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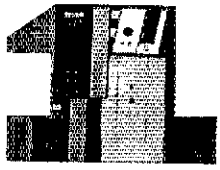

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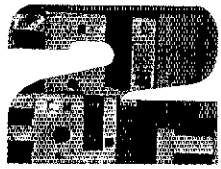

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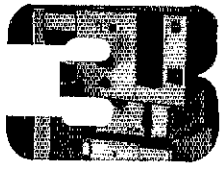

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TM-321A
Compact mobile transceiver

TH-31BT/31A
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New

TM-3530A
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KENWOOD

The TM-321A comes with 16-key DTMF mic.
A complete line of accessories is available for all models.

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

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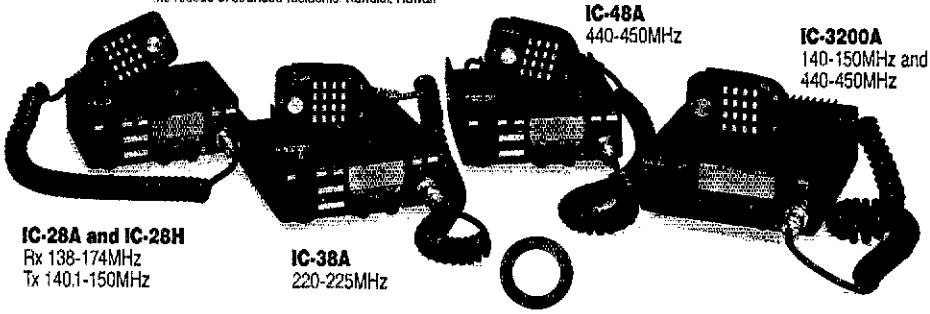

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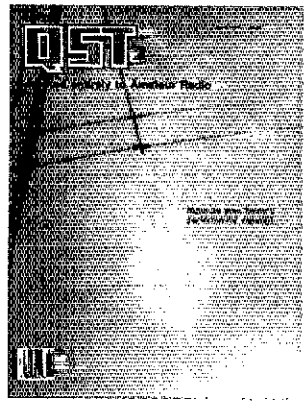

OUR COVER

Clarence Henderson, WBØTUH, of Independence, Missouri has devised a simple method to test a beam antenna visually. Using a horse syringe, dye (RIT™ dye is suitable) is injected into the coax while transmitting. Once the dye begins to flow, you can remove the syringe and use a funnel to pour the dye into the coax. The dye will color the electrons, causing your emissions to form a rainbow-like pattern which will provide a visual indication of your antenna's F/B ratio and the presence of any sidelobes. This effect is best observed on the first day of April. *(photo courtesy WBØTUH)*

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TECHNICAL

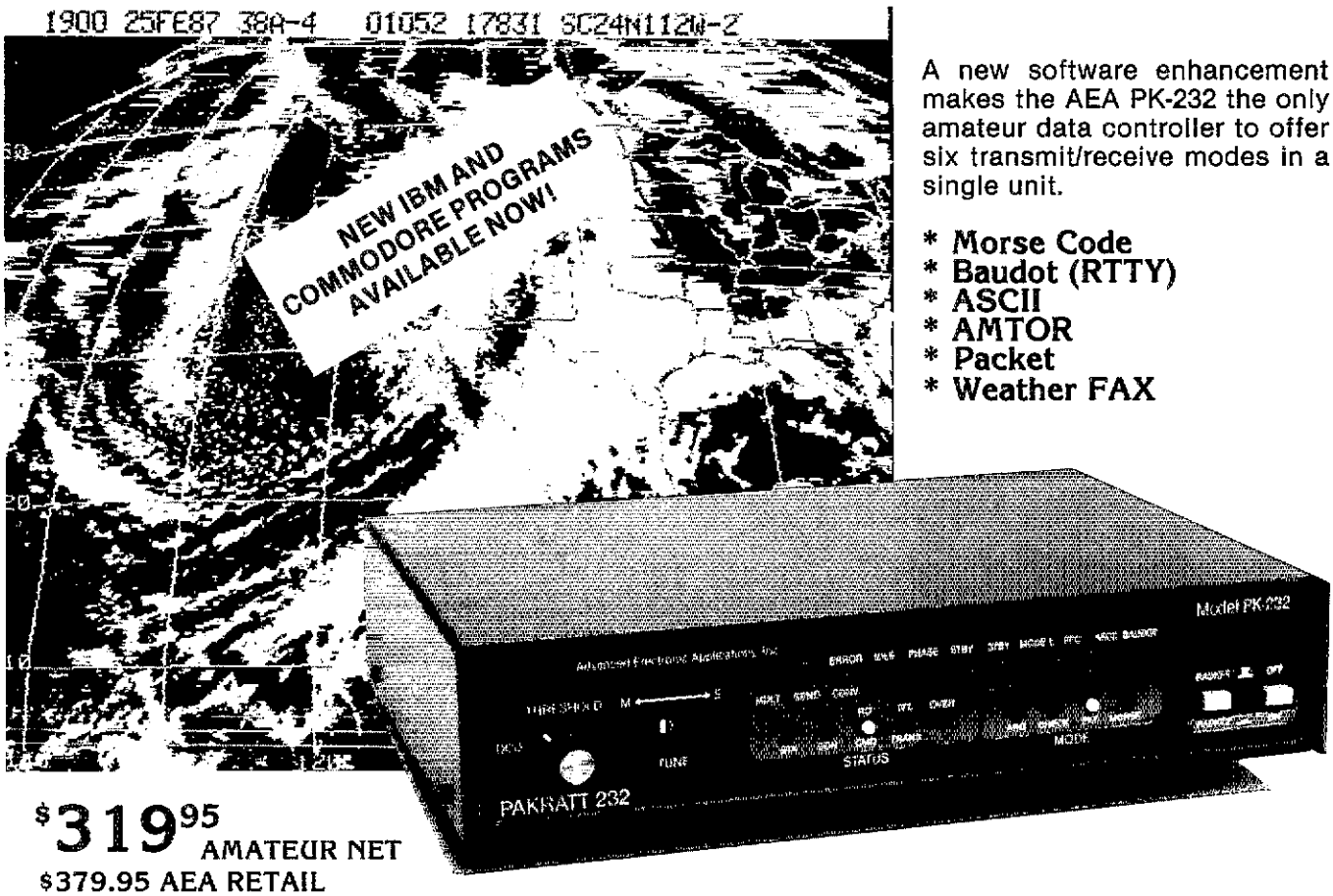
NEWS AND FEATURES

OPERATING

DEPARTMENTS

New PK-232 Breakthrough

Six Digital Modes - Including Weather FAX



A new software enhancement makes the AEA PK-232 the only amateur data controller to offer six transmit/receive modes in a single unit.

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* **AMTOR**
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* **Weather FAX**

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Your home computer (or even a simple terminal) can be used for radio data communication in six different modes. Any RS-232 compatible computer or terminal can be connected directly to the PK-232, which interfaces with your transceiver. The only program needed is a simple terminal program, like those used with telephone modems, allowing the computer to be used as a data terminal. All signal processing, protocol, and decoding software is in ROM in the PK-232.

The PK-232 also includes a no compromise VHF/HF/CW modem with an eight pole bandpass filter, four pole discriminator, and 5 pole post detection low pass filter. Experienced HF Packeteers are reporting the PK-232 to have the best Packet modem available.

Operation of the PK-232 is a breeze, with twenty-one front panel indicators for constant status and mode indication. The 240 page manual includes a "quick start" section for easy connection and complete documentation including schematics. Two identical back panel radio ports mean either your VHF or HF radio can be selected with a front panel switch. Other back panel connections include external modem disconnect, FSK and Scope Outputs, CW keying jacks, and RS-232 terminal interface.

The RS-232 connector is also used for attaching any Epson graphics compatible parallel printer for printing Weather Fax. Weather maps and satellite photos, like the one in this ad, can be printed in your shack.

Contact your local AEA dealer today for more information about the one unit that gives you six modes for one low price, the PK-232.

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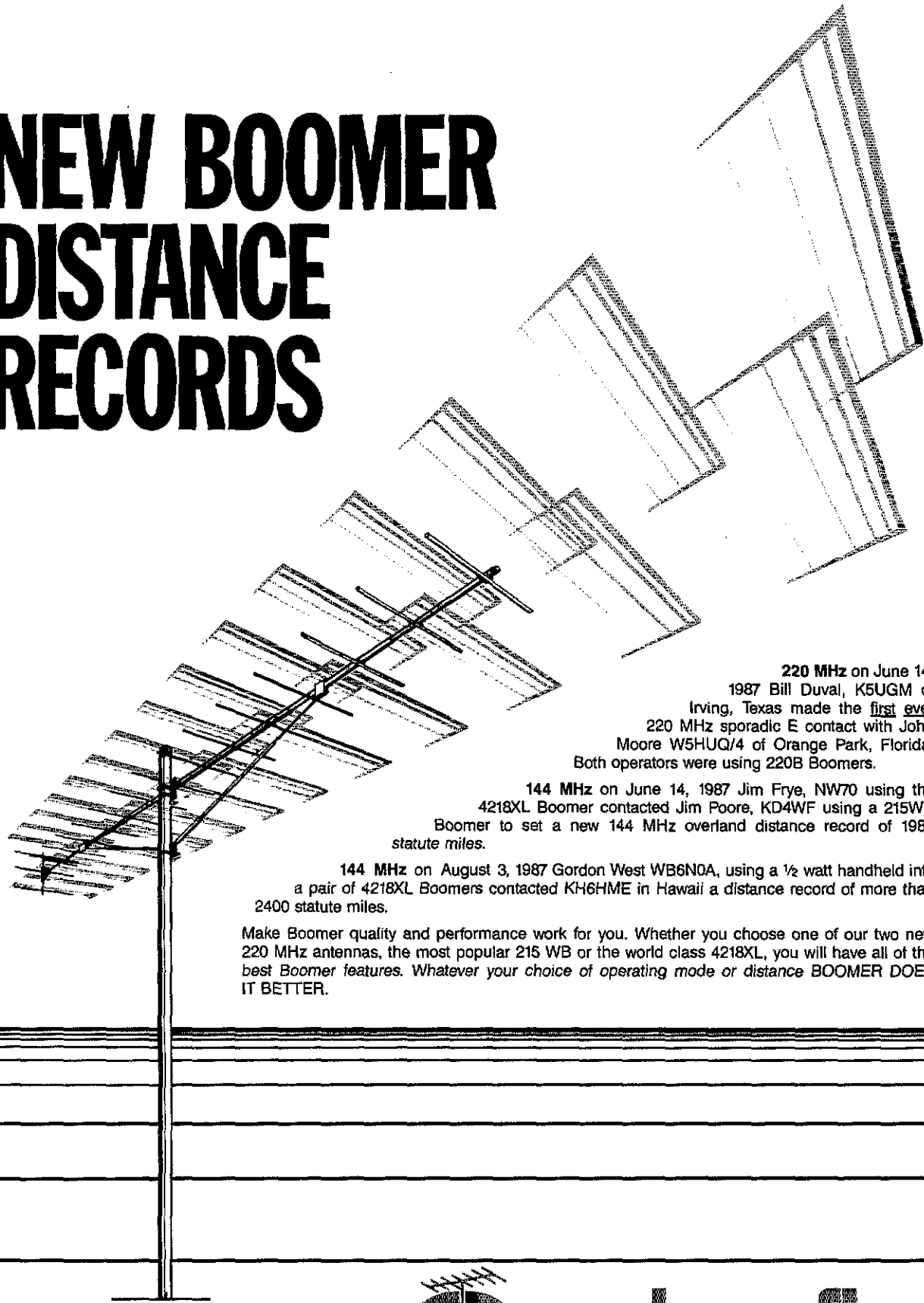

220 MHz on June 14, 1987 Bill Duval, K5UGM of Irving, Texas made the first ever 220 MHz sporadic E contact with John Moore W5HUQ/4 of Orange Park, Florida. Both operators were using 220B Boomers.

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

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

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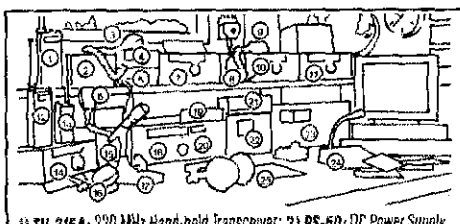

(1) **TH-315A:** 220 MHz Hand-held Transceiver; (2) **PS-50:** DC Power Supply; (3) **MC-43S:** UP/DWN Microphone, included with (4) **TM-2530A:** Deluxe 25 W, 2m FM Transceiver; (5) **TM-3530A:** Deluxe 25 W, 220 MHz Transceiver (also comes with MC-43S mic.); (6) **MC-48B:** 16-key DTMF Microphone; (7) **R-5000:** High Performance Receiver; (8) **SP-430:** Matching External Speaker for TS-430S/TS-440S; (9) **MC-48B;** (10) **TS-711A:** 2m, 25 W All Mode Base Transceiver; (11) **TS-811A:** 70cm, 25 W All Mode Base Transceiver; (12) **TH-215A:** 2m, Full-featured HT; (13) **TH-21RT:** Pocket-sized, 2m FM Transceiver; (14) **TS-440S:** HF Transceiver (with AT-440 installed); (15) **SP-940:** Matching External Speaker for TS-940S; (16) **MC-48B;** (17) **MC-60A:** Base Station Microphone with UP/DWN controls; (18) **TS-940S:** Competition Class HF Transceiver with General Coverage Receiver (AT-940 installed); (19) **IF-232C:** Computer Interface Level Translator; (20) **IF-10B:** Computer Interface Module (installed inside TS-940S); (21) **SW-2000:** SWR/Power Meter; (22) **SM-220:** *Station Monitor with pan display option BS-8 installed;* (23) **TL-922A:** HF Linear Amplifier; (24) **MC-85:** Multi-function Desk Microphone with Graphic Equalization and three outputs; (25) **HS-5:** Deluxe Headphones

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Oklahoma — William E. Goswick, K5WG, 12717 S 124th E Ave, Broken Arrow 74011 (918-369-2115)
South Texas — Arthur R. Ross, W5KR, 132 Sally La, Brownsville 78521 (512-831-4458)
West Texas — Amelia "Milly" Wise, W5OVH, 8516 Mt Scott, El Paso 79904 (915-751-4160)

"It Seems to Us . . ."

Band Planning

The old-timers will tell you, it used to be simple. There was CW, and there was phone, and the FCC told you where you couldn't operate phone. As long as you stayed inside the band, that was about all there was to it.

Now, it's not so simple. The FCC still says where you can't operate phone. But now there's also RTTY, and slow-scan TV, and FAX, and what about packet? And even within the phone bands there are operating specialties that don't coexist too comfortably. And that's just HF; at VHF and higher, things get even more complicated.

As Robert Frost said, "Good fences make good neighbors." But the FCC isn't interested in building any more "fences" for us, to keep the devotees of the various modes and operating interests from getting in one another's way. (Fortunately, neither does the Commission seem inclined to tear down the existing fences, in tribute to the false god of "deregulation.") If fences are to be built, we must do it ourselves.

And indeed, why not? Most governments don't even specify the phone bands for their amateurs; for decades, operating patterns in other countries have been determined primarily by voluntary "band plans" developed by the amateurs themselves, and enforced through peer pressure. By and large, it's worked; the problems caused by the occasional recalcitrant are more than offset by the flexibility thus afforded.

Coming as we do from a tradition of detailed but generally benevolent government regulation, where there is ample opportunity for citizen participation in the regulatory process, US amateurs have less experience with the voluntary approach than do some of our overseas counterparts. Particularly in Europe, where a 2-meter repeater may be within range of a half-dozen neighboring countries, internationally agreed band plans are practically a necessity. The band plans are under continual review by permanent international committees within the IARU Region 1 organization, and the committees' recommendations are considered at the triennial Region 1 conferences.

Here in the US, we've drifted rather gradually into the band-planning business. First came so-called "gentlemen's agreements" that, for example, RTTY would be confined to certain parts of the "CW" bands to minimize interference between the two modes. As long as the benefits of such an arrangement were self-evident to both RTTY and CW operators, the fact that no formal agreement actually existed was of little consequence. On VHF, the advent of FM repeaters, auxiliary operation and beacons created a need for band planning that was addressed only partially by FCC rulemaking. While band-planning issues have been dealt with on occasion at IARU Region 2 conferences, it was not until the Buenos Aires Conference in October 1986 that anything approaching a comprehensive band-planning exercise was undertaken in this forum.

So, the need exists for band planning, and for ongoing review of the plans already in place. What about the means? It's apparent that the ARRL must provide the means for band planning in the US. The League is the only national organization representing the broad spectrum of amateur interests. It functions democratically. It has the necessary international ties, through the IARU.

The ARRL Board has the authority to determine League policy on band-planning issues, as on all policy issues. But to function effectively, the Board must be given recommendations and the results of studies performed by others; it cannot decide highly technical issues in a vacuum. Recognizing this, when the Board restructured its standing committees in 1985 it charged its Membership Services Committee with performing studies and making recommendations to the Board on band planning. This doesn't mean that the MSC has all the answers, but rather that it should know the right questions—and who to ask.

Usually the "who" will be you, the member. Accordingly, on page 73 of this issue you will find that your comments are sought on a proposed plan for the 13-cm band (2300-2310 and 2390-2450 MHz). Together with input from other sources, and particularly the VHF Repeater Advisory Committee, the VHF/UHF Advisory Committee and the ARRL Committee on Amateur Radio Digital Communication, your response will help tailor the plan for amateur use of this important allocation.

This is not the only band-planning issue now before the MSC; you will find another one, concerning beacons, described at Minute 79 of the 1988 Annual Meeting of the Board (March *QST*, p 52). Others are on the horizon, including provision for automatically controlled packet stations on HF and a review of Region 2 band plans in preparation for the next Region 2 Conference in October 1989.

Want to know more band planning, or about spectrum management in general? Chapter 2 of *The ARRL Operating Manual* contains a wealth of information. But as we said in the beginning, it isn't simple any more!—*David Sumner, K1ZZ*

"They said I couldn't work DX with just 100 watts. Especially with a radio that has less than 1000 switches on the front panel.

But the truth is, I'm working lots of DX, more than some of these blockbuster types, thanks to my Yaesu FT-747GX.

You see, my no-nonsense FT-747GX was designed with me in mind, so I can hop around the band fast to nail those DX stations. While the other guys are warming up their amplifiers, I'm working the new country!

My FT-747GX has a super receiver, with a directly-driven mixer for great overload protection. And, Yaesu included the CW filter in the purchase price (I used the money I saved on postage for the QSL cards!).

And my FT-747GX is loaded with other features. The receiver works from 100 kHz straight through to 30 MHz, and it's a fantastic shortwave broadcast receiver. I can use all twenty memories for that alone! Plus it's got dual VFOs. A noise blanker. Split frequency operation for the pile-ups. And scanning up the band helps me check out openings as they happen.

I just put in the optional crystal oven, and next month I'm going to pick up the FM board. I can't wait to tell my buddies I worked England on a repeater!

And with the money I saved when I bought my FT-747GX, I got a second ten-meter antenna for satellite work on the high end of the band. I use my personal computer to tell me what satellites are going by, and the computer even sets the frequencies on the radio for me.

Now my friends are getting FT-747GX rigs, too. I knew they'd figure out my secret weapon sooner or later. But now I'm setting the pace!

Thanks, Yaesu. You've made a rig that makes sense."

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. **Repair Service:** (213) 404-4884. **Parts:** (213) 404-4847. Prices and specifications subject to change without notice.

YAESU

"They laughed when they saw my radio. Then they saw my logbook."

UP FRONT in QST

The Four Rs: To give teacher Rosalyn Fleishman (center) some needed free time, Craig Dible, KB6LAK, a Beverly Hills social science teacher, helped teach reading to her fifth graders. *Archie's Ham Radio Adventure* was among the materials Craig used; he also answered the students' questions about Amateur Radio. Craig also provides licensing instruction for students. *(photo courtesy KB6LAK)*

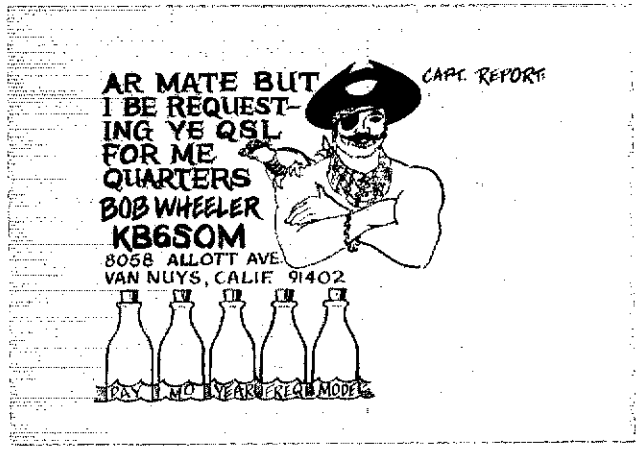
East Meets West: To help celebrate the birthday of the King of Nepal on December 29, Lloyd and Iris Colvin (W6KG and W6QL) and members of the Japan UNICEF Ham Club operated from Kathmandu using the calls 9N5QL and 9N7YDY. Krishna B. Khatry (front left), 9N1MC, Chief Engineer of the Ministry of Communications, was on hand for the event. *(photo courtesy 9N1MC)*

There's More to the Picture Than Meets the Eye

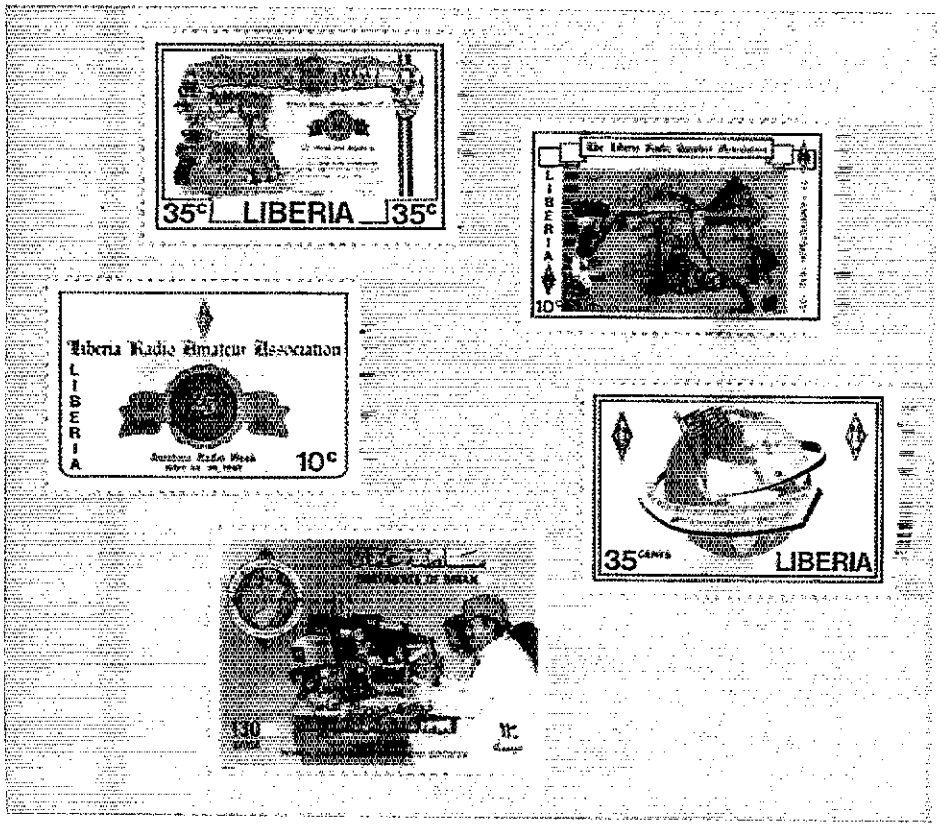
Sunspots aren't the only thing happening on 10 meters—prime time for E skip is almost here. To find out more about this exciting propagation mode that *isn't* tied to the sunspot number, check out W3EP's E-skip article and AK7M's Novice Notes article on 10-meter E skip, both in this issue.

Happy Birthday Guglielmo

To honor the man who made the first transatlantic radio contact, International Marconi Day will be observed on Saturday, April 23; a number of special-event stations around the world will be operated by amateurs. Marconi, who often described himself as an "amateur," was born on April 25, 1874.



Ahoy Mates! An out-of-the-ordinary QSL card is what Bob Wheeler, KB6SOM, of Van Nuys, California wanted, and Bob's unique QSL is not likely to be easily overlooked. Bob also sends a KB6SOM lapel pin to those who send him a QSL. *(QSL courtesy KB6SOM)*



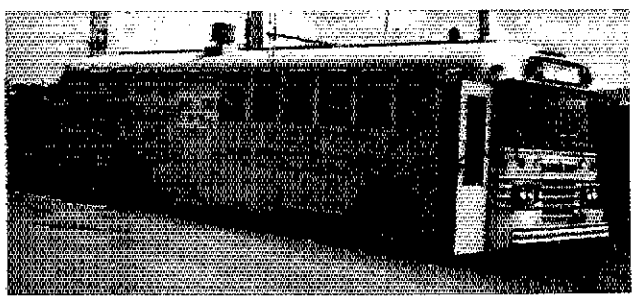
Postage Due: Several new Amateur Radio stamps have been issued recently. The Liberian Ministry of Post and Telecommunications released four stamps commemorating the 25th anniversary of the Liberia Radio Amateur Association. The Sultanate of Oman issued a stamp marking the 15th anniversary of the Royal Omani Amateur Radio Society (ROARS). *(Oman stamp courtesy N2ATT; Liberian stamps courtesy LRAA)*

Want Some Peace and Quiet?

Is noise hampering your 160- and 80-meter QSOs? Check out W1FB's article elsewhere in this issue; maybe a snake is just what the doctor ordered! The snake, with its unidirectional response and reduced susceptibility to man-made noise, could be the answer to your problems.

A Job Well Done: Using mostly junk parts from a WWII-era ARC-5 transmitter, Wildon Priddy, KA4FKU, of Shively, Kentucky built the RX noise bridge featured in W1FB's article in December 1987 *QST*. Perhaps seeing Wildon's fine construction effort will spur you on to begin that *QST* project you've been thinking about building. *(photo courtesy KA4FKU)*

Have Bus Will Travel: The Central Alberta Radio League's Unit 901 began life as a city transit bus, but it now sports a large operating area, seating for 10 people, four bunk beds, a kitchen and a bathroom. The mobile communications center also features a 40-foot crank-up tower and a 4-kW generator. The bus, a joint venture of CARL, Alberta Public Safety Services and the county of Red Deer, is used for disaster exercises and activities promoting Amateur Radio. Unit 901 served as a main communications headquarters in Edmonton for the 1984 papal visit. *(photos courtesy VE6BLD)*



League Lines

87-14 update: The FCC has denied the ARRL's Freedom of Information Act request filed last year for two internal FCC studies of the Land Mobile Service. Meanwhile, United Parcel Service of America, Inc (UPS) has filed very late comments based on its alleged long-range plans to develop a nationwide private land mobile network using frequencies within the 220-222 MHz band. See this month's Happenings column for details.

QST ***is looking for human-interest articles.*** Not only can you share your writing with your fellow amateurs, you can also receive $50 per published article page. If you have a completed manuscript that features amateurs enjoying their hobby or covers some aspect of Amateur Radio operating, we'll be glad to review it for possible use as a *QST* feature article. For a copy of the *QST Author's Guide* or if you have any further questions, write to the Managing Editor at ARRL HQ, 225 Main St, Newington, CT 06111. We look forward to reviewing your material for possible publication in *QST*.

Club Bicentennial "200" call signs have been very popular! Many hams accepted the challenge in September *QST* to try to work all states with "200" call signs. A special endorsement sticker for the "We The People" WAS will be offered for working 50 of the 51 different designated entities, with the District of Columbia available as a "wild card" in case one state is missed. The endorsement application will be available upon request *after November 1*. The endorsement sticker will be available after January 1, 1989 (after all states have had their turn) upon submission of the application and an SASE with one unit of first-class postage. Meanwhile, keep working those "200" call signs. In April and early May, look for "200" prefixes from preregistered clubs in the following states:

March 26-April 1—Washington DC
April 23-29—Maryland
April 30-May 6—Louisiana
May 7-13—Minnesota
May 14-20—Wisconsin

13-cm band plan proposal: The ARRL is looking for input from the membership on the proposed 2300-MHz (13-cm) band plan, which can be found following this month's The New Frontier column. Comments on the proposed band plan may be addressed to: 13-cm Band Plan, Attention Bart J. Jahnke, KB9NM, at ARRL HQ.

NTS and ARES articles needed: ARRL HQ is actively seeking photographs, short articles and full-length stories relating to the National Traffic System and the Amateur Radio Emergency Service (ARES) for publication in the very popular Public Service column. Contact the Field Services Department at HQ for further details.

FCC Amateur Auxiliary volunteers needed: Many ARRL Sections are still in need of qualified amateurs to fill open positions in the Amateur Auxiliary to the FCC's Field Operations Bureau. Auxiliary members assist the Amateur Radio community (and the FCC) by keeping amateur operating and technical irregularities to a minimum, by participating in Local Interference Committees and by dealing with amateur-to-amateur complaints, thus continuing ARRL's 50-plus year tradition of Amateur Radio self-regulation. For more information, contact Luck Hurder, KY1T, in the Field Services Department at HQ.

During February, the ARRL Interference Reporting System (AIRS) filed numerous reports of nonamateur-to-amateur interference with the FCC Treaty Branch based on observations by its volunteers. Included in these reports were continuing problems with commercial fishing beacons on 160 meters, Radio Fujian (China) on 80 meters. Also reported were Radio Moscow and Radio Tirana (Albania) on 40 meters and Russian maritime stations on 15 meters.

Traveling to Canada? US amateurs traveling to VE-land are reminded that the US has automatic reciprocity with Canada. All that is needed for operation north of the border is your *original* license. Visitors must use the appropriate VE/VO/VY identifier, such as NUØX/VE2 when visiting Quebec.

If you are planning a trip to a foreign country other than Canada and are interested in the possibility of operating there, you must apply for a license even if the US has a Reciprocal Operating Agreement with that country. You can obtain information about operating from virtually any country by writing the Regulatory Information Branch at HQ. Please include an SASE. Remember that many countries require a minimum of 4-6 weeks lead time for processing of reciprocal permit requests, although some do offer "walk-in" processing.

An incomplete list of third-party countries appeared in last month's Happenings column. The corrected list is in this month's column on page 66.

VHFers! Don't forget the ARRL Spring Sprints in April. 144 MHz—April 11, 220 MHz—April 19 and 432 MHz—April 27. For further details see the Contest Corral column in this issue.

Call for Papers: HAMBIT '88 Florence, Italy, on November 27, 1988. Papers in Italian or English are invited on telecommunications, CAE/CAD, computer measurement, digital signal processing, computers as aids for the handicapped and related subjects. Camera-ready double-spaced papers should be preared on size A4 (8.2 × 11.69-inch) white paper with 1.38-inch margins on all sides, not over 20 pages. Submit to Carlo L. Ciapetti, I5CLC, Via Trieste 36, 50139, Florence, Italy no later than August 31, 1988.

Nominations for the Third Annual AEA Amateur Ambassador Award are being accepted until August 1, 1988. The award recogizes dedication to Amateur Radio, positive influence on nonamateurs and the promotion of the Amateur Service. The award will be presented at the ARRL National Convention in Portland, Oregon in September 1988. Send requests for the AEA Amateur Ambassador Award nomination form to Advanced Electronic Applications, Amateur Ambassador Award, PO Box C-2160, Lynnwood, WA 98036.

Leaque Lines

Conducted By Brian D. Smith, KA9OIH
1742 Century Way, Apt 8, Indianapolis, IN 46260

The FCC may have withdrawn its proposal for a no-code license, but there's an even more radical idea in the offing—a no-theory license. "It makes sense," says FCC spokesman G. Gordon Lidd. "You can get a driver's license without knowing how to repair a car, so why should Amateur Radio be any different?" If the plan is approved, the FCC would offer a new license, ranking below the Novice class, known as Lackey Class.

A shortage of volunteer examiners has prompted the FCC to implement a get-tough, military-style solution: the draft. Between now and next April 1, all amateurs must report to their nearest post office to pick up selective service cards. A lottery will determine who must give amateur exams and where in the US they will be stationed. Basic training will be in Gettysburg.

FCC officials have announced that when all 2-by-1 and 1-by-2 calls are exhausted, they will begin issuing even shorter calls. The next group will include 1-by-1 calls such as W9Z and K4B; 1-by-0 and 0-by-1 calls such as N3 and 7B; and, finally, "1" calls such as W and 8.

In an effort to reduce the overly restrictive requirements of its awards program, the ARRL has abolished its current versions of WAS, WAC, DXCC, the A-1 Operator Award, the Rag Chewers' Club and the Brass Pounders' League. In their place, the League will offer:

- WMS—Worked Many States. For amateurs who contact and occasionally confirm QSOs with 30 states. This eliminates the time-consuming, frustrating practice of trying to nail down rare states such as Vermont and Nevada.
- WAC—Worked A Continent. Includes North America.
- DXDC—DX Decade Club. For amateurs who have worked 10 different countries, including the US.
- The A-2 Operator Award. For halfway decent, sometimes polite amateurs who bend the rules only when necessary (such as using higher-than-legal power when trying to work rare DX, etc). You may nominate yourself for this award.
- RGC—Rag Gummers' Club. To qualify, talk with another amateur on the air or on the telephone for 10 minutes about something besides RST, QTH and name. (Suggestions: WX, rig and age.)
- Brass Tappers' League. Open to amateurs who have delivered at least three messages or can provide a reasonable excuse for why they couldn't (had to work late, kid sick with the flu, etc).

TV exercise guru Richard Simmons will operate a special-event station on April 1 at Waist Watchers headquarters in Estonia. Its call will be UR2FAT.

As hardcore DXers know, Serrana Bank was deleted as a DXCC country a few years ago. But in a surprise move, the ARRL has decided to add another bank to the DXCC Countries List—Chase Manhattan. "It's wealthier than many countries already on the list," explained ARRL spokesman Manny Watts.

A DXpedition in April will feature the special call M0NEY. The station will begin operating at 7 MHz and increase the frequency by 5¾ kHz, compounded daily.

Coming Next April 1:

- Nielsen ratings for the most popular slow-scan TV stations
- A consumer guide to the latest in rabbit-ear VHF antennas and spark-gap transmitters
- A delectable DXpedition to St Peter/Paul Mounds
- How to build an inexpensive full-wave 160-meter rotating beam antenna
- A new ham radio comic strip: Yagi Bear

A.C. Schock, KA9QRS, Leaque Lines resident advice columnist, answers questions from QRT readers.

Q. I'm a DXer who's especially interested in working European stations. So far I've confirmed every European country except HB0. Can you help me locate an HB0 station?

A. I can help, but I don't see what this has to do with working Europe. HB0, an abbreviation for Home Box Office, can be found in the Yellow Pages under Television—Cable. Once it's hooked up, check your cable guide for the specific channel. No sweat.

Q. I'm a new ham and the other day I heard a station identifying itself as W1AW. It was sending "QST" and then a long string of Morse code at high speed. What's the story here?

A. I wish I knew. I tried to work this station a few days ago, but the operator wouldn't stop transmitting. In fact, he apparently wanted to impress me by gradually increasing his code speed from 5 to 35 WPM. My advice is don't bother. The guy's obviously a pompous lid.

Q. I understand the FCC is based in Gettysburg. What's the address?

A. I don't see what the FCC has to do with it, but the Gettysburg Address begins, "Fourscore and seven years ago..." Check your history book for more info.

Q. Just got a card from an OM who bills himself as "WAS DXCC." What does this mean?

A. DXCC stands for DX Century Club, meaning the op has confirmed QSOs with 100 countries. But apparently this fellow has lost his DXCC status because of poor operating ethics. He gets an A for honesty, but an F for common sense.

PC-Board Production in the ARRL Lab

Take a computer, add some software and you've got a modern method of easing the PC-board production process. Here's a look at one way we employ modern technology in the ARRL Lab.

By Tom Miller, NK1P and Paul K. Pagel, N1FB
ARRL Lab Technician Senior Assistant Technical Editor, *QST*

Nowadays, most of the electronic equipment we use is assembled on printed-circuit (PC) boards. More than likely, most of you have built a project for which you've made a PC board, so you know basically what's involved when it comes to making "onesy-twosy" boards that probably aren't too complex. If you've not yet tried your hand at this art form, you'll find some of the methods commonly used by radio amateurs to make PC boards described in an article by Doug DeMaw[1] and supplemented by material in Technical Correspondence.[2]

But what would you do if you had to produce *many* high-quality PC boards, the majority of which were quite complex? The hacksaw, dry-transfer, resist ink or tape-and-pad approaches would be awfully time-consuming (if not downright unusable), wouldn't they? With that in mind, we thought you might be interested in knowing how one part of the project-development process—making PC-boards for *QST*, *QEX* and the *Handbook*—works in the ARRL Lab.

[1]Notes appear on page 18.

Once Upon A Time...

In the not-too-distant past, we spent hours sitting at a light table (see Fig 1) using quadrille paper and PC-board layout tape to indicate the location of each pad and connecting trace on a PC board. Generating such tape artwork is a slow process and requires considerable skill and patience; all trace runs are left to the PC-board designer's ingenuity. Once the board pattern is completed, it is photographically reproduced on a piece of transparent film. The transparency is then used to photographically expose the PC board.

After this, the board is etched. The completed tape master is fragile, and if the pattern needs to be modified, the physical limitations of

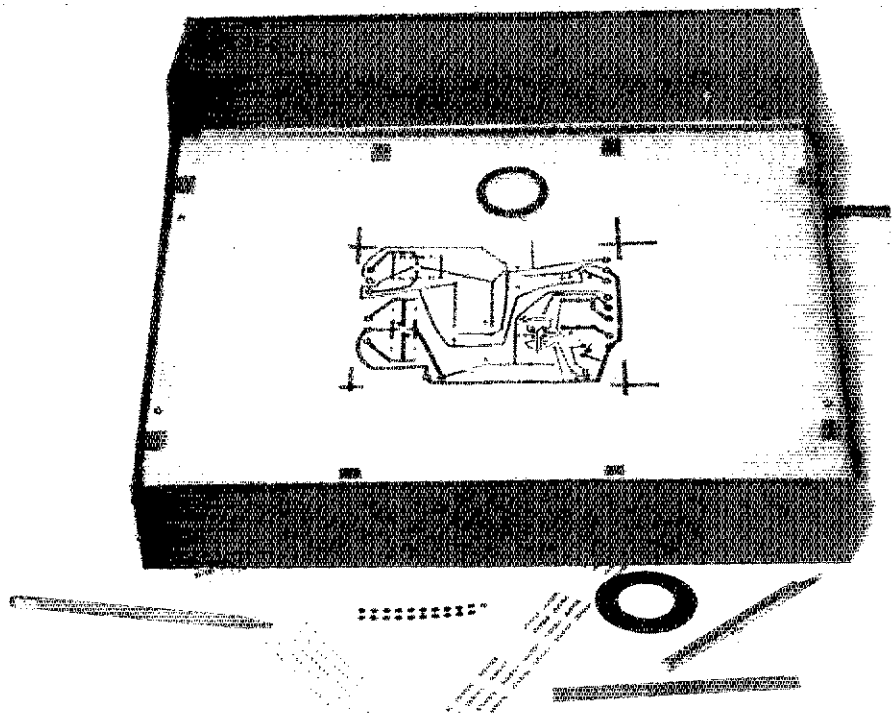


Fig 1—This homemade light table consists of a piece of translucent plastic beneath which is mounted a pair of fluorescent lamps. An internally mounted fan is used to prevent heat buildup. The tape artwork, usually done 2× (double size) and then photographically reduced, is laid out on a piece of transparent film.

the materials used prevent making more than minor changes. What's more, if several versions of a circuit board are needed, or if a large area has to be modified, the artwork may have to be reproduced—from scratch—maybe more than once!

The Right Stuff

About three years ago, the ARRL lab acquired some state-of-the-art equipment for PC-board production. The tools include a computer aided design (CAD) software package by Wintek Corporation called smARTWORK®, and circuit-board-production equipment.[3,4] These items, combined with an IBM® PC, color monitor, printer and plotter, enable us to make complex boards faster and easier.

With the aid of the software, the overall development procedure is consistent, and it doesn't require a great amount of experience to produce large and complex boards. As a result, projects are almost a snap to build, and don't require the use of wire-wrap or "ugly construction" methods (except during prototyping). Consequently, the end result looks more attractive and provides long-term reliability.

smARTWORK is supplied on a 5¼-inch floppy disk formatted to run with PC-DOS versions 2.x and above. Granted, at a cost of about $900 a copy, smARTWORK is *not* a piece of software that's likely to find its way into the hands of many radio amateurs! But as technology and competition progress, more CAD programs are becoming available and at lower prices.[5]

Hardware Considerations

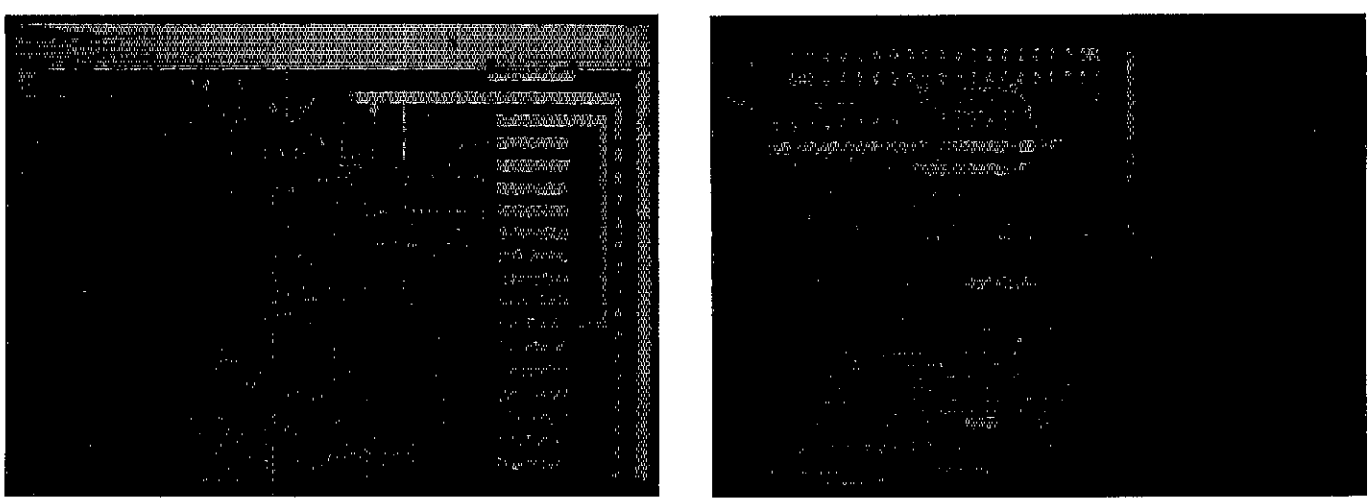
To use smARTWORK efficiently, the computer must be equipped with at least two floppy-disk drives: one for the program disk, and one on which to save the board-design data. A minimum of 192 kbytes of RAM and a color/graphics adapter board are also needed.

Although you can use a monochrome monitor with smARTWORK, a color monitor is preferred when making double-sided boards. This is because smARTWORK shows the traces on each side of the board in different colors. Photographs of two smARTWORK displays are shown in Fig 2. The left-hand photo is that of a display of a single-sided board; the right-hand photo shows how a double-sided board appears on the screen.

To get the PC pattern into a workable form, a dot-matrix printer and/or a plotter is needed. A plotter produces much clearer and more reproducible artwork.

Take a look at the title photo; it shows the overall CAD hardware layout in the ARRL Lab. From left to right, you see a color monitor atop an expansion chassis. This chassis provides additional expansion-board slots and a power supply to supplement the standard PC complement of eight expansion slots. A 30-Mbyte hard disk drive is mounted in the expansion chassis. Next is the main PC chassis containing two floppy-disk drives, followed by an Epson® MX-100 dot-matrix printer and a Houston Instruments DMP 41 plotter.

Although many manufacturers claim



(A) (B)

Fig 2—smARTWORK displays as they appear on a color monitor. At A, the display of a single-sided board. A double-sided board is shown at B. The two layers of the double-sided board are displayed in different colors; the program offers several colors from which you may choose.

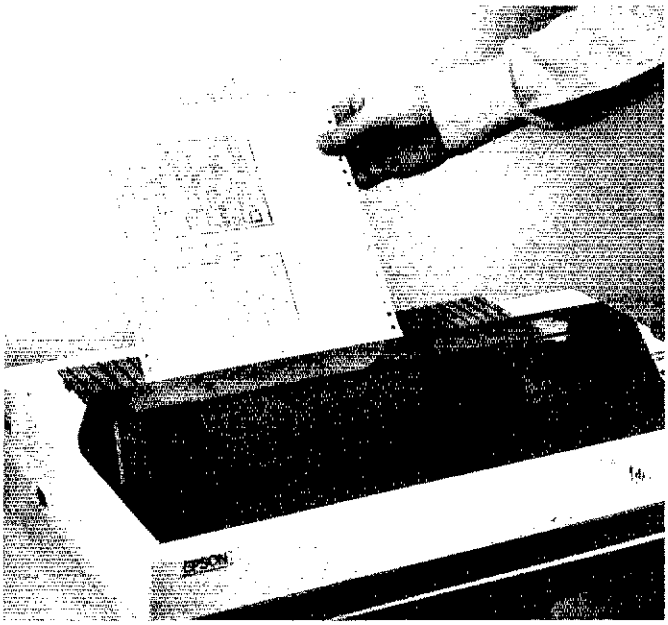


Fig 3—A sample of the dot-matrix printer output produced by smARTWORK. This particular printout is 1× (actual size) and shows patterns for both sides of a double-sided board; the bottom side of the board is the upper pattern. The printed copy is normally used only to check the accuracy of the layout.

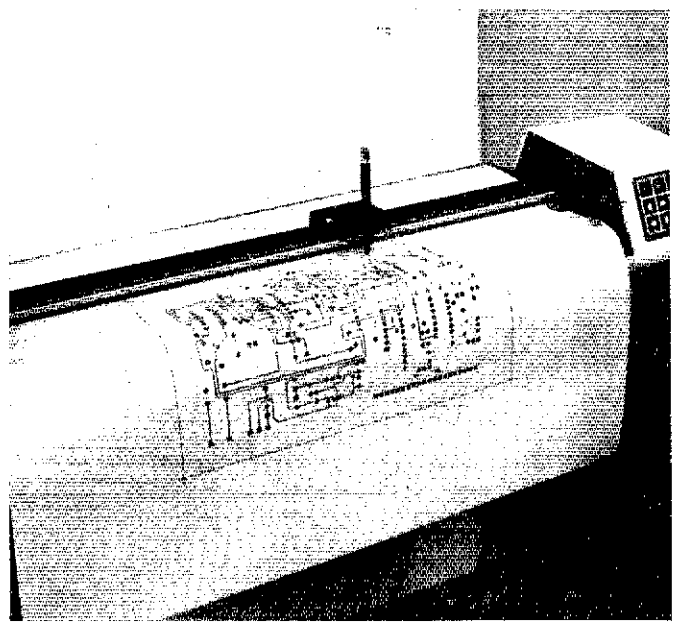


Fig 4—The plotter at work. This pattern is 2× (double size). The plotter pen moves horizontally, and the paper is pushed and pulled beneath the pen to reach the top and bottom of the pattern. It's fascinating to watch the pen zipping across the paper with such accuracy!

that their computers are compatible with the IBM PC, only those machines that closely emulate the operation of the IBM PC and its color/graphics adapter can run smARTWORK. smARTWORK will not run on the IBM PCjr.®

Using the Software

We won't attempt to describe in detail the use of the CAD program; that would require pages of explanation. We'll simply touch on the highlights to give you a taste of what it's like.

smARTWORK uses the computer's display screen as a window that shows a portion of a large PC-board's layout space. This window can be moved around the workspace to view any portion of the layout. One or both sides of the board—and a silk-screen layer—can be shown at any time; double-sided circuit boards are easily designed with this program. (As you see in Fig 2, the opposite sides of the board are displayed in different colors.) For easy viewing, the layout visible in the window is larger than actual size. Using the computer's keyboard, or a mouse (optional), you can place and remove conductor pads and traces. All conductors are perfectly vertical, horizontal or run at 45° angles. The program ensures that sufficient conductor separation exists, and that line widths are consistent. This results in a circuit board that is uniform and easily reproduced.

The resolution available for pad and conductor placement is fixed at 0.05 inch, more than enough for most applications. smARTWORK understands how to make electrical connections. This knowledge includes the ability to connect two points without shorting to a third and automatically finding the shortest route between two points once the originating and ending points have been identified. Several trace widths and pad sizes are available, and "FAT" cells—Wintek's name for a block that measures 0.05 by 0.05 inch—allow easy addition of ground planes and oversize traces. You simply plop a bunch of FAT cells together to construct your desired trace or plane.

Layout mistakes are easily erased and corrected. A few keystrokes or "mouse tracks" are all it takes. You don't have to slouch over a paper pattern, lifting pads and ribbons with a drafting knife, curling traces around corners and through IC pads. Though smARTWORK can make decisions on how a trace should run, you can override the program's choice and decide on another path. In fact, the whole process of designing a PC board can become somewhat of a pleasurable maze game!

Once you feel the circuit-board pattern is complete, you can save it as a standard DOS disk file. The pattern can be duplicated and merged with another pattern file in the program's edit mode. Paper copies can be made of the completed pattern, or (depending on the capabilities of the plotter) the copies can be made on vellum or polyester film. A camera-ready piece of artwork ("hard copy") can be made using a dot-matrix printer (as shown in Fig 3), or a plotter (see Fig 4). The pattern can be scaled anywhere from 1× through and including 2×. This step requires that the pattern be transferred to the film using photographic techniques.

Etching the Board

Once the PC-board layout has been transferred from the smARTWORK plot to transparent film, there are four steps remaining in the production of the PC board. These stages are shown in Fig 5.

The positive transparency (top left) produced from the artwork is used to make a film negative (top right). This is done by placing the positive on top of Kepro RF-2024 reversing film in a small contact frame. A GE Photo-ECT lamp exposes the film. This takes three minutes at a lamp-to-film distance of about 15 inches. After exposure, the film is developed using Kepro RFD developer, a process that takes two or three minutes.

A photographic process is also used to expose photosensitive board material (bottom left). We use Kepro negative photosensitized FR-4 with a 2-oz copper laminate. Because of the material's sensitivity to UV light, we use a red lamp in the PC-board developing/etching room to provide illumination when opening the packages and handling the unexposed board material.

The pattern negative is placed on top of the unexposed PC board in the contact frame. With the photoflood lamp used, an exposure of six minutes is required. Next, the board is placed in the developing tank (the one to the left in Fig 6). The developer is primarily sodium carbonate with a defoaming agent additive, maintained at a temperature of 110°F, which is sprayed on the board. It takes about 2 minutes to develop the board. This process removes the photoresist from all board areas that are not to contain copper. From here, it's on to the etching process.

Until we acquired the new etching system, we used a rudimentary ferric-chloride etchant process. (You can see the etchant tank we used in Fig 21, p 24-9, of the

Construction Techniques chapter of the 1988 *Handbook*.) A heat lamp warmed the etchant; the tray containing the etchant and board was slowly raised and lowered by a motor-driven cam to provide some agitation and hasten the etching process.

Our present PC-board etching system, the tank to the right in Fig 6, provides a greater degree of control over the etching process. The closed tank offers increased operator safety. Like the developer unit, the etcher sprays the etchant (sodium persulfate) across the board. About 5 to 10 minutes in the 110° bath is sufficient to etch the board.

Immersion in a stripper solution (Kepro DFS-12G—about 90% sodium hydroxide —a caustic substance) follows. Two to five minutes in the solution does the job. This process removes any residual resist.

The board is then buffed with steel wool and dipped in a tin-plating solution, which deposits a tin/lead layer on the bare copper. This coating takes solder well and enhances the appearance of the finished board (bottom right in Fig 5). Finally, the mounting holes for the components are drilled and the board is ready for use.

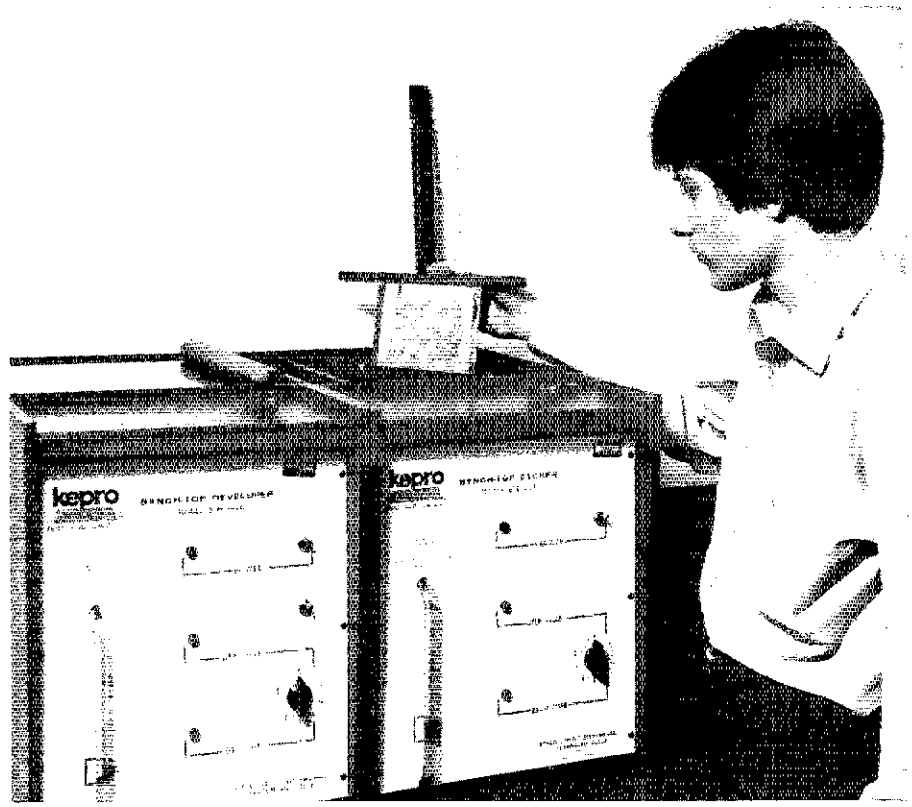


Fig 6—Tom Miller, NK1P, checks a PC board during the etching process. This Kepro system employs closed tanks, ensuring a great degree of safety.

Summary

Nowadays, many radio amateurs are reluctant to attempt construction of a project without the aid of a PC board or pattern. Whether it be a matter of time or just the fact that appearance is a prime consideration, we recognize the need for PC boards. Because of the increasing need for PC-board-oriented projects, we're glad we have the computer-aided means to do the job quickly and efficiently. It's one more way computers have made inroads into Amateur Radio.

(PS—We've now got a schematic-capture CAD program, too!)

The ARRL's efforts toward making building more attractive to radio amateurs are aided by Stas Andrzejewski, W6UCM, who owns and runs A & A Engineering. Stas offers PC boards, kits and assembled units for many projects presented in *QST* and the *Handbook*. In many cases, Stas designs and manufactures the PC boards for projects.

To obtain more information on what A & A Engineering has to offer, contact Stas at 2521 W La Palma Ave, Unit K, Anaheim, CA 92801, tel 714-952-2114.

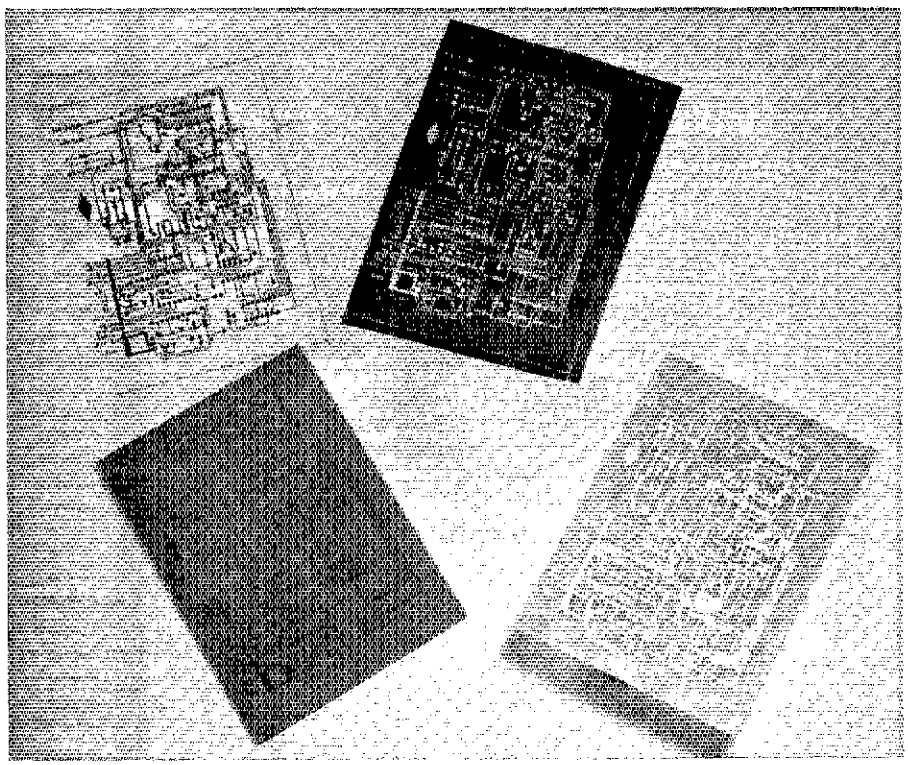


Fig 5—The four stages of the PC-board production process are shown here. At the upper left is the positive transparency; to its right is the negative. After exposure, the photosensitive board appears as shown at the lower left, ready to be developed and etched. The finished product appears at the lower right.

Notes

[1]D. DeMaw, "Homemade Circuit Boards—Don't Fear Them!," Aug 1987 *QST*, pp 14-16 and 23.

[2]P. Pagel, "Making PC Boards—One More Way," and L. Johnson, "And Another," Technical Correspondence, Nov 1987 *QST*, p 43.

[3]smARTWORK is available from Wintek Corporation, 1801 South St, Lafayette, IN 47904, tel 800-742-6809 (USA only, including IN and AK), or 317-742-8428.

[4]Kepro Circuit Systems, 630 Axminister, Fenton, MO 63026-2992, tel 800-325-3878 or 314-343-1630.

[5]An interesting article describing several PC-Board design programs appeared in the Jun 1987 issue of *Radio-Electronics*. "Designing PC Boards On Your Computer," by Robert Grossblatt, pp 97-99, discusses the basics of CAD and some of the things to look for in PC-board design software. See also Eva Freeman, "Low-Cost PC Board Layout Software," Oct 1987 *Ham Radio*, pp 8-15.

From TUs to Communications Processors

In the dim, distant past, terminal units reigned supreme. Today, a sleeker, more sophisticated descendant exists: the multimode communications processor.

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In order to copy RTTY signals and present the information they convey in human-readable form, some sort of black box is needed between your radio equipment and you. Years ago, such a black box was called a "terminal unit" or "TU." Now they're also identified by the names "interface," "modem" (*mo*dulator-*dem*odulator) and more properly, communications processor.

A Bit of History

Early TUs—modems—consisted of no more than a pair of simple tone decoders that eventually drove a relay in the teleprinter. From the '50s, not much changed in the makeup of the modem for 20 years or more, save for the replacement of vacuum tubes with transistors, and transistors with ICs. Then, around 1974, a stage of evolution occurred: the dawn of microcomputers. Slowly, microcomputers began to replace the teleprinter in ham shacks. In addition to the printed page, information could now be read from a video display instead of punched paper tape.

During the last few years, ASCII RTTY, AMTOR and packet radio joined CW and Baudot RTTY as exciting new digital modes of Amateur Radio operation. The interest in these modes required the adoption of a new approach to the design of modems. (See the sidebar "What's a Communications Processor?") On top of this, there was the ever-increasing growth in the world of microcomputers. Since 1976, many microcomputer systems have appeared, become obsolete and virtually disappeared. The process is ongoing. Computers of different manufacture are unique in that they usually have their own operating system, quirks, and use a different microprocessor than that of the competition.

The Software Problem

Another factor in the evolution of the modem is software development. Amateurs demanded specific software packages to use the various modes with their particular computers. I had my share in developing such software, but it's a task I wish never to become involved in again, especially in my spare time! Why? (1) Software written for one microcomputer system is *not* directly convertible to another; (2) writing a software package for a specific computer system that will become unpopular in a few years is *not* worth the effort; (3) designing a modem to be used with any *one* computer system is *not* the way to go. As computers become obsolete, so do such modems.

Obviously...

It became clear to amateurs, product manufacturers and software developers that radio amateurs: (1) wanted a modem that would not become obsolete with changes in computer systems; (2) wanted a multimode modem that would replace the individual units each operating mode previously required; (3) didn't want to buy specialized software every few years for their newly acquired computer system. Enter the multimode communications processor.

Two Modern Communications Processors

My discussion of communications processors will center around the Kantronics UTU-XT™ and KAM™ models. These units are designed to be used with any home computer or terminal. However, the differences in features offered by each unit are such that one may be more attractive to you than the other.

UTU-XT

The UTU-XT (Fig 1) has been around for about four years. This unit supports

What's a Communications Processor?

You can think of the modern multimode communications processor as a small computer system. An ASCII terminal (or home computer) connected to the unit is used simply as a display and a message-storage device. All of the communications decoding is done in the communications processor.

A typical communications processor has several audio filter sections (analog or digital) that separate the mark and space tones, and convert the filter output to levels suitable for use by the microprocessor and its associated circuitry. The microprocessor is programmed to decode the incoming signals and forward that information on to the display. The software that controls the decoding is contained in EPROM.

Data transfer between the communications processor and terminal is usually done by means of an RS-232-C I/O (input/output) interface, but some units also include TTL-level I/O control. This communications processor/terminal communication is carried out by additional software referred to as *communications, comm, modem* or *terminal* software. Some communications processor manufacturers include simple BASIC programs in their instruction manuals and/or offer such software as an extra-cost option. COMM.BAS is one example of landline telecommunications software that is provided by the computer manufacturer (IBM). Other landline telecommunications software (PC-Talk™ or ProCOMM™, for instance) can also be pressed into service. Landline telecommunications software is not ideally suited for Amateur Radio communications, however. You're better off using software specifically designed for Amateur Radio communications.—*Clay Abrams, K6AEP*

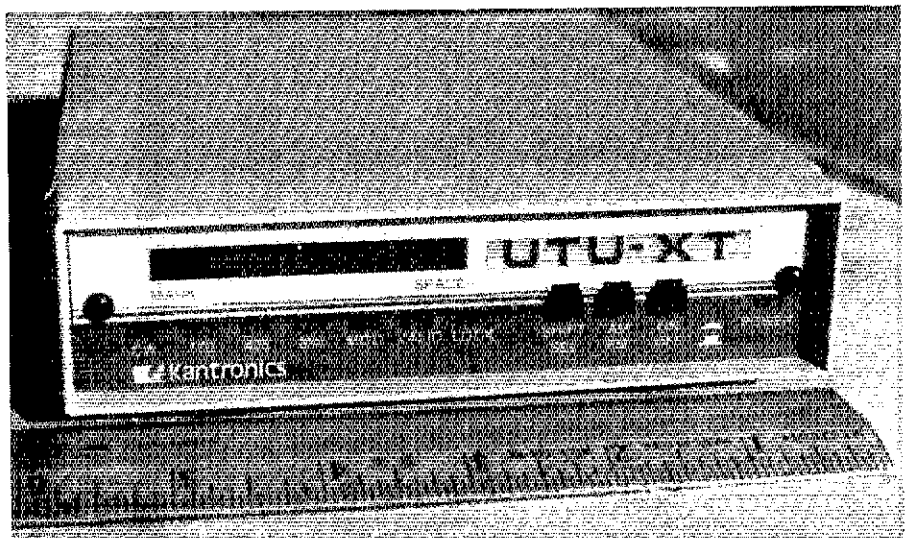

Fig 1—The original Kantronics UTU-XT operated the CW/RTTY/AMTOR modes; current (and updated) versions include packet operation—physical appearance remains identical. This communications processor measures approximately 5¾ inches wide, 1½ inches high and 8 inches deep. The electronics are contained on a single PC board. On the front panel are the 10-segment tuning display, several LED status indicators and three push-button switches. The rear panel supports a DB-25, a 5-pin DIN and audio and power connectors. All I/O connections are made at the rear panel. A single, internal jumper allows selection of RS-232-C or TTL levels.

CW/RTTY/AMTOR operation. The current version of the UTU-XT, the /P, offers packet-radio operation as well. (Both units are externally identical.) The UTU-XT is driven by a 63A03 microprocessor and contains 32 kbytes of EPROM (erasable, programmable read-only memory), 128 bytes of EEPROM (electrically erasable, programmable read-only memory) and 8 kybtes of static RAM (random-access memory). When these units are powered down, their last operating configuration can be saved in EEPROM if the PERM command is given.

Three of the four MF10CN switched-capacitor filters (SCFs) in the unit are employed to provide 12 poles of filtering for the mark and space filters. These filters are software-programmable for different mark and space tones, and any RTTY shift between 170 and 850 Hz. Shifts of 170 and 850 Hz are the defaults.

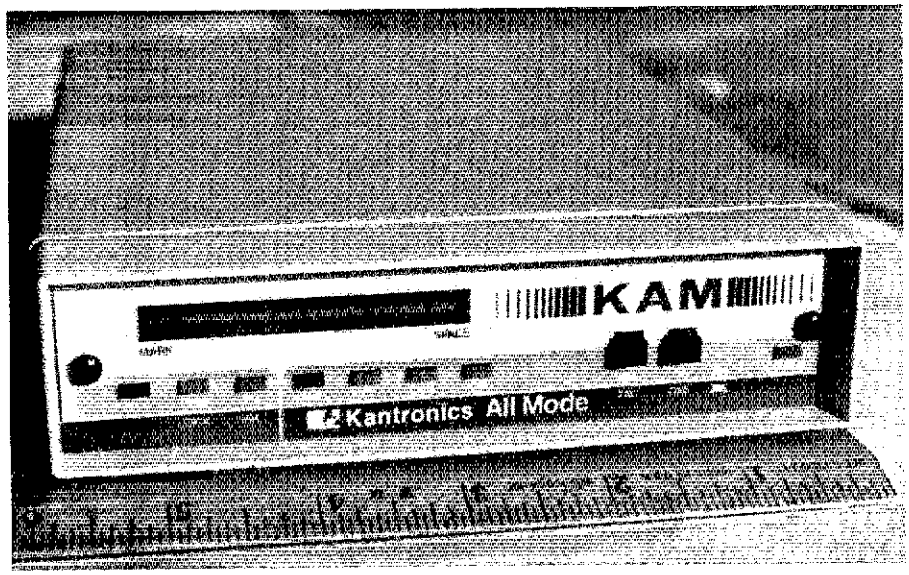

Fig 2—The Kantronics KAM all-mode communications processor. It's slightly deeper than the UTU-XT (8-7/8 inches) and has one less push-button switch on the front panel. The LED status indicator labels reflect the impact of the inclusion of packet radio as an operational mode.

KAM

The KAM (Kantronics All Mode) is, as its name implies, an all-mode communications processor (CW/RTTY/AMTOR/packet). Like the UTU-XT, the KAM (see Fig 2) also employs a 63A03 microprocessor and 32 kbytes of EPROM, but has a larger EEPROM (512 bytes) and more static RAM (32 kbytes) than the UTU-XT. The KAM has four more ICs than the older UTU-XT; they're used for the HF packet-radio functions.

Control

Most commands for the UTU-XT and KAM units are identical, but there are some differences. The UTU-XT has 127 commands (V 2.0 software) and the KAM has 141 commands (V 2.03 software).[1] Specific commands are issued to select modes of operation, reset default values and select operational conditions for each mode.

Asynchronous Communications

Because the communications processors are so flexible, it's possible to attach almost any type of ASCII terminal or computer to them. The major consideration when making communications processor/computer connections is knowing your computer's serial port characteristics. Many serial ports in low-cost computer systems or add-on boards do not provide for proper flow control, or "handshaking." (This lack of support is also evident in some software.)

Flow control is the ability of the communications processor and terminal to send each other stop and go signals to prevent loss of data. The data loss occurs because too much information is being transmitted to the communications processor or terminal, and the data can't be handled quickly enough. With flow control, the device receiving information can tell the information sender to pause momentarily. When the receiver is ready, it signals the sender to resume transmission. When flow control is not (or is improperly) implemented, your system may hang in the middle of a QSO, and you may have to power down and start all over again.

Two means of flow control are available: XON/XOFF (often referred to as the software method), and RTS/CTS (sometimes called the hardware method). Both of these flow-control methods are supported by the UTU-XT and KAM.

CW/RTTY/AMTOR Modes

The commands for these modes allow for a wide variety of different communications processor setups. This is particularly

[1]Notes appear on page 21.

useful when it comes to operating RTTY. For instance, each MARS (Military Affiliate Radio Service) branch has its own operating procedures. These procedures may even vary within different regions throughout the US. With the command flexibility, you'll be prepared for any situation you're likely to encounter. Though these commands may seem confusing at first, within a few weeks you'll be proficient in their usage.

How these commands are used is best described by a brief example. Let's say you're using the UTU-XT and want to make an RTTY contact. First, you type RTTY, which places the unit in RTTY receive mode at 45 bauds. A speed change is accomplished by entering Control S. To transmit, you enter Control T; to return to receive, you type Control R. In transmit, a Control L sends a LETTERS SHIFT and Control N commands a FIGURES SHIFT. Typing Control X returns you to command mode. Quite simple, really.

Special Features

Most communications processors have identical packet-radio operation commands; the differences are typically minor. The KAM, however, offers two packet-radio features that are not found in other products.

The KAM introduced a new mode of operation called the Personal Mail Box. With this feature, you can receive personally addressed messages at any time of the day. A host computer system does not have to be used. Once the feature is activated, up to 22 1-kbyte packets may be stored in the unit's memory. When you're ready to review the messages, the commands PBlist and PBread are used. The personal mail box mode operates with a command structure similar to that of the WØRLI bulletin board software.

Another feature of the KAM communications processor allows simultaneous packet operation on HF and VHF. The unit is placed in a gateway mode in which data can be received on HF and transmitted on VHF, or vice versa. Or, two contacts may be established simultaneously on HF or VHF. This can, however, get to be confusing when you consider that up to 26 multiple connects can be made at a time. When the KAM is used as part of a digipeater, the HF and VHF channels may be active together.

In addition to these two features, the Kantronics units permit RTTY lowercase characters to be transmitted in Baudot by using the NULL character as a special shift character. The technique used is similar to that by which the Cyrillic alphabet is transmitted. This type of communication, however, is presently limited to Kantronics units. I dislike the use of uppercase only on RTTY, and find this "mixed mode" exciting.

I found the programmable filters in both units to be an asset when copying commercial RTTY signals. The MODEM SHIFT feature allows you to choose various mark and space tones and automatically selects the proper shift.[2] Tuning in HF packet signals on the UTU-XT and KAM is easy using the LED tuning indicator.

CW Operation

Receiving CW remains the weak link in all communications processors regardless of system configuration. I have not found an adequate software algorithm for flawless CW copy. The units discussed here copy CW as well as any microcomputer software package I've seen, which is poor to fair on hand-sent CW. Machine-sent CW copy is flawless, as you might expect. With the Kantronics units, you must approximate the received CW speed setting within plus or minus 20 WPM.

With the ability to simultaneously work HF and VHF packet, the KAM is a most exciting communications processor to use. Without external switching of the audio and control lines, however, it's impossible to operate RTTY, AMTOR and CW on VHF with the KAM. That's because the VHF connector is connected only to the packet hardware on the PC board. If your interest is in HF operation only, consider the UTU-XT.

The Manuals

These documents are the most important means of determining how to use the units.[3] When you first fire them up, you'll have to configure them for use on the different modes. Although it's relatively easy to do this for the CW and RTTY modes, if you're not experienced with the packet/AMTOR modes of operation, the configuration process can be a major task. With over 100 commands, it could take some time to sort things out! If you know of a local ham with a similar unit, it may be helpful to contact him or her first, before trying to put your modem on the air.

Provided with the Kantronics units is a separate manual on AMTOR operation. This manual tends to be heavy in theory and weak in descriptions of practical application, however.

Software

The Kantronics UTU-XT and KAM manuals have examples of simple BASIC communications programs. Some computer manufacturers also supply simple communications software. I've tried a few commercially available communications software packages and found them to be unsatisfactory for Amateur Radio use (see the sidebar, "What's a Communications Processor?"). Therefore, I decided to write my own software (written in assembler and C), to run on an IBM® PC or compatible.[4] In the process, I included a few features I feel are important:

- Split screening. This allows for separate receive and transmit windows. While receiving, you can enter replies into a buffer for later transmission.
- Buffers. I include a 4-kbyte receive buffer in my software. The synchronous communications port is also configured for interrupt-driven operation. This enables you to scroll backwards through received text that has already scrolled off the screen.
- RTS/CTS or XON/XOFF flow control. Without these control functions, it's easy to overrun a communication processor's buffers, especially if you transfer files directly from disk to the unit.
- Support of two COMM ports. The software should be able to handle two communications ports simultaneously. With this capability, two communications processors can be used to provide a gateway, similar in function to that offered by the KAM. For instance, a UTU-XT can be operated on 20 meters in conjunction with a KPC-1 on 2 meters.

The UTU-XT and KAM are easy to interface between computer and radio equipment. I believe they are precursors of devices we'll be seeing for years to come. Someday, we may find communications processors built into our transceivers. The advances in Amateur Radio are very exciting in the late 1980s!

My thanks to Travis Brann, WA5RGU, of Kantronics for providing the communications processors I used when preparing this material and for offering constructive criticism.

Notes

[1]It's important to fill out your equipment warranty cards so that you can be advised, and take advantage, of any updates provided by the manufacturer. For instance, while working on this article, I received V 2.03 of the KAM software. This release added five commands, bringing the total to 141. Recently, Kantronics announced V 2.7 enhancements for the KAM. For more information, contact Kantronics at 913-842-7745.

[2]Mark tones as low as 50 Hz and space tones as high as 4 kHz can be selected in 1-Hz steps. Practically, tone frequencies of less than 300 Hz should not be used. Also, the radio equipment must be capable of handling the wide shifts possible with MODEM SHIFT.

[3]Kantronics provides equipment manuals to the blind in the form of ASCII text files on disk. Kantronics manuals are available only on MS-DOS formatted disks. (Some older equipment manuals can be obtained on Apple-formatted disks.) Contact Kantronics at 1202 East 23rd St, Lawrence, KS 66044, tel 913-842-7745.

[4]If you are interested in obtaining a copy of the communications software I've developed for use with the IBM PC and compatibles, or wish to comment on the information contained in this article, please include an SASE for a reply.

Phase Noise and its Effects on Amateur Communications

Part 2: Last month, we looked into the causes and effects of phase noise in amateur gear. This month, we'll delve into measurement of phase noise, both at home and in the lab.

By John Grebenkemper, KI6WX
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10501 N Tantau Ave
Cupertino, CA 95014

In part 1 of this article, I discussed the causes and effects of phase noise in amateur communications systems.[1] This month, procedures used for measuring both receiver and transmitter phase noise will be discussed.

Measuring Receiver Phase Noise

A block diagram of my receiver phase-noise measurement setup is shown in Fig 6. The test setup consists of an oscillator, a step attenuator and an ac voltmeter. The output of the oscillator is fed through the attenuator to the receiver's RF input. The ac voltmeter is connected to the audio output of the receiver. The receiver is operated in SSB or CW mode with the AGC disabled.

The oscillator and step attenuator must be carefully constructed (well shielded, minimum necessary lead lengths, and so on) for proper operation of this test setup.[2] The oscillator provides the reference signal for measuring phase noise. The phase noise of the oscillator must be less than that of the receiver if we are to measure receiver phase noise accurately. The oscillator should have a power output of at least +10 dBm (10 mW) into 50 Ω. Less power than this may limit the accuracy of the measurement setup at low phase-noise levels. The oscillator should be constructed in a metal box and powered by an internal 9-V battery to minimize unwanted signal leakage.

The step attenuator must have a maximum attenuation of at least 140 dB. Preferably, it should be adjustable in 1-dB steps. It is difficult to design a single attenuator circuit that provides this much attenuation, so a step attenuator with a maximum of 60 or 70 dB of attenuation should be used in series with fixed attenuators to obtain the maximum value. A design for a suitable step attenuator is given in *The ARRL Handbook*.[3] Each of the fixed attenuators can be constructed in a shielded enclosure using standard pi or T resistor configurations to achieve the desired attenuation.[4] Use BNC connectors on the oscillator and step attenuator; they have better shielding properties than UHF connectors. Commercial step attenuators and in-line coaxial attenuators are sometimes available on the surplus market. If you choose to build attenuators, use 5% (or better) precision resistors. The accuracy of the phase-noise measurements depends to a great extent on the accuracy of the attenuators.

The ac voltmeter is used to measure the audio output level from the receiver. The voltmeter should measure true RMS voltage, but commonly available peak-reading ac voltmeters are adequate for this application.

Phase-noise measurements are done on the band for which the oscillator is built. Measurements should be made in each amateur band, since phase-noise levels of many receivers vary from one amateur band to another. Briefly, the measurement procedure is as follows: A reference audio output level is established by tuning the receiver to the oscillator frequency and measuring the audio output voltage. The receiver is then tuned above (or below) the oscillator frequency in increments of the desired offset frequency. The attenuation is then decreased until the noise voltage at the audio output is the same as the reference level. The difference in the two attenuator settings is then corrected for the receiver bandwidth to give the SSB phase noise at that offset frequency. The process is then repeated for several different offset frequencies. Now we'll go through the measurement procedure step by step.

Step-By-Step Measurement Procedure

1) Connect the test equipment as shown in Fig 6. Set the step attenuator to its maximum attenuation. Switch the oscillator out of the line. Set the receiver for SSB or CW reception with the AGC disabled. Preamplifiers or input attenuators in the receiver should be disabled, if possible. Use the narrowest IF bandwidth available in the receiver. Set the RF and AF gain controls to maximum, unless this causes the audio amplifier to overload from receiver noise. In case of audio-amplifier overload, reduce the audio gain until there is a minimum of 10 dB of headroom in the audio amplifier. This can be done by decreasing the AF gain (while monitoring audio output voltage) by 10 dB after all signs of gain compression disappear. In other words, decrease the AF gain to 10 dB below the point at which the audio output voltage begins to vary linearly with adjustment of the AF gain control.

2) Determine the 6-dB bandwidth of the receiver. An easy way to do this is to enable the oscillator, tune the oscillator signal through the receiver passband and note the

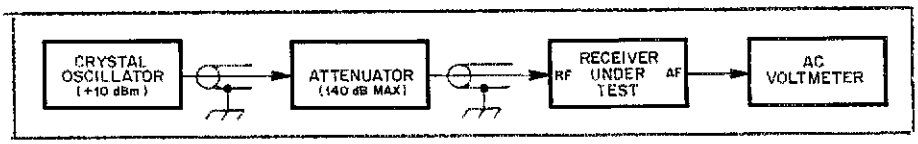


Fig 6—Block diagram of test setup for measuring the SSB phase noise of an SSB or CW receiver.

[1]Notes appear on page 25.

frequencies at which the audio voltage is 6 dB below the peak response. The difference between the upper and lower frequencies is the receiver's bandwidth. Alternatively, the published 6-dB bandwidth for the receiver can be used. The bandwidth measurement doesn't have to be very accurate—a 25% error in the bandwidth factor affects the phase-noise measurement by only 1 dB. Record the receiver bandwidth (Δf).

3) Switch the oscillator into the line. Center the oscillator signal in the receiver passband. Switch the oscillator out of the line and measure and record the audio output voltage. Switch the oscillator into the line again and adjust the step attenuator until the audio voltage increases by 41% (3 dB) from the no-signal value. The signal is now at the receiver's MDS (minimum discernible signal) level. This setting is a compromise: A higher setting allows more precise measurement of the audio output voltage; a lower setting decreases the possibility of overloading the receiver front end. Record the frequency to which the receiver is tuned (fo), the setting of the step attenuator (A_0), and the audio output voltage (V_0).

4) Measure the phase noise by first tuning the receiver to the desired offset frequency, given by fo + f, where f is the offset frequency. Then, adjust the attenuator until the audio output voltage is as close as possible to (V_0). Record the total attenuation (A_1) and the audio voltage (V_1). The SSB phase noise at this offset frequency is found by

$$L(f) = A_1 - A_0 - 10 \log (\Delta f) \quad \text{(Eq 1)}$$

where L(f) = SSB phase noise in dBc/Hz.

5) Determine if the receiver is overloaded at this offset frequency as follows: Decrease the attenuation by 3 dB. Note the audio voltage at the new attenuator setting (V_2). The audio output voltage of the receiver should increase by approximately 22% (1.7 dB) from V_1. If it increases by less than 18% (1.4 dB), it is likely that some stage in the receiver is overloaded, and the SSB phase-noise measurement is inaccurate. If the overload is in the audio stages, it can be eliminated by decreasing the audio gain and repeating the measurements. If the overloading is occurring in the RF or IF stages, the receiver's blocking dynamic range has been exceeded. The overload may be eliminated by reducing the receiver's RF gain and repeating the measurements. The existence of this problem indicates that, at this offset frequency, the receiver's performance is limited by blocking dynamic range, not phase noise.

6) Repeat steps 4 and 5 for several offset frequencies. Ideally, measurements should be made at offset frequencies separated by no more than half of the receiver's bandwidth, in order to make sure that no discrete phase-noise components are overlooked. This is tedious at the greater offset frequencies. Generally, a coarser sampling is adequate to plot the phase-noise curve, as long as you check the intermediate offset frequencies to make sure that no discrete signals are present. The measurements can start at offset frequencies as close as a few times the receiver's bandwidth, if the receiver has good IF filters. You can determine if the offset is too small by disconnecting the audio voltmeter from the receiver and listening to the audio. If you can hear the carrier signal at all, the offset is too small. All that should be present is noise, if the measurement is to be accurate. Increase the offset until no trace of carrier remains in the audio to be sure.

The measurement technique outlined in the steps above is quite accurate. SSB phase-noise levels of less than −160 dBc/Hz can be measured on a receiver that has good sensitivity and a high gain-compression point (good dynamic range), as determined in step 5. It is difficult to construct an oscillator that has a noise floor much below this level and, as mentioned earlier, the oscillator phase-noise level limits the accuracy of the measurement setup.

This measurement technique has advantages and disadvantages. One of its major advantages is that it measures the *apparent* phase noise of the receiver. Apparent phase noise includes the effects of filters; it is the phase noise that actually limits a receiver's dynamic range.

One disadvantage of this measurement technique is that it doesn't allow *direct* measurement of the phase noise of an oscillator. Therefore, it can't be used to directly measure the phase noise of a transmitter. This limitation can be overcome by using a receiver with known phase-noise characteristics to measure the phase noise of a transmitter. The transmitter is substituted for the oscillator in the test setup, and its output is attenuated to the power level of the oscillator. As long as the transmitter phase noise is greater than that of the receiver, measurements of the transmitter's phase noise will be accurate.

Another disadvantage is that, at some offset frequencies, the receiver's dynamic range may make phase-noise measurement impossible. Precision in this measurement technique requires that the oscillator output be variable from a very low level to a very high level, in small, precise steps.

Table 3 and Fig 7 show the phase-noise characteristics I measured in the receiver section of my ICOM IC-745 transceiver using this method. Table 3 includes the attenuation and voltage values to show

Table 3

SSB Phase Noise of ICOM IC-745 Receiver Section

Oscillator output power = −3 dBm (0.5 mW)
Receiver bandwidth (Δf) = 1.8 kHz
Audio noise voltage = 0.070 V
Audio reference voltage (V_0) = 0.105 V
Reference attenuation (A_0) = 121 dB

Offset Frequency (kHz)	*Attenuation (A_1) (dB)*	*Audio V_1 (volts)*	*Audio V_2 (volts)*	*Ratio V_2/V_1*	*SSB Phase Noise (dBc/Hz)*
4	35	0.102	0.122	1.20	−119
5	32	0.104	0.120	1.15	−122*
6	30	0.104	0.118	1.13	−124*
8	27	0.100	0.116	1.16	−127*
10	25	0.106	0.122	1.15	−129*
15	21	0.100	0.116	1.16	−133*
20	17	0.102	0.120	1.18	−137
25	14	0.102	0.122	1.20	−140
30	13	0.102	0.122	1.20	−141
40	10	0.104	0.124	1.19	−144
50	8	0.102	0.122	1.20	−146
60	6	0.104	0.124	1.19	−148
80	4	0.102	0.126	1.24	−150
100	3	0.102	0.126	1.24	−151
150	3	0.102	0.124	1.22	−151
200	0	0.104			−154
250	0	0.100			−154
300	0	0.098			< −154
400	0	0.096			< −154
500	0	0.096			< −154
600	0	0.097			< −154
800	0	0.096			< −154
1000	0	0.096			< −154

Asterisks indicate measurements possibly affected by receiver overload (see text).

Transmitter Phase-Noise Measurement in the ARRL Lab

Last month, the technique used in the ARRL lab to measure transmitter phase noise was introduced briefly. The system essentially consists of a direct-conversion receiver with very good phase-noise characteristics. As shown in Fig A, we use an attenuator after the transmitter, a Mini-Circuits ZAY-1 mixer, a Hewlett-Packard 8640B signal generator, a band-pass filter and an audio-frequency spectrum analyzer (HP 8556A/8552B) to make the measurements.

The transmitter signal is mixed with the output of the signal generator, and signals produced in the mixing process that are not required for the measurement process are filtered out. The spectrum analyzer then displays the transmitted phase-noise spectrum. The 100 mW output of the HP 8640B is barely enough to drive the mixer—the setup would work better with 200 or even 400 mW of drive. To test the phase noise of an HP 8640B, we use a second '8640B as a reference source. It is quite important to be sure that the phase noise of the reference source is lower than that of the signal under test, because we are really measuring the combined phase-noise output of the signal generator and the transmitter. It would be quite embarrassing to publish phase-noise plots of the reference generator instead of the transmitter under test! The HP 8640B has much cleaner spectral output than most transmitters.

As in the sidebar, "Phase-Noise Photographs from the ARRL Lab," in part 1 of this article, phase-noise photographs for several popular amateur transceivers are shown. All photographs were taken directly from the spectrum-analyzer display, using the test setup shown in Fig A. These photos do not necessarily reflect the phase-noise characteristics of all units of a particular model.

The log reference level (the top horizontal line on the scale in the photos) represents −60 dBc/Hz. It is common in industry to use a 0-dBc log reference, but such a reference level would not allow measurement of phase-noise levels below −80 dBc/Hz. The actual measurement bandwidth used on the spectrum analyzer is 100 Hz, but the reference is scaled for a 1-Hz bandwidth. This allows phase-noise levels to be read directly from the display in dBc/Hz. Because each vertical division represents 10 dB, the photos show the noise level between −60 dBc and −140 dBc. The horizontal scale is 2 kHz per division. The offsets shown in the photos are 2 through 20 kHz.

What do the Phase-Noise Pictures Mean?

Although they are useful for comparing different radios, Figs B-E can also be used to calculate the amount of interference you may receive from a nearby transmitter with known phase-noise characteristics. An approximation is given by

Interfering signal level =
NL + 10 × log BW (Eq A)

where
Interfering signal level is in dBc
NL is the noise level on the receiving frequency
BW is receiver IF bandwidth in Hz

For instance, if the noise level is −90 dBc and you are using a 2.5-kHz SSB filter, the interfering signal will be −56 dBc. In other words, if the transmitted signal is 20 dB over S9, and each S unit is 6 dB, the interfering signal will be as strong as an S3 signal.

The measurements made in the ARRL lab apply only to transmitted signals. Because we do not have computer-controlled instrumentation, it is not practical to make the large number of measurements necessary to evaluate receiver phase noise more precisely than author Grebenkemper's setup allows. It is reasonable to assume that the phase-noise characteristics of most transceivers are similar on transmit and receive, because the same oscillators are generally used in the local-oscillator (LO) chain.

In some cases, the receiver may have better phase-noise characteristics than the transmitter. Why the possible difference? The most obvious reason is that circuits often perform less than optimally in strong RF fields, as anyone who has experienced RFI problems can tell you. A less-obvious reason results from the way that many high-dynamic-range receivers work. To get good dynamic range, a sharp crystal filter is often placed immediately after the first mixer in the receive line. This filter

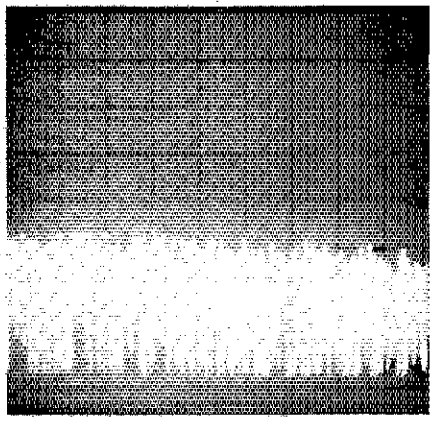


Fig B—Kenwood TS-940S (serial number 7050361) phase-noise characteristics. Measurement frequency: 3.5 MHz, power output: 127 W.

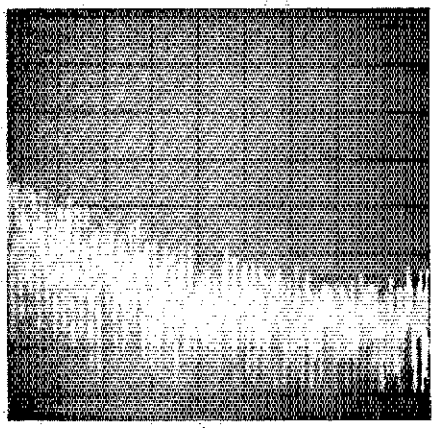


Fig C—ICOM IC-745 (serial number 03101) phase-noise characteristics. Measurement frequency: 3.5 MHz, power output: 100 W.

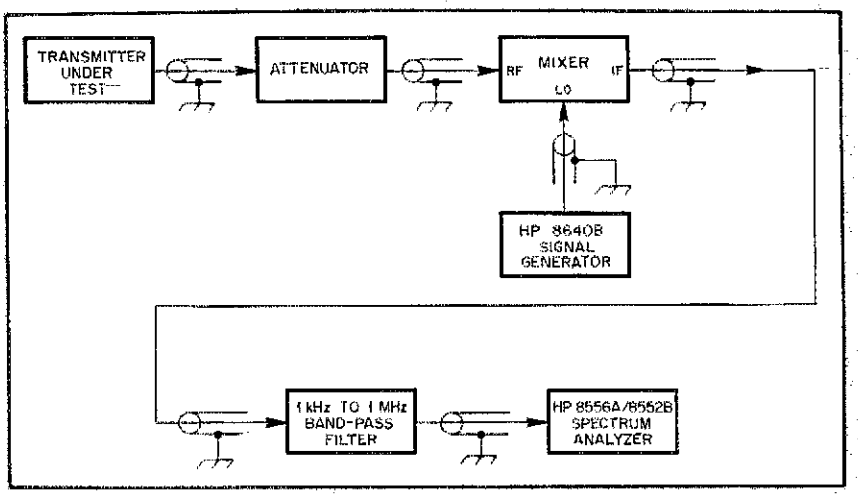


Fig A—ARRL transmitter phase-noise measurement setup.

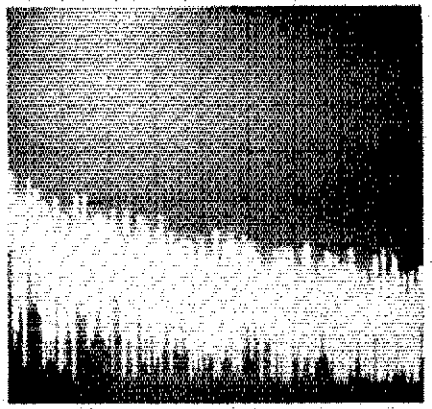


Fig D—Kenwood TS-440S (serial number 7051669) phase-noise characteristics. Measurement frequency: 3.5 MHz, power output: 104 W.

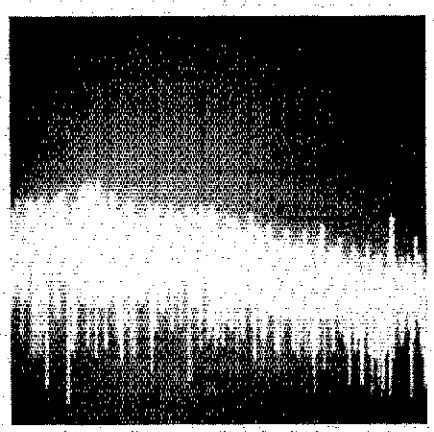


Fig E—Ten Tec Corsair II (serial number 58001721) phase-noise characteristics. Measurement frequency: 14 MHz, power output: 103 W.

removes all but a small slice of spectrum for further signal processing. If the desired filtered signal is a product of mixing an incoming signal with a noisy oscillator, signals far away from the desired one can end up in this slice. Once this slice of spectrum is obtained, however, unwanted signals cannot be reintroduced, no matter how noisy the oscillators used in further signal processing. As a result, some oscillators in receivers don't affect phase noise.

The difference between this situation and that in transmitters is that crystal filters are seldom used for reduction of phase noise in transmitting because of the high cost involved. Equipment designers have enough trouble getting smooth, click-free break-in operation in transceivers without having to worry about switching crystal filters in and out of circuits at 40-WPM keying speeds!—*Zack Lau, KH6CP, ARRL Laboratory Engineer*

their relationships to phase-noise levels in my IC-745 over this range of offset frequencies. The data obtained from the ratio of V_2 to V_1 indicates that the receiver was probably overloaded at offset frequencies from 5 kHz to 15 kHz. This measurement was limited to an SSB phase-noise floor of – 154 dBc/Hz because of the low power-output level of the oscillator. Fig 7 is based on the far-out phase noise data obtained from Table 3, as well as the close-in phase noise measured using laboratory test equipment and the same IC-745. The data obtained using the method described earlier and that obtained from the laboratory test equipment closely track each other. The phase-noise performance of this transceiver generally exceeds that indicated by the "good" curve in Fig 5 of part 1 of this article.

Conclusion

Close-in phase noise generally has little effect on the performance of amateur communications systems. However, far-out phase noise *can* significantly reduce the dynamic range of a receiver. Far-out phase-noise performance has effects just as critical as blocking dynamic range and two-tone dynamic range performance of receivers. Ideally, these measurements should be made for a range of offset frequencies. Far-out phase noise in receivers

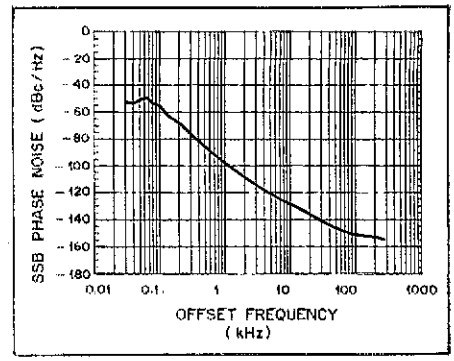


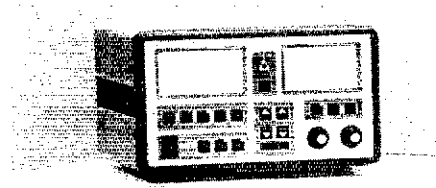
Fig 7—Measured SSB phase noise of an ICOM IC-745 transceiver (serial number 01528).

can be measured with relatively inexpensive test equipment, as long as care is taken to perform the measurements properly.

Notes

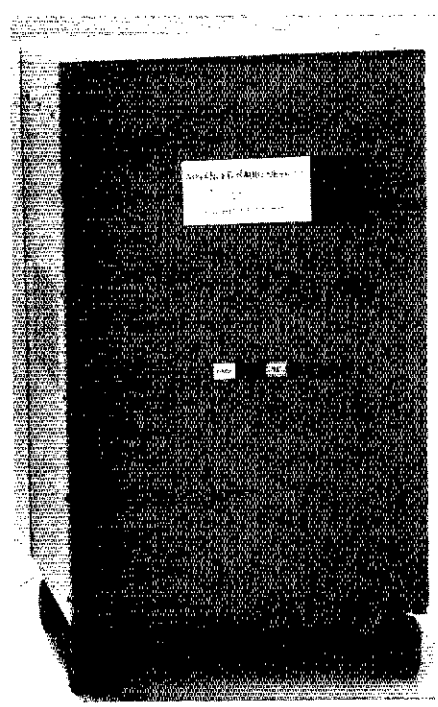
[1]Part 1 appeared in Mar 1988 *QST*, p 14-20.
[2]A simple oscillator circuit suitable for use in this application appears in W. Hayward and D. DeMaw, *Solid State Design for the Radio Amateur*, 2nd printing (Newington: ARRL, 1986), p 126, Fig 26.
[3]M. Wilson, Ed., *The ARRL Handbook*, 1988 edition (Newington: ARRL, 1987), p 25-43.
[4]Component values and construction information for fixed attenuators are given in *The ARRL Handbook*, 1988 edition, p 25-44.

New Products



ADVANCED RADIO DEVICES HF LINEAR AMPLIFIER

☐ The ARD model 230A is a legal-limit, continuous-duty HF linear amplifier covering the amateur bands from 1.8 to 21 MHz. (The 230A can be modified for Amateur Radio use at 28 MHz.) The 230A is a two-piece unit (separate control head and RF deck/power supply section) featuring full microprocessor control, backlit liquid-crystal status display, RS-232-C interface for external computer control, and automatic tuning and monitoring. A pair of Eimac 3CX800A7s handles power amplification, and the amplifier requires only 50 to 70 W drive for 1500 W output (CCS) on all bands. Other features include full QSK operation, built-in SWR calculation and protection circuitry, a heavy duty power supply, and automatic safety monitoring of filament voltage, reverse power, grid and plate current, airflow and amplifier efficiency. Price class: $3695 plus shipping. Manufacturer: Advanced Radio Devices, 103 Carpenter Dr, Sterling, VA 22170, tel 703-478-3100.—*Rus Healy, NJ2L*



Improving the HW-9 Transceiver

If you own an HW-9 or other QRP transceiver, you'll find these ideas will add to your operating enjoyment. So, heat up that soldering iron!

By Chuck Hutchinson, K8CH and Zack Lau, KH6CP
ARRL Technical Department

This article is divided into two parts. In the first part Chuck, K8CH, describes the portable QRP station that he uses for Field Day and vacation operating. The second part describes circuit modifications by Zack, KH6CP. Although the ideas presented concentrate on using and improving the Heath HW-9, they can be adapted to many QRP rigs.

Chuck's QRP Package

I enjoy chasing DX with QRP—most of the time. But Field Day and vacation are two times when QRP operation is particularly appropriate and rewarding. I'm not averse to running 100 watts (or even the legal limit when conditions warrant), but my entire QRP station with transceiver, power supply, antenna, keyer and other accessories is about the same size and weight as my 100-W, full-feature transceiver. That means it's a lot easier for me to take the QRP station to the Field Day site. As for vacation, only the QRP rig will fit into the car along with the rest of the family luggage.

I use two 9-Ah gelled-electrolyte, lead-acid batteries as a portable power supply.[1] These are not lightweights, but they're good for many hours of operation. Exact time before recharging is required depends on duty cycle. In other words, transmitting "eats" the batteries more rapidly than receiving.

While one battery is powering the transceiver, the other can be recharging. My favorite method of recharging the batteries is to use a solar panel—mine is rated at 18 V and 500 mA.[2] It feels good to put those free photons to work—and solar energy is good for bonus points on Field Day! An ac-operated charger was described in June 1987 *QST*.[3] That charger ensures optimum charging of batteries. For best battery life, don't run the batteries flat before recharging. *The ARRL Handbook* explains proper care of lead-acid batteries (Chapter 6 in recent editions).

[1]Notes appear on page 29.

Portable Antennas

For portable operation, I like to use a dipole suspended by tough, lightweight nylon cord. The dipole in my portable station uses plastic insulators (see Fig 1). The center insulator has an extra hole so that a nylon line can be used to support the

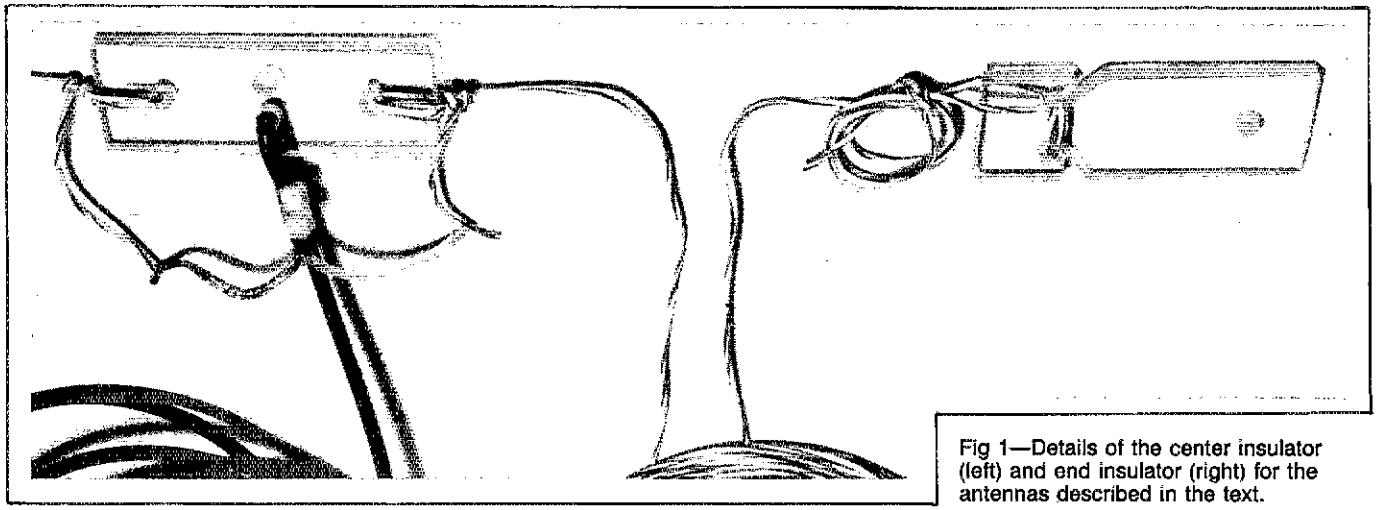


Fig 1—Details of the center insulator (left) and end insulator (right) for the antennas described in the text.

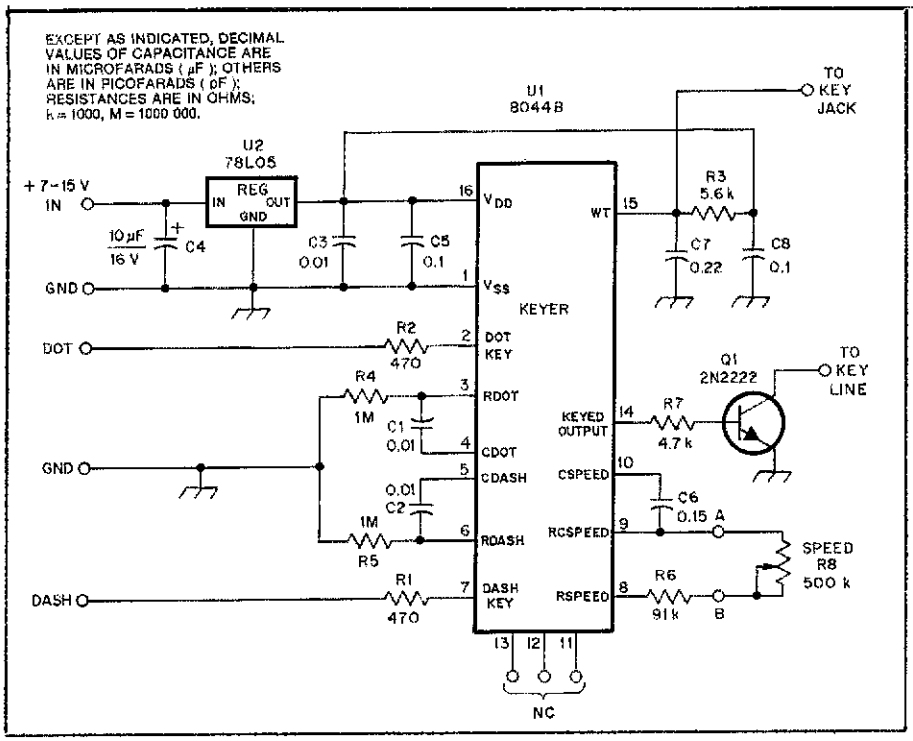


Fig 2—Schematic diagram of a keyer based on the Curtis 8044 IC. Capacitors are disc ceramic, except for C4, which is electrolytic. C6 and C7 are NP0 types, although any temperature-stable capacitor of the proper value should work fine.

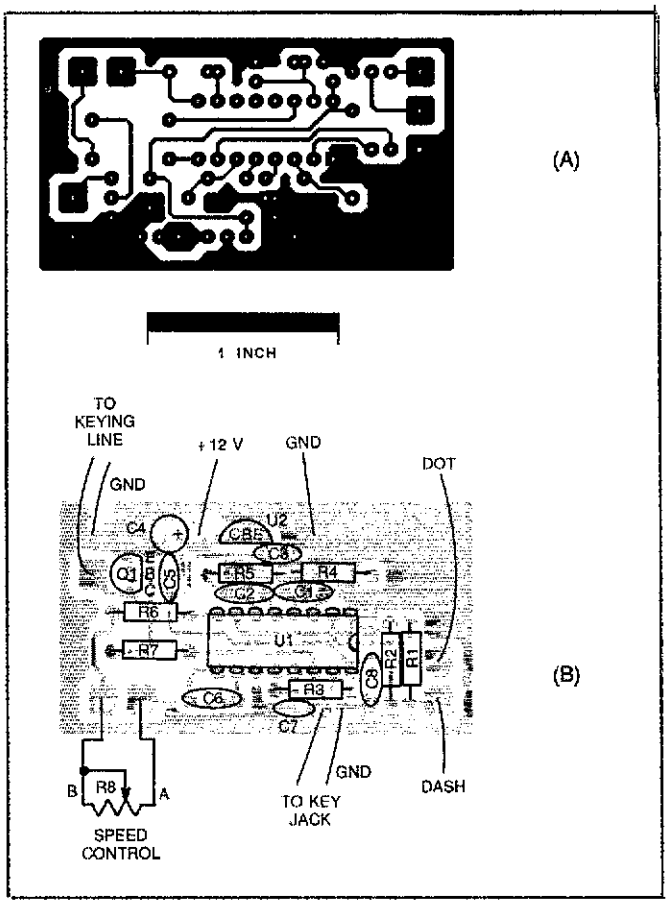


Fig 3—Circuit-board etching pattern (A) and parts-placement guide (B) for the keyer. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

center. The end insulators are made so that element lengths can be adjusted easily for changing bands.

For 80-meter operation, I use an end-fed quarter wavelength of wire terminated with a banana plug. The plug fits neatly into the RF connector on the HW-9's rear panel. The far end of the wire is supported by a plastic insulator like those used in the dipole. Because this antenna operates against ground, I carry a couple of clip leads to make a connection to the best ground I can locate. (For instance, I've had good luck grounding to the heating pipes in a motel. The secret is to use what you have available.)

Accessories

At first, I used my son Scott's (N1DSF) Heath μMatic Memory keyer with the HW-9. (I mounted a phono connector to the HW-9's rear panel to provide switched 12 V dc power for the keyer.) Later, I decided to build into the transceiver a keyer based on the Curtis 8044 CMOS IC. The circuit is based on the 8044 spec sheet, and the schematic is shown in Fig 2. Tom Miller, NK1P, prepared the schematic and the PC board shown in Fig 3. I mounted the completed board upside down using a bolt and nut that holds the HW-9's BFO shield in place. I moved the wire from the key jack to the circuit board, and ran a new wire from the circuit board to the key jack. The SPEED control, R8, is added to the front panel, and a jack for the paddle is added to the rear panel.

For portable operation, I wanted to package the station for easy transport. An aluminum briefcase proved to be just what I was looking for. Packing foam, cut with a hacksaw blade, cushions the HW-9. The rest of the station, except the solar panel, goes into the case with the HW-9: the two gel batteries, dipole with feed line, 80-m end-fed antenna, nylon cord, clip leads, keyer paddle, lightweight headphones and an ARRL Minilog.

Conclusion

My portable QRP station is not made for backpacking. It does, however, fill my need for something that goes easily to Field Day or on vacation. The entire station, except for the solar panel, fits into a briefcase. What could be more convenient?—*Chuck, K8CH*

Zack's Circuit Improvements

Although this portion of the article concentrates on improving the Heathkit HW-9 QRP transceiver, these modifications may be of general interest to home-brewers, as they can be adapted to many QRP rigs. These modifications include adding an SWR meter that requires no balancing adjustments, removing audio thumps and clicks, and improving the signal-to-noise ratio of the HW-9's NARROW audio filter.

The new HW-9 SWR meter is a version of the directional coupler used in the Tandem match.[4] The main advantage to the coupler shown in Fig 4 is that no adjustments are required. Anyone who has fiddled with trimmer capacitors trying to get a good null will appreciate this feature. Faraday shielding is not used in this application, as coupler directivity is adequate for the uncompensated diode detectors.

The switching circuit, shown in Fig 5, allows the existing HW-9 meter to be used as an SWR meter on transmit and as an S-meter (it's normal function) on receive. When the voltage at the input of this circuit (Q403 collector) is zero, Q1 turns on and Q2

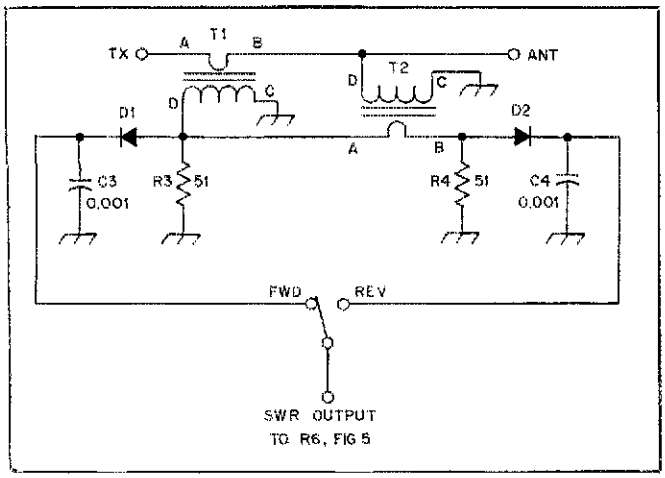


Fig 4—Schematic diagram of the SWR meter.
D1, D2—Shottky diode HP 2800-2835 (1N34A can be substituted).
T1, T2—Broadband transformer. Primary has 14 turns of no. 26 enam wire on an Amidon FT-23-43 toroid core. Secondary is 1 turn of no. 22 hookup wire.

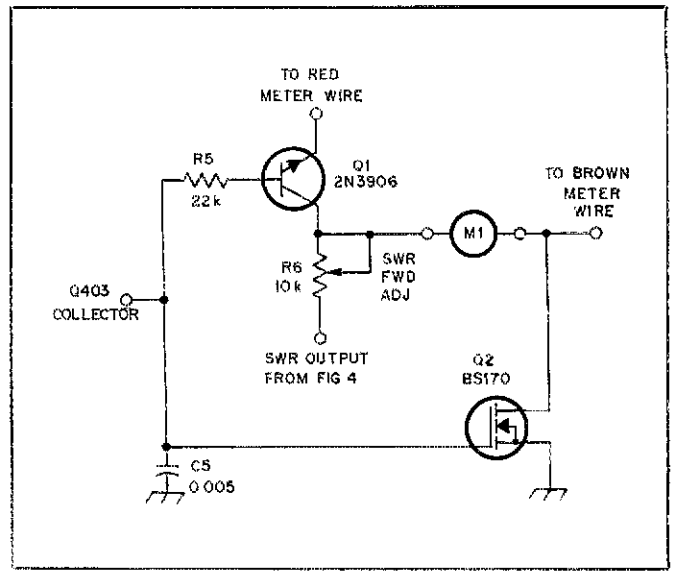


Fig 5—Schematic diagram of the meter switch circuit. Q403 is a Heathkit part designator.

turns off. This allows the meter to function normally. When the input voltage is raised to 12 volts, as is the case during transmit, Q1 is turned off and Q2 is turned on. Q1 now prevents current from the S-meter circuit from affecting the SWR measuring circuit. When Q2 is turned on, it effectively shorts out the S-meter calibration voltage, as it is not wanted while using the meter to measure SWR.

The audio thump suppressor is used to reduce the audio thumps that result when the HW-9 switches from transmit to receive. The audio line in the original HW-9 sounds like it's being shorted out when the rig switches between transmit and receive because a transistor, Q303, is used to do exactly that! A 12-dB reduction in audio thump can be obtained by using a JFET switch to break the audio line while transmitting. See the schematic in Fig 6. When the gate of the JFET Q3 follows the source, the JFET acts as a resistor with a value of roughly 100 to 300 ohms. When the gate is grounded, the JFET effectively breaks the audio line. A dc bias of roughly $V_{cc}/2$ is needed at the source of the JFET for the circuit to work. This is supplied by the output of U304. C2 is used to reduce the high-frequency response of the switch to help remove the high-frequency audio clicks. R2 is optional. A properly selected value for R2 will provide a degree of audio limiting and further thump reduction beyond the measured 12 dB. It is possible to eliminate the thump entirely by adding additional low-pass or band-pass filtering after the JFET switch. The remaining thump exists only in the wide filter position, as the narrow filter removes it.

The final modification increases the dynamic range of the HW-9 by a few decibels. If the capacitor values in an active filter circuit are too small, a substantial increase in noise results. The new values shown in Table 1 are chosen for a 250-Hz Bessel response centered at 700 Hz. A Bessel response is chosen to eliminate ringing. Measurements in the ARRL lab indicate that the filter shape tends to change at very low signal levels if the capacitor values are too small. In some cases, the band-pass response actually becomes a notch response, although the notch is usually above the desired passband.

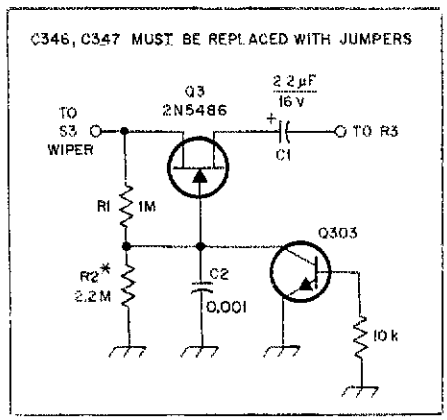


Fig 6—Schematic diagram of the audio thump suppressor. Q303 is part of the transceiver—see text.

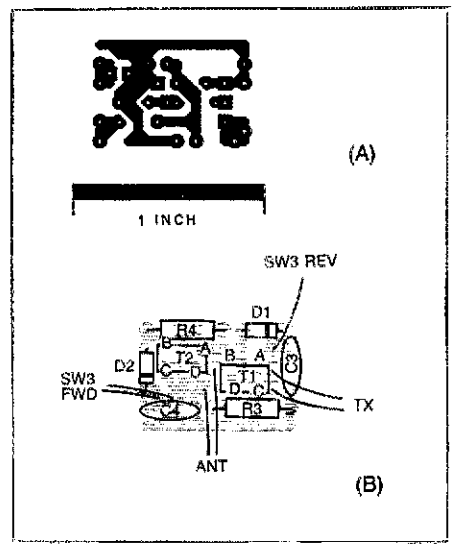


Fig 7—Circuit-board etching pattern (A) and parts-placement guide (B) for the SWR meter. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

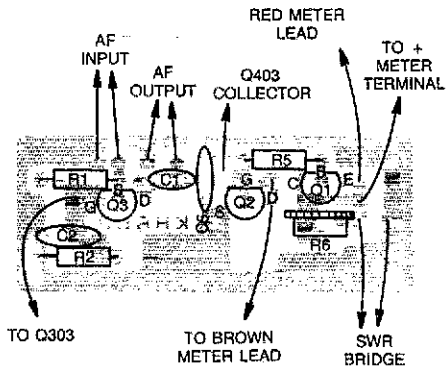
Construction

The modifications to the HW-9 involve stuffing two PC boards and changing parts on the TR circuit board. The board shown in Fig 7 contains the directional coupler, and the board shown in Fig 8 contains the audio-thump suppressing circuit and the meter-switching circuit. This allows the coupler to be mounted in the back of the rig next to the antenna jack, while keeping the thump removal circuitry next to the audio section.

It is essential that C346 and C347 be replaced with wire jumpers for the thump removal circuit to work, as they would block the needed dc bias voltage. One of these capacitors can be used as C1 on the modification board, but take care to get the polarity right.

Thanks to Heath's excellent design, it is not necessary to unsolder all the wires to get to the solder side of the TR board. First,

(A)



(B)

Fig 8—Circuit-board etching pattern (A) and parts-placement guide (B) for the audio thump suppressor and meter switch circuit. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

set the BAND switch to 20 meters and remove the BAND-switch shaft. Then, unsolder the blue keying wire and remove the six screws holding the back panel to the chassis. After removing the five nuts securing the TR board, the circuit board can be flipped up, exposing the foil side. While you have the foil side of the TR circuit board exposed, install the NARROW audio filter components listed in Table 1. I used metal film capacitors, but polyester or polystyrene capacitors can also be used, although the latter may be physically a little large. I recommend using 5%-tolerance resistors to prevent the center frequency of the filters from being too far off.

The collector lead of Q303 has to be unsoldered and attached to a hookup wire that goes to the thump suppressor. This "flying mod" is unsightly, but I see little alternative. A 10-kΩ resistor must be soldered between the base of Q303 and ground, or the thump suppressor may not allow any audio through! The resistor prevents quiescent currents from keeping the transistor on when it isn't supposed to be.

I made the switch for choosing forward or reverse power readings by combining it with the existing audio SELECTIVITY switch. First, I bought a standard Switchcraft DPDT slide switch. The plastic slider handle is too short, so I then bent the metal tabs holding the (new and old) switches together to take them apart. I then swapped the plastic slider handles, taking care not to lose the metal slide contacts. This gave me a DPDT switch with a long slider handle. You could mount a separate switch if you like, but I prefer modifications that don't require making holes in the front panel.

