs no boom support. It has 3 wide spaced elements on 20 and 15 not counting the extra driven element. 10 meters has 4 wide spaced elements not counting the extra driven element. The Pro-37 uses a unique direct feed system which enables the driven elements to contribute gain to the antenna, while giving it the broadest possible frequency spectrum. Clean design makes the antenna easy to assemble and erect and solves maintenance problems. No clutter on the elements or boom. The Pro-37 uses the proven Mosley traps which on the Pro-37 will handle 2.5 KWDC out on C.W. and 5 KWPEP on SSB. We're quite excited about the Pro-37 and we know you will be too!

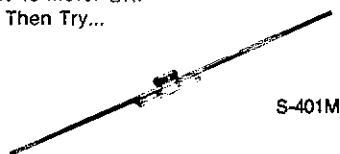
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Vertical Aerial, 10 thru 40 no band-switching is necessary. Very portable and no pipe mount needed
MODEL V-4-6



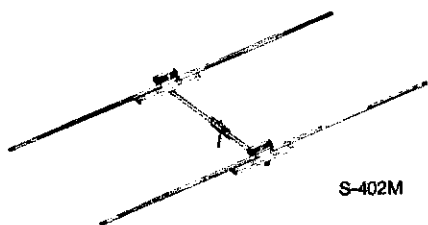
V-4-6

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Then Try...



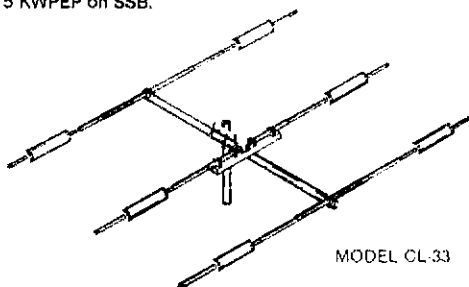
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BROADBANDED SINGLE ELEMENT
Can be made into 2 element or 3 element later.



S-402M

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Strongest Built 2 Element on 40 Meters
Excellent Bandwidth. Can be made to 3 element later.



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- * Rated at 1KW CW and 2KW on SSB

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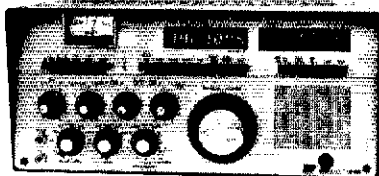
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K4AZTB and K8AQG. Remember to maintain your ARRL appointment you must report your activity monthly and maintain League membership. Thirty one members of the South Western Wireless Assn. provided communications for the "Iron Man Triathlon." The Va. Beach club served a similar function in their area with 16 members active. K1AW handled US Coast Guard traffic during the hurricane. N4JSP K4AFC and K4AEZB and K4AEZB upgraded to General, and K4AWLR is now N4KQO. K4DDR and AA4AP are back active after recent illnesses. K14LO reports the STARES Net is very active with nightly sessions and liaison to the VA NTS nets. N4GHI and N4EXQ made BPL. K4JST N4GHI K4BWT AA4AT WD44LY and WA4CCK had PSHR total of over 100. Total traffic for the month was 5648 with 47 stations. With the increasing traffic load more stations will be needed to carry the load and be liaison to the 4RN. Traffic: N4EXQ 1212, N4GHI 704, AA4AT 384, WA4CCK 365, WB4PNY 335, W3ATQ 302, WD44LY 261, K4JST 267, K4BWT 184, WD4OCVY 153, K4KDJ 145, K4AVJ 136, K4BTE 121, K4AZB 111, WD4FC 111, K4AOC 83, K3BZR 70, K4GR 59, NN4I 57, NT4S 54, K4JM 51, K4ECD 51, KE4AT 44, WB4EDB 42, K4AIUM 37, K4BPW 35, WB4VMX 34, K14LO 33, K14W 32, K4MLC 26, K4ZTB 24, N6AND 18, N4FNT 17, K4VWK 16, W4LXB 12, WD4DZ 12, WB4KIT 10, NW4O 7, WA4TV8 7, WB4ZNB 6, N4IBY 4, W4KX 3, WB4FDT 2, W4TZC 2, N4LE 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: K8DB. ACC: WA8CTO. SGL: K8BS. TC: K8CG. Rpt Coord.: WD4KHL. I regret to report that Doug Kibler, WB8AZI, has become a Silent Key. W8VFN is doing great on new freq, 3885 at 8 P.M. daily. W8LYV is recovering from heart attack. Nice turnout was experienced for quarterly QCVA mtg in Chas.

Net	Time	Fr	QNI	QTC	Sess.	NM	
Hillbilly	1420	Noon	Sn	121	20	KC8YU	
WVFN	3865	6:00		813	108	30	N8AJC
WVMD	7235	11:45		782	75	30	W8FZP
WVN	3567	7:00		233	90	30	W8LYV
WVNN	3730	8:30		189	29	29	KD8RD
KFC 2M	8747	8:30 M		26	0	4	N8FYF

Traffic: W8LYV 150, K2BQ 125, WD8LY 122, N8EMQ 104, K8BOGF 62, W8FZP 57, N8AJC 55, W8JWX 41, K8KT 40, K8UQY 33, K8TPF 28, K8BOMM 26, K8QEW 26, W8HZA 22, K8BG 19, W8KJ 7.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, K0J — SEC: W80FQB. STM: WD8AIT. ACC: W80DUV. OQ/RFI: N02F. SGL: WD8QL. PIC: K0BYPH. TC: K0BP. BM: W8MDT. DEC: W80TUB. KC8WR. DTMS: K80Z. N0CXI. NM: W80RYL. W8LAE. W8HJZ. N0DZA. Christmas is just around the corner. From all of our section leaders and myself, we wish you the best during the holiday season. If you are not on 80 meters this winter you are missing a good bet. By the way, the Delta Loop which was featured in the October QST works quite well. I have put one up and have worked some excellent DX, not to mention good section communications. Thanks to all the amateurs who answered our call for help in field organization appointments. We appreciate the interest and can still use more assistance statewide. Digital communications is growing very fast in Colorado with the RMPRA the major sponsor. Contact our TC, K0BP, for assistance if your interest is in packet. Congrats to K8OTU, Granby. He has promoted Amateur Radio in this small town by his presentations to schools and many organizations. Also, as EC he and his small ARES group have performed a public service in all areas to his district. 73 & Seasons Greetings, de K0J.

Nets COL QNI 928, QTC 47, Int 182, time 944, 29 sess.; CWN QTC 75, QNI 109, time 458, 28 sess. CWN QNI 2742, QTC 370, time 270, 30 sess. CWN QNI 465, QTC 17, Int 252, time 1338, 30 sess. CWN QNI 220, QTC 71, time 324, 20 sess. Traffic: N80CP 2641, W80HJZ 1311, K8JAN 714, K8RXX 608, WD8AIT 273, W8ACH 248, N0CXI 240, W8BOYI 229, K8BZ 200, W8BBSZ 105, W8LAE 98, N0DZA 93, W8NFW 46, W8HRS 45, A15W 38, W8BNA 32.

NEW MEXICO: SM, Joe T. Knight, W5PDY — ASM: W5HD. DEC: K85XD. STM: KV5U. NMs: WA5JUNO K8LL W5VFG. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583 at 1930 local and handled 198 msgs with 155 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 85 msgs with 1020 stations in. New Mexico Breakfast Club meets daily on 3939 at 0630 local and handled 88 msgs with 838 stations in. Yucca 2-Mtr Net 7818 & 9333 handled 28 msgs with 482 checkins. Cascan Club 8516 handled 19 msgs with 179 checkins. SCAT 2-Mtr Net 6606 handled 14 msgs with 434 checkins. Early Birds handled 6 msgs with 501 checkins. W5YUW & WA5MSP are Silent Keys. We will miss them. Messilla Valley ARC will conduct VEC Exams at Las Cruces on Dec. 1. W5HD hopes to have VE Exams in Albuquerque around February. Traffic: W5DAD 192, N5EXC 55.

WYOMING: SM, Dick Wunder, WA7WFC — ASM: K7AWS. SEC: W7VYK. I still have openings for volunteers in the field organization. I am sad to report that W7FT, Sam Zuckerman, became a Silent Key in September. Doc was a pioneer in the Amateur Radio field & held every major award and certificate in Amateur Radio. Congrats to the High Plains ARC of Torrington for conducting the FIRST ARRL volunteer exam in Wyo. This month & one of the first in the country with serial no. 4. K7C7G upgraded to Extra at this exam; congrats to Wayne. K7AR reports the Wyo. Cowboy Net held 20 sessions with 694 QNI & 16 QTC. WA0PFJ reports the Wyo. Jackalope Net held 23 sessions with 280 QNI. Traffic: W87NHR 240, W7HLA 40.

SOUTHEASTERN DIVISION

ALABAMA: SM: Joseph E. Smith, Jr. WA4RNP — SEC: ALABAMA: STM: N4JAW. SGL: K44WVU. BM: K44VU. OQ/RFI: K4LEL. Well, here it is the month of Christmas and now it's time. We have our PIC out on a move to Dallas, but I have someone in mind that can do the job. The Shelby Co. ARC, SCARC, has these new officers: KE4GC, pres.; K4CAF, v.p.; K4JSA, secy/treas. There were two Extra Class upgrades reported to me, W4DGI and KE4GC. The 160-meter and the 10-meter contests will be this month on the 1st and 2nd and the 8th and 9th, respectively. BPL: WA4JDH. PSHR: WA4JDH WACKS K84GN WA4LXP WD4NYL WA4RNP. Nets: CAND reports 877 messages in 30 sessions with WACKS W4I and NW4X rep DRNs. DRNs reported 787 messages in 80 sessions with WA4JF WA4JDH WA4XA NW4X KC4GS and WACKS on the air. 73 and Merry Christmas, Joe. Traffic: WA4JDH 882, WACKS 194, NW4X 194, LXP 85, WA4XA 58, WA4RNP 58, WD4NYL 42, K84GN 31, K4AOZ 26, W4DGH 10, WB4TVY 10, KC4GS 8.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4ABY. STM: K4VHC. ACC: WA4ABY. BM: W4BIA. OQ/RFI: W4RZL. PIC: WA4PNY. SGL: W4BTZ. TC: K4UDR. 1985 Atlanta Hamfestival moved to Georgia World Congress Center on July 27 & 28. If U are planning a hamfest in '85, now is the time to contact SE Division Director W4RH to

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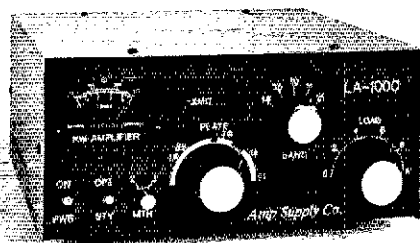
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LA-1000A 1200 WATT AMPLIFIER



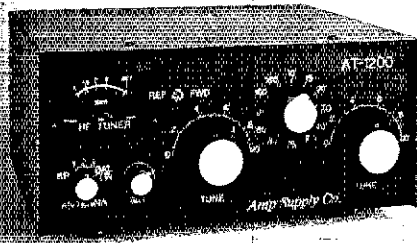
LA-1000A

The LA-1000A is a portable kilowatt now covering 160-15 meters. Typical drive requirement is 100 watts PEP yielding 1200 watts PEP SSB 800 watts CW. The compact linear uses four 6MJ6 tubes, has a tuned input and QSK built in and comes in an attractive gray-on-gray finish.

This is a super linear for all purposes, the LA-1000 excelled during the Heard Island DX pedition with over 30,000 contacts. The rugged design lends itself to continual use during contests and users are even running it on RTTY at 500 watts input.

LA-1000A \$449.50*

AT-1200 TUNER



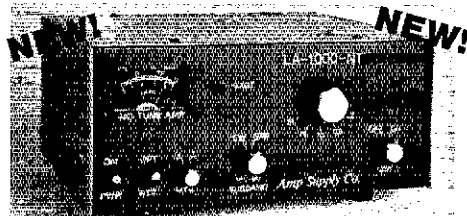
AT-1200

The AT-1200 antenna tuner is the perfect companion for the LA-1000A or any amplifier running up to 1200 watts input. It covers 1.8 to 30 MHz, has an antenna selector switch for 3 coax positions and 1 long wire or balanced feedline, and a built in SWR bridge and meter.

AT-1200 \$189.50*

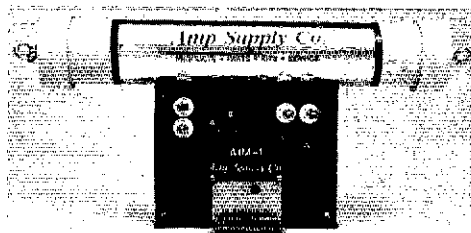
BL-1500 9:1 5 KW Balun \$29.50*

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More contacts, eliminate tune-up time, and less tune-up interference are yours with the NEW LA-1000-NT. The NO TUNE LA-1000 offers full coverage of the 160-15 meter amateur bands. A powerful 1200 watts PEP input and 800 watt DC input is the power rating of the LA-1000-NT. As with all Amp Supply Amplifiers, the NO TUNE LA-1000 features QSK, full break-in CW, Computerized CW and Keyboard Operators will love conversation-like full break-in (QSK) CW. If you desire a compact kilowatt amplifier that needs no tuning and you have a transceiver capable of delivering 100 watts PEP—The LA-1000-NT is the perfect addition to your radio station!!

