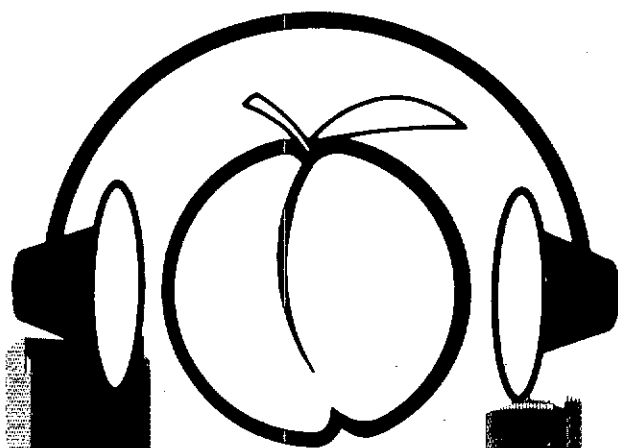


# QST

devoted entirely to Amateur Radio



ARRL National Convention  
July 10-12, 1987 · Atlanta

# We have a wonderful world of RF at Henry Radio

Many Amateurs are professional electronics engineers. This message is for them.

In the beginning Henry Amplifiers were for communications. Many still are. Amateur, commercial, MARS, military, short wave broadcast, FM broadcast, VHF link, domestic, foreign. . . Henry amplifiers go everywhere for diverse services. HF point-to-point, VHF, UHF, SSB, AM, FM, RTTY, packet, meteor burst, digital, marine shore station. . . are you beginning to get the idea? If you need a special purpose vacuum tube amplifier for a specific frequency from

2 MHz to 500 MHz at power levels up to 10,000 watts, we invite your inquiry.

But communications is only the beginning. Think about plasma generation, sputtering and etching, thin film deposition, laser excitation, nuclear magnetic resonance (NMR), photo-emissions and mass spectrometry, scientific research, industrial production. . . Henry equipment is used in all of these applications. We have always been customer driven and still are.

## Recent projects include:

- |   |  |
|---|--|
| <b>10,000 watt 41 MHz Meteor Burst</b><br>U.S. Air Force  | <b>4,000 watts 145 MHz VHF</b><br>Point-to-Point — Indonesia                                     |
| <b>10,000 watts 60 Mhz</b><br>U.S. Air Force  | <b>3,000 watts 320 MHz</b><br>Pulse for Satellite Test station, Hughes Aircraft.                 |
| <b>2,000 watts 45 MHz</b><br>numerous customers including SHAPE Headquarters,<br>U.S. Dept. of Interior, The Mitre Company, M-A Com, Etc. | <b>5,000 watts 400 MHz</b><br>Pulse for Laser Excitation, University of California               |
| <b>2,000 watts 13.5 MHz</b><br>Plasma generator for vacuum etching, many customers.   | <b>2,500 watts 27.12 MHz</b><br>to ignite Argon Torch Photo-Emissions Spectrometry — Switzerland |
| <b>1,000 watts 13.5 MHz</b><br>Same application as previous listing   | <b>1,500 watts 40 MHz</b><br>same application as above — The Baird Corporation                   |
| <b>5,000 watts 13.5 MHz</b><br>Same application as previous listing   | <b>2,000 watts 27.12 MHz</b><br>Mass Spectrometry, VG Isotopes, England                          |
| <b>5,000 watts various Marine HF frequencies</b><br>Shore Stations  | <b>2,000 watts 13.56 MHz</b><br>Sputtering — Munich, Germany                                     |
| <b>10,000 watts 90 MHz</b><br>Laser Excitation, Alumin Co.  | <b>3,000 watts 6 MHz</b><br>Shortwave AM — Broadcast, Iraq                                       |
| <b>2,000 watts 110 to 150 MHz</b><br>United Technology  | <b>2,000 watts 70 MHz</b><br>Airborne Radar Research, England                                    |
| <b>3,000 watts 450 MHz</b><br>Western Research  | <b>5K Classic Amplifiers</b><br>Export   |

If you have a requirement for high power RF, please call Ted Shannon, Mary Silva or Ted Henry (Los Angeles office). And don't forget, Henry Radio still produces the world's broadest line of fine Amateur amplifiers!



## Henry Radio

2050 S. Bundy Dr., Los Angeles, CA 90025  
Butler, Missouri 64730  
Telex: 67-3625 (Henradio) FAX (213) 826-7790

(213) 820-1234  
(816) 679-3127

# KENWOOD

**NEW!**  
Computer Interfaced

## “DX-celence!”

### TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

• **100% duty cycle transmitter.**

Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.

• **High stability, dual digital VFOs.**

An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning “feel”.

• **Graphic display of operating features.**

Exclusive multi-function LCD sub-

display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.

• **Low distortion transmitter.**

Kenwood’s unique transmitter design delivers top “quality Kenwood” sound.

• **Keyboard entry frequency selection.**

Operating frequencies may be directly entered into the TS-940S without using the VFO knob.

• **QRM-fighting features.**

Remove “rotten QRM” with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.

• **Built-in FM, plus SSB, CW, AM, FSK.**

• **Semi or full break-in (GSK) CW.**

• **40 memory channels.**

Mode and frequency may be stored in 4 groups of 10 channels each.

• **Programmable scanning.**

• **General coverage receiver.**

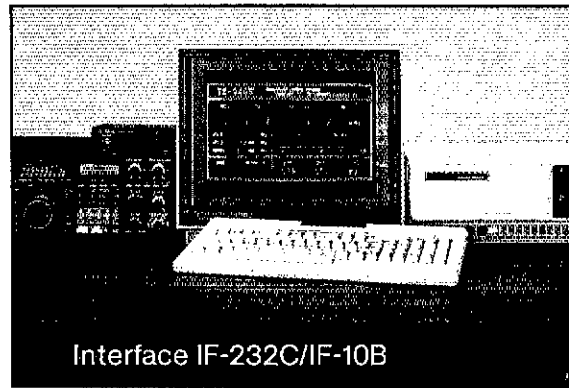
Tunes from 150 kHz to 30 MHz.