I used RG-174 cable on the audio and SWR meter connections to prevent unwanted signal pickup. The rest of the connections are made with standard hookup wire.

Table 1
Component Changes

Part No.	Old Value	New Value
R352	680 k	16 k
R353	33 k	1.8 k
R354	1.5 M	39 k
R357	680 k	6.8 k
R358	33 k	680
R359	1.5 M	16 k
C339, C341	1000 pF	0.027 μF
C344, C345	1000 pF	0.082 μF

Once you're sure everything is installed correctly, turn on the rig. Hopefully, the audio hiss in the WIDE position will be as loud as before. If not, Q3 may have been installed backwards, or you may have forgotten to replace C347 with a jumper. The hiss should be less in the NARROW position, because the modification is supposed to reduce noise. With the rig hooked up to a dummy load, you should be able to notice much less of an audio thump when using WIDE audio selectivity, and no thump when using NARROW. If a nasty thump is heard, Q303 is not hooked up properly. If you hear just a little bit of thump, you may consider adding R2 to reduce the thump by a few more decibels. Basically, you want as low a value of R2 as possible without turning the audio off all the time. Typical R2 values range from 1.5 to 2.2 M, depending heavily on the FET used.

While transmitting into a dummy load, adjust R6 for the desired meter deflection in the forward position. If the meter deflects the wrong way, a diode is hooked up backwards. A bad Q2 (power MOSFET) will either affect the S-meter calibration or make the bridge read backward with no power output. A properly operating bridge will measure little, if any, reflected power when using a dummy load. Since there is no SWR specification for the MRF-237s, you should be careful not to transmit into a load with an SWR greater than 2.

When all is working well, reassemble your HW-9 and enjoy. I'm sure you'll find your transceiver more pleasant to operate.—*Zack, KH6CP*

Notes

[1]Gelled-electrolyte 9-Ah batteries are available from American Electronics, 173 E Broadway, Greenwood, IN 46142, tel 317-888-7265. Reference Dick Smith part no. S-3321; price, $34.95. American Electronics also sells a charger that operates from 120 V ac. Reference Dick Smith part no. M-9523; price, $9.95. For shipping and handling add $1.50 plus 5% of order. American Electronics has a $20 minimum order.

[2]A solar panel rated for 1 A at 9 V or 500 mA at 18 V is also available from American Electronics. Reference Dick Smith part no. Z-4845; price, $149. See note 1.

[3]Warren Dion, N1BBH, "A New Chip For Charging Gelled-Electrolyte Batteries," *QST*, Jun 1987, pp 26-29.

[4]John Grebenkemper, KA3BLO, "The Tandem Match—An Accurate Directional Wattmeter," *QST*, Jan 1987, pp 18-26.

QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

Hundreds of earth-orbiting satellites transmit pictures to earth on a daily basis. A lot of interesting imagery is available and it is free! A basic receiving station includes a VHF or S-band receiver, a stereo tape recorder and a video display. Following the guidelines in March *QEX*, you can assemble a station to receive hard copy from weather-satellite automatic picture transmissions.

The March issue of *QEX* includes articles on:

- "ASAT: An Apple-based Satellite Imaging System," by Grant Zehr, WA9TFB
- "Superconductivity," by Maureen Thompson, KA1DYZ
- "Using Surplus 75-ohm Hardline at VHF," by Bill Olson, W3HQT

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Strays

I would like to get in touch with...

☐ anyone who served in the 3187th Signal Service Battalion during WW II. We are having a reunion in August. *Ray Raymond*, W6SYM, 4676 Smoke River Ct, San Jose, CA 95136.

On-Ground Low-Noise Receiving Antennas

There is much discussion about low-noise receiving antennas for 160 and 80 meters. Here are the results of some of my experiments with these antennas.

By Doug DeMaw, W1FB
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Luther, MI 49656

Most of you know about Beverage antennas and their value for unidirectional, low-noise response during receive.[1,2] Unfortunately, few amateurs have the available real estate to accommodate a classic Beverage antenna. The typical alternative is to build and use a small receiving loop.[3] These antennas provide bidirectional, low-noise response in the plane of the loop. If a sense antenna is added we can obtain a relatively unidirectional response (cardioid) with a loop. Normally, a preamplifier is used with a Beverage or loop antenna to compensate for the loss in antenna gain over a conventional dipole or vertical system.

The So-Called Snake Antenna

I am hearing considerable talk about "snake" antennas these days on 160 and 75 meters. Some users report excellent low-noise reception with the snake. Others complain that their receivers seem to be dead when they attach this signal grabber. My curiosity prompted me to become involved in several QSOs wherein the topic was snake antennas. Some interesting information evolved.

Here is a description of this strange antenna. You place a long piece of RG-58 or RG-59 coaxial cable on the ground, then short circuit the far end of the line (shield braid to center conductor). The near end of the cable is attached to the receiver antenna jack. Theoretically, this represents a 50- or 75-Ω dummy load if a long enough piece of cable is used (long enough so the total line loss is greater than 20 dB). The line is lossy and somewhat leaky. This enables it to provide a 50- or 75-Ω termination while receiving signal energy along its length. The term "snake" seems to have been assigned because the cable lies in or on the grass, as snakes are known to do.

I do not see anything wrong with this approach to low-noise reception, provided certain rules are followed. The longer the piece of coaxial line (in terms of a wavelength), the better the antenna performance. The velocity factor (VF) of the line should be taken into account when constructing a snake antenna. For RG-58A and RG-59A the VF is 0.66. It is 0.79 for RG-58 and RG-59 foam-dielectric cable. This means that 1 λ (wavelength) of RG-58A for 1.9 MHz is

$$L_{ft} = \frac{984 \times VF}{f_{MHz}} = \frac{984 \times 0.66}{1.9}$$

This equates to a length of almost 342 feet. If the velocity factor were not used, we would have an antenna that was almost 518 feet long. The snake does indeed offer the advantage of reduced length over a Beverage antenna of the same electrical length.

Some users told me that the snake antenna was no good; the receiver went dead, or nearly so, when it was attached. Investigation showed that an exact half- or full-wavelength dimension was being used (inclusive of the velocity factor). Assuming no cable losses, a half wavelength line or multiple thereof repeats what it sees at the terminated end. Since the far end is shorted, a dead short is seen at the receiver end! No wonder things seemed unusually quiet! Other hams reported good results, but only when random lengths of cable were being used. No doubt these odd lengths were not multiples of ½ λ!

I constructed a ½-λ RG-58 snake antenna for 3.9 MHz. Sure enough, my receiver appeared dead when it was attached. Signals were heard, but they were some 50 dB weaker than when I used my 80-meter transmitting loop for receive. I added a ¼-λ line section at the station end of the snake, and signal levels jumped up by 20 or 30 dB on receive. My next test was to return to the ½-λ antenna. I removed the short circuit at the far end and placed a 51-Ω, 1-W carbon resistor between the inner and outer conductor at that point in the line. Reception was as good as it was when the 0.75-λ snake was used. I recommend that you use a 51-Ω terminating resistor, irrespective of the electrical length of your snake antenna. This antenna is shown in Fig 1A. (Use a 75-Ω resistor with RG-59 cable.)

Why are On-Ground Antennas Quiet?

A good on-ground antenna has the ability to perform nearly as well as a Beverage antenna, assuming it is terminated properly and it is one or more wavelengths long. To be specific, it will have a unidirectional response off the terminated end. This means that it will reject noise energy off the end opposite the termination. It will also reject much of the noise off the sides of the antenna. My experimental snake antenna exhibited these desirable characteristics.

An on-ground antenna may be well removed from the immediate field of a

[1]Notes appear on page 32.

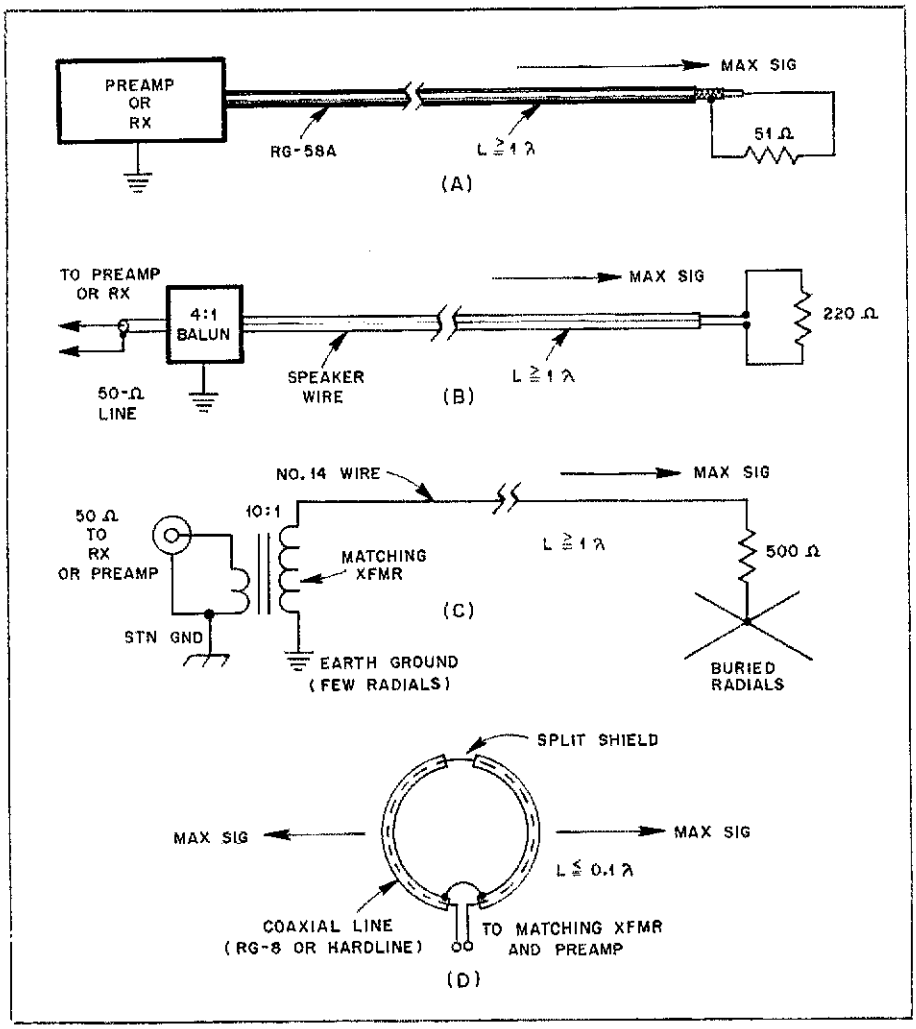


Fig 1—Examples of low-noise receiving antennas. The snake antenna with coaxial cable is shown at A. A 51-Ω terminating resistor is used rather than short-circuiting the far end of the line (see text). Example B shows the W1FB parallel-wire snake antenna that uses no. 22 speaker wire. A 220-Ω termination and a 4:1 balun transformer provide a 50-Ω match to a preamplifier or receiver. Antenna C is a classic Beverage antenna. The earth supplies the missing conductor for this two-wire transmission line. A shielded receiving loop is shown at D (see note 3).

local noise source, whereas a dipole or other transmit-receive antenna may be in the major part of this noise field. I have laid a random length of wire (long) on the ground in urban locations to test this theory. The wires were not terminated, and the signal response seemed to be omnidirectional. But man-made noise dropped markedly from that picked up by the main antenna. Of course signals dropped in strength also, but not by the amount noted for the noise. In other words, the effective signal-to-noise ratio improved substantially.

You may want to try a simple on-ground wire for 160 or 80 meters on your city lot. It need not be in a straight line. You may route it around the perimeter of your yard. I have also used large wire loops that were simply laid on the ground. Excellent results were obtained with these antennas on 160 meters. Don't hesitate to experiment. Use whatever system reduces the noise pickup without seriously degrading the level of the received signals. I once discovered that the frame of my metal ham-shack desk was a better receiving antenna on 160 meters than was my ¼-λ vertical. I could copy weak signals with the desk antenna that were not discernible with the vertical, owing to reduced noise pickup!

Parallel-Wire Snake

I object to the high cost of a coaxial cable snake antenna. Furthermore, cable without a noncontaminating jacket will become contaminated in due course (a year or two) from soil acids, alkalinity and moisture. In a cost-saving move, I developed a two-wire balanced snake antenna that uses inexpensive speaker wire. This is the clear plastic insulated wire that has a copper and a tinned conductor. I bought a 1000-foot spool of no. 22 speaker wire from ORA Electronics for $31.[4] From this wire I was able to make two on-ground receiving antennas for 1.9 MHz. See Fig 1B.

The characteristic impedance of this wire is approximately 190 ohms, according to the two-wire transmission-line formula (1/16 inch conductor spacing and 25.3 mil wire diameter). I assumed a VF of 0.7, which is midway between that of RG-58A and 300-Ω TV ribbon. I cut the antennas to a length of 362 feet, 6 inches for 1.9 MHz. The far ends are terminated by 220-Ω, 1-W resistors. A 4:1 balun transformer is used at the receiver end of the antennas to provide a 50-Ω characteristic for the receiver.

Information about how to construct a 4:1 balun transformer may be obtained from *The ARRL Handbook* and from the book by Jerry Sevick, W2FMI, *Transmission Line Transformers*.[5] Since these are receiving antennas, the wire gauge and core size for the matching transformer may be relatively small.

I find the performance of the parallel-wire snake to be as good as that of the coaxial snake antenna. Certainly the cost is much lower per antenna. Ultraviolet radiation from the sun, plus soil contaminants and moisture, will cause the wire insulation to deteriorate eventually, but the replacement cost will be relatively modest.

Some Problems

I have received reports about snake antennas exhibiting unusual noise pickup. Amateurs have also mentioned a lack of unidirectional response with these antennas. Investigation revealed that the installations were less than ideal. For example, the snake antennas were lying on the ground under which the radial system for a vertical antenna was placed. The proximity of the two systems apparently results in unwanted mutual coupling. The noise picked up by the vertical antenna is transferred, in part, to the snake by way of the radials. This unwanted coupling also spoils the directional characteristics of the snake antenna. Try to remove your on-ground receiving antenna from the vicinity of the buried radial system. In an ideal installation, it should be a wavelength or more away from any other same-band resonant antenna. This is generally impractical in an urban setting, so do the best you can to isolate your antennas from one another.

Preamplification

Most low-noise receiving antennas have a substantial loss compared to a ½-λ dipole. This includes the Beverage and the small receiving loop (shown in Fig 1 at C and D). Although the noise may be reduced considerably with an on-ground, a loop or a Beverage antenna, the signal energy is reduced also. It is possible to have an already weak signal too low in level to override the receiver noise. Also, the overall receiver gain may be too low to provide ample headphone or speaker output for Q5 copy. A preamplifier has an obvious

advantage in this situation.

Be sure to apply the same rules for low-band preamplifier design that are used for VHF and UHF reception. A low-noise first stage is mandatory. The overall gain of the preamplifier should be 30 to 40 dB. Variable gain is useful for matching the receive-antenna gain to that of your transmitting antenna. I prefer a unity-gain situation when using a low-noise receiving antenna.

A common-gate JFET first stage in the preamplifier will yield a low noise figure and provide approximately 10 dB of gain. This may be followed by an IC amplifier, such as the Motorola MC-1350P. This chip has provisions for a manual gain control. It is necessary only to vary the IC bias by means of a potentiometer when changing the gain. An MPF102 or 2N4416 FET that is used with an MC-1350P IC will provide up to 50 dB of gain. I hope to develop a preamplifier of this type for presentation in *QST* later on.

Summary

When it comes to low-noise MF and HF reception, the name of the game is *experimentation*. A number of makeshift systems offer the promise of improved reception. This depends on your location, available real estate and the type of man-made noise in your immediate area. A good low-noise receiving antenna may be the tool you need to obtain your DXCC award on 160 meters. Don't be reluctant about experimenting!

Notes

[1]B. Boothe, "Weak-Signal Reception on 160—Some Antenna Notes," *QST*, Jun 1977, pp 35-39.

[2]H. H. Beverage and D. DeMaw, "The Classic Beverage Antenna Revisited," *QST*, Jan 1982, pp 11-17.

[3]D. DeMaw, "Beat the Noise with a Scoop Loop," *QST*, Jul 1977, pp 30-34.

[4]ORA Electronics, 20120 Plummer St, PO Box 4029, Chatsworth, CA 91313. To order, phone 1-800-423-5336. Catalog available.

[5]J. Sevick, *Transmission Line Transformers*, 1st edition (Newington: ARRL, 1987). Available from HQ for $10 plus $2.50 (book rate) or $3.50 (UPS), or from your local dealer.

New Products

MFJ MULTI-MODE DATA CONTROLLER

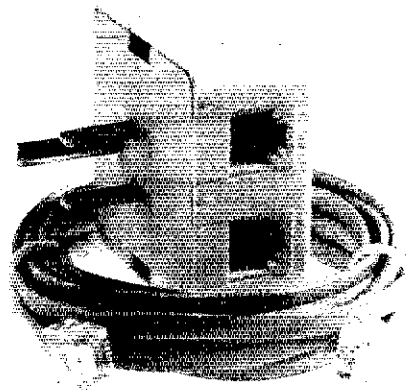
☐ MFJ has introduced the model 1278 data controller. The unit supports packet radio, ASCII, Baudot, CW, SSTV, HF FAX and CW contest-keyer operations. The 1278 features high-performance HF, VHF and CW modems, software-selectable dual-radio ports, a tuning indicator and 32 kbytes of RAM. An ac-operated power supply is built in. External equipment requirements include an HF or VHF radio and a computer with a serial port and terminal software.

MFJ offers a package of materials to get you started with the 1278. The Starter Pack includes a computer interface cable, terminal software and an instruction manual. Versions are available for the Commodore 64/128™, VIC20™, and the IBM® PC or compatible computers.

The 1278 automatically sets itself to match your computer data rate. It also features a threshold control to compensate for varying band conditions, lithium battery backup, a tune-up command, RS-232-C and TTL serial ports and a watchdog timer. Included with the 1278 is a package of test and calibration software and instructions for use. Price class: 1278 7-mode data controller, $249.95; Starter Pack, $19.95. Manufacturer: MFJ Enterprises, Inc, PO Box 494, Mississippi State, MS 39762, tel 800-647-1800 or 601-323-5869.—*Rus Healy, NJ2L*

KALGLO TELEPHONE LINE/MODEM SURGE PROTECTOR

☐ The KALGLO Electronics TLP-2 is a surge suppressor designed to eliminate damaging transients from telephone lines.

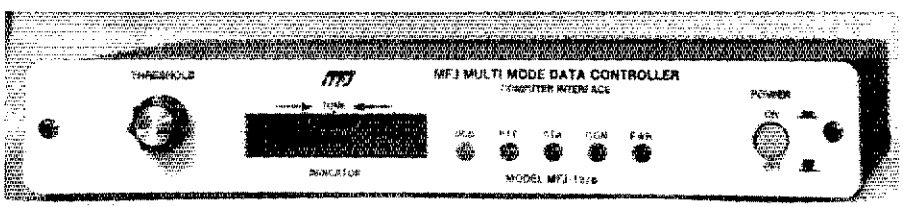


The TLP-2 plugs into any three-prong ac wall outlet, and has modular telephone jacks for phone and modem cables. The transient discharge system is a two-stage circuit using MOVs and gas-discharge tubes that shunt transient energy to the ground pin of the ac outlet. Response time is rated at 1 ns and maximum energy dissipation is 142 joules. Maximum voltage and current ratings are 6 kV and 14 kA, respectively. Price class: $39.95. Manufacturer: KALGLO Electronics, Inc, 6584 Ruch Rd, East Allen Twp, Bethlehem, PA 18017-9359, tel 800-524-0400 or 215-837-0700.—*Rus Healy, NJ2L*

NCG TRIBAND BASE AND MOBILE VHF/UHF ANTENNAS AND TRIPLEXER

☐ Two series of VHF/UHF triband antennas are available from NCG Co of Anaheim, California. The CX-901 is a one-piece fiberglass antenna for base-station use on the 144, 440 and 1260-MHz amateur bands. Power handling is rated at 150 W on all three bands. The antenna comes with a type-N connector, and has a 50-Ω feed impedance. Overall length is 3 ft, 4 in. The CX-801 mobile antenna covers the same bands as the CX-901, with a folding 3-ft, 3-in. stainless-steel whip. Power handling capability is 100 W on all three bands. The connector and feed impedance are the same as those of the CX-901.

The CX-801 and CX-901 are designed to operate with the CFX-4310 triplexer, allowing simultaneous use of one antenna and feed line on more than one band. (The triplexer can be used with antennas other than the CX-801 and CX-901.) Triplexer passbands are 1.3 to 150 MHz, 400 to 500 MHz and 900 to 1300 MHz. Power ratings are 1000 W from 1.3 to 60 MHz, 800 W from 100 to 150 MHz, 500 W from 400 to 500 MHz and 200 W from 900 to 1300 MHz. For more information on the CX-801, CX-901 and CFX-4310, contact the NCG Co, 1275 North Grove St, Anaheim, CA 92806, tel 714-630-4541. —*Rus Healy, NJ2L*



Sporadic-E Propagation at VHF: A Review of Progress and Prospects

Great strides in sporadic-E achievements and theory have been made since amateurs discovered this fascinating propagation mode in the 1930s. This review of progress and future prospects provides a practical guide for effective use of VHF sporadic-E propagation.

By Emil Pocock, W3EP
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Thousands of spectacular sporadic-E contacts made on the 50, 144 and 220-MHz bands during the past half-dozen years have created considerable excitement in VHF circles. US and Canadian 6-meter operators have long awaited the opportunity to make 50-MHz "E-skip" contacts into Europe, and the first two-way transatlantic 50-MHz sporadic-E contacts were made on July 1, 1983, soon after British amateurs gained access to the band. Most of the British stations that made 5000-km[1] and longer contacts were running only a few watts! Since then, many stations in Canada, on the East Coast and in the South and Midwest have been treated to European sporadic-E openings.[2] Similar contacts between the East Coast and Hawaii (up to 8000 km) and the West Coast to Japan (7600 km and longer) are frequent enough to suggest even greater possibilities for 6-meter sporadic E.

Numerous contacts in the 2200- to 3200-km range made recently on 144 MHz prove that sporadic E on the higher VHF bands is not limited to the 2200-km distance maximum characteristic of "one-hop" E-layer propagation. Stations as widely separated as St Paul Island (in the Gulf of St Lawrence) and Florida have completed 2-meter contacts over 2200 km into the Midwest and Far West; during the June 1987 ARRL VHF QSO Party, several extraordinary contacts over paths 2900 km and longer were completed on 144 MHz from Arizona and Nevada to Georgia and

[1]Notes begin on page 38.

Phenomena Related to Sporadic E

Other closely related propagation modes are sometimes confused with temperate-zone sporadic E. Long-duration *meteor scatter* is often difficult to distinguish from true sporadic E. When the MUF is just below 50 MHz, for example, random meteors may elevate the MUF to a useful level for a few tens of seconds at a time. At times, such scatter simply evolves into solid sporadic-E propagation and may serve as an early warning of E-skip conditions.

During especially intense sporadic-E sessions, *backscatter* may be evident. Backscatter signals are much weaker than normal E-skip signals; they may exhibit multipath flutter (a hollow, from-the-bottom-of-a-barrel sound) or have a slight echo. Backscatter signal paths are usually well off expected great-circle bearings, but focus on known sporadic-E reflection centers. The expected communication range via backscatter is short (in the 300- to 1100-km range); thus, backscatter may be useful for making contacts between the normal tropo distance and the shortest E-skip distances. Backscatter contacts may be especially useful in "filling in" grid-square multipliers on 50 MHz during contests, for example. Backscatter has been observed on 144 MHz when the MUF was in that range.

Field-aligned irregularities (FAI) is a newly discovered propagation mode that may exist simultaneously with sporadic E and persist for an hour or more after all evidence of normal sporadic E has disappeared. FAI signals are generally very weak and may easily be confused with backscatter signals. Signals propagated by means of FAI have a rough, auroral quality; because of this, SSB communication via FAI may be marginal at best. To make use of FAI, operators generally must point their antennas northward—as is necessary with auroral propagation—toward an existing or former sporadic-E center. Distances up to 2000 km have been reported for FAI work at 144 MHz.†

Intense auroral propagation that spontaneously evolves into sporadic E in the northern latitudes of the US and in Canada is known as *auroral-E propagation.* Sometimes this shift takes place over the course of a minute and may be evident during a single contact. A rough, raspy, auroral signal may be quickly transformed into a strong, crystal-clear signal. When this happens, auroral E has taken over. Another characteristic of auroral E is that it sometimes supports communication over distances much greater than would be expected for other types of sporadic E (up to 3200 km), because auroral E_s clouds are typically higher than temperate-zone clouds. Commonly observed auroral-E paths include Alaska, the Yukon and the Northwest Territories to the upper US Midwest and New England. Auroral E is observed far less often than temperate-latitude sporadic E and primarily on the 50-MHz band.

†For more information, see Thomas F. Kneisel, "Ionospheric Scatter by Field-Aligned Irregularities at 144 MHz," *QST*, Jan 1982, pp 30-32.

Florida via sporadic E. Many other examples of contacts made over similar distances indicate that conditions capable of supporting such contacts may be more common than once thought.[3] In spite of these accomplishments, the longest 144-MHz sporadic-E contact was not made in North America, but rather is claimed by Gyula Nagy, HGØHO, and Salvatore Patruno, EA8XS, who united two continents over a 3865-km path on July 16, 1983.[4]

Perhaps the most remarkable recent achievement came with a report of the first *220-MHz* sporadic-E contact. In an event long predicted and anticipated by amateur VHF enthusiasts, and preceded by several near-misses, Bill Duval, K5UGM, and John Moore, W5HUQ/4, finally broke through a 1500-km path from Texas to Florida on June 14, 1987, during the ARRL VHF QSO Party.[5] Undoubtedly, this feat will be repeated in the future as the popularity of the 220-MHz band grows.

What is Sporadic E?

Sporadic-E (also known as E_s) propagation is probably familiar to many low-band operators as the summertime "short skip" on 10 meters. It is also responsible for most of the long-distance (600 km and greater) contacts on the 6-meter band. Sporadic E is a type of ionospheric E-layer reflection caused by small patches of unusually dense ionization.[6] These sporadic E-layer "clouds" appear unpredictably, but they are most common over the US and southern Canada during the daylight hours of late spring and summer. Sporadic-E events may last for just a few minutes to several hours; a given event usually affects only small areas of the country at any one time. During June and July, signals propagated by means of sporadic-E ionization may be heard on 50 MHz for several hours a day on more than half the days. Sporadic E is observed on 144 MHz less than a tenth as often as on 50 MHz. Signals are often remarkably strong, allowing 50- and 144-MHz stations running 10 watts, and often much less than that, to make contacts 1500 km and longer with relative ease.

Geographical, Seasonal and Daily Variations

The appearance of sporadic E is related not only to time of day and to season, but to geographical location. Researchers have identified five distinct geographic zones of sporadic-E occurrence based primarily on seasonal and hourly characteristics. These zones are shown in Fig 1. Within the northern temperate zone, sporadic E may appear at any time, but long-term observations have shown that it occurs more often from mid-May to mid-August than in any other months, followed by a less productive period from mid-December to mid-January. Mid-latitude sporadic-E also occurs most often from 0800 to 1200 and 1900 to 2300 local time[7], regardless of season, with a statistical peak at about the midpoint of each time period.[8] The daily and seasonal probabilities of sporadic E over the US from May through August are shown graphically in Fig 2.

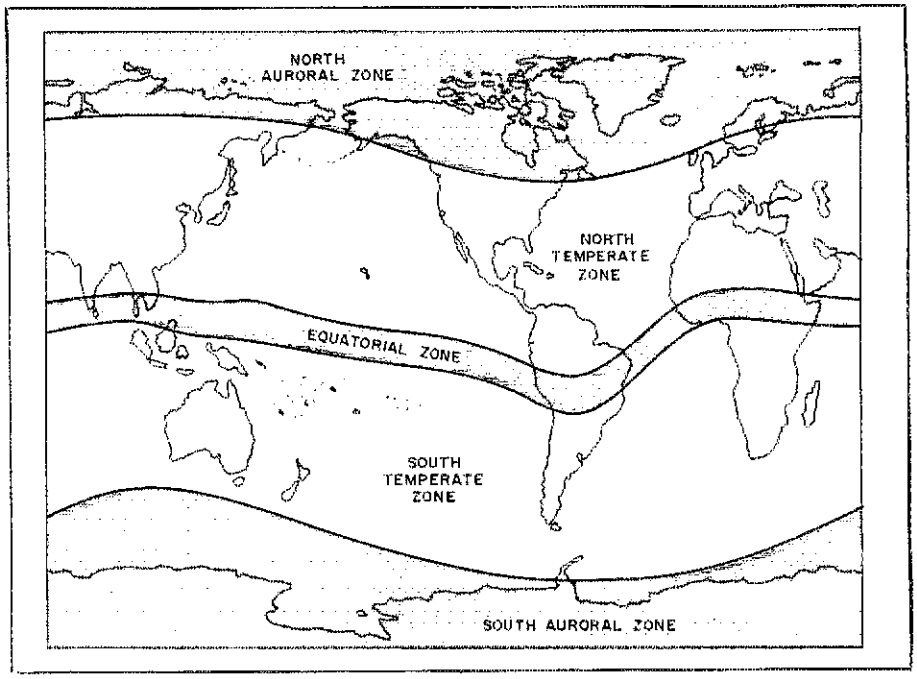


Fig 1—Classification of sporadic-E propagation phenomena by geographic region. This map is based on Smith, "Occurrence of Sporadic E" (see note 9).

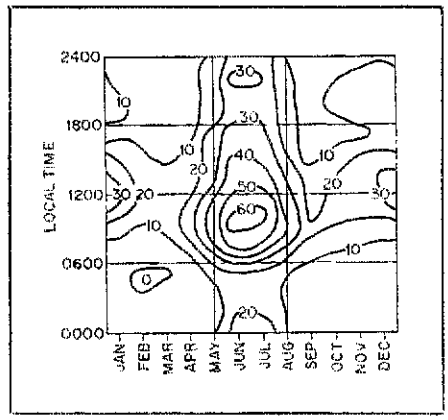


Fig 2—Average occurrence of sporadic E in the northern temperate zone as a percentage of time. The curves on this graph—*isograms*—are lines of constant percentage. Note that the peak period for sporadic E is 0900 to 1100 during June and July. The data for this chart were gathered between 1948 and 1954 at a site in New Mexico for a critical frequency greater than 5 MHz (equivalent to a maximum usable frequency [MUF] of 27 MHz). Nonetheless, this chart can serve as a fair guide to the likelihood of sporadic E in the entire continental US and southern Canada. (Based on Smith, "Occurrence of Sporadic E.")

There are also significant variations within the northern temperate zone. Sporadic-E ionization occurs most often in the western Pacific, China and southeast Asia, and least often over the north Atlantic and adjacent portions of northeastern North America! In the US, E skip is nearly twice as common over the Southwest as over the Northeast.

Peak times for sporadic E in the rest of the world vary considerably. Like that of the northern temperate zone, the major sporadic-E season in the southern temperate zone occurs from late spring to early summer (mid-November to mid-February in the southern hemisphere). In the equatorial zone, sporadic E is a nearly constant phenomenon of the 8-hour period centered at noon regardless of season, but it is rare any other times. In the two auroral zones, sporadic E is least likely to appear at noon, but it appears more than half the time in the 1800 to 2400 period with little variation throughout the year.[9]

E-Skip and Solar Activity

The relationships between the formation of temperate-zone sporadic E and solar geophysical conditions are still debated. Most researchers have held that there is no clear correlation between the sunspot cycle and sporadic-E formation that compares with the close association between F-layer and solar conditions.[10] Some recent work has suggested that this may not be the case, and that low solar activity, whether measured as solar flux (sunspot number) or

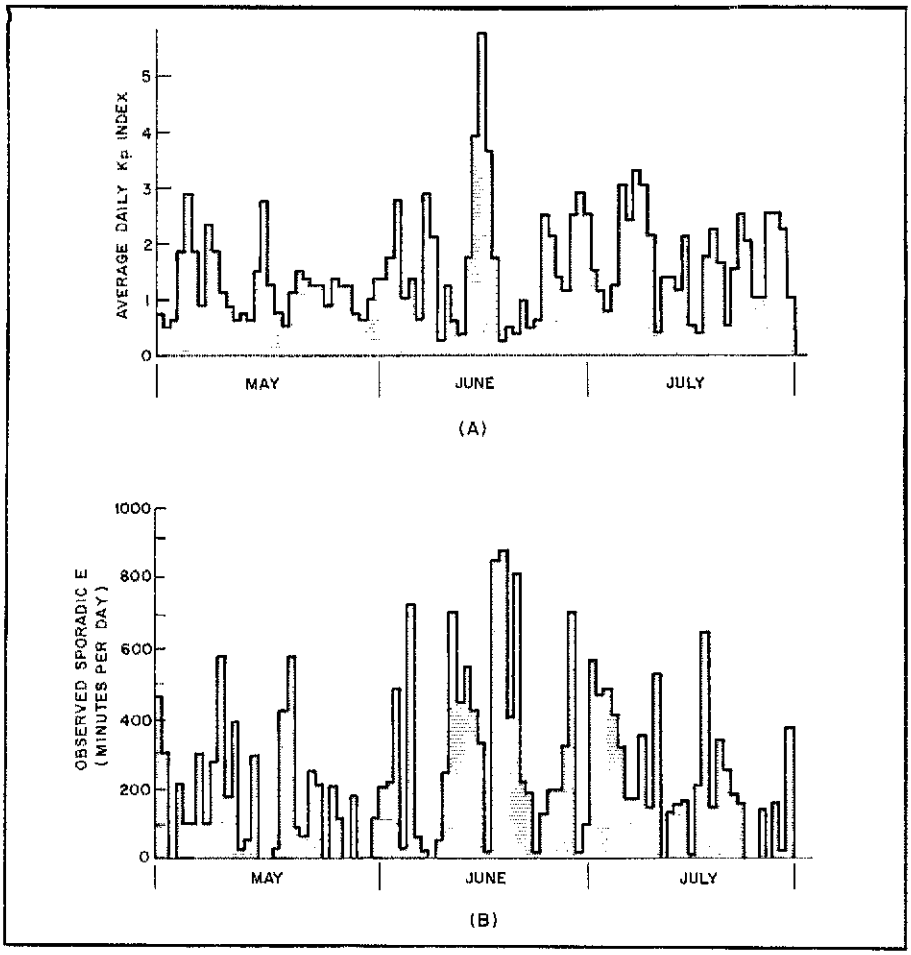
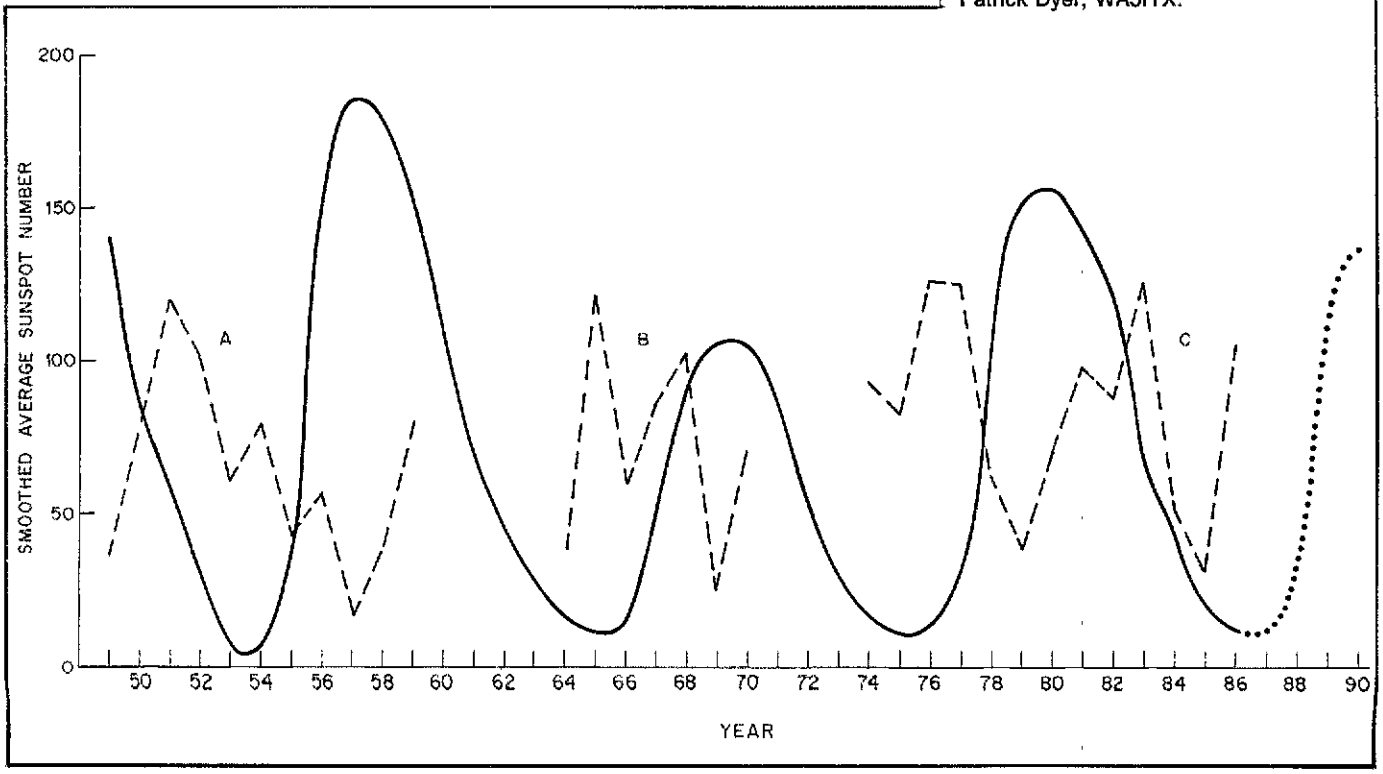


Fig 3—A comparison of average planetary K index (K_p) values (A) and observed daily minutes of sporadic-E signals heard on 50 MHz (B) during 1965. Based on Dyer, "Fifty-megahertz E_s."

short-term geomagnetic field conditions (planetary A and K indexes), are most favorable for temperate-zone sporadic-E formation.[11]

One analysis of the relationship between the planetary K index and sporadic E, summarized in Fig 3, demonstrates that observed 50-MHz E-skip conditions have occurred more often when the K index was low. When the index was high, as during the geomagnetic storm of June 15 to 22, 1965, observed minutes of sporadic-E activity fell off precipitously. The relationship between sporadic-E ionization and the

Fig 4—Relationship between the solar cycle (solid curve) and the occurrence of sporadic E in the northern temperate zone. The three studies of sporadic-E occurrence shown here used different criteria and are not directly comparable. Segment A (1949 to 1959) is a count of instances of measured critical frequency greater than 5 MHz at a site near Washington, DC, based on W. B. Chadwick, "Variations in Frequency of Occurrence of Sporadic E, 1949-1959," in Smith and Matsushita, eds., *Ionospheric Sporadic E*, pp 182-193. Segment B (1964 to 1970) shows variation in the number of minutes of 50-MHz sporadic-E signals monitored at San Antonio, Texas, based on data in Dyer, "Fifty-megahertz E_s." Segment C (1974 to 1986) represents minutes of sporadic-E signals monitored between 88 and 108 MHz from San Antonio; data for this plot were kindly provided by Patrick Dyer, WA5IYX.



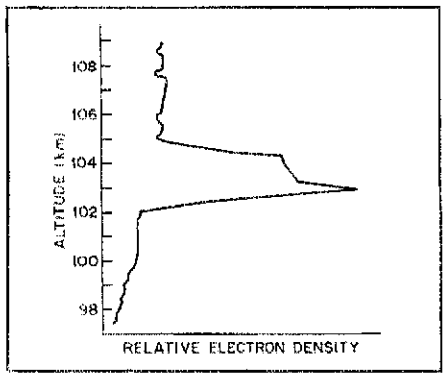


Fig 5—Electron density as a function of altitude across a sporadic-E cloud. Based on the results of an Aerobee rocket flight from Wallops Island, Virginia, in May 1962, reported in L. G. Smith, "Rocket Observations of Sporadic E," *Radio Science*, 2 (Feb 1969), p 179.

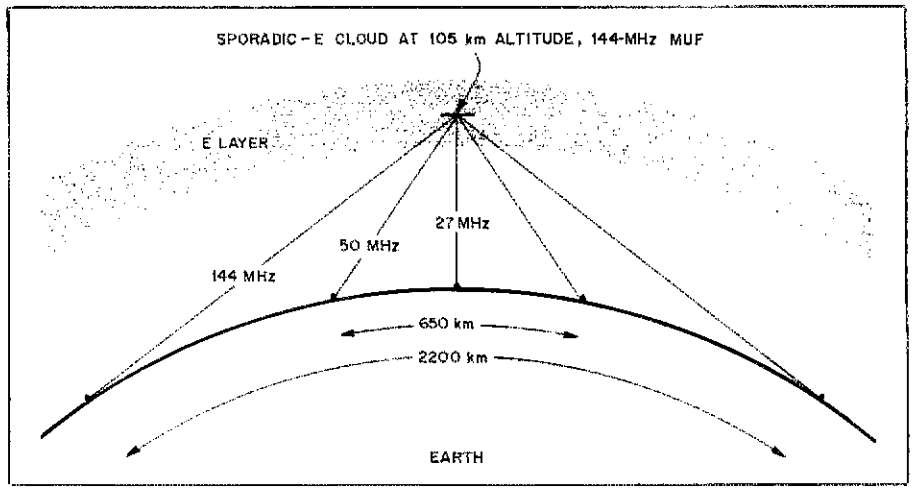


Fig 6—Relationship between path distance and sporadic-E MUF. For an E cloud with a 144-MHz MUF, the path distance at 144 MHz will be the maximum single-hop distance, about 2200 km. As the frequency is decreased from the MUF, the path distance shortens. At 50 MHz, the expected path length will be about 650 km. At the critical frequency (0.188 × MUF)— 27 MHz in this case—the path distance decreases to zero (that is, a signal transmitted straight up will be reflected straight down).

11-year solar cycle is less clear, but data from three long-term studies, presented in Fig 4, suggest that sporadic E may peak during solar minima.[12]

Causes of Sporadic E

The cause, or more likely the multiple causes, of sporadic E are still being pursued by researchers. Ten distinct types of sporadic E, and at least nine different theories of causation, were listed in a review of what was known about sporadic E in 1959. The classification of distinct types has been retained, but since the 1960s, the wind-shear theory has gained more acceptance than any other in explaining temperate-zone sporadic-E formation.[13]

In its simplest form, the wind-shear theory holds that gaseous ions are accumulated and concentrated into small, thin, patchy sheets by the combined actions of high-altitude winds and the earth's magnetic field in the E region of the ionosphere. The resulting sheets, or sporadic-E clouds, may attain the required ion density to serve as a reflecting medium for VHF radio waves. Recent work has emphasized the role of long-lived iron and magnesium ions (thought to be the result of meteor evaporation) in the formation of sporadic-E clouds. Sporadic-E clouds observed by rocket-borne instruments and backscatter experiments have been found to be 50 to 100 km in diameter, 2 to 4 km thick, and 95 to 115 km in altitude. The results of one such rocket experiment are shown in Fig 5. Although most research has confirmed a close association between wind shear and sporadic E, not all aspects of the sporadic-E phenomenon can be explained, including its diurnal and seasonal variations.[14]

The Classical E-Skip Model

The wind-shear theory is consistent with classical descriptions of temperate-zone E skip derived from observations of amateur VHF communications and specially designed experiments.[15] In the classical model, sporadic-E reflections are assumed to be specular (mirrorlike) and associated with a single E cloud that lies midway along a given radio path at an altitude of about 105 km. See Fig 6. At this altitude, the maximum possible single-reflection (single-hop) distance computes to about 2200 km. The highest frequency reflected back to the surface of the earth, the MUF, varies from 20 MHz to at least 220 MHz. At the MUF, the angle of reflection is greatest, the single-hop distance is longest and signal strengths are greatest. As the signal frequency decreases from the MUF, the angle of reflection decreases, the resulting signal path is shorter and signal strength is relatively less. At some *critical frequency*, signals transmitted straight up will be reflected straight down (zero angle of reflection).[16]

The classical model also describes a relationship among MUF, signal frequency, angle of reflection and resulting path distance that can serve as a very useful tool for quick evaluation of sporadic-E conditions. These relationships are presented graphically in Fig 7 and can be calculated more precisely if desired.[17] The minimum MUF of a single sporadic-E reflector can be determined when the frequency and path distance of any observed contact are known.

Consider a 50-MHz contact between stations in Memphis and Indianapolis, 600 km apart, shown in Fig 8. What is the minimum possible MUF of the cloud that is supporting that path? Refer to Fig 7 and read up from 600 km until you reach the dashed line corresponding to 50 MHz. Then find the MUF by interpolating between the solid curves for 144 and 220 MHz. In this case, the MUF is something over 144 MHz—say, 160 MHz. The process can be taken one step further to estimate the likely distance that could be spanned on 144 MHz using the same E cloud as a reflecting point. Follow the imaginary 160-MHz MUF line up and to the right until it intersects the dashed line that corresponds to a signal frequency of 144 MHz. This intersection corresponds to 1800 km on the horizontal scale. Such an analysis strongly suggests that a 144-MHz path from Minneapolis to Tallahassee—or any other 1800-km path with the same center point—should be possible. Fig 7 also reveals another curious relationship: the MUF is about 5.3 times the critical frequency (zero on the horizontal [distance] scale).

This classical analysis works well in many practical applications, and it has enabled many alert operators to anticipate 144- and 220-MHz sporadic E. It may also be helpful to keep in mind that the sporadic-E MUF often climbs very rapidly, but reaches 144 MHz only one-tenth as often as 50 MHz. The sporadic-E MUF exceeds 200 MHz on rare occasions. Because the VHF Amateur Radio bands are widely spaced in the radio spectrum, monitoring frequencies between the amateur bands, such as the TV Channels 2 to 13, FM broadcasting or aircraft navigation aids, may provide more precise indications of actual conditions. See Table 1.

Multiple-Hop Paths and Other Complications

The classical model may help to explain single-hop paths, but what about sporadic-

Table 1

Spectrum Usage, 27-225 MHz

Frequency (MHz)	*Services*	*Modes*
26.96-27.41	CB radio	AM, SSB
28-29.7	Amateur Radio	FM, AM, SSB, CW
30-49	Police, fire, paging and other services; some European television	FM; video
49-50	Cordless telephones and low-power personal communications	FM
50-54	Amateur Radio	FM, AM, SSB, CW
54-72	Television Channels 2-4	FM, video
76-88	Television Channels 5-6	FM, video
88-108	Broadcasting	FM
108-136	Aeronautical services	AM
144-148	Amateur Radio	FM, AM, SSB, CW
150-174	Police, fire, paging and other services; NOAA weather radio	FM
174-216	Television Channels 7-13	FM, video
220-225	Amateur Radio	FM, SSB, CW

This table shows major users of the radio spectrum from 26.96 to 225 MHz. Stations in these services may serve as sporadic-E-propagation indicators.

E contacts longer than 2200 km—the maximum single-hop distance (assuming an E_s-layer altitude of 105 km)? The classical model requires that such paths be completed by hops via at least two E clouds spaced at just the right distance to complete the path. Further, each cloud must exhibit the necessary MUF. Longer paths, such as those from the East Coast to Europe or from the Midwest to Hawaii, require an even trickier cloud arrangement because at least three hops are necessary to complete them.

Numerous reports of 144-MHz contacts in the 2200- to 3200-km range appear to challenge the classical explanation of long-path E-skip propagation. The primary difficulty lies with the distance between hops. Although such contacts exceed the normal 2200-km maximum for normal single-hop propagation, they are significantly shorter than 4000 km, the expected double-hop path supported by E clouds with MUFs just under 144 MHz. A classical two-hop, 2500-km contact at 144 MHz would require that two sporadic-E clouds with MUFs in the 200-MHz range exist simultaneously about 1250 km apart! This coincidence seems quite unlikely, as even one cloud exhibiting an MUF of 200 MHz is exceedingly rare.

Some participants in 144-MHz contacts in the 2800- to 3200-km range have heard or worked stations at intermediate distances. This is evidence that multiple hops may be responsible in such situations. In other cases, there has been no evidence of intermediate hops. Lack of such evidence does not preclude the existence of intermediate hops, of course. In some cases, it has been argued that there were simply no stations active at intermediate distances.

There are other possible explanations for sporadic-E propagation beyond the one-hop range. Sporadic-E clouds higher than 110 km could support contacts over longer distances (a cloud at an altitude of 150 km would lengthen the single-hop range to 2500 km), but there is little evidence that

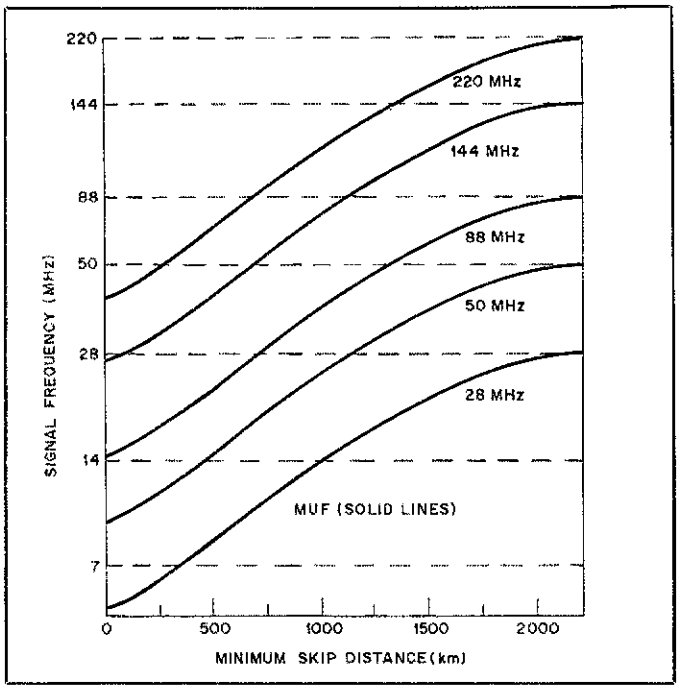


Fig 7—Relationship between path distance, frequency and MUF for signals propagated by means of sporadic-E clouds at an altitude of 105 km. This chart assumes a single-reflection path from one E cloud. Read signal frequency from the dashed lines (left vertical scale), MUF from the solid lines and minimum skip distance from the horizontal scale. This graph allows determination of E-cloud MUF when path length and signal frequency are known, and maximum path length for a given signal frequency when the E-cloud MUF is known. See text.

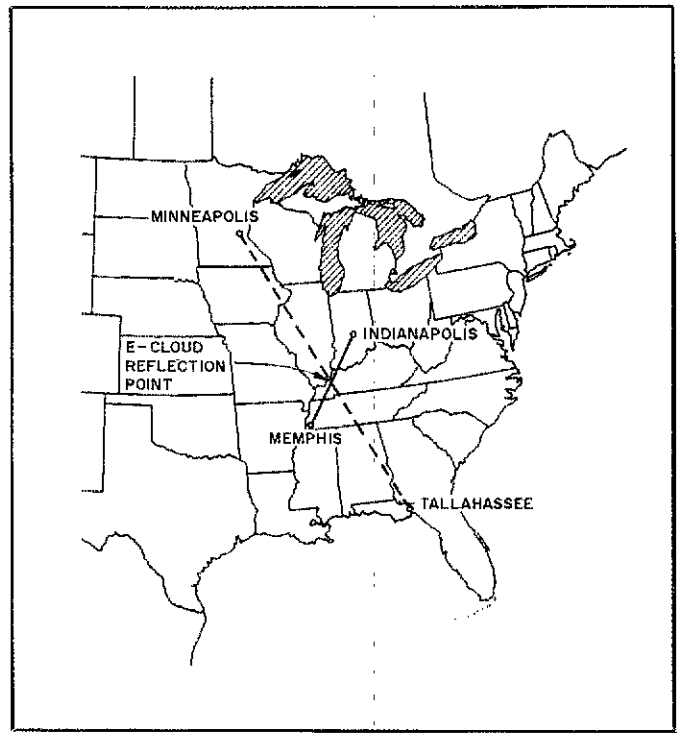


Fig 8—A 50-MHz E-skip contact between Indianapolis and Memphis (600 km) suggests the existence of a sporadic-E reflection point over western Kentucky (at mid-path). Used in conjunction with Fig 7, such a plot can be used to determine probable paths on other frequencies. For example, this reflection point would support 1800-km paths at 144 MHz, such as that shown between Minneapolis and Tallahassee.

sporadic-E clouds form at altitudes higher than 120 km. E-skip paths may be lengthened by extended tropospheric enhancement or unusually high station elevation at one or both ends of the path, but it is unlikely that these factors explain more than a few particular cases.

Tilted E clouds may provide a more promising solution. Rocket soundings of the E layer have revealed that some clouds do not lie parallel to the earth's surface, but are tilted a few degrees, and sometimes as much as 30 degrees, from the horizon. Such tilting could allow cloud-to-cloud reflections at frequencies greater than the normal MUF, creating paths in the 2200- to 3200-km range.[18] Fig 9 shows this possibility for two clouds that exhibit the necessary orientation.

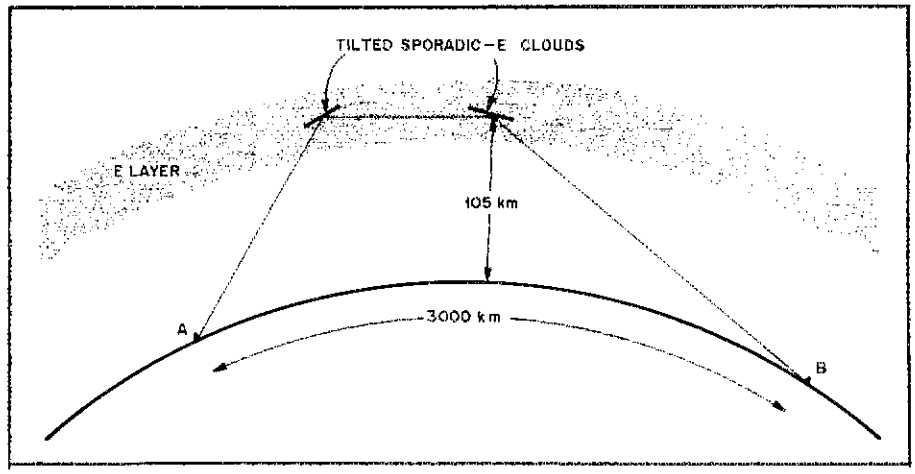


Fig 9—Proposed explanation for observed 2200- to 3200-km sporadic-E contacts that behave as if propagated via single-reflection paths. Distances longer than normal single-reflection paths might be possible by means of reflections between tilted E clouds. The MUF of the sporadic-E clouds along an earth-cloud-cloud-earth path need not be as great as that for the cloud in a single-reflection, earth-cloud-earth path because the reflection angles required to bring signals back to earth are less for the earth-cloud-cloud-earth model. (Based on Paul, "Limitations and Possible Improvements of Ionospheric Models"; see note 18.)

Prospects

A 220-MHz E-skip contact has been completed, and three- and four-hop 50-MHz contacts are common enough to no longer be surprising. What is left to achieve? It is apparent that a transcontinental 144-MHz contact is possible. The claimed world 144-MHz distance record of 3865 km is greater than the distance from Los Angeles to Charleston, for example. On June 14, 1987, the North American continent was nearly spanned on 144 MHz when James Fry, NW7O/7, in southern Nevada, hooked up with James Poore, KD4WF, Savannah, Georgia—a distance of 3165 km. Undoubtedly, an actual trans-North-American 144-MHz contact will be completed in the near future.

Transatlantic 144-MHz contacts are likely as well. Most of the 50-MHz US-Europe contacts have been in the 5000-km range, suggesting at least three hops, but a careful choice of location in North America can easily reduce the distance to the two-hop range. Newfoundland and Ireland are separated by little more than 3000 km, and the distance even from Dublin to Prince Edward Island is less than 4200 km—just within the 4400-km limit of ordinary two-hop E-skip contacts.

After 50 years of experience with sporadic E, it seems reasonable to conclude that radio amateurs have experienced nearly everything possible for this propagation mode. Recent accomplishments prove that a great deal remains to be discovered about the unpredictable and fascinating world of sporadic E.

Editor's Note: The spectacular sporadic-E opening of June 14, 1987 will be examined in depth in an upcoming *QST* article. Stay tuned.

Notes

[1]Mile ≈ km × 0.62. 2200 km is approximately 1365 miles.

[2]See The World Above 50 MHz, *QST*, Sep 1983, pp 81-82, and later issues.

[3]Several such episodes have been reported in The World Above 50 MHz since 1980, including contacts made by VE1SPI (St Paul Island) into the Midwest on June 12, 1982 (*QST*, Sep 1982, pp 72-73, and Oct 1982, p 71); by Steve Wagner, W7CI, Arizona, and Fred Fish, W5FF, New Mexico, into the Midwest and East Coast on June 26, 1983 (*QST*, Sep 1983, pp 81-82); and the numerous contacts made across the country on June 14, 1987, reported in *QST*, Sep 1987, pp 66-67.

[4]Radio Society of Great Britain *VHF/UHF Newsletter*, May 1987.

[5]Robert B. Cooper, Jr, "Sporadic-E Skip on 200 Mc.?," *QST*, Nov 1958, pp 33-35 and 162. The circumstances of the contact were reported in *QST*, Sep 1987, p 67, and by Michael R. Owen, "Midlatitude E_s at 220 MHz," *QEX*, Oct 1987, pp 4, 9.

[6]The term *reflection* is used loosely throughout this article (as well as in most writing on propagation) to describe the return of radio signals from various ionospheric layers, but reflection is a misnomer that sometimes causes conceptual problems. The actual physical mechanism is more accurately described as *refraction*. Ionospheric refraction involves the gradual bending of radio waves as they travel through an ionospheric layer—a layer sometimes several tens of kilometers thick, as in the case of the F layer. When bending is great enough, radio waves are returned to earth at some distance—the familiar skip distance—from their origin, making it appear as if reflection were the cause. In addition, ionospheric refraction is a function of ion density and signal frequency. Refraction is greater with increasing ionization and decreasing signal frequency. Another way to think of this relationship is that lower-frequency radio signals are refracted to a greater extent than higher-frequency signals under the same conditions. In the special case of mid-latitude sporadic E, refraction generally takes place through a very thin ionospheric layer, often less than 5 km thick, making E_s refraction appear even more like reflection. Nevertheless, keep in mind that *refraction* is the mechanism of sporadic-E propagation.

Further general discussion of ionospheric propagation can be found in Gerald L. Hall, ed., *The ARRL Antenna Book* (Newington: ARRL, 1984), pp 1-6 to 1-9; and Mark Wilson, ed., *The ARRL Handbook for the Radio Amateur*, 65th Ed. (Newington: ARRL, 1987), pp 22-1 to 22-7. Discussions of a more technical nature can be found in Kenneth Davies, *Ionospheric Radio Propagation* (Washington: US Government Printing Office, 1965). For introductions to sporadic-E propagation, see Wilson, ed., *ARRL Handbook*, pp 22-14; and G. R. Jessop, *VHF/UHF Manual*, 4th Ed. (Potters Bar, England: RSGB, 1983), pp 2-19 to 2-20.

[7]Twenty-four-hour local time is used throughout this article.

[8]The times cited refer to when sporadic-E ionization exists *directly overhead* and so must be adjusted to fit particular communication paths. The average peak of sporadic-E activity will come somewhat earlier for easterly paths, as the responsible sporadic-E clouds will often be several hundred kilometers to the east. Likewise, the peak time for contacts to the west will appear somewhat later than the time given. Europeans have discovered, for example, that the most likely period for transatlantic contacts is 1800 to 0200 local time in England (the same as UTC when the United Kingdom is not on summer time), with a peak during 2200 to 2300. On the East Coast of the US, this translates to 1700 to 1800 local time. See G. F. Kimbell, "Transatlantic Propagation by Sporadic-E at 50 MHz," *Radio Communication*, Jul 1986, pp 491-494.

[9]Ernest K. Smith, Jr, "The Occurrence of Sporadic E," in K. Smith and Sadami Matsushita, eds., *Ionospheric Sporadic E* (New York: Macmillan, 1962), p 3-11.

[10]Harry Risbeth and Owen K. Garriott, *Introduction to Ionospheric Physics* (New York: Academic Press, 1969), p 200; and W. B. Chadwick, "Variations in the Frequency of Occurrence of Sporadic E, 1949-1959," in Smith and Matsushita, *Ionospheric Sporadic E*, pp 182-193.

[11]For an explanation of these measures of solar geophysical activity, see Carl L. Bixby and James Morris, "The Art and Science of DXing," *QST*, Jan 1979, pp 11-14.

[12]Patrick J. Dyer, "Fifty-megahertz E_s, 1964-1970," *Radio Science*, 7, Mar 1972, pp 351-353.

[13]J. A. Thomas and E. K. Smith, "A Survey of the Present Knowledge of Sporadic-E Ionization," *Journal of Atmospheric and Terrestrial Physics*, 13 (1959), pp 295-314, and E. K. Smith, "Some Introductory and Background Comments on Our State of Knowledge of Sporadic E," Radio Science, 1 (Feb 1966), pp 129-131.

[14]The two most influential papers on the wind-shear theory are J. D. Whitehead, "The Formation of the Sporadic E-Layer in the Temperate Zones," *Journal of Atmospheric and Terrestrial Physics*, 20 (1961), pp 49-58, and W. I. Axford, "The Formation and Vertical Movement of Dense Ionized Layers in the Ionosphere Due to Neutral Windshears," *Journal of Geophysical Research*, 68 (1963), pp 769-779. Much additional work has been done since. See the published proceedings of two sporadic-E conferences in *Radio Science* 1 (Feb 1966) and 7 (Mar 1972) for discussions of findings and theories.

[15]Of the 10 types of sporadic E identified by atmospheric physicists, at least four occur commonly in the mid-latitude temperate zone. (See Thomas and Smith, "Survey of Present Knowledge of Sporadic E.") The so-called classical description aids in explaining most instances of midlatitude sporadic E, but it does not presume to cover all types and specific cases. The classical model assumes that sporadic-E clouds are essentially thin (2 to 4 km), flat, horizontal layers of unusually dense ionization 95 to 115 km in altitude and up to 100 km in diameter. They seem to occur most commonly at an altitude of about 105 km. The general physical processes governing sporadic-E radio refraction are assumed to be consistent with other forms of high-altitude ionization. (See Davies, *Ionospheric Radio Propagation.*) Much professional work has sought to confirm or modify this basic model, and to explain its causes, based on indirect radio observations and direct observations of sporadic-E clouds. (The collections of articles in *Radio Science* for February 1966 and March 1972 are examples of this work.) The classical model of sporadic-E behavior was also used by Shelby Ennis, "Working 2-Meter E-Layer DX," *QST*, Jun 1967, pp 24-28; and by Mel Wilson, "Midlatitude Intense Sporadic-E Propagation," *QST*, Dec 1970, pp 52-58, and Mar 1971, pp 54-57.

[16]Transmitter-receiver instruments known as *ionosondes* measure the altitude and critical frequency of ionospheric layers by transmitting a range of frequencies straight up and observing the characteristics of the returned signals.

[17]The relationship among MUF, operating frequency and path distance for sporadic-E clouds at 105 km altitude may be approximated by:

$$d = 420\sqrt{\left(\frac{5.33f}{f_m}\right) - 1}$$

where
d = path distance in km
f = working frequency in MHz
f_m = maximum usable frequency in MHz

This equation is adapted from Eq 4.14 in Davies, *Ionospheric Radio Propagation*, p 165.

[18]L. G. Smith, "Rocket Measurements," *Radio Science*, 1 (Feb 1966), pp 244-245; L. G. Smith and E. A. Mechtly, "Rocket Observations of Sporadic-E Layers," *Radio Science*, 7 (Mar 1972), pp 367-376; and Adolf K. Paul, "Limitations and Possible Improvements of Ionospheric Models for Radio Propagation: Effects of Sporadic E Layers," *Radio Science*, 21 (May-Jun 1986), pp 304-308. Cloud-to-cloud propagation was also suggested by Wilson, "Midlatitude Intense Sporadic-E Propagation," *QST*, Dec 1970, pp 52-58.

New Books

FUNDAMENTALS OF MATHEMATICS—OUTLINE AND REVIEW PROBLEMS FOR ELECTRONIC CIRCUIT FUNDAMENTALS

By Walter Weir and Gregory Weir. Published by Prentice-Hall, Englewood Cliffs, NJ 07632. First Printing, 1987. Soft cover, 8½ × 11 inches, 183 pages, $13.

If you are struggling with the math needed to earn an Amateur Radio license or upgrade to a higher class, the title of this book is likely to attract your attention. The Table of Contents reads like a "What's What" of basic math: Differences in Calculators, Arithmetic Computation, Positive and Negative Numbers, Fractions, Powers and Roots, Using Exponents, Algebra, Working with Equations, and Trigonometry. This sounds like just the sort of review you'd expect to be most helpful as you prepare for any Amateur Radio license exam!

After a quick glance through the book you'll notice that the text was not typeset, but was apparently printed using a computer with a letter-quality printer. You'll also see that each chapter is broken into smaller sections. Many of these sections end with a set of Practice Questions, allowing you to check your understanding of the principles just reviewed. In addition, each chapter ends with a Self Examination, which you can use to test your knowledge of the information in that chapter.

Unfortunately, you won't have to study far into this book to discover that something is missing. On page two, there's a blank where the division symbol (÷) should be. Later, the Greek letter pi (π) is omitted.

Page six lists various mathematical functions you can perform on a scientific calculator. Although it isn't immediately obvious, there are several symbols missing here, too. Pages 12 and 13 have a list of 11 symbols of mathematical relationships that you should know. Seven of the definitions begin: *a b*, and in one case even the *a b* is missing.

Any character that wasn't on the print wheel used for the text is simply missing! These characters should have at least been hand drawn after the manuscript was printed. Missing a few symbols might be understandable, but this book has missed them all! For a student who really needs the review, these omissions will lead to complete frustration.

The shortcomings of this book don't end here either. Many of the sets of Practice Questions that I looked at had at least one incorrect answer given in the list at the end of the chapter. For example, on page 103 there are some practice questions requiring you to convert between numbers written with metric prefixes and numbers written with powers of 10. The first problem is to convert 13 mA to a number with a power of 10. The answer given on page 114 is 13×10^{-6} A. (Of course the correct answer is 13×10^{-3} A.)

Most of the Self Examination questions that I checked had correct answers listed at the end of the book, but I ignored any question that might have had a missing symbol. You might argue that $(-110) - 10$ is not -11, or that $3024 - 9$ is not 336. Normally, I'd agree, but I honestly believe the authors intended the operations here to be division (÷) and not subtraction (−).

There are also a number of statements in this book that are either misleading or completely wrong. The authors suggest that the correct way to read 300600 is "Three-hundred thousand and six hundred." Horrors! When you read a number, *and* means there is a decimal point! It's "three-hundred thousand, six hundred."

The definitions given for real and imaginary numbers also left my head spinning. "Numbers such as -1 or -4 do not belong to the real number system..." therefore, they are imaginary. The authors used *7* as an example of both a rational and an irrational number. Now how can that be?

This book lists a number of important mathematical rules, and offers detailed, step-by-step instructions for performing a number of types of calculations. The Practice Questions should give you plenty of exercise with these techniques. Unfortunately, I think the authors have lost all credibility because of the numerous errors in the book. How are you to know which statements are true or which of your answers to the Practice Questions differ from the authors' because the book is wrong? If you need a math review, this book will only serve to mislead and confuse you. I recommend you steer clear of this one!—*Larry Wolfgang, WA3VIL*

Product Review

Conducted By Mark Wilson, AA2Z
Senior Assistant Technical Editor

MFJ-931 Artificial RF Ground

Reviewed by Doug DeMaw, W1FB

Martin F. Jue, who heads MFJ Enterprises, is known for developing clever and unique Amateur Radio products. The MFJ-931 is no exception. It's the first example I have seen of a commercially made network for removing unwanted RF energy from hot mics, rigs and keyers. I developed and used a small Transmatch in the 1960s for solving the same problem. I lived on the second floor of an apartment, and getting an effective earth ground was impossible without canceling the reactance in the two-story water pipe that I used for the station ground. Without tuning the ground lead to the water pipe, my station equipment was too hot to touch, especially when I was transmitting on 20, 15 and 10 meters. After using my Transmatch to cancel the reactance of the ground system, things became rather pleasant in my ham shack!

The name "artificial ground" is a misnomer, in my view. You do not create a ground with a network of L and C. Rather, you make an existing poor ground more effective.[1] I have been asked by a number of hams if the MFJ-931 will, for example, take the place of a ground-radial system or above-ground counterpoise. The answer is a definite *no*! Nothing will replace a proper ground screen for a vertical antenna, unless it has equivalent conductive mass and dimensions. It's important that you understand the function and purpose of the MFJ-931.

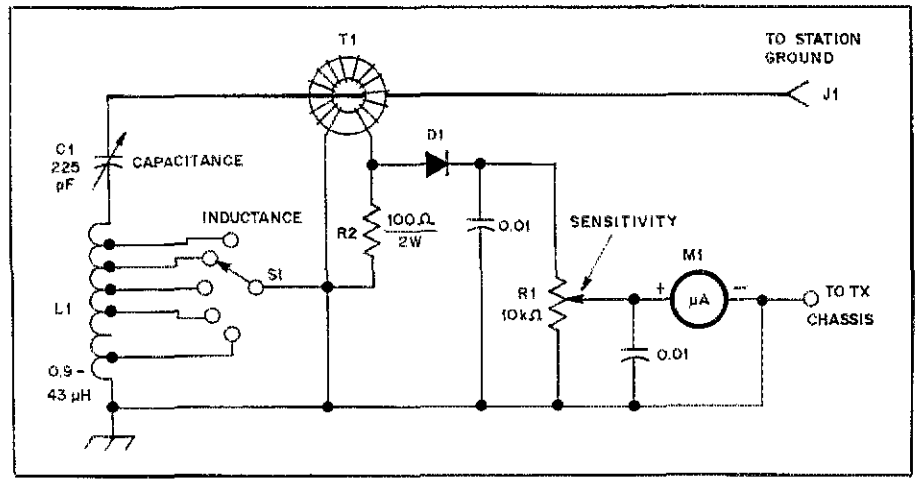


Fig 1—Schematic diagram of the MFJ-931 artificial ground. See text.

A Look at the Circuit

Since MFJ does not supply a schematic diagram with the unit, I took the time to trace the circuit to help show what the MFJ-931 actually does. See Fig 1. C1 and L1 comprise a series LC network. S1 has 12 positions and permits the selection of various inductance values from 0.9 to 43 μH, as measured on my Boonton Q meter. C1 measures 25 to 225 pF on my digital capacitance meter. C1 is a receiving-type capacitor with fairly close plate spacing.

The main lead for the station ground is attached to J1, a binding-post connector. RF current along the ground lead is sampled by toroidal transformer T1; this configuration is used in a number of SWR bridges. We are interested only in *forward current* in the ground lead, so there is no need to measure reflected power.

The sampled RF current is rectified by D1 across a 100-ohm load resistor, R2. The resultant dc voltage registers on M1, which appears to be a microammeter. R1, the SENSITIVITY control, is used to keep the meter needle from pinning.

S1 and C1 are adjusted alternately for the highest meter reading at M1. As the reactance is tuned out of the ground system, the forward power through T1 increases to cause the highest attainable reading at M1.

Practical Tests

I first tried the '931 with my FT-101E transceiver, which resides permanently in my lab as a piece of test equipment. I have no earth ground for the rig, so I threw a random length of no. 18 hookup wire on the floor and routed it out the door into the yard. Overall wire length was roughly 24 feet. I then operated the '101E into a

[1]In effect, the MFJ-931 "improves" a ground by shifting an unwanted RF voltage loop (maximum) away from the station equipment by means of a series-resonant LC circuit. Because of this, one or more high-RF-voltage points can exist somewhere in the "artificial ground" system provided by an MFJ-931. *Wherever* an RF voltage maximum appears in an antenna system, *there is a shock or fire hazard.* So, play it safe: *Treat the tuned ground wire as an antenna wire.* Be sure that the tuned ground wire cannot be touched by children or pets, and that there is adequate spacing between the wire and combustible materials.

Table 1

MFJ-931 Artificial RF Ground

Dimensions (HWD): 3.5 × 7 × 7.5 in.

Weight: 2 pounds.

Color: Case, dull black. Panel, black with brushed-aluminum labels and outer trim.

trap 20/40-meter dipole above my lab. I attached the probe for my Tektronix 453-A scope to the cabinet of the FT-101E to provide a visual indication of the RF voltage on the main frame of the transmitter. Indeed, there was RF voltage on the rig cabinet during 40-meter operation, as noted on the scope display. I adjusted INDUCTANCE and CAPACITANCE controls on the '931 (C1 and L1 of Fig 1) until I had a flat trace on the scope (maximum deflection sensitivity). I observed that this coincided with maximum meter reading on the MFJ-931 tuner. After changing the operating frequency from 7000 kHz to 7300 kHz, I found it necessary to slightly readjust the '931. I repeated the tests at 20 meters and obtained similar results.

I next created a condition of high SWR by connecting only the center conductor of the RG-58 feeder to the antenna jack on the '101E. The chassis and mic became *very* hot with RF voltage. When I adjusted the '931, I was able to make the random-length ground wire act like a ¼-wavelength counterpoise, and the chassis "cooled off."

I brought the MFJ-931 tuner into my house and connected it in series with the main ground lead to my radial system in the field where my antennas are located. I tested the unit by generating RF power with my FT-102 transceiver and AL-80A amplifier. I could find no evidence of an inferior ground until I reached 15 meters. There was not enough RF on the equipment cases to feel a tingle upon touching the cabinets, but the MFJ unit did show a peak in meter reading as I adjusted the tuner controls. I did note, however, some interaction between the settings of the '931 and my station Transmatch. I found it necessary to touch up my Transmatch setting for an SWR of 1:1 after tuning the station ground for maximum indicated current on the '931 meter. The interaction would be more pronounced when using an inferior ground, such as I employed during my first round of tests.

Conclusions

I would have enjoyed using the MFJ-931 during some of my DXpeditions. Second- and third-floor accommodations in the West Indies generally afford a poor RF ground. Plastic plumbing is used extensively there (to avoid corrosion from the salt air), so nothing conductive goes to ground from the station site! I have dangled wires off verandas and laid wire along walls on the floor, hoping to simulate an earth ground. This worked on some bands, but on others it was a wasted effort. The MFJ-931 would have solved my problem.

The '931's components appear to be of high quality. The only annoyance I experienced was when hand capacitance reared its head during '931 adjustments on the higher frequencies. C1 of Fig 1 is floating above chassis ground, as shown. It is panel-mounted by means of fiber insulating washers. This brings the RF-active tuning shaft out of the case, insulated from your hand only by the tuning knob. You will discover that, under some conditions, you can set the '931 for maximum meter reading, but when you remove your hand from the C1 knob, the reading will change. It's not a serious problem, but an annoying one. This would not occur if C1 were set back into the cabinet on insulators. An insulated shaft coupler could then be used to make the control accessible from the front panel.

The MFJ-931 is available from MFJ Enterprises, Inc, Box 494, Mississippi State, MS 39762, tel 800-647-1800. Price class: $80.

AMECO PT-3 1.8-54 MHz PREAMPLIFIER

Reviewed by Mark Wilson, AA2Z

The PT-3 is Ameco's latest outboard preamplifier, replacing the very popular PT-2 preamplifier that found its way into many ham shacks over the years. I still remember the first time I saw a PT-2 and heard it magically improve signal copy on an old National NCX-5 transceiver. Even with today's hottest transceivers, serious DXers and contest operators still use external preamplifiers. Although today's rigs have plenty of sensitivity for casual use, a preamplifier is a big help when using low-noise Beverage or loop receiving antennas on 160 and 80 meters. In addition, sometimes a preamp comes in handy for copying weak signals on 10, 12 and 15 meters.

Features

The PT-3 is designed for use with transceivers. There are two SO-239 jacks on the rear panel, one for connection to the antenna (ANTENNA) and one for connection to the antenna jack of your transceiver (TRANS.). TR switching—to take the preamp out of the line during transmit—is built in. A sensing circuit detects the presence of RF at the TRANS. jack and switches the built-in antenna relay to bypass the preamp. The sensing circuit in the review unit switches reliably when 400 mW or more RF is applied to the TRANS. jack. The built-in relay can handle up to 350 W, which is more than adequate for most transceivers. If you use a high-power amplifier, place the PT-3 between the transceiver and amplifier input. Insertion loss through the PT-3 relay won't be noticed through 30 MHz, but it exceeds 1 dB at 6 meters. See Table 2.

I spent some time listening on a separate receiver to signals transmitted through the PT-3 with the preamp in and out of the line. The RF-sensed relay switching attack time is very fast. I could hear a slight shortening of the first dot in a CW transmission, but I found that the semi-break-in circuit in the test transceiver produces a much more noticeable shortening of the first dot.

A front-panel DELAY control varies the amount of time that the relay stays closed after you stop transmitting. This helps prevent excessive relay chatter during SSB operation or semi-break-in CW operation. I found it convenient to adjust the DELAY control for approximately the same dropout time as the VOX delay in my transceiver. Use of the PT-3 during QSK CW operation is impractical because relay response time is not fast enough.

When the front-panel PREAMP IN/OUT switch is set to OUT, signals are routed directly through the double-pole, double-throw TR relay to the TRANS. jack. When the preamp is in line, signals are routed to a singly tuned band-pass filter and then to the 40673 dual-gate FET RF amplifier.

Front-panel BAND and TUNE controls adjust the band-pass filter. The BAND switch changes inductors, while the TUNE control adjusts a variable capacitor. There is some overlap among the ranges. Table 2 shows the actual ranges measured in the ARRL lab for the four BAND switch settings. Tuning is fairly sharp, but it is not difficult to find a definite peak by listening to the received signal or watching the S meter.

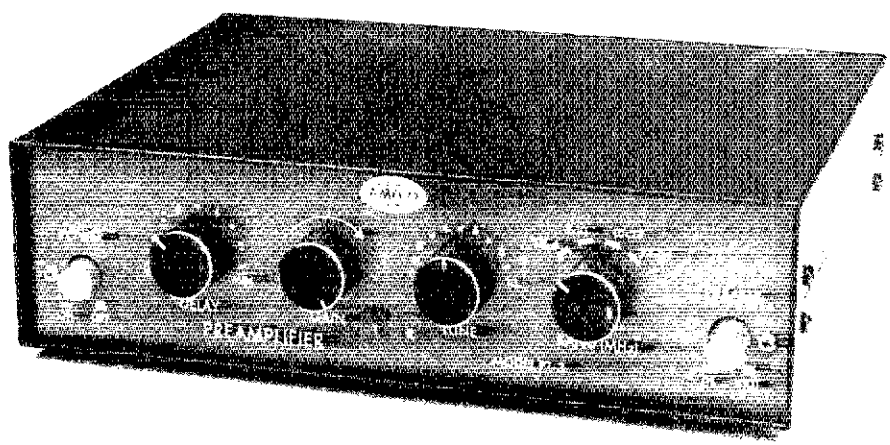


Table 2

Ameco PT-3 1.8-54 MHz Preamplifier

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Gain: Greater than 20 dB.	See below.
Power requirement: 12 V dc.	12 V at 75 mA.
Insertion loss: Not specified.	See below.
1-dB compression point: Not specified.	See below.
Transmitter power handling: 350 W max.	As specified.
Size (height, width, depth): 2.5 × 8.75 × 6.5 inches.	
Weight: 2.4 pounds.	
Color: Black.	

ARRL Lab Measurements

Frequency (MHz)	*Gain (dB)*	*Insertion Loss of the TR Relay (dB)*	*1-dB Compression Point (input, dBm)*
1.8	28.0	0.10	−37.5
3.5	28.0	0.10	−37.0
7	23.0	0.11	−31.5
10	20.0	0.12	−28.0
14	19.0	0.10	−27.0
18	18.5	0.14	−27.0
21	18.0	0.16	−25.5
24	16.0	0.26	−24.5
28	16.0	0.29	−24.5
50	14.5	1.22	−19.5
54	12.0	1.22	−17.0

Band Switch Setting (MHz)	*Actual Frequency Range (MHz)*
1.8- 4.0	1.495- 4.022
4.0-10.0	3.499- 9.313
10.0-23.0	8.270-21.776
23.0-54.0	18.625-51.670

The GAIN control adjusts the source bias on the 40673. By varying this control, you can adjust the PT-3 gain from approximately − 10 dB to the maximum available. Maximum gain varies from band to band—see Table 2. It's good to be able to reduce preamp gain, especially when there are a lot of strong signals on the band.

Hookup and Operation

There isn't much to hooking up the PT-3. Connect it to an antenna, your transceiver, and a 12 V dc source, and you're on the air. The review unit was equipped with Ameco's optional P-12T wall transformer. It is possible to wire the PT-3 for use with a second receiver or a separate receiving antenna (such as a Beverage). Information on these modifications is not in the manual, but is available from the factory.

It is easy to hear the improvement that the PT-3 makes when trying to copy weak 10-meter signals on an older tube-type transceiver. In the first 10 minutes of listening one winter evening, I found a half dozen weak signals that went from the ESP level[2] to easy copy with a touch of the PREAMP IN switch. I found similar results on 15 meters.

The test transceiver had adequate sensitivity on 80-20 meters, and using the PT-3 made no difference in signal copy. In fact, I found that the PT-3 overloaded the rig on 40 meters, making copy impossible because of receiver-generated spurious signals.

Overall, I find the PT-3 to be a useful addition to my station. Used wisely, it's a big help with weaker signals on 10, 12 and 15 meters, and it would be useful at times with a low-noise receiving antenna for the low bands. Manufacturer: Ameco Equipment Co, 220 E Jericho Tpk, Mineola, NY 11501, tel 516-741-5030. Price class: PT-3, $110; P-12T power supply, $9.

[2]The extrasensory perception level at which the contact is largely telepathic instead of telegraphic.

RF CONCEPTS RFC 3-312 220-MHz AMPLIFIER

Reviewed by Bruce Hale, KB1MW and Mark Wilson, AA2Z

So you say your new 220-MHz transceiver is a wonderful thing, but you'd like a bit more "smoke" at the antenna? Here's a deal for you! The RF Concepts RFC 2-317 amplifier will take that 25-W transceiver and turn it into a 120-W powerhouse—and add a 20-dB-gain receive preamplifier at no extra charge! Before you conclude that we're applying for jobs writing advertising for RF Concepts, let's look at the inside details of this amplifier.

Circuit Highlights

The power amplifier in the RFC 3-312 uses a pair of parallel-connected SRF-3883 bipolar transistors. The receive preamp uses the same circuit found in the 144-MHz version of the amplifier—a CF300 GaAsFET drives a U309 JFET. Relay switching is handled by four more small bipolar transistors and a handful of diodes. There's really not a whole lot to this amplifier, but simplicity is a good idea when you want a device that just sits there and *works*.

Like the 144-MHz RFC 2-317 reviewed in October 1987 *QST*, the 3-312 always operates linearly, even in the FM mode. The only difference between FM and SSB modes is the TR relay turnaround time. The delay is lengthened for SSB operation to avoid relay chatter between words in the transmission. Turnaround time can be adjusted by tweaking a small potentiometer, accessed through a hole in the side of the amp.

There are two ways to switch the amp from receive to transmit. RF-sensed switching is standard, but there is also a key jack that can be used to switch the amplifier. The keying polarity can be changed with a jumper so that the amplifier is either switched by grounding the key jack or by applying +3 to 12 V dc at the jack. This external keying feature can be handy for SSB operation; with the keying externally switched, you don't have to worry about the amplifier switching to receive if you pause during a transmission.

Back at the ad copy desk, you should know that it's practically impossible to hurt this amplifier. The amplifier has built-in SWR sensing circuitry that shuts down if the reflected power exceeds 30 W. If this circuitry is activated, the SWR LED on the front panel lights, and the amplifier must be switched off to reset the circuit. Overheating protection is provided by an internal thermostat. If the heat sink temperature exceeds 175 °F, the amplifier shuts down; it resets itself when the heat sink cools down. Power-supply reverse polarity protection is provided by a diode across the power-supply connections. (Connecting the power supply incorrectly will cause the 35-A fuse to blow.) Finally, there are two diodes at the input of the preamp to protect it from strong signals.

Controls and Indicators

There are three switches and four LEDs on the front panel of the 3-312. The

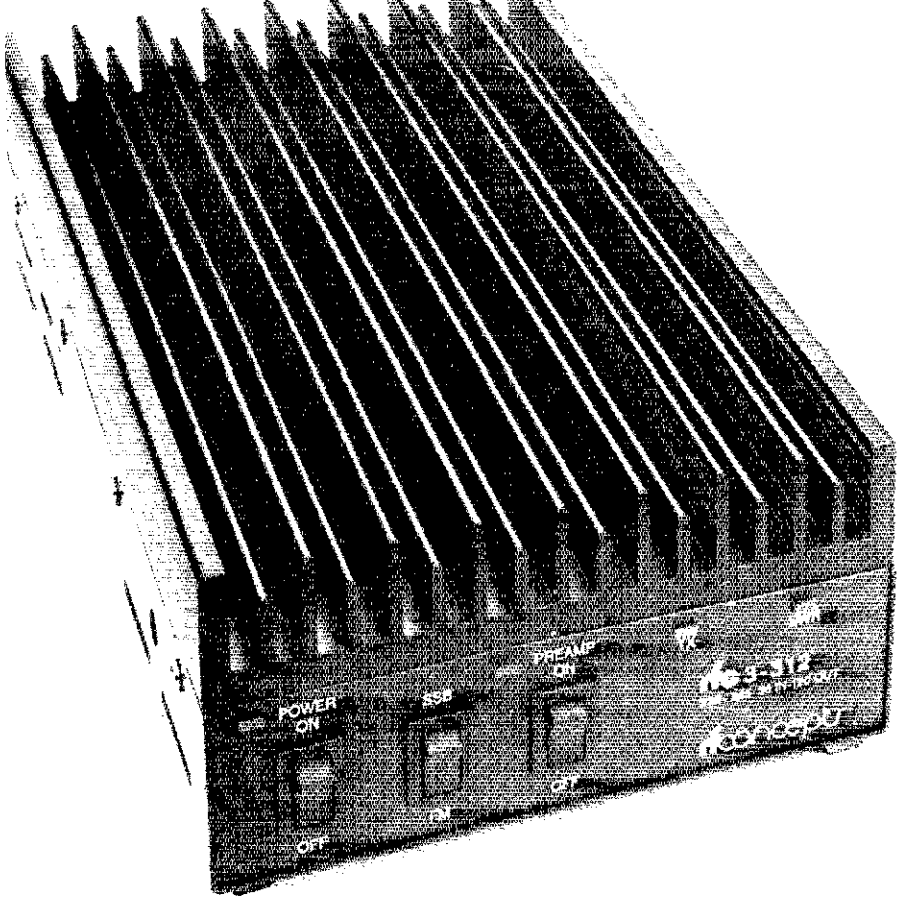


Table 3

RF Concepts RFC 3-312 220-MHz Amplifier, Serial no. 3-3012

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency range: 220 to 225 MHz.	As specified.
Modes of operation: FM, CW, SSB.	As specified. Also works on packet radio.
Power output: 120 W (±0.75 dB) for 30-W drive. Input power: 0.2 to 40 W.	38-W output for 5-W drive; 70-W output for 10-W drive; 108-W output for 20-W drive; 127-W output for 28-W drive.
Spurious signal and harmonic suppression: Not specified.	See Fig 2.
Receive preamp: 18 dB gain with 1.25 dB noise figure.	20.54 dB gain, 1.27 dB noise figure at 220 MHz.
Receive preamp 1-dB compression point: Not specified.	+1 dBm output.
Power requirement: 13.8 V dc at 20 A.	13.8 V dc at 21.5 A required at full output.
Color: Black	
Size (height, width, depth): 3 × 6 × 11.5 inches.	
Weight: 5 pounds.	

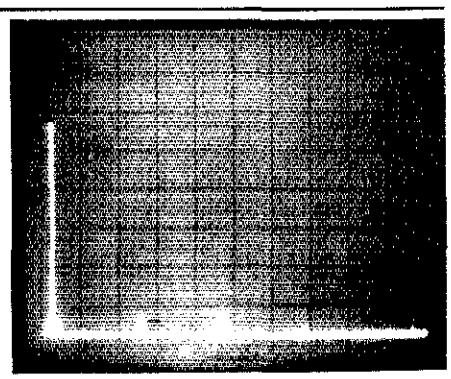


Fig 2—Spectral display of the RFC 3-312. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. Output power is approximately 127 W at 222 MHz. The fundamental has been reduced in amplitude approximately 22 dB by means of notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 72 dB below peak fundamental output. The RFC 3-312 complies with current FCC specifications for spectral purity.

POWER switch controls the power amplifier, and lights the POWER LED. The PREAMP ON/OFF switch controls the preamplifier and lights the PREAMP LED. It is possible to use the preamp without switching on the main power switch. The SSB/FM switch controls the TR turnaround delay. The TX LED lights when the amplifier switches to the transmit mode, and the SWR LED lights when the protective circuitry shuts down the amplifier.

SO-239 connectors for RADIO and ANTENNA are located on the rear panel of the amplifier. The rear panel also supports the external key jack, a four-pin Jones plug for applying 13.8 V dc to the amplifier and the fuse holder for the 35-A fuse. The front-panel switches can also be controlled through a five-pin DIN jack located on the rear panel. RF Concepts does not supply a remote-control head, but the manual clearly indicates how to hook up the DIN jack; the only parts required are three switches and a 10-μF capacitor.

Testing and Operation

Initial ARRL Lab tests indicated that the second harmonic of the review amplifier was suppressed by 56 dB—4 dB shy of the FCC spectral purity requirements. We returned the amplifier to the factory, where the customer service folks found that our unit was from an early production run. RF Concepts had redesigned the output filter for better performance since the time our unit was built, and they upgraded our amplifier at no charge. Service was prompt and friendly. With the new filter, amplifier harmonics are well below the FCC-specified level.

Hookup is simplicity itself (who let that advertising hype in here again?). Connect power and RF cables, and you're ready to go. During the review period, the amp was in use at AA2Z with an IC-375A (see Product Review, March 1988). The amplifier worked flawlessly. It also saw service at a multiop January VHF Sweepstakes effort at WA2OMY. Although it was primarily used on FM during the contest, we also used the RFC 3-312 on SSB and CW for a while after our high-power tube-type amplifier failed. Good thing that the RF Concepts brick is reliable! We made more than 140 contacts on 220 MHz during the contest, and the RFC 3-312 amplifier made a lot of those contacts easier.

The RF Concepts amplifier is a fine addition to any 220-MHz station—FM or weak signal—where you need some additional oomph. The preamp is helpful in many cases, too. Similar models requiring 2 W and 10 W drive are available. Price class: $264. Manufacturer: RF Concepts, 2000 Humboldt St, Reno, NV 89509, tel 702-827-0133.

heating protection is provided by an

Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

APPLYING DRY-TRANSFER PANEL LABELS

☐ Applying dry-transfer labels to a panel *after* controls have been mounted can be frustrating because manipulating label sheets between control shafts and mounting bushings is difficult. To get around this, I tried cutting the desired labels from the carrier sheets, but my 10 thumbs aren't nimble enough to hold such small pieces in place for burnishing!

Here's how to solve this problem. Cut the desired label from the carrier sheet with scissors or a knife and place it face down (so that it reads properly) on a sheet of the label-backing paper (supplied by the label manufacturer to separate the carrier sheets). Place a piece of Scotch® Magic™ tape on the label. It will stick to the label but not to the backing paper. Lift the assembly and position the label—which can be read through the tape—in the desired place and press it to the panel. Now use a ballpoint pen to burnish the label. The Magic tape accepts ink, so you can easily see when the burnishing job is complete. When the label is fully burnished, pull away the tape. There you are: As neat a labeling job as you could wish for. For crowded panels, I find that 1/16 inch of tape around the edges of the label is enough to hold the label in place for burnishing.

Whatever technique you use to apply dry-transfer labels, be sure to clean the panel first with a solvent capable of removing oil without damaging the panel surface. Residual oil, human or otherwise, can prevent dry-transfer labels from adhering properly to the panel. Do this cleaning shortly before applying the labels.—*Harold J. Read, ex-W9HBW, -W9HBX, -W9LHP, Grove City, Florida*

KEEPING TRACK OF AWARD ENDORSEMENTS

☐ Some operating awards can be endorsed for additional submissions beyond the basic qualification level. Keeping track of progress up the endorsement ladder requires good record keeping. You can use the same award-record sheets again and again if you use a *colored* pen (I use red) to enter QSO data on the record sheet. When you have accumulated enough entries to qualify for the basic award, make a black-and-white photocopy of the record sheets for yourself and send the *originals* to the award administrator.

Use the photocopied sheets to track your endorsement progress without confusion. The entries you made in color on the original record sheets appear in black on the photocopy. Record your endorsement data in color on the photocopy, and you'll have no trouble distinguishing records of endorsement QSOs (colored ink) from data pertaining to the basic award (black ink).

I devised this scheme to aid me in working toward Japan Amateur Radio League awards. JARL's Japan Century Cities (JCC) and JCG (Japan Century Guns)[1] awards, for example, have endorsement increments of 100, beginning at 200. With 641 Japanese Century Cities and 569 Japanese Century Guns, I'd go crazy without an easy means of distinguishing records of the first hundred QSOs from records of the second hundred, and so on. This technique helps me keep my records straight.—*Jack Wichels, W7YF, Edmonds, Washington*

PUTTING KNOBS ON 3/16-INCH SHAFTS

☐ Controls with 3/16-inch-diameter shafts seem to be more common than knobs to fit them! A suitable 3/16-to-1/4-inch adapter can be made using 1/4-inch-OD diameter copper tubing (available from hardware stores). Cut the tubing with a hacksaw, and deburr the inside edge of the cut if necessary.

Make a set-screw hole as follows: Drill a ¼-inch hole within an inch of one edge of a block of scrap wood. Stuff the tubing into the wood. Drill the set-screw hole through the wood and into the tubing. You may need several tries to perfect this technique, but a foot of tubing contains enough material for many practice runs! —*Zack Lau, KH6CP, ARRL Lab Engineer*

ANOTHER TELEPHONE RFI CURE

☐ A hint by Mikio Maruya, WA6BSJ, in April 1984 *QST*, page 43, suggested the addition of line filters to eliminate telephone interference. Each of WA6BSJ's filters contained four RF chokes and three capacitors. After experiencing telephone RFI with my Yaesu FT-101EE transceiver, I found a simpler—and possibly more universal—cure. First, I installed an ac-line filter in the transceiver power cord within *2 inches* of the rig. Next, I connected the filter case to a cold-water-pipe ground by means of heavy wire. This simple solution entirely eliminated my interference problem.—*Dave Zinder, W7PMD, PE, ARRL Technical Advisor, Phoenix, Arizona*

Editor's Note: The use of plastic pipe fittings in modern plumbing makes the "cold-water-pipe ground" an increasingly unsure option. Before depending on cold-water plumbing for electrical grounding of *any* kind, be sure that the system is conductive between your intended ground point and the main water inlet for the house.

[1]Japan has, as administrative districts, 47 prefectures. These are divided into cities, towns and villages. The *gun*, which is not an administrative district, is a regional congregation of towns and villages. See *The ARRL Operating Manual*, third edition, for details on JARL awards.—Ed.

DOUBLE-STICK TAPE KEEPS COIL WINDINGS IN PLACE

☐ Before I began rewinding a coil for my dip meter, I wanted to make sure the turns would stay in place as I wound the coil. The necessary inductance required many turns of small-diameter wire, and I didn't want the winding to loosen and scramble if I dropped the coil during the winding process.

Bol-l-l-n-ng! The cover photo from April 1934 *QST* shows what can happen if you're winding a coil and let go too soon. See this column's "Double-Stick Tape Keeps Coil Windings in Place" for a hint on how to avoid this predicament when winding coils with small-diameter wire. (Tie optional.)

To keep the turns in place, I wound double-stick transparent tape on the coil form before beginning the winding. Even though I relaxed my pull on the wire several times during the winding process, the turns stayed put!—*James Herb, W3SHP, Selinsgrove, Pennsylvania*

A LEG FOR C64 PROGRAM CARTRIDGES

☐ Many hams use Commodore 64™ personal computers. Coupled with the right software, the C64 provides an easy way to get on CW, AMTOR and RTTY. Many software packages come in the form of plug-in cartridges. You simply stick the card edge into the connector at the back of the C64 and away you go.

The AEASOFT cartridge that I use is rather long. I was concerned that the long cartridge put a bending moment on the C64 connector that might cause eventual connector failure. I felt what the cartridge needed was a "leg up"—or, at least, a "foot up"—to support its free end.

A search through my junk box uncovered a plastic equipment foot of just the right height. I used a few drops of glue to secure the foot to the bottom of the cartridge. Now, there's no evidence of

movement once the cartridge is inserted into the connector, as the foot rests on the desk top and supports the cartridge. —*Paul K. Pagel, N1FB, ARRL HQ*

SAFETY SCREEN FOR COOLING FANS

☐ For added protection of transceiver fans in cylindrical cowlings: Cut a piece of plastic window screening and secure it over the fan cowling with a hose clamp or a strong rubber band. This keeps children's fingers and slim projecting objects out of the fan—especially important when the rig is used outside of the controlled environment of the home station.—*Clyde C. Blake, KA1BSZ, Ely, Vermont*

INCREASED GAIN FOR SOURCE-FOLLOWER AMPLIFIERS

☐ The output of a source-follower amplifier working into a high-impedance load can be greatly increased (a stage voltage gain of about 3 instead of the slight voltage loss normal for a source-follower circuit) by tapping the source terminal into one section of the RF choke as shown in Fig 1. The additional output voltage is sometimes advantageous, such as when working into a frequency multiplier stage. —*Gordon Crayford, VE6EI, Lacombe, Alberta, Canada*

Editor's Note: The RF choke in VE6EI's circuit provides a voltage step-up because it functions as an *autotransformer*. A four-section choke might be worth trying if you need a voltage step-up of 4.

Capacitor C1 in Fig 1 can be considered optional when the resistance of R1 is only a few percent of the reactance of the bottom third of RFC1. For example, at a frequency of 7 MHz, the reactance of one of three equal sections of a 2.5-mH RF choke will be about ⅓ of the choke's total reactance— 36,600 Ω. (In practice, field interaction between the choke sections renders this division by three approximate.) If R1 = 560 Ω (for example), it need not be bypassed because its resistance is only 1.5% of 36,600 Ω.

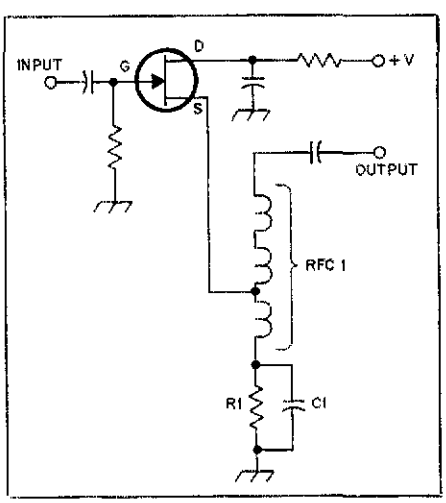


Fig 1—VE6EI uses an RF choke to step up the voltage at the output of a source-follower amplifier. RFC1 is a three-section, 2.5-mH choke. See the text for how the circuit works, and for notes on C1, R1 and RFC1.

Common RF chokes are usually manufactured to inductance tolerances much wider than this. The unnecessary capacitor may be more useful somewhere else! In some cases, omission of C1 may actually improve circuit performance because R1 tends to "kill the Q" of RFC1, reducing the likelihood that resonance in the choke will cause instability in associated stages. These comments also apply when the reactance of the *entire* RF choke is between R1 and the FET source—when the choke is used only as a choke, and not as an autotransformer.

USE *QST* MAILING BAGS AS HEAT-SHRINK MATERIAL

☐ *QST*'s plastic mailing cover can be used as heat-shrink material! Cut a ribbon of the plastic and wrap it around whatever you wish to seal. If necessary, secure the winding with a temporary tie of thread or small wire. A match provides enough heat, but tends to darken the plastic; a propane torch is too hot.—*W. Burt Butts, KK4TN, Douglasville, Georgia*

Editor's Note: KK4TN's hint really works! *QST* mailing-bag plastic is colorless, so it absorbs heat more slowly than black heat-shrink material: Be careful that you don't ignite the plastic or associated wire insulation as you cure the winding. In the ARRL lab, a disposable lighter and a heat-shrink gun both produced good results. The lighter worked faster.

WHISTLE-SWITCH TVI

☐ *Another* source of TVI: whistle-actuated switches. On almost every band I tried between 1.8 and 30 MHz, interference characterized by horizontal color streaks, and sometimes picture tearing, occurred on VHF TV channels as received by the living-room TV. These effects seemed to occur with voice peaks in my SSB transmissions.

Using a tape recorder to modulate my transmitter, I went to a TV in a nearby bedroom to see if that set was similarly affected. The bedroom TV can be turned on and off by remote control—*sonic* remote control by means of a power-receptacle switch that responds to a squeeze-whistle device. Hmm: When I turned the bedroom TV *on*, my wife told me that the interference had vanished from the living room TV! As I turned off the bedroom TV with the whistle, the TVI returned!

I deduced that the remote-control device, in its off state, was somehow generating bursts of VHF RF on my MF/HF SSB voice peaks. I wired a 0.01-μF disc capacitor, rated for 120 V ac service, across the ac input terminals of the device. Problem cured.—*Charles J. Michaels, W7XC, Phoenix, Arizona*

A BROADBAND ANTENNA AT K6EHZ

☐ "The thicker the elements, the broader the bandwidth," or so the antenna pundits say. I've built inverted-V dipoles in which each leg consisted of two wires in parallel at various spacings; these antennas exhibited useful broadbanding. My present 40-meter antenna consists of a pair of two-wire elements, each 32½ feet long, center fed with 52-Ω coax. Spacing between the wires in each element is 10½ inches. At an apex height of 45 feet, and with an apex angle of 107°, the antenna exhibits an SWR of unity across the entire 40-meter band. Performance is three to four S units better than a ground-plane vertical antenna at a distance of several hundred miles. —*P. Romiti, K6EHZ (SK)*

Editor's Note: Thicker conductors—and parallel conductors simulating a single thicker conductor—do make for broadened antenna bandwidth; more on this in Jerry Hall, "The Search for a Simple, Broadband 80-Meter Dipole," *QST*, Jul 1983, pp 22-27. See also Frank J. Witt, "Broadband Dipoles—Some New Insights," *QST*, Oct 1986, pp 27-37. For resonance at a given frequency, a thicker antenna will be somewhat shorter than a thinner one. The improvement in short-range coverage by K6EHZ's broadband dipole—a result of the greater high-angle radiation of the inverted V relative to the vertical—is unrelated to antenna bandwidth.

ALUMINUM GUTTER SCREENING FOR SHIELDING

☐ Aluminum Gutter Guard screening (available in hardware stores) is useful for shielding ventilation openings in radio gear. Because it's manufactured by expanding one piece of aluminum sheet, Gutter Guard screening avoids the corrosion problems common to screening made of individual wires. Also, its open "weave"—holes about ¼ inch square with less than 1/16 inch of aluminum between them—obstructs air flow minimally.—*Dan, N6BZA, and Marty, W6BDN, Levin, Menlo Park, California*

FILE COMB STRAIGHTENS BRAID

☐ Need to straighten the braid on bare lengths of coaxial cable and shielded wire? Use a file comb to brush the braid along its length.—*Guy Black, W4PSJ, Fairfax, Virginia*

USING HEAT AND COLD TO MOUNT PARTS

☐ A remembered high-school physics demonstration helped me replace the tip on my collapsible 5/8-wave hand-held transceiver antenna. I'd pulled the original tip loose and lost it. The replacement tip sent to me by the factory apparently had been made for a different antenna: The socket for the antenna was too small.

I enlarged the socket with a drill one size smaller than the antenna tip. Then I put the antenna in our food freezer for a couple of hours. Next, I heated the tip in a 400° F oven for 15 minutes. Taking proper care not to be burned by heat *or* cold, I tried to assemble the parts again. Voilà! Shrunk by cold, the antenna slipped into the heat-enlarged hole of the tip. As the parts reached the same temperature, the antenna swelled slightly and the tip shrank, resulting in a press fit as strong and tight as a weld.—*Richard Ellers, K8JLK, Warren, Ohio*

Technical Correspondence

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

EASY RS-232-C

☐ Following the publication of my Atari® packet-radio program,[1] I searched for a way to make the computer compatible with TNCs and modems requiring RS-232-C I/O. (The Atari has TTL levels only.) My solution is simple and inexpensive. The circuit (shown in Fig 1) uses a Maxim MAX232 IC and five capacitors to convert TTL voltage levels of 0 and +5 to RS-232-C voltage levels of ±10. The primary advantage of the Maxim IC is that it eliminates the need for a dual-voltage power supply. This IC is designed to take a +5 V input level (such as that supplied at the Atari's controller jack) and produce the ±10 V levels using an internal voltage doubler and +10-V inverter. This approach greatly reduces the number of components required to convert TTL voltage levels to RS-232-C voltage levels.

The use of the MAX232 IC increases the versatility of not only the Atari computer, but any others equipped only with a TTL serial port. It enables such computers to be easily used with TNCs or modems that require RS-232-C voltage levels.

The MAX232 IC is produced by Maxim Integrated Products, Inc, 510 N Pastoria Ave, Sunnyvale, CA 94086, tel 408-737-7600. You can purchase the MAX232 from Jameco Electronics®, 1355 Shoreway Rd, Belmont, CA 94002, tel 415-592-8097.—*Steve Stuntz, NØBF, 1656 South California St, Loveland, CO 80537*

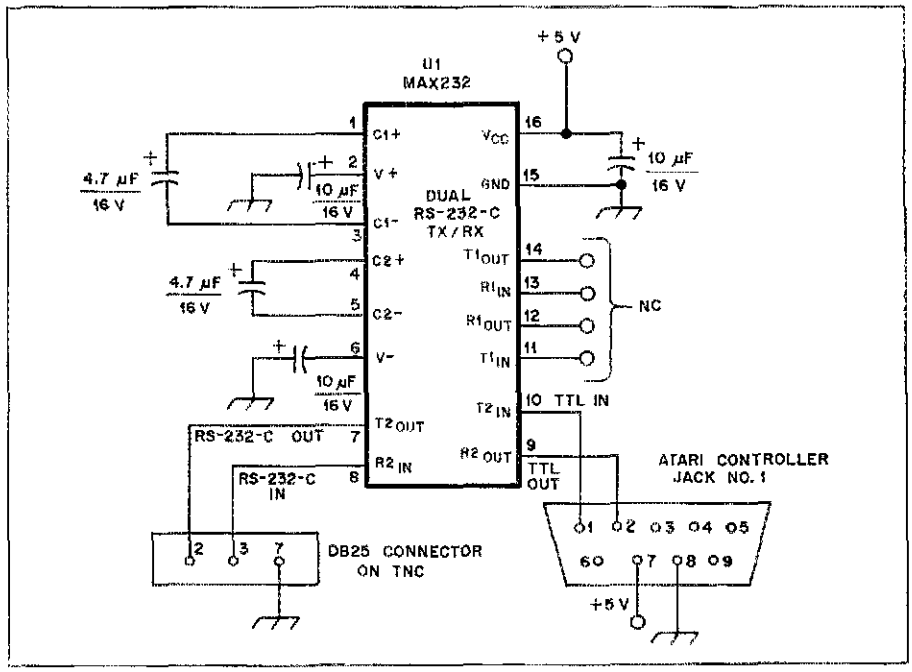


Fig 1—An RS-232-C adapter for the Atari (or other computers) equipped with TTL-only I/O. This circuit uses the MAX232 IC and five capacitors.

DIODE FAILURE

☐ After reading "Unequal Equalizing Resistors Spell Diode Doom,"[2] I'd like to comment on the conclusion drawn by Paul Atkins, K2OZ, relative to the rectifier failure in a two-year-old commercially made amplifier.

Mr Atkins concludes that the first diode in the string shown in Fig 6 failed because of resistance drift in the equalizing resistors paralleling the diodes. First, it's impossible to tell if the resistors drifted in value without having prior data with which to compare the readings.

Second, one cannot necessarily determine the value of any of the resistors (except possibly the 131-kΩ unit that was in parallel with an open diode) by measuring the resistors paralleling functional diodes. Although K2OZ's digital multimeter is undoubtedly a low-voltage instrument, it *may* generate enough potential to cause some diode leakage current to flow, especially in the case of diodes that have already been overstressed and therefore exceed their original leakage ratings. (One failure mode of PN junction diodes is reduced breakdown, sometimes to just a few volts.)

Third, and most important, PN junction semiconductors that are operated in a mode of reverse overstress do not fail in such a way as to "crack completely in half." The failure indicated is usually the result of a high-energy (reverse) transient or excessive forward surge, as might be caused by the inrush current required to charge a large-value capacitor.

Although the "fix" shown in Fig 7 of the article has been used for many years by amateur experimenters, this approach is not recommended for high-reliability equipment, and as such is never used by military and aerospace contractors responsible for the design and production of modern, long MTBF (mean time before failure) power systems. Here's why:

1) The compensating resistors and capacitors triple the component count, increasing the probability of failure and the number of failure modes and mechanisms possibly created.

2) To be effective, the equalizing resistors must draw considerably more current than the reverse leakage current of the highest leakage diode in the string. This dissipates additional power and reduces power supply efficiency, while raising the ambient temperature of the diode's environment.

3) The compensating capacitors, to be effective, must offer a low-reactance path for high-frequency transients that might occur over a broad spectrum. As such, the capacitors can transmit considerable transient energy to critical circuits following the power supply, increasing the probability of failure in or near the load. The very low reactance energy storing (filter) capacitors are often too slow to respond to very fast-rising transients. This is truer in modern power supply designs that omit the inductive reactor (choke) commonly found in older power supply circuits.

4) Modern, hermetically sealed, low-leakage silicon rectifiers that offer extraordinary reliability, and nearly infinite operating life, are available at reasonable cost. These devices can be designed or selected by their manufacturer to withstand extreme and repetitive transient energy. Further, modern high-reliability silicon rectifiers use "dual plug" metallurgically bonded construction with large surface-area connections (internal to the diode) that allows them to withstand large forward surges, even at elevated junction temperatures.

5) There is a plentiful supply of high-voltage silicon rectifier assemblies that incorporate carefully matched, low-leakage junctions. By matching the diode elements

[1]S. Stuntz, "A Packet Terminal for Atari Computers," Nov 1987 *QST*, pp 15-17; see also Feedback, Jan 1988 *QST*, p 49.

[2]Hints and Kinks, *QST*, Oct 1987, p 37.

in such an assembly for equal reverse leakage and breakdown voltage, the reason for using equalizing resistors is permanently eliminated. Manufacturers of such rectifier assemblies also offer products with high transient energy capabilities, often expressed as a joule rating. Commercially available rectifier assemblies have both single-cycle and repetitive forward surge current ratings by which the user may select a product best suited to the application.

More effective than using resistor/capacitor networks to parallel questionable rectifier diodes is to use circuits especially suited to the solution of the probable causes of failure. These might include the use of high-energy varistors in parallel with the power transformer primary, or series resistance before the filter capacitor to limit the surge current to a finite value.

Diodes don't crack completely in half without reason. But K2OZ suggests the wrong reasons in his Hints and Kinks item. The failure mode that results from continuous reverse voltage overstress, as would have been caused by drifting values of equalizing resistance, is a short circuit, not an open circuit. My comments are supported by data collected during thousands of hours of testing bipolar power semiconductors to destruction in an effort to determine both the causes and modes of such failures.—*Steven D. Katz, WB2WIK, 153 Rodman Ct, Eatontown, NJ 07724*

[Steve is Manager, High Reliability Products, Semtech Corp, Newbury Park, CA. Semtech is a manufacturer of high-reliability power bipolar semiconductors, including power rectifiers, supplied primarily to the defense and aerospace industries.—Ed.]

THE MOON AND IONS(?)

☐ I've corresponded with Phil Loosen, VE1CF, concerning the possible enhancement of 80- and 40-meter transequatorial propagation during the full lunar phase.[3] He was kind enough to send me photocopies of letters he'd received from other hams, as well as a few excerpts from published articles. I am pleased to see that his letter has stirred the scientific curiosity of many hams. Judging from the letters, however, there seems to be much speculation about the cause of the phenomenon.

Please understand there is nothing wrong with speculation on this subject: Most scientific advancements in *any* area have begun in this way. As a matter of fact, even I have been speculating! But there are two points that must be addressed. First, the majority of hams are not experts in aeronomy (the study of the earth's atmosphere, including the ionosphere). I include myself among this majority, even though I am a scientist and understand the basic physics of the ionosphere. Second, speculation must be backed up by research and experiment.

I suspect that hams who subscribe to the existence of the propagation enhancement effect of the moon may not have performed controlled tests. Who can blame them for not doing so? How many hams are lucky enough to go on the air every single night for years at a time? How many hams record the phase of the moon in their logbooks? Statements like: "Australia really booms in here on 80 meters during a full moon" should certainly be regarded as interesting, but not conclusive.

Keeping these two points in mind, I suggest the following course of action for those intrigued by this interesting phenomenon: (1) Contact scientists and radio engineers at major universities, research institutes and major communications companies who specialize in aeronomy. They may already know about this effect and have an explanation, making further work unnecessary. I am sure most scientists and radio engineers would be happy to help, especially if they are hams. (2) Search scientific and technical journals that can be found in most university libraries. (Popular books and articles are not quite as reliable as reference material.) Reading material I suggest includes: *The Journal of Geophysical Research* and other American Geophysical Union publications, journals from the National Oceanographic and Atmospheric Administration (NOAA), journals from the National Center for Atmospheric Research, *The Physical Review Letters*, and *The IEEE Transactions on Antennas and Propagation*.

If, by some small chance, this phenomenon is unknown to the experts or not found in respected journals, the intrepid ham can try one of the following to check for its existence: (1) Study the propagation records kept by major communications companies. (I must warn you, however, that this may prove impractical because the records probably span decades, making it difficult to create the necessary copies.) (2) Perform controlled experiments with either radio amateur QSOs or SWL reports. These tests would be very demanding, requiring lots of planning and operation over many years using the same equipment, antennas and power levels. (Does anyone know of a good southern hemisphere equivalent to WWV?)

Mankind has long had a romance with the moon. Old wives' tales tell of strange events that occur only during the full moon. Unfortunately [or *fortunately!*—Ed.], these stories are usually untrue. We are so deeply moved by the beauty of the full moon that it heightens and enhances our awareness and memory. This may well be the case for the so-called lunar ionospheric enhancement, although I certainly hope not. Of course, there is one possibility that may have been overlooked: Maybe hams in the southern hemisphere go on the air only when there is a full moon. I am sure a psychological study of "radio werewolves" would be very interesting...—*Nicholas Elias, N3AIU, Department of Astronomy and Astrophysics, The University of Pennsylvania, Philadelphia, PA 19104*

[3]P. Loosen, "The Moon and Ions," Technical Correspondence, Oct 1987 *QST*, p 38.

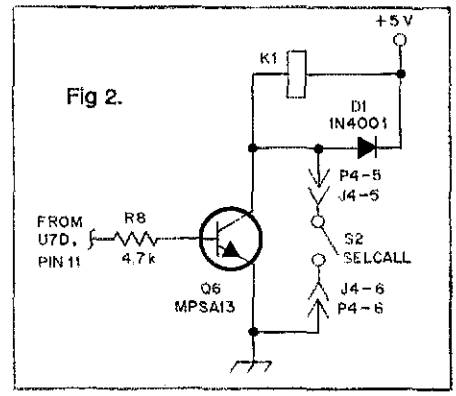
Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you may be reached if necessary.

Feedback

☐ Please refer to *QST*, Feb 1988, Technical Correspondence, Fig 1, p 42. The label at the cathode end of D2 labeled "TO TRANSMIT BIAS" is incorrect. The label should read "TO V_{CC}." Author Lau also points out that to put the amplifier into transmit, you apply +12.5 V to the line labeled "TRANSMIT BIAS" (at RFC2).

☐ Please refer to "Professional Quality DTMF Decoder and SELCALL System," *QST*, Feb 1988, pp 19-22. There is an error in the schematic diagram of Fig 1, p 20. The correct wiring of Q6, K1, D1 and S2 are shown here in Fig 2. On p 22, the sixth line of the second column should read: "The AND gates (U9B and U9C) trigger another timer (U1B), turning on the buzzer..." (Thanks to F. M. "Woody" Liljedahl, W5HHS, for bringing this to our attention.)

Fig 2.



☐ Please refer to "A New Breed of Receiver," *QST*, Jan 1988, pp 16-23. On p 19, second column, the eighth line should read: "1-dB-ripple Chebyshev design. Again the...". On p 20, Fig 7, the terminating resistor for the Chebyshev low-pass filter at the bottom of the drawing should have a value of 1.6 kΩ, not 16 kΩ. Also, in the first column, the second line from the bottom, should read: "...by the parallel combination of R1 and C4". On p 21, Figs 8A and 8B, the Y axis (RELATIVE AMPLITUDE) numbers between 10 and 60 and 20 and 80, respectively, should be preceded by minus signs. On p 23, Fig 9, the output coupling capacitor for U12 should be shown as having a 16-V rating, not 6 V. (Thanks to Ed Wetherhold, W3NQN, and author Gary Breed, K9AY, for bringing these corrections to our attention.)

Get Ready for the New W1AW

CQ CQ CQ de W1AW W1AW K... This is the beginning of a thrill that most of us have experienced sometime in our early Amateur Radio days. That thrill becomes reality when we hear... **W0PAN de W1AW AR**

By Larry J. Shima, W0PAN
Controller, ARRL

Fifty years ago, W1AW—the Hiram Percy Maxim Memorial Station, the memorial to the League's founder—took to the airwaves with its first code practice and bulletins from the 225 Main Street site. Since then, virtually every amateur has come to rely on its many vital services as the lifeline of the Amateur Radio community. Construction of the Maxim Memorial Station was authorized by the ARRL Board of Directors on February 17, 1937, the date of the first anniversary of HPM's death. Construction was completed in the spring of 1938, and the formal dedication took place on September 2, 1938—HPM's birthday.