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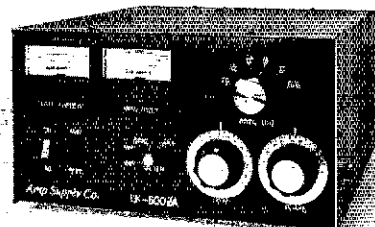
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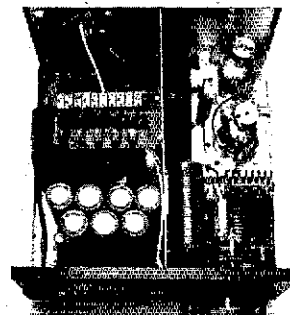
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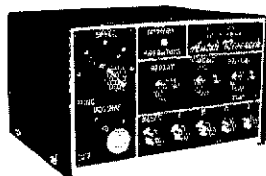
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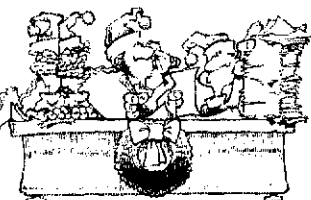
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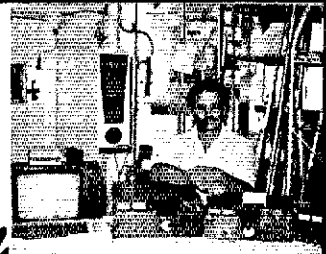


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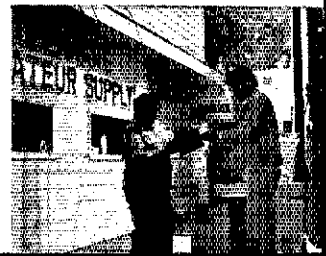
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You can select 3 optional \$80 Fox Tango filters for your TS430S: SSB Narrow (1.8 or 2.1KHz bandwidth), CW Narrow (250 or 400Hz), and AM (5.0KHz). To improve CW or AM reception, you must use one of the filters indicated. For SSB there is a choice: you can add one of the narrow filters, or you can use the Improved Filter Cascading Kit.

We recommend the Cascading Kit because it is more effective. It benefits both SSB and CW reception without affecting the other modes or TX. When you just add a narrow SSB filter, the mode switch lets you select either the stock (2.4KHz) filter or the narrow one. Either way, the I-f signal passes through only one filter — the other is idled in the Fox Tango Cascading Kit two filters are active: the signal first passes through the stock filter and, near the end of the I-f chain, through a second filter — the high quality 8-pole Fox-Tango 2.1 KHz unit and its amplifier board. Here are the results:

	BEFORE (with Stock SSB)	AFTER (with Cascade Kit)
-30dB Bandwidth	3.2 KHz	2.15KHz
IMD Dynamic Range	85dB	100dB (50KHz Spacing)
Idle Noise (I-F)	0dB (Reference)	-4dB (below reference)

The narrower bandwidth improves selectivity. The greater dynamic range reduces QRM. The reduced noise makes weak-signal reception easier. And, as a bonus, the Shift control works much better. Installation is inboard, instructions are complete, no drilling is required, and only a few soldered connections are needed. However, skill is necessary; your dealer can help if desired.

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NEW!

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Products

Communications Electronics,™ the world's largest distributor of radio scanners, is pleased to announce that *Bearcat* brand scanner radios have been acquired by Uniden Corporation of America. Because of this acquisition, Communications Electronics will now carry the complete line of Uniden *Bearcat* scanners, CB radios and Uniden *Bandit*™ radar detectors. To celebrate this acquisition, we have special pricing on the Uniden line of electronic products.

Bearcat® 300-E

List price \$549.95/CE price \$339.00
7-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC Bands: 32-50, 118-136 AM, 144-174, 421-512 MHz.
 The *Bearcat 300* is the most advanced automatic scanning radio that has ever been offered to the public. The *Bearcat 300* uses a bright green fluorescent digital display, so it's ideal for mobile applications. The *Bearcat 300* now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys. Separate Band keys to permit lock-in/lock-out of any band for more efficient service search.

Bearcat® 20/20-E

List price \$449.95/CE price \$269.00
7-Band, 40 Channel • Crystalless • Searches AM Aircraft and Public Service bands • AC/DC Priority Channel • Direct Channel Access • Delay Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz.
 Find an easy chair. Turn on your *Bearcat 20/20* and you're in an airplane cockpit. Listening to all the air-to-ground conversations. Maybe you'll pick up an exciting search and rescue mission on the Coast Guard channel. In a flash, you're back on the ground listening as news crews report a fast breaking story. Or hearing police and fire calls in your own neighborhood, in plenty of time so you can take precautions. You can even hear ham radio transmission, business phone calls and government intelligence agencies. Without leaving your easy chair. Because you've got a *Bearcat 20/20* right beside it.

The *Bearcat 20/20* monitors 40 frequencies from 7 bands, including aircraft. A two-position switch, located on the front panel, allows monitoring of 20 channels at a time.

Bearcat® 210XL-E

List price \$349.95/CE price \$209.00
6-Band, 18 Channel • Crystalless • AC/DC Frequency range 32-50, 144-174, 421-512 MHz.
 The *Bearcat 210XL* scanning radio is the second generation scanner that replaces the popular *Bearcat 210* and 211. It has almost twice the scanning capacity of the *Bearcat 210* with 18 channels plus dual scanning speeds and a bright green fluorescent display. Automatic search finds new frequencies. Features scan delay, single antenna, patented track tuning and more.

Bearcat® 260-E

List price \$399.95/CE price \$249.00
8-Band, 16 Channel • Priority • AC/DC Frequency range 30-50, 138-174, 406-512 MHz.
 Keep up with police and fire calls, ham radio operators and other transmission while you're on the road with a *Bearcat 260* scanner. Designed with police and fire department cooperation, its unique, practical shape and special two-position mounting bracket makes hump mounted or under dash installation possible in any vehicle. The *Bearcat 260* is so ruggedly built for mobile use that it meets military standard 810C, curve y for vibration rating. Incorporated in its rugged, all metal case is a specially positioned speaker delivering 3 watts of crisp, clear audio.

NEW! Bearcat® 201-E

List price \$279.95/CE price \$179.00
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NEW! Bearcat® 180-E

List price \$249.95/CE price \$149.00
8-Band, 16 Channel • Priority • AC only Frequency range: 30-50, 138-174, 406-512 MHz.
 Police and fire calls. Ham radio transmissions. Business and government undercover operations. You can hear it all on a *Bearcat 180* scanner radio. Imagine the thrill of hearing a major news event unfold even before the news organizations can report it. And the security of knowing what's happening in your neighborhood by hearing police and fire calls in time to take precautions. There's nothing like scanning to keep you in-the-know, and no better way to get scanner radio performance at a value price than with the *Bearcat 180*.

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The first no-crystal programmable handheld scanner.
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Frequency range 10 kHz to 30 MHz.
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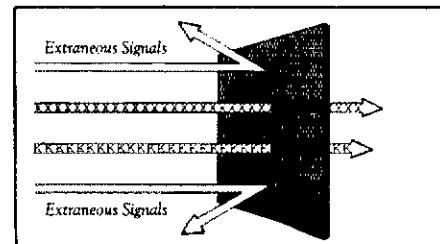
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List price \$159.95/CE price \$99.00
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Uniden® PC33-E

List price \$59.95/CE price \$44.00
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Uniden® PC55-E

List price \$89.95/CE price \$59.00
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avoid any conflict. Also if U plan to have an ARRL sanctioned affair, ask for the forms needed. Savannah area hams were ready for Diana & Isadore, but fortunately the storms reared to the NE. Well organized local nets are of the most importance in many instances & can save lives. If U are an Extra or Advanced licensee & desire to be a VE, please write to ARRL Hq. for the forms. Tnx to W4KGP KK5M & KA4HHE for FB job during exercise Night Tango. Macon gang agn helping with security at GA State Fair. BGMRPC at Newnan 84-85 officers: W5AN, pres.; WD4PIF, v.p.; W5ARDH, secy./treas.; WD4PTH, act.; WD4PAH, fin. Albany ARC getting gud results from their new classes. Tnx to all the instructors in the section who are taking time to teach & bring forth some FB hams to the Georgia section. If UR ARRL membership expires & U hold an appointment it will be cancelled. So please renew when U receive the notice. There are now three FCC approved "OOs" in the section. We still need more. Won't U let me know who U are? Rome had another fine hamfest. Crowd, WX &, of course, the BBQ were on as ever. GSN is getting more ops but short of what it should be with over 8000 hams in the section. Owing to military transfers, ARC of Columbus elected W4FIZ, pres & NO4U, v.p. As Ol' Man Winter approaches we don't know what we will be in for, but I know that if any of U can assist in any way U will help Ur fellow man. Best of the Holiday Season to all, & I hope that you'll get that new piece of equipment U have been longing for. Traffic: W4JWU 141, W4PIM 98, KANM 34, K4VH 2, AA4TT 24, K4AII 24, W4HON 18, K4EV 17, W4BIA 16, N4BWS 16, N4UJ 13, K4IIG 6.

NORTHERN FLORIDA: SM, Phil O'Dwyer, WF4X — ACC: N4ADI, SEC: W4UEA, STM: W4G4U, PIO: W4A4PUP, SGL: KC4N, BM: KB4LB, OO/RFI: K4JJE. Congrats to K4JJE on rapid upgrade to FCC Auxiliary status. Many thanks to John, W4GUJ, our past Bulletin Manager. John asked to be relieved so please join me in welcoming our new BM, KB4LB, who seems to find time for everything. The RKC News people called W4A4PUP for info on hams who could give them inputs on Diana, so he referred them to K4FEH in Georgia who provided the services they were seeking. Congrats to So Fla Section on being first in US in traffic last year; we did pretty well as we were 7th — this is computed on SAs and traffic reported on them, so let's plan on being first in 1985! That super close call on most of my certificates is by courtesy of Paty, W4PUO, and I truly appreciate her help as well as that of all of our League Officials! Many thanks to our clubs, PIAs and ECs for the fine newsletters you've been sending me. Don't forget the ARRL Information Net each Sat at 8 A.M. Eastern, with KB4T as NCS and Evelyn, W4WYR, doing a FB job. Recent decisions by the FCC on repeater frequency assignments point out the credence they give to our Repeater Councils, so remind your club officials that it's time to renew support of our council. N4PL and W4GUJ were champs on reading bulletins on HF and W4HMD did yeoman duty on our local VHF net. I will welcome any suggestions you send on how our ARRL can be more effective, and would truly appreciate some DX input for this column. Traffic: WF4X 488, N4PL 342, WX4H 317, WF4Y 317, W4AQXT 285, N4EDH 252, W4BADL 222, N4HMD 189, KC4VK 165, KB9LT 161, W44EYU 154, KB4LB 121, W4G4U 111, N4GMU 105, KD4KK 104, W4GUJ 97, KF4U 93, K4VND 83, WD4HO 76, W4B4TZ 73, W4DTY 71, WD4HP 70, W4MGO 68, K4LPT 63, WD4EQB 59, W4BYG 56, KC4FL 54, NF4O 52, WD4JDU 44, WD4MLQ 44, WX4J 43, W4JUI 42, W4KIX 41, N4JAC 33, KF4RR 30, KF4TM 28, N4ADI 27, K4KAC 27, W4AAWG 23, NQ4P 23, N4C4 22, K4ACV 20, N4JH 17, W44FJY 16, W4M 15, N4LF 14, W4RIG 8, N4IIF 8, W4A4PUP 7, N4BOY 6, W4A4PUO 5, W4A4ST 2, N4AF 2.

SOUTHERN FLORIDA: SM, Richard D. Hill, W4PFK — SEC: W4SS, STM: K4ZK, TC: KI4T, BM: W44EIC, ACC: AA4WJ, PIO: W4WYR, SGL: KC4N, OO/RFI: W4SS, W44EIC reports total bulletin activity of 338 bulletins received and transmitted this month. Bulletin stations reporting were W44EIC 111, WD4KBW 27, W4DL 57, AA4BN 22, W4ESH 20, WT4F 37, K4IEK 24 and AA4MI 40. W4JM reports he is now assistant EC for Polk Co. W4LLA ran 31 phone patches this month. KE4O is subbing on TCC and is hoping for a permanent assignment. The South Brevard ARC Message Fair relayed 42 messages via packet radio to N2WX, who then relayed these to QFN or packet QSP at other stations. Coopnet. Saw in the Ft. Myers ARC Modulator that W4PFI had won the L'Etroit CW Contest for the second straight year at Malbourne. Congrats to KA4AMC who passed his Extra Class exam in early October. K4ZK has updated the "EMERGENCY OPERATIONS SCHEDULE FOR FLORIDA SECTION NETS," and mailed it to the net managers and other League Officials. K4IA prepared an interesting breakdown of QFN statistics. In addition to the regular roster, he provided a list by date showing the NCS, QNI, QTC, QND and rate for both early and late sessions. KB5W, manager of RN5c4 is trying to get a RN5 RTTY net going to back up the Christmas rush. Anyone interested should contact either KB5W or W5GHP. 73 de W4A4PFK. Traffic: W3CUL 3840, K4ZK 3752, W4PFI 2777, W4A4E 252, W44EIC 225, W4NFK 211, K4SC 202, K4EJ 181, KA4GUS 156, W4WYG 141, K4IA 127, W4DL 113, KA4AMC 95, N2WX 95, W4A4XU 88, W44AD 86, W4DVO 76, N4KFU 76, KF4RL 64, KF4JA 62, KA4NFX 62, K4FQS 58, AA4BN 54, KA4YHS 51, W44AWN 50, W4ESH 50, KE4O 48, AF3S 45, W4LLA 44, W4DKBW 43, AA4MI 40, W4PKP 39, W3TLV 34, W4B9E 34, KA4GDU 33, K4JI 32, K4A4PZ 31, K5IHH 30, WT4F 30, W4GCK 30, KB4KB 28, K4DGR 26, K9ALX 24, W4SS 24, K4BAKY 22, WBSST 20, KB4AXG 20, W4WYR 19, K4JLL 17, N4JO 15, W44LK 14, K44BBA 14, N4KB 13, N4X4 12, K4IRT 12, KA4RVN 10, K44XQ 8, K4EBO 8, W4KDD 8, W4JLR 8, W4JM 8, W4K4F 7, KA4SH 7, W4ROA 8, K4OCY 7, W4DMCC 5, W4MPD 4, W4SHP 4, KB4ELQ 4, W4V4F 2. (Aug.) K5IHH 32, W44YNO 1.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzer, N7EH — STM: W7EP, NMs: K6LL, W7CAG, KA7HEV. The start of the school season has also started rise in public service activities by Arizona amateurs. The Cocooning ARC reports the following provided comm. for the 15K run sponsored by the Diabetes Assn.: N7FU, W47XK, KD7XS, KA7DH, N7GXF, W7KAX reports the following help with comm. for the Kingman A-2 100 + 1 Parade: W7KAX, N7BU, KA7JY, W7B8O, W7B4Z, W7CBA, W47XXC, K4TES, KA7FD, W7BYQ, KB8O, W7STN, W4RFWA, W4YCP, KA7AVO, W7R5F, W7PZD, N7GOC. W7YS reports all is set for Flagstaff's volunteer exams in November, while W7OY reports that Tucson's volunteer exams are set for December. The Green Valley ARC reports it is sponsoring an evening dinner in November for 9N1MM. The Mingus Mtn. RC present special service plaques to the following: KB7CN, N7CQ, KW7D, W7FEM, W7JCW, W7NGK, W47UD