• **1 yr. limited warranty.**

Another Kenwood First!

**Optional accessories:**

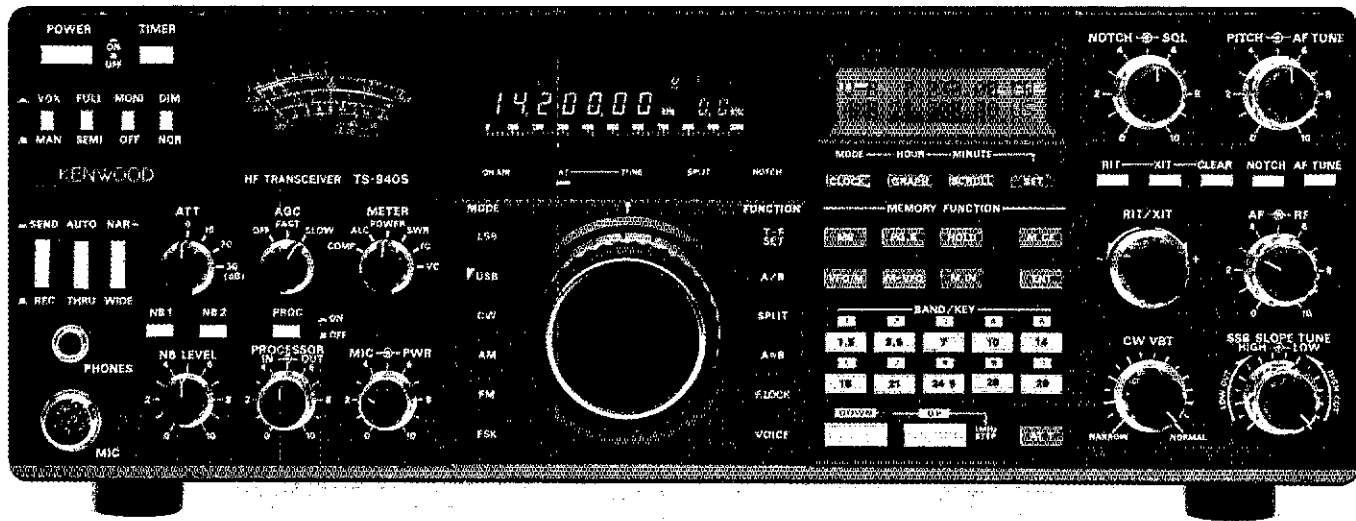
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external



Interface IF-232C/IF-10B

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.

SEE THE TS-940S PRODUCT REVIEW IN THE FEBRUARY 1986 ISSUE OF QST



More TS-940S information is available from authorized Kenwood dealers.

## KENWOOD

KENWOOD U.S.A. CORPORATION  
Communications & Test Equipment Group  
2201E. Dominguez St., Long Beach, CA 90810

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

**NEW!**



# ICOM IC-761

## A NEW ERA DAWNS

- Built-in AC Power Supply
- Built-in Automatic Antenna Tuner
- SSB, CW, FM, AM, RTTY
- Direct Keyboard Entry
- 160-10m/General Coverage Receiver
- Passband Tuning plus IF Shift
- QSK up to 60 WPM

The IC-761 ushers in an exciting new era of amateur radio communications; an era filled with all the DX'ing, contesting, and multi-mode operating pleasures of a fresh new sunspot cycle. The innovative IC-761 includes all of today's most desired features in a single full-size cabinet. This is ham radio at its absolute best!

**Work the World.** The IC-761 gives you the competitive edge with standard features including a built-in AC power supply, automatic antenna tuner, 32 fully tunable memories, self-referencing SWR bridge, continuously variable RF output power to 100 watts in most modes, plus much, much more!

**Superb Design, Uncompromised Quality.** A 105dB dynamic range receiver features high RF sensitivity and steep skirted IF selectivity that cuts QRM like a knife. A 100% duty cycle transmitter includes a large heatsink and internal blower. The IC-761 transceiver is backed with a full one-year warranty and ICOM's dedicated customer service with four regional factory service centers. Your operating enjoyment is guaranteed!

**All Bands, All Modes Included.** Operates all HF bands, plus it includes general coverage reception from 100kHz to 30MHz. A top SSB, CW, FM, AM, and RTTY performer!

**Passband Tuning and IF Shift** plus tunable IF notch provide maximum operating flexibility on SSB, CW, and RTTY modes. Additional features include multiple front panel filter selection, RF speech processor, dual width and adjustable-level noise blanker, panel selectable low-noise RF preamp, programmable scanning, and all-mode squelch. The IC-761 is today's most advanced and elaborate transceiver!

**Direct Frequency Entry Via Front Keyboard** or enjoy the velvet-smooth tuning knob with its professional feel and rubberized grip.

**Special CW Attractions** include a built-in electronic keyer, semi or full break-in operation rated up to 60 WPM. CW narrow filters and adjustable sidetone.

**Automatic Antenna Tuner** covers 160-10 meters, matches 16-150 ohms and uses high speed circuits to follow rapid band shifts.

**Complementing Accessories** include the CI-V computer interface adapter, SM-10 graphic equalized mic, and an EX-310 voice synthesizer.

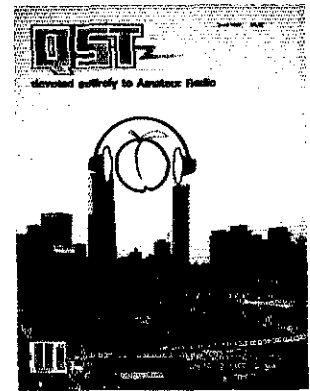
**You're The Winner** with the new era IC-761. See the biggest and best HF at your local ICOM dealer.



ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 Customer Service Hotline (206) 454-7619  
3150 Premier Drive, Suite 126, Irving, TX 75063 / 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349  
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 761487





### OUR COVER

This year's National is sure to be hospitable. Even if you're a Yank... ah, from the North! Join your friends for a weekend to remember in Atlanta. The story's on page 45. (Logo design by Jim Massara, N2EST74; photo courtesy Steve Hogben Architectural Photographics, Atlanta, Georgia)

June 1987 Volume LXXI Number 6

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### OPERATING

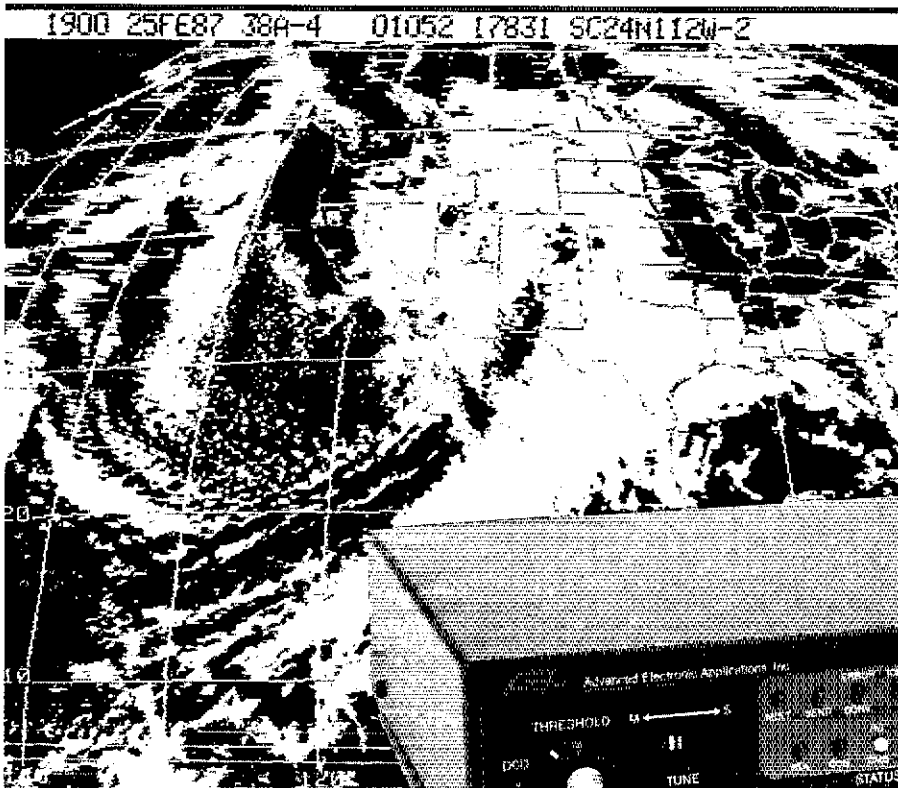
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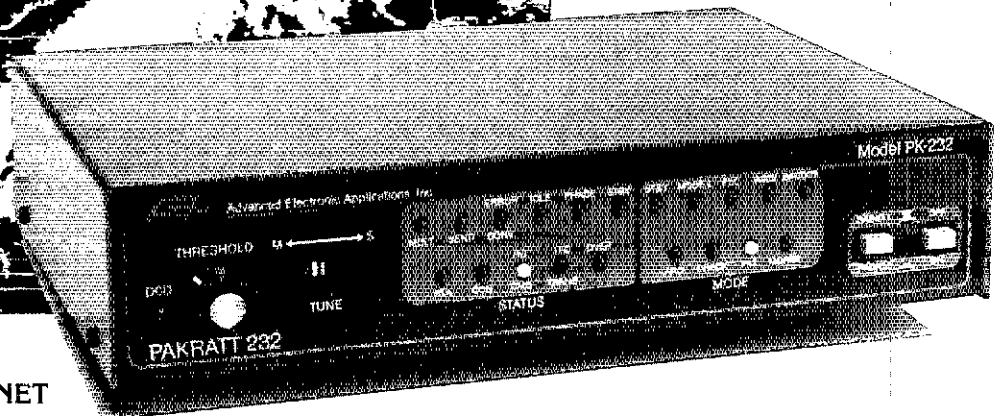
New PK-232 Breakthrough

# 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<sup>95</sup>**  
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.



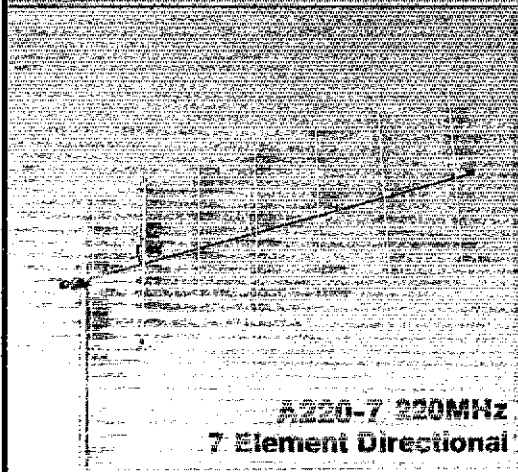
**Brings you the Breakthrough**

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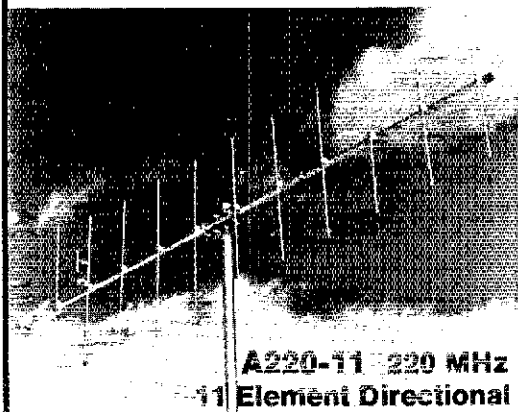