Over the years, a number of changes have occurred at the station, including the addition of a 120-foot tower with stacked four-element monobanders on 20 meters and a two-element 40-meter beam fixed to the west. Three 60-foot towers comprise the balance of the antenna farm, with monoband beams on 10, 15 and 6 meters, plus an assortment of strategically located VHF/UHF antennas. But W1AW is still basically in the vacuum-tube era, as the last major renovation was in 1964.

At that time, the present RF system, consisting of a single signal source with separate transverters and amplifiers for each of the HF bands, was put into service. This RF equipment is in need of replacement. The equipment is not reliable anymore, and, in some cases, signal quality and strength is not what it once was. During the past 24 years, this equipment has served the Amateur Radio community continuously. After all of this wear-and-tear, W1AW is in dire need of numerous and costly repairs, just to remain functional.

In addition, 50 New England winters have taken their toll on this proud station. The exterior walls need repair to preclude costly structural damage. The outdated electrical system is operating near maximum capacity. The interior needs structural work to make better use of the limited available space.

As plans were developed to update the station, it became evident that only a *major* renovation could address the host of both structural *and* equipment deficiencies. As we prepare to celebrate the 75th anniversary of the founding of The American Radio Relay League, there can be no better tribute to this historic milestone than to ensure that W1AW can continue to be a viable, state-of-the-art station for the next 75 years and beyond.

This is a from-the-ground-up renovation that will simultaneously preserve its traditional and historic architectural integrity. Present plans include the following:

- new exciters and linears on 160-10 meters, including the WARC bands
- total station control by a dedicated computer
- three new visitors' operating positions
- excavation of the basement for the creation of a new emergency communications command post

- all-new electrical wiring
- installation of new interior finishes and restoration of existing interior where possible
- repairs to the outside brickwork, roof, gutters and windows
- complete weatherproofing
- possible remote-site W1AW operation

How is This Going to Happen

Only with your help! W1AW is *your* station. Maybe you would like to thank W1AW for every WPM you've improved your code speed via W1AW daily and nightly code practice. Or perhaps you've enjoyed a contact or two with W1AW or you operated W1AW while visiting HQ and had the thrill of being at the DX end of a pileup. Or perhaps you've found W1AW news bulletins, DX bulletins or propagation forecasts useful. Whatever the case may be, please consider giving something back to W1AW, so it may continue to be Amateur Radio's flagship station, a showcase of exceptional signal quality and a model of station design and construction.

The ARRL Board of Directors has identified a goal of $450,000 to accomplish this objective. The **W1AW Fund Drive** is now underway, with a target date of July 1, 1988.

We need your support if the W1AW project is to succeed. W1AW is **your** station. Please be as generous as you can to ensure that it remains the Amateur Radio station you and your fellow hams can continue to rely on in the future. This is your chance to enhance the service W1AW provides to all radio amateurs. Your generosity today will directly affect future generations of hams and potential hams.

How to Contribute

W1AW is *your* station. You've been updating your home station periodically, keeping up with the constantly evolving technology of the Amateur Radio Service. After 50 years of nonstop code-practice and bulletin service to the entire amateur community, W1AW now needs to upgrade as well. This is not, however, simply a case of replacing one box for a newer one as you might do in your own shack. This is a massive renovation, inside and out. After years of wear-and-tear, W1AW is in dire need of numerous repairs structurally and technically, just to remain functional. Please help us make W1AW a modern station at the cutting edge, one that any ham (and all ARRL members) will be proud of. Here's how to contribute to the Fund Drive:

- **By Mail:** Address all contributions to W1AW Fund Drive, 225 Main St, Newington CT 06111. Please make your check or money order payable to W1AW Renovation Fund.
- **By Phone:** For your convenience, credit-card contributions can be made by calling Jennifer at ARRL HQ, tel 203-666-1541, between 8 AM and 4 PM Eastern Time, weekdays.

All contributions are tax deductible to the extent allowed by law, as ARRL is a 501(c)(3) tax-exempt organization. Please be as generous as you can to help W1AW maintain its leadership on the frontlines of Amateur Radio technology. Thank you.

Recognition

Contributors to the W1AW Fund Drive will be recognized as follows:

- *W1AW Kilowatt Club:* Those contributing $1000 or more.
- *Hiram Percy Maxim Club:* Contributions of $500-$999
- *W1AW Century Club:* Contributions of $100-$499
- *W1AW Booster Club:* Contributions of up to $100

All contributors will receive a handsome certificate, suitable for framing. Members of the *Hiram Percy Maxim and Kilowatt Clubs* will, in addition, have their name and call sign inscribed on a special plaque that will be on permanent display in the renovated W1AW Building. Members of the *Kilowatt Club* will receive a specially inscribed personalized plaque, which you'll be proud to display in your ham shack. In addition, special recognition will be given to those who donate substantially more than $1000. QST

Strays

TELECOMMUNICATIONS POSITIONS AVAILABLE

☐ The US Coast Guard is looking for Amateur Radio operators between the ages of 17 and 42 to serve in the telecommunications field. Training begins with four weeks of code-typing class, followed by 20 weeks of intensive specialized instruction. Veterans or those holding a current Extra, Advanced, General or FCC Second-Class Radiotelegraph license may be elegible for the Direct Petty Officer Program. For more information, contact the USCG Recruiting Office, 4360 Stevens Creek Blvd, Suite 104, San Jose, CA 95129-1122.

I would like to get in touch with...

☐ anyone with data on constant-voltage transformers type 2-2899 and 9-2330, mfd in 1962-63 by Sola Electric Co (Division of Basic Products Corp); a schematic for microwave oscillator Model 622-BKP or 623-BKP from Alfred Electronics; or "blueprints" or construction hints regarding bolometer heads for a Hewlett-Packard microwave power meter 430C. Per Gustafsson, OH1AXV, Molngrand 2, SF-21600 Pargas, Finland.

☐ anyone with a manual for a Measurements Model 65-B signal generator. Jim Yex, WB3CQA, 2189 Lancelot Dr, North Huntingdon, PA 15642.

☐ any hams who served with US Navy Mobile Communications Unit 40-A during WW II. John Bud Jones, N4QPB, 2000 S Eads St, #712, Arlington, VA 22202.

☐ anyone seriously interested and involved in collecting and restoring classic tube-type amateur receivers (Collins, Hammarlund, National, etc). John Browning, 6442 Cathay Cir, Buena Park, CA 90620

☐ anyone with info on sources of ½-inch ceramic slug-tuned coil forms and/or National type XR-50. Russ Smith, W6ONK/7, PO Box 141, Brownsville, OR 97327, 503-466-5481.

☐ anyone using a Hewlett-Packard 110 portable computer for packet radio. Dave Dobbs, K8NQN, 6612 Pleasant St, Cincinnati, OH 45227.

☐ anyone with a schematic and owner's manual for a Swan HF-700S. Bob Attix, N6GKK, 120 Playa Blvd, Watsonville, CA 95076.

***QST* congratulates...**

☐ the following radio amateur on 60 years as an ARRL member:

- Robert E. Troy, Jr, W4AHP, of Montgomery, Alabama

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

- James A. Babcock, K4ABJ, of Raleigh, North Carolina
- Clarence H. Young, W2RFY, of Randolph, New York

Log of a 40-meter Zepp

If antennas could talk, what stories would they tell?

By Rodney H. Newkirk, W9BRD
7862-B W Lawrence Ave
Norridge, IL 60656

December 1937—Just got put together by my excited new owner. The skinny kid and his stepdad strung me between poles atop a Chicago apartment building. Nice view.

January 1938—Survived two nasty snow and ice storms. Must be doing okay. The kid came up and snipped a foot off my far end. Three days later he spliced 2 feet back on.

July 1938—Heard him bragging to his ham buddies about clinching WAS with a 6L6 and two crystals. They all looked up at me and I felt real good. Being a skyhook is fun.

June 1939—Hey, they took me down. Rolled me up, stuck me in a big box, and stacked me with his other radio stuff. What gives?

July 1939—I'm back up on another apartment building down the street. Kid got reluctant permission from his new landlord. I get blamed for BCI even when nobody's home.

November 1940—Real FB year. Rough weather didn't faze me. Good showing in the ARRL Sweepstakes and raised the countries total to 47.

March 1941—Lots of action on 80 now where my feedline does much of the radiating. Kid signed up for traffic on military-affiliated nets. I prefer DX.

December 1941—Gee, lots of excitement around here. The kid and his OM knocked me down and packed me away, along with his homebrew rig and souped-up Sears superhet.

December 1942—Kid returned from an out-of-town war job. He and the OM headed out with a big suitcase. Dad returned later and sadly locked the storeroom door.

December 1943—Man, it's cold and damp down here in the cellar. *I'm* doing okay but that other stuff is suffering. Oh, for the good old days.

December 1944—I'm hanging in there. Rust spots are sprouting on the rig. Kid's mother came down and looked at us again. She sniffles a lot.

December 1945—I keep remembering our biggest thrill: a QSO with Admiral Byrd's south pole Snow Cruiser, KC4USC, back in 1940. Or was it '41?

January 1946—He's back! Gosh, he's not a kid anymore. Wearing a funny brown suit with stripes on it. Rushed right down to take a look at us.

February 1946—I didn't get put back up yet. New building owner objects. Mildewed rig and receiver are drying out behind the kitchen stove.

March 1946—Rig's okay but the receiver blew up. My old pal quickly built a two-tube blooper from the ARRL *Handbook*. Hottest set he ever used.

April 1946—Finally back up between two low chimneys. Those sticks were getting bowlegged, anyway. Wow, it's great to see the sky again.

June 1947—A wonderful year. What a comeback! Conditions are fabulous. Just like old times—me, my buddy and a logful of exciting QSOs.

July 1947—Oh-oh, down and back in the cellar again. Pal's gone away, another job. Took some other radio stuff with him. Maybe I'm going out of style.

August 1951—He's back, but only to be off again. This time he took me apart, boxed my insulators and tightly coiled my wire. This could be *it*.

August 1971—Where did the years go? I've been bounced around like crazy. Hey, my owner's kid is a ham! They wound some tank coils out of my old no. 12.

January 1987—The OM is retired now. Uses a puny indoor wire to schedule his son on 30 meters. Oh, well—I know he realizes that *I* could do a better job.

January 1988—The last of my old chipped insulators hit the trash pile. No regrets, really. I had my days in the sun. The OM, too. We remember.

Rod Newkirk, W9BRD, conducted QST*'s "How's DX?" from 1947 to 1978. "Log of a 40-meter Zepp" first appeared in the February 1988 issue of* Enjoying Radio. QST

Strays

THE WILD BLUE YONDER

☐ The Wilmington Warriors Association will be holding its annual reunion April 6-8 in Harlingen, Texas, the home of the Confederate Air Force. The group, whose members served at the air base in Wilmington, Delaware between 1942 and 1945, meets each year at an air base in other aviation-oriented location.

Carl Smith, WØBJW (right), former ARRL President and present IARU Vice President, with Betty Gillies, W6QPI, and Lew Bradley, W4SWP, at the 1986 Wilmington Warriors Association reunion.

In 1986, the group met in Seattle, Washington, the home of Boeing. Among those attending were Carl Smith, WØBWJ, who served as ARRL President in 1984 after the death of Victor C. Clark, W4KFC.

Betty Gillies, W6QPI, was in the original WASPs (Women's Auxiliary Service Pilots) and was instrumental in the formation of the Powder Puff Derby and the 99ers, a women pilot's organization.

FOREIGN SERVICE DAY BANQUET

☐ The US Dept of State ARC will hold its annual Foreign Service Day Banquet Thursday evening, May 5, at the Arlington Hall Station Officers' club, in Arlington, Virginia. Persons interested in attending are welcome to contact Brad Rohrer, K1CTK, days at 703-875-7454, or evenings at 703-379-2484.

The New Face of DXCC

"Basic DXCC—Still the 'standard' worldwide; don't mess with it!"—*KB1HC*

By John F. Lindholm, W1XX, Manager and Robert J. Halprin, K1XA, Deputy Manager
ARRL Membership Communications Services

"The cliche 'If it ain't broke, don't fix it' became the battle cry of the DX community worldwide when it became known that the DX Advisory Committee was studying the possibility of restructuring the DXCC program. The message received was loud and clear: add a few more awards, clarify and simplify some of the rules, but don't change the basic program—just fine-tune it."

So reported DXAC Chairman John Parrott, W4FRU, to the ARRL Board at its annual meeting in Farmington, Connecticut on January 22-23. The message was not lost, as the Board affirmed the findings of the DXAC in its comprehensive report by adopting the report in its entirety.

This review of the DX Century Club program prompted over 1500 survey responses and hundreds of individual letters from DXers worldwide. Input such as "You don't change a product or service which is a proven winner" (W4ZR) was representative. Well over 90% of the respondents expressed satisfaction with the present DXCC awards program. Looking for some refinement of the program, however, K6SSJ quipped: "Even if your car runs well, you still put new spark plugs in it on occasion." Or as K6IR suggested, "The patient is not terminal. All that is needed is an aspirin and a little TLC."

Action Taken

Taking this approach, the Board authorized a retooling of the DXCC rules, country criteria and country-deletion criteria and accreditation criteria—rewritten to provide a clearer and more concise description of the program. New single-band DXCC awards were created for 10, 80 and 40 meters for contacts made since November 15, 1945. The 5-Band DXCC also becomes endorsable for additional bands: 160 meters and VHF. Additional features include easing of endorsement levels for 160-meter, VHF and the new 80- and 40-meter DXCCs to increments of 10, with a once-a-year exception at levels above 150. The Satellite DXCC award is now also endorsable in 10-country increments. Also, new additions to the DXCC Honor Roll will be recognized monthly in *QST*, after the usual June publication of the annual DXCC Honor Roll listing. See the accompanying sidebar for details on application procedures for these new DXCC awards.

The DXCC Desk.

Country Criteria

The criteria for what constitutes a DXCC country has continued to baffle even the experts. It's not surprising with such diverse entities as the United States, Alaska, British Cyprus, Mellish Reef and the United Nations as countables. 9H4G has defined the cause of some of the confusion: "A country is a political area with a specific government. Once islands which were not separate political entities were accepted as separate 'countries,' the DXCC was into geography. Combining political with geographic considerations to make DXCC countries leads to confusion in determining what qualifies."

Thus, for example, some wonder why the UK Sovereign Base Areas on Cyprus count, but the Royal Order of Bull Moose

Application Procedures

(1) New application forms have been prepared for the new awards; they must be used for these new awards. To request application forms, send two units of First Class postage to: DXCC Application Forms, ARRL HQ, 225 Main St, Newington, CT 06111.

(2) To lessen the impact on the processing of other applications, the processing of new DXCC awards will be phased in as follows:

- *10-Meter Single Band Award:* Applications will be processed beginning **July 1, 1988.** Applications will be accepted during a two-week "window" prior to that date (beginning June 15) and held for processing beginning July 1. The applications received during the window period with the highest total number of valid credited countries will be assigned the Number 1 certificate. Subsequent numbers will be assigned in accordance with the number of country credits. Those applicants who are tied will be assigned the same number, with the subsequent number(s) left vacant. For example, if there are two Number 3s, a Number 4 certificate will not be issued; the next number issued would be Number 5.
- *Satellite Award:* Applications will also be processed beginning **July 1, 1988.**
- *80-Meter Single Band Award:* Applications will be processed beginning **November 1, 1988.** Same basic ground rules as the 10- Meter Award (two-week window, certificate numbering, etc).
- *5-Band DXCC:* The 5-Band DXCC will be endorsable for 160 meters, for applications received starting **November 1, 1988.** Contact the DXCC Desk directly for a special information sheet.
- *40-Meter Single Band Award:* Applications will be processed beginning **May 1, 1989.** Same basic ground rules as the 10-Meter Award.

does not. Good question! The overwhelming desire was to clearly define what constitutes a country and then consistently apply the standards. Enter the new country criteria (see sidebar). As K6IR further noted: "Don't come up with any 'wild card' countries or equally unbalanced ideas. Keep it straightforward. None of this weird score keeping, PLEASE."

The exhaustive study that went into the restatement of the country criteria revealed something surprising. In spite of the nebulous wording of the criteria, it has generally been applied with remarkable consistency through over 40 years of DXing. It is a myth that the DXCC list is rife with countries that made it to the list by mistake or by accident. It has evolved through the years from a simple one-sentence statement to a near replica of the Magna Carta. As the need for criteria of ever greater detail grew with the passage of time, DXCC countries came into being measured against the instrument in place *at the time*. The newly adopted criteria that appear elsewhere in this article were written to: (1) be consistent with past decisions; and (2) minimize the perception that country determinations are made in a haphazard fashion.

Deletion and Accreditation Criteria

Politically, countries come and go. This sometimes calls for a deletion of a country from the Countries List. Heretofore, no guidelines have existed on this process. No more. Researching every single deletion since 1945 led to the development of different categories of deletion. Now defined, they will provide the guideposts to chart the course for future deletion considerations.

Accreditation refers to whether DXpeditions and DX operations such as W3AZD/1S and the like will be credited (ie, contacts with the DXpedition will be valid for DXCC awards). The perception exists and persists that the DXCC Desk conducts an inquisition when DXpeditioners have the temerity to submit their operating authorization documents for routine inspection. The reality is that the vast majority of operations are accredited routinely *without* the submission of any paperwork. It's only for those few places known to be restrictive in either licensing or entry that some proof must be produced. Unfortunately, even in these rare cases the required documents too often do not exist. By and large, DXers understand and approve of the procedure to maintain the highest standards for DXCC and the Amateur Radio Service itself—the latter a sometimes fragile commodity in certain third-world countries.

CQ DX

The DXAC and the Board expresses its thanks to DXers throughout the world for their thoughtful input which has been an essential element in determining the future direction of the DXCC program. New exciting single-band awards, an endorsable Satellite award, monthly Honor Roll listings for new qualifiers and a complete rewrite of the rules that govern DXCC all make for a new face on the DXCC program in which you, the DXer, can directly participate. Now that we have a level playing field, let's get on with working new ones.

The "New Face" of DXCC Includes These Features:

- 10-Meter Single Band Award
- 80-Meter Single Band Award
- 40-Meter Single Band Award
- Endorsable Satellite Award
- Endorsable 5-Band DXCC
- "Instant" Honor Roll upon qualifying
- Eased endorsement levels for 160 meters
- Rewrite of the rules, country criteria and accreditation criteria
- New deletion criteria

The complete DXCC rules are contained here and in the new 1988 edition of The ARRL DXCC Countries List now available from dealers or directly from ARRL HQ for $1 (US).

ARRL DX Century Club Rules

The DXCC rules below were adopted by the ARRL DX Advisory Committee and approved for implementation by the ARRL Board of Directors on January 23, 1988.

Introduction

"...the number of countries worked is increasingly becoming the criterion of excellence among outstanding DX stations."

Clinton B. DeSoto, W1CBD, October 1935 *QST*

From its simple beginnings, culminating in the announcement of the new DX award, **The DX Century Club**, in September 1937 *QST* (which was itself based on the "ARRL List of Countries" published in January 1937 *QST*), membership in the ARRL DX Century Club (DXCC) has been *the* mark of distinction among radio amateurs the world over. That it is regarded with such prestige by DXers is a testament to its integrity and level of achievement. The high standards of DXCC are intensely defended and supported by its membership. The rules established by the founders of DXCC were consistent with the art of Amateur Radio as it existed at the time. As technology improved the ability to communicate, the rules were progressively changed to maintain a competitive environment and complement the gaining popularity of DXCC.

Because of vast changes in the international scene brought about by World War II, it logically followed that DXCC needed to be recast, as indicated in December 1945 *QST*. Ultimately, after a great deal of study, the first postwar DXCC Countries List emerged, as published in February 1947 *QST*. The new DXCC Rules appeared in March 1947 *QST*. Contacts were valid from November 15, 1945, the date US amateurs were authorized by the FCC to return to the air.

The DXCC rules today represent the aggregate of experience gained from administering postwar DXCC. Some countries on the DXCC Countries List do not, of course, meet the present criteria. This includes countries "grandfathered" from the WW II era or those that met the criteria as it existed at the time and are not subject to deletion (see Section III for the appropriate grounds for deletion). Changes are announced under DXCC Notes in *QST*.

SECTION I. BASIC RULES

1) The DX Century Club Award, with certificate and lapel pin (there is a nominal fee of $2 for the DXCC lapel pin) is available to Amateur Radio operators throughout the world free of charge. ARRL membership is required of DXCC applicants in the US and possessions, and Puerto Rico, and CRRL membership is required for applicants in Canada. ARRL membership is *not* required of foreign applicants. All DXCCs except 5BDXCC are endorsable (see Rule 5). There are 12 separate DXCC awards available, plus the DXCC Honor Roll:

(a) **Mixed** (general type): Contacts may be made using any mode since November 15, 1945.

(b) **Phone:** Contacts must be made using radiotelephone since November 15, 1945. Confirmations for cross-mode contacts for this award must be dated September 30, 1981, or earlier.

(c) **CW:** Contacts must be made using CW since January 1, 1975. Confirmations for cross-mode contacts for this award must be dated September 30, 1981, or earlier.

(d) **RTTY:** Contacts must be made using radioteletype since November 15, 1945. Confirmations for cross-mode contacts for this award must be dated September 30, 1981, or earlier.

(e) **160 Meter:** Contacts must be made on 160 meters since November 15, 1945.

(f) **80 Meter:** Contacts must be made on 80 meters since November 15, 1945.

(g) **40 Meter:** Contacts must be made on 40 meters since November 15, 1945.

(h) **10 Meter:** Contacts must be made on 10 meters since November 15, 1945.

(i) **6 Meter:** Contacts must be made on 6 meters since November 15, 1945.

(j) **2 Meter:** Contacts must be made on 2 meters since November 15, 1945.

(k) **Satellite:** Contacts must be made using satellites since March 1, 1965.

(l) **Five-Band DXCC (5BDXCC):** The 5BDXCC certificate is available for working and confirming 100 DXCC countries on each

of 5 bands **(with the exception of 10/18/24 MHz).** Contacts are valid from January 1, 1969. This DXCC award is endorsable for additional bands: 160 meters, 6 meters, 2 meters. 5BDXCC qualifiers are also eligible for an individually engraved plaque (at a charge of $25).

(m) **Honor Roll:** Attaining the DXCC Honor Roll represents the pinnacle of DX achievement:

• **Mixed**—to qualify, you must have a total confirmed country count that places you among the numerical top ten DXCC countries total on the current DXCC Countries List (example: if there are 318 current DXCC countries, you must have at least 309 countries confirmed).

• **Phone**—same as Mixed.

• **CW**—to qualify, you must have a total confirmed country count equal to the station(s) with the highest confirmed CW country count or among those between one (1) and nine (9) less than that total.

To establish the number of DXCC country credits needed to qualify for the Honor Roll, the maximum possible number of current countries available for credit is published monthly in *QST*. First-time Honor Roll members are recognized monthly in *QST*. Complete Honor Roll standings are published annually in *QST*, usually in the June issue. See DXCC Notes in *QST* for specific information on qualifying for this Honor Roll standings list. Once recognized on this list or in a subsequent monthly update of new members, you retain your Honor Roll standing until the next standings list is published. In addition, Honor Roll members are recognized in **bold print** in the DXCC Annual List (usually published in the December issue of *QST*) for those who have been listed in the previous Honor Roll listing or have gained Honor Roll status in a subsequent monthly listing.

#1 Honor Roll: To qualify for a Mixed or Phone Number One plaque, you must have worked *every* country on the current DXCC Countries List. On CW, you must have the highest number of country credits given to any station. Write the DXCC Desk for details.

2) Written proof (confirmations, ie, QSL cards) of having made two-way communication must be submitted directly to ARRL Headquarters for all DXCC countries claimed. The use of the official DXCC application forms is *required.* Complete application materials are available from ARRL Headquarters. Confirmations for a total of 100 or more countries must be included with your first application. By ARRL Board of Directors action, 10-MHz confirmations are not creditable for DXCC.

3) The ARRL DXCC Countries List criteria will be used in determining what constitutes a DXCC country.

4) Confirmation data for two-way communications (ie, contacts) must include the call signs of both stations, the country, mode, and date, time and frequency band.

5) Endorsement stickers for affixing to certificates or pins will be awarded as additional DXCC credits are granted. For the Mixed, Phone, CW, RTTY and 10-Meter DXCC, these stickers are in exact multiples of 25, ie, 125, 150, etc, between 100 and 250 DXCC countries; in multiples of 10 between 250 and 300, and in multiples of 5 above 300 DXCC countries. For 160-Meter, 80-Meter, 40-Meter, 6-Meter, 2-Meter and Satellite DXCC, the stickers are in exact multiples of 10 starting at 100 and multiples of 5 above 200. Confirmations for DXCC countries may only be submitted for credits in increments that will at least bring the new total up to the next endorsement level.

Exception: Once per year, any participant in Mixed, Phone, CW, RTTY or 10-Meter DXCC having an accredited DXCC total of 250 or more, or any participant in 160-Meter, 80-Meter, 40-Meter, 6-Meter, 2-Meter or Satellite DXCC with an accredited DXCC total of 150 or more, may make a submission without regard to the number of cards submitted.

6) All contacts must be made with amateur stations working in the authorized amateur bands or with other stations licensed or authorized to work amateurs. Contacts made through "repeater" devices or any other power relay method (aside from Satellite DXCC) are invalid for DXCC credit.

7) In countries where amateurs are licensed in the normal manner, credit may be claimed only for stations using regular government-assigned call signs or portable call signs where reciprocal agreements exist or the host government has so authorized portable operation. No credit may be claimed for contacts with stations in any country that has temporarily or permanently closed down Amateur Radio operations by special government edict where amateur licenses were formerly issued in the normal manner. Some countries, in spite of such prohibitions, issue authorizations which are acceptable.

8) All stations contacted must be "land stations." Contacts with ships and boats, anchored or under way, and airborne aircraft, cannot be counted.

9) All stations must be contacted from the same DXCC country.

10) All contacts must be made by the same station licensee. However, contacts may have been made under different call signs in the same country if the licensee for all was the same. That is, you may simultaneously feed one DXCC from several call signs held, as long as the provisions of Rule 9 are met.

11) Any altered, forged or otherwise invalid confirmations submitted by an applicant for DXCC credit may result in disqualification of the applicant. Any holder of a DXCC award submitting altered, forged or otherwise invalid confirmations may forfeit the right to continued DXCC membership. The ARRL Awards Committee shall rule in these matters and may also determine the eligibility of any DXCC applicant who was ever barred from DXCC to reapply and the conditions of such application.

12) Operating Ethics:

(a) Fair play and good sportsmanship in operating are required of all DXCC members. In the event of specific objections relative to continued poor operating ethics, an individual may be disqualified from DXCC by action of the ARRL Awards Committee.

(b) Credit for contacts with individuals who have displayed continued poor operating ethics may be disallowed by action of the ARRL Awards Committee.

(c) For (a) and (b) above, "operating" includes confirmation procedures and/or documentation submitted for DXCC accreditation.

13) Each DXCC applicant must stipulate that he/she has observed all DXCC rules as well as all pertinent governmental regulations established for Amateur Radio in the country or countries concerned, and agrees to be bound by the decisions of the ARRL Awards Committee. Decisions of the ARRL Awards Committee regarding interpretations of the rules here printed or later amended shall be final.

14) All DXCC applications (both new and endorsements) must include sufficient funds to cover the cost of returning all confirmations (QSL cards) via the method chosen. Funds must be in US dollars, utilizing US currency, check or money order made payable to the ARRL, or International Reply Coupons (IRCs). A chart showing the various return postage rates is available from the DXCC Desk. Address all correspondence and inquires relating to the various DXCC awards and all applications to: ARRL Headquarters, DXCC Desk, 225 Main St, Newington, CT 06111, USA.

15) The ARRL DX Advisory Committee (DXAC) requests your comments and suggestions for improving DXCC. Address correspondence, including petitions for new country consideration, to: ARRL Headquarters, DXAC, 225 Main St, Newington, CT 06111, USA.

SECTION II. COUNTRIES LIST CRITERIA

The ARRL DXCC Countries List is the result of progressive changes in DXing since 1945. The full list will not necessarily conform completely with the current criteria since some of the listings were recognized from pre-WW II or were accredited from earlier versions of the criteria. While the general policy has remained the same, specific mileages and additional points have been added to the criteria over the years. The specific mileages in Point 2(a) and Point 3, mentioned in the following criteria, have been used in considerations made April 1960 and after. The specific mileage in Point 2(b) has been used in considerations made April 1963 and after.

When an area in question meets *at least one* of the following three points, it is eligible as a separate country listing for the DXCC Countries List. These criteria address considerations by virtue of Government [Point 1] or geographical separation [Points 2 and 3], while Point 4 addresses ineligible areas. All distances are given in statute miles.

Point 1, GOVERNMENT

An independent country or nation-state having *sovereignty* (that is, a body politic or society united together, occupying a definite territory and having a definite population, politically organized and controlled under one exclusive regime, and engaging in foreign relations—including the capacity to carry out obligations of international law and applicable international agreements) constitutes a separate DXCC country by reason of **Government.** This *may* be indicated by membership in the United Nations (UN). However, some nations that possess the attributes of sovereignty are *not* members of the UN, although these nations may have been *recognized* by a number of UN-member nations. Recognition is the formal act of one nation committing itself to treat an entity as a sovereign state. There are some entities that have been admitted to the UN that lack the requisite attributes of sovereignty and, as a result, are *not* recognized by a number of UN-member nations.

Other entities which are not totally independent may also be considered for separate DXCC country status by reason of Government. Included are Territories, Protectorates, Dependencies, Associated States and so on. Such an entity may delegate to another country or international organization a measure of its

(continued on page 84)

Don't Fall Head Over Heels Because of Amateur Radio

Make every tower-climbing season a safe one. Here are some tower-climbing safety tips you can really hook on to!

By Thomas Willeford, N8ETU
6612 Burdett Rd
Wadsworth, OH 44281

I first became interested in climbing safety for many of the same reasons that I became interested in ham radio. I liked the fun, adventure and public service features of Amateur Radio. Climbing towers to work on antennas holds a similar sense of fun and adventure. Part of the challenge is to work safely, without taking risks while on a tower.

My dad and I frequently participated in "antenna parties" with several of our friends. Our club's repeater antenna and the tower at our home QTH also needed work from time to time. These sessions were full of the fun and adventure of ham radio. But there was also some concern and worry. I worried about my dad and some of the other climbers. My mom worried about dad, too—so much in fact that she bought him a brand-new climbing belt and tower hook for his birthday.

But worry isn't enough. One thing I've learned since becoming a ham is that you must take some action when you have a concern. So I decided to gather some information on climbing safety. At first glance, there didn't seem to be much information available other than that old standby, "Don't raise an antenna near a power line." This rule is important, but a call to the local power company and the local telephone company turned up quite a bit of additional information that my dad and I have discussed frequently. *The ARRL Handbook* also includes some excellent information.[1] Other hams also offered some good advice about climbing safety. I'm sharing the information I've collected with you in the hope that it will make all of your climbs safe ones.

The First Step

Everyone agrees that the most important safety factor in any kind of hazardous endeavor is having the right attitude. Safety is important and worthy of careful consideration and implementation. The right attitude toward safety is a must for tower climbers. Lip service won't do, however. You must put the safety rules into practice.

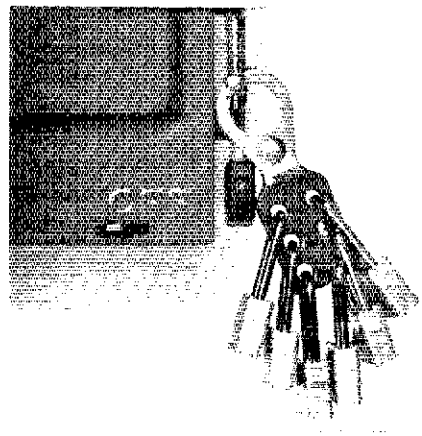


Fig 1—If the switch box that feeds power to equipment on your tower is equipped with a lock-out hole, use it. With a lock through the hole on the box, the power cannot be accidentally turned back on. *(photo courtesy of American Ed-Co, Solon Springs, WI)*

It's easy to take shortcuts or ignore safety rules when you've done a job many times. We've all seen interlocks bypassed on Field Days or when equipment was being tested. And when was the last time you had both hands inside a piece of equipment you were working on? Even so, hams have an excellent safety record.

The safe ham's safety attitude is simple: *Don't take any unnecessary chances.* There are no exceptions to this plain and simple rule. It's the first rule of safety and, of course, of climbing. The second rule is equally simple: *Don't be afraid to terminate an activity—in this case, climbing—at any time if things don't seem to be going well.*

Take time to plan your climb; this time is never wasted, and it's the first building block of safety. Talk the climb over with friends who will be helping you. Select the date and alternate dates to do the work. Choose someone to be responsible for all activities on the ground and for all communication with the climbers.

Study the structure you'll be climbing and choose the best route to your objective. Plan emergency ascent and descent paths and methods. Make a list of emergency phone numbers, even though they may never be used. Develop a plan for rescuing climbers from the structure should that become necessary.

Give careful thought to how much time you will need to complete the project. Allow enough time to go up the tower, do the work, and then climb down during daylight hours. Include time for resting during the climb and for completing the work in a quality fashion. Remember that the temperature can change fast as the sun goes down. Climbing up or down a tower when your hands and feet are cold is difficult—and dangerous.

Give careful consideration to the weather, and climb only in good weather. Investigate wind conditions, the temperature, and the weather forecast. The weather can change quickly, so if you're climbing a particularly tall tower, it may be a good idea to have a weather alert radio handy during the climb. *Never* climb a wet tower.

The person who is going to climb should disconnect and tag all sources of power to the structure. All switches or circuit breakers should be labeled clearly with *DO NOT TOUCH* instructions. Use locks on any switches designed to accept them. (See Fig 1.) Only the climber should reconnect power sources.

An important part of the climbing plan is to review notes on the present installation and any previous work. I know a ham who keeps a notebook that lists every bolt and nut size on his tower/antenna installation. When he climbs, he is able to take the minimum number of tools with him to do the job. It's also a good idea to review the instruction sheets, maybe even taking them with you.

[1] M. Wilson, Ed., *The 1988 ARRL Handbook* (Newington, CT: ARRL, 1987), pp 37-21 to 37-31.

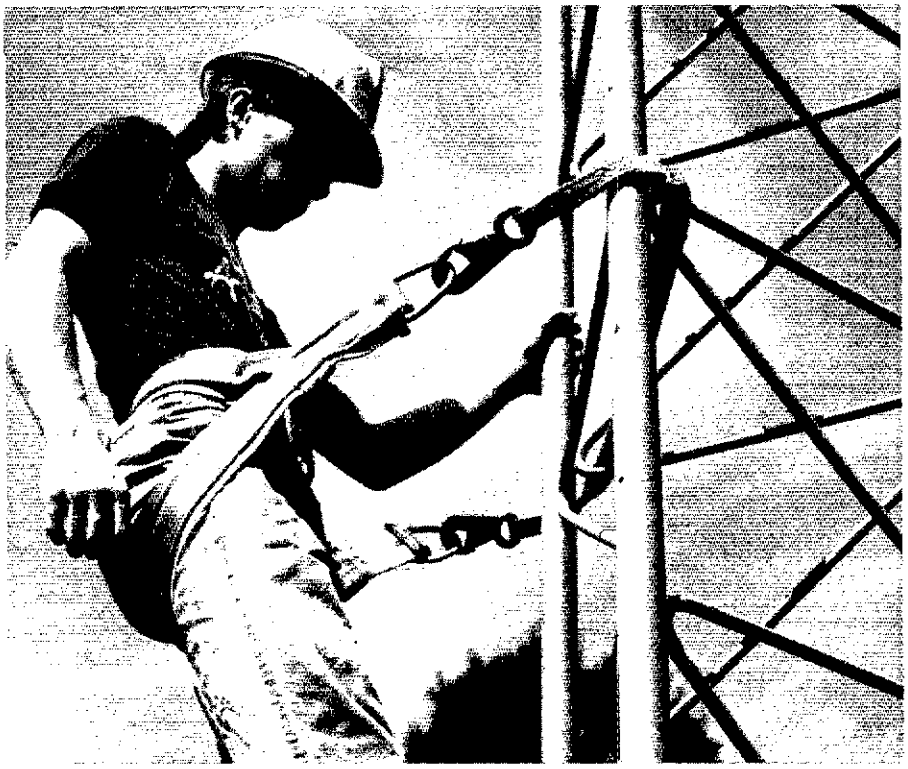


Fig 2—Tom Miller, NK1P, ARRL Lab Technician, demonstrates the proper way to attach a safety hook to a belt. Notice that the hook openings face toward the *outside* of the belt. That way, a hook can't be accidentally released by pressing it against a tower leg.

If you take too many tools up the tower, there is a much greater chance of dropping something, risking injury to the ground crew and possibly damaging the tool. Besides, climbing is hard work and there is no sense in making it more difficult by carrying a heavy load of tools. It's better to use a pulley and line setup or a free line to hoist tools. Always rig the pulley and rope so the ground crew does the raising and lowering of tools and equipment. In other words, plan carefully what you are going to do up there and what you'll need to do it efficiently and safely.

Your Climbing Wardrobe

Equipment is another important safety consideration. By equipment, I don't just mean tools. I mean safety equipment. First, select and care for your safety equipment as if your life depends on it—because it does!

The list of safety equipment essential to safe climbing and safe work on the tower should include:

1) High-quality safety belt
2) Safety glasses
3) Hard hat
4) Long-sleeved, pullover shirt with no buttons or other openings to snag. (Long sleeves are especially important for climbing wooden poles)
5) Long pants without cuffs
6) Firm, comfortable, steel-shank shoes with nonslip soles and well-defined heels
7) Gloves that won't restrict finger movement. (Insulated gloves if you *must* work in cold weather)

Your safety belt should be approved for use on the structure you are climbing. Different structures may require different types of safety hooks or straps. The belt should be lightweight, but strength should not be sacrificed to save weight. It should fit you comfortably. All moving parts, such as snap hooks, should work freely. You should inspect safety belts and harnesses carefully and thoroughly before each climb, paying particular attention to stitching, rivets and weight-bearing mechanical parts.

Support belt hooks should always be hooked to the D-rings in an outward configuration. That is, the opening part of the hook should face toward the outside of the belt when engaged in the D-rings (see Fig 2). Hooks engaged this way are easier to unhook deliberately but won't get squeezed open by a part of the tower or engage and snag a part of the tower. The engagement of these hooks should always be checked visually. A snapping hook makes the same sound whether it's engaged or not. Never check by sound—look to be sure the hook is engaged properly before trusting it.

By the way, the D-rings on the safety belt are for support hooks only. No tools or lines should be attached to these hooks. Such tools or lines may prevent the proper engagement of support-belt hooks or they may foul the hooks. At best, they could prevent the release of the hooks in an emergency. No one should have to disconnect a support hook to get a tool and then have to reconnect the support hook before beginning to work again. That's foolish.

Equipment you purchase new is best. Homemade belts or home-spliced lines are dangerous. Used belts may have worn or defective stitching or other components. Be careful of "bargains" that could cost you your life. Carefully inspect any used belt for signs of wear or weak stitching before you buy.

Straps, lanyards and lines should be as short as possible. Remember, knots generally reduce the load strength of a line by approximately 50%.

On the Tower

Before actually climbing, check the structure visually. Review the route. Check for obstacles, both natural (like wasp's nests) and man-made. Check the structure supports and add more if necessary. Guy wires can be obstacles to the climb, but it's better to have too many supports than not enough. Check your safety belt, support belts and hooks at the base of the tower. Really test them before you need them. Never leave the ground without a safety belt—not even 5 or 10 feet. After all of this preparation, the actual climb should be quite simple, as long as you are careful.

Climb slowly and surely. Don't overreach or overstep. Patience and watchfulness are rewarded with good hand- and footholds. Take a lesson from rock climbers. Hook on to the tower and rest periodically during the climb. Don't try to rest by wedging an arm or leg in some joint; to rest, hook on. Rests provide an opportunity to review the remainder of the route and to make sure that your safety equipment feels good and is working properly. Rest periods also help you conserve a margin of energy in case of difficulty.

Finally, keep in mind that the most dangerous part of working on a tower occurs when you are actually climbing. Your safety equipment is not hooked up at this time, so be extra careful during the ascent or descent.

You must climb the tower to install or work on an antenna. Nevertheless, any work that can be done on the ground should be done there. If you can do any assembly or make any adjustments on the ground, that's where you should do the work! It's much easier to move to the proper position to do the work, and it's less tiring to work on the ground. It's also quite a bit easier to get a different tool if one is needed. The less time you have to spend on the tower, the better off you'll be.

When you arrive at the work area, hook on to the tower and review what you have to do. Determine the best position to do the work from, disconnect your safety strap and move to that position. Then reconnect your safety strap at a safe spot, away from joints and other obstacles. If you must

move around an obstacle, try to do it while hooked on to the tower. Find a comfortable position and go to work. Don't overreach—move to the work.

Use the right tools. If you don't have the correct tool, ask the ground crew to haul it up. Be patient. Lower tools, don't drop them, when you are finished with them. Dropped tools bounce unpredictably and can cause injury or damage, or be broken or lost. While you're using a tool, it's a good idea to tie the tool to a piece of string or light rope, and to tie the other end to the tower or some other point. That way, if you drop a tool, it won't fall all the way to the ground. Don't tie tools to the D-ring or your safely belt, however!

Beware of situations where an antenna may be off balance. It's hard to obtain the extra leverage needed to handle even a small beam when you are holding it far from the balance point. Leverage can apply to the climber as well as the device being levered. Many slips and skinned knuckles result from such situations. A severely injured hand or finger can be a real problem to a climber.

Before descending, be sure to check all connections and the tightness of all the nuts and bolts that you have worked on. Have the ground crew use the rope and pulley to lower your tools. Lighten your load as much as possible. Remember, you're more tired coming down than going up. While still hooked on, wiggle your toes and move a little to get your senses working again. Check your downward route and begin to descend slowly and even more surely than you went up. Rest is even more important during the descent.

The ground captain is the director of all activities on the ground, and should be the only one to communicate with a person on a tower. Hand-held transceivers can be very helpful for this communication, but no one else should transmit to the workers on the tower. Even minor confusion or misunderstanding about a move to be made could be very dangerous.

"Antenna parties" can be lots of fun, but the joking and fooling around should wait until the job is done and everyone is down safely. Save the beer until after the work is completed, even for the ground crew.

These are just a few ideas on tower-climbing safety; no list can include everything that you might run into. You can't be too careful when climbing. Keep safety in mind while doing antenna work, and help ensure that after you have fallen *for* ham radio, you don't fall *because of* ham radio.

Tom Willeford was first licensed in 1980, when he was 12 years old. He is presently a sophomore at Purdue University, where he is majoring in Aero/Astro Engineering. His operating preferences are 2 meters and HF CW.

Exam Info

ARRL/VEC
225 Main St, Newington, CT 06111

FILING FORM 610s

Forms being forms, and hams being people, problems frequently appear with how and where to file a Form 610. In this installment of Exam Info, we'll briefly go over the more common problems with the Form 610; it's no April Fool's joke when the FCC returns an application without action.

Novice Applications

1) Regardless of where the Novice testing occurs, all 610s for Novice licenses *only* must be mailed by the two administering Novice examiners directly to the FCC's Gettysburg, Pennsylvania office; these applications are not to be submitted to any Volunteer Examiner Coordinator (VEC). (Note: Novice examiners do not have to be accredited VEs—but whether they are or not, Novice 610s must be sent to Gettysburg.)

2) The two administering VEs should sign on the back of the application in Section II-A *only* (at the top); Section II-B is for the three VE signatures for Technician and higher licenses earned at VEC-coordinated sessions.

3) When using the newer 610 (released by the FCC in February 1987) for a Novice license, Elements 1A and 2 must be checked off on Line D of the Administering VEs' Report (at the top on the front of the application); before this version was released, the administration of those two elements had been accommodated in the VE certification.

4) A single application cannot be used for a Novice license and later reused for upgrading the Novice to Technician class (or higher). This is so even if two General-class amateurs sign on the back at the top for the Novice elements and three accredited VEs sign at the bottom for the Technician. The FCC requires that two separate 610s be submitted in all such cases.

However, one or more license classes may be skipped as long as (a) the elements passed were administered by the same examiners at the same testing session, and (b) all elements needed to qualify for the higher class are accounted for in the Administering VEs' Report. For example, an unlicensed person's application may be used for an initial Technician class license (skipping the Novice); similarly a Novice's 610 can be completed to indicate a "double upgrade" to General.

Other Common Errors on 610s

1) If you already hold an amateur license and are applying for an upgrade, check off Box 2D (Examination to Upgrade Operator Class); do not check off Box 2C (Examination for New License). Though passing an upgrade exam will result in a license that is new to you, the FCC defines "new license" as the first ticket issued to an individual.

2) Although not a requirement, we advise that upgrade candidates desiring new call signs (assuming they are eligible) place their initials by Box 2E (Change Call Sign).

3) Take care to indicate your correct *year* of birth in Item 6. Many applicants mistakenly write in the current year when they file.

4) For Items 10, 11 and 12 (applications already on file with FCC), check the "yes" box only if you have: (a) a 610 filed with FCC for modifications other than an upgrade, or (b) a Form 610-B (club station license) or Form 610-A (Reciprocal Operation) on file with FCC. If you are one of the hundreds who upgrade at one session and again at a later session but before your pending license has arrived, check the "No" box because the coordinating VEC cannot forward your later application to the FCC until a copy of the license *being upgraded* is attached to the 610. Therefore, the FCC will not see an application for upgrade until all "pieces" are already accounted for.

5) All licensed amateurs who file 610s—regardless of the actions requested on the applications—must attach either the *signed* original license or a photocopy thereof to the back of the Form 610.

Although these are the more common problems that the ARRL/VEC staff encounters, mistakes are made on every part of the application. Whether you are filing a Form 610 for an initial license, upgrade or simply for license renewal, make sure that the application you send the FCC is complete, accurate and signed. If the FCC finds that they must return an application, no action will have taken place on it, nor will it be processed until the application is resubmitted.—*Jim Clary, WB9IHH, Manager, ARRL/VEC*

Strays

CALL FOR *QST* TECHNICAL ARTICLES

Moonbounce activity is growing faster than ever—hundreds of stations around the world are now active on VHF, UHF and SHF EME. There are many special challenges involved with equipping a station for successful EME adventures. *QST* is the place to share your circuit and station designs, commercial equipment modifications and home building experiences with other active and interested amateurs. And *QST* authors are paid for feature articles!

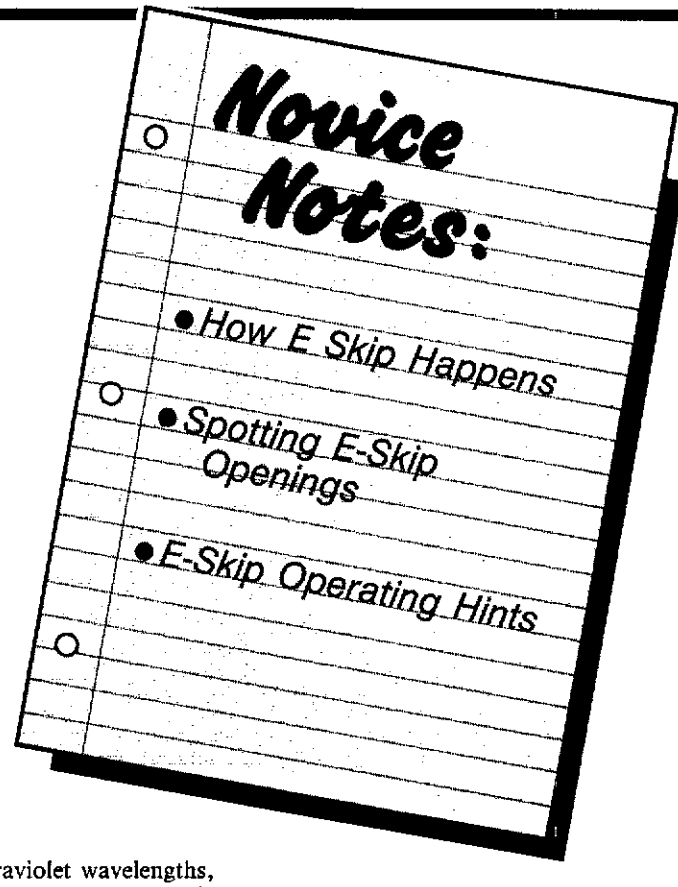
Almost every amateur can get involved with moonbounce—your article may spark someone's interest in this fascinating mode of communication! Send outlines and articles to *QST* Technical Editor, ARRL, 225 Main St, Newington, CT 06111 or call 203-666-1541.

AFCEA LUNCHEON

The Washington Chapter of the Armed Forces Communications and Electronics Association (AFCEA) will hold a reception/luncheon on Wednesday, April 20 at 11:15 AM at the Capitol Hilton, Washington, DC. The guest speaker will be Gen John T. Chain, Jr, USAF, Commander SAC Offutt AFB.

The cost of the luncheon is $20. For additional information and reservations, please call Ms Diane Sibley at 202-457-3060.

Are You Ready for 10-meter E Skip?



Every spring brings spectacular sporadic-E propagation to the 28-MHz band. Here's how to get in on the fun.

By David Newkirk, AK7M

When Novice Enhancement hit the streets in the spring of last year, Novices and Technicians made hay with their new 10-meter SSB privileges by working choice 28-MHz DX. Solid openings into Europe, the Caribbean and South America at once proved to Novices and Techs that 10-meter voice is just the thing for local nets—*and* long-haul contacts, sunspots permitting.

That was in March of last year. By the end of May, something even more amazing—if that's possible—began to occur almost like clockwork: For a few nights a week, and then for weeks at a time, 10 meters opened for astonishingly strong medium-distance communication right around dinnertime and stayed hot for hours—sometimes until well after midnight. Ten meters in general—the Novice/Technician SSB segment in particular—sounded like one big party. Signals were strong, propagation was solid and everybody was excited.

Long-time hams call it *sporadic E* or *E skip*. Unlike normal DX propagation, its occurrence *doesn't* seem to depend on the number of sunspots. Like normal DX propagation, however, sporadic E causes Amateur Radio celebrations whenever it happens—and it happens nearly every spring and summer on 10! This year's sporadic-E excitement is right around the corner. So, let's get cracking: Here's more on sporadic-E propagation, how to spot it, and what you can expect it to do for you.

What is E Skip?

Most long-distance medium- and high-frequency communication is made possible by the action of solar radiation on the earth's atmosphere. Energy from the sun —particularly at ultraviolet wavelengths, we believe—charges or *ionizes* air molecules in the upper atmosphere. This region of charged air molecules is called the *ionosphere*. The ionosphere possesses one characteristic of vast importance to us earthbound radio users: It can *refract* (bend) radio waves.

Where to Learn More About Sporadic E

For more on the past, present and future of sporadic E, see "Sporadic-E Propagation at VHF: A Review of Progress and Prospects," on page 33 of this issue.

It is actually a pretty imprecise word to use for a huge region of ionized air that begins about 45 miles above the earth and reaches altitudes of well over 200 miles. The ionosphere's behavior varies with height and the degree to which it is bombarded by solar radiation. Because of this, ionosphere researchers—you're one of them now, if you use the ionosphere for radio communication—divide the ionosphere into three layers: D, E and F. (See Fig 1.) As far as scientists have been able to determine, the D layer doesn't do anything useful: When it exists (only during the daytime, luckily), it makes itself known mainly by *absorbing* long-distance signals on the lower-frequency amateur bands. (For instance, D-layer absorption is why you can't work from, say, Denver to Boston at noon on 80 meters.) The E and F layers—particularly the F—are responsible for most intercontinental shortwave DX. (During the daytime, the F layer separates into *two* layers, F_1 and F_2. The F_2 layer is generally considered to be the DX workhorse of the two.)

Regardless of which of its layers takes the honors, the ionosphere's ability to refract radio waves back to earth is the key to most DX propagation. Choose the right frequency and time of day, year and solar cycle, and you can use ionospheric E- and F-layer refraction to put your radio signal into just about any corner of the world. The level of solar activity is a major factor in such DX work: The more sunspots, the better (generally) the long-distance radio propagation via normal E- and F-layer refraction. And then there's *sporadic* E.

Sporadic-E ionization occurs when relatively dense *clouds* of ionization form at E-layer heights—at an altitude of about 70 miles—and drift, seemingly at random, until they disappear. While they exist, sporadic-E clouds can provide astounding propagation at frequencies between about 21 and 225 MHz. Sporadic-E propagation can happen at any time of year, but the best E-skip openings usually occur from late spring to late summer, and for a shorter period in early winter. Statistically, the best times of day for sporadic-E openings are between 8 AM and noon, and between the hours of 6 PM and 12 AM.

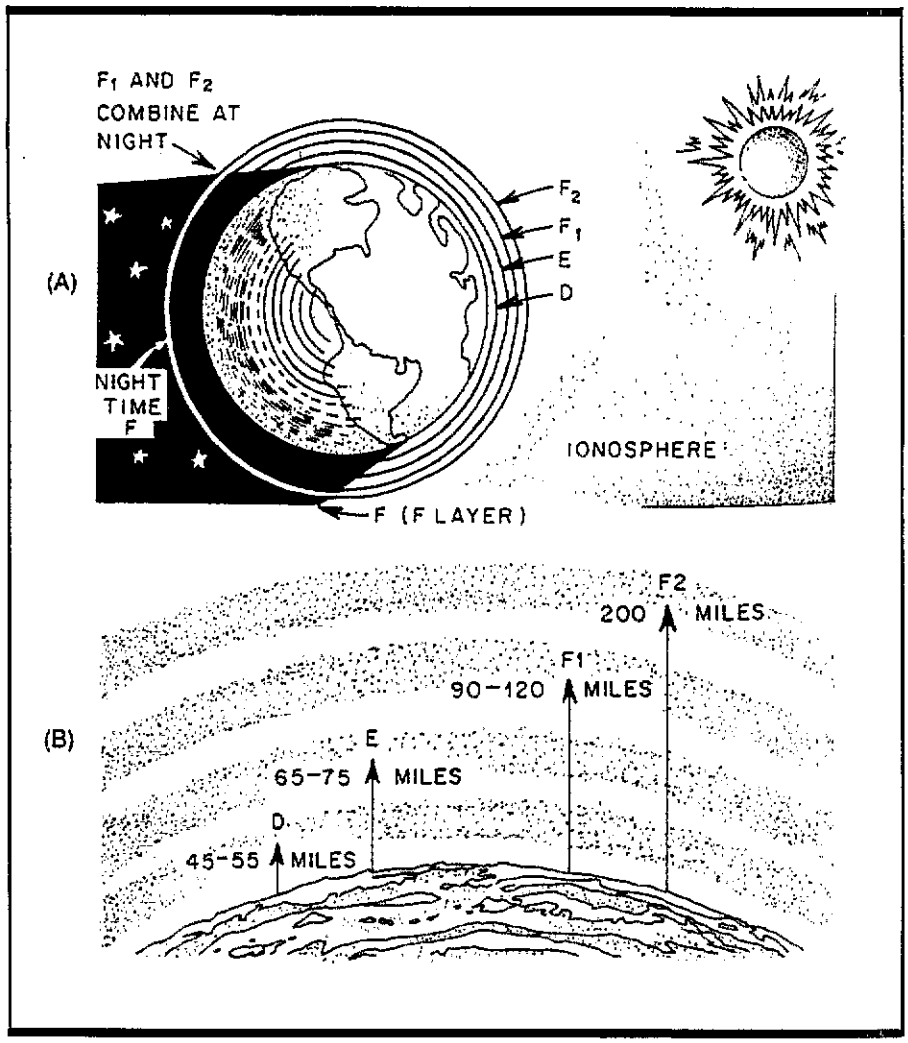


Fig 1—Most long-distance medium- and high-frequency radio propagation would get nowhere fast without the interaction between solar radiation and the ionosphere. So far, three ionospheric *layers*—D, E, and F—have been named and characterized. Fig 1A shows how these layers vary between day and night. During the day, the F layer splits in two—the F_1 and F_2 layers. At night, normal ionization disappears at D- and E-layer heights, and the F_1 and F_2 layers merge. For reasons yet unknown, *sporadic-E* ionization can occur at E-layer heights (65 to 75 miles above the earth, as in Fig 1B) at *any* time of day and year, sunspots or not.

Sporadic-E propagation seems to owe little, if anything, to sunspots: Last summer's sporadic-E season, arguably the best on record, occurred at "the bottom" of the sunspot cycle. (The hotter the E-skip opening, the higher the signal frequencies it can support. Last spring's sporadic-E season brought openings so intense that hams were able to complete the first documented two-way Amateur Radio contact via *220-MHz* E-skip!)

No one seems to know for sure what makes E-skip tick. Radio amateurs are still trying to solve the sporadic-E puzzle. What causes the formation of E clouds in the first place? One theory suggests that high-altitude wind shear plays a part. If E clouds occur and drift randomly, why are multihop E-skip contacts—each of which would seem to require the presence of several E clouds spaced *just right* for the duration of the contact—so common? One theory suggests that *tilted* E clouds may be the answer.

Well, enough theorizing. You *don't* have to be a physics prof to have fun with the unexplained mystery of sporadic E! All you have to do is be at your radio at the right time. Here's how to make E skip work for you.

Putting Sporadic E to Work

At 28 MHz, sporadic-E propagation can allow contacts over distances of a few hundred miles to several thousand. "A few hundred miles" is great for WAS-seekers: In working all states on 10 meters, you'll probably use E skip to work "close in" states. (Midwestern hams may be able to work all states using *only* E skip.) Under the right conditions, multihop E skip can even step out for *transoceanic* DX.

Classic (single-hop) 10-meter E skip, however, makes for rollicking good fun mainly because the medium-distance communication it affords is solid for hours on end. Here in Connecticut, such openings often begin with contacts into Maryland, Pennsylvania or the Virginias in the early evening. "Hey! Short skip's in!" we shout. Soon, the nearer-in stations fade out; now, stations from Ohio, Indiana, Michigan, Tennessee, Kentucky and the Carolinas boom in. (This stage often lasts for hours; while such E skip is on, the Novice/Technician SSB segment goes wild!) Later, if we're lucky, the band steps out to Minnesota, Illinois, Wisconsin, Iowa, Missouri, Arkansas, Mississippi, Alabama, Georgia and Florida. (If we're *really* lucky, *multihop* E will produce even better DX.) The fun may last beyond midnight. Sleepily, we hit the hay and vow to get in at the *beginning* of the opening next time.

Getting in on the E skip action is easy. For starters, be sure to check the band at the right times: during late morning and early evening. In fact, it's a good idea to check the 10-meter band whenever you can, because E skip can happen at any time of day. (Don't hear anyone? *Call CQ.* If you have a directional antenna, be sure to rotate it as you scan the band. *You* may be the person who "opens the opening"!) Make an agreement with your friends that you'll alert each other if any of you discovers an opening.

Be sensitive to shifts in propagation. When E skip is in, it's *really* in, and signals will be strong. Is that other station weak because propagation is failing, or is the opening strengthening to that region? With experience, you'll be able to judge this rapidly—and knowing the difference can save you time and unanswered calls.

You *don't* need a directional antenna and maximum power to have fun with sporadic-E propagation, by the way. A dipole and 100 watts will do well; even a more modest setup can do wonders. (A friend of mine, operating from his car, once worked from Connecticut to California via *6-meter* E skip with a whip antenna and a couple of watts!)

Start Checking the Band *Now*

If this year's spring/summer E-skip season hasn't already started by the time you read this, it'll start soon, sunspots or not. (Remember: Even during days of punk F-layer propagation, 10-meter E skip can *roar.*) Now's the time to start checking 10 meters as often as you can.

Once you've learned how to recognize and take advantage of sporadic E, you'll understand why so many hams are excited about it. So, here's *my* sporadic-E prediction for 1988: After you experience just one hot E-skip opening, you'll be hooked!

Dave Newkirk works at ARRL HQ as an Assistant Technical Editor for QST.

Moved and Seconded . . .

Those present at the Annual Meeting of the ARRL Board of Directors (front row, l-r) W9PRN, W7RM, W4UG, N4MM, WØFIR, KØTO, W6EJJ, K5OS, WA2DHF, WØOZC, WB5IGF, WB5JBP, WAØKUH; (second row, l-r) WB1EYI, N3AKD, AB8P, K1LLU, K9KM, W1UED, AGØX, VE3CDM, K1ZZ, W4RA, W2HD, W4RH, KN1K, WB2VUK, N5TC, WØPAN, W1XX, W4OYI; (third row, l-r) N6NB, WA6WZO, KX1B, W2BCH, W3ABC, W6ZM, W8RC, KB6ZV, W6ZRJ, W7QMU, W4WYR, WØHZR, K6ITL, W4RI, KU7G/1, KØPGM and K1KI.

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

An incomplete version of Minute 81 appeared in the Minutes of the Meeting as printed. The correct version:

"81) It was moved by Mr. Nathanson, seconded by Mr. Milius, that the following resolution be adopted:

"'WHEREAS, the entire world and some American possessions are active on forty-meter SSB on the 7075-7100 kHz portion of the forty meter band, and

"'WHEREAS, the American Amateurs are disadvantaged in international contacts as a result of this condition, and

"'WHEREAS, the use of this portion by American Amateurs is reasonable and just, now, therefore,

"'BE IT RESOLVED, that the Communications Counsel is directed to prepare a petition to the FCC that will allow Advanced and Extra Class Amateurs to operate SSB in the 7075-7100 kHz portion of the forty-meter band.'

"After discussion, it was moved by Mr. Heyn, seconded by Mr. Haynie, to postpone consideration of this resolution. A Roll Call vote being requested, the question was decided in the affirmative, 9 votes in favor of postponement to 6 votes opposed. Those voting in favor were Messrs. Butler, Frenaye, Haynie, Heyn, Mark, Mendelsohn, Metzger, Quiat and Turnbull. Those voting opposed were Messrs. Drake, Grauer, Harrison, Milius, Nathanson and Stafford. So consideration of the matter was POSTPONED. During the course of the discussion, the Board was in recess from 4:50 to 5:10 PM."

The final paragraph of Minute 86, which proposed to have the Volunteer Resources Committee study the division of the Washington Section into two ARRL Sections, should read:

"It was moved by Mr. Mendelsohn, seconded by Mr. Mark, that consideration of this matter be postponed. A Roll Call vote being requested, the question was decided in the affirmative, 9 votes in favor of postponement to 6 votes opposed. Directors voting in favor were Messrs. Butler, Grauer, Harrison, Heyn, Mark, Mendelsohn, Metzger, Nathanson and Turnbull. Those voting opposed were Messrs. Drake, Frenaye, Haynie, Milius, Quiat and Stafford. So consideration of this matter was POSTPONED."

Respectfully submitted:
Perry Williams, W1UED
Secretary

New Products

NIC SURFACE-MOUNT COMPONENT KITS

☐ NIC Components Corp has available kits of surface-mount capacitors and resistors, handy for builders of SMD projects. Five kits are available.

Manufacturer: NIC Components Corp, 6000 New Horizons Blvd, Amityville, NY 11701, tel 800-645-9333 or 516-226-7500.—*Rus Healy, NJ2L*

Kit No.	*Contents*	*Price*
NMC 1206	200 ceramic chip capacitors, 10 pF to 0.22 μF	$35
NMC 0805	200 ceramic chip capacitors, 10 pF to 0.10 μF	$35
NTC	150 solid tantalum chip capacitors, 0.1 μF to 47 μF	$85
NFC	60 metallized polyester capacitors, 0.01 μF to 0.22 μF	$60
NRC 18	365 thick-film chip resistors, 10 Ω to 1 MΩ	$40

KANTRONICS MAXFAX EPROM UPDATE

☐ Kantronics has introduced updated EPROMs for the KAM, KPC-1, 2, 4 and 2400 TNCs. The update (2.8) allows screen displays of weather facsimile charts and data storage to RAM or disk, or printing of these charts on an Epson® printer. Software is available for IBM® PC (MAXFAX-PC) and Commodore 64™ and 128 computers (MAXFAX-64/128). (The IBM PC requires a CGA adapter for use with MAXFAX.) Price class (MAXFAX update 2.8 EPROM and software on diskette): $19.95 plus $2.50 shipping. Manufacturer: Kantronics, Inc, 1202 East 23 St, Lawrence, KS 66046, tel 913-842-7745.—*Rus Healy, NJ2L*

Amateur Radio in Yugoslavia

Curious about what Amateur Radio is really like in Yugoslavia? Take an inside look at ham radio, Yankee-Uniform style!

By Rick Booth, KM1G
Offshore Publications
220 Reservoir St, PO Box 817
Needham Heights, MA 02194

His signal was thunder, 20 over nine, banishing QRM we'd endured through three nights of fruitless waiting. "Whiskey One Romeo Tango," said an unmistakable voice, "this is Whiskey One Romeo Tango on frequency."

At my location, that prefix was DX.

Regaining composure, my control operator yanked the plug from the headphone splitter, spilling the last words into a crowded shack. Ten pairs of eyes turned expectantly to me, and I thought, "Calm yourself, boy. You've worked a thousand stations. He's just another." Afraid lest habit send my own call to my lips, I glued my eyes on the sign over the rig. Sweat trickled down my temples. I keyed the mike.

"Whiskey One Romeo Tango, Whiskey One Romeo Telephone, this is Yankee United Two Alpha Kilo Lima, Yankee Uniform Number Two, Alpha Kilo Lima, over."

That did it. The die was cast. I'd transmitted from foreign soil, a dream of every American ham and maybe every ham who ever lived. The ensuing QSO, thoughtfully taped in the states, is a treasured memento of the most thrilling moment (so far) in my ham career, one brought about in part by ham radio itself, and enhanced beyond measure by the amateurs of Split in the Dalmatian coastal portion of Yugoslavia.

The author gets in a little operating time at club station YU2AKL in Split, Yugoslavia. (*photos courtesy KM1G*)

Ten days earlier at my Connecticut home, I'd heard my neighbor Bob DeBragga, W1RT, working Europeans on 20 meters. I chimed hello. Bob knew about my impending trip to compete on the American team in the Dalmatian Cup, an international yacht race on the Adriatic Sea. The Yugoslavian government sponsors the annual regatta through its breathtaking islands, in part to publicize its tourist industry. Bob said a quick hello without breaking his QSO, then waited until it came back to him.

"Other European stations wait," he said. "I'd like to call for any Yugoslavian stations, particularly in the city of Split, Sierra, Papa, Lima, India, Tango. Any Split stations, please call W1RT."

Fat chance, I thought. Not even Amateur Radio can perform a miracle like that, Bob, even if your antenna *is* 30 feet higher than mine. But what did I hear? "Yes, Whiskey One Romeo Tango, I'm in Split, what can I do for you? This is Yankee Uniform Two Alpha Alpha. My name is Tom."

My own signal wasn't clear in Europe, so Bob passed the particulars of my arrival in Split. To my amazement, Tom passed his telephone number, and those of other Split hams, on the air. Written on the back of a blank QSL, they snuggled with my passport through five days of hellacious sail racing, until I found myself on the veranda of Split's first-class international marina, near a public telephone. Put plenty of coins in and dial, they said. I did. It rang. Someone picked up. What now? My Serbo-Croatian is bad.

"Kilo Mike One Golf," I blurted. Tom didn't miss a beat, and in excellent English asked where I was. "I'll be there in 15 minutes," he said, and he was.

Tomislav Dugec, YU2AA, is one of the best-known hams in the world, a proven DXer and DXpeditioner, arguably the world's preeminent prefix hunter. An electrical engineer, Tom is on the air virtually every minute he's not at work, either from his home station or from the Radio Club Marian station, YU2CBM. YU2AA and his old call YU2DX come to mind practically any time the subject is Yugoslavia.

Time was limited at our first meeting, and we only peeked at Tom's home antenna. It wasn't until the next day that I visited YU2CBM, atop an apartment building overlooking Split, and rival YU2AKL downtown. YU2AKL is the Radio Club Ante Jonic station. Tom was once a member of YU2AKL, but quit the 40-year-old club for the 20-year-old YU2CBM some years ago. Yugoslavian hams must be club-affiliated, whether they have a home station or not.

Finding a club is no problem, at least not in populated areas. Clubs abound in Yugoslavia, not just for radio but for most hobbies, and they enjoy state financial help. Amateur Radio is widely known in the country, much more than in the US. Several times, at my hotel on the outskirts of Split and elsewhere, I was asked how I

Tomislav Dugec, YU2AA, is one of the local amateurs who made KM1G's visit to Yugoslavia an enjoyable and memorable experience.

had so many Yugoslavian friends. Told "Amateur Radio," not a single Yugoslavian asked, "What's that?" I expected the question, but I never used my Morse code pantomime—except on fellow sailing enthusiasts elsewhere in Europe.

For five days the AKL-CBM hams took turns driving six kilometers to my hotel to pick me up, take me to Split and show me around. I saw the sights as only an insider can, and each day naturally ended up at a club, usually YU2AKL, which had better social facilities.

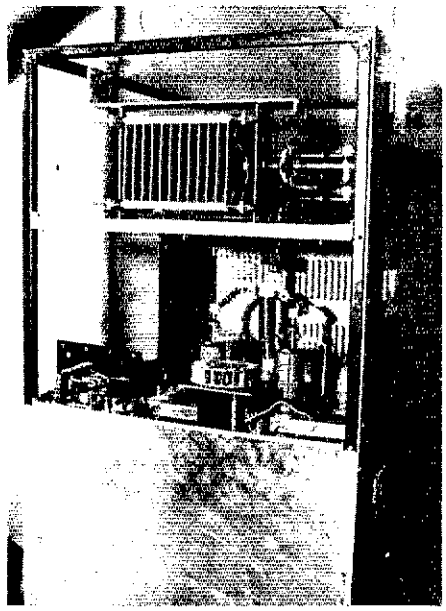
YU2AKL occupies three floors in a modern building overlooking a pedestrian mall. An office is reserved for administration, which is handled by a full-time paid secretary who is a club member. The secretary works under a portrait of Ante Jonic, a Yugoslavian war hero of the Partisans, killed in action, for whom YU2AKL is named. The same wall is packed with plaques for every kind of international award, radio and otherwise, imaginable. One radio room is reserved for experienced radio operators, another for newer ones, and a state-of-the-art teaching classroom adjoins.

American clubs take note: Yugoslavians have regular classes, in a room designed and designated solely for teaching. YU2AKL hams home-brewed a code generator any US "Elmer" would appreciate. It not only offers varied speeds and code groups, but generates QSB, QRN and QRM, simulating conditions on the bands. It's hard-wired into headphones at a dozen desks in the classroom, like the language labs in an American high school or college.

While the quarters are nice, many stateside shacks have better, or at least more modern, radio equipment than YU2AKL had when I was there. The novice station included a Kenwood TS-510S and Yaesu FT-101Z, hooked up to a doublet for 80 meters and a five-element wire Yagi fixed on North America for 40 meters. The novices built and tuned the beam, and while it isn't high enough, it still exhibits a 5 dB front-to-back ratio. In Europe, the first thing novices learn about antennas is front-to-back ratio; the bands are *packed*.

The advanced operating position contained an ICOM IC-745 and a Kenwood TS-530S. Antenna choices included the 80-meter doublet and 40-meter beam, a 20, 15 and 10-meter vertical, and a TH3 MkIII triband beam. During my visit, the club was waiting anxiously for a new Kenwood TS-440S and Kenwood amplifier, which, according to a recent QSO, have since arrived.

The physical facilities at YU2CBM aren't as pretty as YU2AKL's, but this is only skin deep; function is fine. There's nearly as much space, and the location is better, especially with a quad on the roof. The rotator says volumes about hamming in Yugoslavia: It's armstrong. The mast protrudes downward into the shack from the roof, rotated by a locking hand wheel.



A home-brew HF amplifier at club station YU2AKL.

Slopers for the low bands slant away from the building. The club uses two rigs, a Yaesu FT-101ZD and a Yaesu FT-707.

Keeping rigs and other equipment up-to-date is a nagging headache for Yugoslavian amateurs. Error-correcting RTTY is coming, but computers are primitive and the Yugoslavians admit software—when they can get it—is a horror story. Hardly anything is known in Split of packet or AMTOR, other than their existence. One reason may be the scarcity of affordable gear; Yugoslavians buy used and make do more than Americans do. Drake and Collins are still household names there; such gear exists in quantity in Yugoslavia, together with a smattering of old Kenwoods. I was quizzed closely about my TS-430S. What money they have, the Yugoslavians spend on exciters. Amplifiers they can often make, depending on tube availability. Other accessories they home-brew or do without. I didn't see a single first-class pair of headphones or a truly smooth paddle.

Yugoslavia has six amateur license classes, A through F. The lowest class, F, is for CW only, on 80 and 40 meters. Class E is repeater privileges only (mostly 2 meters) and class D is for VHF and UHF, including SSB. Class C is the beginning of serious HF work, with phone and CW on 80 and 40 meters, while class B allows all bands (160-10 meters), limited to 300 watts. Class-A operators are allowed 1500 watts on all bands. Amateurs must have their own stations to get their own call. Many Yugoslavians opt to work exclusively at clubs.

And they operate a lot. Not surprisingly, given their emphasis on teaching, they operate very well, too. Yugoslavia is an amateur Utopia for an American steeped in the "traditional" aspects of the hobby: high frequency, DX, and contest-oriented CW and SSB. To get respect among peers in Yugoslavia, you must work CW. Personal calls often have a two-letter suffix, clubs frequently a three-letter one. When the country expanded the availability of two-by-twos some time ago, clubs and individuals were allowed to retain their old calls. The number in a call denotes from which Yugoslavian republic it emanates: YU1, Serbia; YU2, Croatia; YU3, Slovenia; YU4, Bosnia-Herzegovina; YU5, Macedonia; YU6, Montenegro; YU7, Vojvodina; and YU8, Kosovo. Nine and zero are reserved for special calls, of which Yugoslavia issues a lot, especially for contests. All you have to do is ask.

The biggest HF sport in Yugoslavia is contesting, followed closely by DXing. VHF DXing and contesting are also popular. The country has a fair interest in fox hunting (Amateur Radio direction finding), some of the hams told me. But it's contesting that wins the hearts and minds of the young operators, which Yugoslavia has many of. The club operations that permeate much of amateur life make DXing ho-hum, because DXing at a club level robs much of the personal achievement; with enough operators, a club is QRV so much the log is bound to fill up with juicy prefixes.

The Yugoslavians don't have all the modern rigs, antennas, towers and computers that Americans do, so in contests they make up for it with sheer numbers of operators, notably loggers who are able to avoid dupes incredibly well.

They also go in for high power and big antennas. YU2AKL members built, and occasionally use, a full-size, seven-element beam for 20 meters. Mounted on a custom-made rack atop one member's bus (which usually carries a merry-go-round for the tourist trade), they truck it into nearby mountains.

Alas, the big beam can't stay long on a building in Split. Antennas have a short lifespan, and the reason is the "bora." The bora is wind, 120 miles per hour and more, that roars across Yugoslavia from the northeast. About twice a year the city of Split gets stripped of all its TV antennas (VHF and UHF), and the ham antennas often go, too.

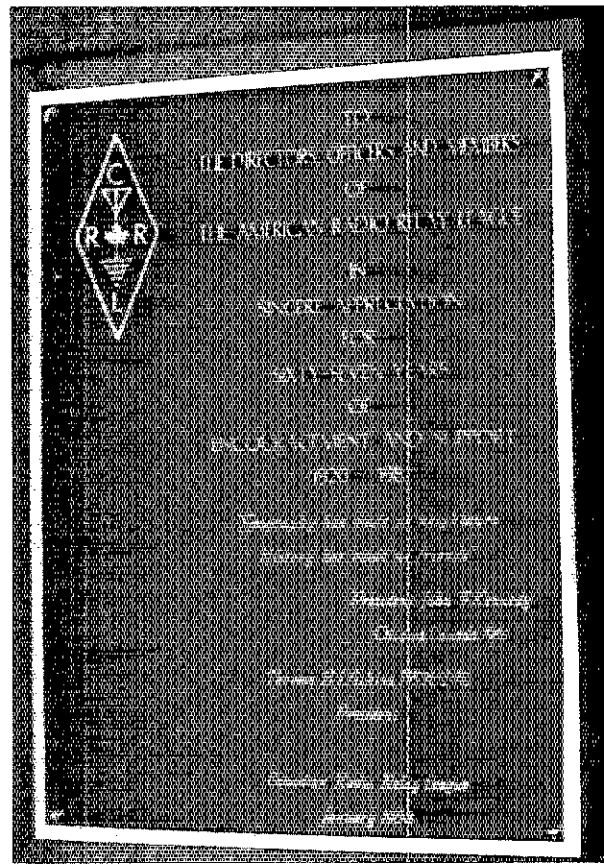
I had a taste of that wind sailing in the Dalmatia Cup, some of the most exciting sailing of my life. I thought nothing could surpass a fast boat. I was wrong. I should also have known that those telephone numbers in my pocket, the ones tucked in with my passport, would be a passport in their own right, a passport of a different kind. From flashing across the Adriatic I went to flashing across the world, dumbfounded at the sound of a friend's voice so clear through a speaker.

The next time you work a Yankee Uniform, think about the club he has to belong to, and about the way they do things in Yugoslavia, a country with a thriving, well-known and highly respected Amateur Radio population. We could learn a lot from them.

Hail and Farewell to CRRL

Amateur Radio in Canada entered a new era on January 1. On that date, the Canadian Radio Relay League—for more than six decades a Division of the ARRL—became fully autonomous. Long represented on the ARRL Board by a voting Director, the amateurs of Canada now have their own democratically elected Board and are free to chart their own destiny.

Five years in the making, CRRL autonomy is not a divorce from ARRL. It's more like having grown-up offspring leave home to set up housekeeping on their own. When the new Articles of Association and Bylaws of the League took effect on New Year's Day, it was the final step in a carefully planned process designed to ensure that CRRL would be a strong voice for Amateur Radio in Canada, now and in the future.



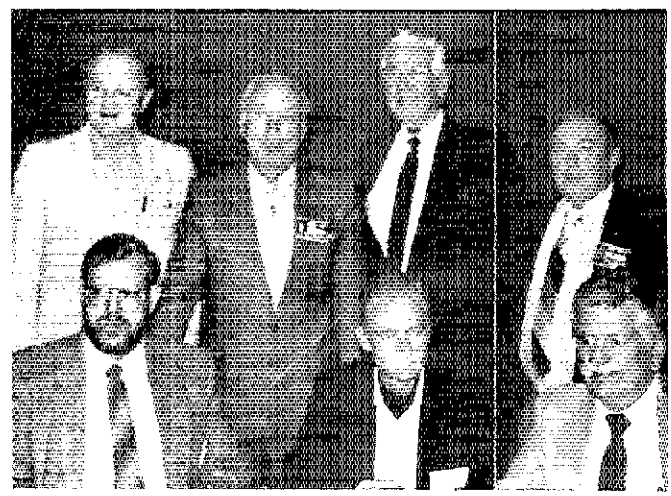
The CRRL presented this handsome plaque to the ARRL at the January 1988 ARRL Board of Directors meeting.

The flag-lowering ceremony comes to an end. From the left: K1ZZ, W9PRN, VE3CDM, WØPAN and W3ABC. (*photo courtesy JH1VRQ/N1CIX*)

As K1ZZ lowers the Canadian flag from the flagpole in front of ARRL HQ, VE3CDM (left) and WØPAN look on. (*photo courtesy JH1VRQ/N1CIX*)

The bonds between US and Canadian amateurs remain strong, as well. Canadian League members remain eligible to participate in ARRL operating and awards, for as long as CRRL wishes it so. *QST* will continue to be delivered to CRRL members, we hope with some additional material of special interest to Canadians. The ARRL President is welcome at meetings of the CRRL Board, and vice versa. As sister societies in the International Amateur Radio Union, ARRL and CRRL will continue to work together for the common good, upon the firm foundation of shared traditions.

A scene from last year's CRRL Board Meeting in Toronto: (l-r) VE3CJ, VE2VW, W4RA and VE3CDM.



Among those in attendance at the last ARRL Executive Committee meeting held in Canada, last September in Montreal, were: Front row—VE3GRO, VE2AX and VE2ZZ; rear—VE2VW, VE3CDM, VE2IJ and VE2ED.

Happenings

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

87-14 Updates

The FCC has denied the ARRL's Freedom of Information Act (FOIA) request filed in March 1987 for two internal FCC studies of the Land Mobile Service. These two studies, ARRL believed, had suggested that many of the channels in the 800-MHz band were underutilized. The FCC's Field Operations Bureau (FOB) had originally denied the FOIA request last March, stating these documents represented advice and internal opinions within the Commission and, as such, were exempted from FOIA requests.

The ARRL then requested the Commission to review its decision. Finally, on December 21, the Commission again denied the ARRL request, saying that the release of the documents would "harm the quality of Commission decision-making" by diminishing the internal discussion of controversial issues.

In other 87-14 news, United Parcel Service of America, Inc (UPS) has filed late comments based on its alleged long-range plans to develop a nationwide private Land Mobile network using frequencies within the 220-222 MHz band and employing narrow-band technology.

The ARRL has submitted a motion to strike the comments on the grounds that, in addition to being six months late, it has not afforded the substantial number of others who have commented on this Docket the opportunity to rebut. The Administrative Procedure Act and the Commission's own rules do not permit this unilateral submission of comments without affording others the opportunity to respond.

The UPS comment was filed on January 29, 1988; deadline for filing of reply comments in this Docket expired July 31, 1987.

MORE ON TV ANSWER

Radio Telecom & Technology, Inc (RTT) of Cerritos, California has submitted comments on the TV Answer Inc petition (RM-6196) to allocate 500 kHz from the 216-222 MHz band for interactive viewer response.

RTT would utilize spectrum adjacent to a TV channel and the unused blanking interval when there is no picture visible. They say the "T-Net" system, as they call it, carries more data, and would allow the use of ASCII keyboard responses. Thus, no additional RF spectrum is needed.

According to RTT, the T-Net system is more spectrum-efficient because it does not require spectrum that is in demand by nonbroadcast services.

ARRL/VEC STREAMLINED

After comprehensive study, the ARRL Volunteer Resources Committee (VRC) and staff have outlined a plan to streamline the ARRL/VEC and improve the service and support given to its Volunteer Examiners. Some of the enhancements have already been implemented.

Field stocking of exam materials is now being tested among 13 of the most active Volunteer Examiner Teams (VET) who have established a history of regularly scheduled testing and who have demonstrated their reliability over a period of at least one year. Test materials, which have been sent to these VETs in sufficient quantities to last about six months, will be replenished as needed.

Once the results of the field-stocking pilot test are in and any necessary fine tuning is accomplished, field stocking will be opened to other ARRL/VEC VE Teams with a record of regularly scheduled sessions. This will permit them to rotate exam elements periodically as needed, and will help to eliminate last-minute emergencies.

In the process, several ARRL/VEC forms have been simplified and consolidated and are now being field tested among those same 13 VE Teams. These forms, when finalized, will be put to use throughout the ARRL/VEC program, reducing the administrative burden on all ARRL/VEC VE Teams.

Overall, this streamlining of the VEC will have positive effects throughout the field. Urgent pre-session exam-element mailings from the ARRL/VEC will be reduced because the most active VE Teams will be stocked, and thus more attention may be given to the needs of individual VE Teams that do not hold exam sessions on a regular schedule.

If you currently hold an Extra or Advanced class license and wish to participate as a Volunteer Examiner in the ARRL/VEC program, write to the VEC Department at HQ. You will receive the latest *ARRL VE Manual* and materials that explain your responsibilities as a VE. Familiarize yourself with the proper VE procedures and pass an open-book test—and in no time you will receive your accreditation badge.

As an active ARRL/VEC Volunteer Examiner, you'll be joining a team of exceptionally dedicated volunteers who provide an essential service to the hams in their communities. You can share in the personal satisfaction that comes from helping others achieve their goals in ham radio.

K3ZJ NAMED FCC SENIOR ATTORNEY

David R. Siddall, K3ZJ, has been named Senior Attorney Advisor in the Legal Branch of the FCC's Policy and Rules Division, Mass Media Bureau.

Dave's duties include assisting with formulation of policies to govern the possible introduction of advanced broadcast television service.

Before joining the FCC, Siddall was a legislative attorney with the Congressional Research Service (CRS) of the Library of Congress, serving as an advisor to congressional committees and members of Congress. Siddall authored many studies and reports to Congress on legal issues while with CRS.

Siddall joined the FCC in 1985 in the Policy Division of the Common Carrier Bureau, where he assisted in formulation of policies governing provision of enhanced services by telephone common carriers.

Siddall earned his BA at Lindenwood College and completed postgraduate work in political science at the University of

Bombay (India) under a fellowship from the Rotary Foundation. He received his JD from the National Law Center, George Washington University, where he was editor of the *Journal of International Law and Economics.*

Siddall is active in Amateur Radio, is Roanoke Division CAC Representative, and past-President of the Potomac Valley Radio Club.

BEVERLY BAKER DEPUTY CHIEF, PRB

FCC Chairman Dennis Patrick has announced the appointment of Beverly G. Baker to the position of Deputy Chief of the FCC Private Radio Bureau. She will be working with the newly appointed PRB Chief Ralph Haller, N4RH.

Baker joined the Commission in 1979 as a staff attorney in the International and Satellite Division of the Common Carrier Bureau. Since that time she has held positions in the Domestic Facilities Division and the Computer II Task Force of the Common Carrier Bureau, and the Tariff Division as Chief of the Legal Branch.

Since October 1987 she has been Legal Assistant to the Chief, Private Radio Bureau.

She holds a BA from Denison University and a JD from Cornell Law School. She is a member of the Bar of the District of Columbia and the Supreme Court of Ohio.

GENERAL LOREN G. WINDOM, W8GZ, SK

Loren G. Windom, W8GZ, 82, will be missed by the amateur community.

"Windy" was Director of the ARRL Central Division from 1931 through 1934. At the time there was no Great Lakes Division and the Central Division included all of both current Divisions.

Windy was a frequent contributor to *QST*, and his name is synonymous with a particular multiband antenna, the "Windom." This was but one of his many technical contributions to Amateur Radio.

General Windom, a much-decorated hero of World War II, went on to a distinguished legal career in Ohio.

He and Don Wallace, W6AM (SK), shared the honor of working more postwar DXCC countries on phone than anyone else (366), and Windy earned 5BDXCC No. 3.

Goldwater Scholarship Fund

The following has contributed $25 or more to the Goldwater Scholarship fund: The L. Dennis and Susan R. Shapiro Fund, $150.00.

31 SCHOLARSHIPS AVAILABLE

The Foundation for Amateur Radio (FAR), a nonprofit organization with headquarters in Washington, DC, now plans to award 31 scholarships for the academic year 1988-89 to assist licensed amateurs. The Foundation, composed of 50 Washington, DC-area Amateur Radio clubs, fully funds four of these scholarships and administers the rest without cost to the donors.

Licensed radio amateurs may compete for these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment at an accredited university, college or technical school. Some of the scholarships require a General-class license or higher. The scholarships range from $500 to $2000 with preference given in some cases to residents of specified geographical areas or certain fields of study.

Additional information and application forms can be requested by letter or QSL card from: FAR Scholarships, 6903 Rhode Island Ave, College Park, MD 20740.

Amateur Radio Call Signs

Amateurs often ask HQ what call signs have been assigned lately. This list shows the last call sign in each group to be assigned for each call area, as of February 1, 1988.

District	*Group A*	*Group B*	*Group C*	*Group D*
0	WEØN	KEØSS	NØIVM	KBØBTH
1	NO1Q	KC1HU	N1FLR	KA1RMW
2	WD2P	KE2EH	N2HWL	KB2FAC
3	NN3E	KD3GI	N3FZE	KA3SQK
4	AB4GB	KK4WS	N4RZU	KC4DEN
5	AA5EG	KG5HA	N5MAK	KB5FGX
6	AA6GR	KJ6CY	N6RIV	KB6VQG
7	WJ7O	KF7GY	N7KKJ	KB7DUO
8	WA8J	KE8PW	N8JCV	KE8DWJ
9	NW9Y	KE9IL	N9HED	KB9ABF
Alaska	*	AL7JP	NL7MP	WL7BQK
Hawaii	*	AH6IU	NH6OG	WH6BWD
Puerto Rico	*	KP4OO	WP4NF	WP4HTC
Virgin Is	KP2T	KP2BL	NP2CI	WP2AFU

*All Group A calls assigned

FCC LA OFFICE PHONE NUMBER

The Cerritos, California office of the FCC has changed its listed telephone number to the following:

213-809-2096 (Public number)
213-865-0598 (Recorded information)

The address remains: FCC, Cerritos Corporate Towers, 18000 Studebaker Road, Room 660, Cerritos, CA 90701.

ARRL LIFE MEMBERSHIP MAY TRANSFER TO SPOUSE

The ARRL Board of Directors at its January meeting made Life Membership transferable to a spouse under certain limited conditions. ARRL By-Law 9 now reads "Life Membership is not transferable; however, upon the death of a Life Member, it may pass to a surviving spouse upon request, if he or she is a Family Member and licensed at the time of the Life Member's death. A new Life Member plaque, if desired, will be available for a one-time fee of $25."

ARRL FOUNDATION BOARD MEETS

The ARRL Foundation Board of Directors met via telephone conference on January 30, 1988. Paul Grauer, WØFIR, and Edmond Metzger, W9PRN, were re-elected President and Vice President, respectively. The Foundation welcomed back Larry Shima, WØPAN, ARRL Controller, who was elected Treasurer. Shima had been a founding Director of the Foundation in 1973 and had served as its first Treasurer. Steve Place, WB1EYI, was reelected Secretary. The Foundation also welcomed Leonard Nathanson, W8RC, as a new Director.

It was reported that as of December 31, 1987, the Foundation balance was $240,706.

The Foundation voted to study the establishment of $500 scholarships in each ARRL Division. The Foundation will study if these scholarships should supplement or be in addition to already established scholarships.

The Foundation heard a report from its Long Range Planning Committee which recommended a newsletter or mailing for recent contributors and development of a plan for amateurs to include the Foundation as a beneficiary when preparing their wills. The Committee also noted that fundraising efforts for the Phase-IV geosynchronous satellite should be planned since no work has been done to replenish the satellite fund since 1985 when the last matching fund grant was made to AMSAT.

Foundation President Paul Grauer, WØFIR, noted the passing of Foundation Director and Treasurer F. George duPont, WA1SVY, and praised his dedication and work on behalf of the Foundation.

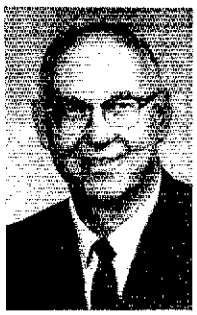
The next meeting of the Foundation's

officers and Directors will be July 23, 1988 in the Hartford area.

L. PHIL WICKER, W4ACY, HONORARY VICE PRESIDENT

At the January ARRL Board of Director's meeting, Phil Wicker, W4ACY, was elected Honorary Vice-President, capping more than 35 years of voluntary service to ARRL.

Phil was first licensed in 1930 as W4ACY and his wife Alice is WA4ZMA. He was first appointed an assistant director in the Roanoke Division in 1952 and served in that capacity until elected Vice-Director of the Roanoke Division in 1966. Phil served as Vice-Director until 1974 when then Roanoke Division Director Vic Clark, W4KFC (SK), was elected ARRL Vice President, and Phil succeeded him as Director. Phil served three terms as Director, retiring in 1980. He presently again holds an appointment as assistant director.



Phil has also served as a Director and Vice-President of the ARRL Foundation, and is still active as its Honorary Vice President.

He is a Charter Life Member of ARRL, AMSAT, QCWA and OOTC, and is a founding member of the Greensboro (NC) ARC. In 1969 he received the Roanoke Division Service Award.

Phil will be 80 on June 2. Happy Birthday, Phil!

NUØX NEW *ARRL LETTER* EDITOR

The sign above his desk said "Midwestern spoken here." Since I planned to interview HQ's new employee from North Dakota, Jay Mabey, NUØX, my first thought was that I might have to find some W8 or W9 here at HQ to translate Jay's midwestern drawl! Then a deep voice behind the desk said "Can I help you?" The drawl was unmistakably midwestern, but understandable to this southerner-turned-New Englander, so the interview began without a translator after all.

Jay is the new Assistant Manager of the Regulatory Information Branch (RIB) at HQ. He is primarily responsible for interpreting FCC rules, handling problems dealing with city ordinances concerning antenna tower heights and editing the *ARRL Letter.*

Jay is from Grand Forks, North Dakota, was first licensed in 1966 as WNØPVA and now holds an Extra-Class ticket. He earned a BS degree in Criminal Justice studies from the University of North Dakota in Grand Forks.

Active in ARES, SKYWARN and other Amateur Radio emergency services, Jay was Vice President of the Forx Amateur Radio Club, Grand Forks, and president of the Sioux Amateur Radio Club at the University of North Dakota. Jay is interested in all facets of Amateur Radio but recently has been concentrating on packet radio, both HF and VHF.

WA2CCN NEW LAB SUPERVISOR AT HQ

Henry (Hank) Grilk, WA2CCN, is the new Supervisor of the ARRL Laboratory at HQ.

Prior to joining the ARRL, Hank was Director of Electronics Engineering at Ketchum & McDougall Inc, of Roseland, New Jersey.

Hank earned BS degrees in EE, ME, mathematics and physics.

First licensed in 1957, Hank currently holds an Advanced-class license. He is an ARRL Life Member and belongs to the Skylands Amateur Radio Association.

Hank has gravitated to many particular "specialties" in Amateur Radio, but his current specialty is emergency service and he is active with RACES. Other interests include powerboat racing, fishing and hunting.

Hank holds 14 patents, most of which are in the field of marine electronics and CATV. He has also published several symposium papers. Welcome aboard, WA2CCN!

LEAGUE REPORT TO INDUSTRY

On February 5, 1988 at Miami, ARRL Executive Vice President David Sumner, K1ZZ, presented a report to the informal gathering of Amateur Radio industry representatives. This group has met periodically on the eve of some of the larger hamfests and conventions over the past three years. Unsurprisingly, their main concern is that industry and Amateur Radio organizations have effective programs to promote the growth of the Service.

Some of the topics touched on in the League's report are summarized below.

Archie Comic Books

Many *QST* readers have seen *Archie's Ham Radio Adventure,* which was a joint educational project developed by the industry and the League. The first printing of 100,000 has been delivered to school teachers and others who have programs to interest young people in Amateur Radio. At last count, about 40,000 of the second printing have been distributed. More than 1300 students already have signed up for the Archie Radio Club, and the responses are coming in at an accelerating pace.

A follow-up questionnaire sent to Archie Radio Club members between three months and a year after they signed up was returned by 438 of them. Of these, 94% said the comic was helpful in their understanding of Amateur Radio: 55% said they had heard about ham radio before receiving the comic; 96% wanted to become hams; 77% were working on a license; and 22% had actually become licensed! We haven't established a cause-and-effect relationship between their receiving the Archie comic and becoming hams, but we have verified, through random sampling, that the 22% figure looks correct (ie, 97 out of 428). They are predominantly in the 9-12 age group and are from all over the country. At this relatively early stage, this number is encouraging.

Special thanks go to Dick Ross and *CQ,* which made it possible to provide an effective business reply card; to ACC, which helped defray the cost of the second printing; and to Rich Moseson, NW2L, who supplied the explanation of Novice Enhancement.

"The New World of Amateur Radio" Videotape

The initial order was for 1050 videotapes, and 250 more are on order. Numerous copies went to clubs, instructors, teachers, Section Managers, public-access cable TV channels and to both commercial and educational television stations. We have informal feedback that at least 15 broadcast stations have actually shown it, but that may be only the tip of the iceberg.

We know there are *lots* more copies in circulation. Duplication of the tape is actively encouraged. It has been fed via C-band satellite at least twice, once with Tony England and David Sumner cohosting a live "wrap-around," with untold numbers of VCRs recording each time. Additional distribution is being made overseas, particularly via the United Kingdom in PAL (as opposed to NTSC) video format.

The feedback we have been getting has been very postive. Criticisms were rare. The only one of particular substance was that it's too long for some presentations and that a shorter version would be useful to have.

We've already distributed 50,000 pamphlets to groups wanting to show the tape to prospective hams, so people will have something to carry away with them to remind them of what they saw.

Novice Enhancement

We have all seen figures that showed a spurt of new Novice licensees, some of them just trying to get "grandfathered" before the test changed. Nevertheless, the numbers of Novices have not been discouraging and are running about 40% ahead of two years ago.

International Third-Party Traffic—Proceed With Caution

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

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

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

*Temporary agreement around Christmas only in past years.

**Limited to special-event stations with call-sign prefix GB (GB3 excluded) and to stations on Pitcairn Island (VR6).

The original idea was to improve the Novice privileges to help turn inactive license-holders (present and future) into active hams. The verdict is in: Novice Enhancement has definitely activated the 10-meter band between 28.3 and 28.5 MHz, and upgrading figures are up. Even so, we need more publicity about Novices now having meaningful privileges and about how to give Novice exams.

League Strength

Our membership is now about 150,000, up by more than 6000 in a year. Sometime this year, we will surpass our all-time high (of the CB boom).

We had a 16% growth in the number of Field Organization volunteer slots filled, and we've reminded them that recruitment is an important part of every volunteer's job.

Retirees and Empty-Nesters

The League has done some spadework and believes that a pilot project to actively recruit retirees holds considerable promise. As a result, we have developed a general plan to try a pilot recruitment project in the Tampa-St Petersburg area. While we have a general plan in mind, we are going to emphasize field participation and leadership. The effort to recruit the field cadre is planned to be kicked off at the time of the Orlando Hamcation. You will hear more about this program as it unfolds.

Vans

At Orlando in early 1987, there was discussion of the concept of having a van to tour the country and give demonstrations of Amateur Radio as a recruiting resource. At that meeting, some speculated that some vans are already available and suggested that a survey be made of existing vans before seriously considering commissioning one.

The ARRL Field Services Department sent out a call for vans during 1987. It turns out that we located 35 vans in 19 states and Canada.

It seems that we have been thinking of this as a *hardware* problem when it's really a *software* problem. In other words, collectively we have lots of vans, many of which are fine for public relations and recruiting when they're not employed for emergency communications, public service events or Field Day. What we need is a program to present, either in the existing vans or, in some cases, without involving vans.

Summing Up

The mood of the industry representatives was that positive steps have been taken to promote growth of the Amateur Radio Service. Nevertheless, there appeared to be signs that the Novice Exam is too difficult for some prospective hams. It is argued that the reading level of the tests may be unnecessarily high, particularly for youths. There was a continuation (from previous meetings) of discussion concerning combining the Novice code and written elements so that an individual doing poorly on one subject but excellently on the other could receive a passing grade. Also, "code recognition" as opposed to "code copying" was discussed. All in all, the meeting provided a forum for a stimulating exchange of ideas and resulted in the unmistakable feeling that real progress is being made.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Connecticut, Idaho, Minnesota, North Dakota, Ohio, Oklahoma, Southern Florida, Western New York, Puerto Rico and Virgin Islands sections:

You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

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

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

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

Any candidate for the office of Section Manager must be a resident of the Section, a licensed amateur of Technician class or higher, and a Full member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination.

Petitions must be received at Headquarters on or before 4 PM Eastern Local Time June 10, 1988.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before July 1, 1988. Returns will be counted August 22, 1988. SMs elected as a result of the above procedure will take office October 1, 1988.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 1988.

If no such petitions are received for a Section by their specified closing date, such Section will be resolicited in October 1988 *QST*. An SM elected through the resolicitation will serve a term of 18 months.

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

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

Richard K. Palm, K1CE
Manager, Field Services Department

How's DX?

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

DXing for Little Guns

WB2EKK's suggestions make good reading as well as good sense, whatever *"caliber category" you rate yourself at!*

"There are actually three classes of little guns: (1) tribander at less than 60 feet, and a less-than-1-kW amplifier; (2) nondirectional (or fixed directional) antenna and a small amplifier; and (3) wire antennas, no amplifier. A tribander at 50 feet and a 400-watt amplifier may seem like a big gun to the guy (like me) with a barefoot transceiver and a wire 15 feet up. But, if the ham with the tribander is new to DXing, he can *still* be a little gun. However, this article is really oriented towards the guys who don't or can't have a beam or amplifier.

You ask what my definition of a big gun is? Anyone with monobanders, gain antennas on 40, 80 or 160 (or an amplifier that won't even consider running on 110 volts) is a big gun. On the low bands, anyone with enough wire (if it was all straightened out) to reach FP is a big gun. Remember though, that the big gun really *is* the operator, not the station. (Now, I'll bet that someone like W9KNI would be a big gun with an HW-8 and a dipole! In fact, W9KNI's book, as well as his section in the new *ARRL Operating Manual,* are must reading to anyone new to DXing.

I personally have three major principles in little-gun DXing: listen a lot, have fun and then listen some more. The second point is probably the most important one for the little gun. If you're going to stay awake at night because you spent an hour and never got through the pileup, then buy a house, a beam and an amplifier. If your blood pressure rises when you hear W3LPL giving a 9M2 a 589 when you can't even hear the 9M, then it might be better for your health to take up county hunting. But, if you still get that rush of adrenalin after tuning 15 CW for an hour and working C21XX on his first CQ, or calling VS6DO on 40 CW right as he stops tuning up, you can find that little-gun DXing really beats the thrill of blasting through the pileup with an 8-element monobander and an Alpha 77.

First, a few words on your station. If you're a little gun, chances are that it is by choice. Space, financial or other limitations dictate the amount of real estate, money and time you can dedicate to Amateur Radio. However, within these bounds you can still maximize the efficiency of your operations. The area with the biggest bang for the buck is your antenna. Put up the highest, longest antenna you can get away with or afford. It doesn't have to be pretty or match the description in the antenna book. If it is a random wire, make it as long and as high as you can. If it is a vertical, give it as good a ground as you can. If it's your rain gutter, connect it to the downspouts, too! Whatever you can do to squeeze out a few extra drops of ERP may make the BY9 stop and pull you out of the noise.

The VU4GDG operation was often on 20 CW, transmitting on 14.005, listening on 14.030. The 5 kHz range of most RIT circuits isn't sufficient, let alone enough to allow you to easily move your transmit frequency to zero beat the last guy worked. The tendency of late is for split operation. RIT just can't hack that. If you can afford it, get a transceiver with split VFOs and memory, and a separate VFO. If you are stuck with an older rig, put in the sharpest filters you can (make sure you retain the wide position as well), and ignore the pileups working split operation. Instead, circle the feeding frenzy, looking for DX stations either leaving or circling as you are. (This works particularly well from the East Coast for picking up those needed Caribbean countries.)

You've got to enjoy the going, as opposed to the getting there.

Accessories? On CW, a memory keyer, good filters and high-speed QSK make the difference. On phone, a properly adjusted voice processor, good filters and good phonetics can get you through. For instance, KILO KILO lacks audio punch, while KILOWATT KILOWATT really kicks up the power meter. Cute phonetics are fine on the 40-meter nets, but DX stations rarely come back to WB2 Eternally Knock Kneed.

Know your station. If a DJ2 calling CQ on a clear frequency won't return your call, don't spend much time on pileups on *that* band. A great way to learn your capabilities is to work some stations in one of the "second tier" contests that occur almost weekly, such as the WAE, RSGB and Radiosport. The QRM isn't wall-to-wall, and a lot of the little guns are in there, so you won't be going head-to-head with KM1H or W7RM. There are also many geographically localized contests, such as the All Asia, or VK/ZL, that afford the opportunity to see how well you get out to a particular area of the world. Since the QSO rates in these contests are more moderate, the DX operators will often take the time to give you a comparison with other local stations.

Listening

This is the real key to little gun DXing. Get them *before* the pileup starts! There is always someone calling CQ, so why add to it? Tune across 20 meters, listening for CQs or DX stations in QSO. Check the call. If you need it, wait around and call. (W9KNI has an excellent section in his book on this point.) An additional listening aid may go against the grain of your personal preference, but I have found that it increases my enjoyment as well as my country total. This is spotting nets (usually on 2 meters). Many feel that DXing should be a solitary pursuit and that the challenge is removed with the use of spotting nets. But there is room for all kinds in Amateur Radio, and spotting nets can be a lot of fun and a good way to meet other DXers.

Many big guns put 2-meter antennas on top of their towers. But often you can utilize your hand-held to listen to your local DX spotting frequency, as we do here in the capitol area where 147.42 is the National Capitol DX Association spotting frequency. It is another type of fun to snare 7P8DP and announce it on the DX repeater before the others find him. Many clubs such as the Potomac Valley Radio Club and the Yankee Clipper Contest Club also have packet-radio DX spotting bulletin boards up on 2 meters. These are fantastic new ways to check DX activity, as well as WWV propagation reports.

If you're interested in working new countries, keep tuning until you find one. If your country total is below 200, or even 250, they're almost always out there. The key thing to remember if you're hunting for a new one is that if you have a ZD8 QSL up on the wall, don't stop to work 'em again, especially if there is a pileup. You might miss that ZD9 who came on for 20 minutes just 10 kHz away. Tuning can be boring, but it is the key to being a good DXer (even if you're using a KT34XA at 135 feet!). I find I can read the newspaper or *QST* while I'm tuning—or even write out checks or QSL cards. I can't talk and listen at the same time though, so 2-meter rag chewing is out.

As sunspots continue to increase, keep checking for openings on 15 and 10. Those two bands are about the best for the little gun since they're "spread out" and your antenna height is "electrically higher." If you can get in on the initial crest of an opening you can pick up a lot of new ones before the big boys on 20 realize the higher bands are open. Look for long-path openings on 20 and 40. Even if you have an omnidirectional antenna, a long-path opening works to your advantage since many inexperienced guys with beams will be pointing 180° away. After the Honor Roll guys get through, you'll have a good shot. (You can usually recognize long path by the wavery quality signal. It sounds like

it is going the long way around!)

Keep tuning! If you hear someone signing DSW on CW, hang around. It might be one of the rare ones, UI or UH. Of course, it might be one of the zillion UB5s, too. If on phone you hear someone say QSL QRZ—hang around and check it out. If you hear an English accent it could be G, or it might also be VKØ or GU4. If you hear French, be alert for an African station. Wait out American call signs to make sure they aren't /KH3. Remember, HZ1AB's voice may sound like he is from Detroit because he might just be from there.

And then listen some more. Even if you hear a hopelessly large pileup, if not much else is going on listen to the DX operator for a while. You'll get to know his pattern, and when he is ready to QRT he may announce when he will next be on. A good way to listen to a pileup and continue to check the band is through dual VFOs. Keep one on the DX pileup, and switch to the other periodically to tune across the band.

Remember gray line. Stations in countries that have sunrise/sunset times opposed to yours will be the easiest to work. (A quick band check before work or after supper is a common operating habit.) Keep in mind that the DX station will be on when it is convenient for *him*, as opposed to convenient to a WB8. If you're coming home late from a party, check 40, 20 or even 15. (Recently C21XX was 579 on 15 meters at 2330 local time.) You never know.

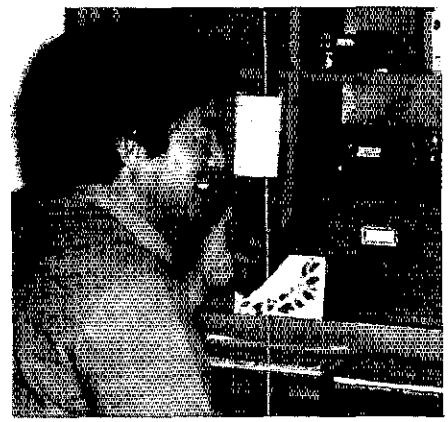
Check WWV at 18 minutes past the hour. An A index of below 16 and a K of below 3 are signs of good conditions. As solar flux levels go above 90 and 100, 15 and 10 meters become bigger contenders. If you're like me and have to budget your operating time, don't waste it on a period when there is a minor storm in progress. Join a DX club or net. There are a lot of other little guns out there who have their own tricks, and a lot of the big guns can pass along great tips. Just like fishing, half the fun is talking about the catch (or the ZA who got away) afterwards.

Finally, remember that there is a wide variety of interests within Amateur Radio. Take advantage of all you can: RTTY, contests, rag chewing, public service, DXing—they're all facets making up the well-rounded ham. Try to keep in mind that many DX stations may not be interested in saying nothing but 59 QSL QRZ all their lives. Spend some time chatting with the 3B8 who indicates he wants to rag chew. Conversely, don't tell 3C1MB all about the weather, etc, when he is running US stations! Some day you too will be waiting for Albania with no new countries to work.

See you *before* the pileups!

KOREAN TYPHOON

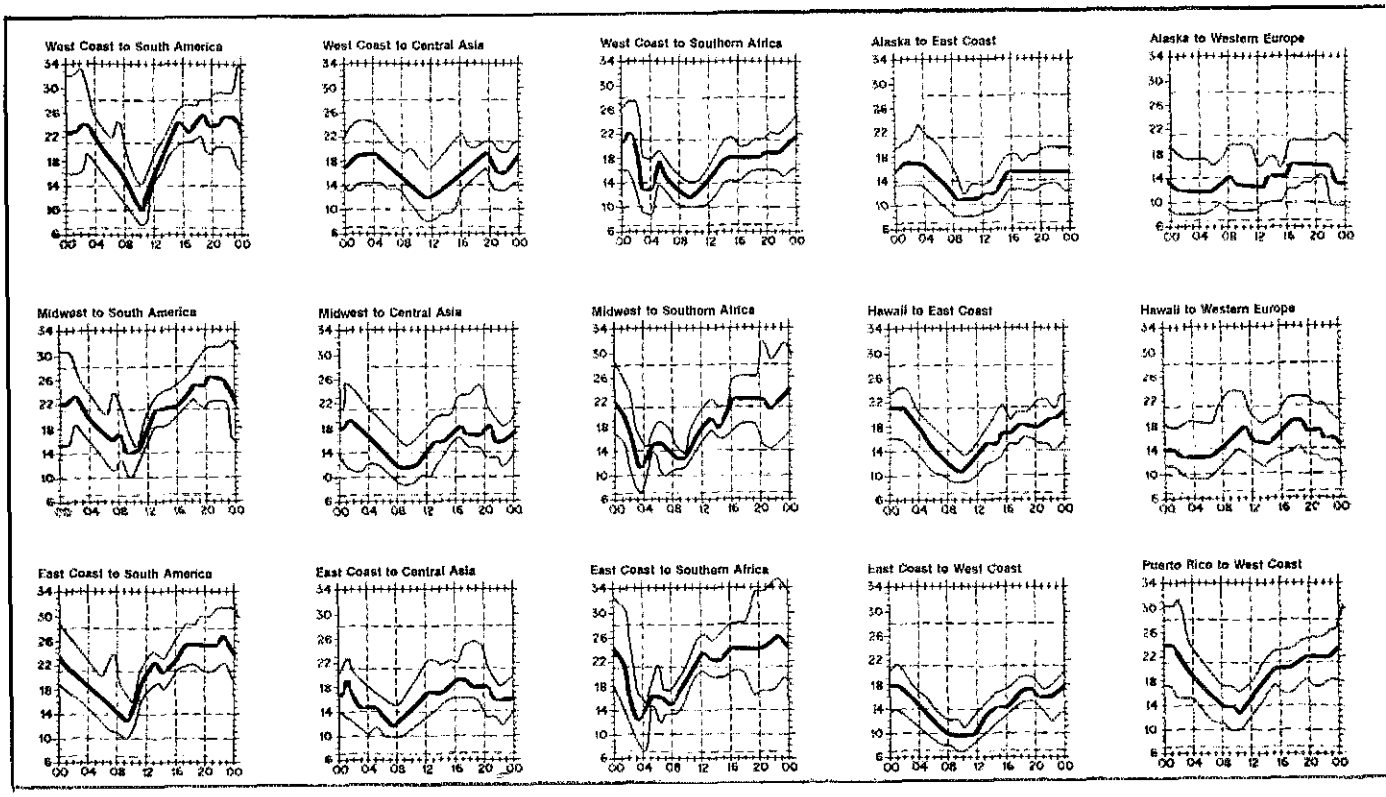
Summer 1987 was the occasion of terrible typhoons and floods in Korea, the worst in 80 years. HL hams played a vital public-service role in disaster communications, as reported by Kwak Bae Sook, HL1ATL (Editorial Director of the Korean Amateur Radio League, Inc).



Kim Un Yung at HLØERC

July 22 was an unforgettable day for HL hams, especially for the Non-San Ham Club's (NHC) 23 members in Non-San City, located in the middle-western part of South Korea. This had been a summer of heavy storms. The worst one hit July 21-22, with total dead and lost estimated at 590.

At approximately 2 PM local time on July 22, HLØERC (club station of the Red Cross in Seoul) received an emergency call asking helicopters to rescue at least 80 people isolated by the flood in Kang-Kyung. Early that morning, the NHC had already taken action to cover with 2-meter hand-helds all the dangerous-looking places around Non-San. Club member HL3EAO went to Kang-



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

Kyung (a major town adjacent to the Keum River which was flooding) in the early afternoon. At the moment he got there, a bank on the river started to break apart and he conveyed the information, asking for helicopters. (Commercial lines were down, and ham radio communications became vital.) HL3ECV (who lives a distance from Non-San) relayed the request to HLØERC on HF. Along with HLØERC on HF, HLØECQ was activated on VHF. HL3EAO, who covered all the disaster aspects in Kang-Kyung, kept in close contact with HLØECQ. Well-equipped HL3ECT copied all the reports on VHF, relaying them to HLØERC. (There was minimal propagation between Non-San and Seoul.)

By 4 PM local time, four helicopters started the rescue, working together with NHC. The club helped both in communications and in the actual physical rescue. One of the major broadcasting stations in Korea (KBS) reported that they had saved almost a hundred lives.

This first successful rescue operation in 32 years of Korean Amateur Radio history demonstrated again the real role of Amateur Radio in public service and, not incidentally, that our everyday DXing is a training ground preparing hams for their role in any emergency.

Congratulations to *all* the hams who participated.

CIRCUIT

☐ **CI8C:** The main VE station for the Trans-Polar Ski Trek over the North Pole will operate till about mid-June, managed by VE3BHF, Box 313, Don Mills, ON M3C 2S7, Canada, in a prime demonstration of Amateur Radio practicality and cooperation.

☐ **Palmyra:** Hot news of the month is the NCDXF assistance to the Kingman Reef and Palmyra operation late this month being planned by DJ8NK, F6EXV, WØRLX and others. Last month's anticipated KH1 stint by VK9NS/NL also received support from the foundation, in addition to gear donations to 3B9FR on Rodriguez and YK1AO/YK1YL. NCDXF info from Rusty Epps, W6OAT, 651 Handley Tr, Redwood City, CA 94062, 415-365-5918.

☐ **7 MHz:** All Chinese broadcasting transmissions on the 40-meter amateur band have ceased—the result of an active 17-year effort by the JARL and the JA PTT!

☐ **1988 International DX Convention:** The convention will be held at the Holiday Inn in Visalia, California Apr 22-24. Guest speakers will include Western Sahara ops and the Colvins. Queries to W6AOA at 213-820-1234 or N6IC at 213-647-8928 or 818-784-2590.

☐ **SJ9WL/LG5LG:** PA2TAB along with PA3BRC, PAØGSB and PAØJAB had hoped to activate Murokulien during the March WPX.

☐ **DXCC List:** W8JST feels that his record keeping is simplified when filing QSL cards by country name, Abu Ail to Zimbabwe, as were DXCC records kept in early days.

☐ **9N5QL:** The Colvins helped to celebrate the King of Nepal's birthday and from Dec 27 to Jan 7 this year made 3500 contacts in 121 countries. No bureau in Nepal, so cards via Yasme Foundation, Box 2025, Castro Valley, CA.

☐ **VP5W:** WM6F is *not* the QSL manager; please take heed.

QSL Corner

Administered By Joanna Hushin, KA1IFO

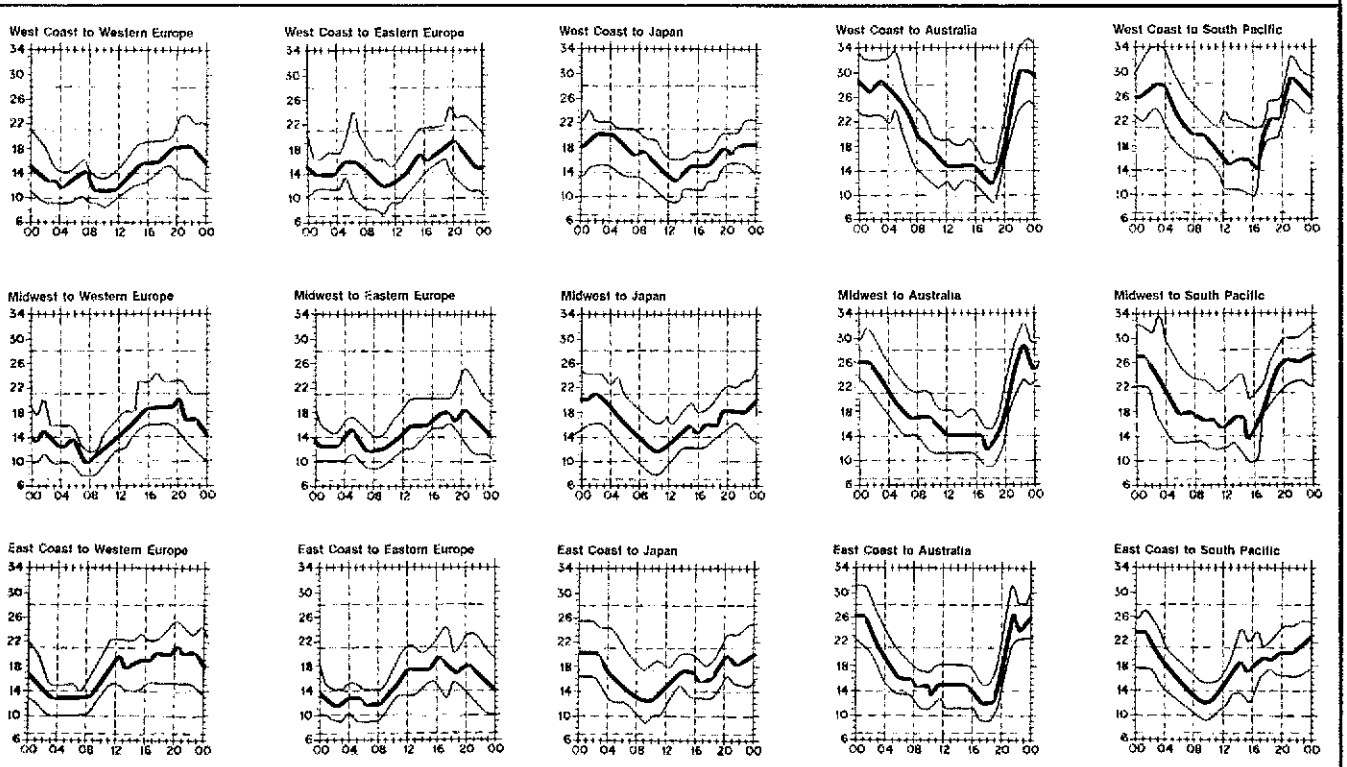
Here is some information for those of you who would like to QSL a QSL manager or direct to the station location. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.

