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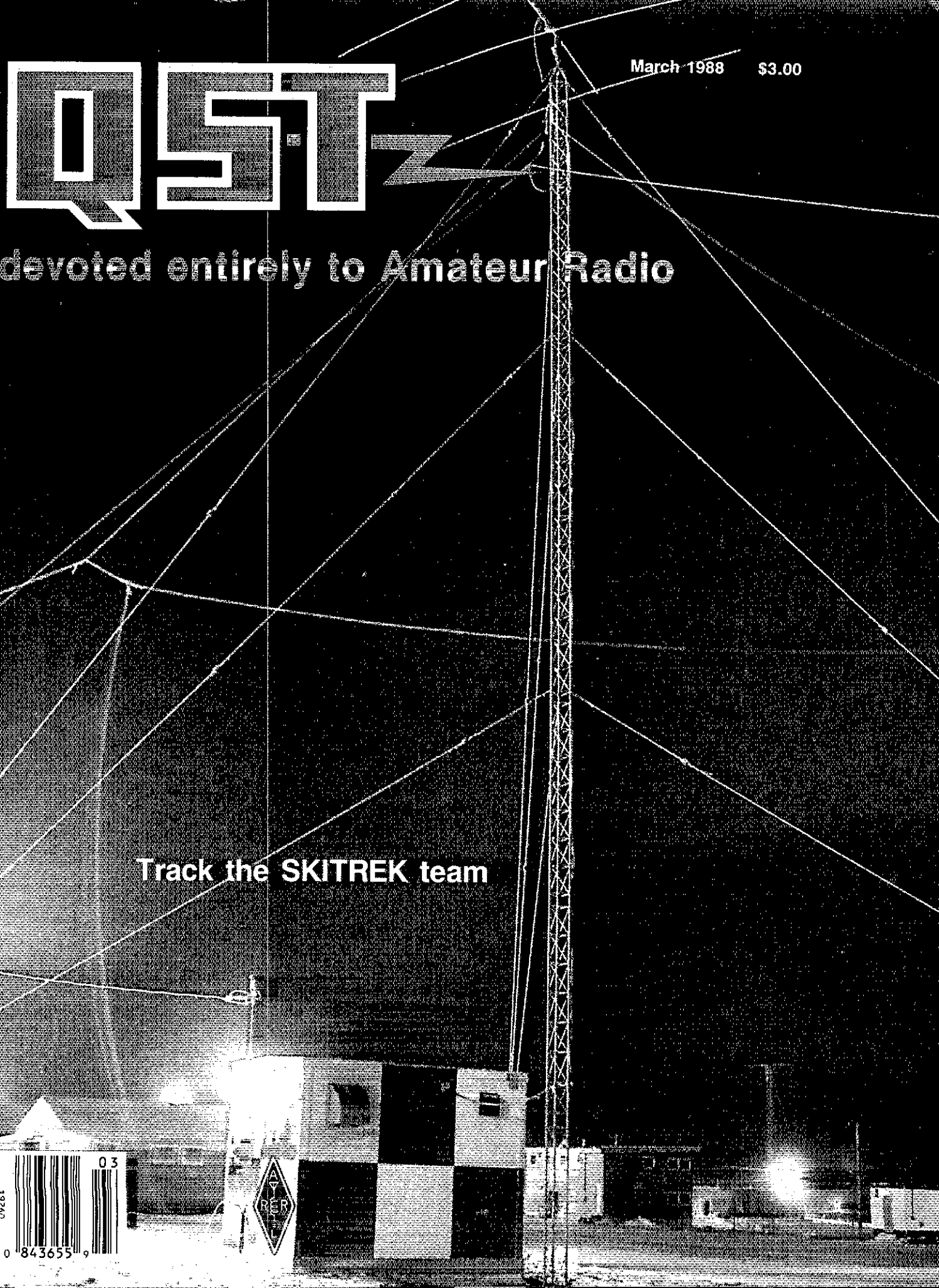

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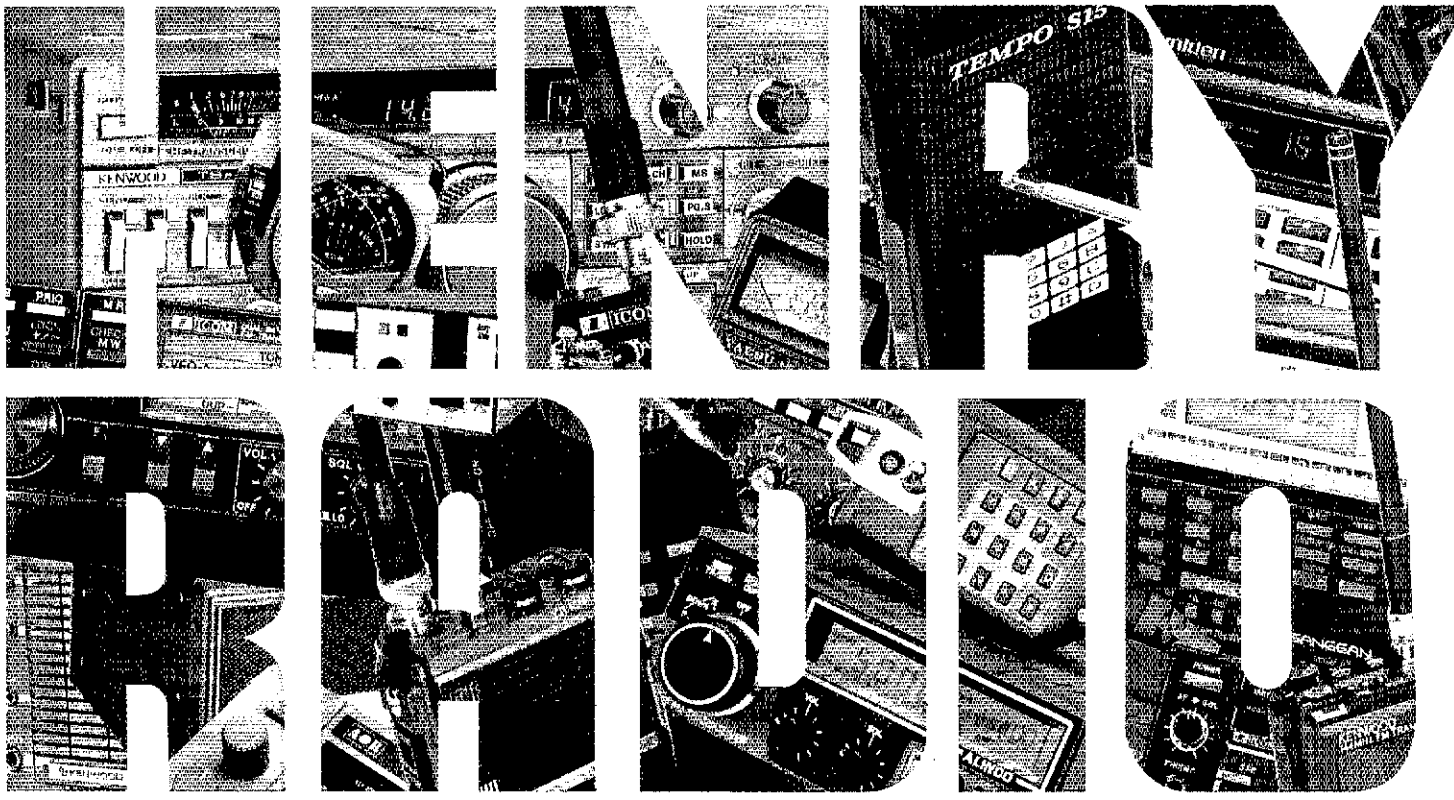

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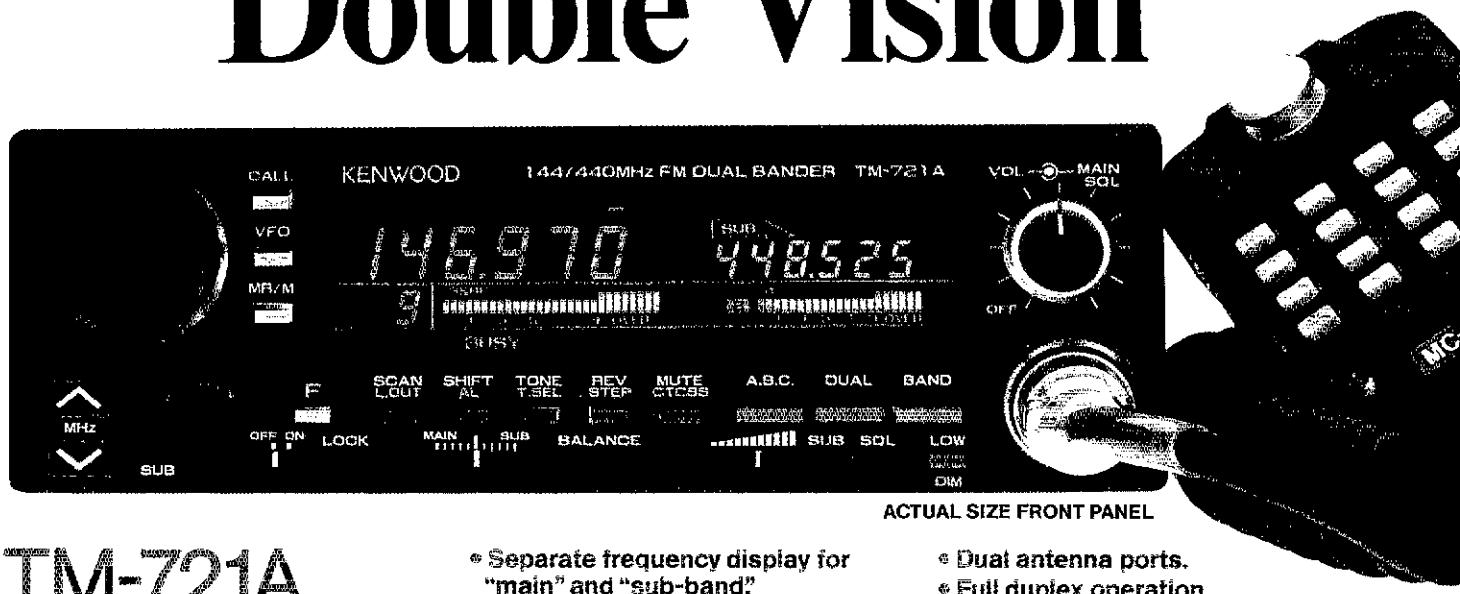


ACTUAL SIZE FRONT PANEL

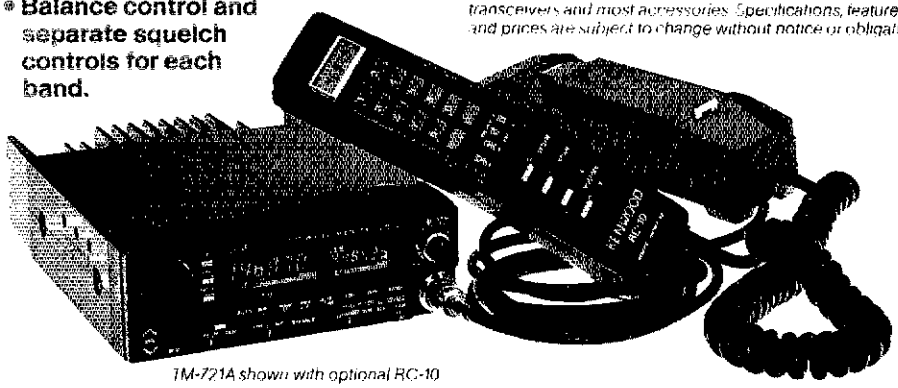
TM-721A

Deluxe FM dual bander

The Kenwood TM-721A re-defines the original Kenwood "Dual Bander" concept. The wide range of innovative features includes a dual channel watch function, selectable full duplex operation, 30 memory channels, extended frequency coverage, large multi-color dual digital LCD displays, programmable scanning, and more with 45 watts of output on VHF and 35 watts on UHF. TM-721A—Truly the finest full-featured FM Dual Band mobile transceiver!

- **Extended receiver range** (138.000-173.995 MHz) on 2 meters; 70 cm coverage is 438.000-449.995 MHz. (Specifications guaranteed on Amateur bands only. Two meter transmit range is 144-148 MHz. Modifiable for MARS/CAP. Permits required.)
- **30 multi-function memory channels.** 14 memory channels and one call channel for each band store frequency, repeater offset, CTCSS, and reverse. Channels "A" and "b" establish upper and lower limits for programmable band scan. Channels "C" and "d" store transmit and receive frequencies independently for "odd splits."
- **Separate frequency display for "main" and "sub-band."**
- **45 Watts on 2 meters, 35 watts on 70 cm.** Approx. 5 watts low power.
- **Call channel function.** A special memory channel for each band stores frequency, offset, and sub-tone of your favorite channel. Simply press the CALL key, and your favorite channel is selected!
- **Automatic Band Change (A.B.C.)** Automatically changes between main and sub-band when a signal is present.
- **Dual watch function allows VHF and UHF receive simultaneously.**
- **CTCSS encode/decode selectable from front panel** or UP/DWN keys on microphone. (Encode built-in, optional TSU-6 needed for decode.)
- **Balance control and separate squelch controls for each band.**
- **Dual antenna ports.**
- **Full duplex operation.**
- **Programmable memory and band scanning, with memory channel lock-out and priority watch function.**
- **Each function key has a unique tone for positive feedback.**
- **Illuminated front panel controls and keys.**
- **Dimmer control.**
- **16 key DTMF mic. included.**
- **Handset/remote control option (RC-10).**
- **Frequency (dial) lock.**
- **Supplied accessories:** 16-key DTMF hand mic., mounting bracket, DC cable.

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



TM-721A shown with optional RC-10

Optional Accessories:
• **RC-10** Multi-function handset/remote controller • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SW-100B** Compact SWR/power/volt meter • **SW-200B** Deluxe SWR/power meter • **SWT-1** 2m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-40** Compact mobile speaker • **SP-50B** Deluxe mobile speaker • **PG-2N** DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MA-4000** Dual band mobile antenna (mount not supplied) • **MB-11** Mobile bracket • **MC-43S** UP/DWN hand mic. • **MC-48B** 16-key DTMF hand mic.

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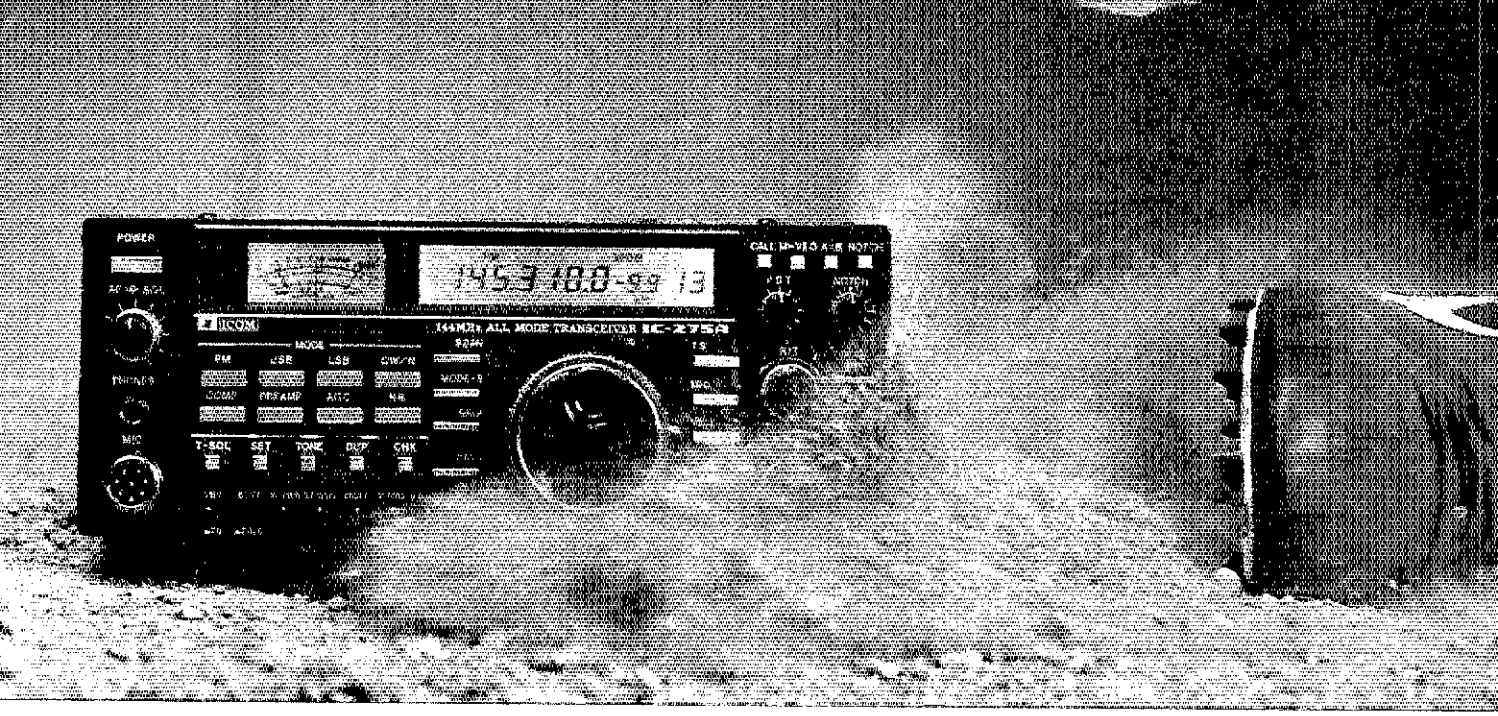

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ICOM has your winning line-up for fixed, portable, and mobile operations on today's hottest amateur bands. Slide into the winner's circle with ICOM's deluxe "75" series transceivers, with a team committed to excellence from VHF to UHF communications. Each compact all-mode unit delivers maximum performance, reliability, and ease of operation. It's a championship line-up!

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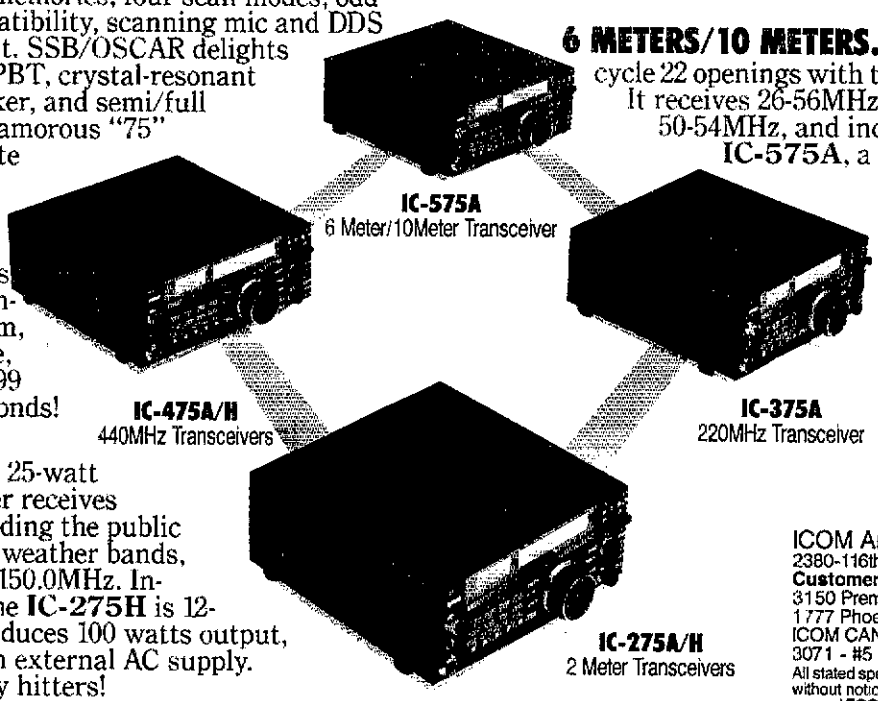
220MHz. The 25-watt **IC-375A** receives 216.0 236.0MHz, transmits 220.0-225.0MHz, and includes AC supply. A genuine masterpiece!

440MHz. Enjoy top-notch 430.0-450.0MHz operation wi the 25-watt **IC-475A** featuring AC supply, or go high power using the 75-watt, AC/DC-powered **IC-475H** "super rig."

6 METERS/10 METERS. Join the fun of sunspot cycle 22 openings with the superb 10-watt **IC-575A** It receives 26-56MHz, transmits 28-29.7MHz, an 50-54MHz, and includes AC supply. The **IC-575A**, a true superstar!



IC-575A
6 Meter/10Meter Transceiver

IC-475A/H
440MHz Transceivers

IC-375A
220MHz Transceiver

IC-275A/H
2 Meter Transceivers

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Monitor all of today's action with four scanning modes: spectrum, programmable, mode, and memory. Scans 99 memories in five seconds!

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QST (ISSN: 0033-4812) is published monthly as its official journal by the American Radio Relay League, Newington, CT USA. Official organ of the Canadian Radio Relay League.

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Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.

OUR COVER

One of the Amateur Radio support bases for the joint Russian-Canadian SKITREK expedition ready for operation. The SKITREK team will begin their journey on or about March 1. For more information, see the SKITREK items in Up Front in *QST* (p 12) and Canadian NewsFronts (p 67). *(photo courtesy VE3CDX)*

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March 1988
Volume LXXII Number 3

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.

* **Morse Code**
* **Baudot (RTTY)**
* **ASCII**
* **AMTOR**
* **Packet**
* **Weather FAX**

$319.95 AMATEUR NET
$379.95 AEA RETAIL

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.

AEA Brings you the Breakthrough

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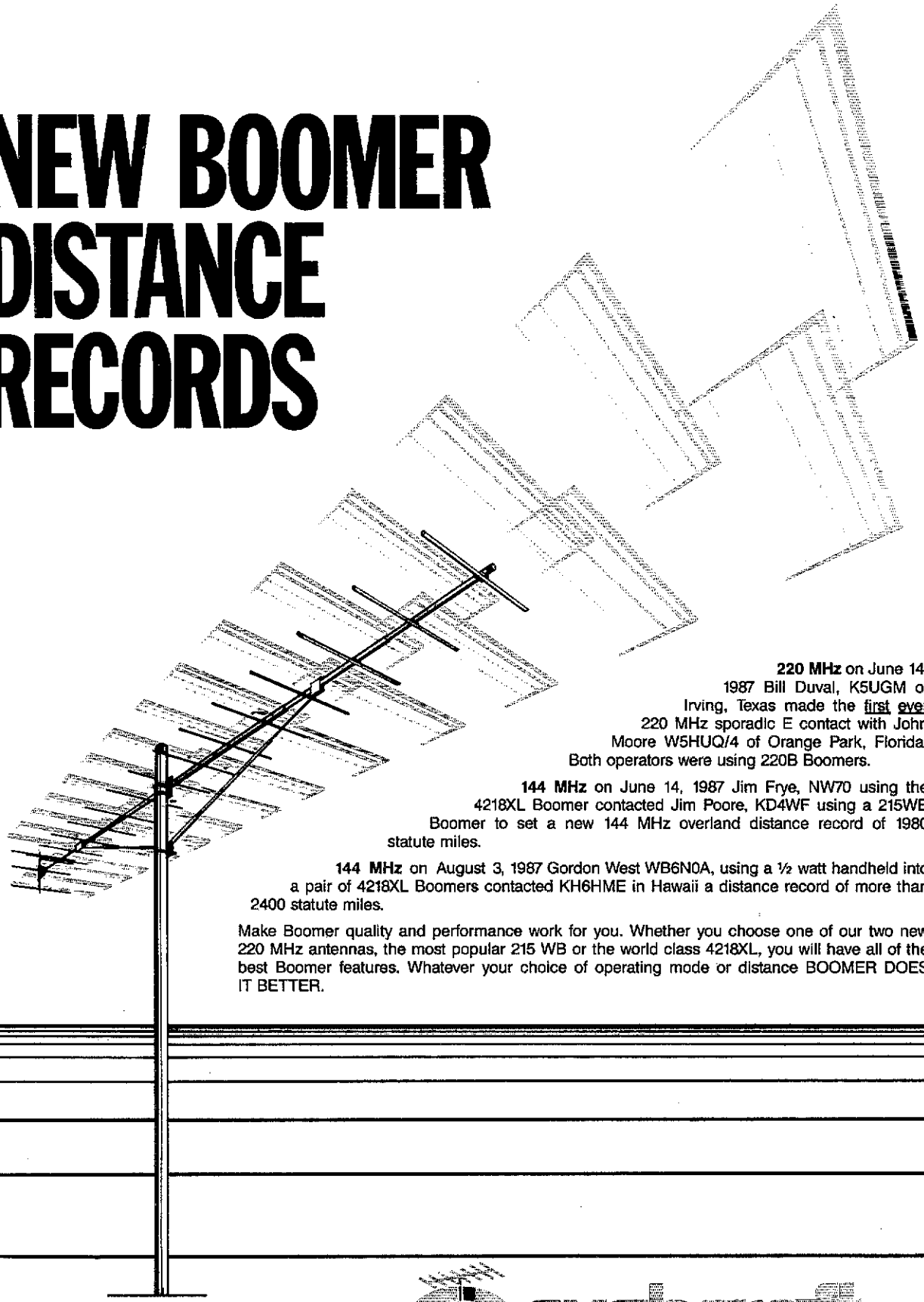
NEW BOOMER DISTANCE RECORDS



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.

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

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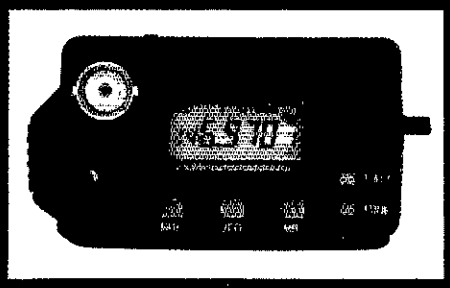
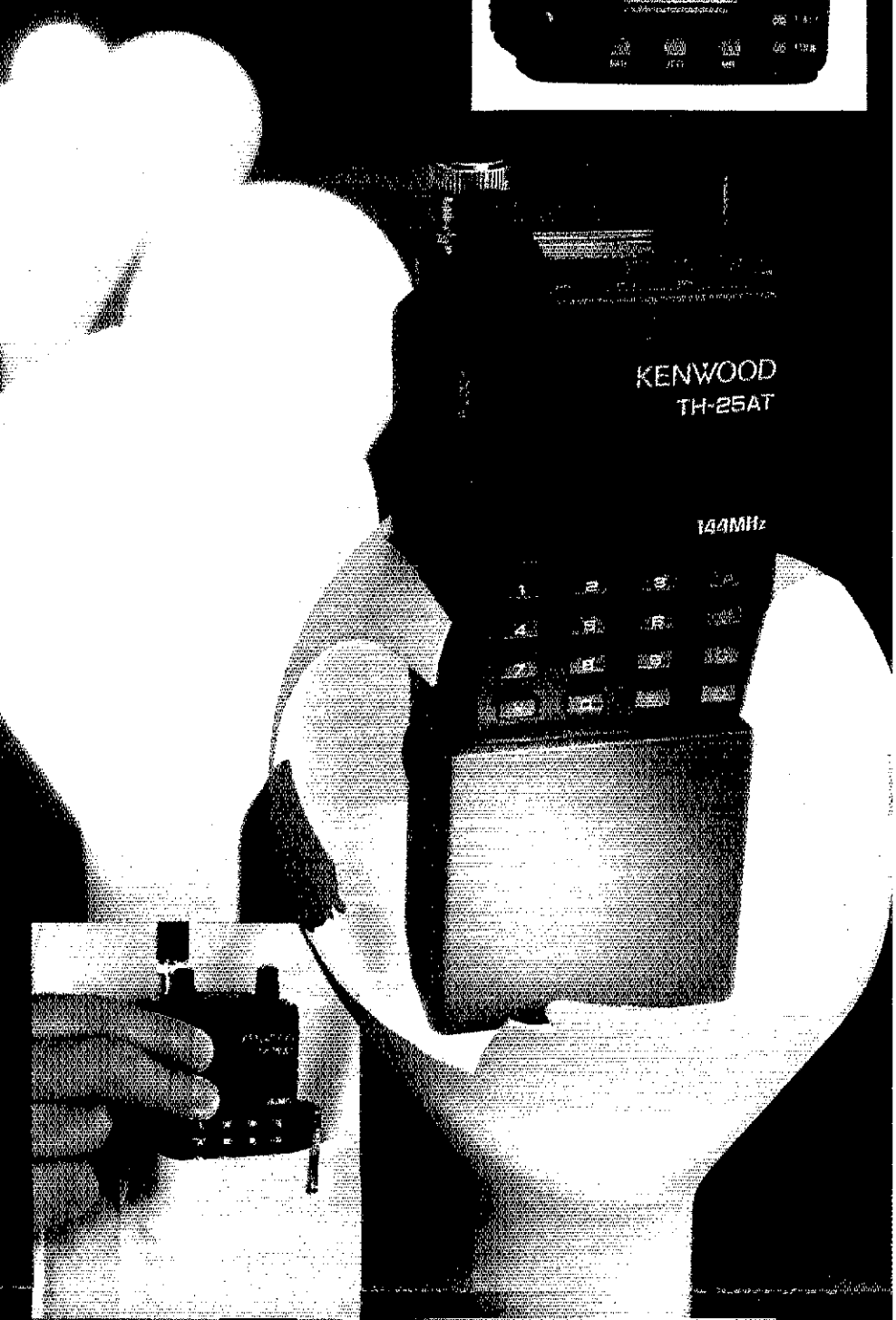
Compact Breakthrough!



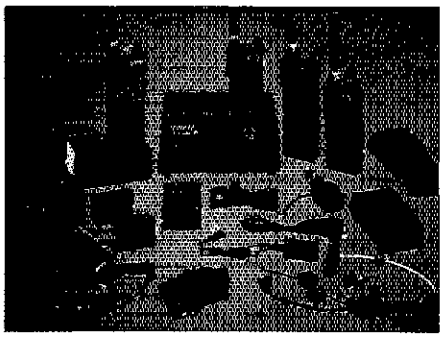


TH-25AT/45AT

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

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West Indies — Jose A. "Tony" Purcell, KP4IG, Urb Tomas Carrion, Calle 2, #95, Juana Diaz, PR 00665

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West Texas — Amelia "Milly" Wise, W5OVH, 8516 Mt Scott, El Paso 79904 (915-751-4160)

"It Seems to Us . . ."

TV Answer: What was the Question?

Spectrum allocations issues usually are of the kind that can lead reasonable people to differ.

Like land, the radio spectrum is a finite resource. The main difference is that, unlike a plot of land, a band of frequencies can be returned to a pristine state simply by turning off one or more transmitters. So the radio spectrum, while finite, is said to be infinitely renewable. But the extent of its renewability is limited by economic considerations, and these naturally give rise to conflicting priorities.

The amateur bands are a lot like our public lands. They are available for noncommercial use by any citizen willing to pay the modest "admission fee" of passing a license exam. The exam helps ensure that entrants to this "land" will use it safely and in the public interest, and will respect the rights of others.

Our bands are like public lands in another way, too. Because so much of the public benefit derived from their existence is intangible, there will always be those who see in them an opportunity for commercial exploitation. We tend to view proposals for the reallocation of amateur bands for commercial purposes as the moral equivalent of open-pit mines in national forests or parking garages in Central Park, but usually we can acknowledge that other reasonable people may see things differently.

Usually. Once in a while an idea comes along that is so preposterous, and the actions of its proponents so outrageous, that no amount of human charity can put a reasonable face on it—or on the actions of those who would even take it seriously. That's the situation with regard to a proposal filed with FCC in December on behalf of "TV Answer, Inc.," a self-serving petition seeking allocation of 500 kHz somewhere in the 216-222 MHz band "for the primary use of a new television viewer-response service" developed by the firm. Developed? Well, maybe not.

First, some history. Back in November 1986, the FCC granted an individual named Oscar Morales-Garza an experimental license "to conduct tests and demonstrations of the TV Answer System at 218.250 MHz." The "system" involves having 50-watt transmitters sitting on tops of TV sets all across the country, bleeping high-speed data bursts back to a central receiver to tell someone what viewers think or want.

Six months later, at the request of the licensee, the license was modified to permit operation in the 216.25-219.75 MHz range. Six months after that, there being no evidence at hand that any over-the-air experimentation had actually taken place, FCC found itself in receipt of an application for a further modification, this time to add 220-222 MHz to the list of authorized frequencies; to double the power of the experimental transmitters; to authorize a 500% increase in the number of transmitters; and to assign the license from Morales-Garza to a corporation, TV Answer, of which he is an officer and director. One of the arguments used for the additional frequencies was, "The more varied the range of potential test frequencies, the greater the likelihood that, at the conclusion of the demonstration period, an optimal frequency for the TV Answer system can be identified."

Hold that thought; we'll come back to it. (By the way, we don't wish to make light of the difficulties faced by the licensee; the geographical coordinates listed in his application place the center of his operation a couple of hundred miles out into the Atlantic, where, last time we checked, there weren't too many TV households. So the delays are, perhaps, understandable.)

What the FCC wants to grant in the way of experimental licenses outside the ham bands is no business of ours, so it wasn't until the most recent application for modification that we took any notice. Then we filed a "petition to deny," setting forth the League's opposition in the strongest possible terms.

But wait; things are just beginning to get interesting. On December 2, along comes the aforementioned petition to FCC on behalf of TV Answer, seeking reallocation of a 500-kHz chunk of 216-222 MHz spectrum! And it doesn't seem to matter which of three candidate 500-kHz chunks in that range is chosen: "These frequencies are technically indistinguishable in terms of how the System operates." If you find that inconsistent with the statement in the experimental application, you're not the only one; and this doesn't even scratch the surface of the flaws in the two documents.

FCC wasted no time in putting the petition on public notice, assigning it RM-6196 and setting a comment deadline of January 27. And the TV Answer folks cranked up their PR machinery, sending out printed and videotape propaganda to a dizzying list of broadcasters, cable operators, and educators who might innocently see some virtue in the system.

Did they stimulate comment? Yes, they did. And little wonder; they supplied form-letter comments and a postpaid envelope to send them to the FCC. Postpaid? Yes—a business reply envelope addressed to the FCC and stating, "Postage will be paid by addressee"! And sure enough, the Postal Service sent the FCC a bill for the postage! At this point one would think the only "answer" needed, TV or otherwise, is to the question of who goes to jail, and for how long.

But there's more. Being a careful sort, our Counsel, Chris Imlay, made absolutely certain that no extension of time for comments had been granted by FCC before filing ours at the last possible moment on the due date, January 27. It's essential to not show one's hand too early in filing such comments, so opponents will not have two opportunities for rebuttal—once in their own comments, and again in reply. But on January 28, the day after the deadline, FCC released an order extending the deadline to February 29! We won't repeat the explanation for this intriguing chronology given to us by an FCC staffer; it would only make you upset, and if pressed for confirmation he'd probably have to deny ever saying it.

What can you do? If this reaches you in time, you can file your own comments with FCC (original and five copies, please) telling them what you think of RM-6196 and their handling of it. To keep things in perspective, remember that this is just a petition to FCC, not a Commission-drafted proposed rule making.

You can also bank on this. As far as the League is concerned, 220 MHz is off limits to poachers. The TV Answer proposal deserves immediate dismissal. If instead it actually shows signs of going anywhere and our 220 band is involved, the Washington Redskins won't be the only ones brandishing scalps.—*David Sumner, K1ZZ*

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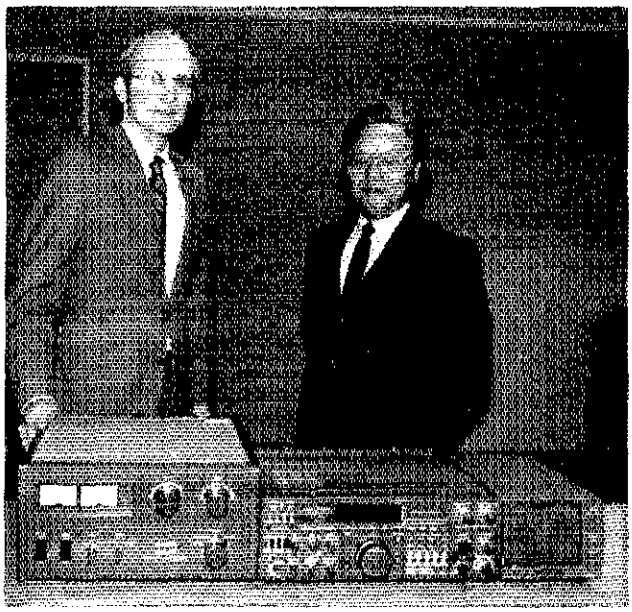
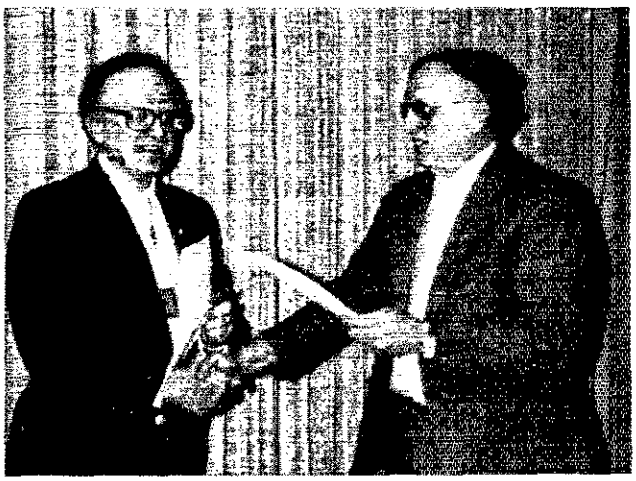
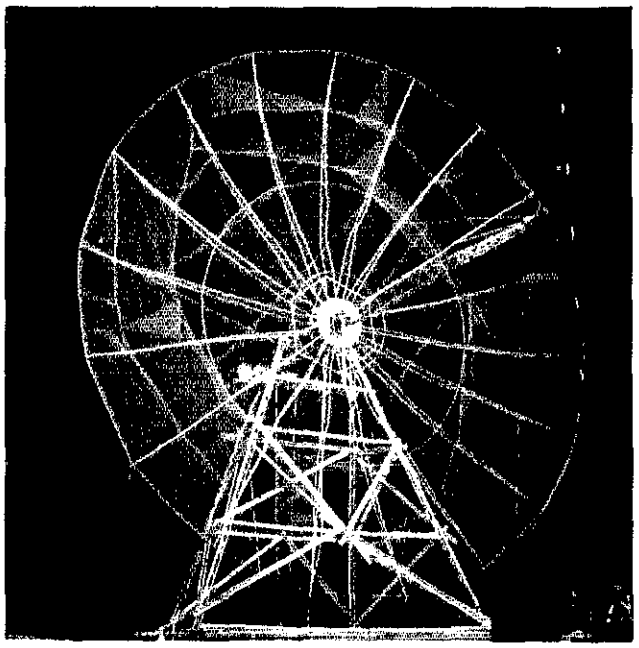


New Equipment Donated to ARRL: Shiro Nomura, JA1CB, Kenwood USA Corporation Chief Engineer (Communications Engineering and Service) presents ARRL Executive Vice President David Sumner, K1ZZ, with a TS-940 transceiver, SP-940 external speaker with audio filters and a TL-922 amplifier. The station is now in use at one of the guest operator positions at W1AW. Thank you, Kenwood.



It's Official: After more than 60 years of informal but close cooperation, the National Weather Service and the ARRL have made it official. On January 19, a Memorandum of Understanding was signed by Dr Richard E. Hallgren (right), Assistant Administrator of the National Oceanic and Atmospheric Administration and Director, National Weather Service, and Perry Williams, W1UED, Secretary of the ARRL and Washington Area Coordinator. The brief ceremony took place at the NWS headquarters in Silver Spring, Maryland.



Does Guiness Know About This?: Thought to be the largest amateur dish in Europe, this 53-foot 432-MHz antenna was built by the Lohja Amateur Radio Club (Finland). The dish, located 40 miles west of Helsinki, took almost two years to build and was destroyed once by a snowstorm, but was rebuilt in time for the 1987 ARRL International EME Competition. Because of receiver problems and lack of a high-power license, which limited the station to 50 watts, the only US stations worked were KP4I, K1FO and NC1I. Matti Rouhiainen, OH2PO, says to expect better results after correction of the receiver problems and an increase to 1000 watts! (*photo courtesy OH2PO*)

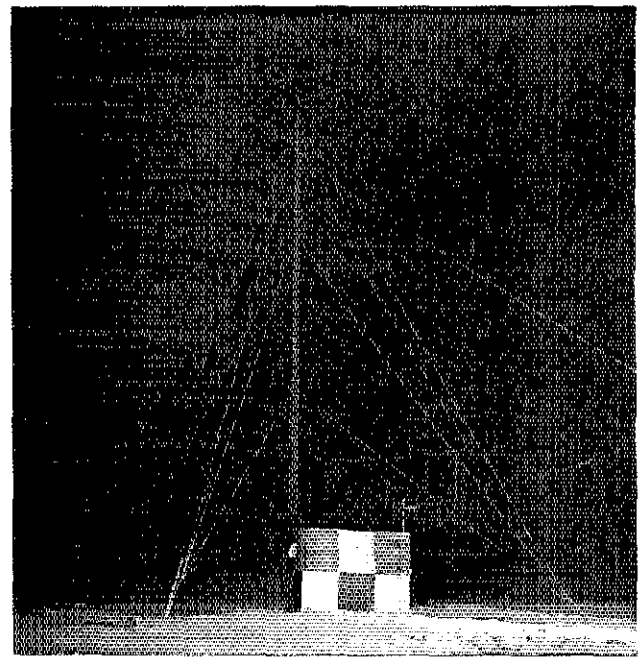
RF Runs Amok?: No, the elaborate Christmas lighting at the QTH of Rodger Stuart, KS6P, of Escondido, California is not due to errant RF. Actually, the lighting is provided by 1500 feet of Christmas lights. That's a home-brew 7-element 10-meter beam on an 80-foot tower in the background, by the way. (*photo courtesy KS6P*)

Tracking SKITREK

The SKITREK team, made up of four Canadians and seven to ten Russians, will be leaving Cape Arktichesky (on the Severnaya Zemlya Islands in the Soviet Union) on or about March 1 and should arrive at Cape Columbia (on Ellesmere Island in Canada) in early June. The skiing expedition will make geomagnetic, glacial and meteorological observations and conduct experiments in physiology and biochemistry to determine the limits of human endurance and social isolation. Expedition leader Dr Dmitri Shparo, UA3AJH, says, "We are going to join two continents with a ski track. It is a walking trip...to show that we are very close neighbors."

Although most amateurs won't be able to hear the expedition's signals, the location of the team will be transmitted by the digitalker on UoSAT OSCAR 11. The team will hear their position over the satellite on 145.825 MHz; the signal should be audible to amateurs around the world as well. Amateur Radio support bases in Canada, Russia and on an ice island will be linked by packet radio.

As you have no doubt noticed, this month's cover highlights the expedition; Canadian NewsFronts also presents SKITREK information. A special postcard commemorating reception of the UoSAT digitalker will be available from the Canadian Radio Relay League.



One of the Amateur Radio support bases for SKITREK. (photo courtesy VE3CDX)

Feeling Out of Phase?

Then you'll want to learn more about phase noise and how it affects *your* communications. Check out Part 1 of KI6WX's article, "Phase Noise and its Effects on Amateur Communications," beginning on page 14 of this issue. Part 2 will include details on a simple system you can use in your own shack to measure receiver phase noise.

A Family Hobby: No one is left out of the Amateur Radio fun in this family! Noal Hatch, W7PWH, of Provo, Utah was first licensed 50 years ago, in 1938. His wife received her license 36 years ago, his oldest son received his 26 years ago and the rest of the family joined the amateur ranks during the last two years. Seen here are (l-r) Roger, N7KCQ; Noal; his wife Lillian, W7QPF; daughter-in-law Janeal, KA7ZSR; Ronald, K7QEZ, and Robert, N7ITL. *(photo courtesy W7PWH)*

Fact is Stranger Than Fiction

Have you had an unusual Amateur Radio experience or coincidence? Send us your most interesting one(s) (100 words or less, and photos if available), and we'll publish some of them soon in Up Front in *QST*.

It's an Extra!: Fred Fichman, WA6YVA, of Calabasas, California is a proud papa. His 12-year-old son Jeremy, AA6U (right), recently upgraded to Extra; Fred wonders if Jeremy might be the youngest Extra. Certainly he must be one of the youngest. Fred's other son, Kevin, N6QXH, upgraded to Technician at the same time. Fred also managed to convince his aunt and uncle, Ferdinand (KB6RSS) and Joyce (KB6RST) Fichman, of Santa Monica, to become hams. Fred has only one problem: "Now if someone will just tell me how I can get my wife to say even one word over a microphone, I would certainly appreciate the advice." *(photo courtesy WA6YVA)*

League Lines

FCC Part 15 proposals threaten Amateur Service, ARRL finds. ARRL will file comments in Docket 87-389, requesting that the FCC restrict all intentionally radiating devices from the amateur bands; maintain existing limits on unintentionally radiating devices; and require that information on resolving RFI problems be included with Part 15 devices when they are sold.

The ARRL has also filed comments to head off a petition which threatens the 220-MHz band. This and other news in this month's Happenings column.

The ARRL Board of Directors met January 22-23 and elected George Wilson, W4OYI, as Second Vice President, and Clyde Hurlbert, W5CH, as Third Vice President. All other incumbent officers were reelected. The Board voted to add new endorsable single-band DXCC awards for 80, 40 and 10 meters, and approved a fund-raising program to renovate W1AW (details on both of these important programs next month). The West Indies Section was divided into two separate sections—Puerto Rico and the Virgin Islands, including Guantanamo Bay. The complete story and minutes of the meeting begin on page 47.

The deadline for receipt of nominations for the 1987 ARRL Herb S. Brier Instructor of the Year Award (for volunteer instructors) and for the 1987 ARRL Professional Teacher of the Year Award (for teachers who are compensated) is ***April 1, 1988.*** Submit the name(s) of your nominee(s) and a brief explanation to your Section Manager as soon as possible.

Open House: The ARRL HQ building and W1AW, the Hiram Percy Maxim Memorial Station, will be open Sunday, June 5, from 10 AM to 4 PM. If your club or group would like to schedule a visit on this date, please notify HQ. Be sure to bring a copy of your ticket if you'd like to operate W1AW.

W1AW operated under the call sign W2ØØAW during the Bicentennial week (January 8-15) of Connecticut's ratification of the US Constitution. The Constitution Bicentennial on the air activity continues with more special "200" prefixes from preregistered clubs in the following states:
February 27-March 4—Ohio
March 5-11—Florida
March 12-18—Vermont and Maine
March 26-April 1—Washington DC
April 23-29—Maryland

Murphy infiltrated last month's League Lines column. In one story we mentioned that this year's ARRL National Convention was in Seattle. Of course, ***the National Convention is in Portland, Oregon, September 9-11, 1988.*** Secondly, the correct address of the 8th call area QSL bureau is: ***8th Area QSL Bureau, PO Box 182165, Columbus, OH 43218-2165.***

Each year, the ARRL Foundation sponsors a number of scholarships and the Victor C. Clark Youth Incentive Program. The deadline for all ARRL Foundation Scholarship applications, for the 1988-89 academic year, except for the $5000 ARRL Scholarship to Honor Senator Barry Goldwater, is May 1, 1988. The deadline for the Goldwater Scholarship is June 1, 1988. The Clark Program provides mini-grants year-round to groups that demonstrate a serious intent to provide support for the development of Amateur Radio among high-school-age youth. ***For further information*** about these scholarships, which range from $500 to $5000, and other Foundation Programs, ***contact the ARRL Foundation, c/o ARRL HQ.***

You asked for it and you got it! The FCC monthly list of issued amateur call signs will now appear regularly in the Happenings column.

An opening exists in the Technical Department at HQ for an Assistant Technical Editor. We are looking for a licensed (and experienced) amateur with a Bachelor's degree in science or engineering, or equivalent experience. The successful candidate for this job must be able to write effectively, have a solid grasp of electronic fundamentals and be able to do library research. The ideal candidate would have experience in preparing material for publication, in operating personal computers, and in speaking before groups of people. Starting salary is $25,012; excellent benefits. Contact Chuck Hutchinson, K8CH, at HQ.

There's an assistant manager position open with the Volunteer-Examiner Coordinator Department at HQ. No need to already be an accredited Volunteer Examiner (although it would help), but an Extra Class ticket is mandatory as are solid 20+ WPM code skills. Annual salary range is $21,008-25,210. Contact VEC Manager Jim Clary, WB9IHH, at HQ for more information.

The position of Assistant Contest Manager is open. This position requires applicants to be interested and knowledgeable in the ARRL contest program. An amateur license, personal-computer familiarity and some writing skills preferred. Contact Contest Manager Billy Lunt, KR1R, at HQ.

Want to combine your writing and Amateur Radio skills in an exciting job offering a broad range of hands-on editorial responsibilities? The Production/Editorial Department is looking for a ham with an English or Journalism background (education or paid work experience) to fill the position of ***Editorial Assistant.*** Starting salary range $15,418-16,960. Send your resume and cover letter to the Editorial Supervisor at HQ.

Phase Noise and its Effects on Amateur Communications

Part 1: A mystery to many amateurs, phase noise is nonetheless an important performance parameter of our gear. This month, we look into its causes and effects.

By John Grebenkemper, KI6WX
Tandem Computers, Inc
10501 North Tantau Ave
Cupertino, CA 95014

It's a Saturday evening and you're listening on 80 meters, tuning for a response to your just-completed CQ. You hear a weak station calling, and just as you are about to copy the last part of the call sign, the signal is masked by a loud, raspy CQ. The station answering you is totally masked by this hissy signal. This noise is clobbering the whole band! You recognize the call sign of the interfering station—it's George, the new Novice just a few blocks away. After you tune up the band to confirm that he is really operating in the Novice subband, you're tempted to give him a call and tell him what a lousy radio he purchased, but good sense and curiosity prompt you to try to figure out the cause of the interference.

You doubt your receiver is the problem, because it has excellent dynamic range, and turning on its RF attenuator doesn't eliminate that awful rasping. Therefore, it must be George's transmitter. Maybe his transmitter has a parasitic oscillation, but you've never heard a signal so thoroughly wipe out an *entire* band.

Most likely, the cause of this problem is oscillator phase noise. What causes it? In this example, it could be George's transmitter, but it could also be your receiver. Oscillator phase noise can dramatically impair your ability to communicate with other stations, whether it comes from the receiver, the transmitter, or both.

What is Oscillator Phase Noise?

Oscillators have formed the basis of most radio communications systems since spark-gap transmitters were retired. Originally, these oscillators used piezoelectric crystals or high-Q LC tuned circuits as resonant elements. More recently, *phase-locked loops* (PLLs) have been used in radios with synthesized local oscillators. There is no theoretical reason that prevents a phase-locked oscillator from having better phase-noise characteristics than a free-running oscillator using an LC tuned circuit.

An ideal oscillator would generate a sine wave at a given frequency with no deviation in amplitude or phase over time. If we looked at this signal with an ideal spectrum analyzer, we would see all of the energy concentrated at the fundamental frequency

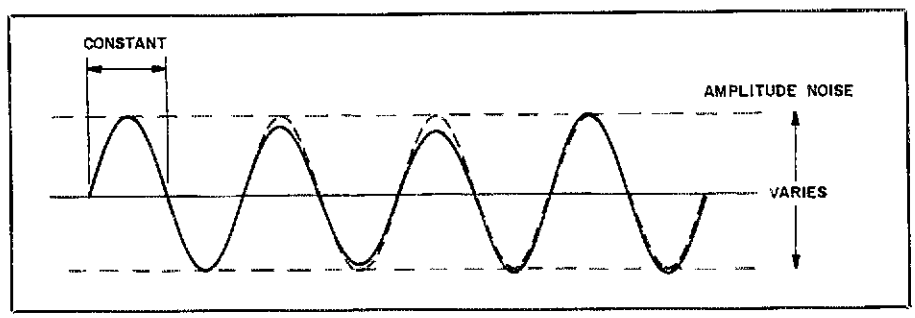


Fig 1—Oscillator amplitude noise effects as viewed on an oscilloscope. The broken line shows the output of an ideal oscillator; the solid line shows the output waveform of an oscillator with a large amount of amplitude noise.

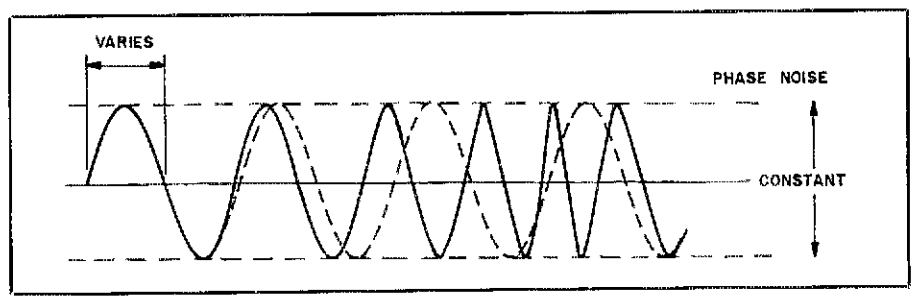


Fig 2—Oscillator phase-noise effects as viewed on an oscilloscope. The broken line shows the output of an ideal oscillator; the solid line shows the output waveform of an oscillator with a large amount of phase noise.

and none at any other frequency. If ideal oscillators existed, problems with phase noise wouldn't exist.

Oscillator signals vary in both amplitude and phase as a function of time. These variations are referred to as *amplitude noise* and *phase noise*. Amplitude noise is an undesired variation in the *amplitude* of an oscillator signal. If we use an oscilloscope to look at oscillator output, we can see that the amplitude peaks of the sine wave vary with time (Fig 1).

Phase noise is an undesired variation in the phase of the signal. In this case, an oscilloscope shows that the time between zero crossings of the signal varies over time when compared to the zero crossings of an ideal sine wave. An exaggerated example of phase noise is shown in Fig 2.

Several factors combine to make amplitude noise much less important than phase noise. The first is that most oscillators tend to produce less amplitude noise than phase noise. This occurs because the active devices in most oscillators are operated in a gain-saturated condition. Gain saturation occurs when increasing the input to a device or stage results in no further increase in output. If a device or stage is sufficiently gain saturated, small changes in the amplitude of the input signal (amplitude noise, in other words) produce no change in the output level.

Amplitude noise is secondary in importance to phase noise for another reason. Most modern ham rigs use mixers in their signal-generation schemes. Because mixers are usually operated with their local-oscillator input ports gain saturated, any amplitude noise on the input signal generally does not appear on the mixer output.

Specifying Phase Noise Levels

There are many ways to display oscillator phase noise. The most common presentation is called single-sideband (SSB) phase noise. This is simply a display of the phase-noise characteristics on one side of the carrier. The SSB phase-noise presentation has probably achieved its widespread use because SSB phase noise is easy to measure and interpret for the average person who is familiar with RF measurement techniques. The display of SSB phase noise is exactly what you would see if the oscillator was observed using an ideal spectrum analyzer with a 1-Hz sampling bandwidth.

The vertical axis is the SSB phase noise measured in units of "dBc/Hz." The "dBc" means that we are measuring the power in the phase noise relative to the power in the carrier. The "Hz" implies that we are making this measurement in a 1-Hz bandwidth. (Phase noise is usually not actually *measured* in a 1-Hz bandwidth, for reasons of instrumentation limitations. See the sidebar entitled "A Sample Phase-Noise Scenario.")

The horizontal axis represents the difference between the measurement and oscillator frequencies, and is usually referred to as the *offset frequency*. Offset frequency is measured in Hz, and it is usually plotted on a logarithmic scale. An offset of 1 kHz means that we are measuring the phase noise 1 kHz from the carrier; an offset of 10 kHz is 10 kHz from the carrier, and so on. A 10-kHz offset from a 10-MHz carrier means that we are making measurements at 9.99 MHz or 10.01 MHz.

Two typical phase-noise measurements are shown in Fig 3. At an offset frequency of 0 Hz, the SSB phase noise is always 0 dBc/Hz, because we are measuring the carrier power, which is the reference for these measurements. At any other offset, the SSB phase noise is always a negative dB value.

Phase noise in a communications system can be divided into two different regions. The *in-band* or *close-in* phase noise is the component that is *within the modulation bandwidth* of the signal. The *out-of-band* or *far-out* phase noise is the component that is *beyond* the modulation bandwidth of the signal. The modulation bandwidth of an amateur SSB signal is 3 kHz. Therefore, we can define the close-in phase noise of an SSB signal as the noise at offsets of less than 3 kHz, and the far-out phase noise as the phase noise at offsets greater than that. The difference between close-in and far-out phase noise is similarly defined for modes with different modulation bandwidths.

A Sample Phase-Noise Scenario

Phase-noise levels are specified in decibels relative to the carrier level, at a particular offset frequency *in a 1-Hz bandwidth*, or dBc/Hz. But this doesn't tell us how much interference is caused by a particular phase-noise level at a given offset frequency, because we don't use 1-Hz receiving bandwidths. If you know your receiver's IF bandwidth, the received carrier power of the phase-noisy signal, the phase-noise level and the frequency offset, you can easily calculate the received power of the phase noise. Then you can calculate how strong a desired signal must be to be copiable through the phase-noise interference.

Let's assume that somehow we know the phase noise on a transmitted signal is −110 dBc/Hz at 4 kHz (where our receiver is tuned) from the carrier. Let's also assume that our receiving bandwidth is 500. This means that there is *500 times* as much phase-noise power getting through our receiver as there would be at a receiving bandwidth of 1 Hz. A power ratio of 500, expressed in dB, is 27. Because our receiver bandwidth is wider than 1 Hz, the phase-noise hiss we hear is not 110 dB below the carrier: it's 27 dB greater in our 500-Hz bandwidth. That's −83 dBc/500 Hz.

If the carrier of the phase-noisy signal produces 5000 microvolts at the receiver antenna terminals, the phase noise in our 500-Hz receiving bandwidth is 83 dB below 5000 microvolts.† This is equivalent to 0.35 microvolt at the receiver's antenna terminals.

This is more than enough signal strength to degrade the sensitivity of a good HF receiver. In fact, a desired signal of reasonable strength could easily be masked by this much phase noise. The sensitivity of a typical receiver is about −137 dBm for a 500-Hz receiving bandwidth. Such a receiver can detect a signal as weak as 0.03 microvolt. In our sample case, the phase noise hits 0.35 microvolt at the receiver input—21 dB greater than the weakest signal our receiver can hear. The phase-noisy incoming signal has degraded our receiver's sensitivity by 21 dB!
—David Newkirk, AK7M, Assistant Technical Editor, QST

†How true to life is the strength of the interfering signal in this example? On a receiver S meter calibrated for S9 = 50 μV (a common standard), 5000 μV is 40 dB over S9, assuming that the meter calibration is accurate. Signals of this strength are commonplace at many locations.

Glossary of Terms

Amplitude noise—Undesired variations in the amplitude of an oscillator or synthesizer signal.

Blocking—The region in which a receiver limits the output resulting from a desired signal because of an undesired signal on a different frequency.

Gain saturation—The point at which an increase in input to a device or circuit results in no increase in output.

Natural frequency—The frequency in a feedback circuit (such as a PLL) that produces optimum loop response.

Offset—The difference in frequency between the carrier and the center of the sampling bandwidth in a phase-noise measurement system.

Phase Noise—Undesired variations in the phase of an oscillator signal.

Underdamping—Lack of sufficient negative feedback in a loop (such as a PLL). The loop tends to oscillate in this state.

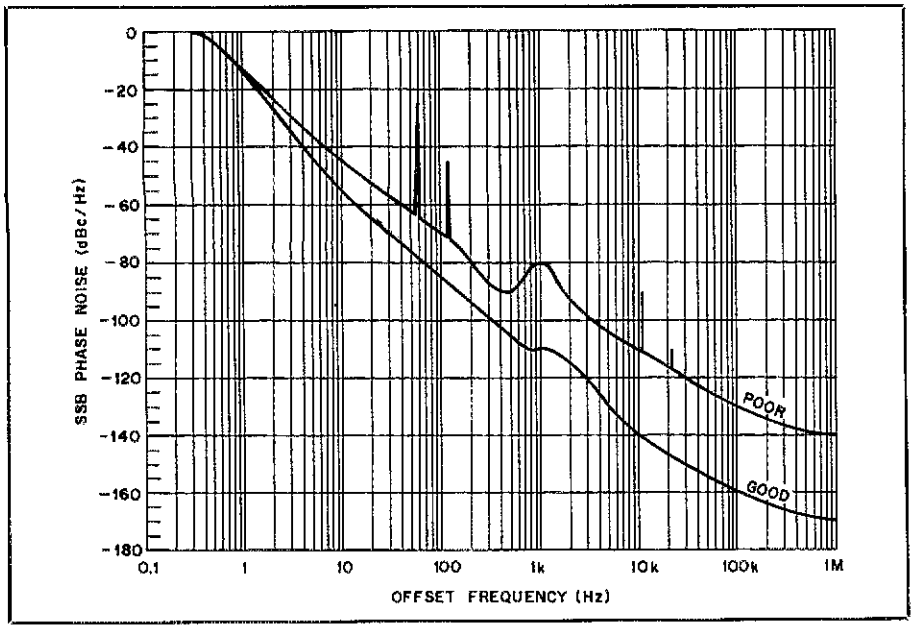


Fig 3—Phase-noise characteristics of two synthesized oscillators. The lower curve represents the output of a well-designed synthesized oscillator. The upper curve represents that of a poorly designed synthesized oscillator. Note the broad peak at 1 kHz, and the spikes visible near 60 and 120 Hz, and 11 and 22 kHz. (See text.)

The example used in Fig 3 shows the phase noise for two different synthesized oscillators. The phase-noise plot labeled "good" is the phase noise from an excellent synthesized local oscillator. These phase-noise characteristics are considered "state of the art" for oscillators used in HF receivers. The phase noise from this oscillator rapidly decreases with increasing offset frequency, reaching −160 dBc/Hz at an offset frequency of 100 kHz. The slight flattening of the phase-noise plot near 1 kHz results from the natural frequency of the PLL. (See the glossary.) (It is normal for a synthesized oscillator to show flattening or a few dB of peaking of the phase noise at the natural frequency of the PLL.) This oscillator would present only minor phase-noise problems in amateur applications.

The phase-noise plot labeled "poor" is typical of what one would expect from an inferior synthesized oscillator. The characteristics of such an oscillator include strong spurious signals, an underdamped PLL, and a high phase-noise floor. (See the glossary.) Large spurious signals are shown at harmonics of 60 Hz and 11 kHz. These signals result from frequency modulation of the oscillator in the PLL, and are generally caused by inadequate shielding or poor loop design. The broad peak at 1 kHz results from an underdamped PLL. Any peaking greater than this is indicative of a poorly designed phase-locked oscillator.

The phase noise of the poorer oscillator in Fig 3 is only −130 dBc/Hz at a 100-kHz offset. This is generally caused by deficient design of the phase-locked oscillator. Any of the above forms of degradation in the phase noise of an oscillator compromise the performance of a transmitter (and/or receiver).

Effects of Oscillator Phase Noise

In order to understand the effects of phase noise, we have to keep some basic principles in mind. The term *communications system* used throughout this article refers to the receiver, the transmitter to which the receiver is tuned, and other nearby transmitters. The term *system* is used to convey that phase-noise effects can result from *both the receiver and transmitters,* not just the affected receiver.

Principle 1: Whenever a carrier is passed through a mixer, the phase noise of the oscillator driving that mixer is *added* to the carrier. This means that the oscillator SSB phase-noise power at a given offset frequency is added to the phase noise already present on the carrier at the same offset frequency. For instance, suppose we pass an ideal carrier (one with no phase noise) through two mixers, each driven by an oscillator with an SSB phase noise of −130 dBc/Hz at a 10-kHz offset. After passing the carrier through the first mixer, the SSB phase noise on the carrier is −130 dBc/Hz. After passing the carrier through the second mixer, the phase noise on the carrier is −127 dBc/Hz. This is the *sum* of the phase-noise *power* of the carrier and local oscillators at the 10-kHz offset frequency. (Summing two equal powers is a doubling of either power, or a 3-dB increase. −127 dBc is twice as much power as −130 dBc.) This example illustrates that *the oscillator with the worst phase-noise characteristics limits the performance of the system.* This principle holds for both transmitters and receivers.

Principle 2: *Phase noise on a transmitted signal causes effects identical to phase noise generated in a receiver.* (Of course, transmitter-generated phase noise can affect many users of the radio spectrum, while receiver-generated phase noise only affects the person using that receiver!)

Principle 3: Passing an oscillator signal through a filter *reduces* the phase noise in accordance with the filter bandwidth and attenuation characteristics. For instance, passing a carrier through a filter (centered on the carrier frequency) with a bandwidth of 20 kHz reduces the phase noise for offset frequencies greater than 10 kHz. As a result of this, transmitters and receivers have an *apparent phase noise* that is usually less than the sum of their local oscillator phase-noise levels. The *apparent* phase noise is what limits the *system* performance.

Phase noise on a transmitted signal causes effects identical to phase noise generated in a receiver.

This effect must be applied with a good understanding of exactly what the filtering does. For instance, in receivers, filtering *before* a mixer determines the apparent phase noise; in transmitters, filtering *after* a mixer determines apparent phase noise. The improvement in the apparent phase-noise floor achievable with filtering depends on the power level of the signal being filtered. A normal filter at room temperature generates thermal-noise power of about −170 dBm/Hz. A −10-dBm signal passed through this filter can achieve a noise floor no lower than −160 dBc/Hz.

Close-In versus Far-Out Phase Noise

The close-in and far-out phase-noise components act on a communications systems in different ways. Close-in phase noise limits the performance of the system even when there is plenty of signal present. With an AM or FM signal, the close-in phase noise limits the maximum signal-to-noise ratio (SNR) that can be achieved by the system. With a frequency-shift-keyed or a phase-shift-keyed signal, the close-in phase noise limits the maximum bit error rate that the system can achieve. Both of these effects can be quantified once the communications system is defined. With an SSB voice signal, the effects are much harder to predict, but excessive phase noise does degrade SSB signal intelligibility to some extent.

Amplifier Noise: The Hiss that Confuses the Phase-Noise Issue

Plus or minus perhaps 100 Hz to 100 kHz from the transmitted carrier of a synthesized, broadbanded rig, phase noise is usually the major hiss producer.[1] Farther out from the carrier, however—half the band away, perhaps—transmitted amplifier noise from the same broadbanded rig may be busting up weak-signal QSOs for hams across town. What's going on? Isn't all transmitted broadband hiss caused by phase noise?

Phase-noisy oscillators usually manifest themselves as broadband hiss when

(1) Our receiver has a phase-noisy oscillator, and we tune it to a frequency adjacent to a very strong signal emitted by a phase-quiet transmitter; or

(2) Our receiver has a phase-quiet oscillator, and we tune it to a frequency adjacent to a very strong signal emitted by a phase-noisy transmitter; or

(3) Our receiver has a phase-noisy oscillator, and we tune it to a frequency adjacent to a very strong signal emitted by a phase-noisy transmitter.

We can infer from these points that if we install phase-quiet oscillators in transmitter and receiver, we ought to be able to tune our receiver to a frequency closely adjacent to a very strong signal from the transmitter without encountering anything like phase-noise hiss. Yet, after an exhaustive phase-noise cleanup at transmitting and receiving sites, we test our communication system only to discover that the transmitter still emits broadband hiss! The culprit is transmitted *amplifier noise.*

Just about every modern transmitter or transceiver consists of a high-gain, linear amplifier strip that amplifies the low-level output of oscillators, mixers and phase-locked loops to hundreds of watts or a few kilowatts. Because amplifier circuitry is not perfectly quiet, the output of the transmitter contains noise (hiss) in addition to the amplified signal. Transmitted along with the desired signal, this hiss can degrade the noise floor of nearby receivers—just as transmitted phase noise can.

Where does amplifier noise come from? *Thermal noise,* for one thing. Electronic components operated at temperatures greater than absolute zero generate random electrical noise. This noise is broadband in nature. Greatly amplified in an audio amplifier—or greatly amplified in a radio transmitter, transmitted as broadband radio noise, received and converted to audio—it sounds like hiss. Random variations in electron flow within active amplifier components (transistors and vacuum tubes) are another source of amplifier noise. Transmitted as broadband radio noise, received and converted to audio, it also sounds like hiss.[2]

How strong will transmitted amplifier noise be on the receiving end? As is the case with phase noise, its severity depends on path loss and antenna gain. The nearer the noisy station, the stronger the noise will be—if your receiver doesn't overload first.

How wide will transmitted amplifier noise be? That depends on the characteristics of tuned circuits and other filters in the transmitter's signal path. If the rig needs no retuning for full power output across an entire amateur band, the power bandwidth of its transmitted amplifier noise may be correspondingly wide. By comparison, the strength of transmitted phase noise generally varies greatly within a relatively small band around the carrier, generally decreasing in amplitude with distance from the carrier.[3]

As we become more aware of the importance of phase-quiet oscillator design, we need to keep transmitted amplifier noise in mind as well. In the laboratory, amplifier noise can interfere with phase-noise measurements, just as a preamplifier can modify the results of receiver measurements. In practice, one ham's transmitted amplifier noise can raise the noise floor for ham neighbors even if all the rigs in the neighborhood have phase-quiet oscillators. Because of this, knocking phase noise back to the Vacuum-tube Age won't be the end of the transmitted-hiss battle. We need quieter broadband transmitter amplifiers, too.—*David Newkirk, AK7M, Assistant Technical Editor,* QST

Notes

[1]As encountered on the air, the practical effects of phase-noisy oscillators often appear to be limited to this range. In fact—and this is very important to keep in mind in the testing laboratory and as equipment is designed—there is no theoretical limit to the bandwidth of phase noise.

[2]Strictly speaking, only the second of these occurs as a result of amplification. Combining thermal noise under the term amplifier noise is acceptable for the purposes of our discussion because their on-the-air effects are identical.

[3]The output spectrum of a phase-noisy rig often contains abrupt peaks and dips within this general amplitude decrease, depending on the design and characteristics of its signal-generation scheme. The amplitude of amplifier noise is usually not as variable with frequency.

The effect of close-in phase noise on FM signals is relatively easy to calculate, and makes a good case study of the effects of phase noise, because of the wide use of FM by amateurs in the VHF and UHF bands. Oscillator phase-noise limits derived from the FM case should be adequate for most other modulation modes, with the possible exception of phase-shift keyed modulation.

Phase noise on an oscillator signal has exactly the same effect as frequency modulating the oscillator with noise. In fact, given the SSB phase noise of an oscillator, it is possible to calculate the equivalent frequency deviation. This deviation is called the *incidental frequency modulation* (IFM) of the oscillator.

The phase noise in an FM communications system causes a constant noise level to appear at the receiver output, regardless of the strength of the received signal. This noise imposes a maximum SNR that the communications system can achieve. Equations for computing IFM and limiting SNR, and an example of their use, are given in the Appendix.

It takes an oscillator with a very high level of close-in phase noise to degrade amateur communications systems. Most amateur communications are accomplished with marginal signal to noise ratios, and the close-in phase noise would have to be *very* strong to cause problems in such situations. Therefore, for most amateur applications, close-in phase noise is relatively unimportant.

Phase noise on an oscillator signal has exactly the same effect as frequency modulating the oscillator with noise.

Far-out phase noise, however, can have a significant impact on amateur communications. Its main effect is to degrade the dynamic range of a communications system. This degradation can result from phase noise in either the receiver or the transmitter. If the transmitter has excessive phase noise, transmitted signals are partly composed of broadband FM noise. The phase-noise emissions of some current amateur equipment are capable of significantly increasing the noise level on an entire amateur band! The effect of this is generally experienced only by amateurs living within a few miles of the offending transmitter, because the power level of the phase noise is quite low. A kilowatt transmitter with a high level of phase noise

Table 1
Typical Maximum Tolerable Phase-Noise Levels

	14 MHz	*144 MHz*
EIRP	+50 dBm	+50 dBm
Loss from transmitter to receiver (distance = 1 mile)	60 dB	80 dB
Signal power at receiving antenna (0-dBi gain receiving antenna)	−10 dBm	−30 dBm
Noise power at receiving antenna (background noise)	−150 dBm/Hz	−172 dBm/Hz
Equivalent SSB phase noise	−140 dBc/Hz	−142 dBc/Hz

This table shows maximum phase-noise levels tolerable in a communications system before dynamic range is significantly degraded. In both cases, EIRP is 100 W; separation between transmitting and receiving antennas is 1 mile; the receiving antenna is omnidirectional and has 0 dBi gain; and the receiver is sensitive enough to detect the noise.

At 14 MHz, path loss and received noise power allow the receiver to detect any phase noise stronger than −140 dBc/Hz. At 144 MHz, background noise is lower and path loss is higher, resulting in a tolerable equivalent phase-noise level of −142 dBc/Hz at this frequency. See text for additional information.

produces only a few microwatts in a typical amateur receiving bandwidth. As low as this may seem, however, it can be quite a problem for nearby receivers when you consider that a typical HF receiver is capable of detecting signals of less than 10^{-15} watts!

Far-out phase noise in a receiver oscillator is less destructive, because it affects only the receiver in which it is generated. The net effect, however, is the same: Any signal that reaches a mixer in the receiver is modulated by the phase noise in the local oscillator driving that mixer. As such, the signal appears to have at least as much phase noise as the local oscillator. Thus, sufficiently strong signals *off* the receiving frequency can degrade receiver sensitivity by raising the noise floor *at* the receiving frequency. Receiver dynamic range is reduced as the noise floor rises.

As an example, suppose that a transmitter has a power output of 1 kW and an SSB phase noise of −100 dBc/Hz at a given offset frequency. At that offset frequency, the transmitter radiates noise at a level of −40 dBm/Hz. In a 2-kHz bandwidth, this is equivalent to a noise level of −7 dBm, or 200 μW. This is sufficient power to cause significant interference to local receivers. *The effect on a receiver is the same as if the transmitter had low phase noise and the receiver had an SSB phase noise of −100 dBc/Hz.* Fortunately, the oscillators in most amateur equipment don't have this much SSB phase noise at offset frequencies greater than a few kilohertz.

The effect of phase noise on an amateur communications system can be calculated with reasonable accuracy if a few simple assumptions are made. From the calculated effects, we can calculate the oscillator performance necessary to meet our requirements. The assumptions are:

1) The transmitter is located 1 mile from the receiver.

2) The EIRP (effective isotropic radiated power) of the transmitter is 100 W (+50 dBm).

3) The loss from the transmit antenna to the receive antenna is the same as in free space. (This isn't strictly true for signals propagated above ground, but it gives an approximation of the expected signal attenuation. The actual attenuation is almost impossible to calculate because of the effects of the local terrain.)

4) The receive antenna gain is 0 dBi in all directions.

5) Our goal is phase-noise level that does not significantly degrade the performance of the communications system. That is, the received noise resulting from oscillator phase noise should be equal to or less than the background noise normally picked up by an antenna on a given amateur band. (Background noise is composed of radio emissions from our galaxy, as well as man-made noise and atmospheric noise, and varies with frequency.)

Table 1 shows the results of these calculations. The table shows values for both 14 MHz (representative of the HF bands) and 144 MHz (representative of the VHF bands). As can be seen from these calculations, the phase noise must be less than −140 dBc/Hz if there is to be no noticeable interference. A higher EIRP or less transmitter-to-receiver antenna separation would require even better phase-noise performance to guarantee no significant interference. The graph of Fig 4 shows phase-noise interference generated at 14 MHz as a function of transmitter-to-receiver antenna separation, and the apparent SSB phase noise of the system. The interference level is plotted in S units, assuming S9 is equal to 50 μV and each S unit is 6 dB. As can be seen from the graph, an SSB phase noise of −120 dBc/Hz at a distance of 500 feet produces nearly an S9 signal. This graph may be applied to local situations to estimate the interference potential that could result from oscillator phase noise.

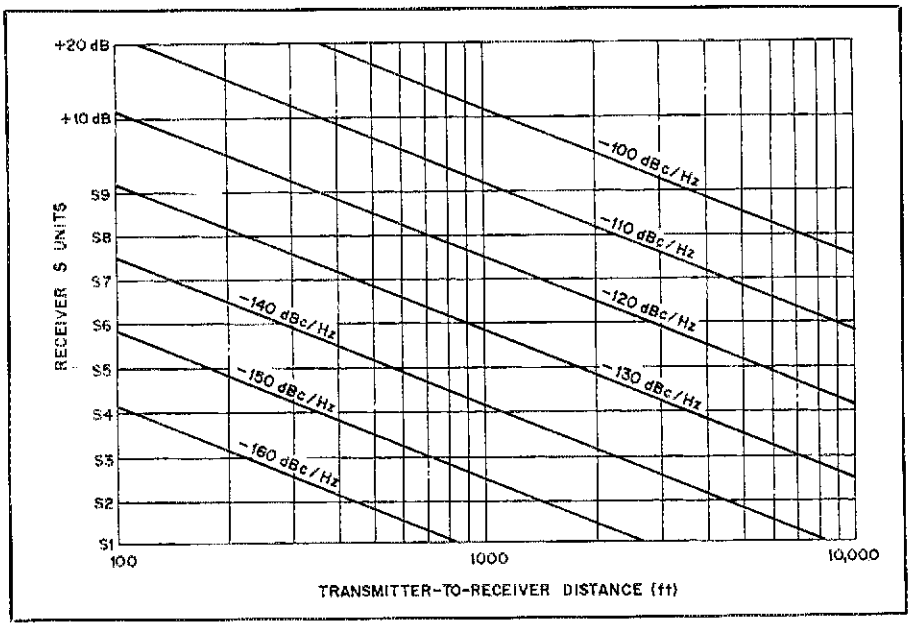


Fig 4—Phase-noise interference at 14 MHz as a function of the distance between transmitting and receiving antennas. The curves are based on a transmitter EIRP of 100 W and a receiving bandwidth of 2 kHz. The path loss from the transmit antenna to the receive antenna is assumed to follow the free-space attenuation curve. S9 is equivalent to 50 μV.

Phase Noise Levels in Amateur Equipment

Equipment cost limits the extent to which we can minimize phase noise in communications systems; with this in mind, we can set rough phase-noise performance standards for equipment in various price ranges.

Curves showing my recommendations for such standards appear in Fig 5. These

curves represent tools for comparison of phase-noise performance in amateur equipment. I derived them to give an overall idea of the phase-noise performance of amateur equipment.

These recommendations are shown by four curves: "excellent," "good," "fair" and "poor." When the phase-noise characteristics of a radio are known, they can be compared to the curves in Fig 5. The worst curve that a radio's phase-noise characteristics pass through should be considered the performance of that radio. The "excellent" curve represents close to "state of the art" performance for HF and VHF synthesized oscillators. For amateur equipment, this curve is approached by free-running LC and crystal oscillators, and the very best transceivers.

The "good" curve represents what is achieved by most well-designed amateur equipment. It doesn't cost a great deal more to design a radio that meets this curve (as opposed to the "poor" or "fair" curves). A radio with phase-noise performance that only meets the "fair" curve hasn't been designed with much regard for minimizing phase noise. The "poor" curve represents a design that is *so* poor that a transmitter with this performance shouldn't be used on the amateur bands because of the great amount of interference it can generate.

The close-in phase-noise characteristics shown in the curves of Fig 5 are relatively easy for most oscillators to achieve. The

Phase-Noise Photographs from the ARRL Lab

The photographs in this section show phase-noise characteristics of several common amateur transmitters. These photos were taken in the ARRL laboratory using procedures developed by Laboratory Engineer Zack Lau, KH6CP. The technique involves mixing the RF output of a Hewlett-Packard 8640B signal generator with the attenuated output of the transmitter under test. (Details of the test setup will be given in Part 2 of this article.)

The scale on the spectrum analyzer on which these photos were taken is calibrated so the base line in the photographs represents −140 dBc/Hz. Vertical divisions are 10 dB, and horizontal divisions are 2 kHz. The horizontal scale covers offset frequencies from 2 kHz to 20 kHz. *Phase-noise levels can be read in dBc/Hz directly from the photographs.* The photos presented here were chosen because they are representative of the equipment available on the amateur market, although *these photos do not necessarily reflect the phase-noise characteristics of all units of a particular model.* Photo A, which shows the phase-noise characteristics of the HP 8640B RF signal generator, serves two purposes: It shows excellent phase-noise characteristics, and it shows the measurement limits of the ARRL test setup. (We hope to have much greater measurement capability in the near future, but this system allows measurement of all but the most phase-quiet signals.)—*Rus Healy, NJ2L, Assistant Technical Editor,* QST

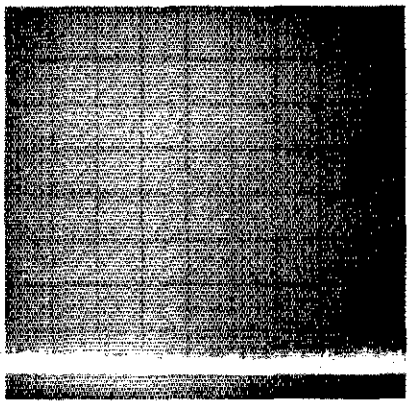


Photo A—HP 8640B RF signal generator (serial number 2044A15060) phase-noise characteristics. This photo was taken using a second 8640B as a local oscillator. This photograph shows the measurement limits of the system used to measure transmitter phase noise in the ARRL lab.

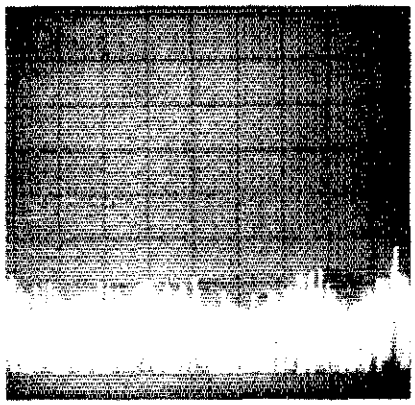


Photo B—ICOM IC-751A (serial number 01043) phase-noise characteristics. Measurement frequency: 14 MHz, power output: 102 W.

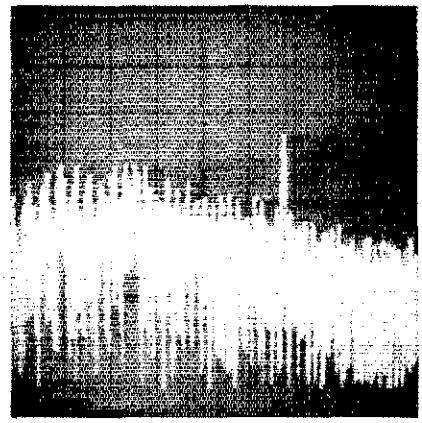


Photo D—Yaesu FT-767GX (serial number 6J030740) phase-noise characteristics. Measurement frequency: 14 MHz, power output: 95 W.

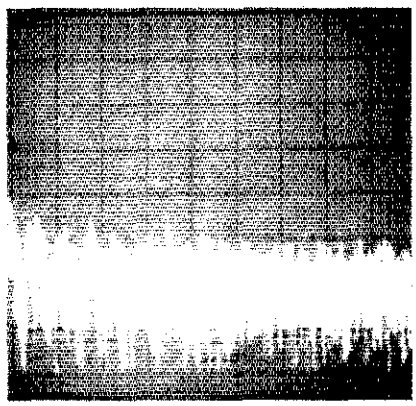


Photo C—Kenwood TS-930S (serial number 7080033) phase-noise characteristics. Measurement frequency: 7 MHz, power output: 91 W.

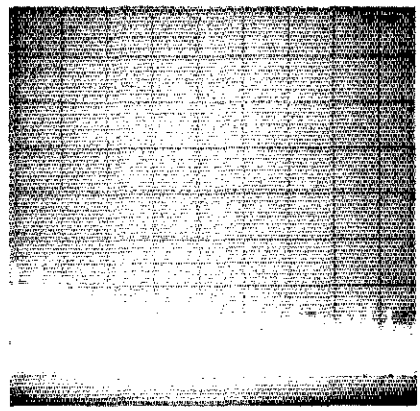


Photo E—Ten Tec Argonaut 515 (serial number 515-0533) phase-noise characteristics. Measurement frequency: 14 MHz, power output: 5 W.

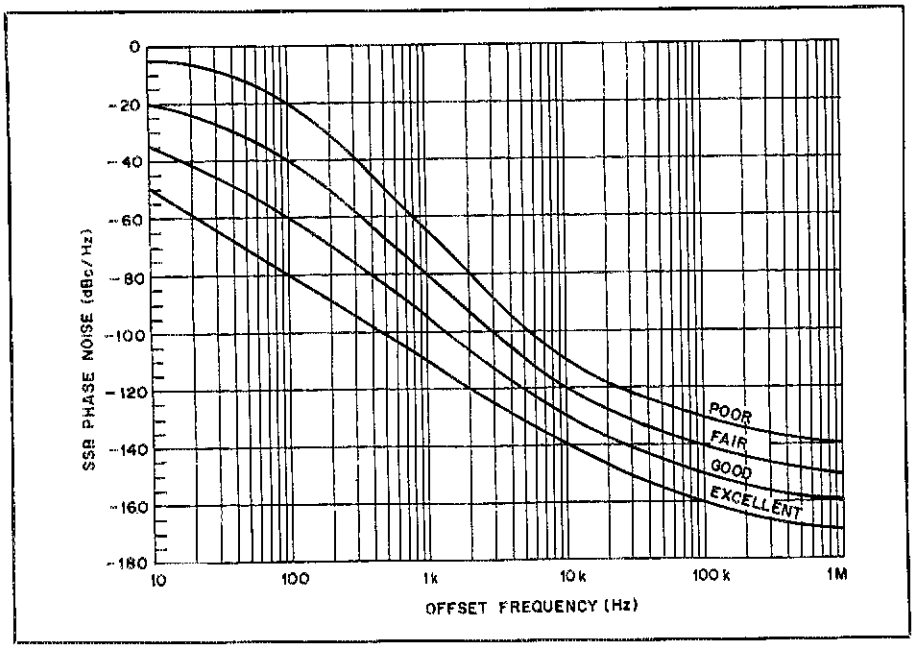


Fig 5—Phase-noise performance levels for amateur equipment. The curves from top to bottom represent poor, fair, good and excellent phase-noise performance. (See text.)

Table 2
Incidental Frequency Modulation

Curve	*IFM*
Excellent	0.4 Hz
Good	2.5 Hz
Fair	20 Hz
Poor	160 Hz

Incidental frequency modulation (IFM) resulting from the phase-noise levels shown in Fig 5. The IFM was calculated for the frequency range from 10 Hz to 10 kHz.

close-in regions of the curves were derived mainly from the effects of IFM on the limiting FM SNR. Table 2 lists the close-in phase-noise IFM integrated from 10 Hz to 10 kHz for each of these curves. (Even a radio generating the IFM level corresponding to phase noise matching the "poor" curve provides adequate voice communications capability.)

Measuring Phase Noise

Equipment capable of measuring low levels of far-out phase noise is quite expensive. It is not unusual for commercial enterprises to invest $100,000 in good phase-noise measurement equipment. Inexpensive techniques are, however, available for measuring the apparent phase noise of communications receivers and transmitters. In Part 2 of this article, I'll describe the test setup I use to measure received phase noise. The method used by ARRL for measuring transmitted phase noise will also be discussed. [Because most modern transceivers use the same local oscillator and mixer chain on both transmit and receive, overall phase-noise performance can be evaluated by measuring either transmitted or received phase noise—Ed.] The equipment necessary to measure *receiver* phase noise can be built by enterprising amateurs for well under $100.

APPENDIX

Manipulating Units of Measurement

Several of the units of measurement used in this article may be unfamiliar to many amateurs. Manipulation of some of these units is covered here.

Oscillator phase noise is converted to a power level per Hz [Pn(f)] by adding the SSB phase noise [L(f)] to the carrier power [Pc]. This is done by the equation

$$Pn(f)\ \{dBm/Hz\} = Pc\ \{dBm\} + L(f)\ \{dBc/Hz\}$$

where the units are shown in braces.

Power level per Hz [Pn(f)] is converted to a power level [P] in a given bandwidth [Δf] by

$$P\ \{dBm\} = Pn\ \{dBm/Hz\} + 10 \log (\Delta f\ \{Hz\})$$

where the units are shown in braces. This equation assumes that the power level per Hz is constant across the bandwidth.

Incidental Frequency Modulation

The incidental frequency modulation (IFM) resulting from the phase noise on an oscillator can be found by

$$IFM = \sqrt{2 \int_{f_a}^{f_b} f^2\, L(f)\, df}$$

where L(f) is the SSB phase noise converted from dBc/Hz to relative power per Hz, and f_a and f_b are the lower and upper frequency limits of the communication bandwidth. (For amateur FM operations, the communication bandwidth is typically between 100 Hz and 5 kHz.)

An approximation of the limiting signal-to-noise ratio in dB can then be defined (using IFM) as

$$SNR_{limit} = 20 \log \left(\frac{FM_{dev}}{IFM} \right)$$

where FM_{dev} is the RMS deviation of the FM signal. This equation yields only an approximation because it doesn't take into account the effects of preemphasis or deemphasis in the FM system, nor the spectral distribution of the modulating signal. (This equation generally yields results that are within a few dB of the actual numbers we would find if we took the trouble to include the other effects.)

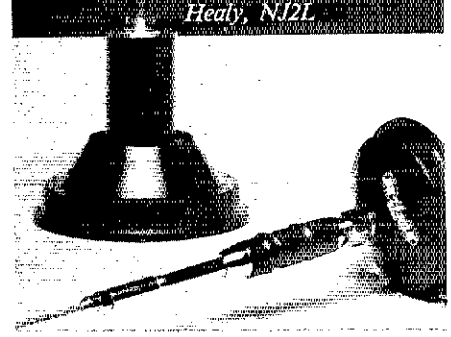
The limiting SNR effects on a VHF amateur communications system can be found as shown in the following example. Let's assume the apparent phase noise in a communications system is −40 dBc/Hz at a 100-Hz offset frequency, and decreases to −74 dBc/Hz at a 5-kHz offset frequency. The resulting IFM is 100 Hz. This is not very good performance for synthesized oscillators, even at VHF. If we now assume that the RMS deviation of the FM signal is 5 kHz, the maximum SNR that can be achieved in this system is 34 dB, which is more than adequate for voice communications. QST

New Products

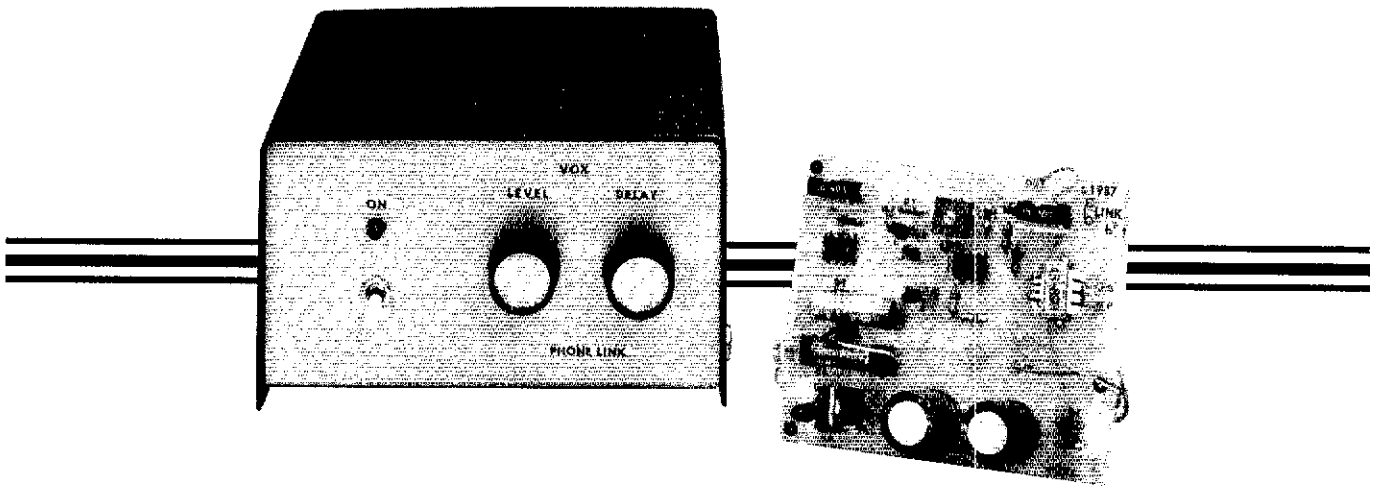
HUSTLER MAG-MOUNTS

☐ Hustler has introduced two new series of magnetic-mount antennas for the 144- and 220-MHz bands. The RX series (pictured lying down) consists of 5/8-wavelength antennas designed to handle 100 W of transmitter power and vehicle speeds up to 75 mi/h. These antennas are chrome with black bases and coil covers. All-black versions are also available (RX-2B and -220B).

The FX series antennas (pictured upright) are rated at 200 W and 100 mi/h. All-black versions of these antennas are also available (FX-2B and -220B). Price class: RX-2 and -220, $19.95; RX-2B and -220B, 24.95; FX-2 and -220, $24.96; FX-2B and -220B, $29.95. Manufacturer: Hustler, Inc, One Newtronics Pl, Mineral Wells, TX 76067, tel 817-325-1386.—*Rus Healy, N1ZL*



The Cordless Phone Link



The house needs painting, but you'd rather be on the air. Why not do both? With the cordless phone link, you can be in two places at once!

By Brian E. Brachel, KA8HLI
PO Box 71684
Madison Heights, MI 48071-0684

A while back, I began to think of how great it would be to put my feet up on the coffee table (coffee in hand, of course) and talk on 2 meters. The farthest I could get from my radio was the length of my microphone cord. I'd have to drag the radio to the sofa if I wanted real "armchair copy." Then, it struck me: "Why not bring the sofa to the radio using a cordless phone link?" I could make low-band contacts sitting at a distance in my easy chair! Shortly thereafter, I obtained a commercial cordless telephone. One evening spent on modifying the circuit so it could easily interface with my radio had me in two places at once! The best part is I didn't have to disassemble a thing.

The Circuit

Fig 1 shows a block diagram of the cordless telephone interface box. Operation of the unit is straightforward. The voice-operated switch (VOX) control circuitry runs off a 12 V ac operated power supply. In turn, audio is channeled to the duplexer, then to the telephone's base unit, where it allows my voice to control on-the-air operation.

Fig 2 is the schematic of the interface. A 555 timer chip is used for VOX control. The LM1458 serves as a duplexer to receive and transmit audio to and from the radio via the cordless phone. The design is simple, but effective.

The Power Supply

The design of the PC board is simple and compact, and it is large enough to accommodate both the power supply and the phone-link circuitry. The circuit consists of an ac power transformer that supplies 9 to 12 V output. This transformer feeds positive and negative dc supplies. The supply outputs are filtered and regulated to provide ±5 V dc to operate the interface circuit.

The Duplexer

In this circuit stage, an LM1458 op amp connects to a 600-Ω phone-line transformer, the speaker audio and the microphone drive circuits of the transceiver. It allows the received and transmitted audio to be carried on the same phone line with a high degree of isolation. This prevents normal levels of received audio from keying the transmitter.

The VOX Circuit

Audio entering the microphone triggers VOX control. Q1 acts as an amplifier stage. VOX sensitivity is adjustable. The sensitivity setting depends on the noise level entering the cordless phone. R10 sets VOX sensitivity by varying the base bias on Q1.

Q1 also feeds Q2, which triggers the 555 timer. The timing period of U2 is adjustable, but depends on how long the delay time of the VOX switch is. The out-

The Wireless Goes Cordless

With the popularity of cordless telephones, it was only a matter of time before someone came up with the idea of using one as a radio link in an Amateur Radio station. In 1986, I decided to experiment with a cordless telephone to do just that. I used one of the first available on the market—a Radio Shack/Duofone (model ET-330). The cordless phone worked on two bands (49 MHz and 1.7 MHz), and it was quite susceptible to electrical noise. I felt that by using the Duofone during the prototyping process, it would prove to be the worst-case situation, and would give the interface the ultimate test. The experiment worked extremely well, and produced excellent audio clarity. Today's cordless telephones operate on 46 MHz/49 MHz. The frequency was changed to eliminate the noise problems of the past, thus giving the same or better performance than what I have experienced.

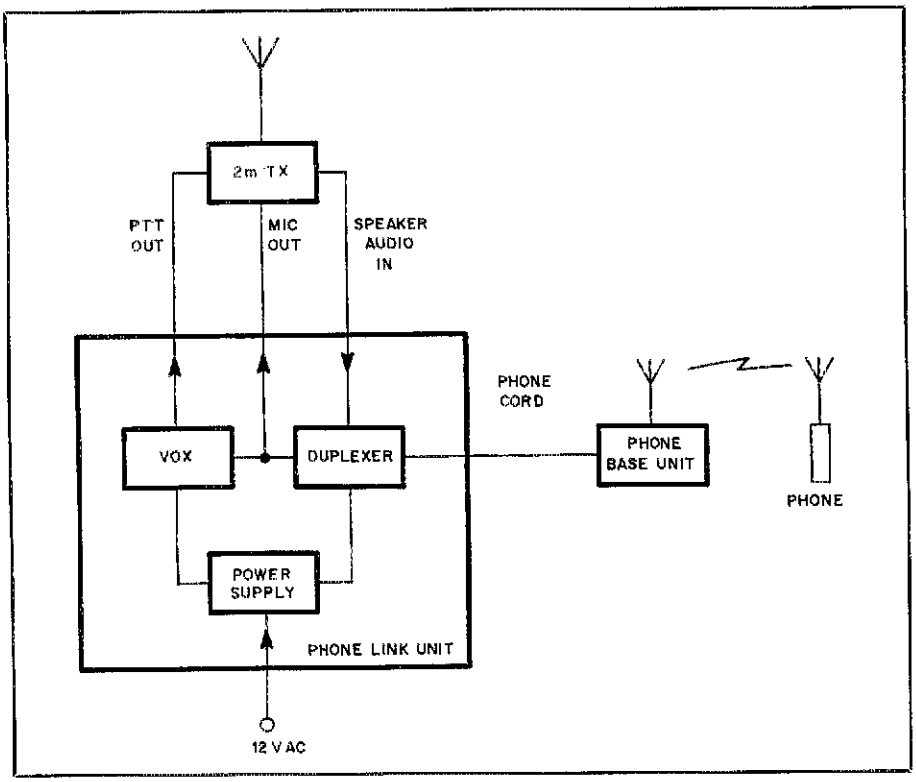
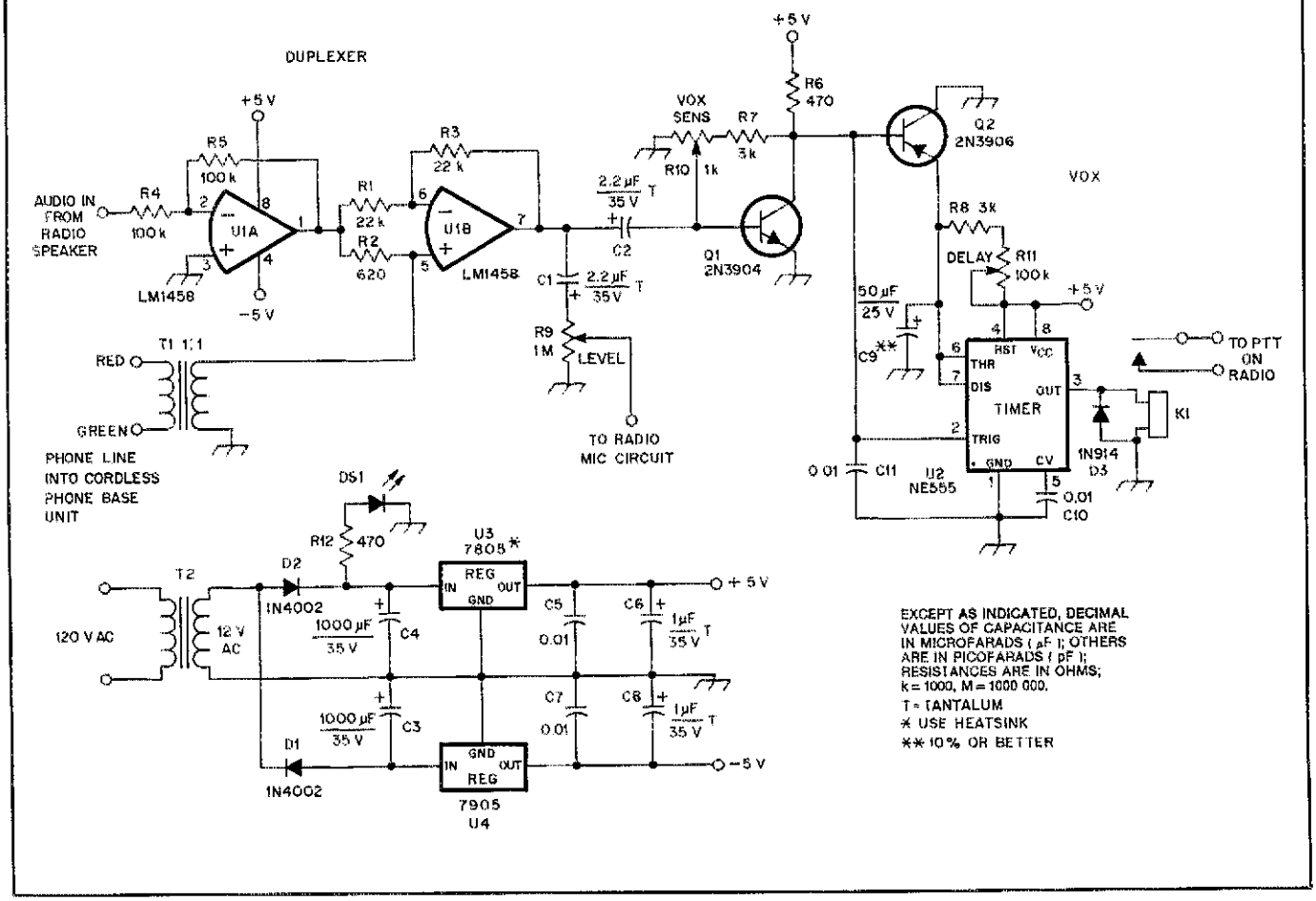


Fig 1—Block diagram of the cordless telephone interface.

Fig 2—Schematic of the cordless telephone link (below). Part designators not shown in the parts list are for PC-board parts-placement purposes. Most parts can be purchased from Radio Shack® or Jameco Electronics, 1355 Shoreway Rd, Belmont, CA 94002, tel 415-592-8097. C9 is available from Sprague Electric, 92 Hayden Ave, Lexington, MA 02173-7929, tel 413-664-4411. T1 is used for isolation in the duplexer stage, and is available from the Calrad Corp, 819 N Highland Ave, Los Angeles, CA 90038, tel 213-465-2131. All resistors are ¼ W unless otherwise specified.

C1,2—2.2-μF, 35-V tantalum electrolytic.
C3,4—1000-μF, 35-V electrolytic.
C5,7,10,11—0.01-μF, 50-V Mylar®.
C6,8—1.0-μF, 35-V tantalum electrolytic.
C9—50-μF, 25-V aluminum electrolytic, 10% tolerance maximum (Sprague 630D102 or equiv).
D1,D2—1N4002 diode.
D3—1N914 diode.
DS1—LED.
K1—5-V reed relay (RS 275-232 or equiv).
Q1—2N3904 NPN transistor.
Q2—2N3906 PNP transistor.
T1—600-Ω telephone transformer (Calrad 45-699 or equiv).
T2—12-V/250-mA ac power transformer (Jameco AC250 or equiv).
U1—LM1458 op amp.
U2—NE555 timer.
U3—7805 voltage regulator.
U4—7905 voltage regulator.
Misc—1-ft modular plug cable assembly.



FCC Comments—Is It Legal?

[The following interpretation was made by the Technical Standards Branch-OET, in coordination with the Personal Radio Branch-PRB.]

1) A regular, unmodified cordless telephone may be used only as a connection to a telephone line, and not for any other purpose, pursuant to Part 15, Section 15.233(e).
2) A cordless telephone may be used as the basis for a piece of equipment to be operated in the Amateur Radio Service. In this respect, it is just another component used in building a device.
3) After the cordless telephone is modified to be connected to a transceiver, it is no longer a cordless telephone and may not be used under the provisions of Section 15.231. The only frequencies that are acceptable for use are those available under Section 15.117 (49.830 MHz, 49.845 MHz, 49.860 MHz, 49.875 MHz and 49.890 MHz).
4) The individual amateur may operate under the provisions of Section 15.119 provided the requirements of the subject Section are followed. This includes the restriction that only five (5) or less devices may be constructed and that in no case may the devices be marketed.
5) A device constructed in quantities of more than five (5), or marketed, must comply with the provisions of Sections 15.117 and 15.118, and must be certified pursuant to Subpart J of Part 2 prior to marketing.
6) The remote control provisions of Section 97.88 do not apply where the device is used simply to function in place of the wire connection between the microphone and the transmitter. It is then considered to be an "extended cable" or "cable extender." The headphone or speaker cable may also be treated in this manner. In such cases, they should not be referred to as "remote control" devices.

Editor's Note: What about the security of your station? What prevents a neighboring ham who also owns a cordless phone from using the same frequency to operate your Amateur Radio equipment? By unplugging your cordless phone from the linking circuit, you immediately eliminate other operators from accidentally, or intentionally, using your QTH as a remote-base station. Unplugging your phone from the link unit will become as commonplace as disconnecting other equipment while not in use. Illegal operation of your station can also be prevented by using the ON-OFF switch on your interface.

put of the VOX switch, pin 3 of U2, drives the PTT switch relay, K1. K1 keys the transmitter as you speak into the cordless-phone transmitter. When you stop talking, the VOX circuit turns off, and the transmitter unkeys. The received audio from the radio is passed through the duplexer and coupled into the phone line via the 600-Ω transformer, to arrive at the earpiece.

Construction Tips

The PC board can be constructed in several ways: PC boards for the cordless phone link can be home-made or purchased from me.[1] Fig 3 shows the PC-board layout for those wishing to make their own. Fig 4 shows the parts-placement diagram and interconnections between the cordless phone and the transceiver.

When inserting the components on the board, be careful to place polarized devices, such as voltage regulators, ICs, transistors, diodes and capacitors, in their correct positions. Use a low-wattage soldering pencil to prevent damage to components. Heat sinks for TO-220 case devices (RS 276-1367 or equiv) should be used on both voltage regulators. Consider enclosing the finished circuit board in a metal box to ensure maximum RF shielding.