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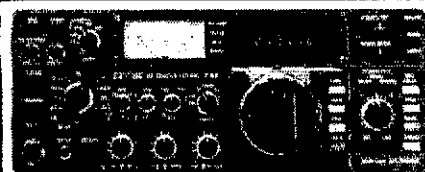
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- *FL-54 270 Hz CW filter (1st IF)..... 47.50
- *FL-52A 500 Hz CW filter (2nd IF)..... 96.50 89⁹⁵
- *FL-53A 250 Hz CW filter (2nd IF)..... 96.50 89⁹⁵
- *FL-44A SSB filter (2nd IF)..... 159.00 144⁹⁵
- SM-5 8-pin electret desk microphone..... 39.00
- HM-10 Scanning mobile microphone..... 39.50
- MB-12 Mobile mount..... 19.50

*Options also for IC-745 listed below

- IC-730 8-band 200w PEP xcvr w/mic \$829.00 569⁹⁵
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- FL-44A SSB filter (2nd IF)..... 159.00 144⁹⁵
- FL-45 500 Hz CW filter..... 59.50
- EX-195 Marker unit..... 39.00
- EX-202 LDA interface; 730/2KL/AH-1..... 27.50
- EX-203 150 Hz CW audio filter..... 39.00
- EX-205 Transverter switching unit..... 29.00
- SM-5 8-pin electret desk microphone..... 39.00
- HM-10 Scanning mobile microphone..... 39.50
- MB-5 Mobile mount..... 19.50

IC-720A 9-band xcvr/1.30 MHz rcvr \$1349.00 869⁹⁵

- FL-32 500 Hz CW filter..... 59.50
- FL-34 5.2 kHz AM filter..... 49.50
- SM-5 8-pin electret desk microphone..... 39.00
- MB-5 Mobile mount..... 19.50
- IC-745 9-band xcvr w/1.30 Mhz rcvr \$999.00 789⁹⁵
- PS-35 Internal power supply..... 160.00 144⁹⁵
- CFJ-455K5 2.8 kHz wide SSB filter..... 4.00
- HM-12 Hand microphone..... 39.50
- SM-6 Desk microphone..... 39.00

See IC-740 list above for other options ()



IC-751 9-band xcvr/1.30 MHz rcvr \$1399.00 1199

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- FL-53A 250 Hz CW filter (2nd IF)..... 96.50 89⁹⁵
- FL-33 AM filter..... 31.50
- FL-70 2.8 KHz wide SSB filter..... 46.50
- HM-12 Hand microphone..... 39.50
- SM-6 Desk microphone..... 39.00
- CR-64 High stability reference xtal..... 56.00
- RC-10 External frequency controller..... 35.00
- MB-18 Mobile mount..... 19.50

Options: 720/730/740/745/751 Regular SALE

PS-15 20A external power supply..... \$149.00 134⁹⁵

EX-144 Adaptor for CF-1/PS-15..... 6.50



Options - continued Regular SALE

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- EX-310 Voice synth for 751, R-71A..... 39.95
- SP-3 External base station speaker..... 49.50
- Speaker/Phone patch - specify radio..... 139.00 129⁹⁵
- BC-10A Memory back-up..... 8.50
- EX-2 Relay box with marker..... 34.00
- AT-100 100w 8-band automatic ant tuner..... 349.00 314⁹⁵
- AT-500 500w 9-band automatic ant tuner..... 449.00 399⁹⁵
- AH-1 5-band mobile antenna w/tuner..... 289.00 259⁹⁵
- PS-30 Systems p/s w/coord, 6-pin plug..... 259.95 233⁹⁵
- OPC Optional cord, specify 2 or 4-pin..... 5.50
- GC-4 World clock..... 99.95 94⁹⁵

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- IC-551D 80 Watt 6m transceiver..... \$699.00 599⁹⁵
- EX-106 FM option..... 125.00 112⁹⁵
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- EX-144 PS-15/CF-1 fan adaptor..... 6.50
- AG-35 Mast mounted preamp..... TBA
- IC-271A 25w 2m FM/SSB/CW xcvr..... 699.00 619⁹⁵
- PS-25 Internal power supply..... 99.00 89⁹⁵
- AG-20/EX-338 2m preamplifier..... 56.95
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- AG-1 Mast mounted 15dB preamp..... 89.00
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Common accessories for 271A/H and 471A/H

- SM-6 Desk microphone..... 39.00
- EX-310 Voice synthesizer..... 39.95
- TS-32 CommSpec encode/decoder..... 59.95
- UT-15 Encoder/decoder interface..... 12.50
- UT-15S UT-15S w/TS-32 installed..... 79.95

VHF/UHF mobile multi-modes

IC-290H 25w 2m SSB/FM xcvr, TTP mic 549.00 489⁹⁵

IC-490A 10w 430-440 SSB/FM/CW xcvr 649.00 579⁹⁵

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IC-37A Compact 25w 220 FM, TTP mic 449.00 399⁹⁵

IC-47A Compact 25w 440 FM, TTP mic 469.00 419⁹⁵

UT-16/EX-388 Voice synthesizer..... 29.95

IC-120 1w 1.2 GHz FM transceiver..... 499.00 449⁹⁵

ML-12 10w amplifier..... TBA

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IC-505 3/10w 6m port. SSB/CW xcvr \$449.00 399⁹⁵

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LC-10 Leather case..... 34.95

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| Deluxe models | Regular SALE |
| IC-02AT for 2m..... | 349.00 299 ⁹⁵ |
| IC-04AT for 440 MHz..... | 379.00 339 ⁹⁵ |
| Standard models | Regular SALE |
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| IC-2AT with TTP..... | 269.50 219 ⁹⁵ |
| IC-3AT 220 MHz, TTP..... | 299.95 239 ⁹⁵ |
| IC-4AT 440 MHz, TTP..... | 299.95 239 ⁹⁵ |

Accessories for Deluxe models Regular

- BP-7 425mah/13.2V Nicad Pak - use BC-35..... 67.50
- BP-8 800mah/8.4V Nicad Pak - use BC-35..... 62.50
- BC-35 Drop in desk charger - all batteries..... 69.00
- BC-60 Six position gang charger - all batts..... TBA
- BC-16U Wall charger - BP7/BP8..... 10.00

Accessories for both models Regular

- BP-2 425mah/7.2V Nicad Pak - use BC35..... 39.50
- BP-3 Extra Std. 250 mah/8.4V Nicad Pak..... 29.50
- BP-4 Alkaline battery case..... 12.50
- BP-5 425mah/10.8V Nicad Pak - use BC35..... 49.50
- CA-2 Telescoping 2m antenna..... 10.00
- CA-5 1/2-wave telescoping 2m antenna..... 18.95
- FA-2 Extra 2m flexible antenna..... 10.00
- CP-1 Cg. lighter plug/coord - BP3 or Dlx..... 9.50
- DC-1 DC operation pak for standard models..... 17.50
- LC-02AT Leather case for Dlx models w/BP-7/8..... 39.95
- LC-2AT Leather case for standard models..... 34.95
- LC-11 Vinyl case for standard models..... 17.95
- LC-14 Vinyl case for Deluxe models w/BP-7/8..... 17.95
- RB-1 Vinyl waterproof radio bag..... 30.00
- HH-SS Handheld shoulder strap..... 14.95
- HM-9 Speaker microphone..... 34.50
- HS10 Boom microphone/headset..... 19.50
- HS-10SA Vox unit for HS-10 (dlx only)..... 19.50
- HS-10SB PTT unit for HS-10..... 19.50
- ML-1 2m 2.3w in/10w out amplifier..... SALE 79.95
- ML-25 2m 2.3w in 20w out amplifier..... SALE 179.95
- SS-32M Commspec 32-tone encoder..... 29.95

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- EX-310 Voice synthesizer..... 39.95
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- CR-64 High stability oscillator xtal..... 56.00
- R-70 100 Khz-30 Mhz digital receiver..... 749.00 569⁹⁵
- EX-257 FM unit..... 38.00
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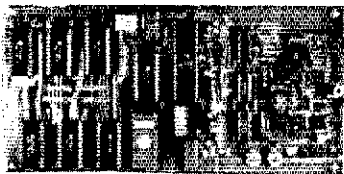
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Virginia residents add 4% sales tax

WB7VUU WA7VWG WA7WAH WA7VDZ W7WGW WA7DZD. The Western AZ RC will issue a special certificate to any amateur QSO with a club member on all bands including 2M. PSRR this month goes to KB7FE. SWN: QNI 148, QTC 144. ATEN: QNI 954, QTC 129. Traffic: KB7FE 368, WTAMM 212, W7EP 181, K8LL 80, KA7HEV 46, W7KXE 37, WB7CAG 32, K7POF 30, WA7KRG 22, KF6TF 11, K7JKM 10, WB3LQ 9, K7NMQ 7, K7GH 4, WA7NXL 3. (Aug.) W7EP 127, KE7W 2.

ORANGE: SM, Sandra Heyn, WA6WZN — SEC: WBUBQ. STM: WA6QCA, ACC: KA6NLY, BM: WB6CXL, OO/RFI: Coord: W6RE, PIO: NS6W, SGL: N6HIQ, TC: AA6DD, DECs (by counties): WB6JB (Orange); W6LKN (Riverside); WA6IKH (San Bernardino); KA6Hil (Inyo). Congrats to KB6CYD on South Orange Co. EC appointment. Bishop ARC has new repeater at 148.0181 K6PWR. Mazurka Peak repeater near Big Pine on 148.16176 is now W6ZDIF. If you are interested in San Bernardino Microwave Society, contact secy. K6HJL. Victor Valley ARC provided comm for "Pow-Wow Days" parade including WD8CHR, K6ESDS, KB6BLD, K6EPS, W6FHY, N6KNA and WA6ICA. EC WA6OPS reports successful seventh birthday celebration of club station WD6BPT at St. Jude hospital. Coachella Valley ARC has changed meeting night to first Monday; their Novice class is taught by W6BBY and KA6IYS. Southern Calif. DX Club weekly DX roundtable held 7:30 P.M. Thursdays on their repeater AD6P/R 145.48 (-8) located on Mt. Lukens. N6WV is Orange Co. area contest coordinator for Southern Cal. Contest Club. N6GZP, v.p. of Southern Counties Amateur Teleprinter Society is new editor of their newsletter, "Scatter." Inland Empire RTTY Network announced new RTTY net 8 P.M. Thursdays on 145.70 MHz simplex. SCRRBA (Southern Calif. Repeater & Remote Base Assn.) held open meeting in which Southern Calif. 23 cm bandplan revised for the next three years. SCRRBA noted that new links and controls will be best coordinated on 23 cm since 70 cm coordination is closed for the Orange Co./Los Angeles area. Director WA6WZO announced 1985 Southwestern Division convention to be held August 9-11 on the Queen Mary in Long Beach. PSRR: W66TIF, WB6QBZ, WA6QCA, KA6HJK/T. Net: Time QNI QTC NM

SCN/1 (20+) 3598 7 P.M. 200 175 A16
SCN/2 (13-) 3598 8:15 P.M. 123 53 K76D
SCN/V (FM) 148.645 9 P.M. 471 388 WA6QCA
RTTY/VHF 145.12 9 P.M. 410 155 KA6HJK

Traffic: KA6HJK 236, WA6QCA 162, W6RE 161, WB6TIF 150, K6GGS 128, WB6QBT 116, N6GOT 106, AD8A 78, A16E 31, W6CPB 22, W6PNS 12, K6ZCE 6, W6TKV 2, WA6WZN 1.

SAN DIEGO: SM, Arthur R. Smith, W6INI — ACC: WA6CDE, TC: N6NRR, BM: WA6HJJ, STM: N6GW, SEC: W6INI, PIO: K6GLF. Upgrade to Advanced: K6GLF, ex-WA6CUP. Newcomers to Amateur Radio are always welcome to visit their local club. Why not drop in on one of the following starting times are 7:30 P.M. 1st Tue: North Shores ARC, Clairemont Sec. Cen, 3605 Clairemont Dr., S. D. 1st Wed: Palomar ARC, Glendale Federal, E. Vista Wy at Anza Vista, 1st Thur: South Bay ARS, Norman Center, 270 F St, Chula Vista, and Convair ARC, Convair Rac, Clairemont Mesa Blvd at Mission Rd. 2nd Mon: 220 Club, Sierra Mesa Rec Cen, 9020 Village Glen Dr., S. D. 2nd Thur: ARC of El Cajon, Parkway Jr Hi, 9009 Park Plaza Dr., La Mesa. 3rd Tue: Poway ARS, 1st Baptist Ch, 13604 Midland Rd., Poway. 3rd Thur: SD RA, County Education Cen, 6401 Linda Vista Rd., S. D. 4th Mon: Escondido ARS, Glendale Federal, 1505 E. Valley Pkwy, Escondido. Listing to be continued. NCTN met 29 times, handled 115 messages & sessions with 24 check-ins. Traffic: KJ6D 349, KT6A 343, KB6A1 91, W6HUJ 46, WA6IK 28, N6GW 11.