A71BK	(KI4GV)	VK9YA	(W5ODD)
CE7ZK	(W4RXT)	VK9YV	(G3TBT)
AY5EIC	(LU5EIC)		United Kingdom only, others via VK9YC, who is also VK6YX.
AY7DXT	(LU5EIC)		
AZ1ARU/15	(LU5EIC)		
EL2MS	(KD8IW)		
HC2CG	(KE7PL)		
HC2GG	(KE7PL)	VP2MF	(VE3FHO)
HM5KY	(HL5KY)	VP2MR	(W5STI)
J6DX	(W8UMD)	VP2MKS	(K5VZN)
KP4HL/KP5	(NG7X)	VP5Y	(N6EK)
		VP9AD	(W3HNK)
LW1DPV	(LU5EIC)	V2AO	(KE4OC)
L2D	(LU5EIC)	V31MZ	(KD2EU)
OHØMB/OJØ	(N2AU)	3C1CW	(F2CW)
		3C2A	(AK1E)
RZ1OWA	(Y25BL)	3C3CR	(F6AJA)
TL8HW	(KJ4GK)	5T5BC	(K4PHE)
T5GG	(I2MQP)	8P6B	(VE5RA)

QSL MANAGER VOLUNTEERS

KC9V	SM2OJR
NA5U	WA7CYY

☐ QSL Corner, December 1987 *QST*, page 57, contains information and addresses for the ARRL Incoming Bureau. QSL Corner, March 1987 *QST*, pg 59, contains information on the operations of the ARRL Outgoing Service. For additional information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St, Newington, CT 06111. ☐



Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more-detailed explanation. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Data provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for April 16 to May 15, 1988, assume a sunspot number of 88, which corresponds to a 2800-MHz solar flux of 127.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300 and 5-country increments above 300. The totals shown below are exact credits given to DXCC members from December 28, 1987 through January 26, 1988. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

CX8AC/163 DL5LAW/119 I1XA/298 JL1HGH/163 PY3DF/229 KA1GM/119 NM3C/116 KX5W/248 KE8GG/120
DF2YA/104 DL6BAH/103 IK2DJV/253 JE4CIL/110 SM5MJL/113 KB1FR/100 KB4SRE/106 W6DTV/102 KE8KE/123
DJ3GW/166 DL6UQ/103 IK3DVY/109 JH9PUW/139 SM6CCO/220 K2HTO/106 KD4HV/103 KE7NT/107 K9HEK/199
DK8KR/107 F6AST/125 I7OYT/238 LU9DUW/102 SMØOFW/154 KK2E/122 N4KTY/106 N7CJO/192 W9BYS/104
DL2NCL/110 G3SB/107 JA1BC/124 PA3DKE/107 VE3CWH/113 WA2HMM/103 W4LRE/114 W7DHS/105 NRØF/102
DL3FBR/111 HA6KQD/113 JE1BDC/230 PA3ENH/113 K1FIR/101 WB2EKK/142 WB4KKA/108 K8OQL/227 WØZPM/102
DL4ZBK/105 HG7B/106 JE1BYI/302

Radiotelephone

CE1FGT/148 FD1LGA/120 I2PJX/110 JE1BYI/108 LA9GK/105 XE1SIE/128 KB2VI/101 K5RE/312 KE8AI/108
DF5MR/108 FE6FUN/112 I4UYL/158 JL1HGH/163 PA3ENH/107 ZL2BLC/106 KM3J/135 KA5ENC/106 KAØCDN/265
DF8NM/109 G4DII/125 I7OYT/236 JA5IOQ/148 SM6CCO/117 N1EBT/156 N3DHM/101 KE7NT/102 KAØIAR/107
DL3AAW/109 G4RBD/105 JE1BDC/215 JH9PUW/139 SM6NJK/109 K2HTO/103 KB4SRE/101 K8DFC/258 WØIJR/265

CW

DJ3GW/153 EL2ED/104 IK3DVY/108 LA9ABA/114 SMØOFW/138 VE3LDT/270 K3PA/176 W7GUR/104 W9PC/134
DJ5FM/102 HAØKDA/109 JE1BDC/106 OK3KSQ/105 TF3SD/107 Y54OL/108 K7TED/106 KB8DB/107 WA9BXB/103
DL4TH/127 IK2ECC/161 JE1BYI/249 SM6CCO/164

RTTY **160 Meters**

DK1RV/144 KA9PJZ/101 KR9O/101 K3KG/102 N9US/113

5BDXCC

WB2CVL KE4YD KZØC W4DOU JA1UPT JA2APA JH6QPD VK7AE SM6BGG
NN2G K7LJ WA6SLO W5CWQ KA2AJT PP7HS JA1JXR F6HWM

Endorsements

Mixed

CT1YH/256 HB9DDZ/201 ON4UN/338 XE1F/186 K2MRB/251 K4JYS/310 KU5L/260 W7GUR/316 K9JWU/276
CX4CR/318 HB9HT/315 OZ9PP/323 YU1HA/343 K2SHZ/352 K4LNA/200 N5TP/331 W7LYO/294 K9KU/326
DF3UB/201 I8WY/291 PAØRLF/288 YU2AKL/318 KB2HK/297 K4MQG/346 W5AH/223 W7QB/176 K9LHA/311
DF6FK/312 IKØAZG/287 PY1DH/348 ZS3BI/131 KB2OR/154 K4RA/330 W5ODD/293 W7UZA/327 K9MFI/315
DJ5LE/274 JA1BLC/336 PY2JSF/250 5H3RB/201 KB2RV/312 KJ4VH/156 W5ONU/201 WB7EWC/176 N9AIB/279
DJ6GK/301 JA1QXY/322 PY4LW/313 K1EFI/321 KC2NB/299 KX4R/315 W5XX/308 K8NN/324 N9RD/270
DK1RV/306 JK1OPL/326 SLØAS/286 K1IU/309 KW2P/315 N4KG/337 WB5QBV/224 KB8DB/312 N9US/301
DK9MC/274 JM1MGP/279 SLØZG/290 K1TO/242 N2WS/281 N4AVV/312 WZ5U/281 N8AHK/174 NF9V/225
DKØZR/278 JR1SSH/291 SM2OTU/211 K1WJL/316 NB2P/312 W4NNH/351 WZ5V/252 N8EOA/130 W9AA/164
DL3AR/301 JA2IVY/316 SM5CSS/286 KB1JU/253 NI2C/280 W4RXT/300 KI6GI/178 NF8O/275 W9ISF/185
DL6FBH/128 JA4JBZ/275 SM5FQQ/314 KN1M/252 NN2G/282 WA4DPU/305 N6BOI/275 NN8R/200 WA9BXB/260
EL2AY/203 JH4JNG/215 SM6AFH/337 NF1G/178 WA2JTY/195 WB4LFM/323 W6DN/329 W8CC/293 WA9VGY/321
F6FNU/277 JA5EN/329 SM6CTQ/325 W1AA/356 N3BNA/279 WB4VKW/286 W6EE/364 W8CFG/334 WB9IWN/199
F6HUJ/294 JA6GWU/229 SM6NJK/164 W1OHA/342 N3ELN/157 AA5BK/175 W6TXL/343 W8LJP/290 KØIIR/232
FM5WD/259 JH6QPD/286 SM7BOL/311 W1PNR/310 W3HCW/255 K5FNR/212 WB6EXW/313 W8QBA/300 KØQC/279
G3KAA/320 JA7ARD/321 SM7CMY/300 W1SP/350 W3XX/326 K5PZ/151 WJ6O/262 WA8PYL/327 KAØFAR/150
G3MCS/329 JA7BJS/321 SMØGMG/314 W1UN/329 WA3AFS/252 K5QY/313 K7EQM/313 WB8JEY/315 KBØG/291
G4BWP/292 JA7IL/321 SV1IW/309 W1YY/324 WA3EBA/149 K5WA/186 K7LJ/271 WB8SFF/157 NFØF/138
G4IUF/300 JA8EJO/225 UQ2MU/316 WB1AJG/175 AA4DO/228 KA5W/312 K7PM/272 WB8UZT/255 WØGKE/325
G4OBK/239 JA9FPI/312 VE3KP/301 WB1GBU/253 AA4NA/310 KE5AX/300 KC7V/279 WD8PKF/308 WØWP/318
HB9BLQ/300 KL7JAI/228 VE4DQ/263 K2AX/263 AA4XR/208 KF5AL/248 NS7J/339 K9HQM/313 WAØSTV/225
HB9BOS/198 ON4FQ/325 VE4ZN/310 K2IJ/311 K4IQJ/178 KF5EA/201 W7ALZ/269

Radiotelephone

CT1FL/334 I1HAG/319 JA2UYS/306 SM7BOL/301 W1EQD/277 W3ICQ/311 N5CFN/133 NS7J/314 K9KU/308
CT1TM/254 I1TBE/322 JH6QPD/282 SV1IW/303 W1FAB/266 AA4CJ/314 W5ILR/224 W7GUR/311 K9LHA/308
CX2CB/270 I1TLJ/280 JA7ARD/319 VE3ZN/254 W1PNR/310 AA4DO/151 W5ODD/238 W7UZA/298 K9MFI/303
CX8CG/159 I1XA/296 JA7BJS/318 VE4ZN/297 W1SP/349 K4JCA/158 WB5ROW/300 K8MID/274 KA9TNZ/250
DF2AL/279 I1ZFT/315 JA7IL/321 Y81ZN/150 WA1SMI/263 K4MQG/341 WZ5U/281 K8NN/324 N9AIB/260
DF6FK/311 I3LBW/259 JA9FPI/302 YV5CMI/148 WB1AJG/173 KI4FW/175 WZ5V/252 KB8DB/312 N9US/252
DJ6FN/321 I6GKI/132 KA2CC/186 VK1ZL/225 K2EWB/163 KI4UJ/153 K6CID/282 KB8NN/291 W9ISF/184
DK1RV/302 I8IYW/200 LA4HW/310 ZS6FU/285 K2SGH/310 KW4V/249 KI6GI/178 KC8YM/298 W9TY/272
DKØZR/227 IK8GCS/254 ON4UN/338 7X2LS/281 KB2HK/297 KZ4V/208 W6DN/306 N8AHK/173 WA9VGY/317
DL4MBD/127 IØZV/349 OZ3YI/204 K1EFI/308 KC2NB/298 N4AVV/309 W6IYV/169 W8CFG/332 WB9IWN/199
DL5NAO/255 IKØAZG/286 PY2JSF/250 K1TO/198 NI2C/258 N4KG/325 W6TXL/314 W8LJP/289 KØIIR/161
EA1IY/328 IKØEIM/202 PY4OY/259 KB1CD/265 NN2G/270 WA4DPU/206 WD6EAW/224 WA8PYL/319 KØQC/239
EL2AY/202 IKØGPP/262 SLØZG/277 KB1FE/230 WB2CVL/311 WB4LFM/321 K7IRO/324 WD8PKF/305 KBØG/254
F6FNU/277 JM1MGP/270 SM5CSS/265 KN1M/193 K3SLJ/175 WJ4S/126 K7PM/254 K9FYZ/318 WØPSH/229
G4BWP/281 JR1SSH/290 SM5FQQ/314 NF1G/177 N3BNA/261 KA5W/301 KC7V/255 K9HEK/199 WØRHZ/203
G4NXG/202 JA2IVY/202 SM6CTQ/312 W1AA/356 W3HCW/254 KC5ZA/251 N7CJO/185 K9HQM/311 WAØRVK/211
HB9BLQ/285

CW

CT1YH/226 IK2DJV/225 JA9FPI/171 SM5CAK/253 VE4AEX/201 K2SHZ/284 WJ4S/130 WB8JEY/296 W9TY/305
DJ3XD/231 I8WY/285 ON5CW/180 SM5CSS/225 VE4DQ/149 KQ2O/249 W5ODD/273 WD8PKF/248 KØQC/235
DJ5LE/249 JA1QXY/294 OY7ML/251 SM6CTQ/293 K1EFI/286 N3BNA/202 W6DN/265 K9MFI/300 KBØG/254
DK1RV/262 JA2IVY/193 PY2KQ/124 SM6LWH/181 K1IU/254 N4KG/304 K7PM/156 KB9XG/250 KBØU/225
G4BWP/259 JH4JNG/150 SLØAS/286 SMØGMG/289 K1TO/209 WA4DPU/250 KA7AIG/183 N9AIB/175 KUØS/204
HB9BOS/156 JA5IU/260 SLØZG/264 TI4SU/200 KN1M/180 WB4VKW/248 KC7V/225 N9US/287 NFØF/132
HB9DDZ/181 JA7IL/277 SM2OTU/192 VE3KP/268 N1ATD/201 WB4ZBI/174 NS7Z/270 NF9V/202 WØWP/314
HB9HT/295

RTTY **160 Meters**

F6HUJ/218 K1IU/151 WB2CZB/125 N4KG/162 WB9NSZ/125

DXCC NOTES

Annual Listing Corrections

Mixed: JA6GXM/319, LA8CJ/321, VE4SK/328, W3MP/365, N4FKZ/305, K6PU/344, KI6T/352, K9GX/315. Phone: K2MFY/297, NO2U/332 W6ARJ/334. CW: AK5B/257, W9SFR/310.

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

AMATEUR RADIO IN CHINA

☐ The article by Dave Sumner, K1ZZ, in January 1988 *QST* concerning the visit of the CRSA delegation to the United States was of particular interest to me.

While I was in Beijing, China with a tour group in October 1987, I was contacted by Yuan Bo, a graduate student at Qin Hua University. He is a radio amateur who had received a letter which I had addressed simply to "Radio BY1QH at the University." He took me to the station, which is located in a university dormitory room, so that I could operate on the 20-meter band. I made a number of stateside contacts. Bo told me that he wished that more US amateurs would make personal contact with their Chinese counterparts. As mementos of my visit with Bo and of my operation from BY1QH, I was given a QSL, snapshots of the station and, of course, the lifetime memory of a unique experience.

And in case you wonder about the possible language barrier, there was none. Bo spoke excellent, virtually unaccented English even though he had never been outside of China.—*Robert A. Buhbe, N6NJH, Seal Beach, California*

30 AND 12 METERS: USE 'EM OR LOSE 'EM

☐ Much has been said and written about contests and about awards chasing on the new WARC bands. At the risk of reopening Pandora's box, I would like to present my viewpoint.

Regarding 30 meters, it seems the consensus is not to use it for other than a ragchewing band because of its secondary status and because of the narrowness of the allocation. I agree that these are enough reasons not to allow contest operation, but awards chasing should be allowed. As an aside, I was very enthusiastic at first when the band was touted as the place where you could actually ragchew with DX stations. My illusion lasted through my first QSO when all I got for my efforts was a "formula QSO." I have yet to enjoy a good ragchew on the "ragchew band." Since ragchewers aren't ragchewing, awards chasing might as well be allowed.

Regarding 12 meters, to the best of my knowledge there appears to be no reason not to allow both contesting and awards chasing on this band. The band is open to DX and both CW and SSB are supported, yet it seems to be a forgotten band. Maybe all that is needed are reminders in *QST* to use the band if ragchewing is your primary goal.—*R. Wanderer, KT2D, Pompton Lakes, New Jersey*

[Contacts made on 12 meters are valid for DXCC and for WAS. Contacts made on this band are *not* valid for 5BWAS or 5BDXCC, though.—Ed.]

BEST "REGARDSES"

☐ Many of the abbreviations and Q signals originally used in telegraphy have found their way into radiophone usage and, oftentimes, with unsavory results.

Consider "73." What does it mean? "Best regards." Note that "regards" already has an "s" on it. So wrongfully using "73s" means "Best regardses"—a grammatical atrocity. Even worse, when one says "my best 73s to you," this translates to "my best of best regardses to you." Please say "73."

Similarly, "88" means "love and kisses"—already in the plural form. Therefore, "88s" is inappropriate. 73 and 88 to all.—*C. H. (Rip) Merrell, W4FX, Anderson, South Carolina*

ENHANCE INTERNATIONAL GOODWILL

☐ Section 97(1)(e) of the FCC rules which govern Amateur Radio sets forth as one of the service's fundamental purposes "continuation and extension of the amateur's unique ability to enhance international goodwill."

Most hams probably take for granted the fact that we actually do fulfill this principle. After all, one need only glance through the pages of *QST* for the evidence. There's the annual DXCC Honor Roll with Joe Ham being credited as the world's most DXtraordinary amateur. One finds color photos from a DXpedition to a barren lump of cooling lava somewhere east of Java that is so new that the operators couldn't even find a palm tree from which to string an antenna. The DX columns are full of QSL information so that you may receive that coveted scrap of wallpaper confirming that the DX station actually heard your "59, how QSL?"

There is a lot of DXing out there, but how much of it actually furthers international goodwill? Is international goodwill helped whenever rare DX stations who wish to ragchew are chased away from the US phone bands by deafening pile-ups? Who benefits from a DXpedition to a barren South Seas island? What have we learned from a 15-second exchange of signal reports and QSL information?

How much DXing is real person-to-person communication in which one learns something about the other ham, his country and his way of life? Hams have been blessed with the ability to communicate readily with almost any point on Earth. We have taken this valuable gift and squandered it in pursuit of multi-colored QSL cards and fancy gold-colored awards. We still act as if worldwide communication is an extraordinary event.

All of this is not meant to minimize the positive effect that ham radio has already had on international goodwill. We must come to regard every 15-second "59, how QSL?" type of DX contact as a missed opportunity to better the state of the planet.—*Harry Bloomberg, WA3TBL, Pittsburgh, Pennsylvania*

CW—THE FARNSWORTH WAY

☐ Many hams are familiar with the Farnsworth method of Morse code instruction. The Farnsworth method is a way of sending slow-speed CW by transmitting the individual characters at some higher speed while increasing the spacing between characters. The overall result is slower speed. W1AW uses a character speed of 16 WPM for code transmissions below 13 WPM.

I became interested in learning who Farnsworth was and made a number of inquiries among the ham fraternity. I discovered that the Farnsworth method was fairly well known and in common use, but the identity of Farnsworth himself was somewhat of a mystery.

It was a Stray that I placed in *QST* which began my continuing correspondence with Bart Bartlett, W6OWP, to whom I am indebted for the following information on Donald R. (Russ) Farnsworth and his method. I also wish to thank Tom Foster, KD5VS, and Don Johnson, W6AAQ, for their help in obtaining this information.

Farnsworth, who is now a Silent Key, was first licensed in the mid-1930s as W9SUV. He later held the calls W6TTB and WØJYC. In the late 1950s, Russ Farnsworth asked Bart Bartlett to help him prepare some tapes for a code course he had developed. His unique method of instruction was to maintain the code speed at a constant 13 WPM throughout the course, but starting with simple text and gradually increasing the complexity of the text material. It is more than likely that the Farnsworth method was used by more than one person, each independent of the other and all finding it to be a very practical method of sending slow-speed CW.—*Bill Fisher, W2OC, Armonk, New York*

The New Frontier

Conducted By Bob Atkins, KA1GT
103 Division Ave, Millington, NJ 07946

Transverter News

Mike Agsten, WA8TXT, has written with some comments on using interdigital mixers in transverters as described in the January column. He has been using an interdigital converter as a bilateral mixer in his portable 2304-MHz rig for several years. Using the MMIC unit shown in Fig 1, which Mike calls his HPU (high performance unit), he has worked DX from 6 to 80 miles away. Mike credits Al Ward's (WB5LUA) 1296-MHz transverter notes for the PIN diode switch idea.

See Fig 1. With +12 V on the upper supply rail, D1 and D3 are biased into conduction, and D2 and D4 are biased off. Signals from the interdigital transverter are then routed to the antenna via the two-stage amplifier chain consisting of MMICs U1 and U2. When +12 V is applied to the lower rail, D2 and D4 turn on while D1 and D3 turn off. Signals from the antenna are then routed to the transverter via MMICs U3 and U4. Although a simple series PIN diode switching arrangement such as this does not give very good isolation (particularly at these frequencies), it is nevertheless simple to implement and performs adequately in this application—which is all that counts in the end!

Mike uses this HPU on 2304 MHz, but the circuit is not frequency specific and should work fine at 1296 MHz. Many enhancements are possible, of course. Mike uses a similar unit in his home station, with a three-stage amplifier in the transmit line and a directional coupler in the output line for power monitoring.

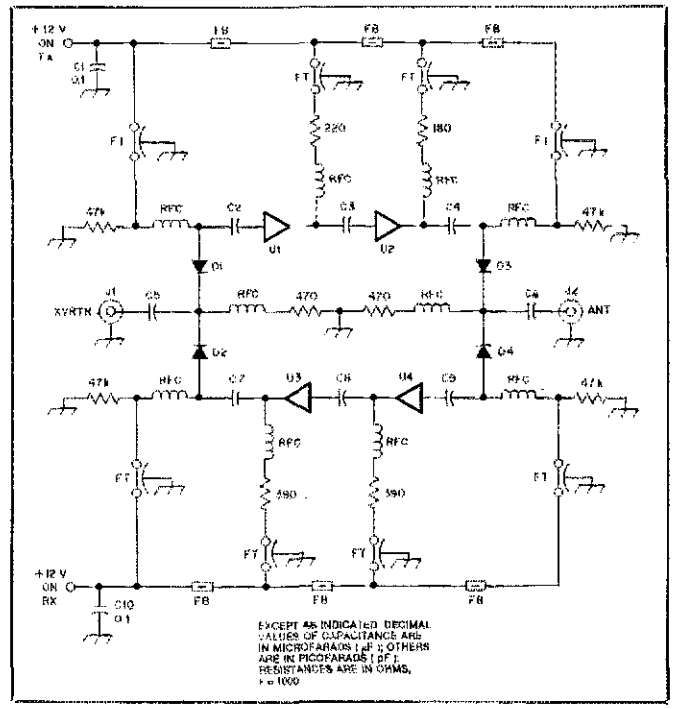


Fig 1—WA8TXT's PIN diode switched MMIC TR module.
C2-C9—47-pF, 110-mil porcelain chip.
D1-D4—HP5082-3379 PIN diodes.
FB—Ferrite beads.
FT—470- or 1000-pF feedthrough.
RFC—4 turns, 28 AWG, 1/8 inch ID.
U1—MSA0204.
U2—MSA0304.
U3, U4—MSA0404.

COLORADO ACTIVITY REPORT

In July and September of 1987, Lauren Libby, KXØO, and Phil Bergeson, WØMXY, mounted two DXpeditions to the summit of Pikes Peak near Colorado Springs. Pikes Peak is 14,110 feet above sea level and some 7000 feet above surrounding terrain. The purpose of the expeditions was to study long-range propagation paths on 1.2, 2.3 and 10 GHz.

The first expedition was on July 3, 1987. On this trip, tests were run between KXØO and Dan Osborne, WB5AFY (a 450-mile path), on 1.2 and 2.3 GHz. Signals were between Q5/S2 and Q5/S8 on 1.2 GHz. KXØO was running 10 W to a 45-element loop Yagi. WB5AFY was running more than 700 W to four Yagis.

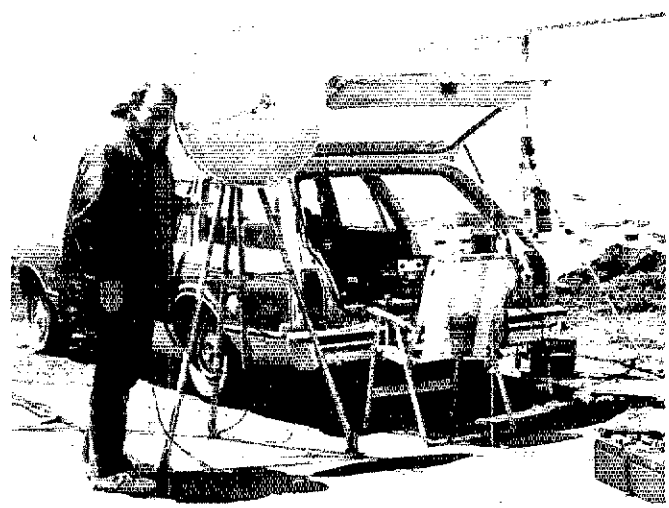
Although WB5AFY also heard KXØO's signals on 2.3 GHz, the path did not support two-way communications. KXØO worked Bill, KØRZ, over an 80-mile path on 1.2 GHz with S9 +20-dB SSB signals. Both stations were running 250 mW output to 30-inch dishes. It appears that narrow-band work on 10 GHz will also yield some good DX with these power levels. Next summer KXØO and company plan on trying some longer paths with 5-W rigs on each end.

The second expedition weekend provided better results overall. Before sunrise on September 7, KXØO and WØMXY braved 15° weather on the Peak. This time, WB5AFY was worked on 1.2 GHz with Q5/S6 to Q5/S8 signals using the same equipment as on the earlier trip.

At 10:20 AM, WB5AFY was worked on 2.3 GHz, and Q5/S3 to Q5/S8 signal reports were exchanged. The 2.3-GHz contact was coordinated on 432 MHz. This was the first Colorado to Texas contact on 2.3 GHz. KXØO was running 30 W to a 60-element loop Yagi; his receiver has a 1.2-dB noise figure. WB5AFY ran 400 W to a 4-ft dish.

The same day, KØRZ went mobile and covered 10 grid squares in southern Colorado and western Kansas. KØRZ used 10 W and a small dish on 2.3 GHz, and gave several stations their last few grids for VUCC. KXØO worked KØRZ over a 200-mile path from Pikes Peak to western Kansas.

It appears that the tropospheric bending common at 1.2 GHz is not nearly as good at 2.3 GHz. These experiments yielded 2.3-GHz signals more than 8 dB weaker than the 1.2-GHz signals. Moisture also seems to be a factor at 2.3 GHz, as the first experiment with WB5AFY was on a very humid day with temperatures in the 90s (at mid-path), but during the second trip (when a 2.3-GHz QSO was made with WB5AFY), humidity was 25% and temperatures were in the upper 70s at mid-path.



The Pikes Peak Expeditionary Force: Lauren, KXØO, with some of the microwave gear on July 3, 1987. Colder weather and low humidity on September 7, 1987, contributed to the first-ever successful 2.3-GHz contact from Colorado to Texas between KXØO and WB5AFY. *(photo by WØMXY)*

Proposed ARRL 13-cm Band Plan

In accordance with Minute 30 of the January 1988 Board of Directors meeting, the following 13-cm (2300-2310 and 2390-2450 MHz) draft band plan is being presented for your consideration. We need your input to determine what your present and future needs and/or uses might be. Many generic terms have been included in this draft band plan which may cover multiple modes of operation. This approach provides maximum flexibility for future technological growth, especially on the duplex channels. Some uses may include FM, digital or cellular communications.

The 13-cm band is split into two portions for amateur allocation: 2300-2310 and 2390-2450 MHz. Both portions are shared by Government RADIOLOCATION limited to the Military Services.

There is also an Industrial, Scientific and Medical (ISM) allocation centered on 2450 MHz ± 50 MHz. This means that interference may be experienced from 2400 MHz ever-increasing to 2450 MHz. Amateur Radio and other radio services operating within this segment must accept harmful interference which may be caused by ISM applications.

International allocations limit amateur space communications to the range from 2400-2450 MHz subject to not causing harmful interference to other services.

Your opinions, comments and input as to future usage of the 13-cm band are solicited. Send to: 13-cm Band Plan, Attn: Bart J. Jahnke, KB9NM, ARRL HQ, 225 Main St, Newington, CT 06111.

Proposed ARRL 13-cm Band Plan

2300-2310 MHz

2300.000-2304.000	Wideband data (paired with 2390-2394)[1]
2304.000-2304.300	EME, CW and SSB working[2]
2304.100	CW and SSB calling frequency
2304.300-2304.400	Beacons
2304.400-2306.000	FM (paired with 2394.4-2396.0)[3]
2306.000-2310.000	Wideband data (paired with 2396-2400)[1]

2390-2450 MHz

2390.000-2394.000	Wideband data (paired with 2300-2304)[1]
2394.000-2394.400	Simplex
2394.400-2396.000	FM (paired with 2304.4-2306.0)[3]
2396.000-2400.000	Wideband data (paired with 2306-2310)[1]
2400.000-2410.000	Amateur Satellite (space-to-earth, paired with 1260-1270)[4]
2410.000-2430.000	FMTV channel[5]
2430.000-2440.000	Amateur Satellite (earth-to-space, paired with 3400-3410 MHz)[6]
2440.000-2450.000	Experimental, spread spectrum[7]

Notes

[1]Wideband digital channels of 4-MHz bandwidth are recommended to allow for 1.544 or 2.048 Mbit/s packetized radio relay. There is space for two 4-MHz duplex channels in the 2300-2310 and 2390-2400 MHz bands.

[2]It is expected that weak-signal CW and SSB will occur toward the bottom of the 2304.005-2304.300 MHz range, leaving some guard band around beacons in the 2304.300-2304.400 MHz range.

[3]Should FM duplex channels be spaced every 50 kHz?

[4]The Amateur Satellite Service is authorized to use the 2400-2450 MHz band in either the space-to-earth or earth-to-space, directions. As only the earth-to-space direction is authorized in the 1260-1270 MHz band, AMSAT's Phase 4 program plans to use 1260-1270 MHz for earth-to-space, 2400-2450 MHz space-to-earth. The present plan is for two 750-kHz-wide transponders using the same frequency segment but opposite-handed circular polarization (ie, one RHCP, the other LHCP). As this may or may not be practicable, it would be conservative to have room for two 1-MHz-wide satellite channels for the first Phase 4 launch in the early 1990s. Long-term prudence suggests allocating 10 MHz for satellite space-to-earth in the 2400-2450 MHz band, and this segment should be at the bottom of the band (ie, 2400-2410 MHz) to minimize interference from ISM sources, particularly microwave ovens.

[5]FMTV, as described in the *1988 ARRL Handbook*, pp 20-8 to 20-15, uses a highest modulating frequency (M) of 6 MHz and a peak deviation (D) of 4 MHz. Assuming K = 1, bandwidth (B) is calculated as follows:
B = 2M + 2DK = (2 × 6,000,000) + (2 × 4,000,000) = 20 MHz.

[6]The rationale for designating 10 MHz (2430-2440 MHz) for satellite earth-to-space is to provide future expansion in duplex with 3400-3410 MHz. Because of ISM interference centered at 2450 MHz, the 2430-2440 MHz range may not be usable for earth reception of satellites and thus may be usable only for earth-to-space. However, 3400-3410 MHz may be used in either direction but is not available in ITU Region 1.

[7]The upper 10 MHz (2440-2450 MHz) may be useless except to the most robust types of modulation because of interference from ISM. Therefore, spread spectrum seems to be best suited to this environment, and amateurs can contribute to the state of the art by developing techniques for sharing ISM bands.

Strays

ATTENTION HAMFEST AND CONVENTION SPONSORS

☐ ARRL HQ maintains a register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the Hamfest and Convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned Hamfests and Conventions. This must be done by your Division Director for sanctioned Hamfests and, additionally, by the Executive Committee for Conventions. Application forms can be obtained by writing or calling the ARRL Convention Program Manager, tel 203-666-1541.

NTS OLD TIMERS: STAND UP AND BE COUNTED!

☐ The League would like to know how many amateurs who were active in the original National Traffic System, circa 1949-50, are still active, so we can compile a list of NTS "old timers." Contact Luck Hurder at HQ.

I would like to get in touch with...

☐ anyone with schematics or manuals for Tektronix 516 oscilloscope or Knight-Kit (Allied Radio) 20 kΩ/volt VOM. Rich Bonkowski, W3HWJ, 5988 Starwood Dr, San Jose, CA 95120.

☐ anyone with construction plans for single- or multi-channel Yagi or log periodic antennas for TV low and high VHF and UHF bands. Charles Kelsey, WB2EDV, 15 Blanchard St, Mayville, NY 14757.

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to PO Box 117, Burtonsville, MD 20866,
or call 301-384-6736 to record late-breaking information.

Need There Be Line Of Sight?

Ask that question of any ham who is active exploiting the capabilities of the bands over 50 MHz, and you will receive a resounding "No!" But all too many amateurs whose interest in the VHF bands is limited to using an HT through the local repeater still believe that, in this part of the spectrum, propagation stops at the horizon. This view is shared by a large number of professional radio people, especially those specializing in radar.

It was surprising to me to discover recently that, 56 years ago, the father of radio, Guglielmo Marconi, conducted experiments at about 500 MHz between the coast of Italy and a yacht cruising offshore. I came across this significant piece of radio history while looking through a stack of *Proceedings of the Institute of Radio Engineers,* which have been languishing in my basement for the past 20 years. The translation of Marconi's last paper, by Professor R. M. Fano, was submitted to the *Proceedings* by Thomas J. Carroll of MIT's Lincoln Laboratory and appeared in the August 1956 issue. In a few paragraphs, Marconi describes work conducted in 1932 and 1933. During the latter series of tests, Marconi's shore station consisted of a 25-W transmitter feeding a dipole backed up by a 2-meter (6-foot) parabolic dish which was mounted on a building at 38 meters (125 feet) above sea level. [The location was apparently within sight of the coast.—Ed]. The shipboard receiving installation employed a similar dish mounted 5 meters (16.5 feet) above the water.

Concerning the results of these tests, Marconi wrote, "In spite of the fact that the optical distance was only 30 kilometers (18.75 miles), the radio-telephonic and radio-telegraphic signals sent by the transmitting station were received on the yacht with clarity, great strength and regularity at a distance of 150 kilometers (90 mi), that is five times the optical distance." He further said that he could not incrementally extend this range due to the geography of the coastline; nevertheless, he noted that "Morse signals were detected very feebly and with slight fading, but often legible, at 258 kilometers (161 miles)."

Marconi concludes that, "The speculation that may arise from such results concerns the entire theory of radio transmission over distances greater than the optical one." He promised further experiments and a more detailed paper but, unfortunately, illness and his subsequent death prevented him from carrying out these plans.

Marconi, despite his affiliation with successful commercial interests, often characterized himself as "an amateur." I think that we can all detect some ham spirit in these early microwave experiments. If he had been in better health and had lived longer, Marconi might well have brought home the message that something goes on at these short wavelengths which results in propagation well beyond line-of-sight, and that substantial variations occur with changing weather conditions. As it was, the amateur community undertook most of the early propagation research on frequencies above 56 MHz. Anything above 30 MHz was called "the Ultra-highs" in those days.

Ross Hull, an import from Australia who worked at ARRL Headquarters in the mid '30s, was one of those who believed that these frequencies are good for something besides line-of-sight and demonstrated it in many experiments. Ed Tilton, W1HDQ, the originator of this column, was another. Ed specifically addressed the question in a feature article carried in the March 1946 issue of *QST*. It was appropriately entitled "Need There be Line-of-Sight?" and particularly dealt with getting out on 2 meters from poor locations. Nevertheless, it also evoked the question relative to extended range work between better located stations. In those days, people didn't know that it is possible to consistently work over paths of 300 miles or more on 2 meters. Appearing as it did soon after we got back on the air at the conclusion of World War II and just following our move from 112 to 144 MHz, W1HDQ's article, and succeeding references to the subject in this column, set the stage for numerous amateur VHF accomplishments during the late '40s and into the '50s.

I thought some readers might be interested in a little bit of early history of what we now call the world above 50 MHz.

ON THE BANDS

Not much in the way of operating news this month. It seems to be especially dull in comparison to the flurry of E_s activity on both 6 and 2 meters in December. The propagation mode that doesn't depend on the ionosphere or the troposphere, EME does come through to provide some interesting bits of news. On the 6-meter scene, W6JKV informs me that he has doubled the size of his array, going from two to four M² 50-foot 11-element Yagis. Jim can now hear his own echoes almost anytime the moon is up. Yet the monster is fully steerable. Tests with WA4NJP in Georgia, who he has now worked a number of times, continue.

K5JL supplies an interesting account of pioneering EME work on our new 33-cm band; Jay's initial contact was with WA5ETV. I believe this is the first amateur moonbounce contact on this band. Several prominent licensed amateurs, including WØPW, W6PO and W4WD, worked off the moon, operating under experimental licenses prior to our gaining access to the band. K5JL writes that he is using a 23-cm SSB transverter, modified for 902. This feeds a solid-state 15-W amplifier which, in turn, drives a 7289 cavity amplifier delivering about 150 W. An MGF-1402 brings the overall converter NF down to less than 1.0 dB. A 30-foot dish rounds out the line-up. Jay says that WA5ETV has a similar setup with a 30-foot dish. Results have been very gratifying, with echoes about 10 dB above the noise received at 100 W output. Echoes have even been received using the 15-W driver. Latest to join the 33-cm EME club is WB5LUA who called to inform me that he has now worked K5JL. Al is using his 24-foot dish. Let's hear some more 33-cm reports, EME or otherwise.

Perhaps you have heard of the 6-meter packet meteor-scatter experiment proposed by WØRPK Indianola, IA for the January VHF SS. Ralph, using the special software developed for the SAREX 2 shuttle flight, proposed to find out how many stations he could log during the contest with a completely automatic station. He set up on 50.505 FM with 160 W and a 5-element Yagi. W3XO was one of the stations on the other end. I can't say we did much during the SS, but in a test run the Tuesday evening before the contest, we completed the exchange in only a few minutes. I was running about 400 W to a 6-element Boomer at 60 feet. The rest of the setup here is an AEA PK-232 hooked to a Radio Shack TRS-80 Model 100 portable computer. While not completely successful, our results do show that packet techniques do provide another means of taking advantage of meteors. A modulation scheme other than FM would be of great help, but the Doppler associated with meteor propagation can kill you with straight FSK, such as that used by HF packet operators.

In other 6-meter news, LA6OJ calls from Norway to say that he is looking forward to working North American stations in the coming months. He is regularly on 50.200 with 20 W to a 4-element beam.

There's a new beacon in the Honolulu area. Word received is that KH6JJK runs 5 W to a vertical on 50.080.

KA3B announces that he is taking orders for the 1988 Edition of the *50 MHz North American SSB Directory and Beacon List.* Harry has also compiled a listing of 6-meter repeaters. For ordering information, send an SASE to Harry Schools, 1606 S Newkirk St, Philadelphia, PA 19145.

SOFTWARE

TESTLOG

Ever wish you could simply rattle off the contest QSOs and not have to write each contact in the log—not to mention having to continually update the dupe sheet? With a computer and the right software, you can let the machine handle this drudgery. I have recently had the opportunity to try what appears to be an almost ideal logging program for VHF contests. It will work in HF contests too, but the fact that it keeps track of grids and

Microwave Standings

Listings are call, state, US states worked, call areas worked, grids worked and best terrestrial DX worked in miles. Call areas are the 10 US call areas plus KH6 and KL7 plus each VE and XE call area plus DXCC countries not located within the continental limits of the US, Canada or Mexico. Therefore, the UN Building does not count as a separate call area. In order to make the standings a true reflection of stations currently active on the bands above 902 MHz, those not reporting activity within the past two years are subject to being dropped. They will be reinstated upon written presentation of continuing activity. It is not necessary to have worked additional states or grids in order to remain in the standings or be reinstated, merely an indication of continued activity and interest. Compiled February 10, 1988. Deadline for next update is August 5, 1988.

902 MHz (33 cm)
Minimum best DX 150 miles

W1JR	MA	10	5	25	378
W1RIL	MA	9	3	16	230
AF1T	NH	9	3	—	320
W1EJ	NH	6	2	—	—
WB2NPE	NJ	9	5	19	396
W2PGC	NY	6	6	12	478
KD5RO/2	NY	4	3	8	300
WA3AXV	PA	9	6	18	326
N3CX	PA	8	5	14	400
WS4F	GA	3	1	3	165
WB5LUA	TX	3	2	4	272
W6CPL		1	1	6	178
NI8O	OH	6	5	8	293
VE3LNX		7	5	22	350

1240 MHz (23 cm)
Minimum best DX 150 miles or 10 grids

W2SZ/1	MA	17	8	34	—
K1FO	CT	15	7	21	468
W1JR*	MA	13	9	33	655
K1PXE	CT	13	5	—	448
WA1OUB	NH	12	7	28	496
W1RIL	MA	12	6	23	450
AF1T	NH	10	4	—	350
W1EJ	NH	8	4	—	—
K1LPS	VT	7	5	—	288
W1QXX	MA	6	3	—	260
K2UYH*	NJ	25	32	—	770
WB2NPE	NJ	17	8	42	756
WA2LTM*	NJ	17	6	—	770
W2VC	NJ	16	7	26	537
W2PGC	NY	13	9	25	960
N2BJ	NY	13	5	22	—
K2YCO	NY	11	8	—	—
K2EVJ	NY	10	6	—	426
KD5RO/2	NY	6	6	13	360
WA2FUZ	NY	5	3	—	125
K2LME	NJ	3	—	4	—
WA3AXV	PA	16	7	33	698
WA3JUF	PA	14	5	20	300
W3IP	MD	13	7	22	369
K3HZO	MD	13	6	25	—
WA3NZL	MD	11	7	—	780
KB3QM	DE	7	—	7	—
W3RUE	PA	4	3	7	—
K4QIF*	VA	22	25	—	790
WB4NXY	KY	17	7	29	730
WS4F	GA	9	3	13	625
W3IY/4	VA	7	5	—	481
WA4OFS	FL	7	2	17	1042
K4NTD	FL	4	2	—	847
WB5LUA*	TX	28	28	104	1260
W5HN	TX	14	5	44	140
W5DFU	OK	13	6	38	1031
W5RCI	MS	13	4	29	—
WB5AFY	TX	12	3	50	685
K5UR	AR	11	4	34	654
WA5ASH	TX	10	6	33	1425
WA5VJB	TX	9	5	—	1140
KD5RO	TX	9	3	35	650
K5SW	OK	8	4	23	—
WD5AGO	OK	8	2	35	—
WA5TKU	TX	5	3	18	1112
WA5HNK	TX	5	2	15	740
W0RRY/5	OK	5	2	11	285
W5NZS	OK	5	—	20	—
W5HPT	TX	4	1	—	571
WB5LBT	LA	3	2	—	—
W5UC	TX	3	1	12	163
N5BBQ	OK	2	2	3	1042
W5NZS	OK	2	1	4	—
WA5DBY	TX	2	1	—	—
K5PJR	OK	1	1	1	271
WA5TBE	TX	1	1	—	571
W5GVE	TX	1	1	—	366
N6CA*		8	10	30	2472
K6ZMW		4	3	—	402
W6CPL		3	4	15	2476
W6KGS		3	2	—	362
N6XQ		3	3	10	2519
W6XJ		2	3	—	250
K6QXY		2	2	—	2358
KC6A		1	1	—	130
N6TX		1	1	—	112
N6NB/7	UT	4	2	—	295
WB5TCO/7	AZ	2	2	2	403
WA7JUO	NV	2	1	—	—
W8YIO	MI	20	12	45	950
WA8TXT	OH	18	9	25	820
NI8O	OH	18	8	48	—
K8WW	OH	16	7	32	448
WB8BKC	MI	15	7	33	650
W8IDU	MI	5	4	1	—
WB8PAT	OH	4	3	1	401
W9ZIH	IL	24	9	—	790
WB9SNR	IL	14	8	27	760
WA9FWD	WI	8	3	8	—
W9UD	IL	5	4	—	760
W0UC/9	WI	3	2	6	290
WB0DRL*	KS	27	18	115	1100
W0RAP	IA	14	5	52	678
WA0TKJ	KS	13	5	40	1100
W0OHU	MN	12	5	20	814
K0TLM	MO	12	4	28	—
KC0QR	NE	10	3	38	430
K0RZ	CO	7	3	28	413
K0ALL	ND	6	2	—	283
KX0O	CO	5	2	16	653
W0YZS	MO	4	2	—	425
W0PW	CO	3	2	3	97
W0ZJY	KS	3	1	—	170
NO0Y	KS	2	2	4	170
W0RT	KS	2	2	3	—
W0MDL	MN	2	2	—	340
W0VB	MN	2	2	—	340
KH6HME		2	2	—	2472
VE3LNX		12	7	36	425
VE4MA		6	14	22	800

2300 MHz (13 cm)
Minimum best DX 100 miles or 5 grids

W2SZ/1	MA	6	3	10	—
W1RIL	MA	6	3	7	230
W1JR	MA	6	2	5	257
W2PGC	NY	4	4	7	315
KD5RO/2	NY	2	3	5	250
WA3AXV	PA	11	6	19	671
N3CX	PA	6	4	9	250
WA3JUF	PA	5	3	10	—
W4HHK*	TN	10	7	12	582
WB4NXY	KY	4	4	6	360
WS4F	GA	2	1	2	147
WB5LUA*	TX	12	5	32	933
WB5AFY*	TX	7	3	18	285
W5DFU	OK	4	2	11	235
W5RCI	MS	3	2	4	—
WA5VJB	TX	3	1	13	185
W5UC	TX	3	1	12	163
W5HN	TX	3	1	10	230
W5ASH	TX	2	1	11	225
W5NZS	OK	2	1	4	—
KD5RO	TX	2	1	—	940
WA5DBY	TX	1	1	1	65
K5PJR	OK	1	1	1	271
W6CPL		1	1	5	105
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	115
W8YIO	MI	10	8	18	940
WA8TXT	OH	4	4	5	291
W9ZIH	IL	9	4	—	470
WB9SNR	IL	6	4	7	—
KX0O	CO	3	2	10	450
K0RZ	CO	2	2	10	144
WB0DRL	KS	2	1	3	—
VE3LNX		3	3	9	296

3300 MHz (9 cm)
Minimum best DX 100 miles or 5 grids

WB5LUA	TX	3	1	11	165
WB5AFY	TX	3	1	10	285
WB5LUA/5	AR	3	1	6	288
W6OYJ	CA	1	1	2	214
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	115
K0RZ	CO	2	1	5	70

5600 MHz (5 Cm)
Minimum best DX 100 miles or 5 grids

K5PJR	OK	6	2	29	331
WA5ICW	OK	5	2	21	242
W5UGO	OK	5	2	20	210
WD5AGO	OK	3	2	5	94
WB5LUA	TX	2	1	10	215
WD5AGO/5	TX	1	1	1	224
W6OYJ	CA	1	1	2	214
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	115
K0RZ	CO	2	2	5	75
W5UGO/0	NE	1	1	1	331

10 GHz (3 cm)
Minimum best DX 100 miles or 5 grids

N6XQ		1	1	6	208
W6OYJ/6		1	1	5	404
W6CPL		1	1	5	131
K6HLH		1	1	5	125
W6SFH/6		1	1	4	414
K6KKO		1	1	4	208
WA6MHZ		1	1	4	104
WB6BKR		1	1	4	168
N6GN/6		1	1	3	414
WD6FWE		1	1	1	174
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	116

24 GHz (1.25 cm)
Minimum best DX 50 miles

WA3RMX/7	OR	1	1	5	115
WB7UNU/7	OR	1	1	—	115
K0RZ	CO	2	2	6	78
KX0O	CO	1	1	2	165

47 GHz (0.6 cm)
Minimum best DX 10 miles

WA3RMX/7	OR	1	1	2	14
WB7UNU/7	OR	1	1	—	14

*Some stations worked via EME.
—Information not supplied.

Note: Some stations not meeting minimum listing criteria are carried again this time, but cannot be in the next update. Please supply complete current information, including best terrestrial DX in miles.

even displays them in an array that looks like an outline of the US should be a real boon to the VHF contester. Grids that have been worked are highlighted so you can see immediately if you have missed any easy close-in ones and concentrate your efforts accordingly. The score is continually updated and when you attempt to enter a dupe, you are greeted by the "bird." No more scanning the dupe sheet looking for that station you probably forgot to enter anyway. My belief is that any type of computer logging takes some getting used to for most of us. But, once the learning process is complete, it should make contest operating much more efficient and enjoyable. The developer of this nifty software, which runs on IBM or compatibles with 256k or more, is Forrest Hudspeth, WA3FAE. For further information, Forrest can be reached at 301-795-1466 or at his *Callbook* address.

VHF-PAK

The October 1987 issue of the *Midwest VHF Report* published by Roger Cox, WB0DGF, carries a review of the VHF-PAK, a software package that should be of interest to VHFers. VHF-PAK was written by several prominent VHFers, including W9IP, WA1JXN and WA1OUB and contains a number of programs such as a moon tracking program, meteor prediction program and a distance and bearing calculator. VHF-PAK requires an IBM PC-XT or AT or compatible with at least 256k of memory and DOS 2.0 or later. Another version, called VHF87-PAK, provides improved performance, but requires an 8087 or 80287 coprocessor. Additional information may be obtained from Bob Mobile, WA1OUB, RFD #2 Box 442, Hillsboro, NH 03244. An SASE would be appreciated.

DAYTON HAMVENTION® VHF PROGRAM

This was supposed to have been in last month's column, but space limitations prevented it. Anyway, for those who haven't made up their minds about attending the 1988 HamVention, maybe a word about the VHF activities planned will help. This year, a more extensive and better organized program of events of interest to VHFers is promised. This is largely due to the efforts being put forth by the newly formed Midwest VHF/UHF Society under the leadership of W8NJR. That group will sponsor the Friday evening noise-figure event as well as the antenna-gain measurements Sunday morning. Dayton, always a fun time, should be especially so for VHFers this year.

EASTERN VHF/UHF/SHF CONFERENCE

Dayton is but the first of the VHF gatherings of the year. The West Coast Conference will be coming up in May, although I don't have details on it as of this writing. The 14th annual Eastern VHF/UHF/SHF conference is to be held May 20 through 22 at Rivier College, Nashua, NH. The program includes a Friday evening hospitality room including an informal swap-fest, a full day of technical talks on Saturday and antenna-gain and noise-figure measuring on Sunday. Inexpensive housing in dormitory rooms is available, but early registration is advised. For further information on the conference, contact Lew Collins, W1GXT, 10 Marshall Ter, Wayland, MA 01778 or call 617-358-2854 between 1800 and 2200 Eastern Time.

A 13-CM BAND PLAN PROPOSAL

The ARRL is looking for input from the membership on the proposed 2300-MHz (13-cm) band plan found following this month's The New Frontier column. If you or anyone you know has comments on the proposed band plan, please address them to 13-cm Band Plan, Attn Bart J. Jahnke, KB9NM, 225 Main St, Newington, CT 06111.

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

Feedback (The Readers Write)

My mailman hates me! My mailbox is often too small for the amount of mail I receive and, as a result, the mailman must drive his mail truck up my driveway and deposit my mail on the sun porch instead of stuffing it in the mailbox out on the curb.

In contrast, I love receiving mail. Nothing makes me happier than to go out on the sun porch and find a pile of mail that takes two hands to handle. Some of that mail is in response to what appears in this column, and this month I want to share some of my FM/RPT mail with you.

National Simplex Frequency = National Calling Frequency?

The first letter is from Hart Smith, W8QX, who opines that some of us are not using the FM simplex frequencies as they were intended to be used.

☐ Your column in August brings to mind a situation which has been a sore point with me for many years on 2 FM; that is, 146.52 MHz is referred to as a "National Simplex Frequency" and not a "National FM Calling Frequency." Because of its rather ambiguous designation, 146.52 ends up being used as a simplex channel for rag chewing rather than serving only as a calling frequency that should be vacated as soon as a QSO is established.

One reason why I have just about given up on 2 FM is that it has become very difficult to obtain contacts for simplex rag chews. In a number of well-populated areas, for example, night after night you're likely to find that 52 is occupied by some sort of informal roundtable. So, where does one go to put out a general call? In desperation, when I'm looking for someone to chat with, I usually end up calling CQ on a repeater and, if the fellow I hook up with is near enough for simplex, I try to lure him to a vacant channel. Otherwise, I'm forced to QSO on the repeater even though I feel that repeaters should be used primarily by mobiles and hand-helds rather than base stations.

More than once I've heard the individuals who hang out on 52 say, "Anybody's welcome to break in if they want to make a call." Unfortunately, that suggestion is rather useless since the frequency is already occupied and only those operators interested in listening to the QSO in progress are around to be called.

Since we already have a "Calling Frequency" for 2 SSB, which is well observed around here, I think that an "FM Calling Frequency" would work out equally as well. Those of us who prefer simplex to repeater work could once again monitor 52 for calls or send our own CQs on 52 without having to wait for a two- or three-hour QSO to finally die.

I believe that *QST* should occasionally publish a box listing the generally recognized calling frequencies for the various modes and bands with a strong suggestion that these frequencies be used *only* for making contact, after which a prompt QSY is in order. I'm sure that if this policy were in force, there would be greater occupancy of the many other simplex channels which are presently almost never used. And many more hams who have invested in 2 FM gear would once again put the band to use for rag chewing.

Novice On Board

☐ Phil Kelly, N8HBI, secretary of the Farout Amateur Radio Club in Dayton, wrote to complain about those who complain about Novices.

I just finished reading the September "FM/RPT" and I have a few comments.

It is our job to help the newcomer learn the ropes. As an Extra, I work the Novice CW bands on a regular basis to give them code practice. Our club repeater system, which simulcasts on 147.135 and 224.02 MHz, welcomes all Novice operators. We have also trained many Novices in traffic handling with our VHF traffic net.

Novice Enhancement has done a lot for our radio club. Activity on our repeaters (already the most active in town) is at an all-time high. Check-ins on the traffic net are also at an all-time high and our meeting attendance is better than ever. Also, thanks to Novice Enhancement, we had our most successful Field Day in the 14-year history of the Farout ARC.

I'm sure that there are those Novice operators who operate with poor habits, but it's our job to show them the way, not to scare them off. These operators are our future.

Our repeater system is plagued by malicious interference on a daily basis, but not by Novices. It is caused by hams who have been licensed for years and by unlicensed persons.

Take the time to help your fellow ham. The "Elmer" concept is far from dead. In fact, to me it has new meaning; that is to help the new operator begin an adventure into a new mode of operation and, hopefully, he or she will want to upgrade.

☐ John Gebuhr, WBØCMC, wrote to remind us who we are talking to now that Novices are in our midst.

I read with interest "Trouble In Paradise" (September *QST*). One thing that needs to be mentioned is not to ask a Novice to go simplex on the repeater's output. If one wishes to go simplex with a Novice, it must be done on a designated Novice simplex frequency or, at risk, on a repeater output *between* 222.1 and 223.91 MHz.

☐ Dale Trautman, N7IXS, who recently upgraded from Technician to Advanced, mentioned that in his area, "people probably kerchunk (the local repeater) half a hundred times a day or more. I monitor this repeater here at my home and there is always someone kerchunking it. This went on before Novice enhancement and still continues."

"Granted, our fellow operators are supposed to identify themselves, but often fail to do so. Actually, I feel the solution to the problem might be that they should be taught to say, 'N7IXS testing.' My Elmer taught me that I should test off the repeater frequency. Our fellow operators should also be so enlightened. This might stop some of the unidentified transmissions on the repeaters on all bands."

Mobile Installations: Scratching The Surface

☐ The last letter is from Bill Munsil, N7AOU, who adds another tip concerning mobile radio installations.

Just read the column in January *QST*. Here's a real no-no...when traveling for the weekend in a lady friend's new car, do not—repeat—do not scratch the paint on the roof with the mag mount. (She hasn't spoken to me in over two years now!)

REPEATER LOG

According to December 1987 reports received, repeaters were involved in the following public-service events: 734 vehicular emergencies, 30 medical emergencies, 22 fire emergencies, 7 alerts/drills, 4 criminal activities, 3 power failures, 1 search and 1 weather emergency.

The following repeaters were involved (followed by the number of events): W2VL 49, WA2ZWP 3, W3LIF 6, W5FC 55, K5OS 2, WA6BJY 8, WD6DIH 101, KA6EEK 80, W6FNO 362, N6ME 136.

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
500 Riverside Dr, London, ON N6H 2R7
Tel 519-473-1668

The Jack Ravenscroft Decision

The appeal in the Jack Ravenscroft case has been partly successful. For those unfamiliar with the case, Jack, VE3SR, an Ottawa-area amateur, was taken off the air and ordered to pay costs and damages to a neighbour who had complained that Jack's Amateur Radio transmissions had interfered with the operation of electrical and electronic equipment in her home. That decision was reviewed by three justices of the Ontario Court of Appeals in Toronto on January 28-29. Here is their judgement:

1. The injunction banning Jack from transmitting is lifted and Jack may return to the air.

2. However, within 90 days, Jack must arrange for modifications to his neighbour's equipment, modifications that will suppress interference resulting from his transmissions, *to a standard approved by DOC.* Failing this, upon application to a district court judge, the injunction is reinstated.

3. If Jack's neighbour refuses to allow such modifications, the injunction is lifted permanently.

4. The award to Jack's neighbour is increased from $2500 to $5000. The increase is to compensate Jack's neighbour for inconveniences she will suffer while her equipment is being modified. Jack continues to be responsible for approximately 60% of the costs incurred by his neighbour prior to the original trial. No additional costs are awarded, either to Jack or to his neighbour. This basically leaves Jack and his neighbour responsible for their own costs.

It is probably dangerous to speculate on what this judgement means for the Canadian Amateur Radio community. However, the judgement seems to imply that:

1. Solving an Amateur Radio interference problem is a responsibility that must be shared by both the radio amateur and those experiencing interference. The amateur must be prepared to arrange for modifications to susceptible equipment, modifications that will suppress the interference. Those experiencing the interference must be prepared to accept these modifications. If they refuse, the amateur may continue operating.

2. DOC must become involved in these matters, even if the interference is to non-radio equipment. In fact, they must become an arbitrator and determine when the amateur has done all that can be reasonably expected and when those experiencing the interference must take responsibility for the susceptible nature of their equipment.

The appeal was conducted by a team of lawyers from the Toronto firm of Borden and Elliot. Each lawyer worked in his own area of expertise: constitutional law, law of nuisance or the principle of statutory authority. Those who attended the appeal found the lawyers well prepared and persuasive. They agreed that Jack probably had the best representation possible.

At press time, the judgement appeared to be acceptable, both to Jack and to Jack's neighbour.

SECTION MANAGER APPOINTMENT

Gord Kosmenko, VE5GF, has asked CRRL to accept his resignation as Saskatchewan Section Manager. Bruce Rattray, VE5RC, will complete the remainder of Gord's term.

SECTION MANAGER ELECTION RESOLICITATION

To all CRRL members in the Maritimes-Newfoundland Section: Because no nominating petitions for the office of Section Manager were received by the deadline specified in 1987 October and November *QST*, you are hereby *resolicited* for nominating petitions pursuant to an election for Section Manager. A petition, to be valid, must carry the signatures of five or more CRRL Full members residing in the Maritimes-Newfoundland Section. It is advisable to have more than five signatures. Photocopied signatures are not acceptable. Petition forms, FSD-129-C, are available from CRRL Headquarters in London, Ontario, but are not required. The following form is acceptable:

...(place and date)
Field Services Manager
CRRL Headquarters
Box 7009, Station E
London, Ontario N5Y 4J9

We, the undersigned CRRL Full members residing in the Maritimes-Newfoundland Section, hereby nominate...(name and callsign) as Section Manager for this Section for the next two-year term of office....(signatures and callsigns)...(addresses with postal code)

A Section Manager must be a resident of his or her Section and a licensed radio amateur holding a Canadian Advanced Amateur Certificate, and have been a CRRL Full member for a continuous term of two years at time of nomination.

Petitions will be received at CRRL Headquarters until 1600 EDT, 1988 June 10. If only one valid petition is received, the person nominated will be declared elected. If more than one valid petition is received, a balloted election will take place. Ballots will be mailed from CRRL Headquarters on or just before 1988 July 01. Returns will be counted just after 1988 August 19. A Section Manager elected as a result of these procedures will serve for an eighteen-month term of office beginning on 1988 October 01.

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

Jack Strangleman, VE3GV
Field Services Manager

SPECIAL PREFIXES FOR VE8-ANNOUNCING THE POLAR SKITREK DIPLOMA

To publicize the joint Canada-Soviet Polar Bridge Skitrek expedition, scheduled to begin on March 01, DOC has authorized radio amateurs in the Northwest Territories only to use the special prefix *CI8* from February 15 until June 15. Also to publicize the expedition, CRRL announces the *Polar Bridge Diploma.* Requirements for this large beautiful certificate are contacts with 1) three different stations in the Northwest Territories (usually VE8), 2) three different stations in Asiatic RSFSR or the USSR (usually UA9 or UAØ), 3) one Skitrek base camp station in either Canada or the USSR, 4) one station from the National Capital Region of Ottawa, Canada, and 5) one station from the National Capital Region of Moscow, USSR—nine contacts in all. All contacts must be made between 1988 February 15 and 1988 June 15. Send application, certified log data and award fee ($5 or 10 IRCs) to CRRL Awards Manager Garry Hammond, VE3XN, 5 McLaren Avenue, Listowel, Ontario N4W 3K1.

NOTES FROM ALL OVER

☐ Skitrek's Canadian base camp station at Resolute Bay, Northwest Territories, will use the special callsign CI8C for the duration of the Skitrek expedition. The station will be manned by a series of operators (VE1ASJ, VE3CDX, VE3XN and others) working in two-week shifts.

☐ DOC did extend the deadline for comments on its Discussion Paper, "Utilization of the Spectrum 30.01-890 Mhz," to March 15. The CRRL response stressed the importance of our present bands and outlined future needs of the Amateur Service in this part of the RF spectrum.

☐ The *Canadian Amateur Call Directory* project is well under way. *Directory* people will probably get your name, callsign and address by referring to the CRRL database. Everyone else? Ask them to send a card (a QSL card is fine) to CACD, Box 56, Arva, ON NØM 1CØ.

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

Views on Common Licensing

Our column this month consists of a slightly updated version of the comments made by Norbert Gabriel, DJ7ZY, at the 1987 international informal ham meeting at Friedrichshafen, West Germany. Incidentally, for those of you traveling in Europe in 1988, this year's Friederichshafen meeting will be held June 16-19. If you're interested, write DARC, PO Box 1155, D-3507 Baunatal, Federal Republic of Germany, for more details.

The Situation in CEPT

After several years of discussions, in June 1985 the CEPT adopted a method of common Amateur Radio licensing, applicable within the CEPT only. This was a second try by CEPT after a first attempt in the 1970s had failed. The regional organization CEPT, with its official French name being Conference Européenne des Administrations de la Post et Telecommunication, comprises 26 member administrations from western Europe (in the political sense) including Yugoslavia. CEPT is similar to the organization CITEL in Region 2. One of the several reasons for the long period of discussion before success was achieved is because of the three-level decision-making structure in CEPT. When discussions started in CEPT, three member administrations (West Germany, France, Luxembourg) had already gained some good experience with bilateral operation agreements for radio amateurs. This experience had a positive impact on the further development of a common CEPT solution, because it showed some other countries which were hesitant that the idea did work out in practice.

An attempt by IARU Region 1 to attend a CEPT meeting dealing with this subject failed, because at that time the CEPT meetings were closed to observers. Nevertheless, the establishment of the IARU Region 1 Common License Group in 1981, very successfully chaired first by I1RYS, later DL1FL and now ON8MC, was and is a forum to foster the wishes of radio amateurs towards more cooperative licensing arrangements. In the meantime, CEPT has opened its meetings a bit for observers from certain international and national organizations. The new standing orders of CEPT should now be examined in this connection to consider whether the attendance of IARU on a regular basis is appropriate.

Since the implementation of CEPT licensing, the number of the usual short-term visitor licenses which had to be issued by the German telecommunication administration (Deutsche Bundespost) have decreased drastically. Most certainly this reduction of administrative work will be similar within other CEPT administrations.

To review very briefly, there exist two CEPT license classes, 1 and 2. Class 1 is the higher class including operation on HF and VHF, while class 2 is the lower class for VHF work only. A few administrations have chosen CEPT Class 1 as being equivalent to their relatively low degree national license classes. According to CEPT Rec T/R 61-01, it is left up to the individual administrations to classify their national license classes, with the guidance that the operational possibilities for a radio amateur are not "considerably extended compared to those in his home country."

In March 1987 the Deutsche Bundespost informed 10 other CEPT administrations that CEPT class certificates from countries which are not yet able to implement Rec T/R 61-01 will be acknowledged in Germany. Thus, for example, the British licensing authority is issuing CEPT license certifications to their radio amateurs for use in the Federal Republic of Germany. On 26 June 1987 the Dutch PTT informed 15 of those administrations not yet participating in the CEPT regulation about the same favorable unilateral concession for their amateurs visiting The Netherlands.

The application of CEPT Rec T/R 61-01 by 10 of the 26 CEPT administrations (as of June 1987) within two years after its entry into force can be considered as a good measure of success, especially when compared with the results of other CEPT recommendations. There exist many other CEPT recommendations which officially have been in force for many years but nevertheless are applied by only two or three administrations. The fact that 18 CEPT administrations have already classified their national license classes seems to be a good indicator that further progress can be expected.—*Norbert Gabriel, DJ7ZY*

(Next month in this column we will have some further comment by DJ7ZY on how the CEPT concept can be spread to other areas of the world.—*W1RU*)

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*.

Club Contest Rules	Jan 1988, p 86	Novice Enhancement Report and Order	Apr 1987, p 64
Considerate Operator's Frequency Guide	Jan 1988, p 13	Packet-Radio Frequency Recommendations:	
Constitution Bicentennial WAS	Sep 1987, p 14	Below 225 MHz	Sep 1987, p 54
Element 2 Question Pool, New and Revised Questions, Answers	Apr 1987, p 23	Above 225 MHz	Mar 1988, p 51
Frequency/Mode Allocations	Jan 1988, p 77	QSL Bureaus Incoming	Dec 1987, p 56
Hamfest Calendar Rules	This issue, p 73	Outgoing	Mar 1988, p 59
Landline BBSs	Oct 1987, p 56	Reciprocal-Operating Agreements	Mar 1988, p 55
License-Renewal Information	Jan 1988, p 77	Tech and General Written Exams	Apr 1987, p 29
Major ARRL Operating Events and Conventions—1988	Jan 1988, p 78	Third-Party-Traffic Agreements	This issue, p 65
		VUCC Annual Listing	Dec 1987, p 68
		What is Amateur Radio?	Mar 1988, p 26
		220-MHz Band NPRM	Apr 1987, p 16

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

CP5LE Discovers New Missions Through Amateur Radio

"What is someone from New Jersey doing in Bolivia?" This is a question often asked of CP5LE, Barbara Grebenstein of Cochabamba, Bolivia. As amateurs well know one's profession can take that person far from home and such is the case of Barbara. Born in Jersey City, Barbara grew up in nearby Cliffside Park and earned a BA in art from the College of Saint Elizabeth. She became an advertising designer/copywriter for the college textbook division of Prentice-Hall and later, in the Pennsylvania Poconos region, set up an antique shop which offered restoration services for paintings, furniture and primitives. All that changed, however, when she joined the Sisters of Charity of St Elizabeth whose commitment to the people of Bolivia brought her eventually to the community of Cochabamba.

The Sisters of Charity have served the people of Bolivia for 25 years. Specifically, the Sisters' Bolivian mission is "to accompany the people of this developing country in their personal development and growth via education, health care, social service and catechetical work." Barbara has lived in Bolivia for seven years and has worked primarily with two groups of weavers as well as in the administration of a small country hospital. She continues to work with a group of young Bolivians who currently are initiating a small cottage industry in woodworking at a technical school.

Barbara's interest in Amateur Radio, however, goes back to her college years during the 50's when her roommate's floor model radio also tuned in a few amateur bands. Barbara developed a growing fascination for listening to a local amateur in regular contact with DX stations and soon tried her inexperienced hand with a Lafayette shortwave receiver kit. A few years later she purchased a Hallicrafters S120, erected a 25-foot vertical antenna and spent hours listening to amateurs. "This made me realize how much I wanted to enjoy personal contacts with others," said Barbara. "So I investigated the requirements to be a licensed amateur but in those days one had to take a six-week course at a center, usually in a large enough city."

Barbara had almost given up the idea of being a licensed amateur until a few months prior to departing for Bolivia. "I realized the need and possibility of Amateur Radio from Bolivia, so I wrote to ARRL requesting information for US citizens obtaining licenses abroad and kept the reply for future reference." During her first years in Bolivia, it was difficult to set up a station and it was not until 1984 that she

Barbara Grebenstein, left, works with group of weavers and their children from the Cochabamba Valley.

and another YL applied for Bolivian novice licenses. Together, they began Amateur Radio operation from Bolivia with a borrowed TS-130S and an inverted V. With the help of a good friend and missioner, CP8AB, Barbara established regular contacts with the more remote areas of Bolivia and in the process learned about radio.

The International Mission Radio Association (IMRA) donated a Swan 500C for use by the Sisters of Charity and, with a Johnson Viking Courier amplifier, the YLs had their own shack. "Along with our Bolivian schedules, we found 'fun-time' (even in the middle of the night) to work towards our 1st-class Bolivian licenses, mainly by making DX QSOs on 40 meters." (The Bolivian 1st-class license is available to a novice who meets the requirement of submitting 100 QSL cards from contacts consisting of at least 15 countries and 3 continents or by passing an advanced exam.) "The DX bug really bit me when I heard those faraway places," Barbara recalls.

In February 1986 Barbara became CP5LE, and after more than 30 years of interest in radio she could now contact other amateurs. "The bonus of all this was the realization that I was a DX station and there aren't too many English-speaking YLs working DX out of Bolivia!" The upgrade made possible regular contacts with the US and other countries off the continent, with families, friends, communities, primarily with the continued help of N2ACD, WB2LVB and W2GHB in the New York area. Most of this was done up to mid-1986 from the nearby station of a close friend and missioner, CP5HF (also a YL). Thanks to our "New York connection," the Swan 500C now works in tandem with a new TH3-Jr which sits atop a 32-foot tower donated by IMRA.

A QSO with CP5LE may reward you with this original QSL designed by Barbara.

CP5LE is active in her local radio club, which is more than just a group of amateurs. "Our club is the locally responsible institution for control and activity of radio amateurs in the entire state of Cochabamba. It offers us a means of interaction and service with many local amateurs on a regular basis." Recently Barbara and a friend gave a mini course on Amateur Radio at the National Scout Jamboree held in Cochabamba. As amateurs have done in the past, they discussed plans for the annual Scout Jamboree on the Air to be held later that year. Interest ran high, some having seen amateur equipment in friends' or relatives' homes while others knew nothing of Amateur Radio. It was also a means of informing the youth of the service aspect of radio. This was of particular appeal to this group as scouting stresses service to others.

Radio is very much related to Barbara's life as a missioner, as a means of personal and social service. Presently Barbara and CP5HF are setting up a 2-meter system with a group of Sisters who live in an area where there is no other means of communication with the city. A system of repeaters is already partially completed, making the 2-meter system possible. This service aspect of radio is the important and major reason why Barbara sought an amateur license.

This very busy YL is a member of YLRL, YLISSB, IARS and INDEXA. With the help of KU7F as her QSL manager, CP5LE works toward various awards and certificates. "I have a long way to go for some of the awards, but in the process what links everything are the many friends I made via radio. I believe the enjoyment I derive from DX is closely related to the endless possibilities that radio offers me to tell others something of Bolivia and its people, and I love doing it. From the two principal ancient cultures of the Quechuas and Aymaras to the breathtaking Andes, the country has much to share. Being able to talk personally with someone clear around the globe about his or her country gives me an increasing awareness of that same desire of a station who wants to QSO with CP5LE."

Washington Mailbox

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

Deed Restrictions and the Radio Amateur

In the last installment of this column (January 1988 *QST*, pp 55-56), we discussed zoning and other municipal restrictions on the installation and operation of Amateur Radio antennas. The impact of adverse antenna ordinances has been minimized by the PRB-1 preemption order. Municipalities, generally speaking, now understand that their desire to regulate antennas must be tempered by reasonable accommodation for Amateur Radio operation, and that only the minimum practical restrictions on antenna installations can be enacted. The trouble is, cities, towns and counties are not the only source of antenna regulation. Your neighbors, and the local homeowner's association, may have the authority to regulate antennas, too. PRB-1 can protect you from your town, but not from your neighbors.

Long before zoning regulation of land existed, private restrictions, placed in deeds, controlled the uses to which a parcel of land could be put. The English system of common law permitted a seller of land to impose certain restrictions on the use of that land, which that seller, even after the sale was long past, could enforce in the courts. These restrictions, formerly called covenants, were included in the deed from the seller of the land to the buyer. Today, deed restrictions are typically referred to as Covenants, Conditions and Restrictions, or "CC&Rs."

These days, covenants are used often, especially in new housing developments, by builders or developers as a means of controlling land use after individual parcels of land are sold. Suppose, for example, that a builder has a tract of 100 homes, and is selling them one at a time to families. The builder, until he is able to sell all of the lots, wants to control the use of the homes he already has sold so, for example, one of the buyers cannot paint his house 20 different colors, making the remaining unsold houses less marketable. Since the time of the CB boom in the mid-1970s, builders and developers have included antennas in the standard list of things they do not want homeowners to install while the builder is attempting to sell the remainder of the houses in the development. They are concerned that some people find them unattractive. So, when the subdivision plan is filed with the town, a list of covenants is filed as well, and every deed from the builder makes reference to the list, subjecting every buyer to the restrictions, and even subsequent buyers when a house in the development is sold again.

After the builder sells all the houses in the development, he has no further interest in enforcing the covenants. He has made his profit and is off to the next development. Typically, the declaration of covenants provide that enforcement authority passes at that time from the builder to the homeowner's association for the development and/or to individual homeowners themselves. The homeowner's association is charged with maintaining the aesthetics of the neighborhood, and often can determine whether any additional structures, such as a tool shed, swing set or antenna, can be built at all. If a homeowner installs an antenna in violation of the covenants, he or she can be sued, and in some cases, fines can be assessed in the form of liens on the land. Some advance research can help avoid costly problems later, as we will see.

Q. What are deed restrictions and how can I find out if there are any on my land?

A. Deed restrictions, filed with the land records office for cities or counties, are usually termed "Declaration of Covenants" or something similar. This master list of covenants, which is primarily a list of things not to be done on a particular tract of land, is referred to in deeds from the seller of land to a buyer. The land is sold to a buyer "subject to" the covenants on file. Even if you do not buy your land from the original builder who filed them, the covenants "run with the land" if they are referenced in the deed to any particular buyer. So, even though you may never have seen the list of covenants on file, and even though they are not fully explained in your deed, and even if you did not buy your home directly from the builder who established them, you are bound by them, as you have bought land which is itself subject to those restrictions. You should, before you sign a contract for the purchase of land, have your attorney check the land records for covenants.

Q. How can I avoid antenna covenants when I buy a house?

A. You may not be able to avoid them, but you can avoid surprises. Make sure that your contract for the purchase of land specifies that the purchase is contingent on the absence of any deed restrictions, covenants or conditions which would prevent or restrict your ability to install an amateur antenna at least (fill in the blank) feet in height. Require that, within two weeks of the signing of the contract, the seller give you a notarized statement to that effect. If there are such covenants, you could attempt to obtain approval for your proposed antenna from the homeowner's association, architectural control committee or the builder, in accordance with the covenants, before signing the contract to purchase the house.

Do not rely on oral representations of anyone involved. Unless you have written, unconditional authorization from whoever has the enforcement authority, you should not assume that you will be able to put up your antenna after you settle on the house. Your attorney should be consulted before the contract is signed.

Q. But in my area, I can't buy a new house, or even a recently built house, without covenants. Can't I challenge the covenants or get the FCC to invalidate them on that basis?

A. No. Both the courts and the FCC presently view antenna covenants as a private contractual matter between the buyer and seller of land. This may not be a realistic view as, more and more, amateurs have no alternative in choosing where to live. While the League attempts to change these attitudes, the fact that land without covenants is unavailable in a particular area does not make a good defense to covenant restrictions.

Q. Some amateurs have successfully asserted their rights to install antennas in spite of deed restrictions prohibiting antennas. How can this be done?

A. There are some standard defenses to covenants. The best one is to show that the restriction has not been enforced against others in the neighborhood. If there are CB antennas, or other amateur antennas, it may not be possible to enforce the restriction against you. Even in this case, however, there are limitations. One court has held that the existence of TV antennas in a development where covenants prohibited all antennas did not constitute abandonment. An amateur could not put up a beam antenna because the amateur antenna was held to be significantly different from smaller TV antennas. Also, do not assume that abandonment of one covenant will extend to others. If, for example, your neighbor keeps a boat in his driveway in violation of the covenants, this will not waive the anti-antenna covenant.

There are other defenses, however. The longer a covenant goes unenforced, the more difficult it is to enforce, as courts require prompt objections to covenant violations. Further, if actions of the homeowner's association have led the amateur to believe that approval was given or that the covenants would not be enforced, it is arguable that the amateur should be allowed to keep the antenna, even if in violation of the covenants.

Q. The covenants in my development do not prohibit the installation of amateur antennas, but do require the approval of the homeowner's association before any structures are erected. How do I convince them to approve my antenna?

A. Tactics differ, but generally the best strategy is to prepare in advance for the questions you are likely to encounter. Be prepared to tell them: (1) how you have planned the installation to minimize visual impact; (2) how it will be safe; (3) how it will enable you to conduct emergency and public service communications for the neighborhood (you might point out the advantages of your amateur station in neighborhood functions); (4) how it will not affect property values; (5) how RFI is minimized by higher antennas; and, (6) that you need it in order to communicate effectively and reliably. The best thing to do is to sit down with your immediate neighbors on all sides, explain what you propose to do and assure them that the Voice of America is not being constructed next door to them. If the approval of your immediate neighbors is obtained, the homeowner's association is much less likely to object. If you are anticipating much opposition, you might consider the advantages of a crank-up support structure and, as a compromise, offer to keep it cranked down when not in use.

Q. It sounds as though the FCC has protected us from antenna restrictions, only to allow the same restrictions from a different source. What is the League doing to alleviate this problem?

A. The ARRL Board of Directors considers covenants the most serious cumulative problem that faces amateurs at present. The League's Legal Strategy Committee is preparing factual data as to the pervasiveness of covenants, in order to show that deed restrictions are not just a matter of a contractual agreement between the buyer and seller of land. As it is the FCC's policy to protect its licensees against unreasonable local restrictions, it should state that anti-antenna covenants are not in accordance with public policy, to offer the amateur another tool to use in his effort to install an antenna that works. We will continue this work until the job is done.

Note: Questions in this column are typical of those commonly responded to by ARRL HQ staff. Questions and answers above have been prepared by ARRL Counsel Christopher D. Imlay, N3AKD.

Do You Remember These?

This ham radio trivia quiz, sent in by Glenn T. Lechner, NV8I, of Ortonville, Michigan, will test your knowledge of rigs, manufacturers and advertising from the 1960s and '70s. Material for this quiz was obtained from ads that appeared in *QST* during that time.

Give yourself three points for each correct answer on questions 1-20. Add two points for each correct in the matching section, questions 21-40. Rate yourself using the following.

- 90-100 Extra
- 80-89 Advanced
- 70-79 General
- 60-69 Technician
- 50-59 Novice
- 0-49 Newcomer to ham radio—Welcome!

1) This transceiver was a tri-band 200-W SSB-and-CW rig, model 753. Who was the manufacturer?

2) A favorite of 2-meter AM operators during the middle 1960s, the designator was TX-62. Who made this rig?

3) This rig was called the "Tornado." Who made it and what was the model number?

4) WRL was a big name in ham radio in the '60s. They made a five-band 300-W transceiver that was "out of this world." What was the model designator of this unit?

5) The HQ-170-VHF even covered the 6- and 2-meter ham bands. Who manufactured this receiver?

6) The "Benton Harbor Lunchbox" was another popular 2-meter AM rig. What was the manufacturer and model designator?

7) This rig was a favorite with the HF mobile operators, due to its built-in 12-V power supply and small size. SB34 was its designator; who manufactured it?

8) This manufacturer advertised "FREIGHT PREPAID on our V40, V80 and V160 VERTICALS!" Who was it?

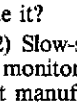
9) In the middle '70s, this digital 2-meter FM rig was a popular unit despite its hefty price. The designator was FM-DX. Who was the manufacturer?

10) The "C" line was a well-known HF lineup. What were the designators for the transmitter, receiver and transceiver, what was the company name and where was it located?

11) This middle-'70s ad headlines "THE TRANSCEIVER YOU'D EXPECT IN 1980 IS READY NOW!" What was the rig and who made it?

12) Slow-scan TV was popular in 1975. The SS2 monitor was available in kit form from what manufacturer?

13) This company manufactured aircraft radios in addition to a full line of 2-meter FM rigs which were popular in the mid-'70s. The GTX-200 was one of the lineup. Who was the manufacturer?



14) This 2-meter rig featured 12 crystal-controlled channels, 10 watts and crystals for 94, 52, 34/94 and 16/76. The model designator was the 826MA. Who was the manufacturer?

15) This 2-meter mobile rig featured 22 user-programmable channels by cutting diodes on a matrix board. Name the rig designator and manufacturer.

16) The NCX-5 was a five-band HF rig popular in the mid-'60s. Who was the manufacturer?

17) The Duo-Bander 84 was advertised in 1966 for only $159.95 wired! What was the company?

18) What band did the HW-22 cover?

19) The 700CX was a 700-W five-band SSB transceiver. Who made it?

20) This digital-readout general-coverage receiver was advertised as a "professional receiver" in 1979. The model designator was DR33C. Who was the manufacturer?

Match the items on the right with the correct name on the left. Names may be used more than once.

21) HT-37	A) Swan
22) 2B	B) Viking
23) DX-60	C) Midland
24) NC-200	D) Hallicrafters
25) 70A	E) Drake
26) 1200X	F) Collins
27) FM-27B	G) ICOM
28) Ranger	H) Kenwood
29) 240	I) Yaesu
30) HX-50	J) Motorola
31) R-599	K) Clegg
32) ML-2	L) Heath
33) 210	M) ROBOT
34) KWM-2	N) Johnson
35) Multi-2000	O) National
36) SPR-4	P) Hammarlund
37) Metrum II	Q) Atlas
38) 13-505, Ø or 9	R) KLM
39) 51S-1	
40) FM2XA	

Ham Trivia Answers

1) EICO
2) Ameco
3) Hallicrafters SR-500
4) Galaxy V
5) Hammarlund
6) Heath HW-30
7) SBE (Raytheon)
8) Gotham
9) Clegg
10) T4X-C, R4-C, TR4-C; Drake: Miamisburg, Ohio
11) Ten-Tec Trition IV
12) Venus
13) Geneave
14) Standard
15) ICOM IC-22S
16) National
17) WRL (World Radio Laboratories)
18) 40 meters
19) Swan
20) McKay Dymek Company

Matching Answers

21) D	28) N	35) R	
22) E	29) A	36) E	
23) L	30) P	37) J	
24) O	31) H	38) C	
25) M	32) E	39) F	
26) A	33) Q	40) A	
27) K	34) F		

Coming Conventions

NORTH CAROLINA STATE CONVENTION

April 10, Raleigh

The 16th Annual NC State ARRL Convention and Computer Fair, sponsored by the Raleigh Amateur Radio Society, will be held in the Jim Graham Building, NC State Fairgrounds, Hillsborough Street, just west of the Raleigh Beltline. Registration by mail is $4 each until April 2 and $5 at the door. A flea-market space, one table and two chairs (ours only), will be $6 each. FCC amateur exams will be given the same day. Preregister by contacting Vince Yakamavich, AA4MY. There will be an ARRL forum, ladies' programs, QCWA, NAVMARS, ARRL NTS/ARES meetings, CW, ARRL, AMSAT and RARS booth. Dealer setup Saturday, 4-10 PM and Sunday, 6-8 AM. Free welcoming party in the Hamfest Building, Saturday night, 7-10 PM. Wouff Hong Ceremony. Talk-in 146.04/64 and 146.28/88. For preregistration, flyer or dealer information contact Rollin Ransom, NF4P, write Rte 5, Box 267, Zebulon, NC 27597, or tel 919-269-4406.

MISSOURI STATE CONVENTION

April 15-17, Kansas City

The PHD ARA will sponsor the 1988 PHD Kansas City and Missouri State ARRL Convention at the Kansas City, MO Convention Center, 13 & Broadway, Kansas City, MO. Hours 8:30 AM-6 PM both days. There will be a complete program of forums and workshops, KCDX Club, packet, computers, ATV, ARRL, FCC and many more. 700 swap tables, large indoor flea market, tables $10 for both days. Preregistration $4 (door $5). Exams 7 PM Friday and 8 AM Sunday—$1 charge and must preregister by April 12. Banquet World Famous Gold Buffet on Saturday evening, $12.50 each. Guests include Paul Grauer, WØFIR, ARRL Midwest Division ARRL Director; Lee Hayford, AH2W, Manager ARRL Club Services; Bill Pasternak, WA6ITF, Producer Westlink Radio News; and others. All preregistrations honored if received by April 12. For registration and information send SASE to PHD ARA, PO Box 11, Liberty, MO 64068 or tel 816-781-7313.

April 10
North Carolina State, Raleigh

April 15-17
Missouri State, Kansas City

April 22-24
International DX Convention, Visalia, CA

May 14-15
Alabama State, Birmingham

May 20-22
Atlantic/New York State, Rochester

May 20-22
Midwest Division, South Sioux City, NE

ARRL NATIONAL CONVENTIONS

Sept 9-11, 1988—Portland, Oregon

June 2-4, 1989—Dallas-Forth Worth, Texas

INTERNATIONAL DX CONVENTION

April 22-24, Visalia

The ARRL International DX Convention is sponsored by the Southern California DX Club. It will be held at the Grosvenor Holiday Inn; you must make your own hotel reservations. There will be forums, contests, seminars, eyeball QSOs. Preregistration by mail is $38 per person; includes banquet and brunch. Please make checks payable to International DX Convention and mail to Don Bostrom, N6IC, 4447 Atol Ave, Sherman Oaks, CA 91423.

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.

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.

†**Connecticut (Southington)—April 17.** *Sponsor*: Southington ARA. *Time*: 9 AM-1 PM. *Place*: Southington National Guard Armory, 590 Woodruff St. *Features*: flea market, exams, refreshments. *Talk-in*: 146.28/88, 145.60 simplex. *Admission*: $2. *Tables*: advance $8, door $10. *Contact*: Chet KA1ILH, tel 203-628-9346, Joe N1ESB, tel 203-621-0916.

†**Georgia (Marietta)—April 2.** *Sponsor*: Kennehoochee ARC. *Time*: vendors 8 AM-4 PM, public 9 AM-3 PM. *Place*: Cobb County Civic Center in Marietta, exit 112 off I-75. *Features*: FCC exams at 10 AM, flea-market spaces. *Talk-in*: 146.28/88. *Contact*: Gene Clay, WA4JXB, 4021 North Cooper Lake Rd, Smyrna, GA 30080, tel 404-435-1229 after 4 PM or before 9 AM.

†**Illinois (Sullivan)—April 17.** *Sponsor*: Moultrie ARK. *Time*: 8 AM-3 PM. *Place*: Moultrie County 4-H Fairgrounds, Cadwell Rd, five miles east of Sullivan. *Features*: flea market, exams, preregistration only. *Talk-in*: 146.655/055 and .52 simplex. *Admission*: advance $2, door $3. *Tables*: no charge to vendors. *Contact*: MARK, PO Box 79, Sullivan, IL 61951 or call Vernon Jack, K9SWY, tel 217-728-7596.

†**Kansas (Hays)—April 24.** *Sponsor*: Hays ARC. *Time*: 8 AM-4 PM. *Place*: Old Bowling Alley, South of 13th & Cantorbury on the east side. *Features*: CW Contest, Fox Hunt, VE testing, packet classes, computer seminars. *Talk-in*: Hays rpt, 147.78/18. *Admission*: no advance, $5 at door. *Tables*: $5. *Contact*: Andy Oldham, NØFBS, 117 N 8th St, Wakeeney, KS 67672, tel 913-743-2712.

Massachusetts (Braintree)—April 10. *Sponsor*: South Shore ARC. *Time*: vendors 9 AM, public 11 AM with a fee of $1. *Place*: Viking Club, 410 Quincy Ave. *Features*: free parking, refreshments. *Tables*: (8 feet) $10 each paid in advance by April 7, payable to Hal Jones, WB1ABM, 48 Saning Rd, N Weymouth, MA 02191. Check receipt will be sent. No refunds after April 7; tables on day of event are $12. *Contact*: tel 617-335-5777 (Hal) evenings.

Massachusetts (Cambridge)—April 17. *Sponsor*: MIT Radio Society. *Time*: Vendors 7 AM, public 9 AM-4 PM Sunday. *Place*: Albany & Main St. *Features*: flea market, tailgating, free parking. *Talk-in*: 146.52 and 449.725. *Admission*: advance $5, door $6. *Contact*: W1XM, c/o Mike Strange, 229 Commonwealth Ave, Boston, MA 02116, tel 617-253-3776 (mail advance reservations before April 5).

Massachusetts (Fitchburg)—April 24. *Sponsor*: Montachusett ARA. *Time*: vendors 8:30 AM, public 10 AM-3 PM. *Place*: George Wallace Civic Center. *Talk-in*: 144.85/145.45 and 146.52. *Admission*: $2. *Tables*: $10. *Contact*: For table reservations, James Beauregard, KB1AY, 7 Mountain Ave, Fitchburg, MA 01420.

Massachusetts (Framingham)—April 10. *Sponsor*: Framingham ARA. *Time*: setup 8:30, public 9 AM. *Place*: Framingham Civic League, 214 Concord Street, Rte 126. *Features*: flea market, exams. *Talk-in*: 147.15 repeater. *Admission*: $5. *Tables*: $12. *Contact*: Jon Weiner K1VVC, 52 Overlook Dr, Framingham, MA 01701, tel 617-877-7166, exams $4.55 to ARRL/VEC, FARA, PO Box 3005, Framingham, MA 01701.

Minnesota (Bemidji)—May 7. *Sponsor*: Paul Bunyan ARC. *Time*: 8 AM. *Place*: Moose Lodge. *Features*: SKYWARN retraining, computer & packet radio demos, presentation of DX expedition, exams. *Talk-in*: 146.13/73. *Contact*: Paul Bunyan ARC, PO Box 524, Bemidji, MN 56601, tel 218-751-1964.

†**Minnesota (Duluth)—May 7.** *Sponsor*: Arrowhead RAC. *Time*: 10 AM-3 PM. *Place*: First United Methodist Church, at 230 East Skyline Parkway. *Talk-in*: 146.34/94. *Admission*: $4. *Tables*: (4 ft) $5. *Contact*: Ron Carlson, KØBR, 5128 Wyoming St, Duluth, MN 55804, tel 218-525-6860.

†**Minnesota (Fergus Falls)—April 16.** *Sponsor*: Lake Region ARC. *Time*: 8 AM-3 PM, testing starts at 10 AM. *Place*: Otter Tail County Fairgrounds Hockey Arena, US Hwy 59 on southeast edge of Fergus Falls. *Features*: VE testing, Northwest Packet Meeting, Army MARS State Meeting, flea market, refreshments. *Talk-in*: 146.04/64 voice and 145.01 packet. *Admission*: advance $3, door $4. *Contact*: Keith McKay, NØFKF, Rte 1, Box 46, Battle Lake, MN 56515, tel 218-826-6274.

Minnesota (Rochester)—April 9. *Sponsor*: Rochester ARC. *Time*: 8:30 AM. *Place*: John Adams Junior High School, 1525 NW 31st St, Rochester, MN. *Features*: flea market, refreshments, free parking. *Talk-in*: 146.22/82 MHz. *Admission*: advance $3, door $4. *Tables*: 8 or 6 feet $8. *Contact*: RARC c/o WBØYEE, 2253 Nordic Ct NW, Rochester, MN 55901.

†**New Jersey (Flemington)—April 16.** *Sponsor*: Cherryville Rpt Assn. *Time*: 8 AM-4 PM. *Place*: State Rte 31 at the Hunterdon Central High School Field House. *Features*: FCC exams, refreshments. *Talk-in*: 146.52, 147.975/375, 147.615/015, 222.52/224.12, 449.850/444.850. *Admission*: advance $3, door $4. *Contact*: Marty Grozinski, NS2K, GRA PO Box 308, Quakertown, NJ 08868, tel 201-788-4080.

New Jersey (Paramus)—May 22. *Sponsor*: Bergen County ARA. *Time*: 8 AM-4 PM. *Place*: Bergen Community College, 400 Paramus Rd. *Features*: Amateur testing Novice-Extra 8 AM-11 AM. *Talk-in*: 146.19/79 and .52 simplex. *Admission*: free. *Tables*: sellers $5 per space, tailgate only. *Contact*: Pete Adely, K2MHP, tel 201-796-6622 for testing information only. General information contact: Jim Joyce, K2ZO, 286 Ridgewood Blvd, Westwood, NJ 07675, tel 201-664-6725.

†**New Jersey (Pennsauken)—April 24.** *Sponsor*: Willingboro Area Rpt Group. *Time*: 8 AM to 2 PM. *Place*: Stardust Ballroom, from north (North Jersey, NY, CT) and south (South Jersey, DE, MD)—take NJ Turnpike to exit 4. Proceed on Rte 73 4.8 miles to Rte, 130. Go under Rte 73 and make a right onto Rte 73. Bear right to Haddonfield Rd (¼ mile). Stardust Ballroom is on left. Bear right and use jughandle at traffic light to enter hamfest site. *Features*: flea market, refreshments, VEC exams 10:30 AM (registration 9:45-10 AM). *Talk-in*: 146.925. *Admission*: Adults $3, advance $2.50, XYLs and children under 16 free. *Contact*: Willingboro Area Repeater Group, PO Box 472, Willingboro, NJ 08046, tel Jack Engel, K2KLM, 609-877-5249 after 6 PM.

New Jersey (Trenton)—April 23-24. *Sponsor*: Trenton State College RC. *Time*: 9 AM-6 PM Saturday, 10 AM-4 PM Sunday. *Place*: Trenton State College. *Features*: flea market, commercial exhibits, packet-radio forums. *Talk-in*: 146.07/67. *Admission*: no advance, at door $7 both days, $3 students and seniors, $5 Sunday. *Contact*: TCF-88, Trenton State College, Hillwood Lakes, CN4700, Trenton, NJ 08650-4700, tel. 609-771-2667.

†**New Jersey (Upper Saddle River)—April 9.** *Sponsor*: Chestnut Ridge RC. *Time*: 8 AM-3 PM. *Place*: Education Building, Saddle River Reformed Church, East Saddle River Rd & Weiss Rd. *Features*: refreshments. *Admission*: $1. *Tables*: $10 for the first, each additional table $5, tailgating $5. *Contact*: Jack Meagher, W2EHD, 27 Fourth St, Closter, NJ 07624, tel 201-768-8360.

New Mexico (Las Cruces)—April 23-24. *Sponsor*: Mesilla Valley RC. *Time*: 10 AM-4 PM. *Place*: Dona Ana County Fairgrounds. *Features*: VE exams, swap tables, refreshments, forums. *Talk-in*: 146.04/64, 146.16/76. *Admission*: $5 under 12 free. *Tables*: $6, overnight RV parking $5. *Contact*: Karl Hess, WF5A, 712 Stagecoach Dr, Las Cruces, NM 88001, tel (day) 505-646-5132, (night) 505-522-1172

New York (Auburn)—April 16. *Sponsor*: Auburn ARA. *Time*: Vendors 7 AM, Public 8 AM-4 PM. *Place*: Aurelius Volunteer Fire Department, Webster Rd, off Rtes 5 and 20, 3 miles west of Auburn. *Features*: refreshments, parking. *Admission*: $3 (advanced sales also). *Tables*: $5. *Contact*: James P. Nash, N2DTG, 114 Dunning Ave, Auburn, NY 13021, tel 315-253-0512.

†**New York (Melville)—May 1.** *Sponsor*: Suffolk County Radio Club. *Time*: 8 AM-2 PM. *Place*: Rte 110 about ¼ of a mile north of Harrison Rd, on east side of rte 110, Republic Lodge 1987, 585 Broad Hollow Rd. *Features*: Refreshments, free parking. *Talk-in*: 144.61/5.21. *Admission*: door $3, wives and children under 12 free. *Tables*: Indoor tables $10, outside spaces $7. *Contact*: Bill Sullivan, N2ETG, 23 Manchester Ln, Stony Brook, NY 11790, tel 516-689-9871.

†**New York (Owego)—May 7.** *Sponsor*: STARC. *Place*: Treadway Inn, Rte 17 at exit 65. *Features*: VEC exams, forums, flea market. *Talk-in*: 146.16/76 and 146.52. *Admission*: advance $3, door $4, under 14 free. Gate and dinner tickets combined $15. *Contact*: For more info or ticket orders, send SASE to STARC, PO Box 7082, Endicott, NY 13760.

Ohio (Dayton)—April 29. *Sponsor*: Miami Valley FM Assn. *Time*: 7 PM. *Place*: Conference Center (Madison Room) of the Hara Arena and Conference Center (same location as HamVention). *Features*: refreshments. *Admission*: free. *Contact*: Miami Valley FM Association, PO Box 263, Dayton, OH 45401.

Ohio (Dayton)—April 29-May 1. *Sponsor*: Dayton HamVention. *Time*: Noon Friday and continuing all day Saturday and Sunday. *Place*: The HARA Arena and Exhibition Center. *Features*: Giant 3-day flea market, technical forums, ARRL and FCC forums, new products and exhibits, special group meetings and much more. *Admission*: $8 advance, $10 at door. *Banquet*: $16 advance, $18 at door. *Contact*: Checks for advance reservation to Dayton HamVention, Box 2205, Dayton, OH 45401.

†**Ohio (Medina)—April 8.** *Sponsor*: Medina M2M Group, Inc. *Time*: 8 AM-2 PM. *Features*: special women's activities, specials for mother. *Talk-in*: 147.63/03. *Admission*: advance $3, door $4. *Contact*: Clarence Miller, 620 Oak St, Medina, OH 44256, tel 216-725-4492.

Oklahoma (Lawton)—April 16. *Sponsor*: Fort Sill ARC. *Time*: 8 AM-6 PM. *Place*: Comanche County Fairgrounds. *Admission*: $2. *Tables*: $5 preregistration only, tailgate $3. *Contact*: Edwin, AA5DS, 4624 NE Bell Ave, Lawton, OK 73507.

Oklahoma (Skiatook)—April 16. *Sponsor*: Green Country ARC. *Time*: 9 AM-5 PM. *Place*: Skiatook Community Center. *Features*: VE exams, flea market, commercial dealers. *Talk-in*: 147.045/645. *Admission*: door $3. *Tables*: $2. *Contact*: Troy Hammons, KA5EKA, 1800 E 176th N, Skiatook, OK 74070, tel 918-396-2713.

South Carolina (Charleston)—April 10. *Sponsor*: Charleston ARC. *Time*: 8 AM-5 PM. *Place*: Elks Recreation Site, Hwy 7 just south off I-26. *Features*: exams, flea market, dealers. Talk-in: 146.16/76. *Admission*: $5. *Contact*: Jenny Myers, PO Box 70341, Charleston, SC 29405, tel 803-747-2324.

†**South Carolina (Greenville)—April 30-May 1.** *Sponsor*: Blueridge ARS. *Time*: Saturday 8 AM-5 PM, Sunday 8 AM-3 PM. *Place*: 1 mile north of I-85 on US 25N Bypass. *Features*: flea market refreshments, free parking, indoor dealers. *Talk-in*: 146.01/61 primary, 146.22/82 backup. *Admission*: advance $4, door $5. *Contact*: Send SASE to BRARS, PO Box 6751, Greenville, SC 29606.

†**Tennessee (Clarksville)—April 9.** *Sponsor*: Clarksville Amateur Transmitting Society. *Time*: 8 AM-4 PM. *Place*: Clarksville National Guard Armory. *Features*: VE testing, flea market, refreshments, free parking. *Talk-in*: 145.205/805 or 147.98/38. *Admission*: $2. *Tables* $5 (contact Lucky Holeman, KF4L, Rte 2, Box 213A, Clarksville, TN 37043, tel 615-362-3859). *Contact*: CATS c/o Larry Burns, WD4DBJ, Rte 1, Box 162A, Indian Mound, TN 37079, tel 615-232-6141.

Tennessee (Clinton)—April 16. *Sponsor*: Oak Ridge ARC. *Time*: 8 AM-5 PM. *Place*: National Guard Armory. *Features*: refreshments, flea market, tailgating, FCC exams at 10 AM, (before April 15, send a check for $4.50 payable to WCARS/VEC, a copy of your license and a completed 610 form. Bring original license and two IDs to exam). *Talk-in*: 146.28/88, 146.37/97 backup. *Admission*: $3. *Tables*: 8 foot dealer tables $5. *Contact*: Ray Adams, N4BAQ, 4325 Felty Dr, Knoxville, TN 37918.

†**Tennessee (Columbia)—April 17.** *Sponsor*: Maury ARC. *Time*: 8 AM-4 PM. *Place*: Maury County Park in the Baker Building. *Features*: flea market, refreshments, free parking. *Talk-in*: 147.72/12. *Admission*: $2, children 12 and under free with an adult. *Tables*: (8-ft) $8 each. *Contact*: George Russell, WB4JCR, PO Box 832, Columbia, TN 38402, tel 615-388-0577.

†**Texas (Angleton)—April 16.** *Sponsor*: Brazosport ARC. *Time*: 8 AM-5 PM. *Place*: Brazoria County Fairgrounds. *Features*: swapfest, FCC exams, seminars, transmitter hunt, ARRL Forum. *Talk-in*: 147.98/38, 222.34/223.94, 147.54. *Admission*: advance $5, door $7. *Tables*: swapfest tables $5. *Contact*: BARC PO Box 291, Lake Jackson, TX 77566, tel (days) 409-233-8144, (nights) 409-345-5653.

†**Washington (Spokane)—April 9.** *Sponsor*: Spokane RAC/Inland Empire VHF Club. *Time*: 8 AM-5 PM. *Place*: Red Cross Bingo Hall, West 708 Boone. *Features*: Seminars, forums, DXing, packet radio, MARS, license exams, refreshments, parking. *Talk-in*: 144.830/145.430, 147.84/147.24. *Admission*: no advance, at door $2. *Contact*: Edward Ferrel, W7EQU, tel 509-487-1743.

†**West Virginia (Charleston)—April 9.** *Sponsor*: Kanawha ARC and Tri Counties RC. *Place*: Charleston Civic Center. *Features*: refreshments, forums. *Talk-in*: 146.28/88, 146.52 simplex. *Admission*: door $4. *Contact*: W. Doug Sweeney, N8AJC, 933 Glen Way, South Charleston, WV 25309, tel 304-766-6655 after 5 PM.

†**Wisconsin (Cedarburg)—May 7.** *Sponsor*: Ozaukee RC. *Time*: Vendors 7 AM, Public 8 AM-1 PM. *Place*: Circle B Recreation Center, Hwy 60 and County I, 20 miles north of Milwaukee. *Features*: refreshments. *Admission*: advance $2, door $3. *Tables*: $3 (4 ft). *Contact*: SASE, 1988 ORC Swapfest, 101 E Clay St, Saukville, WI 53080, tel 414-284-3271.

†ARRL Hamfest

Strays

QCWA BANQUET AT DAYTON

☐ The Dayton/Cincinnati Chapter 9 QCWA will hold its annual banquet in conjunction with the Dayton HamVention® on April 29, 1988, at Neil's Heritage House in Dayton. COD bar at 6:30; dinner at 7:30. Tickets are $13 each. For tickets, contact Bob Dingle, KA4LAU, 657 Dell Ridge Dr, Dayton OH 45429, tel 513-299-7114.

Guest speaker for the evening will be Carole Perry, WB2MGP, "Amateur of the Year" at last year's HamVention. QCWA membership is not a requirement to attend.

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is given to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in *italics* for each band listing. Initial qualifiers are shown first, followed by those with endorsements, for December 12, 1987 through February 12, 1988. An SASE will bring you the rules and application forms.

6 m (50 MHz)

100

281	WB5AFY
282	W0GN
283	KA1MVB
284	N4HB
285	N0CW
286	W7FIV
287	KX4R
288	WA5UFH
289	KA3ETI
K1GPJ	250
WB2MKN	175
KI3W	150
N4HB	175
KX4R	125
AK4T	150
W5HUQ	150
WA5UFH	200
K6CH	225
W7FIV	150
W7LQV	150
W7US	200
K8YAH	175
WA9FYB	175
N0CW	125
N0GPD	125
K0IFL	150

2m (144 MHz)

100

216	N5CTE
217	W5UUM
218	WA5PUP
219	W7RV
220	AA7A
221	N8GWG
222	N4HB
223	WB0HUO
224	WB5NAA
225	N4VC
226	N8CGY
227	AA4TJ
W2GU	150
W2RS	125
WD4AHZ	125
N4VC	125
W4ZD	200
K0IFL	125
WA0TKJ	250

1.25 m (220 MHz)

50

27	WB9MSV

70 cm (432 MHz)

50

113	WA0TKJ
114	WB2DNE
W5HUQ	80
K8WW	170
W0RAP	180
WA0TKJ	70

23 cm (1296 MHz)

25

WA0TKJ	35

10 GHz

5

28	K8HLH

(continued from page 53)

authority (such as the conduct of its foreign relations in whole or in part, or other functions such as customs, communications or diplomatic protection) *without* surrendering its sovereign status. DXCC country status for such an entity is individually considered, based on all the available facts in the particular case. In making a reasonable determination as to whether a sufficient degree of sovereignty exists for DXCC purposes, the following characteristics (list not necessarily all-inclusive) are taken into consideration:

a) Membership in specialized agencies of the UN, such as the International Telecommunication Union (ITU).

b) Authorized use of ITU-assigned call sign prefixes.

c) Diplomatic relations (entering into international agreements and/or supporting embassies and consulates) and maintaining a standing army.

d) Regulation of foreign trade and commerce, customs, immigration and licensing (including landing and operating permits), and the issuance of currency and stamps.

An entity that qualifies under Point 1, but consists of two or more separated land areas, will be considered a single DXCC country (since none of these areas alone retains an independent capacity to carry out the obligations of sovereignty), *unless* the areas can qualify under Points 2 or 3.

Point 2, SEPARATION BY WATER

An island or a group of islands which is part of a DXCC country established by reason of **Government**, Point 1, is considered as a separate DXCC country under the following conditions:

(a) The island or islands are situated off shore, geographically separated by a minimum of 225 miles of open water from a continent, another island or group of islands that make up *any part* of the "parent" DXCC country.

For any *additional* island or islands to qualify as an additional separate DXCC country or countries, such must qualify under Point 2(b).

(b) This point applies to the "second" island or island grouping geographically separated from the "first" DXCC country created under Point 2(a). For the second island or island grouping to qualify, at least a 500-mile separation of open water from the first is required, as well as meeting the 225-mile requirement of (a) from the "parent." For any subsequent island(s) to qualify, the 500-mile separation would again have to be met. This precludes, for example, using the 225-mile measurement *for each* of several islands from the parent country to make several DXCC countries.

Point 3, SEPARATION BY ANOTHER DXCC COUNTRY

(a) Contiguous land mass: Where a country, such as that covered by Point 1, is totally separated by an intervening DXCC country into two areas which are at least 75 miles apart, *two* DXCC countries result. This straight line measurement is made at the closest point, and may include inland lakes and seas (that are part of the country) in the measurement. International waters may be included in the separation but do not contribute to the 75-mile minimum requirement.

(b) Islands: Where two islands, of the government under Point 1, are totally separated by an intervening DXCC country (also under Point 1), each island counts as a separate DXCC country. No minimum distance is required. The test for total separation means that a straight line cannot be drawn from any point on one island to any point on the other island without passing through another DXCC country. This intervening country may be part of either island, another island, or part of a continent.

Point 4, INELIGIBLE AREAS

(a) Any area which is unclaimed or unowned by any recognized government does not count as a separate DXCC country.

(b) Any area which is classified as a Demilitarized Zone, Neutral Zone or Buffer Zone does not count as a separate DXCC country.

(c) The following do not count as a separate DXCC country from the host country: Embassies, consulates and extra-territorial legal entities of any nature, including, but not limited to, monuments, offices of the United Nations agencies or related organizations, other inter-governmental organizations or diplomatic missions.

SECTION III. DELETION CRITERIA

A DXCC country is subject to deletion from the ARRL DXCC Countries List if political change causes it to cease to meet Point 1 of the Countries List Criteria (a derivative of such change may cause it to cease to meet Points 2 or 3) or if it falls into Point 4 of the criteria. Additions to and deletions from the DXCC Countries List come about as a result of a myriad of such political changes. Reviewing the nature of the changes which have occurred since 1945 as they affect DXCC, these changes can be grouped into categories as follows:

(a) **Annexation**. When an area that has been recognized as a separate country under Point 1 is annexed or absorbed by an adjacent Point 1 country, the annexed area becomes a deleted country. Examples: India annexed Sikkim (AC3); China annexed Tibet (AC4); Indonesia annexed Portuguese Timor (CR8).

(b) **Unification.** When two or more entities that have been separate DXCC countries under Point 1 unite or combine into a single entity under a common administration, one new DXCC country is created and two or more DXCC countries become deleted. Example: Italian Somaliland (I5) plus British Somaliland (VQ6) became Somalia (6O/T5).

(c) **Partition.** When one country is divided or partitioned into two or more countries, one DXCC country is deleted and two or more DXCC countries are created. Example: French Equatorial Africa (FQ) was deleted and replaced by Central Africa (TL), Congo (TN), Gabon (TR) and Chad (TT). The partition category is *not* employed when the original political entity continues in some form. That is, if part of country A splits off to form country B, the original DXCC country (A) is retained and one new DXCC country (B) is added. Examples: the British Sovereign Bases on Cyprus (ZC4); Aruba (P4).

(d) **Independence.** Mere independence does not result in a Countries List deletion. Examples: the Tonga Islands, then a British protectorate (VR5), is the same country as the present listing of the Kingdom of Tonga (A3). Further, an entity already recognized as a separate DXCC country is *not* deleted because of a change in its independent status. Bangladesh (S2) is the same listing as East Pakistan (AP), which was already separate from West Pakistan by virtue of Point 3. Also, a country that merely changes its name (such as when Upper Volta became Burkina Faso) does not change its basic status as a DXCC country on the DXCC Countries List.

SECTION IV. ACCREDITATION CRITERIA

1. The many vagaries of how each nation manages its telecommunications matters does not lend itself to a hard set of rules that can be applied across the board in accrediting all Amateur Radio DX operations. However, during the course of more than 40 years of DXCC administration, basic standards have evolved in determining whether a DX operation meets the test of legitimate operation. The intent is to assure that DXCC credit is given only for contacts with operations that are conducted appropriately in two respects: (1) proper licensing; and (2) physical presence in the country to be credited.

2. The following points should be of particular interest to those seeking accreditation for a DX operation:

(a) The vast majority of operations are accredited routinely without any requirement for submitting authenticating documentation.

(b) In countries where Amateur Radio operation has not been permitted or has been suspended or where some reluctance to license amateur stations has been evidenced, authenticating documents *may* be required prior to accrediting an operation.

(c) Some DXCC countries, even though part of a country with no Amateur Radio restrictions, nevertheless require the permission of a governmental agency or private party prior to conducting Amateur Radio operations on territory within their jurisdiction. Examples: Desecheo I. (KP5); Palmyra I. (KH5); Kingman Reef (KH5K).

3. In those cases where supporting documentation is required, the following should be used a guide as to what information may be necessary to make a reasonable determination of the validity of the operation:

(a) Photocopy of license or operating authorization.

(b) Photocopy of passport entry and exit stamps.

(c) For islands, a landing permit and/or signed statement of the transporting ship's, boat's or aircraft's captain, showing all pertinent data, such as date, place of landing, etc.

(d) For some locations where special permission is known to be required to gain access, evidence of this permission having been given is required.

4. These accreditation requirements are intended to preserve the DXCC program's integrity and to ensure that the program does not encourage amateurs to "bend the rules" in their enthusiasm, thus jeopardizing the future development of Amateur Radio. Every effort will be made to apply these criteria in a uniform manner in conformity with these objectives.

Exploring Ham Radio

Conducted By Rosalie White, WA1STO
Assistant Manager, Club Services Department

Amateur Radio Weekend Licensing Class

One of the first Amateur Radio weekend licensing classes was held by Gordon West, WB6NOA, last June. In past years he has helped more than 1000 people earn their Novice and higher licenses in his evening classes at Coastline Community College in California. When Novice Enhancement hit, a flood of inquiries swamped the school and enrollees took all the available class times. So Gordon decided to offer his "Novice voice-class license" course in its entirety during a single weekend. It was so successful that he offered it again in July, in August and yet again in October.

What Radio School's Weekend Classes are Not

Radio School's weekend classes are not a shortcut in teaching. They are not cram courses, but a compression of learning for those who cannot attend traditional *12-week, 2-hours-per-week classes.* Home study periods culminate in one final weekend course. Radio School stresses the very short time between start and finish, which enrollees find very appealing. Students visualize "a painless, rapid capsule of instruction," according to West.

Class Structure Prior to the Big Weekend

Study begins for most students when they first sign up at least 30 days prior to the actual weekend class. Radio School personnel send study materials immediately to enrollees. Their enthusiastic "welcome letter" states: "Get a jump on class and start your study now! Begin learning the code by playing the first tape cassette...take out a pencil and paper and have some fun. And the enclosed theory book is what we use in class, so start now by beginning with the first chapter. See if you get through the book before our weekend course begins."

Two weeks prior to the big weekend, followup letters and telephone calls ensure prestudying by students. "That's the key in making this weekend class work," states West. At this point enrollment stops unless those inquiring already know some code or theory. Traditional course instructors assign homework when handing out books and tapes at the first session. They often present movies, videotapes or radio demonstrations to whet appetites. Students may or may not be familiar with Amateur Radio. So "Weekenders" begin with a head start and a definite goal in sight.

The Big Weekend

The group first meets Friday afternoon, studying together until evening. Class resumes Saturday, convening through to the night, and continues through Sunday. Students take the exam that evening. The *group absorbs more than 20 hours of code,* theory, and on-the-air sending and receiving. The latter covers good operating techniques. The class design, of the "Question and Answer format," incorporates audio-visual materials and props. Students learn "how to recognize why the correct answer is indeed right," says Mr. West. "We have carefully planned our code and teaching syllabus to integrate actual equipment operation into every hour of our instruction." At hourly breaks local hams present mini-demonstrations of equipment to highlight answers to specific questions or just to illustrate favorite aspects of Amateur Radio. West invites area hams to observe that the weekend instruction is really equal to conventional courses. In comparison, traditional class schedules run 10-14 weeks in length. Instructors design weekly two-hour classes, plus homework. The format varies from half code and half theory to all theory with a separate code class using on-the-air practice. Having no time limit allows a less rigid outline, fitting it to the students' individual abilities. A sponsoring club may implement an Elmer program encouraging and assisting students, and offering an equipment show-and-tell. Instructors use audiovisual materials they create or find in publications such as *The ARRL Novice Instructor's Guide.*

Radio School boasts a 95% pass rate for the first round of tests. "Outside examiners, separate from the instructors, administer the exams. Radio School allows three attempts per examination element (and uses different tests for each try). West encourages those students who do not pass to study at home for one week and then retake the exam. Traditional course teachers administer "practice" exams during the final weeks of their class. Examiners proclaim practice exams as *the* exam, if they're passed. Students are a lot calmer than when they *believe they're "under the gun."*

Harried parents, salespeople on the road (who listen to tapes while driving), professionals or anyone with limited time find the weekend concept very appealing. It allows those needing an extra push to put in just a little more effort and reach the Novice goal.

Adapting Your Methods to a Trial Weekend Class

If teaching a weekend course of this type interests you or your club, keep in mind the following points. Intense classroom study requires fast-paced instructors who can quickly and clearly present the material. A teacher must reorganize standard lesson plans to fit a three-day period. Prestudy cannot be stressed enough. When thinking of a location for the classroom, consider room size—Radio School always draws approximately 50 people. Find nearby food establishments (unless meals are to be catered such as Radio School does) and restrooms in order to keep break time to a minimum.

What is *Your* Reaction?

A number of questions usually surface when raising the issue of intensive weekend study. What type of Novice are we attracting with this style of Amateur Radio class? Does one month of prestudy followed by a weekend of compressed learning provide a person with enough guidance in how seriously we take our privileges? The purpose of the Novice license is to give someone a license to learn. This is true whether the amateur earns the ticket through a traditional method or weekend course. A license is only as good as the effort one puts into it. We must impress that on students in weekend, self-study and regular classes, *and* on ourselves.

Gordon West, WB6NOA, utilizes numerous types of radio equipment and accessories to incorporate effective teaching.

Conducted By
Vern "Rip" Riportella, WA2LQQ
PO Box 177, Warwick, NY 10990

Phase 3C Operating Schedules

Last month, I introduced AMSAT's new Phase 3C satellite. Launch is now scheduled for late May, so as you're reading this the launch process could be nearing its countdown stages. Last month, I said there are five key facts you need to know in order to operate the new satellite, and I explained some of them. This month, let's look at another important aspect of operating: operating schedules.

The operating schedule of Phase 3C is a means of planning *what* happens *when*. There are two primary determinants of an operating schedule: power budgets and technical compatibility of activities.

The power budget of the satellite is directly related to the availability of sunlight to the solar-cell arrays. Without sunlight, the satellite's batteries would soon be exhausted, and the satellite would be forever mute thereafter. Even though the high elliptical orbit of Phase 3C takes it out to 36,000 km (22,000 miles), there are occasions when the positions of the sun, earth and satellite are such that the satellite falls into the earth's shadow. These "eclipses" come and go in cycles. They can occur up to once per orbit, and can last only a few minutes; others stretch to durations of more than an hour.

In any case, the spacecraft cannot be safely operated with a negative power budget (more power being consumed than is being generated) for very long. During an eclipse, the on-board computer[1] and various other subsystems are powered from the battery, but the power-hungry transponders are shut down.

Because the satellite's Mode B receiver and the Mode-JL transmitter both use the 70-cm band, it's impractical to run Modes B and JL simultaneously.[2] Some arrangement needs to be made to tell which mode is in use. This arrangement takes the form of the operating schedule.