Where R9, R10 and R11 plug into the PC board, different pad sizes are included to accommodate different styles of potentiometers. Instead of using PC-mount potentiometers, you may choose to use external VOX sensitivity and mic gain controls.

Do not connect the cordless phone link to the telephone line. This circuit does not use blocking capacitors at the transformer. Consequently, it will load down the phone line as though you had left the phone off the hook. The phone link connects directly to the cordless telephone.

If you would like to connect your

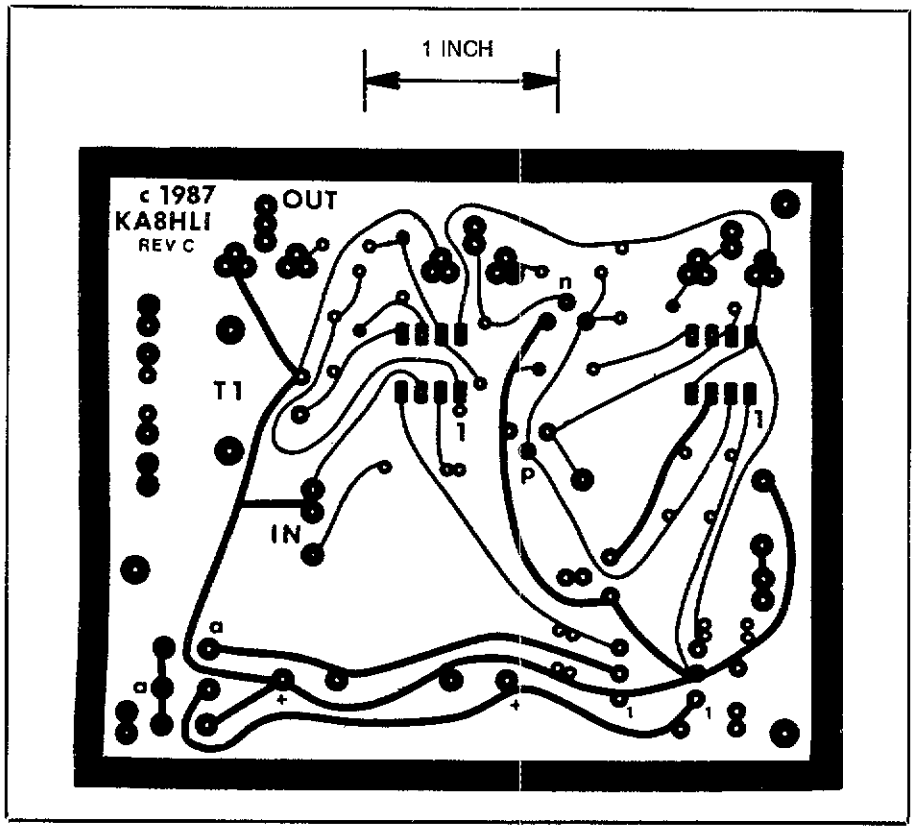


Fig 3—Circuit-board etching pattern for the cordless telephone link. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

[1]A PC board and parts kit is available from the author for $30. Cost of the PC board alone is $10. ARRL and *QST* in no way warrant this offer.

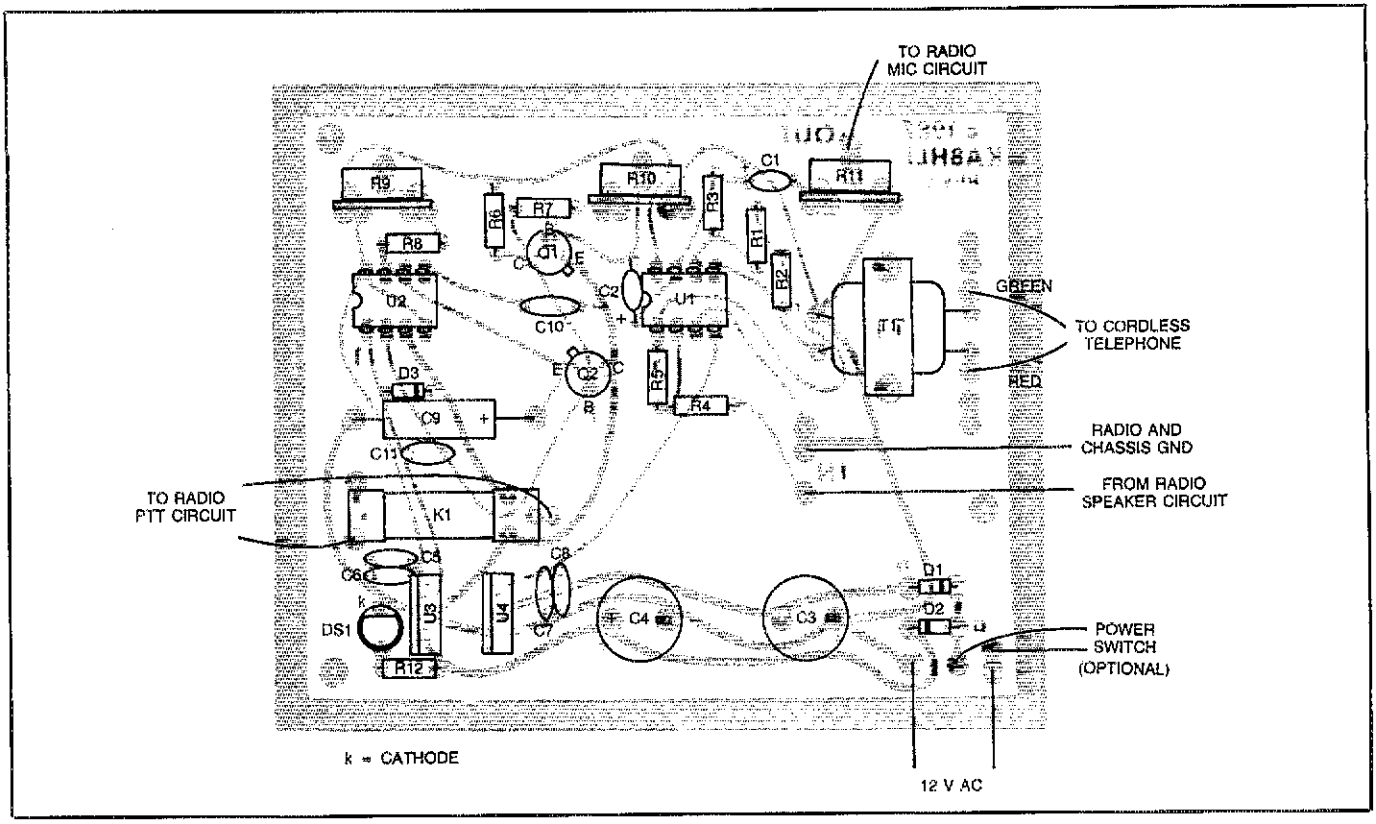


Fig 4—Parts-placement guide for the cordless telephone link. Parts are placed on the nonfoil side of the board; the shaded areas represent an X-ray view of the copper pattern. Gray areas represent unetched copper. A DPDT switch can be connected to the unused pads above and below the wire connections to the cordless telephone to allow you to connect and disconnect the received audio line or speaker/microphone.

cordless phone to the line, however, you can use a DPDT switch to connect the cordless phone to the phone-link unit or to the phone line. This setup enables you to return your telephone to normal service quickly and easily.

If you want to get fancy, add a couple of DPDT switches to the circuit. Extra pads are included on the PC board to accommodate switch connections that will allow you to connect and disconnect the received audio line or mic to a speaker.

Adjustment

It's time to bring the phone link on line. Here are step-by-step instructions for setting up and calibrating the link.

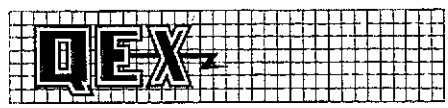
1) Set R9, R10 and R11 to mid level.
2) Connect the phone link to the cordless phone base unit using an inline coupler (RS 279-358). Next, connect the unit to the microphone and speaker jacks on the radio.
3) Apply power to the phone link unit, radio and phone.
4) Adjust the radio's volume control until the audio level being channeled into the phone's headset is at a comfortable listening level. Remember that turning up the radio too loud can key the transmitter.
5) Speak into the telephone transmitter and adjust R9, R10 and R11 for:
   A) microphone audio level into the radio (R9)
   B) VOX trip sensitivity level (R10)
   C) VOX delay (key-down time of transmitter) (R11)

Conclusion

The cordless phone interface is fun, and requires very little construction time. You'll find many uses for it. When you're not doing errands around the house, you can qualify for WAS or DXCC from your easy chair!

Brian Brachel earned his Amateur Radio license in 1980, rapidly upgrading to Advanced. In the early part of the same year, Brian left a job with the local police department to begin a career with Spectra-Physics, located in Mountain View, California, and known as the world's largest manufacturer of lasers. His first position was Field Engineer for the high-power industrial laser group. Five years later, he was promoted to Technical Support Engineer, and relocated to San Jose. In 1986, he was again promoted to Field Service, but this time as the supervisor in charge of all domestic service.

Brian is often found on 15 and 40 meters, and on 146.52 MHz in the Detroit area. His other interests are bowling, karate and designing circuits.



QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

Conventional antenna impedance bridges for determining SWR are useful at HF and lower frequencies. Above 30 MHz, however, their performance becomes limited by undesirable reactances associated with the potentiometer used. A broadband VHF impedance measuring hybrid circuit helps overcome these problems. Building the circuit and using it correctly are discussed in the pages of February *QEX*.

The issue includes articles on:

- "A Broadband VHF Impedance Measuring Hybrid," by Wilfred N. Caron
- "33-cm Band Summary," by Bill Olson, W3HQT
- 1987 *QEX* Index
- "Facsimile in Japan," by Yoshi Iwasaki, JA3CF

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, and is published monthly. The special subscription rate for ARRL/AMSAT members is $8 for 12 issues; for nonmembers, $16. There are additional postage surcharges for mailing outside the US; write to Headquarters for details.

Traps for VHF Interference

Do you have VHF TVI problems? These coaxial traps can help eliminate the interference!

By Joseph E. Fleagle, WØFY
320 Greentrails Dr South
Chesterfield, MO 63017

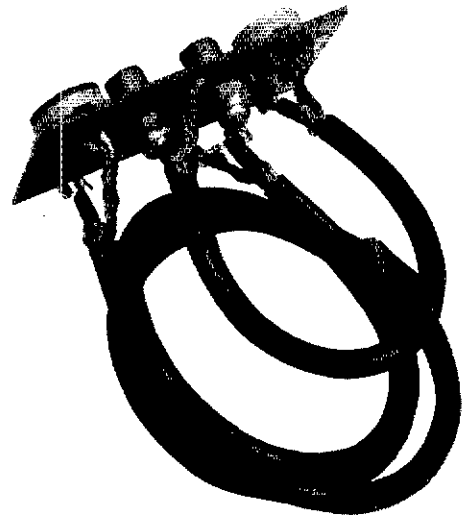


Fig 2—Photograph of completed traps for 50 and 144 MHz.

Bigger antennas, higher-power transmitters and more sensitive receivers have improved communications range on the 50- and 144-MHz bands over the past several years. Unfortunately, these increases in power and antenna gain have also increased the chances for TVI! Even if yours is a moderate station (perhaps 100 watts to a medium-sized Yagi), within a few hundred feet of the transmitting antenna (farther in fringe TV areas), your VHF signal is much stronger than the TV signals. Although the interference-rejection capabilities of TV sets have improved significantly in recent years, strong signals can still overload many TV tuners.

Overload can take many forms. TV channels 2 and 11 are most commonly affected by 50- and 144-MHz transmissions. Channel 2 is adjacent in frequency to 50 MHz, and the fourth harmonic of 50 MHz falls in channel 11. The image frequency for a TV tuned to channel 2 is in the 144-MHz band, and the second harmonic of 144 MHz is the image frequency for a TV tuned to channel 11.

Channel 11 interference doesn't necessarily mean you are radiating harmonics—a strong 50- or 144-MHz fundamental can cause harmonic generation *in the TV tuner*. In more severe cases of overload, all channels—both picture and sound—may be affected. Even very low transmitter power levels may produce interference. In one instance I experienced, 2 watts output at 144 MHz was sufficient to create noticeable streaks in the TV picture, while 20 watts output wiped out the picture and destroyed the sound (by means of audio rectification) on all channels, when the beam was pointed at the neighbor's house. The kilowatt amplifier wiped out everything—irrespective of beam heading!

First Steps

In the event of a TVI complaint, first enlist the assistance of the complainant and run some tests to determine the extent of the problem. Having another ham to assist is helpful. The object of the tests is to gauge the extent and severity of the problem. Which TV channels are affected? What specific characteristics are affected (picture only, sound only, or both)? Try all the frequency bands and modes you normally operate, and different beam headings. Also vary power output, if possible. Keep notes on results so that you can tell if the situation improves or worsens as changes are made.

TVI in General

The usual point of entry into TV sets is the antenna lead, although external speaker leads, wired remote-control units, and the ac power line can act as pickup points. In extreme cases, RF can enter directly through the case of the TV set. In cases of direct pickup, the only remedy may be moving the TV—to face in a different direction, or a few feet from its present location. RF field intensities can vary considerably over distances of a few feet within buildings, and moving the set can sometimes help to eliminate interference problems.

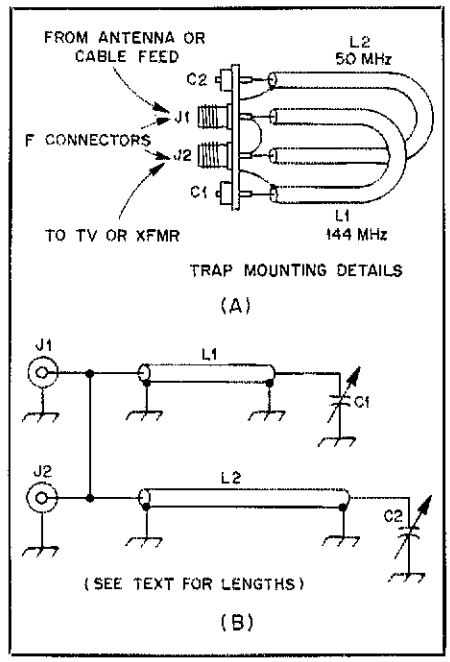


Fig 1—A pictorial diagram of the mounting details for the coaxial traps is shown at A. The F connectors, variable capacitors and cable loops are mounted on a scrap of double-sided PC board material. At B, the schematic diagram of the trap circuit is shown. The filter is bilateral; either connector can be used for input or output.
C1—3-12 pF ceramic trimmer.
C2—7-45 pF ceramic trimmer.
L1 (144 MHz)—7 inches for cables with 0.66 velocity factor (VF) (RG-8, RG-58); 8 inches for cables with 0.80 VF (semi-rigid and foam dielectric cables).
L2 (50 MHz)—26 inches for cables with 0.66 VF; 29 inches for cables with 0.80 VF.

The best way to deal with RF entry via the TV antenna terminals is with a quarter-wave stub used as a notch filter. There are a few tricks to obtaining maximum performance from stubs, however. First, don't use 300-Ω twin lead for the stub. Twin-lead stubs can produce high-Q notches, but they are very sensitive to surrounding objects and physical positioning, and are nearly impossible to tune precisely enough to obtain more than a few dB of rejection at the desired frequency. A better way is to transform the 300-Ω feed line to 75 Ω, and use a piece of coax for the stub. Most modern TVs have a 75-Ω input; if not, a second transformer can be used at the 300-Ω input on the TV. Second, it is best to use a tunable stub. Especially at 144 MHz, tuning stubs with a dip meter or by trimming them with cutters for minimum interference is too imprecise. As little as a ¼-inch change in stub length may change the notch depth by 10 dB or more!

Building the Stubs

My design for capacitively tuned 50- and 144-MHz stubs is shown in Figs 1 and 2.

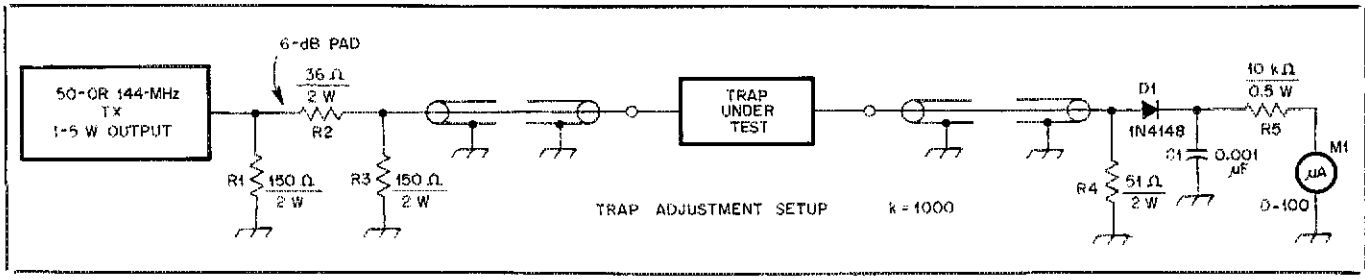


Fig 3—Schematic diagram of a circuit that can be used to pretune the coaxial traps. Adjust the capacitors for minimum meter deflection at the desired frequency. Some retuning is often necessary after the traps are connected to the TV.

The coax used is RG-59, although I've used RG-8, 0.141-inch semi-rigid Hardline, and ½-inch aluminum-jacketed Hardline as well. The lower the cable loss, the better! Stubs made of RG-59 produce notches 28 to 30 dB deep in the test setup of Fig 3. The lower-loss cables produce notches 35 to 40 dB deep.

The dimensions shown are not critical. The lines were chosen to be 1/8 wavelength long at the operating frequency, but a half inch either way won't affect stub performance, because the stubs are tuned with the capacitors. The 50- and 144-MHz stubs can be connected in parallel if dual-band capability is required. The tuning does not interact. I usually mount the two F connectors and the two trimmer capacitors on a scrap of double-sided PC board material. The 144-MHz coil is small enough not to take up much space; I coil the cable for the 50-MHz stub. The shield of each stub is connected to the PC board foil at both ends, and to the rotor of its associated trimmer capacitor. This method of capacitor connection eliminates hand-capacitance effects during tuning. I pretune the stubs in the test setup shown in Fig 3 so that only a slight touchup is usually needed after installation.

For best results, the stubs should be installed as close as possible to the TV antenna terminals. After the stubs are tuned for maximum interference rejection on the TV, flip through the available TV channels to make sure that the stub does not degrade reception. The 50-MHz stub of RG-59 attenuates the channel 2 picture carrier by about 7 dB. Stubs made of lower-loss cables have a higher Q, and produce less attenuation of the TV signals. Channel 2 attenuation has not been a problem in any of the situations I've encountered.

Like any transmission-line resonator, these stubs have higher-order resonances. Although coax lengths have been chosen so that no high-order resonances fall within VHF TV channels, some do fall in the UHF TV band. (This isn't a problem unless the TV set has a common VHF/UHF antenna input.) If a stub does severely attenuate a UHF signal, simply shorten the coax by an inch or so, retune the stub and try again.

Results

These stubs have eliminated, or at least decreased the severity of, every interference situation in which I've tried them. In the 144-MHz interference example cited earlier, there were two TVs in the house. RG-59 stubs completely eliminated the interference to one TV; the other still suffers mild TVI when I run 600 watts output with the beam aimed directly at the neighbor's house. I intend to try some lower-loss stubs to see if the interference can be completely eliminated.

The stubs are not a panacea—as stated earlier, it is possible for RF to enter the TV via the ac power line, or even directly through the case of the TV. If you need to keep undesired signals from entering a TV via its antenna terminals, however, these stubs do an excellent job.

Joe Fleagle was first licensed in 1961 as K3OPB, and has been active on the VHF bands ever since. He earned a BSEE from Johns Hopkins University in 1964, and works as Lab Manager of the RF Engineering Lab at Emerson Electric's Electronics and Space Division in St Louis, Missouri. Joe is presently active on 50 through 432 MHz from his home in Chesterfield, Missouri, in grid square EM48.

Strays

I would like to get in touch with...

☐ any blind hams using the Commodore 64™ computer with a voice synthesizer. Paul Graziani, 119 Pearl St, Little Rock, AR 72205-5959.

Transmitting Loops Revisited

The interest in large HF-band loops remains high. Here are some ideas that you can apply toward multiband loop construction.

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

Lee Aurick (W1SE/4) and I described low-height delta loops in October 1984 *QST*.[1] Since that paper appeared in the journal, Lee and I have had a continuous flow of letters from readers. Many questions have been asked about possible variations in the loop design and configuration. I must say that our typewriters have been busy! This article provides the answers to many of the questions we have fielded since 1984, and includes some new information.

Using the 80-meter Loop on 1.8 MHz

One of the often asked questions about the 80-meter full-wave loop is, "Can I use this antenna on 160 meters?" The answer is "yes and no." Rather nebulous, eh? First, I will say that loop performance on half the fundamental frequency is miserable. A closed half-wave loop can be force fed with a Transmatch in order to provide an SWR of 1:1 for the transmitter and receiver, but the antenna gain will be somewhat less than that of a half-wave dipole. Some Transmatches will not have sufficient tuning range to obtain an SWR of 1. Transmatches that have variable capacitors with small plate spacing will arc and overheat at high power levels when a half-wave closed loop is used. Because of these problems, my answer to the earlier question is "no." But there is a "yes" part for the question also.

Fig 1 shows the arrangement I used in 1986 for loop operation from 160 through 10 meters. You will see that it is not a loop by definition. The point electrically opposite the feed terminals is open. This arrangement is frequently referred to as a half-wave open loop (at 160 meters in this example). Technically speaking, an antenna is not a loop unless it consists of a *closed* circuit. So much for semantics!

The antenna in Fig 1 was used during the summer period in closed form. I did not use the 160-meter band then, owing to QRN. The loop was cut for 3.8 MHz in accordance with $L_{feet} = 1005/f_{MHz}$. This arrangement worked effectively from 80

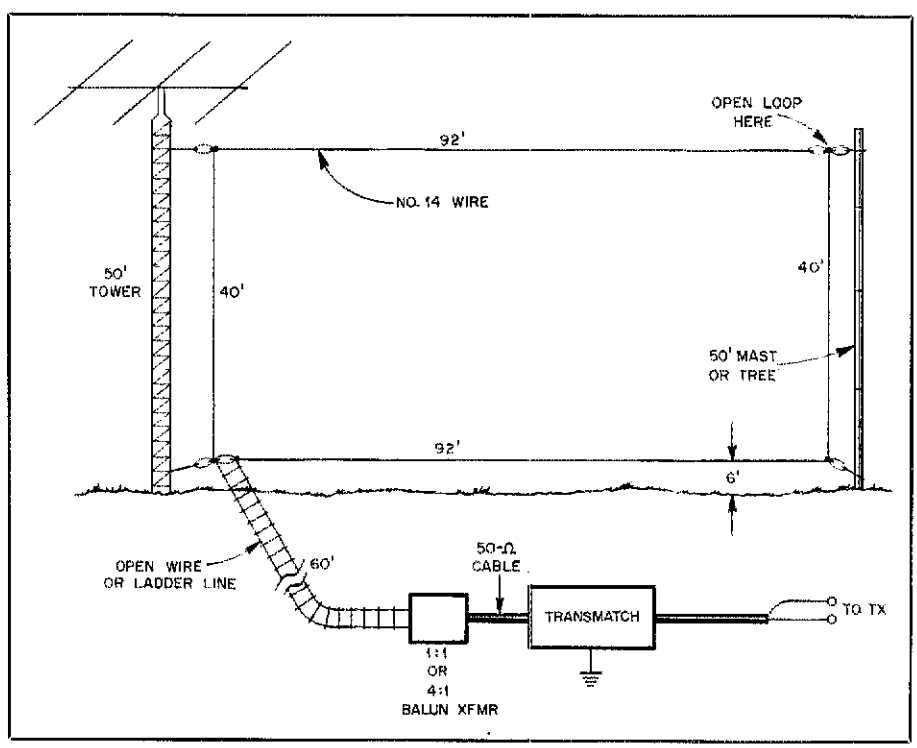


Fig 1—Dimensions for a full-wave rectangular loop that is suitable for use from 160 through 10 meters. At 1.8 MHz it operates as a half-wave open loop (misnomer). See text for further information.

[1]D. DeMaw and L. Aurick, "The Full-Wave Delta Loop at Low Height," *QST*, Oct 1984, pp 24-26.

through 10 meters by virtue of the balun transformer and Transmatch. On 40 meters the SWR was no greater than 1.4:1 across the band, without the Transmatch. A 4:1 balun transformer was used.

Opening the Loop

As may be seen in Fig 1, the antenna consists of two independent wires, each 132 feet long. In essence, we now have an inverted L antenna (top section and left-hand vertical wire). The bottom section and right-hand vertical wire serve as a counterpoise against which the top section is worked. This eliminates the need for a collection of buried radial wires, although a good ground screen will provide better overall performance for an inverted L than can be expected from a simple counterpoise, as shown.

My results on 160 meters with this antenna were excellent. I had good coverage within the US, and I had no trouble working European and South American stations with 500 watts of output power. Performance on the bands from 80 through 10 meters was similarly impressive.

Antenna Height

The experts may argue that a loop so close to the ground is not worth considering. Needless to say, the greater the loop height the better it will perform, especially for DX operation (lower radiation angle). I find this to be generally true when feeding the loop at the center of the top or bottom wires (horizontal polarization). However, with the lower corner feed as shown in Fig 1, polarization is principally vertical, and the radiation angle appears to be fairly low. The rectangular format is necessary for me because my antenna supports are only 50 feet high: The more rectangular the loop becomes, the lower the gain with reference to a completely circular loop. The latter shape yields the greatest gain.

A question often asked is, "How can I fit a loop onto my small city lot? Can I distort the shape and fit it into the available space?" I have found that almost any convenient shape will work, provided the loop is resonant at the operating frequency. A recent letter from Cal Simsen, W7WXW, contained a sketch of his "somewhat" delta loop. The shape conforms to the support-pole height and space he has available. This is shown in Fig 2. Despite the antenna not forming an equilateral triangle, he reports excellent multiband performance. Bill Martinek, W8JUY, has an 80-meter delta loop strung between two tall trees. He has the apex down, and that is where he feeds the loop. The top of the triangle is substantially longer than the two sides, but the system works very nicely on all HF bands. I have seen other loop antennas that had shapes I will not attempt to describe. Irrespective of the Ugly Duckling appearance, the users reported good results. Take heart if you have limited space for a loop. Don't be afraid to experiment with odd antenna shapes!

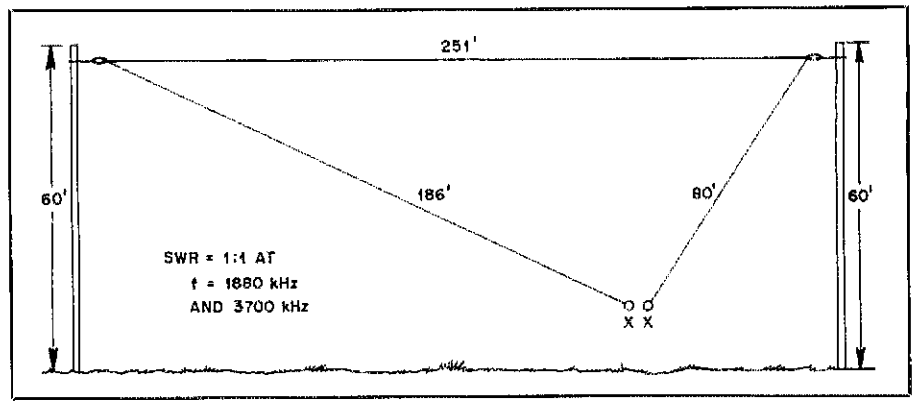


Fig 2—Details for the nonuniform delta loop used at W7WXW. It works well even though it is not an equilateral triangle.

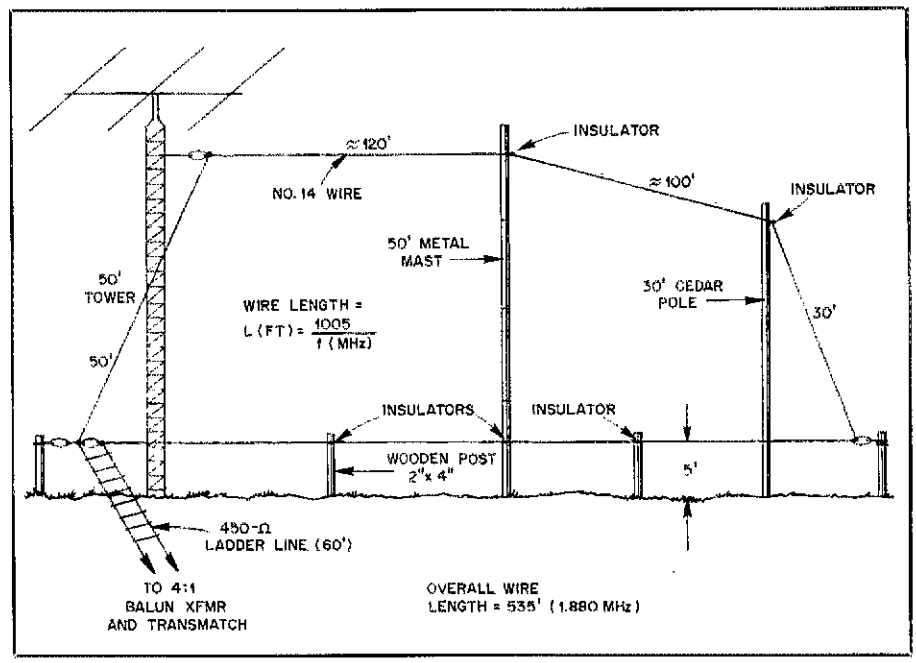


Fig 3—Arrangement used at W1FB for a multiband loop. Lower corner feed yields vertical polarization and a low radiation angle. This somewhat rectangular loop is low to the ground, but it performs nicely from 160 through 10 meters. Feed-line length is not critical provided the length of the 50-Ω cable between the balun transformer and the Transmatch (see Fig 1) is less than 15 feet. The balun transformer must be designed for use at 1.8 MHz and higher.

Vertical Versus Horizontal Loops

Another common question I have been asked is, "Will a horizontal loop (parallel to ground) work as well as a loop that is erected vertically (perpendicular to ground)?" At this point I always ask the person what his frame of reference is. How good is good, or what do you mean by "good"? That term is a mighty broad one!

I have used horizontal and vertical loops a number of times. My experience indicates that a horizontal loop is a poor performer for DX unless it is a half wavelength or greater above ground. The closer it is to earth the higher the radiation angle. You may compare this to a two-element beam antenna. The ground acts as the reflector in this example. Horizontal loops that are close to ground (¼ wavelength or less, for example) shoot the signal skyward on the fundamental frequency of the antenna. This can provide super results for short-haul work (300 to 1000 miles on 80 meters), and this type of loop may greatly outperform an 80-meter dipole at 60 or 80 feet. If this loop is operated on its harmonics, various radiation angles result, and the system can offer reasonable performance

on the bands above the lowest resonant frequency of the loop. I once used a diamond-shaped loop on Montserrat (VP2MFW) that was 60 feet high and 1000 feet on a leg. It was parallel to ground and fed with a balun transformer and 50-Ω cable. The DX performance from 160 through 10 meters was phenomenal. (However, it was erected on a cliff next to the ocean, and at least 20 additional dB in the signal reports was a result of the exotic call sign!) I would not hesitate to recommend a parallel loop of that type if you have room for it.

Choice of Wire

Rule no. 1 is to use large enough wire to avoid damage during ice and wind storms. No. 14 or 16 Copperweld® is good if you don't make sharp kinks in it. Kinking cracks the copper covering, and the steel core will eventually rust through. Use gentle bends when handling this wire.

I use stranded no. 14 wire in my loops, and it seems to endure nicely. Some amateurs have reported problems when using plastic- or cloth-insulated wire. They could not make the antenna resonate when using the $1005/f_{MHz}$ formula. I suspect that the insulation changes the propagation factor of the wire and causes the resonant frequency to be lower than the calculated value. I have not attempted to prove this theory, but it's worth investigating.

A 160-10 Meter Rectangular Loop

I no longer use the antenna in Fig 1. I decided it would be better to erect a full-wave loop for 160 meters, even though it would be *very* rectangular in shape. This antenna is shown in Fig 3. You will note that three supporting structures are required, owing to the long span of the top and bottom loop wires. Thus far the performance on 160, 80 and 40 meters is excellent. Although the antenna is broadside north and south, it appears to work well to the east and west on the three bands. Maximum directivity should be in the plane of the loop on harmonic frequencies, and the strength of the European and Oceanian signals on 80 and 40 meters tends to bear out this theory. I have copied VK signals at RST 579 on 1.833 MHz at 1100Z (September 1987), although I did not care to enter the pileup.

I have observed also that the 160-meter loop is superior to my triband Yagi on 20 meters part of the time, respective to signal-strength readings on European signals. It depends upon the time of day and on propagation conditions at a given instant. This is because the loop has, in theory at least (with lower corner feed), a lower radiation angle than the tribander has at only 55 feet above ground. There are times, however, when the strength of monitored DX signals with the Yagi exceeds those with the loop by 3-6 dB. The loop is always quieter (QRN) than is the Yagi. This is characteristic of a closed loop, and it can really pay off on 160 and 80 meters during weak-signal reception.

Closing Comments

Full-wave loops present a feed impedance of approximately 115 ohms. At harmonic frequencies the loop impedance varies from 80 to 250 ohms, as observed during my measurements. You may check the resonant frequency of your loop by observing the frequency at which the SWR is lowest (resistive condition) or by connecting a small 6-turn loop of wire across the feed terminals and checking the resonance with a dip meter.

Loops are affected less than are dipoles by nearby conductive objects. Maybe this is because a loop antenna has a low Q. This characteristic causes the antenna bandwidth to be somewhat greater than it is for a half-wave dipole or vertical antenna. A square or circular loop has a greater aperture (capture area) than a dipole, and hence has a slight gain over a dipole.

I hope this update answers your questions. Perhaps it will inspire you to try this fine antenna, even though it may be necessary for you to adopt a nonuniform antenna shape.

New Books

HANDBOOK OF PRACTICAL IC CIRCUITS

By Harry L. Helms, KR2H. Published by Prentice-Hall, Inc, Englewood Cliffs, NJ 07632. First edition, 1987. Hardcover, 6 × 8 inches, 163 pages, $34.95.

Open any piece of electronic gear these days and you'll find ICs. These "black boxes" can be mystifying for the beginner in electronics. Harry Helms' book provides enough information to show an interested beginner how to design and build with linear and digital integrated circuits.

The book is an IC "cookbook"; as Mr Helms states in the preface, "This book is a collection of IC 'recipes.' The emphasis here is not on designing IC applications circuits 'from scratch,' but rather on working, debugged circuits that are ready to be used." Mr Helms begins with a short chapter introducing ICs. Included is some information on their history, the techniques used to fabricate ICs and the different "families" of linear and digital ICs. The first chapter also features some general information about power-supply requirements and construction tips. The rest of the book provides the recipes. Beginning with op amps in Chapter 2, Mr Helms introduces the more commonly used ICs and shows a few simple circuits that can be built with each chip. Chapter 2 also contains information on using audio-amplifier and comparator ICs.

Chapter 3 contains more information on linear circuits, including the popular 555/556 timer ICs, voltage-controlled oscillator and function-generator chips, phase-locked-loop devices and voltage-regulator ICs. Sample circuits are provided for each chip, along with short descriptions of the ICs and their applications.

TTL ICs are covered in Chapter 4. The chapter begins with a very good overview of TTL, including tips on building with TTL ICs. The chapter continues with descriptions of some of the more common TTL ICs, and again Mr Helms gives a general discussion and provides sample circuits for each IC.

Chapter 5 provides information about using CMOS ICs. A chart showing the commonly used CMOS IC part numbers is provided, along with pinouts and sample circuits for many of the typical CMOS ICs.

Chapter 6, "Tying It All Together," discusses interfacing TTL and CMOS ICs and describes some simple interface circuits. Debugging and troubleshooting are also covered in this final chapter. A section in this chapter shows the reader where to go for more information and lists the addresses of several major IC manufacturers. This way, the reader is not left to fend for himself; Mr Helms makes it clear that this book cannot provide all the information required to design and build with integrated circuits.

This is a useful book. It is rather small for the $34.95 price tag, but the information provided is basic and fundamental. Many useful circuits are shown in the book. Along with the tutorial discussions, *Handbook of Practical IC Circuits* is a source of useful reference information. This is the kind of book that ends up dirty, slightly torn and splattered with solder, within easy reach on a corner of a builder's bench.—*Bruce S. Hale, KB1MW*

Strays

THANKS FOR THE HELP!

While he was on Guam, George Mateyko, N1BEX/5, ran a request for information on the HB35T TET 5-element HF antenna in Strays. George was overwhelmed by the response, and the antenna worked fine. George would like to thank those who responded; he reports he is now back stateside in Martha, Oklahoma and the antenna is still working fine.

The Tox Box

If your station resembles a rat's nest of audio and control cables, the Tox Box can help you clean up the mess!

By George Murphy, VE3ERP
ARRL Contributing Editor
103-1095 Mississaga St
Orillia, ON L3V 6W7, Canada

Does a jumble of audio cables make your operating position look like an aerial view of the junction of several major highways? If it doesn't, you are probably either new to ham radio, or one of those compulsively neat people who wears a necktie with your pajamas.

The Tox Box was conceived after losing one too many rare DX contacts because I couldn't find my keyer under all the junk connected to my rig. I needed a convenient place to plug in my microphone, headset, external speaker, foot switch, tape recorder and phone patch. The result is the Tox Box—shown in the photo. The whole thing is controlled by the two switches at the top. On the front panel are jacks for microphone, headset and output to the transmitter. If you want your station to look extra tidy, these jacks can be located on the rear panel. The rear panel has level controls (R1, R2, R3) and jacks for a foot switch and low-voltage dc to operate the internal relay. Connections for cables from the receiver external speaker jack and to an external speaker are also located on the rear panel. If you don't have an external speaker, you can make your Tox Box big enough to build one in. If you already have an external speaker, you may be able to build the Tox Box into it!

Circuit Description

The basic circuit is shown in Fig 1. K1 operates along with the TR relay in the transmitter. The dc input can be anything capable of actuating K1—an ac-to-dc adapter is fine. S1, INPUT, selects input to the transmitter from either a microphone or a tape recorder. S2, OUTPUT, directs audio to either a speaker or headphones. TAPE IN accepts a cable from the earphone jack on the tape recorder. RX AUDIO IN feeds from the receiver earphone jack, or from the external speaker jack (if the radio has one, and if it cuts off the internal speaker). OUTPUT TO TX accepts a microphone cable to the transmitter (or phone patch, which is probably already connected to the transmitter's microphone input). TAPE OUT feeds the microphone jack on the tape recorder.

With S1 switched to MIC the rig operates just as if the Tox Box weren't there, except that receiver audio also goes through K1B and the RX TAPE LEVEL control to TAPE OUT. If you push the RECORD button on the tape recorder, you'll get a recording of the receiver audio. Most tape recorders use automatic volume control (AVC) when recording, and at normal volume levels, your receiver may overload your recorder. The RX TAPE LEVEL control allows adjustment of receiver audio sent to the tape recorder.

On transmit, K1 is actuated. The microphone output goes to the tape recorder through K1C, S1C and R2. This feature allows you to record both sides of a QSO without any manual tape-recorder switching. If you use a very low-output microphone and your tape recorder requires a large input signal, you may have to replace R2 with a simple preamplifier circuit.[1] Such a circuit can be powered from the dc input voltage.

When S1 is switched to TAPE, press the PLAY button on the recorder, and either stomp the foot switch or press the mic PTT button. If you operate VOX, merely turning on the recorder should get things moving. (I don't use VOX, so I haven't tried this.) When K1 is actuated, the tape-recorder output is sent to the transmitter, and also through K1C and S1C to the speaker or headphones so you can monitor the transmission. Once you have set your tape recorder output level to suit the

[1] M. Wilson, ed., *The 1988 ARRL Handbook* (Newington: ARRL, 1987), p 7-4.

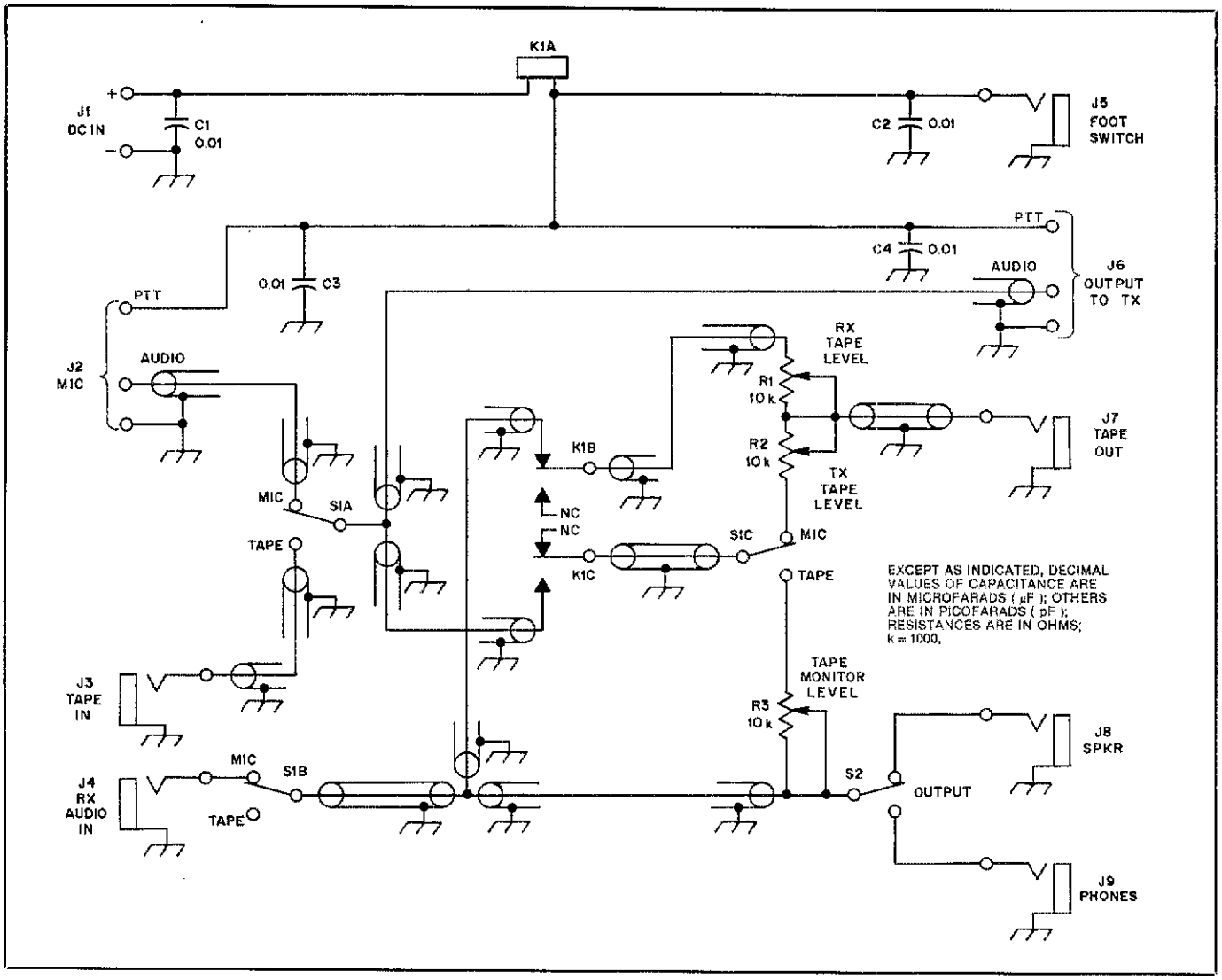


Fig 1—Schematic diagram of the Tox Box. The circuit can be built into any suitable enclosure, or into an existing accessory, such as a station speaker. In addition to the parts listed below, assorted jacks, plugs and cables to match the Tox Box and your station equipment are needed.

C1-C4—0.01-μF ceramic capacitors (optional—see text).
J1, J3-J5, J7-J9—1/8- or 1/4-inch audio jacks.
J2, J6—Appropriate microphone connectors to match radio.
K1—DPDT relay (RS 275-213, 214, 215, 217 or similar—see text).
R1-R3—10-kΩ audio-taper potentiometers.
S1—3PDT switch, RS 275-661 or similar.
S2—SPDT switch, RS 275-662 or similar.

normal audio input setting of your transmitter, you may find that R3, TAPE MONITOR LEVEL, is not required. (You will have to do a little experimenting to determine the values and settings of all the level controls.)

The first Tox Box I built (many years ago) had a 50-kΩ to 8-Ω audio output transformer which, by means of fiendishly clever switching, handled impedance transformation for both transmitted and received audio. I can't find these transformers anymore, but impedance matching doesn't bother me, so I left out the transformer. I am not aware of any impedance-matching problems with the Tox Box in my station—the recordings sound okay, and on-the-air reports of playbacks have been satisfactory. After all, we're not talking hi-fi here. If your radio uses radically different input and output impedances than your accessories, you may want to add impedance transformers to the Tox Box. (If your transmitter has a 50-kΩ microphone-input impedance, you may want to add a transformer between the TAPE OUT jack and the OUTPUT TO TX line.)

Construction Notes

A multitude of construction approaches can be used in building a Tox Box. Here are some general guidelines. Use point-to-point wiring, and keep all the lead lengths as short as possible. Use shielded cable for *all* the audio connections. It doesn't hurt to install RF bypass capacitors (0.01 μF) at all the control-line jacks. Add a hefty ground screw to your Tox Box and connect this terminal to your station ground bus. An interior view of a Tox Box built using these guidelines is shown in Fig 2.

I will let you in on one of my character quirks. I am practical (spell that *C-H-E-A-P*). Whenever I get a new rig, I make up a short cable with a ¼-inch, shielded, in-line 3-wire jack on one end, and a connector (usually removed from the matching microphone) to match the microphone connector of the rig on the other end. Then, I install a ¼-inch, shielded, 3-wire plug on the microphone cable. After I connect them all together, I'm on the air. This way, when I add audio stuff (like the Tox Box), I don't need any fancy, hard-to-get microphone connectors. I just use standard stereo plugs, jacks and ready-made cables. The last cable in the system is the short one with the fancy connector. (The photographs belie this philosophy, because I built that Tox Box for someone

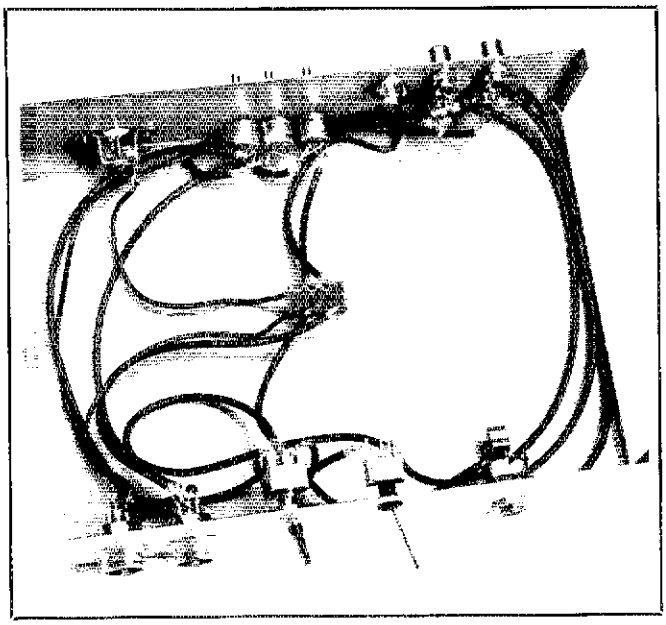


Fig 2—Interior view of the Tox Box. Audio lines should be shielded, and all cables should be kept as short as possible. RF bypass capacitors are used at the PTT and foot switch inputs and output connectors to minimize the possibility of stray pickup.

else—a purist who would not dream of butchering his nice new equipment. I, being *practical*, never build anything for a *QST* article until I have a customer for the prototype!)

Installation Notes

The whole purpose of the Tox Box is to get rid of cabling at the operating position, so run all interconnecting cables behind your equipment. Where it is necessary to plug a cable into the front of something (such as a microphone connector or headphone jack on your rig), bring the cable to the front underneath the cabinet, then up to the jack. Right-angle plugs are great for this sort of thing—they make your station look as if it were assembled with élan rather than mere expediency. If you plan things right, the only cables left in front of you will be from your microphone and headset, which isn't bad as long as the Tox Box is in front of you at desktop level. If you plan to put the Tox Box somewhere else, install the microphone and headset jacks in the rear panel. Then, at some convenient, inconspicuous location (such as under the front edge of your operating table) install a small box with jacks for your microphone and headset, run cables under the table from it to the Tox Box, and plug 'em in.

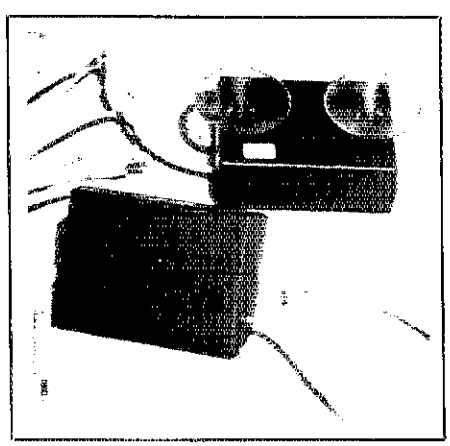
Conclusion

In the past I have been accused of erratic operating, and now I know why. Since the Tox Box has made my station all neat and tidy there is no place for mice to nest, so my cat no longer jumps up to hunt. Between miceburgers, she used to rub up against all the knobs on my rig! QST

New Products

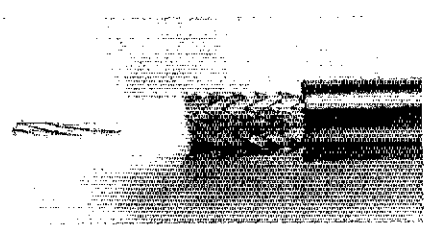
ELECTRON PROCESSING, INC ULTIMATE MOBILE SPEAKER

☐ The 8-ohm, 0.4-W Ultimate Mobile Speaker solves the problem of mounting an external speaker for communications equipment in a vehicle. It features two large suction cups to temporarily mount the 4.4 × 3.25 × 1.5-inch plastic enclosure to any smooth surface—without drilling holes or otherwise defacing the vehicle. The speaker can be removed quickly and hidden for security. Price class: $30. Manufacturer: Electron Processing, Inc, PO Box 708, Medford, NY 11763, tel 516-764-9798—*Mark Wilson, AA2Z*



ARCHER® COAXIAL CABLE

☐ Radio Shack® has dramatically improved its Archer coaxial cable. The new cable features low-loss polyethylene dielectric, all-copper conductors and 99.5% shield coverage. Typical specifications for RG-8A size cable are: velocity factor, 66%; loss per 100 ft, 1.7 dB at 50 MHz and 6.5 dB at 400 MHz. Price class: RG-58 size, 16 cents per foot; RG-8A size, 36 cents per foot. Available at Radio Shack stores nationwide.—*Mark Wilson, AA2Z*



RADIO SHACK NOVICE VOICE CLASS COURSE

☐ Gordon West, WB6NOA, and Fred Maia, W5YI, have coauthored a package of training materials designed to bring people into Amateur Radio as Novice-class operators. Radio Shack is marketing the package as the *New Novice Voice Class FCC License Preparation* packet. Included are two Morse code training cassettes and a 108-page book containing an introduction to Amateur Radio, background of Novice enhancement, information on FCC rules and regulations, license examination procedures and the Novice class question pool, with answers and explanations. The package even includes an FCC 610 form. Price, $19.95; available from Radio Shack stores.—*Rus Healy, NJ2L*

Strays

HQ IS LOOKING FOR ARTICLES

☐ HQ is always looking for articles and other material for *QST* and *QEX*. Payment of $50 per published article page in *QST*, $35 per published article page in *QEX* and $20 per published Hints and Kinks item is made upon publication. In addition, there is a $6 per published page premium for manuscripts that are already keyboarded into machine-readable form (IBM® PC format). Material published in Strays, in UpFront in *QST* or in monthly columns (Technical Correspondence, Public Service, etc) is not covered by the compensation guidelines.

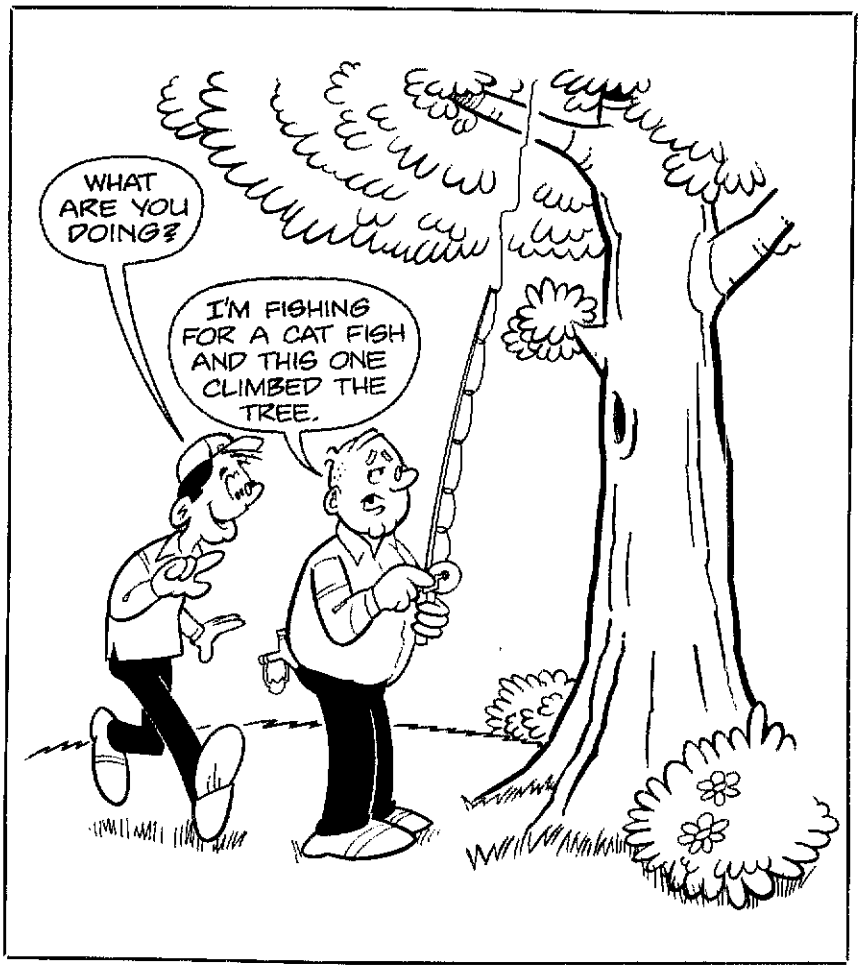
If you have a completed manuscript or a Hints and Kints item, we'll be glad to review it for possible use in a League publication. For a copy of the *QST/QEX Author's Guide* or if you have further questions, write to the following at ARRL HQ, 225 Main St, Newington, CT 06111: (for *QST* technical material, including Hints and Kinks) Paul Pagel, N1FB; (for other *QST* material) Joel Kleinman, N1BKE; (for *QEX*) Maureen Thompson, KA1DYZ. We look forward to reviewing your material for possible publication in *QST*, *QEX* or another League publication.

Hidden Antennas– One Ham's Solution

Are you living in an area where antennas are forbidden? Here is one way to battle the hardship and win!

By Jim Neu, W8RJI
9973 Cambridge Court
South Lyon, MI 48178

Jim and his wife recently moved to a senior citizen development where outside antennas are not allowed. Jim had three choices: (1) sacrifice Amateur Radio, (2) use an indoor antenna with limited output, or (3) sneak about the grounds and erect an invisible antenna. Guess which option Jim chose? In this letter to his friend Paul, Jim tells us how he accomplished this feat.



Dear Paul:

I guess I goofed. It has been one month since I received your letter and it took me this long to answer it. Like I told you, we moved into a senior citizen co-op, and were informed that *no* outside antennas were allowed. Since I like to work 75, 40 and 2 meters, I want to tell you how I met the challenge of putting up my antenna.

With a 40-meter dipole in hand, I set out to locate a new home for it. Up to the attic crawl space I went. The dipole ended up along the ridge board, with its ends bent to fit the attic curvatures. At the same time I erected the dipole, I discovered that the former residents had had a TV antenna in the crawl space. I erected my dipole only about 6 inches away from it. I figured that if I had problems, a simple series-resonant filter at the set would remedy the matter.

Well, I did have TVI, and the filter did not get rid of it. It seems that the TV antenna installation crew had added and hidden a four-set coupler/amplifier in the ceiling of the basement!

That antenna gave excellent performance on 40-meter CW. A VE7 said I was the strongest signal on the band at his QTH. (Wasn't he nice? He didn't even ask for a QSL card.) Seventy-five-meter sideband results were awful, to say the least. The crowning touch came when my weak signal elicited the remark, "Fella, you can get more QRP QSOs on CW." I'm sure father Kenwood would want his transceiver back if he knew I was using it like this! That coupler/amplifier is now at the bottom of my junk box!

To analyze my situation, I sat back and sketched what my 75-meter antenna system looked like: a center-fed 40-meter dipole, a coaxial shield and center conductor tied together and fed like a long wire, an antenna tuner, and a ground. On the 75-meter band, most of the antenna current stayed inside the tuner. The good book *(The ARRL Handbook)* says maximum radiation comes from the high-current portion of the antenna. How can an antenna radiate if most of its current is inside a shielded box, and *below* ground level, too?

Out to the garage I went to look through boxes stuffed with wire and antenna gadgets. I found that the rubber on my slingshot was still good. About the same time, my wife poked her head through the door and asked, "Whatcha doin'? Looking for antenna wire? Is that a slingshot you're holding? Yep. Why

don't you grow up!"

With my bad ear, I thought she said *go* up. That was it! The answer to my antenna trouble on 75 meters! See? It takes a wife to solve such problems.

Meeting the Challenge

I noticed thin wire in one of the boxes. If I could run the wire high enough in the surrounding trees, I could have a hidden antenna. As I looked around, I noted a tree on the neighboring farmer's lot; it was about 75 feet from the side of my house. I disassembled the 40-meter dipole almost immediately. My new plans called for a half-wave 40-meter Zepp with open-wire end feed.

The feeders would be located inside my house so as not to be visible. The AWG 24 wire I chose to use for the flat top is so small I had trouble soldering it. I pushed all 66-plus feet of wire through a small hole at the end of the attic to get it outside. So far so good; no one suspected a thing.

The next morning I had a close call. I waited until the working residents left, and before the others had finished their breakfast I went outside to hang the far end of the Zepp. I tied my fishing line to a small rock. With the slingshot, I was able to get the line up and over that tree I told you about. This was the crucial part! A neighbor stuck his head out of the door and yelled, "What are you doing?"

"I'm fishing for catfish and this one climbed the tree," I answered back.

"Come on, what's happening?" he persisted.

"I'm drying my fishing line." He must have been satisfied with that, because he went back into his house. I was glad that he was not a fisherman, or he would have known that you don't have to dry a monofilament line.

I went back to work, removing the rock and tying some 125-pound-test nylon line onto the fishing line. I reeled in the fishing line and tied the end of the antenna to the 125-pound line. (I first made sure there were no knots in the twisted nylon. I melted it to keep the strands together, and twisted the antenna wire between the strands.) After this was done, I went to the other side of the tree to pull the whole works up in the air. Tying the braided line high in the tree completed the hardest part of the job.

I walked away from that clandestine activity and grabbed my pruning shears. Wanting to look inconspicuous, I pruned a nearby shrub and swept the clippings from the sidewalk. After this, I jumped on my bike and went to the mailboxes to make believe I was mailing a letter. The idea was to not, *definitely not,* turn on the rig until much later. In fact, it wasn't until about 6:30 the next morning that I tuned up on the 75-meter band. I thought if there were unusual TV or radio problems at this time, it couldn't possibly be traced to me. After all, my neighbors could not see me, so how could *I* be the one making trouble?

Notice that I *did not* use an end insulator. That would have made the antenna too visible. I have used this antenna in the rain without experiencing insulation problems. I did put some spaghetti sleeving over the wire where it goes through the insulator hole in the attic, and a short piece of plastic tubing where the antenna wire goes through the wall. On 75 meters, I tie the feed-line conductors together and use a tuner. This inverted L configuration works well. On 40 meters, since the feeders are 38 to 40 feet long, I use a tuner also. On this band, I get about a two S-unit better report from W6-land than a local friend of mine gets when we are both working skeds. He has a trap-tuned 40-meter element on his tribander up "umpteen" feet. Maybe these results are normal; his antenna is sharply resonant in the high end of the phone band, and mine is broadly resonant at the bottom end of the CW band where our sked was.

All of the house wiring (ac power, telephone and cable TV) enters from underground cabling, so my antenna does *not* cross over outside wiring. I run my rig barefoot to reduce fundamental-overload TVI, and to allow the use of smaller gauge wire for the antenna. Should the antenna fall down, it will not short across other wires.

Well, this just about covers the *what, why,* and *how* of my *hidden* 75- and 40-meter antenna. As you can see, it isn't hidden at all, but made almost invisible to the eyes of well-meaning (?) neighbors.

73 for now,

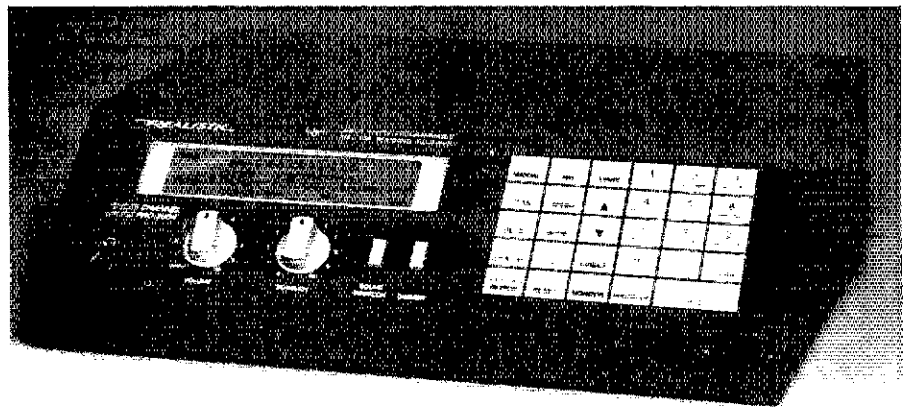
Jim, W8RJI

Jim Neu earned his Amateur Radio license in November 1937. All of his equipment was home-made until well after WW II. His US Naval career included nine months of specialized electronic training and three years of lecturing on Radar and Countermeasures. Jim was employed with the Burroughs Corp (UNYSIS) for 30 years, where he designed electronic test fixtures for in-plant use and later retired as an electronics Quality Control Engineer. In 1979, Jim's Amateur Radio license was upgraded to Extra Class. He can often be found operating CW, SSB and FM. Jim's other hobbies include fishing and boating at an inland lake located near the co-op.

New Products

REALISTIC PRO-2004
300-CHANNEL SCANNER

☐ Radio Shack has introduced a 300-channel VHF/UHF scanner with coverage from 25 to 500 MHz, 760 to 825 MHz, 852 to 869 MHz and 896 to 1300 MHz. The Pro-2004 is capable of receiving AM, narrowband FM and wideband FM signals. It includes a variety of convenient features, such as ten search ranges, direct search capability from any displayed frequency, a display dimmer and battery backup. Suggested price, $419.95. The Pro-2004 is available at Radio Shack stores. More information is available from Radio Shack, 1700 One Tandy Center, Fort Worth, TX 76102, tel 817-390-3300 —*Rus Healy, NJ2L*



Conducted By Mark Wilson, AA2Z
Senior Assistant Technical Editor

ICOM IC-375A 220-MHz Multimode Transceiver

Reviewed by Mark Wilson, AA2Z

ICOM fulfills many a VHFer's wish with the IC-375A. Part of ICOM's new line of compact 25-W VHF transceivers, the IC-375A was the first 220-MHz multimode transceiver on the market. Until now, VHFers who prefer separate transceivers for each band had to find some other way (usually a low-band transceiver and transverter) to get on 220-MHz SSB and CW.

The IC-375A features 25 W output, FM, SSB and CW operation, coverage of the entire 220-MHz band (and then some), built-in ac-operated power supply, a fast TR turnaround DATA mode, memories and scanning, passband tuning and notch filter, and full-break-in CW operation. The operating features and functions of the IC-375A are virtually identical to those of the ICOM IC-275A reviewed in October 1987 *QST*. See the IC-275A review for a detailed description of many of the controls and connections listed in Table 1.

Frequency Control

Like its 2-meter counterpart, the IC-375A features VFO A/B selection, 99 tunable memories, four useful memory scanning modes, RIT and the ability to enter virtually any repeater frequency split. A 1.6-MHz split is standard, but it is easy to program any split from 1 kHz through 9.999 MHz using the SET control. In the DUPlex mode, the frequency display shows the actual transmit and receive frequencies.

Receiver

The IC-375A receiver covers 216 to 236 MHz. Unfortunately, there isn't a whole lot to listen to outside the amateur band. In the 216-220 MHz range, you can hear low-power wildlife tracking telemetry beacons and tone and data transmissions from inland waterway buoys. The range above 225 MHz (all the way to 400 MHz) is assigned to the military and mostly used by aircraft. If the receiver coverage went a little lower, to 215.750 MHz, you could listen to TV Channel 13 aural carriers to monitor propagation.

A band-pass filter followed by a 3SK121 dual-gate GaAsFET RF amplifier, more filtering and a singly balanced JFET mixer (employing a pair of 2SK125s) contribute to solid receiver performance. The dynamic-range figures detailed in Table 2 are similar to those of many current HF transceivers. An outboard preamp is desirable for weak-signal work, however, because the IC-375A has a receiver noise figure in the 4-dB range.

The IC-375A receiver is a multiple-conversion superheterodyne design. In the

Table 1
IC-375A Controls and Connections

Front Panel

General

POWER switch
SPEECH synthesizer switch (for optional UT-36 synthesizer)
Mode switches
DATA switch
CW DELAY control
S-RF/C ALC meter switch
XMIT transmit/receive switch
XMIT and RECV indicator lights

Frequency Control

Main tuning knob
SCAN start/stop switch
MODE-selective scan switch
SKIP scan switch
Dial LOCK switch
TS tuning step switch
MHz select switch
RIT frequency control
RIT on/off switch
RIT-CLear switch
VFO (A/B) switch
VFO A=B equalizing switch
VFO SPLIT switch
DUPlex switch
Duplex CHECK switch
Memory > VFO switch
Memory write switch
MEMory read switch
MEMory DN/UP channel selector
Memory-CLear switch
CALL channel switch

Transmitter

MIC connector (8 pins)
MIC GAIN control
RF PWR control
COMP speech processor switch
TONE-squelch switch (for optional UT-34 tone squelch unit)
Tone SET switch
TONE on/off switch

Receiver

PHONES jack (¼ inch)
AGC switch
AF gain control
AF TONE control
RF GAIN control
SQUELch control
NOTCH filter switch
NOTCH filter control
Pass Band Tuning control
Noise Blanker switch
PREAMP on/off switch (for optional AG-25 external preamp)

Rear Panel

ANTenna connector (SO-239)
KEY jack (1/8 inch)
EXT SPeaker jack (1/8 inch)
GND terminal
Ac power jack (CEE-22)
DC 13.8V jack (Molex)
Fuse holder
ACCessory jack (8-pin DIN)
AQS jack (multipin) for digital communications
REMOTE control jack (1/8 inch)
TX-METER—RF/SWR switch
CW BK-IN—OFF/SEMI/FULL switch
CW SIDETONE level control
Speech COMPressor LEVEL control
MIC TONE control

Table 2
ICOM IC-375A 220-MHz Multimode Transceiver, Serial no. 01040

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: 216-236 MHz. Specifications guaranteed from 220-225 MHz.	As specified.
Modes of operation: FM, USB, LSB, CW.	As specified.
Frequency display: 7-digit LCD, black on an orange background, 3/8-inch-high digits.	
Frequency resolution: 100 Hz.	As specified.
Transmitter	*Transmitter Dynamic Testing*
Transmitter output power: 2.5 to 25 W adjustable.	2.5 to 30.4 W.
Spurious-signal and harmonic output: Greater than 60 dB below peak power output.	–70 dB (see Fig 1).
Third-order intermodulation distortion products: Not specified.	See Fig 2.
Keying waveform: Not specified.	See Fig 3.
Transmit-receive turnaround time (PTT release to 90% output with an S9 signal): Not specified.	With the DATA switch on: FM, 1.2 ms; SSB, 46 ms (see Fig 4).
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: SSB and CW: less than 0.1 μV for 10 dB S/N.	Minimum discernible signal (noise floor), (dBm): –136.5 (2.3 kHz filter)
FM: less than 0.18 μV for 12 dB SINAD; less than 0.28 μV for 20 dB quieting.	0.15 μV for 12 dB SINAD. 0.23 μV for 20 dB quieting.
Receiver dynamic range: Not specified.	Blocking dynamic range (dB): 107.5 Two-tone, third-order intermodulation distortion dynamic range (dB): 87.5 Third-order input intercept (dBm): –3.75
S-meter sensitivity (μV for S-9 reading): Not specified	4.0. Note: S meter was not accurate; 10-dB increase in signal input resulted in 20-dB increase on meter.
Squelch sensitivity: FM: less than 0.14 μV; SSB/CW: 0.56 μV.	FM: 0.065 μV min, 0.24 μV max; SSB/CW: 0.45 μV min, >1 mV max.
Receiver audio output at 10% THD: More than 2 W.	2.0 W.
Color: Black.	
Size (height, width, depth): 4.25 × 9.6 × 11.6 inches.	
Weight: 13.7 lb.	

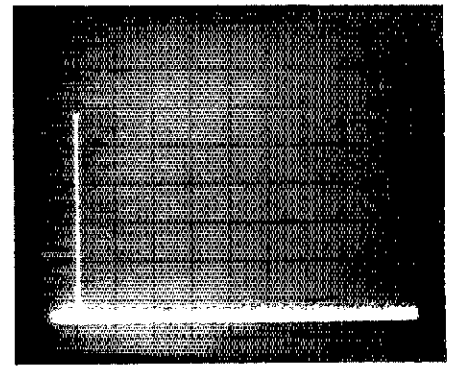


Fig 1—Spectral display of the IC-375A. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. Output power is approximately 28 W at 222 MHz. The fundamental has been reduced in amplitude approximately 22 dB by means of notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 70 dB below peak fundamental output. The IC-375A complies with current FCC specifications for spectral purity.

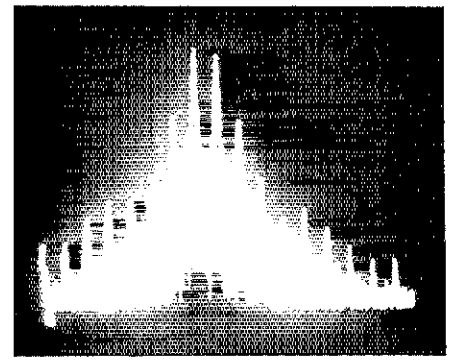


Fig 2—Spectral display of the IC-375A during two-tone intermodulation distortion (IMD) testing. The transceiver is being operated at 28-W PEP output at 222 MHz. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. Third-order products are approximately 22 dB below PEP output, and fifth-order products are approximately 37 dB down.

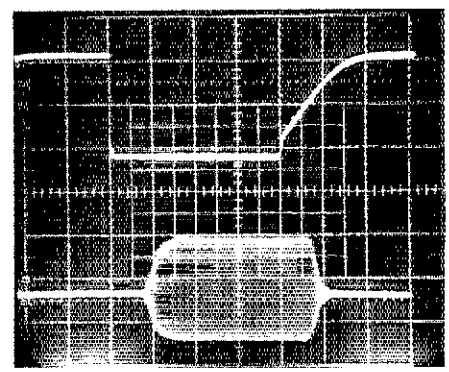


Fig 3—CW keying waveform of the IC-375A. The upper trace is the actual key closure; the lower trace is the RF envelope. Each horizontal division is 5 ms.

SSB and CW modes, it uses four conversions, with IFs at approximately 70 MHz, 9 MHz, 455 kHz and 9 MHz. For FM, three conversions are used with IFs at approximately 70 MHz, 9 MHz and 455 kHz.

The first thing I noticed when listening to the IC-375A is that the receiver sounds very quiet in the SSB and CW modes. The level of hiss and white noise is noticeably lower than what you might expect to hear, and this quietness gives the impression that the receiver is deaf. Of course, lab measurements and on-the-air listening prove otherwise! In an A/B comparison, the IC-375A heard all but the weakest signals I copied with my usual transverter/low-band transceiver combination. Addition of an external Advanced Receiver Research GaAsFET preamplifier made the weaker signals easier to copy, however.

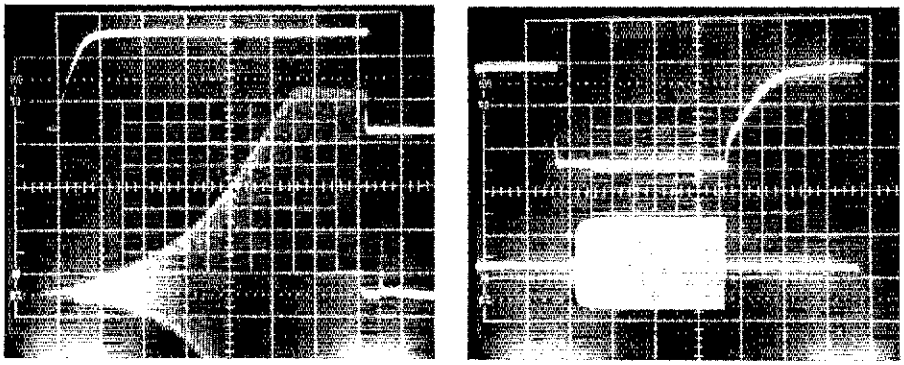
Lab testing turned up a quirk that we also noticed in the 2-meter IC-275A: The S meter is not accurate. A 10-dB increase in signal input results in a 20-dB increase in meter reading. The S meter is *very* generous.

For CW operators, a 500-Hz filter is optional. The review unit was not equipped with this filter.

Transmitter

Transmitter measurements are shown in Table 2 and Figs 1, 2 and 3. Power output easily meets ICOM's 25-W specification. The harmonics and spurious emissions, at 70 dB down from the carrier level (Fig 1), are better by a wide margin than required by FCC regulations.

Transmitter intermodulation-distortion (IMD) testing, however, was a bit disappointing. The third-order IMD products are down only 22 dB (referenced to a single tone), and the higher-order products are fairly strong. See Fig 2. This could create a wide SSB signal, which could bother local stations. For comparison, a typical HF transmitter might have third-order IMD products 35 to 40 dB down, and



(A) (B)

Fig 4—Receiver recovery (turnaround) time waveforms for the IC-375A. The receiver AGC is set to FAST. The photo at A shows the turnaround time in the USB mode using the DATA feature. This combination might be used for AMTOR operation. Each horizontal division is 10 ms. The upper trace shows PTT release. The lower trace is receiver audio output. The receiver is tuned to an S1 signal. Upon key opening, the delay from opening to 90% audio output is measured. The turnaround time is 46 ms. Note that audio will be usable by most communications terminal units before 90% audio output is reached. The photo at B shows a similar measurement, but in the FM mode using the DATA feature. This combination might be used for packet-radio operation. Each horizontal division is 5 ms. Turnaround time is 1.2 ms.

correspondingly lower higher-order products. Many VHF and UHF transmitters and amplifiers need improvement in this area.

The IC-375A includes a speech compressor and a microphone tone control. By careful adjustment of the rear-panel MIC TONE and COMP LEVEL controls, it is possible to get very-good-sounding audio from ICOM's standard hand microphone. You'll need to be able to listen to your signal in a second receiver, or have a local friend listen, to make the most of these adjustments.

CW operators get the choice of semi- or full-break-in (QSK) operation. While some operators prefer QSK operation on HF, it really isn't all that useful on VHF. If you do like QSK, remember that you won't be able to use it with your average 220-MHz power amplifier and/or outboard preamplifier setup. Fig 3 shows the IC-375A's CW keying waveshape. Rise and fall times are a bit sharp, but the signal sounds fine on the air.

As with the 2-meter model, transceiver turnaround times are exceptionally fast thanks to the DATA mode feature. With a TR turnaround time of 1.2 ms in the FM mode (DATA feature enabled), the '375 should be especially attractive to packet-radio operators. In the SSB mode (DATA feature enabled), turnaround is 46 ms. See Fig 4. AMTOR and RTTY operation are covered in the manual.

Manual

The IC-375A manual is detailed and well written. In it, you'll find a wealth of information about operating the radio. Use of every control is explained and information is given for all of the rear-panel connectors. Information on controlling the IC-375A with a personal computer (using ICOM's "communication interface-V" system) is sketchy, though. There is no information about what you can do once you get the computer hooked up. ICOM includes a complete schematic diagram of the IC-375A, but I couldn't find a block diagram in the manual.

Hookup and Operation

The only problems encountered in hooking up the IC-375A in my station resulted from incompatible connectors. For example, the key jack is a 1/8-inch phone jack instead of the 1/4-inch type used on the rest of my equipment. The control line for an external power amplifier is found on the eight-pin ACC(1) jack (a matching plug is not supplied). Note that the amplifier control line is rated for a maximum of 20 V dc. This shouldn't be a problem with most solid-state amplifiers, but be sure to check the keying voltage on tube-type amplifiers before using them with the IC-375A.

I used the IC-375A for casual operation and during the ARRL September VHF QSO Party. Most of the time I used it with an external RF Concepts 120-W solid-state power amplifier. The receiver worked well during the contest on CW, SSB and FM, although there weren't too many rock-crushing signals on the air. I heard plenty of stations, even without an external preamplifier. Reports received during the contest and during the weekly 220-MHz SSB Pack Rats net indicate that the transmitted audio sounds fine.

Manufacturer: ICOM America, Inc, 2380-116th Ave NE, Bellevue, WA 98004, tel 206-454-7619. Price class: $1400.

RF-CONCEPTS RFC 2-23 AND RFC 3-22 SOLID-STATE 144- AND 220-MHz AMPLIFIERS

Reviewed by Bruce S. Hale, KB1MW

Brick 1: a handy-sized unit of building or paving material typically being rectangular and about 2¼ × 3¾ × 8 inches and of moist clay hardened by heat
2: a good-hearted person
3: a rectangular compressed mass (as of ice cream)
4: a semisoft cheese with numerous small holes, smooth texture, and usually mild flavor[1]

I wonder who first used the term "brick" to refer to a small solid-state amplifier. They're not semisoft or full of holes (we won't talk about semiconductor theory), but it's an appropriate term. What can you say about a brick? It just sits there, holding the wall up. A good solid-state brick should just sit there and *work*. These RF Concepts amps are good bricks; you put watts in and you get more watts out.

The RF Concepts RFC 2-23 is a 144-MHz amplifier and the RFC 3-22 is for 220 MHz. Except for frequency range and power output, the two units are virtually identical. Both work on SSB, CW and FM. They are linear amplifiers—the front-panel FM/SSB switch changes the TR-relay dropout time. The relay drops out instantly in FM, but there is a slight delay (adjustable) in the SSB mode so that the relay doesn't drop out between words and syllables.

Both amplifiers accept input power in the range 200 mW to 5 W, but maximum usable drive is about 2 W. The RFC 2-23 puts out 30 W with 2-W drive, and the RFC 3-22 delivers 20 W with 2-W drive. The amplifiers each draw about 4 A at 13.8 V dc at maximum output. They feature automatic SWR protection shutdown circuits. If the amps sense SWR over 3:1 at the output, they automatically shut down to protect their output transistors.

Transmit-receive switching is fully automatic; an RF sensor in the amp switches the TR relay when you transmit. There is no provision for manually controlling the TR relay from the transceiver.

All of these factors contribute to the "brick-like" qualities of the amplifiers. You supply voltage and connect the feed lines, and you're done. The rear-panel power connection is made through a two-pin polarized connector; RF Concepts supplies a 6-foot cable with matching connector and fuse. RF input and output connections are handled by a pair of SO-239 jacks.

Both amplifiers are equipped with gallium-arsenide FET (GaAsFET) preamplifiers. The preamp is activated by a

[1]Webster's Ninth New Collegiate Dictionary (Merriam-Webster, Inc, Springfield, MA, 1983), p 178.

Table 3

RF Concepts RFC 2-23 144-MHz Amplifier, Serial no. 2-0254

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: 143-149 MHz.	Tested from 144 to 148 MHz.
Modes of operation: FM, CW, SSB.	As specified. Also works on packet radio.
Power output: 30 W with 2-W drive. Input power: 0.2 to 5 W.	34.9-W output for 2-W drive.
Spurious signal and harmonic suppression: Not specified.	See Fig 5.
Receive preamp: 20 dB gain with 0.75-1.5 dB noise figure.	21.5 dB gain, 1.22-dB noise figure at 146 MHz.
Receive preamp 1-dB compression point: Not specified.	−11-dBm output.
Power requirement: 13.8 V dc at 4 A.	13.8 V dc at 4.15 A required at full output.
Color: Black.	
Size (height, width, depth): 2 × 3.5 × 6.5 inches.	
Weight: 5 lb.	

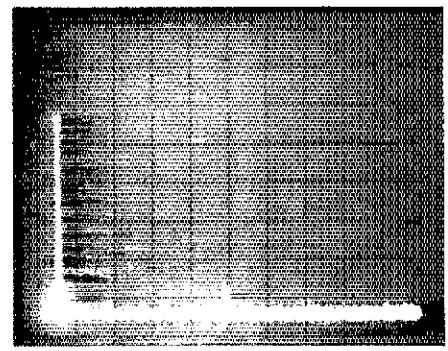
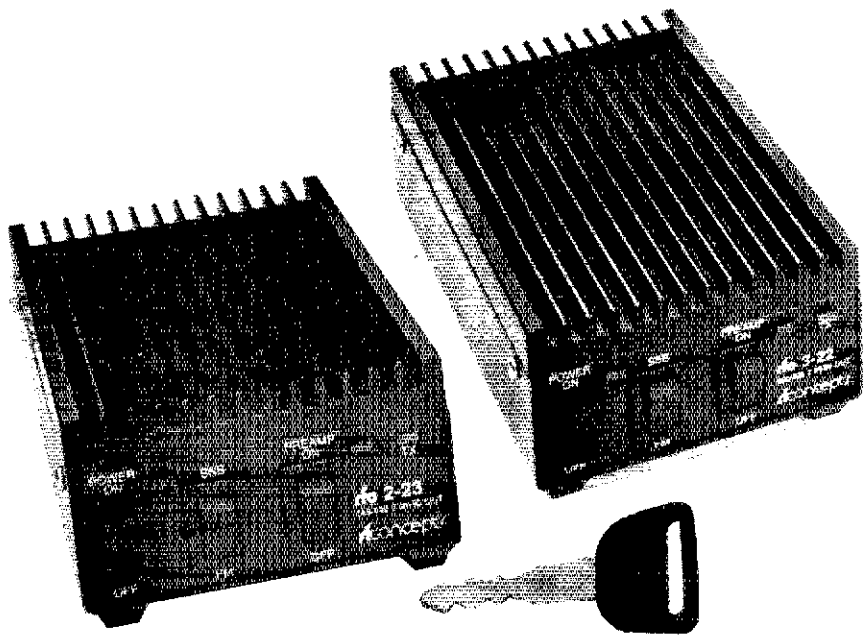


Fig 5—Spectral display of the RFC 2-23. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. Output power is approximately 34 W at 144 MHz. The fundamental has been reduced in amplitude approximately 28 dB by means of notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 64 dB below peak fundamental output. The RFC 2-23 complies with current FCC specifications for spectral purity.



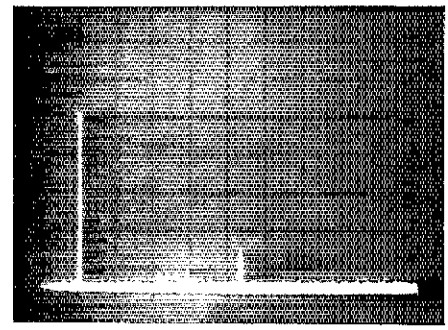


Fig 6—Spectral display of the RFC 3-22. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. Output power is approximately 21 W at 222 MHz. The fundamental has been reduced in amplitude approximately 22 dB by means of notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 66 dB below peak fundamental output. The RFC 3-22 complies with current FCC specifications for spectral purity.

Table 4

RF Concepts RFC 3-22 220-MHz Amplifier, Serial no. 3-1016

Manufacturer's Claimed Specifications	*Measured in 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: 20 W with 2 W drive. Input power: 0.2 to 5 W.	22.8-W output for 2-W drive.
Spurious signal and harmonic suppression: Not specified.	See Fig 6.
Receive preamp: 15 dB gain with 1-1.75 dB noise figure.	22.17 dB gain, 1.47-dB noise figure at 222 MHz.
Receive preamp 1-dB compression point: Not specified.	−8-dBm output.
Power requirement: 13.8 V dc at 4 A.	13.8 V dc at 4.25 A required at full output.
Color: Black.	
Size (height, width, depth): 2 × 3.5 × 6.5 inches.	
Weight: 5 lb.	

front-panel switch, and the preamp *can* be used without the rest of the amplifier on. If you need a boost for your receiver, but don't need full-power transmit, switch on the preamp without switching the main power switch on. The preamp is automatically switched out when the amp goes from receive to transmit.

Operation

Once you've hooked up one of these amplifiers, there isn't much more to do. Front-panel switches are for SSB/FM, POWER ON/OFF and PREAMP ON/OFF. LEDs indicate when power or preamp are on, and when the amplifier is in transmit.

The preamps work very well. For example, at my house, the W1AW repeater went from S3 to S9+ when I switched on the preamp. I used the RFC 3-22 220-MHz

amplifier at my home station with a Yaesu FT-109RH hand-held, and the additional power was convenient when I was using a 220-MHz/6-meter remote station about 15 miles away. The amp handled the 5-W output from the Yaesu with no complaints.

I also used the amplifiers in my car with a pair of hand-held transceivers. I used the 220-MHz amp with a Yaesu FT-109RH, and the 2-meter version proved to be a good companion to a Yaesu FT-23R. Again, the additional power was very handy. Most of the time, I was able to use the low-power position on the hand-held to conserve battery power and still get enough power from the amplifier to access local repeaters. When I needed the full output, I switched the hand-held to high power. The preamp made it possible for me to hear repeaters full quieting in spots where they had been very noisy without it.

We did have a problem with the review RFC 3-22 220-MHz amplifier during initial lab testing: Spurious emissions did not meet FCC requirements, the unit introduced about 10 dB of loss with the power switch off and the preamplifier exhibited unusually low gain and high noise figure. We returned the amplifier to RF Concepts; they promptly repaired it under warranty and returned it free of charge. The problem was traced to a faulty relay, which RF Concepts replaced with a better part. Our review unit was from an early production run; current production units use the better relay.

These amps are real bricks (good-hearted, not semisoft). They do their work, they don't eat much (current) and they don't complain. They make excellent additions to any ham shack or mobile VHF installation.

Manufacturer: RF Concepts, 2000 Humboldt St, Reno, NV 89509, tel 702-827-0133. Price class: RFC 2-23, $112; RFC 3-22, $112.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

☐ In order to present the most objective reviews, ARRL purchases equipment "off-the-shelf" from Amateur Radio dealers. [ARRL receives no remuneration for items presented in the Product Review or New Products columns.—Ed.]

The following ARRL-purchased Product Review equipment is for sale to the highest bidder. Prices quoted are minimum acceptable bids and reflect a discount from the purchase price.

Sealed bids must be submitted by mail and be postmarked on or before March 27, 1988. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

Please clearly identify the item you wish to bid on, using the manufacturer's name, model number or other identification number if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail of the successful bid. No other notifications will be made, and no information will be given by telephone to anyone regarding final price or identity of the successful bidder.

Please send your bids to Kathy McGrath, Product Bids, ARRL, 225 Main St, Newington, CT 06111.

Yaesu FT-23R 2-meter FM hand-held transceiver, s/n 6N073075 (see Product Review, Dec 1987 *QST*). Minimum bid $173.

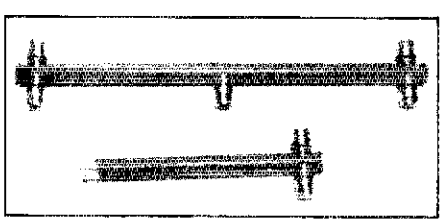
AEA PK-232™ multimode data communications terminal, s/n 03097 (see Product Review, Jan 1988 *QST*). Minimum bid $200.

Kenwood R-5000 general-coverage receiver, s/n 8020070, with YK-88C and YK-88A-1 filters (sold as a package only, see Product Review, Feb 1988 *QST*). Minimum bid $553.

New Products

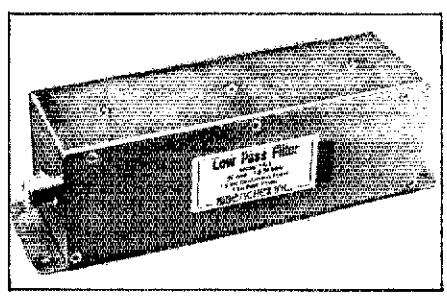
ANTENNA SPECIALISTS RF POWER DIVIDERS

☐ The Antenna Specialists Co, Cleveland, Ohio, has introduced RF power dividers in three frequency ranges for continuous coverage from 144 through 960 MHz. The dividers are available in two- and four-port designs, and can be used for phasing similar or different antennas in a variety of applications. All-copper construction is used; input and output connectors are type-N. SWR is rated at 1.5:1 or less, and the dividers are rated to handle 500 W. For more information, contact The Antenna Specialists Co, 30500 Bruce Industrial Pkwy, Cleveland, OH 44139-3996, tel 216-349-8400—*Rus Healy, NJ2L.*



BENCHER LOW-PASS FILTER

☐ The Bencher YA-1 low-pass transmitter filter is designed to attenuate harmonic radiation by at least 80 dB at and above 54 MHz. Passband frequency range: 1.8 through 30 MHz. The filter has 52-Ω input and output impedances, and is rated to handle 1.5 kW of continuous RF, and 5 kW peak power. For more information, contact Bencher, Inc, 333 West Lake St, Chicago, IL 60606, tel 312-263-1808 —*Rus Healy, NJ2L*

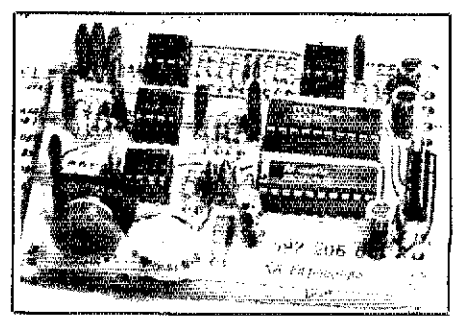


A & A ENGINEERING 8-BIT A/D AM DEMODULATOR

☐ To support Elmer Schwittek's (K2LAF) MULTIFAX™ WEFAX program for the IBM® PC, A & A Engineering has developed an updated demodulator/ADC (analog-to-digital converter) circuit and incorporated it in their no. 206 series kits. This new demodulator overcomes some filter-ringing problems present in the earlier design, and provides more gain in the amplifier stage.

Stas, W6UCM (who owns A & A Engineering), reports that HF WEFAXers are also using the A/D converter section of the demodulator/ADC board to enhance HF WEFAX pictures. In answer to requests from these users for 4-bit A/D conversion capability, A & A Engineering designed the new board to provide 8-bit conversion. Presently, no known WEFAX programs use the full 8-bit capability of this board, but the room for expansion is there. An optional AGC board will soon be offered as an add-on to this demodulator.

To order, or for more information, contact A & A Engineering, 2521 W La Palma, Unit K, Anaheim, CA 92801, tel 714-952-2114. Price: no. 206-KIT, $49.95; no. 206-PCB (PC board only), $14.95; no. 206-ASY (assembled and tested unit), $69.95. A & A Engineering also offers a package that includes the HF WEFAX demodulator (no. 109), the AM demodulator/ADC (no. 206) and power supply (no. 133).—*Paul K. Pagel, N1FB*



Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

TUBING REDUCER REPLACES COAXIAL HOOD

☐ The UG-106 hood is the preferred method of preserving the shielding of RG-8, RG-213 and similar cable behind an SO-239 coaxial jack, but I couldn't find a local source of these parts. I discovered, though, that hardware and plumbing shops carry a substitute: A 1/2-to-3/8-inch copper tubing reducer that does the job nicely! (See Fig 1.) A 140-W soldering iron provides sufficient heat to install the reducer.

Prepare the cable as shown in Fig 1A by removing 7/8 inch of the cable jacket and folding back the braid. Strip 3/16 inch of insulation from the center conductor. Tin the outside of the narrow end of the tubing reducer. After the reducer cools, slide it over the cable, narrow end first.

Tin the back of the SO-239 base plate as shown in Fig 1A and allow it to cool. Solder the cable center conductor to the SO-239 pin (Fig 1B). Slide the reducer flush with the SO-239 base plate and solder it to the plate as shown in Fig 1C. Like tinning the back of the plate, this operation requires thorough heating of the work, so be sure to let the soldered assembly cool before you move to the next step.

See Fig 1D. Pull the cable braid over the reducer. Wrap several turns of solid hookup wire around the braid and twist the wire ends tightly to hold the braid in place. Trim the braid close to the wire with diagonal cutters, then solder the wire-wrapped braid to the tubing reducer. —*John J. LoRe, W4LGD, White Stone, Virginia*

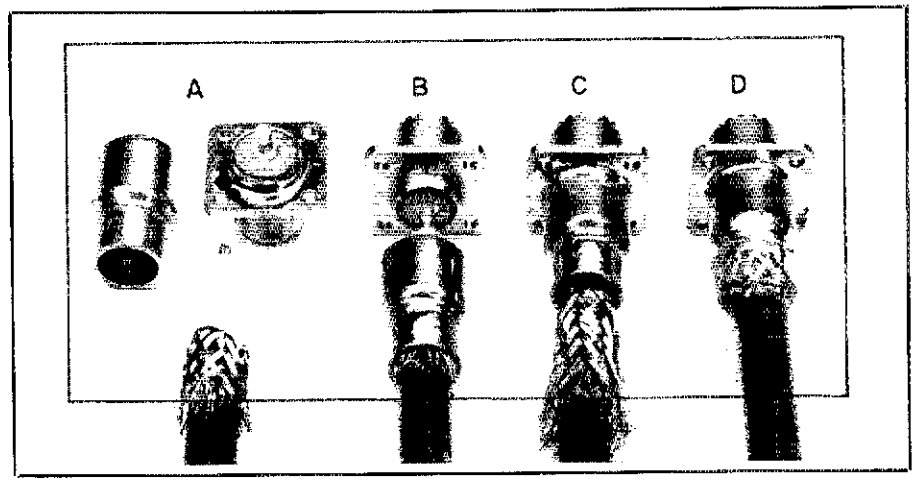


Fig 1—W4LGD uses a 1/2-to-3/8-inch copper tubing reducer as a substitute for the UG-106 coaxial hood. Like the UG-106, the tubing reducer provides shielding between panel and cable braid for RG-8, RG-213 and similar transmission lines. See the text for instructions.

IDENTIFYING IC PINOUTS ON CIRCUIT BOARDS

☐ Building IC projects on perforated board can be frustrating because device identity, orientation and pinout are confusing on the wiring side of a board. Troubleshooting a perf-board IC project is difficult for the same reason. My solution to this problem requires only a piece of masking tape for each IC, a pocketknife and a pen or pencil. The description of the technique assumes that the IC to be identified has already been placed on the board.

Cut a piece of masking tape slightly longer than the footprint of the IC. Using the pocketknife blade, push the tape down over the IC pins until it sticks to the board. Run the sharp edge of the knife blade along the IC pins to smooth the tape, and finish the job by passing the unsharpened edge of the blade between the IC pins to ensure firm adhesion. Next, write the IC's function and pin numbers on the tape. I usually identify only the corner pins of the chip—pins 1, 7, 8 and 14 for a 14-pin device, for instance.—*Gene Shapiro, WØDLQ, Prairie Village, Kansas*

Editor's Note: So acute are the problems of IC pinout and identification in the construction of complex digital prototypes that a number of manufacturers now offer preprinted identification tags that can be slipped over the pins of *wire-wrap* IC sockets. (One such product is the Wrap-ID, manufactured by OK Industries, Inc.) Because these tags are intended for wire-wrap use, they may not withstand soldering heat. Nonetheless, wire-wrap identification tags may be worth investigating for soldered projects, especially for circuits containing many ICs.

SOLDERING TO STAINLESS STEEL—ALMOST

☐ Stainless steel doesn't take solder, but the equivalent of a soldered connection *can* be made to stainless steel by means of a welding technique. Using an oxyacetylene or Mapp® gas torch, braze a patch of brass to the steel. Solder your connection to the brass instead of the steel. If you use this technique for connection to a stainless steel clamp on an aluminum antenna element, be careful not to allow contact between the brass and the aluminum: corrosion can result where these metals touch.—*Edson B. Snow, W2UN, Pompano Beach, Florida*

CLEANING KEY CONTACTS

☐ In the early days of landline and wireless telegraphy, operators cleaned their key contacts with a special burnishing tool. Here's a method of cleaning key contacts *without* a special tool. The business end of a burnishing tool consists of a thin metal strip coated with fine abrasive. The striking pad of a safety matchbook can also serve as a burnisher. Cut the striking pad from the matchbook cover and pull it slowly through the key contacts: once with the abrasive side up and again with the abrasive side down. Fold the strip to create opposing abrasive faces if you prefer to clean both contacts in one pass.—*Joe Rice, W4RHZ, Covington, Kentucky*

Editor's Note: Burnishing tools are still available from various electronics parts houses. These tools are intended for use on relay contacts. Depending on the composition of the contacts to be cleaned, however, injudicious use of abrasives can do more harm than good to a malfunctioning relay or balky code key. Before you resort to abrasive cleaning, try this first: Pass a strip of uncoated, high-quality (bond) paper between the dirty contacts. Gently close the contacts on the paper and move the strip back and forth until the contacts no longer darken the paper. Next, check the contacts for proper operation. If the problem hasn't cleared, a burnishing tool—or its equivalent—is the next step.

SIMPLE AND INEXPENSIVE MOTOR FOR CRANK-UP TOWERS

☐ Cranking up a tower by hand is a chore, and commercial motor drives are expensive. A cast-off power unit from a chain-driven garage-door opener can do the job inexpensively. In my case, I welded a bicycle sprocket to the winch assembly on my tower and coupled a Perma Power® motor to the sprocket by means of a bicycle chain. With the 6-inch sprocket I installed, the motor raises the tower in seven minutes. A smaller sprocket would raise the tower faster, and might be a better choice.—*John R. Kersten, WØNY, Brainerd, Minnesota*

USING A RECEIVER AS A NEUTRALIZATION INDICATOR

☐ Ham lore has it that grounded-grid amplifiers need not be neutralized, but this is true only at frequencies at which reactances in the tube(s) and amplifier

circuitry do not encourage positive feedback. I was reminded of this when I built a grounded-grid amplifier using parts I already had on hand. The tubes I used—805s—work well as class-B audio amplifiers but were not designed for grounded-grid RF service. *This* grounded-grid amplifier required neutralization! My neutralizing technique requires only a receiver (or transceiver in receive mode) and an antenna.

First, remove all power from the amplifier and be sure its high-voltage filter capacitors are safely discharged. Next, hardwire the RF contacts of the amplifier TR relay into the transmit mode. Connect the receiver to the amplifier input and the antenna to the amplifier output. Tune in a steady signal and peak the amplifier tank circuit for a maximum S-meter reading. Adjust the amplifier neutralizing capacitor for a signal null. Finally, return the TR relay wiring to normal. The amplifier is neutralized.

I like this technique because it can be done when nothing in the amplifier is hot, thermally *and* electrically.—*Scott Reaser, K6TAR, Pacific Palisades, California*

Editor's Note: Although neutralization of the amplifier went well, K6TAR later reported that the rig didn't pan out. Showing true ham spirit, Scott penned this note on the back of his publication release form: "Please note that although I think the idea I submitted has merit, that particular application was a disaster. Case in point: 805 triodes made a lousy linear, even if the tubes were free! Subsequent to my original communication, I started over with the amplifier. Rebuilt with a single 3-500Z and a Hypersil® transformer supply, the amplifier works nicely. The lesson is to use parts designed for the application."

SHIELD CHOKES FOR COAXIAL CABLE

☐ When a coaxial (unbalanced) transmission line is used to feed a balanced antenna directly, RF current can flow on the *outside* of the cable shield. Even when a balun transformer is used to correct the imbalance, near-field antenna radiation can induce current flow on the outside of the cable shield if the coax does not leave the antenna perpendicularly. RF current flow on the outside of the shield is undesirable because it can distort the radiation pattern of the antenna, and may lead to inaccurate SWR measurements and stray RF in the shack.

You can use two *shield chokes* to reduce the effects of external shield current at the ends of a feed line. Form each choke by winding ten turns of feed line at the minimum bending radius (usually ten times the line diameter) recommended for the line. Use electrician's tape to hold the turns in place after you wind each coil. Place one choke within ¼ wavelength (at the highest operating frequency) of the antenna; place the other at the same distance from the transmitter. Caution: Don't form shield chokes in foam-dielectric transmission line. Tightly coiling such cable can cause the center conductor to move out of concentricity because of foam "cold flow." This changes the line impedance at affected points and reduces the power-handling capability of the cable.

If you're thinking of using a 1:1 balun transformer with your coax-fed dipole or at the driven element of a beam antenna, consider using a shield choke instead. Shield chokes are easy to construct using readily available materials. Properly built, they can handle as much power as the coax that composes them. In balun applications where impedance transformation is not required, a shield choke may be the better alternative.—*Bob Schetgen, KU7G, ARRL HQ Staff*

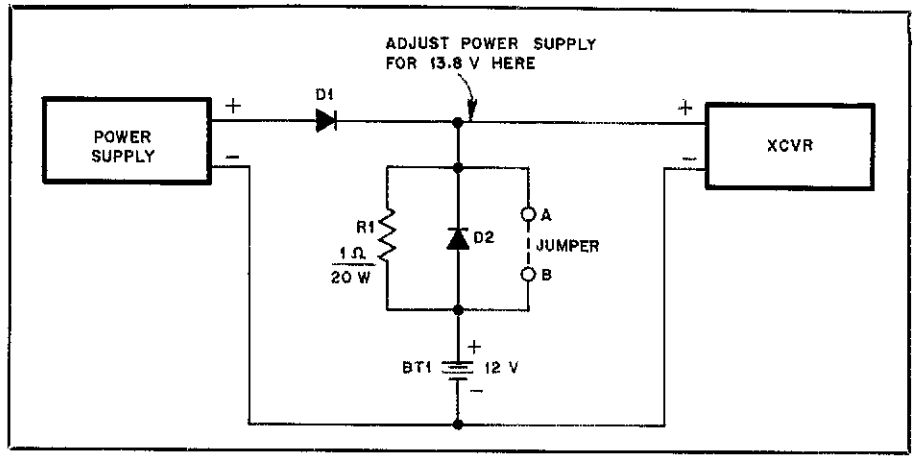


Fig 2—KF6GL's power supply/charging circuit. In this application, D1 and D2 are 6-A, 600 PIV diodes (Motorola MR756, ECG5815 or equivalent), R1 is a wirewound unit and BT1 is a size 27, deep-cycle, lead-acid storage battery. The jumper is used only during power failures (see text). The power supply is normally turned on only while the station is attended. In tailoring this circuit to your application, use conservatively rated components.

ELIMINATING DIAL-DRIVE CLUTCH SLIPPAGE IN THE HW-101

☐ After I became the third owner of a Heathkit HW-101 transceiver, I noticed that its VFO occasionally slipped out of calibration at the ends of its range. I discovered the cause after removing the VFO assembly from the rig to inspect the dial-drive clutch: After years of pressure, the plastic clutch (Heath part no. 266-200) had warped. I reversed the clutch disk so that the inside surface of the disk faces outward, making the warpage work in my favor, Now, the dial drive works well. The clutch allows just enough slippage for manual calibration of the VFO dial scale—*Vernon D. Range, Jr, KA9NBH, Rochelle, Illinois*

A DEEP-CYCLE BATTERY AS AN EMERGENCY POWER SOURCE

☐ After I acquired a size 27, deep-cycle lead-acid battery as an emergency power source for my 2-meter transceiver, hams on the local repeater advised me on how to keep the battery charged. "Connect a variable dc supply in parallel with the battery and set its output voltage to 13.6," they said.

The current capability of my power supply is insufficient for such service. The supply can source the 4.8 A required by the rig during high-power transmit, but is rated at only 3 A for continuous duty. Connecting the supply directly in parallel with the battery *and* the transceiver would, at times, result in current drain exceeding the supply's continuous-duty rating.

Fig 2 shows my solution to this problem. Charging current with this circuit is 1 A or less, and the supply can still power the transceiver. Installation of a jumper across points A and B applies the full battery voltage to the transceiver if this is needed during an extended power failure. —*George Hopkins, KF6GL, Sunnyvale, California*

BETTER AUDIO QUALITY FROM AN OUTBOARD SPEAKER

☐ I have a hearing disability that requires bassier response and more audio output than my stock Kenwood SP-930 speaker could provide without objectionable distortion. I improved the power-handling capability and frequency response of the '930 by replacing its speaker with a 4-inch Radio Shack® automobile speaker (RS 40-1197). This replacement speaker exactly fits the mounting holes in the SP-930! Next, I lined the speaker cabinet with fiberglass insulation (RS 42-1082 or equivalent) to damp acoustic resonances.

Modified in this way, the SP-930 handles the full audio output from my TS-930 transceiver without noticeable distortion, and its frequency response is substantially improved. The outboard speakers used by many hams can probably be improved by similar modifications.—*Maurice Sasson, MD, W2JAJ, New Rochelle, New York*

Technical Correspondence

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

THE DIGI-CAT IS BACK

☐ You can now obtain preprogrammed 8748 microcontroller ICs and PC boards for the DIGI-CAT project (Apr 1987 *QST*, pp 40-43) from author Steve Reyer. Complete kits are *not* available. The preprogrammed 8748 costs $25, and the PC board is $8. Shipping, for up to two items, is $2.50 US and Canada, $3.50 Europe and $4.50 elsewhere. A check or money order in US funds is required. Send your order to: Reyer & Associates, PO Box 17821, Milwaukee, WI 53217. The ARRL and *QST* in no way warrant this offer.