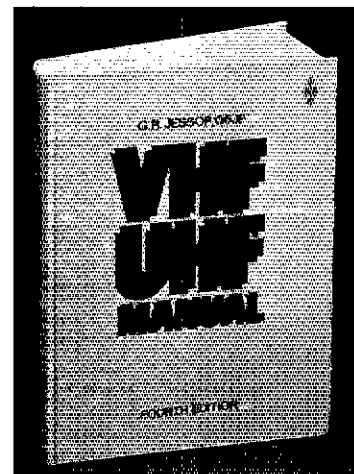
WEST GULF DIVISION
NORTHERN TEXAS: SM, Phil Clements, K6PC — ASM/ACC: N15V, SEC: W5GPO, STM: AE5I, BM: W5QXK, PIO: N5FDL, OO/RFI: W5JBP, SGL: W5UXP. As you read this, work is being completed on computerizing all the section appointee files. I hope this effort will help in giving more efficient service to the membership. Many thanks to our Asst. SM N15V for keeping all the ARES records for the past few years. Please mark Feb. 19 on your calendar and be sure to attend "Stormcom '85" in Dallas. A must for all DECs and ECs and ARES members. An all-new program is planned for this year. It is hoped that all major cities in our Section will send CD officials, and this is our chance for ARES/RACES PR and another good "eyeball QSO" with our served agencies. PSRR: K5UPN KA5AZK N5EZM N5BT KD5FR. Traffic: N5BT 389, K5UPN 306, KD5RC 225, KA5AZK 177, AE5I 169, KD5FR 104, W5OYL 46, N15V 43, W5ASEZT 21, W5QU 20, K5PC 13, N5FDL 8, N5GKF 5, N5EZM 3.

OKLAHOMA: SM, Ray Miller, W5REC — SEC: W5ZTN, STM: KV5X, ACC: K5CAY, BM: W5AS, PIO: N5JY, SGL: W5NZS, STC: W5QML. This is our Leadership team doing a great job! Let them know where you want to help. ATTENTION: ECs, get your annual reports (green sheets) filled out and mailed even though you may not have had a SET. W5LFL was the Grand Marshall of the Cherokee Strip Parade, with the Enid ARC members WD5IFB, K5CAY, WA5FVJ, WD5HUT, KA5BA, WA5UJF, KA5LST, W5LHU and NG5P providing the communications. ATTENTION: All affiliated clubs, get your annual reports ready by the end of the year and mailed. (Send the name of your RFI Committee Chairman to the SM, N55N.) WA5OUV received Certificate of Merit for serving as Net Manager of OTWN for 11 years; thanks O.C.I. K5ENA, WA5KBJ and N55N report that the TRC is now operating a 2-meter net; thanks! K5EZE received a Certificate of Merit for 10 years of check-in on OPEN for over 2 years! With this September News, my appointment ends. It has been my humble pleasure to serve you. Thanks to every one of you for your work; it has made the OK Section, MERRY CHRISTMAS and God Bless. Traffic: W5AS 297, KB5EK 183, K5CXP 172, W55SRX 158, W5RB 166, W5VXU 103, K15P 99, N5GTP 86, WA5OUV 69, W5REC 56, NQ5W 50, WD5IFB 48, NR5L 41, W55UG 39, W5L5W 32, N5H1H 30, W5VOR 30, K5CAY 28, K5QBN 28, W5V1W 26, WA5OGC 25, KA5FUU 24, WA5IMO 23, WD5JCE 21, K5ENA 10, W5AZD 10, KQ5OU 11, NG5P 11.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR — ASM: N5TC, STM: K5QEV, SEC: KA5KRI, ACC: K55V, KA5OIZ, who has celebrated her 39th birthday about 45 times, still working on theory for upgrading; making good time with code and QSOs. OBS N5TC made 23 readings on 8 nets, Hill Country ARC (Kerrville) 2-Meter Net meets Mondays at 7 P.M. local time on 146.371.97. Kendall Co. Emergency Net meets Mondays at 7:30 P.M. local time on 146.04/64. Comal Co. Emergency Net meets Thursdays at 8:30 P.M. on 147.75/15 in New Braunfels. Those who can get into the above repeaters are invited to join in. ORS W5KLV

gave 56 bulletins and 4 propagation forecasts 114 readings on 8 nets!! CAND Manager W5KLV reports 877 messages handled in 30 sessions; DRNs represented 100% by South Texas stations N5DFO N5EFG WB5EPA WB5FQU W5KLV KD5KQ and WB5YDD. CHARRO (Brownsville) has new Saturday coffee meeting place at Sheraton Royale on Highway 77 just north of the Sunrise Mall; BE THERE, starting at 10 A.M. DRN5 Mgr WB5YDD reports Southern Texas represented 100% by N5AMH W5KLV WB5FQU WB5EPA K55V N5DFO W5CTZ KD5KQ W5URN K5OWK N5EFG KE5ER K5GDX WB5YDD. Texas Southmost ARC (Harlingen) all set to give expert communications service to International AIRSHOW 84 for the Confederate Air Force; also set to give the very first AR Examinations in the Rio Grande Valley by AR ops on Dec. 29th. Traffic: WB5YDD 510, W5KLV 324, K55V 248, N5DFO 125, W5BGE 87, WB5EPA 77, W55MMI 58, W5CTZ 51, W5GSKH 16, (Aug.) N5TC 118, W5BGE 44, K5HZR 6.

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(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" x 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November QST. If the 20th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in QST advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of QST will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or characters of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed. F. Pleuter, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. Box AA, Mamaronack, NY 10543 for details.

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ATTENTION MORSE Telegraphers. Join Morse Telegraph Club. Meet old wire friends, swap experiences. Where and when do we meet? Contact John Holman, W3INV, 1 Beth Circle, Malvern, PA 19355. 215-644-2471.

FOR SALE: Large wall calendar with AMATEUR RADIO printed in top half. Excellent gift at \$4 each, including USA mailing. Enclose self-addressed mailing label. W6LS, 2814 Empire, Burbank, CA 91504.

PLAN YOUR 1985 vacation in the Beautiful Black Hills of South Dakota. The Black Hills Amateur Radio Club will be hosting the 1985 Dakota Division Conference July 5, 6, 7 in Rapid City. New equipment exhibits, flea market, YL activities, seminars, awards, Amateur exams, barbecue buffalo available at Saturday night smorgasbord. All past members of BHARC, please QSL KX0U, Gene F. Bauer, 713 Blaine Ave., Rapid City, SD 57701.

THANK YOU for attending Warren, Ohio Hamfest. See you August 18, 1985.

INDIANA: South Bend Swap & Shop, Jan. 6 at the Century Center downtown, on U.S. 33, ONEWAY north between St. Joseph Bank Building and river. Half-acre on carpeted floor. Industrial history museum in same building. Four-lane highways to door from all directions. Talk-in 52-52 & area repeaters. Sponsored by Repeater Valley Hamfest Committee. Contact Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46818, Telephone 219-233-5307.

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STAMP brings QSL catalog of new designs and samples, from \$7 up. 22 years custom printing. WA6SOK, 4056 Acacia, Riverside, CA 92503.

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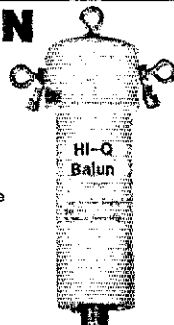
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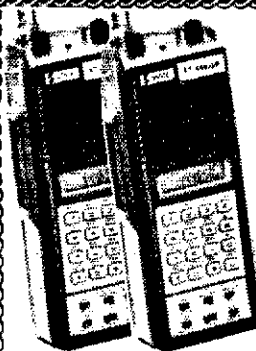
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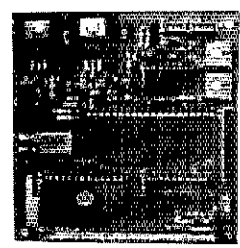
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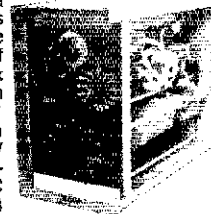
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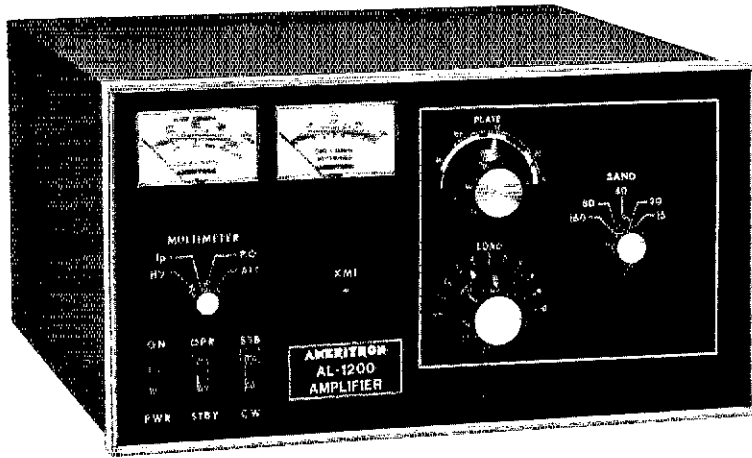
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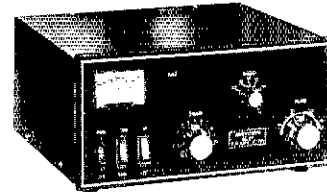


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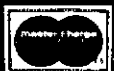


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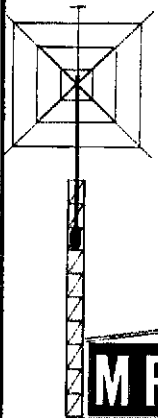
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THE ARRL FOUNDATION, INC.
"for the advancement of amateur radio"

December 1984

Dear Friends:

Happy Holidays and a 1985 full of Amateur Radio Fellowship to each and everyone sharing our great hobby.

We, the Officers and Directors of The ARRL Foundation, urge you to continue to support, financially, our programs. Your contribution will strengthen our efforts to enhance Amateur Radio. We urge you to "leave your Mark on the Future". Please make out your check to The ARRL Foundation, Inc., and identify your tax-deductible contribution, as follows:

1. ARRL Scholarship Endowment Fund Honoring Senator Barry Goldwater.
2. The Past President of ARRL Vic Clark, W4KFC, Endowment Fund.
3. Amateur Satellite Fund.
4. Jesse Bieberman Memorial Meritorious Membership Program.
5. Paul and Helen L. Grauer Scholarship Program.
6. Perry F. Hadlock Memorial Scholarship Fund.
7. General Fund.
8. Any of the above in memory of someone you love.

73 de

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QUALITY POWER accessories. SO-1 Standoffs \$34.50, SO-2 Standoffs \$59.50, PO-1 pulley kits \$8.50, GP-81 and GP518 Ginpole Kits \$129.50, MA-2 Mast Adapters \$22.50, BG-18 Ladder mast for big beams \$249.50. Free catalog IIX Equip. Ltd., P.O. Box 9, Oak Lawn, IL 60454. 312-423-0605. VISA-Mastercharge.

SOLAR ELECTRICITY and wind energy components for Ham Radio and recreation. \$3 for product information refundable with purchase. SPECS Inc. P.O. Box 155, Montrose, CA 91020.

ONV Safety Belts \$69.95 + \$3 handling. Box 886, Saddle Brook, NJ 07662, 201-368-3655 anytime UPI Communication.

MAGICOM RF Speech Processors for selected Kenwood, Drake and Yaesu equipment. Excellent speech quality — 6dB added average output. Affordable prices! SASE for data and cost. MAGICOM, P.O. Box 6552, Bellevue, WA 98007.

T1994A Ham Computer Programs. Write Sam Moore, AC5D, Box 368, Stigler, OK 74462.

WANTED: McIntosh tube gear! Marcus, WA9IXP, Box 385, Elm Grove, WI 53122.

CALL Toll-free 800-327-7798. Ask for Bob Hoffman, Jaro Electronics Corp. We buy all types of tubes. Top prices paid for Varian, Eimac, Amperex, RCA, Western Electric, Raytheon, in Florida Call toll free: 800-432-8524. Address 412 27th St., Orlando, FL 32802.

EXPERT SERVICE by W2YJ: all type Amateur Gear from newest handhelds to older tube rigs. 20 years experience. G. Krickovich, 47 Wren Ave., Lancaster, NY 14088, 716-684-3562 after 5 P.M.

REPAIR, ALIGNMENT, Calibration, Collins written estimates, \$25; non-Collins, \$50. K1MAN 207-495-2215.

\$33 TOUCHSTONE DECODERS - Commercial grade 16-digit Telair/Collins 7640-01, 12 Vdc, DTR and HL filtering, hexadecimal or HL outputs. New, guaranteed. Price includes decoder, crystal, socket, full documentation, UPS. SASE/brochure. Electrovalue Industrial, Box 376-Q, Morris Plains, NJ 07950. 201-287-1117.

TENNAEST - Antenna noise bridge out-performs others, accurate, cost less, satisfaction guaranteed, \$41. Send stamp for details, W8URR, 1025 Wildwood Rd., Quincy, MI 49082.

RTTY HEADQUARTERS: Authorized Dealers for "Hal" and "Info-Tech" products. You can't beat our prices! Call or write Dialta Amateur Radio Supply, 212-48th Street, Rapid City, SD 57702. 605-343-6127.

CX7 SERVICE. 415-549-9210, Mandelkern.

CONTESTERS-DXers-Vacationers — For Rent: One-bedroom beach house in St. Kitts with Cushcraft A4 tri-band beam at 45 feet with Ham IV rotor. Same location used by VPKBU during the 1984 ARRL International DX Contest-Phone. Includes hot shower and kitchen-and more. For rates, reservations or information call or write to: Colorado Amateur Radio, Inc. P.O. Box 719, Parker, CO 80134, 303-841-8444. We also carry most major lines of Amateur Radio equipment.

PROTECT your Bencher key. Rigid plexiglas cover \$9.95. George Chambers, KB6EJ, 302 S. Glendale Ave., Coffeyville, KS 67337.