The most widely recognized terrestrial "standard" time is Coordinated Universal Time (UTC). When dealing with satellites, however, it's often most convenient to use the time as kept by the satellite as the frame of reference. Let's see how this works and why satellite time is employed in the first place. We'll examine this question by analogy to the earth year and earth day.

A "year" in earth time is simply the length of time it takes the earth to make its way around the sun and return to its place of origin. For smaller time intervals, we use the "day" and then divide it into successively smaller units. Significantly, the length of the day—the time required for the earth to rotate once—is unrelated to the length of the year. That's why the day is about 0.00273785 years (1 year = 365.25 days, approximately), and not some nice even number, say 0.001 (1 year = 1000 days). The rotation of the earth is not, to any degree we can detect, synchronized with the motion of the earth around the sun.

For example, in setting up an operating schedule for the baseball season, we could simply say the regular season runs from day 95 (April 4) to day 265 (September 21). The year's calendar begins with day 1, January 1. That's when we reset the clock (calendar) and start again.

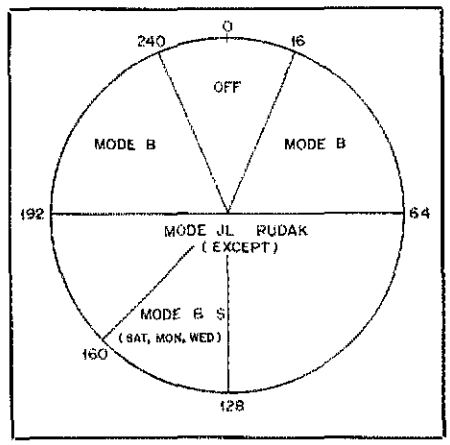


Fig 1—Sample Phase 3C operating schedule.

Let's complete the analogy now. Assume the Phase 3C satellite is the earth. Assume further that its year is defined as the time required for one complete orbit around its "sun," which in this analogy is really the earth. Let's assume that Phase 3C makes one circuit of its elliptical orbit in 11 hours; the satellite "year." Let's call it an S-year.

We could then divide the S-year into S-days (satellite days) of any convenient length. But, just as the rotation of the earth about its axis is unrelated to the movement of the earth around the sun, the rotation of the satellite about its axis is unrelated to its movement around the earth. So, it makes more sense to define an S-day in units that have some significance.[3]

What makes sense is to divide the S-year into 256 S-days. Many of you will recognize 256 as the number 2 raised to the 8th power, and powers of two are easily handled by computers. So, by "decree" alone, there shall be 256 S-days per S-year. Also by decree, the S-year is said to begin at the instant the satellite passes through its closest point to earth—its perigee. Conversely, halfway through its orbit, when the satellite is at its farthest from earth (apogee), the satellite is at S-day 128, or halfway to 256. Just remember, perigee equals "New Year"!

Now we can express a satellite operating schedule simply in terms of S-days, just as we earlier expressed the baseball season in terms of its start and end dates. We could say, for example, that Phase 3C Mode B will be on from S-day 82 to S-day 150.

In practice, the terms S-day and S-year aren't used, however. These terms are simply constructs for this column. In fact, users of amateur satellites use the term "phase," often designated by the Greek letter phi (ϕ), or the term "Mean Anomaly" (MA), to refer to the position of the satellite on its orbit (what we've referred to as S-day so far). When MA = 0, the satellite is at S-day 0—perigee. When the satellite is at MA = 128, the satellite is at S-day 128—apogee. Each of the points in between represents equal increments of time.[4]

That would make perfect sense if you had a clock by which to reckon what the MA time was. And, because most earthlings reckon time with clocks that synchronize with the sun (more or less), it sure would be handy to know how to set the alarm clock to rise for an early morning orbit!

Let's assume the orbital period is exactly 11 hours. Because the orbit is divided into 256 equal-time increments called MA units or MA ticks, each tick must be 11/256 = 0.043 hour, or 2.58 minutes long. Using our sample operating schedule, when we say Mode B begins at MA 82 and runs to 150, we can now figure out what that means in terms of time of day. Assume perigee occurred at 12:00. Recall that at perigee, MA = 0. To find the time when MA = 82, take 82 × 2.58 = 211.4 minutes = 3.52 hours. So, MA 82 occurs about 3½ hours after perigee, or at about 15:31. Now, find when MA 150 occurs. Take 150 × 2.58 = 386.7 minutes = 6.44 hours. So, MA 150 occurs about 6½ hours after perigee, or at about 18:27. We can now see that this Mode B episode lasted from 15:31 to 18:27, or a little less than 3 hours. To double check, take 150 − 82 = 68. Then 68 × 2.58 = 175.44 minutes = 2.92 hours.

Is there an easier way to correlate the

operating schedule to time of day? The easiest means by far is to let a computer be your clock. Many AMSAT tracking programs (those of which I'm aware) actually tell you what the exact MA is at that instant. Then, you plan your operating practices according to what the computer's MA clock tells you.

But suppose you don't yet use a computer. How can you tell what the phase or MA is? For this, you will need to know when perigee occurred. This information is available from many sources. AMSAT Nets or AMSAT Area Coordinators can often supply you with this information. When you know when the perigee occurred, you know when the MA clock started, and you can carry on from there.

Finally, Phase 3C will broadcast its own reckoning of the phase or MA in its telemetry. If you can read the PSK or CW telemetry, it will tell you exactly what the MA is. Thereafter, you can synchronize your reckoning with that of the IHU because *it* is the controlling element that determines when to turn on one transponder and turn off another. Thus, the IHU knows where the satellite is in its orbit, and the IHU's reckoning of that position determines what the MA is and what activities and configurations shall occur.

Next month I'll have a feature article on Phase 3C with an overall summary of the spacecraft and what's needed to operate it.[5]

Notes

[1]The on-board computer in the Phase 3 series of spacecraft is called the Integrated Housekeeping Unit, or IHU.

[2]Mode definitions were provided last month in Table 1. Even if there weren't frequency conflict problems with running Modes B and JL concurrently, the combined power consumption of the two would be prohibitively high.

[3]The spin rate (angular velocity) of Phase 3C will be set at about 35 r/min (3.67 radians/sec).

[4]Mean Anomaly, MA, normally refers to the angle that increases uniformly with time to indicate where the satellite is along its orbit. (Compare Mean Anomaly to True Anomaly.) Experts in the field will recognize that MA, as used in this context, clearly refers to a point *in time* rather than an angle. The period of the orbit is divided into equal "time" increments we call MA units. These *do* correlate to positions along the orbit as determined by the angle MA as used in the classical sense. That is, specifying the position in terms of time after perigee is equivalent to specifying the angle that increases uniformly at a known rate beginning at perigee. Thus, the only practical difference in expressing orbital position is the dimension of expression. In one case, degrees are used; in the other, the implied unit is time—perhaps in minutes. We have often referred to ticks of the MA clock, but this is a mere ad hoc construct. What may not be clear, however, is that the satellite's velocity changes during the course of its orbit. This can be described in terms of Kepler's second and third laws of planetary motion. So, although MA ticks are uniformly spaced in time, the distance traveled by the satellite between successive ticks varies dramatically.

[5]Free information about Phase 3C and how to get started in the satellite program is available from AMSAT, PO Box 27, Washington, DC 20044.

W1AW Schedule

April 3-October 29, 1988 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0200, 1300, 2300; TThSSn: 2000; Sn: 0200
	Fast Code Practice	MWF: 2000; TTh: 0200, 1300; TThSSn: 2300; S: 0200
	CW Bulletins	Dy: 0000, 0300, 2100; MTWThF: 1400
	Teleprinter Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Voice Bulletins	Dy: 0130, 0430
EDT	Slow Code Practice	MWF: 9 AM, 7 PM; TThSSn: 4 PM, 10 PM
	Fast Code Practice	MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM
	CW Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Teleprinter Bulletins	Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM
	Voice Bulletins	Dy: 9:30 PM, 12:30 AM
CDT	Slow Code Practice	MWF: 8 AM, 6 PM; TThSSn: 3 PM, 9 PM
	Fast Code Practice	MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM
	CW Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Teleprinter Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Voice Bulletins	Dy: 8:30 PM, 11:30 PM
MDT	Slow Code Practice	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM
	Fast Code Practice	MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM
	CW Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Teleprinter Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Voice Bulletins	Dy: 7:30 PM, 10:30 PM
PDT	Slow Code Practice	MWF: 6 AM, 4 PM; TThSSn: 1 PM, 7 PM
	Fast Code Practice	MWF: 1 PM 7 PM; TTh: 6 AM; TThSSn: 4 PM
	CW Bulletins	Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM
	Teleprinter Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Voice Bulletins	Dy: 6:30 PM, 9:30 PM

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.

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.

On Monday, Wednesday and Friday, 1300 through 2100 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz; on Wednesday at 2200 UTC they are beamed south.

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 June 1987 *QST*, pages 9 and 70" 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 70.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Tuesdays and Saturdays at 2230 UTC, Keplerian Elements for active amateur satellites will be sent on the regular teleprinter frequencies.

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 1500 UTC transmissions, and 2200 UTC on WThFSn. 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 AM to 1 AM EDT and on Saturday and Sunday from 3:30 PM to 1 AM EDT. 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 PM 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 April 1, May 30, July 4 and September 5.

Strays

I would like to get in touch with...

☐ anyone with a manual or a schematic for a Realistic DX-160 receiver. W. C. Spenn, WR5Q, Box 33081, San Antonio, TX 78265.

☐ anyone with owner's and shop manuals for a Swan 150. Dick Strautman, KAØSKY, Box 19862, Jacksonville, FL 32245.

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

KA1EC, Donald A. Ross, Noank, CT
W1FMI, Charles M. Sawyer, Waterville, ME
WA1FOW, Joseph F. Litwin, Topsfield, MA
KB1JB, Leon Tritter, Canton, MA
KB1MA, Elwin F. Starrett, Union, ME
W1MWF, Joseph E. Devin, Brighton, MA
KA1NWU, Doris M. Babcock, Palermo, ME
W1QJM, Stanley P. Williams, Guilford, CT
WA1VER, Fred W. Hilse, Jr, Cape Elizabeth, ME
KB2BDJ, Rocco D'Amico, New Rochelle, NY
N2BN, Lt Col William B. Smith, Jr, Ret, Plattsburgh, NY
N2CWF, George L. Page, Wilson, NY
W2DRN, Thaddeus L. Mocniak, Niagara Falls, NY
K2GV, Philip B. Wainwright, Amityville, NY
WB2IUN, Edwin C. Hutter, Princeton, NJ
W2LRB, Howard C. Foeri, Roselle Park, NJ
*W2MIO, The Rev Harry J. Sutcliffe, Brooklyn, NY
WB2PZI, Fred J. LaVoice, North Syracuse, NY
WA2RTZ, George L. Karas, Schenectady, NY
W2VM, Edward W. Sanders, Geneva, NY
W3BPJ, Horace L. Wolf, Floral City, FL
K3CIS, Herbert G. Taylor, Bethlehem, PA
N3FMW, Ronald G. Daman, Beaver, PA
KA3LNC, Merle L. Ballou, East Swanzey, NH
W3STG, Robert W. Mallonee, Churchton, MD
W4ACA, Edwin B. Garrett, Pisgah Forest, NC
N4BYD, Olin B. Hammond, Lithonia, GA
KB4EEP, Lee R. Blackburn, Newbern, TN
WD4EQJ, Harry B. Hyman, Myrtle Beach, SC
W4FZF, James V. Orsburn, Henderson, KY
KA4IBW, Brad E. Stratton, Cleveland, GA
KA4IOJ, D. H. Spechler, Hollywood, FL
N4KOV, J. C. Haydon, Oak Ridge, TN
N4NB, Jack C. Bricker, Auburndale, FL
K4RLK, T. Harold Wier, Titusville, FL
KA4URZ, Clyde H. Mills, Mableton, GA
WS4V, Richard Harshaw, Miami, FL
KA4ZRB, Mable I. Watson, Valparaiso, FL
W5ADC, James R. Booker, Holdenville, OK
WD5CVX, Carl L. Sheffield, Jr, Kountze, TX
W5CXE, Kenneth W. Cochran, New Iberia, LA
W5DMK, Lee Toothman, Shreveport, LA
N5DWL, Ray E. Yother, Inman, SC
W5FFM, Eldon F. Tatum, Silsbee, TX
W5KWR, Francis J. Gormley, Santa Fe, NM
*K5RYS, Virgil F. Kain, Hot Springs, SD
WB5VRX, D. R. Martinez, Custer, SD
K16BH, John A. Roseen, La Canada, CA
*K6BXB, Arthur J. Sassone, Red Bluff, CA
W6DTF, Frederick J. Haines, Escondido, CA
W6EAR, John B. Nelson, Half Moon Bay, CA
WA6EQK, Alfred C. Blanchard, Oakland, CA
K6ETY, Lester R. Burger, Point Reyes Station, CA
KH6GS, Jack Chung, Aiea, HI
WA6MOJ, Timothy H. McDaniel, Pasadena, CA
W6UO, Richard T. Parks, San Francisco, CA
KD6VW, Percy L. Porter, Los Angeles, CA
WA6WEK, Raymond M. Staples, Newhall, CA
W7AAC, Robert C. Ellis, Portland, OR
K7GPK, Emil Koth, Tacoma, WA
KL7HEX, John C. Dickens, Anchorage, AK
W7PHO, William H. Bennett, Seattle, WA
W7QYK, Milo Taber, Elko, NV
K7TDF, Kenneth W. Busboom, Sr, Lakeside, AZ
WA7UTK, James A. Cozzalio, Wauconda, WA
KA7VSZ, Harley K. Gray, Torrance, CA
K8AJY, William J. Edmonds, Lachine, MI
W8ARW, Carl B. Snyder, North Fort Myers, FL
W8BOT, Laurence E. Madison, Chagrin Falls, OH
K8BPK, Ralph H. Bischoff, Defiance, OH
W8CSG, Marion R. Longworth, Chelsea, MI
WB8DHW, Cyril F. Harrell, Cincinnati, OH
WD8IZI, Harold L. Griffin, Edwardsburg, MI
K8KOB, Frank Koch, Kettering, OH
W8KYI, Harlan A. Slater, Oberlin, OH
WD8LIO, Donald W. Salmon, Menlo Park, CA
W8NDY, Edward A. Stracka, Garden City, MI
W8RP, Roy J. Purchase, Ann Arbor, MI
KD8SB, Robert G. Shullick, Lorain, OH
W8SDU, Shelby O. "S.O." Watts, Huntington, WV
W8TCA, Charles A. Fastinger, Oak Harbor, OH
WB8VFM, William A. Craig, Detroit, MI
WB8ZGY, Joseph R. Ramsey, Elyria, OH
W9CVB, Carl O. Lindahl, Ashland, WI
W9FN, Richard Carl Vail, Richmond, IN
KA9GCY, Emil L. Forth, North Aurora, IL
WD9GWQ, Leo Wantuch, Lake Villa, IL
KA9MEF, Norman T. Robey, Freeport, IL
W9MVR, Bertram W. Heuvelman, Richmond, IL
W9SOM, Max Stephens, Hopedale, IL
W9WYF, Emil Kumershek, Milwaukee, WI
WD0AKT, John P. Ryder, Chisholm, MN
*W0AM, C. W. Wade, Goodland, KS
W0CGT, James A. Poland, Severna Park, MD
W0DRD, J. Herbert Hollister, Boulder, CO
WD0FMN, Martin J. Dinndorf, Albany, MN
WA0FMV, Paul M. Thomson, Sr, Florissant, MO
W0IGZ, Edwin Wicklund, Kensington, MN
W0MV, Kline E. Bower, Willmar, MN
W0POJ, Marc R. Demanche, Mount Pleasant, IA
N0RT, Ralph W. Tibbils, Monett, MO
W0UKB, John W. Christy, Minneapolis, MN
K0UVD, John M. Wheeler, Greeley, CO
W0UXB, Otis E. Powers, Hermann, MO
VE1ACC, Sheldon Barkhouse, Queens Co, NB
VE3AMF, Mike Shack, London, ON
VE3CZW, J. Robert Dunbar, Amherstview, ON
VE3HHL, A. Edwin Emery, Willowdale, ON
G3FIH, Leslie A. Lear, Bath, Great Britain

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ. Canadian reports should be sent to the CRRL HQ address on page 9.

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

April, 1938

☐ Revised organization concepts in the new A.R.R.L. Emergency Corps proved their validity when flood waters inundated parts of six counties in southern California. Amateur communication helped keep destruction to a minimum.

☐ Communications Manager Handy's treatise on emergency communications planning will become the nucleus of a special booklet on the subject to be issued by the League.

☐ W6GPY resurrects the loop antenna design for receiving purposes and finds it highly useful in nulling out unwanted interference.

☐ Reducing exposed high voltage points is a major objective of W2BRO's "concentric line" tank—an inner conductor for d.c. plate power and an outer (copper tubing) capacity-coupled to deliver the r.f.

☐ Arthur Watts of the Radio Society of Great Britain and the League's Warner and Segal are representing the amateur service at the world radio conference in Cairo, where 71 countries have gathered to revise the radio regulations. No amateur frequency matters have yet been on the agenda, but (thank goodness!) the Japanese proposal to limit all amateur operation to 50 watts has been defeated.

☐ W1QP's "harmonic generator" circuit with two 6L6s drives an 814 to full output on the four major bands.

☐ Field sets used by the National Park Service, although not covering amateur frequencies, are deluxe battery-operated units full of ideas for amateur adaptation.

☐ Crowding at 56 Mc. makes crystal control almost a necessity, so W3VR's transceiver design includes this feature plus a non-radiating receiver circuit to reduce interference.

☐ Thanks to an appropriation from the Library of Congress, the New York Chapter of the American Red Cross has completed a Braille transcription of *The Radio Amateur's Handbook*, for distribution to more than 50 special libraries around the country. An equal number of the current *License Manual* has also been made ready.

☐ Hq. staff newcomer W5CJB's first project is a neat 110-volt a.c.-d.c. code practice oscillator, with a minimum of parts.

☐ W1BZR's speech amplifier design achieves the major purposes of wide frequency response and low hum level.

25 Years Ago

April, 1963

☐ More than 1200 members/amateurs commented on the February *QST* editorial proposing a resumption of incentive licensing (which nearly all favor) accomplished by a return to restricted voice bands (which received far less than overwhelming support). All comments have been forwarded to the appropriate division director for his guidance at the coming Board meeting.

☐ Senator Barry Goldwater of Arizona has, with 23 others of that legislative body, introduced a bill to authorize U.S. reciprocal operating agreements with other countries for visiting amateur use. Ex-6BPI, "Barry" has renewed his personal interest and is now K7UGA.

☐ Ed Tilton provides a brief history of transequatorial propagation, an outstanding discovery from purely amateur efforts. 5B4WR follows up with a detailed explanation of just what TE is and does.

☐ A model of the Oscar beacon satellite was on display for several weeks at the new headquarters of the International Telecommunication Union in Geneva, Switzerland.

☐ Also in this issue is a summary by W6SAI of the performance of Oscar II, which had a shortened life of some 300 orbits because of a less than perfect launch. Nevertheless, much information was acquired concerning tracking, orbital predictions and other factors which will be useful input for the next amateur satellite project.

☐ League President Herbert Hoover, Jr., W6ZH, visited the officers of several European societies earlier in the year to discuss matters of international amateur interest.

☐ The QRM problem would largely be solved if we would but adopt W8SBQ's brilliant (but April) concept of transmitting an f.m. signal of only 375 cycles deviation (to save bandwidth) and then frequency-multiplying the received signal sixteen times to get the full 6-kc. bandwidth!

☐ Nuvistors were designed for TV tuners, but have been found ideal for amateur v.h.f. converters. K1PSR offers a design with an option for crystal control or tunable output.

☐ K2YSN hooked the arm of a small display rotator to his receiver tuning dial mechanism, and thus attained a form of automatic band scanning.

☐ W6PIV describes an upgrading of his meter reader for the sightless, where the voltage to be measured controls the frequency of an audio tone.

☐ Resonance and impedance in a.c. circuits is the subject for this month's installment by George Grammer, part of a series which will eventuate into a "junior" handbook for amateurs. —*W1RW*

Public Service

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

"Tornado on the Ground!"

By Paul Luke, N4NBC

Monday, December 14, 1987 was a cool, typical, late fall afternoon in the mid-south. It was too cool, one would think, for the possible outbreak of severe thunderstorms and tornadoes that the National Weather Service was warning about throughout the day. Little did we realize just how deadly accurate the forecasters would be.

The first sign of danger was at 5:20 PM when a tornado watch was issued for eastern Arkansas in advance of a low pressure system moving out of Texas. This first watch was quickly followed by another watch for west Tennessee and northern Mississippi.

Surface air temperatures began a noticeable rise as barometers began to fall. The late fall day took the feel of an early spring day; concern grew quickly.

At 9 PM, KB4BGC and AA4HV, Net Manager for the Tri-State SKYWARN Net, activated net station W4BS on the 146.22/82 repeater. Within minutes, early reports on winds and pressure were coming in from north Mississippi and southeast Arkansas via W5GWD and WB5PAF. Suddenly, at 9:43 PM, Richard, KB4ZIS, received a frantic transmission by a West Memphis police officer over his scanner. "Tornado on the ground....moving northeast!!" Richard quickly relayed the report over the Fisherville, Tennessee 224.5 repeater to WA4KRP, who passed it to the SKYWARN net.

Radar at the National Weather Service did not detect the tornado, but a warning was issued immediately based on the SKYWARN report. The tornado quickly raced over the Mississippi River into Shelby County, Tennessee and struck the Northaven community just outside the Memphis city limits.

Northaven resident KC4BOH immediately went to the Shelby County fire station after the touchdown. He was quickly put to work checking on the status of residents, and was soon joined by KE4OT, who set up a control point in the area.

By now, Don, KA4EBU, Shelby County EC and Steve, KK4KN, were calling up the Shelby County ARES (SCARES) Emergency Net on the WA4ETE 146.28/88 repeater from the Memphis-Shelby County Emergency Management offices in downtown Memphis. KE4OT began relaying initial damage reports from Northaven, also warning incoming emergency personnel of major gas line breaks in the area.

John, KB4GGD, soon followed with a third net station, W4EM, from the American Red Cross Headquarters in Memphis and began taking initial West Memphis damage reports from N4NBC and KB4LYD.

After the SKYWARN net was suspended, W4EM and the SCARES net moved back to the 22/82 repeater to allow better hand-held coverage into the damaged areas. Both net control stations W4EM and W4BS took damage reports together, keeping time-consuming relay of traffic to a minimum.

One hour had passed since the touchdown as the Red Cross was arriving in West Memphis with emergency generators. Along with the Red Cross vans, KI4I, WB4KXN, KB4GGE and N5LBZ went to the West Memphis Civic Center where an emergency shelter was being set up. At this point, net activity began to slow during the early morning hours only to be rejuvenated when the sun came out to show us the devastation.

The tornado—labeled a category three by the weather service—touched down only four miles southwest of West Memphis. The funnel, with its 200 mi/h winds, moved into the city at 60 mi/h. This provided little if any warning time for those in the path of the storm in West Memphis, a path of destruction which ran for 25 miles and varied from 200 to 300 yards wide.

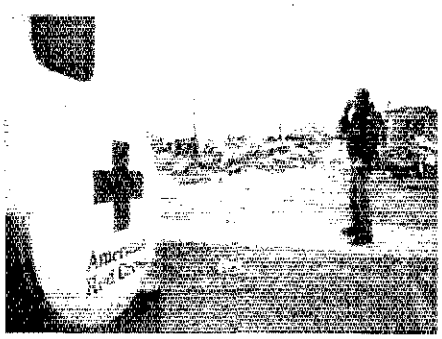
The tornado first struck a residential area, destroying or seriously damaging homes in an area three blocks wide before entering the city's business district. From there, the funnel leveled a grocery store and other businesses. Next in line were more homes, an elementary school, a two-story multi-unit apartment complex and a motel. Finally after crossing Interstates 55 and 40, the tornado destroyed a convenience store and truck stop restaurant filled with hungry travelers. Six people lost their lives, another 150 were injured; at least 1500 people were rendered homeless.

By 8 AM the Red Cross had put together three damage-assessment teams. Before health and welfare traffic began pouring in, two-man Amateur Radio teams helped assessors in the disaster area to compile damage information.

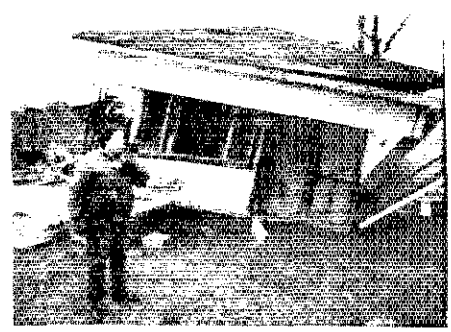
As the news of the disaster spread, health and welfare traffic began to come in on the HF bands. N5LBS took traffic on 40 meters while K4BXJ and K4GBN relayed traffic from 80 meters. W4OQG, serving as net control operator for W4EM, said, "It worked very well having two or three operators at home working the HF bands and passing the traffic over 2 meters. This cut down on the noise and number of people in the radio room. In many cases, we were able to get a response to inquiries in less than an hour."

As the afternoon wore on, traffic volume grew steadily. KJ4KR and KB4LYD handled much of the traffic early in the day, joined later by N4QMI, WB4RRT, N9GSA, WD4SMW, WB4KXN, KE4OT, KK4KN, KB4KA, K4KTP and N4NBC. Jim, KH2AR, serving as a net control operator, prioritized traffic in the disaster area. Messages with phone numbers but not actually in the disaster area were passed to N4ARH and WA4IQL for disposition by land-line if possible. This allowed the mobile stations to concentrate on the disaster area itself. KJ4DZ, N4EWA and K4SHJ helped net control operators process incoming reports. In all, the SCARES net passed well over 275 pieces of formal health and welfare traffic within the first 24 hours of the storm's aftermath.

West Memphis amateurs were directly involved with providing Amateur Radio communications assistance to the American Red Cross and the Arkansas State Office of Emergency Services, Conway. In addition, many West Memphis amateurs were active on Arkansas Section



Jeff Dobisch, N4QWA, communicates damage assessment reports to American Red Cross Disaster Services.



Jack Chambers, KB4LYD, providing American Red Cross HQ with West Memphis, AR initial damage reports.

nets, as well as Fifth Region nets, with the passing of health and welfare message traffic.

By Wednesday, amateurs received a well deserved break as cellular telephone communications were established among the four Red Cross disaster centers and chapter headquarters. On Thursday, however, this system proved unreliable as the batteries on the cellular phones could not keep up with the demand placed on them. Once again, W4EM was back on the air passing critical administrative traffic between Red Cross HQ and their disaster centers. Portable stations were set up by NU4U, N4EMB, KA4LEQ and N4NBC, with N4QLK serving as a net control operator with W4OQG and K4BXJ. Later in the day, hardline telephone communication was reestablished to the centers, and net operations were suspended for the last time.

It was a disaster long-expected in the mid-south; the drills and preparedness activities had paid off. Hams were given high praise by Richard Coleman, Meteorologist in Charge of the National Weather Service office in Memphis. In a statement released to the media, Coleman said that ham reports monitored directly by hams at the weather service were "instrumental in the broadcast of the tornado warning....and provided approximately 10 minutes of warning lead time to persons in the path of the storm in Shelby County." In Northaven, there were more than 60 homes destroyed by the funnel. Miraculously, there were no deaths in this area.

It is especially rewarding to realize that as Amateur Radio operators, we were responsible for helping SAVE LIVES!! In doing that, and assisting those who lost everything they had, we show the world what a fantastic hobby we enjoy.

TRAFFIC TOPICS DE KR7L

Have you ever noticed when checking into a net, day after day, that some of its sessions seem to go better than others? Operation on certain days of the week seems to be a real pleasure. On these days, the net "clicks." The session is fast, traffic is handled with a minimum of problems, and there are a large number of check-ins to the net.

While propagation, particularly during the winter months, can make or break an individual net session, it does not explain these consistently good days. Futhermore, this phenomenon always seems to occur on the same day each week.

The primary responsibility for a smooth net session on the same day each and every week lies with the person acting as the Net Control Station (NCS). More than anyone, this operator sets the tone of the net and is most directly responsible for the success or failure of that session.

What are some of the characteristics of a good NCS? As a real-life example, let's consider Jerry Seligman, W7BUN. Jerry runs the Wednesday sessions of the Washington Amateur Radio Traffic system (WARTS) on 3970 kHz at 6 PM local time. Let's take a look at what makes Jerry one of the more effective Net Control Stations:

1) He has the strongest signal on the net. This is due to the combination of a good antenna and linear amplifier. It is an unbeatable combination—not only can anyone wishing to check into the net hear him, but he can also hear them. In this manner, relays are held to an absolute minimum.

2) He has good ears; not just good reception, but good hearing. This ability to hear well is due, in large part, to his contesting experience. Good hearing is not only a physical attribute, but a developed skill, well-honed by his years of contesting and chasing DX.

3) He maintains an absolute, iron discipline over the net when it is in directed session. If anybody gets out of line or does not do as he is told Jerry is quick to politely enlighten them to the error of their ways.

4) He knows most of the people who frequent the net. This comes through experience and longevity as an NCS. It also develops from a willingness to learn names and calls.

5) He knows the geography of Washington and has developed a sense of traffic routing within the state.

6) He remembers where stations have moved to handle their traffic. In addition, he is aware of other nets in operation on the band and is careful to not direct stations off frequency into the middle of these nets.

7) Jerry does not encourage chatter on the net frequency during directed session. When going through the roll call, he recognizes each station by their call sign and name, but does not encourage conversation. He is aware of the continuing passage of time while the net is in session. Jerry, like other good Net Control Stations, recognizes that he is not running a social net, but rather, a directed formal traffic net.

Handling Instructions

HXA—(Followed by number.) Collect landline delivery authorized by addressee within _____ miles. (If no number, authorization is unlimited.)

HXB—(Followed by number.) Cancel message if not delivered within _____ hours of filing time; service originating station.

HXC—Report date and time of delivery (TOD) to originating station.

HXD—Report to originating station the identity of station from which received, plus date, time and method of delivery.

HXE—Delivering station get reply from addressee, originate message back.

HXF—(Followed by number.) Hold delivery until _____ (date).

HXG—Delivery by mail or landline toll call not required. If toll or other expense involved, cancel message and service originating station.

An HX prosign (when used) will be in serted in the message preamble before the station of origin, thus: NR 207 R HXA50 W1AW 12... (etc). If more than one HX prosign is used, they can be combined if no numbers are to be inserted; otherwise the HX should be repeated, thus: NR 207 R HXAC W1AW... (etc), but: NR 207 R HXA50 HXC W1AW... (etc). On phone, use phonetics for the letter or letters following the HX, to insure accuracy.

IN SERVICE

☐ Rankin County, MS—November 16, 1987. The Rankin County ARES Net was activated in response to a severe weather threat. The net, operating on KF5IZ/R, was controlled from the National Weather Service (NWS) in Jackson. N5JPX started as NCS while N5DZE put the packet station on the air. Liaison stations were established on VHF and HF while moblie units were deployed throughout the area to provide spotter reports. Contact was made with stations in Centerville, Crystal Springs, Natchez and Vicksburg.

ARES members were able to provide current weather observations from the areas west and south of Jackson to the NWS. These reports complemented Weather Service radar equipment as the storm system developed. KB5BCF reported a tornado on the ground just south of Jackson. This information prompted NWS officials to issue a tornado warning. The tornado touched down just south of the capital city, tracked northeast, just missing downtown, and hit Flowood. Damage was heavy, injuries were sustained, but fortunately no fatalities were reported. —*James R. Waltress, N5JPX, EC, Rankin County, MS*

☐ York County, PA—December 14, 1987. An adhesive manufacturing plant accidentally released chemicals and forced an evacuation of homes within a half mile. The York County Emergency Management Officer called to activate the York County RACES unit. Communications were established at the Emergency Management headquarters, Red Cross headquarters and the evacuation center. Twenty-two radio amateurs were available to help and 10 were dispatched to various communications centers. RACES activity was maintained until evacuated families were allowed to return to their homes about three hours after the emergency started.—*Jack Dellinger, N3BQB, York County RACES Officer*

☐ Fort Worth, TX—December 20, 1987. A wide area of Fort Worth lost telephone service on this Sunday mornrning. More than 50,000 telephone subscribers in the southwest portion of the city were affected. N5CEJ, RACES Director, called on RACES members to assist in communications. The public was advised by radio and TV to hang a white towel or sheet over a bush in their front yards if they needed emergency assistance. Radio amateurs who were also Red Cross volunteers patrolled the streets. Radio amateurs were posted at area nursing homes, fire departments and command centers. Telephone service was restored early Monday.—*Dan Dansby, W5URI*

Field Organization Reports January 1988

ARRL Section Emergency Coordinator Reports

Thirty-five SEC reports were received, denoting a total ARES membership of 17,758. Sections reporting were: AB, AR, CO, EPA, IA, LAX, MD, MI, MN, MO, NE, NFL, NH, NLI, NM, NNJ, NTX, NV, OK, ORG, SCV, SD, SDG, SFL, SJV, STX, UT, VA, VT, WA, WMA, WNY, WTX, WV, WY.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	114	90.00	528	1071
TCC Central				
TCC Pacific	116	93.55	411	766
Summary	230	91.77	939	1837
Cycle Three				
TCC Eastern	53	90.32	25	50
Cycle Four				
TCC Eastern	116	93.55	504	1009
TCC Central	85	91.40	497	1020
TCC Pacific	113	88.71	571	1132
Summary	314	91.22	1572	3161

TCC Roster

KB1AF W1CE W1EFW WA1FCD WB1GXZ KN1K W1NJM KT1Q W1QYY KW1U WB2EAG WA2FJJ W2FR W2GKZ NN2H NQ2H KB2HM N2IC W2LWB W2MTA W2RQ WA2SPL KA2UBD NY2V N2XJ N3AZW N3COY N3EMD N3FM W3GL WB3GZU W3OKN W3PQ KQ3T NJ3V AA4AT N4EXQ N4GHI K4MTX WB4PNY N4SS W4UQ K4ZK W5GHP K5GM W5JOV AJ5K K5MXQ WZ5N ND5T K5TL W5TNT W5QVK KB5UL KB5W KU6D W6EOT W6INH N6LHE K6UYK W6VZT WF6O KN7B KA7CPT NR7E W7EP W7GHT W7LG NN7H KF7R W7TGU KA7MUL K7OVK W7IGC W7VSE W8BO KA8CPS WD8LDY W8PMJ W8QHB NJ8S KA8WNO N8XX WB8YDZ W9CBE WB9UYU AD0A KC0D K0DJ KA0EPY K0EZ KJ0G N0HFZ N0IA NX0J KE0NI AI0O KS0U VE3FAS VE3GSQ VE3ORN

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	1177	28.80	.758	95.7	
CAN						
PAN*	62	461	7.43	.533	98.9	
Region Nets						
1RN	62	411	6.63	.431	91.0	100.0
2RN	62	400	6.45	.470	93.5	100.0
3RN	31	153	4.93	.500	96.0	100.0
4RN	62	596	9.61	.423	81.6	100.0
RN5	62	597	9.63	.558	88.0	
RN6	49	110	2.24	.239		98.3
RN7	62	358	5.77	.445	91.5	100.0
8RN	62	297	4.79	.305	95.2	100.0
9RN	62	211	3.40	.282	89.0	
TEN	58	658	9.67	.343	100.0	
TWN	54	261	5.20	.353	76.7	98.3
ECN						74.2
TCC						
TCC Eastern	114	1071				
TCC Central						
TCC Pacific	116	766				
Cycle Three						
Area Net						
EAN	31	250	8.06	.608	86.2	
Region Net						
1RN	31	160	5.16	.397	90.3	87.1
2RN	31	114	3.68	.296	92.9	93.5
3RN	20	19	0.95	.160	63.3	70.9
4RN						93.5
8RN						100.0
ECN						90.3
TCC						
TCC Eastern	53	1009				
Cycle Four						
Area Nets						
EAN	31	1228	39.61	1.213	97.2	
CAN	31	1037	33.45	1.860	100.0	
PAN	31	767	24.74	.933	97.8	
Region Nets						
1RN						100.0
2RN	52	232	4.46	.469	72.9	87.0
3RN	59	197	3.33	.276	97.7	100.0
4RN	62	662	10.68	.476	98.4	100.0
RN5	62	577	9.31	.610	100.0	100.0
RN6	62	436	7.03	.770	100.0	98.3
RN7	62	317	5.11	.545	94.0	100.0
8RN	61	320	5.24	.380	95.0	100.0
9RN	62	380	6.13	.413	93.9	100.0
TEN	62	420	6.77	.524	71.4	100.0
TWN	57	257	4.51	.333	98.5	100.0
ECN	57	190	3.33	.445	72.2	100.0
ARN	31	169	5.45	.157	100.0	93.5
TCC						
TCC Eastern	116	1009				
TCC Central	85	1020				
TCC Pacific	113	1132				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AR, AZ, CT, DE, EMA, ENY, EPA, GA, IA, ID, IL, IND, MDC, ME, MI, MN, MO, NC, NTX, OK, ONT, OR, ORG, RI, SB, SC, SCV, SD, SDG, SFL, STX, UT, VA, VT, WA, WMA, WNY, WPA, WTX, WV.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, upon sending notification of qualifying months to ARRL Public Service Branch, will be awarded a special PSHR certificate from HQ.

463
KB6IYK
220
WB5SRX
143
WB2OWO
141
KA1BBU/T
134
VE4JA
KA9FFO
133
KD0CL
132
WA2SPL
131
WA4QXT
130
K4NLK
WA2VJL
128
N4GHI
126
W2MTA
KW1U
123
N4EXQ
120
N2EIA
116
WX4H
114
WA9VND
113
WB4ZJF
112
KA3DLY
K4ZK
111
NM1K
WB1HIH
KA2MYJ
110
WF6O
109
WA4PFK
VE3ORN
108
KA1EXJ
WA4JDH
WR5O
W9YCV
NG1A
107
WB6DOB
KB4WT
N9BDL
WA1FCD
106
WB1GXZ
WD5GKH
W0FRC

105
AA4MP
NQ2H
N3EMD
N9BZZ
W7VSE
104
WD8KQC
103
KA1GWE
WD4COL
KT1Q
W9CBE
KA9VII
102
WB4DVZ
KA2UBD
WA2ERT
W9JUJ
WG7H
101
N8GPU
K8TVG
N0FOO
AG9G
WB7WOW
KD7ME
W4ANK
100
WD8QXT
N2XJ
KB1AF
99
WA1JVV
AC5Z
W2RRX
WJ7E
97
WB4WQL
WB4WII
KI4YV
N5AMK
K0BXF
96
KD8HB
W4CKS
W4PIM
W6INH
WB2VUK
KE8JG
95
WA4LTO
NC9T
94
WA4EIC
KA2ZKM/T
K5MXQ
K1GGS
93
W3FA
W7GHT
WB4ZTR
W4JLS
92
WA0HTN

VE3POJ
91
KA4TLC
K0SI
KA1IFC
W5AS
W5YQZ
W9EHS
90
WB8JGW
VE3DPO
VE3BDM
NJ3V
WB1CBP
89
WA2FJJ
KT9I
K3JL
KA9RNY
N7ELF
K9CNP
88
K4IWW
NV5L
87
N4MWR
WB4PNY
K2ZVI
W1RWG
W9DM
86
KB4JPN
WA4RLV
WB2RBA
WA1TBY
85
AA4ZV
K4MTX
N2HIF
KF5BL
K0ERM
N6EQZ
84
KF4FG
N4KSO
NN2H
W1KX
W5CTZ
83
N8AEH
W6VOM
WD0GUF
NJ9S
W0OYH
KA7AID
W0KK
82
WA3UNX
AA4HT
W6RNL
N7BGW
N7GGJ
81
NK1N
WA4LLE
N3COY

AA4ZV
80
N6NLW
K6UYK
WB8SYA
ND2S
79
N3AZW
WD4KBW
K4BGZ
KB4LB
K0KPY
78
N1EDD
WB4KSG
K2YAI
KN1K
WD9DZV
77
WA4RUE
K9ZBM
76
WA3YLO
N4JRE
VE4IX
VE3CYR
N6MCY
75
WB4HRR
KK4FV
WD8RHU
WA8DHB
74
N3EGF
ND0N
73
WA0TFC
KA0ARP
72
N8CEI
K4VWK
NB1A
WB5J
NZ0C
NO0A
71
KA8CPS
W0UCE
70
W3YVQ
AJ5F
WB6QBY
KA0SBY
KC4VK
KA9RII
69
KA1FVY
W0OUD
AA4AT
68
W1YOL/T
K4BAI
KC3Y
VE4LB
N1DHT

KA2F
WB2QMP
NK1Q
67
K8JDI
N8IBS
WB5YDD
KB5CKQ
KA2INE
N0DPF
KA7EEE
W7LG
66
WB8KWC
AI0O
KA4TWI
KA2ZNK/T
KA7MUL
K9ANV
65
W4RWB
WA6QCA

NT4S
WZ5M
64
WA3UZI
KA4FZI
KB4QPR
N2HDL
W2FR
KQ3T
WB9PFZ
KA1UIH
KB4BZA
63
WD8KBW
N8FWA
KM5L
62
K3NNI
KD8KU
N8EFB
KI4BR
W2GJ

NZ5J
K5UPN
NY0J
61
NG2H
N2ABA/T
WB0WNJ
N2DXP
WB2FTX
60
W4HON
K0PCK
WB4ZNB
K4JST
KP4DJ
VE3GSQ
VE3WV
KD0NH
N4PL
KD0YL
54
KA9CTW/T

52
WB1BTJ/T
48
N6FWG/T
47
N2EVG/T
46
KB2BNW/T
45
KA6HJK/T
KA1NOI/T
40
KA6TND/T
KB4UED/T

The following stations qualified for PSHR during December 1987, but were not listed in last month's column. WB1CBP, W1KX, W1RWG, N2AKZ, KB2BKE, WA2ERT, N2GPA, N2HLZ, N2HPT, KA2JMA/T, K2MT, NG2R, K2YQK, WB2ZJF, K4BAI, W4CKS, WD4COL, WB4DVZ, KF4FG, KA4HHE, W4HON, KI4IG, WA4JDH, KB4JPN, WA4LLE, W4PIM, WA4RNP, W4RWB WB4WQL, WA5UZB, KA8CPS, WA8DHB, N8FXH, K8JDI, WD8KQC, KA8TIK, WD8RHU, WB8SYA, K8UQY, KA8WNO, KD8WX, N0HMR, KE0NI, KA0WIE, KB0Z.

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or more or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

The Brass Pounders League Medallion is available to individual operators who achieve BPL and are listed in the BPL column for the third time. This medallion is a one-time-only award ie, it is not issued more than once. It is not necessary that the three months involved be consecutive. Any three months will qualify an operator. Stations that qualify for the BPL medallion, upon written notification of the qualifying months to the ARRL Public Service Branch, will be awarded the callsign-engraved BPL medallion.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	780	964	1296	976	3101
N1BBT	683	506	693	487	2369
WB9YPY	0	1103	97	690	1890
W3VR	301	291	466	31	1089
WA9VND	13	517	419	27	976
KW1U	6	500	432	25	963
KA1IFC	1	415	432	32	871
WA4JDH	1	428	433	7	869
W9ZRX	0	388	388	0	776
WB0WNJ	241	133	395	2	771
WF6O	0	318	335	12	665
WA2SPL	15	263	320	53	651
WX4H	1	351	275	7	634
KA2UBD	0	303	320	1	624
KA8CPS	10	305	265	31	611
W9JUJ	4	292	305	1	602
N4GHI	46	274	254	27	601
KT1Q	0	326	260	2	588
WD8KQC	1	287	275	16	579
NJ3V	66	230	274	6	576
N6LHE	6	273	275	6	560
WD4IIO	211	88	215	28	534
W0FRC	138	142	204	47	531
N3AZW	20	237	243	25	516
WA4QXT	17	239	224	30	510
WB5SRX	4	226	119	161	510
K4DOR	26	227	243	10	506
KE8JG	119	134	248	7	506
WB2OWO	58	146	256	42	500
N8EGK	0	237	263	0	500

BPL for 100 or more originations plus deliveries:

W5AS	173
K8RDN	165
KA0EPY	100

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Central Gulf Coast Hurricane Net	31	192	4460
Clearing House Net	31	584	491
Empire Slow Speed Net	30	60	394
Hit and Bounce Net	31	307	716
IMRA	26	1226	1908
Kentucky Post Office Net	5	14	116
Mission Trail Net	31	65	909
NYSPTEN	31	63	660
Southwest Traffic Net	31	231	1810
West Coast Slow Speed Net	30	72	443
20ISSBN	27	694	420
75 Meter Interstate SB Net	31	236	1570
7290 Traffic Net	47	404	3306

Results, 18th ARRL 160-Meter Contest

What's this—a host of S9 CW signals on 160?

By Billy Lunt, KR1R
Contest Manager, ARRL

and Mark R. Burke, KA1MIS
Contest Assistant, ARRL

Bad conditions, storms, high noise levels, no DX, QRN, QRM—the normal and expected low-band contest complaints didn't suppress the activity or the upbeat mood for this year's 160-Meter Contest. Not only was activity at an increased level, but conditions were reported as being at least good, if not great, from nearly all areas! The number of newcomers to the band has steadily increased, partly because 160 meters is within the capabilities of most transceivers today. Also, the number of "tall towers" that can be shunt fed, or support dipoles and inverted-Vs, are forever increasing. With the new technology that is available today in combination with large antenna farms, a multitude of "super stations" are emerging on the horizons creating a high level of competition on 160 meters.

Although the top scores were down a bit from the previous year, this didn't prevent three new division records from being set, one single op and two multiop. Check the Division Leaders box for full details. This year, a total of 422 entries for the 160-Meter Contest were received by HQ, up slightly over the 405 logs received for the 1986 contest.

QSOs were plentiful! The top scoring stations had QSO totals into the 900s. The single op QSO leader was K5NA, who completed a total of 988. Not far behind was WØEJ, who contacted 935 stations for the second highest QSO total. Just behind Wade was the third place contender, W3LPL (KM3T,op), with a solid 928 QSOs. WØAIH/9 led the way amongst the multiop stations for the highest contact count by mustering 1009 QSOs. KØDD placed second with 994 QSOs while W8LT showed a strong third with 947.

Multiplier hunting is an art for some and for others it is a reality which comes readily when piling up high QSO totals. The single op station that was the most successful in hunting multipliers was KM1H (KQ2M,op) with a total of 102. Just behind Bob was K5NA, digging out 100 multipliers. Next with 99 multipliers was Dave, KM3T, guest operating at W3LPL. W8LT collected 91 multipliers among the battery of multiop stations for the top multiplier leader. With only one multiplier separating the top spot, KS8S claimed a strong second place with 90 mults. K2WI and crew produced the third highest count with 84 multipliers.

Eastern New York "Superstar" Richard, K5NA, scoring 221k points, returned this year for another first place victory over all other single-operator stations. Dave, KM3T, piloted "super station" W3LPL to the second place spot with a total of 206k points. Close behind was KM1H (KQ2M, op) with 192k points for the third place position.

On the multiop scene, the crew at the Ohio State University club station, W8LT, snuck past the KS8S threesome for the first place win by a little over 6k points. The Wisconsin-based multiop station WØAIH/9 edged out KØDD and his four South Dakota counterparts by only 124 points for their third place triumph.

League HQ received a total of 12 DX logs from around the world this year. G3RZP was the top scoring single op DX entrant. He worked a total of 43 QSOs and 24 mults in a 9-hour period. The top DX multiop station was J6A from the island of St Lucia. The five-stateside-man DXpedition had many propagation problems but managed to work 94 QSOs and 44 mults for their multiop triumph.

Congratulations to all the participants of this year's contest for their valiant effort on one of the most trying bands to work—160 meters. We are looking forward to seeing everyone again Dec 2-4, 1988 for the 19th running of the ARRL 160-M contest. Special thanks to Contest Assistant Mark Gamble for his help in preparing the results.

Top Ten

Single Operator

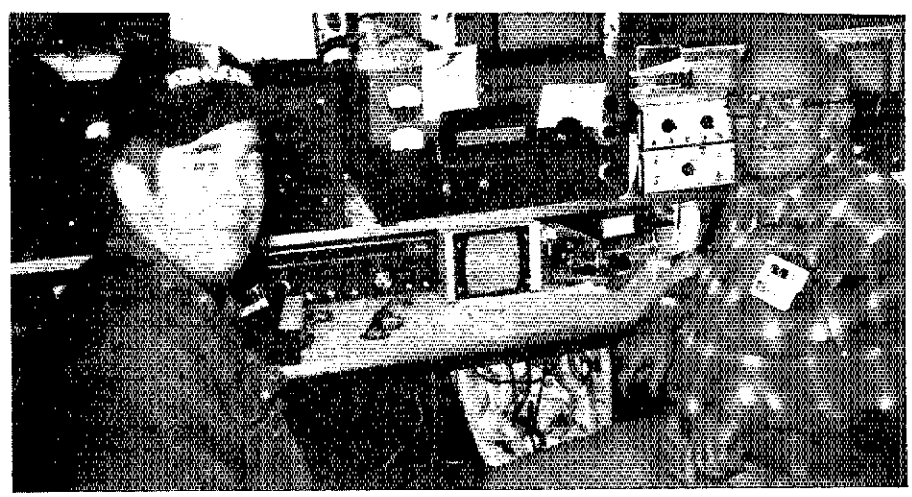
Call	*Score*
K5NA	221,900
W3LPL (KM3T,op)	206,019
KM1H (KQ2M,op)	192,780
AA1K	159,774
WØEJ	147,498
K3KG (KM9P,op)	142,128
K4LTA	124,986
N4ZZ	124,816
WN4KKN/5	123,880
W9YSX	121,891

Multioperator

Call	*Score*
W8LT	181,090
KS8S	174,780
WØAIH/9	160,844
KØDD	160,720
K2WI	141,624
W9AZ	134,400
KA8HFO	118,404
KC5DX	111,840
N4XM	109,650
WØBXR	94,316

Soapbox

We could only operate the first night with hopes to do well with the special call sign, but conditions were very poor. Many stations had trouble with the call and some even sent back W6A?? and asked for our section. Hi! (J6A). The first night was terrible due to a storm. Only the strongest signals could be heard. The second night things were better and we didn't give the DX boys a chance to break through our domestic phalanx. Some still succeeded...! (W1PL). Never called CQ, just answered them. Most QSOs were made with 25 watts output. Lots of fun! Worked several new states on 160 (KT1H). Where were all the 6s and 7s? Glad to hold frequency with my 100 watts and pick up 36 states in 5 hours (KZ2H). Where were the VE2s this year? Didn't hear any of them during the entire contest.



Relaxing after their first-place multiop victory in the Georgia Section, Bill and Bill, operators of W4FGH, kick back and pose for this photo. Bill, W4FGH, is on the right and Bill, WI4F, is on the left.

Rus, NJ2L, secures his position as top single op of the Connecticut Section for the 160-Meter Contest.

Division Leaders

Single Operator			*Multioperator*	
Call	*Score*	*Division*	*Call*	*Score*
VE3KP	94,004	Canada	—	—
W3LPL (KM3T,op)	206,019	Atlantic	K2WI	141,624
W9YSX	121,891	Central	WØAIH/9	160,844
KØPK	104,400	Dakota	KØDD	160,720
K4LTA	124,986	Delta	—	—
W8FN	82,002	Great Lakes	W8LT	181,090
K5NA	221,900	Hudson	—	—
WØEJ	147,498	Midwest	WØBXR	94,316
KM1H (KQ2M,op)*	192,780	New England	N1BVY	10,850
KE7X	68,103	Northwest	—	—
W7XV	69,486	Pacific	KV6H*	80,811
K4XU	110,625	Rocky Mountain	ADØO	63,280
WA8MAZ	103,293	Roanoke	—	—
K3KG (KM9P,op)	142,128	Southeast	NC1R	74,830
K7OX	76,320	Southwest	N6DX*	71,700
WN4KKN/5	123,880	West Gulf	KC5DX	111,840
G3RZP	2,064	DX	J6A	8,272

*Denotes a new division record.

Antennas Used by the Top Scorers

Single Operator

K5NA	Inverted-V at 125 ft and a 155-ft shunt-fed tower.
W3LPL (KM3T,op)	1/4-wave wire vertical, delta loop at 195 ft, sloper off 200-ft tower and an 800-ft Beverage.
KM1H (KQ2M,op)	Vertical, shunt-fed tower and inverted-V at 140 ft.
AA1K	113-ft shunt-fed tower with 200 radials and six 600-ft-long Beverages.
WØEJ	1/4-wave sloper and 1 Beverage.

Multioperator

W8LT	40-ft vertical and 2 wire Beverages.
KS8S	Phased verticals.
WØAIH/9	Verticals, dipoles and Beverages.
KØDD	130-ft base-insulated vertical and 1000-ft Beverage.
K2WI	Inverted-L and two 500-ft Beverages.

What section will be vacant next year? VE4s? (K2WI). A 10-percent dupe rate in response to my call is ridiculous! (KW2J). No foreign contacts (W2GJ). My 90' wire at 15' is the equivalent to using a 6' wire 1' off the ground on 10 meters! Had a lot of fun, though (WB2EKK). Non-DX in 1830-1850 was not followed by anyone (K3MD). Still looking for WY and KL7. Guess I will have to go the linear route. Heard them but couldn't break through (W3HDH). Biggest thrill was working ZL3GQ at 0815 UTC (N4UZ). Small antennas and 100 watts, but still had fun (KY5N). Thanks to all who strained to hear my 100 watts! (W6JTI). I don't feel right giving everyone I work a 599. Most reports to me were 599 which I do not really appreciate as I know it's not true. Let's all give true reports next contest even though it takes a few seconds longer (W7IWU). My entire station was borrowed for the contest. I do not own a rig with 160 meters, but that will change! I was amazed what my 100-watt signal could do! I will be back next year! (NC7K). My ham shack is located in an old shed behind my house near a corn field that was recently plowed, which left many field mice homeless. Where did they go? Why, to my shack of course! Between contacts my son's BB gun was put to good use! (WA7HQD). First time ever on 160 CW. I really enjoyed the contest even though I had an antenna that wasn't supposed to work. I will be ready next year! (NZ8J). Lots of activity but no DX to be heard from the Midwest area. KH6 was the best we could do (W9LNQ). Not bad for going QRP to an unmatched 40-meter sloper! A lot of guys have good ears (NU9R). Excellent conditions even for my simple station. Six new states. . .can't wait for next year (KØOST). I'm amazed at my results using only indoor antennas and 100 watts. Special thanks to all the stations that strained to copy my weak signals (KU7U). I hear the moonbounce guys had a pretty rough weekend also; the aurora was pretty bad (KØDD). Saturday night conflicted with the annual office Christmas party—missed nine prime-time hours, but it was a good party! (VE5UF).

Scores

Scores list call sign, final score, total QSOs, total multipliers and hours operated (if given). Example: EI9J scored 108 points, with 9 QSOs and 6 multipliers in 2 hours of operation.

DX

Bahamas

N4RP/C6A	792-	22-	18-	

Ireland

EI9J	108-	9-	6-	2

England

G3RZP	2,064-	43-	24-	9

Dominican Republic

HI8LC	1,200-	30-	20-	

St Lucia

J6A (K6GXO,N8BJQ,NC8Q,W8ILC, WD8IXE,ops)	8,272-	94-	44-	

Japan

JA8RWU	1,122-	33-	17-	
JA7YAA (JN1VYN,JG3JRM,JJ3CNL, JE7QCQ,JR7DRV,ops)	324-	18-	9-	
JA1YHA (JQ1HKA, JS1s ERB,DCT, ops)	240-	12-	10-	
JA9YBA (JA9s VDA,-10148,JH9VSF, ops)	60-	6-	5-	

Finland

OF3GD	2-	1-	1-	

Poland

SP5GH	390-	15-	13-	

West Malaysia

9M2AX	120-	10-	6-	

W

1

Connecticut

NJ2L	77,200-	439-	80-10	
N4XR	53,747-	365-	71-14	
K1TO	36,394-	289-	62- 5	
W1BIH	28,443-	242-	57- 6	
W1WEF	12,138-	119-	51- 2	
KB9NM	9,180-	135-	34- 5	
K1YRP	8,092-	119-	34-	
AA2Z	3,718-	70-	26- 1	
W1QV	2,058-	49-	21- 3	
WA3VIL	220-	11-	10- 2	
KH6CP/1	2-	1-	1- 1	

Eastern Massachusetts

W1PL	79,350-	493-	75-	
KA1DWX	44,488-	311-	67-13	
W1TR	30,195-	273-	55-14	
W1FJ	16,100-	175-	46-	
W1AX	15,300-	150-	50- 5	
AA1O	13,940-	170-	41-	
AI3E	8,172-	112-	36-	
KA1CLV	6,976-	109-	32-10	
K1XM	6,588-	90-	36- 3	
W1HWU	5,394-	87-	31- 6	
AK1P	3,538-	61-	29-	
KQ1F	2,726-	47-	29- 2	
KQ1V	990-	33-	15- 2	

New Hampshire

KM1H (KQ2M,op)	192,780-	795-	102-34	
N1ACH	106,622-	542-	89-20	
WA3ECT/1	23,056-	256-	44-23	
AK1L	21,560-	245-	44-12	
W1FJH	18,616-	173-	52-10	
W1FZ	8,844-	134-	33-	
KA1LMR	3,770-	65-	29-13	
KT1H	3,672-	68-	27- 5	
AC1J	2,508-	66-	19- 4	
KA1NXT	2,100-	50-	21-11	

Rhode Island

K2MN	18,952-	206-	46-16	
K1IU	15,664-	169-	44- 5	
WA1HYN	8,320-	130-	32- 4	
K1DT	7,070-	101-	35- 6	
N1DM	1,620-	45-	18-12	
N1BVY (+WB1DEZ)	10,850-	155-	35-12	

Vermont

WB1GQR	95,100-	610-	75-26	
K1IK	79,570-	533-	73-22	

Western Massachusetts

KY1H (N1EMG,op)	67,000-	485-	67-16	
KZ1M	11,760-	168-	35- 7	
W1JP	2,760-	60-	23- 3	

2

Eastern New York

K5NA	221,900-	988-	100-38	
NA2M	40,768-	317-	64-	
KN2Q	13,455-	171-	39- 6	
WA2IKR	12,240-	153-	40-	
WB2PUH	2,500-	50-	25- 4	

NYC-Long Island

N2KA	28,320-	237-	59-12	
NR2L	11,356-	167-	34-	
W2KTF	11,232-	144-	39- 5	
W2KTU	8,100-	135-	30-12	
WB2DLA	3,840-	80-	24-10	
W2GKZ	2,288-	44-	26-	
WA2YEI	1,634-	43-	19- 4	

Northern New Jersey

W2GD	113,645-	625-	85-14	
WA2SRQ	109,824-	677-	78-27	
KØDI	75,636-	567-	66-29	
K2STO	20,915-	221-	47-24	
KZ2H	16,212-	184-	42-	

Southern New Jersey

K2FL 13,912- 145- 47- 8
K2WI (+WA2IUO,N2NU) 141,624- 777- 84-

Western New York

KW2J 38,700- 387- 50-12
K2KYH 22,440- 201- 55-10
W2TZ 20,196- 228- 44- 6
NA2Q 15,910- 185- 43-11
KK2B 7,200- 100- 36- 6
KU2A 7,052- 107- 33- 9
W2GJ 5,432- 97- 28-
K2MPE 4,872- 84- 29-13
W2OMV 1,800- 36- 25- 5
W2MTR 576- 18- 16-

3

Delaware

AA1K 159,774- 780- 93-19

Eastern Pennsylvania

W3TS 101,871- 639- 77-
W3UM 87,780- 482- 84-12
K3IPK 49,302- 446- 54-
W3BGN 22,134- 214- 51- 5
WB3FAA 18,480- 231- 40-12
WA3YON 15,224- 173- 44-10
W3CNS 7,000- 100- 35- 4
K3WW 6,732- 102- 33- 2
K4JLD 5,781- 69- 41-
KI3S (+NF3P) 42,336- 432- 49-22

Maryland-DC

W3LPL (KM3T,op) 206,019- 928- 99-
N3CXV 120,960- 690- 84-22
W3HVQ 48,832- 433- 56-14
WB2EKK 10,530- 135- 39-
W3TFA 9,648- 134- 36-
W3GN 7,770- 105- 37-
K3AA 5,576- 82- 34- 5
KB3HH 1,428- 34- 21-
WB3JRU (+KC3AJ) 4,256- 76- 28-

Western Pennsylvania

W3OM 101,232- 694- 72-28
K3UA 72,504- 456- 76-12
K5ZD/3 24,708- 213- 58- 4
K3MD 22,360- 215- 52- 6
W3HDH 14,076- 153- 46- 5
W3KWH (N3EQF,NG3H,ops) 31,512- 303- 52-

4

Alabama

N4JF 50,388- 366- 68-12
WB4CSK 16,400- 164- 50-
WZ4F 10,704- 110- 48- 2

Georgia

K3KG (KM9P,op) 142,128- 810- 84-
KN4B 40,260- 334- 60-31
W4DXI 28,536- 243- 58-
N4UZ 21,033- 183- 57-
AA4EH 13,770- 126- 54-13
W4PGH (+WI4F) 37,816- 323- 58-26

Kentucky

KK4Q 45,714- 401- 57-10
WA4EBN 25,186- 257- 49-30
WB4FDK 11,088- 126- 44- 7
N4XM (+KD4U) 109,650- 722- 75-28

North Carolina

WA8MAZ 103,293- 744- 69-24
K4PB 38,752- 346- 56-
AA4NC 24,299- 257- 47- 5

Northern Florida

WA4JXI (WA4SVO,op) 95,590- 575- 79-20
W4HBK 54,145- 415- 65-
W1XO 10,530- 117- 45- 7
W4WKQ 6,208- 97- 32-12
NC1R (+KB4LTQ,WS4Y) 74,830- 527- 70-33

South Carolina

KØEJ 52,290- 409- 63-15
K4CNW 39,000- 325- 60- 9
W4UKU 34,221- 279- 61-18
K4II 21,944- 211- 52- 8
K8UNP/4 9,495- 104- 45-
K4ADI 6,160- 88- 35- 4

Southern Florida

N4IN 39,520- 295- 65-

Tennessee

K4LTA 124,986- 837- 74-
N4ZZ 124,616- 842- 74-20
K4XO 31,070- 236- 65-11
KV4B 17,545- 158- 55-11

Virginia

W4XD 69,010- 509- 67-18
AA4F 65,205- 465- 69-
K4OD 28,158- 247- 57-13
K4FPF 15,974- 163- 49-10
WA4BUE 13,020- 155- 42-
W4KMS 12,285- 135- 45-15
WU4G 9,964- 106- 47- 7
N4MM 2,600- 50- 26- 1

5

Arkansas

W5KL 43,092- 342- 63- 7

Louisiana

K5KLA 44,667- 350- 63-13
W5EW 36,360- 303- 60-13
K5MC 20,405- 184- 55- 5
NO5H 5,032- 68- 37-

Mississippi

WB5KYK 25,346- 217- 58-20
N9KS/5 8,736- 104- 42-
W5GWD 3,600- 60- 30-12

New Mexico

KB5UL 50,508- 363- 69-19
KT5X 40,736- 301- 67- 6
KN5S 35,295- 270- 65-14
W5DO 34,707- 247- 69-14
WS5O 32,520- 271- 60-13

North Texas

WN4KKN/5 123,880- 803- 76-21
K5WXZ 50,330- 355- 70-23
W5FIX 40,950- 322- 63-21
N5UA 29,036- 212- 68-12
N4QS 19,706- 167- 59- 7
KY5N 10,534- 113- 46- 7
NZ5M 1,554- 37- 21- 6
KC5DX (+AA5DX) 111,840- 684- 80-19

Oklahoma

W7FG 114,404- 770- 74-20
WM4Z 16,356- 174- 47-
W5EHY 11,220- 110- 51- 5

South Texas

WN5TEN 23,200- 200- 58-12
W5IRP 5,776- 76- 38-
N5AFV 608- 19- 16- 2
N5ZR 252- 14- 9-
W5NTJ (+KC5ZT,WR5Q) 49,104- 351- 66-
W5XD (+W2IE) 32,830- 242- 67-11
W5MPX (+KM5S,NQ5B,WØTV, WDØCEN) 19,608- 172- 57-30

West Texas

WF5E 39,744- 309- 64-18

6

East Bay

K6HIH 45,582- 318- 71-
W6FSJ 28,060- 227- 61-11

Los Angeles

N6LL 55,338- 398- 69-20
NE6I 4,292- 74- 29- 8
W6PFE 510- 17- 15- 5
N6DX (AD6C,N6VR,NS6X,ops) 71,700- 466- 75-32
W6UE (AA6RX,WA6OTH,ops) 38,391- 282- 67-20

Orange

N6PE 37,740- 287- 68-20
N4ARO/6 15,200- 152- 50-14

Santa Barbara

W6OUL 11,172- 130- 42- 7
WA6FGV 4,200- 70- 30-10
W6JEQ 3,484- 67- 26- 7
NV6I 2,200- 44- 25-

Santa Clara Valley

W6NA 25,320- 208- 60-16
NS6V 25,245- 228- 55-10
KB6FPW 2,704- 52- 26- 6

San Diego

N6ND 60,680- 395- 74-
KI6MJ 49,700- 343- 70-42
K6NA 4,500- 61- 36-
W6UQF 330- 15- 11-

San Francisco

W6JTI 33,344- 253- 64-30
K6LRN 6,552- 84- 39- 4
WB6EGE (KA6OPN,N6s MQ,QC, WB6WPO,ops) 43,452- 303- 68-32

San Joaquin Valley

K6MO 33,914- 248- 62-17
K6XK 14,625- 149- 45-13

Sacramento Valley

N6JV 41,448- 302- 66-20
AA6DX 7,400- 100- 37- 7
WA6AUE 7,070- 101- 35-
KE6VL 1,104- 24- 23-
KV6H (+KF6A,KI6O,N6IG,NB6G) 80,811- 504- 73-

Pacific

AH6AZ 2,880- 32- 18- 7
WA3KOG/KH6 1,560- 36- 20-

7

Arizona

K7OX 76,320- 524- 72-20
K7SP 42,364- 304- 68-18
KY7M 11,600- 116- 50- 5
NF7E 6,364- 86- 37-

Idaho

KA7T 23,485- 212- 55-12
W7GHT 17,472- 156- 56-
K6RN 12,267- 129- 47-10
KB7CSB 5,518- 89- 31-17
W7IWU 3,744- 72- 26-

Montana

KE7X 68,103- 492- 69-29
KØPP/7 55,556- 407- 68-24
KS7T 14,472- 134- 54- 8
W7LR 1,794- 39- 23- 2

Nevada

W7XZ 69,486- 453- 74-33
NC7K 28,840- 256- 56-19

Oregon

W7YAQ 12,800- 128- 50- 5
AD7T 8,740- 95- 46-

Utah

WA7HQD 20,458- 193- 53-12
WE7H 8,398- 122- 34-
K7CU 6,596- 97- 34- 7

Washington

K9JF/7 44,812- 322- 68-17
W7MCU 24,354- 180- 66-14
W7BYK 16,356- 141- 58-12
W7IEU 10,148- 118- 43-15
K7WA 8,436- 111- 38- 7
NK7V 7,144- 94- 38-
K7UU 5,180- 74- 35- 4

Wyoming

WC7S 60,300- 450- 67-25
WC7M 59,160- 435- 68-15
KC7KC 7,440- 93- 40- 9
NS7Z 3,180- 53- 30- 3

8

Michigan

W8UVZ 63,549- 459- 69-
N8EA 63,308- 458- 68-
W8VSK 26,730- 243- 55-13
W8WVU 19,392- 202- 48-
K8CV 16,860- 205- 46- 8
NO8Q 4,900- 70- 35-
KC8P 4,560- 76- 30-
W8YL 128- 8- 8-

Ohio

W8FN 82,002- 504- 79-17
K8KEM 47,040- 480- 49-
W8SJU 45,960- 383- 60-23
K8SVT 35,868- 294- 61-30
N8AA 13,432- 148- 46- 5
K3JT 12,496- 142- 44- 9
W8GS 12,300- 123- 50- 5
WD8IDM 11,610- 135- 43- 7
W8IQ 10,125- 111- 45- 3
NZ8J 7,216- 88- 41-
W8FDN 6,510- 105- 31- 6
WA8RCN 6,230- 89- 35- 4
K3GP 5,984- 88- 34- 9
W8PN 5,250- 75- 35- 5
WB8TCO 3,248- 56- 29- 7
WA8GLF 2,350- 47- 25-12
K8HF 1,800- 36- 25- 2
AF8C 1,480- 37- 20- 7
W8LT (K1LT,K8s ND,PA,KD8NS, WB8WKB,ops) 181,090- 947- 91-41
KS8S (+AD8P,KU8E) 174,780- 938- 90-42
KA8HPO (+KB8AC,NM8O,WB8YJF) 118,404- 735- 78-40
WB8ZYD (+WB8s MIP,PIY) 10,336- 136- 38-

West Virginia

K8OQL 59,630- 439- 67-24
KV8S 49,088- 379- 64-17
KD8YY 22,442- 229- 49-15
KC8JH 736- 23- 16- 1

9

Illinois

KF9D 109,792- 749- 73-24
K9AB 66,776- 491- 68-
K9HDE 52,461- 390- 67-14
W9LNQ 21,360- 178- 60-
NU9R 15,708- 154- 51- 7
K9PPW 11,616- 121- 48- 6
KA9ACS 11,526- 110- 51-
W9KV 4,032- 63- 32- 4
NJ9Q 2,600- 50- 26- 3
W9CA 936- 28- 18-
W9AZ (AK9F,K9s IFO,NR,KA9s PSO, PWW, KD9RN,W9HBI,WB9HAD, KAØWTR,ops) 134,400- 816- 80-

Indiana

W9YSX 121,891- 781- 77-20
KA9OKH 104,804- 676- 76-24
WB9CIF 21,930- 215- 51-12
K9HCX 6,864- 78- 44-
W9ERW 2,500- 50- 25- 4

Wisconsin

W9UP (NØBSH,op) 113,472- 788- 72-34
WA1UJU 92,752- 682- 68-24
W9WAQ 80,500- 572- 70-23
NI9C 40,267- 299- 67-14
WA9TZE 20,292- 175- 57-
W9MQZ 19,140- 174- 55-
W9HE 12,600- 150- 42- 6
N9KS 11,956- 122- 49-
W9HR 5,244- 69- 38-
WØAIH/9 (+KØFVF,KMØO,WAØRBW) 160,844-1009- 79-42

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Colorado

K4XU 110,625- 730- 75-18
WØCP 41,138- 307- 67- 6
KØRZ 24,288- 184- 66-15
KØOST 14,300- 130- 55-17
KU7U 7,128- 81- 44- 8
ADØO (+NR5K) 63,280- 449- 70-20

Iowa

WØEJ 147,498- 935- 78-
KJØH 51,484- 422- 61-
NØBB 24,308- 206- 59-14
KØSRL 15,300- 150- 51- 8
WØBXR(N2AWE,K9AYK,N9OK, W9TW, WB9ASF,KØIS,KAØs OVA, YDQ,KW8J,NØs BFJ,EL,NUØG, WØOJD,WDØDUK,ops) 94,316- 646- 73-30
NØSM (+KØs JGH,RW,NØDJY, NRØE,WBØVYV) 94,290- 672- 70-23

Kansas

WØUY 22,040- 190- 58-17
WAØCFZ 12,420- 120- 52-14
NØIN 11,628- 114- 51- 1
WØAWP 8,556- 93- 46-
NØFMR 5,544- 84- 33- 6
WØRT 2,760- 46- 30- 1

Minnesota

KØPK 104,400- 693- 75-24
WØUC 56,848- 418- 68-21
W1GV 28,912- 232- 58-11
KNØV 11,352- 129- 44- 6
WØVB 2,184- 42- 26- 5

Missouri

WØHBH 34,038- 279- 61- 7
NSØB 24,080- 215- 56- 5

North Dakota

WBØO 54,536- 401- 68- 8
KCØUM 208- 13- 8-

Nebraska

KVØI 31,696- 238- 56-18

South Dakota

KØDD (+KØKX,NØHUN,NSØN, WAØPEV) 160,720- 994- 80-

VE

Ontario

VE3KP 94,004- 656- 71-
VE3PN 37,584- 324- 58-12
VE3CUI 32,994- 304- 54-12
VE3NBE 11,310- 145- 39-10
VE3ST 4,830- 69- 35- 2

Manitoba

VE4AAU 4,356- 66- 33-

Saskatchewan

VE5UF 36,595- 280- 65-13
VE5XU 17,384- 164- 53-

British Columbia

VE7FPT 23,640- 197- 60-
VE7WO 21,340- 194- 55-

Checklog

W3ARK

Straight Key Night 1987

By Mark Gamble
Contest Assistant, ARRL

On the Keys for New Year's Eve (A Tourist's Memoirs)

There was once a man from Key West
Who thought A1A was the best.
"Not the highway you see,"
he exclaimed unto me
"but the way I talk to the rest."

"I declare I don't quite understand,"
said a tourist with a drink in his hand.
"How could you?" he smiled,
All the hams were beguiled
and went home to get on the band.

It was New Year's Eve in the Keys.
Palms with dipoles swung in the breeze.
"Not a spot too remote,"
our friend strived to denote,
"For SKN to put a ham's heart at ease!"
—Hunt Turner, KØHT

Hunt Turner describes perfectly the feelings of most CW enthusiasts. Straight keying is seen as the heart and soul of Amateur Radio. Bob (N8FTT) says, "Hooray for SKN—it is like a breath of fresh air in these hurried, troubled times. A brief respite from automation and complexity—a time to forget for a while the electronic devices that make for speed, but at the same time remove the art and satisfaction of forming coded signals by hand." Bob has captured Straight Key Night not only in spirit but also in essence. Straight keying can only be described as an art form for those who believe CW is the truest and most eloquent form of radio operation. The rhythms and unique cadences that each individual brings to the world of radio highlights his individuality just as much as the content of his QSOs. Hence, SKN is divided into two categories to be judged. The first is best fist and the second is most interesting QSO.

Last year's SKN claimed 61 entries, while this year hailed 85 brass pounders knocking out a striking 794 QSOs. This is an increase of 136 QSOs over last year's 658. What kind of turnout will next year's SKN produce? Looking over the statistics, one cannot doubt that this upswing in Straight Key Night activity will continue as the bands begin to open, and with it a greater appreciation of the traditional ways of our ham forefathers.

When the last ring of pounding brass had subsided and all was quiet, Bob, N2CPL, walked away with the prestigious title of "Best Fist." Ed, WA3WSJ, gave the highest praise to the venerable N2CPL by stating, "He gets my vote for the best fist in town. This guy is fantastic with a straight key!" In second place and only one vote behind was Leland, W5KL. Others who deserve honorable mention in this category are N4JF, N9CQQ, W1DV/4 and W5WE.

The most entertaining brass pounder of this New Year's Eve was N4JF. Jerry exceeded all others in his "gift of gab," hence he was the champion of the most interesting QSO category. From Alabama to Oregon, Jerry received only the highest praise for his extraordinary abilities. In second place was Jim, AFØZ.

Following Jim were a myriad of others: K6NL, W2KTF, W3TS, WØAWP and WD9JBK all tied for third. Congratulations to not only the winners of each category but all those who participated in SKN.

Key Klix

It was my first year as a ham, a very friendly night indeed! (WAØI). Happy New Year to all at ARRL and many thanks for all you do for "us hams" (KB2AUR). It was great fun—Thanks (N8AA). Thanks for the good memories on SKN (N9CKZ). Another one of those relaxing, unhurried and fun programs called Straight Key Night has come and gone—and I enjoyed it very much (N8FTT). I have been working CW on New Year's since 1939 (W5HFN). God willing, I'll be on next year. I've been a ham for 50 years and a member for just as long (W5ETK). Straight Key Night was a very enjoyable event. From about midnight to closing time in the morning, shortwave broadcasters tore up 40 meters badly (KC4BZH/T). Enjoyed SKN and will be there next year. CW FOREVER!!!! (WC5Z). There was an excellent turn-out. I was fascinated by the many types of old keys used (K4FS). This is how it all began, and good straight-key CW is the essence of Amateur Radio! There were a lot of good fists on the air, and this was another enjoyable SKN (WD4DSS). We did go to a dinner party on New Year's Eve, but all I drank was soda, hence I ended up not being sleepy when we got home so I fired up the rig for SKN at 1:30 AM until 5 AM. I slept until noon and fired up again until the 6 PM stop time. Once again it was a blast. Nice to know I can still use this old piece of Radio Shack brass! (AFØZ). I worked SKN again this year and had a ball. There seemed to be a lot more working SKN this year than usual. I heard a lot of good fists and a few not so good but trying (WA4LXP). The straight key sitting in front of a modern transceiver makes an interesting contrast—not out of place, but a reminder of the early days that will always be with us (K1SWT). An interesting side note—the night before SKN, I worked WB4OUF. He was using a reproduction of a 1929 single tube-type 45, running 2 watts on a breadboard with copper tubing as the coils. His receiver was a Sky Buddy and of course he was using a straight key (AE3G). I participated in SKN for a while, and must admit that I do not miss the old relic (I never was any good with it) (WB7DZX).

Rules, 3rd IARU HF World Championship

The first and second running of the IARU HF World Championship seem to have been well received by the world-wide amateur contesting community. There are no changes in this year's rules. The 24-hour format is ideal for an entrant to stay active on the bands for the entire contest period and also there is an abundance of multipliers to work, including IARU Society HQ stations as well as ITU zones. The IARU HQ stations will be the ones sending their IARU society abbreviation instead of ITU zone in the exchange! To run up a big score for the '88 contest, it is important to strike a balance between large QSO and multiplier totals. Also, remember to work on the low bands as well as on the high bands—anything could happen this year. Patience and good operating will reward you with some extra multipliers.

For those not familiar with ITU zones around the world, there is a abbreviated listing of countries and their corresponding ITU zones in this announcement. Send an SASE (with 2 units of first-class postage) or 2 IRCs early for the proper forms (included is a map) so you will have them in time for the contest. Good luck!

Prefix, Continent and ITU Zone

A2	AF	57	FK	OC	56	KL7	NA	1,2	TJ	AF	47	VP9	NA	11	4S	AS	41
AS	OC	62	FM	NA	11	KP1-5	NA	11	TK	EU	28	VQ9	AF	41	4U(ITU)	EU	28
A4	AS	39	FO(Clip)	NA	10	KX6	OC	65	TL	AF	47	VR6	OC	63	4U(UN)	NA	08
A5	AS	41	FO	OC	63	LA	EU	18	TN	AF	52	VS6	AS	44	4W	AS	39
A6	AS	39	FP	NA	09	LU	SA	14,16	TR	AF	52	VU	AS	41,49	4X	AS	39
A7	AS	39	FR	AF	53	LX	EU	27	TT	AF	47	XE	NA	10	5A	AF	38
A9	AS	39	FW	OC	62	LZ	EU	28	TU	AF	46	XF4	NA	10	5B	AS	39
AP	AS	41	FY	SA	12	OA	SA	12	TY	AF	46	XT	AF	46	5H	AF	53
BV	AS	44	G-GW	EU	27	OD	AS	39	TZ	AF	46	XU	AS	49	5N	AF	46
BY	AS	33,42, 43,44	H4	OC	51	OE	EU	28	UA1,3, 4,6	EU	19,20 29,30	XW	AS	49	5R	AF	53
C2	OC	65	HA,HG	EU	28	OF-OH	EU	18	UA1(FJL)	EU	75	XX9	AS	44	5T	AF	46
C3	EU	27	HB	EU	28	OJ0	EU	18	UA-UZ2	EU	29	XZ	AS	49	5U	AF	46
C5	AF	46	HC	SA	12	OK	EU	28	UA9-UZ0	AS	20-26,30, 35,75	Y2-9	EU	28	5V	AF	46
C6	NA	11	HH	NA	11	ON	EU	27	UB	EU	29	YA	AS	40	5W	OC	62
C9	AF	53	HI	NA	11	OX	NA	5,75	UC	EU	29	YB	OC	51,54	5X	AF	48
CE	SA	14,18	HK	SA	12	OY	EU	18	UD	AS	29	YI	AS	39	5Z	AF	48
CE0A	SA	63	HKØ(M)	NA	12	OZ	EU	18	UF	AS	29	YJ	OC	56	6W	AF	46
CE0X	SA	14	HKØ	NA	11	P2	OC	51	UG	AS	29	YK	AS	39	6Y	NA	11
CE0Z	SA	14	HL	AS	44	P4	SA	11	UH	AS	30	YN	NA	11	7O	AS	39
CM,CO	NA	11	HP	NA	11	PA	EU	27	UI	AS	30	YO	EU	28	7P	AF	57
CN	AF	37	HR	NA	11	PJ2,4,9	SA	11	UJ	AS	30	YS	NA	11	7Q	AF	53
CP	SA	12,14	HS	AS	49	PJ5,6,7,8			UL	AS	30	YT,YU, YZ	EU	28	7X	AF	37
CT	EU	37	HV	EU	28	PY	SA	11	UM	AS	30	YV	SA	12	8P	NA	11
CT3	AF	36	HZ	AS	39	PY0	SA	12,13,15	UO	AS	51	YV0	NA	11	8Q	AS, AF	41
CU	EU	36	I,IS0	EU	28	PY0(T)	SA	13	UP	EU	29	Z2	AF	53	6R	SA	12
CX	SA	14	J2	AF	46	PZ	SA	15	UQ	EU	29	ZA	EU	28	9G	AF	46
D2,3	AF	52	J3	NA	11	S2	AS	12	UR	EU	29	ZB	EU	37	9H	EU	28
D4	AF	46	J6-8	NA	11	S7	AF	53	V2-4	NA	11	ZC4	AS	39	9J	AF	53
D6	AF	53	JA	AS	45	S9	AF	47	V8	OC	54	ZD7-9	AF	66	9K	AS	39
DA-DL	EU	28	JD	OC	90	S0	AF	37	VE,VY	NA	2,3,4,9, 75	ZF	NA	11	9L	AF	46
DU	OC	50	(Minami)			SJ-SM	EU	18	VK	OC	55,58,59	ZK1-3	OC	62	9M2,4	AS	54
EA	EU	37	JD	AS	45	SP	EU	28	VK(LHI)	OC	60	ZL	OC	60	9M6,8	OC	54
EA6	EU	37	(Ogasawara)			ST	AF	48	VK9(W)	OC	60	ZP	SA	14	9N	AS	42
EA8	AF	36	JT	AS	32,33	SU	AF	38	VK9(X)	OC	54	ZS	AF	57	9Q	AF	52
EA9	AF	37	JW	EU	18	SV	EU	28	VK9			1A0	EU	28	9U	AF	52
EI	EU	27	JX	EU	18	T2	OC	65	(C,K)	OC	54	1S	AS	50	9V	AS	54
EL	AF	46	JY	AS	39	T30	OC	65	VK9			3A	EU	27	9X	AF	52
EP	AS	40	W,K	NA	6,7,8	T31	OC	62	(C,K)	OC	54	3B6-9	AF	53	9Y	SA	11
ET	AF	48	KC6	OC	64,65	T32	OC	61,63	VK9(M)	OC	56	3C	AF	47	.J2/A	AS	39
F	EU	27	KG4	NA	11	T6	AF	48	VK9(N)	OC	60	3C0	AF	52			
FT8W	AF	68	KH1	OC	61,62	T7	EU	28	VK9(H)	AF	58	3D2	OC	56			
FT8X	AF	68	KH2	OC	64	TA	EU/ AS	39	VK9(M)	OC	60	3D6	AF	57			
FT8Z	AF	68	KH3-7	OC	61				VP2	NA	11	3V	AF	37			
FG	NA	11	KH6	OC	62	TF	EU	17	VP5	NA	11	3W,XV	AS	49			
FJ,FS	NA	11	KH9	OC	65	TG	NA	11	VP8(F)	SA	16	3X	AF	46			
FH	AF	53	KH0	OC	64	TI	NA	11	VP8	SA	73	3Y	AF	67			

Rules

1) **Eligibility:** All licensed amateurs worldwide.

2) **Object:** To contact as many other amateurs, especially IARU member-society HQ stations, around the world as possible using 1.8 through 30 MHz. (The 10, 18 and 24-MHz bands may not be used for contest QSOs.)

3) **Date:** Second full weekend of July (July 9-10, 1988).

4) **Contest Period:** 1200 UTC Sat until 1200 UTC Sun. Both single and multioperator stations may operate for the entire 24-hour period.

5) **Categories**

A) *Single operator*—phone-only, CW-only and mixed-mode. One person performs all operating and logging functions. Use of spotting nets is not permitted. All operators must observe the limits of their operators' licenses at all times. Single-operator stations are allowed only one transmitted signal at any given time.

B) *Multioperator*—single transmitter, mixed-mode only. Must remain on a band for at least 10 minutes at a time. Only one transmitted signal allowed at any given time. (Exception: Only IARU member-society HQ stations may operate simultaneously on more than one band, with one transmitter on each band/mode. Only one HQ station call sign per member-society per frequency band is permitted.) All operators must observe the limits of their operators' licenses at all times.

6) **Contest exchange:** IARU member-society HQ stations send signal report and official IARU member society abbreviation. All others send signal report and ITU zone. A complete exchange must be logged for each valid QSO.

7) **Valid Contact**

A) The same station may be worked once per band/mode. Mixed-mode entries may work a station once per mode (but only in the generally accepted portions of that band for that mode. **Note:** Reworking a station in the phone portion of the band on CW is not permitted). Example: On any band, a station may be worked once on phone and once on CW (in the CW segment) for additional QSO credit. However, this counts as only one multiplier. Crossmode, crossband and repeater QSOs do not count. Where contest-preferred segments are incorporated in regional band plans, participants are requested to observe them.

B) The use of non-Amateur Radio means of communication (eg, telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

8) **QSO Points**

A) Contacts within your ITU zone, as well as QSOs with **all IARU HQ member-society stations, count one point.**

B) Contacts within your continent (but different ITU zone) count three points.

C) Contacts with a different continent count five points.

9) **Multipliers:** Total number of ITU zones plus IARU member-society HQ stations worked on each frequency band. **(Note: HQ stations do not count for zone multipliers.)**

10) **Scoring:** Multipliers times the total number of QSO points.

11) **Reporting**

A) All entrants are encouraged to use forms available from the ARRL/IARU Secretariat for an SASE (with 2 units of first-class postage) or 2 IRCs.

B) Logs must indicate times in UTC, bands, modes, calls and complete exchange. Multipliers should be marked clearly in the log. Cross check sheets (dupe sheets) are required if more than 500 total QSOs are made.

C) Entries *must* be postmarked within 30 days after the contest (by Aug 10, 1988). Any entry received after mid-Oct 1988 may not be received in time to be included in the printed results.

D) Contest summary, logs and cross check sheets (if required) should be sent to IARU Secretariat, Box AAA, Newington, CT 06111, USA.

12) *Awards:* A certificate will be awarded to the high-scoring CW-only, phone-only, mixed-mode and multioperator entrant in each state, each ITU zone and each DXCC country. In addition, achievement-level awards will be issued to those making at least 250 QSOs or having a multiplier total of 50 or more. Additional awards may be made at the discretion of each country's IARU member-society.

13) **Conditions of Entry**

A) Each entrant agrees to be bound by the provisions of this announcement, by the regulations of his/her licensing authority and by the decisions of the ARRL Awards Committee, acting for the IARU International Secretariat.

B) Disqualifications: An entry may be disqualified if the overall score is reduced by more than 2%. Score reduction does not include correction of arithmetic errors. An entry may be disqualified if more than 2% of duplicates are left in the log. A three-QSO reduction will be assessed for each duplicate QSO found during log checking or for each miscopied call sign. See Jan 1988 *QST*, page 86, for complete details.

Contest Corral

Conducted By Mark R. Burke, KA1MIS
Contest Assistant, ARRL

APRIL

2-3

GARTG SSTV Contest, Part 1. See Mar *QST*, p 83.

International Slow Scan/Fast Scan TV DX Contest, sponsored by the International Visual Communications Assn from 0000Z Apr 2 until 2400Z Apr 10. SSTV and FSTV only. Work stations once per contest. Exchange call, name, QTH and a picture (one of yourself preferred). Score 10 points for the first contact with any DXCC country, 5 points per additional DXCC countries, 2 points per contact with own country and 2 point bonus for an SSTV/FSTV relay contact for the final transmitting station (the original material must originate from another station who receives no bonus points). Trophies. You must use official IVCA contest logs which are available from W6FVV. Postmark logs by May 8 and send to Mr L. E. Tepfer, W6FVV, 12114 E Garvey Ave, El Monte, CA 91732.

SP-DX Contest, phone, sponsored by the Polski Zwiazek Krotkofalowcow, from 1500Z Apr 2 until 2400Z Apr 3. Suggested frequencies are 160-10 meters. Categories: single op, multiband; single op, single band; multiop, single transmitter (all bands); SWL. Non-Polish stations transmit a 5-digit number consisting of RS plus QSO number. Polish stations send a signal report plus 2 letters denoting the province. Count 3 points for each SP-station QSO. Each different province counts as a multiplier (49 max). Multiply sum of QSO points by total number of provinces for final score. Include complete logs, summary sheet and multiplier check list. Certificates. Mail entries by Apr 30 to Polski Zwiazek Krotkofalowcow, SP-DX Contest Committee, PO Box 320, 00-950 Warsaw, Poland.

6

West Coast Qualifying Run, 10-35 WPM, at 0500Z Apr 6 (10 PM PDT Apr 5). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL HQ for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

9

Israel International Contest, See Mar *QST*, p 83.

9-10

GARTG RTTY Contest, Part 2, See Mar *QST*, p 83.

North American QSO Party, CW, See Mar *QST*, p 83.

QRP ARCI Spring QSO Party, Sponsored by QRP ARC International, from 1200Z Apr 9 until 2400Z Apr 10. Operate max 24 hours. CW only. Work stations once per band. Exchange signal report, state/province/country and QRP number if member. Nonmembers send power output. Suggested frequencies: 1.810 3.710 3.560 7.110 7.040 14.060 21.110 21.060 28.110 28.060 50.060. No 12- or 30-meter QSOs. Count 5 points for QSO with ARCI member. Others count 2 points for same continent and 4 points for different continent. Multiply QSO points by states/provinces/countries worked per band by power multiplier (4-5 W output ×2; 3-4 W output ×4; 2-3 W output ×6; 1-2 W output ×8; 0-1 W output ×10). More than 5 W output counts as checklog. If 100% natural power, multiply final score by 2; if 100% battery, by 1.5. Bonus points: add 200 pts for each band a home-brew TX is used; add 300 pts for each band a home-brew RX is used; add 500 pts for each band a home-brew TCVR is used (max 500 bonus pts per band). Awards. Mail entry to be received by May 10 to QRP ARCI Contest Chairman, Red Reynolds, K5VOL, 835 Surryse Rd, Lake Zurich, IL 60047.

Connecticut QSO Party, sponsored by the Candlewood ARA, from 2000Z Apr 9 until 0200Z Apr 11, with a rest period from 0500Z to 1200Z. Phone and CW. Work stations once per band and mode. CW QSOs in CW bands only. Work portables and mobiles again as they change county. No repeater QSOs. Exchange signal report, serial number and QTH (county for CT stations; state/province/country for others). Count 1 point per phone contact, 1.5 points per CW contact, 3 points per OSCAR contact. Club station W1QI counts 5 points per band/mode. CT stations multiply QSOs by states worked (DX only one multiplier), others multiply by CT counties worked. Suggested frequencies: phone—1.860 3.927 7.280 14.280 21.370 28.370 50.110 144.200 146.55; CW—40 kHz from low end; Novice—3.725 7.125 21.125 28.125 MHz. Certificate to highest scorer in each state and WACC Certificate for working all CT counties. Mail logs by May 11 to CARA, PO Box 143, Bethel, CT 06801.

11

ARRL VHF/UHF Spring Sprints, 144 MHz, from 7 PM until 11 PM local time on Mon, Apr 11. (Note: Other Spring Sprint dates are: 220 MHz on Tues, Apr 19; 432 MHz on Wed, Apr 27; 902 MHz on Fri, May 6; 1296 MHz on Thur, May 12; 2304 MHz on Thur, May 26; and 50 MHz on Sat-Sun, 2300Z, May 21 until 0300Z, May 22.) Usual VHF/UHF rules apply. Single-operator only. Exchange grid-square locations (see Jan 1983 *QST*, page 49). Signal reports are optional. Count one point per valid QSO. Multiply QSO points by number of different grid squares worked for final score. Contests are separate; there is no accumulation of scores. The official entry forms, available from ARRL HQ for an SASE, are recommended. Logs must indicate time, call sign and complete exchange for each valid QSO. Multipliers must be clearly marked in the log. Submit separate log and summary sheets for each contest entered and mail contest entries in separate envelopes. Entries for each contest must be postmarked by June 20.

13

W1AW Qualifying Run, 10-35 WPM at 0300Z Apr 14 (10 PM EDT Apr 13). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Apr 6 listing for more details.

16

Holiday in Dixie QSO Party, sponsored by WA5ARJ, on Apr 16 from 1800Z until 2300Z. Suggested frequencies: SSB—7.235 14.245; CW—7.115 21.115. Exchange name, QTH, RS(T) and Holiday-In-Dixie operator's name. Send SASE and QSL for certificate to WA5ARJ, Box 4842, Shreveport, LA 71134.

16-17

Georgia QSO Party, See Mar *QST*, p 84.

North American QSO Party, SSB, See Mar *QST*, p 83.

QST QSO Award Party, phone, See Mar *QST*, p 84.

29

ARRL Spring Sprints, 220 MHz, See Apr 11 listing.

23-24

Helvetia Contest, sponsored by the USKA (Switzerland), from 1300Z Apr 23 until 1300Z Apr 24. CW and phone (mixed mode only). Categories: single op, multiop, SWL. Suggested band: CW—160-10 meters; phone—80-10 meters; no WARC band operation. Work stations once per band, regardless of mode. Exchange RS(T) and 3-digit serial number. Swiss stations will also send one of the following abbreviations to indicate their canton: AG AI AR BE BL BS FR GE GL GR JU LU NE NW OW SG SH SO SZ TG TI UR VD VS ZG ZH. Count 3 points per QSO. Multiply total points by the number of Swiss cantons worked. Awards. Separate logs per band. Mail entry by May 31 to Walter Schmutz, HB9AGA, Gantrischweg I, CH-3114 Oberwichtrach, Switzerland.

North Carolina QSO Party, sponsored by the Alamance ARC, K4EG, from 1200Z Apr 23 until 0400Z Apr 24. Work stations once per band/mode. Mobiles may be worked again as they change counties. Exchange RS(T) and QTH (NC county, state or country). Suggested frequencies: SSB—3.860 7.260 14.260 21.360 28.360; CW—3.540 3.740 7.040 7.140 14.040 21.140 28.040 28.140. Count one point per phone QSO, two points per CW QSO and 5 points for Novice/Tech contacts. NC stations multiply points by total NC counties, states, provinces and countries. Others multiply points by total NC counties worked (max 100). Blank forms are available from K4EG for an SASE. Mail logs by June 30 to NC QSO Party, c/o K4EG, PO Box 3064, Burlington, NC 27215. Include SASE for results and certificate.

QST QSO Award Party, CW, see Mar *QST*, p 84.

Rat's Nest & Crooked Stick Contest Sprint, sponsored by the Issaquah ARC, from 2300Z Apr 23 until 0400Z Apr 24. Phone and CW. Frequencies: CW—7.075 to 7.150; phone—7.225 to 7.300. Work stations once per mode. Max 250 W DC input. Antenna—home-brew wire antenna, in any configuration as long as it includes a crooked stick support. Exchange name, QTH, type of antenna and IARC member (yes or no). QSO points: CW—5 pts; SSB—3 pts. Bonus: to encourage "Elmering": contacts made with apprentice's assist +2 pts each; contacts made by apprentice +5 pts each. Multiply by 2 for each state, province or country for final score. Awards. Send log to Martha Stedman, N7IVX, 15423 SE 7th Pl, Bellevue, WA 98008.

24

W1AW Qualifying Run, 10-40 WPM, at 2300Z (7 PM EDT) Apr 24. See Apr 13 listing for more details.

27

ARRL Spring Sprints, 432 MHz, See Apr 11 listing.

MAY

4

West Coast Qualifying Run, 10-40 WPM to 0400Z (9 PM PDT May 5). See Apr 5 listing for more details.

6

ARRL Spring Sprints, 902 MHz, See Apr 11 listing.

7-8

Ten-Ten International Net Spring CW QSO Party, sponsored by the Ten-Ten International Net, from 0000Z May 7 until 2400Z May 8. Open to all amateurs but only paid-up 10-10 members are eligible for awards. Single operator only. CW and RTTY. Work stations once on 10 meters only. Contacts must be in the CW sub-band. Exchange call, name, state and 10-10 number (if member). Count 2 points for each QSO with a member, count 1 point for each QSO with nonmember. Final score is total QSO points. Awards. Send logs along with cover sheet and dupe sheet postmarked before Jun 1 to Rep of Texas Chapter, c/o Ron Olson, NN5Y, 2913 Hillsdale St, Garland, TX 75042.

Nevada QSO Party, sponsored by the Frontier ARS, 0000Z May 7 until 1800 May 8. 160-6 meters, CW/SSB/FM/RTTY/SSTV. No cross-mode or repeater QSOs. Suggested frequencies: CW—15 kHz up from bottom of General bands; phone—25 kHz up from bottom of General bands; Novice and Tech portion of bands. Exchange: NV—RS(T) and county; others—RS(T) and state/province/DXCC country. Count one point for each contact per mode. Multiply points by number of NV counties worked. Certificates awarded. Mail logs by Jun 1 to Jim Frye, NW7O, 4120 Oakhill Ave, Las Vegas, NV 89121.

12

ARRL Spring Sprints, 1296 MHz, see Apr 11 listing.

W1AW Qualifying Run, 10-40 WPM, at 0200Z (10 PM EDT) May 13. See Apr 13 listing for more details.

14-15

County Hunters SSB Contest, sponsored by MARAC, from 0001Z May 14 until 2400Z May 15 (0800Z-1200Z each day is a mandatory rest period). Work mobile and portable stations each time they change band or county. Fixed stations may work other fixed stations only once, regardless of band change. No contacts on net frequencies. Exchange signal report and QTH (county for US; country for DX). Suggested frequencies: 3.870-3.890 7.225-7.250 14.250-14.285 21.360-21.380 28.570-28.600 MHz. There will be a mobile window at 3.870-3.880 7.235-7.245 14.265-14.275 where low-power mobiles will operate. Fixed stations are asked to work the mobiles and move out of the window. Point value of contacts: mobile—15; mobile team—30; portable—5; DX (incl KH6/KL7)—5; fixed US station—1. Final score equals the total of US counties plus Canadian stations times the total number of QSO points. Awards and certificates. Send your logs by Jun 4 (or an SASE for more information) to Barry Brewer, WA5DTK, PO Box 4342, Patrick AFB, FL 32925.

CQ-M Contest (Peace to the World), sponsored by the Krenkel Central Radio Club of the USSR, from 2100Z May 14 until 2100Z May 15. CW and phone, 3.5 through 28 MHz. Amateur satellites count as a separate band if a 144- to 28-MHz mode is used. Work stations once per band, regardless of mode. No crossmode QSOs. Categories: single op, single band; single op, all band; multioperator, single transmitter (all bands); SWL. Exchange signal report and serial number. Avoid lower 5 kHz of 80/40 meters and lower 10 kHz of 20/15 meters. Count one point per QSO within your continent, 3 points for other continents. QSOs with your own country count for multiplier credit, but have no point value. Multiply total QSO points by the sum of different countries (R-150-S country list) worked per band. The R-150 list is basically the same as the ARRL countries list except for USSR countries. Serious competitors should review the R-150 list. Awards. Mail logs by Jul 1 to CQ-M Contest Committee, PO Box 88, Moscow, USSR.

Utah QSO Party, sponsored by the Utah ARC and the Utah DX Assn, from 1800Z May 14 to 1800Z May 15. Suggested frequencies: CW—1.810 and up 60 kHz from the bottom of each band; SSB—1.860 3.980 7.280 14.280 21.380 28.680; Novice—3.710 7.110 21.110 28.110 28.300-28.500. Exchange: Utah—RST/county; Non-Utah—RST/state/province/country. Novice and Technician station sign N or T. Points: Utah stations receive points for all contacts, 5 points for Novice or Technician, 3 points for all other class licensees. Non-Utah stations, 5 points for Utah Novice or Technician worked, 3 points for all other Utah licensees. Multipliers—Utah stations: Number of states/provinces/countries; Non-Utah stations, number of Utah counties per band (max 29). Awards for top scorers. Send logs and SASE for results to Russ Blair, 2113 E 10095 S, Sandy, UT 84092.

Michigan QSO Party

21

Armed Forces Day

21-22

ARRL Spring Sprints, 50 MHz, see Apr 11 listing.

23

W1AW Qualifying Run

26

ARRL Spring Sprints, 2304 MHz, see Apr 11 listing.

28-29

CQ WW WPX Contest, CW, see Mar *QST*, p 83.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **May 1** to make the **Jul** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Special Events

Conducted By Mark R. Burke, KA1MIS
Contest Assistant, ARRL

Fredericksburg, Texas: The Gillespie County ARC will operate K5TR 1500Z-2300Z **Apr 2** to commemorate the Fredericksburg Easter Fires. Suggested frequencies: lower 25 kHz of the General 40- through 15-meter phone bands; 10-meter Novice phone band; 50.120 MHz. For QSL, send QSL and no. 10 SASE to N5CND, 108 E Centre St, Fredericksburg, TX 78624.

Benton, Kentucky: The Marshall County ARA will operate KA4WWS from 1800Z **Apr 3** until 2400Z **Apr 4** to commemorate the 145th Annual Tater Day Celebration. Suggested frequencies are near the middle of the General phone and CW bands and the 10-meter Novice band. For QSL, send SASE to Clyde Dexter, KA4WWS, Rte #1, Box 486, Benton, KY 42025.

Selmer, Tennessee: The McNairy County ARS will operate WA4GZX **Apr 9-10,** 1400Z-2300Z each day, to commemorate the 126th anniversary of the Battle of Shiloh. Suggested frequencies: phone—80, 40 and 20-meter bands; CW—80- and 40-meter bands; Novice bands. For a commemorative certificate, send large SASE (39 cents) to Joe Bowmen, WA4GZX, Rte 2, Box 96C, Ramer, TN 38367.

Auckland, New Zealand: Local hams of Birkenhead, New Zealand, will operate ZM1BCC **Apr 15-25,** 2100Z-0500Z each day, for the centenary celebration of the local government in Birkenhead. Operation will be on all bands. For special QSL, send QSL via the Bureau.

Houston, Texas: The Northwest ARS will operate N5HF **Apr 16** to commemorate the Houston International Festival and the Reeking Regatta Canoe Race on Buffalo Bayou. Suggested frequencies: 7.260 14.250 21.325 28.400. For QSL, send SASE to PO Box 11073, Spring, TX 77391.

Magee, Mississippi: N5KBQ will operate **Apr 16-17** and **Apr 23-24,** 1800Z-2400Z each day, while under parachute from 10,000 ft. Operating frequency will be 146.580 FM. For special QSL, send QSL and SASE to Jump VHF, Robert Vardaman, N5KBQ, PO Box 742, Hattiesburg, MS 39403-0742.

Green Valley, Arizona: The Green Valley ARC will operate KX7J **Apr 16-17,** 1600Z-2300Z each day, from the world's only missile-silo museum. Suggested frequencies: phone—7.230 14.250 21.350 28.360; CW—7.050 14.050. For QSL, send QSL and SASE to Green Valley ARC, 601 N La Canada, Green Valley, AZ 85614.

Williamsport, Maryland: WA3EOP will operate **Apr 18-24** to celebrate Maryland Odd Fellow Week. Suggested frequencies: phone—3.870 7.240 14.265 21.375 28.375; CW—7.120; FM—147.090. For commemorative certificate, send QSL and SASE to Page Pyne, WA3EOP, 109 S Artizan St, Williamsport, MD 21795.

Irwindale, California: The El Capitan District of Orange County's Council of the Boy Scouts of America will operate N6OVU 0200Z-0400Z **Apr 22** and 2000Z-0400Z **Apr 23-24** for the Camporee on the Air. Operation will be phone on 14.250 21.350 28.350 and down from these frequencies. For special QSL, send QSL and large SASE to N6OVU/COTA, 9731 Dakota Ave, Garden Grove, CA 92644.

Galena, Illinois: The Great River ARC of Dubuque, Iowa, will operate N9FVN 1500Z-2100Z **Apr 23** at the annual Boy Scouts of America US Grant Pilgrimage. Suggested frequencies: lower 20 kHz of the General bands; CW—lower 25 kHz of the 80- and 40-meter bands; Novice phone—lower 25 kHz of 10 meters. For QSL, send SASE to N9FVN, RR 1, Shullsburg, WI 53586.

Worldwide: The Cornish RAC of Cornwall, England, has organized to have EI2IMD, GB4IMD, 1Y4FGM, K1VV, VE1IMD and VO1IMD operate 0000Z-2400Z **Apr 23** to celebrate Guglielmo Marconi's birthday, with each station representing an early Marconi station location. Suggested frequencies: phone—3.775 7.075 14.275 21.255 28.535. Special QSLs are available. A certificate for working 5 of the 6 stations is also available by sending 3 IRCs to the Cornish RAC, PO Box 100, Truro, Cornwall, England.

Philadelphia, Pennsylvania: The Olympia RAC will operate WA3BAT from 1300Z **Apr 23** until 2000Z **Apr 24** to celebrate the anniversary of the United States Submarine Service by operating from the *USS Becuna*, a WW II submarine, and the *USS Olympia*, flagship of Admiral Dewey. Suggested frequencies: phone—3.890 7.240 14.250 21.360 28.325 28.600; CW—3.590 3.725 7.050 7.125 14.050 21.090 21.125 28.150; FM—144.270; 144.225 SSB. For special certificate, send business-sized SASE or one (1) IRC if foreign contact to Olympia RAC, PO Box 928, Philadelphia, PA 19105.

Rocky Point, New York: The Rocky Point Schools ARC will operate N2FCZ 1400Z-2100Z **Apr 25** from Marconi's shack to commemorate his birthday. Suggested frequencies: CW—3.705 21.105. For commemorative QSL, send QSL and SASE to RPS ARC, Rocky Point Jr/Sr High School, 82 Rocky Point Rd, Rocky Point, NY 11778.

Sacramento, California: The California State Railroad Museum will operate WB6RVR/6 1600Z-2400Z **Apr 30** and **May 1** to commemorate the 5th consecutive year of Steam Train operations at the site. Suggested frequencies: phone—7.260 14.260 21.360 28.360. For commemorative QSL, send QSL and SASE to California State Railroad Museum, Attn: Steam Trains, 111 I St, Sacramento, CA 95814.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **May 1** to make the **Jul** issue. Please include the name of the sponsoring organization, and the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, Bill Gillespie, VE6ABC—A/SM: VE6AMM. SEC/TC: VE6AFO. OO: VE6TY. SM/DEC/STM: VE6ABC. Cold weather has stopped all but the hardy for any antenna work. Calgary gearing up for the Olympics. Special station manned by Calgary amateurs using call sign VX6OCO! Will operate until Feb 29th. Poor band conditions at the end of December and beginning of January have delayed reporting on Alberta Public Service Net totals. This to be updated next month. Traffic: ATN QNI 307, QTC 170. AARES Net QNI 141. Personal totals: VE6GUS 92, VE6CHK 55, VE6XV 27, VE6ABC 9, VE6WN, VE6AMM 2, VE6YW 2. All the Best to all amateurs in 1988.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—British Columbia Emergency Net meets on 3650 kHz every night at 0630 UTC. Net Manager Ferdi VE7EJU welcomes everyone to drop in. We work at 10 WPM and do bring traffic. Our total check ins were 787 for January. Why not become a regular member? The BCEN has a newsletter for its members. British Columbia Public Service Phone Net meets every night at 0030 UTC on 3729 kHz. Net Manager Jim, VE7BLO, reports for January check-ins high of 313 low 82 total 5155. That low was the night all signals were poor. We wish to say thanks to Victoria Short Wave Club for their Zero Beat and Burnaby ARC and Surrey ARC for their monthly newsletters. We would like to receive more mail of the amateurs for this report. Traffic: VE7BNI 343, VE7EJU 153, VE7EJW 108, VE7CDF 97, VE7EGM 37, VE7XA 33, VE7FME 30, VE7FB 26, VE7CCJ 9, VE7BCF 6, VE7BZI 2.

MANITOBA: SM, Jack Adams, VE4JA—Many of us are sporting new two-letter calls due to a recent release of two-letter calls available in the Manitoba Section. Finally got on packet radio and with the help of Terry, VE4VR, including a great deal of patience, I am slowly learning the technique. Sure is a great mode. Farming must be picking up as Martin, VE4AIW, is sporting a new ICOM 28H. Just a reminder to Canadian stations wanting their call and name published in the callbook to get their info in. Net reports: CRRL evening phone net: QNI 1021, QTC 15 sessions 30, Manitoba Morning Wx Net: 541 QNI, 28 QTC, 31 sessions. MTN-CW net 262 QNI, 50 QTC, 30 sessions. Individual traffic: VE4JA 82, VE4RO 56, VE4TE 38. Total individual 247.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3GSA. SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. Final year end statistics for our local and section nets activities reveal 2,146 sessions (7%); 18,872 checkins (3.2%); 6,890 traffic (6.9%); handled in 28,046 minutes (3.7%). Percentages in brackets represent the increase over 1987. My sincere thanks to all those who participated in these activities and helped make the NTS a success. BPLs earned in December were: VE3KK (24), VE3GSQ (5), VE3ORN (1), VE3FAS (5). VE3GNW came close. VE3HFQ will be heading up the first ever official Amateur Radio/Environment Canada coordinated effort in this country. Essex County amateurs will be the pilot project for this SKYWARN-type of system of using Amateur Radio equipped spotters to relay severe weather conditions to a local Environment Canada weather office. The Oxford County repeater, VE3OHR, is back on the air and the Club salutes those loyal supporters who contributed to the repeater fund and especially salutes VE3PRJ and VE3GSO for some great work in bringing back a repeater to be proud of. VE3LFM recently passed the Digital Amateur exam and is the first to hold all three amateur certificates of proficiency in the Windsor area. VE3KNI new EC for Fort Frances and area replacing VE3JJB. Chathams's new 440 MHz is on the air and with this new machine there is now complete UHF coverage down the 401 between Windsor and Toronto. The list of packet countries has reached a grand total of 122. Repeater VE3RPT has a brand-new antenna. The following members of the South Pickering ARC participated in the provision of communications for the Olympic Torch Ceremony which was the crowning touch to a full evening of community activities, a day to be long remembered in Pickering: VE3WZ VE3PXX VE3CLL VE3MVD VE3MCZ VE3PXS VE3OOB VE3PLR VE3KZE VE3OYE and his myl Sarah. VE3BDM new OBS for the OPN. VE3SST and VE3PLR have their advanced. New amateurs are VE3PXX and VE3SPI. VE3NME is now VE3DOL and VE3GUE is now VE3AMF. Now's the time to get a head start on your Field Day planning activities. Traffic: VE3FAS 361, VE3GSQ 257, VE3ORN 219, VE3CYR 150, VE3DCX 138, VE3GNW 130, VE3GT 82, VE3DPO 76, VE3BUO 52, VE3POJ 45, VE3WG 40, VE3BDM 37, VE3KCZ 31, VE3KXB 24, VE3WV 24, VE3AJN 23, VE3EAM 23, VE3BAJ 15, VE3NVJ 14, VE3MCO 12. (Dec.) VE3MCO 40, VE3WM 10.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. The Sorel-Tracy hamfest will be held on May 22nd. More details on your local 2 mtr net. Appointments for ORS and OBS are open, see your SM or STM if interested. QST on tape; 102 cassettes (90 minutes) were sent to blind amateurs during 1987 by VE2WH. Maurice, VE3JSF, conduit efficacement le reseau des Joyeux Copains, 0800 hrs sur 3765 MHz. Traffic: VE2JN 72, VE2FKI 63, VE2GEJ 57, VE2BP 57, VE2WH 45, VE2EC 24. (Dec.) VE2GEJ 9.

ATLANTIC DIVISION

DELAWARE: SM, Robert J. Pegritz, KC3TI—Congratulations and a big welcome to all new section staff: ASM: WB3DPJ, SEC: N3FDL, TC: AF3R, SGL: W3XU, OOC: NE3G, PIO: KC3OQ, ACC: WA3WIY, STM: KA3GRQ. Thanks is not enough for the great job done these past years by Hal Low, WA3WIY in all duties of SM. Don't forget public service-March of Dimes and the "WALKAMERICA" want *you*. VE exams springing up now every month. A quick listen to your local HF of VHF net tells times, dates, and more! New Delaware Section newsletter "Diamond State Data" now out quarterly. Call or write me for inclusion of news. Maybe I'll see you in Dayton? PSHR- K3JL. DTN stations 317 tfc 24 in 21 sessions. DEPN stations 71 tfc 16 in 5 sessions. SEN stations 50 tfc 3 in 4 sessions. Traffic: W3QQ 43, KA3GRQ 29, WA3WIY 26, WB3DUG 25, K3JL 24, K3YBW 16, W3PVO 10, KC3JM 9, KC3TI 8.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KA3A, KO3B, K3ZFD. SEC: KB3YS. ACC: KC3QB. OOC: W3IS. SGL: WA3IAO. STM, BM: KB3UD. PIO: W3ZXV. TC: W3FAF. 73 to all the club newsletter editors in EPA. Every paper, plain or fancy, reflects many hours of work and care. KB3RB is doing a great job as Ephrata ARS's new editor. Put May 1's Delaware Co. ARA hamfest on your sked now. Plans for Amateur Radio involvement in the 125th anniversary of the Battle of Gettysburg, June 22-26, continue to develop under the leadership of Penn-Mar RC president (also DEC9) N3ECL. Approximately 180 to 200 Amateurs per day will be needed at the peak of activity. This will be one of the largest ham radio public service communications efforts on record. For general Amateur info, contact Ron Paull, N3ECL (717-528-8412), or Bill Vanderhoof, WA2CRK (717-624-4835). Now a PIA, Bill is Amateur Radio PR chairman for the event. DEC2 Ron Small WB2OOB (717-299-6598) has campsite information for volunteers. Eastern PA Section ARRL is providing support services to the local hams, including interface with the National Traffic System packet network through STM KB3UD. The Foundation for Amateur Radio administers 28 scholarships for student amateurs. Please publicize them and encourage our students to apply. Eastern PA hosted last month's ARRL Atlantic Div. Cabinet meeting in Allentown. W3ABC holds these annual sessions with the Vice-Director, Section Mgrs, Asst. Directors, and Advisory Committee reps to bring us up to date and to listen to our concerns. Harrisburg RAC's '88 officers are KA3BZX, KA3PDQ, N3EYQ, and AA3T. Mid-Atlantic's are WB3ELA, KA3EQT, KC3ZG, and WA3RIZ. York's are N3ESE, N3BQB, KA3OBW, and WA3SRE. Keystone VHF's crew is W3HMS, WA3USG, W3AXC, K3GDI, and KA3CCC. Although we normally list president, VP, secretary, and treasurer, many clubs have other officers who also deserve thanks. In ARES news, we have several new EC's: KA3MUI Cumberland, KA3MVM Lebanon, KA3RKW Dauphin, and K3AUS Juniata. Our SKYWARN program is growing in most areas, with interest in river watch in some regions. State Government Liaison WA3IAO helped us respond to a nationwide survey on call sign license plates. Nice to see K3NB, W3ZID, and W3GJC in the traffic stats this month. N3DRM and KA3NTZ are new ORS's. Traffic (January): N3AZW 516, N3DRM 173, N3COY 148, W3IPX 118, W3JKX 77, KD3AO 74, AA3B 67, N3CD 60, KA3DLY 59, W3KAG 58, W4UQ 53, KB3UD 52, K3WPI 51, KY3M 50, WB8KPE 45, K3TX 41, N3EFW 36, WA3EHD 39, W3AQN 21, WA3CKA 17, KU3R 17, W3VA 15, W3GJC 14, W3TWV 12, W3ADE 9, K3NB 4, W3FAF 4, W3ZID 3. NETS (QNI/QTC/Sessions): EPA 464/158/62, EPAEPTN 579/122/31, PTTN 269/67/31, D3ARES 73/5/4, D6ARES 62/14/8, D8ARES 61/0/4, MARCTN 156/54/13, MARCARES 80/5/5. PBBS' (Call/Total):AG3F 73, K3RLI 182, WA3TSW 36, KB3UD 156.