[The PC-board pattern and parts overlay are presented in the article. An object code listing for the program is available from the ARRL Technical Department for $1 to cover copying and handling costs.—Ed.]

TAMING TOUCH-AND-GLOW LAMPS

☐ John Adams (W7OTC) and Colin Hall (G4JPZ) both had solutions for preventing RF transmitters from *turning on* touch-and-glow lamps.[1,2] There is another problem associated with these lamps: They are prolific *RFI generators* on bands from 160-10 meters—and probably higher![3]

For those of you not familiar with these lamps, they are metal-frame, decorative table lamps that are turned on and off by touching the metal lamp frame. The first touch turns it on dimly; a second touch increases the lamp output to medium brightness, and a third touch results in full lamp brilliance. A fourth touch turns the lamp off and readies it for a new round of switching.

There is no conventional mechanical switch on these lamps. Switching is controlled by a small circuit board enclosed in a plastic box in the lamp base. One lead from this board connects to the lamp frame. This wire, which the Hints and Kinks items referred to as the *signal lead*, senses changes in capacitance when the lamp is touched; it then initiates switching action.

Here's how one of these lamps affected operation at one Amateur Radio station location. Strong, tunable, unstable, raspy (T2 note) signals were observed on all bands from 160-10 meters. The bandwidth of these signals varied from about 15 kHz on 160 meters up to several hundred kHz on 10 meters. (When the signals were first heard, their source was unknown.) The signal strength of these signals was substantial enough to cause destructive interference to communications. On 21 MHz, the RFI registered S7 on a Ten-Tec Corsair receiver.

After a long search and much direction-finding work, the cause of the RFI was found to be a touch-and-glow lamp about 450 feet from the station. With each touch of the lamp frame, the interfering-signal frequency shifted somewhat, but was always present—*even with the lamp turned off!* As long as the lamp is plugged in, a noise generator is going full-blast 24 hours a day!

In an effort to determine if the problem was a faulty individual component or faulty design, a dealer's stock of 10 lamps was checked. Strong RFI was emitted by all the lamps, so the problem appears to be one of inadequate design.

Three lamps were closely inspected. All were made in Taiwan, and none had the Underwriter's label. (It is doubtful that these lamps meet the requirements of Part 15 of the FCC rules and regulations.) Each of the lamps inspected operated in the same manner, but each circuit board (there is one per lamp) seemed to have been made by a different Taiwanese manufacturer. In the following discussion, these circuit boards will be referred to as no. 1, no. 2 and no. 3.

Board No. 1

Applying the reciprocal theorem, I reasoned that the same fix that keeps RFI *out* of the lamps, might also stop the lamps from *radiating* RFI. Accordingly, a 4.7-mH, 100-mA RF choke in series with a 1.8-kΩ resistor was inserted in the signal lead of circuit board no. 1. Most of the RFI was suppressed. Apparently, most of the RF was being radiated by the lamp frame in this case.

Board No. 2

The same fix was applied to board no. 2. Some RFI suppression resulted, but not nearly enough. I then discovered that the RF was also being reradiated by the ac power cord. Several remedies were tried. First, I bypassed the three power leads (hot, hot-switched and neutral) to each other with 0.005 μF capacitors. (Note: These lamps all have two-wire ac power cords; no third-wire ground is used. Also, the leads to which I'm referring are the leads *from the board.*) Next, I placed chokes wound on small ferrite toroids in each of the three power leads. Both of these remedies were applied inside the lamp base, but neither one alone, or both, would eliminate all the interference. Additionally, the lamp power cord was plugged into a Radio Shack power-line filter, but the RFI on 21 MHz persisted.

The cure for the power-line radiation for board no. 2 consisted of winding seven turns of the power cord around an Amidon FT-240-43 toroid (2½ in. OD, 1½ in. ID). This toroid is large enough to pass the power-cord plug and make the winding, but the core is too large to fit into the lamp base. (There may be other ferrite materials better suited for this particular use, but the type 43 material was readily available.)

The ultimate fix proved to be the combination of a 1.8-kΩ resistor in series with a 4.7-mH, 100-mA RF choke inserted in the lamp's signal lead, and the use of the 2½-in. toroid. The other components (bypass capacitors and small ferrite toroids) were removed.

While experimenting with board no. 2, I found that the resistor inserted in series with the lamp's signal lead could be raised to 5.5 kΩ without affecting the operation of the lamp. Raising this resistor to 8 kΩ caused loss of touch operation (no intermediate resistance values were tried). In this particular case a value of 1.8 kΩ was used because it was sufficient. With tougher RFI cases, raising the resistance to the highest value possible, consistent with proper touch operation, would provide greater attenuation. Because a negligible amount of power is dissipated in the resistor, a ½-W unit should be more than adequate.

Board No. 3

This board required a 3.3-kΩ resistor in series with a 9.4-mH RF choke in series with the lamp's signal lead. This change eliminated the RFI on all HF bands except for 21 MHz. Plugging the lamp's power cord into a Radio Shack power-line filter removed the 21-MHz RFI.

A word of caution: If you are thinking of acquiring a touch-and-glow lamp, be advised that even after modification, the interference may still persist within distances of 50 ft or less.

I referred my problems and findings to the FCC and ARRL HQ. The only action the local district of the FCC took was to refer the complaint to the Director of Consumer Affairs of the Electronic Industries Association. The ARRL is willing to assist amateurs who may have a particularly bad local situation, through contact with the FCC in Washington. I hope these actions will result in the removal of this plague from the ham bands.

George Wright, W2GW, helped me identify and locate the source of the RFI problems.—*Rip Merrell, W4FX, Rte 13, Box 190, Anderson, SC 29624*

[1] J. Adams, "RFI and Touch-Controlled Lamps," Hints and Kinks, May 1985 *QST*, p 45.
[2] C. Hall, "More On RFI to Touch-Controlled Lamps," Hints and Kinks, Jan 1986 *QST*, p 49.
[3] C. Enix, "Touch-Lamp Transceiver," Technical Correspondence, Feb 1987 *QST*, p 43.

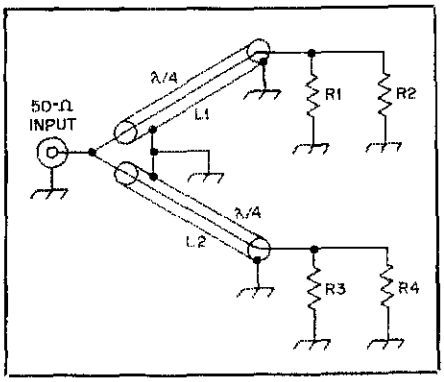


Fig 1—This 1500-W dummy load uses four 50-ohm, noninductive terminations coupled to the power source through quarter-wavelength cables. The length of the cables used between the individual loads and matching sections should be as short as possible.

A LOW-COST, 1500-W DUMMY LOAD

☐ Although commercially manufactured, high-power, 50-ohm dummy loads are available, most are too expensive for amateurs to afford. The popular Heathkit HN-31/HN-31A will often be damaged by power levels barely approaching 1500 watts. One way around these hurdles is shown in Fig 1.

As shown in the diagram, four dummy loads, such as those made by Heath, and two quarter-wave coaxial matching sections are combined to provide an inexpensive, high-power dummy load. The only caveat is that the combination is frequency sensitive, so the quarter-wave cables have to be changed when you change bands. Old coax can be used to lower the overall project cost; the cable losses will make the job easier for the dummy loads. Because of the high voltage levels involved, the coax should be RG-213 or better.

It's important to use *electrical* rather than *physical* quarter wavelengths of cable. The lengths of coax between the individual dummy loads—R1/R2 and R3/R4 and the matching sections—should be as short as possible. If everything is working correctly, the individual loads will be equal in temperature, and the SWR will be very close to 1:1. This project has not actually been tested in the lab, but the theory behind it is quite sound.—*Zack Lau, KH6CP, ARRL Lab Engineer*

RTTY SOFTWARE COMMENTS

☐ I'd like to share some observations concerning incorrect operation of RTTY software and discuss some basic operating concepts of the mode.

There are some software packages that cause the equipment to revert to a spacing condition when you stop typing. (Most signals I hear on the air don't exhibit this anomaly.) In two programs I own, the software resets the output port to a spacing condition after a typing delay of about three seconds. This procedure is not correct. I don't know if this is an oversight on the part of the program author, or if it's a misconception as to how an RTTY program is supposed to work. This type of operation can be very annoying when you have to set your output frequency for net operation. I am sure that some programs can be patched to eliminate such action, but others probably cannot.

The other fault concerns the concept of the so-called "diddle" character that is sent during idle periods. I've noticed that some programs use the BLANK instead of the LETTERS character. The difference between the BLANK and LETTERS is that the BLANK is made up of a start bit and five zero or "spacing" bits, terminated by the stop bits. The LETTERS character is composed of a start bit and five one or "marking" bits, terminated by the stop bits. Therefore, the BLANK is a "noncharacter" consisting of only the five zero bits.

A brief look at the history of radioteletype shows that the LETTERS character was originally used (aside from shifting to lowercase) to keep the main shafts of the mechanical printers rotating and in sync with the sender. This held to a minimum the chance of the receiving station missing or garbling the first character sent. These machines were notoriously undermaintained, and some method of assuring good copy was needed. Hence, the diddle. A secondary benefit of the diddle was to keep the circuit active so that a listener would know that the transmitter was not stuck in a mark condition because of some trouble.

Incidentally, the BLANK character did (does?) have its use. On mechanical printers used in the weather service, the first BLANK received suppressed spacing and allowed a plus sign to be overprinted on a previously sent O to create the "complete overcast" symbol. Any subsequent blanks received caused the printer to lock out and cease printing the plus sign. (I believe there are some of these machines still in service.) So, the BLANK is a BLANK—a nothing.

Computer-oriented people like to call the SPACE a BLANK, so keep this terminology difference in mind when thinking and discussing RTTY. The Baudot BLANK is comparable to the ASCII NULL, whereas the Baudot LETTERS is comparable to the ASCII RUBOUT. The SPACE has its own unique bit pattern in each code.

If you are going to write a RTTY program, don't reset the output port to a spacing condition. And, if you're going to include a diddle feature, make it use the LETTERS character.—*Paul Eriksen, W3TZI, 12 Stalwart Dr, Newark, DE 19713*

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.

New Books

RADIO'S FIRST TWO DECADES

Published by Cologne Press, PO Box 682, Cologne, NJ 08215. 1987 edition. Softcover, 8½ × 5½ inches, 63 pages, $3.50 plus $1 shipping.

Most amateurs I know are interested in the early days of radio. I share their fascination about the days before my time as a ham. You should find *Radio's First Two Decades* enjoyable, whether your interest is academic or nostalgic. The book consists of excerpts from an original Thomas Y. Crowell Company publication called *Radio from Start to Finish*. Permission to print these excerpts was granted by Harper & Row Publishers, Inc.

This book contains six chapters. They are, in order: Radio's Beginning; Marconi Spans the Ocean; The Human Voice Takes Wings; Broadcasting Begins; and Broadcasting Grows. The nonfiction accounts in this book, discussing the activities of such pioneers as Armstrong, DeForest, Edison, Fessenden, Fleming, Hertz, Marconi and Maxwell, are spellbinding. The accounts of the early work of these men were first published in *Radio from Start to Finish* in 1942, but this material is of timeless value. This book should be of special interest to newcomers to amateur and professional radio and it offers a capsule-form refresher for old-timers.

You will learn how some amateur stations became present-day broadcast stations, such as KDKA (Pittsburgh) and WWJ (Detroit). I found the section on the change from spark transmissions to voice and music broadcasting especially engrossing. The public regarded the sound of voices and music in earphones as "uncanny." This form of intelligence coming from an invisible medium was regarded as a miracle! How ironic this seems to us now—we take radio transmissions so much for granted today! I felt the impact of our ignorance about radio-wave propagation when I read the section about Marconi's breakthrough in 1897 when he installed a shore wireless station at Spezia, Italy, and communicated successfully with a warship that was *12 miles out at sea!* The chapter continues with a description of Marconi's first transatlantic communication by wireless. This occurred at 12:30 PM on December 12, 1901. The signals were sent from England and heard at St Johns, Newfoundland—a distance of 1700 miles. The signals were merely clicks in the headphones, but were nonetheless identified as genuine.

I could continue at length with short excerpts from the chapters of this book. But that would deprive you of the joys you will experience in reading this volume. In summary, the book is well worth its modest price. Certainly, any well-rounded amateur will find this book a valuable addition to his or her library.—*Doug DeMaw, W1FB*

Radiosport in the USSR

(N1DNB photo)

Amateur Radio has a long history in the Soviet Union. An official of ARRL's sister society describes some of the activities and achievements of Soviet amateurs.

By V. Efremov, UA3-170-9
Secretary, Radio Sport Federation, USSR

The history of Amateur Radio in the Soviet Union starts with the Society of Radio Friends, founded in 1924. Nowadays, thousands of radio amateurs and radiosport enthusiasts are involved in Amateur Radio activities in technical sports clubs, technical sports schools for children and juniors, general educational schools, extra-curricular institutions, young technicians' stations, and amateur technical circles and sections during their free time.

They learn the Morse code and the know-how of high-speed receiving and sending of radio messages; operate club and individual Amateur Radio stations, ARDF (Amateur Radio direction finding) and all-around combined radio contests; and design Amateur Radio equipment. Radiosport enthusiasts are given sporting ratings and titles, depending on the level of their mastery and according to the All-Union Sporting Classification.

Radio amateurs study radio engineering free of charge (expenses are covered by the Government and organizations cultivating radiosport). All the facilities necessary to take part in radiosport, including Amateur Radio equipment for training and contests, are provided gratis to radiosport enthusiasts.

HF Activities

Amateur Radio started from HF and later from UHF activities. Shortwave radio operators came to be more active in the postwar period. In 1946, the 1st National HF Contest was held. Now they are held on an annual basis. Soviet radiosport enthusiasts are regular entrants in international HF contests.

Club radio stations are popular radio educational centers, drawing youth to Amateur Radio activities. Among shortwave radio operators there are many capable sportsmen, such as G. Rumiantzev, international master of sports, many times National champion and winner of many international events. He has also won (more than once) ARDF and all-around combined radio contests.

The list of top HF and UHF operators also includes well-known hams UQ2GD, UP2NV, RB5AA, UF6CR, UL7QW, RC2AA, UA1MC and UT5DL, who have contributed greatly to the development of Amateur Radio and radiosport in this country.

Radiotelegraphy Activities

Radiotelegraphy, considered most available to the public, is widely developed. Thousands of contests from those in amateur technical circles and sections to National Championships are held in this discipline.

Top scorers, prize winners of national contests, receive radio messages at a speed of 54-60 WPM, and transmit by electronic keying at more than 40 WPM.

In December 1983, the 1st European Radiotelegraphy Championship was held in Moscow. Mr E. Godsmark,G5CO, of Great Britain, served as President of the International Jury of the Championship, and later it was recognized at the IARU Region 1 Conference held in Italy (Cefalu) in 1984. Soviet radio amateur S. Zelenov is the first European champion in this discipline.

Combined Radio Contests

All-around combined radio contest activities started developing in this country in 1960. In 1961, the 1st National all-around combined radio championships were held in Moscow (in the Ismailovo Recreation Park).

This discipline includes finding one's bearings on the ground according to the prescribed course, operating radio stations of limited power in the radio net in field conditions, and receiving and transmitting radio messages at a predetermined speed. A competitive spirit and good physical training are the qualities demanded from those involved in it. These qualities are characteristic for such top scorers as I. Andrienko, Yu. Starostin, V. Vakar, A. Tint, V. Morozov, V. Ivanov, L. Poleschuk (Serbina), T. Romasenko and N. Asaulenko (Zalesova)—the winners and runners-up of National championships and international contests.

ARDF Activities

Amateur Radio Direction Finding activities also came to be very popular in this country. The know-how of designing and improving Amateur Radio equipment, good physical training (necessary for cross-country races), good knowledge of topography, and skills in finding one's bearings

The USSR Amateur Radio Direction Finding team, champions of the ARDF World Championship 1984, held in Oslo, Norway.

S. Zelenov, several times national champion and winner of the international high-speed radiotelegraphy contest, receiving and transmitting messages.

on the ground and "foxes" (transmitters) are the qualities necessary to succeed in this field.

The 1st ARDF National Championship was held in the Crimea in 1957. Three years later, our "hunters" participated for the first time in the international contest held in Leipzig. The debut was a success: A. Akimov and V. Frolov were the winners.

Thousands of our radiosport enthusiasts are involved annually in home ARDF contests. The best "hunters" then qualify for National championships and enter international contests.

The list of wins gained by Soviet radio amateurs in international events is impressive. Since the 1st European ARDF Championship, Soviet radio amateurs A. Grechikhin, V. Kuzmin, V. Verkhoturov, I. Vodiakha, A. Koshkin, V. Chistiakov, Ch. Guliev and G. Petrochkova have won the title of European Champion in team and individual classifications, and were the winners of large-scale international contests.

S. Siniashina (USSR) was the first European champion among women (Yugoslavia, 1977). In 1980 (the 1st ARDF World Championship, Poland) and in 1984 (the 2nd ARDF World Championship, Norway), these Soviet radio amateurs won the title of World Champion in team and individual classifications: V. Chistiakov and G. Petrochkova (1980); V. Chistiakov, A. Petrov and N. Chernycheva (1984). A primary objective of Amateur Radio in our country is to draw wide public attention, particularly from young people, to radio engineering and radio electronics. All-Union Exhibitions of Radio Amateurs' technical art are organized every two years.

Soviet Amateur Radio stations are active on all HF and UHF bands, and amateur satellite communication is becoming more popular. On October 26, 1978 two Amateur Radio satellites were orbited—"Radio-1" and "Radio-2." A new series of Amateur Radio satellites of "Radio" type (six in number) was launched on December 17, 1981. With them, it was easier to establish DX contacts with radio amateurs throughout the world using low-power stations. On June 23, 1987, RS-10 and RS-11 were successfully launched, offering five modes to further extend satellite DX capabilities, as well as offering a Robot QSO mode.

With a view to supervise and render aid in developing radiosport and Amateur Radio activities, the Radio Sport Federation of the USSR was founded in December 1959. This has resulted in improving the activities of public-spirited persons, popularizing Amateur Radio and involving thousands of radio amateurs in radiosport. Along with the Radio Sport Federation of the USSR there were founded republic-level and regional federations aimed at assisting

G. Petrochkova (left foreground), several times national champion and world champion in 1980, and I. Kekin, several times prize winner of national championships and winner of the international contest in 1985.

local radio clubs in developing radiosport, organizing contests, and training coaches, instructors and judges in radiosport.

The first president of the RSF was Ernst Teodorovich Krenkel, famous Polar explorer, Hero of the Soviet Union and doctor of geographic sciences. His call sign, RAEM, is known to many radio amateurs all over the world.

Since 1962, the Radio Sport Federation of the USSR has been a member of the International Amateur Radio Union (IARU). At present, the RSF includes thousands of radio amateurs and radiosport enthusiasts as its members. [According to the latest IARU figures, the RSF has 140,000 members.—Ed.]

The methodological center of radiosport activities, the Central Radio Club of the USSR, was founded in May 1946. Since February 2, 1972, it has been named after E. T. Krenkel. The E. T. Krenkel Central Radio Club of the USSR renders a great deal of help to local clubs in arranging zone, republic and national contests. It corresponds with foreign radio clubs on questions pertaining to the exchange of diplomas (awards) and QSL cards.

For more than 60 years (the 60th anniversary was marked in 1984), Amateur Radio has grown widely and developed in this country. It includes thousands of amateurs in the fields of radio engineering and radio electronics, greatly contributing to the promotion of radiosport and technical progress.

New Products

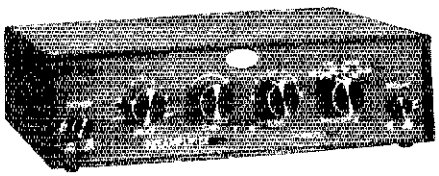
NOVICE WELCOME PACKAGE

☐ Gordon West's Radio School, in conjunction with 30 Amateur Radio equipment manufacturers and accessory suppliers, has introduced a Ham Radio Novice Welcome package, consisting of WB6NOA's 21-day Novice course, literature sheets, rebate coupons and in-store equipment discounts. The package also includes free-issue coupons for several ham magazines, as well as discount subscription offers. Full-line catalogs from several manufacturers, as well as sheets containing useful tips on assembling a Novice station, are also included.

The 21-day Novice course consists of two Morse code cassettes, as well as a 112-page book, an FCC 610 form, a laminated world map, a frequency reference chart and a sample Novice exam. Price: $19.95, plus $2.50 for postage and handling. Available from Gordon West's Radio School, 2414 College Dr, Costa Mesa, CA 92626, tel 714-549-5000.—*Rus Healy, NJ2L*

AMECO PT-3 PREAMPLIFIER

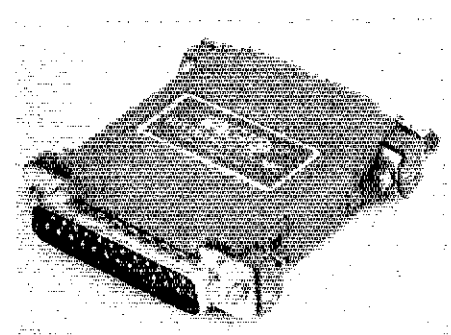
☐ The model PT-3 preamplifier sports continuous coverage from 1.8 to 54 MHz and uses a dual-gate FET to produce signal gains of up to 26 dB. The PT-3 is designed for use with transceivers or receivers and can be easily modified for use with a separate receiver and a receive-only



antenna. The PT-3 is bypassed in transmit mode by a built-in RF sensing circuit and has front-panel adjustable delay for returning to receive mode. RF input and output impedances are 50 ohms. Manufacturer: Ameco Equipment Co, 220 E Jericho Tpke, Mineola, NY 11501, tel 516-741-5030. Price class: (PT-3) $109.95; matching dc adapter (P-12T), $8.95.—*Rus Healy, NJ2L*

KALGLO RS-232 DATA-LINE SURGE SUPPRESSOR

☐ Kalglo Electronic Co, Inc, has introduced a surge suppressor for use on equipment with RS-232 input and output lines, such as printers, plotters and CPUs. The suppressor provides bidirectional surge and spike protection on 11 of the most-used lines in an RS-232 system: lines 1 through 8, 11, 20 and 22. Response time is less than 1 ns; suppressor capacity is 115 joules. Connectors are 25-pin D-types. Price class: $39.95. Manufacturer: Kalglo Electronic Co, Inc, 6584 Ruch Rd, E Allen Twp, PA 18017-9359, tel 215-837-0700.—*Rus Healy, NJ2L*



CODEMASTER MORSE CODE PROGRAM

☐ Greenlight Software Development, Inc, has released Codemaster, a Morse Code training package for the IBM® PC and compatible computers. The program is menu driven and includes context-sensitive on-line help information. Code speed, weight and pitch are keyboard adjustable in each of the available modes of operation, which include drills, keyer and a trainer. The drill mode has several options, including letter groups, random five-character groups, call signs, Q signals and others. Code can also be sent from the keyboard (using the SHIFT or ALT keys), or from four user-definable disk buffers. The user can also edit these buffers from within the program.

In the drill mode, the program sends CW and the user types the characters as they are transmitted. The characters you type are displayed on the monitor, and the ESC key can be pressed at any time to check the copy against what the computer has sent. Other features of the package include display color selection, descriptive error messages and a detailed documentation file. Price is $19.95 (postpaid) from the manufacturer, Greenlight Software Development, Inc, PO Box 2591, Eugene, OR 97402, tel 503-484-7294.—*Rus Healy, NJ2L*

Strays

I would like to get in touch with...

☐ anyone using ST-6 TU and UART dual clock who has experienced deterioration of loop supply square wave shape after adding second Model 28 Teletype to the loop. Is there a simple solution without adding on a selector magnet driver? Russ Smith, W6ONK/7, Box 141, Brownsville, OR 97327.

The 1988 Annual Meeting of the ARRL Board of Directors

By Michael R. Riley, KX1B
Assistant to the Executive
Vice President

On January 22-23, 1988, your elected representatives met a few miles from W1AW and discussed, then decided, the course of the League for the remainder of the year, and beyond.

Items on the agenda included the election of Officers, consideration of revised DXCC rules, renovation plans for W1AW, the League's response to proposed amendments to Part 15 and a game plan for counteracting adverse publicity regarding biological effects of radio frequency exposure. More than 100 items were discussed during those two days; each one affecting Amateur Radio, including you, to some degree. (Refer to Table I for a summary of actions taken.)

Election of Officers

The Board of Directors unanimously reelected Larry Price, W4RA, as President of the ARRL. Jay Holladay, W6EJJ, continues as First Vice President. George S. Wilson, III, W4OYI, past-Director of the Great Lakes Division advanced to Second Vice President, and past-Director of the Delta Division Clyde Hurlbert, W5CH, is now Third Vice President of the League. Tod Olson, KØTO, was reelected as International Affairs Vice President. David Sumner, K1ZZ, continues as Executive Vice President; Perry Williams, W1UED, returns as Secretary and James E. McCobb, K1LLU rounds out the list by being reelected as Treasurer of the ARRL. (Minutes 6-13)

DXCC Revisions

Of high interest to those chasing countries, the Board adopted the recommendations of the DX Advisory Committee to continue the present DXCC program while adding endorsable single-band DXCC awards for 80, 40, and 10 meters. Two-way contacts, subject to established guidelines, from November 15, 1945 are applicable toward these new awards. Also, the Five Band DXCC Award will be endorsable for additional bands, not including 10, 18 or 24 MHz at this time.

It must be stressed that applications toward these new categories of DXCC *cannot* be accepted at this time. So don't run to your post office just yet. The full details for submitting applications will appear next month in *QST*. (Minute 53)

W1AW: Getting Older *and* Better

A fund-raising program for the renovation of W1AW was approved by the Board and will be highlighted in the April issue of *QST*. Although the vast majority of visitors to W1AW have been impressed with the station, and, if licensed, are given the opportunity to operate as guests, the League wishes W1AW to be the premier Amateur Radio station in the United States, worthy of pride by all. By soliciting donations, and with your help, the League can achieve this goal without raising membership dues. (Minute 61)

Welcome Puerto Rico and Virgin Islands Sections!

Recognizing the wishes of League members in the West Indies Section, the Board approved division of the section into two separate entities: The Puerto Rico and Virgin Islands Sections. Headquarters will move quickly to get these two new sections into full Field Organization status. (Minute 39)

W6EJJ, W4RA and K1ZZ listening to the proceedings.

Part 15: A Problem For Us All

The Board, your elected representatives, unanimously agreed that the League will file comments in the FCC proceeding to amend Part 15 of the FCC Rules, Docket 87-389, strongly opposing the introduction of intentional radiating devices into the amateur bands, opposing the relaxation of existing restrictions on unintended radiation from electronic devices (especially in the amateur bands), and supporting a requirement for greater education of end-users of such equipment as to the problem of radio frequency interference.

This is a serious issue which could affect every amateur, member or not, in the United States for years to come. Granted, this FCC proposal may seem insignificant on the surface, but, if it's approved, you may have to contend with an S6 signal from your neighbor's garage door opener or personal computer while chasing DX on 20 meters, checking into a net on 80 meters, or talking with your friends on your local repeater. By the time you read this, the ARRL will have taken determined and timely action on this proposed FCC amendment in behalf of all US amateurs. (Additional information on this issue can be found in this month's Happenings column.) (Minute 45)

Researching the Possible Biological Effects of RF Energy

Have you heard about the recently published medical news linking Amateur Radio with cancer? The ARRL is looking for independent scientific research sources to investigate questions raised, identify possible sources of funding, and report back to the Board of Directors in a timely fashion.

Fund for the Defense of Amateur Radio Frequencies

The Board of Directors realizes that even though you may have a transceiver that transmits on amateur frequencies, your operation on those frequencies is a privilege, not a right. Understanding that other groups, both national and inter-

Table 1
Summary of Board Actions

Minute	Purpose	Disposition
ARRL Organizational (Regarding Articles of Association and By-Laws)		
41	Amend By-Law 36 (Standing Committees)	Adopted
59	Amend By-Law 9 (Life Membership)	Adopted
Other ARRL Organizational Matters		
35	"ARRL Herb S. Brier" and Professional Teacher awards	Adopted
36	Membership Contact Travel SOP	Adopted
37	*ARRL Emergency Communications certification/training*	*To Committee*
38	New Section-Level ARRL/VEC appointment	To Committee
39	Formation of Puerto Rico and Virgin Islands Sections	Adopted
40	Fund for the Defense of Amateur Radio Frequencies	Adopted
45	ARRL to comment on Docket 87-389 (Rewrite of Part 15)	Adopted
50	Amending charge to ARRL Elections Committee	Adopted
55	Public Relations Advisory Committee Resolution	Adopted
57	Ad Hoc Committee on Amateur Radio and the Media expenses	Adopted
58	Additional expenses for 1987	Adopted
60	ARRL Foundation administrative expenses	Adopted
65	Public service award for digipeaters/bulletin boards	To Committee
69	Section and NTS Official Budget Guidelines	Adopted
70	Directors acquiring distinctive League jackets	Lost
74	SOP for ARRL Section Formation	To Committee
77	Providing evaluation service of Silent Key equipment	To Committee
82	*NTS Officials in US required to be ARRL members*	*Adopted*
85	Evaluation of RMS program	To Committee
86	Proposed Western Washington/Inland Empire Sections	Postponed
90	Southwestern Division Convention in San Diego in 1990	Adopted
94	Amend the Advisory Committee SOP	Adopted
95	ARRL Division Director budgets for 1988	Adopted
96	Budgets for committees, task groups and task forces	Adopted
97	QSL Bureau manager reimbursement for 1988	Adopted
98	NTS Officials budget for 1988	Adopted
101	Changing dates of 1988 Second Meeting	Lost
Amateur Radio Operations		
30	EVP to seek input on proposed 2.3-GHz band plan	Adopted
31	Packet RF recommendations for 70-cm and 23-cm band	Adopted
32	EVP to implement ARRL Diamond Jubilee Award Program	Adopted
53	DXCC Resolution by DXAC as amended	Adopted
75	*Repeater trustees advised to connect to 911 service*	*To Committee*
79	Automated VHF/UHF beacon band segment band plan	To Committee
81	Petition the FCC to allow SSB between 7075-7100	Lost
87	Coordination of digipeaters	To Committee
89	Biological Effects of RF Energy resolution	Adopted
91	Resolution asking FCC assistance in repeater coordination conflicts and disputes	Adopted
92	Repeater coordinator guidelines by LSC	Postponed
Publications/Media		
33	Personal QSL cards/League Diamond logo labels	Adopted
68	Development of "plain language" RFI pamphlet	Adopted
76	Emergency/public service video joint projects	Adopted
80	Adequate ARRL Foundation publicity in *QST*	Adopted
83	Shorten lead time in *QST* for Ham-ads/Section News	To Committee
84	Novice exam rules education/improving availability	To Committee
93	Recognition for "The New World of Amateur Radio" staff	Adopted
Miscellaneous		
16	Election of W4ACY as Honorary Vice President	Adopted
34	Resolution to expand Amateur Radio activities in NASA Manned Space Program	Adopted
67	WA1VMC Resolution	Adopted
88	Expedite report on Amateur Radio archive	Adopted
99	Resolution to staff	Adopted

AGØX, W4RH, WA6WZO, WB5JBP and N3AKD listening to a motion being presented.

WA2DHF making a point with W8RC.

W9PRN presents while WB5IGF and W8RC scan the written report.

national in scope, are interested in the frequencies presently allocated to the Amateur Radio Service, and understanding that if the FCC giveth, the FCC can taketh away, the Board decided to allocate $105,000 to defend the US Amateur Radio Service spectrum from outside interests, including the possible reallocation of amateur frequencies that may be attempted during the anticipated World Administrative Radio Conference which may occur in 1992. (Minute 40)

Summary

The Board Meeting was resplendent with dedicated and knowledgeable League volunteers willing to converse, compromise if necessary, then commit themselves toward the good of Amateur Radio as a whole.

As an ARRL member, your elected representatives are directly accountable to you. The following record of the 1988 Annual Meeting of the ARRL Board of Directors is a reflection of their responsiveness to you and your wishes.

Moved and Seconded . . .

MINUTES OF THE 1988 ANNUAL MEETING OF THE BOARD OF DIRECTORS THE AMERICAN RADIO RELAY LEAGUE, INC.

January 22-23, 1988

Summary Agenda

1. Roll Call
2. Moment of Silence
3. Consideration of the agenda for the meeting
4. Approval of Minutes of the 1987 Second Meeting
5. Election of Officers
6. Election of Executive Committee
7. Election of ARRL Foundation Directors
8. Consideration of nominations for Honorary Vice President
9. Reports by the Officers
10. Receive reports and consider recommendations of the Committees
11. Appointment of Committees
12. Directors' motions
13. Authorization of certain expenses for 1988

1) Pursuant to due notice, the Board of Directors of the American Radio Relay League, Inc. met in annual session at the Hartford Marriott Hotel in Farmington, Connecticut, on Friday January 22, 1988. The meeting was called to order at 8:35 AM EST with President Larry E. Price, W4RA, in the Chair and the following Directors present: Frank M. Butler, Jr., W4RH, Southeastern Division; Rush S. Drake, W7RM, Northwestern Division; Thomas W. Frenaye, K1KI, New England Division; Paul Grauer, WØFIR, Midwest Division; Joel M. Harrison, Sr., WB5IGF, Delta Division; Jim Haynie, WB5JBP, West Gulf Division; Fried Heyn, WA6WZO, Southwestern Division; Howard Mark, WØZC, Dakota Division; Stephen A. Mendelsohn, WA2DHF, Hudson Division; Edmond A. Metzger, W9PRN, Central Divison; Gay E. Milius, Jr., W4UG, Roanoke Divison; Leonard M. Nathanson, W8RC, Great Lakes Division, and Vice President; Marshall Quiat, AGØX, Rocky Mountain Division; Rodney J. Stafford, KB6ZV, Pacific Division; Hugh A. Turnbull, W3ABC, Atlantic Division. Also present as members of the Board without vote were: Jay A. Holladay, W6EJJ, First Vice President; William J. Stevens, W6ZM, Vice President; Tod Olson, KØTO, International Affairs Vice President; David Sumner, K1ZZ, Executive Vice President; and James E. McCobb, Jr., K1LLU, Treasurer. Also in attendance at the invitation of the Board as observers were the following Vice Directors: Joseph A. Butler, K5OS, Delta Division; Thomas W. Comstock, N5TC, West Gulf Division; Evelyn D. Gauzens, W4WYR, Southeastern Division; Howard S. Huntington, K9KM, Central Division; John C. Kanode, N4MM, Roanoke Division; James Knochenhauer, K6ITL, Pacific Division; Bruce Meyer, WØHZR, Dakota Division; L.C. "Chuck" Miller, WAØKUH, Midwest Division; James M. Mozley, W2BCH, Atlantic Division; Wayne Overbeck, N6NB, Southwestern Division; Allan L. Severson, AB8P, Great Lakes Division; William R. Shrader, W7QMU, Northwestern Division; Paul Vydareny, WB2VUK, Hudson Division; and Robert Weinstock, KN1K, New England Division. There were also present Thomas B.J. Atkins, VE3CDM, President, the Canadian Radio Relay League, Inc.; Harry J. Dannals, W2HD, ARRL President Emeritus; Honorary Vice President Jean A. Gmelin, W6ZRJ; Past Directors Lys Carey, KØPGM and George S. Wilson, III, W4OYI; Secretary Perry Williams, W1UED; Counsel Christopher D. Imlay, N3AKD; Larry Shima, WØPAN, Controller; Paul Rinaldo, W4RI, Publications Manager; John F. Lindholm, W1XX, Membership Communications Services Manager; Stephen C. Place, WB1EYI, Volunteer Resources Manager; and Michael Riley, KX1B and Robert Schetgen, KU7G, Assistants to the Executive Vice President.

2) The assembly observed a moment of silence in recollection of those who have passed away since the previous meeting of the Board, especially Richard Ridenour, KBØZL and Ed Hart, N4KB.

3) The Chair introduced new Director Joel M. Harrison, Sr., WB5IGF, Delta Division. Mr. Harrison introduced his new Vice Director, Joseph A. Butler, K5OS. Director Mark introduced his new Vice Director, Bruce Meyer, WØHZR of the Dakota Division. Midwest Division Director Grauer introduced the new Vice Director of that division, L.C. "Chuck" Miller, WAØKUH.

4) On motion of Mr. Milius, seconded by Mr. Mendelsohn, the agenda was ADOPTED as presented.

5) On motion of Mr. Mendelsohn, seconded by Mr. Milius, the Minutes of the 1987 Second Meeting are APPROVED in the form in which they appeared in the September 1987 issue of *QST*.

6) Moving next to agenda item 5, election of Officers, the Chair declared that nominations were open for the Office of President. Mr. Butler nominated Mr. Price. On motion of Mr. Milius, seconded by Mr. Butler, it was unanimously VOTED that nominations are closed and Mr. Price is elected as President (applause).

7) Nominations were declared open for the Office of First Vice President. Mr. Quiat nominated Mr. Holladay. Mr. Metzger nominated Mr. Wilson. On motion of Mr. Stevens, seconded by Mr. Butler, it was VOTED that nominations are closed. The Chair appointed Mr. Gmelin as Chief Teller and Mr. Comstock as Teller. The Tellers found 8 votes for Mr. Holladay, 5 votes for Mr. Wilson and 2 blank ballots. Whereupon the Chair declared Mr. Holladay elected as First Vice President (applause).

8) The Chair announced the opening of nominations for an additional Vice President. Mr. Quiat nominated Mr. Wilson. Mr. Harrison nominated Clyde O. Hurlbert, W5CH. On motion of Mr. Mark, seconded by Mr. Milius, it was VOTED that nominations are closed. The tellers found 8 ballots for Mr. Wilson, 5 ballots for Mr. Hurlbert and 2 blank ballots. Whereupon, the Chair declared Mr. Wilson elected as a Vice President (applause).

9) Nominations were declared open for an additional Vice President. Mr. Grauer nominated Mr. Carey. Mr. Stafford nominated Mr. Stevens. Mr. Mark nominated Mr. Hurlbert. On motion of Mr. Quiat, seconded by Mr. Milius, it was VOTED that nominations are closed. The Tellers found 8 votes for Mr. Hurlbert, 3 votes for Mr. Carey, 3 votes for Mr. Stevens and one blank ballot. Whereupon, the Chair declared Mr. Hurlbert elected as a Vice President (applause).

10) The Chair announced that nominations were open for the office of International Affairs Vice President. Mr. Metzger nominated Mr. Olson. On motion of Mr. Haynie, seconded by Mr. Milius, it was VOTED that nominations are closed and Mr. Olson is elected as International Affairs Vice President (applause).

11) The Chair announced the opening of nominations for Executive Vice President. Mr. Mendelsohn nominated Mr. Sumner. On motion of Mr. Milius, seconded by Mr. Butler, it was unanimously VOTED that nominations are closed and that Mr. Sumner is elected as Executive Vice President (applause).

12) The Chair announced the opening of nominations for Secretary. Mr. Metzger nominated Mr. Williams. On motion of Mr. Turnbull, seconded by Mr. Milius, it was VOTED that nominations are closed and that Mr. Williams is elected as Secretary (applause).

13) Nominations were declared open for Treasurer. Mr. Grauer nominated Mike Bowen, W4CYJ. Mr. Mendelsohn nominated Mr. McCobb. On motion of Mr. Mark, seconded by Mr. Nathanson, it was VOTED that nominations are closed. The Tellers found 11 votes for Mr. McCobb, 4 votes for Mr. Bowen. Whereupon, the Chair declared Mr. McCobb elected as Treasurer (applause).

14) The Chair announced the opening of nominations for four Directors to serve on the Executive Committee for one year. Mr. Milius nominated Mr. Stafford. Mr. Mark nominated Mr. Nathanson. Mr. Grauer nominated Mr. Turnbull. Mr. Metzger nominated Mr. Grauer. Mr. Harrison nominated Mr. Haynie. Mr. Nathanson nominated Mr. Mendelsohn. Mr. Heyn nominated Mr. Frenaye. Mr. Turnbull nominated Mr. Butler. On motion of Mr. Milius, seconded by Mr. Mark, it was VOTED that nominations are closed. With eight votes being required for election, the tellers declared Mr. Grauer and Mr. Stafford elected on the first ballot. Mr. Nathanson was declared elected on the second ballot. Mr. Frenaye was declared elected on the third ballot. Accordingly, the Chair announced that Messrs. Grauer, Stafford, Nathanson and Frenaye would be Director members of the Executive Committee for one year (applause).

15) The Chair announced the opening of nominations for three Directors of the ARRL Foundation. Mr. Sumner, as Chairman, presented the report of the Official Availability Committee. On motion of Mr. Grauer, seconded by Mr. Mark, the four persons named in the report were nominated: Messrs. Frenaye, Butler, Nathanson and Shima. The Tellers found 13 votes for Mr. Shima, 11 votes for Mr. Frenaye, 10 votes for Mr. Nathanson, and 7 votes for Mr. Butler. The Chair declared that Mr. Shima, Mr. Frenaye and Mr. Nathanson were elected as Directors of the ARRL Foundation (applause).

16) The Chair announced consideration of the election of an Honorary Vice President. Mr. Milius placed in nomination the name of Lacy Phil Wicker, W4ACY. On motion of Mr. Nathanson, seconded by Mr. Mendelsohn, it was unanimously VOTED that Mr. Wicker is elected an Honorary Vice President (applause).

17) The Board was in recess from 9:41 AM to 10:15 AM.

18) Mr. Price presented his report as President. An important part of the League's work for the year was the effort to preserve the 220-222 MHz band in the face of FCC General Docket 87-14: this effort was described in detail. Other topics included the independence of the Canadian Radio Relay League, visit of the Chinese Radio Sports Association (CRSA) Officers and the IARU Region 2 Conference scheduled for Orlando in October, 1989.

19) The report of the First Vice President, Mr. Holladay, also featured the CRSA visits, his hosting a delegation from Japan and greeting Their Majesties King Juan Carlos, EAØJC, and Queen Sophia of Spain during their visit to California.

20) Vice President Nathanson touched on the Novice Enhancement Program, municipal zoning problems, and the omnipresent problem of deed covenants, conditions and restrictions (CCRs) in his report.

21) Vice President Stevens covered his activities as a member of the Volunteer Resources Committee, the desirability of an organized effort to recruit the senior members of our society into Amateur Radio, and the urgency of long-range planning to prepare for the possibility of a World Administrative Radio Conference in 1992, or thereabouts.

22) International Vice President Olson, after reporting on International Amateur Radio Union meetings and two specialized WARCs, focused on the fund for the defense of Amateur frequencies which had been recommended by the Administration and Finance Committee, and endorsed by the Executive Committee for ratification at the present meeting.

23) The Executive Vice President, Mr. Sumner, presented an extensive report on the affairs of the League. Membership has increased significantly; improved publications sales and reduced costs led to an excellent year from the financial standpoint, and work on laying the foundations for future International Conference preparations was outlined. Comprehensive plans for Amateur Radio recruitment, among both young people and senior citizens, were revealed.

24) Treasurer McCobb presented a brief preliminary financial report, regarding the ARRL portfolio which is worth approximately $6.2 million in both book and market values, and which yields an average of 8½% annual income.

25) In his report, Counsel Imlay summarized legal activities for the year and presented a draft filing in FCC General Docket 87-389 concerning revision of Part 15 of the FCC Rules, and draft comments in opposition to RM-6196, a request for rule

making by TV Answer, Inc., which seeks a 500-kHz block of frequencies somewhere in 216-222 MHz.

26) Mr. Grauer, as President of the ARRL Foundation, reported on its activities for the year, particularly in the area of scholarships. Assets of the Foundation exceed $240,000. After the report, Mr. Mendelsohn presented a check for $500 to Mr. Grauer on behalf of the Long Island Mobile Amateur Radio Club, and Mr. Nathanson presented a check for $100.

27) Canadian Radio Relay League President Atkins brought greetings from the ARRL's "Sister Organization." He then presented a plaque to President Price reading:

TO THE DIRECTORS, OFFICERS
AND MEMBERS OF
THE AMERICAN RADIO RELAY LEAGUE
IN SINCERE APPRECIATION
FOR 67 YEARS OF ENCOURAGEMENT
AND SUPPORT 1920-1987
"Geography has made us neighbours
History has made us friends"
President John F. Kennedy
Ottawa, Canada. 1961
Thomas B.J. Atkins, VE3CDM
President
Canadian Radio Relay League
January 1988

28) The Board was in recess (at 12:20 PM) for luncheon and the taking of the official photograph, reconvening at 2:08 PM with all persons hereinbefore mentioned present.

29) After presenting the report of the Administration and Finance Committee, Mr. Metzger, its Chairman, moved, seconded by Mr. Heyn, that the Administration and Finance Committee report be accepted and the 1988 Annual Budget be adopted as presented at this the Annual Meeting. On motion of Mr. Nathanson, seconded by Mr. Mendelsohn, it was VOTED at 2:23 PM that the Board sit as a Committee of the Whole to discuss budgetary matters. Members of the assembly who were not Directors, Vice Directors or (volunteer) Officers departed from the room. The Committee of the Whole arose and reported to the Board at 3:22 PM and the Board was in recess until 3:45 PM. The absent members returned, Mr. Huntington took the seat for Mr. Metzger, and Mr. Metzger's motion was ADOPTED.

30) Mr. Quiat, as Chairman, presented the report of the Membership Services Committee. On his motion, seconded by Mr. Mendelsohn, it was VOTED that the Executive Vice President is directed to seek input from members on the proposed 2.3 GHz band plan. The data so collected shall be forwarded to the Membership Services Committee for an interim report by the Second Meeting of 1988 and early submission of a recommendation to the Board.

31) On further motion of Mr. Quiat, seconded by Mr. Milius, it was VOTED that the packet radio frequency recommendations of the ARRL Committee on Amateur Radio Digital Communication are adopted for the 70-cm and 23-cm band. The 33-cm recommendations are adopted as interim guidelines for packet frequencies pending conclusion of a study by the Membership Services Committee on revising the current interim band plan.

32) On motion of Mr. Milius, seconded by Mr. Quiat, it was VOTED that the Executive Vice President is directed to implement the ARRL Diamond Jubilee Award Program as recommended in the Membership Services Committee report.

33) On further motion of Mr. Milius, seconded by Mr. Butler, it was VOTED that the Executive Vice President is directed to implement the report of the Membership Services Committee concerning the production of personal QSL cards for League members to the effect that a contest be created to obtain a unique design different from that of Officers, Directors, Vice Directors and Staff and for franchising the printing thereof. The Executive Vice President is further directed to arrange for franchising the production of various sizes of pressure-sensitive labels of the League Diamond logo to be made available to members for their use on personal QSL cards.

34) Mr. Olson, as Chairman, presented the report of the Publications Committee. On motion of Mr. Haynie, seconded by Mr. Holladay, the following resolution was ADOPTED:

WHEREAS, the United States Manned Space Program offers a valuable opportunity to conduct Amateur Radio experiments and operations from space, and
WHEREAS, the National Aeronautics and Space Administration has demonstrated its willingness to consider Amateur Radio participation in the Space Station and Space Shuttle projects, and
WHEREAS, Amateur Radio operation aboard manned space vehicles provides excellent public relations for Amateur Radio, and
WHEREAS, although there have been significant contributions on the part of many individuals and organizations, additional benefits to Amateur Radio from support in the Manned Space Program remain, Be it RESOLVED that the American Radio Relay League continue and expand its participation in the NASA Manned Space Program to ensure that Amateur Radio activities therein are developed to their fullest potential.

35) Mr. Stafford, as Chairman, presented the report of the Volunteer Resources Committee. On motion of Mr. Stevens, seconded by Mr. Butler, it was VOTED that, in recognition of the excellent work being performed by volunteer Amateur Radio instructors in the Amateur community, and by professional educators who use Amateur Radio as part of their curricula in public and private educational institutions, the ARRL Board of Directors reactivates the "ARRL Herb S. Brier Instructor of the Year Award," and creates the "ARRL Professional Teacher of the Year Award" in accordance with the terms of reference proposed by the Volunteer Resources Committee.

36) On motion of Mr. Frenaye, seconded by Mr. Butler, it was VOTED that the ARRL Board of Directors endorses the recommendation of the Volunteer Resources Committee to adopt the proposed Membership Contact Travel Standard Operating Procedure as policy.

37) It was moved by Mr. Mendelsohn, seconded by Mr. Stevens, that the ARRL Board of Directors endorses the recommendations of the Volunteer Resources Committee (1) to make the ARRL Emergency Communications certification and training course developed by staff for ARRL Field Organization Emergency Communication leadership officials mandatory for new SECs, DECs and ECs; and (2) to encourage, though not require, current SECs, DECs and ECs to undergo the certification process by completing the course. Staff is directed to implement this phase of the program. On motion of Mr. Heyn, seconded by Mr. Nathanson, the matter is REFERRED to the Public Service Advisory Committee with a report to be due by the 1988 Second Meeting of the Board.

38) On motion of Mr. Stafford, seconded by Mr. Quiat, it was VOTED that the Volunteer Resources Committee study the advisability of creating a new Section-level appointment in the Field Organization to handle ARRL/VEC matters. The title and exact duties of the position shall be specified by the Volunteer Resources Committee; such duties shall include, but not necessarily be limited to, the dissemination of ARRL/VEC information and test session scheduling within the Section, recruitment of Volunteer Examiners, assistance in setting up ARRL/VEC test sessions within the Section and in general, availability as a resource person and information source relating to ARRL/VEC matters.

39) Mr. Price, as Chairman, reported for the Executive Committee. It was moved by Mr. Butler, seconded by Mr. Quiat, that the present West Indies section is divided into two parts, to be known as the Puerto Rico Section and the Virgin Islands Section. A roll-call vote being requested, the question was decided in the affirmative, 9 votes in favor to 6 votes opposed. Messrs. Butler, Drake, Grauer, Harrison, Mark, Mendelsohn, Milius, Quiat and Turnbull voted in favor; Messrs. Frenaye, Haynie, Heyn, Huntington, Nathanson and Stafford voted in opposition. Accordingly, the motion establishing the Puerto Rico and the Virgin Islands Sections was ADOPTED.

40) On motion of Mr. Olson, seconded by Mr. Mendelsohn, it was VOTED that the Board of Directors of the American Radio Relay League does hereby ratify and confirm the establishment of a "Fund for the Defense of Amateur Radio Frequencies" in the amount of $105,000. During the course of the above, the Board was in recess for dinner from 5:50 PM to 8:25 PM, reconvening with all persons hereinbefore mentioned present.

41) It was moved by Mr. Holladay, seconded by Mr. Mendelsohn, that ByLaw 36 is amended so that the second sentence reads: "Each standing committee shall consist of two or three Directors and a Vice President or Vice Director, or both." A roll call vote being required, the question was decided in the affirmative: all Directors voted aye, so the By-Law was AMENDED.

42) Mr. Butler, as Liaison, presented the final report of the Ad Hoc Committee on Amateur Spread Spectrum Radio Communication. Though interest in the mode appears to be low among radio amateurs, the Committee recommended production of a publication on spread spectrum communications systems. Work on the book is underway; it should be published in 1988.

43) Mr. Holladay, as Chairman, presented the report of the Special Study Committee on Advisory Committees. The Special Study Committee is monitoring implementation of findings and recommendations adopted at the past two Board meetings and is developing a few additional recommendations for improving Advisory Committee performance.

44) Mr. Atkins, as Chairman, presented an interim report of the Ad Hoc Committee on Amateur Radio and the Media. The committee is evaluating material received from the media, radio amateurs and other interested parties, and will prepare a draft set of guidelines for consideration at the second meeting of the Board.

45) Mr. Turnbull, as Chairman, presented the report of the RFI Task Group. On his motion, seconded by Mr. Mendelsohn, it was VOTED that the Executive Vice President, Counsel and staff, in consultation with the RFI Task Group, are authorized and directed to prepare timely comments on FCC General Docket 87-389, which proposes to revise Part 15 of the FCC's Rules. The following points shall be emphasized: (1) Amateur frequencies shall not be used by intentionally radiating devices; (2) Permitted field strengths for unintentionally radiating devices should not exceed presently permitted maxima; (3) Rules should be enacted to require that radio frequency interference (RFI) resolution information, including identification of a manufacturer's contact representative for RFI complaints, be included in any user's or operator's manual for Part 15 devices.

46) Mr. Mozley, as Chairman, reported for the ARRL Committee on Biological Effects of Radio Frequency Energy. The report focused on recent press reports of a study of a possible relationship between Amateur Radio operators and various causes of death. Some of the press reports went far beyond the conclusions of the study itself in inferring a relationship with certain forms of cancer, arousing considerable concern in the Amateur community. Mr. Mozley explained the limitations of the study and the fact that the statistical methodology used is not universally supported by academicians. The Committee is preparing appropriate responses to what has been published, and will present a recommendation for further work by the League in this field later in the meeting. (Applause.)

47) Mr. Comstock, as liaison, presented the report of the ARRL Committee on Amateur Radio Digital Communication. Among subjects of the report were the 6th ARRL Computer Networking Conference and the experiments being conducted under Special Temporary Authority of certain high frequency (HF) stations from July 7 through January 3 (and to continue under an extension of one year recently granted by the FCC). The committee is to prepare draft rule changes for Part 97 to facilitate HF packet radio.

48) Mr. Nathanson, as Chairman, reported for the Legal Strategy Committee, covering the Bodony case and its relationship to the FCC declaration of limited preemption, PRB-1; the increasing problem of deed covenants; and the legal seminar presented at the 1987 National Convention.

49) Mr. Frenaye, as Chairman, presented the report of the Education Task Force. The large committee is hard at work at its tasks of (1) reviewing and updating curricula for the teaching of Amateur Radio classes and (2) exploring and reporting innovative methods of establishing Amateur Radio clubs in schools.

50) Mr. Wilson, as Chairman, reported briefly for the Elections Committee. On motion of Mr. Harrison, seconded by Mr. Heyn, it was VOTED that the Election Committee's charge is amended

Packet Radio Frequency Recommendations of the Committee on Amateur Radio Digital Communication

On page 54 of September 1987 *QST*, recommendations for packet radio frequencies below 225 MHz were printed as approved at the July 1987 Board Meeting. At that meeting, the Board referred the frequencies above 225 MHz back to the Digital Committee for coordination with the VHF/UHF Advisory Committee and the VHF Repeater Advisory Committee, and resubmission to the Board via the Membership Services Committee. Packet radio frequencies resulting from that coordination process were approved by the Board in Minute 31 and are detailed below.

1. General considerations

The following general considerations were noted regarding packet frequencies in the VHF/UHF region:

a. There is a need for 100-kHz-wide channels in order to make use of the 56-kbit/s modems which have recently become available. This data rate is permitted only above 220.5 MHz.

b. At the Computer Networking Conference several papers were presented which dealt with duplex vs simplex operation for packet radio. The conclusion is that in many situations, duplex operation is more efficient. For wideband systems, it is very difficult to build filters that provide adequate isolation for duplex operation in-band. Therefore, there is strong motivation toward crossband operation for the high-data-rate links. The favored approach is to pair frequencies for crossband links in the following manner: 220-420, 420-902, 902-1240, etc.

2. 70 centimeters

a. The 70-cm (420-450 MHz) band presents the most difficult situation of any band in trying to recommend frequencies for packet radio. Existing heavy usage of the band in almost all US metropolitan areas makes it impossible to recommend frequencies that would be applicable nationwide. After discussing the wide variations in packet frequencies in various parts of the country, the committee concluded that the 70-cm frequencies recommended in the committee's report were as good as any as a starting point. If they are available in a given area, they should be the first choice of the local frequency coordinator. If they are not available, then it is up to the local packet-radio operators to work out the best arrangement they can with the local coordinator. Digital operation will have to be fit in where it can, depending on the local situation. Since many of the links (especially the high-data-rate ones) will be point-to-point links, frequency-sharing arrangements should be possible by proper choice of antenna beamwidth, polarization and power levels.

b. The committee recommended and the Board adopted the following operating frequencies if they are available in a given area:

(1) 100-kHz-bandwidth packet channels at 430.05, 430.15, 430.25, 430.35, 430.45, 430.55, 430.65, 430.85 and 430.95 MHz. Use of 430.75 MHz is not recommended in order to minimize interference to/from a distant ATV aural carrier. (There was no suggestion that these channels could be used at the same time as an ATV transmission in the same service area.)

(2) 25-kHz packet channels at 440.975, 441.000, 441.025, 441.050 and 441.075, plus an additional narrowband channel at 431.025, which could serve as a buffer for the wideband packet channels listed above.

3. 33 centimeters

a. There were some difficulties in the 33-cm (902-928 MHz) band created by Automatic Vehicle Monitoring (AVM) Systems and by industrial, scientific and medical (ISM) devices centered at 915 MHz. Nevertheless, there are a number of advantages associated with the band. Japanese Personal Radio Service equipment (available from Japan, but not yet imported into the United States in any significant quantity) is the only known source of transceivers, and they operate in the lower portion of the band. This band holds promise for ATV and for wideband data channels operated crossband with one at 70 or 23 cm. Relative to higher frequencies, it is easier to build and test equipment for this band because of the availability of components and test equipment.

b. Discussion of frequencies for digital communcations on 33 cm began with the observation that the band plan published in the 1987 *Repeater Directory* is an interim one. The VRAC and VUAC are being requested to revisit this band plan in the light of a revised version recently adopted in Southern California. Among other things the Southern California plan reduces the weak-signal allocation to 902-903 MHz and moves most other allocations down 1 MHz. This results in the following differences in digital-mode allocations:

ARRL Interim	*S California*
904-906	903-905
916-918	915-917

c. Digital Committee members recommended that two 3-MHz-wide channels be allocated (to accommodate 1.5 Mbit/s links) with 10.7-MHz spacing. This could be accomplished with channels at 903-906 and 914-917 MHz. The Board adopted these frequencies as interim guidance pending conclusion of a study by the Membership Services Committee on revising the current interim 33-cm band plan.

4. 23 centimeters

a. The committee reaffirmed the earlier recommendations of the Digital Committee, which are consistent with the 23-cm band plan adopted by the ARRL Board, as published in the 1987 *Repeater Directory*. The recommendations are also in accord with the VUAC recommendations that a packet allocation be adopted in a portion of 23 cm available to Novices.

b. The specific 23-cm packet frequency recommendations adopted by the Board are as follows:

(1) 2-MHz-wide channels at 1249.0, 1251.0 and 1298.0 MHz.

(2) 100-kHz-wide channels at 1299.05, 1299.15, 1299.25, 1299.35, 1299.45, 1299.55, 1299.65, 1299.75, 1299.85 and 1299.95 MHz.

(3) 25-kHz-wide channels at 1294.025, 1294.050, 1294.075, 1294.100, 1294.125, 1294.150 and 1294.175. 1294.100 is designated the National packet calling frequency. These frequencies are available to Novice operators.

5. Frequencies below 225 MHz:

a. Upon recommendation of the VRAC chairman, whenever this band plan is published, it should clearly state that use of the recommended channels must be coordinated through the local frequency coordinator.

b. A note should be added to the HF packet recommendations (see sidebar on page 54 of September 1987 *QST*) to the effect that the FCC has not yet authorized 1200-baud operation below 28 MHz.

to include studies relating to Officers as well as Section Managers, Vice Directors and Directors. The Board was then (at 10:03 PM) in recess for the night, reconvening at 8:35 AM on the morrow with all persons hereinbefore mentioned present.

51) The Chair called attention to the written report of the VHF-Repeater Advisory Committee. In response to past Board assignments, the Committee recommended against adding a "coordination pending" category to listings in the ARRL *Repeater Directory* but had no opposition to proposed changes in beacon frequencies.

52) Mr. Kanode, as Liaison, presented the report of the Contest Advisory Committee. The Committee decided that a proposal for a new Field Day category ("Class F") for QRP stations was moot, since published results show that such operations currently receive a substantial score multiplier, except that published rules for Field Day should indicate the "Battery" category as an entry class.

53) Mr. Drake, as Liaison, presented the report of the DX Advisory Committee. It was moved by Mr. Drake, seconded by Mr. Heyn, that the following resolution be adopted:

WHEREAS, the DX Advisory Committee has polled the DX community regarding a "Fresh Start" to the DXCC program, and

WHEREAS, the nearly unanimous response has been one of continued support for the present basic DXCC program, while calling for some refinement and modest expansion; therefore

The ARRL Board hereby RISES in sincere appreciation and thanks for the diligent and thorough efforts expended by the DX Advisory Committee and especially its Chairman, John Parrott, W4FRU, in its comprehensive efforts and deliberations in response to the Board's call for this review; and it is further RESOLVED, that:

1. The Executive Vice President is directed to proceed with implemention and appropriate announcement of the substance of the draft report, except as here amended.

2. Those DXAC recommendations that have been identified as having a cost over and above that already allocated in the 1988 budget are referred to the Membership Services Committee for further study and recommendation to the full Board.

3. The DXAC recommendation of field checking QSL cards is referred to the Membership Services Committee for further study.

On motion of Mr. Mendelsohn, seconded by Mr. Harrison, it was VOTED to amend the DXAC motion by deleting paragraph two and renumbering paragraph three. After further discussion, a Roll Call vote being ordered on request, the question was decided in the affirmative. All Directors voted in favor, so the resolution as amended was ADOPTED. During the course of the above, the Board was in recess from 9:58 AM to 10:37 AM.

54) Mr. Vydareny, as Liaison, presented the final report of the Emergency Communications Advisory Committee. The ECAC recommended adoption of a year-long time frame for SET participation, additional information on operating during public service events and a resource survey of volunteers and membership. During the course of the above, Mr. Joe Butler assumed the seat for Mr. Harrison (at 10:55 AM).

55) Mrs. Gauzens, as Liaison, presented the final report of the Public Relations Advisory Committee (PRAC). The committee completed rewriting the PIO/PIA job guidelines. A Guidebook for PIAs and club publicity chairmen is underway; the PRAC recommends its completion by the new Public Relations Committee. The committee also recommended that a proposed slide presentation about emergency communications might be more useful as a videotape. On motion of Mr. Mendelsohn, seconded by Mr. Butler, the following resolution was ADOPTED:

WHEREAS, the Public Relations Advisory Committee has provided input and outstanding work for the League membership, and

WHEREAS, it has provided leadership and guidance with respect to the intricacies of a specialized field at a time when leadership and guidance was especially vital, and

WHEREAS, its members have given unstintingly of their time, training and talents for the benefit

of Amateur Radio, now therefore,
BE IT RESOLVED, that the American Radio Relay League tenders its most sincere thanks and expresses its deepest gratitude to the Committee and to its members on this, the occasion of the transfer of the functions of the Committee to the new Public Relations Committee.

56) Mr. Overbeck, as Liaison, reported for the VHF/UHF Advisory Committee, principally dealing with beacon frequencies. During the discussion, Mr. Harrison returned to his seat at 11:15 AM.

57) On motion of Mr. Metzger, seconded by Mr. Heyn, it was VOTED that the Executive Vice President is hereby authorized to reimburse the Ad Hoc Committee On Amateur Radio and The Media up to $500.00 for expenses incurred by them during 1988 in the proper execution of their duties, and in accordance with Board policy.

58) On motion of Mr. Metzger, seconded by Mr. Haynie, it was VOTED that the recommendation of the Administration and Finance Committee is approved and that the Executive Vice President is authorized to reimburse the Administration and Finance Committee an amount not to exceed $580.36, the DX Advisory Committee an amount not to exceed $116.63, and the Southwestern Division an amount not to exceed $151.97, for additional 1987 expenses.

59) It was moved by Mr. Turnbull, seconded by Mr. Mendelsohn, that By Law 9 be amended to read, "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 onetime fee of $25.00." A Roll Call vote being required, the question was decided in the affirmative, 13 votes in favor, 1 vote opposed, and 1 abstention. All Directors voted aye, except Mr. Metzger, who voted no, and Mr. Heyn, who abstained. So, By Law 9 was AMENDED.

60) On motion of Mr. Metzger, seconded by Mr. Haynie, it was VOTED to continue the policy of the Board to assume administrative expenses of the ARRL Foundation; the Executive Vice President is hereby authorized to pay during the year 1988 a total amount not to exceed $2,000 in accordance with ARRL Standing Policies with respect to travel, accounting procedures and auditing.

61) On motion of Mr. Metzger, seconded by Mr. Nathanson, it was unanimously VOTED that the Executive Vice President is directed to solicit $450,000 through a special fund raising drive to finance renovations to WIAW. Special recognition of donors at the $1000 and $500 level should be provided in the solicitation.

62) The Board was in recess for luncheon from 12:06 PM to 1:25 PM, reassembling with all those hereinbefore mentioned present.

63) On motion of Mr. Frenaye, seconded by Mr. Nathanson, it was VOTED, at 1:31 PM, that the Board sit as a Committee of the Whole to discuss international matters. The Committee arose at 1:36 PM and reported to the Board. On motion of Mr. Mendelsohn, seconded by Mr. Butler, it was VOTED that the report of the Committee is adopted.

64) It was moved by Mr. Drake, seconded by Mr. Stafford, that the following resolution be adopted:

WHEREAS, the Washington Section has the largest Amateur population (13,000) of any section within ARRL NW Division and has the highest per-capita ratio of Amateur Radio operators of any state in the US; and

WHEREAS, the state is divided into east and west by the Cascade Mountains, which make cross state travel very difficult for five months of the year; and

WHEREAS, this barrier makes it difficult and expensive to effectively coordinate one third of Washington Section's League members who have traditionally felt excluded from the mainstream of Section affairs; now therefore,

BE IT RESOLVED, that Washington Section be divided into two independent ARRL Sections to be known as Western Washington Section and Inland Empire Section. Western Washington Section shall comprise the counties of Whatcom, Skagit, San Juan Island, Snohomish, King, Pierce, Thurston, Clallam, Jefferson, Mason, Kitsap, Grays Harbor, Pacific, Lewis, Wahkiakum, Cowlitz, Clark and Skamania. The Inland Empire Section shall comprise the counties of Okanogan, Chelan, Douglas, Kittitas, Yakima, Klickitat, Benton, Franklin, Walla Walla, Adams, Grant, Lincoln, Ferry, Stevens, Pend Oreille, Spokane, Whitman, Columbia, Garfield and Asotin. Consideration should be given to include northern counties of Idaho, which are geographically separated from the central part of Idaho by barriers similar to those affecting Eastern Washington and are generally considered part of the Inland Empire area. After discussion, on motion of Mr. Nathanson, seconded by Mr. Harrison, it was VOTED that the matter is laid on the TABLE.

65) On motion of Mr. Stafford, seconded by Mr. Butler, it was VOTED that the Volunteer Resources Committee study the advisability of creating a public-service award for individuals or groups sponsoring digital repeaters and/or packet bulletin board systems that handle large amounts of NTS traffic. The VRC shall determine the eligibility criteria for such an award.

66) On motion of Mr. Quiat, seconded by Mr. Drake, it was VOTED, at 2:00 PM, that the Board sit as a Committee of the Whole to discuss certain reports in the media. The Committee arose at 2:17 PM and reported to the Board.

67) On motion of Mr. Butler, seconded by Mr. Harrison, the following resolution was unanimously ADOPTED and an appropriate plaque was ordered prepared for presentation:

WHEREAS, Arline P. Bender, WA1VMC, has served on the ARRL Headquarters staff faithfully and well for more than 27 years; and

WHEREAS, as Field Organization Assistant she has been a friend to countless members of the official family, Section Managers, Field Organization members, and Headquarters staff members; and

WHEREAS, she has conducted countless elections for Section Managers, recorded thousands of Field appointments, sent supplies and personal letters to thousands of Field appointees, and always with a smile and good humor; now therefore,

BE IT RESOLVED, that this Board commends Arline for her great contribution to the League and Amateur Radio and conveys best wishes for a richly deserved, long, healthy and happy retirement. (Applause.)

68) On motion of Mr. Haynie, seconded by Mr. Frenaye, it was VOTED that the Executive Vice-President, in conjunction with the RFI Task Group, is directed to develop a "plain language" pamphlet outlining the responsibilities and suggested sequential actions that should be taken by Amateurs and non-Amateurs when electronic device interference problems are encountered.

69) On motion of Mr. Metzger, seconded by Mr. Turnbull, it was VOTED that the Board of Directors hereby adopts the Section and NTS Official Budget Guidelines approved by the Administration and Finance Committee at its January 22, 1988 meeting. At this point, 2:30 PM, Mr. Comstock departed from the meeting.

70) It was moved by Mr. Nathanson, seconded by Mr. Mendelsohn, that the following resolution be adopted:

WHEREAS, the Board of Directors are representatives of the members, and

WHEREAS, a blazer jacket would make a Director more visible at Conventions and Hamfests,

THEREFORE, it is moved that the Membership Services study advisability of Directors' acquiring distinctive League jackets. After discussion, the motion was LOST.

71) The Board was in recess from 2:40 PM to 3:12 PM.

72) Mr. Price announced appointments to the Standing Committees of the Board as follows:

Administration and Finance—Mr. Metzger, Chairman; Mr. Turnbull, Vice-Chairman; Mr. Drake; Vice-President Wilson, Secretary.

Membership Communications Services—Mr. Quiat, Chairman; Mr. Heyn, Vice-Chairman; Mr. Harrison; Vice-President Holladay, Secretary.

Publications—Mr. Haynie, Chairman; Mr. Butler, Vice-Chairman; Mr. Milius; Vice-President Olson, Secretary.

Volunteer Resources Committee—Mr. Mendelsohn, Chairman; Mr. Mark, Vice-Chairman; Vice-President Hurlbert; Vice-Director Severson, Secretary.

73) President Price reported the following additional appointments: Vice-President Olson and Vice-Director Knochenhauer to the Committee on the Biological Effects of Radio Frequency Energy; Vice-Directors Huntington and Meyer to the RFI Task Group; Joel Kandel, KI4T, Steve Smith, WA4VWV/9 and Geri Sweeney, N4GHI, as members, and Director Stafford as Board Liaison of the ARRL National Emergency Response Committee (ANERCOM), in addition to Jerry Boyd, KG6LF, who was earlier appointed Chairman; and Vice-Director Shrader as Board Liaison for the VHF Repeater Advisory Committee (VRAC).

74) On motion of Mr. Mendelsohn, seconded by Mr. Milius, it was VOTED that the Volunteer Resources Committee develop a Standard Operating Procedure (SOP) for the formation of Sections used in the administration of the ARRL Field Organization. Such an SOP shall include methods of determining the opinion of all Full Members in the proposed section, and the minimum requirements necessary to establish a working local volunteer presence.

75) On motion of Mr. Frenaye, seconded by Mr. Mendelsohn, it was VOTED that the Public Service Advisory Committee examine the merits of encouraging trustees of all repeaters that have an autopatch to also provide a readily accessible method for connecting to 911 (police emergency) telephone emergency services. Messrs. Grauer, Haynie and Metzger asked to be recorded as voting no.

76) On motion of Mr. Stafford, seconded by Mr. Haynie, the following resolution was ADOPTED:

WHEREAS, the staff has acquired the names of various colleges and universities who have active film and video departments,

THEREFORE, the ARRL staff is hereby directed to contact those colleges and universities for the purpose of determining if the film/video departments are available to work on joint projects of producing training and introduction films and videos dealing with emergency communications and public service communications including traffic handling. In order to facilitate the colleges and universities cooperating in such joint projects, the Executive Vice-President may use some type of competition with cash prizes or by offering grants for production of such videos.

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

WHEREAS, a Silent Key leaves behind a station and equipment of generally unknown value to the surviving spouse, and

WHEREAS, the League has facilities to research a range of values for the equipment, and

WHEREAS, the furnishing of this type of data would be a service, now,

THEREFORE, be it resolved that the Membership Services Committee study the establishment of a vehicle to provide this service. A Roll Call vote being requested, the question was decided in the affirmative, with all directors voting aye. So the resolution was ADOPTED.

78) It was moved by Mr. Quiat, seconded by Mr. Heyn, that the Committee on the Biological Effects of Radio Frequency Energy solicit assistance in investigating the methodology used in some well-publicized studies concerning the possible relationships between Amateur Radio and health hazards. On motion of Mr. Holladay, seconded by Mr. Heyn, it was VOTED to POSTPONE the matter.

79) On motion of Mr. Heyn, seconded by Mr. Haynie, the following resolution was ADOPTED:

WHEREAS, the VHF/UHF Advisory Committee recommended that the ARRL petition the FCC to adopt new band segments for automated VHF/UHF beacons, and

WHEREAS, at Minute 79 of its July, 1987 meeting the Board referred the matter to the VHF Repeater Advisory Committee for its recommendation, and

WHEREAS, the VHF Repeater Advisory Committee has now endorsed the VHF/UHF Advisory Committee proposal,

NOW THEREFORE, the Membership Services Committee is requested to study, on an expedited basis, the desirability of amending the automatic-beacon band segments above 144 MHz to be the following.

144.275-	144.300 MHz
220.275-	220.300 MHZ
432.300-	432.400 MHz

902.300- 902.400 MHz
1296.300- 1296.400 MHz
2304.300- 2304.400 MHz
3456.300- 3456.400 MHz
5760.300- 5760.400 MHz
10368.300-10368.400 MHz

The Committee is further requested to submit its report to the Board or Executive Committee, as soon as possible, with a recommendation as to whether or not any petition to FCC that might be required to implement these segments should include the bands above 450 MHz.

80) On motion of Mr. Metzger, seconded by Mr. Grauer, it was VOTED that adequate publicity in *QST* be devoted to the ARRL Foundation, and that pictures of recipients of Foundation Scholarship Awards be included in *QST* columns at the time of presentation.

81) It was moved by Mr. Nathanson, seconded by Mr. Milius, that Counsel petition the FCC requesting that Advanced and Extra Class licensees be permitted to operate SSB between 7075 and 7100 kHz. After discussion, it was moved by Mr. Heyn, seconded by Mr. Haynie, to postpone consideration of this motion. 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 PM to 5:10 PM.

82) On motion of Mr. Mendelsohn, seconded by Mr. Butler, it was VOTED that to remain consistent with all other Field Organization appointments, all National Traffic System officials in the United States above the Section level, including, but not limited to, Region Net Managers, Region Packet Managers, Area Net Managers, Transcontinental Corps Directors and Area Staff Members-At-Large must hold full membership in the ARRL at the time of their appointment or election, and must maintain ARRL membership throughout their tenure.

83) On motion of Mr. Frenaye, seconded by Mr. Heyn, it was VOTED that the Publications Committee examine ways to shorten the lead time for submission of materials to be used in *QST*, particularly with regard to Ham-Ads and Section News, and report back at the Second 1988 meeting.

84) On motion of Mr. Frenaye, seconded by Mr. Mendelsohn, it was VOTED that the Volunteer Resources Committee develop a plan to ensure that General, Advanced and Extra Class Amateur Radio operators are familiar with the current rules for giving Novice Class exams to prospective Amateurs and to improve the availability of Novice testing materials across the country, reporting back to the Second 1988 meeting.

85) It was moved by Mr. Drake, seconded by Mr. Frenaye, that the Board of Directors of the ARRL directs the President to:

A. Appoint a committee of knowledgeable Amateurs with the task of:

1. Review the present status of RMS operations, RMS-MOU, and other guidance papers now in effect.

2. Develop short and long-range plans and guidance for operation of the Amateur Auxiliary.

3. Develop training, operating, and recruitment programs and manuals for RMSs, Section Managers, and others who may be involved in the Amateur Auxiliary.

B. Allot funds in the amount of $6,000 to cover travel, housing, and expenses incurred by the RMS Committee in performance of their tasks. Due date for committee completion of tasks is prior to the 1989 Board of Directors Annual Meeting. On motion of Mr. Heyn, seconded by Mr. Haynie, it was VOTED to REFER the matter to the Volunteer Resources Committee.

86) On motion of Mr. Stafford, seconded by Mr. Mendelsohn, it was VOTED to lift from the table the motion regarding the division of the Washington Section into the Western Washington and the Inland Empire Sections. It was moved by Mr. Drake, seconded by Mr. Stafford, that the motion be amended by striking the text and substituting the following:

WHEREAS, the Washington Section has the largest Amateur population (13,000) of any section within ARRL Northwest Division, and

WHEREAS, the section has the highest percapita ratio of Amateur Radio operators of any state in the US, and

WHEREAS, the state is divided into east and west by the Cascade Mountains, which make cross-state travel very difficult for five months of the year, and

WHEREAS, this barrier makes it difficult and expensive to effectively coordinate one-third of Washington Section's League members who have traditionally felt excluded from the mainstream of Section affairs, it is therefore

RESOLVED that the Volunteer Resources Committee study the division of the Washington Section into two independent ARRL Sections to be known as Western Washington Section and Inland Empire Section.

The study should also give consideration to inclusion of the northern counties of Idaho.

It was moved by Mr. Mendelsohn, seconded by Mr. Stafford, 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.

87) On motion of Mr. Stafford, seconded by Mr. Milius, it was VOTED that the Amateur Radio Digital Communications Committee study the following matters:

1. Whether packet repeaters or "digipeaters" should be sanctioned or coordinated by local frequency coordination councils.

2. If the committee determines that digital repeaters should be sanctioned or coordinated, the committee shall develop suggested or recommended guidelines for use by local frequency coordinators to use in the process of sanctioning or coordinating such digital repeaters.

3. The committee shall seek input from the VHF Repeater Advisory Committee, the VHF-UHF Advisory Committee and packet-radio groups on these matters.

88) On motion of Mr. Stafford, seconded by Mr. Milius, it was VOTED that the Executive Vice President make his report to the Board of Directors at the 1988 Second meeting of his study of establishing an Amateur Radio archive pursuant to Minute 79 of the 1985 Second Meeting.

89) On motion of Mr. Quiat, seconded by Mr. Butler, the following resolution was ADOPTED:

WHEREAS, any possible relationship between exposure to radio frequency energy and health is of concern to the public as a whole, and to radio amateurs in particular, and

WHEREAS, responding to this legitimate concern, the ARRL has for many years conducted an ongoing investigation of this subject through its expert Committee on the Biological Effects of Radio Frequency Energy, and

WHEREAS, the work of the committee has resulted, among other things, in FCC findings that amateur stations as a class do not exceed accepted safety standards for radio-frequency exposure, and

WHEREAS, there have been questions raised in scholarly journals concerning possible relationships between amateur radio and health hazards, and

WHEREAS, inaccurate and irresponsible interpretations of these journal reports have found their way into the news media, causing unfounded anxiety and concern, and

WHEREAS, the methodology used in some well publicized studies of this question is controversial in academic circles, thus calling into question the validity of the conclusions,

THEREFORE, the Committee on the Biological Effects of Radio Frequency Energy is directed to find independent scientific research sources; to investigate the questions raised; to identify possible sources of funding for such an undertaking; and to report in a timely fashion to the Board of Directors.

90) On motion of Mr. Heyn, seconded by Mr. Frenaye, it was VOTED that the holding of the Southwestern Division Convention in San Diego, California on August 23-26, 1990, is approved.

91) On motion of Mr. Mendelsohn, seconded by Mr. Heyn, the following resolution was ADOPTED:

WHEREAS, the Board of Directors has been made aware of recent conflicts in the frequency coordination process involving two entities performing coordination functions in the same geographic area, and

WHEREAS, inconsistent coordinations lead to mutual interference between Amateur stations in repeater operation, and

WHEREAS, in such circumstances it is essential that coordinators develop procedures to avoid incompatible Amateur station repeater operation, and

WHEREAS, the Federal Communications Commission has stated that it seeks "to promote the voluntary resolution of repeater interference disputes at the local or regional level by Amateurs themselves in the finest tradition of the Amateur Service," and

WHEREAS, the present conflict might be more easily resolved with the assistance of the FCC,

NOW THEREFORE, the Board of Directors of the ARRL hereby respectfully requests that the Chief, Private Radio Bureau, utilize his good offices to facilitate a conciliation meeting between the two entities involved with a view toward resolution of all conflict and disputes.

92) It was moved by Mr. Heyn, seconded by Mr. Mendelsohn, that the Legal Strategy Committee be tasked to develop a set of recommended procedural guidelines for frequency coordinators. The LSC shall seek input and recommendations from the VRAC, VUAC, and other interested parties. Such guidelines shall provide information on good coordination practice, including an appeal procedure, to ensure fair play in the conduct of coordination activities. These guidelines shall be prepared for publication in the 1989 ARRL *Repeater Directory*. LSC shall make a final report with its recommended procedural guidelines, no later than the 1989 Annual Meeting. After discussion, on motion of Mr. Nathanson, seconded by Mr. Mark, it was VOTED to POSTPONE consideration of the matter. Mr. Heyn and Mr. Mendelsohn requested to be recorded as voting against postponement.

93) On motion of Mr. Mendelsohn, seconded by Mr. Haynie, it was VOTED that the ARRL Board of Directors, on behalf of the entire membership of the League, recognizes and thanks the entire production staff of "The New World of Amateur Radio" for the hundreds of hours they put in to produce a professional videotape.

94) On motion of Mr. Mendelsohn, seconded by Mr. Harrison, it was VOTED to amend the Advisory Committee Standard Operating Procedures by adding:

"The Chairman of each Advisory Committee and the Committee's Board Liaison shall develop an evaluation of each member's participation to be delivered to the appropriate director 60 days prior to the Annual Meeting of the Board."

95) Moving now to item 13 on the Agenda, on motion of Mr. Nathanson, seconded by Mr. Heyn, it was VOTED that the Executive Vice President is hereby authorized to reimburse Division Directors for actual expenses incurred by them during the year 1988 in the proper administration of ARRL affairs in their respective Divisions, and in accordance with Board policy, up to the amounts as follows:

Atlantic Division	$11,500
Central Division	8,500
Dakota Division	4,500
Delta Division	10,000
Great Lakes Division	15,000
Hudson Division	8,500
Midwest Division	6,500
New England Division	9,500
Northwestern Division	13,000
Pacific Division	10,500
Roanoke Division	10,500
Rocky Mountain Division	8,000
Southeastern Division	11,500
Southwestern Division	12,500
West Gulf Division	10,000

(continued on page 76)

Happenings

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

FCC Part 15 Proposals: Threat to Amateur Service?

As was briefly reported in January *QST*, the Federal Communications Commission, in General Docket 87-389, has proposed to amend Part 15 of its rules, entitled Radio Frequency Devices.

Under these rules, first promulgated nearly 50 years ago to allow for wireless phonograph players, carrier current communications and remote controllers, the FCC has permitted an increasing array of low-power radiofrequency-generating equipment to operate without having to be licensed. All the while, the aim has been to set limits of radiation for the devices so that interference will not be caused to licensed radio services. The present version of Part 15 is, however, unduly device-specific: As a new invention has come along, rules for it have been especially crafted for it, balancing an easing of one rule with a tightening of another to meet the special needs of that device.

The Commission proposes, in this docket, to classify radio frequency devices into two broad categories: intentional radiators and unintentional radiators. The former include, for instance, walkie-talkies, garage-door opener controls, security alarm systems, cordless telephones and the like, which need to generate and transmit radio-frequency energy over the air.

Unintentional radiators include receivers, video-cassette recorders, computers, carrier-current systems, and the like. (A third category, incidental radiation devices, such as power tools, touch-controlled switches, power lines and so on, would continue under the present very simple rule: If such equipment causes interference, its operator shall promptly take steps to eliminate the interference.) There is to be a general set of radiation limits which is frequency- and distance-dependent: At a distance of 3 meters, unintentional radiators will be permitted to generate a field strength of 100 microvolts per meter from 30 to 88 MHz; 150 microvolts per meter from 88 to 216 MHz; 200 microvolts per meter at 216 to 960 MHz; and 500 microvolts per meter above 960 MHz. This is reasonably comparable to the limit for Class B computer devices under the existing rules. For frequencies below 30 MHz, a limit on conducted energy applies instead: 250 microvolts across the power lines.

Intentional radiation devices would be restricted from certain frequencies where safety services, some government operations and some weak-signal activities take place. From 1705 kHz to 30 MHz, there is to be a 30-microvolt-per-meter limit measured at 30 meters (roughly like an S6 intruder into a 20-meter contact) added to those described above. But there are some places where higher field strengths will be permitted.

The League's Position

The ARRL Board of Directors adopted this position toward General Docket 87-389 at its Annual Meeting January 22-23, on motion of Atlantic Division Director Turnbull, who is also Chairman of the Radio Frequency Interference Task Group:

"...VOTED, that the Executive Vice President, Counsel and staff, in consultation with the RFI Task Group, are authorized and directed to prepare timely comments on FCC General Docket 87-389, which proposes to revise Part 15 of the FCC's Rules. The following points shall be emphasized: (1) Amateur frequencies shall not be used by intentionally radiating devices; (2) Permitted field strengths for unintentionally radiating devices should not exceed presently permitted maxima; (3) Rules should be enacted to require that radio-frequency interference (RFI) resolution information, including indentification of a manufacturer's contact representative for RFI complaints, be included in any user's or operator's manual for Part 15 devices." The League's comments will begin by pointing out that the position of the Amateur Radio Service with respect to RF devices is unique: It is the only service colocated with Part 15 devices in residential areas where the vast majority of such devices are found. Not only can the devices interfere with Amateur Radio reception, they can—even more importantly—be severely affected by RF energy from amateur transmitters in the area. Warnings against both conditions should be on the products or in their packages at the point of sale.

The League comments will also show that the lack of complaint about specific devices in the past does not mean that the earlier permitted levels were or are acceptable. It is almost impossible to tell from what source a given white noise signal is coming. The League's filing will be accompanied by engineering studies showing what levels of emission can cause (and are already causing) interference to amateurs.

What Should You Do?

Individual amateurs and clubs should file calm, reasoned comments suggesting the course that the FCC should take. You can point out the interference problems you already have, both to your receivers and the problems perceived by your neighbors because of your transmitting. And you can back up the recommendations in the League resolution above.

The filing deadline is March 7, 1988. If possible, your comments should be typed or printed on one side of 8½ by 11-inch paper with generous margins. An official participation requires an original and five copies of each submission, but the FCC says it will consider single copies of comments from the public. Now is the time: Quieter, more usable bands could be the result.

ANOTHER 220-MHz THREAT

TV Answer, Inc (TAI) is a Virginia company that manufactures equipment used in interactive viewer response to television programming. This company has petitioned the FCC to designate a 500-kHz segment between 216 and 222 MHz as a return link from television viewers to cablecasters for the purpose of expanding its test market.

This return radio link would be 50 watts and according to the company, the system would have the capability of handling nearly a million viewer responses per minute. Viewers would use a hand-held controller costing about $100.

TAI has sent a program package to television stations across the country explaining the TV Answer proposal, including guidelines for commenting on their petition.

The ARRL filed strong comments in opposition to the petition on January 27, noting that TAI's petition must be termed a counterproposal to the FCC's proposal in Docket 87-14. Since this Petition was filed more than four months after the close of reply comments in that Docket, the FCC should dismiss the Petition.

Our comments also noted that the TAI petition was based upon the faulty premise that the 220 band was "underutilized" by amateurs and we suggest that TAI review the comments of the amateur community and the ARRL in 87-14.

We conclude by stating that the petition fails to justify any spectrum allocation and state: "Many alternatives exist to the rather incredible proposal to install relatively high-power radio transmitters in each residence, to be operated by non-technical persons, on frequencies subject to serious interference to and from other authorized over-the-air services on adjacent frequencies. None of the available alternatives are even

Goldwater Scholarship Contributions

The following have contributed $25 or more to the Goldwater Scholarship fund: Roy Shelso, W6RBV, $200; Arizona Repeater Association, in memory of W7LEE, K7UXB, W7YP, K7DZG, NI7F and K7DI, $150.

International Amateur Radio Arrangements

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

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

*Includes all its overseas departments/territories.
**Includes the following territories: VP2A (V2 now), VP2D (J7 now), VP2M, VP2S (now J8), VP2V, VP5, VP8, VP9, VS6, YJ, ZB2, ZD7 and ZF.
***Cancellation claimed by Seychelles

Countries with which the United States shares third-party-traffic agreements:

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
PC	Bolivia	8R	Guyana	J8	St Vincent
PY	Brazil	HH	Haiti	9L	Sierra Leone

explored by TAI. We are simply asked to accept the two-sentence dismissal of each and every alternative to the usurpation of a 500-kHz segment. To jump to the tune played by TAI in this instance would be unconscionably poor spectrum planning on the Commission's part."

CONCERN RAISED ABOUT RF ENERGY AND CANCER

An alleged link between Amateur Radio operators and certain forms of cancer has once again found its way into the press. In early January the Associated Press reported on a study that purported to link hams' exposure to RF energy with incidences of several kinds of cancer. The AP story cited a study conducted by Dr Samuel Milham and published in the *American Journal of Epidemiology*.

Some of our members may remember that a similar letter by Dr Milham appeared in the April 6, 1985 issue of *The Lancet*, the British Journal of Medicine. This article reported a study of the deaths of 1691 Washington state and California amateurs listed in the *QST* Silent Keys column. Dr Milham claimed he found a greater number of deaths among the Silent Keys from certain kinds of leukemias than were reported in the general population of white males in a typical year.

Concern over this is understandable, but before you pull the plug on that ham rig there are a few things to consider. This study also showed that radio amateurs had *fewer* deaths than the general population from certain other kinds of leukemia, and in the earlier article there were, in the opinion of competent professionals, serious flaws in Dr Milham's methodology. For example, *QST* Silent Keys includes only about one-third of deceased radio amateurs (not all are reported to us) and those who are reported are not necessarily representative of the amateur population as a whole. The bottom line is that even the experts have disagreed as to the significance of the study, and it certainly did not establish a causal link between Amateur Radio operation and certain cancer incidences.

The ARRL position on the original study was summed up in an editorial published in October 1985 *QST* that covered the study, as well as other pertinent data and findings.

As of this writing, copies of the most recent article are being studied by the ARRL Committee on Biological Effects of RF Energy. When this study is further along, it will be possible to determine whether the flaws in methodology seen in the original article have been corrected.

If you would like to read the October 1985 *QST* editorial and don't have a copy, we can provide you with one for an SASE. Send inquiries to: Regulatory Information Branch, ARRL HQ, 225 Main St, Newington, CT 06111.

FCC DENIES "INSTANT" NOVICE PETITION

Last month we briefly mentioned an FCC news release saying the Commission had denied a petition requesting that a successful Novice examinee be able to begin operating immediately. Successful examiness would, under the petition, use a temporary call sign consisting of the call sign of one of the volunteer examiners plus a unique numeral.

This petition, RM-5924, was filed by Frederic Hambrecht, KJ4JE. In it, he stated that the long waiting time between the exam and the receipt of the license is such that the recently acquired skills of the Novice are diminished. He also argued that Novices would be identifying with the call sign of one of the Volunteer Examiners, and thus the FCC would have a direct means of accountability for violations without the administrative burden of maintaining a file of temporary call signs.

In responding, the FCC commented that at the time the petition was filed in the Spring of 1987, the Gettysburg licensing office was receiving nearly three times the normal number of applications. This was a temporary anomaly caused by the start of Novice Enhancement. The FCC said that the situation had now returned to normal, with an average processing time for amateur licensees of 18-21 days.

The FCC also said that the "instant Novice" petition appears to be contrary to the requirements of the international Radio Regulations. These require the FCC to verify the operational and technical qualifications of any person who wishes to operate an amateur station prior to licensing.

To conclude, the FCC said: "On balance, it appears that the application processing period is not unreasonable. In view of the relatively short time that it takes us to process an application, the marginal benefits to be derived by authorizing successful Novice operator examinees temporary operating authority are outweighed by the disadvantages that could occur." The petition was denied on December 18.

FAR SCHOLARSHIPS ANNOUNCED

The Foundation For Amateur Radio Inc (FAR) has announced that it plans to

award 27 scholarships for the academic year 1988-89.

The scholarships are awarded to licensed radio amateurs who intend to pursue a post-secondary education and are enrolled, or have been accepted for enrollment, at an accredited university, college or technical school. Some scholarships require at least a General-class FCC license, and in some cases preference is given to residents of certain geographical areas or studies within certain programs. Scholarship awards range from $500 to $2000.

The Foundation is composed of 50 local-area Amateur Radio clubs in the greater Washington DC and Baltimore areas. It fully funds four of the scholarships with income realized from grants and local hamfests.

The remaining 23 scholarships are administered by the Foundation without charge to the donors in the interest of promoting Amateur Radio and those scientific, literary and educational pursuits that advance the Amateur Radio Service.

Further information and an application form can be requested by letter, postmarked prior to May 31, 1988, from FAR Scholarships, 6903 Rhode Island Ave, College Park, MD 20740.

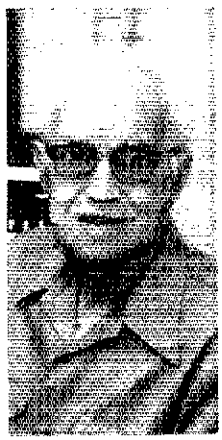
FCC TO CONTINUE HF AUTOMATIC PACKET MESSAGE FORWARDING

In response to an ARRL request, FCC Private Radio Bureau Chief Ralph Haller, N4RH, has authorized a one-year extension of the Special Temporary Authority (STA) for HF Automatic Packet Operation. This new extension expires January 4, 1989 and applies only to the approximately 60 stations currently so authorized.

This extension allows for the continued operation of HF packet-radio automatic message-forwarding, pending drafting and revision of new rules. The request was authorized by the ARRL Executive Committee.

GLEN GLASSCOCK, WØFA, SK

Glen Glasscock, 83, one of Colorado's best known and most prominent hams, passed away on October 16, 1987. First licensed in 1927 as W9ENM, he was a charter member of the A-1 Operator Club and served as ARRL Rocky Mountain Division Director from 1938-40. He had also held the calls W2KG and W9FA.



Glen was active in recruiting new amateurs, helping them to earn their ticket and then making sure they had equipment to get on the air. For many years, he sent on-the-air code practice on 80 and 2 meters.

He was a member of the Naval Reserve and retired as a Captain in 1962. For many years he worked for broadcasting station KOA in Denver as an audio engineer. He will be missed by the amateur community.

Amateur Radio Call Signs

The following are the call sign assignments as of January 1, 1988:

District	Group A Extra	Group B Advanced	Group C Tech/Gen	Group D Novice
0	WEØB	KEØSI	NØITS	KBØBQW
1	NO1H	KC1HN	N1FKK	KA1RKO
2	WC2Y	KE2DV	N2HUN	KB2EWM
3	NM3W	KD3FY	N3FYD	KA3SOL
4	AB4FO	KK4VV	N4RVG	KC4CXJ
5	AA5EE	KG5GP	N5LXI	KB5FCD
6	AA6GH	KJ6CJ	N6RDW	KB6VKQ
7	WI7Y	KF7GC	N7KGT	KB7DQT
8	NZ8T	KE8PI	N8JAS	KB8DSH
9	NW9H	KE9HU	N9HCM	KA9ZYO
Alaska**		AL7JO	NL7LW	WL7BQC
Hawaii**		AH6IT	NH6OD	WH6BWB
Puerto Rico**		KP4OO	WP4NB	WP4HSU
Virgin Is	KP2T	KP2BK	NP2CI	WP2AFU

**All Group A calls assigned

DAYTON SCHOLARSHIPS AVAILABLE

The Dayton Amateur Radio Association is accepting applications for its 1988 scholarship program. The program is open to any licensed amateur graduating from high school in 1988.

Awards will be based on a combination of financial need and academic achievement with consideration given for service to Amateur Radio and community involvement.

There are no restrictions on courses of study and there is no requirement to be applying for a four-year degree; those planning on an Associate's degree or attending an accredited trade school will also be considered. The award is $1000 toward tuition at the school of the winner's choice.

All entries must be postmarked no later than May 15, 1988, and award winners will be announced around June 1, 1988.

For information and application forms, contact Scholarship Committee, 317 Ernst Ave, Dayton, OH 45405.

17-METER AMATEUR BAND NOT OPEN

The 17-meter amateur band (18.068-18.168 MHz) is *not* yet open to US amateurs. Rumors were flying very fast that the FCC had opened the 17-meter band and ARRL HQ was deluged with phone calls requesting information.

The ARRL is doing everything possible to get early access to the band, which, while available to amateurs in many countries, including Canada, on a not-to-interfere basis, will not become a worldwide exclusive amateur allocation until July, 1989.

Are You a Lawyer? ARRL Needs Volunteer Counsels!

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

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

The ARRL has studied the current list of assignments, both international and domestic, and is attempting to identify segments that might be made available for amateur operation sooner than 1989. However the 17-meter band is *not* available at the present time.

TRICARICO LEAVES COMMISSION

William J. Tricarico, Secretary of the FCC, will be leaving to become the Executive Assistant to the Secretary of the Nuclear Regulatory Commission. Tricarico has been FCC Secretary for the past 10 years.

Petitions for rulemaking and comments should now be addressed to R. Walker Feaster, Acting Secretary. Feaster has been with the Commission for 14 years in the Office of the Managing Director.

KA1OTG NEW ASSISTANT MANAGER, DXCC BRANCH

While your columnist was walking in the hallowed halls of Headquarters, I came upon a young man muttering, "Honor Roll," "Golden Jubilee," "318 countries," "endorsements" and the like. Fearing that this young squirt was in a state of shock, I escorted him to the employee lounge and plied him with two cups of hot coffee. There I discovered I was talking to Glen Norton, KA1OTG, the new Assistant Manager in the DXCC Branch at HQ, still somewhat dazed from his first day's work.

Glen is from New Britain, Connecticut and was first licensed in 1986. He now holds a General-class license. Glen is currently attending Central Connecticut State University part-time, majoring in computer science. Glen is interested in DX, and enjoys CW and 20-meter phone.

How's DX?

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

K4KGR's Return to Guadalcanal

This unusual DXpedition had its origin in September 1942, when George Holder (now K4KGR), member of a marine patrol on Guadalcanal, made contact with a tall, immaculate Englishman leading a small group of armed natives. This Englishman was Martin Clemons, former Resident Commissioner of Guadalcanal, but then a Coastwatcher, operating from deep within the jungles. This wasn't a chance meeting, as Clemons was reporting enemy activity on the east end of the island.

Clemons' party was one of three groups of Coastwatchers made up of local government workers, planters and missionaries. They were given instructions in communications operations and supplied with equipment known as teleradios. As efficient as the teleradio was, when broken down into components (receiver, transmitter and speaker) each part weighed from 75-100 lbs! (A far cry indeed from today's lightweight versatile transceivers!) Then there were batteries, charging generators and fuel (plus supplies to feed 12-16 natives who made up the team). This WW-II-vintage equipment could send and receive signals up to 600 miles, and a simple code was devised in relaying communications to Townsville, Australia.

The time was 1942 and the Solomons were directly in the path of an invading army. From jungle and mountain hideouts, the Coastwatchers reported the landing at Tulagi and the one a few weeks later on Guadalcanal. Their activities may have saved Guadalcanal, as the battle for this island was the turning point of the war in the South Pacific.

K4KGR, still fascinated today with the exploits of the Coastwatchers, returned to Guadalcanal in 1985 and 1987. The purpose of this recent trip would be to retrace some of his own activities and to operate his ham gear from some of the areas initially used by the Coastwatchers. It turned out to be a one-man expedition, using a Ten-Tec Argosy II and the "Field Day Special" antenna (*QST*, June 1984).

Permission to operate from the Solomons was received and H44RO, a VK ham on a teaching mission to Guadalcanal and other members of the Solomon Island Radio Society furnished a great deal of assistance. The best made plans, etc, did not include a week-late arrival of clothes, jungle hammock and antenna! The assistance of H44RO with power supply, antenna tuner and 20-meter antenna made K4KGR/H44 an immediate reality. George reported Australian signals sounding like locals, with KH6, KL7 and W6s received with good strong signals.

While awaiting arrival of his luggage, K4KGR made several trips into the jungle and mountains attempting to get as close to the original Coastwatcher sights as transportation would permit. One of the most satisfying trips was made into the interior, 15 miles from the ocean, to the crest of a 2800-foot mountain known as Gold Ridge. The immediacy of the past was very apparent

K4KGR operating from a native hut on Bloody Ridge.

when George discovered the remains of a gasoline-operated refrigerator used by the Coastwatchers in the early '40s. Some of the older natives remembered when the Europeans came to their village and put up a long wire and talked into a black box as they watched the ocean with field glasses.

On his return from Gold Ridge, K4KGR was greeted with the news that his luggage had arrived. With clean clothes, the rest of his gear and the jungle hammock, it now meant that he could move into the jungle and spend the night with a degree of protection from the malaria-bearing mosquitos. Operate he did, from significant WW-II sites—names that are very much alive today to many: Taivu Village, Lavoro River, Point Cruz, Bloody Ridge. Except for four native huts and a small shelter used as a church, Bloody Ridge was just like it was in 1942. Upon arrival, the group was met by the village chief who granted permission to use an unfinished native hut as headquarters. This hut was near a foxhole occupied by K4KGR for six weeks in 1942. With native help, the Field Day Special Antenna was erected and battery-operated contacts took place with W6GIO (the first), then N6HIK, NH6CH and VK5ANB. The next day more contacts were made with South America, the Midwest US and New England. With the equipment about ready to make its last gasp, K4KST was logged while operating on 5 watts.

Following the trail of the Coastwatchers has been a wonderful experience for K4KGR—reliving poignant history, meeting ever-helpful hams, working the world "Field Day Style" and demonstrating still again that Amateur Radio is a vital part of world history as well as a very deep personal part of our lives.

DX COCKTAIL PARTY

[The following material, courtesy of W6BDN, seems particularly appropriate as this column is being prepared—very close to the official Jan 1 welcome to 1988.—Ed.]

Each of our amateur bands has its own unique characteristics (now, how's that for a profound statement?). If you're working toward 5BDXCC on SSB, you are undoubtedly aware of a man-made uniqueness on 40 meters. For those of us in the continental 48, the phone band does not coincide with that used by a lot of the rest of the world. They really must *want* to work *stateside* and listen up to allow *us* to contact them. DXpeditions, DX wayfarers and a few regulars will listen up in the normal course of their activities. For the most part, however, the best opportunity to make 40-meter SSB DX contacts is during a DX contest. The ARRL tourney in March is the best, since it pits the Ws and VEs against the world.

The first seven hours of a recent contest had netted me only two new 40-meter sideband countries, despite high flux (for the solar doldrums) and very low geomag. The sun was rising in Western Europe and I was hoping things would pick up.

G3FXB appeared with a nice signal. [G3FXB looks to be one of the featured speakers at the Visalia DX Convention in April!—Ed.] I tried to use psychokinesis to aim the inverted-V in his direction. I set VFO B on his listening frequency and checked to be sure the SPLIT button was activated (I too often forget!) Just as my preparations were completed, VK9NS started calling QRZ CONTEST on the frequency. Their voices and speech were almost identical and they were zero beat. It wasn't the fragmented, squawky kind of QRM—just two voices talking at once.

The *DX Edge* showed that it was dawn in England and dusk down under. What should I do? The G would surely disappear shortly as his sun rose. The VK9 would weaken as he lost the twilight enhancement. Either might QRT anytime. They'd both be new band-countries for me. Playing the percentages, I called for the G. It was difficult copying him because of that other voice, and there was QRM on my transmitting frequency. Somehow we finally completed the exchange.

I reset VFO B and got in line for Norfolk. It was equally painful. But I eventually made it into his log also.

So, when you're at a cocktail party trying to follow your group's conversation (while filtering out the loud voice behind you as well as the general din), just remember that you may be in training for the next DX Test!

CIRCUIT

☐ **SK:** It is sad to report *any* Silent Keys, let alone DX figures who have been so pervasively an important part of our DX scene.

(L-r) VHFer KH6HME, the legendary Jack Wheeler, KH6CC, and "Mr Hawaii," KH6IJ. (*Matsuyo Nose photo*)

Hail and farewell W7PHO, W8MPW and W1TW.

☐ **Aruba:** Credit will be given for contacts Jan 1, 1986 and later but please don't submit before April 1, 1988. (Note you'll have to resubmit a Netherlands Antilles card along with your creditable Aruba QSL.)

☐ **Dayton:** The SW Ohio DX Assn will again host a DX dinner during the HamVention, to be held at Stouffers Dayton Plaza Hotel Fri, April 29. (Previous guest speakers have included W9KNI, VE3BMV, KH6BZF and W1YL.) Reserve with a check or money order payable to SWODXA for $20 and an SASE to Jay Slough, K4ZLE, 8183 Woodward Dr, West Chester, OH 45069.

☐ **YB3ASQ:** W7TSQ is now QRV 10-80 (and maybe 160 if he can get the slopers to play!)—most days 1230-2330, bands depending on propagation. QSL to his home QTH of W7TSQ (*not* W6TSQ!).

☐ **5B4JK:** Claude left Nicosia in July 1984 for a new assignment in Abu Dhabi (where licensing isn't possible for him). Someone is bootlegging his former call, so beware!

☐ **FJL:** RZ1OWA/RZ1OWB, the Polar Geophysical Observatory and Weather Stations, Franz Joseph Land, wants cards sent direct *only* via Serge N. Matveyev (ex-UA1OSM), PO Box 47, Arkhangelsk, 163068, USSR. (*Thanks WB6ZUC*)

☐ **Colvins:** The Yasme DXpedition to XE2GKG ended Dec 1, totaling 8000 contacts in 122 countries. Iris and Lloyd were in the center of two major 6.2-strength scary earthquakes but sustained no damage. At year-end it was to be go for them to operate in the Kingdom of Nepal. Cards via Box 2025, Castro Valley, CA 94546.

☐ **Cook:** 15JHW hoped to be on from Rarotonga late Jan early Feb, possibly also from Northern Cook. QSL via his home call.

☐ **J3:** KN5X/J3 was operated by NT5D, WB5N, KN5X—confirmations via KN5X, Brian Attaway, 12516 Audelia 2412, Dallas, TX 75243.

☐ **Syria:** WB6ZUC's October trip to Damascus included a visit to YK1AO, revealing the good news that YK1AO's wife Sihan may be getting her license soon and may well come on "CW style."