WE BUY, Sell & Trade all types of new and used amateur radios, scanners, antennas & accessories. Huge selection. Shaver Radio, 1775A, S. Winchester Blvd., Campbell, CA 95008. 408-370-6685.

WANTED: MOTOROLA radios and parts. Charlie Tepper, 212-268-6535 evenings.

AMATEUR RADIO'S NEWSpaper — Worldradio. Latest info. One year subscription (12 issues) only \$10. Worldradio, 2120-A 28th St., Sacramento, CA 95818.

BEARING and DISTANCE chart. 23 pages of data lists antenna heading and distance to 600+ locations in the world. Computer-generated chart is based on your exact QTH. Users guide included. Allows you to aim your dipole or beam toward areas you wish to work. Legible print, bond paper, vinyl cover, shipped flat. \$10 complete (CA add 6-1/2%) Dawn Mackey, XYL NW6U, Box 1157, Felton, CA 95018. QSL for info/sample.

1985 CALLBOOKS: Either, \$18; both, \$34. Any 6 or more, \$18. "Low/Medium Frequency Scrapbook," Ken Cornell, 4th edition, \$3. 2/\$5. Radio Handbook, 22nd, edition, \$12. Postpaid U.S.; Century Print, 8059 Essex, Riverside, CA 92504-1599. 714-887-5910.

TEN-TEC 544 with CW filter, noise blanker and 262M power supply, as new, \$400. Drake MN-4C matching network, mint, \$100. Will include dust covers and hand mike. Don KB2FR, 609-429-4949.

RCA VIDEOVOICE transceivers, transmit pictures via audio. Only slightly used. Service Manual. Worth \$20-25,000. Asking \$1,800 each. Ralph E. Adams, 405-524-2471.

ROTOR RELIEF: The "D-LAY-5" brake delay works on CDE/Hy-Gain Ham II, Ham III, Ham IV, and Tailwister models. Refer to April 83 QST product review. Still only \$19.95 postpaid. Lance Johnson Engineering, Box 7363, Kansas City, MO 64116.

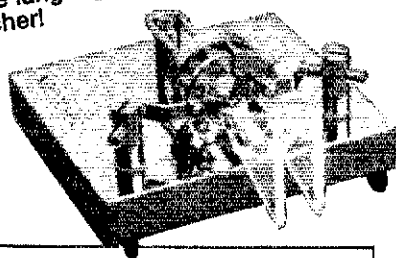
BOOKS BY John Kraus, W8JK: "Antennas," "The Antenna Bible," \$45. "Electromagnetics," new third edition, basic electromagnetic theory from capacitors to antennas, \$35. "Radio Astronomy" \$22.50. "Our Cosmic Universe," all about the new astronomies, \$9.50. "Big Ear," W8JK's science-adventure story from ham radio to exploration of the universe, \$4.50. Add \$1 per book for shipping anywhere. Cygnus-Quasar Books, P.O. Box 85, Powell, OH 43065.

YAESU FT-1012D, fan, speaker with phone patch SP-901P, microphone YD-148, instruction manuals. For sale as a unit, \$475. Handling and Shipping add \$25. K4DAY.

THE BEST- IS EVEN BETTER!!

Discerning CW operators world-wide have long recognized the Bencher Iambic Paddle as the finest paddle available at any price, but at Bencher we kept trying to make the best even better. And we've succeeded!!

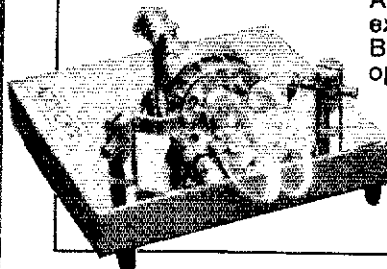
Bencher paddles now feature stainless steel needle bearings, all stainless fasteners and a stainless steel lifetime spring. And of course, gold plated pure silver contact points, polished Lucite finger pads, the massive leaded steel base and a full range of locking adjustments that made the Bencher paddle the hallmark of fine CW. Old-timer or new novice, you can't find a smoother, more responsive paddle for flawless keying, certain to make your CW operating a real pleasure. Remember, CW is the language of amateur radio - and no one speaks it better than Bencher!



BY-1	Black Base	\$ 46.95
BY-2	Chrome Base	\$ 59.95
BY-3	Gold Plated	\$150.00

NEW FROM BENCHER! A single lever, non-iambic paddle for the amateur who prefers the more traditional approach to electronic keying.

A paddle built to the same exacting standards that made Bencher famous among CW operators everywhere.



ST-1	Black Base	\$ 46.95
ST-2	Chrome Base	\$ 59.95
ST-3	Gold Plated	\$150.00

BENCHER 1:1 BALUN

3.5 - 30 mHz
Finest non-rust materials Rugged Cyclac case
Lightning protected, Built-in center insulator
Amphenol coax connector
Rated 5 KW, OK w/antenna tuners.

ZA-1A	Balun	\$21.95
HWK	2" Boom Mounting Kit	\$ 4.95



BENCHER AUDIO FILTER

Imagine! An Audio Filter for CW or SSB, with variable center frequency, bandwidth down to 90 hertz with sharp skirts, and NO RINGING! Eliminate tiring white noise. Makes the best receiver better. For solid QSO's out of garbage.



XZ-2	Audio CW Filter	\$ 69.95
AP-1	Accessory	\$ 9.95

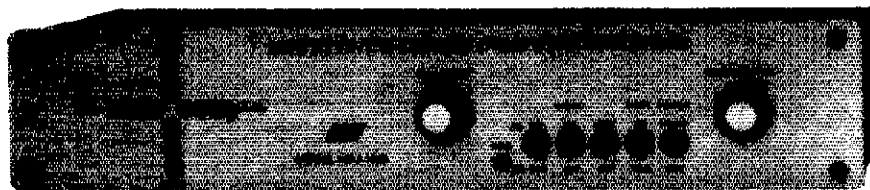
Bencher products are available at better dealers nationwide, or add \$3.00 handling per item.

BENCHER, INC.

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NEW FROM MFJ

MFJ'S MOST ADVANCED RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE HAS FM, AM MODES, LED "SCOPE" TUNING ARRAY, RS-232 INTERFACE, VARIABLE SHIFT TUNING, 170/850 Hz TRANSMIT, TRUE MARK-SPACE DETECTION.



MFJ-1229
\$ **179.95**

FREE MFJ RTTY/ASCII/CW software for C-64/VIC-20. Complete package includes MFJ-1229, software on tape, cables for C-64/VIC-20.

Engineering, performance, value and features sets MFJ's most advanced RTTY/ASCII/AMTOR/CW computer interface apart from others.

FM (limiting) mode gives easy, trouble-free operation. Best for general use, off-shift copy, drifting signals, and moderate signal and QRM levels.

AM (non-limiting) mode gives superior performance under weak signal conditions or when there are strong nearby stations.

Crosshair mark-space LED tuning array simulates scope ellipse for easy, accurate tuning even under poor signal-to-noise conditions. Mark and space outputs for true scope tuning.

Transmits on both 170 Hz and 850 Hz shift.

Built-in RS-232 interface, no extra cost.

Variable shift tuning lets you copy any shift between 100 and 1000 Hz and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII). Push button for 170 Hz shift.

Sharp multi-pole mark and space filters give true mark-space detection. Ganged pots give space passband tuning with constant bandwidth. Factory adjusted trim pots for optimum filter performance.

Multi-pole active filters are used for pre-limiter, mark, space and post detection filtering. Has automatic threshold correction. This advanced design gives good copy under QRM, weak signals and selective fading.

Has front panel sensitivity control.

Normal/Reverse switch eliminates retuning while checking for inverted RTTY. Speaker jack. +250 VDC loop output.

Exar 2206 sine wave generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone lines: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying for transceivers with FSK input. Has sharp 800 Hz CW filter, plus and minus CW keying and external CW key jack.

Kantronics software compatible socket.

Exclusive TTL/RS-232 general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL/RS-232 lines: RTTY demod out, CW demod out (TTL only), CW-ID in, RTTY in, PTT in, key in. All signal lines are buffered and can be inverted using an internal DIP switch.

Metal cabinet. Brushed aluminum front. 12 1/2 x 2 1/2 x 6 inches. 18 VDC or 110 VAC with optional AC adapter, MFJ-1312, \$9.95.

Plugs between rig and C-64, VIC-20, Apple, TRS-80C, Atari, TI-99 and other personal computers. Use MFJ, Kantronics, AEA and other RTTY/ASCII/AMTOR/CW software.

7-IN-1 RTTY OPERATING AID

MFJ-1221
\$79.95



Indispensable. Improves any RTTY station.

1. **Crosshair LED "scope" Tuning Array.** Makes tuning quick and easy with dead-on accuracy. Tune for maximum vertical and horizontal display.

2. **Scope Adapter.** Mark/Space outputs for scope.

3. **Shift Indicator.** LEDs indicate 170, 425, 850 Hz shift. Especially useful for RTTY outside ham bands.

4. **Sharp Mark and Space Filters.** Greatly improves copy under crowded, fading and weak signal conditions. For 170, 425, 850 Hz shifts.

5. **Normal-Reverse Switch.** Check for inverted RTTY without changing sidebands and retuning.

6. **Output Level Control.** Adjust signal level into TU.

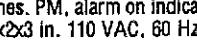
7. **Limiter.** Evens out signal variation for easier, smoother copy.

Plugs between receiver and TU. Mark is 2125 Hz and Space is 2295, 2550, or 2975 Hz. 10x2x6 inches. Uses floating 18 VDC or 110 VAC with AC adapter, MFJ-1312, \$9.95.

24/12 HOUR CLOCK/ID TIMER

Switch to 24 hour UTC or 12 hour format! Battery backup. ID timer alerts every 9 minutes after reset. Red .6 in. LEDs. Synchronizable to WWV. Alarm, Snooze function. Minute, hour set switches. PM, alarm on indicators. Gray/Black cabinet. 5x2x3 in. 110 VAC, 60 Hz.

MFJ-106 \$19.95



MFJ ELECTRONIC KEYS

MFJ-407
\$69.95



MFJ-407 Deluxe Electronic Keyer sends iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7x2x6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, \$9.95.

MFJ PORTABLE ANTENNA

MFJ's Portable Antenna lets you operate 40, 30, 20, 15, 10 meters from apartments, motels, camp sites, vacation spots, nearly any electrically clear location where space for a full size antenna is a problem.

A telescoping whip (extends to 54 in.) is mounted on self-standing 6x3x6 inch aluminum case. Built-in antenna tuner, field strength meter, 50 feet RG-58 coax. Complete multi-band-portable antenna system that you can use nearly anywhere. Up to 300 watts PEP.

MFJ-1621
\$79.95



MFJ ANTENNA BRIDGE

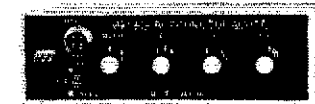
MFJ-204
\$79.95

MFJ Antenna Bridge. Trim your antenna for optimum performance quickly and easily. Read antenna resistance up to 500 ohms. Covers all ham bands below 30 MHz. Measure resonant frequency of antenna. Tells to lengthen or shorten antenna. Easy to use, connect antenna, set frequency, adjust bridge for meter null and read antenna resistance. Has frequency counter jack. Use as signal generator. Portable, self contained. 4x2x2 in. 9 V battery or 110 VAC with adapter, MFJ-1312, \$9.95.



MICROPHONE EQUALIZER

MFJ-550
\$49.95



Greatly improves transmitted SSB speech for maximum talk power. Evens out speech peaks and valleys due to voice, microphone and room characteristics that makes speech hard to understand. Produces cleaner, more intelligible speech on receiving end. Greatly improves mobile operation by reducing bassy peaks due to acoustic resonances. Plugs between mic and rig. 4 pin mic jack, shielded output cable. High, mid, low controls provide ±12 db boost or cut at 490, 1170, 2800 Hz. Mic gain, on/off/bypass switch. "On" LED. 7x2x6 inches. 9 V battery, 12 VDC or 110 VAC with adapter, MFJ-1312, \$9.95.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT DELIGHTED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (LESS SHIPPING).

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Box 494, Mississippi State, MS 39762

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Telex 53-4590 MFJ STKV



MFJ TUNERS

**QUALITY TUNERS THAT DELIVER MORE PERFORMANCE,
MORE FEATURES, MORE VALUE FOR YOUR MONEY.**

MFJ-941D 300 WATT VERSA TUNER II

\$99.⁹⁵ MFJ's fastest selling tuner packs in plenty of new features.

New styling! Brushed aluminum front. All metal cabinet.

(+\$4) **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 watts 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-949B

300 WATT

DELUXE VERSA TUNER II

\$139.⁹⁵

MFJ's best
300 watt
Versa

tuner II. Matches every-
thing from 1.8 - 30 MHz,
coax, randoms, balanced
lines, up to 300W out-
put, solid state or tubes.

Tunes out SWR on di-
poles, vees, long wires,
verticals, whips, beams,
quads.

Built-in 4:1 balun.

300W, 50-ohm dummy
load. SWR meter and 2
range wattmeter (300W
and 30W).

**6 position antenna
switch** on front panel, 12
position air-wound in-
ductor; coax connectors,
binding posts, black and
beige case. 10 x 3 x 7 in.

MFJ-940B, \$79.95, 300 watts, SWR/Wattmeter, antenna switch on rear.

No balun. 8 x 2 x 6 in. eggshell white with walnut grained sides.

MFJ-945, \$79.95, like MFJ-940B with balun, less antenna switch.

MDJ-944, \$79.95, like MFJ-940B with balun, antenna switch on

front panel, less SWR/Wattmeter.

Optional mobile bracket for 940B, 945, 944, \$5.00.

MFJ-900 200 WATT VERSA TUNER

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient

airwound inductor gives more watts out.

5x2x6 in. Use any transceiver, solid state or tube.

Operate all bands with one antenna.

OTHER 200 WATT MODELS:

MFJ-901, \$59.95, like 900 but includes

4:1 balun for use with balanced lines.