# CUSHCRAFT ENHANCERS FOR THE NEW NOVICE BANDS

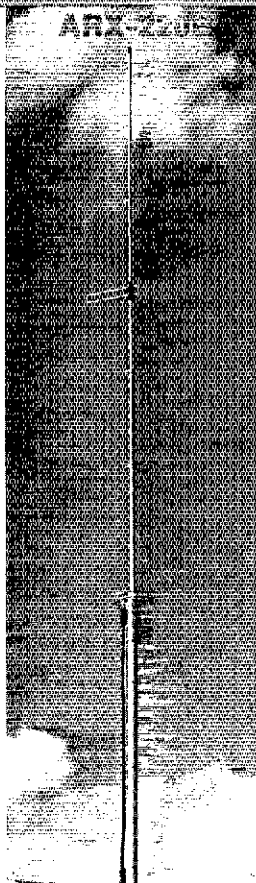
ALL BAND VERTICAL



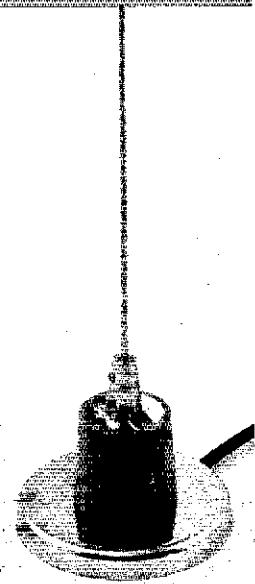
**A220-7 220MHz  
7 Element Directional**



**A220-11 220 MHz  
11 Element Directional**



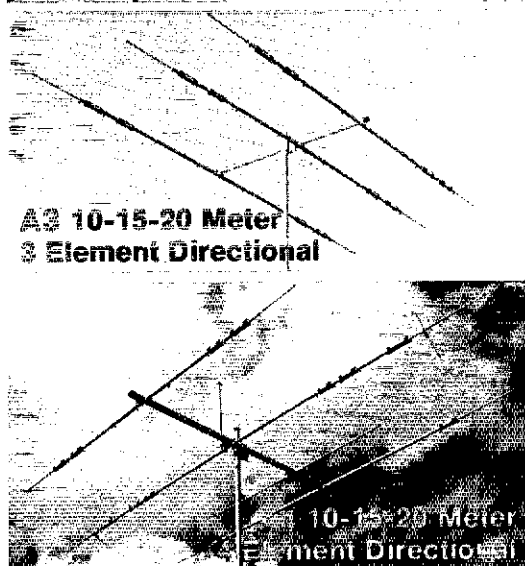
**220MHz  
Omni-Base**



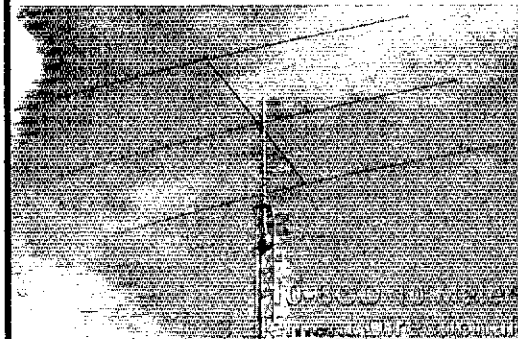
**CS-220  
220MHz Mobile**



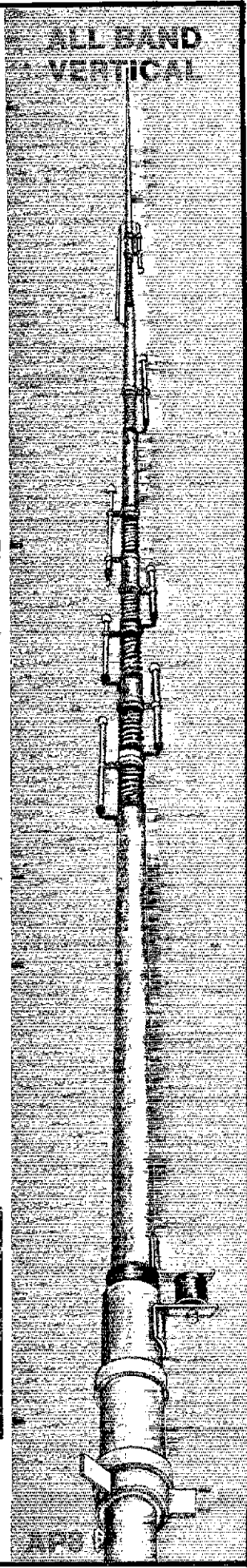
**220MHz Portable**



**A3 10-15-20 Meter  
3 Element Directional**



**A4 10-15-20 Meter  
4 Element Directional**



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# KENWOOD

# NEW!

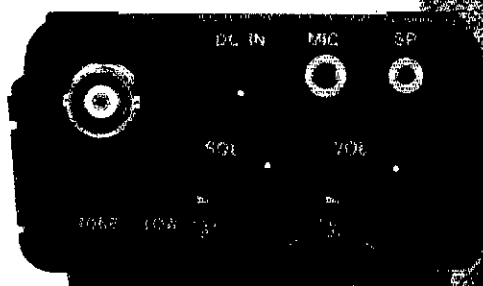
## This HT Has it All!

### TH-215A/415A

#### Full-featured Hand-held Transceivers

Kenwood brings you the greatest hand-held transceiver ever! More than just "big rig performance," the new TH-215A for 2 m and TH-415A for 70 cm pack the most features and the best performance in a handy size. And our full line of accessories will let you go from ham-shack to portable to mobile with the greatest of ease!

- **Wide receiver frequency range.** Receives from 141-163 MHz. Includes the weather channels! Transmit from 144-148 MHz. Modifiable to cover 141-151 MHz (MARS or CAP permit required).
- **TH-415A covers 440-449.995 MHz.**
- **5, 2.5, or 1.5 W output, depending on the power source.** Supplied battery pack (PB-2) provides 2.5 W output. Optional NiCd packs for extended operation or higher RF output available.
- **CTCSS encoder built-in.** TSU-4 CTCSS decoder optional.
- **10 memory channels store any offset, in 100-kHz steps.** Each memory channel can store frequency, frequency step, offset, reverse switch position, and CTCSS frequency.
- **Nine types of scanning!** Including new "seek scan" and priority alert.
- **Intelligent 2-way battery saver circuit extends battery life.** Two battery-saver modes to choose, with power save ratio selection.
- **Easy memory recall.** Simply press the channel number!
- **12 VDC input terminal for direct mobile or base station supply operation.** When 12 volts is applied, RF output is 5 W!
- **New Twist-Lok Positive-Connect™ locking battery case.**
- **Frequency entry by keyboard or UP/DWN keys.**
- **Priority alert function.**
- **Monitor switch to defeat squelch.** Used to check the frequency when CTCSS encode/decode is used or when squelch is on.