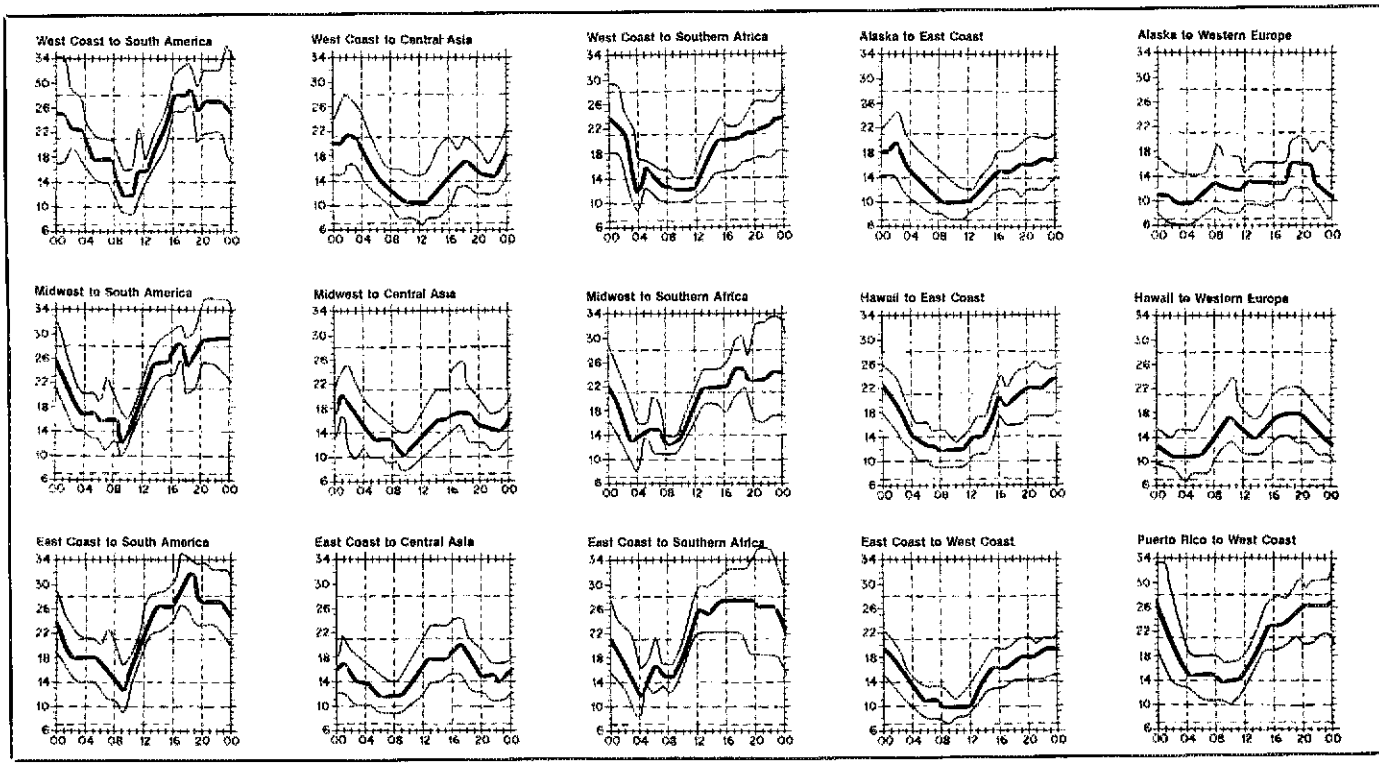
☐ **J6:** LRU via W8ILC, LRV—K6GXO, LRW—N8BJQ, LRX—WD8IXE, LRY—WB8ENR, LRZ—KA8CFU, LRR—W8PR, LRS—W8RKL, LRT—NC8Q.

N4ID (ex-HS2AIW) operated VK8TX from atop 1143-foot-high Ayers Rock almost a year ago. (The first HF operation from this monolith?) Jim reports propagation was better in Alice Springs!

☐ **FO0QK:** You won't want to miss this attractive card if you worked Mike Dec 27 to Jan 10. SASE to W6TM.

☐ **KX6:** N2PC/KX6 is active on all bands, phone, CW, RTTY, AMTOR and packet. Cards via Charles Lloyd, K2CL, 105 Crow Hill Rd, RD #2, Freehold, NJ 07728.

☐ **V31TP:** WC0W (ex-WB0DLT) operated



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

from Belize Feb 19 for about a 10-day period. Confirmations via John Patterson, 4803 Westport, Jefferson City, MO 65101.

☐ **Navassa:** Feb 10-18 featured K2SG/KP1 160-10 meters, operated by N2EDF, K2SG, KE4VU, N4GNR and W3GH. QST

QSL Corner

Administered By Joanna Hushin, KA1IFO

ARRL-MEMBERSHIP OVERSEAS QSL SERVICE

Send outgoing cards: American Radio Relay League, QSL Bureau, 225 Main St, Newington, CT 06111, USA.

This is an "outgoing" service that allows ARRL members to send DX QSL cards to foreign countries at minimum cost and effort. While QSLing direct to foreign amateurs is faster, it is also more tedious. Time spent searching for addresses in the foreign *Callbook*, addressing and stuffing envelopes, and mailing could be better spent operating DX. And, the cost of IRCs, airmail postage and envelopes can be prohibitive.

An unlimited number of QSLs may be sent for distribution 12 times per year. The fee is just $1 per pound or portion thereof (155 QSL cards average a pound). Recommended size of QSL cards is 3½ × 5½ in (90 mm × 140 mm).

The ARRL-Membership Overseas QSL Service operates *only* in an outgoing capacity. To receive QSLs from DX stations, see "The ARRL DX QSL Bureau System" (Incoming), Dec 1987 *QST*, page 56, or send an SASE to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.

US amateurs may send SWL reports to foreign shortwave listeners. Unlicensed (associate) members may send SWL cards to foreign amateurs. QSL managers: write for details.

Note: The ARRL QSL Service should not be used to exchange QSL cards within the 48 contiguous states.

Requirements

1) Presort your DX QSLs alphabetically by call-sign prefix (AP, C6, CE, DL, F, G, JA, LU, PY, 5N, 9Y, and so on).

2) Enclose the address label from your current copy of *QST*. The label shows that you are a current ARRL member.

3) Enclose payment of $1 per each pound (or less) or cards—approximately 155 cards weigh one pound. In other words, $1 is the *minimum charge* whether you send 1 card or 155 cards. Please pay by check (or money order) and write your call sign on the check. Do not send cash.

4) Include only the cards, address label and check in the package. Wrap the package securely and address it to the ARRL Outgoing QSL Service, 225 Main St, Newington, CT 06111.

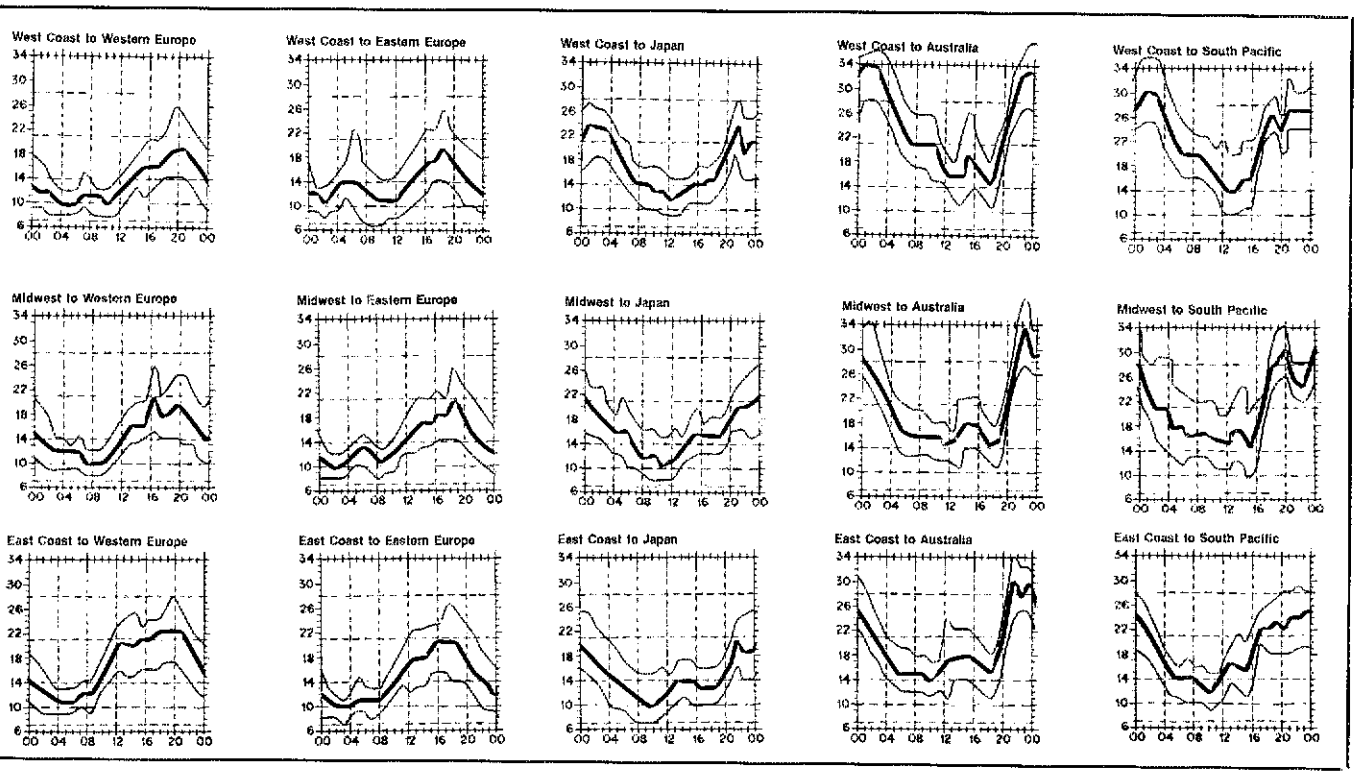
5) Family members may also use the service by enclosing their QSLs with those of the primary member. Include the appropriate fee with each individual's cards and indicate "family membership."

6) Blind members who do not receive *QST* need only include the appropriate fee along with a note indicating that the cards are from a blind member.

7) ARRL affiliated-club stations may use the service when submitting club QSLs by indicating the club name. Club secretaries should check affiliation papers to ensure that affiliation is current. In addition to sending club station QSLs through this service, affiliated clubs may also "pool" their members' individual QSL cards to effect an even greater savings. Each club member using this service must also be a League member. Cards should be sorted "en masse" by prefix, and a *QST* label enclosed for each ARRL member sending cards.

Countries not Served

A5	Bhutan	TZ	Mali
A6	United Arab Emirates	V4	St. Christopher and Nevis
A7	Qatar	VP2E	Anguilla
BV	Taiwan	VR6	Pitcairn Is
C9	Mozambique	XT	Burkina Faso
D6	Comoros	XU	Kampuchea
ET	Ethiopia	XW	Laos
HZ	Saudi Arabia	XX9	Macao
J5	Guinea-Bissau	XZ	Burma
KC4	US bases in Antarctica	YA	Afghanistan
		ZA	Albania
KC6	Belau	ZD7	St Helena
KC6	Micronesia	ZD9	Tristan da Cunha
KH1	Baker and Howland Is	ZK2	Niue
KH3	Johnston Is	ZK3	Tokelau
KH5	Palmyra and Jarvis Is	3C	Equatorial Guinea
KH7	Kure Is	3V	Tunisia
KH9	Wake Is	3W	Vietnam
KP1	Navassa Is	3X	Guinea
KP5	Desecheo Is	4W	North Yemen
P5	North Korea	5A	Libya
SU	Egypt	5H	Tanzania
T2	Tuvalu	5R	Madagascar
T3	Kiribati	5U	Niger
T5	Somalia	5X	Uganda
TJ	Cameroon	7O	South Yemen
TL	Central African Rep	7Q	Malawi
		8Q	Maldives
TN	Congo	9G	Ghana
TT	Chad	9N	Nepal
TY	Benin	9U	Burundi QST



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 March 16 to April 15, 1988, assume a sunspot number of 79, 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 November 20 through December 27, 1987. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DF8TS/129	G4HKA/122	OE3EMN/198	S79D/154	YT7OO/102	KC3RY/122	KA6OGC/101	N7ACP/102	KD9YB/102
DJ9GR/203	HAØNNN/103	OK1RD/274	SM5BBS/108	YV1AVO/124	KB4PEF/100	N6LL/105	N7CNH/100	WA9PQY/101
DKØMN/104	HV2VO/157	OK2BDP/127	SMØLH/115	ZL1BQD/306	KJ4PV/103	W6POK/100	K8RYU/108	KQØJ/275
DL3MAA/111	JA1JPM/119	OK2BKH/106	VE3LZD/105	K1BNO/102	N4QAJ/104	WI6V/102	N8DLJ/107	NUØA/101
DL3SAX/158	JF4GKN/105	OK3CSQ/102	VQ9AC/126	KA1S/101	N5ATT/148	KD7GX/183	NY8P/102	WØTIV/120
F3SG/236	JR8OGB/103	OZ1BLZ/156	YU3WZ/107	WB2WVG/103	WA5Q/129	KY7K/100	KD9RN/124	WØYNZ/319
FB1LND/118	JAØYAD/108							

Radiotelephone

CE5FSB/102	DJ3DR/116	DL3SAX/157	IN3FJT/210	LA2TY/121	OK1RD/204	KA1KP/102	WB3KBZ/VP9/150	N6LL/104
CT1CFH/106	DL2DBE/112	EA1DZA/121	JF4GKN/105	LA3ZV/108	SM5BBS/108	KD2UF/109	KB4WQO/105	NG8Z/101
DF1QT/173	DL2YCD/110	FD1JIB/225	JA7IKQ/110	LX1CC/165	VE3LZD/104	N2CJT/105	W4VN/IØ/104	NY8P/101
DF6QV/239	DL3MAA/100	F3EJ/103	KP4GY/108	OK1JMJ/107	YV1AVO/110	K3SLJ/174	N6CGB/103	NØEUQ/110

CW

DF2WV/110	EA7CH/110	IK6ASR/114	JE7BEX/104	OK3BRK/103	SM7OYP/130	VE6EJ/111	WD4JHY/105	KA6SOC/110
DJ9GR/141	F3SG/101	JH1OCC/104	OK1RD/206	OK3CSQ/101	VE1CFQ/109	YT7OO/102	NG5F/102	NKØI/106

RTTY

OH2LU/103	9Y4VU/107	W1EW/100	W5SL/105	W9DNE/100				

160 Meters

HKØHEU/113	OK3BRK/103	OK3CSQ/102	SM5BHW/100	K2UVV/103	NA2M/103	W9MAF/101		

5BDXCC

EA6NB	KB4HU	DL9HX	AA1V	VE3IR	K2AGJ	KN2N	SP2JKC	JA3JOR

Endorsements

Mixed

DF1QT/185	IK2EGL/233	OK2DB/320	ZL2VS/229	K2LP/281	W4FHI/261	K6OZL/335	W7ZR/316	K9ZXG/263
DJ6BN/312	IK5CXL/249	OK3IF/225	ZP5CE/318	K2LWR/357	W4OTX/332	K6TS/250	K8BVY/286	KG9E/259
DK1YK/324	IT9QDS/300	ON5NT/327	4X4IL/226	KB2OR/149	W4YA/329	KA6DXY/260	K8MC/300	W9MP/270
DK5QK/315	IØDUD/322	OZ6EI/263	4X4UH/303	N2BJ/302	WA4CCP/270	KM6B/322	K8RA/327	W9UO/288
DL1EC/202	IØZSG/213	PY5EG/314	9Y4VU/323	N2CIC/280	WA4SSI/205	KX6C/255	K8SUS/130	W9ZWH/314
DL1SV/266	ISØURA/162	PY5WD/320	AA1V/309	NA2J/292	WB4CSK/290	W6LDE/199	KC8NU/200	WA9GCB/151
DL3OH/336	JA2BL/331	SK7AX/271	AK1L/283	NA2M/296	WC4B/262	W6MJP/328	N8ZA/325	WA9WJE/327
DL3IE/325	JG2CLS/173	SM2EJE/288	K1BU/293	W2GKZ/345	WD4FZO/230	W6MND/311	NE8Z/321	WD9BEG/290
DL5FF/293	JG2UUS/127	SM4CTT/320	K1CC/325	W2HTI/359	WW4J/226	WA6IGU/231	NJ8N/279	WD9DID/226
DL7HU/352	JA3DM/200	SM6CMR/204	K1HZ/321	W2LPE/360	K5FNR/179	WR6O/126	W8GBH/127	KØBFR/152
DL8VN/301	JE3NWQ/205	SM7FDO/302	K1KA/260	W2VT/182	K5FUV/286	WT6V/153	W8IQ/307	KØCS/315
DL9EM/226	JA4DBV/266	SM7HCW/306	K1NOK/282	K3RT/310	K5KYD/215	K7EG/315	W8PHZ/358	KØJFN/275
DL9EY/260	JA5AQC/317	SMØCMH/200	KA1X/252	K3YGU/180	W5AL/360	K7HRW/248	W8QBG/323	KØVV/301
EA1BC/348	JA5KT/308	SMØDBR/310	KC1AG/175	KC3AJ/289	W5EFA/314	KE7UL/281	W8QWI/336	KØYGT/313
EA1SQ/284	JA6VA/330	SP5EAQ/310	KF1J/206	KV3D/279	W5SL/250	KW7J/125	W8YA/334	KAØCDN/283
EA3GF/189	JH7DNO/313	UA2AO/338	KS1G/257	W3NQC/250	WB5LBJ/DU/309	NK7L/282	WA8OSE/305	KUØA/149
F8QB/279	JA8AQ/333	VE3IPR/312	N1CWA/216	W3YT/314	WB5MTV/201	W7CUS/262	AJ9D/313	NØXA/313
F9RM/352	JA9NLE/301	VE5FX/278	WA1FCN/263	AA4NJ/219	WB5WQG/311	W7HPI/263	K9FN/328	NXØI/261
G4MZF/W4/166	KH6BZF/299	VE6EJ/150	WA1JVV/125	K4FPF/195	WD5AAM/287	W7HS/239	K9JPI/177	WØIJR/283
HA8KVB/176	KH6CD/362	VE6WQ/317	WB1CNM/271	K4HJE/336	WD5EWP/181	W7HX/251	K9MNT/307	WØRI/334
HB9CDZ/255	LU4DMG/358	VE7DX/314	AA2X/156	K4JAG/260	AA6G/320	W7IYW/327	K9VQK/323	WØYVA/249
HB9CND/261	OE2DYL/284	WL7K/228	AI2S/152	K4RD/323	K6AXC/324	W7XN/305	K9XJ/328	WBØWRU/272
IK1HJS/249	OK1TA/335	YU2YM/321	K2BK/357	N4SF/316				

Radiotelephone

CP5LE/149	IØDUD/322	OE2DYL/283	VK9NS/300	K2BK/320	KD4GP/255	W5EFA/313	N7US/321	WA8SXM/225
CP8HD/265	IØER/303	OK1TA/325	WL7K/227	N2BJ/301	KK4HD/152	W5LVD/310	NK7L/281	WD8IPJ/279
DF2IS/227	IØZSG/198	OK2DB/300	ZL1BQD/295	N2CIC/280	KV4F/310	W5SL/191	NK7Y/250	K9FN/326
DL7HU/349	IØZYA/201	ON5NT/327	ZP5CF/358	NA2M/267	N4MAD/175	WB5LBJ/DU/309	W7HPI/263	K9JSK/177
DV3YU/162	JI1FJV/182	OZ3PZ/329	ZP5ZR/210	W2HTI/358	N4ONI/200	WB5TED/308	W7LZG/223	K9ZXG/199
EA5BYP/251	JE3NWQ/201	PY5EG/313	4X4IL/219	AC3T/150	W4BLB/274	WB5WQG/303	W7ZR/303	KC9YE/127
F3HU/233	JA4DBV/250	PY5WD/314	5N9GM/254	K3RT/277	W4BMJ/299	WD5AAM/287	WA7CYY/177	KD9NA/156
F9RM/352	JA5AQC/314	SM2EJE/281	9Y4VU/322	K3UA/316	W4FRU/309	WD5EWP/181	K8WWA/263	KD9RD/149
HKØHEU/303	JA5KT/254	SM7HCW/298	AA1V/308	KR3J/180	W4OTX/332	K6AXC/324	KB8DT/276	KS9R/289
I2BVG/321	JA6VA/289	SP5EAQ/310	AK1L/273	KZ3H/159	WA4ETN/178	K6HNZ/291	KC8NY/293	W9ZWH/304
I2JQ/309	JH7DNO/311	UA2AO/334	K1KA/144	N3FBN/175	WA4WTG/323	KM6B/320	N8DJS/194	KØBFR/141
I2WTY/311	JA9NLE/290	VE3IPR/312	K1NOK/271	NB3T/280	WC4B/229	W6HXW/319	N8HTT/204	KØIUC/315
IK2EGL/214	KH6BZF/296	VE5FQ/276	KA1X/264	AA4NJ/181	KA5SWC/151	W6WCA/200	NJ8N/278	KQØJ/275
I3NEN/229	LU1BR/328	VE6WQ/309	KC1AG/175	K4ADN/251	KC5QX/125	K7EG/280	W8QBG/318	KUØA/149
I4BAC/323	LU4DMG/358	VE7DX/309	KF1J/198	K4HJE/336	N5HBQ/155	KY7M/250	W8QWI/289	NXØI/252
I7KBI/315	LU5HN/301	VK2AGA/175	W1BIH/340	KC4BX/290	W5AL/310	N7BEK/152	WA8OSE/302	WØYNZ/317

CW

DL1SV/196	I2YWR/156	OK2DB/271	PY5WD/306	VK9NS/268	K2BK/266	AG4S/281	W5SL/210	N8GG/126
DL5FF/277	IK2EGL/147	ON5NT/315	SM6CMR/164	9Y4VU/281	W2VT/178	K4ZIN/132	KI6T/152	W8QWI/302
DL9EY/165	JG2CLS/138	OZ1FRR/300	SM7FDO/290	KA1X/178	KZ3H/177	WB4CSK/260	N6LHN/176	W8RT/309
EA6FD/275	JH2TPI/280	OZ1KAQ/157	SM7HCW/261	W1JR/307	K3UA/301	KC5M/264	W6SN/264	K9GX/292
HB9CDZ/252	JA3GM/309	OZ3Y/310	VE3IPR/266	WA1WTP/178	W3NB/125	W5AL/266	WA6IGU/226	KAØCDN/258
HB9CND/261	JA6VA/293	PA3CNI/150	VE6WQ/274	NA2M/250	AA4NJ/133	NQ5C/200	KS7P/217	WØIJR/257
HL4XM/129	OK1TA/302	PY4WA/157	VE7DX/251					

160 Meters

W2LPE/152

DXCC NOTES

Honor Roll Reminder: Those wanting to upgrade their standings or make Honor Roll must have their cards into HQ no later than March 31, 1988 to be listed.

Annual Listing Corrections

Mixed: K1DRN/341, W2AYJ/361, W2TA/320, WA2LMW/289, N3CSL/154, W3YX/325, K4WMB/318, KJ4BK/273, N4OM/317, W4FX/352, K8IP/335, KA8OUT/150, KS9Z/312, YV5BNR/282. Phone: KB2XP/260, W4CYJ/286, N6UC/334, K8IP/264, ZL3QN/331. CW: WB3DNA/132, W4CRI/206. 160 Meters: W2LZX/100.

Correspondence

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

HOW BIG IS THAT MEASUREMENT?

☐ Congratulations on an excellent article [in January *QST*, page 34] on the International System of Units entitled "Measurements—How Big Is That?"

The metric system is becoming more common in many areas of which the public is generally unaware, such as in the manufacture of automobiles, electronics, medicine and chemicals. It's too bad that the US can't decide whether or not to adopt the metric system for everyday use. The metric system is easier to use than the present system. The main obstacle is public resistance and apathy.—*Don Hillger, WDØGCK, Fort Collins, Colorado*

☐ Julian Macassey's article on the metric system in January *QST* was interesting, but it contained an error which I must point out. "Kilobucks" and "megabucks" are common today, but they were predated by the "centibuck" or "cent" which was derived from the Latin "centum," meaning hundred. Also, no mention was made of the unit "nanoflash," meaning a very short period of time.—*John D. Young, WA8KNE, Jacksonville, Florida*

THANKS!

☐ A big public "thank you" to a ham who went beyond the call of duty to help a person in trouble. Klissa Rueschhoff, KAØTXJ, of Lawrence, Kansas has demonstrated again to us that Amateur Radio operators are the most helpful and friendly people in the world.

While cruising down the Kansas Turnpike in September 1987 and chatting with Klissa on a local repeater in Lawrence, a tire on my camping trailer exploded. As luck would have it, this happened just past the last Lawrence exit with the next exit 26 miles down the road!

To make a long story short, Klissa not only arranged for a tow truck to come out and lift the trailer so that the tire could be changed, but also went out of her way to purchase a replacement tire and bring it to us on the highway, spending over an hour of her time to help us out of our predicament.

At a time like that, it is hard to express the appreciation you feel for an individual who will provide this kind of help, but hopefully this will let Klissa know how we feel.—*Hal Wilson, WB9FNN, Evansville, Indiana*

SLOW CW—FOR A REASON

☐ I recently received and devoured my first issue of *QST*. I receive *QST* in talking book form due to my blindness. In the December 1987 issue, there appeared a letter from James Buntain, W6VYM, who was complaining about the slowness of some people in their use of code. Although I am not yet licensed and am currently studying for my Novice ticket, I feel compelled to comment.

First of all, there are many people of retirement age who took and passed the code tests long ago. They, along with people who have physical disabilities, may not be able to attain their former speed. Also, if you do not use a language, it can get rusty. Make no mistake, Morse code is like any language. Would any of us care to take a test on a foreign language we learned in high school or college? We may have passed the test then, but how would we do now? We should all learn patience, because someday you may be the other guy whom you complain about now.—*John Levis, Rochester, New York*

TO BE DESTINATED?

☐ The December 1987 *QST* FM/RPT column provides reminders for any repeater user, but I was dismayed by the author's assertion that "destinated" is not a word and has no business being used in a QSO.

Virtually any dictionary will support the conclusion that a "word" is safely defined as a sound (or series of sounds) that convey meaning. By this definition, "destinated" certainly qualifies as a word. Whether we like to hear it or not, it does convey meaning in the context of a QSO when the operator identifies the fact that he has arrived at his destination. For the skeptics, however, I am pleased to report that a quick trip to the local library has shown that "destinated" is a legitimate word, and has been since the 15th century. The key point, however, is not whether or not a word appears in the dictionary, but whether or not one has the right to use it. It conveys a thought or idea rather effectively. Consider the words or phrases commonly encountered in our hobby that do not appear in a typical stock dictionary. Are they any less valid?—*Mike Pagel, KA9LAQ, Stevens Point, Wisconsin*

WE THE PEOPLE WAS—WORKING!

☐ I just could not send in my application for the "We The People" WAS [Worked All States] award without a few comments.

First of all, some awards appeal to me, but not all. This is an award which has special appeal because I feel that no group meets the spirit of "we the people" like ham radio. This is especially true when I look back on the contacts contained in my application.

I began with the attitude of making the contacts in a casual manner. I could have worked most of the states during the Sweepstakes or on nets. Instead, most were "rag chews" of 45 minutes or more. The contacts were with some very young and some very old "people" and, although the majority were with OMs, several QSOs were with YLs. A few sent QSLs or notes following the contacts. In short, this award will have a very special meaning to me because of the operator on the other end.—*Donald J. Simpson, W3EYF, Baltimore, Maryland*

QSL—THE EASY WAY

☐ I would like to comment on the letter from Kevin Biekert, KB5AQV [in January 1988 *QST*] concerning QSL practices. I have been hamming from North Dakota for the past 40 years and, on occasion, I do get requests for QSL cards.

First of all, I would like to compliment the ARRL on their outgoing QSL bureau. I worked a considerable amount of DX before this service was provided and the difference in my postage bill now pays for my membership dues many times over.

I have always had the practice of returning my QSL in the same way which I receive them. If it comes airmail, it goes back that way. If it comes as a postcard, it goes back that way. Naturally if postage is on the envelope, that's great! But what I appreciate even more than the postage is to have a return envelope or address sticker so that I don't have to copy the address from the incoming DX card. If you fill out 30 to 40 cards at a sitting, like one does after a contest, it can get rather exasperating. Also, if you don't get the card, it's probably because we erred in copying the address. That's why the bureau system is so nice—we don't have to worry about addresses at all!

It is also nice to have all the information on one side of the card and to have the month, day and year clearly identified with all times in UTC. If the card comes as a result of a contest in which sequential numbers are used, putting my number on your QSL makes things really easy!

I do QSL 100% on receipt of all cards. In 1980 I had 5000 cards printed of which there are 1500 left. If you can make it easier for us, we will appreciate it, and you will stand a much better chance of getting your contact confirmed.—*Art Ekblad, KØQQ, Minot, North Dakota*

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.

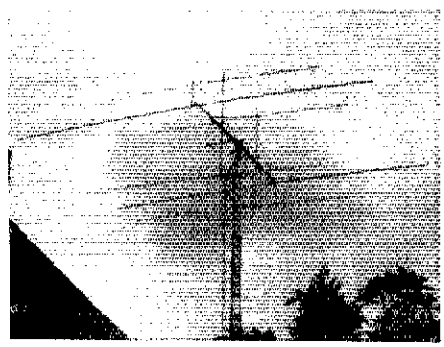
Another 6-meter Propagation Mode

Although the promise of F2 DX is definitely in the air, there are those who are not willing to wait for it. A rising group are equipping themselves to span great distances on 50 MHz at any time without depending on the ionosphere at all. They are using the technique that proved so viable on 2 meters and 70 cm and is increasingly finding converts on the higher bands as well. As I'm sure everyone has guessed, I am talking about moonbounce, or EME as it is popularly known.

The first 6-meter EME contact dates back to 1972 and the work of two groups, one working in the Tulsa, OK area and the other near Houston, TX. The group in Tulsa was comprised of W5WAX, now K5SW, and K5WVX, now K5CM. On the Houston end were WA5HNK and W5SXD. Both used what seemed then to be gigantic fixed arrays of eight 6-element Yagis and their skeds were run when the moon was within an hour or so of rising or setting, thus taking advantage of horizon gain. That work sparked some further interest, but not the swelling of EME activity that has taken place on 2 meters and 70 cm. Nevertheless, a few 6-meter moonbounce contacts were made over the years, with WB6NMT, W7FN and K6MYC being some of those most consistently involved.

The reasons for the failure of 6 meters to catch on as a moonbounce band are several. Most obvious is the size of the arrays needed. Also, exploitation of the mode on this band has always been assumed just "too hard." Contributing to this difficulty is the fact that cosmic noise is considerably higher at 50 MHz than at the higher frequencies. In addition, ionospheric propagation modes have been serving 6-meter aficionados quite well, so there is less impetus for most to go to the considerable effort required for successful EME. But thank goodness, ham spirit does not give up just because something is "too hard." There are a few in our ranks, and that number has been growing over the past year or so, who have accepted the challenge of 6-meter moonbounce with the same determination that drove the early climbers of Mount Everest—"because it is there!"

One of those who has been preparing for 6-meter EME for several years, and waiting for others to join him, is WA4NJP in Georgia. Ray has assembled an array of four 8-element Yagis and runs the legal limit. Most of the rest of the current crop of 6-meter moonbounce experimenters are Californians. Presently actively trying, with varying degrees of success, are K6MYC, K6HCP, W6JKV and K6QXY. Using only a single 11-element M Squared Yagi, albeit 50 feet long, K6MYC has been able to hear his own echoes on several occasions. To accomplish this, Mike, like the pioneers who demonstrated 6-meter moonbounce 16 years ago, takes advantage of horizon gain by working near moonset. K6QXY's attempts have been with four 10-element Yagis on 30-foot booms but a problem with phasing has blocked success so far. However, Bob is in the process of improving his system, replacing the present Yagis with the longer M Squared variety and correcting the phasing difficulty.



The 6- and 2-meter-EME-capable arrays at W6JKV. For 6 meters Jim uses two 11-element 50-foot-long M Squared Yagis mounted side by side. On 2 meters it's a quad array of 4 M Squared Yagis (33-foot boom). *(photo by W3XO)*

Meanwhile, W6JKV has caught the 6-meter EME bug in a big way. Interest in this phase of 6-meter DXing is not exactly new with Jim. Most will recall that he has made attempts at moonbounce during some of his DXpeditions. But this is his first try from his own QTH. For the effort, he has put up an array of two M Squared Yagis mounted side by side (see accompanying photo). A nonmetallic horizontal member prevents the undesirable disruption of the pattern one would normally expect from such an arrangement. In any case, the system works. Using only 600 W output he has already succeeded in working WA4NJP. This conductor had the pleasure of being present on Jim's first EME QSO. As is usually the case with moonbounce, signals were not what could be termed "loud," but they were audible all over the shack and were distinct enough to be recorded on the audio track of a videotape I made of the contact. Since that time, Jim has worked Ray on several more occasions. It's interesting to note that their contacts have come with both of their antenna arrays elevated above the horizon—so ground gain is not a necessity for successful 6-meter moonbounce.

Despite the fact that K6MYC has helped Jim with much of his installation, he wasn't about to let him get too far ahead. Mike managed to use a recent Hawaii vacation to extend the terrestrial distance covered via 6-meter moonbounce. Using a pair of 50-foot M Squared Yagis at his QTH on the Kona Coast of the Big Island, K6MYC has exchanged reports with WA4NJP. Again arrays at both ends of the path were aimed considerably above the horizon, so it's becoming clear that horizon gain is not a necessity.

The work done to date by these few pioneers has been just enough to demonstrate to the rest of us that 6-meter EME is doable. Hopefully, it will serve to pique the interest of many more who seek a new challenge. W6JKV is particularly intrigued by the prospect of being able to work distant stations on 6 meters without waiting for F2 or E_s propagation to favor the intended path. To further this desire, Jim promises something new and bigger in the way of an array. Keep tuned.

Are there other potential 6-meter EMErs out there? I would be especially interested in hearing any reports of activity or serious intention so that information can be passed along to the current active practitioners.

ON THE BANDS

6 Meters—Sporadic-E is the big story this month. Although we are accustomed to a spurt of E_s around the winter solstice, this year's mini-season seemed to be better than most. It even featured a number of excellent 2-meter openings. But more on that in the section to follow.

Propagation on 6 meters was outstanding, particularly during the week preceding Christmas. This conductor was alerted to the conditions at 2345Z Dec 18 by a phone call from W5NZS Oklahoma City who informed me that Central America stations, including YS1ECB and TI2HL, were in at his location. Usually tips like this from more southerly located stations do not lead to anything in this part of the country, but this time was different. A little listening revealed a Florida station on CW and a weak SSB signal with a familiar voice. This turned out to be XE1GE, who was finally worked at 0100Z Dec 19. It was nice to be able to say hello to Goeff again after several years. Many will recall that he was very active during the last solar peak. The next morning, W5FF near Albuquerque telephoned to report that he had experienced a great opening to Central America and the Caribbean that evening, including KP4s, a KP2 and a contact with HH7PV.

The band was open for the next few evenings before Christmas, seemingly better

70-cm Standings

For WAS holders, listings are WAS number, call, state, call areas worked and grids worked. For others, call, state, US states worked, call areas worked and grids worked. Call areas are the 10 US 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. Grids are those Maidenhead designators worked since the VUCC award was instituted Jan 1, 1983. Those not showing some indication of activity or interest within the past two years are subject to being dropped. They will be reinstated upon presentation, in writing, of a statement that they are still active on the band and wish to be listed in the 70-cm Standings. It is not necessary to have worked any new states or grids in order to remain listed or be reinstated. Compiled Jan 10, 1988. Updates for next listing must be at PO Box 117, Burtonsville, MD by July 5, 1988.

WAS Holders

1	WØYZS*	MO	—	—
2	K2UYH*†	NJ	55	—
3	K5JL*†	OK	48	—
4	WB5LUA*	TX	41	—
5	W5FF*†	NM	28	—
6	W1JR*†	MA	50	157
7	WØRAP*†	IA	42	190
8	WBØTEM*	IA	—	—
9	KAØY*	IA	—	—
10	WA4MVI*†	SC	26	—
11	K5FF*†	NM	29	—
12	DL9KR*†		55	202

K1FO*†	CT	46	44	206
W2SZ/1*	MA	29	12	79
K1PXE	CT	25	11	—
K1LPS*	VT	22	12	—
W1RIL	MA	14	8	33
AF1T	NH	14	8	—
W1EJ	NH	13	8	—
N1AIS	MA	11	5	—
KA1DHO	MA	9	4	11

W2VC	NJ	27	11	67
W2PGC	NY	24	10	45
WB2NPE	MJ	24	9	79
K2GK	NY	24	9	71
WA2FGK	NJ	22	9	—
WA2FUZ	NY	18	8	—
K2YCO	NY	17	8	—
N2BJ	NY	16	8	46
N2WK	NY	15	9	51
W3RUE	PA	30	11	59
W3IP	MD	28	10	57
WA3FYJ	PA	25	10	44
WB3LJK	MD	24	10	50
AE3T	PA	23	8	—
KB3QM	DE	23	—	54
K3HZO	MD	22	10	51
W3ZZ	MD	22	9	58
W3WFM	MD	21	9	60
WB2DNE/3	MD	17	8	51
KB3PD	DE	14	5	37
AC3T	DE	13	5	18
W3XO	MD	13	5	12
WA3DMF	MD	10	5	13
K4QIF*	VA	48	38	—
W5HUQ/4*†	FL	36	39	—
WB4NXY	KY	29	8	90
KC4EG	KY	28	8	65
WA4PCS	KY	27	9	—
W4FJ*	VA	25	8	—

W4ISS	GA	25	8	—
WA4CQG*	AL	25	8	—
WS4F	GA	23	8	61
WA4SBC	VA	21	7	46
K4QF	AL	21	—	—
N4VC	TN	20	5	54
WD4DGF	TN	15	6	29
WB4RUA	GA	15	4	31
K4KAE	SC	14	6	—
WA4OFS*	FL	13	11	53
WA4OWC	FL	11	—	—
KB4CRT	FL	9	2	31
WB4SLM	GA	9	2	31
WD4FAB	FL	9	—	25
KA4CRT	MS	8	2	16
WD4AHZ	FL	9	2	43
NA4I	GA	5	2	14
WØRRY/5*	OK	48	35	165
WB5AFY*	TX	42	33	158
W5RCI*	MS	36	14	118
K5UR	AR	28	9	137
K5SW	OK	27	9	108
W5HN	TX	26	8	62
WA5VJB	TX	22	7	—
KB5MR	OK	21	5	71
W5DFU	OK	20	8	62
WA5HNK*	TX	19	6	44
KE5EP	TX	19	—	75
W5ASH	TX	18	8	69
W5SXD	TX	17	5	36

K5JRH	TX	17	4	—
WA5DBY	TX	14	4	—
N5BBO	TX	12	3	58
W5UWB	TX	11	3	17
W5NZS	OK	6	—	50
W6ABN*		43	34	—
N6AMG*		9	16	—
K6JYO		9	6	—
K6QXY		4	3	—
WA6HXM		4	2	—
W4WD/7*	UT	38	33	—
W7JF*†	MT	34	25	—
W7HAH*	MT	25	20	42
K7ICW	NV	4	2	20
W8IDU*	MI	41	11	—
NI8O	OH	31	10	119
WB8BKC	MI	30	9	73
W8YIO	MI	30	9	67
WA8MIL	MI	20	9	55
WB9SNR	IL	34	11	77
W9ZIH	IL	33	11	—
WB9MSV	IL	25	8	92
NC9F	IL	20	9	51
W9YCV	WI	13	6	25
WØUC/9	WI	13	4	6
KB9NM	WI	9	3	—

KØTLM*†	MO	47	24	91
KØALL*	ND	35	17	—
WØPW*	CO	28	10	—
WØRT	KS	28	7	79
KØDAS	IA	26	7	—
WØFY	MO	24	8	46
WBØDRL	KS	21	6	74
WØOHU	MN	20	6	46
KCØQR	NE	18	8	80
WØJRP	MO	18	8	55
KCØOG	NE	18	6	56
KFØM	KS	16	5	60
WAØTKJ	KS	15	5	50
KØRZ*	CO	10	5	35
WBØDGF	NE	10	3	25
NØBTN	NE	6	3	19
KH6HME		2	2	6
VE1UT	NS	14	6	—
VE3LNX		21	10	65
VE4MA*†		45	43	—
G3SEK*		19	38	152

*Some contacts made via EME.
†WAC.
—Information not supplied.

each night. Even double-hop was in evidence on at least two of these occasions, with WA7KSF DM43, K7NN DM42 and N7AMA DM33 being worked between 0200 and 0230Z Dec 23. In addition, several 6s were heard including WA6PEV. The evening of the 24th (Zulu) brought extremely short skip with stations in southern New England, Ohio and Michigan putting in very loud signals here in the Washington, DC area. With the combination of short skip, loud signals and double-hop, it seemed more like June than December!

Another testifying to the outstanding nature of the December 6-meter conditions is WD4AFY Savannah, GA. Andy writes that he began to experience E_s starting the morning of the 12th when he worked into western New York and New England. That evening brought a string of upper Midwest stations. He is enthusiastic over the amount of fun that can be had on 6 meters with low power. He runs 15 W from a Microwave Modules transverter and a 3-element beam. Another echoing that sentiment is KB3PD Newark, DE. Rick notes that since last July he has worked a total of 26 states and 46 grids with nothing more than a barefoot IC-502. About half of these were with the quarter-wave whip on the unit and for the rest a dipole at 20 feet provided a little extra help.

There is good news from The Netherlands. From the RSGB's *VHF/UHF Newsletter* edited by G4ASR comes word that, beginning Mar 1 and running for five years, Dutch amateurs will be permitted to operate on 6 meters. There are limitations imposed on this authority. They are permitted CW only and can operate between 50.00 and 50.45 using no more than 30 W output. Unlike the UK, in Holland there is no restriction as to ERP. However, because 6-meter operation is on noninterference basis, the Dutch National Society, VERON, is recommending the use of low-gain antennas. This means that yet another European country and a new group of enthusiastic operators will be around to make life on 6 meters even more lively next summer than it was last.

Another news item arrives via a UK publication, this time G8VR's column entitled VHF/UHF which appears in the RSGB's monthly magazine *Radio Communication*. One of Ken's recent columns includes information concerning a new 6-meter operation on Ascension Island in the South Atlantic. The word is that G4MAB is currently assigned to the island and will be operating on 6 meters as ZD8MB. His plans include establishment of a beacon on 50.032. More details as they are received.

At press time, W5UWB reports an opening Jan 6 between 2120 and 2300Z to Colombia. Worked were HK5K, HK5T and HK8GR. John says that this was his first opening to that area since October. Apparently conditions are perking up in the Far East as well. JA1VOK writes that December 26 brought strong 53.74-MHz TV audio and 48.24-MHz TV video from West Malaysia as well as 48.25 video from East Malaysia. Hat also received 48.25-MHz TV on New Year's Day. On Jan 3, he heard Australian 46-MHz TV video but nothing of the audio at 51.7 MHz. No 6-meter amateurs were heard on any of these occasions.

2 Meters—The sporadic-E that was so much in evidence on 6 meters also visited 2 meters more than we are accustomed to for a winter season. Other years have produced very short scattered openings, but this year they were considerably more numerous and widespread. What also seems like somewhat of a departure from the norm, this winter's openings tended to favor the western states, including the Pacific Northwest. WA7VHW Spokane, WA reported a short two-minute opening to the Phoenix area on Dec 1 in which he worked three stations. But, that was just a prelude to what was going to happen December 14. Don says that, beginning at 2325Z and lasting for almost the next two hours, he made 12 contacts in seven grids in Arizona, Nevada and Southern California. WA7LNQ Seattle reports the same opening, lasting for him from 0030 to 0110Z and resulting in 15 contacts in Arizona and Southern California. Five days later, on Dec 19, WB7SLY reports that he and several other Phoenix and Tucson stations worked XE2GSA and XE2SSZ, both near Agua Caliente, Mexico. Gary fesses up to the fact that, although they were on 144.2, he and the others had to resort to FM in order to complete the contacts. Extreme measures are sometimes justified.

W5UWB Kingsville, TX reports two openings quite unusual for the time of year. The first occurred that same Dec 19 evening. Although for him it lasted only 10 minutes, beginning at 2338Z, and produced just five contacts, one of them was with K5WXN El Paso just 600 miles away—very short skip for 2 meters any time of the year. John's other four QSOs that night were with Arizona stations AA7A, W7RV, WA7YWN and WA7GSF. W5UWB's second unusual opening for this time of the year occurred between 0300 and 0310Z Dec 23 while 6 meters was wide open to the northeast, north and northwest. Worked were Florida stations WD4AHZ and N4MZ with John's beam set at 60 degrees rather than direct-path 90-degree direction. This appears to be the type of propagation referred to by many as "FAI." That same evening, at 0243Z, KF4FL Johnson City, TN reports that he and WA4MJD worked W5FF during a very short weak opening.

FM/RPT

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

How to Reduce Your Repeater Telephone Bill

This month's FM/RPT describes how a group of amateurs was able to work cooperatively with their local telephone company to reach an agreement for a noncommercial rate on their repeaters' autopatch facilities. Perhaps you too may be able to reach an understanding with your local telephone company using the benefit of their experience.

The cost of operating a ham repeater is not cheap and when a chance to save money comes along, it is appreciated. Recently, Southwestern Bell amended its criteria for classifying the type of service it charges (commercial versus residential) for Amateur Radio repeater phone lines. If a repeater meets the new guidelines, the telephone company must charge the residential rate, which is approximately half the commercial rate. This action was the result of efforts by several groups and persons in Texas trying to get what they felt was the fair and proper rate.

Noncommercial Criteria

Initially, Gene Demuth, W5FJD, of Fredericksburg, obtained a favorable ruling from the Texas Public Utilities Commission (PUC) requiring General Telephone (GTE) to charge him the residential rate. Following that, the Big Spring Amateur Radio Club asked Southwestern Bell Telephone to lower their rate. Southwestern Bell checked with the PUC and agreed to lower the rate provided the repeater was neither in a commercially zoned area nor shared a location with a commercial service. The Big Spring ARC repeater is located out of town and had no other phone service in the building; thus, it qualified for the R-1 rate. In addition to obtaining the lower rate, the telephone company refunded the club more than $1000 in past overcharges.

In October, the Snyder ARC moved their 2-meter repeater to a new tower. Previously, they shared a telephone line at the old tower. Paul Gilbert, KE5ZW, the repeater trustee, while obtaining the new telephone line, addressed the previous cases to the telephone company customer representatives. After much discussion, he was informed that the Snyder ARC repeater was not eligible for the R-1 rate because the tower was inside the city limits and other commercial telephone circuits came into the building where the repeater was located. That decision seemed unfair because many ham repeaters are located in areas that would not allow them to meet this R-1 rate criteria.

FCC Rules and Regulations to the Rescue!

KE5ZW obtained the name of the Southwestern Bell manager who had been involved with the Snyder ARC dealings and opened discussions with her. The telephone company argued that when a telephone line came into a commercial area, it might be used for commercial purposes, so the commercial rate must apply. In response, Paul cited FCC Rule 97.110 prohibiting business communications via Amateur Radio. He argued that since the Amateur Radio Service was not permitted to conduct business, the FCC rules superseded telephone company guidelines and, as a result, the repeater telephone line qualified for the R-1 rate. Paul contended that as long as the telephone line was used for Amateur Radio phone patching, the R-1 rate must apply.

After additional discussion, the telephone company manager agreed to research the matter. Two days later, the manager called KE5ZW and announced that the PUC guidelines had been changed. Stressing that each Amateur Radio use would be determined on an individual basis, the telephone company changed its guidelines and required that the telephone line could be used only for Amateur Radio, that no advertising or business functions would be performed and that the telephone line would not be located in a public place. According to these guidelines, the Snyder ARC repeater qualified for the R-1 rate (their telephone line was new and the first month's bill had not even been paid, so they would not get any refund for overcharges).

Meanwhile, the Caprock Repeater Club of Lubbock, through its representative, Don Mosher, WB5BRY, was also trying to get a lower rate. Don had been talking to the telephone company at the same time as KE5ZW and he too was successful in getting the R-1 rate under the new policy guidelines. In addition to the new lower rate, the Caprock Repeater Club received a $2002 refund for 17 years of overcharges!

These victories once again strengthen Amateur Radio's stance that it is for noncommercial emergency use and that federal regulations are a tool against unfair local rules and charges. If the telephone company is charging a commercial rate for your club or personal repeater, and the public utilities guidelines in your state are similar to those in Texas, contact the telephone company to apply for the lower residential rate. If the guidelines are different, then contact your public utilities board or commission because it is unfair to be charged for something one is prohibited by law from doing; that is, conducting business on Amateur Radio.

(Anyone wishing more information on this matter may contact Paul Gilbert, KE5ZW, 210-38th St, Snyder, TX 79549, tel 915-573-2163.)

WESTERN PENNSYLVANIA HAS NEW FREQUENCY COORDINATOR

The new coordinator for the Western Pennsylvania Repeater Council is, and all correspondence to the council should be sent to Joseph A. McElhaney, KR3P, 319 Mount Vernon Dr, Apollo, PA 15613.

MICHIGAN'S UPPER PENINSULA HAS ITS OWN FREQUENCY COORDINATOR

An agreement has been reached between the Michigan Area Repeater Council (MARC) and the newly revived Upper Peninsula Amateur Radio Repeater Association (UPARRA).

Michigan coordination is now perfomed by both groups, with MARC handling all frequency coordinations for lower Michigan and UPARRA handling them for the Upper Peninsula of Michigan.

The address for UPARRA is Box 218, Alpha, MI 49908. The address for MARC is: (all bands except 220 and 440 MHz) PO Box 1572, Ann Arbor, MI 48106; 220- and 440-MHz correspondence should be sent to MARC, c/o Len Todd, N8AGS, A-6389 140th Ave, Holland, MI 49423.

REPEATER LOG

According to November 1987 reports received, repeaters were involved in the following public-service events: 302 vehicular emergencies, 23 medical emergencies, 13 fire emergencies, 6 criminal activities, 5 drills/alerts, 4 public-safety events, 3 power failures and 2 weather emergencies.

The following repeaters were involved (followed by the number of events): W2VL 41, W3LIF 7, K5OS 6, WA6BJY 11, WD6DIH 62, KA6EEK 55, N6ME 151, K8DDG 10, K9LSB 13, N9RM 2.

On Line

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

Have Computer, Will Contest

One of the advantages that computers provide for contest operators was discussed last time; I focused on the use of packet-radio software for contest spotting net operations. This time, the discussion continues with a look at some of the latest software offerings that ease the burdens of contest logging, duping and reporting.

Competing and Scoring with an IBM PC

The proliferation of the IBM® PC and inexpensive PC-compatible computers is being felt in the Amateur Radio world as more and more PC-specific software becomes available. One of the earliest producers of Amateur Radio software for the IBM PC was MJC Technologies (3704½ Foothill Blvd, Suite 524, La Crescenta, CA 91214, tel 818-957-3277). Initially, MJC offered SCORE, a contesting program for ARRL Sweepstakes; recently, the company added KOMPETE for the ARRL International DX Contest.

Both SCORE and KOMPETE allow the contest operator to automatically control a Kenwood TS-940S, TS-440S or Heath SS-9000 transceiver and a Pro-Search antenna rotator in the midst of other contesting operations such as logging and duping. (SCORE was described in the July 1986 and January 1987 installments of On Line, so the rest of this description is devoted to the newcomer KOMPETE.)

KOMPETE features quick duping (generally less than a second) and automatic country identification (or state and province identification for DX contest operators) based on call sign. In addition, the program provides automatic local or UTC date and time recording, on-line help, extensive user-definable configuration and preference settings, and contest log, status and analysis report generation.

Eight windows, activated with the computer's function keys, provide for entry of new contacts, display of the contest status, control of transceiver and antenna rotator, display of the last five entries, display of countries' status (with those that need to be worked highlighted), display of contacts and multipliers per band and display of a specified station or contact number in the log (for editing, if necessary). Ten memory registers are provided in the log entry and transceiver control windows for saving contact exchanges and transceiver information for future recall when needed.

Commodore 64™ Real-Time Contesting

The Commodore 64 is still one of the most popular computers in Amateur Radio. There is an extensive line of ham radio software available for the C64, including some fine contest programs.

As its name implies, Contester III is the third generation of Commodore 64 contesting software from Winner's Edge Software (2003 Sarazen Pl, Reston, VA 22091, tel 703-620-3776), and each generation is a marked improvement over its predecessor. The basic Contester III is an all-purpose contest program. In addition, contest-specific modules are available for ARRL International DX, ARRL Sweepstakes, CQ World Wide DX and CQ WPX contests.

Duping, logging, running score and multiplier tracking are provided at all times during a contest. Up to 2200 contacts per band on as many as six bands (memory permitting) may be recorded, with 1200 contacts saved on each diskette (diskette swapping is handled under program control). Additional statistics are also available on screen; the program can report total number of contacts per contest and per band, total number of multipliers per contest and per band, points per contact, points per multiplier, contacts per hour and other timing information.

For CW contesting, a maximum of 21 user-programmed messages may be sent from the computer. The messages may include automatic serial numbering and insertion of call signs, but this option requires the addition of a simple CW interface circuit. CW speeds between 5 and 55 WPM are supported.

After the contest, the program prints a log (by band, if required), a sorted dupe sheet, a sorted multiplier check sheet and QSL card labels. To protect against power failures, the program has automatic backup and program recovery after power is restored.

Post-Contest Log Preparation

Clarke Greene, K1JX, wrote the Contests chapter of *The ARRL Operating Manual*. Clarke included program listings (in Microsoft™ BASIC) for post-contest logging and duping of the ARRL International DX, ARRL Sweepstakes, ARRL VHF, CQ World Wide DX, CQ WPX VHF and IARU HF Championship contests. Complete program listings are provided to allow you to type the programs into your computer. To save time, the programs are available on disk for $5 directly from K1JX (92B2 Cynthia Ln, Middletown, CT 06457). Also, the programs are available for downloading from CompuServe's HamNet.

NEW LITERATURE

☐ *RTTY Awards*—The British Amateur Radio Teleprinter Group (BARTG) has recently published a new book, *RTTY Awards*, written by Ted Double, G8CDW. In its 80 pages, the book describes over 60 international RTTY awards including illustrations of a number of award certificates. The book states, "With the tremendous increase in the number of people actively using RTTY and other modes of data communications, it has become apparent that there is a general lack of information on the range of operating awards available and it is the aim of this book to give an insight into this aspect of the hobby." The book is available from Mr J. Beedie, GW6MOK, BARTG Components Manager, Ffynnonlas, Salem, Llandeilo SA19 7NP, Wales, and is recommended for anyone chasing green-keyed wallpaper.

☐ *QZX* Index—A 60-page index of all of the articles and programs that have appeared in *QZX* since December 1982 has recently been published. The index for *QZX*, "the journal covering Amateur Radio and Sinclair computers," is available for $5 (plus $1 for shipping and handling) from *QZX*, 2025 O'Donnell, Las Cruces, NM 88001.

PX: Project Mac Update

Project Mac has been an overwhelming success. After the project was announced in November *QST*, Amateur Radio software for the Apple® Macintosh computer poured in here for the following two months. As a result, there now is a cornucopia of software for the rest of us, including a ham-radio Hypercard stack that was provided by Ted Tripp, KGØRI.

If anyone is interested in obtaining a copy of the Project Mac software, send me (WA1LOU, not ARRL Headquarters) one 800k or two 400k formatted 3½-inch Macintosh diskettes with a sturdy SASE and include at least 56 cents postage for one diskette or 73 cents postage for two diskettes.

FRIENDS OF AMIGA MEET ON THE AIR

The AmigaNet meets every Tuesday evening at 2300Z on 3882 kHz (plus or minus interference). Net Control Doug Frie, NG2G, calls together all hams to exchange ideas about the Commodore Amiga computer. —*Kathy Wehr, WB3KRN*

HELP WANTED

I would like to get in touch with...

- anyone with a source for top-quality contest logging and duping software for my IBM PC clone. Bill Mullin, AA4M, 3042 Larkin Pl, San Diego, CA 92123.
- anyone with a source for ham-radio software for my Morrow CP/M® computer. Jim Garry, W2UKJ, 36-05 218th St, Bayside, NY 11361.
- anyone with information on how to interface a Flesher TU-170 to the RS-232 port of a Tandy® 1000 SX computer. Charles Bisceglia, KF4PC, 5 Par Harbor, Salem, SC 29676.

The New Frontier

Conducted By Bob Atkins, KA1GT
103 Division Ave, Millington, NJ 07946

More on the 1296-MHz Transverter

In last month's column, I discussed alternatives for local oscillator (LO) circuits for use in 1296-MHz transverters, and interdigital mixer/multiplier details for the same application. A schematic diagram of the transverter circuit, including the matching network used between the LO and the mixer, as well as the MMIC gain block, were also presented. This month, I'll cover particulars of the MMIC gain block, and matching network adjustment. But first, a couple of items in last month's column need some clarification. The matching network shown in Fig 1 of that column should be built so that its output *directly feeds* the multiplier diode in the interdigital mixer. The network and multiplier/mixer should *not* be connected via coaxial cable, as the drawing shows. Also, to avoid potential confusion, the small-value feedthrough capacitor that connects the matching network to the multiplier diode should be labeled as an *insulated* feedthrough.

The MMIC gain block may be used on transmit and receive. I used a three-stage unit, each stage using an MSA-0404. This gives a gain of about 23 dB at 1296 MHz, and should give gains of around 20 dB at 2304 MHz and 15 dB at 3456 MHz. The 1296-MHz noise figure should be around 6 dB. The reason for using MSA-0404 units throughout is to obtain the flattest possible frequency response so the unit can be used on all three bands. Using the "high power" MMIC also helps to minimize intermodulation products. Power output at 1296 MHz at the 1-dB compression point is 20 to 25 mW. I will not go into detail here on the construction of MMIC amplifiers, since I covered that subject in the January 1986 column. Al Ward, WB5LUA, also discussed this in "Monolithic Microwave Integrated Circuits" in February and March 1987 *QST*.

The matching network shown last month in Fig 1 requires careful adjustment to obtain good harmonic generation from the multiplier diode, and hence adequate mixer-diode current. To adjust this network, connect a milliammeter to the output of the mixer diode via an RF choke. The matching circuit is then adjusted for maximum mixer-diode current, which can be up to 10 mA with 100 mW of drive. This corresponds to about 10 mW of output at 1440 MHz. The multiplier tuning screw will also have to be adjusted for peak mixer current. It may help to initially use a very sensitive meter to measure mixer current, then switch to a higher-current meter once the circuits are preliminarily aligned.

On transmit, about 0.5 mW of signal at 144 MHz is sufficient to give around 20 mW output from the MMIC gain block. The output of a 10-W 2-meter rig must be attenuated by about 43 dB to drive the gain block. If small changes in the 144-MHz input signal do not produce corresponding changes in the 1296-MHz output signal, then the system is operating in compression and the input power should be reduced. *The ARRL Handbook* describes the construction of attenuators (1988 edition, p 25-43). On receive, a low-noise IF amplifier at 144 MHz is desirable. There are many such designs in print; again, *The ARRL Handbook* or *RSGB VHF/UHF Manual* are good sources.

The output of the transverter contains a number of unwanted signals (LO feedthrough, intermodulation products, and so on) which are best removed with an external filter such as the one described in *The ARRL Handbook* (1988 edition, p 32-23). This is a three-pole interdigital filter, and will reduce spurious signals to about −50 dBc (50 dB below the carrier signal). Without this filter, spurious signals were present at about −30 dBc.

The transverter puts out a clean signal. I manually switch the system from transmit to receive and back, which is practical, but rather inconvenient. A series of RF relays or PIN diode switches would perform this function much more conveniently. One final point: All the subassemblies (LO source, MMIC gain block, matching network and IF amplifier) should be contained in shielded enclosures if the transverter output is to be as spectrally clean as possible. The MMIC gain block has gain from a few MHz through 4 GHz, so any spurious RF signals that get into it will be amplified.

NEW FRONTIER INDEX

This index covers the contents of this column from its debut in October 1980 through December 1987. The subjects are indexed in four main groups: *construction* articles that deal with the building of equipment; *tutorial* articles that explain an aspect of microwave technology in some detail; *informational* articles (usually these are short items about a particular topic); and *operational* articles that deal mainly with microwave activity reports. Some items may appear in more than one category.

(continued on page 76)

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
500 Riverside Dr, London, ON N6H 2R7
Tel 519-473-1668

The Canadian Amateur Call Directory

By now, you and most other Canadian amateurs have received a mailing from the *Canadian Amateur Call Directory*, which, for the present at least, is being sponsored by CRRL. That mailing explained that, because of the *Canada Privacy Act*, DOC has ruled that names and addresses of Canadian amateurs will no longer be available from them. With this change, listings of Canadian amateurs in all present callbooks will now deteriorate, making it difficult to forward QSL cards and to identify the location of Canadian amateurs heard on the air.

The mailing left more than a few amateurs scratching their heads and wondering: (1) if the names and addresses of Canadian amateurs were no longer available from DOC, how did the *Directory* people get their names and addresses?, and (2) if the *Directory* people had their names and addresses for the mailing, why didn't they just use those? The answers are: (1) that the names and addresses did not come from DOC but from an outside source (not the most up-to-date listing, but the best that was available), and (2) that the names and addresses were made available only on condition that they would not be copied, but would go directly to the company that prepared the mailing and not to the *Canadian Amateur Call Directory* or to CRRL.

It is important that as many Canadian amateurs as possible complete the information cards included with the mailing. Information from these cards will be cross-referenced with information from other listings of Canadian amateurs: listings in old callbooks, listings produced by clubs and provincial amateur radio societies, and CRRL's own database. However, if every Canadian amateur would submit an information card, it would not only make life easier for the people compiling the *Directory*, but would result in a *Directory* that is close to 100% accurate and complete.

Please talk it up at your local club meeting or on the air. Also, hope that CRRL, which has asked DOC to review its ruling in the light of the *Access to Information Act*, is successful in getting DOC to make its own listing available again. That would ensure the success of the *Directory* project.

Dick Maguire, VE4HK (left), receives the 1986-87 OSCAR (Outstanding Service Concerning Amateur Radio) from Winnipeg ARC President Bill Karle, VE4KZ. Dick was recognized for his work in organizing communications for the annual Manitoba Marathon and during the aftermath of the Edmonton Tornado. (*VE4YU photo*)

RSGB 1988 COMMONWEALTH CONTEST

This year, CRRL's sister-society, RSGB, is celebrating its 75th Anniversary. That makes it particularly appropriate for Canadian amateurs to join in the fun in this year's RSGB Commonwealth Contest. (To our US readers: Sorry, but you can't participate. You opted out in 1776, hi.) Here are the rules:

1) General rules for RSGB HF contests, published in the 1987 January *Radio Communication* will apply.
2) *When:* 1988 March 12 1200 UTC until 1988 March 13 1200 UTC.
3) *Sections:* Single-operator entries only from RSGB members in the UK and licensed radio amateurs within the British Commonwealth, including British Mandated Territories. Entries may be single-band or multi-band. Single-band entries submit separate logs for each band. Multi-band entries will not be eligible for single-band awards.
4) *Bands and Modes:* A1A (CW) only in the 3.5, 7, 14, 21 and 28-MHz bands. Please operate on the low 30 kHz of each band except when contacting Novice stations in their own sub-bands.
5) *Contacts and Exchange:* Contacts may be with any station using a British Commonwealth or British Mandated Territory call sign except those within the entrant's own call area. (Note: VE1-8, VO1-2 and VY1 are all considered separate call areas.) Exchange consists of RST and a three-figure serial number beginning with 001. Serial numbers from noncompeting stations must be recorded.
6) *Scoring:* Each contact counts for 5 points. 20 bonus points may be claimed for the first three contacts with a Commonwealth call area on each band. (Note: a list of the 112 call areas for this contest is available from CRRL.) British Isles counts as one call area regardless of prefix (G, GB, GD, GI, GJ, GM, GU and GW) except that special-event station GB5CC will count as a separate call area.
7) *Documentation:* For each contact, log must show time, call sign of station worked, RST and serial number sent, RST and serial number received and points claimed. Please check logs for duplicate contacts. Unmarked duplicates will be penalized 10 times the number of points claimed for the contact. Logs containing six or more duplicates will normally be disqualified. Include a signed declaration that you operated within the terms of your licence and that you observed the rules and spirit of the contest.
8) Send logs to RSGB HF Contest Committee, Box 73, Lichfield, Staffs WS13 6UJ, England, so as to arrive by 1988 April 11.
9) *Awards:* Winner—Senior Rose Bowl; runner-up—Junior Rose Bowl; Certificates of Merit to the first, second and third-place operators in UK and overseas multi-band, the leading UK and overseas single-band operator for each band, and the leading station in each Commonwealth call area.

(continued on page 75)

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

ROARS Celebrates an Anniversary

The Royal Omani Amateur Radio Society may not have been established for as long as some other members of IARU, but it is *well* established, and does it ever have an abundance of enthusiasm! That enthusiasm manifests itself in a number of ways. His Royal Majesty Sultan Qaboos bin Said, A4XAA, is patron of the society. His Excellency Ahmed bin Suwaiden Al-Balushi, A4XFK, Minister of Posts, Telegraphs & Telephones, is president of the society. The 200-member society has a headquarters building that rivals many a larger society in size and facilities. ROARS has an Amateur Radio camp on the outskirts of Muscat, and it was here that a number of Amateur Radio stations were set up to operate nonstop during the period of the celebration of the 15th anniversary of ROARS in November 1987.

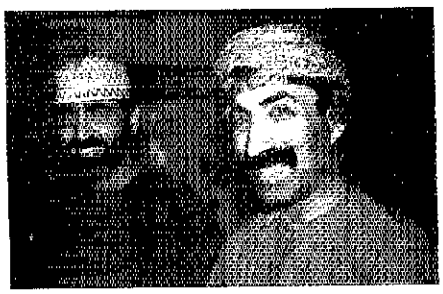
The 15th anniversary was attended not only by Omanis and expatriates stationed in the area but also by a number of foreign guests from Jordan, Pakistan, Kuwait and the United Arab Emirates. In addition, IARU was represented by its president W1RU, by Region 1 secretary G3FKM and by Region 3 chairman 9V1RH. There were a number of formal meetings, with speeches and the usual ceremonies, and A4XXV, at the radio camp, worked several thousand stations and well over 100 countries.

The enthusiasm of ROARS is a reflection of the mood of the country. Located on the Persian Gulf, Oman is a country which two decades ago had less than 10 miles of paved roads. Now, it has mile after mile after mile of concrete multilane highways, modern office buildings and hotels, universities, social programs, excellent communications and all the other favorable trappings of a modern country. And yet, with all of these modern aspects, the country retains its age-old traditions and customs and its charm.

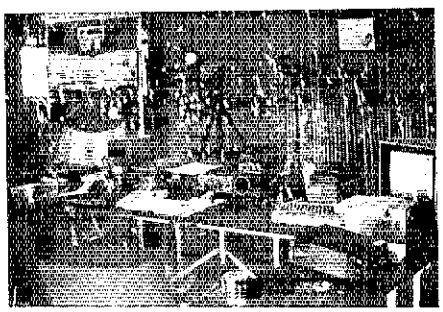
ROARS has achieved a great deal in its relatively short history and is to be congratulated for its fine organization and infectious enthusiasm. Those of us who had the privilege of visiting Oman this past November are also grateful for the many courtesies extended to us, particularly by ROARS Chairman Abdi Razak Al-Shahwarzi, A4XJT, who, we think, spent at least 26 hours each day keeping things running smoothly.

The entrance to one of the buildings at the Amateur Radio camp where A4XXV was operated. That's a photograph of His Royal Majesty the Sultan, A4XAA, with Abdi, A4XJT at the right.

At a typical Omani luncheon, huge platters of food are placed on the carpets, and everyone kneels or sits and helps himself—no individual plates or knives and forks (or chopsticks) are used. The food is plentiful and delicious.



ROARS Chairman A4XJT and His Excellency ROARS President A4XFK.



This is one of the several operating positions at A4XXV. QSOs were made on 160 through 10 meters, using CW, SSB, RTTY and SSTV.

Mini Directory

As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in *QST*.

Advisory Committee Members	Jun 1987, p 51
Club Contest Rules	Jan 1988, p 86
Considerate Operator's Frequency Guide	Jan 1988, p 13
Constitution Bicentennial WAS	Sep 1987, p 14
DX Contest Awards Program	Feb 1988, p 86
Element 2 Question Pool, New and Revised Questions, Answers	Apr 1987, p 23
Frequency/Mode Allocations	Jan 1988, p 77
Hamfest Calendar Rules	Sep 1986, p 84
Landline BBSs	Oct 1987, p 56
License-Renewal Information	Jan 1988, p 77
Major ARRL Operating Events and Conventions—1988	Jan 1988, p 78
Novice Enhancement Report and Order	Apr 1987, p 64
Packet-Radio Frequency Recommendations:	
Below 225 MHz	Sep 1987, p 54
Above 225 MHz	This issue, p 51
QSL Bureaus	
Incoming	Dec 1987, p 56
Outgoing	This issue, p 59
Reciprocal-Operating Agreements	This issue, p 55
Tech and General Written Exams	Apr 1987, p 29
Third-Party-Traffic Agreements	This issue, p 55
VUCC Annual Listing	Dec 1987, p 68
What is Amateur Radio?	This issue, p 26
220-MHz Band NPRM	Apr 1987, p 16

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

1988-1989 YLRL Officers

President, NM7N: Mary Lou Brown, former professor and department chairperson of the Physical Education Department, University of California, is an avid QRP and CW operator who has earned certificates for

DXCC/QRP, WAC/QRP and WAS/QRP. Mary Lou was first licensed in 1981 and received her Extra Class call in 1985. She brings to her new office the experience of being YLRL's Vice President and the Receiving Treasurer for District 5-7. When she is not bird watching, gardening, hiking, fishing and tending to canine friends Sadie and Fred, Mary Lou chases DX, and joins up with friends on YL Open House and the Tangle Net. NM7N is a member of MINOW, the Washington Emergency Net and her county RACES/ARES net, and was recently appointed EC for Skagit county.

Vice President, WI4K: Carol Shrader moved to her new office from being YLRL's Secretary, 4th District Chairperson and Chairperson of the Nominating Committee. Formerly from Atlanta, where she was treasurer of the

Southeastern DX Club, Carol was honored by being the first YL selected to life membership in SEDXC. She was charter president of the Metro Atlanta Ladies Amateur Radio Club and is currently a member of the VA Beach ARC, VA DX Century Club, Atlanta RC and the Dixie DXers Contest Club. WI4K is an experienced DXer and contester who has 5BDXCC, 5BWAS, WAZ, WPX Honor Roll, WAS/YL, WAC/YL, DX/YL and YLCC. An accomplished pianist and flutist, Carol is a member of her church affiliation's orchestra.

Secretary, KA6SOC: Sue Ludemann, formerly YLRL's treasurer, is a CW op with an Extra Class license who enjoys the activities of the Tangle Net, YL Open House and YL Round Table. Sue is a member of the California Division of Forest emergency communi-

cations network as well as a chairperson of the Berkeley-West Contra Costa Chapter Disaster Action Team and chairperson of the Damage Assessment Group. She presides over BAYLARC and is a member of DLYL, WARO, JLRS and the East Bay Radio Club.

Disbursing Treasurer, KK5L: Carol Noack was first licensed in 1977 and since upgrading to Extra has become a Volunteer Examiner with the Golden Triangle VEC. In 1987 Carol served as YLRL's 5th District Chairperson as well as TYLRUN's Secretary/Treasurer. She is a member of YLISSB, 10-10 International and Army MARS, and holds DX membership in JLRS, ALARA and BYLARA. Carol served as Jefferson County (Texas) ARC's

tary/Treasurer during 1981, 1983 and 1985 through 1987.

Receiving Treasurer, Districts 1-4, WA2BGE: Jean Chittenden is well known in a variety of Amateur Radio capacities. She has twice served as YLRL's Receiving Treasurer, was president of SAYLARC four terms, presi-

dent of Larkfield's ARC and a three-term director of LIMARC. She traveled to the People's Republic of China with W6AM and W6GC in 1980 and returned to give lectures on her trip. She is a VE and OO, and belongs to ARES and RACES. Jean is a member of YLISSB, SAYLARC, WRONE, CHARA, the Buckeye Belles, LIDXA, NCDXF and IDXF.

Receiving Treasurer, Districts 5-7, KU7F: Flo Reitzel has been a member of YLRL since 1979 and currently serves as custodian of the

YLCC certificate records. Flo, first licensed in 1979, has held her Extra Class license since 1982. She is an active member of YLISSB where she served as Vice President. Flo is a member of MINOW and has been the organization's Secretary/Treasurer. She also holds membership in WARO, JLRS and MARAC, and is an alternate Net Control for the Washington Amateur Radio Traffic System (WARTS). Flo is proud of her USA-CA 466, and is the first YL to work all New Zealand counties.

Receiving Treasurer, Districts 8-0, VE and US possessions, KC7ET/9: Evelyn Cavallo joins YLRL's officers for the first time since she became a member in 1980. Before moving to Illinois, Evelyn was an active amateur in

Douglas, Arizona where she established the first YLRL booth at the Sierra Vista Hamfest. Evelyn was instrumental in helping YLs in her area to enter Amateur Radio as well as bringing her hobby to schoolchildren through her many science class presentations. KC7ET participates in YL Open House and Tangle Net, and is a member of the Illinois VE Program.

1987 East Meets West SSB Contest Results

Sponsored by YLRL

1st Place:	N2EVZ	19*	WA2NFY	11
2nd Place:	WAØUMB/3	16*	WD8IKC	11
3rd Place:	WB3FUR	16*	N7APJ	10
	W6QGX	13	J87CD	9
	NV5R	11	NM7N	9
			(check	log)

Coming Conventions

HUDSON DIVISION CONVENTION

March 13, 1988, Valhalla, New York

The Westchester Community College '88 convention/hamfest, jointly sponsored by Hudson ARC/Westchester Emergency Communications Assn. Forums, workshops, giant flea market, FCC exams and more. Admission $4 at the door. *Talk-in:* 147.66/06, 146.31/91, 222.80/4.40. Exhibitor information, contact Bob or Sarah Wilson, 914-997-8491. For other information contact Rich Moseson, NW2L, "The Great 88," 19 Linden Ave, Bloomfield, NJ 07003, tel 201-680-8017.

KENTUCKY STATE CONVENTION

March 26, 1988, Elizabethtown

The Lincoln Trail Amateur Radio Club is sponsoring the 1988 Kentucky State Convention at Pritchard Community Center, off Hwy 62 west side of town. Admission in advance $4, at the door $5. Time is 7 AM to 4:30 PM. Talk-in is on 146.52 simplex and 146.38/98. Features include food, forums, flea market, dealers, VEC testing. Applicant must have original license, copy and two forms of ID. For more information contact Chuck Strain, tel 502-351-1715.

NEBRASKA STATE CONVENTION

March 12-13, 1988, Kearney

The Midway Amateur Radio Club will host the 12th Annual Nebraska State ARRL Spring Convention at the Holiday Inn in Kearney. Features include flea market, VE testing, women's activities, commercial exhibitors, forums, NE Army MARS Meeting and Saturday evening banquet. For more information contact Timothy Loewenstein, WAØIVW at RR 3, Box 232-B, Kearney, NE 68847.

March 11-13
Florida State, Orlando

March 13
Hudson Division Convention, Valhalla, New York

March 12-13
Nebraska State, Kearney

March 26
Kentucky State, Elizabethtown

April 10
North Carolina State, Raleigh

April 22-24
International DX Convention, Visalia, CA

ARRL NATIONAL CONVENTIONS

Sept 9-11, 1988—Portland, Oregon
June 2-4, 1989—Dallas/Ft Worth, Texas

Attention Hamfest and Convention Sponsors

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your Division Director. For conventions, approval must be made by your Director and, additionally, by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541 ext. 283.

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.

Arkansas (Jonesboro)—March 19. *Sponsor:* Jonesboro ARC. *Time:* 8 AM-3 PM. *Place:* Craighead County Fairgrounds, 2731 Highland Dr. *Talk-in:* 146.01/61. *Contact:* Glen Bradley, K5RAG, Rte 6, 1903 Jean Dr, Jonesboro, AR 72401, tel 501-932-6420.

Connecticut (Norwich)—March 26. *Sponsor:* RASON. *Time:* 9 AM. *Place:* VFW Hall, Raymond Hill Rd, Uncasville (Rte 32 south of Norwich). *Features:* auction, food (bring equipment to be auctioned). *Talk-in:* 146.13/73. *Admission:* free. *Contact:* KY1F, tel 203-536-0187.

Connecticut (Plainville)—March 20. *Sponsor:* Insurance City Repeater Club. *Time:* 9 AM-2 PM. *Place:* American School for the Deaf, 139 N Main, W Hartford. *Talk-in:* 146.28/88. *Admission:* $2. *Tables:* $10. *Contact:* Chuck Motes, K1DFS, 22 Woodside Ln, Plainville, CT 06062, tel 203-747-6377

†**Florida (Fort Walton Beach)—March 19-20.** *Sponsor:* Playground ARC. *Time:* 8 AM. *Place:* Shrine Fair Grounds on Lewis Turner Blvd. *Features:* FCC exams, ARRL, MARS, QCWA meetings, banquet Saturday night, RV parking. Talk-in: 146.19/79 and 52. *Contact:* PARC, PO Box 873, Fort Walton Beach, FL 32549.

†**Georgia (Columbus)—March 27-28.** *Sponsor:* Columbus ARC. *Time:* 9 AM-5 PM Sat, 9 AM-3 PM Sun. *Talk-in:* 146.01/61. *Contact:* Red Hunt, K4DOW, tel 404-571-5959.

†ARRL Hamfest

†**Illinois (Grayslake)—March 27.** *Sponsors:* Libertyville & Mundelein ARS. *Time:* Vendors 6 AM, public 8 AM-2 PM. *Place:* Lake County Fairgrounds, north I-294 exit Rte 120 west, right on Rte 45, fairgrounds 2 blks on left. *Features:* Electronic and radio swapfest, commercial exhibitors, code-speed testing, public cafeteria and free parking. *Talk-in:* 147.63/03, 146.52 simplex. *Admission:* $2 by mail until 3/18, door $3. *Tables:* advanced commercial setup by reservation only. *Contact:* Marc Abramson, PO Box 751, Libertyville, IL 60048, tel 312-255-0642, 8 PM-10 PM.

†**Kentucky (Cave City)—March 12.** *Sponsor:* Mammoth Cave ARC. *Time:* 8 AM. *Place:* Glasgow Swapfest, take Cave City exit from I-65, go east to first traffic light, turn left, hamfest on left 1 mile. *Features:* forums, flea market. *Talk-in:* 146.94, 147.03, 145.41. *Admission:* $3. *Contact:* Mike Goad, 1379 Whites Chapel Rd, Glasgow, KY 42141, tel 502-651-9166.

†**Louisiana (Lafayette)—March 12-13.** *Sponsor:* Acadiana ARA. Time: Sat 9 AM-5 PM, Sun 9 AM-1:30 PM. *Place:* Holiday Inn Central Holidome, south of I-10 on Hwy 167. *Features:* dealers, forums, flea market, exams, women's activities and tour. *Talk-in:* 147.81/21. *Admission:* $2. *Contact:* June Bodensteiner, 129 Patricia Anne, Lafayette, LA 70508, tel 318-837-9484.

Maryland (Baltimore)—March 26-27. *Sponsor:* Baltimore ARC. *Time:* 8 AM. *Place:* Maryland State Fairgrounds. Take I-83 exit 17, 3 miles n of I-695 just n of Baltimore. *Features:* flea market, computers, electronics bargains, refreshments, free parking. *Admission:* $4 for 1 day or $6 for both, children under 12 free. *Contact:* GBH&C, PO Box 95, Timonium, MD 21093-0095, tel 301-HAM-FEST.

Michigan (Grand Rapids)—April 2. *Sponsor:* STARS. *Time:* 8 AM-2 PM. *Place:* Grandville High School on Wilson Ave, SW, 1 mile south of 28 St SW (M-11). *Features:* seminars. *Talk-in:* 144.67/5.27. *Admission:* $3.50. *Contact:* Bob Czachorski, 3949 Honeybrook SW, Grandville, MI 49418., tel 616-534-8200.

†**Michigan (Grosse Pointe)—March 27.** *Sponsor:* Southeastern Michigan ARA. *Time:* 8 AM-2 PM. *Place:* Grosse Pointe North HS—2 miles E off I-94 on Vernier. *Features:* Food, guest speaker, packet forum, DF forum. *Talk-in:* 146.14/74. *Admission:* advance $1, door $3. *Contact:* SEMARA SWAP LINE, tel 313-323-4099.

Michigan (Marshall)—March 19. *Sponsors:* Southern Michigan ARS and Marshall High Photo Electronics Club. *Time:* Vendors 6:30 AM, public 8 AM-3 PM. *Place:* I-69 to I-94 then east to exit 110 or I-94 to exit 110 (old US-27) then south and east to Marshall High School, follow signs. *Talk-in:* 146.66, 146.52 or 223.94. *Admission:* advance $2, door $3. *Tables:* $.50 per foot (min 4 ft). *Contact:* SASE to SMARS, PO Box 934, Battle Creek, MI 49016 or call Wes Chaney N8BDM, tel 616-979-3433.

Michigan (Plainwell)—March 4-6. *Sponsor:* State Technical Institute. *Time:* 8 AM-3 PM. *Place:* 33 Alber Dr, 15 miles northeast of Plainwell on Pine Lake. *Features:* exams, seminars, packet radio, much more. *Talk-in:* 146.46 and 224.28/2.68. *Admission:* $2. *Tables:* $4 and $6. *Contact:* Philip Schmitt, WA8JXE, State Technical Institute, 33 Alber Dr, Plainwell, MI 49080 or call 8 AM-3:30 PM 616-664-4461.

Minnesota (Moorhead)—March 26. *Sponsor:* Red River RA. *Place:* Ramada Inn. *Features:* flea market, seminars, speakers, banquet. *Talk-in:* 146.16/76. *Contact:* Tim Gooding, KDØYX, 1006 Sheyenne St, West Fargo, ND 58078, tel 701-282-6630.

New Hampshire (Derry)—March 19. *Sponsor:* Interstate Repeater Society. *Time:* 8 AM. *Place:* Lion's Club Hall, Lions Ave, Hudson. *Features:* flea market. *Talk-in:* 146.25/85, and 224.46. *Admission:* $2. *Tables:* $10 includes two admissions, some have 110 power. *Contact:* IRS, PO Box 693,

Derry, NH 03038, tel 603-434-4435.

†**New Jersey (Dover)—March 19.** *Sponsor:* Splitrock ARA. *Time:* Vendors 6 AM, public 8 AM. *Place:* Dover Armory, 35 miles west of NYC. Take I-80 to Exit 34, and go ½ mile south on Rte 15. *Features:* VEC exams at 10 AM, refreshments, free parking. *Talk-in:* 146.385/985 and 146.52 simplex. *Admission:* $3, XYLs and children under 12 free. *Tables:* $8, tailgating $5. *Contact:* SARA Hamfest, PO Box 610, Rockaway, NJ 07866.

†**New Jersey (Egg Harbor City)—March 12.** *Sponsor:* Shore Points ARC. *Time:* 9 AM-2 PM, dealers 7 AM. *Place:* Atlantic County 4-H Center, Rte 50, between Rte 30 and Atlantic City Expy, exit 17. *Features:* food and drink. *Talk-in:* 146.385/985, 146.52 simplex. *Tables:* $5 indoors. *Contact:* SPARC, PO Box 142, Absecon, NJ 08201.

New Jersey (Livingston)—March 11. *Sponsor:* Irvington RAC. *Time:* Vendors 5:30 PM, public 7 PM-11 PM. *Place:* American Legion Post 201, 305 Eisenhower Pkwy, take Garden State Pkwy to exit 145, west on Rte 280, exit 4A, south 2 miles, turn right to parking lot, halfway between Rte 10 traffic circle and Eagle Rock Ave. *Features:* food, parking. *Talk-in:* 146.52 simplex, 147.415/6.415. *Contact:* Walt Meineman, 100 Llewellyn Ave, Bloomfield, NJ 07003, tel 201-429-0504.

†**New Jersey (Trenton)—March 27.** *Sponsor:* Delaware Valley Radio Assn. *Time:* 8 AM-2 PM. *Place:* New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township, approx 2 miles south of the I-95-Rte 206 interchange. *Features:* Handicap and wheelchair accessible, flea market, computer equipment, refreshments and free parking. *Talk-in:* 146.07/67. *Admission:* Advance $3, door $4. *Tables:* Indoor selling spaces $10 (wall space) or $7, outdoor spaces $6, doors open 6 AM for vendors. *Contact:* HAM-COMP '88, c/o KB2ZY, Box 441B, RD #1, Stockton, NJ 08559, SASE.

New York (Newark)—March 26. *Sponsor:* Drumlins ARC. *Time:* 8 AM-4 PM. *Place:* Marbletown Fire Hall, 6416 Silver Hill Rd. *Features:* indoor flea market, tailgating, dealers, demonstrations, food, exams at Lake District Emergency Management Office, Rte 31, Newark. *Talk-in:* 146.145/745. *Admission:* $3. *Tables:* $2. *Contact:* Jack Slocum, N2CSY, tel 315-331-1539.

†**North Carolina (Charlotte)—March 19-20.** *Sponsor:* Mecklenburg ARS. *Time:* Sat, 9 AM-5 PM, Sun, 9 AM-3 PM. *Place:* Charlotte Convention Center, corner 4th and College St. *Features:* flea market, forums, FCC exams. *Talk-in:* 145.29 and 146.94. *Admission:* advance $5, door $6. *Tables:* advance $10, door $12. *Contact:* Andy Hawkins, G4GKK, tel 704-523-4122.

Ohio (Circleville)—March 13. *Sponsor:* Teay ARC. *Time:* 8 AM-4 PM. *Place:* Pickaway County Fairgrounds, Rte 22 east of Rte 23. *Talk-in:* 147.78/18, 146.52 simplex. *Tables:* advance $5, door $6. *Contact:* Tim or Betty Harron, 339 Walnut St, Circleville, OH 43113, tel 614-477-2355.

Ohio (Conneaut)—March 6. *Sponsor:* Conneaut ARC. *Time:* Vendors 7 AM, public 9 AM-3 PM. *Place:* Conneaut Human Resources Center, 327 Mill St. *Features:* flea market, exams, refreshments. *Talk-in:* 147.99/39. *Admission:* $3, under 12 free. *Tables:* $5. *Contact:* Jack Marttila, 697 Broad St, Conneaut, OH 44030.

†**Ohio (Madison)—March 27.** *Sponsor:* Lake County ARA. *Time:* Vendors 5:30 AM, public 8 AM-3 PM. *Place:* exit 212 off I-90 and follow signs north to the Madison High School, at corner of Middle Ridge and Burns Rds. *Features:* exams, flea market, food, forums, alternate activities. *Talk-in:* 147.21/81. *Admission:* Advance $3, door $4. *Contact:* Carl Lorman, KA8RLH, 7803 Skyline View Dr, Mentor, OH 44060, tel 216-953-9784.

†**Ohio (Maumee)—March 20.** *Sponsor:* Toledo Mobile Radio Assn. *Time:* 8 AM-5 PM. *Place:* Lucas County Recreation Center, Key St. *Talk-in:* 147.27 rptr, 442.850 rptr. *Admission:* Advance $3.50, door $4. *Contact:* D. F. Hilbert, K8KAS, 4511 289 St, Toledo, OH 43611, tel (D)419-537-0552, (N)419-726-6253.

†**Ohio (Randolph)—May 22.** *Sponsor:* Portage ARC. *Time:* 8 AM-4 PM. *Place:* Between I-76 and Rte 224 on Ohio Rte 44. *Features:* flea market, games, arts, crafts, forums, camping, showers, restaurant. *Talk-in:* 144.79/5.39. *Admission:* Advance $3, door $4. *Contact:* Joanne Solak, KJ3O, 9971 Diagonal Rd, Mantua, OH 44255.

†**Pennsylvania (Belle Vernon)—March 6.** *Sponsor:* Two Rivers ARC. *Time:* 8 AM-4 PM. *Place:* 20 miles south of PGH on Rte 51, or from I-70 "51 north exit" 3 miles north on Rte 51 to Rostraver Gardens. *Features:* forum, ice skating, refreshments. *Talk-in:* 146.13/73. *Admission:* free. *Contact:* TRARC, c/o WB3ERE, 5901 Roslyn St, McKeesport, PA 15135-1126, tel (D)412-751-1800, (N)412-751-4874.

†**Pennsylvania (Monaca)—March 20.** *Sponsor:* Beaver Valley ARA. *Time:* Dealers 6 AM, public 8 AM-4 PM. *Place:* Community College of Beaver-Dome, Rte 60 (Beaver Valley Exp) to Center Twp exit—signs to CCBC. *Features:* VE exams, home-cooked food, computer demos, free parking. *Talk-in:* 145.31. *Admission:* $3 each, $5 for two. *Tables:* sold in advance. *Contact:* Don, WB3HWB, 207 Hall Rd, Aliquippa, PA 15001, tel 412-774-7079.

†**Pennsylvania (York)—March 6.** *Sponsors:* Pen-Mar RC, Keystone VHF and Hilltop Transmitting Assn. *Time:* 8 AM. *Place:* Rte 30 to Rte 74N from York to Rte 921, turn right at Rte 921, hamfest ¼ mile on right. *Talk-in:* 146.37/97, 147.93/33. *Admission:* $4. *Contact:* York Winterfest, N3ECL, 2449 Heidlersburg Rd, Gettysburg, PA 17325, tel 717-528-8412.

Texas (Midland)—March 20. *Sponsor:* Midland ARC. *Time:* Sat 10 AM-5 PM, Sun 8 AM-2:30 PM. *Place:* Midland County Exhibit Building, north side of Hwy 80. *Features:* swapfest, food, exams. *Admission:* $6. *Tables:* $6. *Contact:* Midland ARC, PO Box 4401, Midland, TX 79704.

Vermont (Milton)—Feb 27. 6th Annual Northern Vermont Winter Hamfest. *Time:* 9 AM-3 PM. *Place:* Rte 7, Milton High School. *Features:* forums, flea market, auction, radio exams (walk-in basis only). *Talk-in:* 146.85 and 145.47. *Admission:* $2, under 18 free. *Contact:* Mitch Stern, WB2JSJ, tel 802-879-6589.

†**Washington (Puyallup)—March 12.** *Sponsor:* Mike and Key ARC. *Time:* 9 AM-6 PM. *Place:* Pavilion of the Western Washington Fairgrounds. *Features:* snack bar, VE exams, free parking. *Talk-in:* 146.82, 224.12 rpt. *Admission:* $3. *Tables:* before Mar 1 $15, after $18, setup 4 PM-9 PM Fri, 6 AM-9 AM Sat, commercial space $50. *Contact:* Reservations, M&K Swapfest, 13517 117 Ave NE, Kirkland, WA 98034, VE info, SASE 637 2nd Ave So, Kent, WA 98032.

Wisconsin (Appleton)—March 12. *Sponsor:* Fox Cities ARC. *Time:* Dealers 6 AM, public 8 AM. *Place:* Appleton East HS, 2121 Emmers Ln. *Features:* testing. *Tables:* $5 reservations only. *Contact:* Don Baker, NB9J, 621 W 7 St, Kaukauna, WI 54130, tel 414-766-3886.

Wisconsin (Jefferson)—March 27. *Sponsor:* Tri-County ARC. *Time:* 8 AM-3 PM. *Place:* Jefferson County Fairgrounds. *Features:* exams. *Talk-in:* 144.89, 145.49, 146.52. *Admission:* advance $2.50, door $3. *Tables:* advance $3, door $4. *Contact:* SASE to TCARC, PO Box 321, Milton, WI 53563.

Wisconsin (Madison)—April 10. *Sponsor:* Madison Area Repeater Assn. *Time:* Vendors 7:30 AM, public 8 AM. *Place:* Dane County Exposition Center Forum Building. *Features:* flea market, refreshments. *Talk-in:* 146.16/76. *Admission:* advance $2.75, door $3, children under 12 free. *Tables:* advance $7, door $8. *Contact:* All reservations by Apr 3, MARA, PO Box 3403, Madison, WI 53704, tel 608-274-5153.

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.

Strays

HAVE A GOOD PHOTO THAT MIGHT BE OF INTEREST TO FELLOW AMATEURS?

QST is always on the lookout for interesting or unusual Amateur Radio-related pictures for use as Strays or in Up Front in *QST*; here's your chance to bring your club or individual activities to the attention of fellow League members. Or perhaps you have a humorous or offbeat photo that will bring a smile to *QST*'s readers. Whatever the case may be, send your good-quality photos (no "instant" photos or slides, please) along with any relevant information including photo credit, to HQ, attention Editorial Supervisor.

QST congratulates...

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

• Lyle Dusenbury, W8DIV, of Pontiac, Michigan

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

• Alan Prescott, W8DLD, of Cape Coral, Florida

• Howard Griswold, K4FMJ, of Holiday, Florida

• Irving Sears, W4JCJ, of New Port Richey, Florida

• Kenneth Leiner, N4LC, of Orlando, Florida

• James Swafford, W7FF, of Tucson, Arizona

☐ William Eitel, W6UF, of Dayton, Nevada on being awarded the Armstrong Medal by the Radio Club of America, Inc in recognition of his contributions to the design and manufacture of high-power radio tubes.

☐ Renville McMann, Jr, W2PCD, of New Canaan, Connecticut on receiving the Busignies Memorial Award by the Radio Club of America, Inc for his work in developing professional broadcasting equipment.

☐ Frank Gunther, W2ALS, of Staten Island, New York on receiving the Fred M. Link Award for his pioneering achievements in the development of two-way police radio communications.

☐ Dr John Ryder, K4IHX, of Ocala, Florida on receiving the Ralph Batcher Memorial Award for his documentation of radio history and achievements in the field of higher education.

☐ George Uminski, K6YGK, of Del Mar, California on being included in the 21st Edition of *Who's Who in the West*.

I would like to get in touch with...

☐ anyone with a tech manual and schematic for Collins 30S-1 linear amplifier. William Sturn, PSC Box 1472, APO NY 09023.

☐ anyone with an instruction manual/schematic for a Hickok Model 546 tube tester. Paul Osborn, KF5NT, Rte 2, Box 589J, Fairfield, TX 75840.

Club Spectrum

Conducted By Lee Hayford, AH2W
Club Services Manager, ARRL

Youth and New Hams Speak Out On Club Activities

By Mary Schetgen, N7IAL
Volunteer Resources Assistant

If you've ever wondered why young hams or those of all ages who've just earned their tickets don't flock to your club in the numbers you'd like, you'll find this interesting. If you do get your share of new and young hams but they never show up for a second visit, you'll find this fascinating. Though we don't claim that the survey was conducted scientifically, whatever your club's success at recruiting local hams, there's a message here for you.

In May 1987, ARRL Volunteer Resources Office mailed survey questionnaires to 1,000 amateurs from across the country to get their views on Amateur Radio club activities. Five-hundred newly licensed and 500 licensed amateurs under 18 years of age made up the survey group. The survey itself took the form of a four-page questionnaire which asked for essay-type responses, as well as rank order preference listings of various club activities. The ideas, opinions and constructive criticisms—written onto the margins and backs of questionnaire sheets—provided important additional feedback on the respondents' impressions of the club experience. Below are summaries of the most frequently given responses listed in the order of their importance to the new and young ham respondents.

Respondents overwhelmingly listed radio or electronics store referrals when asked a question about finding, joining and participating in local Amateur Radio clubs! Many respondents shared brief comments and suggestions about issues important to their club experience:

Brad, WB7WTD: *"Get everyone involved! This does two things: It maintains the individual's interest, and it spreads the work load."*

Beth, N3FOF: *"We need more women and kids! I'm always trying to sell people on this great hobby. Let's develop a strategy for getting younger children, teenagers and women involved."*

Jerry, N7JDV: *"Let's make formal meetings come to the point and not be drawn out. After they are completed, have a more social aspect to the remainder of the meeting."*

Dan, N3FIX: *"I would tell radio club presidents that the unity and friendships brought about by club attendance, as well as activities and learning experiences, make for much better Amateur Radio all around."*

Thanks to all who took the time to respond. We hope their observations will give you—club officers and club members—new insight into what young hams and new hams are looking for and what your club might change to make every member's club experience more enjoyable. There's a message and an opportunity here for all who care to see it. What you do with it will in part determine your club's growth and health in the year to come.

Under age 18	Newly licensed
Being an active member of my local radio club would be a lot more fun if the club had:	
1. More youth activities	1. Better programs
2. More outings and socializing	2. More outings and socializing
3. Club contest activities	3. More youth emphasis
Three things I like most about being a radio club member are:	
1. General information gained from club attendance	1. General information gained from club attendance
2. Fellowship/camaraderie	2. Fellowship/camaraderie
3. Elmering (teaching and being taught)	3. Regular club meetings
Three things I like least about being a member of a radio club are:	
1. Boring business meetings	1. Boring business meetings
2. Not enough young members	2. Intraclub cliques
3. Meetings too long	3. Younger members felt less accepted
If you are not a member of a local Amateur Radio club (most-cited reasons)	
1. Too far away	1. Not enough time
2. I will be joining	2. I will be joining
3. Adult members' "squabbling"	3. Lack of interest
Activities and benefits that local clubs now provide (most-cited activities)	
1. Formal club meetings	6. Newsletters
2. On-the-air net	7. Repeater
3. Novice classes	8. Upgrade classes
4. Volunteer Exam sessions	9. Programs or speakers
5. Community service	10. Field Day
What young and new hams stated was the most personally enjoyable aspect of club participation	
1. Repeaters	1. Field Day
2. Upgrade classes	2. Programs and speakers
3. Field Day	3. Formal club meetings
4. Formal club meetings	4. Informal get-togethers
5. Volunteer Exam sessions	5. Work with youth
6. Newsletter	6. Upgrade classes
7. Contests	7. Repeaters
8. Novice classes	8. Novice classes
9. Summer outing	9. Newsletter
10. On-the-air net	10. On-the-air net

In response to the essay question, "What would you tell radio club presidents?" most respondents asked club presidents to put emphasis on improving these areas:

1. Help new members get acquainted
2. Celebrate and encourage the Elmering efforts in one's own club
3. Encourage good operating practices at a local level
4. Encourage youth to join the club
5. Develop youth-oriented activities and opportunities for participation so as to sustain youth interest

Strays

AFCEA LUNCHEON

The Washington Chapter of the Armed Forces Communications and Electronics Association (AFCEA) will hold a reception/luncheon on Thursday, March 10 at 11:15 AM at the Omni-Shoreham, Washington, DC. The guest speaker will be Dennis Patrick, Chairman of the Federal Communications Commission.

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

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

K1AMJ, Martin Coan, Westport, CT
W1GT, James H. Green, Sudbury, MA
K1LZM, Morton Charles Warburton, Wayland, MA
W1PLM, Leonard I. Albert, Waban, MA
W1ZPW, Lucien J. Henault, Grafton, MA
W2ANW, Thomas J. Lydon, Rutherford, NJ
N2AVY, Robert B. Barrett, Sanford, FL
WA2BNP, Dwight A. Rigney, New Hyde Park, NY
WA2CGC, Bernard Levine, Yonkers, NY
W2EYR, John J. Jankowski, Bethpage, NY
N2FPN, Brian L. Tizzano, Jersey City, NJ
AH2G, Joseph J. Frekot, Philadelphia, PA
W2HHK, N. Colman O'Leary, Seattle, WA
W2KGM, Albert G. Collard, Whiting, NJ
W2KHU, George E. Kositch, Malone, NY
W2MXG, Ira R. Rothstein, Sunrise, FL
WA2RHZ, Donald Matthews, Jr, Middletown, NJ
KA2RRI, Joseph R. Urys, Schenectady, NY
N3CQL, William E. Smith, Downingtown, PA
WA3GBT, Clifford S. Brown, Kane, PA
W3IBB, Robert G. Freeburger, East Lansdowne, PA
W3IRU, Ernest H. Nicholson, Jr, Havertown, PA
WA3QZQ, Walter C. Motz, Pittsburgh, PA
WA3RSC, Chester C. Furnier, White Oak, PA
KB3VK, Alexander Jasko, Jr, Arnold, MD
N4AYM, Edward C. Stroop, Sarasota, FL
K4BW, L. C. Quaintance, Pompano Beach, FL
WB4DMZ, William E. Holleyhead, Sr, Dallas, TX
WA4EFB, George B. Hoagland, Kissimmee, FL
KA4EJR, Henry E. Williams, Sr, Savannah, TN
WA4ENB, Norman O. Edwards, Fort Ogden, FL
K4FKU, Martin J. Laverty, Sr, Earlysville, VA
W4HPD, William L. Rubin, Arlington, VA
WD4JAX, Charles W. Germann, Nashville, TN
N4JCO, Frank M. Beattie, Jackson, TN
*W4KUS, William L. Elkin, Greenwood, SC
N4LO, Robert C. Ferrar, Leesburg, FL
K4LYU, Joe L. Bryson, Spartanburg, SC
W4MYL/EP2VH, Vernon H. Hardy, Annandale, VA
W4PCD, Leonard Woida, Decherd, TN
W4PEC, Edgar S. Wright, Augusta, GA
NN4S, John S. Price, Bluff City, TN
W4WIK, Herman Jones, Gallatin, TN
*WB4YTH, Lloyd B. Howe, Aurora, CO
WD5BUE, Samuel L. Goldstick, Lewisville, TX
K5DUJ Harvey I. Wetzel, Duncan, OK
*NO5F, Carroll L. Fogleman, Albuquerque, NM
WD5JYR, Robert L. Phifer, West Monroe, LA
W5NDP, R. Douglas Holder, Austin, TX
WB5NNG, John N. Murrah, Mimbres, NM
WB5OGO, Delono J. Keller, Lubbock, TX
W5OHB, Harry J. Wills, Schertz, TX
KA5OME, Arthur J. Dick, El Paso, TX
K5PJA, W. E. Tennison, Lubbock, TX
KB5SD, Joe Pace, Haughton, LA
W5SKI, William H. Reynolds, Sam Rayburn, TX
W5WCJ, Paul W. Mayronne, Jefferson, LA
WB5W, Glenn G. Selter, Oklahoma City, OK
W6DEY, Roy R. Maxson, San Marcos, CA
KA6FFP, Fred H. Stelling, Yerington, NV
N6GNJ, James N. Pierce, Alhambra, CA
W6IEV, F. Andre Burgess, Sacramento, CA
WB6JOE, Harold W. Roberts, Redding, CA
W6ME, Robert F. Herbig, Oceanside, CA
N6PLG, Ron R. Gates, Oxnard, CA
WB6RJB, W. R. Smith, Lakeside, CA
WB6RQD, Roderick Harley, Capitola, CA
W6RVI, C. M. Wells, Beaverton, OR
W6UMC, Fred A. Reed, Monterey Park, CA
*K6WA, John F. Blackburn, Los Angeles, CA
W7AN, Charles E. Williams, Seattle, WA
W7AUS, John B. Belongia, Seattle, WA
W7EJI, Emanuel A. Cardon, Vancouver, WA
KB7KW, Styrk G. Reque, Scottsdale, AZ
W7RNW, Orion Mack, Ogden, UT
KL7RU, James R. Kemp, Juneau, AK
W8BMR, Milton H. Klein, Columbus, OH
K8CIP, Frederick H. Monroe, Millington, MI
W8DCW, Robert R. Filliez, Minerva, OH
NU8F, Joseph Lucido, St Clair Shores, MI
WD8JHK, Edward L. Sorenson, Drayton Plains, MI
W8KH, George D. Lightfoot, Canton, OH
W8MEK, John J. Devanney, Cincinnati, OH
WB8NMR, John W. Ludden, North Canton, OH
W8PCS, Edwin C. Thaiss, Toledo, OH
WA8UKH, William E. Frederick, Wheeling, WV
KB8WF, James H. Fulton, St Clairsville, OH
W8YPG, Russell J. Rodenbo, Kingston, MI
W9LDO, John F. Lukes, Sr, Wisconsin Rapids, WI
WA9NIX, Carl M. Keefe, Trempealeau, WI
KA9RQB, John J. Holland, Chicago, IL
W9UHF, T. Glade Wilcox, Kalamazoo, MI
NØAOR, Charles E. Williams, Prairie Village, KS
WØBVN, Joseph A. Flaherty, Sr, Kansas City, MO
NØDRA, Milo Riesgaard, Jr, Griswold, IA
KAØGXI, Galen R. Meier, Saint Paul, MN
KAØINN, Ferdinand Witthuhn, Tabor, IA
VE1BDA, Albert Rose, East St John, NB
VE1DC, John Horne, Moncton, NB
VE1LO, Herbert Moore, Dartmouth, NS
VE1OT, Gerald Guptill, Newcastle, NB
VE3CJJ, Gordon Offord, Napanee, ON
VE3EMT, John Tangen, Lambeth, ON
VE3GUV, Robert Niece, Welland, ON
VE3KAS, Brian A. Freeman, Timmins, ON
VE3OL, Allen Betzner, Brockville, ON
VE3XY, John Williams, London, ON
VE7AHN, George Wincott, Chilliwack, BC
VE7DAP, Clifford Norman, Victoria, BC
VE7EZU, Roger Huysman, Chilliwack, BC
EI5A, The Rev Fr Thomas Brennan, Dublin, Ireland
GW3CDH, Ellis E. Evans, Gwent, 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

March, 1938

☐ Regenerative circuits in the second detector as well as the mixer help provide gain and sensitivity in W1JPE's low-cost five-tube superhet. A separate b.f.o. avoids "locking up" which so often occurs in oscillating detectors.

☐ Hallicrafters engineers Miles and McLaughlin have designed a preselector with "infinite rejection" of images, often so troublesome in superhets.

☐ The 1936 trip of explorer Capt. Johnson on the *Yankee* for the first time included amateur communications, with W8IGQ on board operating WCFT while W1ZB, W1NI, W1FTR and W1SZ supplied most of the stateside contacts.

☐ W1JXP tore down two defunct marine magnetos and used the parts, plus carefully-selected ribbon foil, to make a velocity microphone which compared favorably with commercial versions.

☐ Class B modulator pioneer W8UD points out the difference between a sine wave and normal speech, as concerns computing percentage of modulation.

☐ W2KJL continues his series on basic television principles, and this month's cover features a photo of a received picture on his universal test unit.