MFJ-16010, \$39.95, for

apartment, motel, camping,

operation. Tunes 1.8-30 MHz.

\$49.⁹⁵

(+\$4)

MFJ-989 3 KW ROLLER INDUCTOR VERSA TUNER V

\$329.⁹⁵ Meet "Versa Tuner V". It has all the features you asked
for, including the new smaller size to match new smaller rigs -
(+\$10) only 10 3/4"W x 4 1/2"H x 14 7/8"D.

Matches coax, balanced lines, random wires — 1.8 to 30 MHz. 3 KW PEP-
the power rating you won't outgrow (250 pf-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.

Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges

(200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter

MFJ-1312 is available for \$9.95.

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 ball.

MFJ-981, \$239.95, 3 KW, 18 position switched dual inductor.

SWR/Wattmeter. 4:1 balun.

**ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO
OBLIGATION. IF NOT DELIGHTED, RETURN WITH-
IN 30 DAYS FOR PROMPT REFUND (LESS SHIPPING).**

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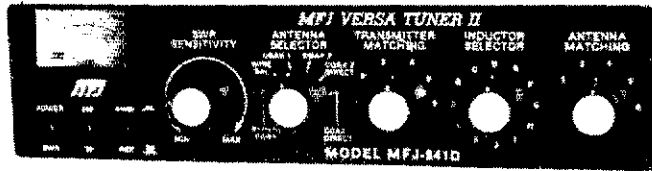
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Telex 53-4590 MFJ STKV



MFJ ACCESSORIES

300 WATT ANTENNA TUNER HAS SWR/WATTMETER, ANTENNA SWITCH, BALUN. MATCHES VIRTUALLY EVERYTHING FROM 1.8 TO 30 MHz.



\$99.95 MFJ-941D

NEW FEATURES

- **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 300/300 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 watts 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. 1000V capacitor spacing. Black. 11x3x7 inches. Works with all solid state or tube rigs. Easy to use, anywhere.

RTTY/ASCII/CW COMPUTER INTERFACE

MFJ-1224
\$99.95

Free MFJ RTTY/ASCII/CW software on tape and cable for VIC-20 or C-64. Send and receive computerized RTTY/ASCII/CW with nearly any personal computer (VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, etc.). Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 170, 425, 850 Hz) and any speed (5-100 WPM RTTY/CW, 300 baud ASCII). Sharp 8 pole active filter for CW and 170 Hz shift. Sends 170, 850 Hz shift. Normal/reverse switch eliminates retuning. Automatic noise limiter. Kantronics compatible socket plus exclusive general purpose socket. 8x1 1/4x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, \$9.95.

RX NOISE BRIDGE

Maximize your antenna performance!



\$59.95 MFJ-202B

Tells whether to shorten or lengthen antenna for minimum SWR. Measure resonant frequency, radiation resistance and reactance.

New Features: individually calibrated resistance scale, expanded capacitance range (± 150 pf). Built-in range extender for measurements beyond scale readings. 1-100 MHz. Comprehensive manual. Use 9 V battery. 2x4x4 in.

INDOOR TUNED ACTIVE ANTENNA

NEW! IMPROVED! "World Grabber" rivals or exceeds reception of outside long wires! Unique tuned Active Antenna minimizes intermode, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Tele scoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 in. Uses 9V battery, 9-18 VDC or 110 VAC with adapter, MFJ-1312, \$9.95. **MFJ-1020A \$79.95**



POLICE/FIRE/WEATHER 2 M HANDHELD CONVERTER

Turn your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner!

\$39.95
MFJ-313

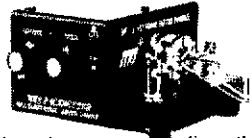
144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA maritime coastal plus more on 160-164 MHz. Converter mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts). Use AAA battery. 2 1/4x1 1/2x1 1/2 in. BNC connectors.



MFJ/BENCHER KEYS COMBO

MFJ-422
\$109.95

The best of all CW worlds - a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! MFJ Keyer - small in size, big in features. Curtis 8044-B IC, adjustable weight and tone, front panel volume and speed controls (8-50 WPM). Built-in dot-dash memories. Speaker, sidetone, and push button selection of semi-automatic/tune or automatic modes. Solid state keying. Bencher paddle is fully adjustable; heavy steel base with non-skid feet. Uses 9 V battery or 110 VAC with optional adapter, MFJ-1305, \$9.95.



VHF SWR/WATTMETER

Low cost VHF SWR/Wattmeter! Read SWR (14 to 170 MHz) and forward/reflected power

MFJ-812 \$29.95

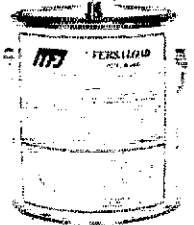
at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.



1 KW DUMMY LOAD

MFJ-250 \$39.95

Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP. VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7 1/2x6 1/4 in.



24/12 HOUR CLOCK/ID TIMER

MFJ-106
\$19.95 NEW

Switch to 24 hour UTC or 12 hour format! Battery backup maintains time during power outage. ID timer alerts every 9 minutes after reset. Red LED .6 inch digits. Synchronizable with WWV. Alarm with snooze function. Minute set, hour set switches. Time set switch prevents mis-setting. Power out, alarm on indicators. Gray and black cabinet. 5x2x3 inches. 110 VAC, 60 Hz.



DUAL TUNABLE SSB/CW/RTTY FILTER

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WANTED: COLLINS KWM-2 - 30 L-1 Samsonite carrying case, State condition. Claude Pennington, W4PN, 800 1st St., Macon, GA 31201. 1-919-743-8953.

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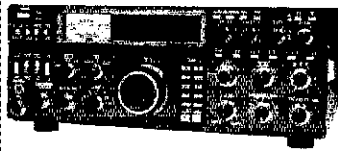
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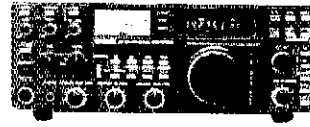
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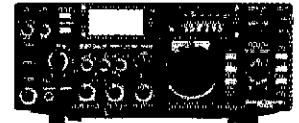
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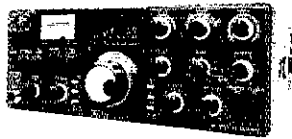
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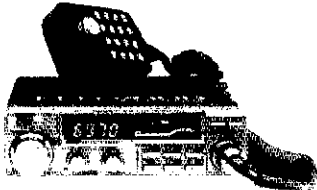
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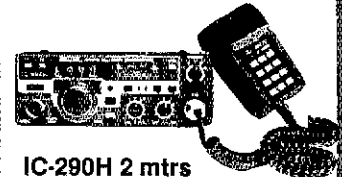
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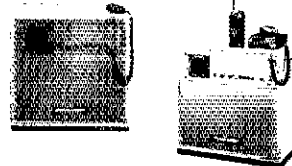
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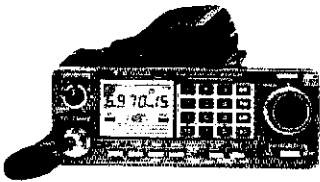
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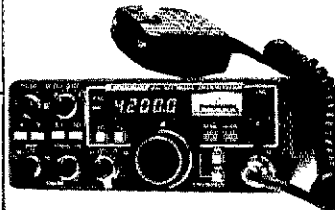
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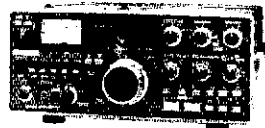
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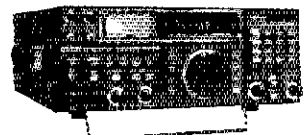
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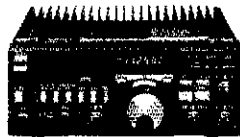
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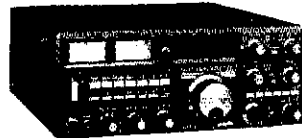
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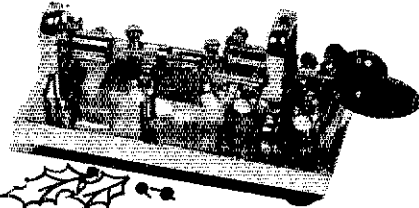
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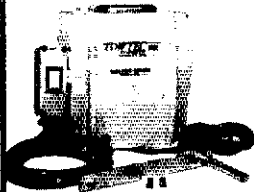
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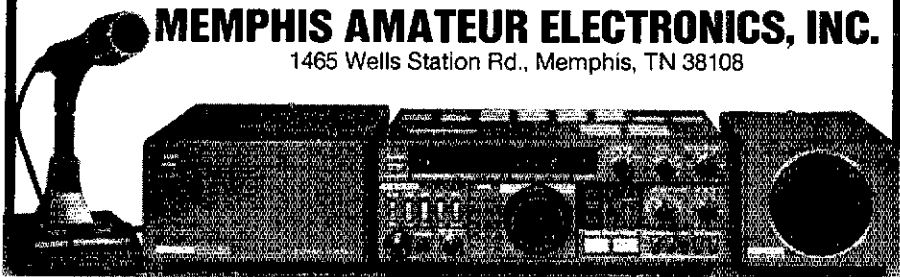
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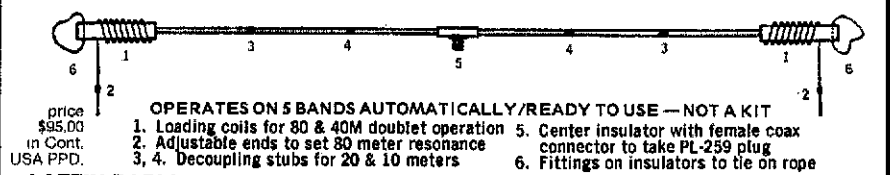
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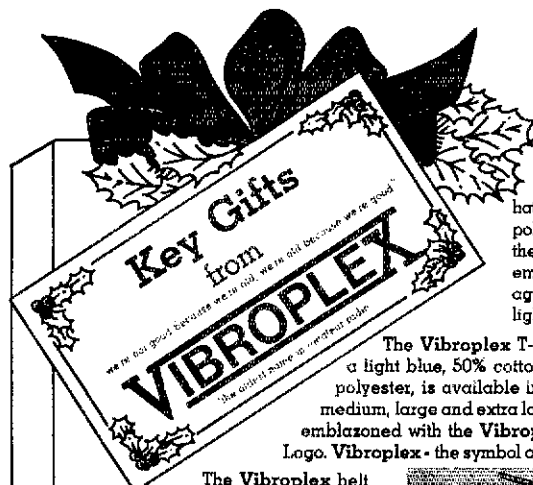
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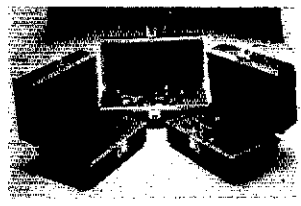


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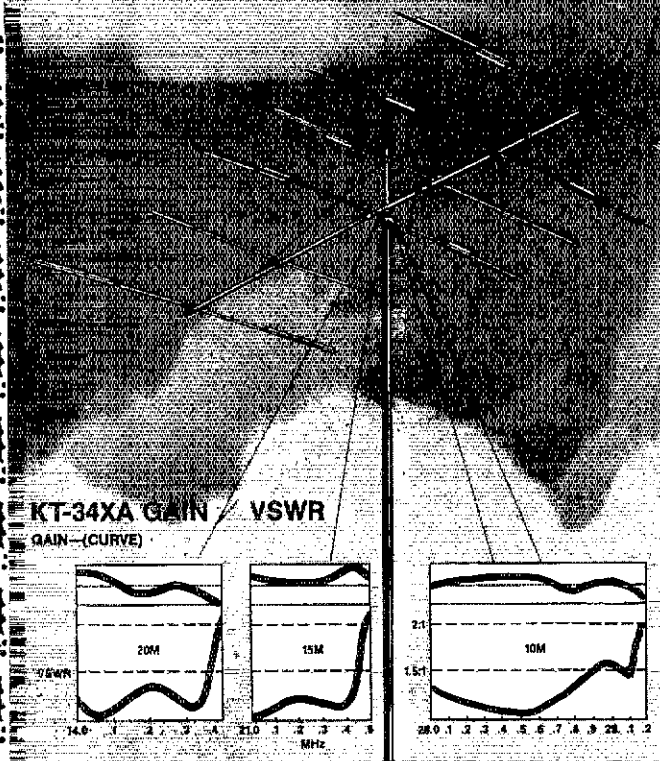
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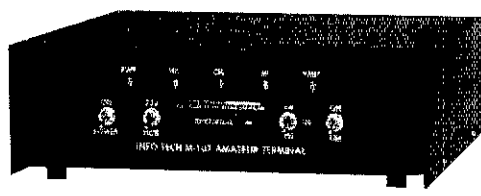
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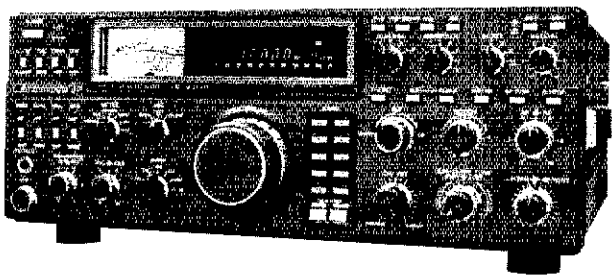
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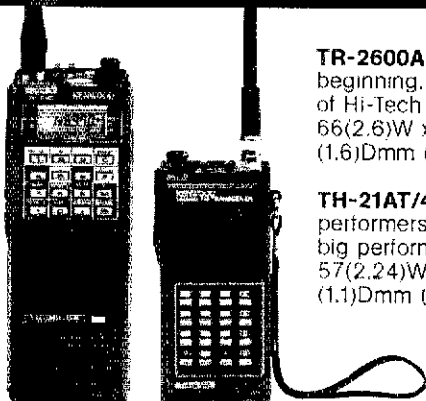
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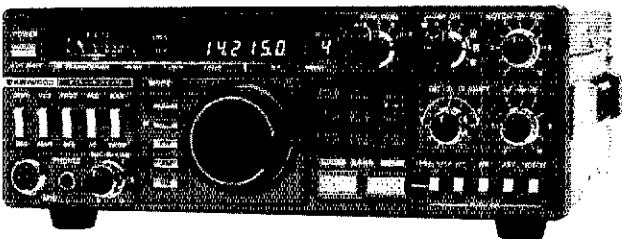