MARYLAND-DC: SM, Philip Battey, W3FZV—Congratulations to K3OMN who has been appointed ORS. MADRAS is a new club in Montgomery County whose members are principally interested in HF activities particularly in contesting and DXing. Contact KC3NG for details. She can be found on the 145.45-MHz repeater. The AARC sponsorship of the MD Slow Net has really paid off in training new traffic handlers not only within the section but throughout the eastern half of the country as well. Among the MSN graduates found on MDD and MEPN are KJ3E, KT3T, KB3NL, NC3V, N3EGF, NA3Q, and KB4TEH. MSN meets daily at 1930 local time on 3.717 MHz. K3NNI is said to have the best fist on a bug in all of Howard County. Congratulations to NC3V and XYL upon the arrival of a baby boy. KA3RFE/N was putting out a potent signal on 80 meters during Novice Roundup. KJ3E with 60 watts output has the best signal on MDD. W3USO takes a bundle of messages for the DC area on MEPN. KB3NL is working hard at his code for an upgrade. Many new upgrades are apparent. The new testing system seems to be working FB thanks to our VEs. K3KMO/M has a perfect fist at 55 mph on his way home from work. K3ORW is a great phone traffic handler and does well on CW when he stops by MDD. KA3PMK got the Golden Jubilee Award using a little Century 21 and wire antennas in his attic. WITH THE NETS: NET/MGR/QND/QTC/QNI. MDD/W3FA 62/201/539. Top Brass W3FA /98 KC3Y 78, WA4YLO/75, K3NNI/64, W3QQ 61/ MSN/KC3Y 31/48/411. WRPON/WB3BFK 28/16/411, MEPN/N3EGF 31/193/899, HOCARES/K3NNI 2/2/22, BCN/N3EGF 4/1/39, MAVEN/W3YVQ 1/0/4 PSHR:W3FA 93, WA3YLO 76, N3EGF 74, W3YVQ 70, KC3Y 68, WA3UZI 64, K3NNI 62 Traffic: W3IWI(PBBS) 257, W3FA, 125, KJ3E 125, N3EGF 115, KC3Y 109, WA3YLO 98, K3NNI 74, W3LDD 62, W3YVQ 60, K3ORW 54, N3DE 51, WB3BJM 50, NC3V 45. NC3Z 44, K2EB 35, KK3F 34, WA3UZI 30, KT3T 25, WB3BFK 24, KC3DW 21, KX3U 11, K3OMN 9, NF3X 8, KC3ZJ 8, WA3GYW 7, WA1QAA 6, W3DQI 5, WA2WDT 4, W3ZNW 2.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—ASM: N2CER. SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: N2BQT. PIO: VACANT, SGL: VACANT. BM: WB2UVB. OOC: WA2HEB. ATCs: K2JF, KA2RJA and WB2MNF. A new 220-MHz repeater in Atlantic County should be on the air by the time you read this. The repeater, sponsored by the Atlantic County ARES, frequency split is 222.68/224.28. Please note that the input frequency IS in the Novice sub-band and they are more than welcome to use it. ID will be WB2VMU/R. Congratulations to Joe Lameiras, WA2WJL on being named SJRA's Amateur of the Year. Also in the kudos dept., congratulations to the DVRA, Burlington Co. RC and SJRA on operating successful operations from W2ØØZQ, K2ØØKED and K2ØØAA, respectively. VE testing April 21, 7 PM sharp in the Basement Training Room at the Bellmawr Community Bldg. on Browning Rd. For further info contact William Helmetag, WA2VQG at (609) 546-7710 or (609) 939-3032. Also on April 21 by JSARS at Riverwood Pk. Rec. Bldg. in Toms River at 7 PM. For info call Bill Haldane, AC2F at (201) 269-5659. Cape May Cnty. ARC VE testing on April 23 at the Library Bldg. Basement, Mechanic St. in Cape May Court House starting at 10 AM. For further info contact Mary Petruzzi, AE2Y at (609) 886-6739. Until next month, 73, Traffic: (Dec.) WB2ZJF 501, NG2R 59. (Jan.) WB2ZJF 203, WA2HEB 8.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—ACC: N2EH. BM: K2KWK. OOC: W2AET. PIO: WA2PUU. SEC: NN2H. SGL: WB3CUF. STM: W2GLH. TC: K2QR. DECs: WA2AIV Western, WB3CUF Mohawk, NN2H Central, WB2NAO Northern, WA2UFQ Southern. Jan. BPL: WB2OWO KA2UBD NJ3V. PSHR: N2ABA N2EIA N2EVG WA2FJJ W2FR W2GJ NN2H W2MTA WB2OWO WB2RBA ND2S KA2UBD K2YAI KA2ZKM KA2ZNZ. CONGRATULATIONS! Liverpool ARC Ham-of-the-Year in memory of John Bonar, NA2C, awarded to N2BQV N2CCN WA2ELA W2GLN and K2QCX

NY RACES	SSB	117-011-05	NYSR	CW	015-004-05
NYS/M*	CW	387-264-31	NYS/E*	CW	386-292-31
WDN/M*	FM	436-217-31	WDN/E*	FM	616-303-31
NYPON*	SSB	736-332-31	VHF THIN	FM	054-000-04
NYSPTEN	SSB	660-063-31	BRVSN	FM	355-009-31
Empire SS	CW	394-060-30	JCRACN	FM	215-011-30
Q Net	FM	458-002-31	BlueLine	FM	050-010-15
OCTEN/E*	FM	665-095-31	OCTEN/L*	FM	300-035-31
STAR*	FM	390-049-31	LCARES	FM	063-000-05
TIGARDS	FM	069-004-05	WDN/L*	FM	534-251-31
CNYTN*	FM	274-077-31	NYS/L*	CW	284-151-31

*NTS Net. Skyline (Cortland) ARES 147.225 Tu @ 8PM; Ontario 146.82 Sn @ 830PM; Steuben 145.19 Mn @ 8PM; Chenango 146/685 Wd @ 730PM; Lewis 147.015 Sn @ 6PM; Onondaga 147.30 Mn @ 730PM; Oneida 146.94 Tu @ 730PM; Tompkins 146.97 Sn @ 8 PM; Tioga 146.76 Sn @ 8PM; Wayne 146.685 Sn 845AM. Other ARES want to send info to Section Emergency Coordinator or SM? IT SEZ HERE that NY State has 26K Hams now with some 434K in the USA. WNY has 10K Hams with about one third ARRL members . . . are you, the reader, a member? Club Officers: Black River Valley ARC NQ2W K2MQX N2FIJ WA2OEP; Jefferson Co. RAC WB2ASL NW2O WA1VGM KA2IWO. Lancaster ARC N2GDU KB2CSM KB2AMD W2UJR; Salt City DXA NM2L KA2AJT KS2Z KB2G. WNY had 35 of the 50 affiliated clubs file Annual Reports during 1987. I hope the following will file soon in 1988: ARATS Binghamton ARA CWJHS Champlain Valley ARC DARC Ltd. Ft. Herkimer Fulton IBM Explorers Liverpool ARC OCARA RAWNY RDXA Rome RC SUARC and Tryon ARC . . . that way, thru the Club's affiliation, your club will continue to receive the mailings and information from ARRL! Keep mailing addresses up-to-date as well as your Club's list of officers so that support is possible. If you don't tell AH2W at ARRL, you will get out of touch. Club info in this column and the receipt of club newsletters by the SM do not keep your club enrolled as an affiliated club. HAMFEST CALENDAR: May 7 STARC at Owego; May 21 Rochester Atlantic Division/State Convention; June 5 Rome Ham Family Day; June Cortland; July 10 Batavia at Alexander; more to come. Enjoy them Spring posies! Traffic (Jan.): KA2UBD 624, NJ3V 576, WB2OWO 500, N2EIA 451, KA2ZKM 260, W2MTA 245, KA2DBD 219, N2ABA 212, WA2FJJ 205, KA2QOO 167, ND2S 136, NN2H 111, K2YAI 110, WB2QIX 96, W2FR 94, KA2ZNZ 87, N2EVG 77, W2UYE 72, WB2RBA 63, KB2ENU 54, W2GJ 42, WB3CUF 24, AF2K 19, K2QR 18, KE2EA 13, K2BWK 8, WA2OEP 8, NY2V 8. (Dec.) KC2JW 32, KB2MB 16.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. STM: N3EMD. BM: KC3ET. TC: N3EFN. OOC: KX3V. ACC: AK3J. SGL: W3DTW. PIO: N3DOK.

NET	QNI	QTC	SESS	kHz	T/D	MAN
WPACW	305	156	31	3585	7:00 P/D	WA3UNX
WPAPTN	395	90	31	3983	6:00 P/D	WA3HLN
KFN	196	55	21	3983	1:00 P/D	N3EMD
PFN	176	161	31	3958	5:00 P/D	WA3THT
WPA2MTN	335	89	31	46/28/88	8:00 P/D	KA3BGC
NWPA2MTN	557	58	29	44.53/45.13	9:00 P/D	KC3Y
WPARTTY	12	3	5	3640	9:00 P/SU	WA3ZSC

New officers for 1988: McKean County Radio Club are Pres. N2EUD, VP NJ3K, Sec/Treas N3FWW: Conemaugh Valley ARC Pres KA3IUJ, VP WA3BIX, Treas WB3JSW. Sec WB3DRV, Trustee WA3YOL, Foothills ARC Pres NM3Z, VP WB3EUC, Sec WB3EKR, Treas N3FKQ. BVARA Pres WB3FKE, 1st VP WB3FKB, 2nd VP KA3SFS, Sec. KA3BNG, Treas WB3HWB, Trustee WA3ZEW. The GPVHFS Pres WA3QKX, VP WA3IKG, Sec KA3ORL, Treas K3JZD, Trustees K3LIE and K3WOD. Congrats to and may they get all the backing they need from their members. I have received complaints from some of our traffic handlers about incomplete messages coming through the NTS nets. Too many messages come through with incomplete addresses, wrong telephone numbers, and text not making any sense. The addressee is confused when you call to deliver such a message. I will not accept

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an incomplete message. It is so easy to use the ARRL ARL message numbers in many instances, and if you cannot use the ARL numbers, be sure the message is complete. Try hunting thru the phone book for the Jones family or Smith family etc. to confirm addresses or get telephone number. Sorry, but it can be irritating. Jan Traffic: KQ3T 320, N3EMD 309, W3OKN 254, N3FM 154, N3CZW 115, WA3UNX 114, N3AES 109, KA3NVP 109, K3SMB 62, KC3ET 61, KV3X 46, KA3GXP 44, WA3DBW 40, W3RUL 31, KC3GO 28, WA7WIB 26, WA3QNT 26, W3KUN 18, KC3YE 16, KD3AC 14, KV3L 14, WB3HBE 12, N3COR 9, K3LTV 8, KA3EGE 7, W3AHH 2, (Dec.) KV3X 57, W3AHH 4.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH, STM: K9CNP. OOC: W9TT. BM: K9EUI. SGL: W9KPT. PIO: N9EWA. ACC: WB9SFT. TC: N9RF. ASM: AA9D.

ILLINOIS SECTION NETS

NET	FREQ	TIMES (LOCAL ILLINIOS)
ISN	3905	1800 DAILY
ILN	3690	1830+2200 DAILY
ITN	3705	1900 DAILY
CTN	147.69/09	2100 DAILY
ILARES	3905	16301ST+3RD SUNDAYS

ILLINOIS INDEPENDENT NETS

IEN	3940	0900 SUNDAY
ILPN	3915	1630 M-F, 1430 SUNDAY
NCPN	3915	0700 MONDAY-SATURDAY
NCPN	7270	1215 MONDAY-SATURDAY

Congratulations to KE9IC (EX KF5NX + WA4MUW) on his recent retirement from the USCG after 23 years of service. Don has recently moved to Mt. Olive and is active on NTS and Packet. AA9D, N9RF, and W9QBH all reported that the ARRL forums at the Wheaton HAMFEST were well attended and appreciated. My special thanks to them for carrying the ball in my absence due to a problem at work that cropped up the last minute. W9OES is researching packet stations in an around his area in order to integrate those who are interested in a role in ARES. If you live near Morgan Co., are on packet, and have an interest in using your packet station to support emergency operations, please contact Vince. Illinois PIO N9EWA is working toward having special events license plates issued for Field Day 1989. This is quite an effort which requires a lot of research, prior planning with the state, and legislative support. In order to make this a reality, Bill needs everyone to pitch in and help. As a start, he needs all the newspaper articles written about FD in local papers across the state over the years that he can get his hands on. He can also make good use of letters of appreciation that local ham groups have received for providing community service. He needs good, clean, reproducible copies (or originals which he will return) of these items. This is a great project for getting Amateur Radio some well-deserved recognition in Illinois. Please dig thru your memorabilia file and send your items to Bill Itter, N9EWA; IL ARRL PIO: 410 S. Springingguth Rd.; Schaumburg, IL 60193. Traffic: KA9FEZ 229, NC9T 167, W9HLX 136, W9EHS 107, W9HOT 88, W9NXG 88, W9QEW 76, W9LWH 64, K9CNP 49, WA9VLC 43, WA9TVD 37, N7DOY 29, KE9IC 19, WD9DZV 18, W9LNQ 16, K9WMP 11, KA9CTW/T 11, WD9HQW 9, WD9IBH 9, W9KR 8, W9VEY/M 5, WD9CIR 4, N9GKD 3.

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UMH, KD9ER. SEC: WD9AVQ. STM: W9JUJ. ACC: K9ZBM. TC: K9PS. PIO: KA9LQM. SGL: WA9VQO. BM: N9CJT. NM: ITN KD9DU, QIN KJ9J, ICN KD9ER, VHF W9PMT, IWN KA9ERC.

NET	FREQ	TIME DAILY UTC	QNI	QTC	QTR	SES
ITN	3910	1330/2130/2300	3440	336	2270	93
QIN	3656	1430/0000/0300	607	283	1515	62
ICN	3705	2315	186	40	787	31
IWN	3910		1722		378	31
IWN	VHF		1718		348	62
VHF NETS			2614	105	2570	86

Appt: N9GHT. OO/AA. OO reports rcvd from KA9BYN, WA9VQO, KA9FFO, N9CJT, KA9PCT, KA9DZM. Silent Key: WB9FOT, W. Lafayette; W9IQK, Richmond. BPL: W9JUJ, 0/4, R/292, S/305, D/1. W9ZRX. O/0, R/388. S/388, D/0. Elections for Indiana Section Manager are coming up, and I hope that all ARRL members take the time to turn in their ballots. I've decided not to run again. The state's clubs seem to be up to their usual high quality of activity with code and theory classes, special severe weather training, volunteer test sessions and the like. We are truly blessed in Indiana with a core of very active clubs who provide the local point for ham radio in their areas. If you're an active club, contact K9ZBM to find out about the ARRL Special Service Club program. Our OO/AA program is going great as well! Several new OO applications are in the mill and monitoring reports indicate a good level of activity. Art, WA9VQO, has the details on how you can join this important ARRL program. Don't have any hamfests listed for this coming month, except the big one in Dayton! Traffic: W9ZRX 776, W9JUJ 602, NJ9S 229, KJ9J 191, KA9FFO 141, NR9K 88, WA9QCF 68, K9WWJ 59, KB9HH 58, KA9QMI 46, K9TKE 44, WD9HII 38, WB9PFZ 32, KD9ER 32, W9ZGC 31, KA9RNY 30, N9HZ 25, WB9IHR 18, K9ZBM 15, W9XD 14, WB9OZZ 13, W9PMT 12, WA9OHX 10, WD9DWD 10.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9POZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. April 1st is the nominations deadline for *ARRL Instructor of the Year and ARRL Professional Teacher of the Year awards.* April 9th at 8:30 AM, Madison area exams by Four Lakes ARC, 421 Grand Canyon Drive, N9ADN. April 10th at 8 AM, Madison Swapfest, Madison Area Repeater Association, W9HSY. April 16th from 1 to 4 PM, Milwaukee area exams by Badger Examiners, 5353 North Green Bay Avenue, KB9G. April 16th from 6 to 9 PM, Eau Claire area exams, U.W. Management Building, W9NW. April 29th to May 1st, Dayton Hamfest. New officers Ozaukee RC: Pres. WA9JMS, V. Pres WA9JOB, Sec. AA9W. Treas. KA9DDN. WA9JMS of Cedarburg suggests that radio club leaders should "keep business portion of meetings short, let members spend more time together talking, learn from each other, welcome newcomers, and share enthusiasm of the hobby." Taylor County ARC new officers: Pres. W9LEE, Sec. N9ZD, Treas. WD9FWP. Informative net on Saturdays, 10 AM, 3985 kHz SSB with help and tips about Wisconsin packet radio, K9ANC NCS. KZ9O gave Green Bay Mike and Key Club doubly interesting program—showing a video tape he made of his W1AW tour to those at the Club meeting by sending it over his Amateur Television (ATV) set up.

Net	Freq.	Time	Manager	QNI-QSP-Sess
BWN	3984	6 AM	WD9tID	
BEN	3985	Noon	KA9RII	679-255-31
WSBN	3985	5:30 PM	K9ANV	832-204
WNN	3723	6 PM	N9DGL	
WSSN	3645	6:30 PM	N9BDL	201-52-31
NWTN	34/94	6:30 PM	W9ZZM	
WIN-E	3662	7 PM	WB9ICH	331-177-31
WIN-L	3662	10 PM	W9NGP	

Traffic: WB9YPY 1890, W9YCV 280, KA9RII 275, W9CBE 230, K9GDF 189, KA9BHL 170, N9GJI 168, KA9VII 152, N9BDL 142, W9DND 121, WA9WYS 120, WB9ICH 105, W9CXY 104, W9UCL 96, K9AKG 90, K9EP 89, K9ANV 65, AG9G 57, W9UW 51, K9UTQ 50, K9FHI 48, WB9NRK 48, K9JPS 36, KA9KJY 33, KG9B 32, KA9VIA 31, WD9JID 28, KA9WWT 27, KA9USV 18, KA9KLZ 16, W9ODV 16, K9LGU 10, N9BYS 9, W9PVD 9, WD9DNQ 6. (Dec.) W9CXY 107, W9NK 96.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—We're well into 1988, and the early part of sun spot cycle 22 and things are looking pretty good. We've managed to survive such things as "Mid-Winter Madness" and other symptoms of winter. Traffic is holding up at a respectable level and all the Section Nets are doing a great job. Now we're headed for the "SKYWARN" season and all the associated training and get-ready activity. Field Day plans are already under way, and so it goes. By the way, last summer we lost at least three stations who were nipped by lightning. So think ahead and be ready. With pleasure, we announce Bill Smallidge, of Stacy, KAØDFK, as the January Amateur of the Month. Congratulations, Bill, and keep up the good work. Until next time, 73, Jim Swisher, KAØEPY, STM.

MN EMERGENCY FEQ 3860 kHz, BULLETINS 3880 kHz

NET	TIME	FREQ	QNI/QTC/SESS	NET MGR
MSN/1	6:30P	3685 kHz	375/168/31	WØUCE
MSN/2	10:00P	3685 kHz	202/39/31	KDØNH
MSSN	6:00P	3710 kHz	338/38/31	KAØSBY
MSPN/N	12:05	3860 kHz	509/264/31	WBØWNJ
MSPN/E	5:30P	3860 kHz	1003/279/31	KCØT/KDØCI
MNAMWXNT	6:00P	3860 kHz	493/312/27	KBØGI
PICO	9:00A	3925 kHz	No report	WDØBAC

Traffic: WBØWNJ 771, KAØEPY 419, WAØTFC 336, WØUCE 262, NØFOO 245, KDØCL 242, KAØARP 221, KAØSBY 150, WØGRW 135, KT9I 111, WAØONE 86, KBØGI 85, NZØC 75, KCØT 74, KDØCI 68, WDØGUF 64, W9DM 47, KAØPDM 46, KDØNH 36, KØCSE 32, WØTIV 24. Total Traffic: 3,531.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—Peace Garden Hamfest July 8-10: Camping sites with water and power, flea market, dealers, special-event station VE4IHF will be active, dance, breakfast, meetings, Xmitter hunts. Lots of fun for the family in the Turtle Mtns. TRARC (Dickinson) will be active the week of Oct 29-Nov 4 with the call K2ØØND. ND Section ARRL is now sanctioned with the ND Centennial Commission, we are now making our final plans. SEC WØKZU sent out 253 messages in our SET to all parts of the country. Sorry to report the passing away of WØABT. The Fargo club invited me to attend their Jan. meeting. I'm happy to report that no one fell asleep during my report, thanks. KDØEM put a packet BBS on 145.01 for the central part of the state; WBØVHW closed his. Congratulations to KAØHPE and WØWYG on getting Extra Class. Traffic: WØCDO 163, KAØFSM 73.

NET	FREQ	TIME	SESS/QNI/QTC	MGR
GOOSE RIVER	1.9 MHz	9 AM Sun	5/165/5	WØCDO
Data	3885 kHz	6:30 DA	25/707/34	KAØFSM
Wx Nets	3685 kHz	9 AM, 12:30, 5:00 PM Mon-Fri	66/776/40	WØGFE
Storm Net	3685 kHz as needed	1/30/2	WCØM	
North 40	146.64	0300 Z Sun	4/40/0	NSØH.

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—ASM: NØABE, WAØFPR. SEC: KAØKPY. STM: KDØYL. LARK of Watertown reports a plan being studied to put a 2-Meter Antenna on the 800 ft. KDLO TV tower near Garden City. More details as they become available. Also the system that links Watertown and Crandall Hill is reported back in service and working well. KEØIR reports total checkins for 1987 in the Sunday morning net at 1096. Net meets Sun. 8 A.M. MST, 9 AM CST on 3960, for Packet Bulletin service check 145.01 MHz. Club Secretaries may contact me if they would like to obtain the video tape "The New World of Amateur Radio." On a trip to the East Coast KØERM checked into the SD CW net mobile from New Hampshire. New packet stations coming on the air please report to NØABE. For SASE he will send you a map of state packet activity. Traffic: for Jan. KAØAIE 109, WØYSB 17, WBØOMF 43, WAØVRE 67, KDØYL 43, WØMZI 47, NØDPF 404, KØERM 120.

DELTA DIVISION

ARKANSAS: SM, Dale Temple, W5RXU—All ARRL Field Appointees are requested to check in to the Emergency Communications Net at 5:30 PM Sundays on 3.987.5. Where can you find an Arkansas station?? This is by no menas a complete list: 5:00 AM 3.885 Rag Chew; 6:00 AM 3.885 Ark. Phone Net; 6:00 AM 3.937 Rag Chew; 4:30 PM 3.928 Mockingbird Net; 6:30 PM 3987.5 Razorback Net. Arkansas emergency frequency 3.987.5. The "All Arkansas Hamfest" had to be delayed, details later. One of my goals as SM is to establish regular communications with the Field Organization starting with the EC nets at 5:30 on Sundays. Don Lee, WB5HDZ, wrote an excellent article on the West Memphis tornado.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. SEC: N5ADF. ACC: K5DPG. SGL: KD5SL. TC: W5RWF. OOC: KE5QK. Packet: NE5S. The new officers of the Thibodaux ARC are: Pres: Don-WA5RPI, Vice Pres: Wade, WA5LIS, Treas: Johnny-K5CRF, Sec: Debby-KB5DUW and Act. Chair: Frank-WD5JJH. The 16 January one day hamfest by the Southeast LA ARC in Hammond was a humdinger. They packed them in Saturday morning and it was obvious that a several months lull in hamfest activity brings out the troops. There is a lot of merit in a one-day hamfest where you pack them instead of a two-day affair that has a small crowd on Sunday with half the swap tables empty. I receive several phone calls each month inquiring about the date of the next VE exam in a specific location. Most of the time I don't have

(continued on page 110)

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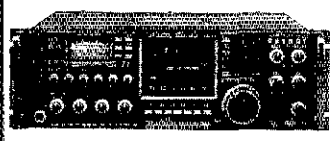

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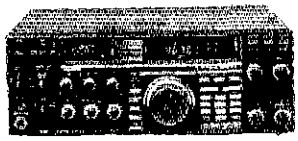

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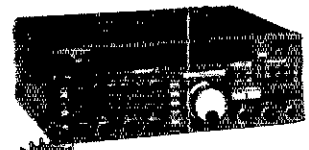

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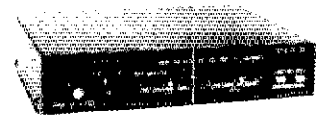

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Works absolutely great! . . . (Bob N1EKP)

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A fine antenna! . . . (Joe KA3MMJ)

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KPC-4	yes	yes	yes	yes	yes	yes
KPC-2	yes	yes	no	yes	yes	no
KPC-2400	yes	yes	no	yes	yes	no
KPC-1	yes	yes	no	yes	yes	no

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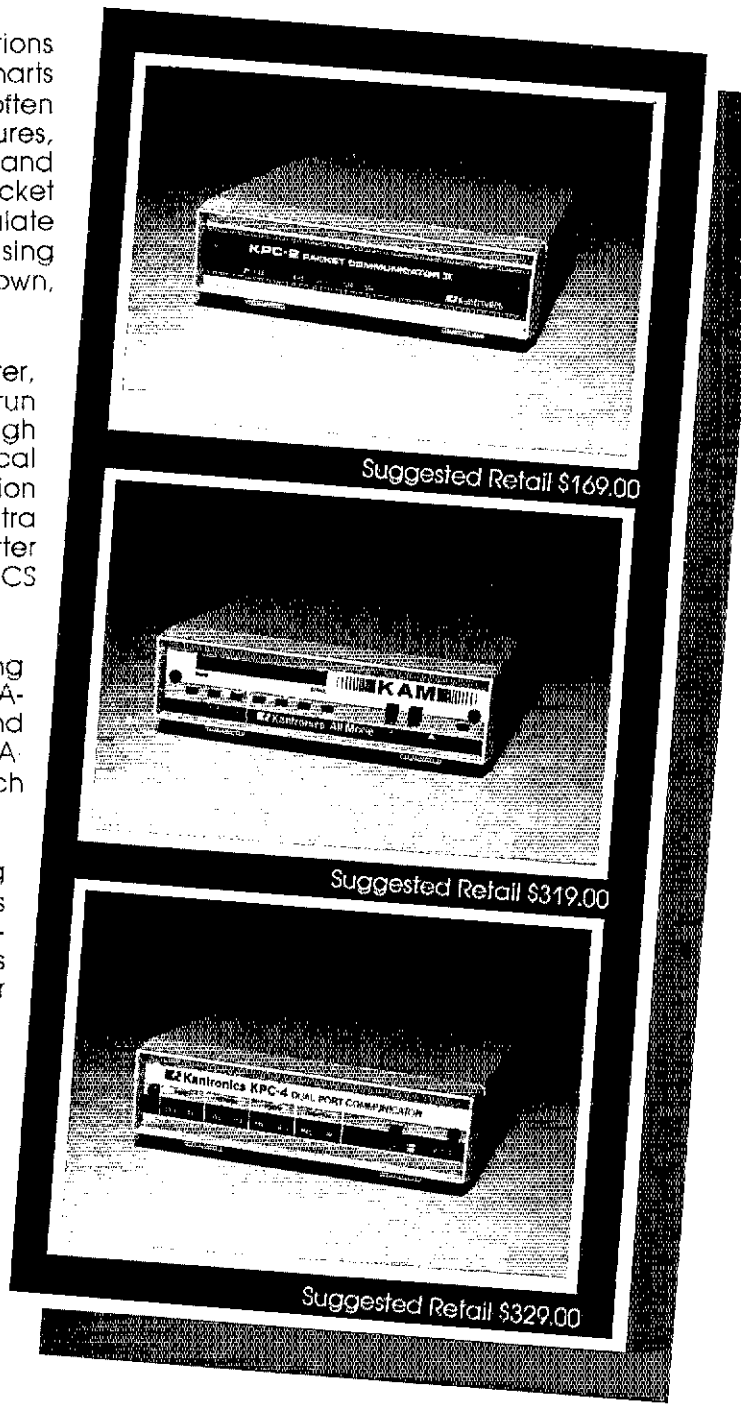

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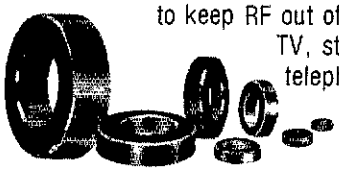

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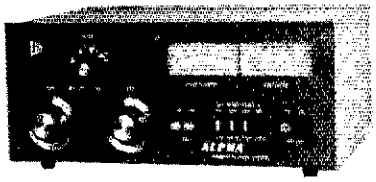

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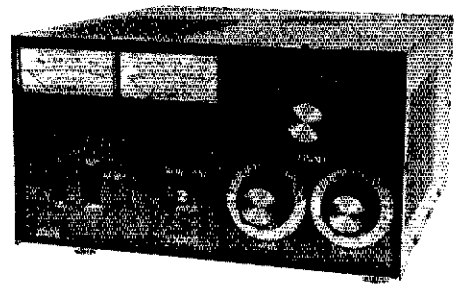

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the information or the name and phone number of a person to contact. One suggestion is to send me your advance schedules and a person to contact. Other proposals would include the information in the Louisiana Council's frequent newsletters or task an ARRL Section Level VE Coordinator. Any suggestions? The West LA ARC in Leesville new officers are: Pres: Harry, KG5EG, V. Pres: Mike, N5BNL, Sec: Marvin, N5HHE and Treas: Bob, N0EBH. Traffic: DRN-5 report for Jan 88. 597 msg in 62 sessions for 92% by K5WOD. WA5WBZ, KF5VW, WA5TQA, KA5PQL and K5APD. CAND report 447 msg in 31 sessions. DRN-5 100% by KF5VW. Bless you boys.

MISSISSIPPI: SM, James N. Davis, KK5Z—ASM: W5TRD. SEC: KA4PKA. SGL: KA5WRX. ACC: K5VXV. PIO: WN5M. STM: KB5W. BM: W5EPW. TC: KF5DE. OOC: KK5K. VHF/UHF Coord: N5DWU. Congrats to following stations on receipt of special "We the People" status during the week of 24-30 Dec 1988: W2ØØCH, K2ØØOS, W2ØØPFC, WY2ØØX, K2ØØOCM, WD2ØØIAD. To following upgrades: Tech: Billy Gray awaiting call; KB5CDG, KB5EZN, Don Read and Don Bunell awaiting call; To Adv. N5KJD, N5KPM; Congrats and GL to new pres. of Rankin County ARC, K5DZE, V-P KA5SVV, Sect N5III and Treas. N5BRL. Congrats to K5DNB on receipt of prestigious TV Emmy Award. To AG5Z, new president of Hattiesburg ARC, VP WA5RKR, Sect KA5WFM, Treas. N5IRT and director VE3IFS. Much appreciation to N5JPX, Rankin County EC for excellent reporting of severe wx near the Jackson/Flora area on 19 Jan 88. Certificate of Merit awarded to N5DOK and KB5EFS for that "Extra" effort; special thanks to all involved: N5JPX, KF5IZ, KA5HGT, KA5SVV, KB5DX, AL7GQ, WD5IKD, KA5RQI, KA5WRX, N5ILY, N5KFV, W5AXQ, KC5SI, WB5YKL, KB5BCF, N5HBB, N5III, KF5DE and KA5TMQ. "Well done" to all from NWS in Jackson. Congrats to new net mgr of Magnolia Section Net, W5YRX; 88 to WA1VMC, ARRL HQ Staff, for her past help and deserved retirement. GL, Arline. DRN5 Miss Rep 100% by N5AMK, KT5Z, W5HKW, KB5W, WB7CQQ and KE5EC. NE Miss 2 Mtr FM net (NS5M) Sess 24, QNI 288, QTC 4. Mag Sec Net ((NS5M) Sess 31, QNI 524, QTC 10. ARRL Info Net (KK5Z), Sess 4, QNI 77. Rankin County ARES, Sess 1, QNI 5. Miss/Lou/Emerg Net (N5EZX) Sess 5, QNI 122. MTN, Sessions 31, QNI 187, QTC 91. MSBN (KF5DE) Sess 31, QNI 1986, QTC 79. Coast ARES (N5LKT) Sess 4, QNI 91. Gulf Coast SBN (W5JHS), Sess 31, QNI 1131, QTC 15. Traffic: N5AMK R 124, S 156, D 1, Total 281. KB5W O 2, S 133, R 179, Total 316. W5JDF S 46, R-45, O 1, Total 92. KT5Z S 45, R 36, O 2, D 1. Total 84. WB7CQQ R 7, D 4, S 2, Total 13.

TENNESSEE: SM, Harry Simpson, W4MI—Thank you for your confidence in choosing me as your SM for the 1988-1989 term. Let me introduce myself to those of you who do not know me, and re-introduce myself to those who knew me as W4SCF many years ago. I was licensed almost 40 years ago, and served as RM for a couple of years, then I was elected SCM in 1954, and re-elected in 1956. I have been TN Army MARS Director for more years than I care to admit. In 1977, I applied for a secondary call, then had to choose between W4SCF and W4MI the following year when the FCC dropped the secondary calls. It is good to renew the old associations, and to start new ones! All appointees of John Brown were offered reappointments; some accepted, others declined or didn't respond. I have an excellent nucleus, and the state program will continue to go forward. If appointees have not been named for all positions, I will handle those positions until a proper replacement is found. Give me a chance, and I will go with you all the way! Since this state is more than 650 miles long, I feel that each of the major divisions should be equally represented. Therefore, I shall attempt to have appointees spread about as evenly as possible. At this time, my Assistant Section Manager is WA4GLS. West TN Assistant and ACC is K4CXY; W4TYU is East TN Assistant and PIO; K4UVH is SEC; DECs are KA4EBU West with others pending; OOC is K4LSP; SGL N4PQY; TC W4HHK. It is with a great deal of pleasure that I announce W4PFP will continue as TPN NM, as will W4TYV as ETPN NM, KA4UVR as TNPN NM and K4WWQ as DRN5 NM. Others are pending, and will be announced as soon as possible. Seriously needed are STM, TN NM and packet stations to check the node for traffic. If you have a news item, a problem, or if you simply want to express your opinion, please let me hear from you. Traffic: WA4FMR 125, W4DDK 75, K4WWQ 48, W4TYV 39, KA5KDB 24, KE4LS 20, K4WOP 18, WA4GZZ 13, W4PSN 8. 73, Harry.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thernes, WM4T—SEC: WB4NHO. STM: KA4MTX. PIO: WA4SWF. Due to health reason, Bob Cooper, KB4OZ, has resigned as KNTN manager. Bob ran this net for several years and on behalf of all of us, I wish to thank Bob for a fine job. His replacement is WA4EBN, effective March 1st. The Cave City Hamfest is March 12th and the E-Town hamfest is March 26; see you at both! BARS will sign K2ØØKJQ and NKARC will sign K2ØØCO during May 28 thru June 3. Each month I get a list of appointees who must be removed because ARRL dues are not paid. Please renew your membership to keep your appointment.

NET	QNI	QTC	SESS	MGR
MKPN	1503	135	31	WD4RWU
KTN	916	34	31	WB4LBG
KYN	357	136	61	K4AVX/KZ8Q
TSTMN	467	35	31	KZ8Q
KNTN	245	50	41	KA4SAA (Temp)

SAR (Jan.) K4VHF 190, KI4QH 115, WD4RWU 88, KA4SAA 53, K4AVX 48, KA4MTX 29, K4HOE 21, N4PEK 16, KB4UJA 15, WA4NOG 7, WB4AUN 6, WD4CQF 4, KU4A 3. PSHR: KI4QH 97, KA4MTX 85, N4GNL 71.

MICHIGAN: SM/SEC: George E. Race, WB8BGY—ASM: WA1LRL. STM: WD8KQC. SGL: N8CNY. TC: W8YZ. Silent Keys, with deep regret: W8HS, KC5BL/W8QAM, K8SUC, WA8QJL, K8ZYR, WA8JUG, WA8HOC. My small soapbox for this month: reporting of activities. If you hold any League appointment, there is, in general, a requirement that you report your activities to MI League Officials or directly to HQ monthly. Examples, ECs to DECs to the SEC to SM and HQ. NMs to STM to SM and HQ. These reports keep us informed of MI activity and help us to judge the effectiveness of various appointments. To all others, if you handle even one piece of formal traffic, I would like to report your activity in this column. Get your SAR to any MI net at month's end. Any traffic for me can be left on the 145.09 MEPN, N8FTY, BBS. Thanks to continued cooperation with the MI State Police EMD and State RACES Director, Jerry McCoy, N8HFV, a new redistricting plan is being put into place in MI. ARES DECs will become District RACES Officers. Each will have the full responsibility

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*Can be used without radials
*Feedline can be buried if desired

*Permanent or Portable Use

ALL TRAP ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

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Model	Band	Length	Price
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D-15	15	22'	18.95
D-20	20	33'	19.95
D-40	40	66'	22.95
D-80	80/75	130'	25.95
D-160	160	260'	34.95

Includes assembly instructions, Deluxe center connector, 14ga Stranded CopperWeld Antenna wire and End Insulators.

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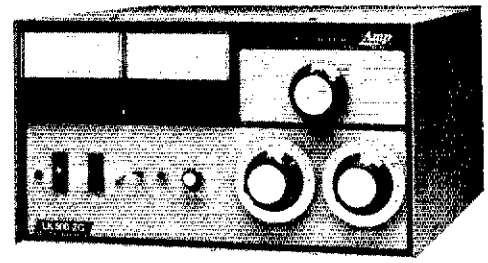

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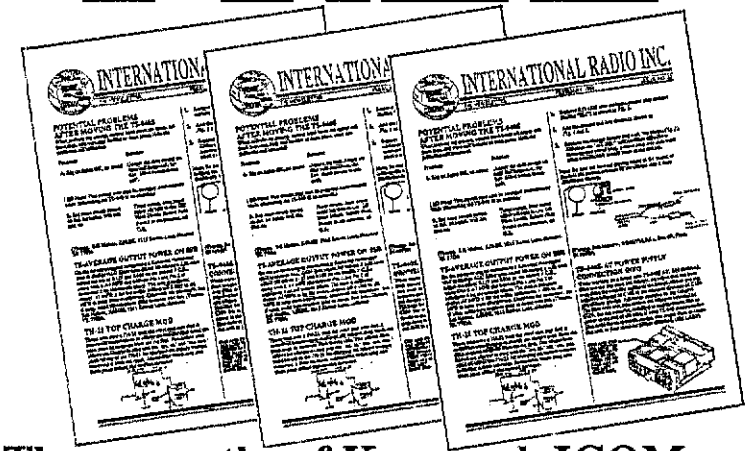

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of putting together an ARES/RACES program in each County of their District. District Public Officials Workshops are being conducted in all areas. These workshops will bring together, Federal State, and Local Officials, to learn the benefits of working with ARES/RACES Radio Operators. All Amateurs are encouraged to attend this series of workshops. Contact your DEC for details. State EMD Officials have approved the sending of Flash Reports on Damage Assessment via packet radio to the State EOC in Lansing, N8HFV-1. A program to format and send the required Flash Report information, can be obtained from Jay Blethen, N8FTY. This program runs on IBM format and is approved for use by SEOC Officials. I am pleased with the good response to the Sunday ARPSC Net on 3.932 kHz at 5 PM. Your input and sharing of information is what makes this net work. Attended by MI League Officials, this is a weekly gathering place to get your questions answered and keep up on the latest happenings in the Section. Please support the following daily MI Nets:

NET	FREQ	TIME/DAY	QNI	QTC	SESS	MGR
MNN	3710	5:30PM Dy	44	4	14	KE8JG
UPN*	3921	5:00PM Dy	1380	87	36	WA8DHB
MACS*	3953	11:00AM M-Sa	501	87	31	K8OCP
MITN	3953	7:00PM Dy	742	243	31	WD8EIB
QMN*	3663	6:00PM Dy	895	154	86	WD8RHU
SEMTN	145.33	10:15PM Dy	343	56	31	N8HSC
GLETN	3932	9:00PM Dy	809	34	29	
WSSBN	3935	7:00PM Dy	764	37	31	
VHF Net Reports Total			664	33	40	NO8Q

*QMN Fast-6:30PM Dy; QMN Late-10PM Dy; MACS-1PM Sun; UPN-12PM Sun; Chk. Dir for other MI Nets. Traffic: KA8CPS 362, WD8KQC 227, KE8JG 104, WD8RHU 101, WA8DHB 86, K8GXV 82, WB8YDZ 68, N8DSW 68, K8UPE 59, NJ8S 59, WB8YPG 56, WB8BGY 51, WD8MJB 46, K8RDN 45, K8HAP 41, NY8W 39, W8QHB 38, WB8SYA 38, N8CNY 32, KC8TU 28, W8EOT 26, K8OCP 26, WA8MVH 24, W8CDU 18, K8EQO 18, K8EQO 18, K8MJK 17, N8HHH 17, KI8Q 16, W8BEZ 15, K8ZJU 14, W8VIZ 12, KA8PWM 11, WD8EIB 10, N8EXS 9, W8CBH 8, NX8S 7, WB8WJV 6, KA8VDX 6, W8URM 5, W8CUP 3, KA8LAR 3, WB8JAD 2.

OHIO: SM, Jeffrey A. Maass, K8ND—Assistant SM: David Kersten, N8AUH (216) 221-6740. SEC: WD8MPV. STM: KF8J. BM: W8ZM. ACC: KJ3O. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK.

NET	QNI	QTC	SESS	TIME(LOCAL)	FREQ	MGR
BN(E)	323	131	31	1845	3.577	N8EVC
BN(L)	183	81	31	2200	3.577	K8TVG
BNR	351	89	31	1800	3.605	W8EK
BSSN	217	121	31	0945,1900	3.573	KD8FW
ONN	175	45	31	1825	3.703	WD8KBW
OSN	300	57	31	1810	3.577	N8AEH
OSSBN	2284	755	93	1030,1615,1830	3.9725	WB8JQW
OSSN	186	104	31	0845M-F,0800S-SN	3.577	KA8GJV
Ohio Section ARES Net				1700 Sun.	3.575	WD8MPV

Hamfests in April and May: Dayton Hamvention April 29-May 1; Medina Hamfest 5/8; Portage ARC Hamfair 5/22. Amateur Radio Examinations: Wickliffe 4/9; Columbus 4/9; Maumee 4/9; Marietta 4/10; North Olmsted 4/16; Akron 4/23; Columbus 5/7; Maumee 5/14; Cincinnati 5/21; Canton 5/28. As always, thanks to Bob Johnson, K3RC, who maintains a list of Ohio examinations, and makes it available on packet BBS systems statewide. Contact me for details on any session listed above. Affiliated Club Coordinator Joanne Solak, KJ3O, is attempting to keep an accurate list of Ohio hamfests and special events as we have done in the past. Unlike past list, this one will contain events for which we have first-hand information from the sponsoring organization. This list will be the source of information in this column, and the list will be distributed at hamfests and in the Ohio Section Journal. Contact KJ3O to add your event to the list. Congratulations to the Lake County ARA on their renewal as an ARRL Special Service Club (SSC)! New officers: Champaign-Logan ARC-Pres: KA8YUM; VP N8HDR; Sec-Treas: N8ETE. North Coast ARC-Pres: K9SSL; VP NO8M; Treas: N8ETY; Sec: WD8ISB. I'm sorry to report the following Silent Keys: W8TNF of the Canton area: NR8Q of Findlay; and W8HQ, most recently of Harlington, TX, but originally from New Philly and Canton. They will be missed. The Burning River Traffic Net (BRTN) in Northeastern OH has had a change in leadership, with Glen, N9AKS, stepping down, and Wil, WA8HED, stepping in to take over the reigns. Bulletin Manager Bob Zimmerman, W8ZM, has begun issuing ARRL Ohio Section Bulletins, which are like Official Bulletins, but with a local foucs. Assistant SM N8AUH and I have used these as a way of passing time-valuable information around the state in a rapid manner. These Ohio Section Bulletins are placed on packet radio, and are automatically forwarded to 17 packet BBS systems around the state with very little delay. If you have information that you feel should be put in an Ohio Section Bulletin, contact me or N8AUH. Official Observer Coordinator Mike Patrick, WB8ZCE, is looking for individuals interested in becoming members of the Amateur Auxiliary of the FCC Field Operations Bureau (Official Observers). Contact Mike for information. Thanks to all who sent cards and good wishes to me following my fall on the ice, and subsequent knee surgery! By the time you read this, I should be back on my feet. Thanks especially to Assistant Section Manager Dave Kersten, N8AUH, who has taken over many of my duties during my down time, ably assisted by SEC WD8MPV and ACC KJ3O! In part due to my accident, and in part due to my increased duties at work, Dave has volunteered to receive your monthly SARs (Traffic and PSHR), and to prepare the reports for *QST*. Net reports should still be sent to me and to STM KF8J for use in our reports to ARRL HQ each month. Please send your reports so that we can receive them by the 7th of the month. Dave should be available on packet (KB8CI) by the time you read this. Congratulations to Len Nathanson, W8RC, who was elected Great Lakes Division Director, and to George Wilson, W4OYI, who was elected ARRL Vice President at the ARRL Board meeting January 22-23! Traffic: K8TVG 245, WD8KFN 238, AD8I/PBBS 232, W8BO 219, K8JDI 208, WB8JGW 175, KV8Q 173, W8ZOL 169, K8IOW 169, KD8HB 162, KD8KU 160, KF8J 132, W8EK 130, WD8QXT 127, KA8GJV 97, N8IBS 95, WD8IKC 94, WA8HED 93, N8IIP 91, W8QZK 85, K8CMR 83, W8CXM 76, N8FWA 71, N8AEH 70, K8ES 69, KA8CGF 67, W8FPA 65, N8GEC 64, WA8SSI 62, W8SKP 61, WB8BWY 61, KE8CV 58, KD8FW 57, WB8KBW 55, N8AUH 51, N8EFB 51, NE8X 50, N8GPU 50, N8CEI 49, WA8EYQ 43, WD8RIB 36, WB8HHZ 35, NW8E 33, WB8KWC 29, KC3JF 28, WD8MIO 28, N9AUG 27, K8EF 25, K8CKY 25, KA8YIT 25, KC8YV 23, K8VOY 22, K8NQN 22, W9SWM 21, KE8DQ 20, K8DXZ 20, WB8YYS 18, K3RC 17, W8JLW 16, WB3LHI 16, WB8KWD 15, KA8RIX 15, KC8JV

15, N8AJU 14, K8LQM 14, WD8JAW 14, KD8WI 13, KA8OQF 13, KA8SOM 13, WD8JYE 13, K8ALV 12, WB8MRL 11, W8LDU 11, KD8IC 11, K8CJS 10, NF8B 10, N8HRW 10, W8BHL 10, W8IQ 10, K8BNQ 9, KA8DRR 9, WA3EZN 9, N8CDN 8, WD8CSP 8, KA8BHN 7, N8CW 6, W8LHA 6, KB8CMW 6, W8DPZ 6, NC8Q 6, KE8JV 6, KG8H 5, WD8DKQ 5, W8ZM 5, W8GDQ 4, WD8PWG 4, W8RG 4, WB8AWM 4, KA8UVU 4, N8HBF 3, KD8XL 3, N8IWZ 3, N8FTO 3, N8ITT 2, W8XT 1, KA8VYT 1. (Dec.) K8JDI 587.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM & STM: K2ZM. SEC: WA2ZYM. BM: WB2IXR. PIO: KB2TM. TC & OO/RFI: KC2ZO. ATC: WA2VGM. SGL: KB2HQ. NWSLTR ED: WB2NHC. NET REPORTS FOR JANUARY(QNI/QSP): AESN 47/1 CDN 623/99 ESS 394/60 HVN 368/98 NYPON 736/332 NYS/E 386/292 NYS/L 284/151 NYS/M 387/264 SDN 298/138. CLUB NEWS: Albany ARA in January heard HL9VX/WB2IGU talk about what it is like to live and work in Korea. They report upgrades at last VE session KA2MYJ KA2UWI N2HQS KB2EOB KA2HRO KA1JXF N2HKQ. Catskill Mtn. ARA held a test session and made plans for Field Day. (No, it is not too early to start planning!) Crystal RC now publishing newsletter every other month. Orange Cty ARC at its last test session report the following upgrades/certificates: KB2CVH KB2END WB2OEE KB2DTU. Overlook Mtn ARC viewed a comedy video, 1981 Frankfort Radio Club DX Contest and report upgrades KB2CLV KA2ZPB KB2PC KE2BN. PEARL is planning a dinner/dance party for April. Saratoga RACES heard about upcoming innovations in the communications field. WARA heard about W2NBT's travels through the British Isles. K2ZVI made a presentation to WECA on the National Traffic System and handling messages. N2FTR, Net Manager of HVN has begun putting out a newsletter with statistics about the net. Net managers compiling information about your nets, send reports to WB2NHC for inclusion in the upcoming newsletter. This also applies to clubs and individuals. Anything you feel worthwhile enough to be distributed to the entire section should be sent to WB2NHC. All appointments are being updated. If you want a field appointment, let me know. JAN. PSHR: KA2MYJ NQ2H WB2VUK K2ZVI N2HIF N2HDL WB1BTJ. JAN. Traffic: N2HIF 385, WB2VUK 146, NQ2H 120, K2ZM 119, K2ZVI 116, N2FTR 52, N2HDL 45, KA2MYJ 44, WA3RKB 29, KA2NGJ 10, W2CJO 8, K2HNW 7, WB1BTJ 6.

NEW YORK CITY-LONG ISLAND: SM/SEC: Walter M. Wenzel, KA2RGI— ASM: K2IZ. ASM VE: W2NL. ACC: KA2WIJ. STM: K2MT. OOC: NB2T. TC: WA2YNH. BM: W2JUP. PIO: N2GQR. The following are traffic nets in and aruond the section that handle NLI messages with the Dec. report figures:

NET	FREQ	TIME	DAY	MGR	SESS	QNI	QTC	QSP
BAVHF	145.350/R	2000	DLY	K2YQK	—	N/A	—	—
NCVHF	146.745/R	1930	M-F	K2HPG	—	N/A	—	—
SCVHF	145.370/R	2000	S-F	KA2JMA	—	N/A	—	—
NYPON	3913 kHz	1700	Dly	KA2UBD	31	693	629	693
NYS/M	3877 kHz	1600	Dly	N2EIA	31	388	402	378
NYS/E	3877 kHz	1900	Dly	KU2N	31	427	429	704
NYS/L	3877 kHz	2200	Dly	KU2N	31	398	352	924
NLT	28450 kHz	2100	Wed	KB2BKE	—	N/A	—	—
ESS*	3590 kHz	1800	Dly	W2WSS		339		70
PNS	145.01	24hr	Dly	AI2Q				36

*Independent Net, recognized by NTS, all times are local. Access AI2Q-4 (Packet Node Station) via WB2QBP-2 Net-Rom Node. Please check into the NYC-LI Ten Meter Net (NLT) for additional traffic handling training. Novices please take note that this net is designed for your participation. ARES EC/DEC reports for Jan: K2TWZ WA2WKV KA2CHD WA2UJI KA2CAH KA2JMA KD2YA KA2UIU. If you are interested in more information about the Amateur Radio Emergency Service, please contact me for more information. We need a few more good operators for ARES and NTS, so join in and become part of the doers and not just a taker. Give something back to the hobby. EXAM SESSIONS: LIMARC-second Saturday of each month at NY Inst. of Technology, Old Westbury, contact Joe, W2NL 516-751-0894; SUFFOLK COUNTY VE TEAM-second Saturday of each month at Suffolk County Community College, Selden—contact George, WA2VNV 516-751-0894; GRUMMAN ARC-second Weds. of each month at Bethpage High School, Bethpage-contact Howard W2QUV 516-354-6861; GREAT SOUTH BAY ARC-fourth Sunday of each month (date shifted for holidays) at the Babylon Town Hall—contact Jim, W2DUK, 516-957-5287. If your group holds regularly scheduled license exam sessions and/or classes, let me know at least three months in advance so they can be added to the column before the printing deadline. With the warmer weather on its way and the preparation for upcoming public-service events, please take the time to check out your equipment and encourage a fellow ham to assist along with you at a public-service event. Don't take for granted that all hams know how to handle traffic, relay information, and make an emergency phone call. These are skills that are developed by participation and not gained by osmosis. We all need the brushing up and participation in the nets and events that prepare us for unforseen circumstances. The way we handle a situation or communication can make the difference between life or death. Remember the life you save could prove to be your own, so take a little stronger look at this hobby we all have come to love and return some of the things you have taken back to it and help make it stronger. Reminder: If you are interested in assisting your fellow Amateur community in a special way, please contact me for more information about the Section Leadership and Station appointee positions. ATTENTION ALL CLUB INFORMATION OFFICERS: Please note that Mitchell Reiner, KB2CLI, has taken over as the Hudson Division Information Coordinator, so if you have information about your club's activities and hamfests, exam sessions, and/or classes, please make sure he receives the information. Mitch's address is 8 Forte Av., Old Bethpage, NY 11804. You should also be sending a copy of the information to Alan Taylor, KA2WIJ, and myself so the information can be passed along.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM (VE Liaison): N2XJ. ASM (FO Info): NW2L. Sec: N2BMN. STM: KA2F. OO/AAC: KA2BZS. AAC: KY2S. SGL: W2KB. TC: K2BLA. BM: N2CXX. PIO: WB2QNV (Ph 735-8550). Appointment endorsements for the next two-year term starting 4/88 are: OBS WB2GWD (PBBS Hunterdon County) and PIA KD2JC at Howell (Contact 458-3925). OO applicants KD2AG, of Plainfield, and WB2CZB, of Hillsdale, having passed the certification exam are effective 01/88

members of the Amateur Auxiliary (AA). A Public Service award certificate was presented by our SEC to retired Wayne EC WA2JVP for his over 15 years of service. NNJ Field Organization statistics as of the beginning of 1988 are: In Emergency Communications (ARES)—SEC (1), DEC (11) and OES (101). The DEC position for Warren County is open. In traffic handling—STM (1), NM (8) and ORS (46). Bulletin—BM (1) and OBS (10). Amateur Auxiliary—OOC (1) and OO (12). Technical—TC (1) and ATC (3). Public Info—PIO (1) and OIA (3). Other Leadership ACC (1), SM (1), ASM (2) and SGL (1). Total 205. A section-level meeting of District Emergency Coordinators (DECs) has been scheduled by SEC N2BMN, to be held April 9, 1988. The Cherryville Hamfest is on April 16. Congratulations to the following who were newly licensed or upgraded during January sessions conducted by Major Armstrong Memorial ARC (8/2), Raritan Bay ARC (6/4), Bergen ARA (9/7) and NNJ VE Board (12/11). Novice (3): G McDondald, Sr. G McDondald, Jr. and J Tromboni. Technician (8): KB2DTV, KB2EOY, KB2ERE, S Albrecht, KB2DZA, KB2ERT, KB2ESC, and L Brigando. General (1): KB2AMF. Advanced (6): N2HDG, N2HLS, KB2EVM, KA3FNP, KA2QLO, WB2HXR. Extra (6): WA2FZJ, K2IEZ, KE6HU, KA2YAT, N2HFG, and WB2HJW. Total applicants (35). Total new or upgrade (24). 68.6%! Traffic Nets and Statistics for December, 1987.

NET	MGR	FREQ	TIME	SESS	SES	QSP	QNI
NJM	WB2ZJF	3695	1000	DY	31	182	223
NJPN	W2CC	3950	1800	DY	35	186	416
NJN/E	NZ2R	3695	1900	DY/P	27	227	197
NJN/L	WA2EPI	3695	2200	DY/P	31	113	150
NJVN/E	WB2FTX	146.895	1930	DY/P	31	43	449
NJVN/L	N2FGC	146.49	2230	DY/P	Not received		
NJTTTN	WA2EPI	223.88	2100	DY	31	55	131
NJSN	KA2INE	3735	1830	DY	31	48	155
OBTTN	KA2F	147.12	2000	DY	30	145	255
NNJ.PL	W2QNL	145.01	24HR	VIA WA2SNA-1			

Packet NTS liaison station activity for January, 1988: 60 NTS messages were auto forwarded by the WA2SNA-1 PBBS, 61 were taken off for delivery or transfer to other nets by (KA2PVH, NZ2T, W2QNL, and WB2FTX). Total 121. SAR/PSHR: KA2F 390/117, WA2EPI 169/112, N2DXP 224/61, WB2QMP 165/79, W2QNL 697/111, W2RRX 126/77, KA2INE 109/74, K2VX 164/108, WB2FTX 73/65, WB2VUF 14/-, NR2O 69/-, W2CC 15/-, W2XD 21/-.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—ASM: WBØAVW. SEC: KDØBG. STM: KCØXL. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. The time for the ARRL Midwest Division Convention is getting near! It will be held May 20 - 22 in South Sioux City, NE this year. Be sure to make your plans to attend soon! New officers in the Jones County ARC are Pres. NØEPM, VP NNØL, and Sec./Treas. NØCWP. New officers in the Cedar Valley ARC are Pres. KØVM, VP KØDAS, Sec. WAØRJT, and Treas. NY0U. The Benton County ARC is developing a regular monthly VE testing schedule. KØTDO recently published 26 1/2 column inches of Fort Dodge ARC news in the Fort Dodge MESSENGER! Well done, Paul! We are starting to see positive results in modifying those terminals that were donated by the State. KDØBG has one on packet already plus a few more are up as well. Efforts are being made to blow PROMs so the others can also get up and running as well. NJØY reports a new packet path to northeast Iowa. Both NJØY and NØHY are operating packet from Winneshiek County. The Coon Valley ARC will operate WØØMLY and the Collins Amateur Radio Club will operate AD2ØØC during Iowa's week in the Bicentennial of the U.S. Constitution celebration. As of now, there will be five -200- stations on the air from Iowa. Will there be more? Traffic: WØSS 152, KCØXL 136, KAØADF 87, WØYLS 84, KØGP 76, KØBRE 51, KØPT 48, WBØMCX 37, W4JL 37, WBØAVW 23, KAØSTB 18, KCØKZ 10, WBØOKO 8, WØBW 4, KAØVBA 1.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: WØCHJ. STM: WØOYH. ARES ZONES: Zone 1 Wyandotte. Zone 2 Leavenworth. Zone 3 Johnson. Zone 4 Miami. Zone 5 Linn, Bourbon. Zone 6 Crawford, Cherokee. Zone 7 Neosho, Labette. Zone 8 Chautauqua, Wilson, Elk, Montgomery. Zone 9 Greenwood, Lyon. Zone 10 Woodson, Allen. Zone 11 Coffey and Anderson. Now for the Emergency Coordinators. If the zone you live in is not mentioned now, then perhaps you could volunteer to fill the gap. Zone 2 KAØKKH. Zone 6 NØEOQ. Zone 9 WBØYWZ. Zone 12A NØAOL. Zone 12B WDØDDG. Zone 13 NØCBI. Zone 16 KAØRNY. Zone 17 WØBBM. Zone 18A WØPBV. Zone 18B NØFKO. Zone 19 KBØEY. Zone 20 NUØS. Zone 21 KØPFU. Zone 24 WAØTAH. Zone 26 KAØMGO. Zone 28 WBØOAO. Zone 30 WAØRXS. Zone 32 KØEQH. Zone 36 NXØR. Zone 37 NVØY. Zone 39/40 WAØGBN. This leaves us with Zones 1, 3, 4, 5, 7, 8, 10, 11, 14, 15, 22, 23, 25, 27, 29, 31, 33, 34, 35, and 36 to fill. We know there is activity in those zones. How about someone steppin' forward with comments and someone to fill the EC position? It is not without saying, combined and or split zones are not out of line if that is a concern. More next month, and we'll catch up on the NETS totals for all nets also. Traffic: WØFRC 531, KSØU 246, KØBXF 161, WØOYH 118, NBØZ 108, WØFDJ 70, WØQMT 64, WBØZEN 52, KAØRNY 20, WØCHJ 17, NØDJT 15, NØBDG 14, WØMYM 11, WØRBO 8, WØPB 6.

MISSOURI: SM, Ben Smith, KØPCK—The Heart of America ARC is the latest Missouri Section club to be authorized to use a special call sign during the 200 anniversary of the U.S. Constitution. Next August 6-12, they will be using W2ØØRR. Several clubs have reported their 1988 club officers. Clubs and newly elected officers are: Kimberling City ARC Pres. KØPHI, VP WØQGN, Sec-Treas NQØG; the Tri-Lakes Repeater Association NQØG President-Chairman, WØCGN Vice-Chairman, WAØSFS Technician, WBØZVQ Trustee and KØPUE Sec-Tres; Missouri Valley ARC of St. Joseph, Pres KØJZI, VP NZØX, Sec KAØIKS, Treas WBØHNO, Board Members, KBØDE, and KAØDAY; Rolla Regional Amateur Radio Society Pres KBØWD, Board of Directors, KAØWPH and NAØV; Mid-MO ARC Pres. WCØW, VP NSØB, Sec-Treas WBØTPM; Jefferson City Repeater Club Pres NSØB, VP WCØW and Sec-Treas WAØUFT and the Central Missouri Radio Association of Columbia Pres NØFPI, Rec-Sec, NØHKN, Corres.Sec WAØR and Treas. KAØIBS. The St. Charles ARC held their annual Christmas Message Center at a local shopping mall. They sent 67 pieces of traffic and answered many questions about Amateur Radio. Club members helping were KDØAK KBØBEP KBØBNZ NØGL NØHMZ KAØIKU WØOGS KAØTRL NFØQ KEØQJ KAØYPK and KØBZ. It will soon be Hamfest time. If your club is holding a hamfest offer your

help to be on the committee or assist the hamfest operation in some way. A lot of work is involved. If your club does not have a hamfest, try to attend as many hamfests as you can. It's a great way to meet in person the folks you work over the air, find a few bargains in the flea market and support the sponsoring club. Silent Keys reported: WØRAW and WØHRZ

NET	SES	QNI	QTC	DAY	TIME	FREQ	MGR
MON	62	368	187	DLY	7:00/9:45	3.585	KØSI
MOSSB	31	1083	100	DLY	6:00	3.963	KØORB
MEOW	31	818	74	DLY	5:30	3.963	KØOSQ
HBN	21	363	19	MON-FRI	12:05	7.280	KØOSQ
PHD	4	141	9	MON	9:00	146.43	WAØKUH
NEMOE	13	87	4	TTSun	7:30	144.53/5.13	KEØMI
KCBAR	4	64	4	MON	8:00	145.41	KAØSSE
SWARC	4	79	3	TUE	7:00	146.31/.91	KØKXC
MORA1	5	29	2	SAT	8:00AM	3.630	NOØE
CMEN	4	47	1	WED	9:00	146.16.76	KØPCK
ARESN	4	41	1	THU	9:00	147.855/.255	KAØTGL
TCN	4	41	1	THU	9:00	147.69/.09	NZØF
LOZBC	26	418	0	MON-SAT	6:00AM	146.13/.73	NØHVO
LOZFM	5	78	0	FRI	9:00	146.13/.73	NØHVO
ZAEN	5	57	0	TUE	8:00	147.84/.24	NOØE
MOFON	4	30	0	WED	8:15	222.42/4.02	AIØO
SARN	4	28	0	TUE	9:00	146.43/7.03	WØENW
MARC	4	22	0	Sun	8:00	28.325	NSØB
CMYL	4	18	0	MON	8:00	147.15/.75	NØHVO
CARL	3	16	0	Wed	8:30	146.46	WBØWLU

Traffic: WØBMA 256, KØSI 180, AIØO 176, NDØN 135, WAØYJX 115, NQØG 102, WAØHTN 77, KCØAS 77, KØORB 68, KØPCK 68, K9OCU 50, K2ONP 43, WØOUD 41, KM5L 40, KGØL 28, NIØR 20, WDØELL 18, KT5Y 13, KDØAJ 8, KØUAA 1.

NEBRASKA: SM, Vern Wirka, WBØGQM—STM: Jerry Kohn, WDØEGK. SEC: Michael Ruhrdanz, NØFER. The Nebraska Section Emergency Coordinator, Michael Ruhrdanz, NØFER, of Lincoln, is serving as the 1988 president of the Lincoln Amateur Radio Club. The Lincoln Club has given its annual "Jerry Cox Award" to Jerry Kohn, WDØEGK. Jerry is a Lincoln Club past president and board member. He serves the Lincoln Club as its public service activities coordinator. Jerry is the Nebraska STM. The severe weather season is now upon us in Nebraska. Volunteer weather spotters are needed across the state. Contact your local EC for information about local ARES organization. If you do not know your local EC, contact the SEC, NØFER. The Nebraska Section needs more packet-radio operators for traffic handling, especially to interface with the National Traffic System. If you have packet capabilities and would like to become active in the traffic-handling aspects of our hobby, please contact the SM or STM. Traffic: KØDKM 287, WØKK 98, WAØBOK 38, NYØJ 18, WBØGQM 12, NOØA 10, KAØBCB 9, WCØO 3.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KZ1Z. ASM: KB1H. STM: K1EIC. SEC: N1DCS. OOC: NA1I. ACC: NK1J. PIO: WA1CMF. TC: W1HAD. SGL: K1AH.

NET	NM	SESS	QTC	QNI
CN	WB1GXZ	62	158	320
CPN	NK1J	31	103	382
WCN	N1EDD	32	141	415
CSN	WB1GXZ	21	36	124
NVTN	K1CE	27	84	226
CSTN	K1CE		47	
RTN	KY1F	31	76	280
TMRCN	NM1K	5	5	120

A hearty welcome to KY1F, the new NM of RASON. CT Traffic Handlers Dinner, April 16 at the Red Bull in Waterbury. Consult your NM for details. Another 220 repeater is operating in CT, try 224.38 NE1A. Congratulations to KA1EAJ for being selected SCARA's Ham of the Year. Southington ARA Flea is scheduled for April 17th. The gang at ECARA provided emergency communications and transportation for medical personnel at the Day Kimball Hospital during a snow-storm on Jan. 8th. ECARA can also be justly proud of the emergency communications assistance they provided to the Town of Putnam during a recent potentially dangerous fire. N1ESB has been appointed the new EC for Southington. An informal poll of participating stations indicate that many thousands of contacts were made during the recent WE THE PEOPLE activities in January. CONGRATULATIONS to all those sponsoring clubs representing the Constitution State in this most special event. W1AW-4 BBS is now supporting Zip Code forwarding to all New England States. Have you or your club been involved in Amateur Radio instruction lately? If so, the ARRL Education Task Force is looking for your input. What special teaching techniques did you employ to make specific concepts come alive? How would you evaluate currently available training materials? How did you modify existing materials to present the information required in a meaningful way to students with wide-ranging academic backgrounds and age differences? What successes have you had working with youth groups, eg schools, scouts or 4H? Please direct your comments to K1KI, KZ1Z or AH2W. Section Novice packet activity appears to be growing on 223.40. Traffic: N1DMV 276, WB1GXZ 256, W1EFW 228, N1API-4 205, KY1T 179, N1EDD 159, KA1GWE 134, KY1F 98, NK1J 87, NM1K 84, W1YOL 83, NK1N 64, WB1CRH 45, KB1ZC 42, K1CE 37, N1FJW 36, W1BDN 32, KA1JAN 30, N1BOW 27, KA1FVY 17, WB2SGI 15, WA1NLD 11, W1QV 7, W1CUH 5.

EASTERN MASSACHUSETTS: SM, Barry Porter, KB1PA—ASM: K9HI. STM: KW1U. ACC: KA1KCU. PIO: K1HLZ. BM: KB1AF. OO/AA: AG1F. SGL: K3HI. TC: KA1IU. EMass Hotline 437-0111. Westlink 449-2226.

Net	MGR	FREQ	TIME(LOC)	DAY
EMRI	N1AJJ	3658	1900/2200	DY
EMRIPN	WA1FCD	3880	1730	DY
EM2MN	NK1Q	63/23	2000	DY
NEEP	NK1BZD	3945	0830	SUN
HHTN	NG1A	04/64	2230	DY
EMRISS	N1CVE	3715	1600/2030	DY
CITN	KB1AF	745/045	1930	DY

Hopefully a decision by the FCC to defeat the 220 proposal will have been announced by the time this is printed. I attended the New England Division cabinet meeting called by Division Director Freneye. Many interesting topics were discussed by this group, which consists of all the New England Division Section Managers and Assistant Division Directors. The cabinet advises Director Freneye and Vice Director Weinstock of the concerns of the ARRL members in this area and gives advice on how they should vote on the various proposals brought before the ARRL Board of Directors. At the last ARRL Board meeting, Div. Director Freneye was elected to the ARRL Executive Board. Congratulations and Good Luck Tom! This October will be the New England Division convention in Boxboro. If you plan to get a room at the hotel, you better act fast because 60% of the rooms are already filled. Look for a major expansion of the Eastern Mass Ham Hotline (phone number above) within the next few weeks. I will have more on this next month. Please be sure that your club officers have sent in the ARRL annual report (please ask at your next club meeting). It is important that the information the ARRL has is current. Both the HQ Staff and the Section Staff rely on this data when answering questions about contacts in various clubs and for mailings to club officers. The ARRL sponsors various annual awards and scholarships. I have received a blurb about the "Instructor of the Year" and "Teacher of the Year" awards. Any teacher or ARRL registered instructor (that deserves it) can be nominated, with the nominations sent thru me for perusal. If you know of any deserving teacher or instructor, please let me know. The deadline is 1 April so there is not much time!! IMPORTANT MEETING NOTICE!!!—The New England Spectrum Management Council (NEMSEC) will be holding a general meeting on May 14, 1988 from 1PM-5PM at the Curtis Middle School, 22 Pratts Mill Road, Sudbury, MA. This meeting is Open to the public. If you have any complaints or criticisms, bring them with you. Contact W1IFL (EMass NEMSEC Director) for more info. On the Packet front the AA1A BBS is now QRT. WB1FLD-1 digipeater is now on the air from Bridgewater on 145.05. KB1PA-3 BBS will be on the air soon from the site of KB1PA-1 Net Rom on 145.01. Both KB1PA-1 and WB1FLD-1 cover most of SE Mass. If anyone is contemplating Novice packet operation, the recommended freq. is 223.58. The Police Amateur Radio Team (Part) of Westford reports the following stats for 1987: DMV's-153; Accidents-99; Traffic Hazards-23; Fires-11; Wreckless Operations-7; Misc-4. A very busy year. PART can be accessed on 156.52 by holding down the * button on a touch tone pad for 3 seconds. They are in range of most all hams in the NE area of Mass. The Elite Amateur Radio Society (EARS) seems to be growing by leaps and bounds. They report that they should have their Mark 4 repeater troubles fixed and on line soon. I want to thank EARS for holding a Santa Claus net this past December. Over 35 youngsters were able to contact the North Pole direct. The Wellesley Club continues to be active in various projects and contests. Has anyone noticed that the HF signals coming from the Attleboro area seem to be stronger recently?? Some of the Sturdy Mem. Hospital Club members have recently put heaters on line. If you know of anyone who is interested in getting their ham ticket or upgrading, now would be the time. The number of Novice classes and upgrade classes has mushroomed, and their are plenty of exam opportunities. The numbers of new licensees is also skyrocketing, with 10-meter SSB being the favorite mode of operation. Despite this, an alarming trend is developing. There has been a huge increase in restrictive zoning problems regarding amateur tower installations in EMass. While PRB-1 helps it can not prevent troubles like this. The reason much of this comes up is because many local zoning board officials are not familiar with what our hobby/service can do for a community. It is up to us to educate the non-Ham public on who and what we are. I bet that if you went to a local shopping area some time and surveyed a couple of hundred people, not more than 15% would know what Amateur Radio is. We need to rectify this situation if we are going to prevent ant future troubles!! One of the best ways to start this is to publicize local club meetings and classes, and let people know who you are during public-service events. Also giving presentations to the local Rotary, Lions, Elks, Masons, Pythians, Knights of Columbus, etc. on what we are about will help increase awareness of our hobby tremendously, and will also serve as a reservoir of new hams. Only through increased publicity and public awareness can we prevent future problems. If your club or group wants to participate in making your local area more Ham-conscious please contact PIO K1HLZ or myself. Have you done anything to promote local public awareness of our hobby lately? Traffic: N1BBT 2369, KW1U 936, WA1TBY 431, KB1AF 479, KA1BBU 438, KN1K 380, NG1A 355, WA1FCD 323, K1GGS 323, W1CE 232. NK1O 189, NK1Q 135, K1ABO 109, N1AJJ 103, NN1Y 83, WA1FNM 71, KA1LIH 67, W1DWZ 36, KA1EID 29, KA1NOI 29, W1DMH 21, K1BZD 17, K1ZYW 14, KA1EDY 13, KD2S 12, K1LCQ 7, KA1AMR 4, KA1KCU 4, KA1RLT 4.

MAINE: SM, Cliff Laverty, W1RWG-ASM: Bill Mann, W1KX, SEC: KA8IJVQ, STM: WA2ERT, BM: W1JTH, OOC: W1KX, PIO: KY1E, SGL: K1NIT, TC: KQ1L, ASM/Packet: N1AHH. Phil Young, W1JTH, Bulletin Manager, reports 98 transmissions by 5 bulletin stations comprising 12 ARRL, 3 Maine, 1 propagation, and 3 packet on CMEN SGN MPSN RACES MENET (packet).

NET	SESS	CHECKINS	TFC	MANAGER
SEA GULL	25	1049	111	K1GUP
PINE TREE	31	295	55	ND1A
AROOSTOOK EMERG	4	68	2	WA1YNZ
MEPUBSVC	4	56	3	KA8UVQ
CENMEEMERGENCY	9	209	8	N1EUK
RACES Oxford Cty	5	78	28	W1RWG
RACES Hancock Cty	5	57	2	WA2ERT
ARES Kennebec Cty	5	85	---	KA1LPW
ARES Cumberland	4	50	---	KA1OOT

Traffic: KA1JOJ 120, ND1A 75, WA2ERT 50, W1RWG 56, W1ISO 41, W1KX 39, WB1CBP 39, W1JJTH 27, N1BCF 25, KA1ODT 25, W1VEH 19, N1BJW 16, W1OTQ 14, WA1YNZ 7, W1BMX 7, N1FFN 4, AJ8C 3, NC4Y 1. PSHR: WA2ERT, WB1CBP, W1RWG, W1KX. The following VE exam sked may be changed in site and date depending on availability of local public buildings. Check with contact person a few days ahead. Apr 9 Rockland KX1I, Apr 23 Winter Hbr AJ0C, May 25 Augusta N1BCF, Jun 4 Bangor K1AG, Jun 11 Ellsworth AK1W, Jun 12 Bath ND1O, Jul 1 Augusta N1BCF, Jul 9 Rockland KX1I, Aug 13 St Albans AK1W, Aug 27 Augusta N1BCF, Sep 10 Windsor KQ1L, Sep 18 Bath ND1O, Oct 8 Rockland KX1I, Oct 27 Augusta N1BCF, Nov 12 Ellsworth AK1W, Nov 26 Bangor K1AG, Dec 11 Bath ND1O, Dec Augusta N1BCF. Listen to bulletins for additional sessions in Aroostook and the Portland area. HAMFESTS: June 4 Bangor, July 16 Mid-Coast/Yankee Club at Union, Aug 13 St Albans, Sep 10 Windsor. 10 new hams at Falmouth High Sch, under the leadership of Bob, KA1LVL, received licenses and put on a one-day ham-a-thon making 152 contacts on 75, 2, and packet. Congratulations. Portland Amateur Wireless Association has elected Bruce KA1PRC, pres; Bill WB1EWA, vp; Frank KC1HB, trea; Doug N1EXD, secy; editors, Ron KA1FI

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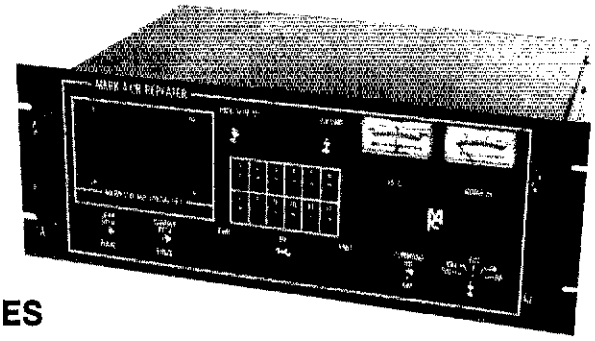

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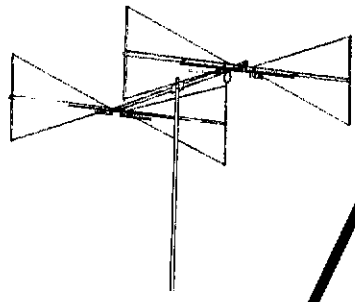

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es WB1EWA. PEN BAY ARC elected Nolan K1ALX pres; Stan K1EHO 1st vp; Chas WA1ZDA tech vp; John N1DOY secy; Ed KC1OG treas.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—ACC: KI1M. STM: W1TN. Each month, I receive many club newsletters from around the section and they tell me a lot about the health of clubs and of Ham radio in general. The quality of newsletters has incresed steadily and the editors deserve praise for their efforts. They also need your input to maintain the quality and substance of the publications. With the start of the new year, many clubs are doing their planning for upcoming public-service events, fleamarkets and other springtime events. The 3-day Lung Association Bike Trek will be held on the seacoast this year and both GBRA and PCARC are planning to work this public-service activity. This promises to be an excellent ARES exercise-contact your local EC or DEC to find out how you can participate. Also, the March of Dimes Walkathons will be held in 5 towns in NH on the weekend of April 16-17. Check with your local club to help with these activities. We have more new Hams this month and more on the way! PCARC reports that they have finished a Novice class with 11 grads and the Contoocook club has both Novice/Tech and upgrade classes in progress. I attended the NE Div ARRL Director's cabinet meeting called by Tom, K1KI. We discussed many of the current concerns in the hobby and provided input to Tom regarding issues on which the ARRL Bd will be voting. Many clubs are finding that weekend breakfast get-togethers are working very well. The Souhegan Valley ARC and Amherst club held a joint breakfast on Jan 17 with 32 in attendance. The Nashua club has two breakfasts each Sat morning from 7-10 AM with good results. These are good opportunities to meet newcomers, stimulate non-active Hams and try out new ideas. The Mt. Moria Rptr Soc had another successful Vol exam and Phil, WA2MBQ, reports that 8 of 20 applicants upgraded. CNHARC had a project night with K1NYS showing his "home-brew" paddle and W1JY displayed a well-built Trans-Match: Build It Yourself is not dead, folks! On the PR front, I received a copy of a company newsletter from Bill, K1TVW, with an excellent 3-page article with pix promoting Amateur Radio. Bill works for Analytyx, a sub of Sanders Assoc. Dale, AF1T, has accepted a 1 year teaching position at State College, PA. Good luck, Dale, and see you during the summer vac. Dale is an ATC and active member of the Concord Brasspounders. Many people active during the Novice Roundup on both CW and phone, also many folks completing "We the People" award and WAS with increased band activity. And congrats to NARC and GBRA on being renewed as ARRL SSCs for 1988. John, W1TN, is in sunny Fla and I put the report together this month—sooo, here we go! (Incidentally, John sent his tfc rpt in from the beach—ouch!) Congrats to N1CPX, WB1HBB and KA1HPO/T for making PSHR this month, and thanks to all traffic handlers for your extra effort! GSFM 154, GSPN 127, NHN 87, NHNTN 34, TSFMEN 4, MCEN 2, TSEN 1. W1PEX 913, WA1FHB 452, K1TQY 398, N1CPX 373, WB1HBB 183, W1FYR 124, NE1J 117, KK1E 82, N1ALM 82, WA1YZN 79, N1NH 74, W1ALE 56, W1TN 38, KA1LBW 26, KA1LMR 24, KA1HPO 20, K1ACJ, 14, KA1OU 14, KA1QWT 14, KA1QIW 12, KA1PFS 7, KA1JOU 5, KA1KFX 1. (Dec.) K1TQY 248.

RHODE ISLAND: SM, Charles H. DiLuglio, K1DA—Elections for OSARC Officers: K1CVP was elected President, KA1JNP, Vice President. Novice Classes to start once again at the Red Cross building in Apponaug the first Thursday in February. The Newport Radio Club is working on the 96/36 repeater. The hope is to restore it to the coverage it had when first put on the air and perhaps improve a little on that. Rhode Island hams can now get license plates for any motor vehicle with their call letters. The bill, passed last year, should be known to the Department of Motor Vehicles by now and requests granted. If they do not, I have copies of the law to remind them. Thanks to the clubs who have put me on their newsletter mailing list. I am pleased to get the newsletters even if I do not refer to them in this space.

VERMONT: SM, Frank I. Suitor, W1CTM—ASM: AE1T. STM: KT1Q. SEC: W1KRV. PIO: WA1YOY. VT Slow Speed Net is active at 3707 kHz on Tue,Thur,Sat. at 1700L. Novices and Technicians can improve CW and traffic-handling skills simultaneously. All VT hams are encouraged to participate. BARC Jan. meeting included a FB tour of National Weather Service facility at Burlington International Airport. KA1UE has become an Amateur Auxiliary member. Congratulations are extended to new licensees: KA1RET (Gordon), KA1RIH (Ian), & KA1RHV (Eric). CVARC Feb meeting included packet BBS review by N1BRT. Phil Baldwin (W1ZW) became a Silent Key on 1-2-88. Although Phil will be missed, his rig will be utilized as it has been generously donated to Vermont Technical College. CVARC Jan. exam session was dedicated to W1ZW and the following upgrades took place: Adv. N1CFA, N1EQO; Gen. N1FHI. K1LOO (Tom) has been appointed EC for Waterbury and N1EQP is new Asst DEC for WA County. A second section packet meeting at Milton Hamfest with another scheduled for April 23 at CVARC HQ—contact K1AUE or K1HKI for details. GMWS Novice classes started 1-27. Contact WA1ZOJ/ND1I. Ross Flagg recently received a new call-N1FHY. KA1YN and KA1YO are active from Florida at 1045L on 14252 kHz. ARES membership in Jan. reached 196. Contact W1KRV to join. Legislative groundwork is in process to allow 6-character license plate—contact W1KRV. The Midwinter Milton Hamfest provided a great opportunity to sharpen flea market bargaining skills for next summer plus getting acquainted with some new hams in area. The fest organized by SJRC/BARC is getting bigger and better every year. KT1Q has been heard on packet radio. Jan. Traffic: WA2BPL 651, KT1Q 586, N1DHT 148, WA1JVV 123, NB1A 36, AE1T 34, WB2MIC 29, WA1VXN 20. NETS: VTN 31/190/192, BSEN 5/97/1, BSN 11/119/0, CAR 26/658/63, GMN 26/488/33, VTPHN 5/100/7, TSEN 4/51/1, TSFMN 4/58/4, CVFMN 5/99/6.

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/RFI: N1CM. PIO/ACC: K1BE. SEC/SGL: WB1HIH. TC: KA1JJM. STM: KA1EXJ, South Worcester ARES and Quaboag Valley ARC provided communications for the Sturbridge Cross Country Ski Race. Sturbridge is celebrating their 250th anniversary this year and Quaboag will be providing communication for the upcoming events. Rusty, NM1K, operated W2ØØAW on the 10th of January. Now he knows what it feels like to be on the other end of a pileup. Great fun, but to make out those QSL cards after is a chore. Worcester area has a new packet BBS up and running under the able direction of SYSOP Eric, K9ES. Eric hope to have the BBS located at the Worcester Airport in the near future. It's operating on 145.030 MHz. NA1Q reports that the WPI Radio Club has a Novice class going and their "brute" amplifier is in the process of being rebuilt by NK1P. Congratulations to Bob, KA1OTQ, the new president of CMARA. With your able leadership CMARA should enjoy a very active year. Explorer Post 73, under the guidance of CMARA, and the donation of Dave, K1COW, is sporting a 40-foot tower for their Field Day and hilltopping activities. MARA's able engineering staff is progressing with the upgrading of the 145.450 MHz repeater. The New England Spectrum Management Council (NESMC) will be holding a General Meeting on May 14, 1988, 1 PM-5 PM, at the Curtis Middle School, 22 Pratts Mill Rd., Sudbury, MA. Contact your NESMC director Tom Duffy, K1JHC, for additional information. Traffic: KA1IFC 871, KA1EXJ 330, KA1CRX 208, WB1HIH 83, NM1U 77, KB1TH 75, WA1YYK 73, KA1CFC 47, K1JHC 33, W1SJV 31, KA1EKQ 17, KA1QFV 15, NI1V 9, W1ZPB 6, WA1CPN 3, W1KK 68, W1UD 342.

NORTHWESTERN DIVISION

ALASKA: SM, Dianne Marshall, AL7FG—Volunteers needed for ARRL appointments in Alaska—call SM at 479-5819. Spring has been busy with many radio operators keeping track of the dogs and athletes in the Yukon Quest, Iditarod, North American, Arctic Winter Games, Ice Festival, Iditeski and numerous other events. Thanks to the operators of KL2ØØKC, KL2ØØGPG and KL2ØØK who made thousands of contacts. Ben Ez Jason, AL7EZ, became a Silent Key Jan 20. His contributions to Amateur Radio will be missed. New net-Tanana Valley Emergency Preparedness Net, Sundays 2000 Local time on 28.4 MHz and 2015 on 146.37/97 repeater. Other nets - Snipers 3920 1800 local, Motley Group 3933 2100 local, AP net 14.292 0800 local. Everyone plan to attend the Motley Group Picnic in July.

IDAHO: SM, Don Clower, KA7T—SEC: K7REX. STM: W7GHT. OOC: WB7CYO. ACC: N7BI. PIO: WB7PFQ. Received the 1st issue of the Idaho Falls Eagle Rock ARC newsletter. The new officers are: Pres-N7GNV, VP-N7HUM, SEC & ED-KB7CSB, Treas.-WB7QNS. The Eagle Rock ARC has an ARES net every Tues. at 9 PM on 146.64. Their meetings are held the first Wed. of each month. It is time to start our planning for Field Day in June. Maybe we should have an award for the best score turned in by an Idaho Field Day station. 73, Don. Traffic: W7GHT 235, KA7IHO 15, K6QT 11.

MONTANA: SM, Ken Kopp, KØPP—New officers for FVARC (Kalispell) are WA7AAI/P, N7CWP/S-T. NN7J elected Pres., but became Silent Key Jan 19. They will organize Glacier/Waterton Hamfest, set for July 15/16/17, W7BKM, Chairman. LYARS NEWSLETTER has handy full-page list of dealers with phone numbers. SASE to KØPP. N7GXP has 4-page tutorial on BBS use. SASE to him. GHRC (B'zmn) rec'd plaque fm Special Olympics Organizers. GFARC's (Great Falls) DX'er K7ABV wants to form DX'ers group. Hank (Missoula) will provide rig for 220-MHz packet link to Spokane with help from Libby's PARK. K7AEZ honored by YRC (Billings) as HAM OF THE YEAR. Traffic: W7TQU 258 (PSHR), KF7R 60 (PSHR),WA7TUW (Dec) 40.

Net	Sess	QNI	QTC	MGR
IMN	31	282	108	KA7EEE
MSN	5	90	0	KØPP
MTN	31	2201	135	KF7R

OREGON: SM, Randy Stimson KZ7T—ASM: KM7R. STM: W7VSE. SEC: W7FBP. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. RFI: AK7T. OO: KA7HJT. STC: N7ENI. We have new officers in the Hoodview ARC and they are Carroll Hermanson, KA7FJX President, Bernie Muller, W7BKO Vice President, Sharon Hobbs, KA7YHV Secretary, and Rozy Clulow Treasurer. The Garden Clubs in the Salem area have a show every year and it is called The Green Show and every year the hams set up a booth for handling messages and this year they handled some 700 messages. Great way to let people know what ham radio is all about. Just a reminder

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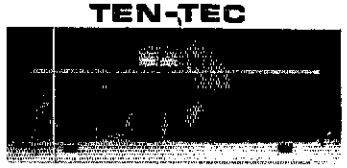

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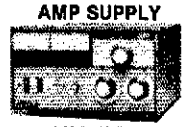

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that Field Day is coming and time to start planning for the event but more about it next month. The 1988 ARRL National Convention is coming along very well. I understand that the exhibitor booths, which there are 110, are all but gone. So far there are 65 exhibitors coming. I have heard that we have some great seminars already scheduled. All in all it looks like a great Convention, and I hope you have it in your plans to be there on Sept.9-10 and 11. There will be some registration forms in the Ham Magazines in the months to come, plus I believe there will be a mailing. Traffic: (P) = Packet. W7VSE 408, N7BGW 216, WG7H 149, KA7EEE 85, N7ELF 81, KF7BX 72, WB7EMO 62. WB7VSN 62, W7ODG 47, WJ7E 41, N7APC 35, N7CPA 23P, KZ7T 10P, WB7SZM 9P, KA7AID 9. (Nov.) N7ELF 71. (Dec.) N7ELF 104.

WASHINGTON: SM, Brad Wells, KR7L—STM: KD7ME. SEC: KA7INX. TC: W7BUN. OOC: N7DVR. SGL: KD7AC. BM: N7CAK. PIO: N7FKV. ACC/ASM: KC7PH. ASM: KD7G. ASM: KA7CSP. ASM: W7UOF. ASM: K7CLL. All available 2-meter repeater pairs for Western Washington are now being used. There is an idea kicking around WWARA that, perhaps, we should "PL" all two-meter repeaters to allow more "machines" to be put into operation on this band. This suggestion strikes me as a bit odd, since the 2-meter band is already overloaded with various types of operating. Even a casual look at the ARRL Repeater Directory shows many unused repeater pairs in the 6-meter, 220 MHz, 70 cm, and 23 cm bands. FM equipment is widely available for use on these other frequencies. It seems to me that, before we worry about installing more 2-meter repeaters in a saturated RF environment, we ought to make use of the available spectrum on these other VHF/UHF bands. Additionally, we are beginning to experience overcrowding on the available 2-meter packet frequencies. Here too, it would seem that appropriate planning for the future would emphasize the use of other VHF and UHF bands which have a great deal of unused, available spectrum. Good spectrum management takes into account the full utilization of every band, rather than trying to force all of our operating into a 4-MHz slot. The City of Tumwater passed Ordinance No. 1144 which requires that individuals erecting radio towers taller than 60 feet provide proof from a licensed engineer that emitted non-ionizing electromagnetic radiation presents no health hazard to other members of the community. The Amateur Radio Assn. of Bremerton will operate W200VE, the Spokane Radio Amateurs will operate W200LA during the week of November 5-11, 1988, for the Bicentennial celebration. New officers for the Clark County ARC: N7CEY, Pres; K7YFJ, VP & Treas; NX7J, Secy. The Clark County ARC banquet saw K7CLL receive the "Sparky" Sherman award for public service and WB7ESV receive the Lloyd Stromgren trophy for club service. 31 amateurs in the Vancouver area received a letter of thanks from the Clark County Sheriff for participating in a local crime watch. Both the Mike & Key ARC and Clark County ARC were successful in coordinating food drives during the latter part of 1987. The Spokane Hamfest '88 is April 9th at the Red Cross Building, West 708 Boon St. 13500 sq. ft. of display and tea market. Hours are 9 AM to 5 PM. The Yakima ARES provided communications during a successful search for lost snowmobilers. I would like to thank all the clubs and individuals who have sent me notes and newsletters during the past 2 years. Much of the information for this column comes from these sources. If you want to catch me "on the air," I monitor 145.31, 146.52 & 147.00. In addition, I check into WARTS (3970 kHz), NWSSB (3945 kHz), CBN (3890 kHz), and WEN (3987 kHz Monday only). PUBLIC SERVICE HOURS: Asotin 1, Garfield 11, King 236, Skagit 17, Thurston 132. Traffic: K7GXZ 232, N7GGJ 187, W7IGC 140, W7LG 137, WA7CBN 131, N6EQZ 122, WB7WOW 86, W7GB 82, K7SUX 59, WA7PIN 58, WA7YEN 56, KA7PMD 32, N7DIP 26, KA7TTY 18, K7AJT 14, N7CWU 14, K7UQH 14, W7IEU 10, K7CLL 3, WA7TWB 2. Category 2: KD7G, KD7ME, KR7L.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG— ASMs: W6ZF, N6DHN. SEC: W6LKE. STM: K6APW. OOC: NY6Z. TC: N6AMG. East Bay Amateur Radio Club officers for 1988: N6AVB/Pres, N6JNK/1VP, KI6MM/2VP, N6IIW/3VP, WI6O/Sect, NU6W/Treas. Try their nets on 21115 at 8 PM and 21395 at 9 PM each Wed, and packet BBS W6CUS-1 on 7.093, 144.97 and 220.90. Mount Diablo Amateur Radio Club 1988 officers are N6KLS/Pres, KT6X/VP, N6NVA/Sect, AA6DL/ Treas, KT6Y, KA6IVF, AA6CK/Dirs. They recently welcomed new members N6LGE, KA6OOH, KB6USZ, KB6USJ, N6OAI, WD5BEZ, KB6TNB, KB6SCZ and KB6UUZ. Livermore Amateur Radio Klub has added a 220 link to their 147.12 (-600) repeater, AD6X/R. It will be left on 223.42 simplex as an encouragement for Novices to join in club activities. Benecia Amateur Radio Club had their Christmas good deeds chronicled in the "Bencia Herald." Through the club's efforts, over $2200 worth of toys, sports equipment, games, books, and cases of fresh apples are on their way to the children in the orphanages at Mulege, Mexico. Hayward Amateur Radio Club is celebrating their 37th anniversary. I have warm memories from their welcome to me as a green Novice in 1952! Congratulations and many more. Jan. Traffic: WB6DOB 201, W6VOM 146.

NEVADA: SM, Joe Lambert, W8IXD—Sierra Intermountain Emergency Radio Association is a new ARRL affiliated club in Minden. They are presently evaluating repeater sites. For SIERRA license class info, call (702) 265-3430. Officers are: WA6RYG, Pres. NZ7E, VP. NF7V, Treasurer. N7GXJ, Sec. Directors are KE7FV, KE7DY, N6MY, WB7NDJ, AND NO7Z. TMRA provided communication support for Incline Village Special Olympics in Feb. Thanks WA7MOF. There is a new 224.02 repeater (N6IPA) above Heavenly Valley. K7HRW reports more ARES action in Elko. He is also supporting the Girl Scouts in Motion program April 23 in Fallon. LVRAC still sponsoring Novice Classes. Contact George, KA7YGK, (702) 459-2586. For exam info in LV area, Janet, NK7N, (702) 565-0242. Several LVRAC members helped KC7HT support the Gold Strike off-road motorcycle race. REMEMBER THE RENO HAMFEST AUGUST 20 AT IDYWILD PARK. SEE YOU THERE! ALSO CONTACT K7HRW FOR DATE OF NEVADA SECTION MEETING TO BE HELD IN RENO IN JUNE.

PACIFIC: SM, Jonathan Starr, AH6GJ—Thanks for giving me a chance to serve as SM PAC. Appreciation to Army Curtis, AH6P, for excellent work during his last term. Other section appointments will be announced next month. Contact me if you would like to serve. Honolulu ARES was partially called up during New Years Eve flooding, but was not needed since telephone service was unaffected in the flooded areas. Maui ARES has signed a Local Memorandum of Understanding with the Maui County Service Center of the American Red Cross. New 75 mtr edition of the Hawaii County Emergency Net, 0530 Z Wednesdays on 3895 or up. New Lahaina, Maui open 2 mtr repeater AH6GR/r on 147.18 + linked up to UHF AH6GR/r 442.750 + in Central Maui. Maui's tourist areas will now have good coverage. AH6CP-1 digipeter in new Oahu site, now giving Kauai Packeteers good access. Please let me know what YOU've been up to for inclusion in this column. Traffic: KH6S 64, KH6H 30. Aloha, Jon AH6GJ.

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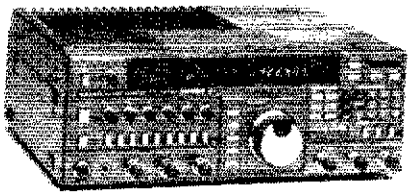

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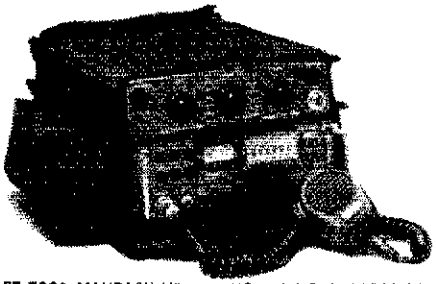

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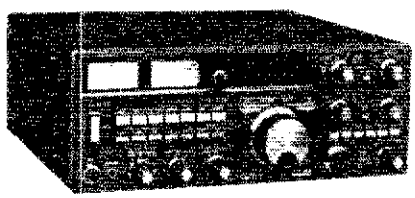

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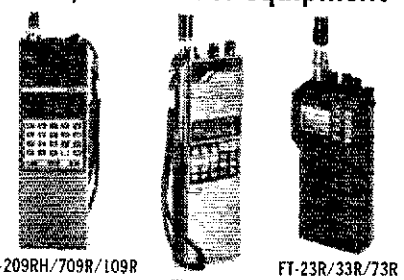

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15 min. from O'Hare!

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—Thanks to the Tehama County ARC for sponsoring the winter Section Meeting in Redding, to Public Information Officer Mark Nelson, AA6DX, for arranging it, and also to those who attended. There was an excellent turnout and some lively discussion. The most heated exchanges had to do with private organizations issuing ham call signs with some people insisting that no one else but the FCC had any business issuing call signs. Note that "primary" call signs will still be issued by the FCC. It is only additional call signs that the FCC is proposing to have issued by a private organization. From the beginning, the League position has been that the FCC should issue the call signs, but if they WON'T, the best qualified group to do so is the ARRL. Would you like to have ham call signs issued by a group representing the Land Mobile interests that are trying to get part of the 220-MHz band? They have ALREADY PROPOSED that they be chosen. Also discussed was a proposal made several years ago by Armand Noble, N6WR (Publisher of Worldradio) that there be local chapters of the ARRL instead of Affiliated Clubs. One of the primary ideas being to bring the feeling that our League is "here," not just back at Headquarters. Attendees were 16 to 5 in favor of considering the proposal. Traffic: N6LUY 289, K6SRF 99, WA6WJZ 98, WA6ZUD 34, W6RFF 21, WB6SRQ 4. (Dec.) W6RFF 32.

SAN FRANCISCO: SM, Bob Smith, NA6T— Looks like the FOUR club paper in Humboldt County is working. This month it's 4 ds pages. HPRS is ready for the 220 link to the Bay Area. Equipment is purchased; now for the time! Redwood VE Team is offering testing on 3rd Wed of the month at Humboldt Co. OES HQ. Need information? Call 442-9245 evenings. Steve, WA8LLY, gets congrats. Everyone in his ADVANCED upgrade class passed! SONOMA CO. RACES just received a Winnebago Van for the new "rolling EOC," they're active again! FD plans already? You bet. SCRA has secured the 2-rock site again this year, where will REXDA BE? Don't forget the monthly luncheon for GSLPRC, 4th Wed at the San Mateo Elks Club at 11:30 AM. Hoppy, WD6CKP is the HAM OF THE YEAR for SCRA; congrats Hoppy! Ken, N6KM, is talking with the local CATV company in Sonoma about what? 145.250 MHz. Does this sound familiar? HY, K6HY strikes again. What an editor. Forest can really real off the stories. Want some good reading? Your newsletter editors should drop K6HY an SASE and include his stories in YOUR newsletter! ACS is at the magic 151, and now they are a LARGE CLUB! Do you newsletter editors need mailing labels? Give me a call for information. The SEC post is still open in the SECTION; ANY ONE INTERESTED? Traffic: N6FWG 40. (Dec.) W6RNL 414.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD— SEC: WC6U. STM: N6AWH. TC: WA6EXV. ACC: W6DPD. Asst. SMs: W6TRP and K6YK. It is with much sadness that I must report that KA6DUT and WB6SPM are SILENT KEYS. 1988 officers of the Sierra ARC are: Pres WW6O, 1st VP KG6LR, 2nd VP WB6VQY, Sec WA6KZV, Treas N6BVP. The Club meets the 2nd Monday in Ridgecrest. 1988 officers of the Stanislaus ARA are Pres N6OCV, VP WA6OHP, Sec KI6TQ. The Club meets the 3rd Tuesday in Modesto. 1988 officers of the Southern Sierra ARS are Pres W6KQI, 1st VP K6RL, 2nd VP N6ORI, Sec K6KND and Treas Caroline Parsons. The club meets the 2nd Thursday in Tehachapi. 1988 officers of the Sonora Pass ARC (SPARK) are Pres WA6N, VP AJ6P, Sec N6KDH, and Treas KI6GG. The club meets the 3rd Tuesday in Twain Harte. Congrats to these recent upgrades: EXTRA KI6WB and KA6YSW; ADVANCED KB6GYM, N6PXP, N6LSF, KB6QLI, and WB6QUO; GENERAL KA6WBY, N6MOK, N6POF, KA7OYA, KB6UUM, and KB6AMT; TECHNICIAN KB6UNC, KB6VBR, KB6TSR, KB6TOI, and KB6PKI; NOVICE KB6VFR, KB6VFS, and KB6VFQ. Welcome to the SJV to NU6O and WB6GUM. W6QON has a TS 440, WB6ITM has a TS 940. The 1988 Fresno Hamfest is May 6-8, 1988 at the Holiday Inn in Fresno. Traffic: N6MCY 64, K6RAU 28, WA6YAB 2, N6MXG 2, W6DPD.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: WA6OCV. TC: WA6PWW. STM: N6JLJ. PIO: WB6OML. ASM: N6JQJ, NS6N. ACC: W6MKM. BM:(vacant) OOC:(vacant) A month with a very busy start! Ted, N6IIU, traveled to the island of Rota, 60 miles from Guam, to work on the Red Cross relief effort after typhoon Roy. Ted managed to call the W6ASH/R reverse autopatch and give an on-the-spot report during the Monday SPECS net. Well done, Ted!... Doc W6ZRJ has been busy playing with his computer, but did find time to attend the ARRL board meeting in Newington (Doc is an honorary ARRL VP)...our STM, Andy N6JLJ, spoke to the IBM ARC on NTS and emergency communications...the EMARC club heard a talk from a representative of the Electric Power Research Institute (EPRI) on the subject of biological effects of electromagnetic fields...the Gabilan club is starting to plan their Field Day bash. From their newsletter, "The meals issue was tabled until the next meeting..." ...as you read this it is certainly not too early to begin planning for YOUR Field Day!...the Northern California DX Club heard from Hil N6HR on Christmas in New Zealand, including visits to the shacks of several prominent ZLs...both SPECS and SVECS had very successful quarterly breakfast meetings in January. At the Project OSCAR annual meeting, the following were elected: Chairman of the Board: N6TX. President: WB6GFJ. Secretary: W6OLO. Treasurer: WB6KCJ. Newly elected to the Board: also new appointments Director of User Services: KH6JRB. Technical Director: WA6KBL. The OSCAR board will now meet at least four times per year, and there will be bi-monthly informal meetings of Project OSCAR. People interested can contact WB6GFJ @ N6IIU-1, or through the Project OSCAR address: P.O. Box 1136 Los Altos, CA (yes, different from GFJ's!)...a friendly reminder that traffic totals are due to our STM N6JLJ as soon after the first of the month as possible, 'cause this report is supposta be in Newington by the fifth! Jan. Traffic: W6KZJ 104, W6ZRJ 30, N6JLJ 6.

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W— ASM: AB4S. SEC: N4MYB. STM: K4NLK. BM: K4IWW. ACC: WC4T. TC: K4ITL. SGL: KE4ML. [BT] Rae Everhart, K4SWN, has "retired" this month after four years of service as Section Manager. The day Rae officially took office, hundreds of amateurs from all parts of North Carolina were already into the fourth of nine continuous days of emergency communications. On March 28, 1984 twelve tornadoes had roared into the state killing 44, causing great damage and disrupting communications throughout the affected area. Rae and his staff coordinated this effort from the first day. The major role played by North Carolina amateurs in this disaster relief effort resulted in official recognition of Amateur Radio's contribution by both the Governor and the N.C. Emergency Management Association. During Rae's tenure much progress has been made in our section; our HF and VHF NTS nets are operating efficiently, packet radio is evolving into its rode in NTS and ARES, clubs are strong, public-service activities are increasing awareness of Amateur Radio and ARRL membership is growing. Thanks Rae! [BT] The ARRL STATE CONVENTION will be held at the Raleigh Hamtest on April 10. Come and meet your new section staff. Also meet Division Director, W4UG, and Vice-Director, N4MM. There will be meetings on Packet Radio, DX, ARES/NTS, QCWA, Navy MARS, and more. [BT] The NC QSO Party sponsored by the Alamance Amateur Radio Club, K4EG, will be held on April 23/24. Write K4EG, KA4OVZ, N4ARY, or KC4AOA for details. I would like to see lots of participation from NC stations. [BT] Exam Schedule: Kernersville, April 2. Lexington, April 16. [BT] Huge winter storm January 7 dumped snow and ice on N.C. and many amateurs were active providing emergency communications for Weather Service, EM officials and hospitals. KA4WYC (EC, Mecklenburg) and N4MBI (EC, Forsyth) reported assistance to four-wheel drive groups. [BT] ARRL Affiliated Clubs annual reports are due. For forms, write WC4T or AB4W. [BT] Field Day is only 2 months away. Has your club/group made final plans? Silent Key: K4CQN. Traffic: K4NLK 396, K4IWW 162, NJ4L 202, KA4EYF 112, WB4HRR 101, WD4HTE 100, AA4MP 97, KA4TLC 74, WB4WII 70, K4SWN 61, KI4YV 60, AA4ZV 52, WB4N 45, WA4MNR 37, N9CGD 35, W4EHF 34, K4DDY 32, KB4FWL 31, N4JRE 26, AJ5F 13, WD4MRD 13, WA3EDN 12, NT4K 14, AB4EO 11, WD4LSS 10, N4UE 10, N4CJJ 9, WD4B 7, WD4EQK 4, K4WC 4. Totals: 30 and Traffic 1,839.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ— April 7 marks 30 years of service to the SC Section by the South Carolina Single Sideband Net. The Net was formally organized at a meeting in Columbia April 1958. First official session was April 7, with formal net rules issued April 19. Over the years some rules and procedures have changed, but as stated in 1958, the basic purpose of the net has remained the same: (1) fellowship, (2) advancement of the radio art and (3) traffic. Also, the net has supported Amateur Radio Week, participated in Simulated Emergency Tests, and activated for emergencies on numerous occasions. Beginning in 1961, the net established the "South Carolina Sidebander of the Year" award. Each Year the person or persons selected best exemplify the ideal net member and Amateur Radio operator. Since 1961, 24 Amateurs have been honored by this prestigious award. All who have supported the SCSSB net over the years are to be commended. I received numerous reports from individuals and ECs indicating major participation by Amateurs during the January Severe Weather. Some requests from officials went far beyond emergency communications needs. I will share my view concerning these requests next month. For all of you who participated — THANK YOU!! Traffic: W4ANK 149, K4ZN 147, KB4BZA 121, KA4LRM 50, WB4UDK 39, W4DRF 16.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC: N4EXQ. ACC: NT4S. OOC: W4HU. BM: AB4U. SGL: W4UMC. PIO: AA4VP. TC: W3ATQ.

VTN	1PM	3907	KB4NGO
VSBN	6PM	3947	KI4BR
VSN	6:30PM	3680	N4KSO
VN(EARLY)	7PM	3680	N4GHI
VN(LATE)	10PM	3680	WB4KSG
VLN	10:15PM	3947	KA4TWI
SVEN	7:15PM	146.82	NT4S
STARES	9PM	146.97	KJ4VT

It is with deepest of regret that I report John Manning, WB4MAE, as a Silent Key. John became a Silent Key on Jan. 7 after an extended illness. He served the section as the Technical Coordinator, an Official Emergency Station, and was active in the Sterling Park QSL Bureau, serving the 4th call letter district. I am sorry to report W4NKG, who was very very prominent in military communications, and N4KEU, who was active in the aviation field, as SILENT KEYS. The ARRL and the FCC have approved the Arlington Amateur Club and the National Capitol DX Assoc. as a special Bicentennial station to operate in the period of June 25-June 1, 1988. SEC N4EXQ announces the formation of a DEC/EC Net that will meet the 3rd Wednesday of each month on 3910 kHz at 9:45 PM. All DECs and ECs are asked to join this net. New field appointments are: KB4PW as DEC, NX4B, KB4OPR and KA8PUU as ECs and W3ATQ at TC. The Lynchburg club reports another very successful public-service effort in providing communications for the Special Olympics at Wintergreen ski resort during Jan. 11-12-13, 1988. Once again, the Rappahannock ARC leads all section affiliated clubs in the submission of the 1988 Annual Report. Has your affiliated club completed their report and sent it in? If Annual Report forms are needed, contact the SM. Upcoming VE exams: Apr 9 Williamsburg, VA, contact Andy Swanson, WJ4X; May 14, Portsmouth, VA, contact Art Thiemens, AA4AT. Jun. 4 Virginia Beach, VA, contact Tom Weikel, KA4UNC; May 21, Richmond, VA, contact Ron Bolton, WU4G. It was the SM's pleasure to present a program to the Gloucester Novice training class on the "Roots of Amateur Radio" and the part played by the founders of the ARRL to ensure the survival of Amateur Radio during the formative period of radio. I wish more opportunities were given during these Novice courses, as well as the more advanced courses, for these newcomers to Amateur Radio to learn of the heritage of our wonderful hobby. Traffic for the month experienced the normal January let-down with a traffic count of 4783, but reporting was excellent with 46 stations reporting. Plan now to attend the League Planning Meeting, May 14-15 in Charlotte, NC. Traffic: N4GHI 601, K4DOR 506, N4EXQ 452, K4MTX 347, WB4PNY 260, KA4TWI 234, W3ATQ 222, AA4AT 193, W4JLS 183, KB4NGO 166, KB4WT 132, WD4MIS 130, NG2H 124, WD4OCW 104, AA4GI 87, WB4ZNB 84, KK4FV 79, K4BGZ 78, N4KSO 71, WA4LTO 64, WB4KSG 63, N6ANQ 55, WD4FTK 50, K4JM 48, KI4BR 44, KB4TRI 42, WA4CCK 37, KB4OPR 31, NT4S 30, K4JST 29, K4MLC 27, KJ4VT 24, K4GR 16, NN4I 16, K4VWK 16, KB4PW 14, N4RSF 11, WB4KIT 10, KK8L 7, KB4UED 6, KA4TNF 6, WA4TVS 5, N4FNT 4, KI4W 4, W4YE 4.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. TC: K8LG. SGL: K8BS. ACC: WA8CTO. Rpt. Coord: WD8OZT. KC8CR is now Extra Class; nice going, Bob. K8LG is new TC for WV. Tnx to Mike for accepting this important post. KV8S is now ATC for WV. WB8ZFL is now becoming active after being licensed for ten years. KA8TIK is now KE8PO. Nice going, Ollie.

NET	FREQ	TIME	QNI	QTC	Sess	NM
WVFN	3865	6:00	1409	141	31	W8YP
WVMD	7235	11:45	941	40	31	W8FZP
WVN	3567	7:00	333	83	31	KZ8Q
WVRN	3640	6:30	394	31	31	K8LG
WVNN	3730	5:15	131	42	30	KE8PO
Hillbilly	14290	Noon su	200	30	5	W8YP

Traffic: KA8WNO 321, W8YP 213, KE8PO 184, K8QEW 143, KD8WX 120, K8TPF 99, W8FZP 85, K8UQY 70, WD8DHC 68, K8KT 46, N8FXH 39, KA8OGF 22, KA8ZXP 22, NC8G 4.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—ASM: KA0MQA. SEC: WB0TUB. STM: KB0Z. ACC: WB0DUV. OOC: KC0UD. SGL: WB0FQB. TC: W0LJF. PIO: N0DZA. BM: K0WOP. This month has been one of the coldest of the season with heavy snow and ice. My thanks to the many ARES members and CWXN for keeping us informed of the bad road conditions. I recently attended a meeting of the Longmont ARC. This is a very

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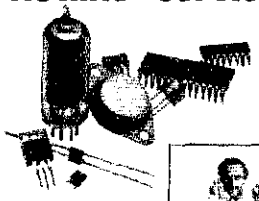

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(3)

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(7)

(3) Coax Cutter. Preserves impedance. 278-244 . . . . . **4.95**

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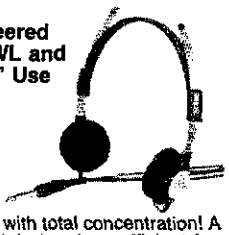

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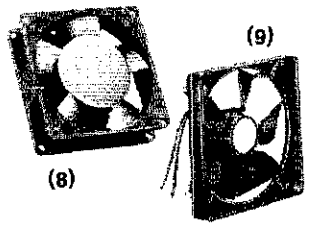

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(9) 4" 120 VAC Fan. 65 CFM. UL recognized. #273-241 . . . . . **16.95**

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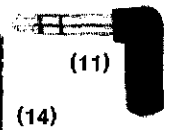
(10)

(11)



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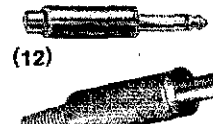

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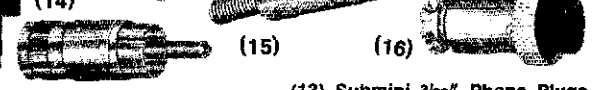

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(21)

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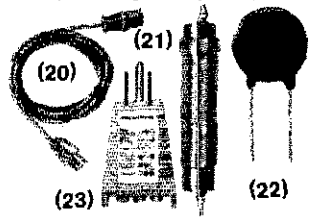

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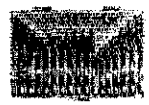

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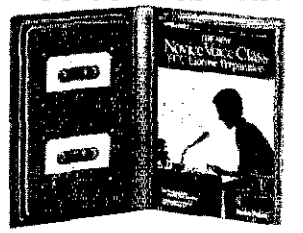

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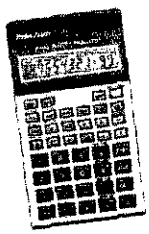

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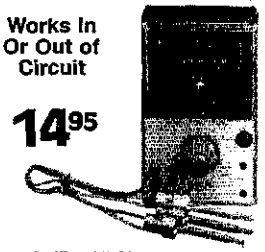

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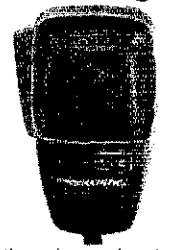

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progressive club with excellent membership attendance, and their newsletter edited by WBØOSA is very informative. When you are in the area, try 147.27/87, to chat with the members of the Longmont ARC. I am actively seeking some nominations on the ARRL awards of Teacher/Instructor and also for the Hiram Percy Maxim award. The deadline on nominations on the Hiram Percy Maxim award is June 1. See *QST* for more details, and send your nominations to me. The ARRL Colorado State Convention in conjuction with the ARA-SARES Swaplest is being held March 20th at the Houston Fine Arts Center, Montview & Quebec in Denver. Hope to CU there. 73, KQ0J. NETS: CWN: QNI 78, QTC 58, QNF 395, Sess 30. COL: QNI: 1301, QTC 43-40, QNF 1102, Sess 30. HNN: QNI 2253, QTC 154-806, QNF 1499, Sess 31. NCTN: QNI 123, QTC 118, QNF 276, Sess 27. SCTN: QNI 205, QTC 15, QNF 276, Sess. 27. *Traffic: NØHFZ 309, KEØNI 255, NØHMR 161, KØHOA 134,* KØINI 102, WBØFFV 106, KBØZ 76, WDØBSZ 70, KAØWIE 54, KBØBLV 30, KEØBI 21, WØNFW 12.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO, KA5NNG, W5QNR. TC: W8GY. ACC: KA5BEM. Southwest Net meets daily, 3583 at 0230 UTC, handled 147 msgs with 201 checkins. NM Roadrunner Net meets daily, 3939 at 0100 UTC, handled 65 msgs with 1410 checkins. NM Breakfast Club meets daily, 3939 at 6:30 AM, handled 165 msgs with 1168 checkins. Yucca 2-mtr Net, 78/18, handled 13 msgs with 497 checkins. Caravan Club 2-mtr Net, 66/06 with 161 checkins. SCAT Net, 66/06 handled 3 msgs with 679 checkins. Into Net 13/73, with 92 checkins. Looking forward to the Las Cruces Bean Feed April 23-24, and Flagstaff Hamfest July 30-31. Vy Vy sorry to report the passing of K5UCB, W5IGU, W5NBT & N5IFR. They will certainly be missed. W5HD & WB5ZGK are recovering after heart surgery. We wish them a speedy recovery. Congrats to KA5NNG as new Net Mgr. for SWN. AA2ØØB, NØØRR & NM2ØØs all report thousands of contacts in the Bicentennial Celebration. Traffic: ND5T 351, KB5UL 152, W5DAD 38.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. New VHF Society Officers: *Pres, NV7V; VP, NS7K; S/T, KE7BG. Congrats! A reminder* to all hams involved in clubs— support your officers by participating in the activities! It's the best way to keep your favorite club moving forward. Marv, W7MR, reports that W2ØØMR had 5937 QSOs including contacts in all states and many DX countries. Too late to work W2ØØMR now—Utah's *week was the last week in Dec. 73 de NA7G. Traffic: WA7KHE* 62, N7JLC 54, WA7MEL 48, NS7K 38, N7IUN 26, NA7G 25, N7ASY 24, W7OCX 6, N7BQE 5.

WYOMING: SM, Jim Raisler, N7GVV—ASM: Steve Cochrane, WA7H. SEC: Jim Anderson, W7TVK. Colorado/Wyoming slow speed CW net and the 12th Region nets need WY CW operators-contact *NN7H*, Duane Sillinger for info. *Would like* to hear from the clubs around the state, how about affiliating with the ARRL? There are several benefits and the price is right. Traffic: NN7H-183. KC7AR reports Cowboy net held 21 sessions-822 QNI-13 QTC. W7MZW reports Pony Express held 5 sessions-240 QTC-1 QNI W7TVK reports State ARES net held 5 sessions-153 QNI and the area 2 meter nets had 211 checkins. Please consider getting involved in your county ARES organization, it's a good way to develop those operating skills. 73 till next month.

SOUTHEASTERN DIVISION

ALABAMA: SM, James Spann, WO4W—ASM: W4XI. SEC: KB4GDN. STM: N4RT. ACC: AA4BL. PIO: KB4KCH. TC: N4QII. SGL: N4FRQ. It is an honor to be able to serve you as new SM. Thanks to WA4RNP for his good work in the past as SM. Note the call of our new section appointment holders—call on them if you need help. Also, please let them know if you are interested in a station appointment. Good to see many of you at the Greenville hamfest which was well *attended. Tornado season is here—time to attend a* SKYWARN class and check your preparedness level. Our new SEC, Boyd, KB4GDN, is working on a new section emergency plan which should be ready soon. If you are a current EC, please check with him. The Tuscaloosa ARC has installed a new controller on their 22/82 repeater. The state-wide packet network developed by ALANET is coming along nicely. Packet messages for me may be left at W4AP BBS in Montgomery.