☐ As chief engineer of Kansas City broadcast station KCMO, W9YNJ designed some 200- and 300-Mc. pack sets using acorn tubes, and describes their layout and construction to give u.h.f. enthusiasts some ideas for their own gear.

☐ W1QV points out ways in which poor house wiring can not only produce considerable noise in an amateur receiver, but also can generate broadcast receiver interference from ham transmissions.

☐ The "Hamdom" page gives League President Dr. Eugene C. Woodruff, W8CMP, his due as an all-around amateur as well as a skilled professional engineer with particular accomplishments in the field of electrification of railroads.

☐ The building housing a new Headquarters station W1AW, a memorial to the late League president Hiram Percy Maxim, is now complete, and equipment built in the A.R.R.L. workshops will be installed shortly.

☐ UPOL is the call sign for a Russian expedition to the North Pole, and operator Ernst Krenkl uses his amateur background and experience to overcome many communications difficulties.

☐ Taylor Tubes has brought out the T40 and TZ40 for 100 watts of r.f. and audio power, at $3.50 each.

25 Years Ago

March, 1963

☐ The cover shows a new League headquarters building in mid-construction, located on the W1AW property which was acquired just 25 years ago in Newington, Conn.

☐ An expected flood of comment on the "incentive licensing" editorial last month is being carefully read at Hq. and then sent to the appropriate division director, since it is the Board of Directors which will set League policy in this matter.

☐ Responsive to that Board's earlier request for technical material between the "How to Become" level and the *Handbook*, George Grammer has authored a "junior" handbook entitled *Understanding Amateur Radio*, primarily a discussion of the basic, everyday, practical aspects of amateur communication. A series of excerpts from it will run in *QST*, commencing with this issue.

☐ After extensive studies by the U.S. Coast Guard, at League request, it has been found feasible to expand our operating privileges on 160 meters shared with Loran navigational units. Every state will have additional frequency privileges, though small power reductions will be necessary in some cases.

☐ The League is opposing a request of FCC by the International Crystal Co. to create a new "hobby class" of license with no exam either for code or theory. ARRL also opposes a petition by Wayne Green, W2NSD, to permit 1-Mc.-bandwith amateur TV in sub-bands of 52-54 and 145.9-147.9 Mc.

☐ KØONM used second-hand steel well casing, obtained at scrap metal prices, to build an unguyed 60-foot tilt-over mast which supports a full-size tri-band beam and rotator.

☐ The League's Executive Committee has initiated a program for more effective spectrum use, calling for more v.h.f. use in local contacts, adherence to minimum bandwidth for the emission employed, and flexibility in equipment so that an adequate choice of powers and bands may be available for the desired communications.

☐ No, the W6s don't really work all the DX—it only seems that way. W3JW made an extensive statistical survey of amateur population and DXCC membership, and concluded that New England is the optimum location for DXing.

☐ After trying for more than a year, moonbounce enthusiasts K5KDN and W5SDA in January obtained the first ever amateur 420-Mc. echo from earth's satellite.

☐ Amateur radio became the prime communications with Guam after typhoon Karen isolated the island for several days back in November; this issue summarizes ham performance during the emergency.—*W1RW*

Amateur Satellite Communications

Conducted By
Vern "Rip" Riportella, WA2LQQ
PO Box 177, Warwick, NY 10990

Introducing Phase 3C: "Superbird" Soon!

Soon, the most complex piece of Amateur Radio hardware ever built will be lifted into a high, elliptical orbit. This hardware will provide enormous communications capabilities for those equipped to take advantage of it. But what does it take to get "on board" the new Phase 3C satellite? This month we'll look at a typical "starter" station for Phase 3C.

As detailed last month, Phase 3C[1] will employ four distinct modes of operation: B, JL, S and RUDAK. Each mode refers to a set of uplink/downlink band pairs and/or modulation types (see Table 1).[2]

To operate Mode B, you need to know five key facts:

1) Where the satellite is
2) When its Mode B transponder is on
3) What frequency to transmit on
4) What frequency to receive on
5) Basic operating practice

Determining the satellite's location, item 1, is called *tracking*. Since high-gain antennas are required, you need to properly aim them at the satellite. Tracking tells you *where* to aim. Tracking techniques and equipment have been covered in this column previously, and will be repeated in an upcoming column.

Item 2 is a matter of scheduling. The operating schedule of Phase 3C will be announced after launch. You can learn the operating schedule by tuning to W1AW bulletins, or by obtaining official AMSAT net bulletins via on-air nets,[3] packet-radio bulletin boards or from telephone bulletin boards.

Items 3 and 4 are addressed in Table 2. Although the table information might lead you to conclude that the passband is divided into many 10-kHz channels, this is not the case. For example, Table 2 shows that if your uplink is on 435.505 MHz, your downlink will be about mid-band on the 2-meter downlink, 145.895 MHz. But, you could just as well have transmitted on 435.507 and heard your downlink on 145.893 MHz. Table 2 merely shows the correlation of uplink and downlink frequencies across a continuous spectrum of available frequencies. Thus, there are no "channels" as such.

There is more to operating via an OSCAR than just turning on the transmitter, though! Item 5, operating practice, will be covered in a future installment. However, well before you turn on the rig, you need to know your basic station requirements to have a good chance of success on OSCAR. So, let's spend a few moments reviewing basic Mode B station requirements. Then you can determine how your shack stacks up and determine where any improvements need to be made.

Let's start at the interface to the satellite: the antennas. You'll need an uplink antenna for 70 cm (435 MHz) and a downlink antenna for 2 meters (145 MHz). How much gain should the antennas have? For the uplink, you want to aim for an effective isotropic radiated power (EIRP) of 27 to 30 dBW (0.5 to 1.0 kW EIRP). EIRP is calculated simply by adding the gain of your antenna in dBi to the power you feed to the antenna in dBW (dB relative to 1 W). Table 3 shows a conversion of watts to dBW. Depending on how much power you have in the shack to feed to the antenna, you can now narrow the range of antennas from which to select. As a rule of thumb, select a 70-cm antenna with at least 10 dBi gain. About 17 dBi gain is the upper limit of gain for practical Yagi or LP antennas used for OSCAR satellites.

Because the satellite receives and transmits using Right Hand Circular Polarization (RHCP), you'll get best results when your antenna is similarly polarized. A

Table 1
OSCAR Operating Modes

Mode	*Uplink Band*	*Downlink Band*	*Notes*
A	2 m (145 MHz)	10 m (29 MHz)	Traditional
B	70 cm (435 MHz)	2 m (145 MHz)	Current favorite
L	24 cm (1269 MHz)	70 cm (436 MHz)	First use: AO-10
S	70 cm (436 MHz)	13 cm (2401 MHz)	New; Phase 3C use
JL	2 m & 24 cm	70 cm (435 MHz)	New; Phase 3C use
JA	2 m (145 MHz)	70 cm (435 MHz)	FO-12 analog mode
JD	2 m (145 MHz)	70 cm (435 MHz)	FO-12 digital mode
K	15 m	10 m (29 MHz)	RS-10/11 use
T	15 m	2 m (145 MHz)	RS-10/11 use
KT	15 m	10 m & 2 m	RS-10/11 use
KA	15 m & 2 m	10 m (29 MHz)	RS-10/11 use

Table 2
Mode B Uplink Frequency Versus Downlink Frequency
(Preliminary Estimates)
(Frequencies in MHz)

Uplink		*Downlink*	
		145.975	— Engineering Beacon
435.425	———	145.975	— Passband limit, upper
435.435	———	145.965	
435.445	———	145.955	
435.455	———	145.945	
435.465	———	145.935	
435.475	———	145.925	
435.485	———	145.915	
435.495	———	145.905	
435.505	———	145.895	— Passband center
435.515	———	145.885	
435.525	———	145.875	
435.535	———	145.865	
435.545	———	145.855	
435.555	———	145.845	
435.565	———	145.835	
435.575	———	145.825	— Passband limit, lower
		145.8125	— General Beacon

Table 3
Converting Watts to dBW

dBW = 10 log (P), where P is expressed in watts

P (Power in watts)	*Equivalent in dBW (Decibels relative to 1 W)*
1	0
2	3
5	7
10	10
20	13
50	17
100	20
200	23
500	27
1000	30

Example: Assume you're feeding 50 W to a 12-dBi-gain antenna. What is the EIRP? Solution: From Table 3, 50 W equates to 17 dBW. Add this to the gain of the antenna in dBi to get: 17 dBW + 12 dBi = 29 dBW EIRP = 794 W EIRP. Similarly, 100 W to a 13-dBi-gain antenna, fed through a 3-dB-loss transmission line yields: 20 dBW − 3 dB + 13 dBi = 30 dBW = 1000 W EIRP.

crossed-Yagi array with between 18 and 20 elements in each plane is the most common solution to the uplink antenna question. A linearly polarized Yagi can also be used, but the compromise will be evident in reduced performance in terms of increased fading, which tends to reduce readability.

For the Mode B 2-meter downlink, your antenna should have between 11 and 15 dBi gain with RHCP. Sure, you can get along with linearly polarized antennas, but fading could become bothersome. Most successful satellite operators use 2-meter crossed Yagis with between 7 and 11 elements in each plane for a total of between 14 and 22 elements. The longer-boom 2-meter antennas are generally very good performers, but elevating an antenna with a boom length of up to 20 feet can be difficult in some installations.

After many years of experimenting, I'm convinced it's a mistake to try to stack circularly polarized, crossed-Yagi antennas. Stacking helices is hard enough. Stacking linearly polarized antennas is a well-developed technology. Stacking crossed Yagis is so complex and sensitive to changes in frequency, polarization, spacing and power division that I strongly recommend you don't try it.[4] The best way to obtain more circularly polarized gain is to increase the antenna's boom length.

Before we move into the shack, there are a few more things we need to mention in conjunction with the antennas. An az-el (azimuth-elevation) rotator system is highly desirable, but not absolutely essential. If, for example, you're using fairly low-gain antennas with their correspondingly broader beamwidths, you can often get along without an elevation rotator as long as the antenna is set at a fixed elevation of some predetermined value, say 30 degrees above the horizon. That way, if your antenna has a half-power beamwidth of 60 degrees, which corresponds to a gain of about 10.5 dBi,[5] the signal at the horizon will be only 3 dB down from the main lobe. Similarly, the signal from the satellite at a 60-degree elevation will be down only 3 dB from the main lobe. Of course, you will need an azimuth rotator nevertheless.

Using a mast-mounted 2-meter preamplifier is very helpful for 2-meter Mode B downlink reception. If you use low-loss transmission line, you can probably put the preamp in the shack, out of the weather. In any case, you *should* use a preamp.[6]

In the shack, a Mode B station needn't be terribly elaborate. Essentially you need a good, stable SSB/CW-capable 2-meter receiver, and a clean 435-MHz SSB/CW transmitter and amplifier. I still use the setup I had 10 years ago for AMSAT OSCAR 7 Mode B: An HF transceiver (TS-820), a 10-meter-to-70-cm transverter (Microwave Modules MMT432-28S) and a 2-meter all-mode transceiver (TS-700S) form the central elements. The transverter feeds a solid-state 70-cm amplifier. If you've accumulated the usual assortment of radios typical of many modern shacks, perhaps you already have most of the gear you need. Otherwise, you may want to investigate several approaches to configuring a successful Mode B station.

Next month, I'll discuss Phase 3C operating schedules. In the meantime, you might want to tune in on the Phase 3C launch. It will be transmitted on a worldwide AMSAT Launch Information Network Service (ALINS).[7,8]

Notes

[1]Phase 3C will obtain its traditional OSCAR number only after having been successfully placed in operation.

[2]RUDAK is a German acronym for digital repeater. It uses a Mode L frequency pair of 24 cm up, 70 cm down.

[3]Active AMSAT nets are listed on p 64, Oct 1987 *QST*.

[4]The discussion of why stacking is unsatisfactory is beyond the scope of this column. Suffice it to say, I doubt you'll be happy with the results.

[5]M. Davidoff, *Satellite Experimenter's Handbook* (Newington: ARRL, 1984) page 6-3, eq 6.4.

[6]Although a mast-mounted preamp is *desirable* for the 2-meter Mode B downlink, it is *essential* for the 70-cm downlinks of Modes JL, JA and JD.

[7]Information on when ALINS will be on the air will be transmitted on all AMSAT nets and carried on W1AW bulletins as launch day approaches. See note 3.

[8]You can obtain free information on how to get started on Phase 3C—and information about AMSAT in general (including available tracking software)—by sending an SASE to AMSAT, PO Box 27, Washington DC 20044.

Canadian NewsFronts

(continued from page 67)

SECTION MANAGER ELECTION: SECOND NOTICE

To all amateurs in the Manitoba Section: You are hereby solicited for nominations pursuant to an election for Section Manager. Because of space limitations, the full election notice is not reproduced here. Please check this column in the 1988 February *QST*, p 69, or contact CRRL Headquarters for complete details on how to prepare and submit a nominating petition.

NOTES FROM ALL OVER

☐ Need a program for a club meeting or licensing class? CRRL now has over 40 titles in its videotape library. There is no charge for borrowing a tape, just the cost of return shipping. Contact CRRL Headquarters for details.

☐ CRRL officials were scheduled to meet with DOC on Feb 20 to work with DOC on Restructuring the Amateur Service. At press time, the airwaves were filled with speculation that DOC favoured a four-tier licensing system with a no-code VHF-UHF entry-level licence and relaxed code and technical requirements throughout. Last year, CRRL and CARF proposed a three-tier system with a no-code VHF-UHF *Basic* licence; a 7-WPM code endorsement which would add CW privileges on HF bands and phone privileges on 10 metres; and a full-privilege *Advanced* licence with 12-WPM code and more difficult technical requirements.

☐ By the time you read this, the Transpolar Skitrek should have begun. As reported in February *QST*, you can follow the progress of the expedition on UoSAT OSCAR 11. Listen for the satellite's digitalker on 145.825-MHz FM as it passes over your area.

☐ During 1987, the CRRL Outgoing QSL Bureau forwarded just over 100,000 cards to over 200 DX countries around the world. Bureau Manager Don Welling, VE1WF, says that's up 40,000 cards from 1986, and the new sunspot cycle has just begun. Use of the Outgoing Bureau is free, but only to CRRL members.

Strays

SOUTH CAROLINA SM RECEIVES AWARD

☐ Jimmy G. Walker, WD4HLZ, South Carolina Section Manager, is the winner of the 1987 Roanoke Division Service Award. Jimmy has held many ARRL Field Appointments, including Section Communications Manager (SCM), Section Emergency Coordinator (SEC) and Emergency Coordinator (EC). He was first elected Section Manager in 1983, and was re-elected in 1985 and 1987. Jimmy is the founder, president and chairman of the board of the Greater Pee Dee Radio Society, Inc, which sponsors the NN4N repeater, a national traffic net and a VE team. First licensed in 1977, Jimmy holds an Advanced class license. He is married, has two children and lives in Marion, South Carolina, where he is a computer engineer with the Polymer Products Division of Du Pont De Nemours & Co.

I would like to get in touch with...

☐ any hams who are members of the American Academy of Religion and/or the Society of Biblical Literature. George Cave, W4KDX, University of Tampa, Tampa, FL 33606.

☐ any hams who play the organ who are interested in forming a net, preferably 80 or 40 phone. Albert Kaufman, W1JVQ, 84 Glendale Ave, Bridgeport, CT 06606.

New Frontier

(continued from page 66)

IARU conference	Nov 81
Leaf attenuation	Dec 83
Microstrip calculations	Dec 81, Apr 82
Microwave activity	Oct 80
Microwave components	Jan 81
Microwave contests	May 81, Aug 82, Nov 85
Microwave DX (1000 km) Award	Nov 83
Microwave societies	Oct 86, Dec 86, Jan 87, May 87
Microwave spectrum allocation	Jul 81
Military equipment nomenclature	Oct 83
Modulating Gunn oscillators	Dec 86
Scaling antennas	May 83
Silver plating	Jan 85
UoSAT	Oct 81, Nov 81, Oct 82, Nov 82
Waveguide	Feb 85, Oct 83

Operational

1.3-GHz Oct 81, Jun 82, Sep 82, Oct 82, Sep 84*, Jan 85, Mar 85, Sep 85, Oct 86, Jun 87
2.3 GHz Jun 82, Dec 82, Sep 83, Aug 84, Jan 85, Mar 85, Apr 85, Jun 85, Sep 85, Oct 85, Dec 85, Jun 86, Jan 87, Feb 87
3.4 GHz Aug 83, May 86*, Sep 86, Dec 86, Feb 87, Mar 87, Jul 87
5.7 GHz Jun 82, Jul 86, Jun 87
10 GHz Nov 80*, Oct 81, Feb 82, Apr 82, Jul 82, Oct 82, Nov 82*, May 83, Oct 83*, Nov 83, Feb 84*, Nov 84, Jul 85, Oct 85, Nov 85, Feb 86, Sep 86, Mar 87, Jun 87, Nov 87
24 GHz Aug 82, Dec 84*, Oct 85, Feb 86, May 86
47 GHz Sep 85*, Oct 85*, Jun 87, Jul 87

*denotes DX record

10-GHz BEACONS

According to the San Bernardino Microwave Society newsletter, there are now two 10-GHz beacons operational in the San Diego area. The N6IZW beacon has been on the air for over a year from an 800 ft above sea level (ASL) location in La Mesa, California (grid square DM12LS). It runs 100 mW at 10.249 GHz to a 10-dBi-gain omnidirectional antenna. Modulation is wideband FM with an MCW identifier. The latest beacon is operated by N6XQ from Point Loma, California (DM12JR) and is at 320 ft ASL, overlooking the Pacific. Power output is 100 mW at 10.228 GHz, and the antenna is a 13-dB-gain, vertically polarized horn, oriented at 325° true. Modulation is wideband FM with an MCW identifier. An X-band receiver is also present at the site, and QSOs can be arranged by contacting Jack Henry, N6XQ, at 619-224-7532.

CONFERENCE UPDATE

The Central States VHF Conference will be held this year from July 21 through 24 at the Villager Motel in Lincoln, Nebraska. Contact Roger Cox, WBØDGF, at 3451 Dudley St, Lincoln, NE 68503 for information (tnx Bill Olson, W3HQT).

Moved and Seconded...

(continued from page 53)

96) On motion of Mr. Stevens, seconded by Mr. Nathanson, it was VOTED that the Executive Vice President is hereby authorized to reimburse the following Committees, Task Groups and Task Forces created by the Board, for expenses incurred by them during the year 1988 in the proper execution of their duties, and in accordance with Board policy, as follows:

RFI Task Group	$2,500
Committee on Biological Effects of Radio Frequency Energy	4,000
Committee on Amateur Radio Digital Communication	10,000
Legal Strategy Committee	15,000
Election Committee	6,000
Education Task Force	5,000

97) On motion of Mr. Milius, seconded by Mr. Drake, it was VOTED that to continue the Board's policy of reimbursing QSL Bureau Managers of the League for certain travel in furthering ARRL organizational objectives, the Executive Vice President is hereby authorized to pay during the year 1988 a total amount not to exceed $4,000 under terms prescribed by the general pattern established by the Board.

98) On motion of Mr. Mendelsohn, seconded by Mr. Frenaye, it was VOTED that, to continue the Board's policy of reimbursing National Traffic System officials above the section level for certain approved expenses in furthering ARRL organizational objectives, the Executive Vice President is hereby authorized to pay during the year 1988 a total amount not to exceed $10,000 under terms prescribed by the Field Services Manager following the general pattern established by the Board.

99) On motion of Mr. Mendelsohn, seconded by Mr. Frenaye, the following resolution was unanimously ADOPTED:

WHEREAS, Maty Weinberg, Robert Schetgen, Mike Riley and Perry Williams have toiled with diligence and in excess of the required devotion,

BE IT RESOLVED, that Maty Weinberg, Robert Schetgen, Mike Riley and Perry Williams be commended for the excellent word processing of motions and cooperation with the Board during the Annual Meeting of January, 1988. (Applause)

100) At 7:00 PM, Mr. Holladay assumed the Chair for Mr. Price.

101) It was moved by Mr. Mark, seconded by Mr. Olson, that the Second 1988 ARRL Board Meeting be in the vicinity of Hartford, Connecticut on July 22-23 rather than July 21-22. After discussion, the motion was LOST.

102) Mr. Price returned to the Chair at 7:15 PM.

103) There followed an opportunity for all present to make final comments. Mr. Price observed that Mr. Stevens would be leaving office at the end of this meeting, following a decade of distinguished service to Amateur Radio and ARRL as both Director and Vice President. The President commented that he had had the privilege of working with Mr. Stevens as both a fellow Director and fellow Officer, and so knew firsthand of his numerous contributions to the work of the League (applause). There being no further business, the Board adjourned sine die at 7:45 PM. (Total time in session as a Board: 15 hours, 9 minutes; as a Committee of the Whole, 1 hour, 21 minutes; direct authorizations: $209,848.96.)

Respectfully submitted:
Perry Williams, W1UED
Secretary

Strays

"WE THE PEOPLE" QRP-STYLE

With a Heath HW-8 running but 4 watts into a GM vertical, Leo Servary, W4FRL, has earned the "We the People" WAS. Leo, of Davie, Florida, has other QRP accomplishments to his credit as well, including WAC and a previous WAS.

A ROSE IS NOT A ROSE...

Having seen the mistakes made with Spanish names on QSL cards, Francisco Casariego Rozas, EA6SF, of Ibiza, Spain, sent along some information to help clarify the situation. Spanish people have one or more Christian names and *two* family names; the first is from the father and the second from the mother. You may write just the first and middle names listed in the *Callbook*, or all three names, but never abbreviate or omit the middle name!

BACK IN THE SADDLE

The unidentified "cozy" operator on the cover of the *1988 ARRL Handbook* is, we've been informed, Rulon VanDyke, KA7BCD. Rulon, of Orem, Utah, operated Field Day QRP from The Saddle, located on Thousand Lake Mountain at 10,500 feet.

QST congratulates...

☐ Toby Bogard, KB6GFP, of St Louis, Missouri on receiving Honorable Mention, National High School Tennis All-America from the National High School Athletic Coaches Association.

I would like to get in touch with...

☐ anyone with a manual/schematic for a Tokyo Hy-Power HF Antenna Coupler, Model HG-400L. Jim Knoppow, NE7B, 15355 SE 307 St, Kent, WA 98042.

☐ anyone using Kantronics Hamtest Software that has made a Star SG-10 printer (Xetoc interface) print a hard copy of code or RTTY. Ken Williams, WØJKM, 5713 Hawkes Dr, Edina, MN 55436.

☐ anyone with a manual and/or schematic for a TS-888/U teletype test set. Marvin Moss, W4UXJ, Box 28601, Atlanta, GA 30358.

Public Service

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

Forest Fire!

By Joan Clark, WA6ZFH

On a hot summer afternoon in late August when lightning began to bolt across the sky, who could have known it would spark the biggest fire in the history of California's million-acre Stanislaus National Forest?

Before it was over, there was a total of 139,000 acres burned in what would be known as the Stanislaus Complex Fire. Nearly 5000 firefighters battled this inferno at its peak. It destroyed 18 homes and 24 outbuildings, and claimed one life—a US Forest Service crew leader, David Erickson, 34, from Siskiyou County, who died September 11, when a tree he had cut knocked down another tree, which then fell on him.

My first clue to the fact that a serious problem was at hand was a call on our local repeater, 147.945, the evening of August 31 from my OM Jim, WA6NSK. Jim is a California Highway Patrol Officer here in Tuolumne County and monitors our local repeater from his patrol vehicle during his normal patrol shift. Jim advised that the fire was just over the ridge from Tuolumne City and that the city was being evacuated and roadblocks were being set up. Jim requested some sandwiches and lots of coffee, as he wouldn't be home that night. Ray, KB6CEG, volunteered and delivered the coffee to the law enforcement officers at the roadblocks.

While firefighters assessed the situation, operation centers were set up at Groveland, Buck Meadows and Westside Park near Tuolumne City. A base camp was made in a clearing on the edge of Camp Mather near a site where an annual bluegrass festival, drawing thousands each year, was to be held on Labor Day, a week later. The bluegrass festival never materialized because of the fire.

The situation became a declared emergency on September 3, when the Governor of California declared the county a disaster area. In addition to Tuolumne County the Governor also declared a "state of emergency" in 21 other counties throughout the state that had been ravaged by forest fires.

As is the case in many emergency situations, Amateur Radio operators were soon on the scene where they were most needed, providing assistance via their strongest area of expertise—communications. One of the first to respond to the call for help was Burt Wilcox, W6FGC, of Twain Harte. He was contacted at noon on September 3 by Harry Grace, KI6AD, a retired US Forest Service employee who was called back to active duty. Immediately, W6FGC began collecting his Amateur Radio gear, loaded up his car and rushed off to the USFS Headquarters at Sonora. At that time, he says, he had no idea as to the magnitude of the fire. Shortly thereafter, he had already begun to coordinate various field locations throughout Tuolumne County, which had to be staffed around the clock for the duration of the emergency.

At first it was difficult to get volunteers as many hams were on vacation at that time of the year. Eventually, a total of 64 operators were recruited locally and from neighboring counties. Some of these hams were newly licensed, and as such had very little, if any, experience with the handling of emergency message traffic. In spite of this, it was generally agreed that they performed exceptionally well.

The use of packet radio by W6FGC's group, and others as well, proved to be of exceptional value during the emergency. With 640k RAM and a 21-megabyte hard disk, Burt's system served as an unusually valuable tool, especially for sending long lists of data, including much-needed firefighting supplies, equipment and even the names of firefighters moving from one fire camp to another. This latter category of data provided untold amounts of relief to families and loved ones of fire-fighting personnel.

An American Red Cross shelter was set up at Tenaya School, east of Groveland, where originally 115 evacuees from Groveland had been sent. That whole area had to be evacuated and those evacuees had to be shifted to the Motherlode Fairgrounds at Sonora. A local amateur, W6LQC, provided his HF station for health and welfare traffic from the evacuation center. Since most of the evacuees were sent to the fairgrounds, all the schools in Tuolumne County were closed, so that the schools could be used for additional shelters for the temporarily homeless. By the end of the first week, a total of 7500 persons had been told to evacuate their homes. Within a matter of two days, the Tuolumne County Fairgrounds had been transformed into a small self-sufficient city providing food, clothing, shelter, entertainment for its occupants and, of course, communications.

Within a short week's time, the fire had begun creating its own weather conditions; large masses of clouds formed at higher elevations, then became ice-laden, providing the moisture necessary to feed thunderstorms. In turn, the storms produced electrical activity and turbulence. The resultant lightning provided more sparks while the wind on the ground fanned them into flames, thus producing "firestorming", a term that was used often when referring to the Stanislaus Complex Fire.

When the final tally was made, the time amateurs had donated added up to 2530 actual work hours, which didn't include any travel time. All in all, a very good job was accomplished by *all* amateurs who participated, and as W6FGC had stated, "It was one heck of a learning experience for all of us, and I just can't believe the fantastic job they all did!"

El Wirt, K6ZYY at the Sonora (California) US Forest Service packet-radio station during the Stanislaus Complex Fire disaster.

Stanislaus Complex Fire, east of Groveland, near Buck Meadows.

As every traffic handler realizes, traffic handling has many facets, numerous steps along an often-circuitous path that a message must take to get from point of origination to ultimate delivery. Here, Section Manager Wells and Net Manager Gellert give us some helpful hints on delivery procedures for formal message traffic. Readers are reminded that ARRL HQ is actively seeking many more such articles to assist both new and old-time public service communicators and traffic handlers in the proper performance of their functions.—*KY1T*

TRAFFIC TOPICS DE KR7L

There are several net procedures that should be familiar to every traffic handler. We all know—or should know!—these methods of net operation; however, they are so commonly violated or disregarded that a reiteration is in order.

One of the most common is the failure to recognize that it is the station who is receiving a piece of traffic who sets the frequency when two stations move off the net. How often have you heard:

W7BW WILL TAKE THAT TRAFFIC. . . WHERE TO, KR7L?
KR7L HERE. . . YOU'RE RECEIVE. . . YOU PICK THE FREQUENCY.
I DON'T KNOW WHERE TO GO. WHERE DO YOU WANT TO GO?
HOW ABOUT UP 5?
NO. LET'S TRY DOWN 15, BUT YOU CALL SINCE YOU'VE GOT THE TRAFFIC.

This sort of exchange happens all the time on phone nets. In addition to being incorrect procedure, it wastes a lot of time. Here we have the classic failure of the receive station to set a frequency for handling the traffic. Many times the result is:

NET CONTROL, THIS IS W7BW. . . I CAN'T FIND KR7L.
KR7L BACK. . . I WAS CALLING IN THE CLEAR DOWN 15.
DOWN 15 WAS ALL QRM. . . LET'S GO UP 5.
UP 5. . . YOU CALL THIS TIME. . . KR7L.

There is seldom this type of confusion on a CW net. So why do we insist on doing things the wrong way on a phone net?

Another example of poor procedure is the use of voice Q-signals. On CW, Q-signals are appropriate and speed up a net. On phone, they are totally unnecessary; simply say what you mean! Try "No Traffic" instead of "QRU" the next time you pick up the microphone. What's sad is to hear people use Q-signals improperly, like: "Let's QRL to another frequency." How about the guy who checked in and said, "I'm QRV and QRT," when he meant "I have no trafffic and I'm going off the air." I doubt if half of the people who use Q-signals on phone have ever bothered to look up the meaning of what they are saying.

Right up there with the improper use of Q-signals is the misuse of phonetics. Why do a significant number of operators insist on sending their calls using "cute" phonetics? "Kissing Seven Flapping Rubber Lips" should be reserved for the "Port Orchard's Odd People" net. It's seldom understood on a Section net, where "Kilo Seven Foxtrot Romeo Lima" would cut through the crud on the first try. Add some QRM to a "cute" call and you may as well forget about trying to check into most nets.

While you're at it, skip the phonetics on an FM net. The copy is normally 100% and this additional verbiage just slows the process of passing a message. If you have to spell it out, simply use the letters: "Geoff. . . I spell G E O F F," not "George Echo Oscar Foxtrot Foxtrot." The overactive use of phonetics wastes the primary advantage of FM—reliable, hassle-free copy.

Use the correct procedures. . . it's easier on everyone.

DELIVERIES—PETE GELLERT, W2WSS

Even if we are only moderately active in traffic handling, or live in small communities, sooner or later we will be called upon to make a delivery of a piece of third-party traffic. Many hams enjoy making deliveries, for they have learned that, save the occasional inevitable crank, most folks are gracious about receiving a message, and are often effusively grateful. Other hams, particularly if they have not made deliveries to "The Public" (as opposed to other hams), cringe at the thought of calling up a total stranger, who may have neither an accurate understanding of what ham radio is nor a correct comprehension of your explanation.

I use roughly the following formula, which does not differ significantly from suggestions of many other active traffic handlers, although perhaps mine is somewhat abbreviated: "I am an Amateur Radio operator and I have a greeting message for (XX) from (place of origin); may I read it to you?"

Here is the text (read slowly and always translate ARL numbered radiograms into the actual text). Simply pause at BT ". . . and the signature is. . ." Note that I usually leave out the entire preamble, but if there is an HXE, I will of course ask the recipient if he would like to send an answer. Many hams do that as a matter of course, even without handling instructions; it is a good way to generate traffic and is an extra courtesy to the recipient. Occasionally, if the message passed rapidly to me from its time of origination, or if the date of filing seems particularly relevant, I will mention when the message was filed.

The above seems suitable for the great bulk of messages, which, in fact, are greeting type messages. If the text is clearly not the typical one, you may wish to briefly mention the subject when you make your first introductory remarks: "I have a message with airport arrival times," or "I have some reunion information."

The important thing is not to alarm the recipient by creating the fear that you may be the bearer of bad news—which the bare "I have a message for you" may do.

At times, the recipient will be curious as to who you are and why you are doing this. Explain briefly that radio and handling messages is your hobby and that you are performing this service on a purely voluntary basis. Suppress the surge of irritation that will rise within you when, inevitably, the recipient then says "Oh I see, it's CB." You're much better off saying, "Well, sort of, but we amateurs have to pass tests and get a government license." Of course, much of the above may be unnecessary if you are delivering a message to another ham.

You have an obligation to try to deliver messages as soon as reasonably possible (no, you don't delay taking the XYL to the hospital for your first baby so you can deliver Aunt Victoria's latest on the health of her dog!). In any event, if at all possible, deliver the message within 24 hours of receipt. Don't give up if your first phone call elicits no answer; try at least two or three times before giving up. And if, as has occurred on occasion, the address number is wrong, or missing, at least try the directory.

The generally accepted rule is that you need not go beyond delivery by a local phone call. In some cases, however, you may want to put the message on a post card or make a nearby toll call. Contrary to official doctrine, I do not believe all "routine" messages are created equal, and I will certainly consider the text in determining how strenuously to try to deliver the message; a toll call may be justified for a message relating to arrival times, sickness or a particularly joyous event, while the standard "weather is here, wish you were beautiful" scarcely justifies heroic efforts. And do remember: Inability to make delivery demands a service message back to the originating station. Contrary to some traffic experts, however, I do not believe service messages are required if you have mailed a message rather than phoned it, or if you've received it with a wrong address or number but found the correct one. Nonetheless, you may wish to service the originator with the correction.

Field Organization Reports December 1987

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	132	90.00	1399	2812
TCC Central	118	95.16	1224	5384
TCC Pacific				
Summary	250	92.58	2623	8196
Cycle Three				
TCC Eastern	60	96.77	144	288
Cycle Four				
TCC Eastern	194	92.38	1453	2924
TCC Central	95	85.60	793	1738
TCC Pacific	116	77.33	1198	2362
Summary	405	85.10	3444	7024

TCC Certificates issued this month: N2IC W5GHP K5GM WB5J AJ5K K5MXQ WZ5N W5QVK ND5T N5TC K5TL W5TNT KB5W W6EOT W6INH K6LL W6VZT KN7B KA7CPT NR7E W7EP W7GHT NN7H W7LG W7VSE W9CBE WB9UYU AD0A K0DJ KA0EPY K0EZ KC0D KJ0G NX0J AI0O KS0U

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	2054	66.25	1.315	97.8	
CAN	31	1573	50.74	.982	100.0	
PAN*	62	1183	19.08	.782	99.4	
Region Nets						
1RN	62	760	12.26	.573	95.0	100.0
2RN	62	709	11.43	.595	94.8	100.0
3RN	31	380	12.25	.554	55.4	96.8
4RN	62	1192	19.22	.580	78.4	100.0
RN5	62	1295	20.88	.684	86.0	100.0
RN6						98.3
RN7	61	950	15.57	.636	98.3	100.0
8RN	62	793	12.79	.411	100.0	100.0
9RN	62	544	8.77	.441	91.0	100.0
TEN	62	1201	19.37	.513	85.0	100.0
TWN	62	584	9.42	.566	82.5	100.0
ECN						90.3
TCC						
TCC Eastern	132	2812				
TCC Central	118	5384				
Cycle Three						
Area Net						
EAN	31	767	24.74	.986	91.2	
Region Net						
1RN	31	201	6.48	.407	93.6	96.7
2RN	31	268	8.66	.579	96.8	100.0
3RN	25	20	.80	.111	69.3	93.5
4RN	37	271	7.32	.359	72.9	100.0
8RN						100.0
ECN						100.0
TCC						
TCC Eastern	60	288				
Cycle Four						
Area Nets						
EAN	31	2527	81.52	1.780	96.7	
CAN	31	1816	58.58	1.550	100.0	
PAN	31	1517	48.90	1.200	97.8	
Region Nets						
1RN						96.7
2RN	49	403	8.22	.631	76.5	100.0
3RN	60	358	5.96	.398	97.2	96.7
4RN	62	1175	18.95	.600	94.2	100.0
RN5	62	1304	21.03	.860	100.0	100.0
RN6	62	817	13.18	.759	99.0	100.0
RN7	62	707	11.40	.790	90.8	98.3
8RN	59	714	12.10	.545	91.0	100.0
9RN	62	682	11.00	.615	92.7	100.0
TEN	62	895	14.44	.726	75.2	100.0
TWN	58	515	8.88	.504	91.4	98.3
ECN	58	390	6.72	.695	71.3	100.0
ARN	31	174	5.61			87.1
TCC						
TCC Eastern	194	2924				
TCC Central	95	1738				
TCC Pacific	116	2362				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AR, CT, DE, EMA, ENY, EPA, GA, IA, IL, IN, KS, MDC, ME, MI, MN, MO, NC, NH, NTX, OH, OK, ONT, OR, ORG, RI, SB, SC, SCV, SD, SDG, SF, SFL, STX, TN, 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.

374
KC9CJ
196
KA0ARP
182
W2QNL
179
WB5SRX
169
VE3ORN
168
WD4IIO
164
N4GHI
160
KD0CL
159
WB2OWO
157
WA2VJL
156
KA3DLY
N2EIA
147
W0FRC
144
WA2SPL
143
WF6O
138
WA4QXT
137
W2MTA
136
KW1U
133
KB4WT
127
K4NLK
W9FZW
K4ZK
126
WA9VND
N0FOO
124
KI4BR
NM1K
123
AA4AT
WB4HRR
N6MCY
121
KA1IFC
WA2FRR
W9YCV
VE7BNI
120
KA4TWI
VE4JA
119
WR5O
KA1EXJ
WX4H
118
AA4MP
K5MXQ
117
NQ2H
KA2F
W9CBE
WA4EIC
NG1A
116
WB6DOB
WB1HBB
VE4LB
W7VSE
W4ANK
115
KA1GWE
KI4YV
WD9DZV
W6INH
WD0GUF
114
N4EXQ
112
KT1Q
WA2EPI
WA4PFK
KF5BL
111
N2XJ
ND2S
110
NC9T
AA4HT
109
W9JUJ
KB1AF
WA1FCD
108
W9EHS
K2VX
KK3F
WD4KBW
107
WA4LTO
W1PEX
N9BDL
KN1K
105
WB4KSG
N3EMD
106
KA2MYJ
WB2VUK
104
W5CTZ
WA0HTN
W3FA
103
KA0KPY
KA4TLC
W3YVQ
KA2UBD
N1CVE
102
WB2RBA
AG9G
WG7H
K0BXF
101
WD5GKH
K9CNP
KA9FFO
N9BZZ
W7GHT
100
WB4WII
KA7ZAG
98
K2ZVI
K4MTX
N4KRA
N1CPX
WA1JVV
97
N5AMK
96
K2ZM
NW7K
95
ND0N
N3AZW
94
WB5YDD
N4KSO
WB1HIH
NJ3V
KA9WWT
KJ9J
NJ9S
NK1Q
93
VE3DPO
W5YQZ
KA5ZWY
W9DM
92
K0ERM
WB4ZTR
VE4IX
91
W6VOM
90
N0DPF
AA4TE
KD7ME
KA9RNY
W0UCE
89
WA4RUE
88
WA3UZI
87
KA7AID
WA6WJZ
86
N3COY
N6EQZ
NN2H
KV5X
NO0A
85
N2HIF
K3JL
N3EGF
KA9RII
84
WA4RLV
KJ9L
KA2ZKM/T
N7ELF
83
WB5J
K4BGZ
82
N1EDD
KC3Y
N7GGJ
W2GJ
W5VMP
81
WA3YLO
N4PL
KB4LB
K2YAI
N7BGW
VE7EJW
80
KB5UL
K9ZBM
WZ5N
N0CLS
VE7EJU
79
VE3GT
WB2QMP
K6UYK
W5AS
WA0TFC
K1GGS
78
KB2AYD
N4RKN
77
KK4FV
K0SI
W2RRX
76
NK1N
75
W0OYH
NB1A
N0HWD
K1ABO
WA1TBY
74
KA2INE
N2ABA/T
KT9I
73
K3NNI
N6NLW
KA7EEE
72
AJ5F
KC4VK
WB4TZR
71
WA4MNR
VE3WV
WB6QBX
KB4BZA
KA0SBY
70
NV5L
K4IWW
KA4FZI
KB5CKQ
KA1LIH
69
WB4PNY
WB6BZQ
68
AC5Z
KA2ZNZ/T
KA9VII
WB0WNJ
VE7ANG
67
KB4OPR
VE3CYR
N1DHT
W2FR
WA3UNX
66
W0MZI
W4JLS
KM6L
W0OUD
KQ3T
K5UPN
NY0J
KA7MUL
65
W1YOL
VE3GSQ
WB2FTX
WB9PFZ
64
W5SHN
63
N2FTR
AI0O
K0PCK
KA1MDM
62
K4MLC
WA9VLC
WA6QCA
K4ZN
61
K6APW
NT4S
NN4I
N2DXP
60
W0YMB
KD0YL
KA9CTW
53
KA1QFV/T
52
N6FWG/T
N4MMM/T
48
N2EVG/T
47
KA1HPO/T
46
WB4HXS/T
42
KA5HJK/T
KA6TND/T
41
KA1NOI/T

The following stations qualified for PSHR during the month of November, but were not listed in February's PSHR column: N1CPX, WB1HBB, KA1HPO/T, W1PEX, N2ABA/T, N2EIA, N2EVG/T, WA2FJJ, W2FR, W2GJ, NN2H, W2MTA, WB2OWO, WB2RBA, ND2S, KA2UBD, K2YAI, KA2ZNZ, NJ3V, N7ELF, W7GHT, NW7K, VE7BNI, VE7ANG, VE7EJU, VE7EJW.

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

Call	Orig	Rcvd	Sent	Dlvd	Total
KA0ARP	3170	93	1756	134	5153
KK3F	1	1706	1674	32	3413
W3CUL	679	1065	1511	62	3319
W4HIR	1565	0	1565	0	3130
WD4IIO	1071	217	1089	122	2499
W3VR	406	799	873	87	2165
KA4TWI	92	971	987	56	2106
K4DOR	114	910	1014	10	2048
WB9YPY	0	879	80	570	1529
N4GHI	78	573	657	58	1366
KA9FEZ	—	—	—	—	1288
N3AZW	10	601	608	41	1260
W9JUJ	4	620	575	8	1207
WA2SPL	6	597	545	50	1198
WF6O	2	568	558	47	1170
WA9VND	7	498	556	42	1103
W1PEX	1	295	765	18	1079
KK4FV	1	451	565	17	1034
KA1IFC	1	479	477	62	1019
W7VSE	0	544	450	15	1009
KC9CJ	12	498	198	298	1006
KA2UBD	1	489	480	2	972
WB0WNJ	220	157	540	9	936
W2MTA	6	490	426	6	928
WX4H	0	477	436	5	918
NJ3V	72	382	442	7	903
K4MTX	0	436	456	4	896
N0DPF	283	129	420	56	888
N6LHE	0	443	429	13	885
KA7MUL	3	427	439	12	881
KW1U	3	457	372	35	867
WA4QXT	78	336	402	37	853
N4PL	124	278	420	27	849
VE3KK	318	99	339	82	838
AA4HT	59	370	386	21	836
KT1Q	4	433	380	11	828
K4NLK	36	349	369	21	773
W0BMA	189	197	295	91	772
VE7BNI	54	227	381	79	741
W0UCE	20	355	344	3	722
N4EXQ	14	364	284	50	712
VE3GSQ	30	354	316	6	706
KN1K	3	386	242	48	679
VE3ORN	13	327	247	85	672
WB5YDY	3	348	280	35	666
W5TNT	38	343	274	9	664
WB2OWO	156	177	272	58	663
W4NFK	28	312	304	15	659
W6TH	0	342	288	24	654
W3IWI	0	325	324	0	649
KB1AF	0	325	291	18	634
WB6DOB	110	179	303	32	624
N2EIA	21	282	261	55	619
WA4PFK	32	305	263	11	611
K4JWR	1	311	289	0	601
N2HIF	26	287	263	23	599
AA4AT	29	273	265	30	597
W3OKN	0	278	314	2	594
KA9RII	5	277	298	11	591
WA0YJX	144	151	241	54	590
W5SHN	47	162	362	17	588
W7AMM	40	251	289	8	588
W0FRC	155	134	214	76	579
WB5J	3	274	290	9	576
N3EMD	0	282	286	4	572
K4IA	2	272	283	12	569
NZ5U	225	58	273	10	566
NB5T	3	230	321	6	560
WD5GKH	17	292	244	0	553
K5UPN	1	264	286	1	552
NQ0G	12	243	285	9	549
KB4WT	0	297	222	27	546
K4ZK	2	270	246	27	545
W3ATQ	6	271	256	8	541
WB5SRX	5	235	144	124	539
KA4TLC	60	191	246	35	532
W6INH	12	254	231	34	531
VE3FAS	0	276	249	0	525
KA0EPY	39	256	180	49	524
KJ9J	4	297	195	18	521
AA4BN	4	251	260	5	520
N1DMV	5	247	244	19	515
N6MCY	2	263	282	27	511
N6LUY	0	242	262	3	507
WB4HRR	14	241	210	39	504
WB2EAG	—	—	—	—	502

BPL for 100 or more originations plus deliveries:

N9GJI	179	AA4FG	134	K4EUK	112
KB4HJQ	156	W0FIR	125	WB4TOP	107
WC4D	148	W9FZW	115		

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Clearing House Net	31	920	458
Early Bird Net	31	927	350
Empire Slow Speed Net	31	70	339
IMRA	26	1082	1888
Mission Trail Net	31	139	830
New England Novice Net	24	10	40
NYSPTEN	31	152	660
Southwest Traffic Net	31	374	1638
West Coast Slow Speed Net	30	52	314
20ISSBN	29	1100	381
75 Meter Interstate SB Net	31	1115	1607
7290 Traffic Net	50	1324	3087

Results, Second ARRL 10-GHz Cumulative Contest

Neither rain, fog, dense foliage nor mis-aimed antennas will stop the X-banders.

By Billy Lunt, KR1R
Contest Manager, ARRL

and Mark R. Burke, KA1MIS
Contest Assistant, ARRL

Weather is a major factor in any microwave contest and we had plenty of it! In the Northeast, it rained both weekends. In the South, there was one good weekend and one complete washout due to stormy weather. But in the West, it was perfect contest weather for both weekends, dry and sunny. As a direct result of the regional atmospheric conditions, so went the degree of participation. But despite all, the second running of the 10-GHz Cumulative Contest proved to be exhilarating as well as topping all the marks set in the first event. Participation was quite good this year and up a tad from last year. For 1987, the Contest Desk received a total of 56 entries from all call areas (except the 8th call area) and two VE provinces. Most of the activity again this year revolved around Southern California's microwave groups. (Note the sidebar for a description of how it's done in Southern California.)

Besides contributing to most of the activity, Southern California also claimed all the high-scoring records. The farthest-DX mark for the '86 contest (229 km) was shattered this year by N6XQ with a QSO with K6KKO for a distance of 335 km. Fellow Californians W6OYJ/6 and WA6QYR were close behind with QSOs of 315 and 313 km, respectively. Long-distance QSOs seemed to be plentiful, with 10 stations making contacts at distances of over 200 km. The total QSO record was more than doubled this year by WA6EXV/6 who made 87 QSOs. W6OYJ/6 didn't give him much time to relax, making 84 contacts for the second highest QSO total. In all, there were 10 entrants this year who topped last year's record of 41 total QSOs.

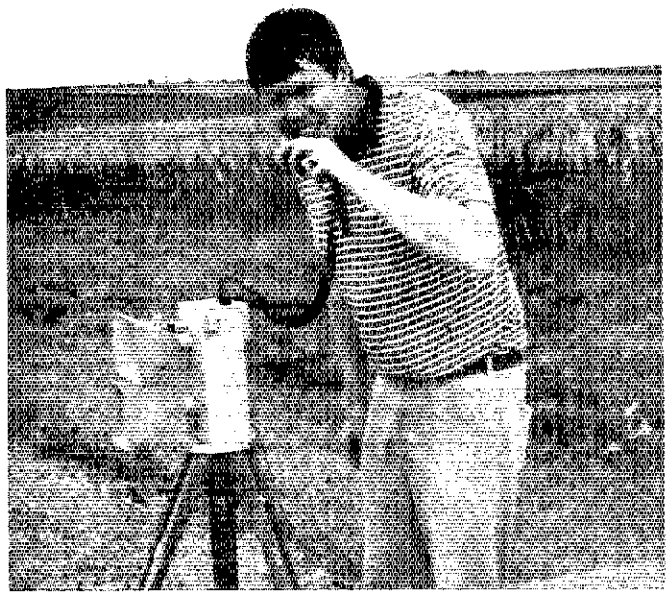
Mixing fresh air, mountaintopping, exercise, patience and radio expertise paid off for W6OYJ/6, scoring 10,536 points for the first-place win. Chuck, WA6EXV/6, was only 320 points off the top mark for a strong second place, and WA6QYR finished third with 8508 points.

If you enjoy experimenting with microwave equipment, the out-of-doors, hiking and making skeds, this is the contest for you. It is to your advantage to go portable from as many places as possible and to work as many stations as you can from each place. You may not only get the satisfaction of winning one of the more creative contests but you'll also experience the technical challenge of participating in such a competition. For those who have not tried 10 GHz, this contest may present unexplored areas of Amateur Radio which will enhance your knowledge and ability in the ever-growing field of microwave communication.

So, get your equipment running! Let everybody know where you are going and when, and then head for the hills for the 3rd annual ARRL 10-GHz Cumulative Contest! Watch for the dates to be announced in an upcoming issue of *QST*.

SOAPBOX

Why did it have to rain both weekends? NI1W's signal from Pack Monadnock (FN42BU) got weak; then I noticed that water was pouring out of the waveguide! (AF1T). Rain both days of both weekends and really limited activity (NI1W). The first weekend we had high winds. Second weekend was a washout! The only QSO was with my friend N1FCK across Lake Pocotopaug in East Hampton, CT. I was on the north side and he was on the southeast side. The winds were brisk at his end and we had problems with reflected waves off the lake (WB1GCM). I had equipment problems both weekends, but not insurmountable. The first



From a field in Southeastern Nebraska, Roger, WBØDGF, operates FM on 10 GHz.

Charles, KØNG, prepares to make a contact from EN1ØRV, one of his portable locations.

10 GHz, California Style!

By Gordon West, WB6NOA

Here in Southern California, the first weekend of the 10-GHz contest was an overwhelming success. Approximately 40 stations in Southern California were on the air for both days to provide some exciting microwave contacts.

Local weather conditions were ideal. A stable high-pressure system, 1020 millibars, provided good line-of-sight propagation. A high-level (3000 feet) tropospheric inversion layer gave us good over-the-horizon bounce. No early-morning fog to attenuate signals! An absence of wind also gave us two delightful mornings of easy operating without everything blowing around or dishes blowing over.

My stations consisted of a 2-foot and 4-foot Anixter Mark dish with an ARR Gunnplexer™ system. Higher-powered diodes were installed by Jim Ford, N6JF, for additional power output rated at approximately 180 milliwatts.

My second system was a duplicate ARR system, modified diodes and a 17-dB horn. This would allow me to find stations too elusive for the narrow beamwidth of the dish.

In Southern California, almost everyone operated vertical polarization. Tests between Los Angeles and San Diego using both polarizations showed little difference in signal strength. However, a cross-polarized contact would be impossible. Unlike other bands where signals decrease when polarization is crossed, on 10 GHz, signals would simply disappear when our feed was rotated 90 degrees.

Here are some notes that might assist new operators in getting acquainted with 10-GHz operation:

1) Make sure your polarization agrees with everyone else. Polarization is usually opposite to what the back of the Gunnplexer system rectangular box looks like. You can verify polarization in the next step.

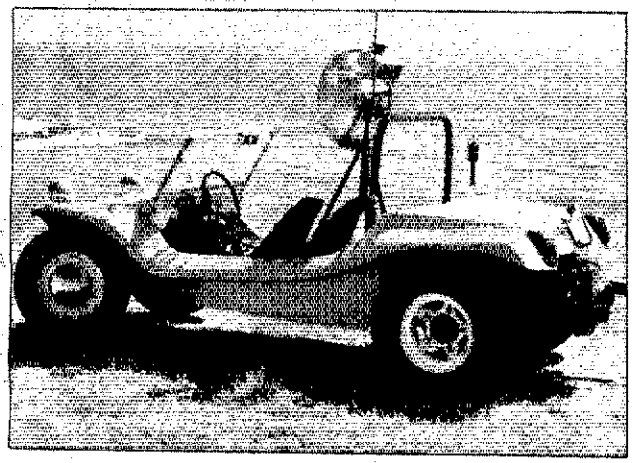
2) Turn the equipment off. Disconnect the equipment from a power supply. Make absolutely sure the equipment is not turned on. Double-check that the equipment is turned off. Now look in the feed horn and verify that the diode is vertically polarized for vertical polarization.

3) Using horns will give you plus or minus 10 degrees leeway in finding distant stations. Using the 2-foot dish will confine the pattern to plus or minus 5 degrees, and the 4-foot dish requires almost precise aiming for any results at all. Up-and-down movement is also contained to these same degree excursions. If you're aiming in the right direction, but have the horn or dish pointed up or down, signals will be lost.

4) Almost all signals from mountaintop locations still look horizontal when compared to the surface of the earth. Seldom is a down-tilt required.

5) Scheduling contacts on 2 meters or other bands is an absolute must. If the other system isn't aimed at you, there is no way you can hear it. Coordinating on 2 meters, 220 and 432 is also a good way to double-check your propagation path. If the 2-meter signals are strong, chances are you'll make the contact. If the 2-meter signals to a distant station with a hand-held are weak, chances are your 10-GHz contact won't make it.

6) We found a direct correlation between VHF propagation and 10-GHz propagation between hand-helds. As 2 meters would build, so would 10 GHz. If you can't establish communications between two 2-meter hand-helds, you'll never make it on 10 GHz.



10-GHz mobile operation: fun in the sun.

7) A magnetic compass is a necessity. This will allow you to reconfirm the expected position of a distant transmitting station. Finding out your reciprocal, via the compass, is also useful when you know the direction that they are beaming. Keep the magnetic compass away from anything metallic to prevent a heading error.

8) An aircraft altimeter is fun. Couple this together with a marine Loran-C navigation receiver, and you have a precise check of your height above sea level and your precise position within 25 yards of your exact geographical position.

9) The Loran-C navigation receiver may also be used to compute the distance and bearing to distant operators. As long as they know their latitude and longitude, range and bearing will automatically compute quickly on a modern Loran-C receiver.

10) A portable solar panel can easily keep your station on the air. A good solar panel will put out greater than 1 A of charging current, and most Gunnplexer systems won't draw more than approximately 900 mA. A gelled-electrolyte battery should keep you on the air for most of the evening.

11) Bring along some ham radio public relations sheets to your operating location. Curious visitors will always ask what you're doing and what's this stuff called ham radio all about. It's a great opportunity to expose newcomers to our hobby. Of course, caution them to stay away from the front of your system and keep them from being exposed to your flea-power RF output.

12) Clipboards with rubber bands are essential. At around noon, the winds pick up, and everything tends to blow away. Dish systems should be well anchored to keep them from blowing over. They will sail away like a kite.

13) Operating 10-GHz mobile is indeed possible, and fun. This allows you to move just a few hundred feet and pick up stations that may have been blocked before. Just a single tree in the path of your contact will completely take you off the air.

weekend's weather was fine. But we paid for that the second weekend. The rain and fog was so thick the mountains were not visible from 10 miles away. Enjoyed it and see you next year (K4HWG). More and more activity showing up in north VA. K4HWG and I have permanent 10-GHz microwave link-ups between QTHs. Three stations in Woodbridge are now active, and due to scouting information from this contest we anticipate over-100-km contacts for the next contest. Weather was terrible (rain and fog) for second weekend, and had to use only compass bearings to align antennae as visibility was about 100 yards up on the mountains. Several paths that were worked last year consequently couldn't be worked this year. Looking forward to next year's contest and anticipate additional entries from here (KA4CKI). Terrific turnout of San Diego-area 10-GHz stations (worked 20 locals). Many surprise unscheduled QSOs with LAX/ORG stations who were amazed to be working me only 2 miles from Mexican border. I did a lot of work before contest to shield and filter out spurious receiver responses to nearby megawatt TV/FM stations. HI/LO inversion bothered us first weekend, but persistence pays. Great contest! N6IZW held weekly workshops for several weeks and got many new stations on the air (W6OYJ). I drove 518 miles on the first 2 days of the contest to various Mojave desert sites to communicate with WA6EXV on Heaps Peak in San Bernardino mountains. Second weekend I spent

VE2VXO snapped this photo of Michael, VE2DUB, preparing to make QSOs atop Mont St Gregoire in Quebec.

both days on Heaps Peak working WA6EXV traveling the desert route. I traveled 250 miles to get to Heaps Peak. So in total I put on 768 miles in the car for the contest. WA6EXV put on about the same for his end of the contacts (WA6QYR). I made an excellent contact with K6KKO, 208 miles over the water duct from Point Loma to Refugio State Park. His signal was about 25 dB above noise on peaks. Who said you have to be on top of a mountain? (N6XQ). Guess I was the only one in Southern CA who stayed home, while everyone else ran around! (W6CPL). Great contest. Better conditions this year than last. The first weekend I made VUCC from DM13AR. On the first day of the second weekend I made VUCC again from DM14KF. The second day again VUCC from DM12JU (NN6W). I enjoyed the contest very much and am looking forward to next year (K6HLH). Best DX was 168 km to W6CPL using only 10 mW Solfan and 4-inch horn antenna! There should be some standardization of polarization! San Diego uses vertical, LAX uses horizontal. Many QSOs were made using my 10-GHz hand-held (possibly the world's first!). I sure would have done better with a dish! San Diego is truly the world's leader in 10-GHz activity (WA6MHZ). I enjoyed the contest very much. I wish the contest was held twice per year (KI6RF). I love this contest. Keep it up (K6PVS). I could only work the first weekend of the contest—had a ball. Look for me during the next contest from BO36. Alaska anyone? (WA2PIV). As a general matter of interest, we had a few costly foul-ups this time and couldn't make out as well as we hoped for (K2DNR/7). It's interesting that the "Contest Fathers" dictated a "101" score to be the minimum...guess I'm a step above that! (WA5LBQ). The contest was fun—my first on 10 GHz! Some of the passersby thought that we were providing communications for the FARM-AID-3 concert being held in Lincoln. Hi, Hi! The worst part of the contest was sitting down and figuring out the score! (WDØDGF). It is lots of work to put a 32-inch dish together. Rain and wind kept me inside the car with the horn (KCØQR). I observed heavy QSB on 66-km, clear, line-of-sight path across Lake Ontario (VE3MA). Solid signals with two Solfan units across Lake Ontario! I guess I don't need Gunnplexers for shots under 200 km. Lots of fresh air and exercise. Thanks for a great contest (VE3LPP).

Scores

Score lines indicate call sign, total score, total QSOs, number of different call signs worked and best DX in kilometers. Example: AF1T had 950 points total from 9 QSOs with 8 different stations. His best DX was 60 km.

1

AF1T	950	9	8	60
N1W/1	306	4	2	60
K1KA	108	2	1	7
N1FCK	102	1	1	2
WB1GCM	102	1	1	2
KA1LMR	101	1	1	1

2

W2TTM	1,577	26	6	72
K2MPD	323	8	1	72
KG2K	323	6	1	72
WB2ONA	145	1	1	45

3

WD4MUO/3	310	15	2	24
WA3ZKR	182	12	1	23

4

K4HWG	660	22	3	38
KA4CKI	538	22	3	38
KØRI	303	3	3	1

5

WA5VJB	3,431	61	19	71
KF5N	999	18	5	71
AA5BW	560	10	4	55
N5BHX	536	11	3	33
N5BBO	218	5	1	33
W5VDS	218	5	1	33
K5BTS	102	1	1	2
K5IS	102	1	1	2

6

W6OYJ/6	10,536	84	37	315
WA6EXV/6	10,216	87	19	172
WA6QYR	8,508	65	15	171
WB6NOA	7,498	49	25	313
N6IZW	7,495	57	34	207
N6XQ	7,338	62	29	335
NN6W	6,647	50	26	172
W6CPL	6,578	37	22	211
WB6DNX	5,886	40	21	281
K6HLH	5,029	35	12	203
WB6BKR	3,350	29	20	168
WA6MHZ	3,169	35	21	168
WD6FWE	3,042	27	19	154
KI6RF	2,996	29	15	185
K6PVS	2,782	17	12	163
WA5BNH	1,248	13	8	169
N6AMD	1,228	7	6	205
WB6IGP	1,186	8	8	158
WA2PIV	927	8	6	60
K6BTO	572	5	5	25
KA6AMD	369	2	2	151
WB6WYR	237	3	2	26

7

K2DNR/7	4,010	59	1	232
KB7CI	4,010	59	1	232

9

WA5LBQ	102	1	1	2

Ø

KØNG	1,299	29	6	40
WBØQIY	984	17	8	37
WBØDGF	945	19	6	37
KCØQR	616	8	5	28

VE

Quebec

VE2DUB (+VE2VXO)	422	7	3	38

Ontario

VE3SMA/3	611	7	5	66
VE3LPP	599	8	4	66
VE3EZP	207	2	2	4

W1AW Schedule

October 25, 1987—April 1, 1988 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0300, 1400; TThS: 0000; TThSSn: 2100; Sn: 0300
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300: Sn: 0000
	CW Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 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
CST	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
MST	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
PST	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.

On Monday, Wednesday and Friday, 1400 through 2200 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from July 1987 *QST*, pages 9 and 77," 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 77.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Tuesdays and Saturdays at 2330 UTC, Keplerian Elements for active amateur satellites will be sent on the regular teleprinter frequencies.

W1AW CW and voice bulletins are sent on OSCAR 10, Mode B, subject to reactivation of the transponder. Look for CW on 145.840 MHz and SSB on 145.962 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1600 UTC transmissions, and 2300 UTC on 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 EST and on Saturday and Sunday from 3:30 PM to 1 AM EST. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 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.

Contest Corral

Conducted By Mark R. Burke, KA1MIS
Contest Assistant, ARRL

Feb 27-Mar 1

YL-OM Contest, CW, Jan *QST*, p 88.

MARCH

2

West Coast Qualifying Run, 10-35 WPM, at 0500Z Mar 3 (9 PM PST Mar 2). 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.

5-6

ARRL International DX Contest, phone, Dec *QST*, p 81.

8

W1AW Qualifying Run, 10-35 WPM at 0300Z Mar 9 (10 PM EST Mar 8). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Mar 2 listing for more details.

12-13

Iowa QSO Party, sponsored by the Iowa Section, from 1800Z Mar 12 until 0600Z Mar 13. Work stations once per band and mode. No repeater QSOs. Exchange signal report and county for Iowa stations; section or country for others. Suggested frequencies: CW—1.810 3.550 7.050 14.060 21.050 28.050 MHz; phone—3.875 7.225 14.275 21.325 28.600 50.110 144.200 146.520 MHz; Novice—10 kHz from low ends. Count 1 point for each phone contact; 1.5 points for each CW contact; 3 points for each OSCAR contact. Novices and Techs count 5 points for each QSO. Iowa stations multiply total QSO points by total sections and total Iowa counties. Others multiply total QSO points by Iowa counties (max 99) worked. Bonus multiplier for each ARRL Iowa Section Official worked (max 8). Awards. Mail logs by Apr 1 to Bob McCaffrey, KØCY, RR #4, Box 228C, Boone, IA 50036.

Maine QSO Party, sponsored by the Portland AWA from 0000Z Mar 12 until 2400Z Mar 13. Work stations on CW and phone for each band. Exchange serial number, signal report and QTH (county for ME stations; state/province/country for others). Suggested frequencies: CW—1.810 and 60 kHz up from low end of other bands; phone—1.870 3.930 7.280 14.280 21.380 28.580; Novice—20 kHz up from low end. Count 1 point for phone and 3 points for CW. Multiply by number of ME counties plus the number of W2ØØ anniversary stations worked for final score (ME stations multiply by ME counties and states/provinces/countries worked). Mail entries to Bernie Cohen, K1SA, 194 Craigie St, Portland, ME 04102.

13

Zero District QSO Party, sponsored by the Davenport RAC, Mar 13 from 1800Z-2400Z. Zero-district stations may work anyone; all others work Ø-district stations only. 80-10 meters only, phone and CW. Work each station once per band and mode. Mobile stations may be worked again as they change counties. Exchange signal report and state. Ø-district stations also send county. Suggested frequencies: CW—60 kHz up from lower band edges; phone—3.900 7.270 14.300 146.52 (no repeater QSOs); Novice—3.730 7.130 28.360. Count 1 point for phone QSOs, 2 points for CW QSOs. Zero-district stations multiply QSO points by total of states, Ø-district counties, provinces and DXCC countries worked. Others multiply QSO points by number of Ø-district counties worked. Any station with over 100 QSOs must include dupe sheet. Mail logs by Apr 30 and SASE for results to WØBXR, 5305 White Post Rd, Bettendorf, IA 52722.

15

W1AW Qualifying Run, 10-35 WPM, at 1400Z (9 AM EST) Mar 15. See Mar 9 listing for more details.

19-21

BARTG Spring RTTY Contest, sponsored by the British Amateur Radio Teleprinter Group, from 0200Z Mar 19 until 0200Z Mar 21. Operate 30 hours maximum. Off-times must be no less than three hours each and must be indicated on log. Single operator, multioperator and SWL categories. Work stations once per band, 80-10 meters. Exchange UTC, signal report and message number starting with 001. Count two points for RTTY QSOs with stations in your country, 10 points for others. Count 200 bonus points for each country worked per band. For final score, add QSO points × (total different DXCC countries + W/VE/VK call areas per band) plus (band countries × 200 × continents). Use a separate log sheet for each band. Mail logs to be received by May 28 to Peter Adams, G6LZB, 464 Whippendell Rd, Watford, Herts WD1 7PT, England.

Bermuda Contest, sponsored by the Radio Society of Bermuda, from 0001Z Mar 19 until 2400Z Mar 20. Operate 36 hours maximum. Off-times must be clearly indicated and must be at least 3 hours each. Single operator only. All stations must operate from their own private residence or property. 80-10 meters, phone and CW. No cross-band or crossmode QSOs. Exchange signal report and QTH (W stations send state; VE stations send province; UK stations send county; West German stations send DOK number; Bermuda stations send parish). W/VE stations work W German, UK and Bermuda stations only. A phone contact and a CW contact with the same station on the same band counts for score if the contacts are made at least 30 minutes apart. A multiplier counts only once per band. Count 5 points per QSO and multiply by the number of VP9 stations worked per band. Separate logs for each band and mode. Logs must be received by Jun 1. Include a dupe sheet if more than 200 contacts are made. See sponsor for awards. Mail to RSB Contest Committee, Box HM275, Hamilton HM AX, Bermuda.

Virginia State QSO Party, Feb *QST*, p 85.

Wisconsin QSO Party, Feb *QST*, p 85.

26-27

CQ World Wide Prefix Contest, phone, sponsored by *CQ Magazine*, from 0000Z Mar 26 until 2400Z Mar 27 (CW contest, May 28-29). Single ops are allowed a maximum 30 hours operating time; off-times must be at least 60 minutes in length and must be clearly indicated in the log. Multioperator stations may operate entire 48 hours. Phone only, 160-10 meters (excluding the WARC bands). Categories: single op, all band and single band; QRP (5 W output maximum); multiop (multiband only) multi and single transmitter. Multi-singles must remain on a band for at least 10 minutes after making a QSO; multi-multis are allowed only one signal per band. All transmitters must be located within a 500-meter-diameter circle or limits of property; no remote stations. Work stations once per band for QSO point credit, but prefix credit may be counted only once. Exchange signal report plus serial number starting with 001. Multi-multis use separate numbers on each band. QSO points: Contacts between stations on different continents count three points on 28, 21 and 14 MHz and six points on 7, 3.5 and 1.8 MHz. For North American stations, contacts between stations in different countries on the NA continent count two points on 28, 21 and 14 MHz and four points on 7, 3.5 and 1.8 MHz. For non-NA stations, contacts with stations in other countries but on the same continent count one point on 28, 21 and 14 MHz and two points on 7, 3.5 and 1.8 MHz. QSOs between stations in the same country count zero points but are permitted for prefix multiplier credit. Multipliers are prefixes, to be counted only once. A prefix is the two- or three-letter/number combination that forms the first part of an amateur call sign, as in W1, G4, DF3, 8P6, etc. Stations operating outside the call area indicated by their call signs must sign portable. The portable prefix counts as the multiplier; for example, AA1K/3 in Delaware counts as an AA3 multiplier. Final score is total QSO points times sum of prefixes worked. Awards and club competition. Mail logs by May 10 (Jul 10 for CW) to *CQ Magazine*, WPX Contest, 76 North Broadway, Hicksville, NY 11801.

30-31

YL-ISSB QSO Party, phone, Jan *QST*, p 87.

APRIL

2-3

GARTG SSTV Contest, Part 1, sponsored by the German AR Teleprinter Group, 1200Z Apr 2, until 1200Z Apr 3 (Part 2 will be held Oct 8-9). 3.5, 7, 14, 21 and 28 MHz only. Work stations once per band. Exchange call signs, signal report and serial number. GARTG members also send membership number. Count 10 points per QSO. Multipliers: countries as defined by the WAE and DXCC lists and W/K, VE/VO, JA, PY, VK call areas. Final score = QSO points × multipliers worked per band × continents worked per band. Add 50 bonus points per GARTG member worked. Mail logs to be received within 2 months to Wolfgang Punjer, DL8VX, PO Box 90 11 30, D-2100 Hamburg 90, Fed Rep of Germany.

6

West Coast Qualifying Run, 10-35 WPM at 0500Z (10 PM PDT Apr 5). See Mar 2 listing for more details.

9

Israel International Contest, sponsored by the Israel ARC, Apr 9 from 0001Z-2400Z. Single-operator stations only. Work each station once per band and mode. Suggested frequencies are 160 through 10 meters (30 kHz from the bottom of each band for CW). Worldwide stations send signal report and QSO number starting with 001. Israeli stations give signal report and three-letter zone code. Count 5 points for each valid contact. Multipliers: One multiplier for each Israeli prefix worked per band plus number of different Israeli zones worked (ARV, ASD, AZA, BSV, DSC, ELT, GOL, HIF, JLM, JOR, JUD, LGL, MKZ, NAT, NGV, SAM, TVL, UGL). Multiply total number of QSO points by number of multipliers for final score. Each log entry must have times in UTC and complete exchange for credit. A summary sheet must include all zones worked, prefixes per band, total QSOs made plus the computation of the score and cross-checking sheets. Entries must be postmarked no later than May 9. Send entry and 4 IRCs for results to 40th Anniversary Contest, Israel Amateur Radio Club, PO Box 4099, Tel Aviv 61040, Israel.

9-10

GARTG RTTY Contest, Part 2, sponsored by the German AR Teleprinter Group. VHF, 1200Z-1600Z Apr 9, HF, 0700Z-1100Z Apr 10. VHF and HF are separate contests. Classifications: A—HF over 200-W input, B—HF under 200-W input, C—SWL, D—VHF. Exchange RST, QSO number, name, QTH, QTH locator (for VHF only). After each QSO the station who called CQ must QSY. HF—3.5 and 7 MHz. Count 1 point per QSO. VHF—144, 432 and 1296 MHz. Count 1 point per 144-MHz, 2 points per 432-MHz, 3 points per 1296-MHz per km worked. Final score is total QSO points. Mail logs to be received no later than 20 days after the end of the contest to Wolfgang Punjer, DL8VX, PO Box 90 11 30, D-2100 Hamburg 90, Fed Rep of Germany.

North American QSO Party, CW, sponsored by the *National Contest Journal* from 1800Z Apr 9 until 0600Z Apr 10 (phone—1800Z Apr 16 until 0600Z Apr 17). Contests are separate. Single-operator and

multioperator. Multiop may be multitransmitter but only one signal per band. No spotting nets for single ops. Single ops may operate any 10 hours. Rest periods must be at least 30 minutes long and noted in log. Multiops may work the entire contest. Use only one call sign per contest. Exchange name and state/province/country. 160-10 (no WARC bands). Work stations once per band. Suggested CW frequencies are 35 kHz above band edge; phone—1.865 3.850 7.225 14.250 21.300 28.600. Try 10 m at 1900Z and 2000Z, 160 m at 0430Z and 0530Z. A valid QSO is two-way logged exchange between a North American station (as defined by CQ WW DX Contest plus KH6) and another station. Multipliers are states (including KH6 and KL7), VE call areas (VE1-VE8, VO1, VO2, VY1) and other NA countries (do not count USA, VE, KH6 or KL7 as countries). Score 1 point per QSO. Multipliers times QSO points for final score. Awards. Send logs, summary sheet and dupe sheets before 30 days after the contest to Dave Pruett, K8CC, 2727 N Harris Rd, Ypsilanti, MI 48198.

11

ARRL Spring Sprints, 144 MHz.

13

W1AW Qualifying Run, 10-35 WPM at 0200Z Apr 14 (10 PM EDT Apr 13). See Mar 15 listing for more details.

16-17

Georgia QSO Party, sponsored by the Dixie DXers Contest Club, 2000Z Apr 16 until 2400Z Apr 17. Work each station once per band. Phone and CW. Single operator, mobile (or portable), and fixed station classes. Suggested frequencies: CW—1.810 3.550 7.040 14.050 21.040 28.050; phone—1.860 3.830 7.230 14.280 21.340 28.450 28.550. Exchange RS(T) and state for non-Georgia stations; RS(T) and country for DX stations; RS(T) and county for Georgia stations. Count 1 point for each phone QSO, 2 points for each CW QSO and 5 points for each Novice or Technician QSO. Multipliers: Each Georgia county (max 159) for non-Georgia stations; each state or VE province (max 60) plus each DX country (max 10) for Georgia stations. Multiply total QSO points times total multiplier for final score. Awards. Mail entry by Jun 1 to Al Roloff, N4UZ, Rte 1, Box 204, Bremen, GA 30110.

North American QSO Party, SSB, see Apr 9-10 listing for more details.

QST QSO Award Party, phone, sponsored by the Canadian Radio Relay League, Apr 16-17, 1500Z-2200Z each day (CW—Apr 23-24). The award is available to any amateur who makes phone, CW or mixed contacts with 8 of the 11 QST stations in Canada. To receive the award send SASE or IRC to Garry Hammond, VE3XN, 3 McLaren Ave, Listowel, ON N4W 3K1, Canada.

19

ARRL Spring Sprints, 220 MHz.

23-24

Helvetia Contest

QST QSO Award Party, CW, see Apr 16-17 listing for more details.

24

W1AW Qualifying Run

27

ARRL Spring Sprints, 432 MHz.

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 **Apr 1** to make the **June** 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

Washington, Texas: The Brenham ARC will operate 0000Z **Mar 4** until 0000Z **Mar 6** from Washington-on-the-Brazos State Park to commemorate the 152nd anniversary of the signing of the Texas Declaration of Independence from Mexico. Suggested frequencies: phone, CW and packet on the VHF/UHF and the 80- through 10-meter bands; 10-meter Novice phone band. For commemorative QSL, send legal-size SASE to BARC, PO Box 44, Brenham, TX 77833.

San Antonio, Texas: The San Antonio RC will operate W5SC 1500Z **Mar 5** until 2300Z **Mar 6** from the Alamo in celebration of Texas Independence. Operation will be CW and SSB in the lower portion of the 80- through 10-meter General bands. For QSL, send SASE to W5SC, 3642 E Houston St, San Antonio, TX 78219-3818.

Fairbanks, Alaska: The Arctic ARC and the North Star Borough will operate special-event stations **Mar 13-22** celebrating the Fairbanks Ice Festival and the Yukon Quest Sled Dog Race. Operation will be on all bands 160-10 and most modes. For special QSL, send QSL and SASE to the station worked.

Piscataway, New Jersey: The Piscataway ARC will operate member stations, signing /VOA, **Mar 19-20,** 0000Z until 2400Z each day, to commemorate the World War II operations of the Voice of America relay station, WRCA. Suggested frequencies: CW—Novice portions of the bands; phone—lower third of the General portion of the 75- through 15-meter bands and the Novice portion of the 10-meter band. For certificate send QSL and no. 10 SASE, or for unfolded, a 9- × 12-in SASE to KO2K via *Callbook* address.

Michigan and Ohio: The Ohio and Michigan ARRL Sections will operate special event stations **Mar 26-27,** 1700Z until 0500Z each day, to celebrate the Diamond Jubilee of Emergency Communications by Amateur Radio. Suggested center frequencies: CW—1.810 3.710 7.130 14.050 21.125 28.125; phone—1.950 3.875 3.932 7.260 14.250 21.325 28.400. Michigan stations will operate 5 kHz up from the center frequencies, Ohio stations 5 kHz down. Work W8LT or W8UM for special endorsement. Ask operators for details of other endorsement. For certificate, send QSO information to Larry Solak, WD8MPV, or George Race, WB8BGY.

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 **Apr 1** to make the Jun issue. Please include the name of the sponsoring organization, the location, dates, times (Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

Exam Info

WILL THE REAL ELEMENTS 3A AND 3B PLEASE STAND UP!

A year ago this month, the Technician/General class question pool (Element 3) was separated into two different pools. They were named Element 3A (Technician) and Element 3B (General). No substantive changes were made to the existing questions; they were merely "split" into two groups.

If you're preparing for your Technician or General test, however, beware! It's easy to confuse *Element* numbers (which refer to overall pools of questions from which exams are designed) with *subelement* numbers (which refer to topical categories of questions within Elements). Under the present scheme, test Elements are as follows:

Element 1A 5 WPM code
Element 1B 13 WPM code
Element 1C 20 WPM code
Element 2 Novice written
Element 3A Technician written
Element 3B General written
Element 4A Advanced written
Element 4B Extra Class written

Once again, written-test Element numbers designate the overall pools of questions from which you should study. Subelement numbers designate the groupings of question topics of questions within each of those pools.

In the question pools for both Technician and General, questions on Rules and Regulations are numbered beginning with "3A" (eg 3A-1.1) and questions on Operating Procedures are numbered beginning with "3B" (eg 3B-1.1). (The nine subelements within each written test Element are defined in Section 97.21{d} of the FCC Rules and Regulations.) Both Elements 3A and 3B have questions that are numbered 3A-1.1 and 3B-1.1.

Unfortunately, in studying for their Tech tests using current license manuals, some candidates have mistakenly concentrated only on those questions whose numbers begin with "3A," that is, only on those questions in subelement 3A. The same mistake is likely to occur with some General-class candidates with subelement 3B questions. Regardless of the Element being studied, if a candidate studies only the questions marked with 3A and not the other eight categories, he/she will be familiar with only the regulatory portion of the test; studying the other eight categories, representing 88% of either the Tech or General class tests, will be overlooked.

The moral of the story is, if you're studying for your Technician test, study all the subelements (A through I) of Element 3A. If you're studying for your General test, study all the subelements (A through I) of Element 3B.

This is yet one more reason why applicants should study more than just the questions and answers. Although some people believe they don't need to study the theory that underlies the questions in the manuals, those who do study the text are much less likely to leave a test session disappointed.—*Jim Clary, WB9IHH, ARRL/VEC Manager*

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. Amateurs throughout Alberta settling into winter routine. Fall amateur classes going well. Moe Lynn, VE6BLY, was involved in a vehicle accident while on his motorcycle. He's in the hospital recovering from broken legs, arm, collar bone, ribs, etc. I talked with Moe a few days ago, and he is coming along well, but misses his radio. Alberta Amateur Radio Emergency Service net is progressing well. Many ECs are checking in. AARES net working with Alberta Public Safety Services. Traffic: ASPN QNI 1530, QTC 12, Informal 105. ATN QNI 331, QTC 67. AARES QNI 171. Personal traffic: VE6XV 35, VE6GUS 17, VE6ABC 3, VE6SD.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—British Columbia Public Service Net meets nightly at 3729 kHz. 0030 UTC, NM Jim VE7BLO reports net attendance of High 195, Low 55, Total 456. Jim reports that band conditions as very good many nights. British Columbia Emergency Net meets on 3650 kHz every night at 0300 UTC. NM Ferdi, VE7EJU, reports Christmas traffic was great with a total of 576 QTC and 863 checkins for the month. Thanks to Surrey ARC, Burnaby ARC, Victor Short Wave Club and others that have been kind enough to keep these reports active each month. Also thanks to all the SNCs for their help in the past years. Traffic: VE7BNI 741, VE7EJU 433, VE7ANG 230, VE7EJW 215, VE7XA 134, VE7FB 107, VE7CCJ 81, VE7FME 42, VE7BCF 30, VE7BZV 24, VE7BZI 14, VE7EGM 14, VE7BNH 9, VE7SR 7, VE7EIR 6.

MANITOBA: SM, Jack Adams, VE4JA—Many thanks each and everyone who over the past year have served in different functions to make up the Manitoba Section of CRRL. 1987 was a year of disagreements and concerns, but by year end things seem to be running normally. 1988 is going to be an interesting year as CRRL is on its own. We need all the help and understanding possible to make this a successful venture. Net reports for Dec. MEPN 941 QNI, QTC 60, sessions 26. MTN CW Net 265 QNI, 69 QTC, 29 sessions. MMWX Net QNI 597, QTC 26, 31 sessions. Indivdual traffic: VE4JA 125, VE4LB 32, VE4KE 26.

MARITIME-NEWFOUNDLAND: SM, Leigh Hawkes, VE1GA. BM: VE1BQO. I have now been advised that contrary to my previous report, this section will NOT be changing. Word has just been received about a Fleamarket to be held in Fredericton, Aug. 19-21st. Mark your calendar. New Amateurs in Nfld include VO1s LS, OU, NF and RI. Congrats all. VO1DI has moved to Grand Falls. 1988 SONRA Exec include, Pres: VO1FX, VP: VO1DK, Sect: VO1RL, Treas: VO1JN. Also Directors VO1s BL, FR, FE, and auditor VO1CR. This will be my last month as SM. Special TNX to all who have supported and contributed thru my term of office. Reminder to Stn and Field appointees. Ur office expires with that of the SM. Contact my successor if u wish to renew. Traffic: VE1BKM 192, VE1VX 41, VE1BPM 23, VE1BTV 5, VE1ALU 4.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3GSA. SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. Toronto Regional Office of the DOC advises amateur radio exams will be held at the DOC office at 55 St. Claire East on the last Friday of each month with a maximum of six candidates at a sitting. Call early for an appointment if you are in the Toronto area. VE3AUR finds her course in calligraphy interesting. The Niagara North Section of the ARES, under the direction of EC VE3HNH, held a simulated emergency test on behalf of the Red Cross in the area. The scenario was an overturned chemical truck which was leaking. 25 ARES stations, 10 non-ARES and 1 Toronto station participated in the roll call. VE3BB earned his WAS award in less than 3 weeks, working 49 states in just 12 days. Congratulations to VE3EUK on being named KWARC's Amateur of the Year. Metro ARES has started a Monday night net on VE3TWR after the OLN or at 18:45 local, which ever comes later. The format is "snappy" and will be used to disseminate ARES info to the membership in a convenient way. John, VE3POJ, replaces VE3DOK as the new net manger of the Open Line Net (OLN) held every evening at 18:30 local on repeater VE3RPT and sponsored by the Toronto FM Society. This is a local area NTS net and can be accessed by anyone in the wide-coverage area using a portable, mobile or 2 metre base station or linked in from 10 metres, 6 metres or 440 MHz. The following members of the Peterborough ARC had a successful outing at the Rally of the Tall Pines: VE3AAU VE3AQQ VE3GRL VE3IQZ VE3MCC VE3NTQ VE3RA. The Scarborough ARC sponsors a number of on-the-air operating awards. Detailed operating rules may be obtained from VE3GGO. The ARRL Awards Committee has voted unanimously to accept the recommendation of the DX Advisory Committee to add Aruba to the ARRL DXCC Countries List. Aruba (P4), with the new listing, will be separate from the Netherland Antilles listing. New amateurs are: VE3CIV VE3NGL VE3PXS VE3PNK VE3PXX while VE3PUA and VE3LLD have their advanced. Traffic update for the year and for the month of December will be provided next month.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. VE2CSC (PBBS) very active on 145.05 also VE2PAK on 145.01. Our STM, VE2EDO, is back from a trip to Australia. Many thanks to all ORS who handled the holiday traffic with no back log. Avec regret j'ai a vous annoncer le décès de VE2BUM et de VE2GVP. VE2RBS-1 est en operation a Sorel sur 145.05. Gilles, VE2AYH, est tres heureux avec son nouveau KENWOOD TS- 440S. Traffic: VE2BP 64, VE2JN 61, VE2GEJ 58, VE2WH 49, VE2EC 24. (Nov.) VE2JN 33.

ATLANTIC DIVISION

DELAWARE: SM, Robert J. Pegritz, KC3TI—This will be the last column that I, WA3WIY, will be writing. I wish to thank all of my appointments for the manner in which they have handled their jobs, and I also wish to thank everyone in Delaware for their cooperation and to wish everyone continued success in your endeavors. Robert Pegritz, KC3TI, now your section manager, will do a fine job, and I am sure your cooperation will be extended to him. Thanks again to all. It is very nice to hear more checkins from New Castle Co. on the DTN and DEPN. Hope you continue to participate. DTN stations 313 traffic 40 in 23 sessions DEPN stations 43 traffic 11 in 4 sessions. SEN Stations 48 traffic 5 in 4 sessions. Traffic: W3QQ 119, KA3GRQ 56, WB3DUG 28, K3YBW 26, K3JL 23, W3PVO 20, WA3WIY 17, KC3JM 12, KC3TI 10, KC3FW 6, W3ZID 4. (Nov.) W3PQ 51.

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. Let's hear it for our county ARES Emergency Coordinators and District Emergency Coordinators. In the 34 counties of Eastern PA they devote many hours to planning for events that may never happen. Much work, little glory. Thanks, people! SEC KB3YS has been holding regional meetings with ARES leadership since the first of the year. KC3TX is now EC in Columbia County. Public Information Officer W3ZXV has introduced himself to the clubs. We hope to develop a realistic public info program that supports and supplements existing efforts. In addition to our EPA hamfests, starting with the York Winterfest in Dover on March 6, try to make the Atlantic Division Convention, May 20-22 in Rochester, NY. With the clubs, PARA's '88 officers are K3ITH, K3HLN, WD4DSV, WA3CQU, and WB3HXM. DLARC's are KU3K, W2SPK, KA3MNY and KB3RI. Lehigh Valley's are N3DPU, N3AB, WA3KIF, and KA3PGW. Reading's are WA3ZIV, KC3QB, W3UQC, and WB3AAK. Dauberville DXers are KQ3V, WB3FYL, N3CHL, and K3ZLK. Everybody should join and support a local radio club. There isn't one? Start one! Please send in your club's 1988 Annual Report so we have your current info. If the club mascot ate your copy, simply write Affiliated Club Coordinator KC3QB for a replacement. In the Philadelphia area, regular VE test sessions are offered by Phil-Mont, Penn Wireless, Warminster, Mid-Atlantic, RF Hill, and Marple Newtown clubs. EPA FEEDLINE, the quarterly newsletter sent to all Affiliated Clubs and Field Organization volunteers, prints a Section-wide test calendar in each issue. The data come from ARRL/VEC printouts and club news letters. Almost certainly, however, we're missing some sessions. Please send your VE test skeds (date, place, time, contact person, phone) for April through the end of the year to KC3LM. By mail or via packet to KC3LM at KB3UD PBBS. Regardless of VEC, we will include your information, but we need it by 15 March. In the York area, contact K3DCU for info on the Hilltoppers' Saturday Novice course beginning on the 19th. NETS (December QNI/QTC/Sessions): EPAEPTN 635/337/31, EPA 507/245/62, D3ARES 78/6/4, D5ESN 52/17/4, D8ARES 70/20/8, D8ARES 72/0/5, MARCTN 156/95/13, MARCARES 82/39/4, SEPATN 51/15/9. PBBS: K3RLI 346, AG3F 320, KB3UD 287, WB3JOE 16. December traffic: N3AZW 1260, N3COY 360, N3DRM 244, KD3AO 181, KA3DLY 168, KA3RGF 153, WA3EHD 145, W3JKX 142, WB8KPE 128, W3IPX 127, W4UQ 123, N3CD 102, KB3UD 79, AA3B 76, W3FAF 67, N3EFW 54, KC3LM 50, K3TX 47, K3WPI 46, KY3M 39, WA3CKA 3, W3ADE 31, W3VA 25, W3AQN 22, W3DP 15, W3CL 14, KO3M 6, W3TWV 6, W3HK 3. (Nov.) W4UQ 65, WA3EHD 62, K3WPI 49, W3AQN 48, KA3RGF 40, KO3M 38, KY3M 38, KB3FW 36, KU3R 37, N3EFW 33, WA3CKA 21, W3TWV 19, W3FAF 18, W3ADE 14, W3CL 12, W3DP 11, W3VA 10, W3BUR 6, W3HK 3.

MARYLAND-DC: SM, Philip Battey, W3FZV—The MD Apple Dumpling Radio Society will honor the Bicentennial of the Constitution by operating station N200EHD. MADRAS issues a nice bulleting called "Dumplin' Doin's". Other club bulletins were received from Anne Arundel, Laurel, and Frederick Clubs. Buck, KC3Y, writes a nice column about MSN for the Ham Arundel News. KX3U recently issued an updated list of MDD members. If you want a copy, let Walt know. W3VVN, our TC, needs more technical questions for himself and the ATCs in the section. Do you have questions about your power supply, transceiver, amplifier, or antenna? Please get in touch with Ken or with ARRL, who will relay your questions to Ken. KG3M does a good job at receiving ARRL messages on RTTY and relaying them throughout the section by way of packet radio. Remember the Timonium Hamfest, sponsored by BARC, on March 26-27. The Frederick ARC was very active throughout 1987 with public-service projects. A recent amateur radio demo was given to some Boy Scouts by the LARC. WA3OGZ, KA3MFM and KA3FYY explained the history and operations of hour hobby. KN3U is working hard to repair some recent damage to his organization of emergency and public-service amateurs. Do you want an official ARRL member's appointment? If you are interested in a job as ORS, OO, PIA, ATC, or OBS please contact the SM. If you're interested in being an OES or EC, then contact KN3U, the Section Emergency Coordinator. About expenses: Reimbursement for any travel and administrative expenses for official League purposes is at the discretion of the SM. If you want reimbursement, please fill out necessary forms, enclose receipts, and send claims to me. N3RO keeps very busy in the Frederick area. With the Nets: Net/Mgr QND/QTC/QNI: MSN/KC3Y 31/42/387, WRPON/WB3BFK 21/45/669, MDD/W3FA 62/289/608, MEPN/N3EGF 30/213/821. HO-CARES/K3NNI 3/6/30, BCN/N3EGF 4/1/32. PSHR KK3F 108, W3FA 104, W3YVQ 103, WA3UZI 88, N3EGF 85, KC3Y 82, WA3YLO 81, K3NNI 73. Traffic: KK3F 3413 (BPL) , W3IWI (PBBS) 649 (BPL), W3LDD 220, K3NNI 172, W3YVQ 167, W3FA 149, KC3Y 147, N3EGF 124, KJ3E 114, NB3P 109, WA3UZI 108, WA3YLO 100, KT3T 75, NC3V 66, K3ORW 57, KC3ZJ WB3BJM 40, KX3U 26, W3DQI 23, WB3BFK 22, WA3GYW 17, W3FZV 10, NF3X 10, WA1QAA 8, KC3DW 6, N3RO 6, W3NZW 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. Congratulations to the Jersey Shore ARS on becoming our section's newest Special Service Club. On Saturday, March 5, the SNJ staff will be conducting on ARRL/SNJ Forum. The site will be the Atlantic County Library in Mays Landing. In addition to conducting section business, we plan on having our Division Director, W3ABC and also K1CE from League Headquarters to talk about ARRL happenings and the latest happenings in our hobby. Since space is limited, we are handling attendance requests through our affiliated clubs. However, there still may be some seating available. If you are interested in attending this event, please contact me at the address listed on page 8 of this QST. VE testing March 19, 7 PM sharp in the Basement Training Room at the Bellmawr Community Bldg. on Browning Rd. at Lewis Ave. For further info contact William Helmetag, WA2VQG at (609) 546-7710 or (609) 939-3032. Old Barney ARC VE testing on March 23 at the Ocean Co. Human Resources Bldg., Recovery Rd. in Manahawkin starting at 7 PM. For further info contact Bill Mays, NV2K at (201) 269-1406. Until next month. Traffic: N2CER 93, WA2HEB 11.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—December BPL: N2EIA W2MTA WB2OWO KA2UBD NJ3V. It was quite a month, wasn't it?! PSHR: N2ABA N2EIA N2EVG WA2FJJ W2FR W2GJ NN2H W2MTA WB2OWO WB2RBA ND2S KA2UBD NJ3V K2YAI KA2ZKM KA2ZNZ. Traffic (Dec.): KA2UBD 972, W2MTA 928, NJ3V 903, WB2OWO 663, N2EIA 619, WA2FJJ 447, K2YAI 319, NN2H 270, KA2DBD 267, ND2S 252, WB2IJH 224, WB2QIX 211, W2FR 204, W2GJ 204, KA2ZKM 160, WB2RBA 155, KA2OOO 144, N2ABA 143, KA2ZNZ 123, W2UYE 86, N2DYT 53, N2EVG 49, AF2K 44, K2QR 25, WB3CUF 20, NY2V 19, KA2TWY 9, K2IUT 6, WA2OEP 6, N4TW 6. (Nov.) N2DYT 38. NOW THAT WAS THE GOOD NEWS FOR DECEMBER! Here's the bad news... we ALL need to spruce up on our operating habits. Think about what you observed during the high volume traffic month, transpose that on top of a "declared" situation, and see if you don't agree. A Talk Net "talk show" (2RNT) started in January for the second call area, related to traffic-handling topics. It meets on 3930 kHz Sundays at 4:30 PM (or earlier) and completes at 5 PM. Discussion and tips on Amateur Radio communications per the Public Service Communications Manual, the Operating Manual and other guidelines presented and/or published by the ARRL. TRY IT, YOU MAY LIKE IT. SECTION APPTS (DEC) WA2UFQ—Southern; (EC) W2BYO-Allegany, N2DAY-Erie, KB2DP-Oneida, WB2QZL-Niagara, WA2UKX-Yates, WB3CUF-Schoharie; (OES) W2BCH K2CWD KB2KW WA2UKX; A SPECIAL THANKS TO KB2KW who has had to step down as DEC-Southern and EC-Broome County. Chuck's priorities are correctly and appropriately established with a power much greater than that of these past assignments.

NY RACES	SSB	101-006-04	NYSR	CW	019-004-04
NYS/M*	CW	388-378-31	NYS/E*	CW	427-388-31
WDN/M*	FM	425-160-31	WDN/E*	FM	523-200-31
NYPON*	SSB	693-593-31	VHF THIN	FM	054-000-05
NYSPTEN	SSB	660-152-31	BRVSN	FM	287-010-31
Empire SS	CW	339-070-31	JCRACN	FM	293-012-30
Q Net	FM	422-004-31	BlueLine	FM	000-000-00
OCTEN/E*	FM	620-124-31	OCTEN/L*	FM	218-074-31
STAR*	FM	355-061-31	LCARES	FM	045-000-04
Skyline	FM	000-000-04	WDN/L*	FM	437-160-31
CNYTN*	FM	287-161-31	NYS/L*	FM	396-362-31

*NTS Net. NOTE: Tioga County "TIGARDS" meets on Sundays at 8 PM 146.16/76 (ARES & RACES) 1987 NYS/M totals were 3,059 messages passed (QSP)... With stations checking in (QNI) 4,082 times. Not bad at all for NTS Cycle 1 Net operation! Plus WDN/M is top notch Local Net with QSP 1504 and QNI 4127! Not at all bad for Cycle 1! THANKS, you pioneers! Also, thanks to your Managers; N2EIA (and previously WB2EAG), and WB2OWO (and N2ABA)! RAGS Awards Coordinator, KA2K, has an expanded role; now with VUCC, plus W.A.S. and 5-Band W.A.S. CLUB OFFICERS: Binghamton WA3WKA KB2PC WB2SGS K2QR; Fulton KC2QV NT2F WB2LBG KA2RRY; Oswegatchie Valley NR2S KA2CMQ WA2TSR; Tompkins County WB2BVJ KB2BON N2GFX N2GFW; Utica NA2A WA2AZA WA2FSU NA2Q. I will close with a SALUTE to two VERY DEDICATED Lady Operators... very best wishes in retirement to Arline Bender, WA1VMC... and once again, as in every year past... GB CR, W2RUF. May we all follow their example as radio hams. "HAVE A NICE DAY."

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—

NET	QNI	QTC	SESS	kHz	T/D	MAN
WPACWN	277	176	31	3585	7:00 P/D	WA3UNX
WPAPTN	563	205	31	3983	6:00 P/D	WA3HLN
KFN	201	89	24	3983	1:00 P/D	N3EMD
PFN	175	293	31	3958	5:00 P/D	WA3THT
WPA2MTN	333	158	31	46/28/86	8:00 P/D	KA3BGC
NWPA2MTN	516	66	27	44.53/45.13	9:00 P/D	KC3NY
WPARTTY	7	2	4	3840	9:00 P/SU	WA3ZSC

It is with sorrow that I must report that WB3HUE, Leslie Grim, of Sigel, PA, is a Silent Key. He had the 147.285 repeater and amateurs traveling in the Cook Forest area will miss him. Our sympathy is extended to his family. Indiana County ARC officers for 1988 are Pres: KA3JGN, VP N3FGY, Sec/Treas. K3RKJ. Best wishes to Shel who was Sec/Treas for 20 years and did a fine job and good luck to his successor. May he have a good term. Fort Armstrong Wireless Assn new officers for 1988 are Pres. W3ZCS, VP W3YEY, Sec. N3DOL, Treas. K3JVJ, congrats to all. Officers of Section are SEC: WA3UFN, STM: N3EMD. BM: KC3ET. TC: N3EFN. OOC: KX3V. ACC: AK3J, SGL: W3DTW. PIO: N3DOK any suggestions or offers of help to them will be most desirable. We need OOs with equipment to trace illegal interference especially on two meters. If found and located, try to have two or more witnesses to verify your report. Please apply to KX3V for appointments. You may also send applications to me. We need your help. We need more volunteers in all areas ORS, ATC, APIOs, etc. We have two stations who made BPL this month: N3EMD and W3OKN, who said it's his third in 52 years. Congrats to both. December Traffic: W3OKN 594, N3EMD 572, KQ3T 447, N3FM 287, N3CZ W242, N3AES 167, W3NGO 133, WA3UNX 109, WA3DBW 76, KA3NVP 74, K3SMB 55, KC3GO 40, KV3L 38, K3LTV 38, W3RUL 35, W3KUN 35, KB3AC 32, KC3ET 32, KA3EGE 29, N3EKJ 18, WA7WIB 17, WA3QNT 14, W3SN 9. WA3TSD 8, K3GXP 7, KC3JQ 5, N3COR 5, W3AHH. (Nov.) W3OKN 134.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ— SEC: W9QBH. STM: K9CNP. OOC: W9TT. BM: K9EUI. SGL: W9KPT. PIO: N9EWA. ACC: WB9SFT. TC: N9RF. ASM: AA9D.

(continued on page 90)

ILLINOIS SECTION NETS

NET	FREQ	TIMES (LOCAL ILLINOIS)
ISN	3905	1800 DAILY
ILN	3690	1830 + 2200 DAILY
ITN	3705	1900 DAILY
CTN	147.69/09	2100 DAILY
ILARES	3905	1630 1ST + 3RD SUNDAYS
ILLINOIS INDEPENDENT NETS		
IEN	3940	0900 SUNDAYS
ILPN	3915	1630 M-F, 1430 SUNDAY
NCPN	3915	0700 MONDAY - SATURDAY
NCPN	7270	1215 MONDAY - SATURDAY

WB9GOJ reports that the 1987 Illinois QSO party was the best in recent memory with a total of 73 (appropriate!) entries submitted. K9FD of Red Bud took fixed station first place honors with KF9D of Elgin winning the mobile category AND placing secong overall. The Society of Midwest Contesters took the honors in the club category. Thanks to AG9E for sending me a copy of the CIRC newsletter. Many clubs send a copy of their newsletter this way each month, and it is greatly appreciated. I know that for many clubs this is not feasible from a budget standpoint on a regular basis, but if your club ends up with a newsletter production overrun some month any of the Section leaders listed at the top of this column would appreciate a copy as it helps us to keep in touch. Thanks to WB8RFB for the traffic procedures article in the December CTN newsletter. His hints and suggestions should be laminated to the desktop of all NTS participants as a guide for the new and a reminder and reference for the seasoned. Congratulations to Dot, N9ALC who got quite a nice Christmas present this year as she passed the 300 benchmark on her DXCC! W9OES makes a good point in his December report - we are always pushing for increased participation in the NTS nets by ARES members as traffic handling skills are vital to the well prepared amateur; those of us on the traffic nets need to remember that there may be some new folks monitoring "in the woods" and conduct the net in a manner which makes it comfortable for them to check in. I'm sure OT NTS types can remember the 'first net jitters'. One suggestion was to keep the traffic transmission speed on the phone nets down to that which can be easily written down as an aid to those who are "copying along." Traffic: KA9FEZ 1,288, W9HLX 382, NC9T 374, KJ9L 245, W9LWH 230, K9CNP 208, WA7MAD 188, NN9M 177, W9HOT 162, W9EHS 160, N7DOY 141, WA9VLC 130, K9QEW 82, WD9DZV 73, KA9BBV 47, W9NXG 44, KA9CTW 41, WB9TVD 34, W9LNQ 32, WD9DZU 30, K9WMP 22, WD9HQW 21, K9KR 13, WD9CIR 10, WD9IBH 10, W9RTD 8, W9EOS 8.

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UMH, KD9ER. SEC: WD9AVQ. STM: W9JUJ. ACC: K9ZBM. TC: K9PS. PIO: KA9LQM. SGL: WA9VOO. 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	3832	509	2684	85
QIN	3656	1430/0000/0300	584	517	1781	52
ICN	3705	2315	143	39	720	39
IWN	3910		1559		366	31
VHF NETS			4145	333	4073	126

Appt: N9CTJ, BM, OO reports received from WB7QWG, KA9BYN, KA9DZM. Silent Keys: K9QLB, Evansville; K9ZDO, Zanesville; W9FN, Richmond. BPL: KJ9J, O/14, R/297, S/195, D/18; W9JUJ, O/4, R/620, S/575, D/8. Congratulations to Noel, N9CJT, in Columbus, Indiana's new Bulletin Manager. Noel's task is to pull the state's two meter packet BBSs into the bulletin distribution network and getting state and national info to club editors. Spring time is storm time in Indiana. I hope our local emergency service is ready to go! State RACES is planning a statewide meeting sometime in March on the topic of emergency responses. I plan to attend and recommend that all our ECs and others involved in such activity be there. Check with WA9ZCE for details. Several Indiana clubs are taking part in the Constitutional Bicentennial celebration with special "200" calls. NR9K continues to send ICN into to new Hoosier Novices and net participation is growing. Join the gang on 3705 for slow-speed net operation. Look for Director Metzger and me at the Indiana Hamfest on March 13. Don't forget the Indianapolis Hamfest and ARRL Convention on July 9-10. Club officers please make sure that you've sent in your 1988 affiliation report. SSCs should also send their SSC renewals in to K9ZBM as soon as they are notified by Hqtrs. Such a small task to stay an active part of the family! If your club has been thinking about upgrading to SSC status, contact K9ZBM for details. There are real benefits for your group if you do. Congratulations to W9UC who received a plaque for 60 years of membership. Outstanding! Chuck is one of the founding fathers of Fort Wayne RC and has been active since the '20s. It would be nice if we all could contribute as much to our hobby as Chuck and his peers did! Station reports for December: W9JUJ 1207, KJ9J 521, NJ9S 345, K9WWJ 143, KA9FFO 111, KB9HH 110, WB9OZZ 101, NR9K 88, N9HZ 81, KA9QMI 75, WB9PFZ 70, KD9ER 49, KA9RNY 49, K9OUP 39, K9ZBM 30, W9ZGC 29, WD9HII 22, WB9IHR 21, WD9DWD 20, N9ASR 15, WA9OHX 13, W9PMT 12.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9QAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. Congratulations and thanks to N9BDL, Lee, for being net control station 402 times last year; mostly on WNN, WSSN, and WIN/E. March 12th, Fox Cities ARC Swapfest, Appleton East High School. The 1988 Wisconsin QSO Party starts at noon on March 20th. Get on the air to meet Wisconsin amateurs. Give the Wisconsin QSO Party a try, check QST Contest Corral or ask other amateurs for details. March 22nd, Tri-County ARC Hamfest, 8 AM, Jefferson County Fairgrounds, walk-in exams by Badger Examiners begin at 10:30 AM, talk-in 146.52 MHz. The Badger State Smoke Signals newsletter promotes Wisconsin Amateur Radio with exam lists, club meeting schedules, plus news, packet radio updates, and features. Contact K9ZZ, K9EN or WB9UQT for information on how you or your club can subscribe to the BSSS. Sorry to report Silent Key W9FBU. KA9WWT, John, of Kellnersville says he thought he finally was working TG9MB in Guatemala on 20 meters SSB. But after several exchanges, John finally discovered it was lucky K9WWT of Hammond, Indiana, who the DX station was QSOing. Traffic: WB9YPY 1529, KC9CJ 1006, KA9RII 591, W9CBE 437, N9GJI 417, W9YCV 347, K9GDF 235, WA9WYS 224, W9UCL 179, K9AKG 147, N9BDL 144, KA9BHL 140, W9DND 107, KA9WWT 102, WD9IID 100, WB9ICH 92, K9UTQ 81, K9BED 64, WB9NRK 64, W9ODV 61, AG9G 60, N9BCX 60, KA9USV 56, K9FHI 52, N9BYS 48, KA9KLZ 38, KG9B 30, W9UW 29, KA9VIA 29, WD9JID 27, K9JPS 27, KA9JJY 24, K9LGU 20, W9PVD 6. (Nov.) KC9CJ 864.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KC0T—If I'm correct, it seems that retail businesses expect to do something like sixty percent of their annual sales during the Christmas Holiday season. I suppose we could say something like that applies to the NTS, especially the Minnesota Section—at least we generated a total traffic count of 9,860! That's a whopper

(continued on page 94)

DX THAT STANDS OUT FROM THE CROWD

A3

10, 15, 20, *40 meters

Whether busting pileups, rag chewing or hunting rare DX, the A3 stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

***40 METERS WITH THE A743 ADD ON KIT, STAINLESS STEEL HARDWARE KIT AVAILABLE**

OUTSTANDING A3 FEATURES

- Typical SWR 1.2:1
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- Longest Element 27ft
- Wind Surface Area 4.36ft
- Turning Radius 15.5ft

With the Cushcraft A3 you too will stand out from the crowd.