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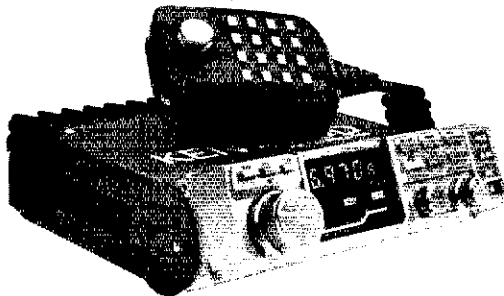
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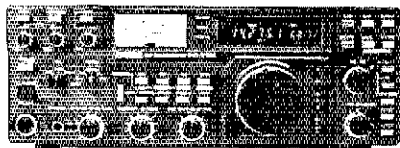
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FL-53A 250 Hz CW filter	96.50	89 ⁹⁵
FL-33 AM filter	31.50	
RC-10 External frequency controller	35.00	
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IC-745 9-band Xcvr/1-30 MHz Rcvr	\$ 999.00	Call
PS-35 Internal power supply	160.00	144 ⁹⁵
CF5-455K5 2.8 KHz wide SSB filter	TBA	
IC-271H 100w 2m FM/SSB/OW Xcvr	TBA	
IC-271A 25w 2m FM/SSB/CW Xcvr	699.00	Call
IC-471A 10w 430-450 SSB/CW/FM Xcvr	799.00	Call
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EX-310 Voice synthesizer	39.95	
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EX-199 Remote frequency selector	35.00	
IC-25A 25w, 2m, grn leds, up-dn-TTP mic	359.00	319 ⁹⁵
IC-25H as above, but 45 Watts	389.00	349 ⁹⁵



IC-27A 25w 2m mobile Xcvr	TBA	
IC-45A 10w 440 FM Xcvr, TTP mic	399.00	359 ⁹⁵
EX-270 CTCSS encoder	39.00	
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RP-3010 10w 440 MHz FM repeater 999.00 899⁹⁵

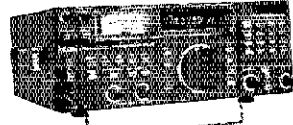
Hand-held transceivers:

Deluxe models

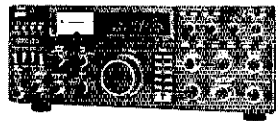
IC-02A for 2 meters	\$ 319.00	289 ⁹⁵
IC-02AT w/DTMF	349.00	314 ⁹⁵
IC-04A for 440 MHz	TBA	
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TS-130SE	629.95	Call
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TL-922A 2K AMP	\$1229.95	Call
SM-220	359.95	



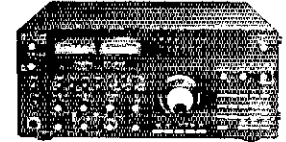
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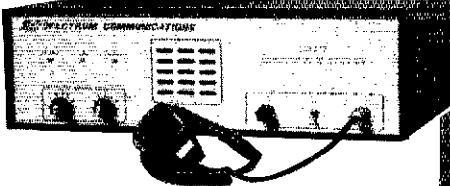


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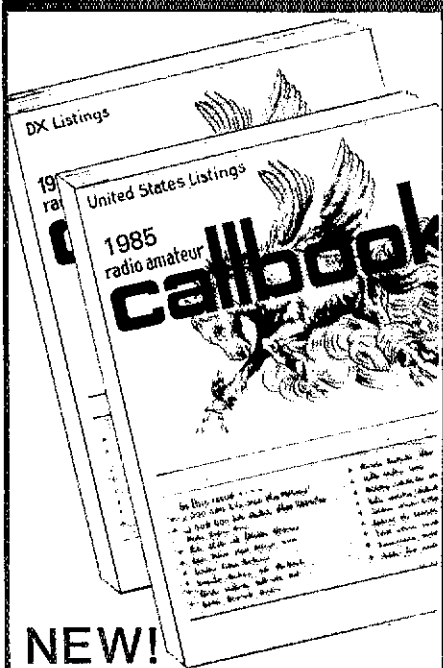
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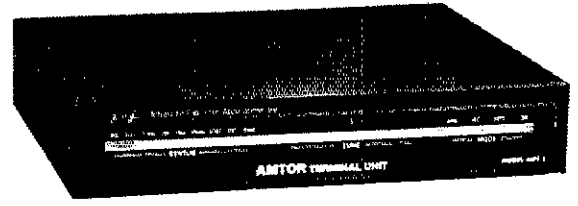
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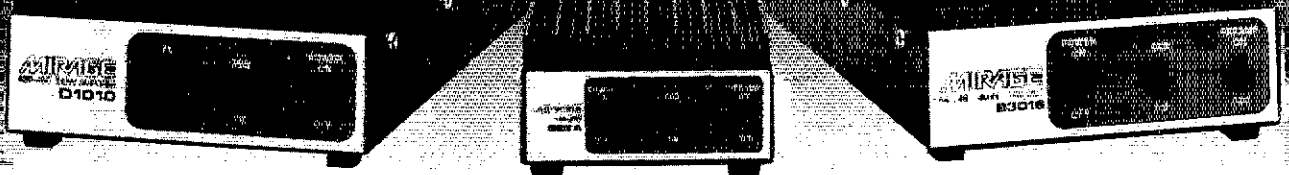
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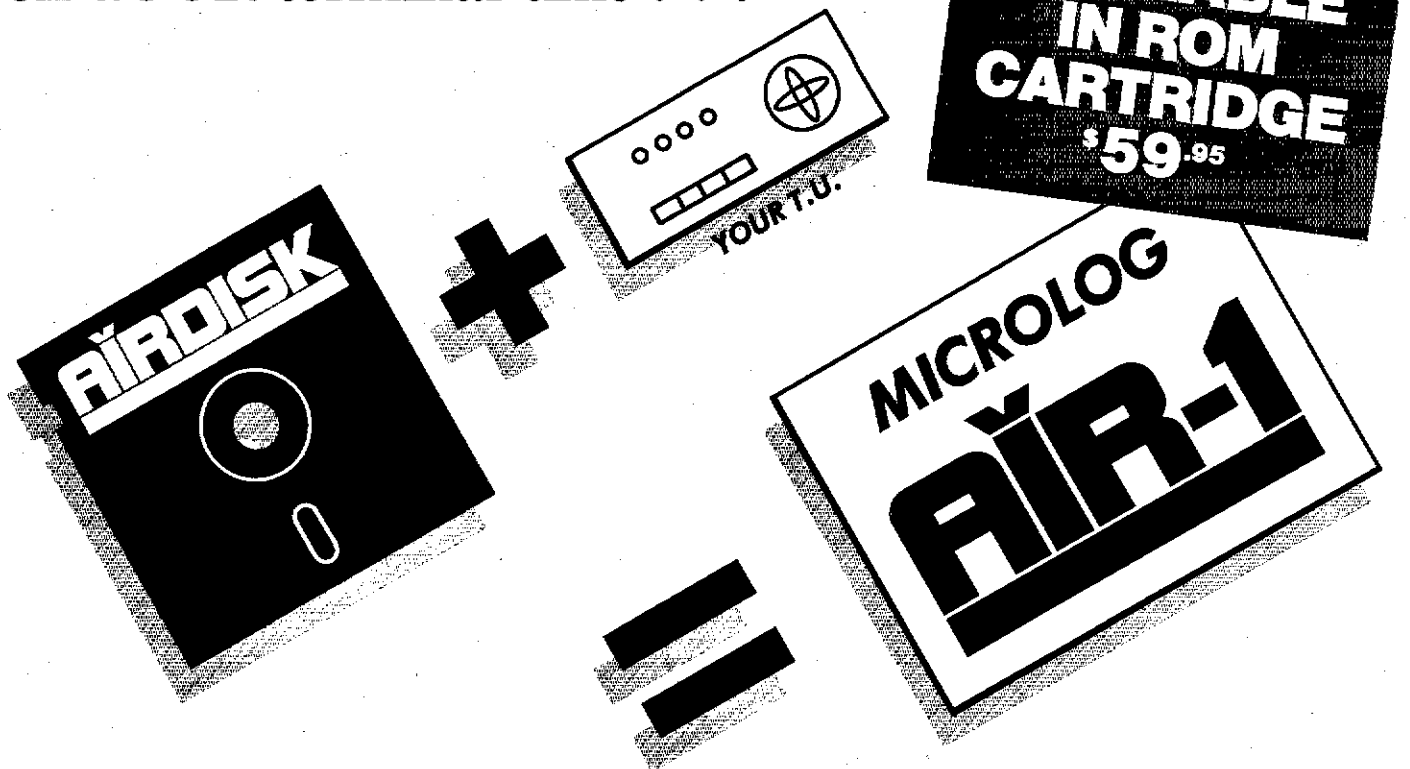
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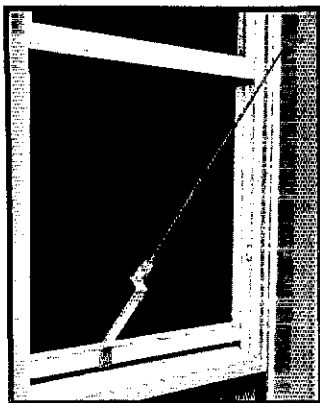
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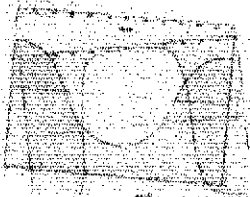
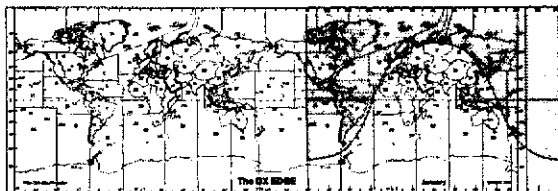
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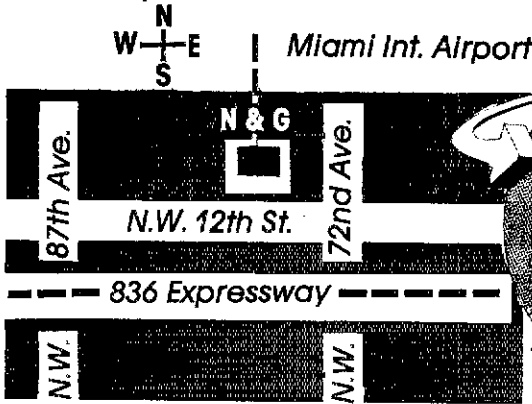
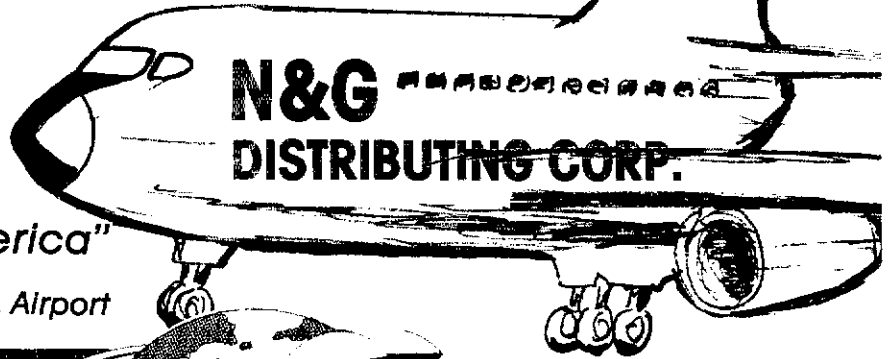
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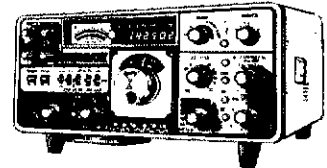
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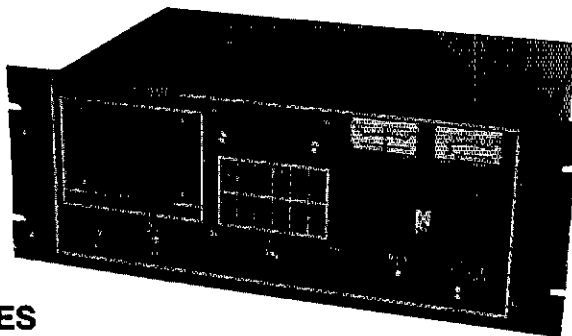
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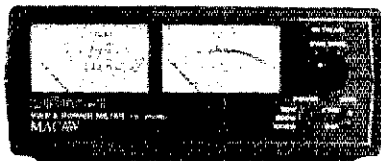
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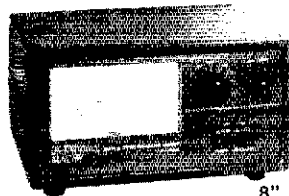


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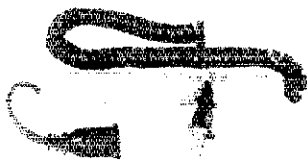
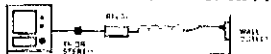
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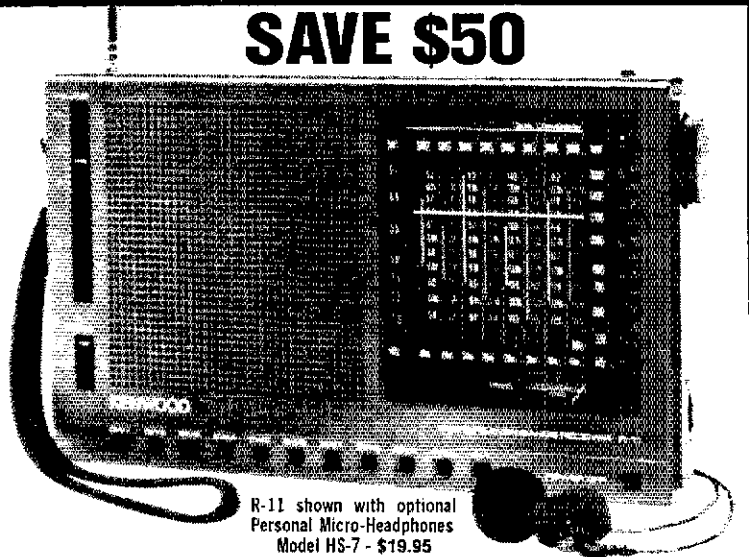
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ROSS \$\$\$ USED December Specials: (over 300 items in stock) Kenwood ST-1 \$39, LH-1 \$18, R-1000 \$295, R-820 with four filters \$689, TS-600 \$299, TS-180S \$429, VFO-100 \$95, Robot 400 \$299, 800 \$299, Yaesu FT-207D \$399, FT-901DM \$579, FRG-7700 \$325, FT-101 \$339, FT-207R \$69 (as is), FT-221R \$289, FC-221 \$59, ICOM IC-245 \$169, IC-21A \$169, IC-2KL \$1095, IC-551D \$479, IC-701 \$419, AT-100 \$259. If this month's special is not what you are looking for send Call letters name & phone # for personal price quote & used list. Over 6,000 ham related items in stock. Mention ad. Prices cash, FOB Preston. Closed Monday at 2:00. Ross Distributing Company, 78 South State, Preston, ID 83263. 208-852-0830.