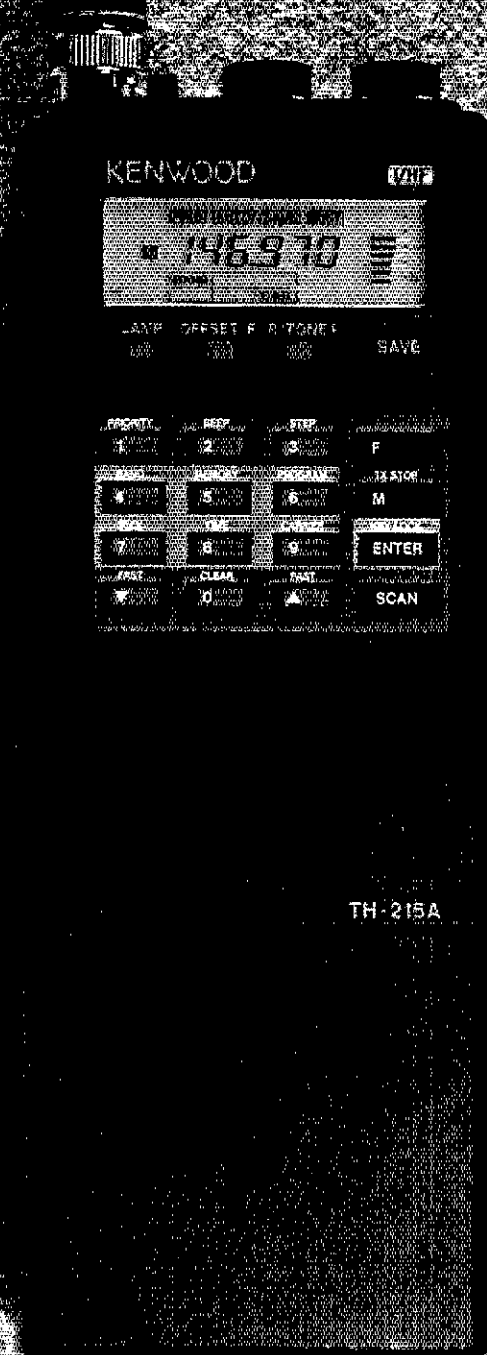


- **Large, easy-to-read multi-function LCD display with night light.**
- **Audible beeper to confirm keypad operation.** The beeper has a unique tone for each key. DTMF monitor also included.
- **Supplied accessories:** Belt hook, rubber flex antenna, PB-2 standard NiCd battery pack (for 2.5 W operation), wall charger, dust caps.



#### Optional Accessories:

- PB-1: 12 V, 800 mA NiCd pack for 5 W output
- PB-2: 8.4 V, 500 mA NiCd pack (2.5 W output)
- PB-3: 7.2 V, 800 mA NiCd pack (1.5 W output)
- PB-4: 7.2 V, 1600 mA NiCd pack (1.5 W output)
- BT-5 AA cell manganese/alkaline battery case
- BC-7 rapid charger for PB-1, 2, 3, or 4
- BC-8 Compact battery charger
- SMC-30 speaker/microphone
- SC-12, 13 soft cases
- RA-3, 5 telescoping antennas
- RA-8B StubbyDuk antenna
- TSU-4 CTCSS decode unit
- VB-2530: 2m, 25 W amplifier
- LH-4, 5 leather cases
- MB-4 mobile bracket
- BH-5 swivel mount
- PG-2V DC cable
- PG-3C cigarette lighter cord with filter



TH-215A shown

# KENWOOD

KENWOOD U.S.A. CORPORATION  
 Communications & Test Equipment Group  
 201E Dolanquey St., Long Beach, CA 90801

Complete service manuals are available for all 110 Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

# KENWOOD

## First Again!

### TW-4100A

#### 2 m/70 cm FM Dual Bander

A Kenwood original just got better! Kenwood was the first to develop a 2 m/70 cm mobile radio in a single, compact package. Since then, other companies have imitated the concept, but still have not done it the "Kenwood way." The all-new TW-4100A is more compact, more powerful, and packed with more features than ever before! With many new features and accessories, and backed by Kenwood's experience, the all-new Kenwood Dual Bander is light years ahead of the rest!

• **Selectable full duplex cross band ("telephone style") operation.**

Remote base or cross band repeater function possible (a control operator is needed for remote or repeater operation\*).

• **45 watts on 2 m. 35 watts on 70 cm. 5 watts (adjustable) low.**

• **Frequency coverage: 142-149 MHz (allows operation on certain MARS and CAP frequencies) and 440-449.995 MHz.**



• **New compact size!** Only 5.9" W x 1.97" H x 7.87" D and weighs less than 4 pounds!

• **Proven high performance** Kenwood GaAs FET front end receiver.

• **Easy to operate!** Only 3 knobs and 8 keys on the front panel.

• **Separate antenna ports for VHF and UHF.** Minimizes loss and increases reliability and performance!

• **10 memory channels.** Lithium battery backs up memory. Store frequency, offset, subtone. Two channels store the transmit and receive frequencies independently for odd split or cross band operation.

• **Front panel-selectable CTCSS tone (when optional TU-7 is installed.)**

• **Non-volatile operating system.**

Even after memory back up cell dies, all operating features remain intact! No re-programming or "board-swapping" necessary!

• **Programmable band scan and memory scan with memory channel lock-out.**

• **Large, illuminated LCD display and main knob.** For excellent visibility in direct sunlight or darkness.