THESE HAMS ENJOY THEIR HOBBY WITH CUSHCRAFT ANTENNAS

Just recently got the beam in the air and it works great! . . . (F.H. Huyette W7ALZ)

Works absolutely great! . . . (Bob N1EKP)

Thanks for a fantastic antenna . . . (Jeff KA8TKC)

The antenna went together quickly without missing or left over parts. Nice job of packing! . . . (Ray KE7RO)

A fine antenna! . . . (Joe KA3MMJ)

The beam performed very well under rugged conditions. Over 13,000 contacts were made and 142 countries . . . (Navassa Expedition 6Y5NR)

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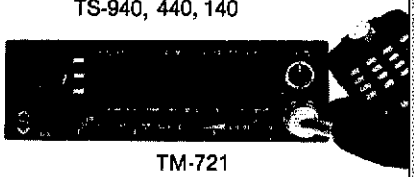
KENWOOD

TS-940, 440, 140



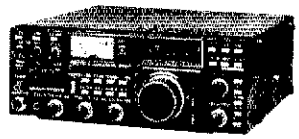
TM-721
TM-721A FM DUAL BANDER
TW-4100A DUAL BANDER

TH-215AT, 315A,
415A, TH-205AT

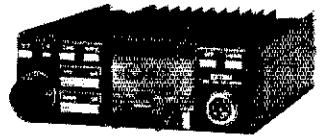
TH-25AT, 45AT

ICOM

IC-735, 761, 751A, 781



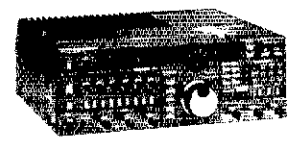
IC-02AT, 03AT, 04AT, IC-μ2,

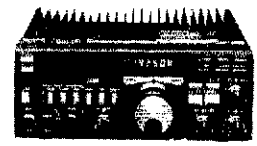


IC-28H, 38A, 48A

YAESU

FT-767





FT-767GX, 757GX, 74 GX

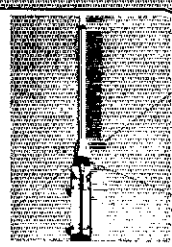
FT-23R, 33R, 73R

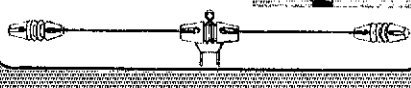
FT-727R
DUAL BAND HT

M-F 9:00 - 5:30 (Phone)
10:00 - 5:00 (Walk-in)
Sat. 9:00 - 1:00 (Phone)
9:00 - 1:00 (Walk-in)
Central Time

ANTENNAS

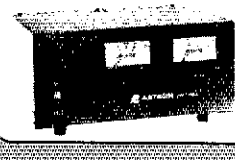
- Larsen Antennas
- Diamond
- Van Gorden
- AEA Isopole
- Columbia Cable





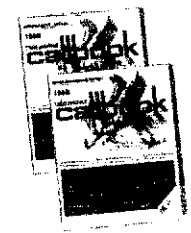
ACCESSORIES

- Astron Power Supplies
- B&W Accessories
- Bencher Paddles
- Welz Meters



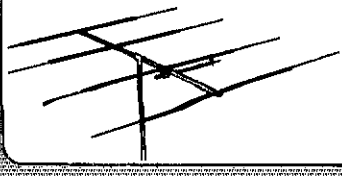
PUBLICATIONS

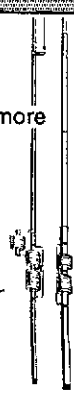
- ARRL
- AMECO
- Radio Amateur Callbook
- World Radio TV Handbook
- Gordon West Radio School



ANTENNAS

- Cushcraft
  AP8, A3, ARX-2B, 215 WB + more
- Butternut
  HF6V, HF2V, HF5B
- Hustler
  Mobile HF, Mobile VHF, etc.

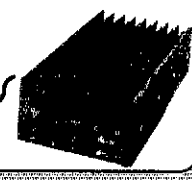




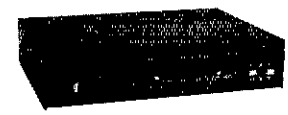
ACCESSORIES

MFJ
Antenna Tuner
Plus Full Line
Of Accessories

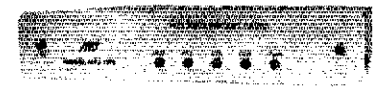
rfconcepts
VHF & UHF Amps



PACKET



AEA PK-232, PK-87



1278

MFJ 1270B, 1274, 1278

of a month—and to any outside the Section who happen to see these figures—yes, they are correct! A Big Thanks to all in the Minnesota Section for a great job. Some really did work hard in the fun part of Ham Radio, that is, traffic handling! And, you can tell by the traffic totals below how it all worked out. A special thanks to Ray Munger, KAØARP, MN SEC, who took upon himself the awesome task of originating all those messages on behalf of the Handi Hams. In spite of sub-zero cold, computer lock-up and other adversities, Ray finally prevailed and the mission was accomplished, just in time to beat St. Nick. Needless to say, a lot of stations all over the country were heavily involved and vital to the success of the venture, and so a Big Thanks to them, too. As a result, Ray, KAØARP has been selected as the Minnesota Section "Amateur of the Month" for December. Thanks Ray and to all in the Section in all our Nets for "making it go." And, best wishes to Everett, WØKYG, who while in the hospital recovering from a broken leg, managed to keep in touch by phone patch and 2 meters. Good luck, Everett, and best wishes for a speedy recovery. Until next time (UNT) 73, Jim Swisher, KAØEPY, STM.

NET	TIME	FREQ	QNI/QTC/SESS	MGR
MSN/1	6:30P	3685	353/166/31	WØUCE
MSN/2	10:00P	3685	272/71/31	KDØNH
MSSN	6:00P	3710	346/36/31	KAØSBY
MSPN/N	12:05P	3860	590/493/31	WBØWNJ
MSPN/E	5:30P	3860	1002/400/31	KCØT/KDØCI
MNAMWXNT	6:00P	3860	473/696/31	KØOGI
PICO	9:00A	3925	4570/696/183	WDØBAC

Traffic: KAØARP 5153, WBØWNJ 936, WØUCE 722, KAØEPY 524, WAØTFC 480, KDØCL 335, WØGHW 287, NØFOO 258, NØCLS 188, KTØI 141, KAØSBY 121, WDØGUF 118, KØOGI 93, WØDM 85, WAØONE 73, NØJP 72, NZØC 72, KCØT 63, KDØCI 47, KØCSE 36, KAØPDM 34, WØKYG 21, WØHWD 21. Total traffic: 9,880.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—The 25th year of the Peace Garden Hamfest will be on July 8, 9 and 10. The Red River Radio Amateur Club in Fargo is planning a hamfest for March 26 with tables, dealers, and VC tests. The weather nets have been busy so far during this mild winter with warm temps and no snow. The data net has had one of the busiest months ever because of the SET test last Oct. More on this next month. Bismarck enjoyed their Christmas party. That was no business or meeting—just a party. CDARC also plans to donate a repeater to NDSU. North Dakota hams will receive new Centennial license plates to help celebrate the ND Centennial years during 1988-1989. We in the North Dakota Section ARRL are planning our centennial activities at this time. There is nothing final on that at this time. Traffic: KAØFSM 229.

NET	FREQ	TIME	SESS/QNI/QTC	MGR
Goose River	1.990	9 AM Sun	4/124/0	WØCDO
Data	3.885	6:30 PM Da	31/711/95	KAØFSM
WX Nets	3.885	9 AM, 12:30 & 5 PM Da	64/878/41	WØGFE
Storm Nets	3.885	as needed		WCØM
North 40	146.64	0200 Sun	4/29/0	NSØH

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—Asst SM: NØABE, WAØFPR. SEC: KAØKPY. STM: KDØYL. South Dakota stations authorized by the FCC for the special "200" callsigns to be operated the week of Oct. 29 to Nov. 4, 1988, are as follows: W200BLK, Black Hills ARC; K200VVY, South Dakota School of Mines and Technology ARC; W200YMB, Mobridge Area ARC; WB200JZZ, HUB City ARC at Aberdeen and W200NOZ, Huron ARC. Make plans now to visit one of the clubs during the week and assist with operating. South Dakota will be well represented. South Dakota call books still available—contact KDØYL. The LARK Treasurer reports the 1987 convention at Watertown boosted the treasury by $2103.77. The South Dakota CW net handled 179 messages in Dec. The net has grown but would like more checkins. Mon-Fri 7 PM CST, 6 PM MST on 3650 total traffic reported for December was 1980. Traffic: NØDPF 888, KØERM 388, KØZBJ 177, KØAIE 113, WØMZI 79, WØHOJ 73, KAØKPY 70, KDØYL 63, WAØVRE 61, WBØOMF 51, WØYMB 17.

DELTA DIVISION

ARKANSAS: SM, Dale Temple, W5RXU—ASM: K5UR. SEC: N5BPU. STM: W9OK. ACC: NI5D. SGL: W5LCI. TC: W5FD. OOC: NR5Q. BM: W5LL. PIO: K5TML. Freq. Coord: WB5FDP. Congratulations to Joel on his election as Delta Division Director. I am honored to have been appointed to complete Joel's term as Section Manager. I appreciate the Arkansas Field Organization Joel has in place and wish for them to remain. Principally, they are listed above. Much of this space allotment has been devoted to traffic in the past. I hope to devote space to other areas in the future. Let me know your thoughts. The "All Arkansas Hamfest" is coming up in April 1988. Plan to attend the ARRL Forum. SEC N5BPU holds an Emergency Communications Net on 3987.5 every Sunday at 5:30 local. All stations are welcome. Hot spots of Arkansas activity next month.

LOUISIANA: SM, John "Wendy" Wondergem, K5KR—ASM: KB5CX. SEC: N5ADF. ACC: K5DPG. SGL: KD5SL. TC: W5RWF. OOC: KE5QK. Packet: NE5S. Russ, N5ADF, La. Section Emergency Coordinator reports that during a recent severe weather storm in the Baton Rouge area, the National Weather Service called on the Amateur Radio community to help with eyewitness reports of property damage and flooding. Although this request was unusual, it was ably handled by Shirl, K5OPL, the Baton Rouge Area SKYWARN coordinator. Using the 146.96 and the 145.49 repeaters and monitoring assistance from El, W5MD, and Shelton, KD5SL, they were able to provide a useful list of damage reports collected from the Greater Baton Rouge area and from points as distant as Amelia, La. Milton, KA7JPH, was recently appointed as the new SKYWARN coordinator and the liaison with the National Weather Service Staff. The 1988 La. hamfest schedule started with a very successful one day hamfest at Hammond on 16 January featuring lots of attendees, swap tables and new equipment dealers. Next is the outstanding two-day bash at Lafayette on 12 & 13 March in the Holidome sponsored by the Acadiana ARA. Don't forget the ARRL and Louisiana Council forums. I hope to see you there.

MISSISSIPPI: SM, Jim Davis, KK5Z—ASM: W5TRD. SEC: KA4PKA. SGL: KA5WRX. OOC: KK5K. ACC: K5VXV. BM: W5EPW. TC: KF5DE. STM: KB5W. PIO: WN5M. VHF/UHF Coor: N5DWU. Tnx to W5AXQ for help during tornado that hit Jackson area 16 Nov. Well done to hams in Memphis and West Memphis for excellence after killer tornado on 14 Dec and massive flood week later. Welcome to new section appointees, KA5WRX, as SGL and KA4PKA as SEC. NE MS 2 Mtr FM Net (NS5M) Sess: 25, QTC 3, QNI 200. Mag Sec Net (NS5M) Sess: 31, QNI 462, QTC 12. ARRL Info net (KK5Z) Sess: 4, QNI 54. Coast ARES (KA4PKA) Sess: 5, QNI 106, QTC 2. MSBN (KF5DE) Sess 31, QNI 1621, QTC 86. Gulf Coast SBN (WD5JXT) Sess 31, QNI 1025, QTC 18. 5th Region CW Net Cycle 4 (W5TNT) Sessions 62, QTC 1304. Miss represented 100% by N5AMK, W5WZ, KT5Z, W5JDF, KB5W and WQ5H. Traffic: KT5Z: Sent 76, Recd 76, Del 10, Total 162. N5AMK: Sent 310, Recd 271, Del 1, Total 582. WD5JXT: Sent 11, Recd 6, Del 10, Total 27. NS5M: Sent 10, Recd 7, Del 6, Total 23. KK5Z: Recd 3, Del 1. DRN5 Sess 62. QNI 1295. Miss represented 100% by N5AMK, KT5Z, W5HKW, KB5W, WB7CQQ.

TENNESSEE: SM, John C. Brown, NO4Q—ASM: WA4GLS. ACC: WA4GLS. OOC: W9FZW. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J and TC: W4HHK. Well fellow Tennessee amateurs, this is the last Section News Report that NO4Q will be composing for publication in *QST*. I have enjoyed the opportunity to be your Section Manager for the last seven years. I guess you might say that I am going out with a big gusto in that I spent the last two weeks of my term in the hospital with a fight or mild heart attack, according to the doctors. It had me fooled as I was sure that I had a digestive problem from the two years I spent as a prisoner of war in WW II. I am well on the road to recovery now, thanks for all the cards, good thoughts and prayers. I will be on the various frequencies on most all modes including packet. I am happy to report that mode for traffic handling is well and getting organized as in the last few days, I have had notification that the region 5 (RN5) net manager has been appointed, and he is making an effort to get all section contacts established. He will need the help of all the people working that mode which seems to be quite a few. I have not been advised of any of the new Tennessee Staff, but I am sure the word will be out soon. It is also requested that all clubs change the mailing of club paper to your new Manager. I enjoyed very much the opportunity of looking at each of the club bulletins and gleaning data or information as food for the source of the info that was included in this column. Thanks to all that sent them along. Again, "GOOD LUCK TO THE NEW SECTION MANAGER" and all the hams in the "SECTION." Section traffic for the period is as follows: LF-Sessions-80, QNI 4210, QTC-136; VHF-Sessions- 34, QNI 530, QTC 408; CW Sessions-32, QNI 253, QTC 56. The CW net honor roll for this period honors N4OZB and W4LVP. Individual station activities for this period is as follows: W9FZW 230 (& BPL), K4WWQ 131, W4DDK 130, WA4FMR 125, KA5KDB 87, W4TYV 80, W4PFP 21, KE4LS 21, WA4HKU 15, KI4V 12, KB4UQ 11, W4EWR 11, WA4GZZ 7 and W4PSN 7. Many thanks for all the fine reports. CUL.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thernes, WM4T—SEC: WB4NHO. STM: KA4MTX. PIO: WA4SWF. Twenty-three NKARC members participated in a search for a lost child who was found safe. Owensboro ARC provided assistance watching for forest fires during the recent drought. Bob Kooper, KB4OZ, is recovering from illness; I wish to thank Rosie, KA4SAA, for picking up Bob's KNTN net manager functions. N4GNL has been appointed as DEC for District 7 (N. Ky).

NET	QNI	QTC	SESS	MGR
MKPN	1436	203	31	WD4RWU
KTN	867	55	30	WB4LBG
KNTN	238	55	39	KB4OZ
KYN	388	178	59	K4AVX/KZ8Q
TSTMN	452	42	31	KZ8Q

SAR (Dec): K4VHF 244, KI4QH 209, WD4RWU 195, K4AVX 101, KA4MTX 45, KC4WN 37, N4PEK 30, KA4SAA 28, WA4SWF 22, K4HOE 19, WD4COF 13, WB4AUN 10, WA4NOG 9, PSHR: KI4QH, KA4MTX 87.

MICHIGAN: SM, George E. Race, WB8BGY—ASM: WA1LRL. STM: WD8KQC. SGL: N8CNY. OOC: NJ8S. TC: W8YZ. The MITN has a newly appointed net manager, Della, WD8EIB, will be over seeing the affairs of this busy MI. net. Welcome back Della, it's nice to have you in this slot again. Stan, K8SB, is stepping down from the ACC position. Thanks Stan, for the years of service. This is my first column as SM. I wish to thank each of you for giving me your vote of confidence. I also want to thank Jim, WB8MTD, our SCM/SM of the past 8 years, for the job he has done. What does a SM do? I am just starting to find out. If I go by the formal description given by the League, it sounds like a formidable task for one to undertake. I can sum up their outline in six words. Recruits, Supervises, Appoints, Maintains, Conducts, and Writes. Looks like I have lots to do ahead. I am here to serve your needs, and the needs of our Section. If you have a club newsletter, please put me on your mailing list. If you would like to hold a league position, please let me know where you think you can fit in. I need several good people in key positions. If you need a club speaker, I would like the opportunity to address your membership. Please get to me well ahead as the dates are filling quickly. Also Dave, W8YZ, and Skip, WD8KQC, make excellent speakers for your meetings. We need to work closely with our new Novices. They need our guidance and need to be welcomed to the local Amateur group. The MI Novice Net is on 3.710 MHz daily at 5:30 PM. Contact the NM, Tom, KE8JG, if you would like to help with this new net. If your group is acting as a VE team, or is providing amateur classes, please let me know where and when. I would like to encourage you to take part in any of the following NTS MI Nets:

NET	FREQ	TIME/DAY	QNI	TFC	SESS	MGR
MNN	3710	5:30PMDY	18	2	7	KE8JG
UPN*	3921	5:00PMDY	1320	125	36	WA8DHB
MACS*	3953	11:00AMM-SA	525	187	31	K8OCP
MITN	3953	7:00PMDY	665	354	31	WD8EIB
OMN*	3663	6:00PMDY	932	210	86	WD8RHU
SEMTN	145.33	10:15PMDY	434	151	31	N8HSC
VHF Net Reports Total . . .			529	21	35	NO8Q

*QMN Fast, 6:30PM Dy; QMN Late 10PM Dy; MACS 1 PM Sun; UPN 12 PM Sun; Chk. Dir. for other MI. Nets. Traffic: KA8CPS 611, WD8KQC 579, KE8JG 506, N8EGK 500, K8RDN 350, KE8X 209, WA8DHB 146, K8DD 126, WB8SYA 116, WD8MJB 114, N8DSW 113, WD8RHU 102, KC8TU 96, WB8YPG 95, K8GXV 82, W8YIQ 75, K6HAP 67, W8QHB 61, K8EQO 61, K8UPE 59, W8IHX 53, NY8W 44, W8EIO 42, WB8MTD 32, K8OCP 29, KI8Q 27, KA8PWM 27, WB8BGY 26, N8CNY 23, WB8EZ 19, K8MJK 19, W8IDT 18, K8ZJU 17, WB8WJV 13, N8EXS 11, KA8LAR 8, W8URM 5, KA8VDX 5, W8YZ 5, W8CUP 3, N8CQF 3. NX8S 1. As your SM, what can I do for you? My address and phone number is on page 8 of *QST*. I am a regular on the MITN. I am on the 3932 Sunday 5 PM MI ARPSC net. March 26 and 27 mark the Diamond Jubilee of the first known widespread use of Amateur Radio for Emergency Communications. Michigan and Ohio will be on the air with special-event stations during this weekend. A nice certificate will be offered for working a special-event station in each state. Look for us!

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: N8AUH. SEC: WD8MPV. STM: KF8J. BM: W8ZM. ACC: KJ3O. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK.

NET	QNI	QTC	SESS	TIME(LOCAL)	FREQ	MGR
BN(E)	328	203	31	1845	3.577	N8EVC
BN(L)	187	179	31	2200	3.577	K8TVG
BNR	319	144	31	1800	3.605	W8EK
BSSN	239	121	37	0945,1900	3.873	KD8FW
ONN	158	51	31	1825	3.708	WD8KBW
OSN	264	107	31	1810	3.577	N8AEH
OSSBN	2427	1516	93	1030,1615,1830	3.9725	WB8JGW
OSSN	195	170	31	0645M-F,0800S-SN	3.577	KA8GJV

(continued on page 98)

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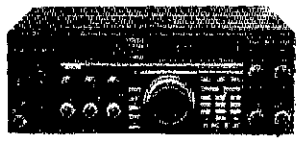

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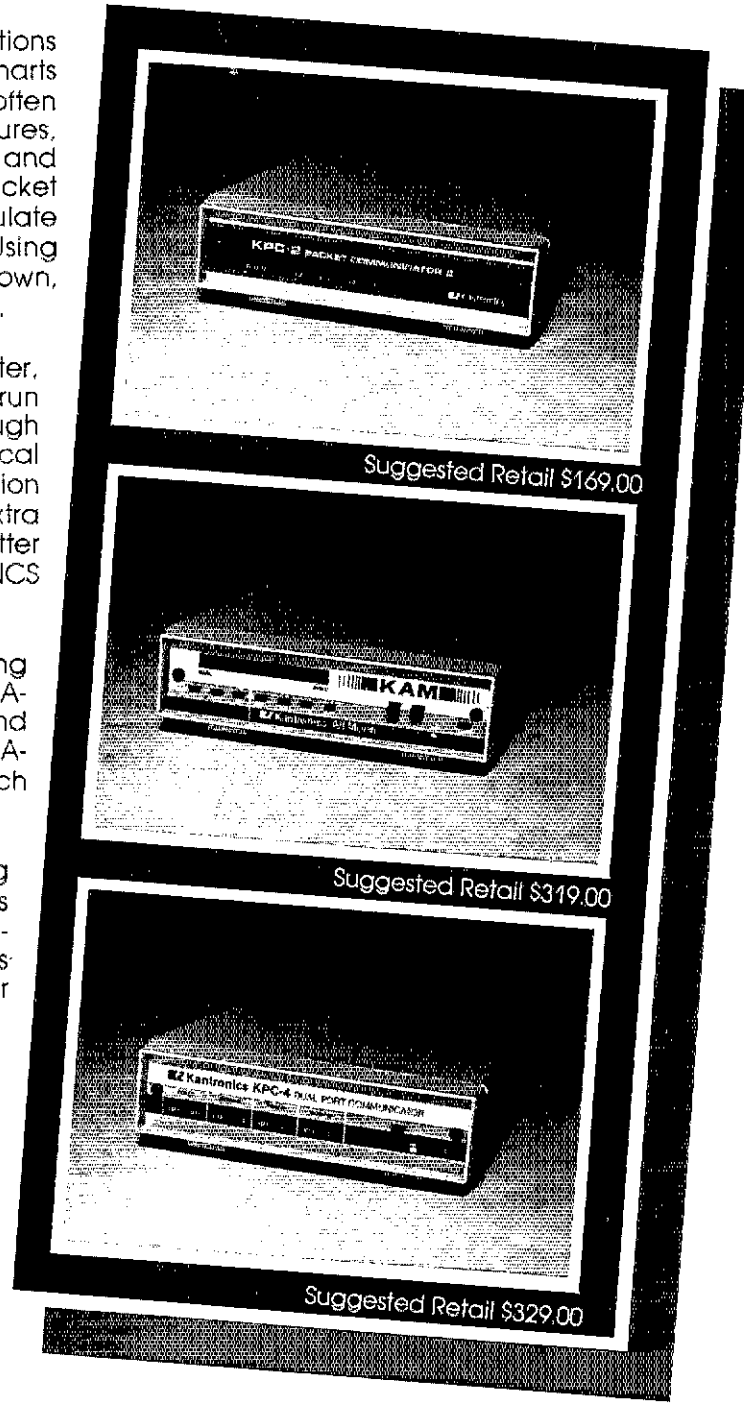

UNIT	WEFAX/KA-NODE/GATEWAY/32K-RAM/PBBS					PSK-MSK
KAM	yes	yes	yes	yes	yes	yes
KPC-4	yes	yes	yes	yes	yes	yes
KPC-2	yes	yes*	no	yes	yes	no
KPC-2400	yes	yes	no	yes	yes	no
KPC-1	yes	yes	no	yes	yes	no

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Partial Listing of Popular Transistors

2-30 MHz 12V. (= 28V)*

P/N		Rating	Net Ea.	Match Pr.
MRF421	Q	100W	$24.00	$53.00
MRF422*		150W	36.00	78.00
MRF454,/A	Q	80W	14.50	32.00
MRF455,/A	Q	60W	11.75	26.50
MRF485*		15W	6.00	16.00
MRF492	Q	90W	16.00	35.00
SRF2072	Q	65W	12.75	28.50
SRF3662	Q	110W	24.00	53.00
SRF3775	Q	75W	13.00	29.00
SRF3795	Q	90W	15.50	34.00
SRF3800	Q	100W	17.50	38.00
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2SC2879	Q	100W	22.00	48.00

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VHF/UHF TRANSISTORS 12V.

	Rating	MHz	Net Ea.	Match Pr.
MRF245	80W	136-174	27.50	61.00
MRF247	75W	136-174	26.00	58.00
MRF248	80W	136-174	33.00	71.00
MRF641	15W	407-512	18.00	42.00
MRF644	25W	407-512	21.00	46.00
MRF646	40W	407-512	25.00	54.00
MRF648	60W	407-512	31.00	66.00
2N6080	4W	136-174	6.25	—
2N6081	15W	136-174	8.00	—
2N6082	25W	136-174	9.50	—
2N6083	30W	136-174	9.75	24.00
2N6084	40W	136-174	11.50	28.00

PARTIAL LISTING OF MISC. TRANSISTORS

MRF134	$16.00	MRF515	2.50
MRF136	21.00	MRF607	2.50
MRF137	24.00	MRF630	4.25
MRF138	35.00	MRF846	43.50
MRF174	80.00	MRF1946,A	14.00
MRF208	11.50	CD2545	16.00
MRF212	16.00	SD1278-1	17.75
MRF221	11.00	2N3553	2.29
MRF224	13.50	2N3866	1.25
MRF237	2.70	2N4427	1.25
MRF238	12.50	2N5589	7.25
MRF239	14.00	2N5590	10.00
MRF240	15.00	2N5591	13.50
MRF260	7.00	2N5641	9.50
MRF261	8.00	2N5642	13.75
MRF262	8.75	2N5643	15.00
MRF264	12.50	2N5945	10.00
MRF309	29.75	2N5946	12.00
MRF317	56.00	2SC1946,A	15.00
MRF406	12.00	2SC1947	9.75
MRF433	11.00	2SC2075	3.00
MRF449	12.50	2SC2097	28.00
MRF450	13.50	2SC2509	9.00
MRF453	15.00	2SC2640	15.00
MRF458	20.00	2SC2641	16.00
MRF475	3.00	*OUTPUT MODULES*	
MRF476	2.75	SAU4	55.00
MRF477	11.75	SAU17A	50.00
MRF479	10.00	SAV6	42.50
MRF492A	18.75	SAV7	42.50
MRF497	14.25	SAV15	48.00
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NE41137	2.50	M57737, SC1019	SAV7

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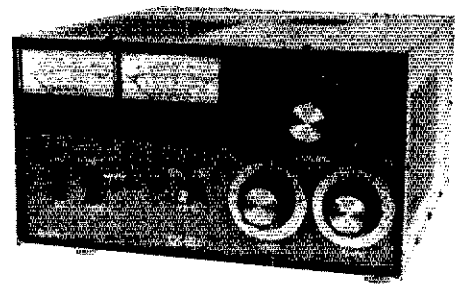

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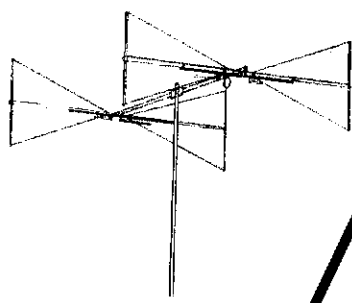

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21st Central States VHF Society Conference held in Arlington, Texas, July 23-26, 1987. 28 papers covering everything from use of TVRO dishes for moonbounce to a solid state amplifier for 5.7 GHz. 166 pages. $10.

6th ARRL Computer Networking Conference held in Redondo Beach, California, August 29, 1987. The latest concepts on networking, high speed modems and other packet-radio technology are discussed in 30 papers that were prepared for the conference. 174 pages. $10.

OTHER CONFERENCES

Mid-Atlantic VHF Conference. This conference was sponsored by the Mt. Airy VHF Radio Club, Oct. 10-11, 1987. 11 papers cover everything from mountain topping to transceivers for the 3400 and 5600 MHz bands. 120 pages. $10.

MICROWAVE UPDATE 1987 held in Estes Park, Colorado, September 10-13, 1987. 17 papers on equipment, antennas and techniques for 902 MHz through 10 GHz. Much information on construction of 2.3, 3.4 and 5.7 GHz gear. 136 pages. $10.

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Ohio Section ARES Net 1700 Sun. 3.875 WD8MPV VE exam session for March and April: Beavercreek 3/12; Maumee 3/12; Columbus 3/12; Ravenna 3/23; Barberton 3/23; Zanesville 3/26; Mentor 3/27; Mentor 4/9; Columbus 4/9; Maumee 4/9; Marietta 4/10; Akron 4/23. Contact N8AUH or me for details. Net Manager KA8GJV reports that the Ohio Sunrise Slow Net (OSSN) has not missed a session since August 1985: good job folks! The Reservoir ARA has been certified to continue as an ARRL Special Service Club: Congratulations! The Fayette ARA has purchased five ARRL "Tune in The World" licensing packages, and has donated them to two high schools, two junior high schools, and the local library. An excellent idea for your club, too! K8PYD advises that the ARRL 8th Area OSL Bureau (the 8-land incoming bureau) has changed addresses. Send your SASEs and inquiries to: PO Box 182165, Columbus, OH 43218-2165. I'd like to take this opportunity to thank some special League volunteers who have worked so hard for you. WD8MPV (SEC) and KJ3O (ACC), our husband/wife combination, have put countless hours into their respective programs, and have built Ohio ARES and Affiliated Club progarms into models for the rest of the country. N8AEH and KA8TNA, co-editors of the Ohio Section Journal, have done an excellent job of producing a first-class communications tool! Bob Johnson, K3RC, has kept the VE program schedule for Ohio, and has thus made testing more accessible for everyone. The Net Managers and KF8J have kept Ohio at the top of the NTS. Bulletin Manager W8ZM has kept us up-to-date, and has dogged League HQ for more official bulletin "meat." Past SCM/SMs N8XX, WB8JGW, and AB8P have offered sage counsel. Director George Wilson W4OYI and Vice Director Al Severson AB8P have helped smooth out wrinkles and solve problems. The list is endless, but space is not. Sincere thanks to all, and see you at Dayton! The 120 Ohio stations listed below have reported a total traffic count of 12,518 radiograms (!!) during the month of December 1987: Traffic: AD8I/PBBS 940, KD8KU 649, W8PMJ 608, K8JDI 587, W8BO 498, K8TVG 447, WA8ERQ/PBBS 408, K8DHD 382, WD8KFN 377, WB8JGW 356, W8ZOL 324, K9ND 274, N8FWA 268, W8QZK 264, N8IBS 249, NE8X 220, N8GPU 218, K8IOW 201, KA8GJV 192, WD8QXT 184, KV8Q 181, N8GEC 178, W8SKP 171, WA8SSI 169, KA8YIT 154, WB8BWY 143, WD8IKC 138, KD8HB 131, N8AKS 130, KF8J 122, NC8O 118, W8EK 102, WA8HED 102, WA8HGH 98, KD8FW 96, K8OZ 86, WB3LHI 84, N8EFB 83, WA8EYQ 82, WA8DYS 79, W8CXM 76, KA8CGF 75, KA8ALV 74, K8NON 72, K8ES 71, K3RC 71, K8LOM 68, WD8KBW 67, WB8HHZ 66, W8JLW 66, WD8RIB 66, N8AEH 65, W8FPA 64, K8DXZ 58, N8CEI 57, KD8HD 54, N8HRW 53, WD8JYE 53, KD8XL 52, WA3EZN 49, WB8KWC 49, KC8YV 48, KA8TNT 48, N8CJS 44, KE8CV 44, KC8JV 44, N8IIP 40, K8CMR 38, W8IQ 38, K8CKY 33, N8AUH 31, KA8HBN 31, KD8IC 31, WD8MIO 29, N9AUG 27, WD8DKQ 27, K8EF 25, K8LMN 25, K8VOY 24, KA8BNQ 23, KA8DRR 23, NW8E 22, WD8CSP 22, KA8FIX 21, N8GOB 20, KA8OOF 20, WD8JAW 19, W9SWM 19, KD8WI 19, WD8CTX 17, N8FWT 17, WB8AWM 16, KC8NM 16. NF8B 14, WB8KWD 14, WA8NZE 14, KB8CMW 13, N8AJU 12, N8FPH 12, W8RG 11, N8HBF 10, WB8MRL 10, WD8ATN 9, N8GYY 9, KG8H 9, KA8UVU 8, W8ZM 8, NU8H 7, WB8GDM 6, WD8PWG 6, KA8SOM 6, KB8DIL/KT 5, W8BHL 4, N8CDN 4, KE8DQ 3, N8HIL 3, W8GDQ 1, KE8JD 1, WB8OFR 1, KA8VYT 1.

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	TIME	FREQ.	NET MANAGER
ESS	6 PM	3.590	W2WSS
NYS/E/L	7 PM/10 PM	3.677	KU2N
NYS/M	10 AM	3.677	N2EIA
NYPON	5 PM	3.913	KA2UBD
CDN	6:30 PM	146.34/94	WB2ZCM
HVN	7:30 PM	144.535/135	N2FTR
SDN	9:30 PM	147.66/06	K2ZVI

NET REPORTS FOR DECEMBER (QNI/QSP): CDN 599/91 ESS 339/70 HVN 331/122 NYPON 693/593 NYS/E 427/388 NYS/L 396/362 NYS/M 388/378 SDN 290/180 CLUB NEWS: Albany ARA elected new officers Pres-KA2HTU VP-K2VV Sec-WB2FMB Treas-K2XA Board-W2OOJ W2XM. Members of Catskill ARA made a presentation on ham radio to the Hensonville Boy Scouts. They report KA2DYB and KB2EMV upgrades. CCNR is organizing an advancement program for upgrading. Crystal RC heard about packet radio from WB2KMY. PEARL reports that KD2FA is organizing a Novice class. WARA learned about an all band dipole from KN2X. WECA will hear about W2NBT's travels thru the British Isles. Start thinking about Field Day. It will be here sooner than you think! There are still positions open in the ENY cabinet. If you are interested, please let me know ASAP. Don't forget the Hudson Division Convention to be held on Sunday, March 13th at Westchester Community College in Valhalla. Hope to see you all there! DEC, BPL: N2HIF WB2EAG Congrats to both. DEC, PSHR: NQ2H KA2MYJ WB2VUK K2ZVI K2ZM N2HIF KB2AYD N2FTR. Dec. Traffic: N2HIF 599, WB2EAG 502, WB2VUK 300, NQ2H 274, K2ZM, 232, KB2AYD 162, N2FTR 142, K2ZVI 124, KA2MYJ 72, K2HNW 37, W2CJO 18, WB2T 10.

NEW YORK CITY-LONG ISLAND: SM/SEC: Walter M. Wenzel, KA2RGI— ASM: K2IZ. ASM VE: W2NL. ACC: KA2WIJ. STM: K2MT. OOC: NB2T. TC: WA2YNH. BM: W2JUP. PIO: N2GQR. The following are traffic nets in and around the section that handle NLI messages with the Dec. report figures:

NET	FREQ	TIME	DAY	MGR	SESS	QNI	QTC	QSP
BAVHF	145.350/R	2000	DLY	K2YQK	31	N/A	232	—
NCVHF	146.745/R	1930	M-F	K2HPG	23	N/A	116	—
SCVHF	145.370/R	2000	S-F	KA2JMA	27	N/A	71	—
NYPON	3913 kHz	1700	Dly	KA2UBD	31	N/A	593	—
NYS/M	3677 kHz	1000	Dly	N2EIA	31	388	402	378
NYS/E	3677 kHz	1900	Dly	KU2N	—	N/A	—	—
NYS/L	3677 kHz	2200	Dly	KU2N	—	N/A		
NLT	28450 kHz	2100	Wed	KB2BKE	5	N/A	18	—
ESS*	3590 kHz	1800	Dly	W2WSS	31	339	70	—
PNS	145.01	24hr	Dly	AI2Q				41

*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 Dec: K2TWZ KA2CHD WA2UJI N2GQS KA2CAH WB2WKV KA2JMA 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, 516-541-2450; SUFFOLK COUNTY VE TEAM—second Saturday of each month at Suffolk County

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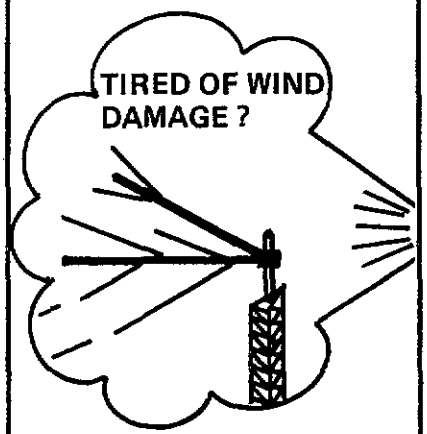
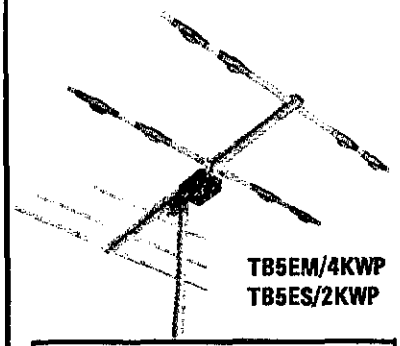


Antennas that last **"Decades"** (not months)



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TB5EM 10, 15, 20 Mtr.	$550.00
TB6EM 10, 15, 20 Mtr.	$655.00
20M326 3 elem. 20 Mtr.	$410.00
20M536 5 elem. 20 Mtr.	$695.00
20M646 6 elem. 20 Mtr.	$1075.00
15M532 5 elem. 15 Mtr.	$550.00
15M845 8 elem. 15 Mtr.	$995.00
10M523 5 elem. 10 Mtr.	$375.00
10M636 6 elem. 10 Mtr.	$725.00
2MVS814, 2 Mtr. phased	$289.00

F.O.B. New Jersey

Prices subject to change.

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Write: **Telrex** P.O. Box 879
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POWER PLUS RELIABILITY!
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- Computer grade capacitors
- Quiet 2-speed fan

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NO-TUNE LK500NTC AVAILABLE TOO!
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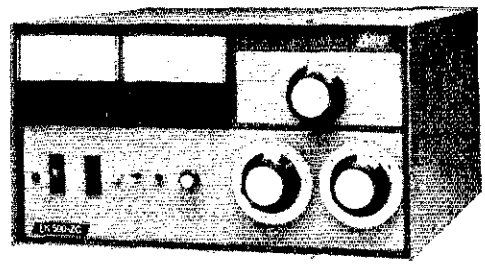
- Fast QSY when you need it most!



The LK500ZC or the No-Tune LK500NTC will take you everywhere, 160-15 meters, and do it with dependable power at the legal limit. They're the workhorse amps for today's serious amateurs who demand power, reliability and value! Our TWO-YEAR WARRANTY assures you that we're serious about being the best.

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CAT# SCFE-115 $8.50
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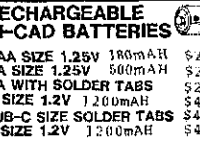

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Community College, Selden—contact George, WA2VNV, 516-751-0894; GRUMMAN ARC—second Weds. of each month at Bethpage High School, Bethpage—contact Howard, W2QUV, 516-354-6861; GREAT SOUTH BAY ARC—every even month on Sunday in Babylon—contact Jim, W2DUK, 516-957-5287. If your groups holds regularly scheduled license exam sessions and/or classes, let me know at least three months in advanced so they can be added to the column before the printing deadline. Congratulations to the new officers of the following Clubs: LARKFIELD ARC—Pres: Ken, N2GHX; VP: Larry, WA2OLP; Sec: Paul, WB2MHJ; Treas: Adrian, KA2MIF; Trustees: Tom, N2GQS, Andy, WA2TSN; KINGS COUNTY RC—Pres: Al, K2AAZ, VP: Jeanette, N2EZL; Rec. Sec: John, KB2ARU; Cor. Sec: Rich, KA2KDQ; Treas: Leo, K2OWH; Trustees: Howard, N2GOT, Murray, KD2IN; South Shore ARC—Chairman: Bob, WB2VOZ; Co-Chairman: Peter, WB2JIB; Sec: Sy, WB2PBG; Treas: Al, KB2UR. Are you interested in helping your fellow "Ham" and being used to your maximum potential, then please contact me and see if there is a position in the Section Leadership that will fit you. The section needs more Official Observers, Assistant Public Information Officers, Official Bulletin Stations and Emergency Stations. If you think you can fill one of these positions or just want to learn more about them, then contact me; my telephone is (516) 957-0218. Traffic: K2YGK 380, N2AKZ 362, K2MT 171, N2GPA 111, KB2BKE 97, N2HLZ 81, N2GNQ 69, NF2N 66, NB2D 59, WA2UKM 55, W2GKZ 52, K2HPG 39, KA2JMA 39, KA2UIU 36, WB2EUF 34, N2ETO 26, K2TWZ 14, KA2RGI 14, KA2ZYX 12, N2FLS 10.

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. and PIO: WB2NQV (PH 735-8550). I am pleased to announce the section leadership endorsement of Kenneth Hampton, Jr., KY2B, as Affiliated Club Coordinator (ACC). Other appointment endorsements for the next two year term starting 3/88 are: EC (Riverdale) N2BOT. OESs KA2BZS, KA2CHK, and N2BOT. OO/AA W2IBB. Another NM change effective 01/88 was NJVN/L WB2ANK to N2FGC. New appointments effective 01/88 are: In Monmouth county ARES EC and OES: WB2DLT (Monmouth Beach), W2JBI (Little Silver), W2YBS (Shrewsbury), and KC2ZC (Spring Lake). OES KA2TGC. OO applicant N2HQU of E Keansburg having passed the certification exam is effective 12/87 a member of the Amateur Auxiliary to the FCC's Field Operations Bureau, (AA). Four new OO applicants have started the AA certification procedure. WB2QMP has accepted the Eastern Area Staff appointment of Second Region Cycles 1 and 2 assistant manager. Congratulations to the following who were newly licensed or upgraded during December sessions conducted by: Major Armstrong Memorial ARC (14/7), Raritan Bay ARC (14/9), NNJ VE Board (25/12), and Ocean/Monmouth ARC (16/10). Novice (8): S Cranwell, R Bender, W Nebus, M Thomas, G Cranwell, D Lange, J Wolff, and D VanArsdale. Technician (22): KB2DOL, KB2DOK, KB2DON, KB2BTI, KA2SZG, KB2EJU, KB2EON, S Fedor, KB2BNW, KB2EAK, KB2EEH, KB2ENF, KA2RHP, C Busacca, T Colley, L Sibley, KB2EFB, KB2EFH, WA2ZVY, KA2ZZB, R Bender, and A Colavita. General (7): KA2RQK, KA2RXZ, KB2APD, KB2HXR, KA2QLO, N2EMS, and R Stubbs. Advanced (8): KB2EKN, K2IER, KB2BQK, KA2EYH, N2HFG, N2HRH, KB2ASG, and N2FQB. Extra (2): KB2DKW and N2GYD. Total applicants (69). Total New or Upgrade (47). 68%! Traffic Nets and Statistics for November, 1987.

NET	MGR	FREQ	TIME	SESS	SES	QSP	QNI
NJM	WB2ZJF	3695	1000	DY	30	186	239
NJPN	W2CC	3950	1800	DY	35	121	399
NJN/E	NZ2R	3695	1900	DY/P	30	170	235
NJN/L	WA2EPI	3695	2200	DY/P	27	37	108
NJVN/E	WB2FTX	146.895	1930	DY/P	30	56	312
NJVN/L	N2FGC	146.49	2230	DY/P	28	40	215
NJTTN	WA2EPI	223.88	2100	DY	28	54	97
NJSN	KA2INE	3735	1830	DY	30	27	127
OBTTN	KA2F	147.12	2000	DY	20	63	17V
NNJ/PL	W2QNL	145.01	24HR	VIA WA2SNA-1			

Packet NTS liaison station activity for December, 1987: 57 NTS messages were auto forwarded by the WA2SNA-1 PBBS, 106 were taken off for delivery or transfer to other nets by (KA2CKV, N2CXX, N2DZZ, N2HIF, NZ2T, W2QNL, WA2EXX, WB2FTX and KB2EKN). Total 163. SAR/PSHR: KA2F 212/119, WA2EPI 147/93, N2DXP 98/62, WB2QMP 80/64, W2QNL 439/140, N2XJ 414/117, K2VX 115/101, KA2INE 57/69, WA2W 28/-, W2XD 15/-, W2CC 20/-.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—ASM: WBØAVW. SEC: KDØBG. STM: KCØXL. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. The ARRL Midwest Division will be held May 20 - 22 in South Sioux City, Nebraska this year. This sounds like it will be a big one! The Iowa-Illinois ARC and Megahertz Manor Maniacs will be using the special calls W2ØLAC and W2ØANZ during the week of December 17-23 as part of the Bicentennial of the US Constitution Celebration, joining the DMARA with W2ØAK. Do other clubs have plans to participate with special calls? Plan to take in the Zero District QSO Party on March 13 between 1800Z and 2400Z. Volunteer license exams are scheduled for March 12, 1988 in Ames. Contact KCØRX at 515-292-4504 for details. Please keep your SM informed of other scheduled VE license exams. W4JL and KØCNM are recuperating after stays in the hospital. WBØSWD was recently awarded his Worked All States on 2 Meters, Certificate Number 93! Congratulations, Lee! WBØB is the new call of WBØBHF. WØIZ bagged 281 countries in 1987 for the DXCC Golden Jubilee, but was followed closely by ABØM with 280. Congratulations Dale and Verni! WDØAWL is getting the shack installed at his new QTH. WØDIA is on the air from his new QTH as well. Traffic: KØPT 254, WØSS 241, KAØADF 228, KØGP 96, KCØXL 96, WØYLS 90, KØBRE 69, WBØMCX 66, WBØAVW 29, WØOMV 24, KAØSTB 13, AEØR 9, KCØKZ 9, WØBW 8. (Nov.) W4JL 25.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: WØCHJ. STM: WØOYH. Continues ARES Alignment by Zones/Counties. Zone 12A Douglas. Zone 12B Osage and Franklin. Zone 13 Pottawatomie, Jackson Wabaunsee, Shawnee. Zone 14 Atchison, Jefferson. Zone 15 Doniphan, Brown, Nemaha. Zone 16 Marshall Washington. Zone 17 Republic, Jewell, Mitchell, Cloud. Zone 18A Clay, Riley. Zone 18B Geary. Zone 19 Ottawa, Lincoln, Saline Ellsworth, McPherson. Zone 20 Dickinson, Morris. Zone 21 Chase, Marion. Zone 22 Butler, Cowley. Zone 23 Sumner, Harper. Zone 24 Sedgwick, Harvey. Zone 25 Rice. Zone 26 Reno, Stafford. Zone 27 Barton. Zone 28 Pratt Kingman, Barber. Zone 29 Comanche, Kiowa, Clark. Zone 30 Edwards, Ford, Hodgeman. Zone 31 Rush, Pawnee, Ness. Zone 32 Finney, Gray, Haskell. Zone 33 Morton, Stevens, Seward, Meade. Zone 34 Grant Stanton, Kearny, Hamilton. Zone 35 Greeley, Lane, Scott, Wichita. Zone 36 Smith, Phillips, Rooks, Osborne. Zone 37 Trego, Ellis, Russell. Zone 38 Norton, Decatur, Graham, Sheridan. Zone 39 Gove, Logan, Thomas, Rawlins. Zone 40 Cheyenne, Sherman, Wallace. Next month will include zones 1-11. Thanks to those of you voting me another

ALL BAND ANTENNAS

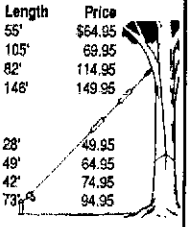
MULTI BAND TRAP ANTENNAS

TRAP DIPOLES

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	55'	$64.95
D-52	10/15/20/40/80	2	105'	69.95
D-56	10/15/20/40/80	6	82'	114.95
D-68	10/15/20/40/80/160	8	146'	149.95

TRAP VERTICALS-"SLOPERS":*

VS-41	10/15/20/40	1	28'	49.95
VS-52	10/15/20/40/80	2	49'	64.95
VS-53	10/15/20/40/80	3	42'	74.95
VS-64	10/15/20/40/80/160	4	73'	94.95



*Can be used without radials
*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!

SINGLE BAND DIPOLES (Kit form):

Model	Band	Length	Price
D-10	10	16'	$17.95
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.

●Any single band, or Trap antenna with "Pro-Balun" instead of Deluxe Center Connector; Add $8.00 to antenna price.

COAX CABLE: (includes PL-259 connector on each end)

Type	Length	With antenna purchase	Separately
RG-58	50'	$8.00	$11.95
RG-58	90'	12.00	16.95
RG-8	50'	20.00	25.95
RG-8	100'	33.00	39.95

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- Sealed, weatherproof lightweight shortener utilize NO rust terminals
- Perfect match for your Antenna Tuner with balanced line output
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- Works with all transmitters, transceivers, receivers, etc.
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- INCLUDES 100 feet of 450Ω Feedline
- Feedline can be shortened
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- Works ALL Bands 160 thru 10 Meters
- Perfect for ALL classes of Amateurs
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- Shorteners provide full 135 feet electrical length; with only 70 feet physical length
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DELUXE CENTER CONNECTOR

- NO RUST Brass Terminals
- NO Jumper Wires Used
- NO Soldering
- Built-in Lightning Arrestor
- With SO-239 Receptacle
- Handles Full Power
- Completely Sealed & Weatherproof
- Easy Element Adjustments
- Commercial Quality

CE-1 $8.95

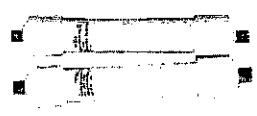
"PRO-BALUN" PB-1 $17.95

- 1:1 For Dipoles, Beams & Slopers
- Handles Full legal power
- Broadband 3 to 35 Mhz.
- Lightweight, Sealed & Weatherproof
- Deluxe connectors require NO soldering
- NO jumper wires
- Minimizes coax & harmonic radiation

DELUXE ANTENNA TRAPS:

1 1/4" Diameter

Completely Sealed & weatherproof - Solid brass terminals - Handles Full Power - NO jumpers - NO Soldering. Instructions included. For 4-band Dipole Ant. 40/20/15/10 $36.00/pr. For 5-band Dipole Ant. 80/40/20/15/10 $38.00/pr.



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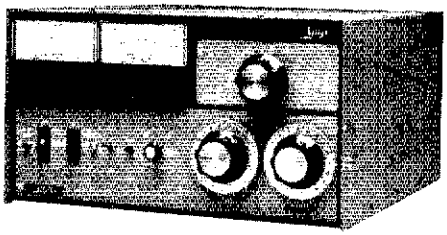
- Peter Dahl Hypersil HV xfmr
- Separate filament xfmr
- Full-wave bridge rectifier



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- Silver-plated HF tank coil
- Computer grade capacitors

AUTOMATIC LOCK OUT CIRCUIT!

- Senses High VSWR, overcurrent
- Guards against mistuning
- Protects your 3-500Z's

From 160 through 15 meters, the LK550 will be the voice of POWER for your station. 1500 Watts PEP output all day, every day, under the toughest band conditions you can imagine. Contester, DXer or ragchewer, that super amp is now affordable — the AMP SUPPLY LK550! Available in a No-Tune version, too — the LK550NT!! And, we back it up with our unbeatable TWO-YEAR WARRANTY! Does YOUR amp offer all these features?

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LK550NT QSK No-Tune ..... **ONLY $2250.00**

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term as your SM. With your continued help, we are shooting for 30 yrs. Traffic: WØFRC 579, NZØM 279, WØFIR 255, KSØU 219, KØBXF 154, KXØI 135, WØOYH 115, NBØZ 73, WØFDJ 65, WØQMT 60, NØBDG 39, WBØZEN 35, NØDJT 26, KØJDD 19, WØCHJ 17, WØMYM 16, WØRBO 7.

MISSOURI: SM, Ben Smith, KØPCK—Clubs reporting their 1988 officers are: Heart of America ARC, Pres. KØVBU, VP, NTØP, Sec. KADSXY and Treas. WB8TVV; St. Charles ARC, Pres. KAØUXQ, VP WBØRAB, Sec. NØHMZ, Treas. NFØQ. Board Members, WDØCZE, NØIAB, NØGOM, NØECE and KAØIKU; Hannibal ARC, Pres. NTØC, VP WBØORZ, Sec. KAØYBS, Treas. KØCG and Trustee, KKØP. The Mark Twain Lake repeater (146.835) now operating from its new location has good coverage in the Northeast part of the state. A net is called every Sunday evening at 9:00 PM. Different clubs helped in their communities during Christmas by providing communications for parades. The Kimberling City ARC assisted with the parade in their town and also operated an amateur radio message booth. ARRL literature was given out to interested persons, and around 100 messages were sent. The booth was operated by: KADRET and KØJAO. The Mid-MO ARC assisted the Jefferson City Jaycees in organizing and providing communications during the parade. Club members participating were: KAØDLD KBØBAB NØCLE NØFI NØLLB NØILV NØIOD NØSS NSØB NYØP W7SJ WAØUFT WB9BVV WBØDZX WBØTPK WBØUEY WBØTPQ and WCØW. The St. Charles ARC provided communications for the St. Louis Marathon. Club members taking part were: KBØBCH KBØBEP WAØCKO KAØCWU WDØCZE NØFTF NØHOA NØHMZ NØIAB KDØIH WØNVM NQØP NFØQ KEØQJ WBØCJB WBØRAB WBØUGY KAØUXV WBØYDQ KQØZ and KWØZ. It will soon be spring storm season. If your club assists in storm watch for your community, contact your local EC to find out how you can help. If you don't know who your EC is or if your county does not have an EC, contact KØOCU, Missouri SEC, and Ken will be glad to give you information on ARES activities in your area. Silent Keys reported, KBØZL and WBØTVG.

NET	SES	QNI	QTC	DAY	TIME	FREQ	MGR
MON	62	378	454	DLY	7:00/9:45	3.585	KØSI
MEOW	31	724	227	DLY	5:30	3.963	KØDSQ
MOSSB	31	935	198	DLY	6:00	3.963	KØORB
HBN	22	294	24	MON-FRI	12:05	7.260	KØDSQ
RRABN	30	326	7	DLY	8:00	146.19/79	KAØLLN
PHD	4	101	7	MON	9:00	146.43	WAØKUH
CMEN	4	59	6	WED	9:00	146.16,76	KØPCK
SARN	5	66	7	TUE	9:00	146.43/7.03	WØENW
KCBAR	4	69	4	MON	8:00	145.41	KAØSSE
MORAT	4	18	4	SAT	8:00AM	3.630	NQØE
SLAN	3	308	3	MON	8:00	146.31/.91	KØWEX
ZAEN	5	76	3	TUE	8:00	147.84/.24	NQØE
ARESN	5	52	2	THU	9:00	147.855/.255	NØFQW
MOFON	4	31	2	WED	8:15	222.42/4.02	AIØO
PHD10	3	11	2	THU	9:00	28.43	WBØKUH
KARES	4	54	1	SAT	9:00AM	146.37/.97	KØUAA
LOZBC	27	479	0	MON-SAT	6:00AM	146.13/.73	NØHVO
LOZFM	5	97	0	FRI	9:00	146.13/.73	NØHVO
TCN	5	48	0	THU	9:00	147.69/.09	NZØF
CMYL	4	17	0	MON	8:00	147.16/.76	NØHVO

Traffic: WØBMA 772, WAØYJX 590, NQØG 549, AIØO 354, NDØN 352, WAØHTN 240, KØSI 182, KØORB 135, WDØELL 129, KØPCK 127, K2ONP 124, KGØL 116, K9OCU 109, KCØAS 88, WØOUD 83, KM5L 73, NIØR 7, KDØAJ 4.

NEBRASKA: SM, Vern Wirka, WBØGQM—STM: Jerry Kohn, WDØEGK. SEC: Michael Ruhrdanz, NØFER. The new net manager of the Eastern Nebraska ARES 2 Meter Net is John Dale, NØFYE, of Lincoln. The Nebraska ARES 2 Meter Net meets Monday through Friday evenings at 9:00 PM local time on the 146.16-76 MHz KØKKV Lincoln repeater. Thanks to Tim Hopkins, KAØQDX, for his past service as the net manager for the eastern Nebraska ARES 2 meter net. Congratulations to the Lincoln Amateur Radio Club and the West Nebraska Club for all of their efforts operating special event stations K2ØØKKV and W2ØØAFG, respectively, during February. The arrival of spring means the Tornado season in the midwest is upon us. Lancaster County EC Burce Colgrove, WDØDMS, reports the Lancaster County ARES spotters training session is scheduled for March 12 at the L.E.S. Service Center in Lincoln. Contact WDØDMS in Lincoln for further details. The North Pole network was set up in December of 1987, allowing some 40 children in five Omaha area hospitals the chance to visit with Santa Claus via amateur television. Thirteen amateurs from the Omaha area participated in the North Pole Network. Cornhusker Net Manager Ken Albright, WBØGMQ, reports the Saturday net was in first place for total QNI and QTC for 1987. Saturday Cornhusker Net Control Tom Bracket, KØUFN, reported a total 1987 QNI of 12,926 and total 1987 QTC of 267. The Cornhusker Net meets daily on 3980 MHz at 1830 UTC. Traffic: KØDKM 385, KØGND 130, WØKK 110, WAØBOK 26, NYØJ 23, NOØA 13, WBØGQM 11, KAØBCB 8, WCØO 5.

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	60	242	323
CPN	NK1J	31	71	170
WCN	N1EDD	31	233	311
CSN	WB1GXZ	23	42	121
NVTN	K1CE	28	146	241
CSTN	K1CE		97	
RTN	KA1JAN	31	69	234
TMRCN	NM1K	4	4	82

Hang in there gang, the Winter is almost over. The VEOSEC Team, consisting of VEs from the Tri-City ARC, RASON and SCRAMS are to be commended for their collective efforts in providing opportunities for their fellow ops. Tri-City has also been busy producing ham radio bumper stickers. SARC recently graduated 9 Novices into hamdom. Welcome N3ANH to the section from MD. FARA's 146.625 repeater is now sporting a new remote receiving site, thus enhancing its system's coverage. WARC has been busy providing communications assistance for the Griskus Memorial 5K Run and the Chesire 1/2 Marathon. Congratulations to N1DLW upon her engagement. GNARC's new 446.025 repeater is now up and running. Packet NTS Ops please be sure to check into C8TN (K1CE-BBS 145.01) often to clear traffic. Be sure to Kill Traffic (KT) received to avoid potential duplicate deliveries. A BIG TNX to W2ØAW, KZ2ØØZ, W2ØØXX, K2ØØMUJ, W2ØØFHP and WA2ØØUWJ for actively participating in Connecticut's contribution to the Bicentennial of the Constitution's on-air amateur radio activities. Attention Club Newsletter Editor, if your club would like to have a wider circulation of its activities, why not send copies of your newsletter to the section's SM, ACC and PIO? Your good deeds could then be shared with others. This could be especially valuable when looking for club speakers and with recruitment. The new edition of the ARRL Novice Instructor's Guide is now available. 73, KZ1Z. Traffic: N1DMV 515, W1EFW 381, WB1GXZ 367, N1EDD 295, KA1GWE 229, NM1K 194, W1YOL 131, KY1F 120, K1EIR 110, NK1J 99, KB1ZC 92, NK1N 86, W1WP 85, N1API-4 71, W1BDN 45, WB2SGI 45, KA1FVY 35, WA1NLD 28, WB1CRH 28, N1BOW 22.

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
NEEPN	K1BZD	3945	0830	SUN
HHTN	NG1A	04/64	2230	DY
EMRISS	N1CVE	3715	1600/2030	DY
CITN	KB1AF	745/045	1930	DY

What a month!! I know all Amateur Radio Operators in Eastern Massachusetts are saddened by the sudden deaths of Al Sears, W1ZHC, and Warren Andrews, W1MXC. Both men operated in the highest traditions of our service. The packet-radio community and the seafaring community will feel the loss of advice and assistance these men selflessly provided when asked. They will be sorely missed. In addition to the loss of these men, it seems an awful lot of hams went in the hospital for operations this last month. I hope all that have been ill are recovering well. Congratulations to the Mayflower Club of Plymouth on becoming affiliated with the ARRL. This club was formed out of local ARES/RACES activities, and is very public service oriented. By the time this is printed the 200th anniversary of the State of Massachusetts ratification of the constitution will have passed, and the activities of N2ØØDR (Wang Club), W2ØØTKZ (Wellesley Club), and KW2ØØR (Sturdy Club) will be a memory. This is being written at the beginning of the voyages of the TS PATRIOT STATE, whose mission is to boldly take Mass. Maritime cadets where they have never gone before. The cadets will cruise down the US East coast, cross the Atlantic, sail the Mediterranean Sea, cross the Atlantic again and return home. The ship will be out about 3 months. Brian Churchill, N1BBT, is aboard operating a ham station that will keep the cadets in touch with their loved ones via NTS and make the journey less lonely. The traffic nets will be running on overdrive to accomplish this mission and will be looking for help. If you have not handled message traffic before, this might be a good time to step in and help provide one of the best opportunities to help non hams that we get. It is an incredible feeling to help with this project. HF Packet is being used this year for the first time. It should speed up message flow. The cadets really picked a good time to get away from all this snow, although sailing thru the storm created some green faces. By the time this is printed, Spring will be right around the corner, and the Marathon and other public service activities will start up again. Some have declared 1988 unofficially "the Year of the Ham" in Eastern Massachusetts. The number of new Novices is growing at a dizzy pace. This will be printed in the month marking the 50th anniversary of Amateur Radio Public Service. Hopefully in April sometime the Governor will proclaim Amateur Radio Week in the state. Activities are still unknown and will be coordinated with WMass section. The Ham hotline is going to be expanded and will really be a unique service to all, thanks to Al Carp, K1HLZ, Section PIO. How does Jim Hatherly, WA1TBY, do what he does?? He edits 3 excellent newsletters, participates regularly in NTS, and works!! (Unless he lives a day longer than 24 hours.) Thanks for all you do Jim. It is great to see the Elite Amateur Radio Club (Lowell Area) back in action. They sponsor the "Nightly Nut Network" that meets nightly on the 145.49 Lowell repeater. It starts about 9:00 PM and goes until the last person signs off (usually in the wee hours of the morning). I look forward to getting a copy of The Quannapowitt Radio Association monthly newsletter. It is very enjoyable reading about the activities of this very active group. The Southeastern Mass ARA has put their new repeater on the air, and they report improved reception. I also received the quarterly Prospect Hill Intermod from the Waltham club (Sponsors of the Heavy Hitters Hamfest). According to reports in this newsletter, the 1989 "Fest will be only one day long. They are looking for a new organizer. Rick Palm K1CE, (of ARRL fame) is still suffering flashbacks from doing the last one, and Elliot, W1MJ, will never be the same, HI HI. Waltham also reports that their 6-meter repeater is back on the air and that their 440 machine is now on 444.075/449.075. The Middlesex club is staying busy. They report Harry Solov, KA1KX (ex W1HVC), has been bitten by the AMTOR bug and is busy selling others on this interesting mode. There is still a need for ARES/RACES operators in EMASS. Contact me if you want to help. If your club is looking for a speaker, any of the Section staff would be glad to put on a program. Contact me for more info. Here's to Spring and no more snow. Have you given your opinion on any Ham issues to the Division Director or Section Manager lately? Please do, it makes the job much easier. Traffic: KW1U 867, KN1K 679, KB1AF 634, NG1A 419, WA1FCD 327, KA1MDM 303, NK1O 299, WA1TBY 285, W1CE 227, N1CVE 190, K1ABO 158, K1GGS 145, NK1Q 137, N1AJJ 100, NN1Y 89, KA1LIH 88, KA1EID 66, WA1FNM 49, KD2S 40, K1BZD 35, KA1NOI 32, KA1AMR 11, K1LCQ 11, KA1EDY 10, K1SEC 9, KA1KCU 2.

MAINE: SM, Cliff Laverty, W1RWG—ASM: Bill Mann, W1KX. SEC: KA8UVQ. STM: WA2ERT. BS: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: KQ1L. Phil Young, W1JTH, Bulletin Manager, reports 41 transmissions by 7 bulletin stations comprising 6 ARRL, 2 Maine, 3 propagation, and 3 packet in November and 9 ARRL, 4 Maine, 2 propagation and 2 packet bulletins in December on CMEN SGN MPSN RACES and MENET PBBS. OBS totals for 1987: ARRL 103, Maine 37, transmissions 461 by 7 stations. The Maine Cabinet, comprising field leadership appointees, continues to meet first Sunday morning each month on 3940 kHz at 9:30. At the end of each session, the cabinet members act as panel for comments and questions from the amateur community.

NET	SESS	CHECKINS	TFC	MANAGER
SEA GULL	27	1019	291	K1GUP
PINE TREE	30	290	133	ND1A
AROOSTOOK EMERG	5	90	1	WA1YNZ
MEPUBSVC	4	46	3	KA8UVQ
HANCOCK COUNTY	4	37	0	WA2ERT
CENMEEMERGENCY	9	203	25	N1EUK
RACES	4	58	19	W1RWG

PSHR: WA2ERT 103, WB1CBP 92, W1KX 91, W1RWG 89. Traffic: KA1JOJ 424, ND1A 136, WA2ERT 124, W1KX 88, KA1ODT 82, N1BCF 81, W1RWG 72, W1JTH 48, W1BMX 44, AK1W 42, WB1CBP 39, N1BJW 31, N1BUN 24, NI1Y 22, W1OTO 20, W1VEH 17, WA1YNZ 6, N1FFN 1. Total traffic: 1101. The Portland Amateur Wireless Assn has returned to its old meeting place at St. Luke's Church. The PAWA, Mid-Coast, Pine State, Aroostook, and Merrymeeting clubs have been active in giving amateur exams. Bill Kaiser, ND1O, has been elected Merrymeeting ARA Ham of the Year—Congratulations. K1GDI is running Novice classes at Morse, and W1RWG is running them at Oxford Hills. Hopefully, we'll have more hams.

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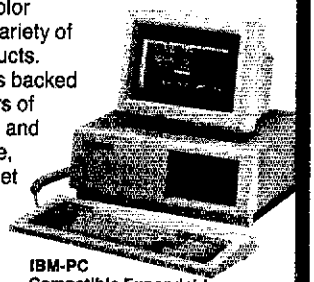

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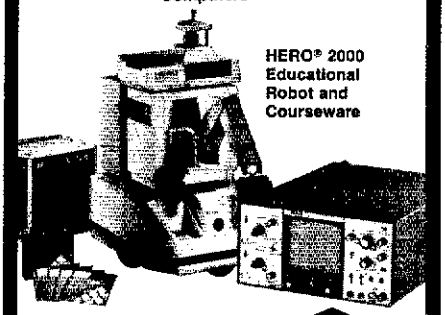

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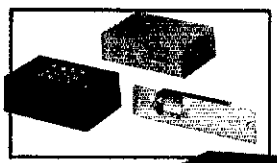

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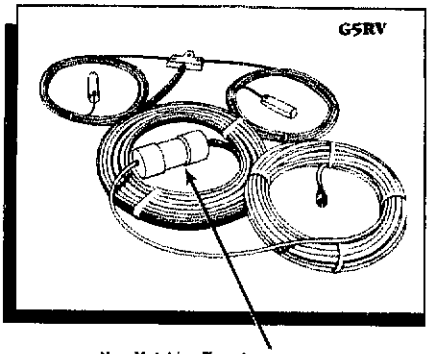

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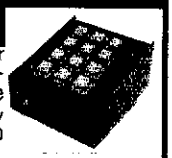

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NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—SEC: K1ACL. BM: K1OSM. The traffic reports for Dec certainly indicate that the holiday Radiogram promotions around the state really worked! We need to see more tfc reports to display the health of NTS, so lets us know if you are active. A double-header this month with the section hitting 100% representation on both 1RN/2 and 1RN/3! Individual accomplishments include Jim, W1FZ, who got DXCC certificate #160 for the first NH station to make it on RTTY! John, WB1ASC, and Chris, KA1LMR, completed their "We the People" WAS. Congrats to Art, W1AM, who received a 50-year membership plaque from the ARRL. Ever wonder if anyone gets those scholarships advertised each year? Well, Lisa Ann Adler, KA1MDT, of East Lempster was recipient of the 1987 Rose Ellen Bills Memorial Scholarship sponsored by YLRL! Parents and students— take another look at the list of Ham radio scholarships offered each year! The Dec issue of the GSARA newsletter has a new look and was loaded with goodies! New GSARA officers: Pres: W1VTP, VP: KA1SU, Treas: KA1FRS, Sec: KC1HH. I have received a note from Jack, WA1ALM, announcing the re-activation of the Contoocook Valley Radio Club. The club was originally founded in 1959 in Henniker, and is back in action with meetings the 2nd Tues of each month in Contoocook. Club officers are Pres: K1OPQ, VP: KA1AUA, Sec: WA1ALM, Treas: K1LAS, Trustee: K1DFQ. Glad you're back in action! The Concord Brasspounders will operate W200OC in June as part of the Constitution Bicentennial celebration. New officers for NARC: Chairman: AK1K, V Chair: KA1OKQ, Sec: KA1GOZ, Treas: K1OSM, Activities: WA1UXA, Program: N1FCC, Membership: KA1CRN. The NARC VE had 35 applicants with a 56% exam pass rate, including 4 Novices. Is your club looking for programs for 1988? We currently have listings of over 50 (!) programs of all types, both Ham and non-Ham, that are available for the asking. Most draw on people within the section, and we include names and tel numbers! For a copy, contact me or drop a note to Pete, KI1M, or Dave, KA1DT. Also note that we have several videotapes for loan. Our new State org. pres, Warren, WB1HBB, has started a project to provide a mailing to new Novices in the section. Let him know of any new Hams in your area ASAP. We were all saddened by the passing of Bill Hall, K1JA, and our thoughts are with his family. Traffic: GSFM 200, GSPN 188, NHN 50, NHNTN 34, W1PEX 1079 *BPL*, N1CPX 439, WB1HBB 228, W1TN 42, KA1HPO 29, KA1LBW 17, KA1PFS 16, KA1JOU 13, KA1LMR 11, KA1LDS 11, KV1S 8, K1ACL 7, N1DQA 6, KC1AF 6, KA1KFX 1.

VERMONT: SM, Frank I. Suitor, W1CTM—ASM: AE1T. STM: KT1Q. SEC: W1KRV. PIO: WA1YOY. Highlights of the NE Division cabinet meeting are as follows: FCC rulings on 220-MHz band fq allocation & the ARRL call-sign petition are expected by 3-88 and maybe sooner. The ARRL position on Part 15 in FCC Rules will most likely be delayed until further tech data is available. Now that CRRL is separate from ARRL, it was requested that CRRL news be sent to those sections (SM) that border on Canada to help us in NE continue the very close friendship that we enjoy with our many friends north of the border. The VE program continues to do fine job & ARRL is hopeful of continued growth. Clubs are encouraged to provide ten local libraries/schools with ARRL info. Radio Shack is now selling licensing materials which should help generate more interest. Growth of our hobby needs to be planned at national and section levels. The NE Div hamfest is scheduled 10/1-2 at Boxboro, MA. Make plans to attend now. Rptr freq coord. continues to create challenges. However, our VT independent rptr coord. committee is doing a super job. Two of our most active section hams have recently become Silent Keys. The legacy and dedication to our hobby of Pete Schrieber (W1HXB) & John Fuller (KA1DK) is an example for all of us to follow. Pete's contribution to net activities (especially the wx net) & John's many years of BARC News service will leave a large void with our section. Congratulations to Bob, W1EXZ and his XYL on their golden wedding anniversary. Burlington area radio classes continue at Red Cross with support from SJRC & BARC. Special tnx to Dan (WA1PDN) & his CVARC crew for running the VT QSO Party. A packet radio coord. meeting was held in Waterbury recently to plan for the expansion of this mode. Further details next month. W1KOO-1 digipeater is back on the air (145.01) from the medical center in Burlington. A computer student info network (COSIN) is developing on 145.07—contact WB2MIC for details. If u wish to get into packet radio, contact Ben (K1AUE) for avail. equipt. list. SJRC has reactivated the swap net & new ham net on Sun @ 2000L on 147.47 rptr. K1MOQ has added a 100 W amp to his 224.68 rptr. The W1DC rptr. is now back in FB shape. Tnx to N1BRT & WA1ODL. ATV continues to expand with the first 33 cm section QSO between KA1LEX & N1QG. Others on 33 cm include K1HGY & KU1H. A split site for the BARC ATV rptr is being planned to overcome input problems when using the 100 W amp. At least 20 hams are now active on ATV in Champlain Valley—contact N1QG for list. Look to a future QST article in Public Service column by N1EUG on the Coolidge Forest Rally Safety Net. ARES participation continues at a high level due in part to the FB ARES bulletin now published monthly. To receive this outstanding publication, contact W1KRV. ARES personnel provided support for the VT Yankee Simulated Emergency Test & in recognition of our capability, VT Yankee has made a monetary donation to help continue our efforts. N1AOU (Ken) obtained police & rescue for a car accident in Cambridge & N1DLE (Barb) gave similar support for accident on I-89. Tnx to you both for ur outstanding efforts. Traffic: KD1R-1 1209, WA2SPL 1198, KT1Q 828, N1DHT 204, WA1JVV 188, W1KRV 120, AE1T 95, NB1A 84. Net Report: VTN 31/193/246. CVFMN 4/95/3. BSEN 4/67/0. BSN 11/122/0. TSEN 5/73/4. TSFMEN 6/80/9. VTPHN 4/75/5. GMN 27/478/34. CAR 27/880/87.

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/RFI: N1CM. PIO/ACC: K1BE. SEC/SGL: WB1HIH. TC: KA1JJM. STM: KA1EXJ. I congratulate all the traffic handlers in this section for their efforts during the Christmas season. A combined total of over 2700 messages were handled. Imagine, over 2700 messages were either sent, originated, received or delivered. Thank you for making a small section outstanding. An excellent article on the G5RV antenna is in the Provin Mt ARA Echoes publication. AA4YH has as thorough an explanation of the operation of the antenna (even on the WARC bands) as I have seen. A gain antenna that is easy to make. SASE to me will bring you a copy of this outstanding article and you'll save about half the price by rolling you own. The fall class sponsored by CMARA turned out 14 new amateurs. A great job done by the training staff at CMARA. 50 members of MARA attended their Christmas party at Landlord Bens in Sterling. Everyone had a great time. Traffic: KA1IFC 1019, KA1EXJ 350, KA1CRX 329, KA1EKQ 123, W1KK 104, WB1HIH 74, WA1YYK 104, NM1U 53, KA1OFC 53, KA1QFV 30, W1SJV 24, NI1V 23, WA1OPN 18, W1ZPB 14, K1JHC 66, W1UD 380.

NORTHWESTERN DIVISION

IDAHO: SM, Don Clower, KA7T—SEC: K7REX. STM: W7GHT. OOC: WB7CYO. ACC: N7BI. PIO: WB7PFO. The Pocatello ARC held amateur exams on 12/12; the VE team was composed of: WC7D, WF7D, KF7D, KF7DL, KC7EG, N7XS, AE7T. Our congratulations to: KB7CVR, KB7DAR, KB7BVZ, W7EBK, & WB7PNW on upgrading. The Pocatello ARC awarded their Ham of the Year to WB7BNJ. K7REX has a digirepeater on 145.05; the call sign is ARES. Dan is working very hard to complete total state coverage for an ARES packet radio system. The new net manager for the Farm net is WA7GSM. We want to wish him gud luck. Traffic: W7QU 2, WB7CYO 4, NW7K 233, W7GHT 609.

Net	Freq	Time	Sess	Qni	Qtc
FARM	3.937	8P da	31	1991	73
CD	3.990	810A M-F	23	733	57

General: W7GHT holds code practice on Mon, Thurs, Sat following the IMN net on 3.3635 at 9PM. 73, Don.

MONTANA: SM, Ken Kopp, KØPP—Many clubs elect officers in Dec. Helena's CCARC chose K7EGM/P, WA7TUW/VP, KA7WXN/S-T. GFAARC (Great Falls) picked N7HKU/P, KD7VH/VP, W7NBB/T, N7GYQ/S. In Billings, the YRC wanted KA7MMY/P, KA7IZU/VP, K7AEZ/S-T. AARC (Anaconda) elected N7HKW/P, N7GHW/VP, KØPP/S-T. The AARC's FD trophy went to GHRC QRPers. Dec simulated emergency test found problems but impressed CD & RACES officials. PROM net now at 4:30 Saturdays on 3910 kHz. YRC (Billings) demonstrated Amateur Radio for shoppers in two malls. N7GXP's daughter, Tammy, needs expensive chemotherapy treatments in SLC at $8K each. Fund set up to help. Contact KA7MAH if you or your club can. KF7T Silent Key. Traffic: W7TGU 51 (PSHR)

NET	SESS	QNI	QTC	MGR
IMN	30	240	97	KA7EEE
MSN	4	68	0	KØPP
MTN	31	1977	134	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 two different clubs. First in the Radio Amateurs of the Gorge there is Tom Cope, KE7BU, President; John Cheney, NB7M Vice President; Karen Mielke, KA7WVC Secretary/Treasurer and in Oregon Tualatin Valley Amateur Radio Club there is Paul Lucas, WB6SHR President; John Ewing, K7SHC Vice President; Jeff Freedman, K7JF Secretary; Susan Benson, N7EPE Treasurer. One other thing, I would like to mention about the Oregon Tualatin Valley ARC is the public service they did this last year. Keep in mind that this club has an average membership of 230 people. There were 56 members who worked 1496 hours and drove 8268 miles during 1987. You might let me know what your club is doing in public service and emergency service. There is a new Official Observer Coordinator and that is Randell Cobb, KA7HJT. He is well qualified for the job and I am sure that the OOs will help all they can. Traffic (P) = Packet: W7VSE 1009, WG7H 325, N7BGW 299, N7DRP 222, W7ODG 154, W7XI 114P, KA7EEE 108, WB7SZM 93P, KZ7T 86P, KM7R 72P, KA7AID 55, N7APC 51, KA7ZAK 46, KF7BX 42. Notice W7VSE with 1009 pieces of traffic. That has to be some kind of record. Great work, Vic Seeberger.

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: KC7LL. Don't forget the ARRL DX contest (phone) this month. You can operate it high power, low power, or QRP. With a format of "the world works the U.S.," it offers the chance to really run some DX stations. It is with deep regret that we report the passing of Bill Bennett, W7PHO, on December 23, 1987. Bill was one of the premier DXers in the country. He started the Western Washington DX Club and was its first president for many years. He operated the W7PHO Family Hour Net and made it possible for many of us "little pistols" to work some really rare DX. Following are the 1987 totals for traffic nets in Washington:

NET	CHECKINS	TFC	SESS	MANAGER
EWTN	775	689	428	WA7CBN
NTN	15585	1488	365	W7TVA
PSTS	1278	489	721	KD7ME
WARTS	36962	2408	365	W7IGC
WSN	5896	1757	723	WA7CBN

The grand totals are 66342 checkins and 7150 pieces of traffic handled during the year. Thanks for a job well done to all who have participated in these nets. Washington has the highest per-capita ratio of hams to general public of any state in the Lower 48: 1 for each 334.2 citizens. Plan to attend the Electronics Fleamarket by the Mike & Key ARC on March 12 from 9 AM to 5 PM at the Puyallup Fairgrounds. Talk in on 146.82 rptr. 24,000 sq. ft. of display area, VE exams (contact Mike Dinkelman, WA7UVJ), free parking, snack bar, and hourly door prizes. The Walla Walla Swapfest will be March 27. Lots of goodies, free admission, free parking, plus coffee and donuts. Washington Section now has a signed agreement with the Field Operations Bureau of the FCC. This agreement will help reduce the workload of the FCC with respect to amateurs and allow us more freedom to self regulate and administer our service. Drop me an SASE for a copy. As part of this agreement, I am expected to provide the FCC Seattle office with current info on VE Exams and licensing classes, so please keep me up-to-date on activities in your area. Radio Club of Tacoma license exams March 26 at the RCT clubhouse—contact W7BUN. North Kitsap ARC license exams on March 26 in Bremerton— contact N7HTK. New officers for WWDXC: Pres: N7FSW. VP: KD7IK & K7LXC. Sect: W7YF. Treas: WA7BPI. New officers for RCT: Pres WB7BLQ. VP: W7BUN. Sect: K1DPO. Treas: N7DRT. New officers for NKARC: Pres: N7HTK. VP: N7IZN. Sect: N7EDA. Treas: WB7VHL. New officers for OARS: Pres: N7HOE. VP: NV7J. Sect: KA7ROP. Treas: N7JSK. Congrats to Seatac Repeater Assn. on becoming an Affiliated Club. Public Service Hours: King 119, Franklin 39, Benton 39. Traffic: W7IGC 454, WA7PIN 335, K7GXZ 302, WA7CBN 265, N7GGJ 239, N6EQZ 212, K7SUX 183, W7GB 133, WA7YEN 129, W7LG 101, N7DIP 55, KA7TTY 41, KA7PMD 35, K7AJT 30, K7UQH 29, WA7TWB 14, KA7IIJ 14, W7APS 13, K7CLL 12, W7IEU 10, KD7ME, KD7G, KR7L.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG— ASMs: W6ZF, N6DHN. SEC: W6LKE. STM: K6APW. OOC: NY6Z. TC: N6AMG. Congrats to WB6DQB on making BPL for December with a TFC total of 624! MDARC's new officers are: Pres, N6KLS; VP, KT6X; Secty, N6NVA; Treas, AA6DL; B/D, KT6Y & KA6IVF; EC, AA6CK. Their membership has grown from 190 to 250 - FB! EBARC's W6CUS-1 is handling over 1000 Msg/month on 7.093, 144.97 & 220.90 MHz. LARK welcomed new members KB6HMI & WA6NFJ. Their 145.35 repeater is now at a new high-level site. HRC is finishing their Novice class, and the Tech/Gen classes start in February. BARC's net is on 146.565 MHz at 8:00 PM each Monday and their ARES net is at 7:00 PM each Monday on 147.735 MHz (–600). Dec Traffic: WB6DOB 624, W6VOM 271, K6APW 227, WB6UZX 40

NEVADA: SM, Joe Lambert, W8IXD—LVRAC reports new officers are Pres. KE7JX, VP N7CXD, Sec. WI7D and Treas. N5BOB. New directors: WN9ANF, N7CAH, KB7CG and WB7Z. The LVRAC has also changed its meeting schedule. PLEASE NOTE: Meetings will be held on the second TUESDAY at 7:00 PM. (The meeting replaced the LVRAC net on the meeting night.) Still at Nev. Power Bldg, Sahara near Jones. The Clark Co. area of RACES and ARES have been combined into a single MON. night on 147.18 repeater. This begins at 6:15 PM. Another informal net in the L.V. area has been formed on 28.400 MHz. This is in the Novice band and will happen at 7:30 every evening for ragchew and code practice. Everyone is invited. We are wishing Jay, K7WYC, tireless SNARS editor, a speedy recovery after his recent hospitalization. K7HRW reports that his Novice classes now carry two hours of college credit. Reno area hams are supporting the Special Olympics in 1989, and a warmup session in February, 1988. NARA is organizing for 1988 Field Day, and for the Nevada Week of the Bicentennial celebration October 22-28. We hope all radio clubs in Nevada will participate. DON'T FORGET THE RENO HAMFEST ON AUGUST 20 AT IDYWILD PARK. WE HOPE TO SEE YOU THERE!

PACIFIC: SM, Army Curtis, AH6P—Aloha and hafa adai to all of the Pacific. It's time for a change! I have greatly enjoyed being your SM for the past several years, and have been pleased to watch a tremendous increase in Amateur activity in the Pacific during this time. Now it is time to pass on to other things. Effective April 1 your new SM will be Jon Starr, AH6GJ. I am very pleased that Jon decided to take on this job, and feel sure he will do well with it. Please contact Jon and let him know you are willing to help. Absolutely outstanding is the naming of the Big Island ARC as the outstanding large club of the year in the Pacific Division. The gang in Hilo have really been working hard, and it is very nice to have their efforts recognized by their peers. Special thanks to WH6AXL, now on Kauai, who did a lot to make this achievement possible. Traffic: KH6S 49, KH6H 21, WX4J 15, EARC Net 4.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—It is time to thank the Yuba-Sutter Amateur Radio Club for allowing the use of their repeater, WD6AXM/R, for the monthly Sacramento Valley Section Net. The net is the first Sunday of the month at 8:00 PM and the frequency is 146.085, input up .600 MHz. All hams are welcome to check in. The SV Section Staff is called first followed by a call for representatives of affiliated clubs, then all others are invited to check in. From my location far south of the repeater, I sometimes have difficulty putting a good signal into it so Jettie Hill, W6RFF, acts as net control. It would be nice to have more of you check in. Hpe CU there. The Yolo Amateur Radio Society now meets at the Davis Science Center, West Davis Elementary School on the first Thursday each month at 7:30 PM. The Amador County ARC was one of the first to put together a VE team to give license exams and, under the guidance of Dave Carlson, KE6NS has continued. Dave is now turning over the Team Chief job to Bobby Brown, WZ6Y, who went all the way to Extra Class in the local exams. Thanks very much, Dave, for your work in the VE program and for continuing as District EC for the Central Sierra Counties and thanks Bobby for taking over. Traffic: N6LUY 507, WA6WJZ 436, WA6ZUD 200, K6SRF 181, WD6BZQ 96, WB6SRQ 7.

SAN FRANCISCO: SM, Bob Smith, NA6T— I hope everyone had a joyful holiday season. The Pacific Division Cabinet Meeting will be the third weekend of January. The newsletter will tell all the current section appointees and Newsletter editors what happened. I hope to see all the Representatives from the Section at the meeting. I am looking for appointees for The Offical Observer-Amateur Auxillary positions within the Section in The San Francisco Bay Area; any questions, contact me. New Amateur classes are being started in all the section clubs. With Novice Enhancement, NOW is the time to gain new members for your club and further amateur radio. Get out and Support Your Local Club. Traffic: N6FWG/T 50.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U. STM: N6AWH. TC: WA6EXV. ACC: W6DPD. Asst.SMs: W6TRP and K6YK. 1988-1989 officers of the QCWA Chapter 99 are: Pres W6VMB, 1st VP K6REZ, 2nd VP N6HB, S/T KB6TBM. The Chapter meets 4 times per year at various locations in the Southern San Joaquin Valley. 1988 officers of the Tulare County ARC are: Pres KA6VAF, VP KB6AWV, Sec W6MUV, and Treas WF6M. The club meets the 4th Thurs at the County Government Center in Visalia. N6MCY made BPL in December. N6PLC is KJ6BH. N7BHW has a TS 711. W6LLF has TS 520S. N6GJI has a TS 430S and a new amplifier. The 1988 Fresno Hamfest is May 6-8, 1988 at the Airport Holiday Inn in Fresno. Write to Fresno Hamfest, P.O. Box 783, Fresno, CA 93712-0783 for more information. Traffic: N6MCY 511, K6RAU 60, WA6YAB 32, W6DPD 6. (Nov.) K6RAU 30, KF6DI 23, N6DTB 4, N6DCX 20.

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 short report this month as most of us were busy with holiday activities. . . welcome to K1GRP who has recently moved to our section from New England. Judging from his traffic totals for the last couple of months, he will be a welcome participant in traffic circles. . . Doc, W6ZRJ, reports that he has been QRL with NTS cycle 4 and also with traffic on packet radio. Doc also had antenna problems during our high winds in December (as did many of us!) . . . a number of clubs in the section had Holiday Dinners, and a number of other clubs had no meeting at all so that members could more fully participate in other holiday activities. Whichever your club did, I hope you had a most joyous holiday season! 73 and Happy New Year to all de Glenn WB6W. PSHR: W6NJR, NR7E (Nov. 71, Dec. 97) Traffic: (Nov.) NR7E 177, W6ZRJ 160, K1GRP 73, W6PRI 89, W8KZJ 44, KA6ASV 35, N6JLJ 24, KA6SXW 24, KB6IWG 14, WA6HAD 12. (Dec.) NR7E 309, KA6SXW 38, N6JLJ 31, W6PRI 17, KB6IWG 14.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. TC: K4ITL. SGL: KE4ML. Big CHARLOTEE HAMFEST March 19-20. I'm writing this article for December, but this will be my last Section News column as SM. Beginning April 1, AB4W will be the new Section Manager. The Section has accomplished a lot of things in the past 4 years and more progress will be made in years to come. Please give your continued support to the Section and AB4W. This Section is NUMBER ONE in the US. Let's keep it that way. A special thanks to STM K4NLK for a tremendous job in NTS. WELL DONE, Bill. Special thanks to AB4W for plowing new ground in Emergency Communications—ARES and securing a new level of interest in Amateur Radio Emergency Communications with State Government. Special thanks to BM K4IWW for covering Section with bulletins. Special thanks to ACC WC4T for recruiting new club affiliations with League and SSC clubs.

(continued on page 112)

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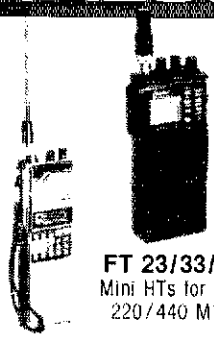
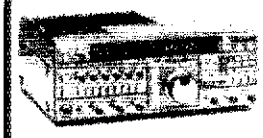


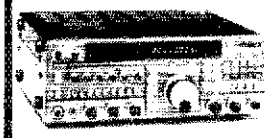
FT 23/33/73
Mini HTs for 2m, 220/440 MHz

FT 727R
2m/440 MHz Dual Band HT

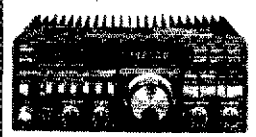


FT-767GX
All Mode Transceiver with CAT System

FT-747GX
Good low-priced basic HF amateur rig.



FT-736R
VHF/UHF Base station for SSB, CW, FM on 2m, 440 MHz, and optional 6m, 220 MHz, or 1.2 GHz.



FT-757GX Mark II
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IC-781
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New 160-10m transceiver with general coverage receive and many built-in features.

IC-28H
Tiny 2m with 45 W output

IC-275A
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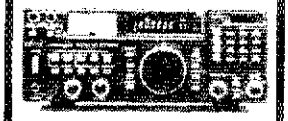
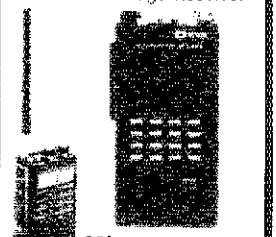


R-7000
General Coverage Receiver

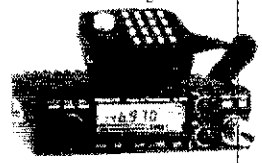


Micro 2AT/4AT
Mini Handhelds for 2m or 440 MHz

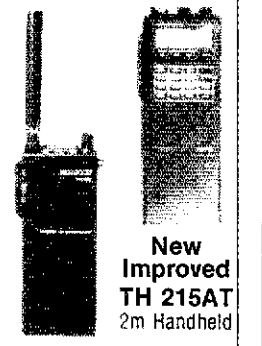
IC-02AT/03AT/04AT
Handhelds for 2m/220/440

TS-140S
HF Transceiver with General Coverage Receiver

TS-940S
HF Transceiver with General Coverage Receiver



TM-221A/321A/421A
2m/220/440 MHz Mobiles



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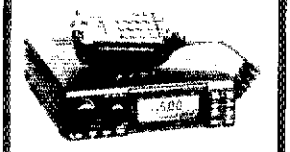

ALR-22T
Compact 2m Mobile

ALD-24T
Compact Dual-band Mobile for 2m & 440 MHz

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HY-GAIN
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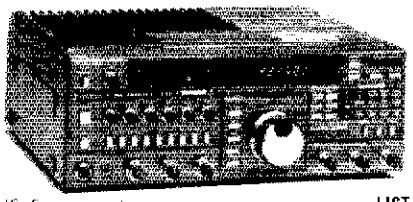
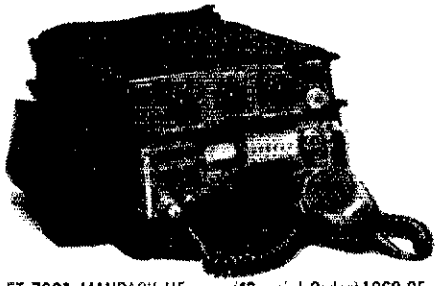
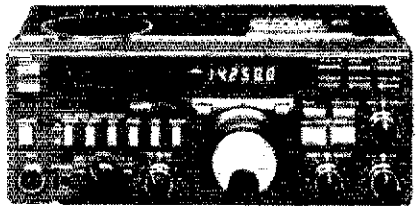


HF Equipment	LIST
FT-767GX 160-10m xcvr/.1-29.99 MHz Rcvr	$1929.95
SP-767 Speaker w/audio filters	79.95
2M/767 2m module	199.95
6M/767 6m module	199.95
430/767 430-440 module	249.95
440/767 440-450 module	249.95
FT-ONE Xcvr/Rcvr/4 filters/RAM/FM	2859.00



FT-70G* MANPACK HF xcvr (*Special Order)	1069.95
FNB-70* Extra 12V, 4 amp-hour nicad	299.95
NC-70* Nicad battery charger/base supply	259.95
CSC-70* Canvas carrying case	89.95
FC-70M* Manual antenna tuner	199.95
FC-70P* Preset antenna tuner	199.95
RSL-70* Whip antenna for FC-70P	27.95
MH-17* Speaker/microphone	31.95
YA-70* Tripod antenna	269.95
YH-70* Telephone-type handset	59.95



FT-757GX MkII 9-band Xcvr/SW Rcvr/mic	$1129.95
FP-757HD Heavy duty supply with fan	299.95
FP-757GX Compact power supply	239.95
FRB-757 External relay box	12.95
FC-757AT Automatic ant. tuner w/memory	399.95
FAS-1-4R Remote antenna selector	99.95
MMB-20 Mobile mount	25.95
FIF-65A Interface; Apple IIe	59.95
FIF-232C for VIC-20/TI/most RS-232	79.95
GX Turbo/F01 Software; Apple II	59.95
GX Turbo/C01 Software; C64/128	89.95
GX Turbo/V01 Software; VIC-20	89.95
FTV-700 Transverter w/no module	175.00
2M/FTV 2m module only	189.00
6M/FTV 6m module only	139.00
70 cm/FTV 430 module only	255.00
FL-7000 Auto. tune HF linear amplifier	1995.00

Misc. accessories	LIST
SP-102 Speaker with audio filter	$ 99.95
SP-102P Speaker/patch	99.95
MD-1B8 Desk microphone	109.95
MH-1B8 Mobile microphone	27.95
YS-60 1.8-60 MHz 2kw PEP wattmeter	99.95
YS-500 140-520 MHz 200w wattmeter	89.95
YH-55 Lo-Z headphones	24.95
YH-77 Lightweight headphones	24.95
FF-501DX Low pass filter	47.95

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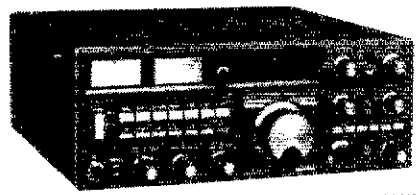

VHF/UHF equipment	LIST
FT-726R VHF/UHF Xcvr w/2m, TTP mic	$1095.00
HF/726 10-12-15m unit	289.95
6M/726 6m unit	269.95
430/726 430-440 MHz unit (OSCAR)	329.95
440/726 440-450 MHz unit (FM band)	329.95
SU-726 Satellite duplex module	129.95
XF-455MC 600 Hz CW filter	69.95
DC-726 DC cable for FT-726R	15.00
FTE-36 Tone board for FT-726R	58.00
AD-2 50w 2m/440 duplexer	34.95
FT-736R 25W 2m/430 full duplex xcvr	1749.95
FEX-736-50 6-meter module	259.95
FEX-736-220 220MHz module	279.95
FT-211RH 45w 2m FM w/autodialer mic	459.95
FT-311RM 25w 220MHz FM w/autodialer mic	439.95
FT-711RH 35w 440MHz FM w/autodialer mic	479.95
FT-2311R 10w 1.2GHz FM w/autodialer mic	559.95
FT-290R MKII 25w 2m FM/SSB xcvr	599.95
FT-690R MKII 10w 6m FM/SSB xcvr	589.95
FBA-8 Holder for C-cell Nicads	27.95
NC-26B Wall Charger for FBA-8	16.95
CSC-19 Soft case	10.00
MH-10F8 Speaker/Microphone	29.95
MH-10E8 Hand Microphone	22.95
FTS-7 Encoder/decoder	49.95
FT-2700RH 25w 2m/440 FM w/TTP mic	599.95
FTS-8 Encoder/decoder	49.95
FVS-1 Voice synthesizer	34.95
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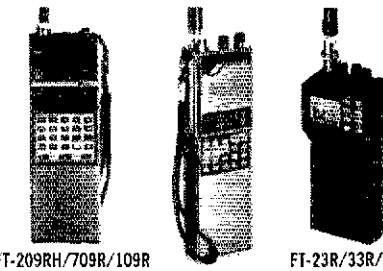

FT-209RH/709R/109R FT-727R FT-23R/33R/73R

Handhelds	LIST
FT-209RH 5w 2m FM HT/TTP/batt/cgr	$389.95
FT-109RH 220 FM HT/TTP/batt/cgr	399.95
FT-709R 4w 440 FM HT/TTP/batt/cgr	389.95
FT-727R 5w 2m/440 FM HT/TTP New CPU!	439.95
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FT-33R 5w 220MHz HT	344.95
FT-33R/TTP 5w 220MHz HT w/TTP	389.95
FT-73R 2w 440MHz compact HT	309.95
FT-73R/TTP 2w 440MHz compact HT w/TTP	349.95

Acc. for 09-series/03-series/FT-727R	LIST
FBA-5 Alkaline battery holder for U9/03	14.95
FBA-5A Alkaline batter holder for 727R	14.95
FNB-3 425ma 10.8v batt (comes w/03 series)	49.95
FNB-3A 425ma 10.8V battery for 727R	49.95
FNB-4 500ma 12v batt (comes w/09-series)	64.95
FNB-4A 500ma 12v batt for 727R	64.95
FTS-6 Encoder/decoder; 09-series	49.95
FTS-7 Encoder/decoder; 03-series	49.95
LCC-6 Leather case w/top cover; 09-series	39.95
LCC-6A Leather case w/top cover; 727R only	39.95
MH-12A2B Speaker/microphone	41.95
MH-18A2B Lapel speaker/microphone	41.95
NC-9B Wall charger for FNB-3	11.95
NC-15 Desk quick charger/AC ps	89.95
NC-18B Wall charger for FNB-4	11.95
MMB-21 Mobile bracket	11.95
PA-3 Mobile adapter and charger	39.95
TA-2 2m 19" telescoping whip ant	11.95
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Other Handheld Accessories	CALL

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FRT-7700 Antenna tuner	64.95
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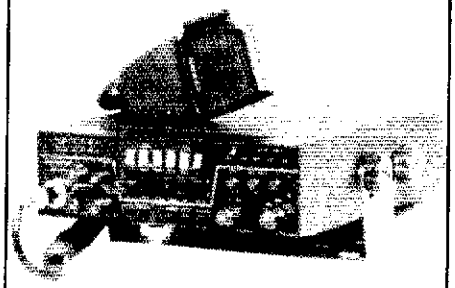

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Selectivity: -6dB -60dB
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AM, FM 6.0 KHz 18 KHz

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Frequency Range: 28.0000-29.9999 MHz
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Power Output: 100 watt Model: SSB—100 Watts, AM/FM—30 Watts, CW—150 Watts
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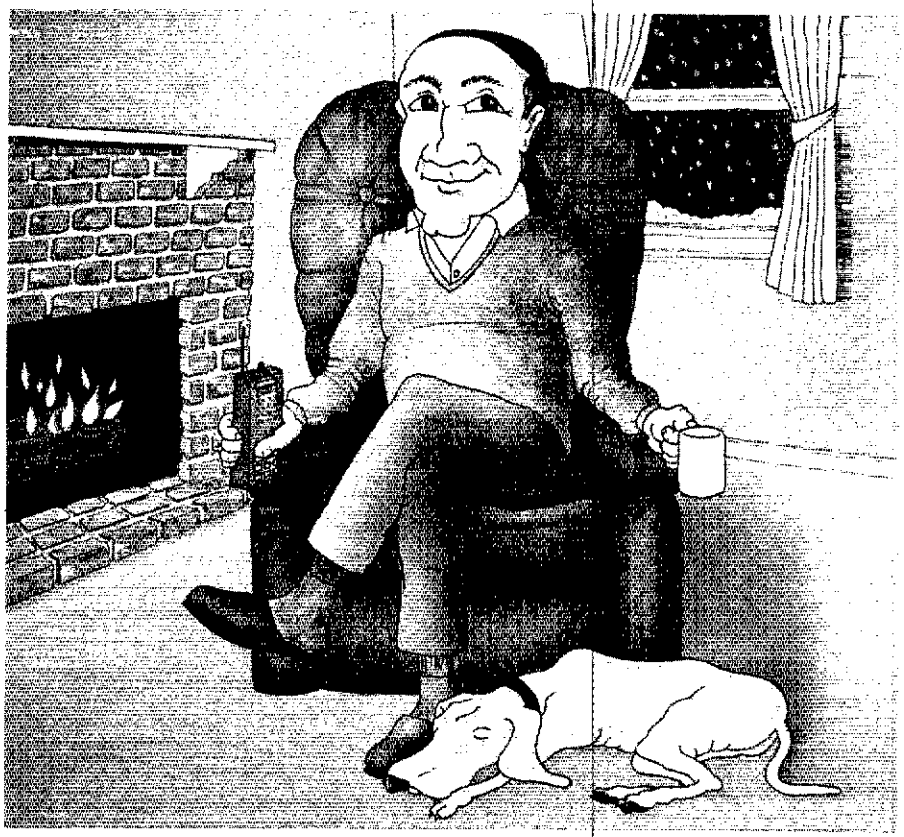

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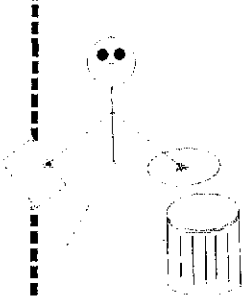

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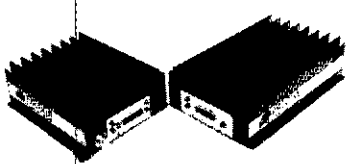

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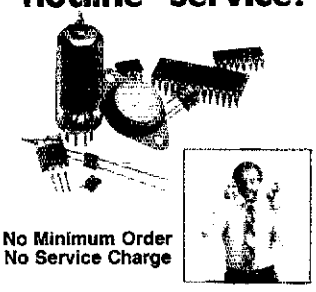

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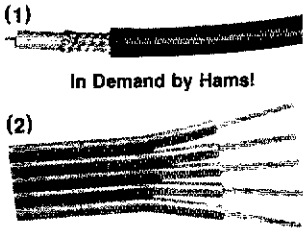

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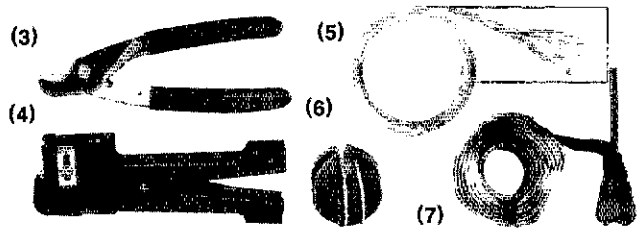

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(4) Coax Cable Stripper. For most popular-size coax. #278-240, **11.95**

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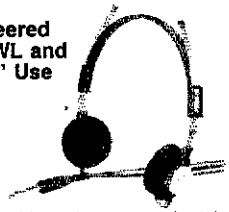

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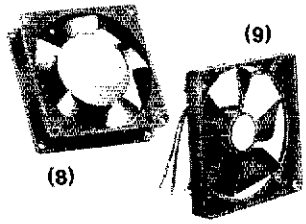

(8) 3" Brushless DC Fan. Great for mobile equipment and for cooling circuitry sensitive to AC fields. 7 to 13.8 VDC. #273-243 . . . . . **14.95**

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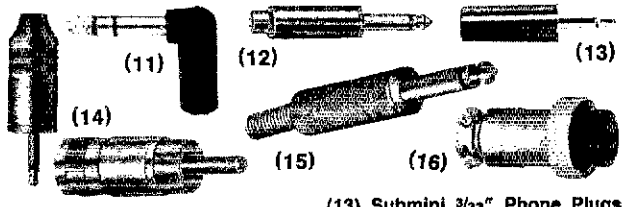

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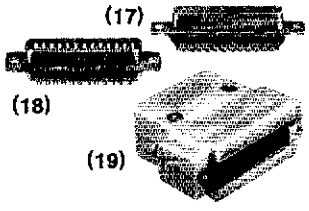

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(19) Shielded Hood. Preserves EMI/RFI protection when used with shielded cable. #276-1536 . . . . **1.99**

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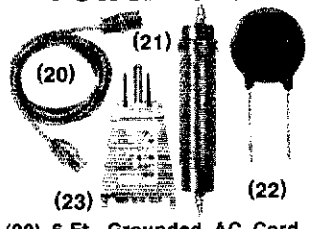

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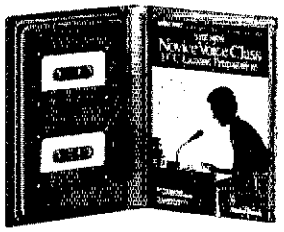

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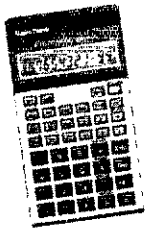

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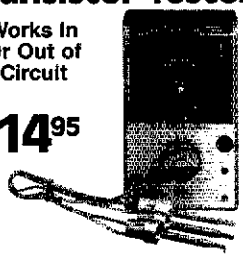

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Special thanks to PIO WA4OBR for handling the league public-service announcements and videos for clubs. Special thanks to TC K4ITL for allowing the ARRL Section staff to be closer to the membership via the linked repeater system. Special thanks to SGL KE4ML for being on top of Amateur Radio legislation in General Assembly, especially the License Plate Bill. You are TOPS in my book and thanks for your dedication. The memories of the past 4 years will last a lifetime. THANKS TO A SECTION DEDICATED TO PUBLIC SERVICE. Congrats to K4NLK, KA4TLC, WB4HRR, KB4HJQ, WB4TOP for making BPL during Christmas traffic crunch. Be sure to forward your SAR and PSHR monthly reports to AB4W beginning April 1. Appointments: KB4IVV EC Davidson County.