NET	FREQ	SES	QNI	QTC	MGR
AEND	3725	31	150	43	N4DCS
ATNM	3965	36	3698	91	WO4E
AENB	3575	62	442	114	W4QAT

PSHR: WA4JDH, W4CKS, W4PIM. Traffic: WA4JDH 869, W4PIM 261, W4CKS 135, W4DGH 8, WB4TVY 8, WO4W 8.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & ACC: WA4ABY. SEC: NC4E. STM: WB4WQL. Asst STM (Packet) W4QO. BM: WB4ZOJ. OOC: W4TG. PIO: WB4DEB. SGL: WB4UVW. TC: WD4PAH. Once again the HAMS of GA came to the rescue during the Jan. ice storm. Our hats off to all who devoted many hours to help the citizens of the Peach State. So many things go unreported, but this time you all filled my mailbox with clippings, reports, etc. All I can say is TNX. Our sympathy to the families of W4AN & W4MES who became Silent Keys just recently. If u hear of a SK, you can send the report directly to ARRL in Newington. By all means send a clipping of the obituary along with the other info. Annual Kennehochee Hamfest in Marietta is on tap for April 2nd. Same place as last year. There are many HAMFESTS in the section each year. Please support them as almost all repeaters exist from the profiles derived from these events. Where would we be nowadays without our repeaters? Reports sent to me indicate that the participation in the section nets have increased. Our traffic handlers are eager to handle more. Won't *u take time to originate a piece to one of your friends some*where? PSHR honorees for Jan are: WD4COL, WB4DVZ, WB4WQL, N4MWR, KB4JPN, KF4FG, WA4LLE, K4BAI, W4RWB & W4HON. WB4ZOJ, our Bulletin Manager, informs me that the section is becoming a leader in PACKET in the Southeastern Div. Tnx to the efforts of many who are devoting *their time to this new mode of communications.* Also, Warren, our BM, is looking for more OFFICIAL BULLETIN STATIONS. If ur interested, contact him for details. New 1988 QCWA officers are WA4HAH Pres, KC4MJ VP, Sec/Treas: W4NZJ, Board mem: KØJRG & W4BIW. Well, spring is just around the corner, so this nasty bad winter is now history. CU at one of the section HAMFESTS. Traffic: NC4E 347, WB4DVZ 99, WB4WQL 94, WD4COL 72, WA4LLE 61, W4QO 54, N4MWR 51, KF4FG 45, KA4HHE 45, K4BAI 39, K4LDI 38, W4HON 17, K4NM 14. (Dec.) W4QO 74, K4LDI 42.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—OOC: John, AB6I. BM: Dave, N4GMU. ASM: Bill, KB4LB. TC: Ed, WØRAO. ACC: Giff, WD4RIO. STM: Rip, AA4HT. SGL: John, KC4N. PIO: Petey, WA4PUQ. SEC: Rudy WA4PUP. Congratulations to the five clubs in NFL who have been granted special authority to use the Bicentennial Call Signs during the week of March 5 to 11, 1988: CLARC Brooksville, WD2ØØIIO; LARA, Tavares K2ØØFC; PARC Palatka, W2ØØNRT; SHARC Pensacola, AA2ØØW; and ZAARC Zephyrhills, K2ØØVLD. It's also time to congratulate the new club officers who are elected for 1988. Not all clubs start their year on Jan. 1, but here are some that are known: LMARS, Altamonte Springs, Mort, WA2ARS, Pres; VP Bruce KL7IV: Treas, KJ4HS Virginia; Secy, Carol, N4OWW. SSRC, Ocala, has Ernie, K4OSM, Pres; VP, Art, WD4RJI; Sec Carolyn, KB4UCV; Treas, Walt, K4ELK. HCARA, Brooksville has Judy, KB4BFB, Pres; VP, Mac, *KB4ODM. Sec, Al, KA4WLO; Treas, Donna, KB4ODO.* NOFARS, Jacksonville has Billy, N4UF, as Pres; VP, Pete, W4PTT, Sec, Bob, WD4PFN; Treas, Bob, KB4NTI. WDWARC, Orlando has Les, N4CNF, Pres; VP Richard, KA4WDA. Sec/Treas, KJ4BG. We wish all these club officers a good 1988 in their efforts to keep their clubs growing and serving all their *communities. When I have more newsletters with new officers,* we'll see that they are also recognized. The Suncoast ARC will have a Charter presentation shortly. We congratulate them and SHARC of Pensacola for their first year of activity with fine growth and interest by their members. 73, N4ADI. Traffic: WX4H 634, WD4IIO 534, WA4QXT 510, A44HT 311, N4PL 265, KB9LT 188, KB4LB 174, AA4QC 148, K4CV 143, KC4VK 141, WC4D 137, N4GMU 119, WD4IUI 114, W4KIX 86, N4JAQ 74, N4ADI 73, W4MGO 69, KI4CQ 52, N4SS 51, KB4FIY 47, WA4PUP 47, WB4GHU 41, W7YWF 41, KA4KAH 41, WA4SXW 41, WA4EYU 39, WB1EKV 37, W4UEA 37, WB4ZTR 35, N4DY 34, N2AOX 29, N4COB 24, WD4EQB 22, WD4FJY 19, W4DTV 18, KI4NN 14, KB4WPI 14, KJ4HS 8, N4NKI 7, WBIM 6, KF4TM 6, KF4SP 4, K3NON 3.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OOC: W4TAH. ACC: K4EUK. WD4KBW reports 105 bulletins received and 220 sent by AA4BN 21, W4DL 60, WA4EIC 115, WT4F 31, WD4KBW 24, K4IEK 31, and WA4RLV 43. I am very sorry to inform you that Ed Hart, N4KB, is a Silent Key. The Gator Chapter Newsletter of Largo reported that Dave, K4KE, was recently written up in the "Rancher" magazine which is the publication of the Florida Sheriff's Youth Ranges. He organized the Boys Ranch Amateur Radio Club in 1968. Dave set up the original station equipment and designed the club room—he averages about six visits a year to the ranch which is 230 miles from his home. N4ORZ reports that she was unanimously elected Dade Emergency Net manager. N4RHJ and KB4YJF were appointed assistant managers. KB4YJF is a 15-year-old general class — the youngest assistant manager ever for DEN. At the monthly ARPSC meeting, W4IYT presented N4ORZ her *certificate as assistant EC also giving her the distinction of* being the first woman to hold this position in Dade County. The Tampa Bay Repeater Association helped bring Christmas to children confined to local hospitals over the Christmas holidays—through the magic of Amateur Radio, the kids were able to talk directly with Santa at his home at the North Pole. *Santa was Shelly, W9TDO. Al, K4CY, of Brooksfield,* is doing an excellent job of listing Florida traffic handlers who are on packet. He also is trying to provide answers to some of the problems which are plaguing NTS packet. Congrats to WA4EIC who now has his Extra Class license. Congrats also to KI4T who has been appointed to ANERCOM—it is an outgrowth of the Blue Ribbon Committee which KI4T served so ably on. I heard indirectly that W4TAH is recognized up at Headquarters as one of the best OOCs in the country. We already knew that, but it's nice that others recognize it also! W4JM reports that he was recently elected secretary of the Central Florida Chapter QCWA #107. The Fort Myers Hamfest had a record number in attendance this January. The Third Annual Traffic Handlers Luncheon was well attended and the forum which followed was absolutely excellent! All modes of traffic handling were discussed, *RTTY, Packet, Two-meter FM,* SSB and CW. The discussion led by K4ZK was relaxed and informal. We must have talked for at least two and a half hours and then reluctantly broke up. Many thanks to KA4FZI and WA4HDH for once again organizing the luncheon. The Fort Myers ARC newsletter, The Modulator, reports that WD9AEP *presented a plaque to K9ALX as winner of the Ham-of-the-*Year Award. He gave a history of the award, naming the previous recipients: W4MPV, KA8CXQ, K4OVC, KF4JA and WD9AEP. W4PRL was given a plaque as past president and certificates were given to those who worked with the Education program during the past year: W2ZUC, K4KKP, WD4CHP, NØABC, KA4FZI and KA4EET. KA4SIH, manager of QFNS, now has a new ICOM 735. K4ZK has stepped down as EC for Martin County and WB9SHT has assumed the position. K4ZK will continue as assistant EC. Congrats to WB9SHT! KA9YHS reports that the Southest Florida Traffic Net had over 1000 QNI during January. This is the fourth consecutive month it was over 1000 and January was the highest month in the net's history. The Miami Hamboree is underway as this is written, and as always it is well organized with great forums. Another instance of strange traffic routing: K4IA said that a message he picked up on EAN and brought to QFN originated in Tampa with Lakeland as the destination. There are certainly enough nets in Florida that could move this message from Tampa to Lakeland that it should NOT take a route like that!! Remember the ARRL Information Net on 3940 kHz every Saturday morning at 8 AM. 73 de WA4PFK. Traffic: W3CUL 3101, W3VR 1089, WA9VND 976, W4NFK 454, WA4PFK 399, K4SCL 385, WA4EIC 314, K4EUK 275, K4ZK 254, WA4RUE 228, K4IA 215, AA4BN 214, WV5Z 212, N4ET 195, KA4FZI 163, WB4WYG 137, WA4RLV 132, KA4YHS 123, WD4KBW 120, KB4MON 113, N4MML 97, W1NJM 96, WB4AID 91, *W4DL 91, KA4NXF 90, NK3D 85, AA4ZV 81,* KB4KXV 79, KA4GUS 76, KA4SIH 63, KF4RL 57, N4ORZ 56, KJ4WJ 54, WT4F 44, K4FOU 43, N1EGN 41, WD9AEP 36, KY4U 35, K5IHH 34, KI4ZW 33, WA4VWJ 32, W4UIO 31, KA4AJR 30, KY8Y 29, W3TLV 28, WD4CHD 28, KAØGYF 26, KF4JA 24, WD4NXK 23, AA4CH 23, WA4HDH 21, K4JI 19, N4QER 17, W3IJR 15, KB4FO 15, KA9ARL 14, KA9AKY 14, N2COI 13, W4VQE 12, KAØGYF 12, KJ8OM 9, KB4EWO 8, W4MFD 8, KB4UIA 8, KD4GR 7, W4MPV 6, K9EHP 6, KB4UHC 6, WA4PIL 6, KB4TIU 6, KB4INF 6, KB6ECH 5, AA4WJ 5, KA4GDU 5, N4QWN 5, N4PSV 5, N4RHJ 4, KA2KNZ 4, W4JM 4, N4NZI 2, K4OVC 2, W4NSY 1. (Dec.) N4KFU 184, W4NFI 34, K4JI 24, N4RLM 12.

WEST INDIES: SM, Jose A. Purcell, Jr., KP4IG—PIO: NP4XM. NMWINS: KP4DJ. NMWINE: VP2VI. PIA: KP4ABN. TC: KP4ARY. SEC: KP4JV. The WINC net was reopened every day at 2230 UTC on 145.350 MHz. Special thanks to KP4NO from the HRPR Club, for his support to this project. The Club has 51 members and will be affiliated to the ARRL soon. The 145.350 and 147.721 MHz repeaters will be linked together soon to provide 2 mtrs coverage for ARES, RACES and the NTS on the island. An ASM is needed for St. Thomas, as well as for St. Croix. Send a card to KP4IG, SM (address on page 8 of *QST*). NETS: WINS-31 session, QNI 103, QTC 1, QND 165. WINE — 27 sessions, QNI 51, QTC 1. KP4DJ: originated 1, rec 4, sent 4, delivered 1 for a total of 10.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NMs:

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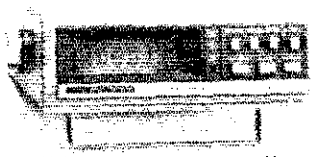

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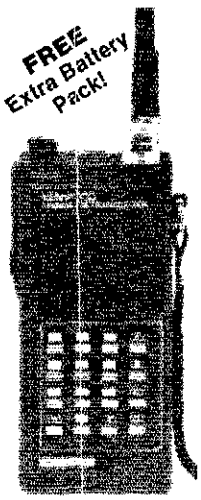

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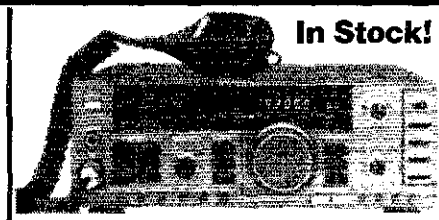

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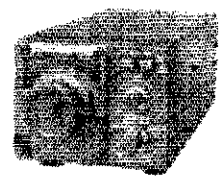

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K6LL, WB7CAG, K7POF. Congratulations to the following clubs who received Bicentennial call signs and operated during February: Arizona ARC, W2200IO; No. AZ DX Ass'n, W2200YS; Old Pueblo RC, W200GV; and Western ARC, N2200D. FB. Oliver, W7WGW reports recent election of officers for AARC. They are: Pres. W7WGW; N7JQY, VP; KA7UND, Sec'y; and K7WMG, Treas. The W7IO Info Net meets Thurs. evenings at 1900 local on the 147.28 repeater. ARCA hamfest at Ft. Tuthill (Flagstaff) this year will be July 29, 30, 31. Larry, KA7UIH (ARCA VP) is hamfest chairman. KA7MUL made both BPL and PSHR. Ray, K7QMR, RACES officer, and Walt, K7KYW, DEC took the Pima Co. Emergency Services van to Green Valley RC for demo. They discussed membership requirements for both RACES and ARES and distributed application forms. They pointed out that the Pima Co. van is available to Green Valley in an emergency. The West Valley ARC is ARRL-affiliated, and there are no longer any geographical requirements for membership. Contact Don, W1JH, to join or renew membership. Pres. is KE7DH. Your SM travelled to Cottonwood and Flagstaff to visit meetings of the Valley Verde ARC and Coconino ARC, both ARRL-affiliated clubs. Good groups. Don't forget So. Mtn. Swapmeet March 20. OPRC will host an ARCA-sponsored fall swapmeet in Tucson on Oct. 16. Watch later announcement for time and location. AZPRA reports holding on-the-air voice "how to" meetings for packeteers in the Phoenix area. they are on every Wednesday at 1900 MST on 146.06/.66 repeater, except the third Wednesday when the meeting is held at DeVry Institute at 1930. Good way to get started on packet. FCC's Long Beach office is now located at Cerritos Corporate Tower, 18,000 Studebaker Road, Room 660, Cerritos, CA 90701 (Phone: 213-426-4451). Bernie, W6YOY is coordinating all ARRL VE exams for the AZ section. Contact him for upcoming schedule of exams. (Tnx, OPRC Solid Copy). K7KYW and XYL, Doris, KC7AQ, are off on tour to VK-ZL land. They have applied for permission to operate 2-M HTs while there. Also, K7RDH and XYL are off to England for vacation and "return to their roots." They will operate from G-land on HF. Sun City West sends in an impressive list of operators living there, plus info on their repeaters and nets. For info contact George, W1RGH, at 602-584-5770. W7FF is in process of moving ham shack from unheated, uncooled outdoor storeroom to vacant bedroom inside house. After 25 years, I'm finally going to enjoy better environmental conditions for operating. 73, and CU on the same street corner next month. JIM.

NET	ABBREV	QNI	TFC	SESS
SOUTHWEST NET	SWN	201	147	31
ARIZONA CACTUS NET(HF)	ACN	721	47	31
ARIZONA CACTUS NET(VHF)	ACN	337	66	31
ARIZONA TFC & EMERG NET	ATEN	1210	39	31

Traffic: KA7MUL 410, *W7EP 149*, WE7G 115, W7AMM 90, WB7CAG 70, KE7EO 66, K6LLP 63, W7KCM 63, W7GAO 45, N7ETP 41, W7OIF 40, K7POF 38, W7LVB 31, K7JKM 25, W7KXE 18.

LOS ANGELES: SM, Phineas J. Icenbice, Jr. W6BF—Happy New Year from your Section Manager. You may have already said Happy New Year to the Pasadena Radio Club through W6KA at the Rose Parade. Pete Hoover, W6ZH, was the radio operator on the Red Cross float and Terry Fiach, WU6N, was the technical engineer who loaded the rig into a wet flower stem. Send Rose Parade QSL cards to Pete Hoover, 1520 Circle Drive, San Marino, CA 91108. The TRW Swap Meet now has a competitor, THE GENERAL DYNAMICS SWAP MEET in Pomona. The 2nd Sat. of each month, NORTH of Interstate #10 Fwy on Haven. Cliff Buttschardt, W6HDO, 950 Pacific St., Morro Bay, CA 93442, is a man after my own heart—he and WB6ERR are active on CQW, Coherent CW. See May QST, 1981, and ARRL 1985 Handbook, page 219, for more details. Many old Collins fans will think that it is KINEPLEX revisited for Amateur Radio. Anyway, it is another way to gain 20 dB or so without an increase in power or changing your antenna. Bill Warner, N6GIC, Dennis Smith, KA6GSE, Chief Cone of the LAFD and Hank Magid, K6YMJ, were all active participants along with Ron Boan, AK6Y, our SEC and about 40 more EC Hams. This emergency communications planning meeting was held at the Van Nuys Police Building Sat. Jan 21st. For more information about the meeting, please contact Ron, Hank or Dennis. Congratulations to Edgar Brown, N6OU, our ARRL Section Technical Coordinator (TC), who was just elected President of the So. Cal. DX Club. Edgar's phone is (818) 367-6588. Edgar needs more ARRL help. Please call him if you are qualified as an Assistant TC. We need engineers and technicians who are experts on RFI. Good news for the Southern California DX Club—they may have a clear channel for the DX Repeater as a result of a recent meeting of the coordinating committee. This has been a real problem since every new location requires coordination. As a new member of the OPTIMIST CLUB—the following quote may be appropriate—"to forget the mistakes of the past and press on to the greater achievements of the future." A well known DXer recently worked RG8AU but another friend worked T21RC, on sideband his phonetics were T21 Radio Check and his QSL route was good to a location in Asia—time DXers have all the luck. 147.42—John in Cuba and is on the Friendly ET DX net every week if you need a good new prefix. Also Alan, TU4BRV5U7, has been on the Friendly ET DX net several times recently, and for the CW fans, he has moved to CW band and worked quite a few on CW.

SAN DIEGO: SM, Arthur R. Smith, W6INI—TC: N6JZE STM: N6GW. SEC: W6INI. Help wanted! The ARRL Field Organization is the backbone of ARRL and is composed of volunteers appointed by the Section Manager. If you are interested in any of the following, contact W6INI (see page 8): Public Info Officer, Affiliated Club Coordinator, Bulletin Mgr, Official Observer Coordinator, Official Relay Stn, Official Bulletin Stn, Official Observer. ARC of El Cajon voted Ham of the Year Award to EC N6NKJ, Escondido ARS officers for '88: Pres N6CLO, VP WB6UHF, Sec N5WB, Treas WJ6U. Upgrades: to Extra AA6GC; to Advance KI6ZW (N6JPS); to Tech KB6OLL. Palomar ARC has developed a system for estimating location of earthquakes which might be felt in S D County. Contact W9FQN (146.73) for info. PARC is upgrading its repeater with a new control decoder. Calif Dept of Forestry recognized Amateur Radio participation in fire prevention activities at an awards dinner. ARES was added to the perpetual trophy and many operators received individual awards. NCTN 30 sessions with 501 ck-ins, 89 msgs handled. ARES-CW 4 sessions, 9 ck-ins. Traffic: KI6ZM 85, KI6ZH 62, N4KRA 28.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—ASM/Ventura: N6MA. ASM/SBar: WB6BYU. ACC: KB6AH. BM: KI6XG. STM: N6WP. PIO: N6FOU. TC: W6KFV. OOC: W6AKF. SEC: WB6IIY. DEC/Ventura: WB6RVA. DEC/SBar: N6AJA. DEC/SLO: WB6IIY. I'm very pleased to announce the latest addition to our Section Cabinet. Mike Baugh, W8AKF, has joined us in the capacity of Official Observer Coordinator and will be building an OO organization for the Section. Mike will be working hard to enhance our Amateur Auxiliary/VolMon program, to help clubs and others form Local Interference Committees with a view towards bringing some of the illegal activities in the Section under control. Our biggest problems at the moment seem to involve non-amateur incursions into our bands (both HF and VHF). Mike will be looking for qualified amateurs to join the OO program, please contact him (805-498-4691) or me if you can help. I had the honor of installing the new officers of the Sulphur Mtn Repeater Assoc. at their January 28th banquet. Retiring from the board are AC6I, WB6CNO and WD6O. These fine hams have guided SMRA well for many years. Congratulations to them and the rest of the Board on a job well done. The new Board consists of Chairman/Pres-W6POE, VP-N3CFX, Sec-K6VK, Treas-N6MA, KI6BR, WB6VKR, K6ELQ, WA6FPX, WB6TNL and WB6BPL. The Poinsettia ARC and the Satellite ARC also held their installation banquets in January, and our SW Div Director, Fried Heyn, WA6WZO, did the honors at those events. The new SARC officers were introduced to you in February QST. At the SARC banquet I also had the privilege of presenting three Certificates of Merit: N6LFJ, Marilyn Hains, has done outstanding work as EC of Santa Barbara County, Western District ARES. Steve Nolan, WA6ARG, and Mel Gin, WA6NVO have dedicated hundreds of hours to building and perfecting the WA6ARG Santa Maria repeater, essentially for ARES use. Their spirit of dedication and leadership is kindling a new spark in northern Santa Barbara County, and their tireless efforts are much appreciated. Poinsettia's new leaders are. Pres-KI6YK, VP-KB6TNE, Sec-N6OPB. Treas-KA6YFD, Past Pres-N6SR, N6QOA and KB6DDP. Congratulations to all, and best in all your endeavours. 73 for now. Traffic: N6NLW 211, W6NOR 141, KB6HGB 52, KB6IEC 35, K6OCI 15.

WEST GULF DIVISION

NORTH TEXAS: *SM, Phil Clements, K5PC—Asst. SM: K5MXQ.* SEC: W5GPO. STM: W5VMP. PIO: K5HGL. ACC: W5UTI. TC: W5LNL. OOC: WB5JBP. SGL: N1CWP. BM: W5QXK. The annual 7290 Tic Net picnic will be held April 29, 30 and May 1 at the Rusk State Park near Rusk, Tx. A program will be given at 9:00 AM Saturday, April 30, with talks by ARRL officials and officials of other nets. A BBQ dinner is planned for 6:00 PM Saturday also. This is a great time to see beautiful East Texas, and eyeball old friends and meet new ones. I hope to see you there if my work sked permits! For further details and info, contact Jo Ann Keith, Ka7AZK, 7290 Tic Net Mgr. Two repeaters are now going great guns out Graham way: 147.18 and 147.34. Also W5OJP and KA5TOR graduated five new Novices in January. The Garland ARC Comm. Center is sporting a new air conditioner and carpet to provide comfort for students. Congrats to Bob Nelson, WB5FYD, who provides us with the ATV repeater showing doppler radar during our SKYWARN operations. A truly remarkable and vital tool for all RACES and ARES units in a 40-mile radius of Dallas. the pix is just great out here in Denton Co., Bob! The K5ZCO repeater on 224.32 MHz specializes in linking int 2 mtr Nets to allow Novice participation. You can check into the Metroplex Tic. Net each night at 6:30 PM (146.88); the Metro Info Net each Thursday at 8:00 PM (146.82) and listen to Dallas RACES operations via a link to 146.88. Novices are not as yet eligible for RACES membership, so do not transmit unless you have an emergency. Perhaps Novice privileges will be restored for RACES soon, as this is a good source of man-power in emergencies. Also the 220 Info Net is held on the K5ZCO repeater each Thursday at 7:30 PM, followed by the link-up to 146.82 at 8:00 PM for the Net there. The repeater is also interested in sponsoring a youth net, especially for teens and younger hams. Volunteer your services and let your interests be known on the Thursday night net. Our Affiliated Club Coord. Dan, W5URI, will be off to Belize in April to deliver ham rigs to the Boy Scouts, and to help them get started in Amateur Radio. Then, in July, Dan will be in Scotland for a Boy Scout International Jamboree. Bon voyage, Dan! The Central Gulf Coast Hurricane Net activity for Jan. QNI-4, 480 QTC-192 in 31 ssns. Net Mgr. is Gary, KG5CW. PSHR for January: WZ5N KF5BL KB5CKO W5VMP K5UPN W5YQZ KB5DOE and K5MXQ. Attention ARES/RACES members; your last chance for a SKYWARN school in the Metroplex area until HAMCOM '88is in Plano on March 3rd at Bowman Elementary School at 7:30 PM. Talk in on 147.18. Traffic: W5TNT 313, WZ5N 231, W5YQZ 210, K5MXQ 168, K5UPN 164, W5VMP 150, KD5RC 90, KF5BL 78, KA5AZK 54, KB5DOE 40, KB5CKQ 36, WX5O 27, KC5NG 23, KA5ZWY 8.

OKLAHOMA: SM, Bill Goswick, K5WG—The Green Country ARC will hold its first annual Swapfest at the Skiatook Community Center, Skiatook, Oklahoma, on 16 April 1988. For details, contact Jack Burgess, N5IDV, at 918/288-6665. The Green Country Hamfest (no connection with the above group), hosted by the Broken Arrow and Tulsa ARCs, will be held on 14-15 May 1988. More details on that event next month. Congrats to Allen Zahra, So. Canadian ARS member who went from unlicensed to General class in 8 weeks! Other SCARS members newly licensed or upgraded: Novice-Don Larson, Technician-Jason McGee; Darlena Long; Mamoru Nishi; Larry Tipton; David DeSelms; Rick Page; Sharlene Rasor; Keith Miller; Jana Rodgers; Ruth Touhey; Frank Phillips; Miki Ichibagase; Masayosh Nakano; Earl Mixon; Douglas Forsyth; Jerry Hunt; Cecil Hurley; Jerri Smith; Wray Smith; and William Herrod. Cimmaron ARS upgrades: Technician- Norman Dow, KB5DIA. General- Bob Haigler, N5KNK; Brad Bailey, N5JEL. January Traffic: WB5SRX 510, W5AS 358, N5IKN 107, KF5SRD 108, W5ERS 101, WA5OUV 83, K5JBN 63, N5FEM 45, KV5R 33, W5VLW 30, WA5ZOO 28, W5VOR 25, K5CAY 18, K5WG 11. December traffic: KF5RD 230. Public Service Honor Roll: WB5SRX, W5AS. Brass Pounders League: WB5SRX, W5AS.

SOUTH TEXAS: SM, Arthur R. Ross, W5KR—ASM: N5TC. STM: K5QEW. SEC: K5DG. PIO: WA5UZB. ACC: WB5YDD. OOC: WA2VJL. BM: K5CVD. TC: NZ5U. SGL: K5KJN. PIA: NZ5U. Seguin enjoying packet with new PK232; reports K5TJA helped KB5AGM erect HF and VHF antennas; Central TX Traffic Net has moved to 147.1/.7 machine courtesy EC W5SK; NM WB5YDD reports 597 messages passed in 62 January sessions; STX represented 100% by W5GTZ NZ5U KD5KQ K5QEW K5WOB W5SHN K5GDX WB5HZQ KE5ZV WA5ZJY WB5YDD. PIA N5IKW, Sam Houston ARK reports KB5CJE is new club secretary; Novice class started in January; video "The World of Amateur Radio" went over great. "AARC/OVER," Austin ARC, reports election of officers, WB5IMB President; WD5N, vice-president; N5HPC, secretary WA5MUM, treasurer; KA5ZVP, activities mgr. San Benito ARC reports KA5UVY elected president of high school computer club; WA2VJL visited Austin for Emergency Management conference. CAND ANM WB5YDD reports 447 messages passed in 31 January sessions; RN5 represented 100%; STX stations helping were KE5ZV, KD5KQ, W5LKU, NX5V, W5KLV, WA5ZJY, WB5YDD. Deep East Texas ARC, Lufkin, newsletter reports AA5BL working repeaters from home brew antenna; W5MAW new on packet; KB5CPK, KB5TLV, KB5EXN upgraded to Technician; WA6JGM passed 20 wpm. KA5TPN reports Golden Crescent ARC elected him as president, WB6OJW as vice president and KB6DWG as secretary/treasurer. Upgrades were WA5EUJ and WB6OJW to Advanced, N5EOP and N5BEA to Extra and KB5EGH to General. Brenham ARC PIA KA5EEQ reports club elected KF5SP, president; W5TZ, vice president; KB5BBG, secretary; KA5EEQ, treasurer; WB5RFQ, repeater trustee. EC N5KAQ reports WD5H and N5HQF showed "The New World of Amateur Radio" to Kiwanis Club. 7290 NM KA5AZK reports 404 messages passed in 47 January sessions. DEC K5UDU reports 2 new ECs in his area; lists major activity as "recruiting." Bryan ARC newsletter reports one new Novice and 5 upgrades in January exam session. Northwest ARS PIA N5FIX, Houston, reports from annual awards banquet: Past President Plaque, KF5OO; Elmer of the Year, KD5KR; Operator of the Year, W5BKK; Special Recognition, KE5IC; Boner Trophy, KA5VIZ; Houston Marathon used 2 nets: one administrative, one timing. ACC WB5YDD reports the following helped with Houston Marathon: W5EZM WA5YSC ND5F WB6YJN WB5UOJ W5DWI W5NRJ NV5L NC5A WD5HML KA5SYW WD5HLF KF5OO WB5SRN WB5IGG WB5UCL K5MIZ NM5I W5RIY W5IRQ WA5F N5KEU KA8VFM WA5IQV N5DTT KB5AEJ WD5JLT N5HF WA5RSU N5DM W5WVR K5BDZ WD5FLZ WA5RVT K5CNU N5ENC KD5AS KB5EEK N5JZY K5STR WB5SHU. PIO WA5UZB reports PIAs are getting excellent press from local newspapers; he and BM K5CVD have been asked to visit several clubs; messages for PIO or BM may be addressed to WB5BBW PBBS. Traffic: WB5YDD 353, WB5J 297, WD4GKH 244, WR5O 169, W5CTZ 107, AG5Z 106, NV5L 71, NZ5J 27, WA5UZB 41, W5BGE 19, KB5EKB 14, KA5CQN 8. (Dec.) WA5UZB 208.

WEST TEXAS: SM, A. Milly Wise, W5OVH— On Jan. 29, I attended the Annual Banquet of the Big Bend ARC, renewed friendships of many years, and gave congrats to new officers; Pres N5DO, Dave Cockrum; VP N5HYD, Doug Otoupal; Sec WB5ZAB, Karl Smith; Treas, WA5ROE, Bob Ward. The Big Bend ARC has renovated the interior of their Comm. Van and have the 2 meter mobile repeater and duplexer built in. On Feb. 7, I attended the Lamb Co. Hamfest at Littlefield and have moved a little closer to getting another WTX club affiliated. Newly appointed ASM Raford Dunagan, WD5EFJ, has visited or talked to all ECs in West Texas Section Dist. 3. New Pres of Big Spring ARC is WB5OVA, Weldon Nuckolls. The 7290 Traffic Net Picnic will be held at Rusk State Park April 29, 30 and May 1. The Prairie Dog ARC of Childress have elected NF5P, Betty Moody, as Pres. V.P. N5HUY, Bill Hindman, Sec. N5IVK. Joe Trammel, Treas. KE5WU Arvene Bellah. The Abilene ARC has a step Van for the Club's Mobile station. ASM Les Bannon, WF5E, called the WTX Section Managers net on Feb 4. The SM Net will be every month on the first Thurs. at 0100 on 3931. All section appointees please check in. Lubbock ARC news has a new format. Pres. is Don Mosher, WB5BRY. Snyder ARC has acquired a 50-foot tower. 73, SM, Milly Wise, W5OVH. Nets (Sessions/QNI/QTC): 7290 Traffic Net 47/404. Texas Slow Net: 29/114/38. Texas CW Net: 62/715/331. Texas Traffic Net: 31/307/134. Day Region West Texas reports 48% by AE5I, W5ERT 597 QTC. Traffic: AE5I 101, N5DUC 16, W5ERT 5.

WATCH FOR OUR BIPLANE OUT AT THE
"DAYTON HAMVENTION"

MARK YOUR CALENDARS RIGHT NOW FOR OUR 9th ANNUAL

FAROUT A.R.C. BLITZ

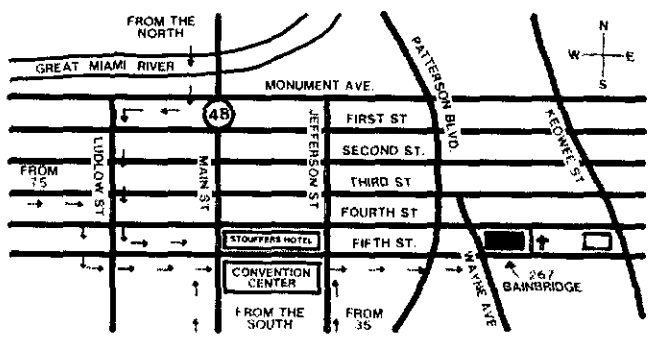
THE PARTY THAT'S GOT THE OTHERS BEAT

* COMPLIMENTARY REFRESHMENTS

* SNACKS
* MUSIC
* GOOD TIMES
* GREAT!! PEOPLE
* PLUS MANY OTHER EXCITING ACTIVITIES

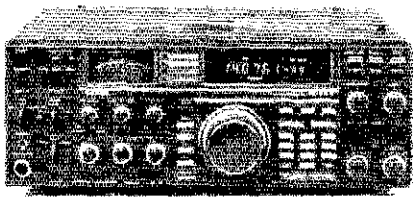
FRIDAY APRIL 29th 8:00 P.M. TILL 12 MIDNIGHT
"KNIGHTS OF COLUMBUS PARTY DOWN ROOM" 267 BAINBRIDGE STREET
DAYTON, OHIO
JUST THREE BLOCKS EAST OF "STOUFFERS HOTEL"

GO EAST ON FIFTH STREET UNTIL YOU GET TO "BAINBRIDGE", TURN LEFT ON BAINBRIDGE FROM FIFTH. THE "KNIGHTS OF COLUMBUS" HALL WILL BE ABOUT A HALF BLOCK NORTH ON YOUR LEFT.
PLENTY OF FREE PARKING JUST SOUTH OF THE BUILDING. HOLY TRINITY CHURCH IS THE LANDMARK YOU SHOULD LOOK FOR. IT'S LOCATED ON THE N.E. CORNER OF FIFTH AND BAINBRIDGE.

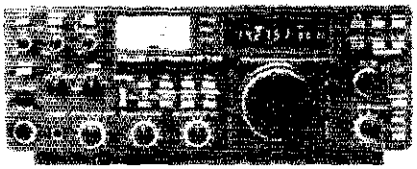


"LISTEN FOR OUR ADS ON KUSW (SHORT WAVE)

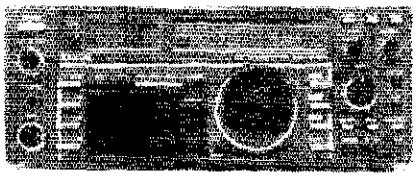
WHILE IN DAYTON FOR OUR BLITZ!
YOU MAY WANT TO TAKE IN THE "DAYTON HAMVENTION"
TAKING PLACE AT HARA ARENA



HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2699.00	2369
HM-36 Scanning hand microphone	47.00	
SP-20 Ext. speaker w/audio filter	149.00	139.95
FL-101 250 Hz 1st IF CW filter	73.50	
FL-53A 250 Hz 2nd IF CW filter	115.00	109.95
FL-102 6 kHz AM filter	59.00	
EX-310 Voice synthesizer	59.00	



IC-751A 9-band xcvr/ 1.30 MHz rcvr	1699.00	1449
PS-35 Internal power supply	219.00	199.95
FL-32A 500 Hz CW filter (1st IF)	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)	115.00	109.95
FL-33 AM filter	49.00	
FL-70 2.8 kHz wide SSB filter	59.00	
RC-10 External frequency controller	49.00	



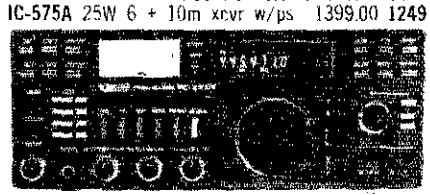
IC-735 HF transceiver/SW rcvr/mic	1099.00	959.95
PS-55 External power supply	219.00	199.95
AT-150 Automatic antenna tuner	445.00	389.95
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	349.00	319.95
MB Mobile mount, 735/751A/761A	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal for 751A	79.00	
PP-1 Speaker/patch	179.00	164.95
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	139.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip	659.00	589.95
AH-2A Antenna tuner system, only	519.00	449.95
GC-5 World clock	91.95	89.95

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1299.00	1149
IC-275H 100W 2m FM/SSB/CW	1399.00	1229
IC-375A 25W 220 FM/SSB/CW	1399.00	1229
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1249

ICOM

IC-475H 75W 440 FM/SSB/CW	1599.00	1429
IC-575A 25W 6 + 10m xcvr w/ps	1399.00	1249



IC-471A* 25W 430-450 CLOSEOUT	979.00	749.95
PS-25 Internal power supply	125.00	114.95
AG-1* Mast mounted preamplifier	99.50	
IC-471H* 75W 430-450 CLOSEOUT	1399.00	989.95
PS-35 Internal power supply	219.00	199.95
AG-35* Mast mounted preamplifier	99.75	

*Preamp $9.95 with 471A or 471H Purchase

Accessories common to 271A/H and 471A/H	
SM-6 Desk microphone	47.95
EX-310 Voice synthesizer	59.00
TS-32 CommSpec encode/decoder	59.95
UT-15 Encoder/decoder interface	34.00
UT-15S UT-15S w/TS-32 installed	96.00

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM CLOSEOUT	639.00	549.95
IC-490A 10W 430-440 CLOSEOUT	699.00	399.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	379.95
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399.95
IC-37A Compact 25W 220 FM, TTP mic	499.00	439.95
IC-47A Compact 25W 440 FM, TTP mic	549.00	489.95
PS-45 Compact 8A power supply	145.00	134.95
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, TTP mic	469.00	409.95
IC-28H 45W 2m FM, TTP mic	499.00	439.95
IC-38A 25W 220 FM, TTP mic	489.00	429.95
IC-48A 25W 440-450 FM, TTP mic	509.00	449.95
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-900A Transceiver controller	639.00	569.95
UX-19A 10m 10W band unit	299.00	269.95
UX-29A 2m 25W band unit	299.00	269.95
UX-29H 2m 45W band unit	349.00	319.95
UX-39A 220MHz 25W band unit	349.00	319.95
UX-49A 440MHz 25W band unit	349.00	319.95
UX-59A 6m 10W unit	349.00	319.95
UX-129A 1.2GHz 10W band unit	549.00	499.95
IC-3200A 25W 2m/440 FM w/TTP	695.00	579.95
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	39.00	
AHB-32 Trunk-lip mount	35.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	
IC-1200A 10W 1.2GHz FM Mobile	699.00	629.95
IC-1271A 10W 1.2GHz SSB/CW Base	1269.00	1129
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	125.00	114.95
EX-310 Voice synthesizer	59.00	
TV-1200 ATV interface unit	139.00	129.95
UT-15S CTCSS encoder/decoder	96.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1529.00	1349
RP-2210 220MHz 25W repeater	1499.00	1329
RP-3010 440MHz 10W FM repeater	1299.00	1149

MasterCard VISA

Hand-helds	Regular	SALE
IC-2A 2 meters	289.00	259.95
IC-2AT with TTP	319.00	279.95
IC-3AT 220 MHz, TTP	349.00	299.95
IC-4AT 440 MHz, TTP	349.00	299.95
IC-02AT/High Power	409.00	349.95
IC-03AT for 220 MHz	449.00	389.95
IC-04AT for 440 MHz	449.00	389.95
IC-u2AT with TTP	329.00	289.95
IC-u4AT 440 MHz, TTP	369.00	329.95

Accessories for micros - CALL $

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	479.00	419.95
A-2 5W PEP synth. aircraft HT	525.00	479.95
A-20 Synth. aircraft HT w/VOR	625.00	569.95

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	79.00
BP-8 800mah/8.4V Nicad Pak - use BC-35	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8	21.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP 7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CA-5 5/8-wave telescoping 2m antenna	19.95
FA-2 Extra 2m flexible antenna	12.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.65
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	24.50
MB-16D Mobile mtg. bkt for all HTs	25.99
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	35.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	24.50
HS-10SA Vox unit for HS-10 & Deluxe only	24.50
HS-10SB PTT unit for HS-10	24.50
ML-1 2m 2.3w in/10w out amplifier	SALE 99.95
SS-32M Commspec 32-tone encoder	79.95

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	$999.00	869.95
RC-11 Infrared remote controller	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker	65.00	
CK-70 (EX-299) 12V DC option	12.99	
MB-12 Mobile mount	25.99	
R-7000 25MHz to 2GHz scan rcvr	1199.00	1049
RC-12 Infrared remote controller	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit	139.00	129.95
AH-7000 Radiating antenna	99.00	

(9)

HOURS • Mon. thru Fri. 9-5:30; Sat. 9-3

Milwaukee **WATS** line: 1-800-558-0411 answered evenings until 8:00 pm Monday thru Thursday.
WATS lines are for Quotes & Ordering only, use Regular line for other Info & Service dept.

All Prices in this list are subject to change without notice.

Order Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

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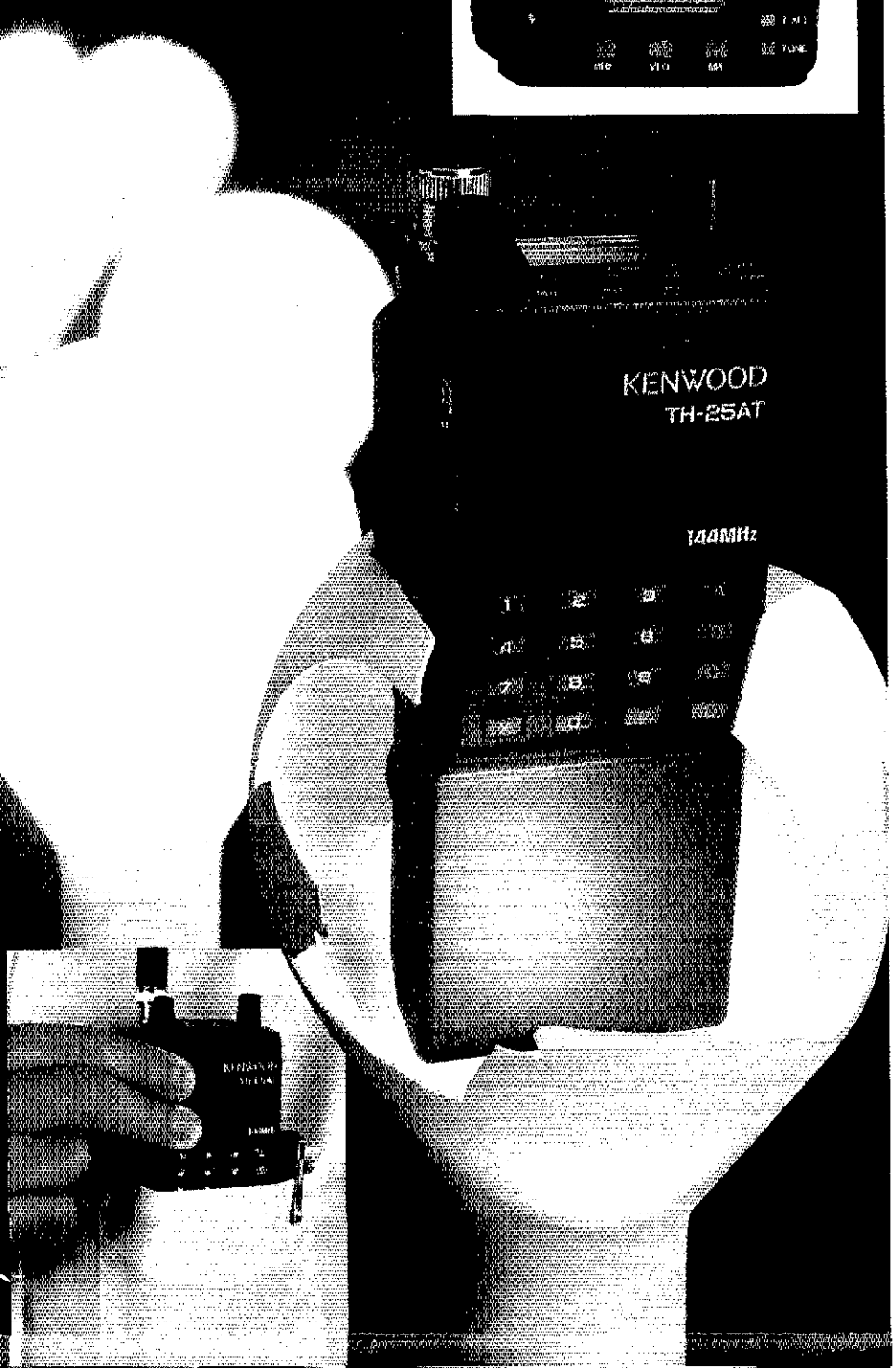
Compact Breakthrough!

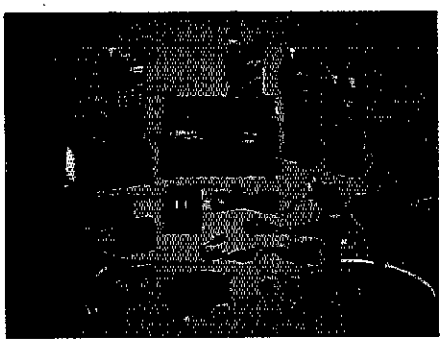


TH-25AT/45AT

New Pocket Portable Transceivers

The all-new TH-25 Series of pocket transceivers is here! Wide-band frequency coverage, LCD display, 5 watt option, plus...

- Frequency coverage: **TH-25AT:** 141-163 MHz (Rx); 144-148 MHz (Tx). (Modifiable for MARS/CAP. Permits required.)
  TH-45AT: 438-450 MHz.
- Automatic Power Control (APC) circuit for reliable RF output and final protection.
- 14 memories; two for **any** "odd split" (5 kHz steps).
- Automatic offset selection (TH-25AT).
- 5 Watts from 12 VDC or PB-8 battery pack.
- Large multi-function LCD display.
- Rotary dial selects memory, frequency, CTCSS and scan direction.
- T-ALERT for quiet monitoring. Tone Alert beeps when squelch is opened.
- Band scan and memory scan.
- Automatic "power off" circuit.
- Water resistant.
- CTCSS encoder/decoder optional (TSU-6).
- **Supplied accessories:** StubbyDuk, PB-6 battery pack for 2.5 watts output, wall charger, belt hook, wrist strap, water resistant dust caps.



Optional accessories:
• **PB-5** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6** 7.2 V, 600 mAh NiCd pack • **PB-7** 7.2 V, 1100 mAh NiCd pack • **PB-8** 12 V, 600 mAh NiCd for 5 W output • **PB-9** 7.2 V, 600 mAh NiCd with built-in charger • **BC-10** Compact charger • **BC-11** Rapid charger • **BT-6** AAA battery case • **DC-1/PG-2V** DC adapter • **HMC-2** Headset with VOX and PTT • **SC-14, 15, 16** Soft cases • **SMC-30/31** Speaker mics. • **TSU-6** CTCSS decode unit • **WR-1** Water resistant bag

KENWOOD

KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
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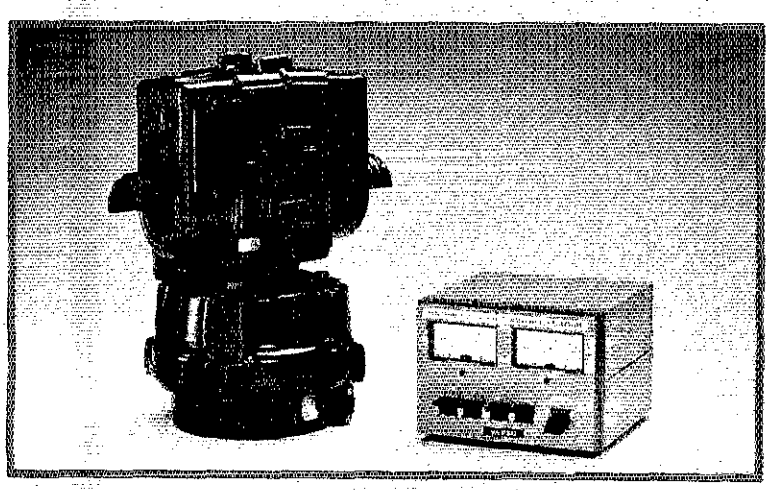
YAESU ROTATORS

QUALITY AND PERFORMANCE in amateur antenna rotators has a new brand name. Encomm, Inc. proudly announces the acquisition of the KENPRO Rotor products and facilities by YAESU of Japan. All models are updated and respecified to meet your needs today.

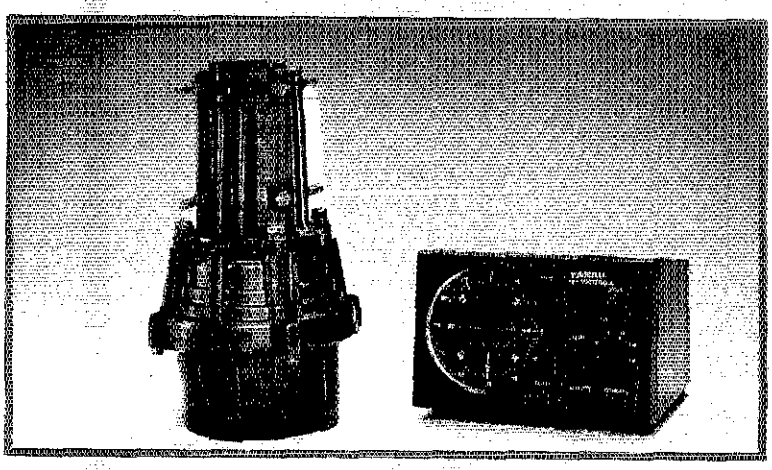
G-5400B Azimuth and Elevation Rotator Combination

For tracking satellites such as FUJI, Oscar-10, NOAA-9 and many others. Improvements in production and components have resulted in a stronger motor system for even better performance. For even more torque, the G-5600B is also available and both are still compatible with the current Kenpro computer interfaces.



G-1000SDX POWER and PRESETS plus 450 ~ Turns

• Preset Directional Control • Big 1100 KGF.CM torque • 450 degrees of rotation • N,E,S, or W centering on dial • WX resistant outside connector • Limit Switches at 450 ~ • Fits std mounting plate and inside popular towers.



YAESU ROTATORS Distributed in the U.S.A. by

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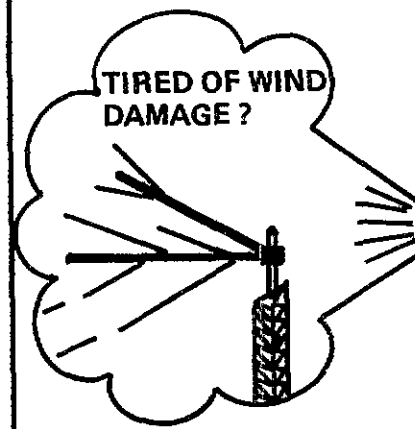
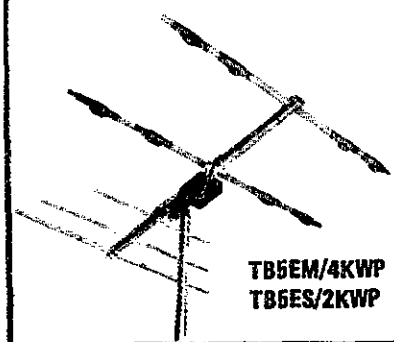
"INVEST" in a Telrex antenna!

Why gamble with shoddy antenna construction when Telrex makes available a professionally designed quality product.



Antennas that last **"Decades"** (not months)



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TB5ES/2KWP

Some of the WORLD'S finest.

TB4EC 10, 15, 20 Mtr.	$335.00
TB5ES 10, 15, 20 Mtr.	$500.00
TB5EM 10, 15, 20 Mtr.	$580.00
TB8EM 10, 15, 20 Mtr.	$695.00
20M326 3 elem. 20 Mtr.	$430.00
20M536 5 elem. 20 Mtr.	$745.00
20M646 6 elem. 20 Mtr.	$1125.00
15M532 5 elem. 15 Mtr.	$565.00
15M845 8 elem. 15 Mtr.	$1065.00
10M523 5 elem. 10 Mtr.	$385.00
10M636 6 elem. 10 Mtr.	$785.00
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Prices subject to change.

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For data on the complete line of Telrex antennas phone (anytime) and leave your call sign, or write.

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Write: **Telrex** P.O. Box 879
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KENWOOD

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NEW!

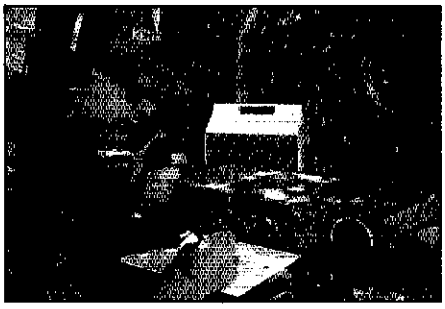
Affordable DX-ing!

TS-140S

HF transceiver with general coverage receiver.

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

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



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

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

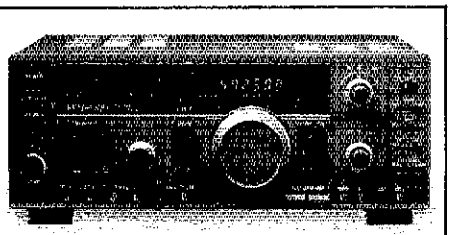
Optional Accessories:

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

TS-680S

All-mode multi-bander

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



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

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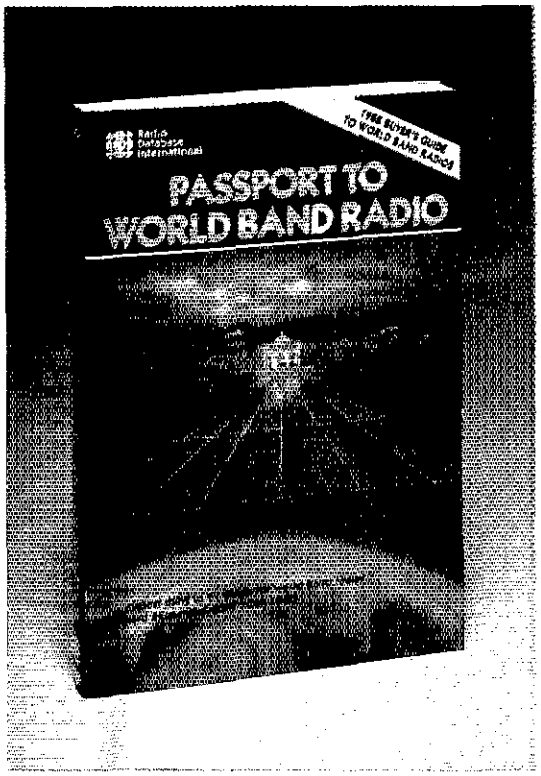

DISCOVER!

Here's your chance to discover (or rediscover) what is going on between our ham bands in the way of international broadcasting. Many modern Amateur Radio transceivers can receive these frequencies. Now it is easier than ever to hear world events as they happen — *providing* you know where and when to look for a particular station. **Passport to Worldband Radio** lists shortwave broadcast stations by country and frequency. It also gives the language, power and antenna directivity at specific times. For example, when might you expect to hear an English language broadcast from Malta? The country listing shows such a transmission on 9515 kHz. For more detail you turn to the frequency listings and see that the broadcast takes place at 2030z with a power of 250 kW beaming Europe. The frequency listing makes identifying particular stations a snap! International radio is a great way of increasing your knowledge of the world. Something is happening *right now!* You can be a part of it by listening in on the medium and shortwave broadcast bands. 352 pages, 1988 edition $15.00 plus $2.50 ($3.50 UPS) for postage and handling.

1988 EDITION
NOW AVAILABLE
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ARRL 225 MAIN ST., NEWINGTON, CT 06111

Setting a new standard of efficiency in moderately priced kilowatt amplifiers

AMERITRON®

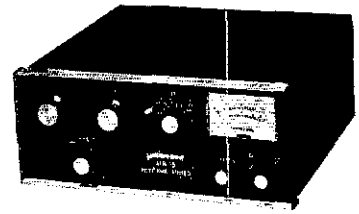
AL-80A LINEAR AMPLIFIER

The Ameritron AL-80A combines the time proven economical 3-500Z with a heavy duty tank circuit to achieve nearly 70% efficiency from 160 to 15 meters. It has wide frequency coverage for MARS and other authorized services. Typical drive is 85 watts to give over 1000 watts PEP SSB and 850 watts CW RF output. A Pi-L output circuit for 80 and 160 gives full band coverage and exceptionally smooth tuning.

The AL-80A will provide a signal output that's within ½ "S" unit of the signal output of the most expensive amplifier on the market—and at much lower cost. Size: 15½" D. x 14" W. x 8" H. Weight: 52 lbs.

PLUS OTHER QUALITY AMERITRON PRODUCTS:
AL-1200 and AL-1500 Amplifiers—
1500W CW output
AL-84 Amplifier—400W CW output
RCS-4 HF Remote Wireless Switch
RCS-8V DC-UHF Remote Switch
PIN-5 QSK Switch

ATR-15 TUNER



The Ameritron ATR-15 is a 1500 watt "T" network tuner that covers 1.8 through 30 MHz in 10 dedicated bands. Handles full legal power on all amateur bands above 1.8 MHz.

Five outputs are selected from a heavy duty antenna switch. The ATR-15 has a peak reading watt meter, SWR bridge and a dual ratio balun. Size: 6" H. x 13¼" W. x 16" D.

Available at your dealer—Send for a catalog of the complete AMERITRON line.

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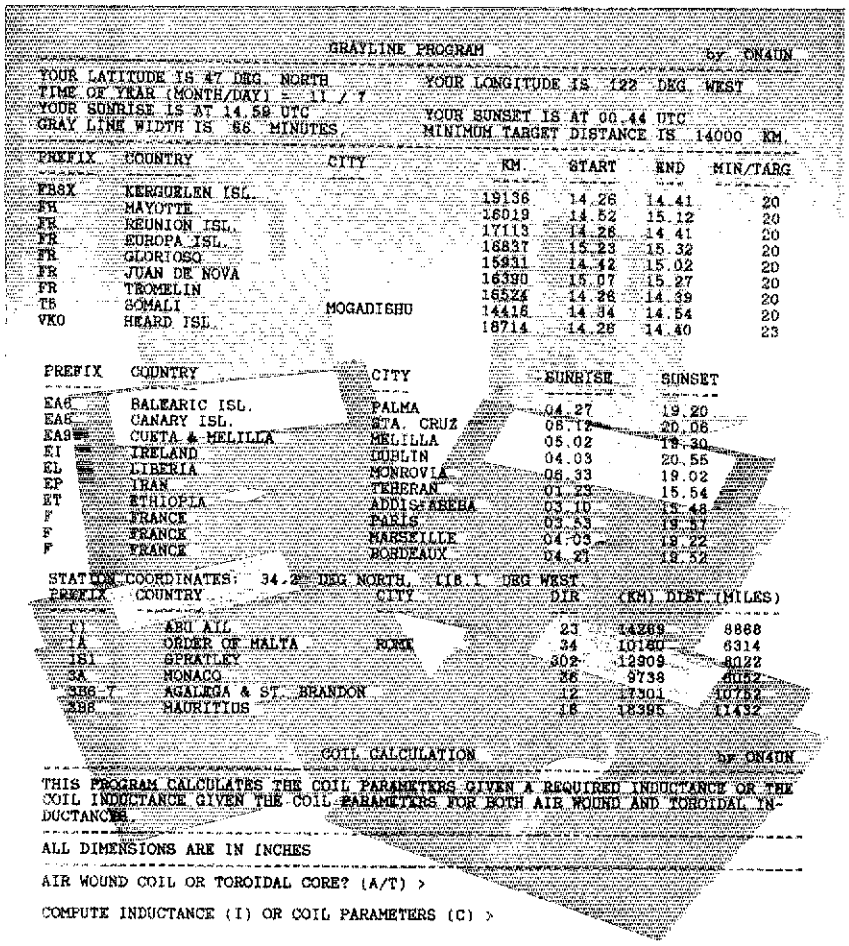

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                        GRAYLINE PROGRAM                        by ON4UN

YOUR LATITUDE IS 47 DEG. NORTH          YOUR LONGITUDE IS  122  DEG. WEST
TIME OF YEAR (MONTH/DAY) = 11 / 7
YOUR SUNRISE IS AT 14.58 UTC            YOUR SUNSET IS AT 00.44 UTC
GRAY LINE WIDTH IS  66  MINUTES         MINIMUM TARGET DISTANCE IS  14000  KM.

PREFIX   COUNTRY              CITY          KM.    START    END    MIN/TARG
------   -------              ----          ---    -----    ---    --------
FB8X     KERGUELEN ISL.                    19136   14.26   14.41      20
FH       MAYOTTE                           16019   14.52   15.12      20
FR       REUNION ISL.                      17113   14.26   14.41      20
FR       EUROPA ISL.                       16837   15.23   15.32      20
FR       GLORIOSO                          15931   14.42   15.02      20
FR       JUAN DE NOVA                      16390   15.07   15.27      20
FR       TROMELIN                          16524   14.26   14.39      20
T5       SOMALI                MOGADISHU   14418   14.34   14.54      20
VK0      HEARD ISL.                        18714   14.26   14.40      23

PREFIX   COUNTRY              CITY          SUNRISE    SUNSET
------   -------              ----          -------    ------
EA6      BALEARIC ISL.         PALMA          04.27     19.20
EA8      CANARY ISL.           STA. CRUZ      08.12     20.08
EA9      CUETA & MELILLA       MELILLA        05.02     19.30
EI       IRELAND               DUBLIN         04.03     20.55
EL       LIBERIA               MONROVIA       08.33     19.02
EP       IRAN                  TEHERAN        01.23     15.54
ET       ETHIOPIA              ADDIS ABEBA    03.10     15.48
F        FRANCE                PARIS          03.53     19.57
F        FRANCE                MARSEILLE      04.03     18.22
F        FRANCE                BORDEAUX       04.27     18.52

STATION COORDINATES:  34.2  DEG NORTH,  118.1  DEG WEST
PREFIX   COUNTRY              CITY          DIR    (KM) DIST.(MILES)
------   -------              ----          ---    ---------------
(.)      ABU ALI                             23      14269      8868
1A       ORDER OF MALTA        ROME          34      10160      6314
1S1      SPRATLEY                           302      12909      8022
3A       MONACO                             26       9738      6052
3B6,7    AGALEGA & ST. BRANDON              12      17301     10752
3B8      MAURITIUS                          16      18395     11432

                        COIL CALCULATION                        by ON4UN

THIS PROGRAM CALCULATES THE COIL PARAMETERS GIVEN A REQUIRED INDUCTANCE OR THE
COIL INDUCTANCE GIVEN THE COIL PARAMETERS FOR BOTH AIR WOUND AND TOROIDAL IN-
DUCTANCES.