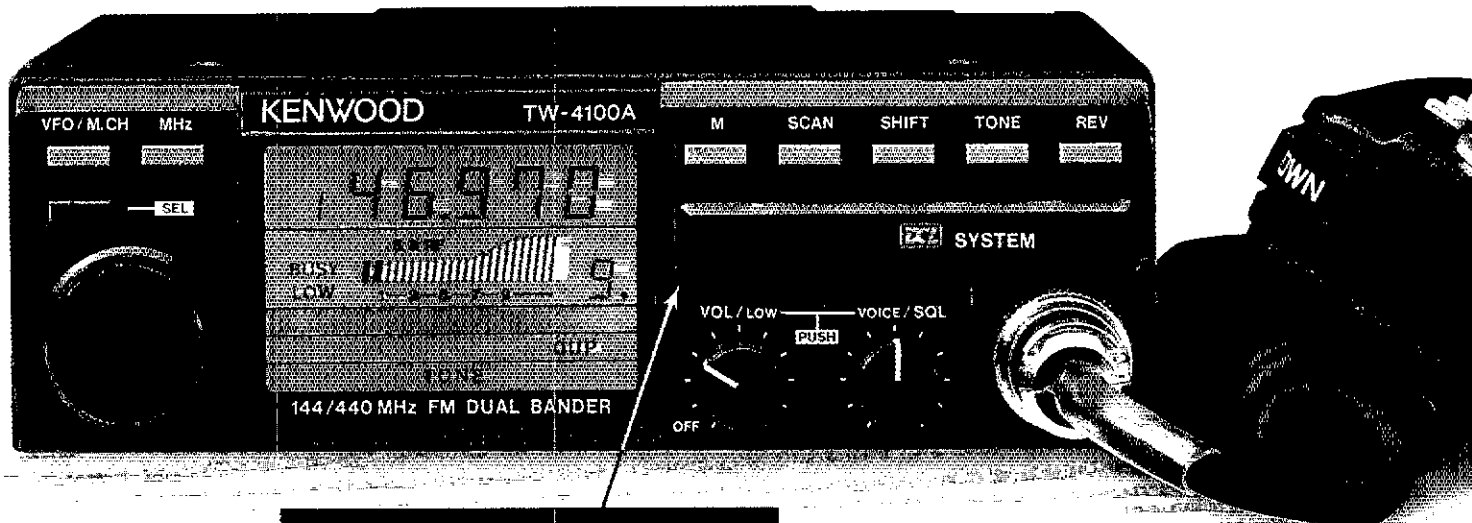
• **Selectable frequency step for quick and easy QSY.**

• **Voice synthesizer VS-2 option.**

**Optional accessories:**

- PS-50/PS-430 DC power supplies
- MU-1 DCL modem unit
- TU-7 CTCSS encoder
- VS-2 Voice synthesizer
- SW-100B SWR/Power/Volt meter 140-450 MHz for mobile use
- SW-200B SWR/Power meter for base station use 140-450 MHz, 0-200 W in 2 ranges
- SWT-1/SWT-2 2 m and 70 cm antenna tuner
- SP-40 Compact speaker
- SP-50B Mobile speaker
- PG-2N Extra DC cable
- PG-3B DC noise filter
- MC-60A, MC-80, MC-85 Base station mics.
- MC-55 (8-pin) Mobile microphone
- MA-4000

Dual band mobile antenna with duplexer (mount not included) • MB-11 Extra mobile mount



• **Digital Channel Link (DCL) option.**

# KENWOOD

KENWOOD U.S.A. CORPORATION  
Communications & Test Equipment Group  
2201 E. Dominguez St., Long Beach, CA 90810

\*Please check FCC regulations on repeater operation  
Minor modification necessary for repeater operation  
Specifications and prices subject to change without notice or obligation.  
Complete service manuals are available for all Ino-Kenwood transceivers and most accessories.



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Ontario  
Quebec  
Saskatchewan

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Southern New Jersey  
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Western Pennsylvania

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Indiana  
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### Dakota Division

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North Dakota  
South Dakota

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# THE AMERICAN RADIO RELAY LEAGUE, INC



The American Radio Relay League, Inc. is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communications in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1954. Its affairs are governed by a Board of Directors, whose voting members are elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"Of, by, and for the radio amateur," ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A bona fide interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US and Canada.

Membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA

Telephone: 203-686-1541 Telex: 650215-5052 MCI  
MCI MAIL (electronic mail system) ID: 215-5052

Canadian membership inquiries and correspondence should be directed to CARRL Headquarters, Box 7009, Station E, London, ON N5Y 4J9, tel 519-225-2188.

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# "It Seems to Us ..."

## 220: What Else Can You Do?

Ever since the FCC proposal to withdraw the bottom two megahertz of the 220-MHz band from amateur use hit like a bombshell in February, thousands of concerned amateurs have been looking for constructive ways to express their outrage. The first target was, appropriately, the Commission itself; and judging from the high quality of the comments that fill the Commission's files in General Docket 87-14, a lot of research and thought was expended in the effort to convince the FCC of its wrong-headedness on this issue. Many of you also shared your ideas and your data on utilization of the band with ARRL Headquarters, which assisted us in the preparation of the comments being filed on behalf of all League members. We're most grateful for your support.

Outrage turned to outright apoplexy in April, with the appearance in land-mobile communications magazines of advertisements placed by Aerotron, Inc., of Raleigh, NC, advising of the availability of amplitude-companded single-sideband equipment for voice and data transmission "in the 216-222 MHz range." The League believes that the ads violate the Commission's rules prohibiting the marketing of equipment for which type acceptance is required, before such is granted. On April 30, the League submitted a formal request to FCC seeking the issuance of an order directing Aerotron to show cause why a Cease and Desist Order should not be issued enjoining them from unlawful activities.

So as to leave no stone unturned in the battle to save 220, many League members have thought of turning to their elected U.S. Senators and Representatives for support. Some already have done so. When you receive this issue the comment deadline will have passed and the Commission will be in the "reply comment" phase, in which comments are accepted supporting or refuting the comments made by others. Unless you can get to Washington to inspect the public file of comments, as an individual League member you're unlikely to be able to participate in the reply-comment process; so it's quite natural that your thoughts might turn in another direction, toward Capitol Hill.