NET	FREQ	NM	QNI	QTC	TFC	QND	SESS
NCEN	3923	WB4WII	1859	735	632	2148	92
NCMN	3927	WB4HRR	1408	770	569	2434	92
CN	3573	K4IWW	2003	1119	1032	4371	184
CSN	3715	AA4MP	654	159	150	1856	92
CNCTN	22/82	WA4MNR	2406	760	498	1794	92
PCTN	28/88	NE4J	942	582	405	1260	92
RARS	O4/64	K4ABJ	859	95	94	1490	90
M2MEN	63/23	KF4MZ	1585	145	119	1211	88
CFARS	31/91	W4EHF	1557	71	71	1513	92
Non-NTS Nets							
PETN	75/35	WB4HRR	1100	226	175	1742	87
THEN	3923	N4LUO	1200	180	134	405	81
Totals			15,573	4822	3879	20,222	1084

Above quarterly report is for Oct, Nov, Dec 1987. Traffic: K4NLK 773, KA4TLC 532, WB4HRR 504, NJ4L 366, KB4HJQ 307, KA4EYF 270, WB4TOP 221, K4IWW 197, WD4HTE 194, AA4MP 190, AA4TE 161, WB4N 160, N9CGD 148, KB4IVV 134, KI4YV 98, WB4WII 95, KB4FWL 70, N4MMM 63, K4SWN 57, N4JRE 54, WA4MNR 49, WD4MRD 48, AJ5F 44, AK1E 43, KB4QQJ 41, WD4EQK 38, WD4LSS 36, K4QXA 35, W4EHF 30, N4CJJ 28, WA2EDN 28, WD4B 22, W4PMN 22, NT4K 21, KA4OXF 18, N4LFT 15, AB4EO 13, KB4FKF 10, W2JDB 6.(Nov.) NE4J 31. December totals: 40 SARs and 5,172 traffic. Congrats to AA4TE who made PSHR Honor Roll. Certificate of Merit to K4NLK, AB4W, K4IWW, WC4T, K4ITL, WA4OBR, KE4ML.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ— Last month I posed a question to you "packeteers." Are you ready to use your packet station in an emergency? And you answered YES!! In an emergency, the SEC or SM will expect your packet station to service large volumes of traffic and if you can not assemble the proper hardware or type at 40 - 60 words minute, you will be in a lot of trouble. So I will discuss hardware. Your station must have the capability for data storage on disk. In an emergency, power sources are unreliable; if the data is not on disk, it will vaporize when the power goes off. Power your station with emergency power to avoid power-line brownouts and blackouts. A second compatible computer is used to enter and edit messages while your computer is attached to the TNC and radio. The disks containing messages can be switched between computers. Don't forget the printer. It will be impossible to service a large volume of traffic addressed to your station without one. If you can not access the nearest "digi," you will need a portable digipeater and don't forget backup software and hardware to counteract Murphy's Law. Where are you passing this traffic?? — a PBBS for store and forward of messages. A POINT IS TO BE MADE!!! No one person can be asked to contribute so much. The answer is—PLANNING, TEAM WORK and DRILLS!!! Congrats to K4WJR for BPL! Traffic: K4WJR 601, N8GJO 446, W4ANK 348, K4ZN 233, KB4BZA 131, WB4UDK 72, KA4LRM 66, KA4YEA 60, W4DRF 44.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC: N4EXQ. ACC: NT4S. OOC: W4HU. BM: AB4U. TC: WB4MAE. SGL: W4UMC. PIO: AA4VP.

VTN	1PM	3907	KB4NGO
VSBN	6PM	3947	KI4BR
VSN	6:30PM	3680	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

The FCC has authorized the Rappahannock Valley Radio Club and the Richmond Amateur Radio Club to operate a "200" station in celebration of the Bicentennial of the U.S. Constitution during the period June 25 - July 1, 1988. These clubs join the Shenandoah Valley and Roanoke clubs who have also been authorized for this operation. KC4VR, an ATC appointee and head of the Local Interference Committee for his area submitted an excellent report covering their efforts in tracking down local QRM and internod problems at their repeater sites. If others are having similar problems, I suggest you contact KC4VR for details. N4EXQ announces KJ4RG as the new EC for Chesterfield county and N4GVQ replaces KB4FYR as EC for Lancaster county. Tnx to KB4FYR for his fine work in the past. Our STM, KB4WT appoints KK4FV, NG2H and WB4KSG as ORS. These stations having met the qualifications of consistent traffic net operation and submission of monthly activity reports for the past several months. In the Virginia section these qualifications must be met and maintained to receive and hold an ORS appointment. Some upcoming VE exam skeds: Mar 5 SPARK, Hampton contact N4IIC - Apr 9, Williamsburg ARC contact WJ4X and May 7, Shenandoah Valley ARC contact NC4B. I received from W4KX, W3KU in 1926, some VA. section newsletters covering the period of 1932-1934. You might be interested to know that the leading traffic handler in April 1932 was W3FJ, now W4FJ, with a traffic count of 424. The Christmas Mail station—W4HIR—had a bangup operation by originating 1565 msgs during a 2-week operation. This effort led the largest single month traffic total ever recorded for the section. The total traffic count for December was 17,122 with 51 stations reporting. Those making BPL were; W4HIR, KA4TWI, K4DOR, N4GHI, KK4FV, K4MTX, N4EXQ, AA4AT, KB4WT, and W3ATQ. Congrats to first timers; KK4FV and KA4TWI. I hope to see many of you at the Vienna Winterfest. Please check the date; I understand the correct date is Feb. 28 instead of the 21st. Traffic: W4HIR 3130, KA4TWI 2106, K4DOR 2048, N4GHI 1366, KK4FV 1034, K4MTX 896, N4EXQ 712, AA4AT 597, KB4WT 546, W3ATQ 541, WB4PNY 430, KB4NGO 332, AA4GL 320, KI4BR 299, WB4KSG 227, W4JLS 194, WD4OCW 176, WB4EDB 175, KB4TRI 153, WB4ZTR 150, KB4OPR 148, K4BGZ 139, W4HDW 117, K4JM 114, N4KSO 114, WD4MIS 112, N4RKN 105, WA4LTO 100, KA8TNF 88, K4JST 77, W4TZC 75, NN4I 66, WB4UHC 53, N6ANQ 53, K4MLC 53, WB4KIT 45, NG2H 40, WB4ZNB 38, NT4S 34, N4KSS 21, W4YE 21, KB4UED 19, N4FNT 11, N3RC 9, K4GR 9, WA4TVS 9, K4AXF 9, K4VWK 4, NW4O 3, KI4W 2, WA1VRL 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8OEW. STM: N8FXH. ACC: WA8CTO. SGL: K8BS. Rpt. Coord. WD8OZT. KA8ZXP has a billboard in the Clksbg. area on 145.01. 46 people attended the KARC installation dinner on Jan. 8. Fayetteville H.F. will be Feb. 28. KV8S has been appointed ATC for Cent. WV. Regret to report that K8GEP has become a Silent Key.

NET	FREQ	TIME	QNI	QTC	Sess	NM
WVFN	3865	6:00	1465	200	31	W8YP
WVMD	7235	11:45	816	81	31	W8FZP
WVN	3567	7:00	272	163	31	KZ8Q
WVRN	3640	6:30	392	37	31	K8LG
WVNN	3730	5:15	118	36	27	KA8TIK
Hillbilly	14290	Noon su	120	16	4	W8YP

Traffic: KA8WNO 870, KD8WX 869, KA8TIK 376, K8TPF 295, W8YP, KE8FI 163, WD8DHC 132, W8FZP 131, K8UQY 97, W8JWX 92, K8QEW 89, N8FXH 60, KA8ZXP 56, KA8OGF 51, K8KT 29, NC8G 21, WD8LDY 20, NJ8J 14.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—ASM: KA0MQA. SEC: WB0TUB. STM: KB0Z. OOC: KC0UD. ACC: WB0DUV. SGL: WB0FQB. PIO: N0DZA. TC: W0LJF. BM: K0WOP. Recently in the Boulder Antenna-Tower case, round one of the suit filed in Federal Court was won by NQ0I & N6DIY. Represented by their attorney AG0X, Federal Judge Z.L. Weinshienk stated that the matter should be settled by conference between the parties under court supervision in accord with PRB-1 rather than taking up court time and involving the expense of a trial. The judge directed the hams to apply for a variance, she directed the county to act in good faith, and stated that the 35 ft limit was not adequate. Judge Weinshienk ordered the parties to return next month to report their progress. The Blizzard of 87 hit Colorado extremely hard as it did the rest of the nation. Many ARES members and groups here in the metro area provided 4-wheel drive vehicles to give help to local hospitals and fire and police departments. Clear Creek & Pitkin Co. ARES members were involved with some of the numerous avalanches occurring this month, in the high country. NETS:CWN: QNI 53, QTC 70, QNF 258, S-24 COL: QNI 1393 QTC 70-148 QNF 1214, S-30 HNN: QNI 2020, QTC 218-865 QNF 1624 S-31. NCTN QNI 246, QTC 268, QNF 472, S-39. SCTN: QNI 177, QTC 64, QNF: 304, S-23. Traffic: KE0NI 1198, WD0BSZ 380, N0HMR 345, K0NI 224, KA0WIE 180, KB0Z 164, WB0FFV 100, W0NFW 37, N0HFZ 31, KE0BI 24, WD0K 13.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO K6LL W5QNR. TC: W8GY. ACC: KA5BEM. Southwest Net meets daily, 3583 at 0230 UTC, handled 244 msgs with 230 checkins. New Mexico Roadrunner Net meets daily, 3939 at 0100 UTC, handled 72 msgs with 1358 checkins. NM Breakfast Club meets daily, 3939 at 6:30 AM, handled 160 msgs with 1099 checkins. Yucca 2-mtr Net, 78/18, handled 24 msgs with 558 checkins. Caravan Club 2-mtr Net, 66/06 with 122 checkins. SCAT Net, 66/06 handled 7 msgs with 648 checkins. Info Net 13/73, with 66 checkins. Certainly nice to have AG0X & W5HD visit the Santa Fe, Los Alamos, Northern NM & High Valley ARC's during their joint Christmas Dinner at Rancho de Chimayo. Special thanks to W5IXR, W5IXS, and many others for a memorable event. Congrats to WA5SWV for playing "Radio Santa." Vy sorry to report the passing of W5KWR, one of NM's oldest hams, and WD5ADU. They will both certainly be missed. Traffic: ND5T 730, KB5UL 377, KN5D 188, W5DAD & Zia Link Pkt Net handled 23 msgs with 76 checkins.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. OOC: Bill Bradford, K7EA. Two stations participated in the 200-year anniversary celebration of the birth of our Constitution. The QARC had a station with the special call sign, as did W7MR. KA7KRW passed her General test—congrats! Bob, W7GXX, got his DXCC—he said it only took 30 years! Way to go, Bob. All you traffic types, tnx and a job well done for your efforts during the holiday season. 73 de NA7G. Traffic: WA7KHE 153, N7JLC 112, N7ASY 93, WA7MEL 93, N7IUN 53, NS7K 35, NA7G 25, W7OCX 9.

WYOMING: SM, Jim Raisler, N7GVV—ASM: Steve Cochrane, WA7H. SEC: Jim Anderson, W7TVK. Getting lots of positive comments from contesters as they are finding it easier to work Wyoming. K7MM, Dan, reported he made clean sweep in Nov SS CW test and 74/75 sections during phone test. Novice classes are being held at Sheridan and Riverton Jr. Colleges, thanks to WA7B and K7MM. ARES activity is picking up in the state; thanks Jim, W7TVK, for those long hours. Traffic: NN7H 336. Nets: State ARES 4 ses./153 QNI, 6 local nets with 181 QNI, Cowboy, KC7AR reports 23/865 QNI/21 QTC, Pony Express, W7MZW reports 4 s./193 QNI/1 QTC. How's our packet system developing to here from you. I'm now on air with a mailbox, N7GVV-1. Digi through KE7NT. 73 till next month.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, WA4RNP—Thanks to all Section Appointees for doing a good job these last 4 years. Pls continue to be active amateurs. Thanks to the other League supporters who keep the "gears" oiled. Thanks to the nets and the "handlers" that keep the "mail" moving. The Brass Pounders League is a select group who have handled over 500 peices of traffic in a month, and I give special thanks to "Mister Traffic Man" WA4JDH, Winston Harris, of Elba, for having over 100 consecutive months as BPL. One Silent Key report: K4IPF, Jack Jones of Selma, AL. Traffic: CAND reports 1573 messages in 31 sessions with DRN5 rep 100% by WA4JDH, and W4CKS. DRN5 reports 1295 messages in 62 sessions with Alabama rep 90% by WA4JDH, W4CKS, NW4X, and W4IBU. RN5 reports 1204 messages passed in 62 sessions with Alabama rep 90% by WA4JDH, W4CKS, NW4X, and W4IBU. RN5 reports 1204 messages passed in 62 sessions with Alabama rep 100% by WX4I, W4CKS, W4QAT, WA4ZPZ, WA4JDH, N4RT, and W4PIM. AEND reports 56 messages passed in 30 sessions with other nets rep by WA4JDH, W4CKS, AA4YJ, and N4DCS. AENB reports 141 messages passed in 62 sessions with RN5 rep by WA4JDH, W4CKS, WX4I, N4RT, WA4ZPZ, K4VIZ, W4PIM and W4QAT. AENM reports 172 messges passed in 35 sessions. Brass Pounders League: WA4JDH. PSHR: WA4JDH, W4CKS W4PIM, and WA4RNP. Totals: WA4JDH 1611, W4PIM 352, W4CKS 270, WA4RNP 61, K4HJX 20, W4DGH 10, K4AOZ 9, KK4OZ 6 and WB4TVY 4. Let's make everything great in "88." Very 73, Joe.

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. Many tnx to Ace, NA4I, for the service rendered to Ga & to the hobby as Official Observer Coordinator. He resigned as of 31 Jan to travel the country in his new camper. I have appointed Harvey, W4TG, as the new OOC. If u desire an OO position, please contact him. I have one Silent Key to report this month and that's Mose Carter, W4FWP, of Pelham. Our sympathy to his family. Mar 26 & 27 are the dates for the annual Columbus Hamfest this year. Same place & the good old Southern hospitality. 1988 Kennehoochee officers are, Chariman: WB4WXC, VC: KB4QKX, Sec: K4JGK, Treas: KA4KRN. Asst S/T: N4OCM, Editor: N4XY. Colquitt County HRS voted in Pres: W1BPP, VP: K4HAV, S/T: AA4P. Now is the time for all of us to contact

our State Legislators for support of our Georgia Amateur Radio Tags. For further info, contact WB4UVW, the section SGL. If u desire repeater coordination in the section, contact Jim, N4JA, in Augusta. The ARC of Savannah elected WD4AFY as Pres, WD4FIH as VP, KJ4NE Sec, KB4GQA Treas & KK5M Trustee. As I am writing this, the state of Georgia is under the siege of a huge winter storm. The net is operating on 3975 as usual. We are prepared for just about anything in the section. At times, many hams crawl out of the woodwork when there is an emergency. Our tnx to all the organized groups & to those who help when it is needed. We invite all of u to the ARES net which meets on Sun at 1700 local time. For further info as to EC positions open in the section, please contact Jack, NC4E, the Section Emergency Coordinator. CU at the Columbus Hamfest at the end of this month. PSHR honorees for Dec are: WB4DVZ, WD4COL, WB4WQL, KA4HHE, WA4LLE, W4RWB, KF4FG, KB4JPN, W4HON, K4BAI & KI4IG. Traffic: WB4DVZ 187, WD4COL 159, WB4WQL 143, KA4HHE 90, WA4LLE 84, KF4FG 53, K4BAI 31, N4MWR 31, K4NM 29, W4HON 22, WB4ABE 22, W4NKO 21.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—TC: Ed, W8RAO. STM: Rip, AA4HT. SGL: John, KC4N. SEC: Rudy, WA4PUP. PIO: Petey, WA4POU. OOC: John, AB6I. BM: Dave, N4GMU. ASM: Bill, KB4LB. ACC: Giff, WD4RIQ. As this is written, "The New World of Amateur Radio" videotape has been seen twice by me. It tells a great story about our hobby and shows how wide the interest in it is. A copy is available from me, and others, so if your club hasn't seen it yet, please do so. It may not mean much to the members, but some of them will want to be involved with its use with schools, Boy/Girl Scouts, Church Groups, Civic Clubs, Neighborhood Organizations, City of Town Councils (when needed) to explain the wide areas of education and service that ham operators can and do perform. To have such spokesmen as Roy Neal, Barry Goldwater, Tony England and several school teachers who show that students are encouraged to do better in their studies after they see and try to understand the "New World of Amateur Radio." ARRL has copies for sale, too, so I highly recommend that your club join with many others to see and use this new tool to help our hobby grow. Does your club want to earn some money? Silly question, but if you recruit a new member for ARRL and use your 4-digit club identifier on the application form, you will receive a check from HQ for $5.00 for every new member! Last year, ARRL grew over 5700 members. So if your club has not been encouraging new members, now is the time to earn dollars for your club, and help keep the ball rolling! 73. Traffic: WD4IIO 2499, WX4H 918, WA4QXT 853, N4PL 849, AA4HT 836, WC4D 457, N4SS 344, AA4FG 304, N4DY 270, K4CY 214, KB4LB 197, WA4EYU 193, N4GMU 184, WB4GHU 182, KC4VK 183, AA4CC 181, N4JAQ 169, WD4IUI 162, KI4CQ 110, W4KIX 109, WB4TZR 108, W7YWF 107, N4ADI 100, NF4O 96, N4JHI 75, WD4EQB 73, WB1EKV 72, W4UEA 68, KA4YLH 62, KB4FIY 59, WA4SXW 59, KA4KAH 31, WD4FJY 27, N2AOX 24, KB4WPI 18, WA4STZ/N4UF 17, NG4P 17, K3NON 16, WA4PUP 16, N4COB 16, KI4NN 16, KJ4HS 13, NS4C 13, W8IM 13, KF4SP 10, KB4TQR 9, KF4TM 6, WB4JHI 6.

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 71 bulletins received and 146 send by AA4BN 22, W4DI 30, WA4EIC 75, WT4F 12, WD4KBW 27, K4IEK 15, and WA4RLV 36. Holiday traffic flowed very smoothly as a general rule this year. Cycle 3 of 4RN was of tremendous help—as was N4DY who came to QFN almost daily with a bucket full from cycle 3. It was gratifying to see the number of volunteers for 4RN cycle 4, both early and late sessions. There were so many that I hesitate to list for fear I might leave someone out—but thanks much! I never heard a request by a QFN NCS for a volunteer that didn't get a response —in fact you had to be pretty quick with the key to get recognized. WA9VND, a fairly new traffic handler, was of great help during this high volume traffic period, relaying hard to move traffic among the various nets. And THANKS to ALL of the many traffic handlers both cycles 2 and 4 who gave so willingly of their time and expertise to facilitate the flow of traffic! KA4FZI was presented with a certificate of merit by the Fort Meyer ARC for her work in organizing a school club and teaching a Novice class for both students and their parents. Good work, Miss Phill! Congrats to W1UY who has passed the certification exam and is now a member of the Amateur Auxiliary to the FCC's Field Operations Bureau. AA4CH, President of the Everglades ARC sent word that the special event held by W4SVI in the Everglades National Park resulted in 38 states, four countries and five Canadian provinces most on 20, 15, and 10 meters. It was the 40th anniversary of the dedication of the park. WA4EIC reports that John, KY0T, Sandra, N4OIN, and her fifteen-year old daughter Dawn are aboard the 29 foot sailing craft Rainbow. They are approaching Durbin, Africa, as this is written. Word from N4GHI via a QNC is that Australian traffic originating in the Eastern area will move via the Atlantic Region Net beginning January 1. KB4MON, WT4F and WA4QJY were active in message originations from a local nursing home. It is with great regret I inform you that Ed Hart, N4KB, is critically ill. W4LLA reports that he handled 79 phone patches during December. WD4KBW sent a report that the Hardee County ARES for the first time, provided communications for Wauchula's Christmas parade. It was the largest parade in the city's history. N9BQB, K3GML, WD4KBV, WD4KBW, N4KHR, W4MMU, KI4MW, KA4OKY and K4RNF worked very efficiently as though they had been doing this event for years. Remember the ARRL Information Net on 3940 kHz at 8 AM Saturday mornings. 73 de WA4PFK. Traffic: W3CUL 3319, W3VR 2165, WA9VND 1103, W4NFK 659, WA4PFK 611, K4IA 569, K4ZK 545, AA4BN 520, K4EUK 491, WD4KBW 439, K4SCL 409, WV5Z 365, WA4EIC 360, KA4FZI 322, W4RUE 219, WB4AID 218, WB4WYG 216, WA4RLV 206, KB4MON 196, KA4NXF 189, KB4KXV 156, WT4F 155, W4TAH 148, KA4YHS 144, W4ROA 132, WD4CHO 122, W1NJM 113, W4DL 106, N4ORZ 101, N4ET 99, KY8Y 95, WB4ZVD 93, KY4U 91, N4BU 77, WA4LGT 75, KI4ZW 69, WA4QJY 69, WA4NBE 69, KJ4WJ 67, N4MML 60, N1EGN 56, KA4AJR 56, KB4LPL 53, KF4RL 53, WD4NXK 52, W4VQE 51, AA4CH 48, KA4SIH 47, K5IHH 47, N4HAS 39, KB4FO 38, K4FQU 35, W3TLV 32, KB4UIA 32, KA9GYF 32, WD9AEP 31, N2COI 29, NK8O 25, W4MPV 23, W4UIO 21, WA4HDH 19, KA0RUL 19, N4QER 18, KB4UHC 18, WA4VWJ 18, W4LLA 16, KD4GR 16, W4WYR 14, KK4UR 12, KA9AKY 12, K9EHP 12, W4MFD 11, W3IJR 11, KF4JA 9, KB4TIU 9, AA4WJ 7, WA4PIL 7, W4DWN 7, N4PSV 6, KA4GDU 6, K4GVI 6, WB2NVJ 4, W4JM 3, WK4F 3, N4RHJ 2, KA2KNZ 2, AA4IF 1, N4ORX 1, W4NSY 1. (Nov.) KB4KXV 60, KY6V 18, NK8O 8, N4RHJ 2.

WEST INDIES: SM, Jose A. Purcell, Jr. KP4IG—SEC: KP4JV. PIO: NP4XM. TC: KP4ARY. BM: KP4EW. SGL: WP4CSG. NM: WINS, KP4DJ; NM: WINE, VP2VI. On February 1, we are going to run again the WINC at 145.350 MHz repeater. We invite you to support the net again. In December, the (FRA) had its Christmas party in the western part of the island, nice activity. On January 10, the Puerto Rico Amateur Radio Club

had its Christmas party in Arecibo with good activity, flea market, music, all. In this month, also, our WINS net manager was in hospital (KP4DJ). Our best recovery wishes to Willie. Please join ARES and NTS; we need you to help our country. See you next month. 73.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—NM's: K6LL, K7POF, WB7CAG. Current Section Leaders: ASM: Ray Bass, K7OMR. ACC: Bob Drake, N7ECE. STM: Bob Howe, W7EP. SEC: Ed Hughes, KX7P. TC: Bill Jorden, K7KI. OOC: John Moore, NJ7E; and SGL: Jim Bailey, KE7WD. Two positions, Bulletin Manager (BM) and Public Information Officer (PIO) remain open. Any volunteers out there who would like to join the team? Congrats. Mike is on one FB operator. Sun City ARC has changed their name to West Valley Amateur RC and Ray, NW7R is still editing the FB NL "Short Skip." Their new officers will be announced next month. Art, NN7A received license and call sign V31JZ for operation in Belize first week of January. Let's have a report on your operation there, Art. Membership statistics: 2,588 Arizona ARRL members as of Nov. '87. Approx one hundred increase over last year, and in line with over-all national incr. figures, percentage-wise. As W6CQK, a 50 year member said, "There have been many zealots and misguided crusaders during the past 50 years—they have come and gone. ARRL is still on course and at the helm." Thanks, Harold. The 1988 International DX Convention at Visalia, CA April 22-23-24 is this year sanctioned by the ARRL. Hope to see many of you AZ DX'ers there. KE7WD reports in from KH6-land while vacationing. Poor fella! He's missing the cold weather. "The NEW World of Amateur Radio" video cassette is now available on loan from your SM. Good for showing to prospective hams including Scout groups, schools, etc. It's VHS format and runs twenty-eight and one half minutes. Congrats to Mike NG7S for winning first place (150 watts or less) in the ARRL DX Test for the whole Southwest Div'n. FB. (Thanks, DX-TRA). KD7XO has completed contacts for the Golden Jubilee award. Congrats. Also, understand that Chris, NU7V has also made this one. SARC voted John, W7CPP as their Ham-of-the-Year. Thanks, ADAW. KB7NE reports that date for the South Mtn. Swapmeet hosted by ARA and sponsored by ARCA will be March 20. See you there, and in the meantime keep those cards and letters coming in.

NET	ABBREV	QNI	TFC	SESS
SOUTHWEST NET	SWN	230	244	31
ARIZON ACACTUS NET(HF)	ACN	839	101	31
ARIZONA CACTUS NET(VHF)	ACN	339	178	31
ARIZONA TFC & EMERG NET	ATEN	1138	418	31

Traffic: KA7MUL 881, W7AMM 588, KE7EO 318, K6LL 291, W7EP 255, K7JKM 170, N7ETP 170, W7KCM 169, WE7G 138, WB7CAG 110. W7OIF 101, W7GAQ 84, W7LVB 50, K7POF 49, W7KXE 18, (Nov.) KN7B 189.

LOS ANGELES: SM, Phineas J. Icenbice, Jr., W6BF—Our SURVEY on the 24 hrs/day, 7 days/wk, MCW code Beacon on two meters, was very interesting. The Amateurs voted 10 to 0 in favor of removing the QRM from the voice band. The only known person that used the Beacon was one 15 year old CBer. Most letters, cards and telephone calls recommended that the CW Beacon be moved to the CB band or into the CW portion of the two meter band if in fact there were any Amateurs that used the Beacon. At least most felt that the bandwidth occupied would be less on CW. Info from our Section Emergency Coordinator (SEC) AK6Y, Ron Boan, indicates that we are organized and ready for action with no major emergency operations in progress since the most recent earthquake. Our new OOC N6JSX, "Ruby" D. R. Kubichek is loaded with inputs from fellow hams about interference. Please put your interference reports in writing to your Section Manager and "Ruby" the LA Section OOC if you want action and a priority position. Please understand that we need your input data (date/time/frequency/signal strength/beam heading/ tapes & other special identification) in writing as soon as possible. Jamming and unlicensed operation can be eliminated if written reports are mailed to your local Section Manager. Your SM was the guest speaker at the San Gabriel Valley Radio Club on Jan 5, 1988. The hospitality was really wonderful and very much appreciated by yours truly W6BF. RFI problems were of great interest at the San Gabriel Valley Radio Club meeting in January. This was evidenced by the fact that my supply of AMIDON Associates eight page mini-catalogs evaporated instantaneously. Split beads and "bars" are also available from North Hollywood (818) 760 4429 in small quantities at reasonable prices. These are very easy to install on existing cables. Anyone having information on RFI problem solving items please send them - so that we can make the info available. The HILLTOP Amateur Mastertie System of Marina del Rey, Ca. published the following story on the ability to communicate. Dennis Dugger may just give us a new appreciation of this ability. Dennis emerged last January from a coma and could neither walk or talk. The only motion his paralyzed body permitted was the blinking of his eyes once for yes and twice for no. Watching this struggle, a clever hospital administrator by the name of Steve Shipley thought that there must be a better way for young Dennis to communicate more efficiently. The doctors assured everyone that Dennis had an active mind and if he could communicate more effectively, therapy aiding his recovery could move along smoothly and rapidly. So Steve took it upon himself to figure out new functions for the lights and bleeps that so often accompany hospital care. "Morse code was the answer," he said. "I knew he could learn that and communicate with his eyes." The next step was to teach Dennis Morse code. In two days, much to the surprise of everyone, Dennis had memorized the code chart. He now was able to communicate through the use of a small electronic box and an infrared light sensor capable of transmitting the blink of an eye into an electronic tone. The sensor was mounted to Dennis' glasses to measure the reflected light from his eyelid. — You may have guessed it. — They now needed HAM RADIO Operators to read the code. Dennis was going too fast for most to copy. STM News: We have finished the holiday traffic now and good work from eveyone. W9UCE came in on net a few days before Christmas with over 400 msg for HandiHams to California. This was a heavy impact on NCN and SCN. However, we cleared them all by Jan. 3. Great job done by the workhorses. WF6O, N6LHE, W6TH, W6INH, N6LUY, NR7E and some others. Thanks a lot for the help and Happy New Year to all. Hope band conditions improve. It would have been much better. Traffic: N6LHE 885, W6TH 654, W6INH 531, K6UYK 454, WB6VPY 99, K6YBV 79, W6NKE 45.

ORANGE: SM, Joe H. Brown, W6UBQ—This is my third year as SM of the ARRL Field Org. The SM is elected for two years. I wish to thank you for your support. Programs we have working are on NTS/PACKET. Thru the efforts of STM WF6O, ASM N6KZB and the WESTNET System, the integration of Packet and the NTS System in our Section has become a reality. (FCC AUX) W6RE, Alex setup a local interference committee structure, now under OOC Nick KA6GVY the training, utilization and activation should bear fruit. (PIO) Danny, N6NRI, needs a copy of all activity reports. If something is happening in your area, get the info to him. Remember old new is no news. Amateur Radio Club Affiliation, resource management and of course the ever widening requirements and responsibilities of public service is always on the agenda. Through involvement in ARES, RACES, Clubs, Training, recruiting and other organized activities, the many problems facing The Amateur Radio Service can be minimized. We need you! There are eleven Section level appointees to help you make Amateur Radio a better and more enjoyable service (hobby). Orange Co, ASM Ralph, WB6JBI, 505 Hilda Cir, Anaheim, CA 92806, 714-778-9272. Riv Co, ASM Bob W6LKN, 5127 Glen Haven Ave. Riverside, CA 92506 714-686-3823. San Berdino Co, ASM Tony WB6QHB, 125 Morgan Way, Upland CA 91786. Digi Comm, ASM Mike N6KZB, 3076 Panorama Rd, #B, Riverside, CA 92506, 714-682-6212, W 714-787-2411. ACC Sandy WA6WZN, 962 Cheyenne, Costa Mesa, CA 92626, 714-549-8516. OOC (FCC AUX) Nicolas KA6GVY, 15421 Vassar St. Westminster, CA 92683. 714-897-9424 W 714-213-822-3061 ext 209. TC (RFI INFO) John KD7XG, 2194 Conejo St. Corona, CA 9172-401. 714-737-8949. STM Dan Farrell, WF6O, 534 North Whittier St. Anaheim, CA 92806 714-778-8496. BM Brooks, K6GGS, 128 South Center, Redlands, CA. 92373. 714-792-1630, 794-9316. SEC Ken Walston WA6ZEF, 1248 North Cypress, Ontario, CA 91762 714-983-1272. PIO Danny Anderson N6NRI, 17120 Ceres Ave. Fontana, CA 92335. 714-350-1646. The Amateur Service has done a fantastic job supporting public activities, more important it has proved its value in emergencies to the Public, Public Service and Public Safety Officials. Training and organization is dependent on your support of ARES/RACES activities. You are needed! Contact Section Leaders and offer your support. The ARES Amateur Radio Emergency Service headed by the SEC is organized through each of the Counties by the DEC's as listed: Inyo Co, Michael France, KA6HII, 1430 Rocking W Dr. Bishop, CA 93514 619-872-2441. Riverside Co, Lee Brown, N6HGT, 5250 Tower Rd, Riverside, CA 92506 714-684-6720. Orange Co, H B Corcorran, N6HOI 3113 South Rene Dr. Santa Ana, CA 92704 714-557-6230. San Bernardino Co, Perry Westrope, WA6LLB, 9857 Mills Ave. Montclair, CA 91763 714-626-6990. By working with clubs, organized groups and the Orange Section Leadership, we hope to develop a more aggressive, visible and effective Amateur Radio presence in every community. Mr. Kowalski's parting gesture was to place frequency Coordination in the hands of the Amateur Community. People smell the roses. We must do our own laundry or we will have nothing to wear or use.

SAN DIEGO: SM, Arthur R. Smith, W6INI—TC: N6JZE. STM: N6GW. SEC: W6INI. Upgrades: N6PPW, N6QMI to Advanced: KB6QOF to Gen; KB6SAE to Tech. AA6EE is also XE2GCK and worked World-wide Contest (CW) from Baja Calif. Club officers for 1988: Palomar ARC, Pres W9FQN, VP N6CKH, Sec KB6NMK, Treas WI6B; North Shores ARC, Pres N6JZE, VP WB6BDY, Sec KB9DD, Treas KA6UCD; ARC of El Cajon, Pres WV6K, VP WS6F, Sec N6KHO, Treas KB6PJH. Palomar ARC meets at 1930 first Wed at Lincoln Middle School, cor Escondido Av & East Vista Way. North Shores ARC meets first Tue, 1930, at So Clairemont RecCen, 3605 Clairemont Dr. ARC of El Cajon meets second Thur, 1930, at Parkway Jr Hi, 9009 Park Plaza Dr (off Dallas), La Mesa. N6CQW is now editor of the Counterpoise. ARES has breakfast & meeting on second Sat at Normal Heights United Meth Ch, 4650 Mansfield, off Adams Av. Breakfast 0800-0845, meeting 0900. Everyone welcome. W6KSI built a solid-state regen rcvr. KB6GHT delivered a ham message by flashing light. A first? NCTN met 30 times, handled 198 msgs, 446 ck-ins. ARES CW 4 sessions, 10 ck-ins. Traffic: N4KRA 221, KI6ZH 128, N6GW 29.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—ASM/Ventura: N6MA. ASM/Sbar: WB6BYU. ACC: KB5AH. BM: KI6XG. STM: N6WP. PIO: N6FOU. TC: W6KFV. SEC: WB6IIY. DEC/Ventura: WB6RVA. DEC/Sbar: N6AJA. DEC/SLO: WB6IIY. The month started off on a tragic note with the tragic December tenth crash of PSA 1771 at the north end of the section, near Paso Robles. Area hams assisted in both ARES and Search and Rescue roles. San Luis Obispo County ARES went on alert immediately and Santa Maria (North Santa Barbara County) stood by to provide backup if needed. W6MSG was first to respond to the disaster, and was on site within 30 minutes after the call went out. K6KAX manned the Salvation Army canteen as net control throughout the week, while Red Cross net control was ably handled by W7AZF (Monday and Thursday). WB6IIY (SEC) (Wednesday through Friday), KH6HFN (Tuesday morning through Friday evening). Other hams working communications in the field were K6BWJ (EC), N6BUY (EC), N6LZD, KA6VNV, W6ZEK and KF6LI. San Luis Obispo County Sheriff's Search and Rescue and Sheriff's Aero Squadron included N6BXK, N6BRR, N6OCR (AEC), N6MZX, K6KZO and WA6KDH. Lompoc (Santa Barbara County Sheriff's) Search and Rescue team captain, WB6BYU (ASM) and team member N6MCW assisted in the field as well. Finally, KI6XG (EC) and N6LFJ (EC) stood by during the whole week to provide backup communications and handle H&W traffic as needed, and KB6KZL organized the potentially critical first night backup in Santa Maria. With that perhaps the major winds which hit the area at mid month seemed very minor indeed, even though several ham antennas bit the dust. Your SM was lucky that he lost only one "leg" of an 80/160 folded unipole. (Got the tower cranked down in time.) Winds recorded in Santa Maria were near 60 mph. - Conejo Valley, Paso Robles and Lompoc ARCs celebrated the holidays with parties and dinners, often incorporating the installation of officers into the festivities. The Sulphur Mtn Repeater Assoc. and the Poinsetta and Satellite ARCs will hold their installation banquets in January. Congratulations to all the new club officers - here's wishing you success in 1988. Let's all work together to make this a banner year for ham radio in SBAR Section. 73 for now.

WEST GULF DIVISION

NORTH TEXAS: SM, Phil Clements, K5PC—Asst.SM: K5MXQ. SEC: W5GPO. STM: W5VMP. ACC: W5URI. TC: W5LNL. PIO: K5HGL. BM: W5QXK. OOC: WB5JBP. SGL: N1CWP. Welcome aboard to our new State Government Liaison for our Section. He is Kenneth Johnson, N1CWP, of Ft. Worth. He will be keeping a watchful eye on the happenings down in Austin re legislation in interest to our hobby. Kenneth did graduate work in political science, and has hands-on experience in this field. We are most fortunate to have his expertise. The new Emergency Coordinator for Upshur Co. is Jo Ann Keith, KA5AZK. She is active daily on the tfc circuits, and editor of the Longview East Texas ARC newsletter. The Temple ARC presented its "Ham of the Year" award to Hal Pagel, N5JLL. WM5V, EC of Rusk Co., sent a fine report on activities during the East Texas tornado outbreak on Nov. 11th. Lots of SKYWARN schools are scheduled in all parts of our Section. Let's get retrained and ready for the upcoming tornado season. Congrats to N5BT, W5TNT, and K5UPN for making Brass Pounders League For December. (tfc count

(continued on page 120)

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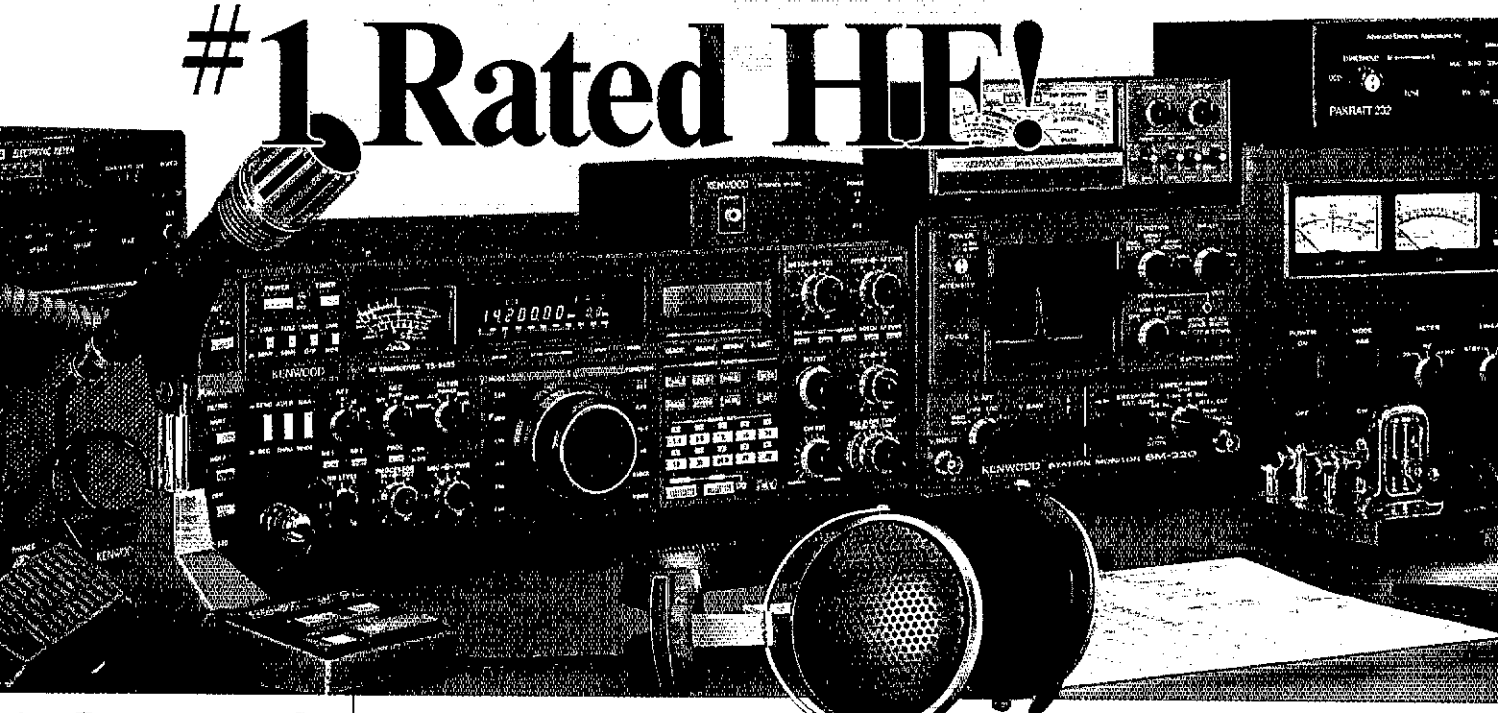
#1 Rated HF!

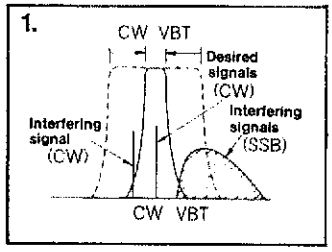


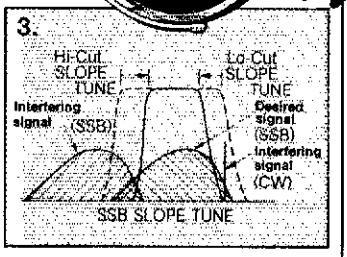
TS-940S

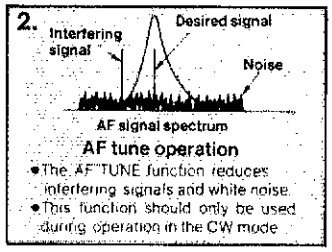
Competition class HF transceiver

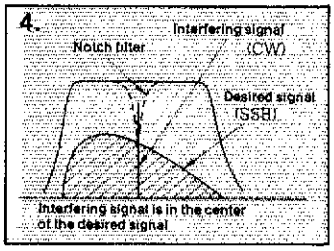
TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance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

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









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

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

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

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

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

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

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

KENWOOD

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Passband Tuning and IF Shifting: A Basic Comparison

Your continuing requests for basic explanations of Passband Tuning and IF Shifting along with illustrated comparisons of those two techniques inspired this Tech Talk's discussion. We will consider their designs, similarities and differences, and their relations to overall IF passband response. The resultant insight will prove beneficial for initially selecting a transceiver to fit your lifestyle and for using its features to maximum advantage.

Tailoring a transceiver's response to receive desired signals with minimum interference involves varying the frequency relations between a unit's crystal filters and their supporting frequency converters (or "heterodyne mixers," as they were called before "high tech" terminology). This particular section of a transceiver is designated as the Passband Tuning or IF Shift section. It is electrically located between the first IF and detector stages, and typically consists of a steep skirted 455KHz and/or 9MHz crystal filter preceded and/or followed by a frequency converter/mixer stage (specific designs vary between transceivers).

The more sophisticated circuitry reflects Passband Tuning while basic/less expensive designs symbolize IF Shifting. A conversion oscillator generates an injection signal that is directed to the previously mentioned mixer(s). Its frequency can be changed ever-so-slightly by a front panel control to tune/shift the mixer(s) center frequency with respect to its related filter's fixed passband, thus reducing adjacent channel interference.

Herein lies an important difference in circuit designs and operation. **IF Shifting simultaneously moves mixer response in the same direction while maintaining a constant overall bandwidth. Passband Tuning, however, simultaneously moves response curves in opposite directions and varies in overall bandwidth to fit desired operating requirements.** It's a multipurpose delight!

A convenient way to analogize all this technical jargon is illustrated in Figure 1 (IF Shift) and Figure 2 (Passband Tuning). Solid and dotted lines symbolize response curves on the input and output sides of IF Shifting and Passband Tuning networks. If we imagine our eyes are subsequent receiver stages looking directly through overlapping areas of both curves like they are two separately sliding windows, we can "see" a transceiver's overall passband response. That is, what will ultimately be output at the speaker.

Each figure's "A" sketch exemplifies a center-tuned condition with a desired signal "D" in the (overall) passband center. An interfering signal slightly higher in frequency (Ih) is also in the passband. Another lower frequency and potentially interfering signal (Il) is outside the passband.

Figures 1"B" and "C" illustrate how IF Shifting handles this situation. Since both response curves "track together," moving the IF Shift control lower in frequency (1B) eliminates Ih but "picks up" Il. Conversely, moving the IF Shift slightly higher in frequency (1C) merely escalates interference Ih: a "no improvement situation."

Figure 2A illustrates a center-tuned Passband Tuning system with the same/previously described interference situation. Moving the Passband Tuning control lower in frequency (2B) separates the two response curves from their center-overlapping positions. Interference Ih is eliminated, plus the narrowed bandwidth (W) prevents reception of Il.

Likewise, moving the Passband Tuning slightly higher in frequency (2C) emphasizes the desired signal's higher pitched tones while also attenuating Ih and Il. When operating RTTY of PACKET, incidentally, peaking slightly higher pitched tones proves quite beneficial. Assuming the transceiver's RIT is used to retune the desired signal without changing the transmit frequency, efficient reception under crowded band conditions is achieved. . .even if the T.U. is "basic design"!

Comparing further, IF Shift's fixed overall bandwidth (W) exhibits full bodied SSB audio regardless of its tuned position. If a particular signal does not fill a passband, vacant areas allow band noises to proceed through filters and become amplified. This situation places additional demands on Noise Blanker and AGC stages. Optional narrowband filters (especially CW filters) are obviously vital for realizing maximum performance in IF Shift systems. If you enjoy casual SSB operations on relatively quiet bands (weekdays), IF Shifting is nice and pleasant.

Passband Tuning provides greater flexibility, however, and it's the popular choice among amateurs operating several modes and/or DX'ing on a limited budget. When center-tuned, it exhibits full bodied SSB audio like IF Shift. When adjusted higher or lower in frequency, its narrowed overall bandwidth emphasizes a desired signal's high or low tones while minimizing interference and assuring maximum Noise Blanker and AGC performance. Adding optional filters is simply a deluxe final touch!

Now the good news: all advanced design ICOM transceivers include Passband Tuning and steep-skirted crystal filters! ICOM's superb IC-761 and IC-781 also include **both** Passband Tuning and IF Shift with front panel selection for casual or serious operating as desired! The phenomenal IC-781 also includes twin Passband Tuning with separate controls for second and third IF stages: it is totally incomparable!

Whether your passband is wide or narrow, there is only one word for top-line performance: ICOM. . .Simply The Best!

Note: "W" is Passband Width.

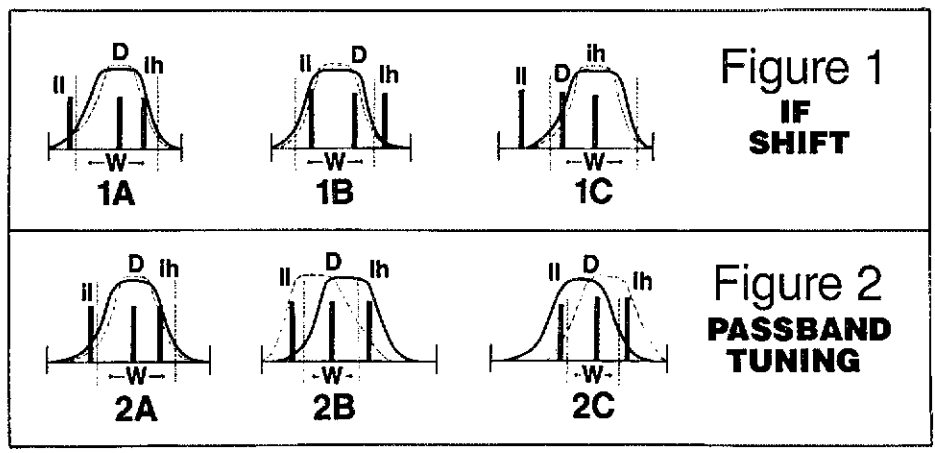


Figure 1
IF SHIFT

Figure 2
PASSBAND TUNING

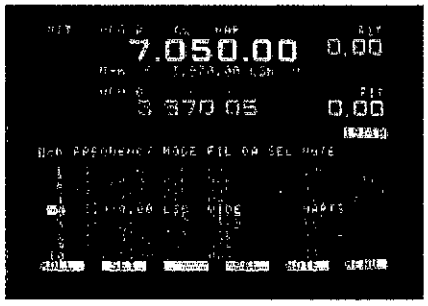
ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline (206) 454-76**
3150 Premier Drive, Suite 126, Irving, TX 75063 / 1777 Phoenix Parkway, Suite 201, Atlanta, GA 303
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canad

ICOM IC-781

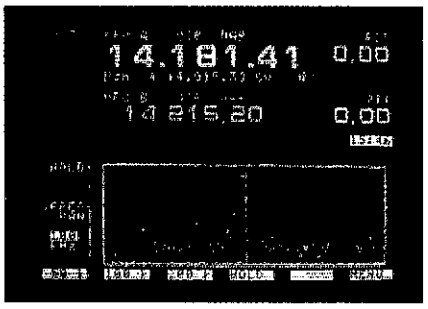
THE FUTURE OF AMATEUR COMMUNICATIONS

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.

ICOM

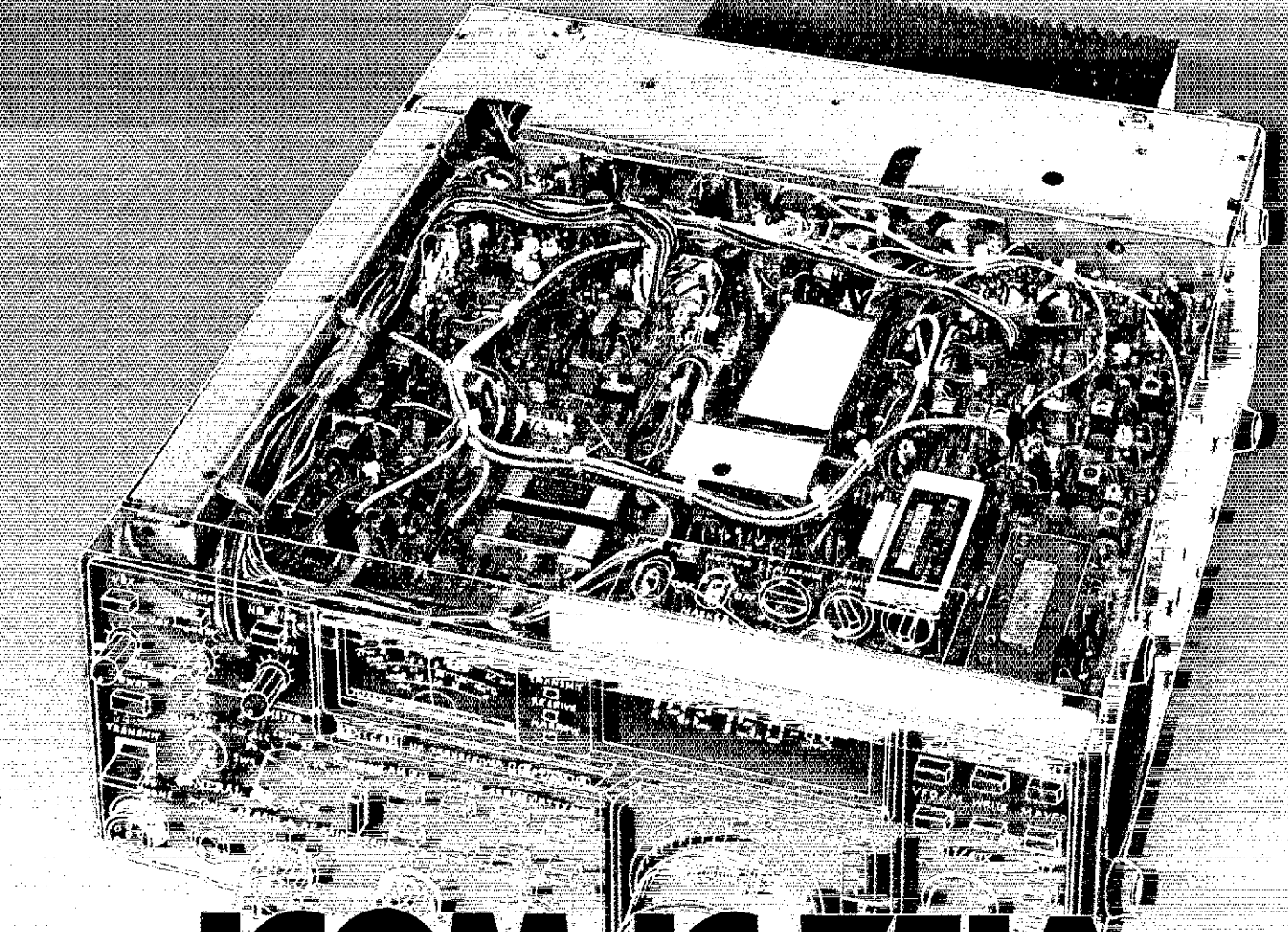
First in Communications

500+) 75 mtr Interstate SSB Net for Dec. QNI:1607 QTC:242 in 31 ssns. Northeast Texas Tfc. & Emer. Net for Dec. QNI:55 QTC:26 in 9 ssns. Cent. Gulf Coast Hurricane Net for Dec. QNI:3,886 QTC:242 in 31 ssns. 7290 Tfc. Net for Dec. QNI:3087 QTC:1324 in 50 ssns. PSHR for Dec. KB5CKQ W5YQZ KF5BL W5VMP K5UPN WZ5N KA5ZWY and K5MXQ. Traffic: W5TNT 664, N5BT 560, K5UPN 552, KD5RC 348, W9OYL 324, K5MXQ 318, AJ5K 308, W5YQZ 284, WZ5N 253, KA5AZK 257, W5VMP 252, N5GFV 231, KF5DL 215, KA5ZWY 141, KB5DOE 66, KB5CKQ 54, WA5EZT 50, KC5NG 39.

OKLAHOMA: SM, William Goswick, K5WG—Congratulations to William Delbrel, W5VGU, on achieving Official Observer/ Amateur Auxiliary certification. The section still needs additional knowledgeable, technically oriented amateurs willing to serve as Official Observers in the Amateur Auxiliary. Anyone interested in this important program please contact me. Hamfest season just around the corner. All sponsors of hamfests or other amateur radio events please forward details to me. If you would like to have ARRL participation at your event, let me know. Clubs should contact Ernie Buck, WB5CDW, for help with affiliation, Special Service Club status, activities, and programs. All field appointees are reminded to report your activity to your leadership official periodically. Failure to report will jeopardize your active status. Congratulations to Carl Drumeller, W5JJ, who is beginning his 56th year as a licensed amateur. All affiliated clubs should have received their annual report forms by now. Please complete and return it as soon as possible. Traffic: WB5SRX 539, N5IKN 146, W5RB 128, W5AS 124, WA5OUV 107, KV5X 81, N5FEM 66, K5GBN 66, WA5ZOO 43, W5VOR 30, W5VLW 28, K5CAY 21. BPL: WB5SRX. PSHR: WB5SRX, KV5X, W5AS.

SOUTH TEXAS: SM, Art Ross, W5KR—ASM: N5TC. STM: K5QEW. SEC: K5DG. PIO: WA5UZB. ACC: WB5YDD. OOC: WA2VJL. TC: NZ5U. BM: K5CVD. SGL: K5KJN. OOC WA2VJL reports San Benito ARC received good press for help with annual Christmas parade; 110 hospitalized children were later given an opportunity to talk with Santa via Amateur Radio; Fred also reports Valleywide Traffic Net (7:15 PM, 147.99/39) going strong. RN5 Cycle 4 NM W5TNT reports 697 messages passed in December; STX represented 100% by W5CTZ, N5TC, WD5GKH, W5TFB, K5GM. PIA NZ5J, Seguin, reports K5TJA represented RACES at an emergency operations planning session with Guadalupe County Emergency Management officials; also says he had a personal high 38 pieces of traffic passed in December. DRN5 NM WB5YDD reports 1295 messages passed in 62 December sessions; STX represented 100% by W5CTZ, N5DFO, KD5KQ, K5QEW, W5SHN, NX5V, KB5AQV, K5GDX, WB5HZQ, KE5ZV, WA5ZJY, WB5YDD. PIA N5FIX, Northwest ARS (Houston), reports 3rd Novice class scheduled for January; NARS and other Houston Hams ready for the Houston Marathon with packet, 2-meter, 220 and 440 MHz coverage; NARS officers for 1988: KA5VIZ, president; N5FD, vice-president; KB5DFZ, secretary; KB5DGD, treasurer; KB5SB, director-at-large. D-CAT (Disaster Communications Action Team), Houston, had a ball with a "winter Field Day" during the ARRL 10-meter contest; 11 operators took part, using 100% emergency equipment. CAND ANM WB5YDD reports 1573 messages in 31 December sessions; RN5 represented 100%; STX stations helping: KE5ZV, KD5KQ, W5SHN, N5DFO, NX5V, W5KLV, WA5ZJY, K5QEW, WB5YDD. TEX (Texas CW Net) NM WD5GKH reports total check-ins up for 1987 (that's good) and total traffic down (not good) because of no big disasters (THAT'S GREAT!). Traffic: WB5YDD 666, W5SHN 588, WB5J 576, NZ5U 566, WD5GKH 553, W5CTZ 445, W5TFB 387, WR5O 280, WA2VJL 223, WA5UZB 208, AC5Z 183, NV5L 74, NZ5J 38, W5BGE 38, KB5EKS 23.

WEST TEXAS: SM, A. Milly Wise, W5OVH—The first WEST TEXAS SECTION Manager's Net was held on Jan. 7 at 0100 UTC with SM W6OVH as NCS. Check ins were SM Section Appointees WD5EFJ, WF5E, N5DO, W7MVJ, KE5ZW, AE5I. Others were WA5ORE, K5JEZ, WB5VIH, W5MVC, KE5FE, KB5SM, WA5YSZ, N5INC, N5FHR, KG5HU. The next WTxSM Net will be Feb. 4 at 0100 UTC on 3933 MHz. Midland ARC will hold their St. Patricks Day Hamfest on Mar. 19 and 20. San Angelo hams helped with communications at Christmas at Ft. Concho with 35 hams participating. Lubbock hams have a new 10-meter net on Wed. at 2100, on 28.454. The EPARC had troubles with their parking lot. Members banded together and were able to prepare the lot for paving. EPARC Novice classes started Jan 16th. K5CU and KB5CV are instructors. The Prairie Dog ARC of Childress have their Comm Van equipped to run HF, 2 meters, lo band UHF and CB and stove, refrig, and bunk. Northwest Texas ARC of Borger held VE tests Dec 20. Snyder ARC participated in Disaster Drill Dec. 15. They now have an active RACES group. PIO Paul, KE5ZW, asks all West Texas clubs to send him their newsletters. Big Spring ARC gained 6 new Novices. ASM Raford Dunagan sent a sample of their Ham Calendar for the year. 73, SM, Milly, W5OVH. Activity report: 7290 Traffic Net, 50 sessions, 1234 msg, AE5I total 232, N5KUC total 14, Texas CW net 583 msgs in 62 sessions; DRN5 1295 msgs in 62 sessions; Texas Traffic net 309 msgs in 31 sessions; KE5VH, total 8, W5OVH total 5.



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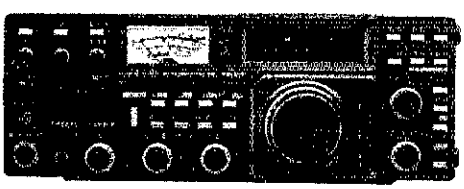

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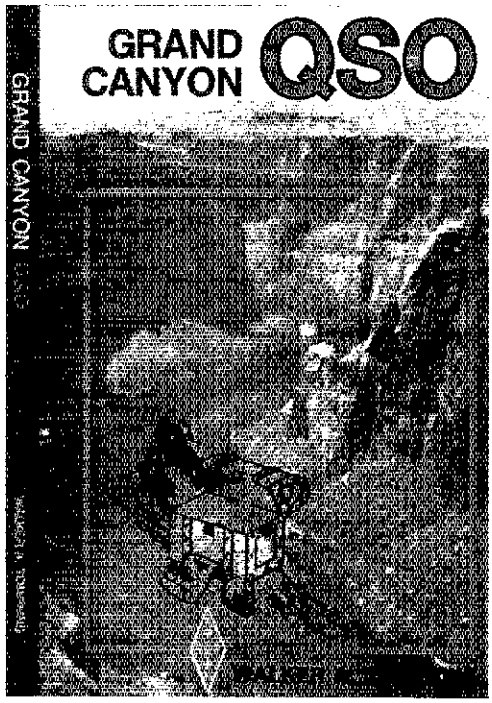

By Walker Tompkins, K6ATX

You'd think that Tommy Rockford would take a break after all that happened to him in *Death Valley QTH*. Not so! This daring young amateur radio operator and his over-the-air friend, Dr. Antonio Bonilla, EA7BK are on the trail of Aztec Gold hidden somewhere in the Grand Canyon near Lake Mead. The hams have clues to the location of the treasure, but they are being followed by the notorious museum bandit, Duke Hollister, who has sworn vengeance against Dr. Bonilla. Can amateur radio save the day against Hollister and his heavily armed compatriots? Will Tommy find the hidden treasure? To find out, pickup a copy of *Grand Canyon QSO* today!

Walker Tompkins bases his Tommy Rockford adventures in areas familiar to the author. This latest book was inspired by runs down the rapids of the Colorado River by K6ATX. (For more information about the author see May, 1986 **QST** page 60.) *Grand Canyon QSO* like the four adventures that preceded it (*SOS at Midnight, DX Brings Danger, CQ Ghost Ship,* and *Death Valley QTH*) is $5.00. All five adventures are available for $20.00. Please include $2.50 ($3.50 for UPS) for shipping and handling.

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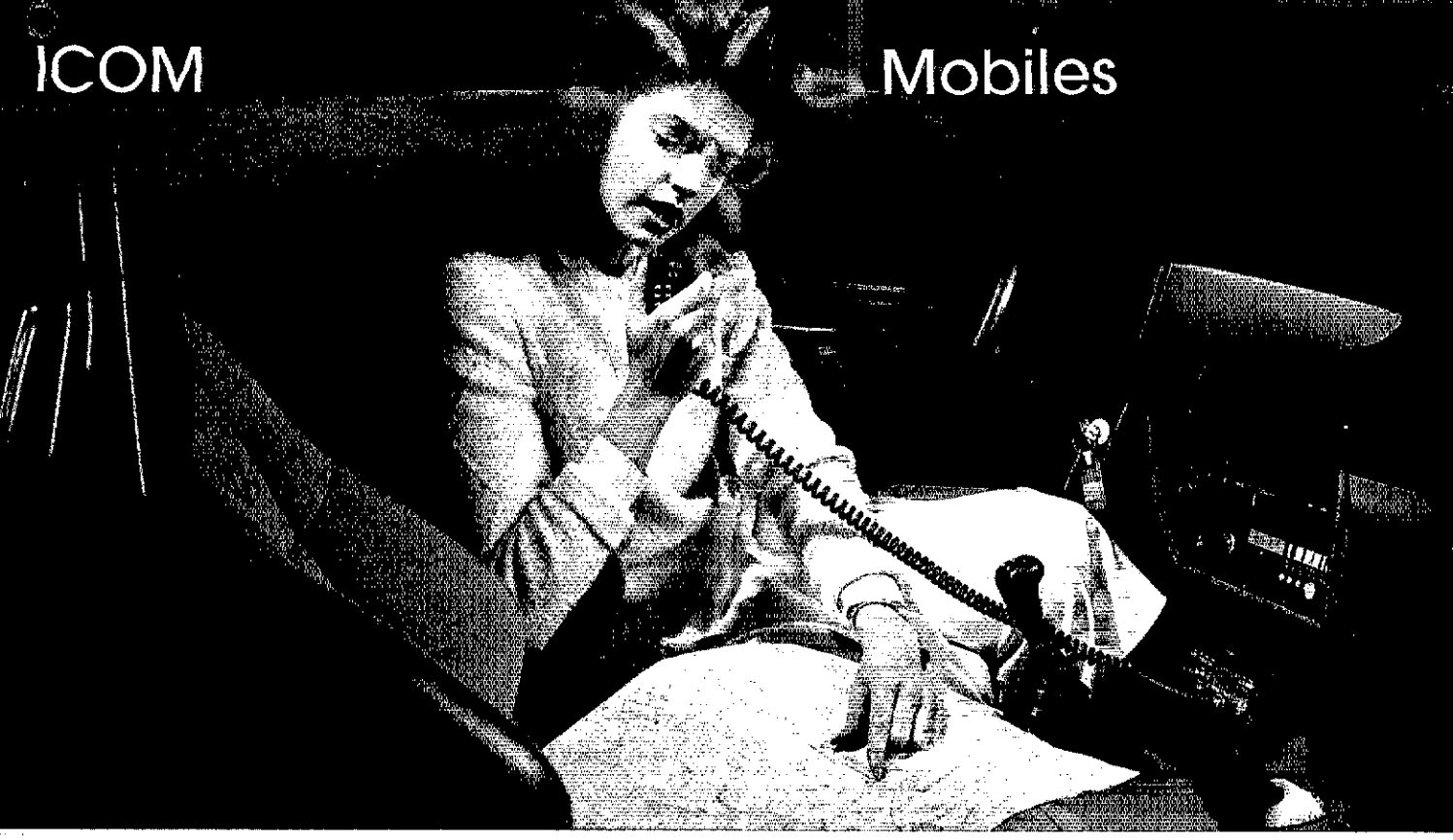

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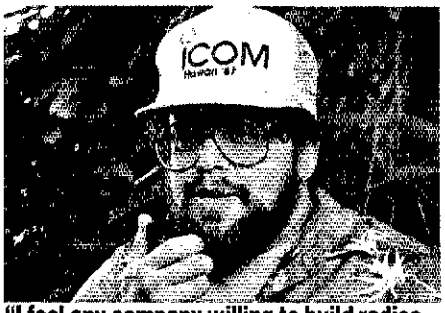

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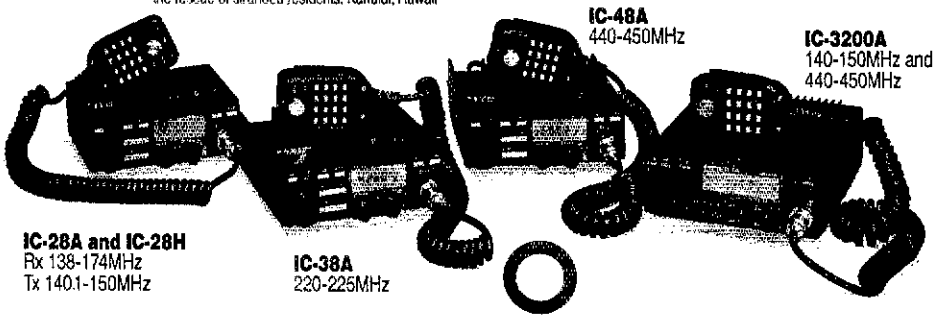

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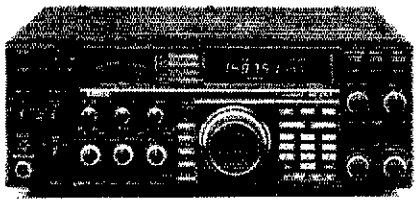
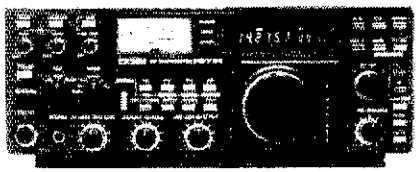
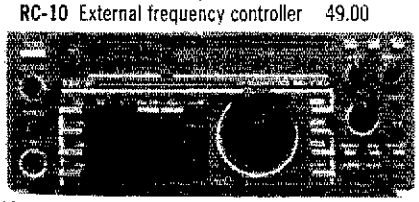


HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	2149
HM-36 Scanning hand microphone	47.00	
SP-20 Ext. speaker w/audio filter	149.00	139.95
FL-101 250 Hz 1st IF CW filter	73.50	
FL-53A 250 Hz 2nd IF CW filter	115.00	109.95
FL-102 6 kHz AM filter	59.00	
EX-310 Voice synthesizer	59.00	



IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	1449
PS-35 Internal power supply	219.00	199.95
FL-32A 500 Hz CW filter (1st IF)	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)	115.00	109.95
FL-33 AM filter	49.00	
FL-70 2.8 kHz wide SSB filter	59.00	
RC-10 External frequency controller	49.00	



IC-735 HF transceiver/SW rcvr/mic	999.00	869.95
PS-55 External power supply	219.00	199.95
AT-150 Automatic antenna tuner	445.00	389.95
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	319.00	289.95
MB Mobile mount, 735/751A/761A	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal for 751A	79.00	
PP-1 Speaker/patch	179.00	164.95
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	139.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip	659.00	589.95
AH-2A Antenna tuner system, only	519.00	449.95
GC-5 World clock	91.95	89.95

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1235.00	1079
IC-275H 100W 2m FM/SSB/CW	1389.00	1229
IC-375A 25W 220 FM/SSB/CW	1399.00	1249
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1249

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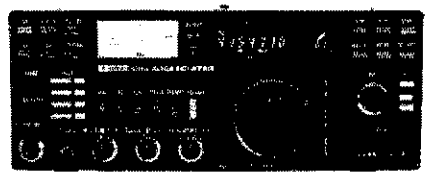
IC-475H 75W 440 FM/SSB/CW	1599.00	1429
IC-575A 25W 6/10m xcvr w/ps	1399.00	1249



IC-471A* 25W 430-450 CLOSEOUT	979.00	749.95
PS-25 Internal power supply	125.00	114.95
AG-1* Mast mounted preamplifier	99.50	
IC-471H* 75W 430-450 CLOSEOUT	1399.00	989.95
PS-35 Internal power supply	219.00	199.95
AG-35* Mast mounted preamplifier	99.75	

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Accessories common to 271A/H and 471A/H	
SM-6 Desk microphone	47.95
EX-310 Voice synthesizer	59.00
TS-32 CommSpec encode/decoder	59.95
UT-15 Encoder/decoder interface	33.95
UT-15S UT-15S w/TS-32 installed	96.00

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM CLOSEOUT	639.00	549.95
IC-490A 10W 430-440 CLOSEOUT	699.00	399.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	379.95
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399.95
IC-37A Compact 25W 220 FM, TTP mic	499.00	439.95
IC-47A Compact 25W 440 FM, TTP mic	549.00	489.95
PS-45 Compact 8A power supply	145.00	134.95
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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	
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UT-29 Tone squelch decoder	46.00	
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UX-59A 6m 10W unit	339.00	309.95
IC-3200A 25W 2m/440 FM w/TTP	649.00	579.95
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AG-1200 Mast mounted preamplifier	105.00	
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RP-1210 1.2GHz 10W 99 ch FM xcvr	1529.00	1349
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IC-3AT 220 MHz, TTP	349.00	299.95
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IC-03AT for 220 MHz	449.00	389.95
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IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	473.00	419.95
A-2 5W PEP synth. aircraft HT	499.00	449.95
A-20 Synth. aircraft HT w/VOR	599.00	529.95

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
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CA-5 5/8-wave telescoping 2m antenna	19.95
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CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.50
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ML-1 2m 2.3w in/10w out amplifier	SALE 99.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	$979.00	849.95
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
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EX-310 Voice synthesizer	59.00	
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SATURDAY
March 5, 1988
9:00am til 5:00pm

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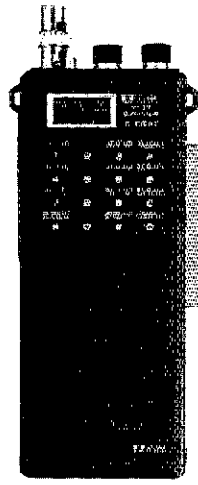

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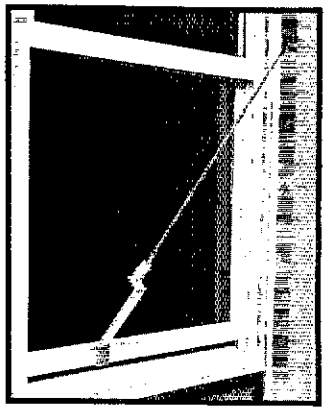

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AP-10

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MRF240	16.00	MRF641	18.00
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MRF422	36.00	SD1405	15.00
MRF454	14.00	SD1477	28.00
MRF455	12.00	SRF2072	12.75
MRF458	18.00		

Tubes

Part #	Price	Part #	Price
3-500Z (Eimac)	120.00	6LQ6	10.91
		6LF6	10.91
3-500Z (Amperex)	95.00	6MJ6	11.27
		811A	16.00
4CX250B (National)	75.00	8072	150.00
		8122	150.00
4CX250B (Eimac)	90.00	8643	120.00
		8874	340.00
572B	85.00	8877	814.00
5894	65.00	8908	18.00
6146B	13.00	8950	14.95
6550A	12.50	M2057	18.00

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IC-735 HF transceiver

K7SS

'MOST RELIABLE HF'

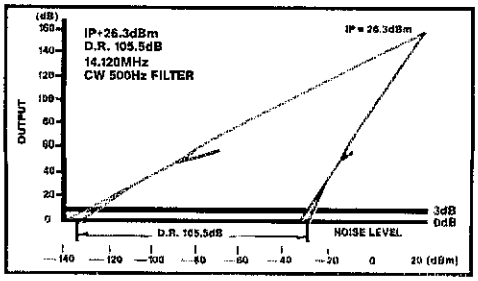
"Of all the possible radios, I chose the ICOM IC-735 for my CQWW QRP world record attempt."

Danny Eskenazi, K7SS, World High QRP Score
-1987 CQWW SSB (PJ2FR)*
-1986 CQWPX SSB (K7SS/WH6)
-1986 ARRL DX PHONE & CW (K7SS/KH6)

ICOM's IC-735 is the world's most popular HF transceiver. With the highest performance, smallest size, and best customer satisfaction of any HF transceiver, the IC-735 is the winner's choice for fixed, portable, or mobile operations.

- **Field Proven 100W Transmitter** with 100% duty cycle. Proudly backed with ICOM's full one-year warranty.
- **105dB Dynamic Range Receiver** includes passband tuning, IF notch, adjustable noise blanker, and semi or full CW QSK.
- **Conveniently Designed.** Measures only 3.7"H by 9.5"W by 9"D.

- **Optional AH-2 Automatic Tuning Mobile Antenna System** covers 3.5MHz-30MHz and tracks with the IC-735's tuned frequencies.
- **All HF Amateur Bands and Modes** plus general coverage reception from 100KHz-30MHz.



- **12 Tunable Memories** operate and reprogram like 12 separate VFO's. Supreme flexibility!

Additional Options: SM-10 graphic equalized mic. PS-55 AC power supply, AT-150 automatic antenna tuner for base operation.

ICOM's IC-735... a proven winner for reliable worldwide HF communications. See it today at your local ICOM dealer.

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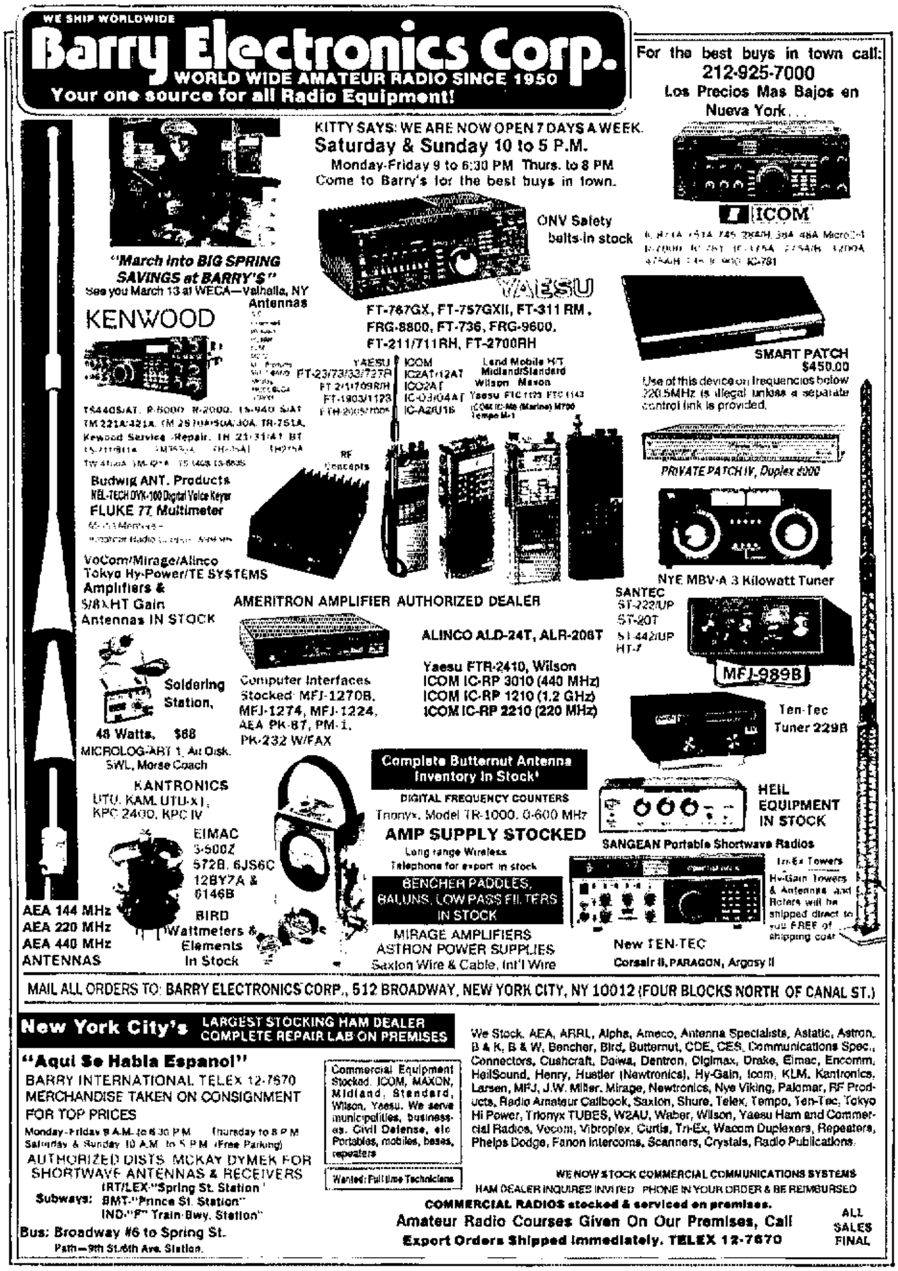
*Final contest results pending.



ETO/QRO

CHANGES FOR THE BETTER

ETO designs and introduces a new ALPHA only when we can make it significantly better than an existing model. Here are some not-so-obvious reasons for a few of the changes that distinguish the new ALPHA 86 AND ALPHA 87.

WHY NO METERS?

Conventional mechanical meters are susceptible to physical damage. With rapidly changing signals, indications are ambiguous. Multiple scales can easily be misinterpreted.

Now that power rules are stated in terms of peak output, electronic bargraphs have several advantages:

- Instant response, providing much better functional accuracy.
- Excellent readability yielded by bright, color keyed LED's.
- Virtual indestructibility.

DIODES FOR T/R SWITCHING?

Everyone knows that conventional antenna relays are noisy and too slow for break-in, fast VOX, or AMTOR. Vacuum relays are fast and quiet enough, but they wear out and must be replaced after a few million operations . . . typically several years' serious use.

A well designed PIN diode switch is even faster, silent, and normally should never need replacement.

3CX800A7 TUBES

We've used Eimac's excellent 8874 (3CX400A7) triodes for 14 years. The larger and newer 3CX800A7 is widely used in military equipment. Two deliver 1.5 kW continuous output easily and at lower cost than three 8874's.

73,

Dick Ehrhorn,
W4ETO

CAREER OPPORTUNITIES

ETO has opportunities for RF power design engineers and technicians. Please send your resume to Steve Christensen.

ALL BAND DIPOLE TRAP ANTENNAS!

PRETUNED - ASSEMBLED ONLY ONE NEAT SMALL ANTENNA FOR ALL BANDS! EXCELLENT FOR APARTMENTS! IMPROVED DESIGN!

FOR ALL MAKES AMATEUR TRANSCEIVERS! GUARANTEED FOR 2000 WATTS SSB INPUT FOR NOVICE AND ALL CLASS AMATEURS! CW-AM-FM

COMPLETE with 90 ft. RG58U-52 ohm feedline, and PL259 connector, insulators, 30 ft. 300 lb. test dacron end supports, center connector with built in lightning arrester and static discharge, sealed, weatherproof, traps - 1"X5" wt 3 oz. Low SWR over all bands - Tuners usually NOT NEEDED! Can be used as inverted V's - slopers - in attics, on building tops or narrow lots. WORKS ON NEW WARC BANDS! The ONLY ANTENNA YOU WILL EVER NEED FOR ALL BANDS! NO BALUNS NEEDED!

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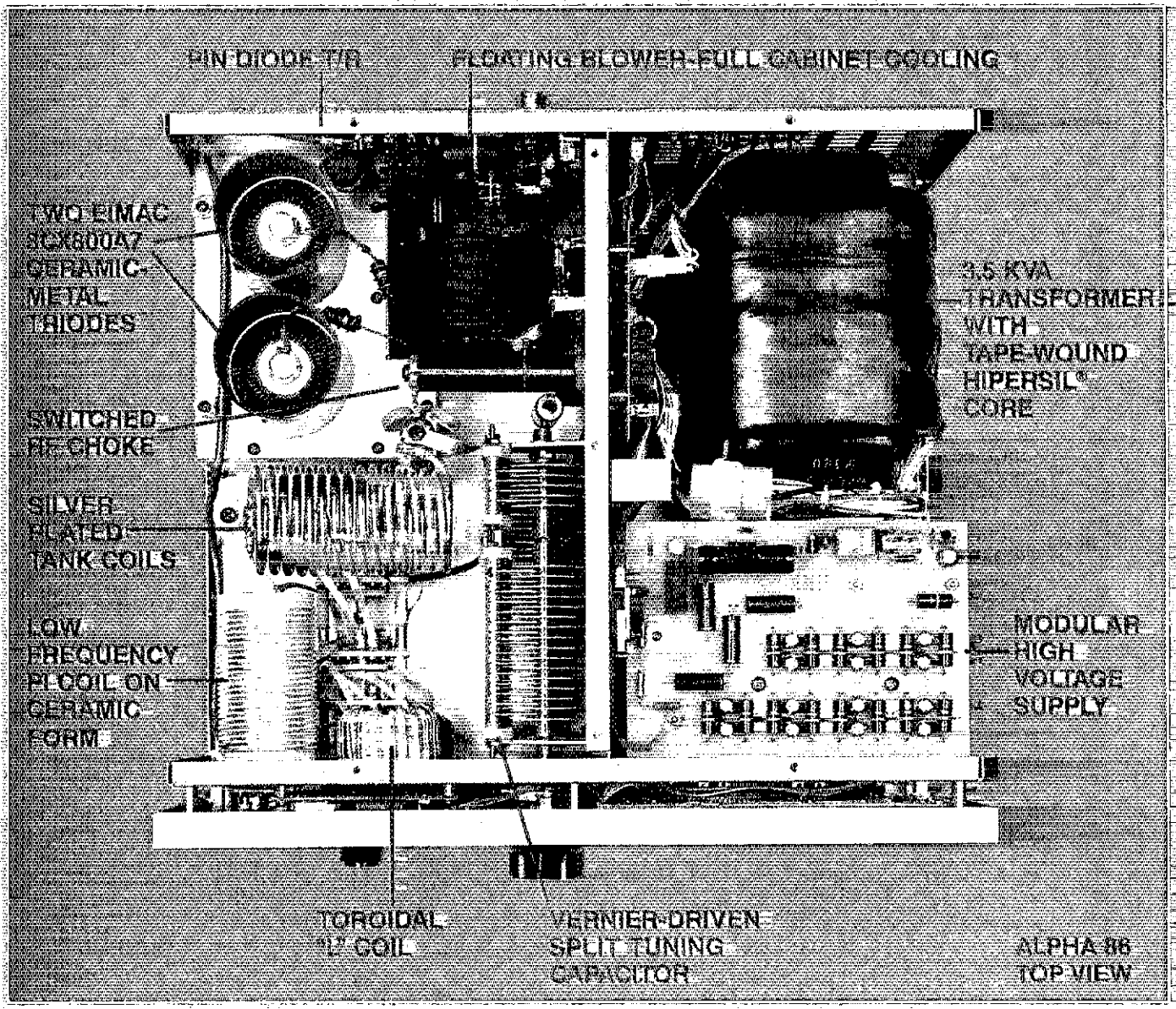
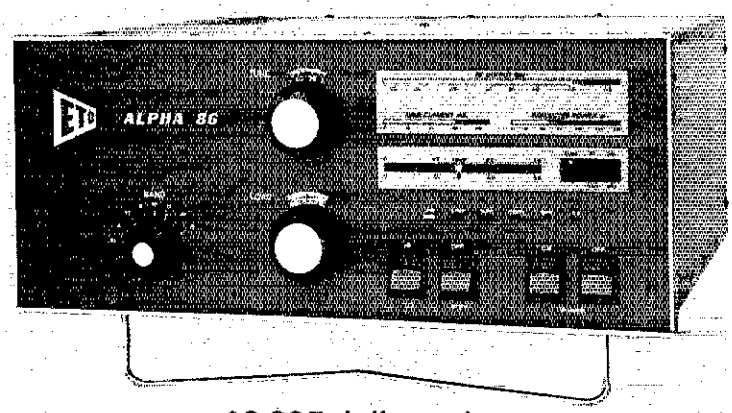


The NEW ALPHA 86 — HEAVY ARTILLERY IN A ONE CUBIC FOOT PACKAGE!



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- Fast, silent T/R and full break-in
- ETO's exclusive 3 YEAR limited warranty

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Tiny, Tough, & Terrific

COMING SOON

The new Alinco ALX-2T is far and away the best transeiver for the dollar and size conscious ham.

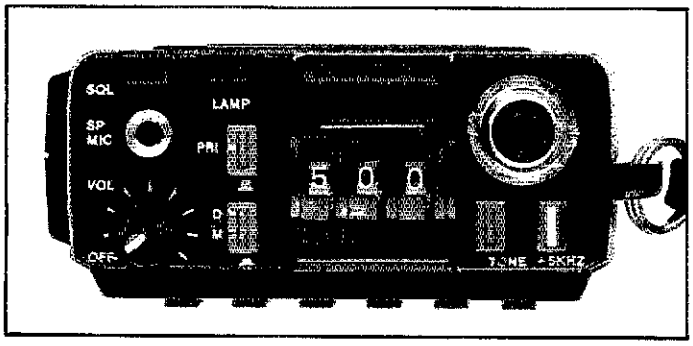
- **Tiny** = Actual size shown - with optional 160mAH battery
- **Tough** = 3+ watts output on high power - with standard 450mAH battery
- **Terrific** = One memory - settings on front panel

- Unit scans between thumbwheel frequency and memory
- CTCSS Board Standard
- 12 button DTMF pad standard
- **Battery save circuit draws 8mA for extended battery life**
- .16uV sensitivity
- LED lights thumbwheel
- 140.18 to 149.995 mHz
- Easy operation
- 2-year factory warranty

Suggested List Price $235.00

Accessories available:

- 7.2v 160mAH Ni-Cd battery
- 7.2v 450mAH Ni-Cd battery
- 7.2v 700mAH Ni-Cd battery
- 9.6v 450mAH Ni-Cd battery (4+ watts output)
- Earphone/microphone
- Leatherette case set
- 117v A/C wall charger
- D/C/ D/C converter
- D/C charging stand
- RCA to BNC adapter



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Burghardt Amateur Center-Watertown, SD
Colorado Com. Center-Denver, CO
Delaware Amateur Supply-Delaware, DE
Doc's Communications-Rossville, GA.
El Original Electronics-Brownsville, Tx
EEB-Vienna, VA
EGE, INC.-Woodbridge, VA.
EGE, INC.-Salem, NH.
Erickson Communications-Chicago, IL.
Floyd Electronics-Collinsville, IL.
The Ham Station-Evansvile, IL.
The Ham Hut-Amarillo, TX.
Hatry Radio-Hartford, CT.
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rl enterprises-Merrifield, MN.
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Texas Comm. Center-Houston, TX.
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Comtech Communications, Edmonton, ALB.
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Com-West Radio Systems-Vancouver, B.C.
Hobby Tronique Inc.-Ville St. Laurent, Quebec
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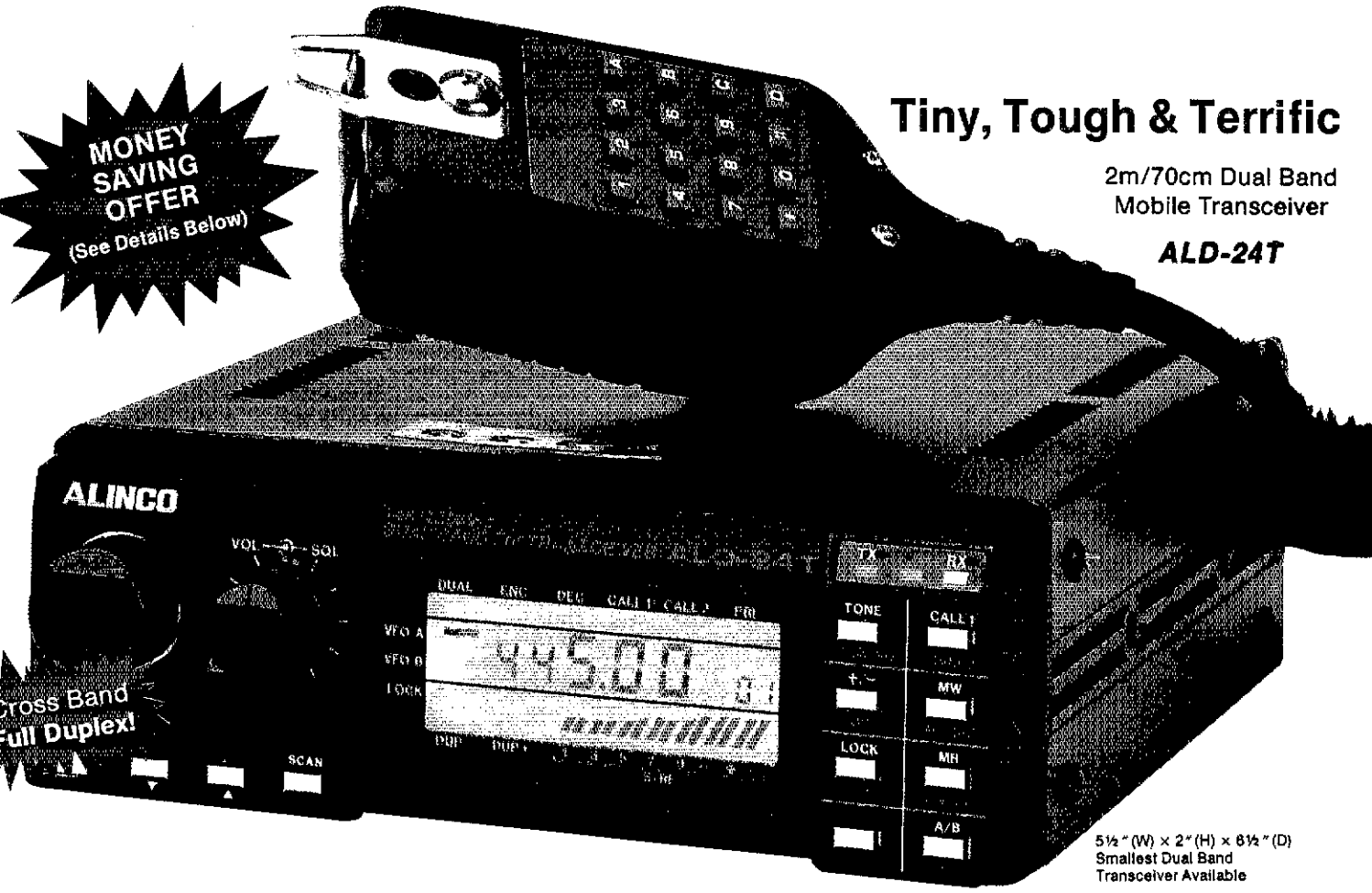
Dual Bander

MONEY SAVING OFFER (See Details Below)

Tiny, Tough & Terrific

2m/70cm Dual Band Mobile Transceiver

ALD-24T



5½" (W) × 2" (H) × 6½" (D)
Smallest Dual Band Transceiver Available

- 25 Watt High - 5 Watt Low Power Both Bands
- 21 Memories
- Dual VFO's
- CTCSS Encoder/Decoder: Standard
- Memory Scan and Memory Lockout
- * Many MORE Features, See Your Dealer!

ALINCO'S ANTENNA BONANZA

You save on every Alinco product because of our value. Now, for a limited time you can save again on your purchase of a Larsen mobile antenna. With your purchase of an ALD-24T dual band mobile, ALR-22T or HT 2 meter mobile or an ALR-72T 70cm mobile you can save from **$25.67** to **$34.72** on a brand new Larsen antenna with the mounting hardware included.

Model	Type	Larsen Antenna w/Coax Assembly	Suggested List Price	Your Cost	Savings
ALD-24T	Dual-Band Mobile	NMO-2/70	$59.72	$25.00	$34.72
ALR-22T(HT)	2 Meter Mobile	LM-150	$40.67	$15.00	$25.67
ALR-72T	440 MHz Mobile	LMC-440	$40.67	$15.00	$25.67

Just send your check or money order along with your warranty card and photocopy of your receipt to Alinco and we'll ship your antenna freight paid (continental USA only). Hurry, this offer effective **January 1, 1988** through **March 31, 1988.**

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AES - Las Vegas, NV
Austin Amateur Radio Supply - Austin, TX
Barry Electronics - New York, NY
Burghardt Amateur Center - Watertown, SD
Colorado Comm Center, Denver, CO
Delaware Amateur Supply - New Castle, DE
Doc's Communications - Rossville, GA
El Original Electronics - Brownsville, TX
EEB - Vienna, VA
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The Ham Station - Evansville, IN
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Hatry Radio - Hartford, CT
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Hirsch Sales Co., Williamsville, NY
HR Electronics - Muskegan, MI
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Madison Electronics - Houston, TX
Maryland Radio Center - Laurel, MD
Memphis Amateur Electronics - Memphis, TN
Michigan Radio - Mt. Clemens, MI
Mission Consulting - Houston, TX
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Com-West Radio Systems - Vancouver, BC
Hobby Tronique Inc. - Ville St. Laurent, Quebec
R&S Electronics Ltd. - Dartmouth, Nova Scotia
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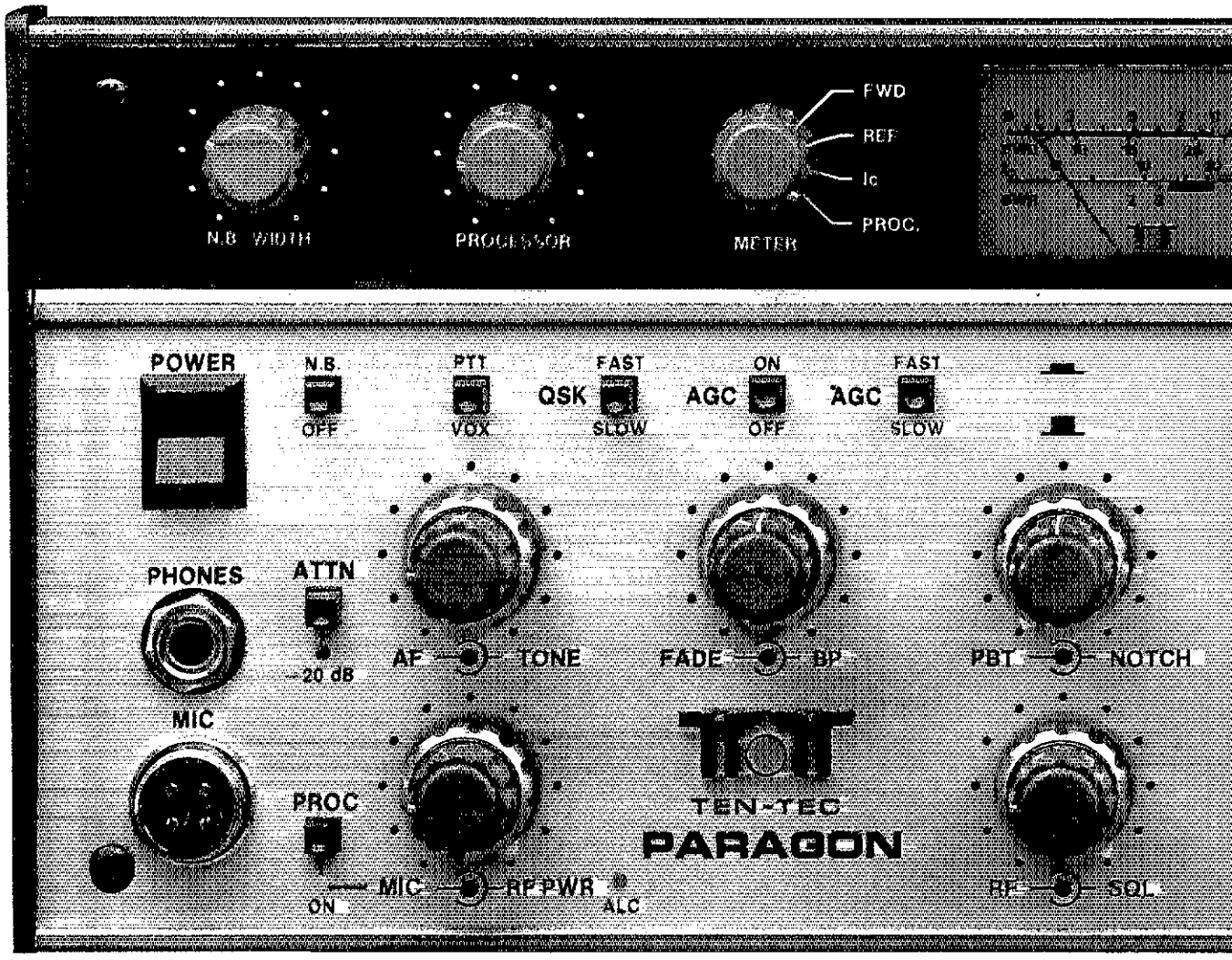


You're face to face

Meet America's Newest, the Ten-Tec Paragon, Model 585

PARAGON HF TRANSCEIVER, Model 585

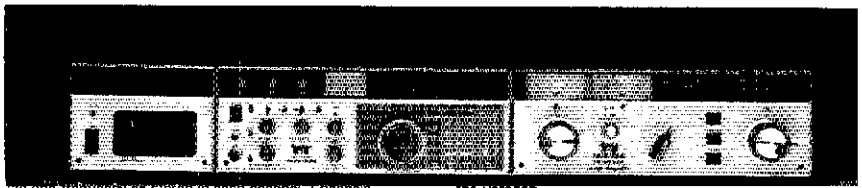
The Paragon Model 585 is a full featured, synthesized transceiver. General coverage all mode receiver tunes from 100 kHz to 29.999.99 MHz. Transmit at 100 watts output on all authorized frequencies from 1.8 to 29.999.99 MHz. SSB, CW, FSK and optional FM. Noise blanker and speech processor are standard equipment. Dual VFOs, RX offset, TX offset, QSK with a changeover time of less than 30 ms, five i-f filters (standard 6 kHz AM and 2.4 kHz SSB, optional 1.8 kHz, 500 Hz and 250 Hz) that are front panel selectable independent of mode, selectable tuning rates with automatic speed-up at rapid tuning knob rotation, passband tuning, audio bandpass filtering, tone control, squelch, notch filtering and more!

Sixty-two programmable memories that include frequency, mode, filter selected, channel number and a 7 character alpha-numeric tag for entering a net name, call sign or I.D. of your choice. As the memory channels are scanned, all of the information is displayed (what a light show!) and the receiver automatically sets up mode, filters, tag and frequency as stored in each channel. Channels scanned are totally controllable with global lock-out, global reset and individual lock-out and reset.

The construction is impressive too. All circuit boards are glass epoxy (G-10) and all of them can be removed without desoldering. The front panel is hinged to provide access to all sections of the chassis. All aluminum construction keeps the weight of the rig reasonable too. And of course, the front panel is a spacious arrangement which makes the critical controls easy to use.

Frequency selection can be made using the main tuning knob, keypad direct entry or up/down buttons that can shift one MHz or to the next ham band. Frequency readout is selectable to display to 100 Hz or 10 Hz. Front panel clock is in 24 hour format. Rear panel input and output provisions keep the all-mode operator in mind too. Fixed level audio out and FSK keying (170 Hz shift), auxiliary dc jack, amplifier control circuits plus all the other connections that you could possibly need, including RS-232 computer interface option.

The Paragon is the end result of a three year engineering effort. Much of that effort was invested in improving the receiver performance and controlling the phase noise inherent in a PLL oscillator. We are proud of the performance of the Paragon and we think it has set new standards of excellence in synthesized rigs. All we ask is that you take the time to check it out. We think that you will share our pride in the Paragon.



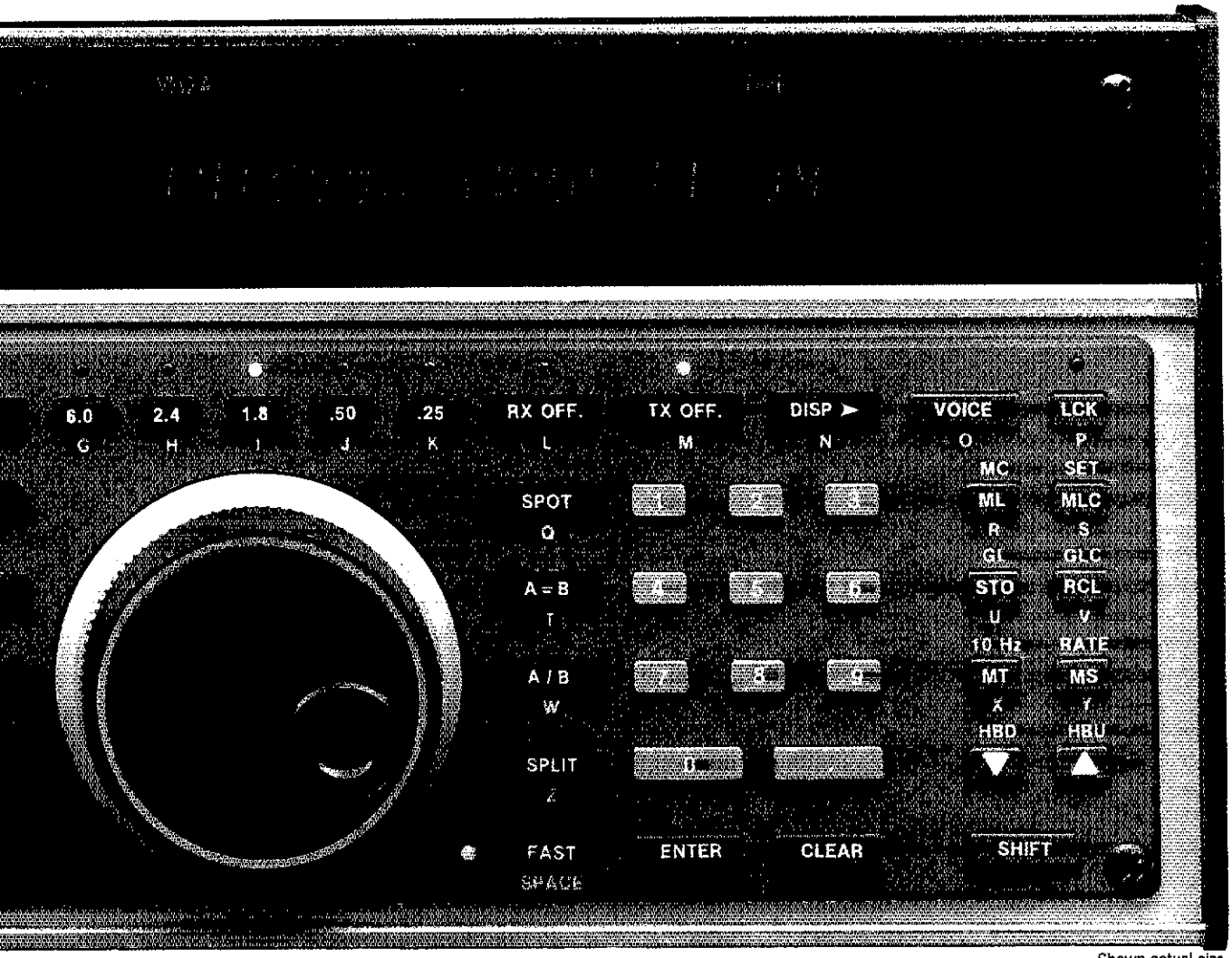
GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.8 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C. at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Tuning Rate:

	Normal	Normal Shifted
CW/USB/LSB/FSK	10 Hz 4.8 kHz per turn	20 Hz 9.6 kHz per turn
AM/FM	50 Hz 24 kHz per turn	100 Hz 48 kHz per turn
	Fast	**Fast Shifted**
CW/USB/LSB/FSK	20 Hz 9.6 kHz per turn	40 Hz 24 kHz per turn
AM/FM	100 Hz 48 kHz per turn	200 Hz 240 kHz per turn

Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062" glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¼" x 14¾" x 14¼". 13 x 37 x 36 cm.
Net Weight: 16 lbs. 7.25 kg.

Paragon Station with Model 960 Matching Power Supply ($229), and the Mighty Titan Amplifier ($2685).



Shown actual size.

with the Paragon.

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Typical 200 watts.
RF Power Output: ALC stabilized, adjustable, 10 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1 - 1.6 MHz	1.6 - 29.999 MHz	
SSB/CW/RTTY	.5 uV	.15 uV	10 db S/N@ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

	-6 dB BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.25 kHz	1.875:1
Standard SSB	2.4 kHz	3.38 kHz	1.67:1
Opt. 1.8 kHz SSB (Model 258)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 255)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 252)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: + 16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: + 18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms, 5% distortion max.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

...America's Best Kept Secret!

TEN-TEC

Highway 411 East
Sevierville, Tennessee 37862
615/453-7172

Write for our new 10-page full-line catalog.

MADE IN USA

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 March 14 through April 13 will appear in June *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 their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or 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/HAMFEST/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.