ALL DIMENSIONS ARE IN INCHES

AIR WOUND COIL OR TOROIDAL CORE? (A/T) >

COMPUTE INDUCTANCE (I) OR COIL PARAMETERS (C) >

RQD. INDUCTANCE (uH)> ? 3.4
COIL DIAMETER IN INCHES > ? 3
COIL LENGTH IN INCHES  > 4

                REQUIRED NUMBER OF TURNS =  9
```

Low Band DXing Software

by John Devoldere, ON4UN

This inexpensive software will save you plenty of time. DXers will find these programs useful: grayline, great circle, and sunrise/sunset time listings. Of particular interest are the types of problems you can solve that have to do with antennas and transmission lines: mutual impedance, element driving impedance, voltage or impedance along with feedlines, feedline transformer, shunt or series input L network iteration and design, shunt or series impedance network, Pi or T line stretcher, feedline T junction/parallel impedances, SWR iteration and calculation, stub matching, horizontal antenna wave angle, vertical antenna design program, top loaded vertical design program, vertical array pattern calculation, element taper, coil calculation, RC/RL circuit transformation and obtaining precise resistance and capacitance values.

When ordering specify format; these versions are available for $30: **MS-DOS** for IBM and IBM compatibles, **DOS 3.3** for Apple 2C, 2E, or 2+, **CP/M** for Kaypro or Xerox, **CB-128 CP/M** for the Commodore C-128. The **MacIntosh** version is $35. Please add $2.50, ($3.50 for UPS) shipping and handling.

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NEWINGTON, CT 06111

ETO/QRO

ETO KEEPS GROWING

We tripled the size of our Canon City facility in 1985 but business has doubled again and we need more room. So we've announced plans to establish a new Technology Center in Colorado Springs.

That will place our product development activity and corporate headquarters closer to educational and other support infrastructures that's concentrated along the front range of the Rockies.

HAVE YOU NOTICED THE "HELP WANTED" BOX IN RECENT QRO'S?

ETO's rapid growth has created immediate opportunities for highly competent professional RF design engineers and techs as well as for manufacturing, QA, and sales and service specialists. If you're interested, please send your resume to Steve Christensen or see us at Dayton.

HERE'S THE NEW "NO-TUNE-UP" ALPHA 87!

Our surveys indicate that few owners use the auxiliary manual tuning on the ALPHA 374 or ALPHA 78. You generally just flip to the desired "bandpass" band position and started talking.

So the new ALPHA 87 uses all available bandswitch positions to provide full bandpass (no-tune-up) coverage of every amateur band from 160 to 10 meters. FCC still prohibits domestic delivery of amplifiers operable above 24 MHz, but if your license permits you can easily and quickly restore 12 and 10 M operation.

THE PHONE COMPANY CHANGED OUR AREA CODE

Please note that southeastern Colorado, including Canon City and Colorado Springs, is now A/C 719.

73,

Dick Ehrhorn,
W4ETO

Hands Off!

NEW ALPHA 87

1.5 kW RF OUTPUT . . . ALL BANDS . . . NO TUNE UP

Just select the desired band and you're on the air with a full 1.5 kW of clean, crisp RF power surging up the coax. Manual tune-up is completely eliminated when you use ETO's new maximum legal power ***ALPHA 87*** bandpass linear amplifier.

ALPHA 87 is identical with the manually tuned ***ALPHA 86*** except for its output tuning networks. The ***'87*** employs an improved version of bandpass circuitry that's been thoroughly proven since 1974 in famous "no-tune-up" ***ALPHA 374's*** and ***ALPHA 78's***. Those amplifiers introduced thousands of serious amateurs to the synergistic blend of legendary ***ALPHA*** power and instant bandchange that made the ***'78*** our most popular ***ALPHA*** ever.

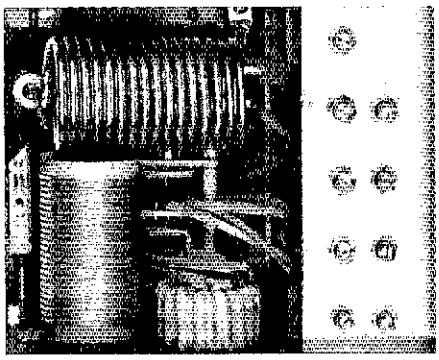
The new ***ALPHA 87*** can safely deliver far more long-term average RF output power than its famous predecessor . . . up to a full 1.5 kW . . . from the same size cabinet and AT THE SAME PRICE! Same exclusive 3 year ***ALPHA*** limited warranty and same famous ETO service, too.

ALPHA 87 SPECIFICATIONS

- Full coverage of amateur 160, 80, 40, 30, 20, 17 and 15 meter bands (Qualified amateurs may easily modify the '87 for 12 and 10 meter coverage)
- 1.5 kW RF power output in any mode (aux. cooling fan required for Pavg. >1 kW)
- Full rated power into load VSWR <1.5:1; electronic VSWR and overload protection
- Instant, silent PIN diode T/R and QSK
- 60 to 80 watts drive for rated output
- Quiet, full cabinet forced air cooling
- ETO's exclusive 3 year limited warranty

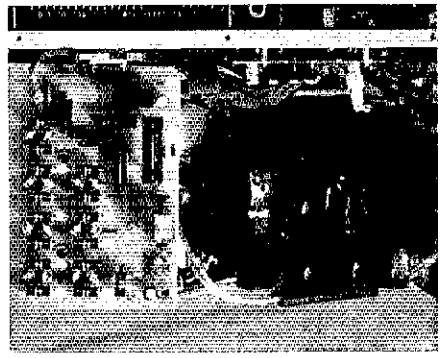
- **No-tune-up *ALPHA 87:* $3,495.00**
- **Manually tuned *ALPHA 86:* $2,995.00**

All ***ALPHA's*** are available FACTORY-DIRECT from ETO, freight pre-paid in North America. To order, or for a detailed brochure describing the ***ALPHA 86, 87*** and the forthcoming fully automatic ***ALPHA 88,*** call or write ETO.



Factory pre-tuned bandpass output networks provide full coverage of each amateur HF band. Maximum legal RF output is instantly available on any band.

Tuned input provides excellent match to transceiver and optimizes amplifier efficiency and linearity.



ALPHA 87 power supply uses 3.5 kVA tape-wound Hipersil® transformer and full wave bridge rectifier for maximum power and durability with mimimum size and weight. Matched and pre-aged computer grade capacitors used in 50 μF, 3+ kV filter yield excellent dynamic regulation and long life.

ETO EHRHORN
TECHNOLOGICAL OPERATIONS, INC.
P.O. BOX 888
CANON CITY, CO 81212
(719) 275-1613

ALPHA 87 will be available for sale pending grant of FCC type acceptance which is expected before this ad appears.

TECH TALK from ICOM

Straight Talk on RTTY and Packet Radio

ICOM Day and Hamfest discussions with radio amateurs nationwide indicate widespread interest and numerous "getting started" inquiries regarding printed mode communications like RTTY and HF Packeting. Recognizing that situation, this Tech Talk will discuss confusing areas such as system interconnections, FSK (Frequency Shift Keying) and AFSK (Audio Frequency Shift Keying) utilization, and desired transceiver features according to those selections. This objective reflects ICOM's well-known philosophy of supporting your endeavors and assuring your full enjoyment of amateur radio's many exciting pursuits.

Interconnecting a computerized RTTY or Packet system typically begins by overviewing your transceiver's wiring and operating features for the most beneficial results. FSK connections in deluxe style transceivers are an ideal first choice, as it provides full use of included RTTY circuitry and front panel controls. AFSK is the logical choice for HF Packeting and for using transceivers lacking specific front panel RTTY features.

Frequency Shift Keying uses a transceiver's RTTY circuitry to shift its CW/key-down carrier between two closely spaced frequencies (170Hz is the most popular separation). Many popular computer interface and RTTY Terminal Units include FSK output connections for this purpose, and it results in a very impressive installation.

Audio Frequency Shift Keying involves directing an interface or Terminal Unit's output audio tones to a transceiver's microphone input (popular tone pairs of 2125 and 2295Hz produce 170Hz shifts). Lower Sideband operation is then selected, Receiver Incremental Tuning is used to compensate for slight Transmit/Receive frequency differences, and the results are pleasant RTTY operations or HF Packeting. Notice that FSK uses switched DC levels to key a transceiver's "built-in" RTTY circuitry while AFSK uses audio-range tones to modulate an SSB transmitter. Assuming the use of similar shifts, polarity, and speeds, however, both FSK and AFSK-generated signals are fully compatible.

Desired transceiver features for superb RTTY reception include high frequency stability, sharp IF selectivity, and an effective means of retuning that IFs center frequency range to favor high-pitched audio tones. The "intelligent nature" of HF Packet setups also includes fast T/R switching requirements (a system "self monitors" for a clear frequency, then immediately transmits a brief burst of data). Generally speaking, transceivers with full CW break-in capabilities are best suited to HF Packeting.

While most modern transceivers exhibit good frequency stability for usual mixed mode and RTTY operations, the inclusion of a highly precise master oscillator with its own temperature controlled oven is ideal for special activities like E-Mail. These ultimately stable items are standard features in ICOM's incomparable IC-781 and IC-761 transceivers, and a readily available option for the IC-751A. Likewise, both wide and narrow bandwidth RTTY and CW IF filters are factory included standard features in the IC-781, IC-761, and IC-751A.

Although transceivers utilizing AFSK concepts and SSB transmission modes lack convenient front panel selection of narrow CW filters for RTTY operation, ICOM transceivers include a most attractive alternative: Passband Tuning. As graphically illustrated in a previous Tech Talk, simply resetting a Passband Tuning control to favor higher-pitched RTTY or Packet tones also narrows overall receiver bandwidth and minimizes QRM. This unique capability turns an economical transceiver into an RTTY or Packeting delight, and its operation with deluxe/FSK-equipped transceivers is totally beyond comparison!

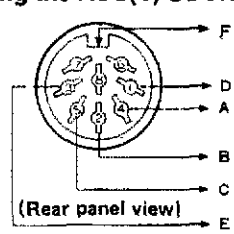
RTTY is a 100% duty cycle mode; thus main transmitter considerations include full duty cycle RF amplifier and power supply operation. This requirement also applies to your high power linear amplifier (if used) antenna system, plus its traps, balun, and coax cables. Items rated for intermittent or SSB use can easily be taxed beyond acceptable limits by long, full-power RTTY transmissions (fortunately, all ICOM transceivers boast exceptionally rugged and reliable RF "finals"!). Think conservatively about your full station when transmitting RTTY or Packet. Reduce total RF output to between one-fourth and one-half usual SSB output for long, dependable equipment life. Note also that all ICOM transceivers include a fully adjustable RF output control that functions on all modes including FSK and SSB/AFSK: professional and effective!

Amateurs preferring ultimate performance in both printed mode and SSB communications will surely appreciate ICOM's top-of-the-line, no compromise IC-781 HF transceiver. In addition to including all previously highlighted features (full duty cycle and FSK operation, multiple filters, Passband Tuning plus IF Shift, and much more), the lower portion of the IC-781's CRT display also "doubles" as an RTTY/AMTOR/Packet terminal display! A rear socket accepts RS-232C ASCII data from an external interface, and you enjoy RTTY-reading right on the IC-781's front screen. Totally incomparable!

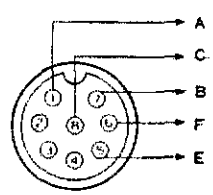
Whether operating printed modes or enjoying casual SSB QSO's, beginning with the "solid RF foundation" of ICOM's superb performance transceivers and accessories assures you great success. Top line operation, dependability, and service are your winning edge!

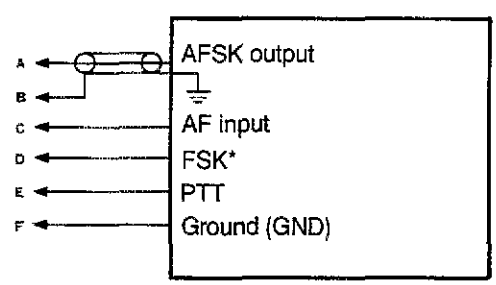
AFSK TERMINAL UNIT IC-735/IC-761/IC-781

- **Using the ACC(1) SOCKET**



- **Using the MIC CONNECTOR**





AFSK/RTTY TERMINAL UNIT

When operating an AFSK such as RTTY, AMTOR, or PACKET, connect the ACC(1) in the diagram below: *FSK available as on IC-761 and IC-781 only.

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline (206) 454-761**
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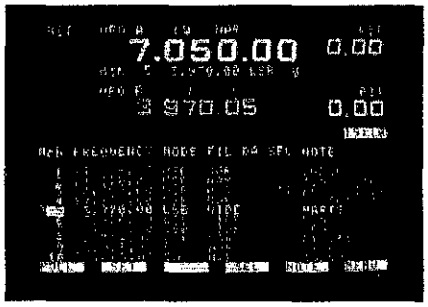
ICOM IC-781

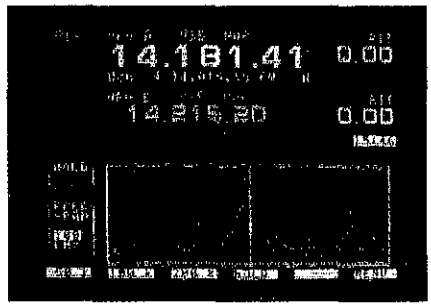
THE FUTURE OF AMATEUR COMMUNICATIONS

Once in a lifetime, a transceiver is introduced that's so extraordinary and innovative that it opens a totally new era in HF communications. ICOM's pacesetting IC-781 proudly exhibits that hallmark achievement with futuristic designs and features of true legendary proportions. Whether DX'ing, contesting, pioneering new interests or enjoying unquestionable top-of-the-line performance, the IC-781 is indeed today's standard of excellence!

Multi-Function Five Inch CRT. *Displays* frequencies, modes, memory contents, operating notes, RIT, two menu screens, plus a panoramic view of all signals in a selected range. A portion of the screen also serves as a display for data modes like RTTY, AMTOR, and PACKET.



Unique Spectrum Scope. Continuously indicates all signal activities and DX pile-ups with your operating frequency in the center. Selectable horizontal frequency spans of ±50, ±100, and ±200KHz for each side of the frequency you're listening to. Vertical range indicates relative signal strengths. A contester's dream!



Dual Watch. Simultaneously **receives two frequencies in the same band!** Balance control adjusts VFO A/B receive strength levels. You can check additional band activity, even tune in your next contact, while in QSO without missing a single word!

DX Rated! 150 watts of exceptionally clean RF output. Easily drives big amplifiers to maximum power.

Twin Passband Tuning with **separate controls for second and third IF stages!** Increases selectivity and narrows bandwidth, independently varies low and high frequency response, or functions as IF shift. **It's DX'ing Dynamite!**

Dual Width Noise Blanker includes MCF filter plus **level and width controls** to eliminate pulse and woodpecker noise with minimum adjacent-signal interference.

Incomparable Filter Flexibility. Independent selection of wide and narrow SSB filters plus CW filters. Second and third CW IF filters independently selectable!

A Total Communications System! Includes built-in 100% duty AC supply, high speed automatic antenna tuner, iambic keyer, semi-automatic, or full QSK CW break-in to 60 wpm, Audio Peaking Filter (APF), RF speech processor, multi-scanning, 105dB dynamic range, all-band/all-mode receiver with general coverage, and much more!

ICOM Dependability. The phenomenal IC-781 is built for action and backed with the most extensive warranty in the industry.

See the IC-781 at your local ICOM dealer.

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ICOM MICRO
THE WINNING HAND

Deal yourself a winning hand n modern technology with COM's new micro-size 2-meter nd 440MHz transceivers. The C-μ2AT and IC-μ4AT combine naximum performance, reliabil-ty and easy operation in a thin-tyled handheld that's perfectly uited for today's active life-tyles.

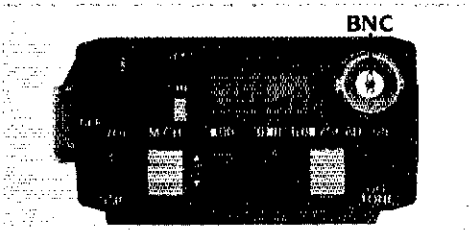
The IC-μ2AT and IC-μ4AT. A reakthrough that ends every amateur adio operator's quest for that one rue, go-anywhere handheld.

Miniaturization. The MICRO ives you all the advantages and per-ormance of a larger handheld, in a ackage so small, so refined, so well-uilt that only ICOM could build it.

Measuring only 4.6" high by 2.3" ide by 1.1" deep, the MICRO fits in our pocket or purse as easily as a assette tape.

This miniaturization doesn't compromise ICOM quality. It's exactly what you'd expect from ICOM, the world leader in handheld radio: high performance in a micro package.

Full Featured. And ICOM hasn't compromised features for size. The



MICRO includes ten programmable memories, transmit offset capability from the back panel including odd offsets, an LCD readout on the top panel for easy readability, up to three watts of output (optional), 32 built-in subaudible tones AND wideband receive coverage from 138 to 162.995MHz in 5KHz steps for MARS and CAP operation plus weather broadcasts (IC-μ2AT) or 440 to 449.995MHz (IC-μ4AT).

There's also a simple-to-use digital **TouchStep Tuning System** for fast shirt-pocket frequency adjustments. The MICRO also includes a band or memory manual scan function. And, the MICRO is backed by four factory-operated regional service centers.

Personalize your ICOM MICRO. The MICRO utilizes most existing ICOM handheld accessories, plus it hosts a new line of versatile accessories including the BP-24 2.6 watt high-power battery pack, BP-23 long-life 1.6 watt battery pack, BC-50 desktop rapid charger, and a variety of carrying cases.

See the ICOM MICRO at your local ICOM dealer. Play your cards right with ICOM!

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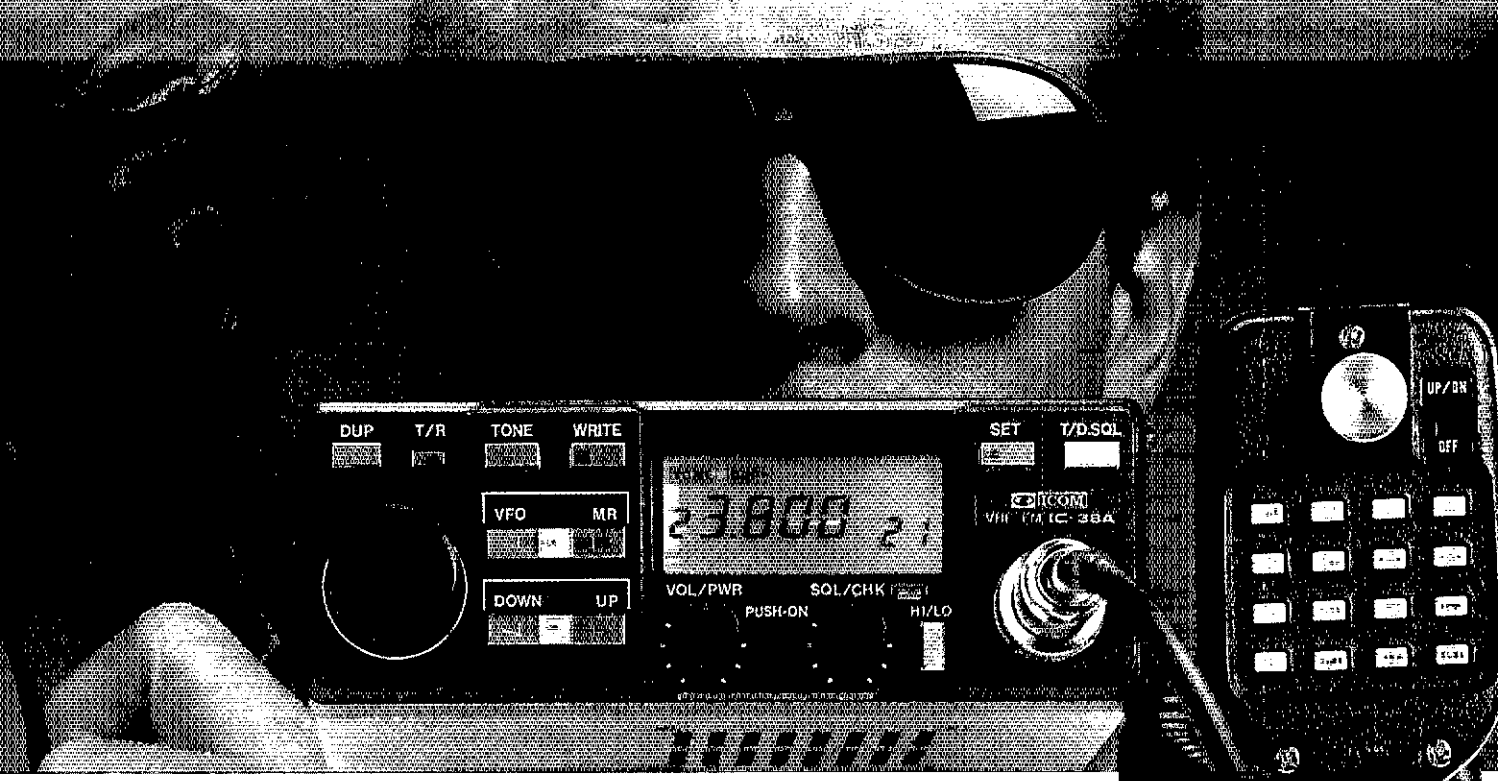


HIGH PERFORMANCE

ICOM has a commitment to high performance 220MHz gear. That's why we're the only manufacturer who can offer you a full line of 220MHz equipment...whether it's a mobile, handheld, base station transceiver, or fiber optic multi-bander.

Handhelds. Choose the full-featured five-watt **IC-03AT** with 10 full function memories capable of storing odd offsets and subaudible tones, scanning and DTMF direct keyboard entry. Or select the **IC-3AT** easy-to-operate handheld featuring thumbwheel switch frequency selection.

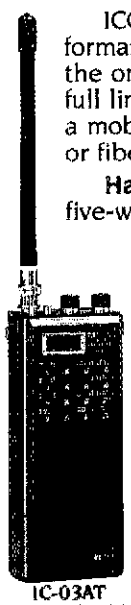
Mobiles. ICOM offers the **IC-38A**, which sports a large LCD readout, 21 memories, scanning, and memory lock-out. The slim-line **IC-37A** features an LED readout, nine memories capable of storing offset and subaudible tones and both memory and band scan.

Base Station. The **IC-375A** is a 220MHz all mode operator's dream...25 watts output, an internal power supply, 99 memories, scanning, and all subaudible tones built-in.

Multi-Bander. The newest addition to ICOM's 220MHz family...the **IC-900** fiber optic controlled six-band mobile, which has a 220MHz optional band unit.

Quality. High Performance. That's ICOM 220MHz.

IC-3AT Handheld



IC-03AT Handheld

NEW! IC-375A Transceiver

IC-37A Mobile

IC-38A Mobile

ICOM 220MHz

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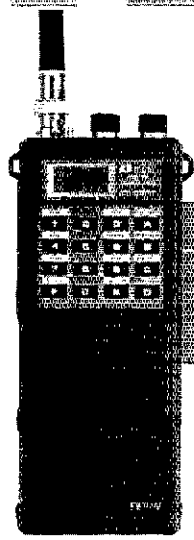

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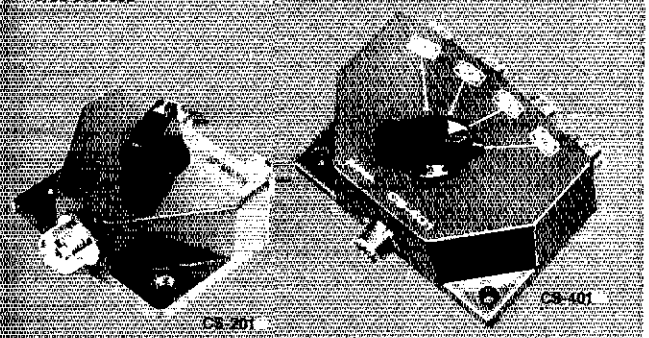

CS-201 CS-401

	CS-201 2 Position	CS-201G 2 Position	CS-401 4 Position	CS-401G 4 Position	CS-4 4 Position
Frequency:	500 MHz	1.5 GHz	500 MHz	600 MHz	1.5 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
Isolation:	+60 dB	+60 dB	+60 dB	+60 dB	+60 dB
Power Rating:	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	500 W PEP 350 W CW
Insertion Loss:	All models less than 0.2 dB				

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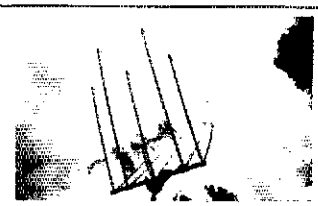

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- DL 122: 12 meter, 2 el. $249.00
- DL 103: 10 meter, 3 el. $339.00
- DL 102: 10 meter, 2 el. $239.00
- DL 1015: 5 el. duobander $489.00
  3 el. 10m.-2 el. 15m., 9' boom
- DL-TRI: 7 el. tribander $789.00
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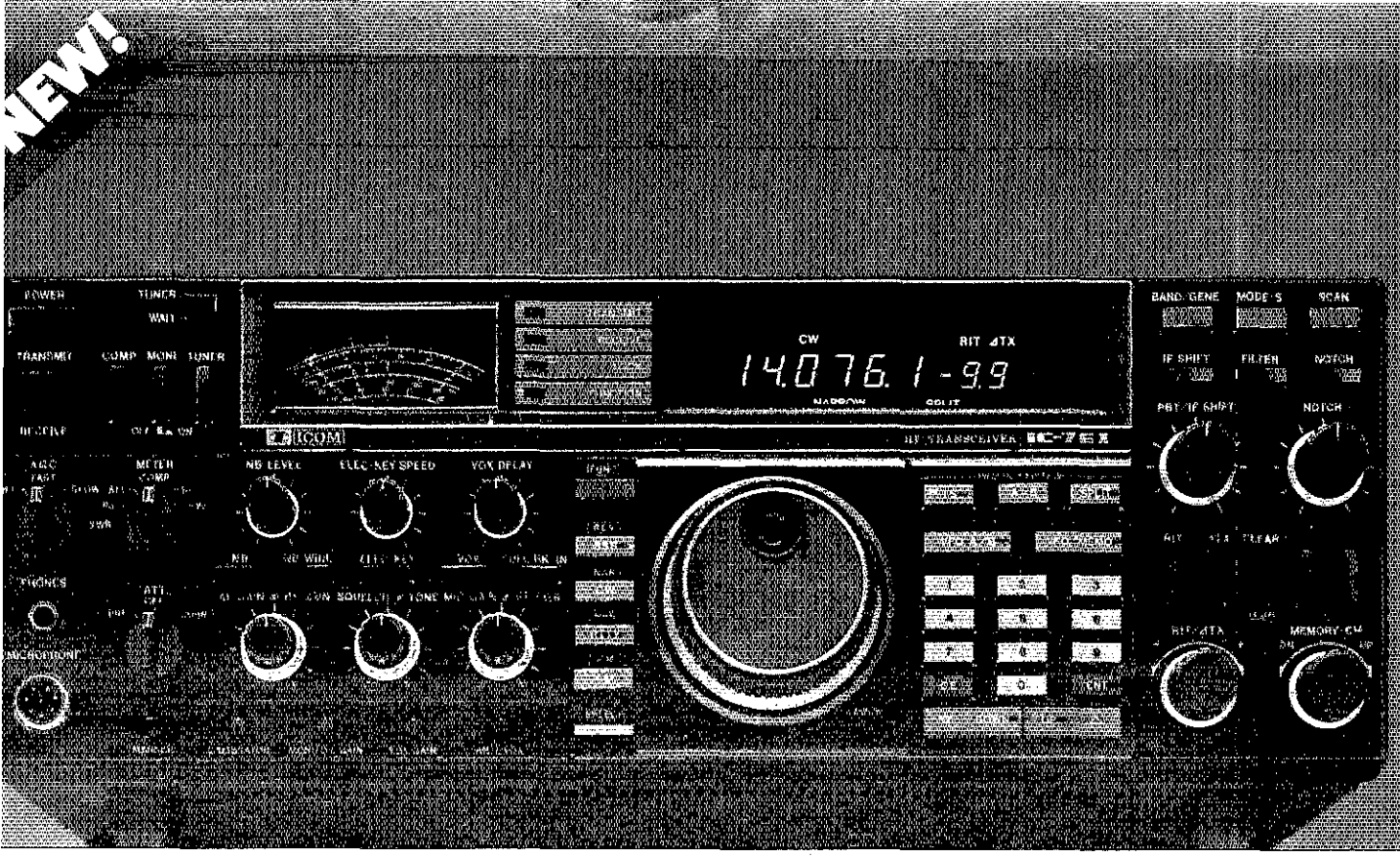

ICOM IC-761
A NEW ERA DAWNS

Built-in AC Power Supply
Built-in Automatic Antenna Tuner
SSB, CW, FM, AM, RTTY
Direct Keyboard Entry
160-10m/General Coverage Receiver
Passband Tuning plus IF Shift
QSK up to 60 WPM

The IC-761 ushers in an exciting ew era of amateur radio communica- ons; an era filled with all the DX'ing, ontesting, and multi-mode operating leasures of a fresh new sunspot cycle. he innovative IC-761 includes all of oday's most desired features in a sin- le full-size cabinet. This is ham radio *t its absolute best!*

Work the World. The IC-761 gives ou the competitive edge with stand- rd features including a built-in AC ower supply, automatic antenna tuner, 2 fully tunable memories, self-refer- ncing SWR bridge, *continuously vari-* ble RF output power to 100 watts in ost modes, plus much, much more!

Superb Design, Uncompromised Quality. A 105dB dynamic range receiver features high RF sensitivity and steep skirted IF selectivity that cuts QRM like a knife. A 100% duty cycle transmitter includes a large heatsink and internal blower. The IC-761 transceiver is backed with a full one-year warranty and ICOM's dedicated customer service with four regional factory service centers. Your operating enjoyment is guaranteed!

All Bands, All Modes Included. Operates all HF bands, plus it includes general coverage reception from 100kHz to 30MHz. A top SSB, CW, FM, AM, and RTTY performer!

Passband Tuning and IF Shift plus tunable IF notch provide maximum operating flexibility on SSB, CW, and RTTY modes. Additional features include multiple front panel filter selection, RF speech processor, dual width and adjustable-level noise blanker, panel selectable low-noise RF preamp, programmable scanning, and all-mode squelch. The IC-761 is today's most advanced and elaborate transceiver!

Direct Frequency Entry Via Front Keyboard or enjoy the velvet-smooth tuning knob with its professional feel and rubberized grip.

Special CW Attractions include a built-in electronic keyer, semi or full break-in operation rated up to 60 WPM, CW narrow filters and adjustable sidetone.

Automatic Antenna Tuner covers 160-10 meters, matches 16-150 ohms and uses high speed circuits to follow rapid band shifts.

Complementing Accessories include the CI-V computer interface adapter, SM-10 graphic equalized mic, and an EX-310 voice synthesizer.

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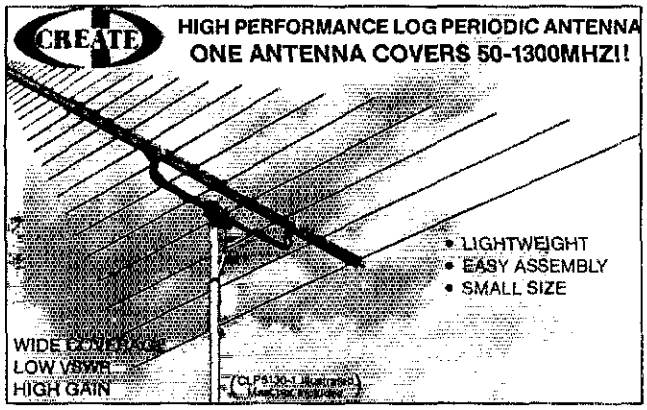
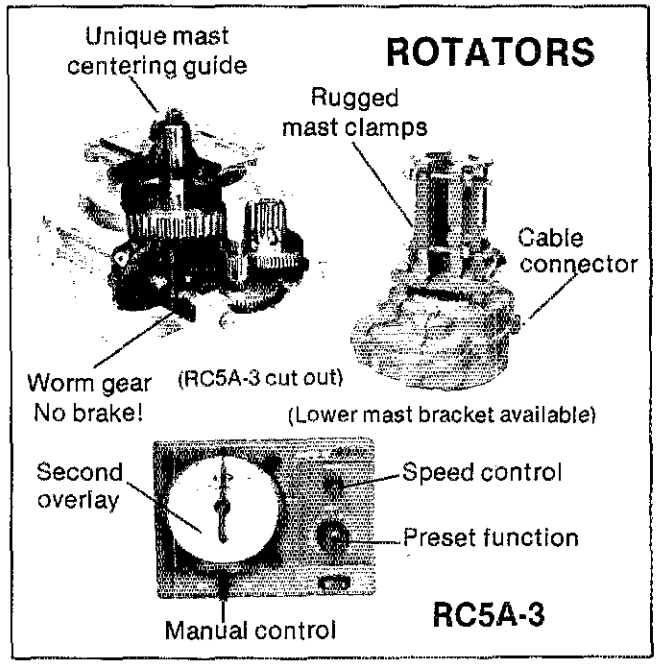


CLP5130-1 50-1300 MHz 25 el. 500W 6′ Boom $239
CLP5130-2 105-1300 MHz 20 el. 500W 4′6″ Boom $139

Operate on 6m, 2m, 1¼m, 70cm, 900 MHz and 1.2 GHz using only one antenna and one feedline. No tuning is required and the VSWR is 2:1 or less across the entire frequency range with excellent forward gain. The boom is made of high quality aluminum and the elements are precut for easy assembly. Each model can be mounted for either vertical or horizontal polarization. Create VHF/UHF log periodics are great for the amateur bands, scanners and numerous other applications.



RC5-1	10 sq. ft.	$251
RC5-3	10 sq. ft. preset	$328
RC5A-2	25 sq. ft.	$399
RC5A-3	25 sq. ft. preset	$459
RC5B-3	35 sq. ft. preset	$736

(All rotators are UPS shippable)

See Lew McCoy's Review In August 1987 Issue Of CQ.

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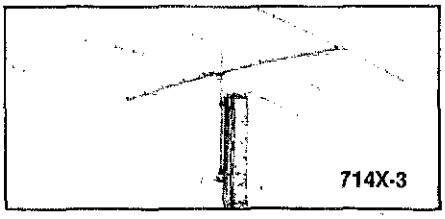
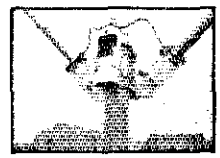
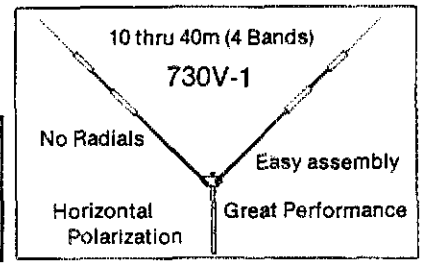


714 Series Tribanders
15-20-40 Meters

Model	Elements 40-20-15	Boom Length	Longest Element	Turning Radius	Wgt. Lbs.	Power PEP	Price
714T	2/4/4	28′6″	43′	25′3″	71	2 kw	$574.
714X	3/4/4	32′5″	44′	26′2″	75	2 kw	$762.
714T-3	2/4/4	28′6″	43′	25′3″	75	3 kw	$707.
714X-3	3/4/4	32′5″	44′	26′2″	80	3 kw	$928.

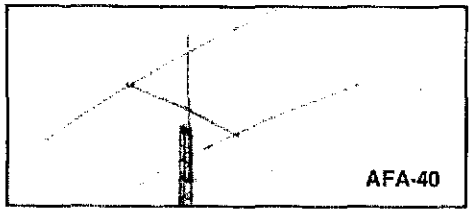
(Prices include balun)





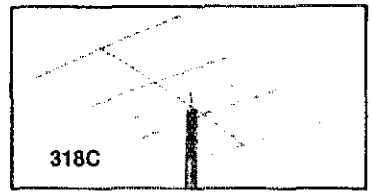
The 730V-1 is a V-dipole consisting of two 19 ft. heavy duty, self-supporting elements and bracket with an efficient balun that is ready for mounting on a standard TV mast. Rotation is not necessary. The V-dipole is superior to standard vertical antennas in gain, noise and efficiency. **$159**

2 Element Phased Arrays



Model	Freq Mhz	Boom Length	Longest Element	Turning Radius	Wgt. (Lbs)	Power PEP	Price
AFA-30	10	12′11″	32′1″	18′	29	1.5 kw	$258.
AFA-40	7	16′8″	47′10″	25′7″	42	3 kw	$388.
AFA-75-1	3.8	29′6″	80′	42′7″	148	4 kw	$1,940.

(Prices include balun)



318 Series Tribanders
10-15-20 Meters
Available Soon
318B + 7 (10-40 Meters)!

Model	Elements 20-15-10	Boom Length	Longest Element	Turning Radius	Wgt. (Lbs.)	Power PEP	Price
318JR	3/3/3	13′1″	31′1″	15′9″	28	1.2 kw	$289.
318	3/3/3	16′4″	31′1″	17′4″	40	2 kw	$345.
318B	3/4/4	20′11″	31′1″	18′4″	49	2 kw	$434.
318C	5/5/5	29′10″	31′1″	21′	58	2 kw	$643.

(Prices include balun)

Prices do not include shipping.

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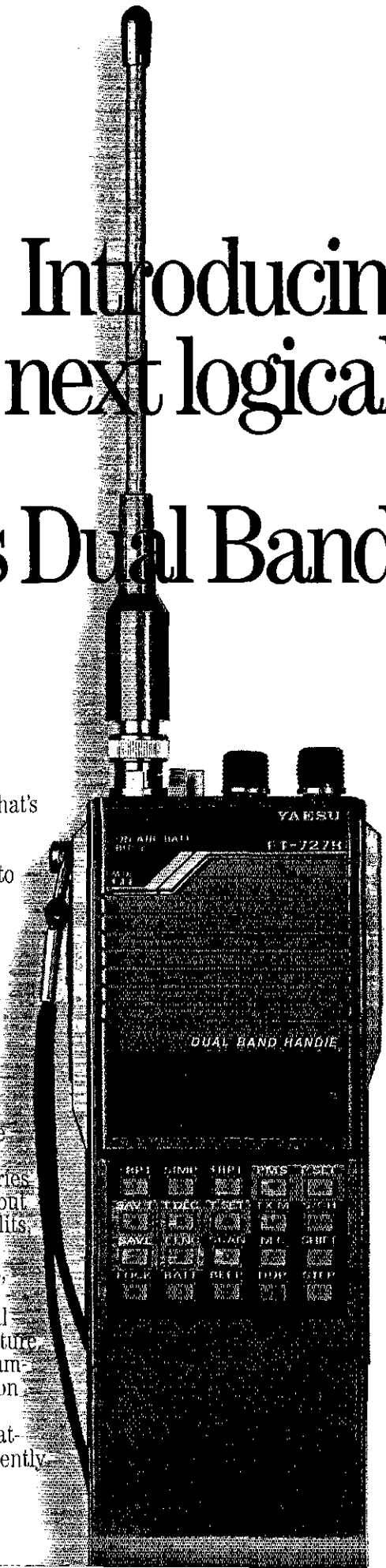

Two affordable radios in one—that's exciting.

Yaesu's dual-band FT-727R packs our best HT know-how into one compact design. At a price that's in step with your ham budget.

Hit hard-to-reach repeaters with a powerful 5 watts on both 2 meters and 440 MHz.

Work the bands quickly and easily with a wealth of microprocessor-controlled commands:

Jump between the separate VHF and UHF VFO registers. Program each of the ten memories for instant recall of repeater input and output frequencies, odd splits, and tone encode/decode.

Scan the memory channels, the entire band, or a band segment. And return to any special frequency with the priority feature.

Use link repeaters by programming TX on one band and RX on another.

Conserve power with the battery saver. It lets you monitor silently while drawing negligible current. And measure your battery level with the digital battery voltmeter. There's even a "Low Battery" LED.

Finally, your operation is rounded out with features like VOX capability. A one-touch repeater reverse switch. An LCD readout with illumination lamp. A high/low power switch. Remote computer control capability. An optional CTCSS module. And Yaesu's full line of optional accessories.

So step up your operating capability now with the logical choice in HT operation.

Yaesu's dual-band FT-727R.

YAESU

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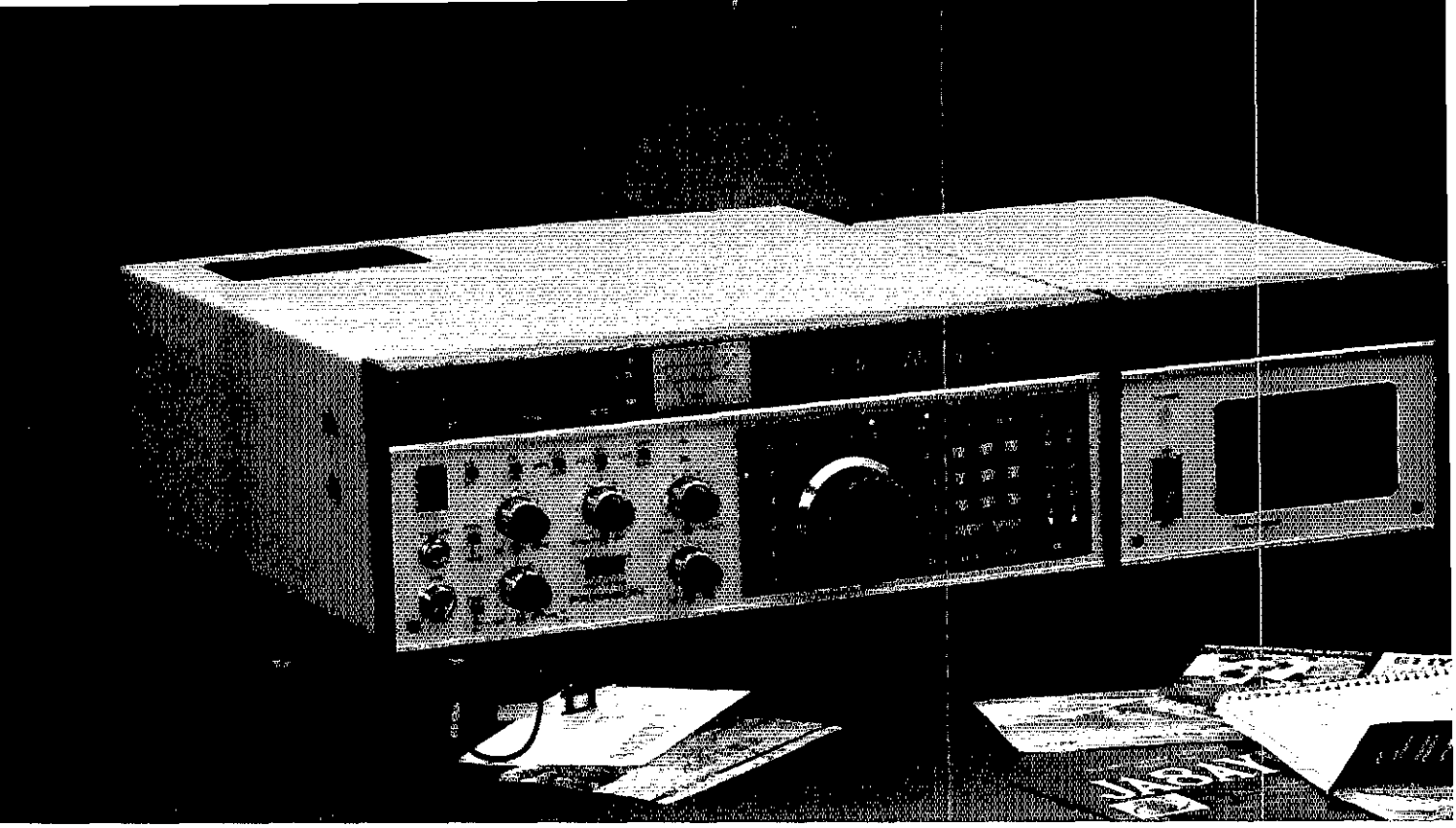
Prices and specifications subject to change without notice.



Depend on Paragon Performance!

Transmitter audio quality that is a pleasure to hear and a receiver that has set new standards for sensitivity and quietness. Receives from 100 kHz to 29.999.99 MHz with two tuning rates. Transmits on all bands from 1.8 MHz to 29.999.99 MHz with 100 watts output. SSB, CW, real FSK and optional FM. Standard equipment includes speech processor, noise blanker, dual VFOs, TX split, RX split and QSK with a changeover time of 30 ms or less. Five i-f filter positions with the 6 kHz AM filter and 2.4 kHz SSB filter, standard. Optional 1.8 kHz, 500 Hz and 250 Hz filters. All are push button selectable in any mode. Passband tuning, notch filtering, audio bandpass filtering, tone control, squelch and more!

Sixty-two programmable memories that store frequency, mode, filter selected, channel number and a 7 character alpha-numeric "tag" for I.D. Scan rate is selectable and as each memory is scanned all of the stored information is displayed (what a light show!). The scanning routine is easily controlled with both individual and global lock-out and reset functions. Alternately, the memories can be tuned with the main tuning knob.

Frequency selection is with the main tuning knob, direct keypad entry or up/down buttons that will shift in 100 kHz or one MHz increments or to the next ham band. DISPlay button selects 24 hour clock or date or tag. VOICE button causes a voice frequency announcement when optional synthesized voice board is installed.

Rear panel controls adjust the VOX, CW monitor level and tone, and SSB sidetone monitor level. Switching is provided to control conventional linear amplifiers and high speed switching for QSK linears, such as the Titan. Other rear panel connections are included for a transverter, FSK (170 Hz shift), fixed level audio out, audio in, external speaker, aux dc and provision for the optional RS-232 control interface.

An absolute delight for the all mode operator.

The construction of the Paragon is impressive too. All of the circuit boards are G-10 glass epoxy and can be removed easily. All aluminum construction and the use of an external power supply, keeps the weight of the Paragon at a svelte 16 lbs.

The Paragon is the result of a three year computer aided (CADEC 4) engineering effort. Much of that effort was invested in improving receiver performance. We are proud of the Paragon and we think it has set new standards of excellence in synthesized rigs. Check it out yourself. We think that you will share our pride in the Paragon.

Write for our new full-line catalog.

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The Term of Warranty Is One Year, As Always

TEN-TEC

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Harness the Titan Power!

The TITAN has it all! Maximum legal power with ease, all bands 160 through 15 meters (through 10 meters after authorized modification), lightning fast QSK for full break-in CW and the digital modes, plus a two speed blower for quiet operation on phone. This awesome performance from a desk top amplifier is made possible by a pair of Eimac® 3CX800A7 ceramic triodes and an absolute "horse" of a power supply.

The heart of the power supply is our own tape wound, four core, Hypersil® transformer which weighs in at an impressive 41 pounds. This transformer is conservatively rated at 2.5KVA CCS (continuous commercial service) or 9KVA IVS (intermittent voice service). The power supply is housed in a separate utility enclosure for remote operation and is nearly noiseless even at full power.

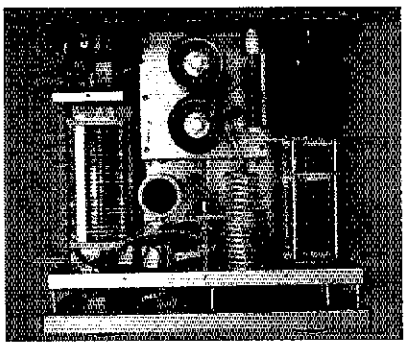
Front panel features include an instantaneous 10 element LED peak output power indicator, a dedicated plate current meter, a multi-meter to read grid current, forward power, reflected power or plate voltage, HI/LO plate voltage select, STBY/OPR switch and power ON/OFF switch. A red LED warns you if grid current becomes excessive and three other LEDs indicate status: WAIT, STBY and OPERATE. Vernier TUNE and LOAD controls, in combination with an outstanding RF deck design, make the Titan a real "pussy cat" to load and operate.

The low drive requirement of the Titan (65 watts in for 1500 watts output typical) makes life much nicer for your exciter too. Operating temperatures are significantly lower and component life extended accordingly. This is especially comforting using "keydown" modes such as RTTY. Adjustable ALC is provided for controlling exciter RF output levels.

The Titan has been the subject of two "product review" magazine articles. See QST, April 1986; CQ February 1986.

The Titan is designed to match our 100 watt exciters but it pairs up nicely, no matter what exciter you operate. If you are ready to choose your dream amplifier the Titan has everything but the highest price. Check it out!

Write for our new full-line catalog.



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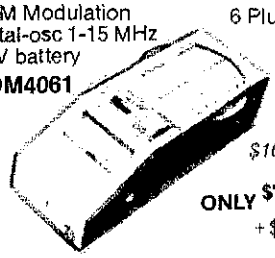

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- Measure resonance of antennas and tank circuits.
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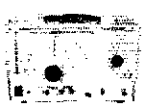
- Use as OSC for Rec. alignment.
- More uses detailed in the RSGB Handbook, pages 18.15 to 18.21.

RF SIGNAL GENERATOR

SG4160



- 100 KHz - 150 MHz to 450 MHz on harmonics.
- RF Output 100 mVs.
- Modulation: Int. - 1 KHz Ext. - 50 Hz to 20 KHz.
- Crystal OSC 1 - 15 MHz.

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PM330

- 1.8 to 500 MHz.
- 50 OHM - N-J Connector.
- 5W, 20W, 120 Watts.
- Accurate to +/- 10%.

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- 10 Hz to 150 MHz.
- 7 Digit readout.
- Gate 1s & 6 sec.
- Accurate to +/- 1 count.

SENSITIVITY: 25 - 100 mV to 30 MHz; 100 - 300 mV to 150 MHz

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AC Adapter is included with unit.

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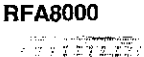
RFA8000



- 0 - 81 dB in 1 dB steps.
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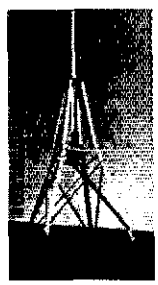
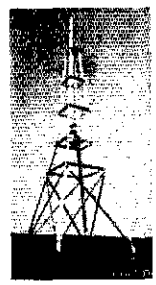
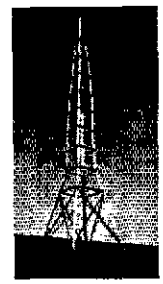


CR-18



CR-30



CR-45

CREATE ROOF TOWERS CONSTRUCTED OF HIGH GRADE ALUMINUM WITH GALVANIZED STEEL BRACING FOR ADDED STABILITY AND STRENGTH WILL EASILY ACCOMMODATE YOUR ANTENNA REQUIREMENTS. THREE SIZES OF ROOF TOWERS WILL SUPPORT VHF ANTENNAS, HF TRI-BANDERS, AND OSCAR SYSTEMS. ROTATORS EASILY MOUNT INSIDE THE TOWER. AN OPTIONAL THRUST BEARING (#303) IS RECOMMENDED. SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.

MODEL	HEIGHT	MAXIMUM ANTENNA WIND LOAD IN FT 2	BASE WIDTH	MAX. VERT. LOAD LBS.	TOWER WEIGHT LBS.
CR-18	5'10"	21 @ 90 MPH	31-1/3"	440	18
CR-30	9'10"	27 @ 90 MPH	39"	1,322	33
CR-45	14'9"	23 @ 90 MPH	39"	881	57
#303	Thrust Bearing For CR-18, CR-30, and CR-45 Maximum Acceptable Mast Diameter 2"ø				

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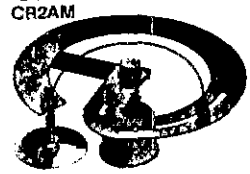
CR2AM



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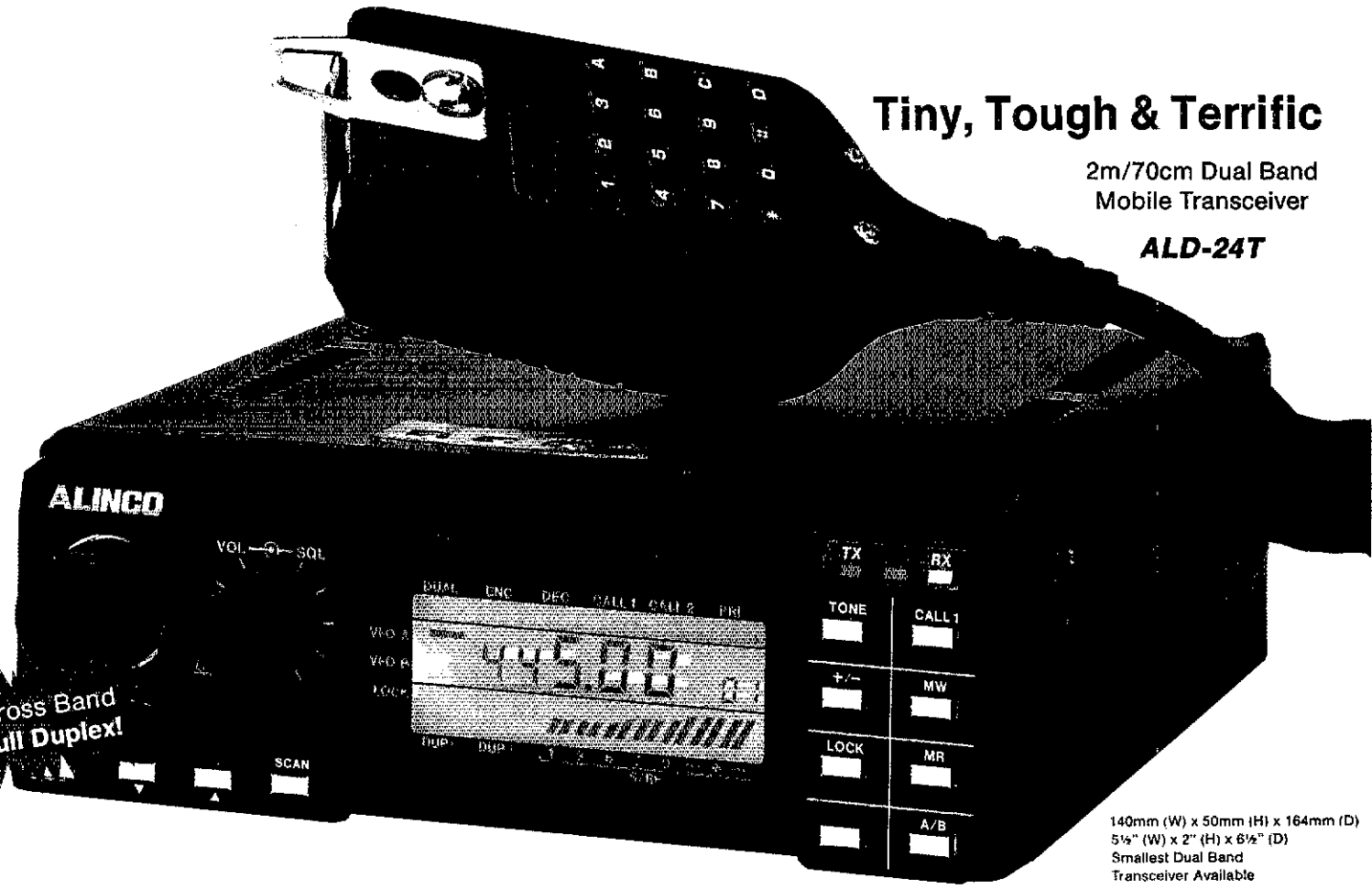

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2m/70cm Dual Band
Mobile Transceiver

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Smallest Dual Band
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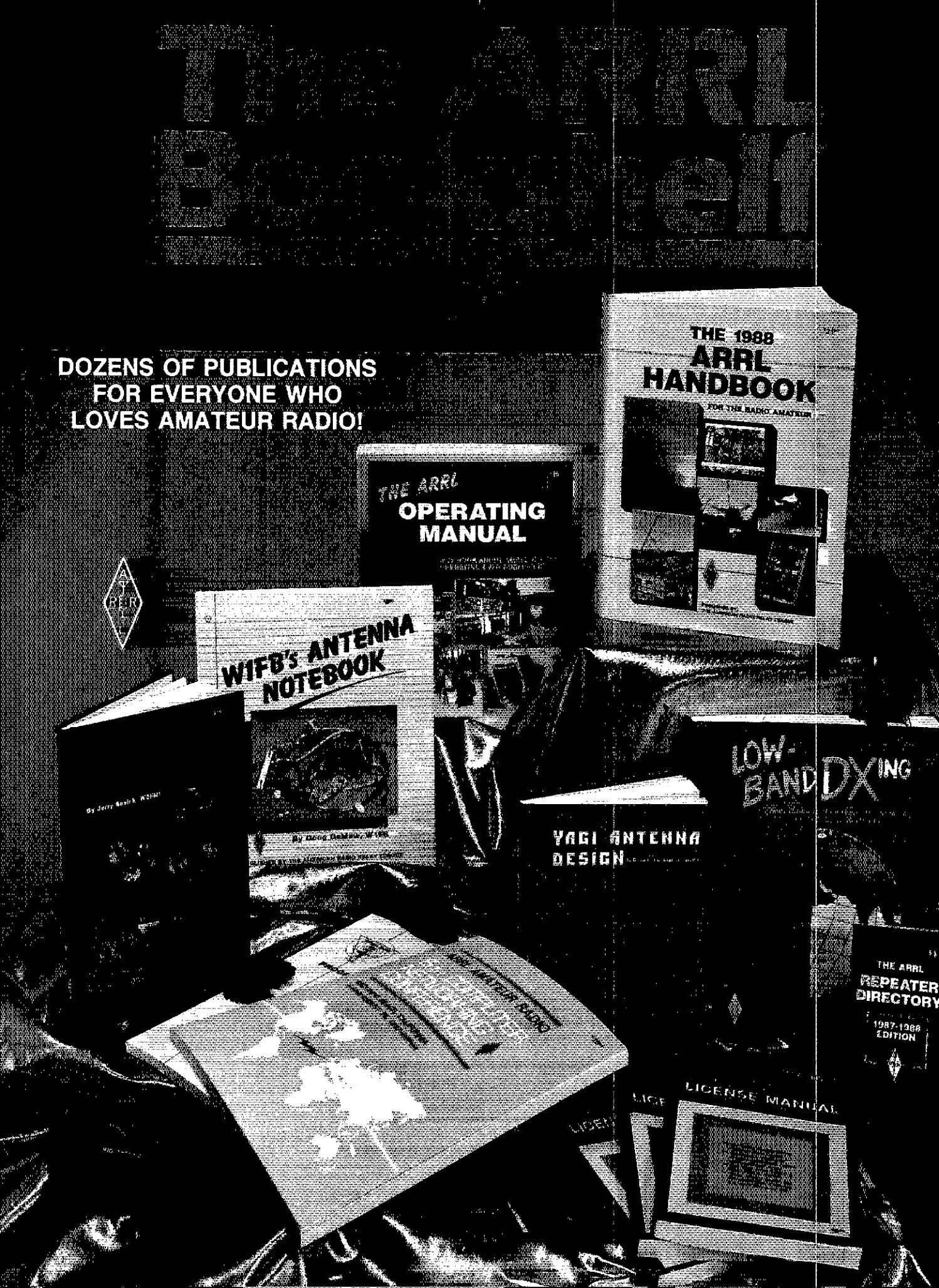
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YAGI ANTENNA
DESIGN
THE ARRL
REPEATER
DIRECTORY
1987-1988
EDITION
LICENSE MANUAL

BRAND NEW FROM ARRL

$10.00

YOUR GATEWAY TO PACKET RADIO

STAN HORZEPA, WA1LOU

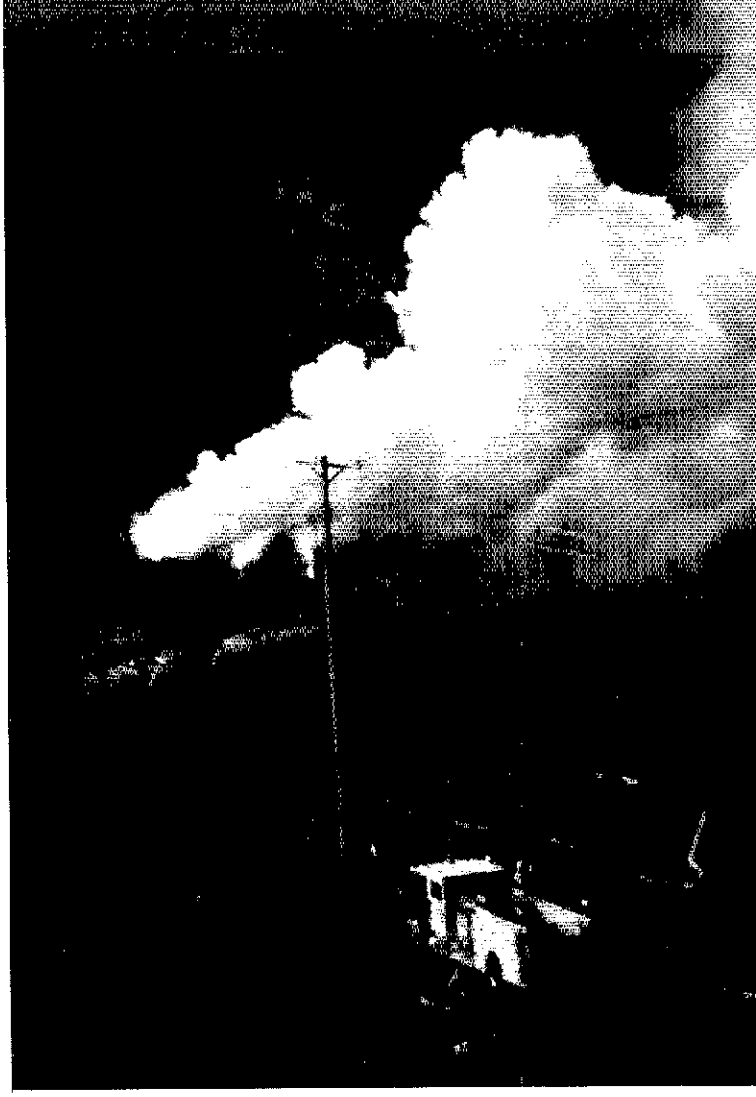
Packet Radio is fun—there are over 30,000 "packeteers" to prove it, and that number is growing every day. Not since SSB in the early sixties or the repeater boom of the early seventies has there been so much excitement among radio amateurs!

What is packet radio good for and what uses does it have for the "average ham?" How can I be sure I have the proper equipment and how do I set everything up? What are these things called protocols? Where is packet radio headed on VHF/UHF and HF? How has the "braaap" of a packet of data sent to a bulletin board replaced the clatter of a radioteletype machine in the autostart mode? Why is packet great for message handling especially in emergency situations? What uses can the computer hobbyist, contester or DX'er find using "packet." This new 205-page ARRL publication has the answers!

Each of the following chapters is written to make understanding packet radio a breeze: The Radio Hacker, History, Theory of Operation, TNCs, Installation, Selecting TNC Parameters, Operating Procedures, VHF and UHF Communications, HF Communications, Time-Shifting Communications, Public Service Communications, Space Communications, and The Network. In addition there are these appendices: TNC 1 and 2 Commands, TNC 1 and 2 Control Characters, TNC 1 and 2 Messages, TNC Command Compatibility, ASCII Character Set, Bibliography and Sources, Glossary. Price of *Your Gateway to Packet Radio* is $10 plus $2.50 ($3.50 for UPS) shipping and handling.

ARRL 225 MAIN STREET NEWINGTON, CT 06111 U.S.A.

The New 688-page ARRL Operating Manual is HOT...



On July 8, 1986, a railroad tanker carrying toxic phosporous derailed and caught fire near Miamisburg, Ohio. The success of the Monsanto Amateur Radio Association's emergency plan in helping local authorities deal with this potential disaster is documented in November 1986 *QST*. The photograph above which was taken over the scene by Mike Carter, WD8BSI, shows what could happen in your backyard! Would you be ready for such a situation? The Emergency Communications chapter by Richard Regent, K9GDF, in the new *ARRL Operating Manual* tells how to prepare for such an eventuality. Emergency Communications and efficient message handling go hand-in-hand. Maria Evans, KT5Y, tells all about this subject and how you can become a part of the National Traffic System in the expanded Traffic Handling chapter.

Over forty percent of the radio amateurs licensed today were at one time or still are shortwave listeners. With modern transceivers, it's possible to hear what is going on outside our ham-bands. David Newkirk, AK7M, adds his enthusiasm for this closely related hobby in the SWL chapter. On a related subject, Paul Rinaldo, W4RI, tells us about the characteristics of the Amateur Radio Spectrum and how our bands are assigned.

Most hams are interested in just getting on the air and talking to someone. Even so, ham radio is a lot more than talking into a microphone or pounding a telegraph key. Carol Smith, AJ2I, and Bill Jennings, K1WJ, have prepared a chapter on Basic Operating. It is just what the newcomer needs in order to get started, and it's good review for some of us who have been away from ham radio for a while. Almost everyone can qualify for the Rag Chewer's Club Certificate, but do you realize that there are hundreds of Amateur Radio awards from throughout the world? Well you can see dozens of these awards in *full color* along with their requirements in the Awards chapter by Bob Halprin, K1XA.

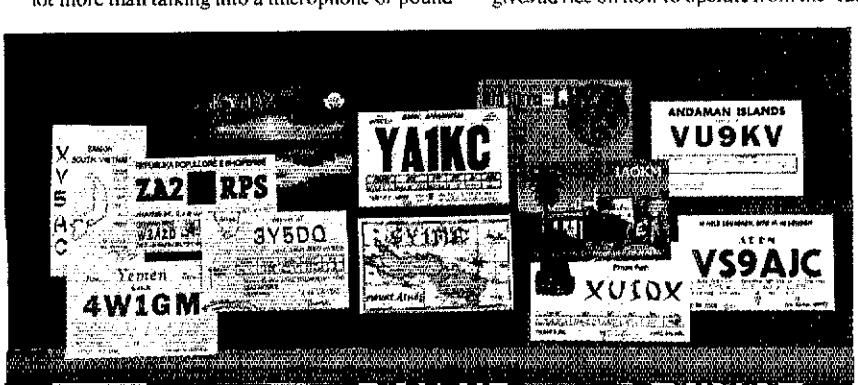
Clarke Greene, K1JX, tells all about competitive operating. Clarke has won almost every major contest, HF, VHF/UHF, from home and away, using full power and QRP. Now he tells how it's done!

Almost everyone seems to be interested in digital communications these days. Stan Horzepa, WA1LOU, covers Packet Radio in detail; while Larry Wolfgang, WA3VIL, covers RTTY and other digital modes in a separate chapter. If you find SSTV or ATV of interest, Bruce Brown, WA9GVK, has put together a fantastic chapter on Image Communications.

If you still need to work the countries represented by the QSLs below, you're not alone; but you can pickup some good tips on working DX from well-known DXer and author Bob Locher, W9KNI. DX-peditioner Carl Henson, WB4ZNH, gives advice on how to operate from the "rare ones" without catching malaria or worse! You can find out when to work DX at anytime during the sunspot cycle by referring to the propagation tables which were newly incorporated in this edition. You'll also find sunrise-sunset tables for working DXCC countries around the world, and there is a great chapter on Antenna Orientation by *ARRL Antenna Book* editor Jerry Hall, K1TD.

Besides "packet," WA1LOU tells what is new in the area of FM and Repeater operation. This chapter is "must" reading for Novices who want to use repeaters for the first time or for those who want to upgrade their existing repeater operations. There is a lot doing these days on weak signal VHF/UHF work and Mike Owen, W9IP, shows how it's done from moonbounce to meteor scatter. Will you be ready for the OSCAR launch that may take place later this year? Dick Jansson, WD4FAB, captures us with his satellite operating techniques.

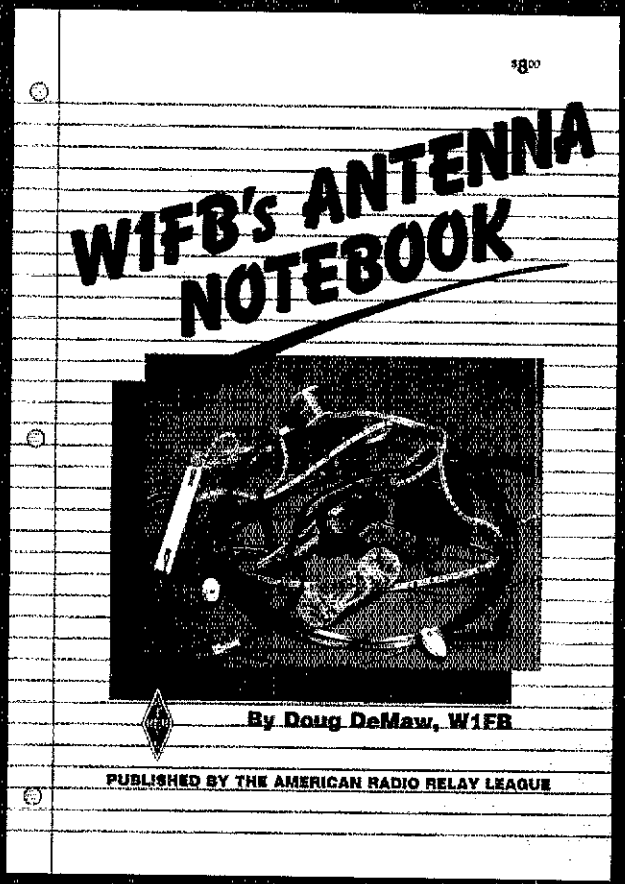
You'll also find numerous handy tables and charts in the third edition of *The ARRL Operating Manual*. It is edited by Robert J. Halprin, K1XA, Deputy Manager of Membership Communications at ARRL HQ. The new edition is available at your dealer or from ARRL for $15. (Please add $2.50, $3.50 for UPS for shipping and handling.)



but it's also FUN!

W1FB's Antenna Notebook

This is one of the most readable books about antennas ever published. It's not really a novel about antennas, but *W1FB's Antenna Notebook* is far from being a dry lecture on the properties of wire and vertical antennas. Instead, we can imagine ourselves being invited over to Doug DeMaw's hamshack to chew the rag about antennas. Have a seat in the easy chair in front of the fireplace while Doug grabs his *Antenna Notebook* off the shelf. Listen intently as we discuss what this new ARRL publication is about.



While the adage, "the bigger and higher the better" might be true for those with unlimited pocketbooks, lots of real estate, and plenty of technical and mechanical knowledge; most of us are constrained in some way, from putting up vast arrays of heavy metal! Wire antennas are inexpensive, can be unobtrusive, and give good performance if designed properly. Verticals don't have to be "equally weak in all directions," and we learn how to overcome this so-called "curse." That bargain coax that you picked up at the local flea market may look good, but is it? The first chapter describes a simple test to find out for sure, as well as telling us about the hidden traps of traps, what conditions cause baluns to do some very nasty things, and a brief discussion on SWR (or VSWR if you prefer.)

The second chapter is devoted to the dipole and its variations: the inverted-V, G5RV, trap dipoles, folded dipoles, multi-band dipoles, and dipole look-alikes. Chapter three covers the care and feeding of end-fed wires. Doug tells how to treat them properly so they won't bite! He will also make your day by telling you how to terminate true longwires—painlessly (so that most of the radiation will be in just one direction.)

During the time that W1FB was *QST* Technical Editor, he lived on a typical suburban lot in Newington, Connecticut. He had a tri-bander for 10, 15 and 20 meters on a 55-foot tower. Since Doug lacked the space to "go out" he decided to "go up" by optimizing his tower and beam for use on the lower amateur bands—especially 160-meters. You'll learn from his experience in one of the most informative chapters on vertical antennas ever written.

Since Doug used to live only 2 blocks from League HQ, he had to cope with over 1 volt of RF at the receiver antenna terminals when W1AW was on the air. With code practice and bulletins being sent on 7 bands, the result was the generation of all sorts of mixing products in many receivers. (This was before the time "bullet-proof" solid-state devices had been developed for receiver front ends.) All of this noise made reception difficult at best! The chapter on Special Receiving Antennas is the result of the author's experience using receiving loops and other types of antennas to overcome this problem. Of course, the antennas described offer a solution to other forms of man-made noise as well.

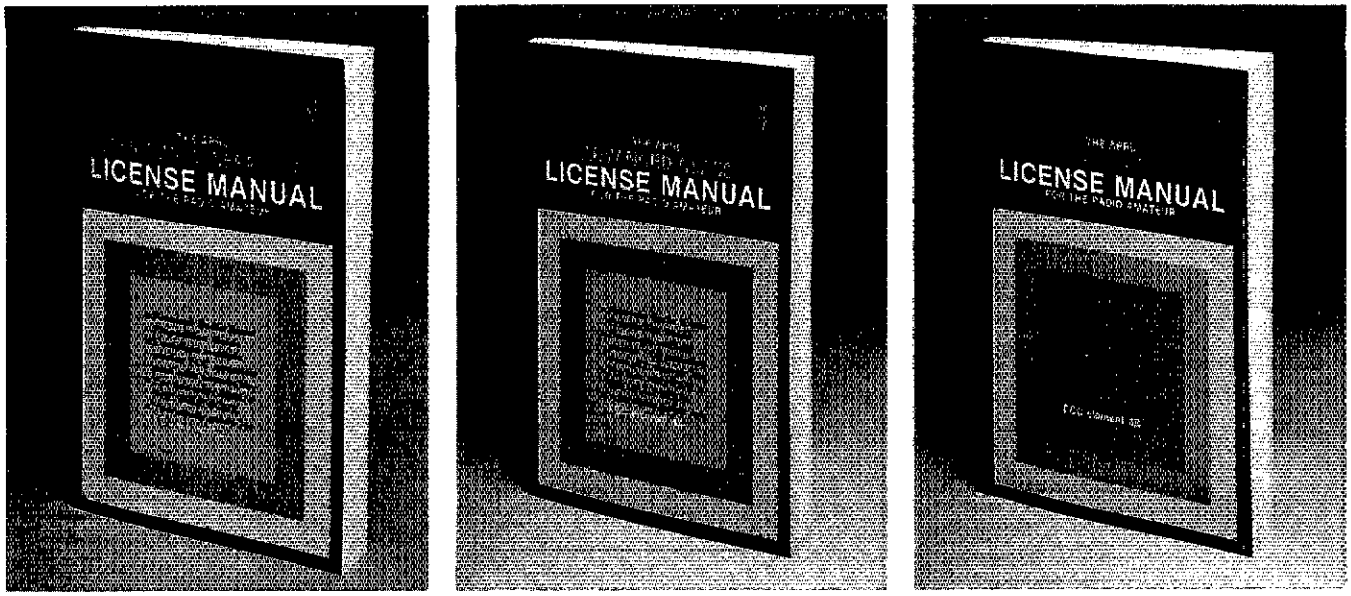
Wire antennas come in two models: the basic street model, like the dipole, and high performance "off road" configurations. The latter actually provide gain over a dipole in certain directions and are described at length: loops (in almost all geometric configurations,) collinear arrays, and cloud-warmers (for effective short-range communication.)

We know of a local amateur who worked 200 countries from his apartment using a 33-foot end-fed invisible antenna running from the window to a nearby tree. He used a black plastic comb as an insulator on the far end. Chapter 6 is devoted to limited-space and invisible antennas including flag poles, TV antennas (the guy lines are the antenna) and the half sloper.

Need a match? The chapter on matching techniques has circuits ranging from simple L-networks to complete Transmatches.

The final chapter is devoted to measurements. It tells how to build and use such useful devices as field strength meters, SWR bridges, noise bridges, dip meters and a current sampling meter for verticals.

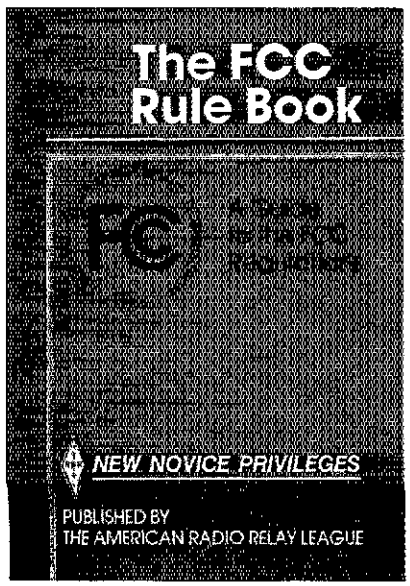
That is *W1FB's Antenna Notebook* in a nutshell. This 122 page publication is available for $8.00 at your dealer or directly from ARRL. Please add $2.50 ($3.50 for UPS) for shipping and handling.



The popular **ARRL License Manual Series.** *The ARRL Technician/General Class License Manual* separates the study material for the Element 3A (Technician) and Element 3B (General) exams for easy study. The material covering the Technician Class is good for exams given through Oct. 31, 1989; the General Class material is good through Oct. 31, 1990. *The Advanced Class License Manual* is good through Oct. 31, 1990 and *The Extra Class License Manual* is good through Oct. 31, 1988.

PASSING POWER!

These publications are just the "ticket" for obtaining your first Amateur Radio license or upgrading to a higher class. *Tune in the World with Ham Radio* is our beginner's package and has been expanded to cover the voice and digital privileges now enjoyed by Novice licensees. Two C-90 cassettes in the kit make learning the code a snap! **The ARRL License Manual Series** covers what you need to know in order to pass the higher class exams. *The FCC Rule Book* has the current FCC regulations that every radio amateur needs, and it has "Washington Mailbox" style rule interpretations found in the popular *QST* column by that name. For code instructions, we have the *Code Kit* (2 C-60) cassettes that cover from 5 to 13 words-per-minute), individual cassettes, and *Morse Code, the Essential Language* which gives tips on learning the code plus its history and usefulness.



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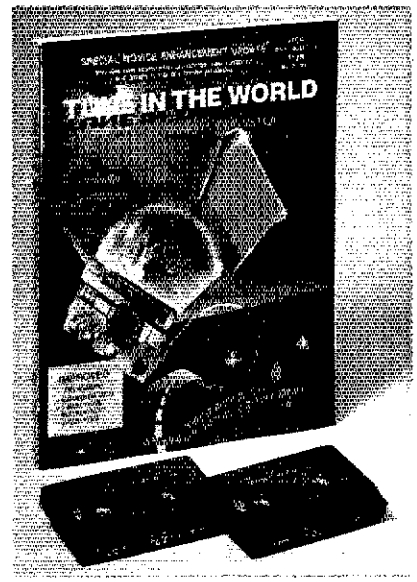

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THE 1988 ARRL HANDBOOK

This is the most comprehensive edition since the *Handbook* was first published in 1926. It is updated yearly to present the cutting edge of rf communication techniques while presenting hundreds of projects the average Amateur Radio operator can build. The 65th edition is packed with information on digital communication modes as well as new power supplies and amplifiers. Ready-to-use etching patterns are provided for many projects. This *Handbook* belongs in every ham shack.

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THE ARRL ANTENNA BOOK represents the best and most highly regarded information on antenna fundamentals, transmission lines, and propagation. 328 pages copyright 1982.

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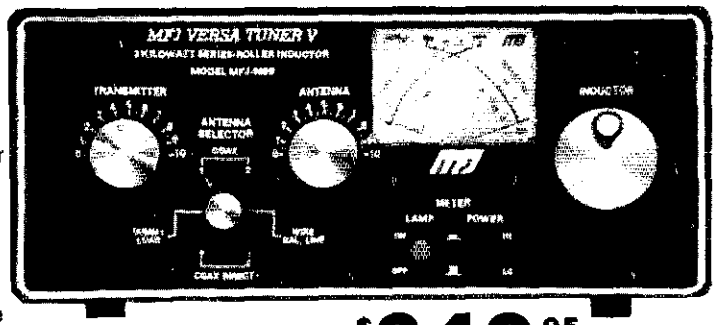
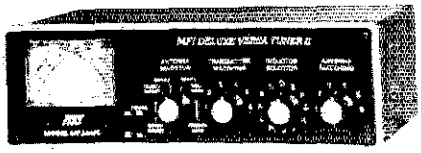


The MFJ-989B's 2-color, lighted Cross-Needle Meter not only gives you SWR automatically with no controls to set but also forward and reflected power at a glance!

Plus . . . 6-position antenna switch, 50 ohm dummy load, 4:1 balun for balanced lines, ceramic feed-through, and flip-stand for easy viewing. Meter light requires 12 V

MFJ-989B $349.95

MFJ's Best VERSA TUNER II



MFJ's all-in-one Deluxe Versa Tuner II gives you a clutter-free shack and all the features you could ever want at a super price. Here's what you get: coax/balanced line/random wire 300 watt tuner for 1.8-30 MHz, Cross-Needle SWR/Wattmeter, 50 ohm dummy load, 4:1 balun and 6-position antenna switch . . . all in a compact 10x3x7 inch cabinet that matches the smaller new rigs.

MFJ-949C $149.95

You can tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A lighted Cross-Needle meter gives you SWR, forward and reflected power -- all at a glance. A 6-position antenna switch lets you select 2 coax lines, direct or through tuner, random wire/balanced line and dummy load. 1000 volt capacitors, efficient airwound inductor, heavy duty switches.

MFJ's smallest VERSA TUNER

MFJ-901B $59.95

The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP Versa tuner -- when both your space **and** your budget is limited. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced and coax lines continuously 1.8-30 MHz. **Excellent for matching solid state rigs to linears.** Efficient airwound inductor. 4:1 balun.

144/220 MHz VHF TUNERS

MFJ-920 $49.95

MFJ-921 $69.95

MFJ's newest VHF tuners cover both 2 Meters and the new Novice 220 MHz bands. They handle 300 watts PEP and match a wide range of impedances for coax fed antennas. MFJ-921 has SWR/Wattmeter.

MFJ's Fastest Selling TUNER

The MFJ-941D is MFJ's best selling 300 W PEP antenna tuner! Why? Because it has more features than tuners costing much more and it matches everything continuously from 1.8-30 MHz.

MFJ-941D $99.95

It matches dipoles, vees, verticals, mobile whips, random wires, balanced and coax lines.

SWR/Wattmeter reads forward/reflected power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. Has 4:1 balun, 1000 V capacitors, 11x3x7 inches.

MFJ's Mobile TUNER

MFJ-945C $79.95

Don't leave home without this **mobile** tuner! Have an uninterrupted trip as the MFJ-945C **extends your antenna bandwidth** and eliminates the need to stop, go outside and readjust your mobile whip.

You can **operate anywhere in a band and get low SWR.** You'll get maximum power out of your solid state or tube rig and it'll run cooler and last longer.

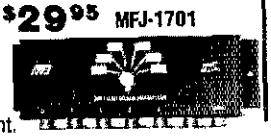
Small 8x2x6 inches uses little room. **SWR/Wattmeter and convenient placement of controls make tuning fast and easy while in motion.** 300 watts PEP output, efficient airwound inductor, 1000 volt capacitors. Mobile mount, MFJ-20, $3.00.

2 KW COAX SWITCHES

MFJ-1702 $19.95

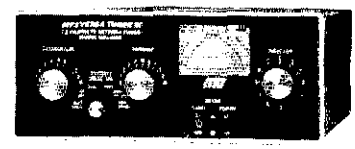
MFJ-1702, $19.95. 2-positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

MFJ-1701 $29.95



MFJ-1701, $29.95. 6-positions. Unused positions grounded. For desk or wall mount.

MFJ's 1.5 KW VERSA TUNER III



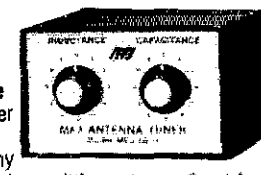
The MFJ-962B lets you use your barefoot rig now and have the capacity to add up to a 1500 watts PEP linear amplifier later. Its small size -- 10¾x4½x15 inches -- matches the new compact rigs.

MFJ-962B $229.95

A lighted Cross-Needle SWR/Wattmeter makes tuning a snap and gives you SWR, forward and reflected power -- all at a glance.

6-position antenna switch handles 2 coax lines, direct or through tuner, wire and balanced lines. 4:1 balun, efficient airwound inductor with heavy duty ceramic switch, 6 KV capacitors. Flip-stand tilts tuner for easy viewing.

MFJ's Random Wire TUNER

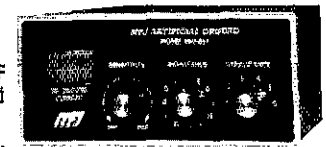


MFJ-16010 $39.95

You can operate all bands anywhere with any transceiver when you let the MFJ-16010 turn any random wire into a transmitting antenna. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. Handles 200 watts. Ultra compact 2x3x4 in.

MFJ Artificial RF ground

$79.95 MFJ-931



You can create an artificial RF ground and eliminate RF "bites", feedback, TVI and RFI when you let the MFJ-931 resonate a random length of wire and turn it into a tuned counterpoise. The MFJ-931 also lets you electrically **place a far away RF ground directly at your rig** -- no matter how far away it is -- by tuning out the reactance of your ground connection wire.

ORDER ANY PRODUCT FROM MFJ AND TRY IT -- NO OBLIGATION. IF NOT SATISFIED RETURN WITHIN 30 DAYS FOR A NO-HASSLE REFUND (less shipping).
• One year **unconditional** guarantee • Add $5.00 each shipping/handling • Call or write for free catalog, over 100 products.

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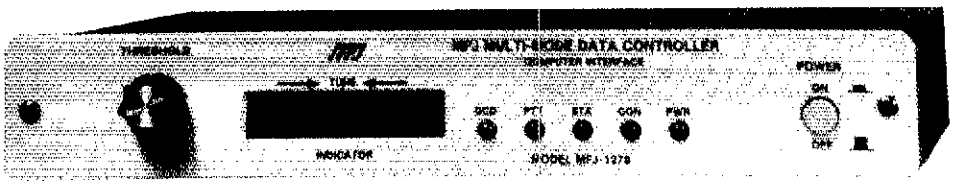
Box 494, Miss. State, MS 39762

FOR YOUR NEAREST DEALER OR TO ORDER
800-647-1800
Call 601-323-5869 in Miss. and outside continental USA. Telex 53-4590 MFJ STKV.
In Canada Call TEXPRO 416-332-5944.

MasterCard VISA

MFJ . . . making quality affordable

MFJ multi-mode data controller



MFJ *shatters* the 6 mode barrier *and* the price barrier with the MFJ-1278 and gives you . . . Packet, RTTY, ASCII, CW, WEFAX, SSTV and Contest Memory Keyer . . . 7 digital modes . . . for an affordable $249.95

Amateur radio's newest multi-mode data controller -- the MFJ-1278 -- lets you join the fun on Packet, RTTY, ASCII, CW, Weather FAX, SSTV and gives you a full featured Contest Memory Keyer mode . . . you get 7 modes . . . for an affordable $249.95.

Plus you get high performance HF/VHF/CW modems, software selectable dual radio ports, precision tuning indicator, 32K RAM, AC power supply and more.

You'll find it *the most user friendly of all multi-modes.* It's menu driven for ease of use *and* command driven for speed.

A high resolution 20 LED tuning indicator lets you *tune in signals **fast** in any mode.* All you have to do is to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

All you need to join the fun is an MFJ-1278, your rig and any computer with a serial port and terminal program.

You can use the MFJ Starter Pack to get on the air instantly. It includes computer interfacing cable, terminal software and friendly instructions . . . everything you need to get on the air fast. Order MFJ-1282 (disk)/MFJ-1283 (tape) for the C-64/128 and VIC-20 or MFJ-1284 for the IBM or compatible, $19.95 each.

Packet

Packet gives you the fastest and most reliable error-free communications of any amateur digital mode.

With MFJ's super clone of the industry standard -- the TAPR TNC-2 -- you get **genuine TAPR** software/hardware plus more -- not a "work-a-like" imitation.

Extensive tests published in *Packet Radio Magazine* ("HF Modem Performance Comparisons") prove the TAPR designed modem used in the MFJ-1278 gives better copy with proper DCD operation under all tested conditions than the other modems tested.

Hardware DCD gives you more QSOs because you get reliable carrier detection under busy, noisy or weak conditions.

A hardware HDLC gives you full duplex operation for satellite work or for use as a full duplex digipeater. And, it makes possible speeds in excess of 56K baud with a suitable external modem.

Good news for SYSOPs! New software lets the MFJ-1278 perform flawlessly as a WORLI/WA7MBL bulletin board TNC.

Baudot RTTY

You can copy all shifts and all standard speeds including 170, 425 and 800 Hz shifts and speeds from 45 to 300 baud. You can *copy not only amateur RTTY but also press, weather and other exciting traffic.*

A high performance modem lets you copy both mark and space for greatly improved copy under adverse conditions. It even tracks slightly drifting signals.

You can transmit both narrow and wide shifts. The wide shift is a standard 850 Hz shift with mark/space tones of 2125/2975 Hz. *This lets you operate MARS and standard VHF FM RTTY.*

You get both the American Western Union and the international CCITT character sets. Autostart for unattended reception and selectable "Diddle".

A receive Normal/Reverse software switch eliminates retuning and Unshift-On-Space reduces errors under poor receiving conditions.

ASCII

You can transmit and receive 7 bit ASCII using the same shifts and speeds as in the RTTY mode and using the same high performance modem. You also get Autostart and selectable "Diddle".

CW

You get a Super Morse Keyboard mode that lets you send perfect CW effortlessly from 5 to 99 WPM, including all prosigns -- it's tailor-made for traffic handlers.

A huge type ahead buffer lets you send smooth CW even if you "hunt and peck".

You can store entire QSOs in the message memories, if you wanted to! You can link and repeat any messages for automatic CQs and beaconing. Memories also work in RTTY and ASCII modes.

***A** tone Modulated CW mode turns your VHF FM rig into a CW transceiver* for a new fun mode. It's perfect for transmitting code practice over VHF FM.

An AFSK CW mode lets you ID in CW.

The CW receive mode lets you copy from 1 to 99 WPM. Even with sloppy fists you'll be surprised at the copy you'll get with its powerful built-in software.

You also get a random code generator that'll help you copy CW faster.

Weather FAX

***You'll** be fascinated as you watch WEFAX signals blossom into full fledged weather maps on your printer.* Other interesting FAX pictures can also be printed -- such as some news photographs from wire services.

Any Epson graphics compatible printer will print a wealth of interesting pictures and maps.

Automatic sync and stop lets you set it and leave it for no hassle printing.

You can save FAX pictures and WEFAX maps to disk if your terminal program lets you save ASCII files to disk.

Pictures and maps can be *printed to screen in real time or from disk* on IBM and compatibles with the MFJ-1284 Starter Pack.

You can transmit FAX pictures right off disk and have fun exchanging and collecting them.

Slow Scan TV

The MFJ-1278 introduces you to the exciting world of slow scan TV.

You'll not only enjoy receiving pictures from thousands of SSTVers all-over-the-world but you can send your own pictures to them, too.

You can print slow scan TV pictures on any Epson graphics compatible printer. If you have an IBM PC or compatible you can print to screen in near real time or from disk with the MFJ-1284 Starter Pack.

You can transmit slow scan pictures right off disk -- there's no need to set up lights and a camera for a casual contact.

You can save slow scan pictures on disk from over-the-air QSOs if your terminal program lets you save ASCII files.

The MFJ-1278 transmits and receives 8.5, 12, 24, and 36 second black and white format SSTV pictures using two levels.

Contest Memory Keyer

***Nothing** beats the quick response of a memory keyer during a heated contest.*

You'll score valuable contest points by completing QSOs so fast you'll leave your competition behind. And you can snag rare DX by slipping in so quickly you'll catch everyone by surprise.

You get iambic operation with dot-dash memories, self-completing dots and dashes and jamproof spacing.

Message memories let you store contest RST, QTH, call, rig info -- everything you used to repeat over and over. You'll save precious time and work more QSOs.

You get automatic incrementing serial numbering. In a contest it can make the difference between winning and losing.

A weight control lets you penetrate QRM with a distinctive signal or lets your transmitter send perfect sounding CW.

More Features

Turn on your MFJ-1278 and it sets itself to match your computer baud rate. Select your operating mode and the correct modem is automatically selected.

***Plus** . . .* printing in all modes, threshold control for varying band conditions, tune-up command, lithium battery backup, RS-232 and TTL level serial ports, watch dog timer, FSK and AFSK outputs, output level control, speaker jack for both radio ports, test and calibration software, Z-80 at 4.9 MHz, 32K EPROM, and socketed ICs. FCC approved. 9x1½x9½ inches. 12 VDC or 110 VAC.

Get yours today and join the fun crowd!

MFJ

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
601-323-5869 **Telex:** 53-4590 MFJSTKV

FOR YOUR NEAREST DEALER
or to order call toll free
800-647-1800

One Year Unconditional Guarantee

MFJ . . . making quality affordable

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received April 14 through May 13 will appear in July *QST*. If the 13th 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 firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in your advertising before your 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 character of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason.

CLUBS/HAMFESTS/NETS

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers—W7GAQ/6, 146 Coleen Street, Livermore, CA 94550.

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1:00-3:00 PM Eastern Time. Rev. Thomas Sable, S.J., University of Scranton, Scranton, PA 18510.

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. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

FCC EXAMS. Novice-Extra Class, Walk-in's only. Sunnyvale VEC ARC, POB 60142, Sunnyvale, CA 94088-0142, 408-255-9000, 24/hr. Gordon, W6NLG, President. Flea Market, March-Sept, Foothill College, Los Altos Hills, CA.

JOIN The Old 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., 20933 Brant Avenue, Long Beach, CA 90810.

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610.

LITTLE Big Horn Net Sundays: 14.067 MHz, 2200 UTC, 21.176 MHz 2230 UTC. Historians and Native Americans welcome. SASE WA2DAC.

ANNUAL Flemington, NJ Hamfest by Cherryville Repeater Association, will be held Saturday April 16 at Hunterdon Central High School Field House on Route 31. Doors open at 8:00 AM, with breakfast and lunch served on site. Talk-in: 146.52, 147.975/.375, 147.615/.015, 222.52/224.12, and 449.85/444.85 MHz. For table reservations and advance ticket sales, call 201-788-4080 or write Marty Grozinski, NS2K, 6 Kirkbridge Road, Flemington, NJ 08822. FCC Exams will be given: send FCC 610 Form, copy of current license and $4.55 (checks to ARRL/VEC) to Cherryville Repeater Association, Box 308, Quakertown, NJ 08822.

DAYTON Hamvention®

April 29, 30, May 1, 1988

Early Reservation Information

• Giant 3 day flea market • Exhibits
• License exams • Free bus service
• CW proficiency test • Door prizes

Flea market tickets and grand banquet tickets are limited. Place your reservations early, please.

Flea Market Tickets
A maximum of 3 spaces per person (non-transferable). Tickets (valid all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. Vendors MUST order registration ticket when ordering flea market spaces.

Special Awards
Nominations are requested for "Radio Amateur of the Year", "Special Achievement" and "Technical Achievement" awards. Contact; Hamvention Awards Chairman, Box 964, Dayton, OH 45401.

License Exams
Novice thru Extra exams scheduled Saturday and Sunday by appointment only. Send FCC form 610 (Aug. 1985 or later) - with requested elements indicated at top of form, copy of present license and check for $4.35 (payable to ARRL/VEC) to: Exam Registration, 8830 Windbluff Point, Dayton, OH 45458

Hamvention Video
VHS video presentation about the HAMVENTION is available for loan. Contact Dick Miller, 2853 La Cresta, Beavercreek, OH 45324

1988 Deadlines
Award Nominations: March 15
Lodging: April 2
License Exams: March 26
Advance Registration and banquet:
USA - April 4 Canada - March 31
Flea Market Space:
Orders will not be processed **before** January 1

Information
General Information: (513) 433-7720
or, Box 2205, Dayton, OH 45401
Flea Market Information: (513) 898-8871
Lodging Information: (513) 223-2612
(No Reservations By Phone)

Lodging
Reservations received after Housing Bureau room blocks are filled will be returned along with a list of hotel/motels located in the surrounding areas of Dayton. The reservation will then become the responsibility of the individual.

HAMVENTION is sponsored by the Dayton Amateur Radio Association Inc.

Lodging Reservation Form

Dayton Hamvention - April 29, 30, May 1, 1988
Reservation Deadline - April 2, 1988

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

Arrival Date _____
[ ] Before 6 pm [ ] After 6 pm

Departure Date _____

Rooms: [ ] Single [ ] Double (1 bed, 2 persons)
[ ] Double Double (2 beds, 2 persons)

Deposit required - Room deposit must be paid directly to the hotel or motel by date shown on the confirmation form sent to you. Use canceled check for confirmation.

Mail to - Lodging,Dayton Hamvention, 1880 Kettering Tower, Dayton, OH 45423-1880

(PLEASE SEPARATE)

Advance Registration Form

Dayton Hamvention 1988
Reservation Deadline - USA-April 4, Canada-March 31

Name _____

Address _____

City _____ State _____ Zip _____

	How Many		
Admission (valid all 3 days)	_____	@ $8.00*	$_____
Grand Banquet	_____	@ $16.00**	$_____
Women's Luncheon (Saturday)	_____	@ $6.75	$_____
(Sunday)	_____	@ $6.75	$_____
Flea Market (Max. 3 spaces)	_____	$23/1 space $50/2 adjacent $150/3 adjacent	$_____
Admission ticket must be ordered with flea market tickets		**Total**	$_____

* $10.00 at door ** $18.00 at door, if available

Make checks payable and mail S.A.S.E. to -
Dayton Hamvention, Box 2205, Dayton, OH 45401

KANKAKEE Hamfest The annual Kankakee Hamfest will be held at the Kankakee County Fairgrounds on May 15, 1988; from 8 AM-3 PM. ARRL booth, large flea market and many exhibitors. $2.50 in advance, $3 at the gate. Take exit 308 off I-57 to Rt. 45 South 1 mile. For further info contact Frank DalCanton, KA9PWW, RR #1, Box 361, Chebanse, IL 60922, 815-932-6703 nights.

THE 19th Annual B*A*S*H will be held on Friday Night of the Hamvention, April 29, 1988 at the Conference Center (Madison Room) of the HARA Arena and Conference Center, (the same location as the Hamvention), starting at 7:00 PM. There is no admission charge, and free continuous entertainment. Hot dinner, sandwichs, snacks and beverages are available. Two exciting top awards, and many others. Stay right at HARA when the Hamvention closes on Friday evening and meet your friends and join us for an evening of fun and entertainment. Sponsored by the Miami Valley FM Association, P.O. Box 263, Dayton, OH 45401.

HAMFEST Sunday May 15, 1988. LIMARC ARRL Long Island Hamfair at the New York Institute of Technology Route 25A/Northern Blvd., Old Westbury, NY. Outdoor tailgateing, no reservations needed, sellers car space $5, general admission $3. Non-Ham women & children free. Exit 39 North on Route 495, go North on Glen Cove Road 2 miles to 25A, turn right 1 mile to site. Talkin 146.25/85. Food, refreshments available with many awards to attendees. Open 7:30 AM for sellers, 9:00 AM for buyers. For further info call Hank Wener, WB2ALW, 516-484-4322 or Mark Nadel, NK2T, 516-796-2366. Next fest 9-18.

THE KISHWAUKEE Amateur Radio Club is sponsoring their 33rd annual hamfest, the first Sunday in May, May 1, 1988 at the Sandwich fairgrounds in Sandwich, Illinois. Hours are 8 AM-1 PM. Overnight camping is permitted, but without hookups. Reserved tables are $5 in advance. Tickets are $2 in advance and $3 at the door. Talk-in 1373. For more information contact Howard Newquist, Kishwaukee Amateur Radio Club, P.O. Box 264, Sycamore, IL 60178.

QSL CARDS/RUBBER STAMPS/ENGRAVING

CANADIANS QSL samples $1 (refundable) M. Smith, VE7FI, Box 1376, Delta, BC V4M 3T3.

DON'T buy QSL cards until you see my free samples or draw your own design. I specialize in custom cards. Send black and white sketch: will give quote. I would also like to introduce you to our personalized QSL Business Cards. Same size as standard business cards (3-½ × 2). Write or call for free samples. Little Print Shop, Box 1160, Pflugerville, TX 78660, 512-990-1192.

FREE samples—stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs—1)FAMOUS KØAAB custom collection. 2)Railroad employees and railfan's specials. 3)Front report styles. 4)Multiple callsigns. 5)Ham business cards. State your sample wants. 39 cents self addressed business size envelope required. Marv Mahre, WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109-3621.

BE SURPRISED—get a variety of cards—100 for $8 or 200 for $13. Samples $1 refundable. Add $2 S&H. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

FREE, 100 QSLs with first order. Samples 50 cents. Gazebo Press, Rt. 4 Box 4148, LaPlata, MD 20646.

ENGRAVING: Callsign/Name Badges by WØLQV. SASE for price sheet. Box 4133, Overland Park, KS 66204.

CADILLAC of QSLs—Completely different! Samples $1, (refundable). Mac's Shack, P.O. Box 43175, Seven Points, TX 75143.

PICTURE QSL CARDS of your shack, etc. from your photo or black ink art work. 500 $25.50; 1000 $39.50. Also non-picture cards. Customized cards, send specifications for estimate. Send two stamps for illustrated literature. Generous sample kit $2; half pound of samples $3. Raum's, R.D. 2, Orchard Road, Coopersburg, PA 18036. Phone 1-215-679-7238

QUALITY QSLs, Samples 50 cents. Olde Press, WB9MPP, Box 1252, Kankakee, IL 60901.

COLORFUL QSLs by WA7LNW—Improve your QSL returns! Revolutionary printing process combines brilliant rainbow colors with sparkling metallic inks. The ultimate QSLs! Samples $1 (refundable) COLORFUL QSLs, P.O. Box 5358, Glendale, AZ 85312-5358.

QSLs, QSLs, Rusprint QSLs quantities of 100, 200, 300 or more. Full color of Old Glory and cartoons. Also parchment, golden eagle and others. SASE appreciated. Rusprint, Rt. 1, Box 363-QST, Spring Hill, KS 66083.

EMBROIDERED Emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

POST CARDS QSL Kit—Converts Post Cards, Photos to QSL's! Stamp brings circular. My Type Shop, P.O. Box 172, Leeds, NY 12451.

QSLs by 'Sam' (samples $1). Sam's Print/Wheels, P.O. Box 55, Petersburg, NY 12138-9729.

MAGNETIC Callsign ... 2 inches x 8 inches ... Instant transfer car to car! Your call in lettering Black, Blue, Green or Red (white background). Each sign only $8.50 ppd. Sign-On, Dept. T, 1923 Edward Lane, Merrick, NY 11566.

FULL Color—3,000 $300; 6,000 $400; 12,000 $600: WA8CZS, 1-614- 452-6375.

DAYTON Hamvention ... We'll be there. Please drop by and chat with Lola & me. QSLs by W4MPY, 705 Audubon Circle, Belvedere, SC 29841.

QUALITY QSL Cards and Rubber Stamps. Send 39 cents postage or SASE for samples. New stock designs or custom cards from your black ink artwork. Sandollar Press, P.O. Box 30726 Santa Barbara, CA 93130.

KENWOOD

TS-940S
NEW Top-of-the-Line
HF Transceiver
- 100% Duty Cycle
- 40 Memory Channels

CALL FOR SPECIAL PRICES!!

TS-440S NEW!
CALL FOR SPECIAL SALE PRICE

TS-140S
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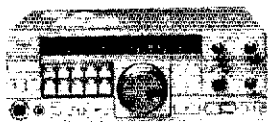

TS-711A **TS-811A**
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TW4100A
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TR-751A
All Mode 2m Mobile

COMPACT 2M FM MOBILE

TM 2570A (70W) TM 3530A (25W)
TM 2550A (45W) TM 221A (45W)
TM 2530A (25W)

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High Tech 2M
HT XCVR

TH215A
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TH-25AT
TH21BT, TH31BT
TH41AT Also in Stock
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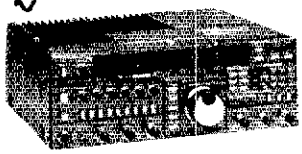
YAESU



FT 767 GX HF/VHF/UHF
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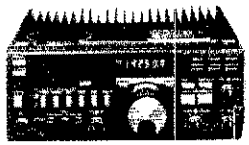

FT-757GX/II
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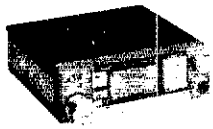
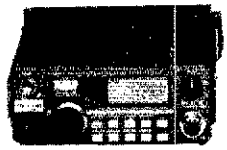


FT2700RH NEW 2M/70cm
Dual Band Transceiver
Full Duplex-Cross Band
Operation
CALL FOR PRICE-SAVE $$!



NEW FT290R 2m Portable
NEW FT690R 6m Portable
CALL FOR SALE PRICES!

FT 209/709 RH
NEW HIGH
Tech HT's
5W Output

New!
FT727 RH
2m/70 cmHT
- 5w Output
- 10 memories
- Battery saver

Call For Sale Prices

FT 23R 2m HT
FT 73R 70 cm HT
- compact size
- 10 memories
- up to 5W output W/FNB 11

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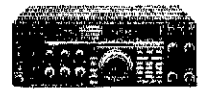
ASTRON POWER SUPPLIES

Heavy Duty- High Quality - Rugged -Reliable
- Input Voltage:105-125 VAC Output:13.8 VDC ± .05V
- Fully Electrically Regulated 5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series with Meter A-Series Without Meter

Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

ICOM



IC-761 New HF XCVR
- Built-in AC Power Supply
- Built-in Automatic Tuner
- PBT Plus IF Shift
- QSK Up To 60 WPM

CALL TODAY FOR SALE PRICE

IC735 NEW General Coverage
Ultra Compact
CALL FOR SPECIAL PRICE!

IC-27A	IC-27H
IC-28A	IC-28H
IC-37A	IC-47A
IC-38A	IC-48A

CALL TODAY FOR SPECIAL ICOM PRICES!

IC02AT - 2mtr
IC03AT - 220 MHz
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High Tech
HT XCVRS

NEW
IC-μ2AT
2m HT

- micro design covers 140-163 MHz
- 10 mem. w/scan
- LCD Readout

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TEN-TEC

PARAGON
General Coverage HF Transceiver
Microprocessor Controlled Multi-Scan
62 Memories Call For Special Sale Price

561 Corsair II	$ CALL
960 Power Supply	$ CALL
229 2KW Tuner	$ CALL
425 Titan Amplifier	$ CALL

MIRAGE

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$289
B23A	2M	Yes	2W	30W	$129
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$259
B3016	2M	Yes	30W	160W	$229
D1010N	440	No	10W	100W	$319

rfconcepts

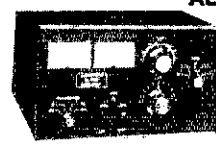
rfc 2-317 2M
30W In = 170W out
LIST $299.00

Model	Band	In-Out	List Price
2-23	2M	2-30W	$112.00
2-217	2M	2-170W	$299.00
2-117	2M	10-170W	$299.00
2-417	2M	45-170W	$299.00
3-22	220	2-20W	$112.00
3-211	220	2-110W	$299.00
3-312	220	30-120W	$264.00

Call For Sale Prices

AMERITRON

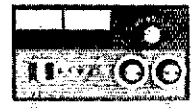
AL80A



AL80A	$985.00	ATR10	$325.00
AL84	479.00	ATR15	380.00
AL1200	1825.00	RCS4	134.50
AL1500	2370.00	RCS8V	134.50

CALL FOR SALE PRICES!

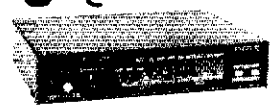
AMP SUPPLY



Model	List	Model	List
LK450	$899	LK45ONT	$1199
LK500ZC	$1395	LK500NT	$1595
LK800A	$2695	LK800NT	$2995
LK550	$1895	AT 3000	$ 499

CALL AND SAVE $$$$$

AEA



PK-232 Packet Controller.....$299.95
144 MHz Isopole.....$49.95
440 MHz Isopole.....$59.95
Other AEA products also in stock call!!!

ALINCO

ELH-230G	CALL	ALR-22T	CALL
ELH-230D		ALR-22HT	
ELH-260D		ALR-72T	
		ALD-24T	

Other items in stock - call!

Kantronics

KAM All Mode Terminal Unit.....$289.95
KPC II Packet Controller.....$159.90
KPC 4 Node Controller.....$299.90

MFJ

1270B/1274 TNC Units	$129.95/159.95
1224/1229 Interface	$89.95/$159.95
202/204 Antenna Bridges	$59.95/$79.95
250 Oil Load	$39.95
260/262 Dry Loads	$29.95/$59.95
407/422 Elect. Keyers	$69.95/$119.95
901/941D Tuners	$59.95/$99.95
949C/989 Tuners	$139.95/$299.95

NYE VIKING

MBV-A 3KW
Tuner

- Low Pass Pi-Network Tuning
- Built-in Antenna Switch/Balun

New-RF Power Monitor System $249.95
CALL TODAY TO SAVE $

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DVK-100 Digital
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- Built-in Auto Repeat Function
- Essential For Contesting
- Fully Compatible With All Xcvrs

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CALL Sign Badges: Custom license plate holders. Personal, distinctive. Club discounts. SASE. WB3GND, Box 750, Clinton, MD 20735, 301-248-7302.

QSLs Quality and Fast Service for 28 years. Include call for decal. Samples 50 cents. Ray, K7HLR, Box 331, Clearfield, UT 84015.

QSL Samples—25 cents. Samcards, 48 Monte Carlo Drive, Pittsburgh, PA 15239.

QSLs Samples $1 (refundable) (stamps okay) M. Dakin, Winzj Press, P.O. Box 265, Revere, MA 02151.

BROWNIES QSL Cards since 1939. Catalog & Samples $1 (refundable with order). 3035 Lehigh Street, Allentown, PA 18103.

QSLs & Rubber Stamps. Top quality QSL samples and stamp information $1. (Refundable with order.) Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

QSL CARDS. White, blue or yellow stock 100 for $9, additional 100 $3. Two week delivery, postpaid. Free samples. Shell Printing, KD9KW, Box 50, Rockton, IL 61072.

PHOTOS, Postcards—Become QSLs. Clear stick on labels. New! "Kall Kards". Stamp brings details. K-K-L, Box 412, Troy, NY 12181-0412.

QSL's—Quality for less is back! See our display ad in this issue of *QST*. Harry A. Hamlen, P.O. Box 1, Stewartsville, NJ 08886.

ANTIQUE-VINTAGE-CLASSIC

WANTED: Old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Avenue, Milw., WI 53204.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201, 818-242-8961.

WANTED: *QST* VOLUME 1. W6ISQ, 82 Belbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brand-name, Model No., SASE Scaramella, Box 1, Woonsocket, RI, 02895-0001.

TELEGRAPH Bugs and old keys wanted. Donations appreciated. John Hensley, WJ5J, 5054 Holloway Avenue, Baton Rouge, LA 70808.

WE MAY HAVE the tubes you need. (Thousands in stock). Send SASE for our list. Pala Electronics, P.O. Box 1376-1, Milwaukee, WI 53201.

BUY, Sell, Collect and Restore early tube equipment? Early receivers, tubes and telegraph gear? Join the Antique Wireless Association which sponsors old-time "meets", flea markets, museum and journal with technical articles and free want ads. Membership and annual dues only $10. Write for information and Museum hours: Bruce Kelley, W2ICE, Route 3, Holcomb, NY 14469.

CODE/CIPHER MACHINES Wanted! Historian buys code/cipher devices, manuals, books, etc! All periods! Melton, Box 5755, Bossier City, LA 71171, 318-798-7319.

WANTED: Hallicrafter silver panel Skyriders and other very old or unusual Hallicrafter equipment, parts, etc. Chuck Dachis, "The Hallicrafter Collector". 4500 Russell Drive, Austin, TX 78745.

ANTIQUE Radio Classified. If you buy, sell or collect old radios, subscribe to Antique Radio's largest circulation monthly magazine. Old radios, TVs, Ham Equip, 40's & 50's Radios, Telegraph, Books & more. Ads and Articles. Free 20-word ad monthly. Sample free. Six-month trial: $10. Yearly rates: $18 ($24 by 1st Class). Write for foreign rates. ARC, P.O. Box 2-B2, Carlisle, MA 01741.

MICROPHONES and related memorabilia used in radio/TV broadcasting prior to 1960 wanted. Cash paid: trade terms available. Write: James Steele, 160 West 77th Street, New York, NY 10024-6942.

I PAY CASH for new and used vacuum tubes, especially vintage and transmitting types. Randy Nachtrieb, WA6GJA, 6392 Park Avenue, Garden Grove, CA 92645, 714-897-9351.

MANUALS For most hamgear made 1935-1970, plus Kenwood. No quotes. Our current catalog "H" at $1 required to order. Over 2,000 models listed. Hi-Manuals, P.O. Box H-802, Council Bluffs, IA 51502-0802.

WANTED—*QST* 1915-1930 pre-1930, Radio Electrics, Callbooks, ARRL Handbooks. Richard Titus, NV2C, 231-9 Lucas Lane, Voorhees, NJ 08043.

EXTREMELY Rare—National NBS-1 Receiver. Special model of NC- 183 built for the National Bureau of Standards. Removed from service—NBS Laboratory, Boulder, Colorado. Works perfectly—almost like new appearance. 10-1/2 inch rackmount. $3,000. Stephen Burgess, 1-303-781-1787.

HELP, Need DM-33 or DY-8 Dynamotor used on BC-456 or MD-7/ARC-5 command set modulators. Pete Hamersma, WB2JWV, 87 Philip Avenue, Elmwood Park, NJ 07407.

WANTED: Johnson Courier. WB6TMY, 707-527-8124.

QST, 1922-1979 complete. All in hard cover bindings. Make offer. KD8F, 313-286-2485.

SELL: Ameco TX-62, VFO-621, CN-50, CN-144, $75. Clegg 22'er MK- II, $60. Heath Pawnee, $100. Clipperton-V, $225. Wanted: Heath SB102, Apache, Mohawk, Johnson Valiant. WA9ULU, 312-272-7125.

QST 1959-87, HR first-85, MacUser first-4/87, Macazine first-9/87. Best offers. Meyer, 601 Riley Road, Delphi, IN 46923.

OLD Books, Old & New Equipment For Sale. SASE for list. K4MSG, 204 S. Harrison Road, Sterling, VA 22170.

QST April 1938 through December 1975. Good cndx, $65, you ship. W2FWH, 201-843-5838, NJ.

WANTED: WWII Military Radios and Accessories. Need ATD Tuning Units, DY43 Dynamotor, BC 222/223 Manuals, ART-13 Connectors, ARR/41/MT-1518 Mount, ATB, GRC 106 Receiver, Hallicrafters HT20. Charlie, 501 Mystic Valley Pkwy., Medford, MA 02155.

SELL *QST* Oldest 1931. Some CQ, 73, HR, and Computer Mags. $1 each. Plus shipping, LSASE for list. Robert Willsey, W5VRA, Box 10, Martha, OK 73556.

US NAVY RBM-3 Receiver, ca. 1943 0.2 to 2 Mc. Clean, complete w/pwr supply, all tubes operating, $250. N6CJH, 182 Montclair, Ventura, CA 93003.

I PAY CASH For vintage audio equipment by Western Electric, Altec, McIntosh, Marantz, Westrex, etc. Randy Nachtrieb, WA6GJA, 6392 Park Avenue, Garden Grove, CA 92645, 714-897-9351.

WANTED: Antique Radios for my collection. Battery sets, early 20s. Good tubes: 200, 200-A, 201-A, WD-11, WD-12, WX-12, UV-199, C-299. Headphones. Charlie Rhodes, Journey's End Road, Vista, NY 10590.

GENERAL

WANTED: Drake R7A Receiver. Tony Ficarra, 144 Gladstone Avenue, Wollongong, NSW AUSTRALIA 2500.

DO-IT-URSELF DXpedition. Stay at ZF8SB. 2BR cottage, beach, Quad. Fish or dive if band folds. Write airmail: ZF8SB, Little Cayman, CAYMAN ISLANDS.

AMIGA Logging Program. Fully featured with user defined entry screen layout and integral QSO duping. Great for contests and operating log alike. Now in AZTEC "C", $40. Allen Ebert, VE3AXV, 924 Westbury Court, Sarnia, Ontario, CANADA N7T 7R7.

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COLLINS Repair and Alignment, former Collins engineer. Research and Consulting, Glenn A. Baxter, P.E., Registered Professional Engineer. K1MAN 207-495-2215.

WE BUY Electron tubes, diodes, transistors, integrated circuits, semiconductors. Astral Electronics, P.O. Box 707, Linden, NJ 07036. Call toll-free 800-526-4052.

FAST, ACCURATE, readable, nonsensational—The ARRL Letter! Every two weeks, we fill you in on what's happening in Amateur Radio. But, you have to be an ARRL member to get it. For a one year subscription, send $19.50 (U.S. funds) and we'll send you the Letter first class mail anywhere in the U.S. and Canada. The ARRL Letter, 225 Main St., Newington, CT 06111.

CHASSIS & CABINET Kits. 5120 Harmony Grove Rd., Dover, PA 17315, SASE K3IWK.

INTERNATIONAL Amateur Radio Network 45 minute programs daily: 3.975/14.275/28.475 at 1300Z, 1700Z, 2100Z, 2400Z, 0400Z plus Sunday on 3.890 MHz AM at 2200Z and 7.290 MHz AM at 2300Z. Glenn Baxter, K1MAN, Network Manager.

WANTED: Drake R7A Receiver. Genuine buyer. Tony Ficarra, 144 Gladstone Avenue, Wollongong, NWS AUSTRALIA 2500.

COMPREHENSIVE Apple Software Transmit/receive CW/RTTY with/without TU. Variable speed code practice. Calculate/display beam headings on world map. More. $49.95 and callsign brings disk and electronic manual for II/II + /IIe. SASE for free brochure. W1EO, 39 Longridge Road, Carlisle, MA 01741.

SAVE $1.50 SHIPPING on any ARRL book. Send book price plus $1 to Marshall Hill Enterprises, Bradford NH 03221.

TRYLON FREE-STANDING Towers, up to 95 feet, for info write BJX Supply, Box 388, Corfu, NY 14036.

RTTY JOURNAL, published 10 times per year for those interested in digital communications. Read about RTTY, AMTOR, MSO, Packet Radio, RTTY DX and Contests, and Technical Articles concerning the digital modes. $10 per year (foreign higher). RTTY Journal, 9085 La Casita Avenue, Fountain Valley, CA 92708.

RADIO SHACK Color Computers: Hardware and Software for ham use. Dynamic Electronics, Box 896, Hartselle, AL 35640, 205-773-2758.

SPY RADIOS WANTED! Buying all types of espionage radios and code machines! Especially wanted are military-type radios in civilian suitcases! Museum, Box 8145, Bossier City, LA 71113, 318-798-7319.

CRYPTOGRAPHY ITEMS wanted. Books, manuals, equipment. Anything related to secret codes or ciphers. WB2EZK, 17 Alfred Road, Merrick, NY 11566, 516-378-0263.

CX7 REPAIRS. Mandelkern, 505-526-0917.

WANTED: LAFAYETTE PrivaCom 3C, 525, 625, or GE5813B. Radio, 2053 Mohave Drive, Dayton, OH 45431, K9SQG.

"HAMLOG" COMPUTER Programs. 17 modules. Full Features. Auto-logs. 7-band WAS/DXCC. Apple $19.95. IBM, Kaypro, Tandy, C-128 $24.95. KA1AWH, PB 2015, Peabody, MA 01960. BLEEP BLOOP: Very distinctive NASA-style two tone beeper announces beginning and end of your transmission. Auto Mode finds you on the satellite. Kit $15.95, Assembled $19.95. John Day, P.O. Box 876, Capitola, CA 95010.

HAM RADIO REPAIR, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco, CA 94128, 408-729-8200.

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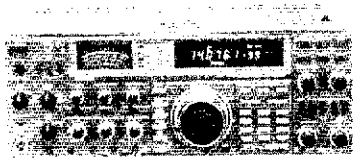

IC-761

HF Equipment	List	Juns
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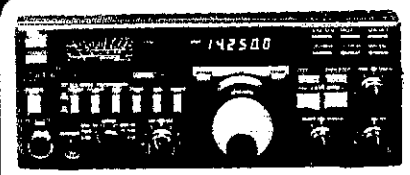
IC-761 Loaded With Extras	2499	Call $
IC-735 Gen. Cvg Xcvr	999.00	Call $
IC-751A Gen. Cvg. Xcvr	1649.00	Call $
IC-575A 10m/6m Xcvr	1399.00	Call $
Receivers		
IC-R7000 25-1300 + MHz Rcvr	1099.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	949.00	Call $
VHF		
IC-275A All Mode Base w/PS	1199.00	Call $
IC-275H All Mode Base 100w	1389.00	Call $
IC-28A FM Mobile 25w	429.00	Call $
IC-28H FM Mobile 45w	459.00	Call $
IC-2AT FM HT	299.00	Call $
IC-02AT FM HT	399.00	Call $
IC-μ2AT Micro HT	329.00	Call $
IC-900 Six Band Mobile	589.00	Call $
UHF		
IC-475A All Mode 25w	1399.00	Call $
IC-48A FM Mobile 25w	459.00	Call $
IC-4AT FM HT	339.00	Call $
IC-04AT FM HT	449.00	Call $
IC-μ4AT 440 FM HT	369.00	Call $
IC-3200A FM 2m/70cm 25w	599.00	Call $
220 MHZ		
IC-375A All-Mode, 25w, Base Sta.	1399.00	Call $
IC-38A 25w FM Xcvr	459.00	Call $
IC-37A FM Mobile 25w	499.00	Call $
IC-3AT FM HT	339.00	Call $
IC-03AT Deluxe HT	449.00	Call $
1.2 GHz		
IC-1271A All Mode 10w	1229.00	Call $
IC-120 1w, FM, Xcvr	579.00	Call $
IC-12AT Deluxe 1w HT	459.00	Call $

HF Equipment TS-440S/AT	List	Juns
TS-940S/AT Gen. Cvg Xcvr	$2349.95	Call $
TS-930S/AT Gen. Cvg Xcvr	1999.95	Call $
TS-830S Xcvr	1199.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1299.95	Call $
TS-140S Compact, Gen. Cvg Xcvr	899.95	Call $
TS-680S HF Plus 6m Xcvr	999.95	Call $
TL-922A HF Amp	1599.95	Call $
Receivers		
R-5000 100 kHz-30 MHz	949.95	Call $
R-2000 150 kHz-30 MHz	699.95	Call $
VHF		
TS-711A All Mode Base 25w	999.95	Call $
TR-751A All Mode Mobile 25w	629.95	Call $
TM-221A Compact FM 45w	419.95	Call $
TM-2530A FM Mobile 25w	459.95	Call $
TM-2550A FM Mobile 45w	489.95	Call $
TM-2570A FM Mobile 70w	589.95	Call $
TH21-BT FM, HT	279.95	Call $
TH-205 AT, NEW 2m HT	279.95	Call $
TH-215A, 2m HT Has It All	359.95	Call $
TH-25AT 5w Pocket HT NEW	329.95	Call $
TM-721A 2m/70cm, FM, mobile	TBA	Call $
UHF		
TS-811A All Mode Base 25w	1,199.95	Call $
TR-851A 25w SSB/FM	729.95	Call $
TM-421A Compact FM 35w	439.95	Call $
TH-415A 2.5w 440 HT	379.95	Call $
TH-41BT FM, HT	299.95	Call $
TH-45AT 5w Pocket HT NEW	349.95	Call $
TW-4100A. 2m/70cm FM	669.95	Call $
TR-50 1w 1.2GHz FM	599.95	Call $
220 MHZ		
TM-3530A FM 220 MHz 25w	479.95	Call $
TH-31BT FM, 220 MHz HT	299.95	Call $
TM-321A Compact 25w Mobile	439.95	Call $
TH-315A Full Featured 2.5w HT	379.95	Call $



HF Equipment FT 757GX	List	Juns
FT-747 GX New Economical Performer	$889.95	Call $
FT-757 GX II Gen. Cvg Xcvr	1129.95	Call $
FT-767 4 Band New	1929.00	Call $
FL-7000 15m-160m Solid State Amp	1895.00	Call $
Receivers		
FRG-8800 150 kHz - 30 MHz	759.95	Call $
FRG-9600 60-905 MHz	699.95	Call $
VHF		
FT-212RH NEW 2m, 45w mobile	459.95	Call $
FT-211RH FM Mobile 45w	459.95	Call $
FT-290R All Mode Portable	599.95	Call $
FT-23 R/TT Mini HT	334.95	Call $
FT-209RH FM Handheld 5w	359.95	Call $
UHF		
FT-712RH, 70cm, 35w mobile	499.95	Call $
FT-711RH FM Mobile 35w	479.00	Call $
FT-770RH FM Mobile 25w	479.95	Call $
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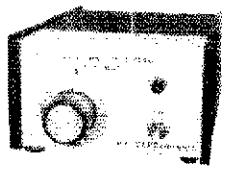

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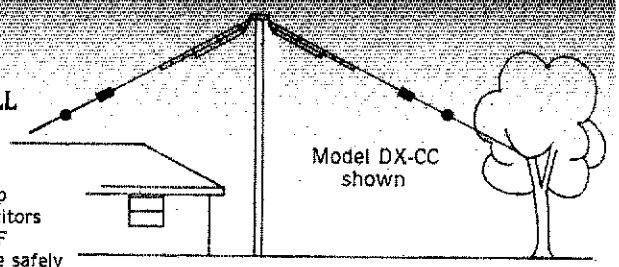

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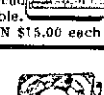

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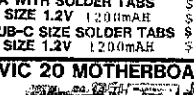

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MFJ 941D Ant. Tuner, brand new, $60. Also MFJ Wire Tuner 900, $18. KA1CO, 813-988-2131, Tampa, FL 33617.

KENWOOD TS 520 HF Transceiver, External Speaker, $400. Mosley CL- 33, 3 Element Tribander Beam, $100. Excellent working condition. Scott, WA4DPL, 404-442-1585 evenings.

MacINTOSH Satellite and Propagation Software. MacTrak™ displays graphic maps (rectangular, polar, great circle), views from space, schedules, windows. Also tracks Sun and Moon. Compatible with KLM/Mirage rotor interface. Shows gray line, sunrise/sunset, bearing/distance, MUF vs. time, areas of world "open". SASE for info or $49.95 from R. Stegemeyer, P.O. Box 1590, Port Orchard, WA 98366.

COLLINS KWM 2A with PM2, NB, 312B-5 and 312B-4 consoles, QFA-1 audio filter, Nye tp filter, D104 microphone, Hustler 4BTV antenna. First $895 takes all, u-pick-up please. Call Don, 718-317-6340.

MICROWAVE Modules MMT-432-28-S $210, Janel 50CA 50 to 14 MHz Converter $15, Hamtronics 432 to 28 MHz converter $15, Regency HR2A 2M FM Transceiver $75, Vibroplex Bug with case $45. NØTK, 303-770-5674.

STAINLESS Steel Turnbuckles, U-Bolts, Eye Bolts, Screw Eyes, Screws, Bolts. Elwick, Dept. 673-S, 230 Woods Lane, Somerdale, NJ 08083.

HAMMARLUND HQ 180 $150, Collins 75 S1 $150, Frederick RTTY 1204A Demodulator $150, Frederick RTTY Scope 1224 $100, Model 19 RTTY $50, RME 10, 6, 2 Converter $40. Henry, 203-426-8041.

4 ELEMENT Super Quad; Kirk 10-15-20 meter, complete with fiberglass arms, aluminum spider mounts, booms, couplers, hardware, instructions manual etc. $600 new—sell for $250 FOB. Also Kenwood Twins R599, T599 matching speaker, manuals, original packaging, $300. Paul, K2PE, 516-364-2047.

WANTED: Kenwood TS-130 SE. Please state condition, price and any accessories included. Philip Schmitt, 800 S. Kendall, Kalamazoo, MI 49007.

MOSLEY: TA-33JR complete with manual. First $125. I ship. WA3MNS, 201 Red Oak Lane, Waldorf, MD 20601, 301-843-1226.

WANTED: Johnson Courier. WB6TMY, 707-527-8124.

ICOM IC48A 450 MHz FM 25 watt with mobile ant. $350. WB2JFS. 157 No. Cologne Avenue, Egg Harbor, NJ 08215, 609-965-1787.

FOR SALE: Like new Kenwood TS520SE Transceiver, Kenwood MC50 mike, qual comp SWR bridge, headphones, additional speaker, AP-10 portable whip antenna. Original cartons. $450 takes all. F.M. Vermond, 11906 McKinley, Hebron, IL 60034, 815-648-4055.

SALE—ICOM Micro 2AT with BP22 and BP24 Battery + BC50U Charger. 10 mo old, mint cond. $300. Kenwood TR-9000 all mode 2 meter, good cond. $250. Pat Brown, 12702 Gotham Drive, Houston, TX 77089, 713-481-1275.

SELL: Gonset GSB-201, Mark III Linear, 2 KW 80-10, $300; Viking 275 W Matchbox, $65; Viking Ranger II, $125; Viking Navigator, $85; Hammarlund SP-600-JX17, $195; R390A, $245; Globe King 500A, $345; RME 4350, $95; Mosley CM-1 Receiver, $75; Hickock Tube Tester, $45; Heathkit Panoramic Adapter, $65; Hallicrafters SP44, $55; KWM2, SM-1, 516F2, Winged, Mint, $475; 312B5, Round, Mint, $275; B&W 5100, $65; 75A4 Speaker, $45; Hy-Gain 13-30 LPDA, $650; Hammarlund HX50, 160-10, $145; HRO-60, A, B, C, D, E, F, G Coils, $400; Bright Electronics A500 Frequency Counter, $100; Collins 75A1, $145; TMC GPR90RX, $140; 160-20, 4 KW Linear, $1500. FOB K8CCV, 216-427-2303, 6-9 PM EST weeknights.

YAESU FT727R Dual band handheld with FTS-6 board. New condition, $275. One FNB-4A battery pack. Never used, $40. WAØNZO, Leon, 701-563-4654.

RADIO Shack AX190, Q multiplier, speaker $55. Ham text for C64 new $50. Cassette C64 $16. Yaesu FT227R two meter, digital scanner $135. Kenwood TS120S, mobile mount, mint $360. Metal detector Outlaw DE280 as new $150. Scanner eight channel, crystal $65. Shipping extra. KD7FE, E5085 Highland Drive, Post Fall, ID 83854.

4CX1000A New in factory carton $200. We ship USA. WA5ALX, 1-505-524-3987.

WANTED: FTV-901R must be excellent condition. Prefer loaded. KA5WOO, 318-394-4455.

QUITTING Ham Radio after 38 years. Send SASE for list of equipment For Sale. K6CS, Charles, 14700 Carlos Circle #33, Rancho Murieta, CA 95683.

DTMF Touchtone decoder boards, speedcall model C527-12L. 12 momentary and 5 latching outputs. Hi-Z audio input. 12 volt power. Manual and schematic, $35. WB4ETT, Bob Ragain, 6001 South Grant Street, Littleton, CO 80121, 303-794-6978.

A SONG Featuring CW? Hear "Brass Pounder" on "All Round Fiddle", a new bluegrass album by Jim Queen, KB3Y. Send $7.50 + $1 postage & handling to Round Fiddle Records, Box 274, Oxon Hill, MD 20745. Maryland residents add 38 cents tax. Allow 6 weeks for delivery.

SmaRTTY for IBM compatible with RS232 port TU. Store incoming text to printer or disk. Send text from keyboard, preloaded buffers or textfiles. Split screen. Turbo Pascal programming, $20. InTeleSoft, 302 Pine Grove Circle, West Monroe, LA 71291, 318-388-1682.

HALLICRAFTERS FPM-300 SSB/CW 80-10M Transceiver used two years. Nice shape. $150 or best offer. Also Hallicrafters Receiver model SX-101A make offer. Hays, 312-234-7104 or write 204 Niles, Lake Forest, IL 60045.

DEAD Battery Pack??? NiCds/Inserts/Rebuilding. Replacement inserts, less wires/plugs: ICOM BP2 $17.95, BP3 (std.) $16.95, BP5 $23.95, Kenwood: PB24 $19.95, PB25/25H/26 $24.95, Tempo: S1 (270 mah) $21.95, S1, 2, 4, 5, 15 (450 mah) $22.95, Azden: 300 $19.95, Ten-Tec: 2991 $24.95, Santec: 144 w/plug $21.95, Yaesu: 207/208R (w/case) $23.95. For rebuilding; add $3 to install in ICOM, Kenwood, Motorola, GE, phone packs, others; SASE quotes/info. In PA add 6%. Add $2 S&H/order. Cunard Associates, RD 6, Box 104, Bedford, PA 15522.

MBA-TOR ROM $45. CP-1 $90. PK64A $170. All for CW/RTTY/AMTOR. Good condition. Don Kadish, 617-891-5287.

WANTED: Battery Drawer for Wilson T1405SM 2M HT. J.W. Brogden, W3VDL, 6020 Lebanon Drive, Falls Church, VA 22041.

ORLANDO—Florida—50 foot Rohn 25 Tower with Tribander and Ham 3 Rotor, $75,900. Also includes 3 bedroom, 2 bath ranch home, 1500 square feet, central air/heat, 2 car garage, fully landscaped, sprinklers, one of Orange County's highest points 130 ASL. Minutes from Disney World/Epcot. Pat Paris, WD4LXN, 6428 Undine Way, Orlando, FL 32818, 305-298-9424.

NEED Help in converting Flesher TU-170 for use on Tandy-1000 with RS-232. Chuck, KF4PC, 5 Par Harbor, Salem, SC 29676.

DRAKE MN2700 $325, MN2000 $225, TR4-CW with RIT, AC4, MS4, #45,000 $575, SP75 $85, MS4 $55; All super mint! John, 1117 DeWitt Terrace, Linden, NJ 07036, 201-486-0039.

WANTED: Heathkit Model MM-1 VOM or the meter for this VOM. K6UFZ, 9368 Balcom Avenue, Northridge, CA 91325.

CLEANING Shack—Argonaut, SB-303, SB-230, Echo II, Echo 70 cm, FT-620B, HP-23B, Rotators, Misc., Etc. #10 SASE for list, CBA—W1CRL.

FOR SALE: ICOM R71A Receiver with FM. About 100 hours use. Mint condition, $595. Greg Dzurisin, 1207 Thomas Drive, Champaign, IL 61821, 217-359-8174.

CHRISTIAN Hams please take note! We want to tell the world about Jesus through amateur radio. We supply missionaries with radio equipment, and patch messages to their families. For more information write: Blessings For Obedience, 1031 Andrews Hwy., Ste. 100, Midland, TX 79701, or call Kelly Coleman at 915-699-5149. God Bless You! Kelly Coleman, N5LXA.

MOTOROLA UHF Paspas 4 can duplexer $300; Heath GT2217 Demon Dialer, book $40; Hewlett Packard 3435A digital meter, battery, book, mint $450; Kenwood TR7950, tone, manuals $325; Yaesu FT207R, tone, mike, dualcharger, manuals $325; AEA MBA-RO Reader, new, manual $180; AEA KT-3 trainer $50; Motorola: Micor station metering test set, new $140; HT220 UHF 4w "pl" $150; HT440 UHF 4w 2t "pl" $220; MX UHF 6w "pl" $340. I ship. WB8MTE, Shima, 6809 Mayfield #1474, Mayfield Hts., OH 44124, 216-461-4357.

PACKET: Equipment For Sale. HAPN-1 packet radio adapter, manual, software, for IBM PC or compatible $65. Pakratt-64 w/32k mod., manual, power supply, cables for Commodore C64, C128 $45 FOB. Jack Horner, KA6SPY, 470 Hillcrest Place #5, Friday Harbor, WA 98250, 206-378-5377.

WANTED: Spark transformer, gap, spark key. Central Electronics 10A, all coils, mint only. W3HWT, 329 Evergreen Drive, North Wales, PA 19454.

WANTED: ICOM 22A. WA6AIZ, 805-259-3485.

C64 & 1541 12V Conversion. Pwr your C64 & 1541 from 13.8vdc & have AC/DC capability. (May require you to use the ext. pwr. opt. on User-Port Hdwe. if pwrd. by int. 9vac instead of 5vdc line.) Pwr. Supply/Timebase Kit $29.95. 1541 D/D Opt. add $9.95. Assd w/D-D Opt. $49.95 (simple C64/1541 mods req'd). $2 S&H. C.Check/MO to N7FAE, P.O. Box 373, Bonanza, OR 97623.

HAM Want Ads: Free Advertising, FREE COPY, wide distribution, bi-monthly, send your ad or request copy, free limited time. Brooks, 222 Cedar Avenue, Arlington, MA 02174.

DELUXE 2-Meter Station. ICOM IC-271H, AG-25 preamplifier, and PS-30 power supply. Like new in original cartons, $1100. W7LJI, 503-686-8879.

APPLE IIC Software, Packet, RTTY, CW, Logbook, Etc. K5HI, 2215 Goldsmith, Houston, TX 77030.

101 + CODE/THEORY Exam Passing Tips. $1 + SASE. Bahr, 2549-G3 Temple, Palmbay, FL 32905.

YAESU FT-101, Fox Tango Filter $350, Drake MN-4 $50. Keith, AA5AC, 505-821-1498.

WANTED: Hy-Gain 105BA, ICOM 230. KD0HH, 507-342-5774 or write.

DX ANTENNA, 40M, 3 element Delta Quad. Send for design data, construction details, feeding and tuning information. Unusual F/B ratio with good gain. The band sounds dead until you turn it. Then the band comes alive! Outstanding log proven performance! $25. N7AM, Jack Riggs, 135 Elm Street, Bremerton, WA 98310, 206-373-8135.

ICOM-R70 all Amateur Band and General Coverage Receiver. Up/down Microcomputer tuning with SSB; CW; and RTTY. Perfect condition in original carton with manual, $400. Certified check or Postal MO. Shipped US. Moses Sparks Jr., 73 Barre Drive, Lancaster, PA 17601, 717-569-9433.

WANTED: Equipment and Related Items. The Radio Club of Junior High School 22 NYC, Inc. is a non-profit organization, granted 501(c)(3) status by the IRS, incorporated under the laws of the State of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your property donation would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Please contact WB2JKJ using the callbook or telephone 516-674-4072 24 hours, seven days a week. Thank you!

ANTENNAS, Hy-Gain 153BA-S, new, $125; Cushcraft 15-3CD, used, $75. Complete with hardware and instruction manuals. UPS Shippable. W7LJI, 503-686-8879.

ANTENNA Parts Catalog Low Costs: Dipole/radial wire, insulators, center feeds, coax, connectors, relays, phasers, plus more. $1 SASE. Davis RF, P.O. Box 230, Carlisle, MA 01741, 617-369-1738.

ROSS'$$$$ New Specials: Kenwood TS-440S/WAT $1009.90, TM-751A $???.90, TM-221A $354.90, TS-140 $764.90, TM-2530A $379.90, TR-851A $604.90; AEA PK-64HFM $169.90; ICOM IC-38A $349.90, IC-04AT $374.50, IC-290H $496.90, IC-761A $5939.90, Micro 2AT $274.90; Yaesu FT-73RTT $275.90, FT-726R $789.90. All LTO. Phone or send SASE for pricing on popular items. Over 8772 ham-related items in stock for immediate shipment. MENTION AD. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830, P.O. Box 234.

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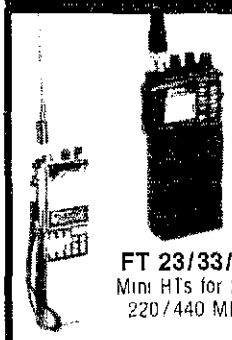

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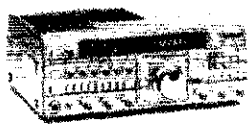

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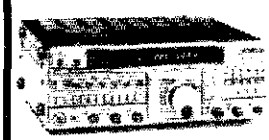

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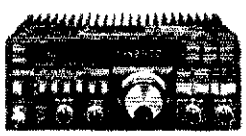

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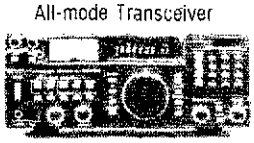

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TS-940S
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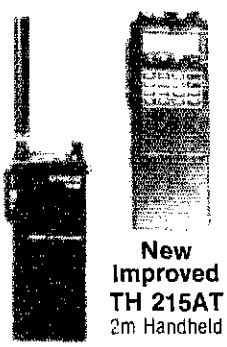

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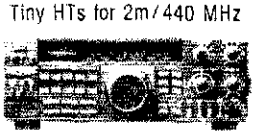

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WANTED: John F. Rider Perpetual Trouble Shooter's Manual Vols. 2, 18, 19, 20, 21, 22 and 23. Mackay Radio Receiver Model 123 BX. RMCA Receiver Type "D" Crystal Receiver. Lee McKinnis, P.O. Box 1225, Bloomington, IN 47402.

WANTED: Schematic and/or manual for oscilloscope OS-34/USM-32. W2WOE, 996 Bonnie Brae, Lake Geneva, WI 53147.

WANTED: Bearcat 210. WA6AIZ, 805-259-3485.

COLLINS 30L1, excellent, $595. John, WA2V, 201-486-0039.

TACTEC MMAG4 synthesized 40 watt VHF radios $300 each. Standard 768L 35 watt UHF radio $300. GE Century II UHF radios $150 each. COCO II, disk drive, modem, ham software $300. Shipping extra. Joe, KB7NU, 206-481-5404.

WANTED: Kenwood VFO-520 in good condition. KB3MP, 215 Tallyho Trail, Chapel Hill, NC 27516.

WANTED: Transistor Zenith Multi-Band "Oceanic" Type Receiver, Toshiba "Globe-Trotter" or Sony "Earth-Orbiter". Bill Wade, 657 14th Avenue, Prospect Park, PA 19076.

WANTED: Collins, 32S3A, 516F-2 P/S, cables, manuals, one owner, mint. K3HKN, 301-531-5563.

ICOM IC-271-H with voice synthesizer unit installed, $700. I ship. WØZAZ, 7401 Plumdale Road, LaVista, NE 68128, 402-592-0868.

TS930S/AT, CW filters, MC60A mic, service manual, speaker. Near mint, $1275. Bud, N7BFN, 206-939-6899.

KENWOOD TS-711 and TS-811, one owner with low hours in excellent condition. $1200 or trade for HF amplifier of equal value. Ron, N5FNY, 817-857-3166.

62' MICROWAVE Tower sporting a KLM KT34XA, Hustler 2 meter, Unadilla 10-80 Invee, Scannertenna and excellent large brick/redwood, 3 br, 2 bath Ranchhouse. Privacy acre edge of Elgin, IL. Close to school and I-90 access. Possession Aug. 1. KN9I, 312-742-1407.

HEWLETT-PACKARD 606A Signal Generator, 0.05-65 MHz, with manual $100. HP-8708A Synchronizer $150. Tektronix 547 Oscilloscope, 50 MHz-BP $135. A. Emerald, 8956 Swallow, Ftn. Vly., CA 92708, 714-962-5940.

WANTED—Manual or copy with schematics for Allied Transceiver, Model A-2517. Urgent. KB6QWC, Kenneth Walker, 21926 S. Vermont Avenue SP #50, Torrance, CA 90502.

GAASFET's—NE72084, $11. MMIC's—Avantek MSA 0104-0404, $3-$3.75. Johanson, ATC, other VHF-UHF-Microwave components. SASE for list. N2CEI, Box 341A, RD 1, Frenchtown, NJ 08825.

WANTED: Measurement Corporation Model 59-UHF Megacycle Meter, M503 Oscillator with Coils, and Megacycle Meter Carrying Case. Lee McKinnis, P.O. Box 1225, Bloomington, IN 47402.

ROSS'$$$$ Used April Specials: Kenwood TS-820S/WCWFL $549.90, AT-200 $119.90, AT-130 $119.90, MC-85 $94.50; Yaesu DC-200 $59.40, FP-707 $109.90, FC-901 $169.90, FT-221 $229.90, FR-101SD $349.90; Swan 102BX $459.90. Phone or send SASE for used items list. Over 8772 new ham items in stock. MENTION AD. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830. P.O. Box 234.

HW-8 QRP Rig, Mint $100; Kenwood TS-140S, 2 mos. old, $700. Guarantee Both. Bill, N3EWP, 814-382-6885.

T8-660 $400; 2M Transverters: FTV-250 $130, HA-2 $100. Wanted: IC-271H, TS-130/430. WØUC, 612-642-1559.

VERTICAL Phasing: Switchable Phased Array Instructions & Hybrid, 160-40M. Info: $1, SASE. Davis, P.O. Box 230, Carlisle, MA 01741.

KANTRONICS KAM, with Kanterm for Commodore 64/128 and WEFAX chip. New, hardly used. Don't like packet. $225 firm. I. Wexler, 10946 Eight Bells Lane, Columbia, MD 21044.

SELL: Heathkit Linear SB-220, professionally wired, rarely used. Manual incl. $230 plus shpg. Mark Wenig, KC2IA, 607 Aspen Drive, Plainsboro, NJ 08536, 609-799-5684.

WANTED: Drake TR7, TR7A or R7A, also NB7 noiseblanker, service kit and MN 2700 antenna tuner. Eckhard Straeter, Box 317, Dublin, NH 03444, 603-563-8816.

WILSON MT-61B 61 foot freestanding, tilt over, crankup tower with RB-61B rotating base. $795/offer. Stan, WSINK, 301-977-7987.

HARNESS The Sun. 3 volt-100 MA solar panel with multi plug adapter $8. Solar charger for 4AA $8. Car battery trickle charger with cigartte light adapter 40MA $15. Larger panels available. Digital world timer, large electronic display of local, world 24 time zones and switchable electronic display of temperature from C° to F°, 1 yr. battery alarm snooze timer, black or burgundy $18. NY state add tax. $2 S&H. Send SASE for information. B.E.A.M. Solar & Electronics H2ZY, 6205-11th Avenue, Brooklyn, NY 11228.

SELL: Heath HW-101, Power Supply, Matching Speaker, $250. KE9BV. Jeff, 5 Twin Oaks, Belleville, IL 62221, 618-632-5718.

CUSHCRAFT 225WB boomer 220-225 MHz 15 element Yagi. Fully assembled and tested. Brand new. Never mounted outdoors. Have owned for 1 week. Can be disassembled for shipping or picked up as is. Spec and assembly instruction sheets included. Complete $55. Was $78. Brian, WBØGPQ, 11533 Terrace Road NE, Blaine, MN 55434, 612-755-9209.

MICROWAVE Modules and Parts. Omni Spectra Voltage Controlled Oscillators (solid state) (specify frequency 50-500 MHz, 500-1000 MHz, 1000-2000 MHz, 2000-4000 MHz) $50. Double balanced mixers (specify frequency) $10. Coaxial relays (new) DC to 12.4 GHz. Power up to 750 watts CW power. 1P3T $45, 1P6T $60. Much more. Send SASE for list. WA5OYG, 1619 Fair Oaks Lane, Richmond, TX 77469.

COMMODORE 64 $80; VIC20 $30; 1541 Disk Drive $100; 1525 Printer $100; (2) Cassette Drives $20/ea.; Hamsoft $30; Amtorsoft $40; MBA-TOR $40; AEA CP-1 $80; New IBM RS-232 Card $20; Heath HR-10 Receiver $35; Tektronix 561A Scope, 2 Plug-Ins $150; Complete set of tubes (new) for Drake C-Line $65; All Mint. Alan Burg, W2MV, 3320 Bainbridge Avenue, Bronx, NY 10467, 212-655-4977.

ICOM IC-471A 430-450 MHz all-mode transceiver, PS-25, EX-309 interface, mobile mount, CommSpec encoder/decoder. Xcvr used/mint, others new, $800. Ted Tsucalas, 1054 Finn Avenue, Littleton, CO 80124, 303-799-0833.

BEST RTTY, CW Terminal: Drake 7000E, Monitor, Epson MX-80 Printer, Dustcovers, $385 or trade for FT-727R, IC-730. K1LEC, 802-886-8121.

WANTED: Mechanical filter adapter per Radio Handbook fifteenth edition, or filters Collins 455J31 or similar. N9ALD, P.O. Box 9302, Green Bay, WI 54308-9302.

ICOM WANTED: R-70 Receiver, SP-3 Speaker. Contact: G. Hawrysko, K2AWA, P.O. Box 568 Boro Hall, Jamaica, NY 11424.

WANTED: Tempo One, "A One DC" Power Supply, Good or minor repairs. Howard Holsti, WBØOFF, Box 373, Napoleon, ND 58561.

WANTED: Collins 75A or 75A-1. John White, 212 Martin Lane, Burnsville, MN 55337.

FOR SALE: Kenwood TS-520, with microphone and spare set of finals, and manual. $375, I ship UPS. KDBLF, 419-726-2467.

900 MHz: Bricks, Exciters, Amps, Preamps; UHF-VHF Preamps; Dow Key Switching Boxes. Pauldon, 210 Utica Street, Tonawanda, NY 14150, 716-692-5451.

COLLINS 32S3 with 516F2, mint, round, low use, $475. Bill, AA6S, 209-732-7163.

GENERAL Electric rack mounted 330 watt (132-174 MHz). Base station: 4EF5A1 power amplifier (4CX250B final), 4EPGB1 power amplifier power supply, ET-57-A four frequency 30 watt narrow band exciter, 4EP38A12 transmitter-receiver power supply and four ER-41-C receivers. Purchased from state police. Mint condition, commercial duty, turnkey package with maintenance manuals and schematics. Perfect for a repeater. Howard, WB8BAU, 419-634-9451.

FOR SALE—W9HGK is a Silent Key. Family selling shack equipment: KDK FM2030, Cobra 2-meter 148GTL*, Yaesu YC-601, Yaesu SP-101PB, Yaesu FT-101EX, Dentron 80-10AT, ICOM IC-02AT*, Heathkit HW-2021, Kenwood TS-820S*, D-104, 444S mikes, receipts for all. *New. Call evenings Ralph Reichenback Jr., 312-634-8107. Best reasonable offers.

R-390A Receiver: $115, electronically complete, repairable, (government removed meters, operation unaffected). R-390A parts: Info SASE. CPRC-26 Manpack Radio, 6 meter FM, with antenna, crystal, handset: $22.50, $42.50/pair, $97.50/six. H-251 Military Communications Headphones: $7.50. Add $4.50/piece shipping, $9 maximum, except R-390A shipped collect. Baytronics, Box 591, Sandusky, OH 44870.

JOBS FOR HAMS

WANTED For Summer of 1988: Instructors in Electronics, Ham Radio, and Computers. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, PA 18451.

CAMP Counselor/Radio Instructor, nine summer weeks in New Hampshire. Top facility for DX, Ham, Novice instr and also local AM, with long established activity. New rigs, triple-beam tower, in supurb area on Ossipee Lake. Write/Call, Alan Stolz, WA1LGI, Five Lockwood Circle, Westport, CT 06880, 203-226-4389.

RF DESIGN ENGINEERS—MMD is a technologically innovative microwave manufacturer of high power amplifiers. We are seeking qualified engineers to design and develop RF high power amplifiers for commercial or defense applications.—You must possess 5 + years of design experience and have the ability to build and test RF/microwave amplifiers. A BSEE is preferred.—Enjoy the career potential MMD offers. We invite you to send your resume to Professional Staffing, Microwave Modules & Devices, Attn: Stephanie Martin, 550 Ellis Street, Mountain View, CA 94043, 415-961-1473.

ELECTRONICS Counselor for coed Vermont children's camp 6/23-8/21. Kit-building/trouble-shooting experience. General or higher class license, some theory, own rig helpful. Might build computer from components. Must be over 18, help as cabin counselor. Contact John Seeger, Bridgewater, CT 06752, 203-354-5728.

USAF MARS: The Military, with a long history of support for Amateur Radio, is continuing expansion of existing USAF MARS CW NETS and needs volunteer proficient CW operators. Requirements include USA citizenship, a qualified FCC amateur license and 12 hours minimum quarterly participation. This is a unique opportunity to contribute your talents to a significant and worthwhile activity without military obligation in support of an official Military operation. Interested parties are requested to provide a brief CQ background profile to: Louis Skipper, W6KF (AFN6CW), Mgr., 725 North "O" Street, Livermore CA 94550-2059.

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Bruce O. Williams, WA6IVC,
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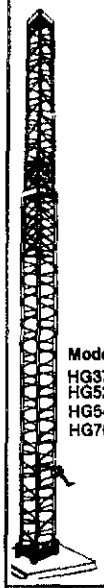
ANTENNA/TOWER SALE!



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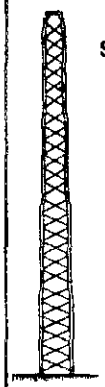
CRANKUP SALE!

All Models Shipped Factory Direct—*Freight Paid*!*

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are *Your Total Delivered Price* In Continental U.S.A.!



ROHN

Self Supporting Towers On SALE!

FREIGHT PREPAID

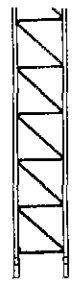
- All Steel Construction—*Rugged*
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	228	$379
HBX48	48 ft	10 sq ft	303	$489
HBX56	56 ft	10 sq ft	385	$569
HDBX40	40 ft	18 sq ft	281	$459
HDBX48	48 ft	18 sq ft	363	$559

Your Total Delivered Price Anywhere In Continental 48 States. Antenna Load Based on 70 MPH Wind.

ROHN

Guyed Tower Packages



- **World Famous Rohn Quality and Dependability**
- **Rugged high wind survival-provides safe installation**
- **Multi purpose towers satisfy a wide range of needs**
- **Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.**

Packages shown below are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

	Model 25G	*Model 45G*	*Model 55G*
50'	$ 699	$1239	$1529
60'	769	1399	1719
70'	829	1539	1879
80'	989	1719	2079
90'	1069	1989	2249
100'	1149	2179	2439
110'	1359	2329	2639
120'	1429	2499	3039

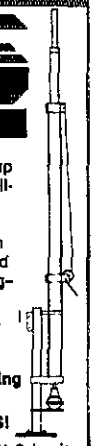
US TOWER CORPORATION

These rugged crankup towers and masts now available from Texas Towers!

Check these features:
- All steel construction
- Hot dipped galvanized
- Totally self-supporting-
- No guys needed

Coax arms, Thrustbearings Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock.

CALL FOR SALE PRICES!



Model	Min.Ht.	Max.Ht.	Ant.load*	Sale price
MA40 mast	21'	40'	10 sq ft	$629
MA550 mast	22'	50'	10 sq ft	999
TX438	22'	38'	18 sq ft	919
TX455	22'	55'	18 sq ft	1385
TX472	23'	72'	18 sq ft	2279
HDX555	22'	55'	30 sq ft	2079
HDX572	23'	72'	30 sq ft	3559

Note-US Towers Shipped Freight Collect From Visalia, CA Factory

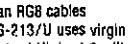
***Note-towers rated at 50 mph to EIA specifications**

RG-213U

$.29/ft $279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

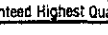
RG-8X



$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield
- Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086



$.39/ft $379/1000 ft

- Same specs as Belden 9913
- Lower loss than RG8U
- *100% shielded-braid & foil*

HARDLINE/HELIAX®

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft.
⅞" LDF4-50 Andrew Heliax®	$1.79/ft
⅞" LDF5-50 Andrew Heliax®	$3.99/ft

select connectors below.

Heliax® is a Registered Trademark of the Andrew Corp.

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Inspd.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE & HELIAX® CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$25	$25	$33	$33
⅞" Heliax®	$29	$29	$29	$29
⅞" Heliax®	$55	$55	$55	$55

COAX CONNECTORS

Amphenol Silver PL259	$1.25
UG21B N Male	$2.95
9086/9913 N Male Connector	$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga	$.10/ft.
¼ mile 18ga copper-clad steel wire	$30
Dog bone end insulator	$.79 ea.

Van Gorden

1:1 Balun $15 Center Insulator $8

Dipole Kits D80 $31.95/D40 $28.95

Short Dipole Kits SD80 $35.95/SD40 $33.95

All-band Dipole w/ladder line $29.95

G5RV all band antenna $49.95

ALPHA DELTA

DX-A 160-80-40 Sloper	$49

CUSHCRAFT

A3 3-el Tribander	$259
A4S 4-el Tribander Beam w/S.S. Hdwre.	$349
A743 & A744, 30/40 mtr KIT for the A3 & A4	$ 89
AP8 80-10 mtr Vertical	*$139*
AV5 80-10mtr Vertical	$119
D40 40mtr Dipole	$159
40-2CD 2-el 40 mtr Beam	$339
A50-5 5-el 6 mtr Beam	$ 98
215 WB NEW 15-el 2 mtr Beam	*$ 89*
230 WB NEW 30-el 2 mtr Beam	$229
4218 XL 18-el 2 mtr Beam	$129
3219 19-el 2 mtr Beam	$109
220B 17-el 220MHz Beam	$109
424B 24-el 432MHz Beam	$ 89
ARX2B 2 mtr Vertical	$ 45

hy-gain

Discoverer 2-el 40-mtr Beam	
Discoverer 3-el Conversion Kit	
EXPLORER-14 SUPER-SPECIAL	
QK710 30/40 mtr. Add-On-Kit	
V2S 2-mtr Base Vertical	
V4S 440MHz Base Vertical	
TH5MK2S Broad Band 5-el Triband Beam	
TH7DXS 7-el Triband Beam	
TH3JRS 3-el Triband Beam	
205BAS 5-el 20-mtr Beam	
155BAS 5-el 15-mtr Beam	
105BAS 5-el 10-mtr Beam	
204BAS 4-el 20-mtr Beam	
648S 4-el 6-mtr Beam	
12 AVQ 20-10 mtr vertical	
14 AVD 40-10 mtr vertical	
18 AVT/WB 80-10mtr Vertical	
18HTS 80-10 mtr Hy-Tower Vertical	
23BS 3-el 2 mtr Beam	
25BS 5-el 2 mtr Beam	
28BS 8-el 2 mtr Beam	
214BS 14-el 2-mtr Beam	
2BDQ 80/40 mtr Trap Dipole	
5BDQ 80-10 mtr Trap Dipole	
BN86 80-10 mtr KW Balun W/Coax Seal	

CALL FOR SPECIAL PRICES!

HUSTLER

6BTV 80-10 mtr Vert	$149	5BTV 80-10 mtr Vert	$129
4BTV 40-10 mtr Vert	$99	G7-144 2-mtr Base	$129
G6-144B 2-mtr Base	$89		

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

HF6V 80-10m Vertical $129 Delivered
- *Full Legal Power*
- Highest Q Tuning Circuits

HF2V 80-40m Vertical $129 Delivered
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- Automatic Band Switching

Accessories:

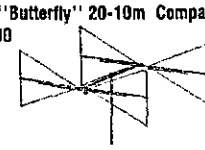
RMK II Roof Mtg. Kit	$49
STR II Stub-Tuned Radials	$29
TBR160 160m Coil Kit	*$49*
30m Add-on Kit	$29
20m Add-on Kit	$39
17/12m Add-on Kit	$27

HF6V HF2V

FREE UPS on ACCESSORIES when purchased w/antenna

HF5B "Butterfly" 20-10m Compact Beam

$199.00



- Unique Design Reduces Size
- Turns w/TV Rotor
- Boom Length 6 Feet
- No Lossy Traps
- Element Length 12.5 Feet

FREE UPS Shipping in Continental USA

MIRAGE/KLM

KT34A 4-el Broad Band Triband Beam	$399.95
KT34XA 6-el Broad Band Triband Beam	$589.95

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119.95
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	*$Call*
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	$Call

ROTOR CABLE

Standard 8 cond cables $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)

Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS

10 FT. STACKED SECTIONS

20G	$48.00	45G	$133.00
25G	$56.00	55G	$165.00

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	$1049.
FK2558	58 ft.	13.3 sq. ft.	1099.
FK2568	68 ft.	11.7 sq. ft.	1149.
FK4544	44 ft.	34.8 sq. ft.	1389.
FK4554	54 ft.	29.1 sq. ft.	1469.
FK4564	64 ft.	28.4 sq. ft.	1579.
25G Double Guy Kit			$279.
45G Double Guy Kit			$299.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$.15/ft
1/4 EHS Guywire (6650 lb rating)	*$.18/ft*
5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7 x 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8 EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 x 9EE (1/2" x 9" Eye to Eye Turnbuckle)	$9.95
1/2 x 9EJ (1/2 x 9" Eye & Jaw Turnbuckle)	$10.95
1/2 x 12EE (1/2" 12" Eye & Eye Turnbuckle)	$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle)	$13.95
5/8 x 12EJ (5/8" x 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 lb Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.32/ft
HPTG4000 Guy Cable (4000 lb rating)	$.52/ft
HPTG6700 Guy Cable (6700 lb rating)	*$.72/ft*
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9902LD Cable End (for 6700 cable)	$11.95
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GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	$29	$49	$69	$89
18 in Wall	$49	$89	$129	$149
25 in Wall	$69	$129	$189	$249

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Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 • Plano, Texas 75074

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(Antenna/tower product prices do not include shipping unless noted otherwise)

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TS440S "DX-CITING"

- 100% Duty Cycle
- 100 Memories
- Direct Keyboard Entry
- Optional Built-in AT

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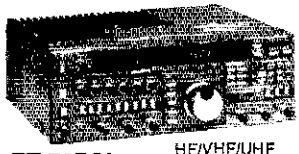

FT-767GX HF/VHF/UHF BASE STATION

- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-in
- Lots More Features

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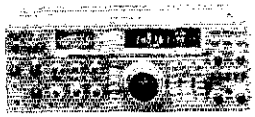


IC-761 NEWEST HF SUPER RIG

- 160-10M/General Coverage Receiver
- Built-In Power Supply and Automatic Antenna Tuner
- SSB, CW, FM, AM, RTTY
- QSK to 60 WPM

ALINCO

ALD-24T DUAL BAND MOBILE

- 140-149.995 MHz/ 440-450 MHz
- 25 Watts on Both Bands
- Crossband Full Duplex
- 21 Memory Channels
- CTCSS Encoder/Decoder, Standard

KENWOOD

TS-140S AFFORDABLE DX-ing!

- HF Transceiver With General Coverage Receiver
- All HF Amateur Bands
- 100 W Output
- Compact, Lots of Features

YAESU

NEW!

FT-736R VHF-UHF BASE STATION

- SSB, CW, FM on 2 Meters and 70 cm
- Optional 50 MHz, 220 MHz or 1.2 GHz
- 25 Watts Output on 2 Meters, 220 and 70 cm
- 10 Watts Output on 6 Meters and 1.2 GHz • 100 Memories

ICOM

IC-735 COMPACT HF TRANSCEIVER

- All HF Band/General Coverage Receiver
- 12 Memories/Frequency and Mode
- USB, LSB, AM, FM, CW
- 100 Watts Output
- Includes HM-12 Scanning Mic

mconcepts

2m and 220 MHz Amplifiers GaAsFET Receive Pre-Amps and High SWR Shutdown Protection

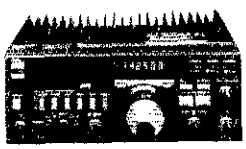
MODEL	144 MHz	SALE PRICED
2-23	2 in/30 out	
2-217	2 in/170 out	
2-117	10 in/170 out	
	220 MHz	
3-22	2 in/20 out	
2-211	2 in/110 out	
3-312	30 in/120 out	
	CALL	

KENWOOD

TM-221A

- 2m FM Mobile Transceiver
- 45W Output w/HiLo Switch
- 14 Multi-Function Memories
- TM-421A Available For 440 MHz

YAESU



FT-757 GX/II

"CAT SYSTEM"

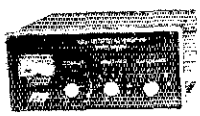
- All Mode HF Transceiver
- Dual VFO's
- Full Break-in CW
- 100% Duty Cycle

ICOM

IC-900 SIX BANDS IN ONE MOBILE

- Remote Controller, Interface A Unit, Interface B Unit, Speaker, Mic and Cables
- Six Band Units to Choose
- 10 Memories Per Band
- Programmable Band Scan
- Fiber Optic Technology

MFJ



NEW!

MFJ-931 ARTIFICIAL GROUND

- Eliminate RF Bites, RF Feedback, TVI/RFI
- Creates Artificial RF Ground with Random Wire
- Improves Radiation Pattern
- RF Ammeter Makes Tuning Easy
- Only **$79.95**

KENWOOD

TH-25AT POCKET-SIZED AND POWERFUL

- Frequency Coverage: 141-163 MHz (Rx), 144-148 MHz (Tx)
- Front Panel DTMF Pad
- 5 Watts Output
- 14 Memories
- TH-45AT Available for 440 MHz

YAESU

FT23/73R

- Super "Mini" HT's
- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-164 MHz, 440-450 MHz
- 2W Battery Pack or Optional 5W Pack

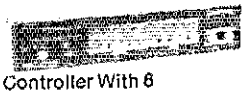
ICOM

IC-μ2AT
IC-μ4AT

MICRO HT'S FOR 2M, 440

- Pocket Size HT Fun
- Ten Memories
- LCD Readout
- Wideband Coverage
- Up to 3 Watts Output
- 32 Built-in Subaudible Tones

AEA PK-232 (PAKRATT)



Data Controller With 6 TRX/RX Modes

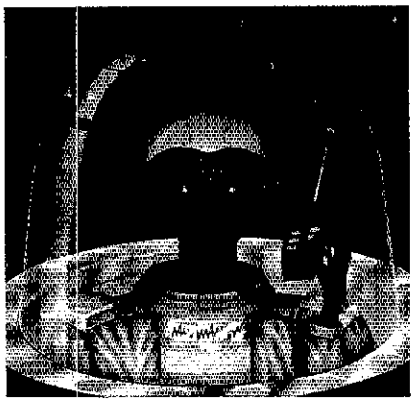
PACKET	ASCII
MORSE CODE	AMTOR
BAUDOT (RTTY)	WEATHER FAX

- All You Need is a RS-232 Compatible Computer or Terminal and Your Radio

HAM NET $319.95

• MOST ORDERS SHIPPED SAME DAY •

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



Why just dream of talking beyond earth?

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

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

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

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

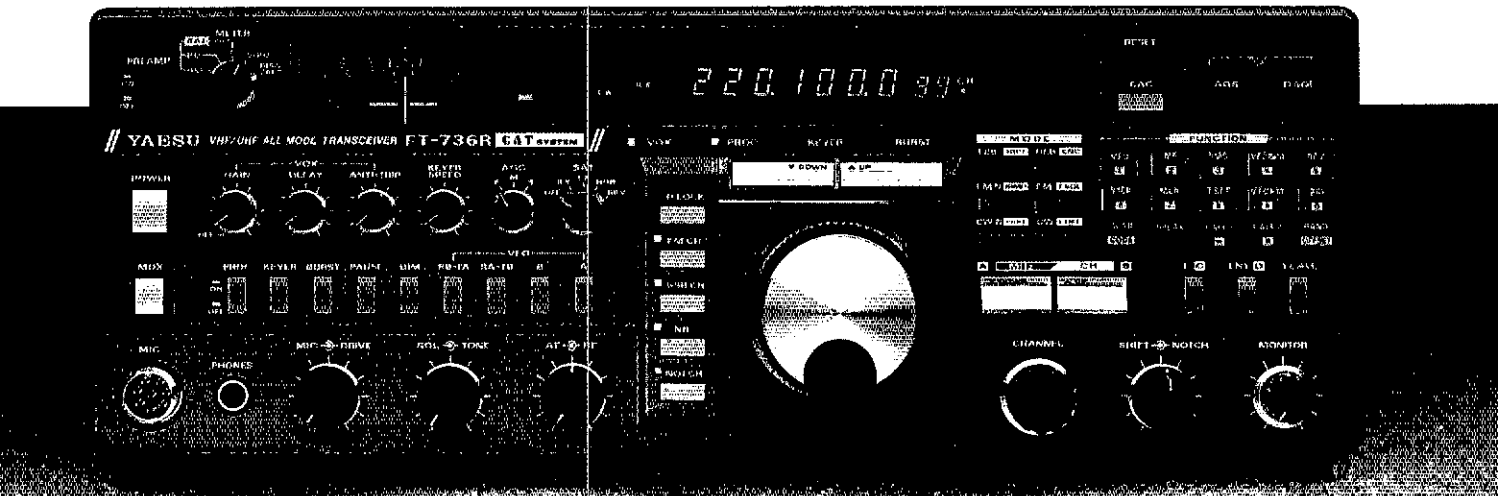
The FT-736R delivers 25 watts RF output on 2 meters, 220 MHz, and 70 cm. And 10 watts on 6 meters and 1.2 GHz. Store frequency, mode, PL frequency, and repeater shift in each of the 100 memories.

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

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

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

YAESU



Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Repair Service: (213) 404-4884. Parts: (213) 404-4847.

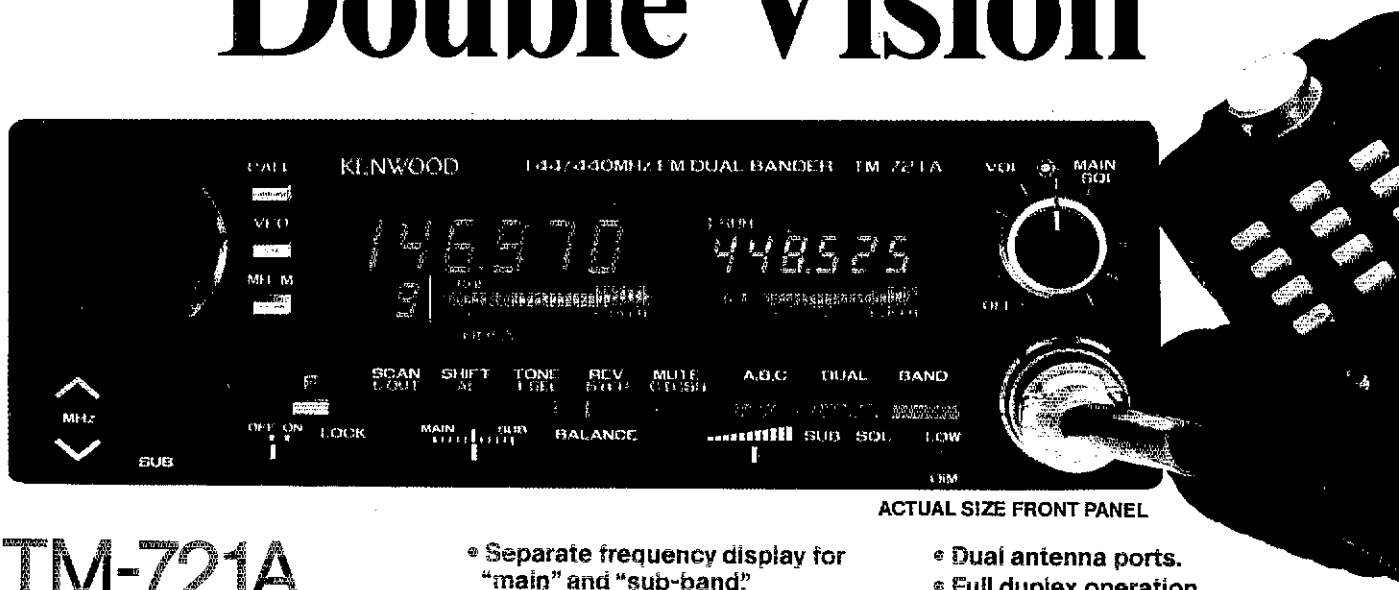
Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc. FT-736R shown with 220-MHz option installed.

KENWOOD

...pacesetter in Amateur Radio

ALL NEW!

Double Vision



ACTUAL SIZE FRONT PANEL

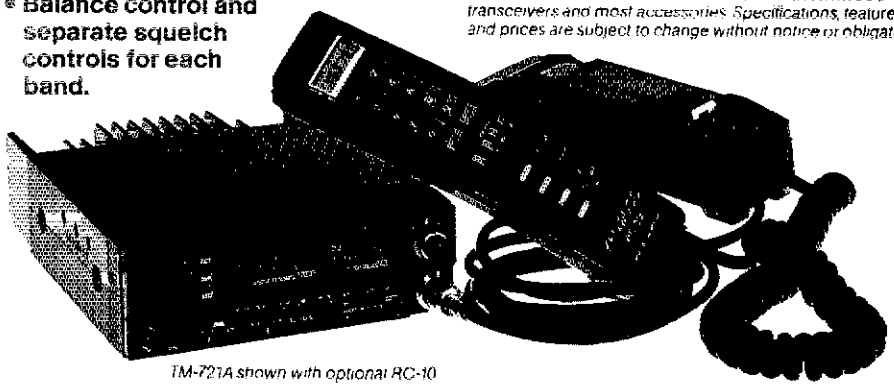
TM-721A

Deluxe FM dual bander

The Kenwood TM-721A re-defines the original Kenwood "Dual Bander" concept. The wide range of innovative features includes a dual channel watch function, selectable full duplex operation, 30 memory channels, extended frequency coverage, large multi-color dual digital LCD displays, programmable scanning, and more with 45 watts of output on VHF and 35 watts on UHF. TM-721A—Truly the finest full-featured FM Dual Band mobile transceiver!

- **Extended receiver range** (138.000-173.995 MHz) on 2 meters; 70 cm coverage is 438.000-449.995 MHz. (Specifications guaranteed on Amateur bands only. Two meter transmit range is 144-148 MHz. Modifiable for MARS/CAP. Permits required.)
- **30 multi-function memory channels.** 14 memory channels and one call channel for each band store frequency, repeater offset, CTCSS, and reverse. Channels "A" and "b" establish upper and lower limits for programmable band scan. Channels "C" and "d" store transmit and receive frequencies independently for "odd splits."
- **Separate frequency display for "main" and "sub-band."**
- **45 Watts on 2 meters, 35 watts on 70 cm.** Approx. 5 watts low power.
- **Call channel function.** A special memory channel for each band stores frequency, offset, and sub-tone of your favorite channel. Simply press the CALL key, and your favorite channel is selected!
- **Automatic Band Change (A.B.C.)** Automatically changes between main and sub-band when a signal is present.
- **Dual watch function allows VHF and UHF receive simultaneously.**
- **CTCSS encode/decode selectable from front panel** or UP/DWN keys on microphone. (Encode built-in, optional TSU-6 needed for decode.)
- **Balance control and separate squelch controls for each band.**
- **Dual antenna ports.**
- **Full duplex operation.**
- **Programmable memory and band scanning, with memory channel lock-out and priority watch function.**
- **Each function key has a unique tone for positive feedback.**
- **Illuminated front panel controls and keys.**
- **Dimmer control.**
- **16 key DTMF mic. included.**
- **Handset/remote control option (RC-10).**
- **Frequency (dial) lock.**
- **Supplied accessories:** 16-key DTMF hand mic., mounting bracket, DC cable.

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



TM-721A shown with optional RC-10

Optional Accessories:
• **RC-10** Multi-function handset/remote controller • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SW-100B** Compact SWR/power/volt meter • **SW-200B** Deluxe SWR/power meter • **SWT-1** 2m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-40** Compact mobile speaker • **SP-50B** Deluxe mobile speaker • **PG-2N** DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MA-4000** Dual band mobile antenna (mount not supplied) • **MB-11** Mobile bracket • **MC-43S** UP/DWN hand mic. • **MC-48B** 16-key DTMF hand mic.

KENWOOD

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P.O. Box 22745, Long Beach, CA 90801-5745