Every day, a Congressman's office is inundated with letters, postcards, and phone calls from constituents expressing opinions on every subject imaginable, and asking for help in dealing with all sorts of government agencies. How do you make it clear what action you want your Congressman to take? How do you make your request stand out?

First, remember that you can't expect your Congressman to be an expert on frequency allocation matters. On the other hand, you don't want him simply to transmit your views to the FCC; you've already done that yourself, right? And you don't want him simply to send a "What's this all about?" sort of inquiry to the Commission, since this will trigger a form-letter response (we've already seen some) that suggests the Commission is being really nice to amateurs in proposing to give us three megahertz on an

exclusive basis. What you want is for your elected representative to give well-deserved support to a group of constituents who have amassed an exemplary record of public service in his state or district. Get his attention by reminding him of the outstanding examples of emergency and/or public-service work by radio amateurs in your area; tell him that an FCC proposal in General Docket 87-14 threatens to reduce your ability to perform similar work in the future; point out that regardless of what the Commission might tell him, amateurs in his state or district have enjoyed full use of the 220-225 MHz band and have a continuing need for the entire band; and ask for his active support in getting the FCC to withdraw its proposal. If you can, offer to bring together a group of his constituents to meet with him or his staff to provide additional information. Avoid exaggeration, and go easy on the conspiracy theories; he knows there's bound to be another side to the issue, and you must protect your credibility as if it were a precious and fragile commodity.

If you've previously established a relationship with him or his staff, you'll already know how to use it; if not, there's no time like the present to start.

Can't do all this? Some League members have suggested inundating Congressional offices with QSL cards with simple messages asking for support. If done tastefully, it can't hurt! Similarly, we understand some local clubs are undertaking petition drives.

If your Senator or Congressman happens to serve on the respective subcommittee that exercises oversight over the FCC, you can expect him to take a greater interest in telecommunications issues. The Communications Subcommittee of the Senate Committee on Commerce, Science and Transportation comprises Senator Inouye (HI), Chairman; and Senators Hollings (SC), Ford (KY), Gore (TN), Exon (NE), Kerry (MA), Packwood (OR), Pressler (SD), Stevens (AK), Wilson (CA), and McCain (AZ). The Telecommunications and Finance Subcommittee of the House Energy and Commerce Committee comprises Rep. Markey (MA), Chairman, and Reps. Hall (TX), Eckart (OH), Richardson (NM), Boucher (VA), Cooper (TN), Swift (WA), Leland (TX), Collins (IL), Synar (OK), Tauzin (LA), Dowdy (MS), Slattery (KS), Bryant (TX), Rinaldo (NJ), Moorhead (CA), Tauke (IA), Ritter (PA), Coats (IN), Bliley (VA), Fields (TX), Oxley (OH), Nielson (UT), Dingell (MI), and Lent (NY).

Senators are addressed "The Hon. \_\_\_\_\_, United States Senate, Washington, DC 20510" and the proper salutation is "Dear Senator \_\_\_\_\_"; Representatives are addressed "The Hon. \_\_\_\_\_, House of Representatives, Washington, DC 20515" and the proper salutation is "Dear Mr. \_\_\_\_\_"

If you get more than a form-letter response, we'd be interested in hearing about it. The League's Washington team stands ready to provide additional backup, as required.—Larry E. Price, W4RA, and David Sumner, K1ZZ



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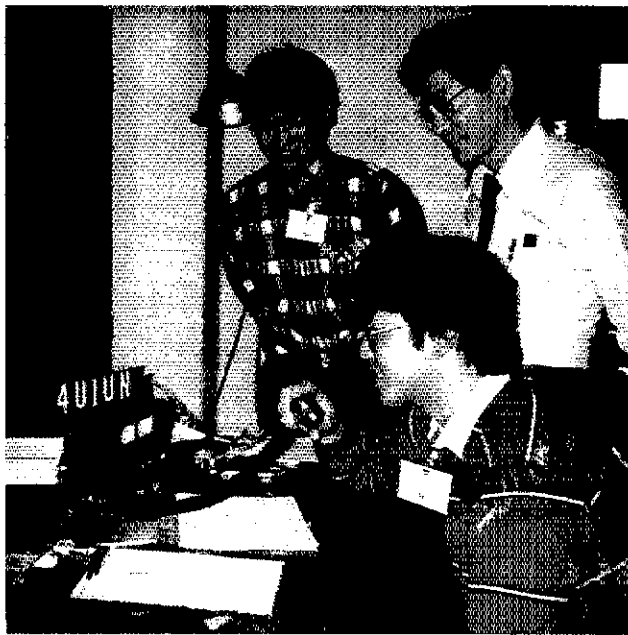
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**IF  
SOMEONE REFERS  
TO YOU  
BY YOUR CALL SIGN,  
SUCH AS K8IGW,  
YOUR HOBBY  
IS THIS**

**Hams in Jeopardy?** You bet! But not the kind that can get you in trouble. On the contrary, Amateur Radio got some excellent attention nationwide via the popular game show *Jeopardy* this past March when this item popped up on the game board. The call belongs to Neil Dorfman, K8IGW, of Southfield, Michigan, who was quick enough to photograph his television screen as the item appeared. He probably had advance notice, though, because his son, Steve, N6DIW, is a writer for the show. By the way, a contestant did answer correctly.