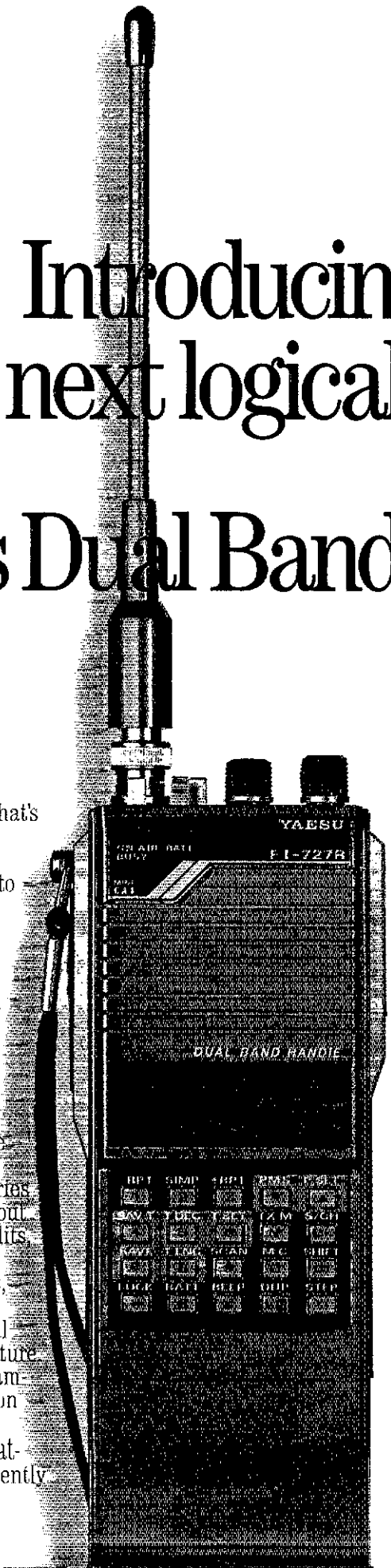
MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610.

LITTLE Big Horn Net Sundays: 14.067 MHz, 2200 UTC & 21.176 MHz 2300 UTC. Native American Indians 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.

Introducing the next logical step.

Yaesu's Dual Band Handie.



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

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.

CAPE COD: Amateur Radio & Computer Flearmarket, Saturday, March 26, 9:30 to 3:00 PM, indoors, Cape Cod Tech, Harwich, MA, Route 6, Exit 10. Exams, sellers $4. K1MRO: 617-432-1723, Barnstable Radio Club.

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 (3-1/2 × 2). Write or call for free samples. Little Print Shop, Box 1160, Pfluegerville, 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. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

FREE, 100 QSLs with first order. Samples 50¢. 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

QSL SAMPLES send $1 (refundable with order) Box 1262, Point Roberts, WA 98281.

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 × 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.

SUNSPOTS are climbing. Do you have enough QSL cards? Send for free samples. 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.

QSLs & Rubber Stamps. Top Quality QSL Samples and Stamp Information $1. (Refundable with order.) Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

CALL Sign Badges: Custom license plate holders. Personal, distinctive. Club discounts. SASE. WB3GND, Box 750, Clinton, MD 20735, 301-248-7302.

QSL's: 100 for $8. Each additional 100 $3. Many styles and colors. Shipped within two weeks, postpaid. Free samples. Shell Printing, KD9KW, Box 50, Rockton, IL 61072.

FULL Color Custom QSLs made from your slide-photo. $89 thousand. B/W 250 $23. Samples. Picture Cards, 3806 NE 24th, Amarillo, TX 79107, 806-383-8347.

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.

QSL CARDS - Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept. B, 310 Commercial, Emporia, KS 66801.

ANTIQUE-VINTAGE-CLASSIC

WANTED: Old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Avenue, Milw., WI 53204.

NEW FROM EEB

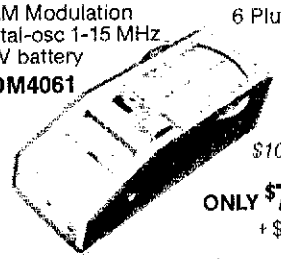
NOW buy that test equipment you've wanted and save!

DIPMETER

1.5 To 250 MHz
6 Plug-In Coils

AM Modulation
Xtal-osc 1-15 MHz
9V battery

DM4061



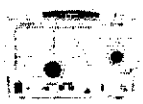
$109.95 Value

ONLY $79.95
+ $4 UPS

- Measure resonance of antennas and tank circuits.
- Check for Harmonic radiation.
- 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.

$219.95 Value **ONLY $149.95** + $4 UPS

RF POWER METER/LOAD

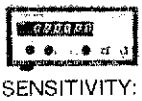
PM330

- 1.8 to 500 MHz.
- 50 OHM - N-J Connector.
- 5W, 20W, 120 Watts.
- Accurate to +/- 10%.

$109.95 Value **ONLY $79.95** + $4 UPS

FREQUENCY COUNTER

FC5250



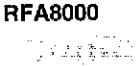
- 10 Hz to 150 MHz.
- 7 Digit readout.
- Gate 1s & 6 sec.
- Accurate to +/- 1 count.

SENSITIVITY: 25 - 100 mV to 30 MHz; 100 - 300 mV to 150 MHz

$169.95 Value **ONLY $129.95** + $4 UPS
AC Adapter is included with unit.

RF ATTENUATOR DC—500 MHz

RFA8000



- 0 - 81 dB in 1 dB steps.
- Accurate to +/- .3 dB
- Steps 1, 2, 3, 5, 10 and 20 dB
- 50 OHm - ½ Watt Insertion Loss .5 dB.

$299.00 Value **ONLY $149.95** + $4 UPS

SWR/RF ANTENNA METER

SWR3P

- Read SWR, RF power and field strength.
- 1.7 to 150 MHz.
- 10 or 100 watt range.
- SWR +/- 5%; POWER +/- 10% accuracy.

$29.95 Value **ONLY $19.95** + $4 UPS

Prices and Specs Subject to Change

Electronic Equipment Bank
516 Mill Street, N.E.
Vienna, Virginia 22180
Virginia orders, technical questions
703-938-3350
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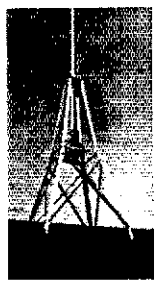
800-368-3270

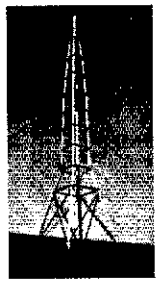
ELECTRONIC EQUIPMENT BANK
516 Mill Street NE
Vienna, VA 22180 USA

ROOF TOWERS



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.	CALL FOR PRICES
CR-18	5'10"	21 @ 90 MPH	31-1/3"	440	18	
CR-30	9'10"	27 @ 90 MPH	39"	1322	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 2½"					

*GUYING IS REQUIRED ON ALL ROOF TOWERS.

ROHN

20G	10' sect	45.95
20AG	top sect.	56.95
25G	10' sect.	57.95
25AG2	top sect.	67.95
45G	10' sect.	137.95
45AG2	top sect	140.95
AS25G	access shell	22.95
AS45G	access shell	56.95
TB-3	thrust bear	53.95
M20G	10' mast	19.96
SB25G	short base	26.95
SB45G	short base	56.95
EP2545G	grn pole AND MORE!	324.95

HUSTLER

6BTV	6 band trap vert	136.95
5BTV	5 band trap vert	116.95
4BTV	4 band trap vert	89.95
G7-144	Fix stat. 2mt collinear	116.95
MO-1/MO-2	mobile masts	21.95
RM10/RM15	10m-15m resonator	11.95
RM10S/RM15S	super resonator	16.95
RM20/RM20S	std & super resonator	15.95/21.95
RM30	30mt std resonator	16.95
RM40/RM40S	std and super	17.95/25.95
RM75/RM80	75 or 80 std	18.95
RM75S/RM80S	75 or 80 super	36.95
BM-1	bumper mt	15.95
SSM-2	stainless ball mt	17.95
SSM-3	spring	16.95
QD-1	quick disconnect	14.95
SGM-2	2mt 5/8 mag. mt.	28.95
H0T	trunk mt w/swivel ball AND MORE!	16.95

VAN GORDEN

PD8010	80-10 dipole kit	34.95
PD8040	80-40 dipole kit	32.50
PD4010	40-10 dipole kit	30.95
SD80	80 shortened dipole	28.95
SD40	40 shortened dipole	25.95
ALL BANDER	160-10mt	28.95
GR5V	AND MORE!	49.95

CABLE & CONNECTORS (per/ft.)

Belden 9913	Low Loss	49cts
Columbia RG213	50 Ω OHM	35cts
RG8/U	Foam	30cts
RG 8X	Mini	16cts
RG59/U	72 OHM	14 cts
PL259/Silver		99/1.39
N-Male for 8/U		4.00
BNC(M)-UHF(F)		4.80
Columbia Low Loss	AND MORE!	39cts

KLM

KT34A	triband 4 el	CALL FOR PRICES
KT34XA	triband 5 el	
2M-14C	2mt. satellite	
2M-22C	2mt. satellite	
435-18C	70cm satellite	
435-40CX	70cm satellite	
432-30LBX	70cm satellite	
2M-13LBA	2 meter	
2M-16LBX	2 meter	

CUSHCRAFT

A4	4 el triband	300.00
A3	3 el triband	224.00
AV5	5 band trap vert	105.00
32-19	19 el. 2mt boomer	97.95
215WB	15 el. wide band 2 mt. boomer	83.95
424B	24 el 70cm boomer	83.95
416TB	16 el OSCAR 435 MHz	60.00
A144-10T	10 el OSCAR 145.9 MHz	53.00
ADP-1	OSCAR pack 2mt & 70cm	150.00
AR-2	2mt vert. ringo	24.50
ARX-2	2mt vert ringo ranger	31.00
ARX-2B	2mt. vert ringo ranger II AND MORE!	37.00

BUTTERNUT

HF6V	80-10 vertical	127.00
HF2V	80-40 vertical	119.00
2MCV5	2MT vertical	54.00
RMKII	roof mtg. kit	45.00
TBR160S	160m add on	47.00
MPS	mtg. post sleeve AND MORE!	6.00

HY-GAIN

TH7DXS	7 el triband	CALL FOR PRICES
TH5MK2S	5 el. triband	
EX-14	4 el triband	
TH3JRS	3 el 750W pep	
18AVT/WBS	5 band trap vert.	
14AVQ/WBS	4 band trap vert	
V2S	2mt omni-direct	
V4	70cm omni-direct	
HB144MAG	2mt. mag. mt. AND MORE!	

HY-GAIN

T2X	20 sq. ft	
HAM IV	15 sq. ft.	
CD45II	8.5 sq. ft	

KEMPRO ROTORS

KR400	11 sq. ft. az.	CALL FOR PRICES
KR500	11 sq. ft el	
KR600	19 sq. ft. az	
KR5400A	az./el.	
KR5600A	az./el	
KR2000	27 sq. ft.	

LARSEN

LMMM	mag. mt.	15.95
LM150	2m coil & whip	25.95
NMOMM	mag. mt.	17.95
NMO150	2m coil & whip MUCH MORE!	27.95

AEA

ISOPOLES ARE BACK IN STOCK!

2 Meter	44.95
220 MHz	44.95
440 MHz	64.95

RTTY-AMTOR Packet

RTTY-AMTOR—PACKET

EEB is one of the few Amateur dealers that actually demonstrates the latest high tech equipment. We test every new item and only sell what we feel confident with. If you are considering Packet, call us and we'll sell you the best (Ask for Scott, WR4S or Ted, AA4GM at 703-938-3350). If you are in the DC area, stop in and marvel at our dedicated RTTY room.

"NEW"!!!

PC-PakRat Terminal Program for IBM compatible and PK-232 Split Screen Xmit & Recv. Buffer. All commands are Simple function keys. Complete help menus for all PK-232 commands & functions. Makes use of the PK-232 Host mode. List Price $29.95. Amt. Price $25.00.

NEW PK-232 with weather fax!

- AMTOR, RTTY, PACKET, CW WEATHER FAX.
- All decoding, signal processing & protocol software for all modes, is on ROM in the PK-232
- Only a terminal program is required for computer interface.
- VHF/HF/CW modem with 8 pole bandpass filter
- Type ahead buffer (750 characters)
- Receiver buffer (2700 characters)
- 240 page users Manual with "Quick Start" section included.

$ SALE CALL + $6.00 UPS
FREE AC ADAPTOR $30.00 VALUE

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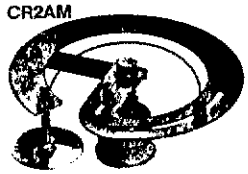
EEB is Bird's No. 1 East Coast Dealer
Large inventory. Package Deal $ CALL $
Bird 43—elements—loads

MISC. ITEMS

DXA	160, 80, 40	49.95
HF5B	5 band beam	199.95
AR200XL	TV rotor	49.95
NM02/70	coil & whip	38.50
AP151-3G	2m on glass	34.50
X-PANDA5	Hustler adapt.	14.95
UGM	1/4 λ mag.	19.95
HR144BN	2m duck	16.95
MONR51	scanner mag	39.95
BL1500	9:1 balun	46.95
Coaxseal		2.49
GR6	5' gnd rod	6.00
D130	25-1300 discone	89.95
M5	5' mast	5.95
CS3G	3-way switch	26.95
LAC2	Blitz Bug	7.50
4UU	4' jumper	8.95

UNTENNA

CR2AM



CR2AM	PERM MT	41.00
CR2A	2M Mag MT	41.00
CR3A	220MHz Mag MT	37.00
CR4A	140MHz Mag MT	34.00
CR2RD	Radome Cover	12.00

CABLE IS NOT INCLUDED

ELECTRONIC EQUIPMENT BANK
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Vienna, VA 22180 USA

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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 Brandname, 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. Fala 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.

QST, 1950 to date, nearly intact. Station equipment, tower, beam, rotator. SASE for list. WØBIG, 6636 KY 56, Owensboro, KY 42301.

WANTED: Radio Manual (by Mechanix Illustrated) 1939-1942. G.P. Cain, 1775 Grand #302, St. Paul, MN 55105.

ELMAC AF-67 Transmitter, PMR-8 Receiver, both mint with pwr. supplies and manuals, best offer. KBØW, P.O. Box 99, Rancho Cordova, CA 95741.

WORLD Map Wanted: Callbook-type Ham prefix color wall map from 1930's, 1940's and/or 1950's. KN4KWD, Malcolm Ringel, 305 Buckhead Avenue, Atlanta, GA 30305.

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.

QST's 1930's to date. Write W1BFA.

HALLICRAFTERS S-120 SWR .55-30 MHz, 4 bands, bandspread, 2 built-in antennas. Looks and runs like new. No work needed. $100. I ship. N1AHR, 603-539-2762.

TRADE ICOM R-7000 for *QST* 1915-30 complete. Richard Titus, NV2C, 231-9 Lucas Lane, Voorhees, NJ 08043.

HALLICRAFTERS S20-R Sky Champion Receiver. Good condition, clean, works. Made about 1941. $45. S19-R Sky Buddy near mint. $75. American Bosch Table Model SWL Receiver. Good $35. Add shipping. N4DFX, Box 446, Drayton, SC 29333, 803-583-3081.

WANTED: Low power CW xtmrs: WRL CW-7, Philmore NT200, Walter Ashe Wat 25, Meissner 2-CW, Globe Chief Deluxe, Lafayette Voyager, Matric Model 50 QRP, Kantronics Rockhound QRP and Kantronics 8040B CW Receiver. Top $ for excellent to mint units. K3OMI, Gary Wagner, 11124 Oak Hollow Road, Knoxville, TN 37932, 615-690-4217 days M-F.

OLD Books, old & new equipment for sale. SASE for list. K4MSG, 204 S. Harrison Road, Sterling, VA 22170.

OLDIES Clean Out! Hallicrafters S27 UHF rcvrs (two). Johnson: kilowatt w/desk, mint Ranger, 6N2 w/VFO. Hammarlund Super-Pro rcvr. Model 15 RTTY. General Radio: 650-A Impedance Bridge, 1212-A Null Detector, 1213-C Calibrator, 1107-A Interpolation Oscillator. Boonton: 74C-58 Capacitance Bridge, 203-B Univerter, Fixed 1030-A VLF Q Indicator. Kay 111-A Mega-Sweep. H-P 803A UHF Bridge. Unitek 1058 Spot Welders. Other misc. Ham gear. Want: Crank-up tower, beam, modern Panadaptor for KWM-380, IBM-PC. Roy, W6RBV, 714-633-1855.

GENERAL

RACAL, RA-6790 commercial grade receiver, US made, LCD read-out to 1 Hz, super stable, 0 to 30 MHz, all modes, 6 Collins mechanical filters. $2500 - plus shipping. Phone for data sheet. Signal One, CX 11A, deluxe American made transceiver, 150 watts output, can be boosted to 200 watts, in super condition, $3500 - you ship or pick up. 1 and 1/2 half hour from Buffalo. Contact VE3CTP, Eric Sr., 416-291-0088 after 6 PM Toronto time.

CHASSIS & CABINET Kits. 5120 Harmony Grove Rd., Dover, PA 17315 SASE K3IWK.

DO-IT-URSELF DXpedition. Stay at ZF8SB. 2BR cottage, beach, Quad. Fish or dive if band folds. Write airmail: ZF8SB, Little Cayman, CAYMAN ISLANDS.

WANTED: Drake C4 Console and FR-Speech Processor plug in unit from DX-Engineering for T4XC. H. Schrooter, Dorfstr. 4, 3131 Gollau/Luechow, WESTERN GERMANY.

WANTED Manuals for Akai 4000-DS Tape Deck and Squeeze Ele-Key EK-150. EA6SF, Apartado 122, 07840 Santa Eulalia, Baleares, SPAIN.

COLLINS Rockwell receiver, HF 2050, 15 KHz to 30 MHz, +25 dBm 3rd intercept, digital IF, all modes, LCD read-out to 1 Hz, military grade, $6500 - plus shipping. Phone for data sheet. Signal one, CX 11A, late serial number, super clean, in mint condition with Shure 444 mike and manual, $2750 - plus shipping. VE3CTP, Eric Sr., 416-291-0088 after 6 PM Toronto time.

TELETYPEWRITER parts, supplies, gears. Toroids, S.A.S.E. list. Typetronics, Box 8873, Ft. Lauderdale, FL 33310. Buy unused parts, cash or trade.

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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.

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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.

MICROLOG AIR-1 with AMTOR, Close-Out Sale. List price $279. VIC-20 AIR-1's $125. Add $5 for shipping in US, $10 elsewhere. MD res add 5% sales tax. G and G Electronics, 8524 Dakota Drive, Gaithersburg, MD 20877, 301-258-7373.

TRYLON FREE-STANDING Towers, up to 96 feet, for info write BJX Supply, Box 388, Cortu, 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 8146, 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.

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NICADS NEW AA 500mAH. Ten for $11 plus shipping. Raymond Richard, 1787 Village Green Drive, Clairton, PA 15025.

SUPER VR85 replaces the popular VR85 satellite tracking program for the Commodore 64. Features include high resolution color map and satellite sprite, tracking data display, footprint sprite, ground trace, mutual acquisition table, transponder mode display, room for twenty satellite Keplerian element sets, Autotrak compatibility, extensive instructions, and strong user support. Send SASE for details. SUPER VR85: $35 ppd (Calif. residents add 6% sales tax) RLD Research, McCloud, CA 96057. W6AMW owner.

QUIET POWER!

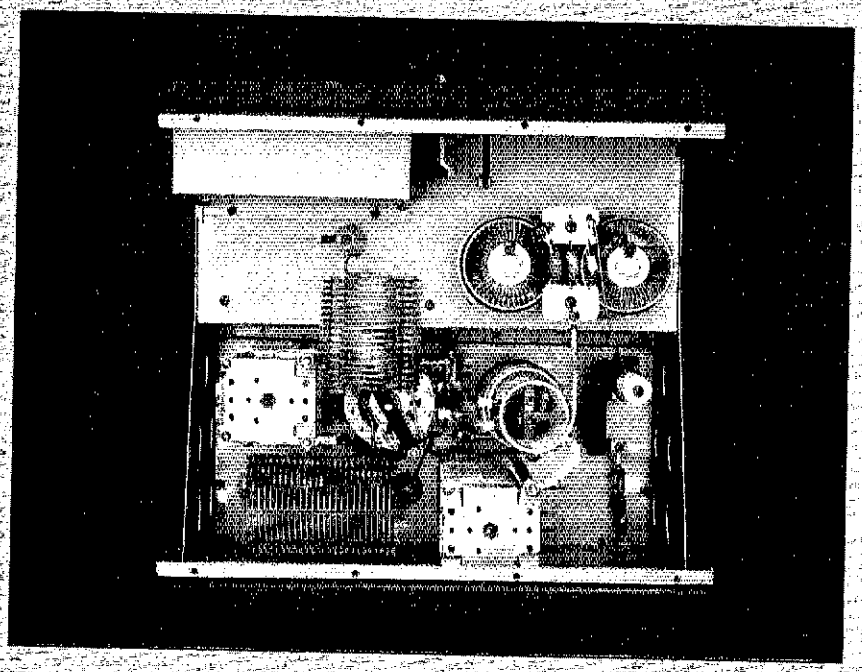
Two years in development, the 230A represents a new dimension in linear amplifier technology and operating convenience. Fully microprocessor based, the RF/power supply deck is remotely controlled via a small "microcontroller." No noisy, large enclosures at your operating position. The 230A provides maximum legal power on all amateur bands with no time limit in any mode.

Drive frequency is continuously monitored by the processor and adjustments made to ensure maximum amplifier output at all times. As you talk, the amplifier's tuning is constantly adjusted as required. Powerful gearhead motors drive the bandswitch, tuning, and loading capacitors.

The business end of the 230A shown below is representative of the rest of the amplifier. The 3CX800A7's are on a subchassis. To their left and inside a completely shielded compartment are the PC boards that communicate with the remote microcontroller. The silver plated pi-coil is below the tubes flanked by the custom manufactured tune and load capacitors. The Radioswitch Model 86 bandswitch can be seen at the approximate center.

Airwound coils for the low frequency portion of the pi and the L network were chosen to ensure maximum amplifier efficiency.

Directly below and unseen in the photograph is the large 80 cfm blower, the high voltage and control power supplies, and drive motors for the tune and load capacitors and the bandswitch.



Microcontroller is not shown.

FEATURES

- Remote control. Place RF/power supply deck up to 250 feet from the microcontroller with optional cable (15-foot cable furnished).
- Fully automatic. The microprocessor monitors drive frequency and keeps the amplifier tuned to maximum efficiency with no operator intervention.
- Safety monitoring. Reverse power, grid and plate current, airflow, filament voltage, and tube dissipation are constantly monitored and protective action taken if necessary to protect the tubes.
- Continuous duty at full power in all modes.
- Connectors for RS-232C control and antenna switching.
- Full QSK.
- Readout of all parameters including VSWR on two custom LCD displays.
- Easy modification to 10-meters.
- Modular construction.

Factory direct sales for lowest cost.
Introductory prices: 230A $3,695. 230C $5,500.
1 year guarantee.

SPECIFICATIONS

Frequency. All amateur bands from 1.8 to 21 Mhz (to 30 Mhz for export).
Drive. 50-80 watts for full power.
Input VSWR. 1.5:1 or less on all amateur bands. Slightly higher for WARC.
Harmonic Suppression. -55dB.
Intermod Products. -35dB down.
Duty. Continuous on all modes including RTTY.
ALC. Full ALC with exciter to prevent exceeding power limits.
Input Power. 220-250 VAC, 60Hz, 20 amperes max.
Dimensions. Microcontroller: 10" wide x 6" high x 9" deep. RF/power supply deck: 14" wide x 22" high x 13" deep.

All interconnect cables are furnished for ease of set up. In addition to the above, the 230C provides continuous frequency coverage from 1.8 to 30 Mhz with a no time output rating of 2250 watts PEP. Three 3CX800A7's are utilized.

Please call or write for additional information. We love to talk about these amplifiers!

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The New 688-page ARRL Operating Manual is HOT...

On July 8, 1986, a railroad tanker carrying toxic phosporous derailed and caught fire near Miamisburg, Ohio. The success of the Monsanto Amateur Radio Association's emergency plan in helping local authorities deal with this potential disaster is documented in November 1986 *QST*. The photograph above which was taken over the scene by Mike Carter, WD8BSI, shows what could happen in your backyard! Would you be ready for such a situation? The Emergency Communications chapter by Richard Regent, K9GDF, in the new *ARRL Operating Manual* tells how to prepare for such an eventuality. Emergency Communications and efficient message handling go hand-in-hand. Maria Evans, KT5Y, tells all about this subject and how you can become a part of the National Traffic System in the expanded Traffic Handling chapter.

Over forty percent of the radio amateurs licensed today were at one time or still are shortwave listeners. With modern transceivers, it's possible to hear what is going on outside our ham-bands. David Newkirk, AK7M, adds his enthusiasm for this closely related hobby in the SWL chapter. On a related subject, Paul Rinaldo, W4RI, tells us about the characteristics of the Amateur Radio Spectrum and how our bands are assigned.

Most hams are interested in just getting on the air and talking to someone. Even so, ham radio is a lot more than talking into a microphone or pounding a telegraph key. Carol Smith, AI2I, 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!

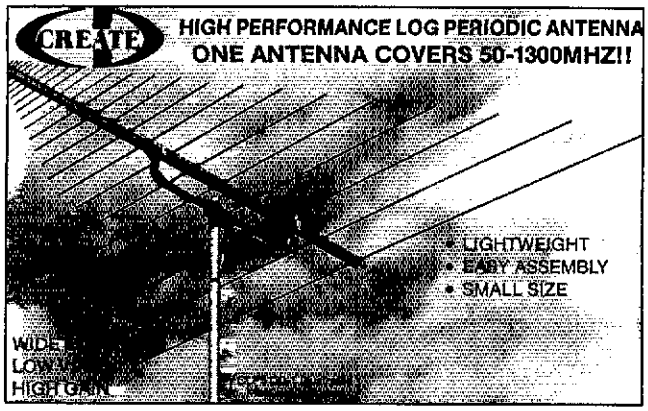
Almost everyone seems to be interested in digital communications these days. Stan Horzepa, WA1LOU, covers Packet Radio in detail; while Larry Wolfgang, WA3VIL, covers RTTY and other digital modes in a separate chapter. If you find SSTV or ATV of interest, Bruce Brown, WA9GVK, has put together a fantastic 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.)

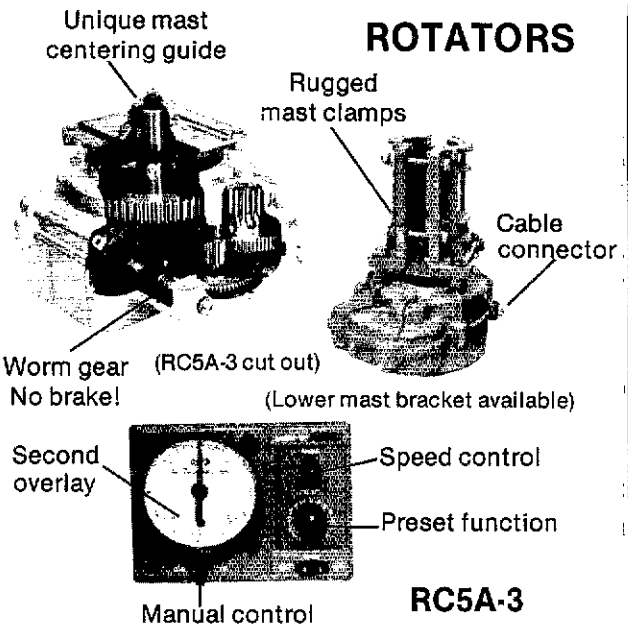
but it's also FUN!



CLP5130-1 50-1300 MHz 25 el. 500W 6′ Boom $239 UPS
CLP5130-2 105-1300 MHz 20 el. 500W 4′6″ Boom $139 UPS

Operate on 6m, 2m, 1¼m, 70cm, 900 MHz and 1.2 GHz using only one antenna and one feedline. No tuning is required and the VSWR is 2:1 or less across the entire frequency range with excellent forward gain. The boom is made of high quality aluminum and the elements are precut for easy assembly. Each model can be mounted for either vertical or horizontal polarization. Create VHF/UHF log periodics are great for the amateur bands, scanners and numerous other applications.

ROTATORS



RC5-1	10 sq. ft.	$251
RC5-3	10 sq. ft. preset	$328
RC5A-2	25 sq. ft.	$399
RC5A-3	25 sq. ft. preset	$459
RC5B-3	35 sq. ft. preset	$736

(All rotators are UPS shippable)

See Lew McCoy's Review In August 1987 Issue Of CQ.

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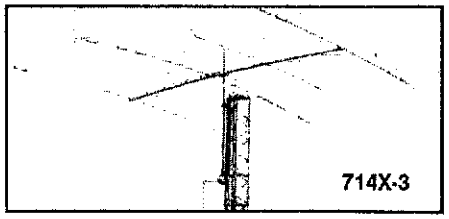
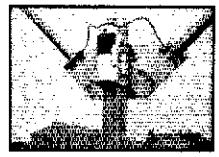
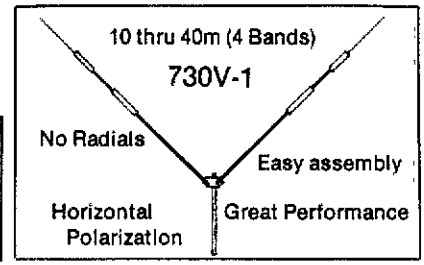


714 Series Tribanders
15-20-40 Meters

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.

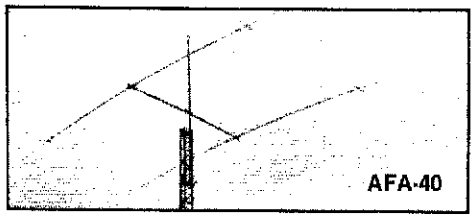
(Prices include balun)





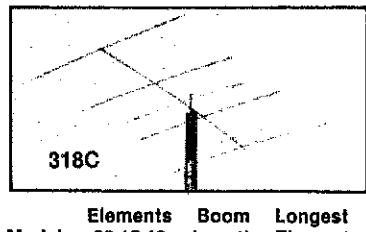
The 730V-1 is a V-dipole consisting of two 19 ft. heavy duty, self-supporting elements and bracket with an efficient balun that is ready for mounting on a standard TV mast. Rotation is not necessary. The V-dipole is superior to standard vertical antennas in gain, noise and efficiency. **$159 UPS**

AFA-40
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

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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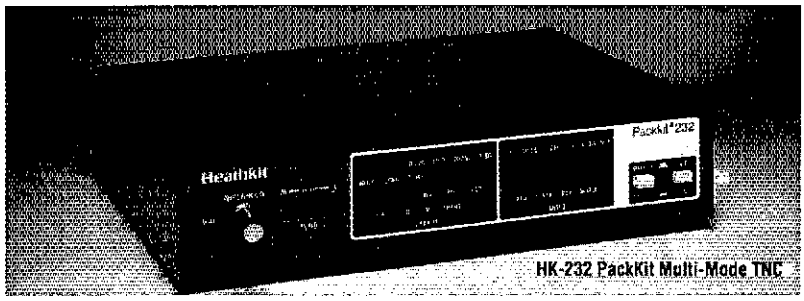
SB-1000 Linear Amplifier



HK-232 PackKit Multi-Mode TNC

Our commitment to Amateur Radio means the Heathkit line is always expanding to meet the demands of even the most veteran ham. Our introduction of the SB-1000 Linear Amplifier and HK-232 PackKit Multi-Mode Terminal Node Controller Kits gives you two more value-packed amateur products to build and use.

The Heathkit SB-1000 Linear Amplifier Kit continues our commitment to produce the most popular linear amplifiers in the industry. Designed to operate at a full 1000 watts PEP output on SSB, 850 watts on CW or 500 watts for 30 minutes continuous on RTTY, this amp covers all bands from 160 to 15 meters including WARC bands. The SB-1000 uses a single 3-500Z tube in a high efficiency circuit for unparalleled performance at the price. Its high silicon E-I core transformer takes up less room and runs cooler. And it features a quiet computer-style fan, a stiff full-wave power supply with computer grade capaciters, adjustable ALC, and plate and load controls with smooth vernier tuning. And the SB-1000 is yours for only **$699.95.**

Consider the Heathkit HK-232 TNC. This versatile unit works on CW, RTTY, ASCII, AMTOR, both HF and VHF Packet, and now even WeFAX. You can work Packet in both HF (300 baud) and VHF (1200 baud or up to 9600 baud with external modem). Operate Morse from 5 WPM to speeds you never dreamed of, or print Weather Facsimile pictures on an Epson compatible printer. Connects to your computer through a standard RS-232 port. Connects to both your HF and VHF radios' PPT line, microphone input and speaker output. The same connections for Packet work on all other modes. Includes bar graph display to make HF tuning a breeze. Operates on 12 VDC at 750 mA with 10% ripple or less. The HK-232 is priced at only **$279.95.**

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KB-101

CODE Tutor, as described in August 1987 CQ. Learn or practice code on your IBM-PC or compatible. Send $9.95 to Archway Data Systems, Box 55, Edison, NJ 08818.

CODE Programs. Apple/C64-128. 37 Modes, Graphics, Lessons, Wrdprcsr, 1-100 WPM, etc. Laresco, POB 2018-QS, Calumet City, IL 60409, 1-312-891-3279.

FOR SALE: Henry 2-K, KWS-1, Jennings Variable Vacuums, 52 and 75 Ohm Non-Inductive Resistors, Filter Capacitors, Linear Parts. Send one dollar for a 20 page list. Bill, KA7VJO, P.O. Box 2030, Upland, CA 91785, 714-986-3515.

WANTED: Western Electric Tubes, Amps, Speakers, Caps, etc. Andy Bouwman, 616-454-3467 after 5 PM.

SOLDERING Station and Tools, European and American. Free catalog. Robert Mink Import-Export, Box 6437Q, Fair Haven, NJ 07704, 201-758-8388.

DRAKE RV75 $250; Hal DS2000 $200; MR2000 $100; DS2050 $300: WA8CZS, 1-614-452-7971.

QUALITY Test Equipment, General Radio, Hewlett-Packard, Tektronics, others, send SASE for list. Ritch, 2810 Camino Iturbide, Green Valley, AZ 85614, 602-648-0163.

FL QTH with antenna farm 3/2 1650 sq. ft. exc. condition. W4AFS, Pompano Beach, FL, 305-782-4898.

CLEAR Glass Coffee Mug: Custom engraved with your call sign and your first name. Only $10 per mug. Write: Regency Glass Engraving, P.O. Box 802, Novato, CA 94948.

VACUUM Tubes: 70,000 on hand. Vacuum Tube Storage Boxes: White. Four sizes. SASE. Tyger Electronics, Box 750, Clinton, MD 20735, 301-248-7302.

WANTED: Cushcraft R-3 Vertical Antenna. W2GVK, 9 Rothwell Drive, Cranbury, NJ 08512.

WANTED: Metron MA1000B linear amplifier with 10 meter conversion. Carl Vincent, KA5MXX, 2317 Rio Grande, Orange, TX 77630, 409-886-3243.

8875 Tubes needed. Advise condition and price. Bill, KDØHG, Box 1456, Lyons, CO 80540.

COMMERCIAL Linear Amplifier, continuous coverage 2.0 thru 32 MHz. Gates Radio HFL-1000 requires one (1) watt drive of SSB, CW or FSK for 1500 watts output. Checked-out ready to operate six units available. Price $3500. Export inquiries invited. J.S. Betts, 1231 Harbor Town Circle, Melbourne, FL 32940, 305-259-0512.

WANTED: Old Timers Bulletin published by the Antique Wireless Association. Need issues before 1973. Frank White, KBØTG, Box 2012, Olathe, KS 66061.

MICROWAVE 100+ Watt Linears and 2C39 Cavities for 2304 MHz, 1296 MHz and 902 MHz. Hi-Spec, Box 387, Jupiter, FL 33468, 305-746-5031.

BEARCAT III VHF/UHF 8-channel scanning receiver. Crystals required. New in factory sealed carton. Includes 115V & 12V power cords & mobile mounting bracket. $60 includes UPS brown. Gerry, N2ASF, P.O. Box 585, Water Mill, NY 11976, 516-283-3070.

1988 CALLBOOKS ("Flying Horse"). Either, $23. Both, $42. Any 4 or more, $20 each. Any 14 or more, $19. Postpaid USA. Century Print, Donald Erickson, 6059 Essex, Riverside, CA 92504-1588, 714-687-5910.

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DRAKE MN-4C 250 watt ant. tuner, Heathkit HD-1410 iambic keyer-paddles, 2 Turner AMB-77 amplified microphones, Realistic MPA-35 35 watt solid state PA amplifier, all mint, best offer. KBØW, P.O. Box 99, Rancho Cordova, CA 95741.

ARGONAUT 515 or 509 wanted. Good condition essential. John Salyer, W3MA, 7 Treble Lane, Malvern, PA 19355.

APPLE PD Ham Software. Six disk sides. $9.95 ppd/all. WA7ZYQ.

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DX BLUEBOOK, 20 Pages, 140 City Bearing's selection, Instant Prefix ID, Locator Grid Map, DX time, Zones, QSL & QTH info. Alpha country list. $7 Satisfaction guaranteed. SASE city bearing's list. Customized bearings available. W4UYZ, J/C Enterprises, 4920 Mayflower Street, Cocoa, FL 32927.

APARTMENT Dwellers/Portable Antenna System: Simple. Inexpensive. SASE for information. Burk Electronics, 35 North Kensington, La Grange, IL 60525, 312-482-9310.

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SSB ELECTRONIC Transverters LT50S, LT2S, LT70S 20W GaAsFET DBM $579. LT33S, LT23S, LT13S $599. 10 GHz $649. 2304 MHz $419. Mastmounted GaAsFET preamps with sequencer MV144S01, MV220S01 $249. 902 or 1296 MHz kits UEK-3 GaAsFET converter $119, USM-3 1W transmit mixer, $129. T144/28 $229, T220/28 $249. Cavity amplifiers 902, 1295, 2304 MHz. High power relays. Catalogue. Transverters Unlimited, Box 178, New Boston, NH 03070, 603-547-2213.

HETERODYNE Frequency meter, military type AN/USM-159A, 125 KHz to 1.000-GHz, w/calibration booklet, headset. AC/DC operation. $50. Albany, New York, Jim Meaker, tel. 518-235-2892.

'N-TENNA Quad Kits, $64.50. Box 5332, Hickory, NC 28603.

1/2 ACRE, 4 Bedroom, 2 Bath, 2100 sq. ft. - 90' free standing tower on top of hill, 1/4 mile from ocean, 20 miles north of San Diego. Martin Jacobs, WB6RKR, 214 S. Nardo, Solana Beach, CA 92075, 619-755-4249.

RIGID Plexiglas covers for following keys Bencher $9.95; MFJ-422 $9.95; Vibrokeyer $11.95. George Chambers, KØBEJ, 302 S. Glendale Avenue, Coffeyville, KS 67337.

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1988 PRODUCT & Price List of our Kits & Assemblies is now available. Send SASE to: A & A Engineering, 2521 W. LaPalma, Unit K, Anaheim, CA 92801.

WANTED: TS440S/AT, PS-50, MC-55, MC-80, PG-2S, HF hi pwr solid state amp for mobile, Hustler super resonators. W2UGM, 66 Columbus Avenue, Closter, NJ 07624, 201-767-0123.

OLDTIMERS! - N6AW is compiling information for a series of articles and a book about W6AM. If you have a story to tell about Don Wallace, jot it down. If you have pictures of Don or his station from past years, please make a copy. (Cost reimbursed.) Send to: Jan D. Perkins, N6AW, 6200 E. Ocean Bl. #7, Long Beach, CA 90803.

BUSINESS Opportunity: Profitable Communications Business, CB/Ham Sales & Service, 23 years, high return, large and faithful following, Long Island, NY owner retiring. Pat, 516-423-3614.

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WANTED: Drake R7A Receiver, mint, unmodified. Call 516-541-8093, KB2DY, 143 Arlyn Drive West, Massapequa, NY 11758.

CONNECTICUT'S Ham Store, Rogus Electronics, 250 Meriden-Waterbury Turnpike, Southington, CT 06489, 203-621-2252.

HAL ST-6000 $230. K3KD, 215-754-6286.

BUYING Gertsch frequency measuring equipment. Model FM3, FM7, DM1, DM3 deviation meters. Mail, phone, condition, price, accessories. K7JWC, 508 3rd Street West, Roundup, MT 59072, 1-406-323-2339.

WANTED: Sony 330K (with tape recorder), 320K (without tape recorder) and Sony CRF1 receivers. Please call Mathew Wolf at 713-871-9000.

SOLAR Modules. Operate 12VDC equipment from free sunlight. Ideal for remote repeaters. Great for field day. 5W - 70W weatherproof modules. Peterson Solar Electric, P.O. Box 4628, Westboro, MA 01581.

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WANTED: All types of transmitting tubes & sockets. Harold Bramstedt, 8104 Egg Lake Road, Hugo, MN 55038, 612-429-9397.

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AX-2 Shoulder Strap with Ground Plane Antenna Base* for TR-2400/2500/2600 3500/3600 handhelds . . . **$9.95**
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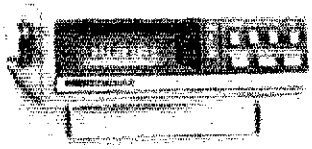
TM-401B 25W compact 440MHZ FM transceiver w/ext. spkr and TTP mic . . . . **Closeout $299.95**



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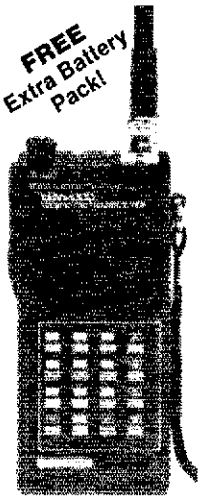

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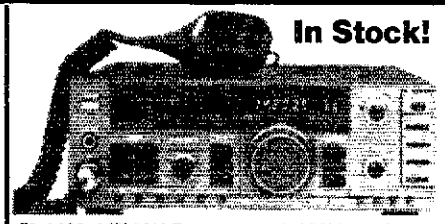

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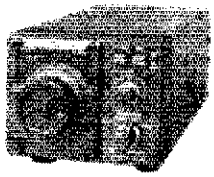

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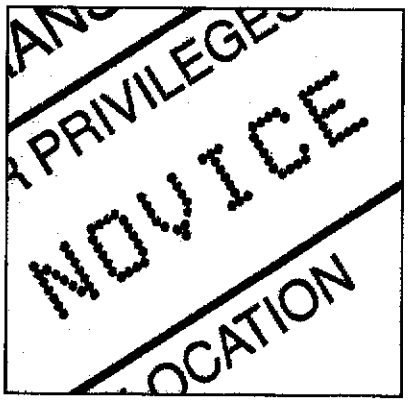

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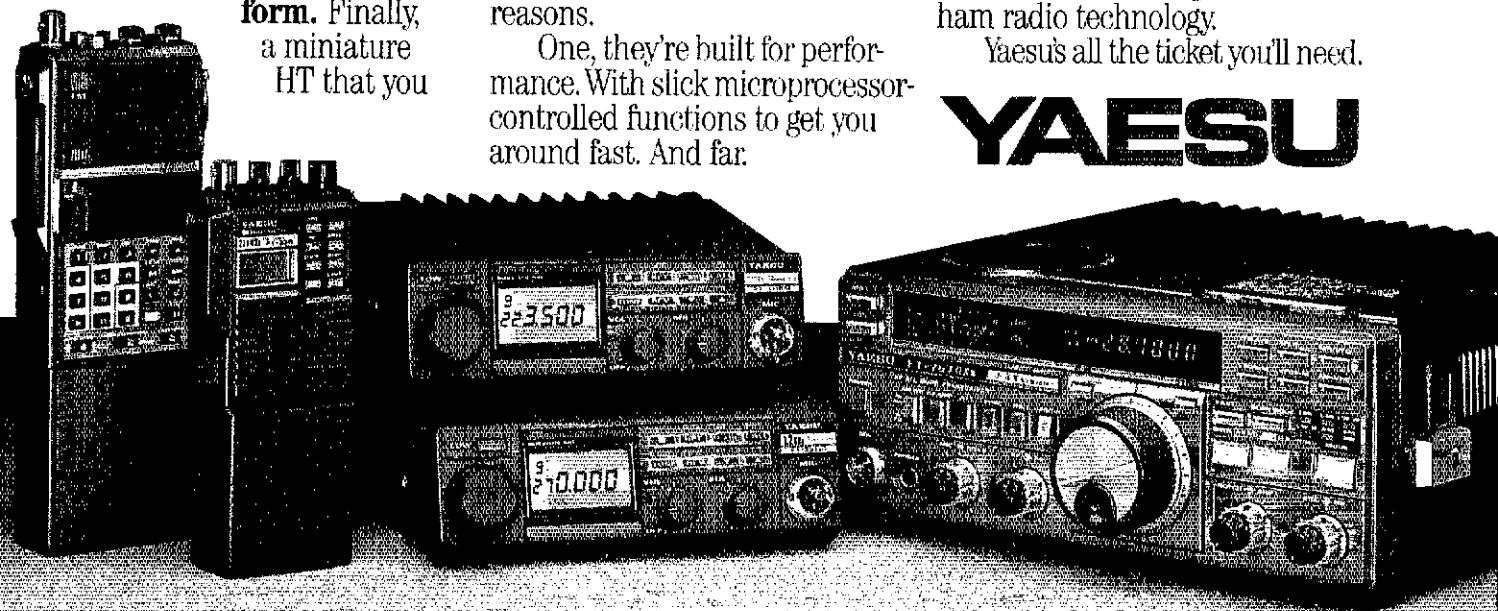

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KENWOOD TS-830, VFO-230, Heil Microphone, Speaker, YK-88C & YG-455C Filters. Excellent condition $1,050. KD2TU, Larry Huston, 212-777-7541.

SELL: Digital (DEC) Rainbow 100 PC with printer, software, etc., $1500; Heath SB-634 station monitor, $75; DX-160 receiver, $50. WA4DPU, Ed (CBA) or 205-830-6765 (eve).

SELL: Sinclair Filter Duplexer mod. 450-1A, $130; BC-939B ant. tuner $55; GE master pro 2 meter RX-$30, TX-$50; Kleinschmidt RTTY $10; Bud pro rack - 10' sloped face, 30' vertical, back door & internal rails $75. You pay shipping, will deliver in KY or Dayton Hamfest. K4RN, Box 312, Versailles, KY 40383, 606-873-9959.

WANTED Blue Racer and Mac Key. Write or phone Bill Smiley White, P.O. Box 5150, Fredericksburg, VA 22403, WB4EDB.

GAASFETS, MMICS, Johansons, ATC chip caps, SMA connectors, and other hard to find VHF-UHF-Microwave components. SASE for list. N2CEI, RD 1, Box 341A, Frenchtown, NJ 08825.

WANTED Tempo 2M rig CL146A any condition. WA4UKX, Box 722, Simpsonville, SC 29681, 803-967-2853.

DRAKE TR5, WARC, CW, NB, $365; R4A $100; R4C supply, audio mods $175; SB 201, 10 MHz $325 (pick-up). Bill, evenings 317-497-9706.

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CLEANING Shack - Microcomputer power, one at (+5 11A, -5 + 12-12 @ .25A) one (+5@8A, +12-12 @1A), one (+12-12 @3.5A) $20 each; Wordstar86 $25; Supercalc86 $20; Dbase/86 $50, Microsoft Basic interpreter & complier $50 each; CBasic80 $50, CBasic86 compiler $90; Flesher DM-170 RTTY demod $20, MFJ-1270 TNC2 $90; burglar alarm w/auto phone dialer $125; Blackbox ser-par converter $40; Hustler Mobile 80-10M $75; Hy-Gain 14AVQ 40-10M vertical $45; Fredrick 1202rb FDM FSK 60Hz demod $199, patch bay w/cords $10; Rac-59 SW antenna switch $10; TEAC 3340s 4track $899; TEAC model2 6 × 4 mixer $149; Shure mics $35. ICOM 720A w/all filters & PS15 $699. Walter, 205-933-2858.

SELL: ICOM IC-751, excellent condition, one owner, $750. Karl W. Sykora, DK6KX, 405 East 63rd Street #47, New York, NY 10021, 212-879-6075.

SELL: Signal One CX11A Tranceiver $2850. Call 806-665-6689, WB5TVP, Pampa, Texas.

TEN-TEC Omni digital, series B, with 2.4, 1.8 SSB and .5 CW filters, power supply, manual, very good condition, $450. Kenwood R600, 0-30 MHz receiver with 3.9 MHz Collins mechanical filter installed by Radio West, mint, $385. Radio West ferrite rod AM band antenna with preamp, $50. Will ship UPS. Jim McGloin, KB9O, 919 State Street #2, Lemont, IL 60439, call 312-257-6180 evenings after 0230Z.

WANTED: National XR-50 coil forms or equivalent. W2PTI, 268 Barben Avenue, Watertown, NY 13601, 315-788-1621.

KENWOOD TS-830S, 500 Hz 1st/2nd IF filters, VFO-240. Low hours, mint condition, $950. Jeff Ross, 7 Timberwick Drive, Flemington, NJ 08822.

TEKTRONIX Model 543 with dual input plug-in and scopecart $100. Model 543A with dual input plug-in and scopecart $125. Measurements Corp. Model 80 signal generator $50. Pick-up only. W2OPE, 315-457-0536.

WANTED: Used coil winding machine for winding lg. universal coils and pi sections. Must be complete with cams, bobbins, motor, etc., ready to operate. L. Lawrence, Ecola, 1394 N. "E" Street, San Bernardino, CA 92405.

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ARGOSY 525D CW Filter, 225 pwr antenna tuner, mike, phones, Bencher key and keyer. Perfect condition. Local pick-up preferred. $500. Doug Frick, 6 W 9th, Pottstown, PA 19464, 215-323-1520.

TELREX Heavy Duty Rotor with both Original & Pro-Search Keyboard entry with Audio Controls. Larry Weaver, KB9V, P.O. Box 1415, Citrus Springs, FL 32630, phone 904-489-6465.

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JOHNSON KW Matchbox with SWR $150. Prepaid UPS Stateside. Ken Johnston, W7LIX, 7521 York Road, Helena, MT 59601.

RG-214 Coax, double silver shield, 75 cents/foot. WB8MPE, 612-377-6274.

ALPHA 374 bandpass no tune, 80-10 meters, 3-8874's, Hypersil, $1350. . . Alpha 76PA, $1475. Jack, WA2V, 201-486-0039.

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SUPER Slide Show, live narrative "30 Greatest DXpeditions" available for hamfests. Limit to four shows in 1988. Write early. Info WA4WME, 202C Chapel Ridge, Hazelwood, MO 63042.

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KENWOOD TS-130S with YK-88SN Filter, SP-120, MC-50, MC-35S, MB-100. $450. WA2JZO, Livingston, NJ, 201-994-2299.

R-390A Receiver: $115, electronically complete, repairable (government-removed meters, operation unaffected). R-390A parts: Info SASE. Professional/Military quality TS-352 voltohm/multimeter, AC-DC, with leads, manual: $12.50. Mint military-spec pull-out 12AT7, 6BA6, 6AG5, 6AL5: $10/six. CPRC-26 Infantry Manpack Radio, 6 meter FM, receiver-transmitter sections, cabinet, antenna, crystal, handset: $22.50 complete, $42.50/pair. 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.

CAN You get the "Classroom Net"? Come to 7.238 at 1200 UTC daily or 21.395 later in the day. If you can't work WB2JKJ and the "Crew" at Junior High School 22 on Manhattan's Lower East Side at these times we may never get to know you or receive your QSL. Don't be shut out of our "QSL Of The Week Award" contest. Don't miss out on making lots of new friends and learning about the most exciting use of Ham Radio in education today. Send a card now via the callbook. You'll be glad you did!

WANTED: Yaesu FTV-250 and FTV-650B 2 and 6 meter transverters YC-355D freq. Counter must be mint! Joe Locastro, WB2NGX, 183-1/2 Lake Avenue, Auburn, NY 13021.

COMMODORE CW Interface with weight control, $29. Works with any transmitter. N3JT, Box 19346, Washington, DC 20036.

WANTED - Yaesu 2M-FL-2100B for FT901DM. Mint only. KB5BBU, Dick Ber, 9617 Vista View, Austin, TX 78750, 512-258-7128.

FV-700DM Memory VFO $110, FP-700 Supply $149, FP-757 GX Supply $169, M-6000 RTTY/CW Decoder $649. SASE for list! Wanted: FRG-7700, FRG-7000 or Kenwood R-600, R-1000 or R-2000 Receiver. KA8UWR, Box 1202, Akron, OH 44309, 216-376-2402 work.

FOR SALE: ICOM IC745 w/FM, FT SSB filter, mic, and service manual. Excellent condition, clean, never mobile - $800. Also: IC551 6M transceiver w/pass-band tuning and internal ARR preamp - a contest winner, good condition - $350. Mike Owen, W9IP/2, 315-379-9669 before 9 PM EST.

WANTED: Swan 100 MXA Xcvr and AC Pwr Supply. K5JGU, 713-864-7435.

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CLIPPERTON 1978 movies and slide show no longer available for hamfests. See ad elsewhere this issue for super slide show, "30 Greatest DXpeditions Of All Time". WA4WME.

COLLINS 75S1, Collins NB, $175. 32S1 516F2 $250 mint. W9ZR, 1-414-434-2938.

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DRAKE UV-3 excellent condition. Guaranteed sale to best offer. KH6PP, 46-490 Kuneki, Kaneohe, HI 96744.

WANTED: MFJ949C antenna tuner, speaker/mike for Kenwood TH215A, Atlas 210X mobile mount including hardware. Bill Strickland, 4312 Hunt Drive, Huntsville, AL 35816.

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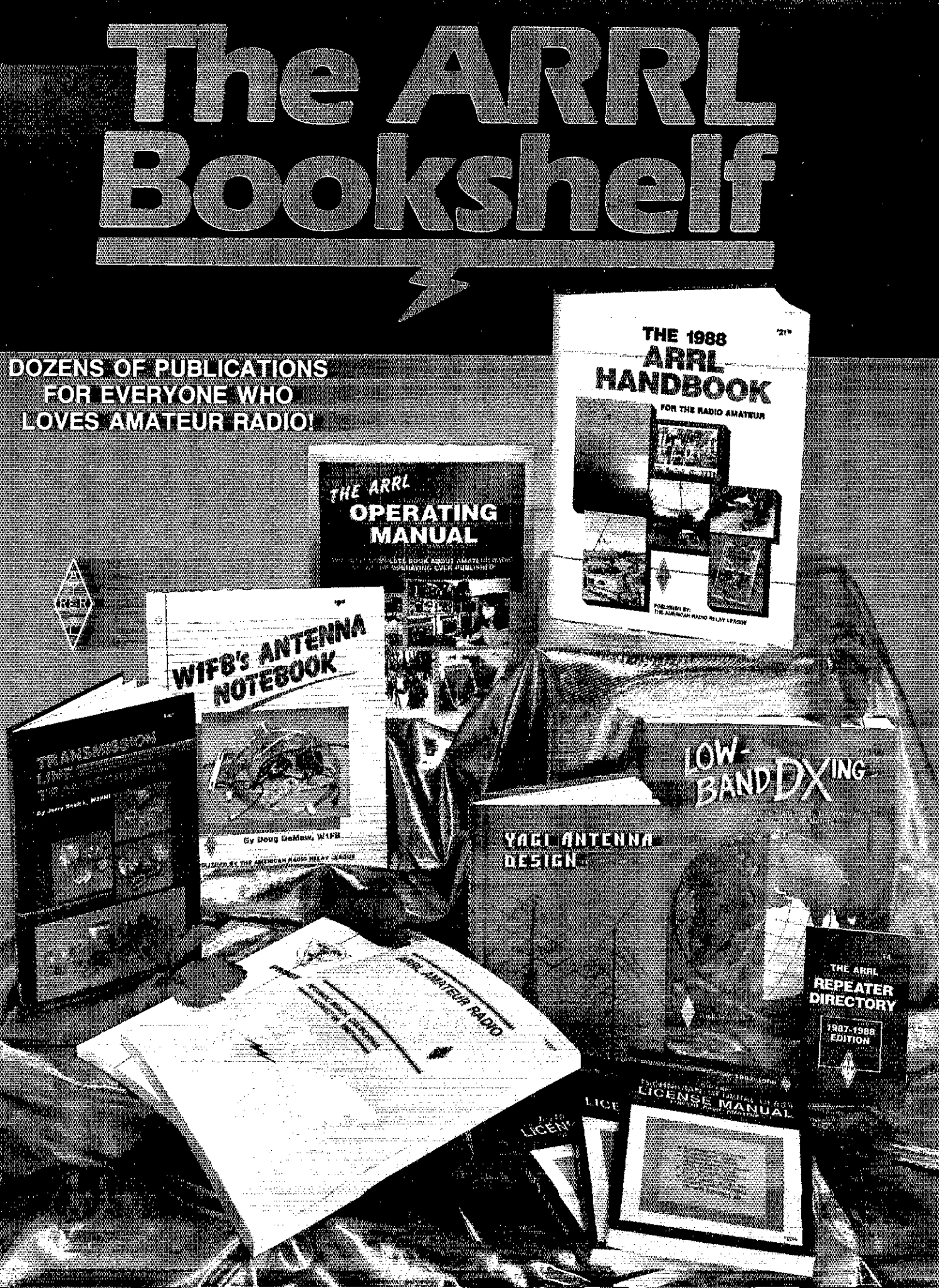

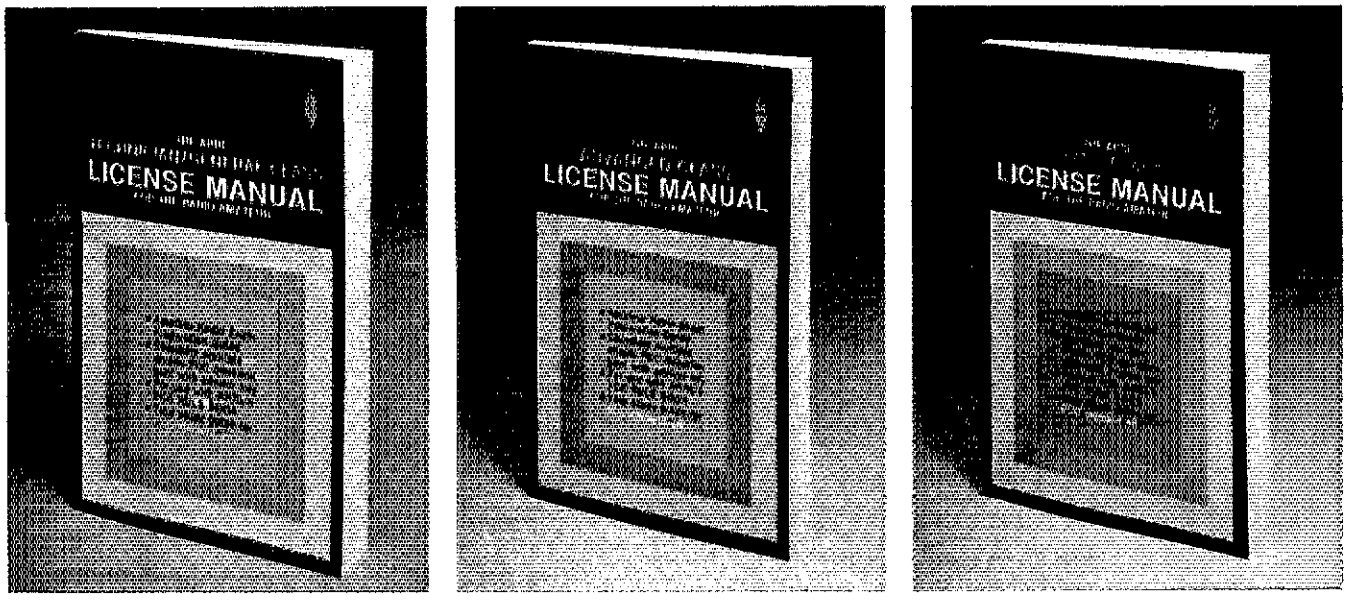

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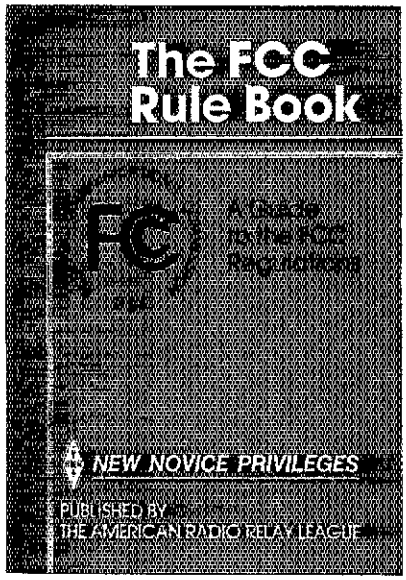

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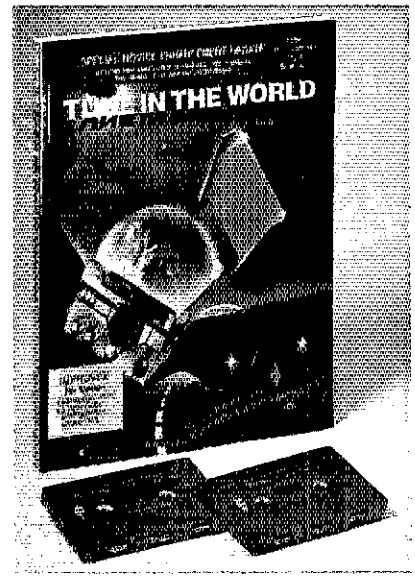

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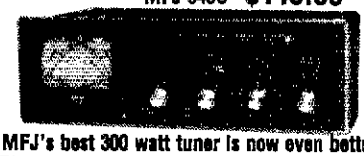


MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

2 KW COAX SWITCHES

MFJ-1702 **$19.95**

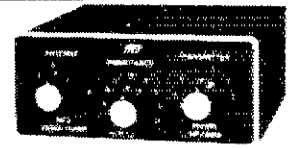
MFJ-1702. $19.95. 2 positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

$29.95 MFJ-1701

MFJ-1701, $29.95. 6 positions. White markable surface for antenna positions.

MFJ's Smallest VERSA TUNER

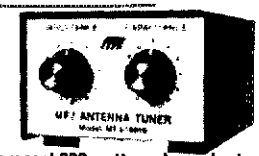
MFJ-901B **$59.95**



MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines continuously from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier for proper matching. Efficient airwound inductor gives more watts out. 4:1 balun for balanced lines. 5 x 2 x 6 inches. Rugged black all aluminum cabinet.

MFJ's Random Wire TUNER

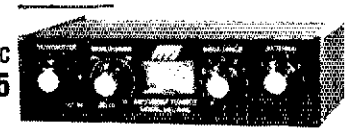
MFJ-16010 **$39.95**



MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

MFJ's Mobile TUNER

MFJ-945C **$79.95**



Designed for mobile operation! Small, compact. Takes just a tiny bit of room in your car. SWR/dual range wattmeter makes tuning fast and easy. Careful placement of controls and meter makes antenna tuning safer while in motion.

Extends your antenna bandwidth so you can operate anywhere in a band with low SWR. **No need to go outside and readjust your mobile whip.** Low SWR also gives you maximum power out of your solid state rig—runs cooler for longer life.

Handles up to 300 watts PEP RF output. Has efficient airwound inductor, 1000 volt capacitor spacing and rugged aluminum cabinet. 8x2x6 inches. Mobile mounting bracket available for $5.00.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT SATISFIED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (less shipping).
• One year **unconditional** guarantee • Made in USA
• Add $5.00 each shipping/handling • Call or write for free catalog, over 100 products.

MFJ

MFJ ENTERPRISES, INC.
Box 494, Mississippi State, MS 39762

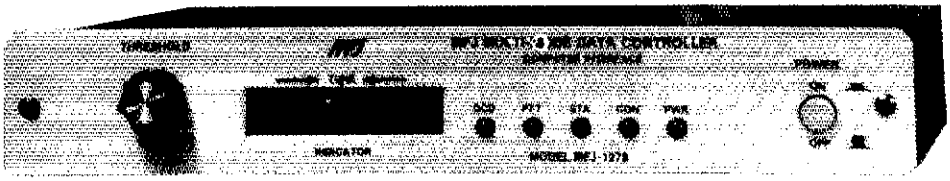
TO ORDER OR FOR YOUR NEAREST DEALER, CALL TOLL-FREE

800-647-1800

Call 601-323-5869 in Miss. and outside continental USA Telex 53-4590 MFJ STKV

VISA® MasterCard

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 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

LEFT Handed Vibroplex Bug wanted in good original condition. AEA MBA-RC $210. Spencer Cromwell, K6VRS, 33815 133rd Avenue SE, Auburn, WA 98002, 206-833-7298.

SELL: Collins KWS-1 Amateur Transmitter, mint condition, with Heathkit RX-1 Mohawk Receiver, $1100. James, 1713 58th Street, Brooklyn, NY 11204, 718-256-4910.

MINIATURE Straight Key Tie Tack or Lapel Pin in 14 karat gold! See our display ad in *QST* Magazine - December 1987 issue, page 176. KDØQS, Tuttrup, 309 16th Avenue NE, Waseca, MN 56093, 1-507-835-7341.

WANTED: Ameco Preamp. Steve, KØSR.

FOR SALE: Attention Novices, Heathkit Transmitter SB-401, CW-SSB, 80-10 Meters, $135. Realistic DX-300 Solid State Receiver, Digital, 20 KC, 30 MHz, $135. Both excellent condition. I will ship. K9JON, 312-758-1985, Illinois.

WANTED - Fiberglass poles - 14 ft. - need eight. Also, CD 45 Rotator or equivalent. Tom Withem, WA9FHM, 1744 Lilly Lane, New Albany, IN 47150, 812-945-4810.

CRYSTALS-Build Something: Remember the New Year is going fast and you resolved to build a QRP rig or low power "AM" phone or reactivate or convert that old rig etc. Do it! FT-243's made to your ordered frequency. 30M $2.95, five or more $2.50. 40M fundamentals and multipliers to 20M, 15M, 10M, $2.50, five $1.95 each. 80M $2.95, five $2.50. 160M $3.95, five $2.95. 10M, 12M overtones $4.95. Sockets 95 cents. Airmail 35 cents per crystal. Stamps or long SASE for listings - circuits. 1700-60,000 kilocycles. "Crystals Since 1933". WØLPS, C-W Crystals, Marshfield, MO 65706.

QRP RIG Wanted: SSB/CW, 80-10, 5W maximum. Working or not. Send condition, price to N8EKA, 520 N 18th Street, Cambridge, OH 43725.

KENWOOD TS-820S with MC-50 mike and 12 V mobile converter. In great condition $450. Triex THD-237 crank-up tower $190: pick-up only. Rich, W3HWJ, 5988 Starwood Drive, San Jose, CA 95120, 408-268-2997.

CONNECTORS Wholesale, PL-259, Reducers, F-59, F-56. For details write, Global Connections, 7102 Old English Road, Lockport, NY 14094.

WANTED—Hallicrafters SX-25 in working condition. No junk. WØJRN, 5985 South Milwaukee Way, Littleton, CO 80121.

DEAD Battery Pack??? NiCds/Inserts/Rebuilding. Replacement inserts, less wires/plugs: ICOM BP2 $17.95, BP3(std.) $16.95, BP5 $23.95. Kenwood: TR2400 $19.95, TR2500/2600 $24.95. Tempo: S1/270mah $21.95, S1, 2, 4, 5, 15/450mah $22.95. Azden: 300 $19.95. Ten-Tec: 2991 $24.95. Santec: 142/1200 w/plug $21.95. Yaesu: 207/208R $23.95. For rebuilding. Add $3 and we install inserts in ICOM or Kenwood. (Send your packs.) For others/info., SASE. In PA add 6%. Add $2 S&H/order. Cunard Associates, RD 6, Box 104, Bedford, PA 15522.

SELL: Alpha 76 Linear Amplifier $2500. Kenwood SW-200A $50. Contact Bob, N2HKM, 201-945-0534.

WEST COAST Swap Sheets: Free Ad, Low, Low, Prices. SASE: WD6APC, 4076 North Hammel, Fresno, CA 93727.

WANTED: Zenith TransOceanic Model 7000 Toshiba Global or Sony Earth Orbit Receiver. Bill Wade, 657 14th Avenue, Prospect Park, PA 19076.

FOR SALE: CDE Ham 1V Ant. Rotor and Cushcraft A4 Beam. Both new in box, $375. Yaesu FT 101B Transceiver, $225. Dave, WA7GBM, phone 509-738-6273.

SELLING GLBT144 2M Transmitter $35; Apple II+ clone computer, drive, monitor, software, asking $275; Apple IIC computer, monitor, printer, power supply, software, asking $600; Commodore 4022 printer asking $125; mint Heathkit HW-2036A 2M FM, $120; 12 V 10 amp supply $35; Teletype model 43 terminal $150; 290 feet 7/8 Heliax, 2 connectors, asking $500; ICOM IC-RP3010 VHF repeater, VHF duplexer, asking $1200. Ray Ihly, WA2LVY, 60 Walton Lake Terrace, Monroe, NY 10950, 914-783-9485.

ICOM IC-02AT with HM-9 speaker/mic, HS-10 headset, HS-105A VOX, case, manual, other accessories, hardly used, $259. Fred, 413 S. New Aromore Avenue, Broomall, PA 19008, 215-356-7292.

KENWOOD TR2500 with 2 batteries, charger, leather case, and MFJ-313 Converter (additional 154-164 receive range). Cost $400, sell $195 postpaid. Also Kenwood TH-21AT with 2 batteries and charger. Cost $240, sell $110 postpaid. Rob, WB5VXL, 319-338-7943 evenings.

WANTED: Johnson SSB Generator. Thurtell, 382 N. Harvey, Plymouth, MI 48170, 313-453-8303.

FOR SALE: Apple II plus computer, dual Comrex drives, 80 columns, Silentype printer, serial card, monochrome monitor, Z80CPM card, AEA-CP-1 RTTY terminal and software, packet software, DOS 3.3, $450. Local pickup only. Currently in operation. W1FYR, HCR Box 69, Gilsum, NH 03448, 603-352-8399.

WANTED: Drake T4X Xmtr + PS. W6WI, 707-996-8373.

PK-64 With HFM-64 for C-64, installed, $155. TH-21A with TU-6 installed, 2M handheld, $145. Hustler Mobile HF antenna system with Estes filters, $85. Excellent condition, will ship UPS. W8HSU, 216-835-0610.

FT-101 Owners. Get top-rated 52-page Volume 3 of Fox-Tango Newsletters. Chock full of hints and kinks, semi-pictorial schematics of PC boards, and valuable two-sided 11' x 17' Service Control/Simplified Alignment Chart. Only $7 postpaid ($9 overseas). FTC, Box 15944, W. Palm Beach, FL 33411, phone 305-683-9587.

WANTED: Collins 75A-4. Thurtell, 382 N. Harvey, Plymouth, MI 48170, 313-453-8303.

WANTED: Manual for "Johnson Viking Kilowatt Amplifier". Good photocopy will do. Millett G. Morgan, Box 92, Hanover, NH 03755, 603-643-3559.

ROSS'$$$$ New Specials: Kenwood TS-811A $989.90, TS-180S $689.90, TW-4100A $549.90, Alliance HD-73 $104.90, Hal CT-2100 $529.90, ST-6000 $799.90, PCI-2000 $489.90, Robot 800C $589.90, 1200C $1199.90, 450C $699.90, Drake 7000E $439.90. All L.T.O. 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.

SELL: Ten-Tec Omni 545, Power Supply, all filters, factory WARC, excellent condition. $450, I ship UPS. Bob, W1VS, 404-843-8547 evenings.

SPRING Cleaning Sale—2M: ICOM IC22-S $95, Regency HR-212 $65, TR-2600 Softcase $15, TR-2600 C-Cell Battery Pack $10; HF: AV3 10-15-20M Vertical $35, Century 21 $165, AEA ATU-1000 $750, Hal ST-6 $150; Misc: TAPR TNC-2 $110, Heath VLF Converter $35, Heath FET VOM $25; AD7I, 201-834-1149 anytime.

LINEAR Amp, mint Heath SB220 2KW $595. Jack, WA2V, 201-486-0039, 1117 De Witt Terrace, Linden, NJ 07036.

SELL: Ten-Tec SX325 Short Wave Receiver $325. W2FZM, 431 Oakland, Maple Shade, NJ 08052.

KENWOOD TS-830S with Fox Tango SSB Filters, YK-88CN, YG-455CN CW Filters and VFO-230, $835. Rick, KS2F, 716-544-0776.

ICOM IC-551D 6M Transceiver $525; ICOM IC-3200A 2M Transceiver w/UT-23, AH-32 and Mount $485; Panasonic RF-4900 SW Receiver $275; Yaesu 727R 2M/440 Handheld $400; Bearcat BC100XL Handheld Scanner $125; Standard SRC-146A 2M Handheld w/Charger $100. All items excellent condition with box and manuals. Ernie Barbieri, WB2IMH, 215-649-2586 after 9 PM EST.

FOR SALE: Kenwood TS-520 SE HF Transceiver. Excellent condition. Used very little. $285 plus shipping. 318-377-0651, WB5UIA, 903 Madison, Minden, LA 71055.

HILLTOP QTH in North Jersey at 1200 feet. Gracious 4 bedroom, 2- 1/2 bath, Colonial w/fireplace, full basement, 2-car garage. 1.2 acres with wooded back. Contest winning 70' LM-470 tower and antennas. Easy access to I-80. Budd Lake, Max Trescott, K3QM, 201-627-6400 Ext. 334.

FOR SALE: Swan 100MXA all solid state mobile 80-10 meters rig. 100 watts PEP. With mobile mounting bracket. Used very little. $395 or best offer. KE7AQ, 920 N. Leroux, Flagstaff, AZ 86001, 602-779-2978.

HEATHKITS Wanted: SB-614 monitor scope, VL-2280 two meter amplifier, SB-230 KW amplifier. Contact G. Hawrysko, K2AWA, P.O. Box 568 Boro Hall, Jamaica, NY 11424.

FOR SALE: Yaesu FT-208R (NC-8 quick charger power supply) FBA-2 battery adapter & spare battery leather case. MFJ-313 VHF converter mint condition, $300. K2QFX, tel. 201-752-4845.

NEW Eimac 5-125B tubes $40 each. Have 12. John Gibson, 1075 Sterling Avenue, Berkeley, CA 94708, 415-849-1051.

KIT, Transceiver, HW101, half completed, with PS23, Heath desk microphone, and speaker HS1661, $160. W2IXV, 305-485-5913.

FOR SALE: Dentron Jr. Tuner $40, Heath Grid Dipper $45, Heath Transistor Checker $50, Smithe Bantam 10-80M Portable Aluminum Dipole $40. Shipping included. John Bojack, NØHRM, 249 Riverwoods Lane, Burnsville, MN 55337, 612-894-3926.

ROSS'$$$$ Used March Specials: Kenwood TS-700A $329.90, AT-230 $179.90, Private Patch II $189.90, Yaesu FV-200 $109.90, FP-707 $99.90, FT-ONE $1295.90, FT-980 $989.90, Hal ST-5000 $99.90, CRI- 200 $169.90. 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.

SALE: Estate of W1BOM; Swan 2 KW PEP 6 meter station: 250-C transmitter, $400; 117XC power supply, $125; TV2-C 2 meter transverter, $250; noise silencer, $35; VOX, $35; hand mike, $18; 14-C DC converter, $100; Mark 6-B linear, $500; 6-B power supply, $250. 55 foot EZ-Way crank-up, tiltover motorized tower including large 2 and 6 meter beams, $1000. All in very good condition. FOB Simsbury, CT. F.W. Cooper, W3NV, 12 Westborough Drive, Simsbury, CT 06089, 203-651-0341.

SELL: GR916A $50, GR821A $30, Boonton 260A Q meter $30. Pick up only. K4QJ, 5312 Beacon Road, Palmetto, FL 34221, 813-722-0680.

SELL: ICOM IC-751A all HF band xcvr, PS-35 power supply, SM-8 microphone. Exellent condition. $950. Bill Giffen, KE6FM, 719-481-4885 evenings.

KWM380: Processor, Blanker, Control Interface, WARC, 1.7 KHz-360 Hz-140 Hz Filters, Rack Kit, Blower Kit, SM380 Mike. Factory update mods. Service manual $2200. KE5BK, 5526 Mona Lane, Dallas, TX 75236, 214-298-8988.

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.

2nd CW Holder seeks USCG RO license and subsequent 6 month sea endorsement via non-union employer. Single, previous sea time, world traveler. K1BTD.

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

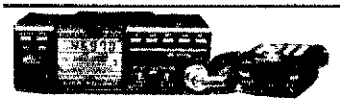
KENWOOD

TS-940S LIST $2349
NEW Top-of-the-Line
HF Transceiver
• 100% Duty Cycle
• 40 Memory Channels
CALL FOR SPECIAL PRICES!!

TS-440S NEW! LIST $1299
CALL FOR SPECIAL SALE PRICE

TS-140S LIST PRICE $899
CALL FOR SPECIAL SALE PRICE!

TS-711A LIST $999
TS-811A LIST $1199
CALL FOR SPECIAL PRICE



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TR-751A LIST $629
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TM 3530A (25W)	LIST $479
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TH-25AT
TH21BT, TH31BT
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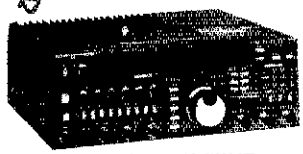
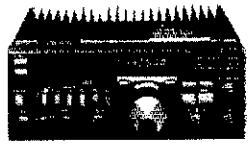


FT 767 GX HF/VHF/UHF
LIST $1895 CALL FOR SALE PRICE



FT-757GX/II LIST PRICE $1,049
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FT 73R 70 cm HT LIST $314.95
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Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

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IC-761 New HF XCVR
• Built-in AC Power Supply
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• QSK Up To 60 WPM
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62 Memories LIST $2,245

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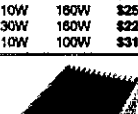
561 Corsair II	SALE $1,199.95
960 Power Supply	$219.95
229 2KW Tuner	$319.95
425 Titan Amplifier	$2,299.95

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

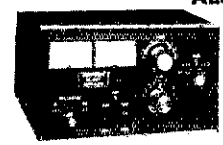


rfc 2-317 2M
30W in = 170W out
LIST $299.00

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
3-22	220	2-20W	$112.00
3-211	220	2-110W	$299.00
3-312	220	30-120W	$264.00

Call For Sale Prices

AMERITRON AL80A



AL80A	$985.00	ATR10	$325.00
AL84	479.00	ATR15	380.00
AL1200	1825.00	RCS4	134.50
AL1500	2370.00	RCS8V	134.50

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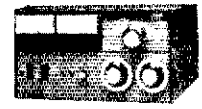
AMP SUPPLY



Model	List	Model	List
LK-450	$899	LA 1000 NT	$ 579
LK500ZC	$1395	LK 500 NT	$1595
LK 800 A	$2695	LK 800 NT	$2995
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ELH-260D.....

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ALR-22HT.....
ALR-72T.....
ALD-24T.....

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KPC 4 Node Controller.....$299.9
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260/262 Dry Loads	$29.95/$59.95
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901/941D Tuners	$59.95/$99.95
949C/989 Tuners	$139.95/$299.95

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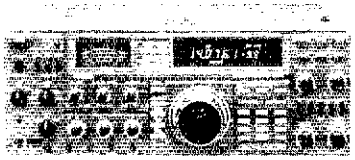

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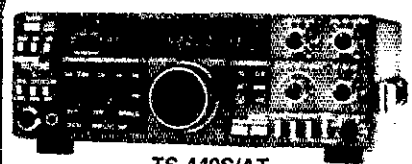
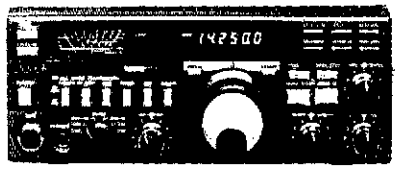
IC-745 Gen. Cvg Xcvr	1049.00	Call $
IC-751A Gen. Cvg. Xcvr	1649.00	Call $
IC-575A 10m/6m Xcvr	1399.00	Call $
Receivers		
IC-R7000 25-1300+ MHz Rcvr	1099.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	949.00	Call $
VHF		
IC-275A All Mode Base w/PS	1199.00	Call $
IC-275H All Mode Base 100w	1389.00	Call $
IC-27A FM Mobile 25w	429.00	Call $
IC-27H FM Mobile 45w	459.00	Call $
IC-28A FM Mobile 25w	429.00	Call $
IC-28H FM Mobile 45w	459.00	Call $
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-47A FM Mobile 25w	549.00	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 $



TS-440S/AT

HF Equipment	List	Juns
TS-940S/AT Gen. Cvg Xcvr	$2349.95	Call $
TS-940S Gen. Cvg Xcvr	2119.95	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-440S Gen. Cvg Xcvr	1099.95	Call $
TS-140S Compact, Gen. Cvg Xcvr	899.95	Call $
TS-680S HF Plus 6m Xcvr	999.95	Call $
TL-922A HF Amp	1599.95	Call $
Receivers		
R-5000 100 kHz-30 MHz	949.95	Call $
R-2000 150 kHz-30 MHz	699.95	Call $
VHF		
TS-711A All Mode Base 25w	999.95	Call $
TR-751A All Mode Mobile 25w	629.95	Call $
TM-221A Compact FM 45w	419.95	Call $
TM-2530A FM Mobile 25w	459.95	Call $
TM-2550A FM Mobile 45w	489.95	Call $
TM-2570A FM Mobile 70w	589.95	Call $
TH21-BT FM, HT	279.95	Call $
TH-205 AT, NEW 2m HT	279.95	Call $
TH-215A, 2m HT Has It All	359.95	Call $
TH-25AT 5w Pocket HT NEW	329.95	Call $
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 $



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HF Equipment	List	Juns
FT-ONE Gen. Cvg Xcvr	$2859.00	Call $
FT-980 9 Band Xcvr	1795.00	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 $
FT-73 R/TT Mini HT	349.95	Call $
FT-709RH FM HT 4w	389.95	Call $
VHF/UHF Full Duplex		
FT-736R, New All Mode, 2m/70cm	1749.95	Call $
FT-726R All Mode Xcvr	1095.95	Call $
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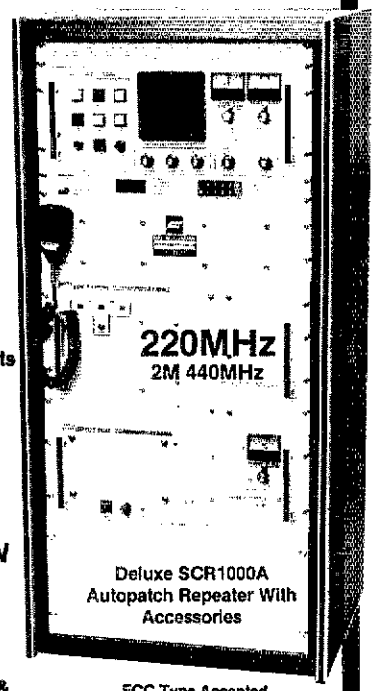

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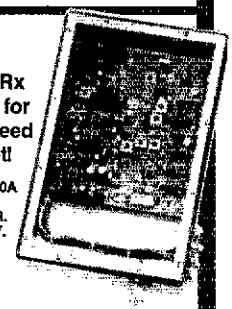

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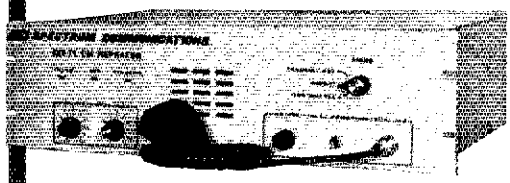

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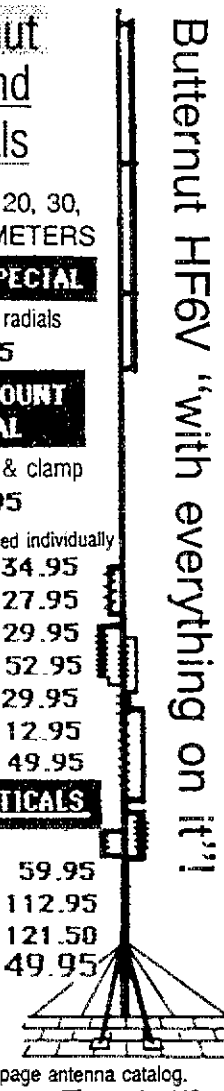

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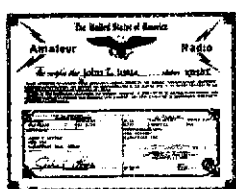

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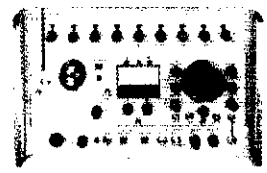
MN-2700 Ant tuner 199 f
MS-4 Speaker 19 mwv
MS-7 Speaker 29 f
P-75 Phone patch 49 f
PS-7 Power supply 149 wf
PS-75 Power supply 89 m
R-4A Ham Rcvr 149 m
R-4B Ham Rcvr 179 m
RV-7 Remote VFO 99 c
SP-75 Speech proc 79 f
Theta 7000E Terminal 229 m
Theta 9000 Terminal 269 m
TR-4C Xcvr 229 wf
TR-5 Xcvr 329 c
TR-7 Xcvr 499 mf
TR-7/tan/DR tilt 549 f
TR-7/tan/nb/aux/3 tilt 629 c
ETO
374A Amplifier 1695 m
GALAXY
100 KHz cal $ 9 m
HAL
CRI-100 Interface $ 99 m
CRI-200 Interface 139 m
CI-2100 Rcv terminal 199 v
CWR-6750 Port reader 269 m
DS-3000KSRV2 Terminal 269 m
ST-6000 Demodulator 399 m
HALLICRAFTERS
Mobile mt for SR-150 $ 29 m
HENRY
1-KD5 Amplifier $449 f
HEWLETT PACKARD
HP-410B VTVM $ 49 m
ICOM
AT-100 Auto ant tuner $249 m
AT-150 Auto ant tuner 269 mcv
AT-500 500w auto tuner 329 c
BP-2 Battery 34 w
HP-1 Headphones 19 m
HS-15SB Switchbox 19 m
IC-120 1.2 GHz FM Xcvr 369 m
IC-251A 2m Xcvr 369 m
IC-255A 2m FM Xcvr 129 f
IC-25H 2m FM Xcvr 239 c
IC-271A 2m Xcvr 599 mwc
IC-271A/PS-25 2m Xcvr/ps 689 c
IC-271A/AG-20 preamp 619 m
IC-271A/PS-25/AG-20 719 m
IC-271H 2m Xcvr 769 mf
IC-271H/PS-35 2m Xcvr/ps 849 m
IC-451A 430 Xcvr 469 mw
IC-45A 440 FM Xcvr 199 c
IC-471A 430 Xcvr 599 w
IC-471H 430 Xcvr 799 f
IC-47A 440 FM Xcvr 329 w
IC-560 6m Xcvr 349 m
IC-730 Xcvr 489 fc
IC-740/ps/fm/mkr/2 filts 599 c
IC-745 Xcvr 689 c
IC-751 Xcvr 799 m
IC-900A/UX-29A 2m 639 v
LC-2AT Case 19 w
LDA Interface 19 f
PS-15 Power supply 99 f
PS-20 Power supply 159 mw
PS-30 Power supply 179 w
PS-55 Power supply 139 m
R-71A/RC-11 remote 659 w
R-71A SW receiver 629 w
RM-2 Controller 69 m
SM-6 Desk mic 25 m
KDK
FM-2033 2m FM Xcvr $199 c
FM-240 2m FM Xcvr 249 mw
KENWOOD
AT-200 Ant tuner $ 99 m
AT-230 Antenna tuner 169 m
AT-250 Auto ant tuner 269 f
BC-5 Mobile charger 24 m
CD-10 Call sign disp 39 f
KPS-7 Power supply 39 f
MC-30S Hand mic 29 m
MC-85 Desk mic 99 w
R-1000 SW receiver 269 we
R-2000/VC-10 VHF conv 449 w
SM-220/BS-8 Scope/pan 349 c
SP-940 Speaker 69 m
TM-211A 2m FM Xcvr 279 m
TR-3500 440 FM HT 129 m
TR-3600A 440 FM HT 199 m
TR-9500 430 Xcvr 399 mf
TS-180S/DFC Xcvr 399 c
TS-430S Xcvr 599 m
TS-520 Xcvr 389 mfc
TS-520S Xcvr 399 m
TS-520S/500 Hz filt 429 m
TS-520SE Xcvr 399 c
TS-670 6-40m Xcvr 499 m
TS-700S 2m Xcvr 369 wf
TS-820 Xcvr 399 m
TS-820S Xcvr 469 f
TS-830S Xcvr 699 mc
TS-930S/AT Xcvr 999 m
TS-940S/AT/VS-1 1629 m
TS-940S/500 Hz filt 1499 f
TU-79 Encoder 29 m
TW-4000A/enc 2m/440 429 f
VC-10 VHF conv 129 w
VFO-230 Remote VFO 229 c
VFO-240 Remote VFO 119 m
YK-88A AM filter 49 w
KLM
Echo II 2m SSB Xcvr $ 89 c
MFJ
752B Tunable SSB filter $ 49 e
941 Ant tuner 29 v
MICROLOG
ACT-1 Terminal $169 v
NYE
RFM-005 Power monitor $179 f
OKI-DATA
182 Parallel printer $189 m
PALOMAR
RX-100 Noise bridge $ 39 f
PANASONIC
RF-2200 SW receiver $ 99 m
ROBOT
800 High Terminal $149 mv
800 Low Terminal 149 mv
SANTEC
HT-1200 2m FM HT $ 99 w
SHURE
444 Desk mic $29 mf
SONY
AC-D468 AC adapter $ 10 m
ICF-2010 SW receiver 249 f
TEMPO
ACH Charger $ 19 m
DVS-1 Digital VFO 39 m
TEN-TEC
1150 Circuit breaker $ 12 mwf
225 Power supply 99 mw
228 Ant tuner 99 m
229A Ant tuner 169 v
234 Speech proc 49 m
252MO Power supply 89 f
255 Power supply 119 m
262G Power supply 89 v
276 Calibrator 19 w
280 Power supply 99 m
283 Remote VFO 129 m
444 Linear 969 f
525 Argosy Xcvr 329 m
525 Argosy/cal/500 Hz 369 f
546 Omni-D Xcvr 349 c
546 Omni-D series B 449 f
546C Omni-D series C 499 m
560 Corsair Xcvr 689 m
560 Corsair/3 filts 749 w
570 Century/21 Xcvr 189 w
574 Century/21 Dig Xcvr 249 c
645 Keyer 49 v
670 Keyer 19 m
979 Power supply 69 m
TOSHIBA
V-9035T Beta VCR $169 m
TRANSCOM
SBA-3 AC ps (as-is) $ 19 m
USI
1400C 14" color monitor $ 99 m
PI-3 12" amber monitor 69 m
WILSON
Charger for 1402-SM $ 19 m
YAESU
FBA-1 Batt sleeve $ 2 w
FBA-5 Batt holder 10 w
FL-101 Transmitter 229 m
FRB-1 Relay box 9 m
FRB-707 Relay box 9 f
FRB-757 Relay box 19 w
FRG-9600 VHF/UHF Rcvr 399 m
FT-101 Xcvr 379 m
FT-101B Xcvr 389 w
FT-101E Xcvr 429 m
FT-101EE Xcvr 399 ce
FT-101EE/CW filt 429 v
FT-101ZD Mk III Xcvr 499 f
FT-102 Xcvr 599 mf
FT-102/AM-FM-102 629 e
FT-102/AM-FM/2 filts 689 f
FT-2 Auto 2m FM Xcvr 89 m
FT-707 Xcvr 369 m
FT-726R/430/hf/sat 899 m
FT-980 Xcvr 999 mf
FT-ONE Xcvr 1099 f
FT-ONE/cw/am/fm/ram 1189 m
FT-ONE/keyer/ram 1129 m
FT-ONE Lot 10 Xcvr 1269 w
FV-101B Remote VFO 99 w
FV-102DM Digital VFO 149 e
FV-700DM Remote VFO 89 m
MD-1B8 Desk mic 59 m
NC-2 Charger 39 w
NC-24 Multi-charger 149 m
SP-102 Speaker 29 e
SP-102P Spkr/patch 59 f
SP-901P Spkr/patch 49 f
SP-980 Speaker 69 m
XF-8.9HC CW filter 19 w
YD-844A Desk mic 25 f
YH-77 Headphones 15 m
YM-35 Microphone 15 w

1-20-88

USED GEAR INFORMATION

(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. **(2)** We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. **(3)** Sometimes used gear is serviced **after** we receive your order. Please allow for a few days delay in shipping your order. **(4)** No trades on used gear. **(5)** Used gear policies do not apply to any New Equipment specials, Closeouts, etc.



SINGER-GERTSCH
FM-10CS signal generator with RFM-10A, FIM-3 and ODM-1 options..... **$3295**
OAM-1 AM module FM-10C .. 195
Purchased new, and used exclusively in our service department. Good condx, operational, manual.

NEW EQUIPMENT CLOSEOUTS

AEA
KT-2 Keyer/Trainer 79.95
BT-1 Basic Trainer 49.95
Isopole 220Jr base antenna 29.95
AMPLICA
85° LNA 59
100° LNA 29
CTS
Computermate workcenter 149.95
COLLINS
AC-2808 Blower kit for 380 249.95
ENCOMM
ST-200ET 1.5w 2m FM HT 189.95
ST-400ET 1.5w 440 FM HT 259.95
With ST-200 or 400ET purchase extra battery, soft case, speaker mic & mobile chgr, only $10 extra.
HAL
CT-2100 CW/RTTY Terminal 299.95
KB-2100 keyboard 149.95
ICOM
IC-290H 25w 2m SSB/FM 549.95
IC-490A 10w 430-440 multi 399.95
IC-471A 25w 430-450 multi 749.95
IC-471H 75w 430-450 multi 989.95
Matching receive preamp $9.95 with IC-471A or 471H purchase.
KENWOOD
AX-2 Shoulder strap 9.95
CD-10 Call sign display 49.95
DF-180 Digital freq. control 49.95
FC-10 Freq. controller 29.95
KPS-7A 6A power supply 49.95
LH-1 Leather case 29.95
LH-2 Leather case 29.95
PS-20 4.5A power supply 39.95
TM-401B 440 FM Xcvr 299.95
VFO-120 remote VFO 99.95
TR-3600A 440 FM HT 269.95
TR-9500 440 Multi-mode 469.95
TH-21A* 2m HT 169.95
TH-41A* 440 MHz HT 169.95
TH-41AT* 440 MHz HT/TTP 199.95
TH-21BT* 440 MHz HT/TTP 219.95
TH-41BT* 440 MHz HT/TTP 219.95
*Includes FREE Extra Battery Pack
TU-6 tone board only $4.95 with the purchase of a TH-41AT.
MIDLAND
18-950 220 5/8 trk/roof ant 14.95
YAESU
FV-107 Remote VFO 69.95
ZENITH
A-8477 TV Hi-pass filter 9.95

AES® Store Locations	Local Phone	Nationwide	In-State
m = **Milwaukee, WI** 53216; 4828 W. Fond du Lac Ave.	(414) 442-4200	1-800-558-0411	1-800-242-5195
w = **Wickliffe, OH** 44092; 28940 Euclid Ave	(216) 585-7388	1-800-321-3594	1-800-362-0290
f = **Orlando, FL** 32803; 621 Commonwealth Ave	(305) 894-3238	1-800-327-1917	1-800-432-9424
c = **Clearwater, FL** 34625; 1898 Drew St	(813) 461-4267		
v = **Las Vegas, NV** 89106; 1072 N. Rancho Dr	(702) 647-3114	1-800-634-6227	
e = **Chicago, IL** Erickson Communications (assocate)	(312) 631-5181		

MasterCard VISA

ADVERTISING DEPARTMENT STAFF

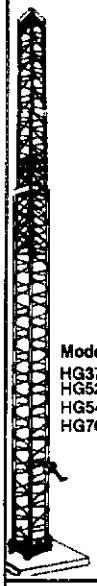
Bruce O. Williams, WA6IVC, Advertising Manager

Angela Beebe, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel

Index of Advertisers

ANTENNA/TOWER SALE!



hy-gain

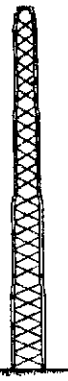
CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



ROHN

Self Supporting Towers On SALE!

FREIGHT PREPAID

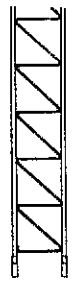
- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	228	$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

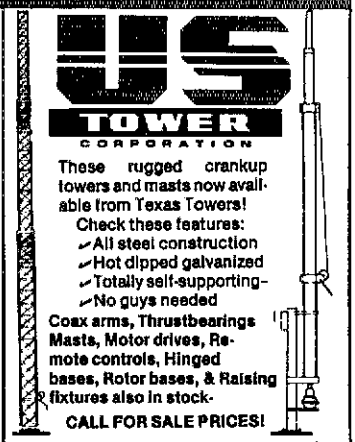
Guyed Tower Packages



- 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	1999	2249
100'	1149	2179	2439
110'	1359	2329	2839
120'	1429	2498	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	$ 549
MA550 mast	22'	50'	10 sq ft	899
TX438	22'	38'	18 sq ft	829
TX455	22'	55'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2059
HDX555	22'	55'	30 sq ft	1879
HDX572	23'	72'	30 sq ft	3229

Note-US Towers Shipped Freight Collect From Visalia, CA Factory

**Note-towers rated at 50 mph to EIA specifications*

RG-213U

$.29/ft $279/1000 ft Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield
- Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086

$.39/ft $379/1000 ft

- Same specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HARDLINE/HELIAX®

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket.....$.79/ft.
⅞" LDF4-50 Andrew Heliax®.....$1.79/ft
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	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
½" Alum	50	3	.5	1.2	2.2
½" Heliax	50	2	.4	.9	1.6
⅞" Heliax	50	1	.2	.5	.9

HARDLINE & HELIAX® CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
⅞" Heliax®	$25	$25	$25	$25
⅞" Heliax®	$49	$49	$49	$49

COAX CONNECTORS

Amphenol Silver PL259.....$1.25
UG21B N Male.....$2.95
9086/9913 N Male Connector.....$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga.....$.10/ft.
¼ mile 18ga copper-clad steel wire.....$30
Dog bone end insulator.....$.79 ea.

Van Gorden

1:1 Balun.....$11 Center Insulator.....$6
Dipole Kits.....D80 $31.95/D40 $28.95
Short Dipole Kits.....SD80 $35.95/SD40 $33.95
All-band Dipole w/ladder line.....$29.95
G5RV all band antenna.....$49.95

ALPHA DELTA

DX-A 160-80-40 Sloper.....$49

CUSHCRAFT

A3 3-el Tribander.....$229
A4 4-el Tribander Beam.....$299
A743 & A744, 30/40 mtr KIT for the A3 & A4 ea$79
AP8 80-10 mtr Vertical.....$139
AV5 80-10mtr Vertical.....$109
D40 40mtr Dipole.....$159
40-2CD 2-el 40 mtr Beam.....$299
A50-5 5-el 6 mtr Beam.....$85
215 WB NEW 15-el 2 mtr Beam.....$85
230 WB NEW 30-el 2 mtr Beam.....$229
421B XL 18-el 2 mtr Beam.....$105
3219 19-el 2 mtr Beam.....$99
220B 17-el 220MHz Beam.....$99
424B 24-el 432MHz Beam.....$85
ARX2B 2 mtr Vertical.....$39

hy-gain

CALL FOR SPECIAL PRICES!

Discoverer 2-el 40-mtr Beam.....
Discoverer 3-el Conversion Kit.....
EXPLORER-14 SUPER-SPECIAL.....
QK710 30/40 mtr. Add-On-Kit.....
V2S 2-mtr Base Vertical.....
V4S 440MHz Base Vertical.....
TH5MK2S Broad Band 5-el Triband Beam.
TH7DXS 7-el Triband Beam.....
TH3JRS 3-el Triband Beam.....
205BAS 5-el 20-mtr Beam.....
155BAS 5-el 15-mtr Beam.....
105BAS 5-el 10-mtr Beam.....
204BAS 4-el 20-mtr Beam.....
64BS 4-el 6-mtr Beam.....
12 AVQ 20-10 mtr vertical.....
14 AVQ 40-10 mtr vertical.....
18 AVT/WB 80-10mtr Vertical.....
18HTS 80-10 mtr Hy-Tower Vertical.....
23BS 3-el 2 mtr Beam.....
25BS 5-el 2 mtr Beam.....
28BS 8-el 2 mtr Beam.....
214BS 14-el 2-mtr Beam.....
2BDQ 80/40 mtr Trap Dipole.....
5BDQ 80-10 mtr Trap Dipole.....
BN86 80-10 mtr KW Balun W/Coax Seal.....

HUSTLER

6BTV 80-10 mtr Vert$129 5BTV 80-10 mtr Vert$109
4BTV 40-10 mtr Vert.$89 G7-144 2-mtr Base $119
G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

HF6V 80-10m Vertical $129 Delivered
- Full Legal Power
- Highest Q Tuning Circuits

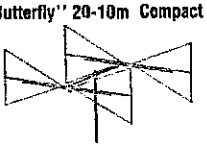
HF2V 80-40m Vertical $129 Delivered
- Full Legal Power
- Automatic Band Switching

Accessories:

RMK II Roof Mtg. Kit.....$49
STR II Stub-Tuned Radials.....$29
TBR160 160m Coil Kit.....$49
30m Add-on Kit.....$29
20m Add-on Kit.....$39
17/12m Add-on Kit.....$27

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

Daiwa MR 750 PE (16.1 sq ft rating).....$289
Additional Motor Units.....$89
Alliance HD73 (10.7 sq ft rating).....$119.95
Alliance U110 (3 sq ft rating).....$49
Telex CD 45II (8.5 sq ft rating).....$Call
Telex HAM 4 (15 sq ft rating).....$Call
Telex Tailtwister (2Q sq ft rating).....$Call
Telex HDR300 Heavy Duty (25 sq ft rating).....$Call
Kenpro KR500 Heavy Duty Elevator Rotator.....$189
Kenpro KR5400 AZ/EL Rotor Package.....$319

ROTOR CABLE

Standard 8 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
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 x 9EE (1/2" x 9" Eye to Eye Turnbuckle)	$9.95
1/2 x 9EJ (1/2" x 9" Eye & Jaw Turnbuckle)	$10.95
1/2 x 12EE (1/2" 12" Eye & Eye Turnbuckle)	$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle)	$13.95
5/8 x 12EJ (5/8" x 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	($8.95
9902LD Cable End (for 6700 cable)	$9.95
Socketfast Potting Compound (does 6-8 ends)	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$29	$49	$69	$89
.18 in Wall	$49	$89	$129	$149
.25 in Wall	$69	$129	$189	$249

ORDER TOLL FREE 1-800-272-3467

Texas, Alaska & for information 1 (214) 422-7306

VISA MasterCard

TEXAS TOWERS

Mon-Fri: 9am - 5 pm
Sat: 9am - 1 pm

Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 • Plano, Texas 75074

(Prices & Availability Subject To Change Without Notice) *(Antenna/tower product prices do not include shipping unless noted otherwise)*

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KENWOOD

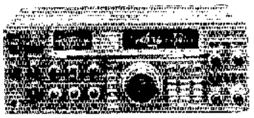
TS440S "DX-CITING"
- 100% Duty Cycle
- 100 Memories
- Direct Keyboard Entry
- Optional Built-in AT

On Sale Now, Call for Price!

YAESU

FT-767GX HF/VHF/UHF BASE STATION
- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-in
- Lots More Features

ICOM



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

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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

rf concepts

2m and 220 MHz Amplifiers GaAsFET Receive Pre-Amps and High SWR Shutdown Protection

MODEL	144 MHz
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

SALE PRICED

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TM-221A
- 2m FM Mobile Transceiver
- 45W Output w/HiLo Switch
- 14 Multi-Function Memories
- TM-421A Available For 440 MHz

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FT-757 GX/II "CAT SYSTEM"
- All Mode HF Transceiver
- Dual VFO's
- Full Break-in CW
- 100% Duty Cycle

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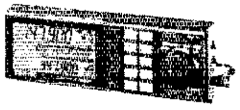
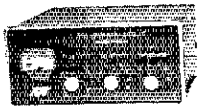


IC-900 SIX BANDS IN ONE MOBILE
- Remote Controller, Interface A Unit, Interface B Unit, Speaker, Mic and Cables
- Six Band Units to Choose
- 10 Memories Per Band
- Programmable Band Scan
- Fiber Optic Technology

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**

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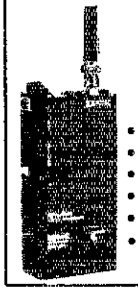
TH-25AT POCKET-SIZED AND POWERFUL
- Frequency Coverage: 141-163 MHz (Rx), 144-148 MHz (Tx)
- Front Panel DTMF Pad
- 5 Watts Output
- 14 Memories
- TH-45AT Available for 440 MHz

YAESU

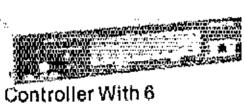
FT23/73R
- Super "Mini" HT's
- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-164 MHz, 440-450 MHz
- 2W Battery Pack or Optional 5W Pack

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

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"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.

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

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New 220 MHz

220: FM for All!

Kenwood brings you a wide range of 220 MHz gear designed for every need. Choose from two types of mobile and two types of HT. The TH-315A is a full-featured HT covering 220–225 MHz. Ten memory channels and 2.5 watts of power. (5 W with PB-1 or 12 V DC.) Uses the same accessories as the TH-215A for 2 meters or TH-415A 440 MHz. For truly "pocket portability," choose the TH-31BT, a thumb-wheel programmable, 1 watt unit. For mobile use, select the TM-321A or TM-3530A.

The TM-321A is the 25 W, 220 MHz, 14-memory version of the super popular, super compact TM-221A. The 25-watt TM-3530A has 23 memories, a 15 telephone number memory and auto dialer. Direct keyboard frequency entry and front panel DTMF pad enhances operating convenience. Novice to Amateur Extra, these transceivers will put everyone on the air "Kenwood Style"!

TH-315A
Full-featured HT

TM-321A
Compact mobile transceiver

TH-31BT/31A
Pocket-held HT

New

TM-3530A
Full-featured mobile transceiver

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

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

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