CORSAIR, .250, .500, 1.8, 2.4 8-pole filters, deluxe power supply \$950. Homebrew 1kW tuner, rotary inductor w/built-in SWR bridge \$75. Skipjack keyboard CW only, 64-character buffer \$75. Skipjack, all parts, PC boards, 256 character buffer, cabinet & keys to build \$100. Call after 4 PM W1FZY, Paul 1-617-249-9890.

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CUBIC ASTRO 103 mint \$495. Original owner. WB6EHH, 209-227-9070.

KENWOOD TR-2500, charger, extra battery, \$185. Wanted; MMT 432-50 transceiver, W7TZO, 503-267-0084.

SWAN 500, Swan 500CX, Drake L-4B linear, top condition, Curtis, 301-662-9416.

1985 Nostalgia Radio Calendar \$1. J. Weldner, Box 23362, Col., OH 43223.

FOR SALE: Antenna Rotors, Alliance Model HD-73 \$65. Telex Tailtwister \$145. Both in good condition. Receiver, NC HFS 27-250 MHz, all coils \$60. TTY Desktop with tape reader model ASF \$90. K8SL, Rolf, P.O. Box 51174, Raleigh, NC 27609.

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KENWOOD: TS-820S, \$400; VFO-820, \$90; R-1000, \$275; Heath HW-8, \$120. Collins: 75A-4, \$200; Autek QF-1A, \$35. Drake W-4, \$45. All mint. Manuals included. U-ship. AA8EE, 619-789-3674 (1730-2130 PST).

TENTEC HERCULES 444 solid state kW linear amplifier \$845. Telrex Mono Banders: 5el 10-meter \$125, 3el 20-meter \$125. W5EBC, 512-328-0024.

OSCAR STATION, IC-251A, IC-451A, Cushcraft antennas, Alliance rotors, \$1000, Dave Galpin, K8BLP, 303-798-3169.

SWAN 102BX with p/s \$500. Galaxy R-1530 general coverage receiver with speaker \$250. All units in excellent condition. K9EJ, 1051 Halsey Drive, Monterey, CA 93940 408-373-7601.

DECEMBER SPECIALS: Butternut HF6V \$105, Mini-Quads \$136.25, UPS extra, send stamp for flyer, Don, WB2RTW, Hart Eastern Communications, 1444 Darlington Drive, Derby, NY 14047, 716-947-4840.

WASCBR complete station for sale. Yaesu FT-980; Kenwood TS-530; Kenwood TS-2500; Yaesu 6 meter; Kenwood 9130; Kenwood R600; tuners, meters, power supplies, etc.; Commodore 64 plus Interface. Make offer. For Information send S.A.S.E. James D. Lampley, P.O. Box 4241, Bryan, TX 77805 or KA5KNX.

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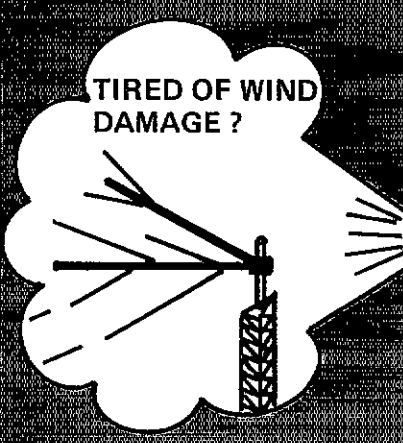


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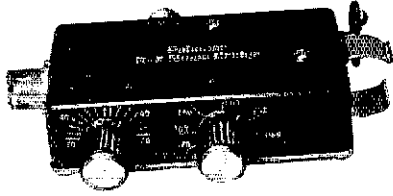


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*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

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12 in Wall	\$25	\$49	\$59	\$79
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TEXAS TOWERS

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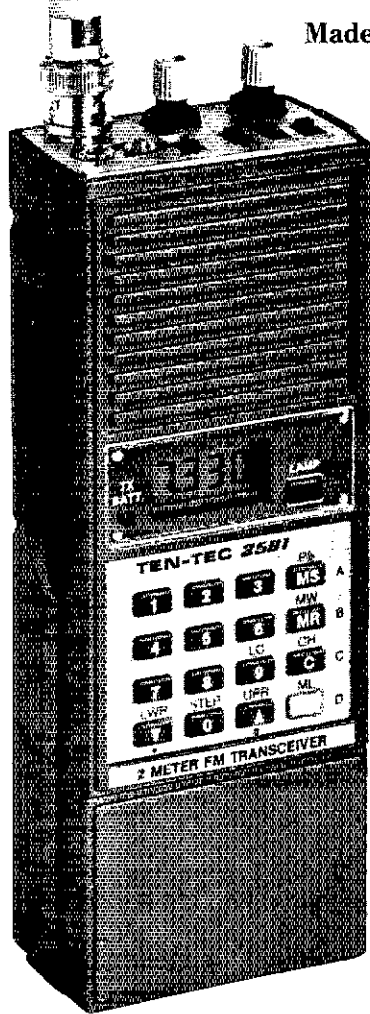
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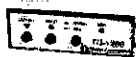
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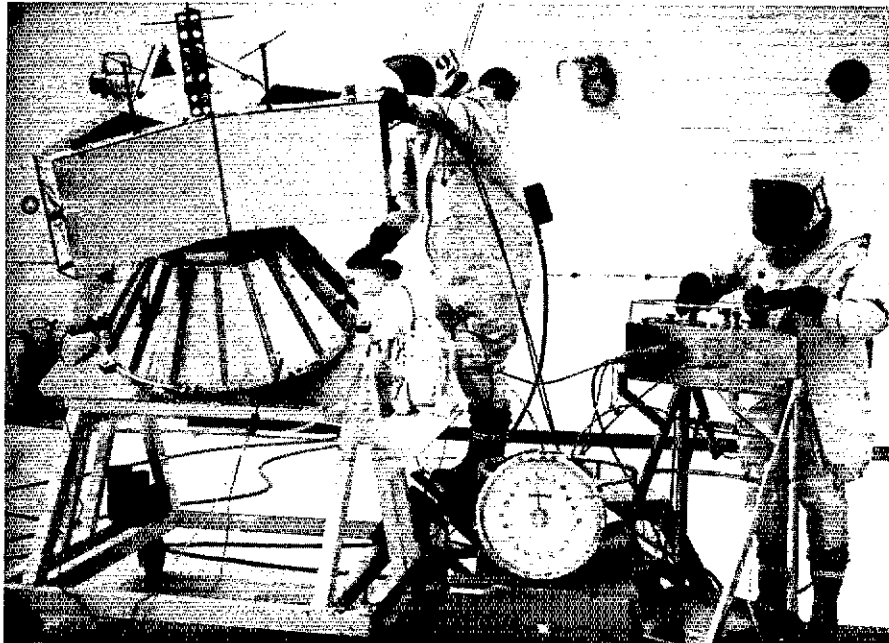
Staying On Top...

Transponder?

Packet
Radio
Satellites?

ARSENE?

Faraday
Rotation
Fading?



Spin
Fade?

JAMSAT?

UoSAT?

N_2O_4 ?

Doppler
Shift?

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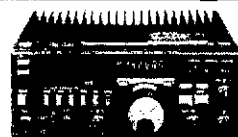
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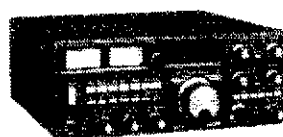


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- Memory/Band Scan • Speech Processor • CW Filter and CW Keyer included

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YAESU



FT203R

New Yaesu FT203R

- Compact VHF Handy Talkie • S-Meter • Small Light Weight

YAESU



FT9800

CAT SYSTEM—Computer Aided Transceiver

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ICOM



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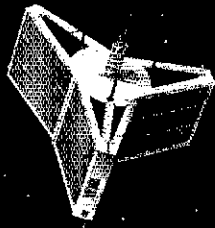
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It's true. Linking up to OSCAR 10 is the one sure way to bring the world into your ham shack. No matter where your shack is.

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Plus you get a lot more extras, including a built-in speech processor, all-mode squelch and a noise blanker.

So no matter where your shack is, let Yaesu's FT-726R introduce you to OSCAR 10. The world is waiting.

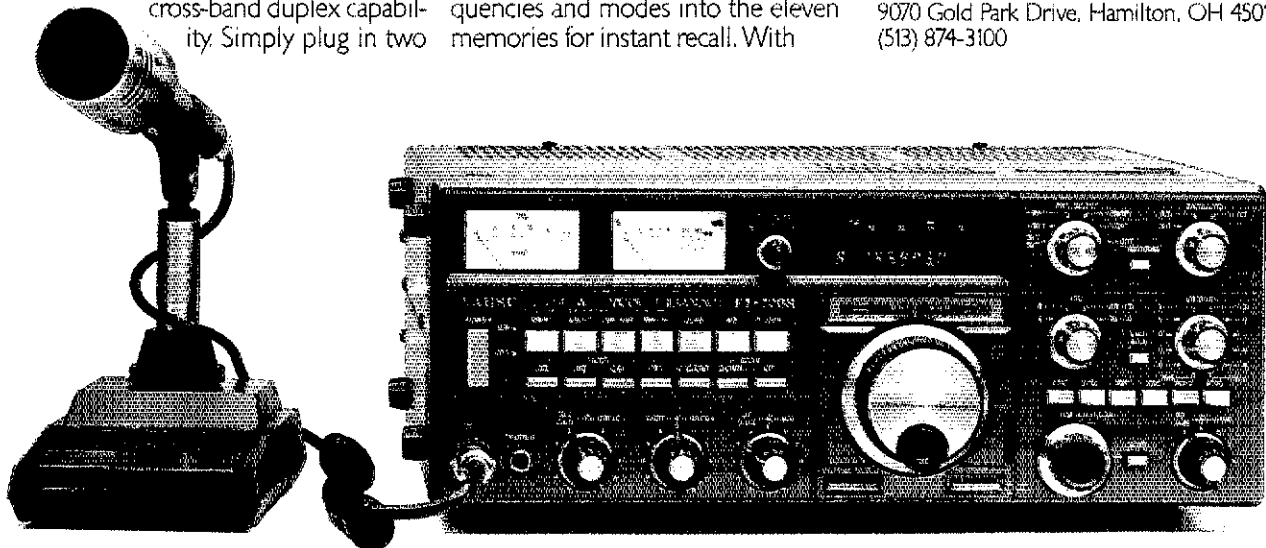
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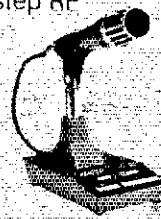
TS-930S "DX-traordinary"

TS-930S

We call it "DX-traordinary" because the TS-930S has now become the favorite rig of the serious contesters! Its superior capability for full break-in split-frequency operation, the speed and convenience with which its eight memory channels can be accessed, its unsurpassed receiver dynamic range and its remarkable ability to select the desired signal during periods of heavy QRM, utilizing VBT, Slope tuning, IF Notch filtering, and tuneable audio filtering, have all combined to make this the rig that gives you the EXTRA EDGE!

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CW, FSK, and 80 watts input on AM. SWR/power meter. Triple final protection circuits plus two cooling fans built-in. 10-Hz step synthesized frequency control. Available with optional automatic antenna tuner built-in, another industry first! Dual digital VFO's. Eight memory channels that store both frequency and band information, with internal battery back-up, (batteries not supplied). Dual mode adjustable noise blankers, especially effective in eliminating "woodpecker" type interference. SSB IF slope tuning, for maximum rejection of interference. CW variable bandwidth, with pitch and side-tone control. IF notch filter. Tuneable audio peaking filter. Unique six digit white fluorescent tube digital display is easy-on-the-eyes during those long contests. RF speech processor, for higher average "talk-power." SSB monitor circuit. 4-step RF attenuator. VOX. 100-kHz marker. AC power supply built-in, 120, 220, or 240 VAC.

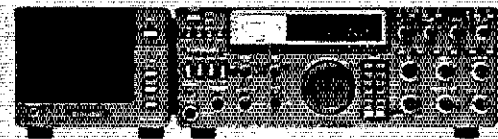


TS-930S Optional Accessories:

AT-930 automatic antenna tuner, SP-930 external speaker, with selectable audio filters, YG-455C-1 (500 Hz), YG-455C-2 (250 Hz), YK-88C-1 (500 Hz) CW filter, YK-88A-1 (6 kHz) AM filter, all plug-in type. SO-1 commercial stability TCXO, MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-42S mobile hand microphone, TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter, 160~6 meter, SW100A SWR/power/volt meter 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

Isn't it about time you stepped into the winner's circle?

More information on the TS-930S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.



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