**UN on 70 cm:** 4U1UN, the United Nations Headquarters station in New York, has expanded its operation. Usually QRV on 14/21/28 MHz, 4U1UN became active on 70 cm for the first time March 28, chalking up a total of 27 two-ways with amateurs in five states. Incidentally, 4U1UN is a DXCC country separate from the US. Shown here are (l-r) JR6NWN, N2GKL (operating 432.1-MHz SSB) and JS1DLC/W2. (N2ATT photo)



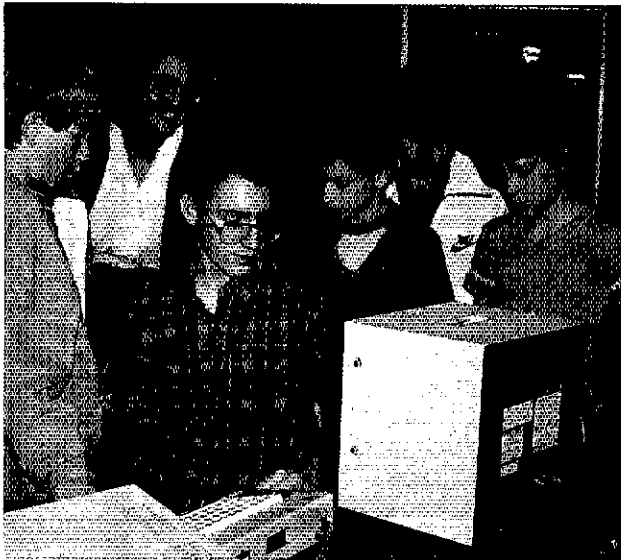
**A Fitting Tribute:** The first ARRL International Humanitarian Award has been given posthumously to Victor C. Clark, W4KFC, former League President and an outstanding radio amateur for many years. A specially designed plaque (lower right corner) was presented to Vic's wife, Hester (left), on March 28, at a Quarter Century Wireless Association banquet in Rosslyn, Virginia. The Banquet was sponsored by the Vic Clark and Washington Chapters of the QCWA. Members of the

Clark family and many prominent amateurs were present as ARRL Secretary Perry Williams, W1UED, presented the plaque to Mrs Clark. (N4MM photo)



## Get Caught in the ARRL Net

Don't know where to find a good roundtable? Then get yourself a copy of the latest *ARRL Net Directory*. Included in the 1987 edition are updated listings of all National Traffic System nets and many local, regional and international net operations. You'll also find many special-interest and Novice nets. In addition, there are helpful articles on traffic handling and other aspects of operating, as well as handy resource material, such as a listing of countries with which the US has a third-party-traffic agreement. For your copy, send \$1 (to cover postage and handling) to ARRL HQ, 225 Main St, Newington, CT 06111.



**Keeping up the Good Work:** Shawn Wakefield, WK5P, shows one of the many reasons why he was named Westlink's Young Amateur of the Year. Here, he demonstrates 2-meter amateur RTTY to a group of 5th graders in Bartlesville, Oklahoma late last January. Shawn was at the school to promote ham radio in general, and to recruit students for a Novice class sponsored by the Bartlesville ARC, for which Shawn is one of the instructors. Shawn's presentation was filmed by a local news team and appeared on the local cable-TV news that night. Helping out with the demo is 10-year-old Novice Jennifer Christie, KB5BBB. (WB5KFP photo)



**Fun in the Sun with Ham Radio:** Members of the San Angelo (Texas) ARC teamed up with other amateurs from Brady to give some 400 Boy and Girl Scouts a good look at how Amateur Radio operates. The scene was the 1987 Amangi Trail Jamboree at Camp Sol Mayer, in west-central Texas, in April. Under the supervision of control operators using the call sign W5QX, Scouts were treated to a variety of hands-on demonstrations, including this packet-radio operation by Charles Cathey, K5JEZ, who headed the amateur outing. Each Scout also received a copy of the requirements for the Radio and Computer Merit Badge and copies of the *Archie's Ham Radio Adventure* comic book and *Ham Radio: A Community Resource*. (photo courtesy SAARC)



**Phase 4 Design Meeting:** This group of AMSAT and ARRL representatives met in Boulder, Colorado April 4-6 to discuss initial design plans for the newest generation of amateur satellites, Phase 4. Unlike its predecessors, Phase 4's geosynchronous orbit would make it accessible to amateurs 24 hours a day, thereby increasing the opportunities for using satellite communications, such as in a national emergency. For a detailed look at Phase 4 and its communications possibilities, see January 1987 *QST*, page 41. (W4PUJ photo)

## Field Day Bonuses

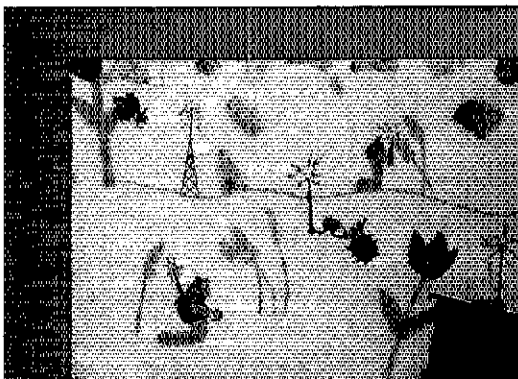
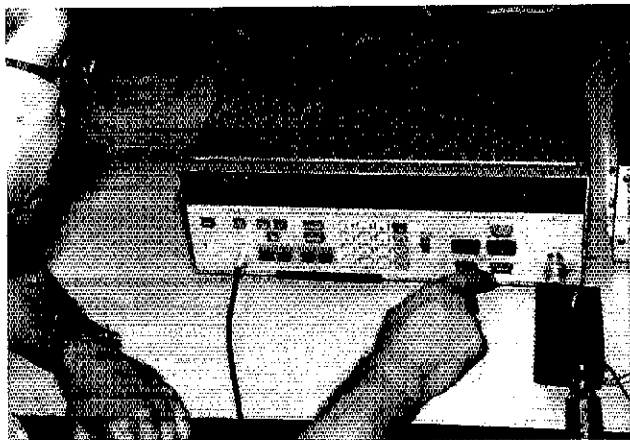
In addition to the usual scoring opportunities in this year's Field Day, **June 27-28**, participants will have a couple of extra bonuses. Entrants will have four additional chances to pick up 100 points for copying the traditional W1AW Field Day message: An extra CW bulletin will run at 1400Z and an extra phone bulletin at 1500Z—on both Saturday and Sunday (April *QST*, page 15, has a detailed bulletin schedule). Also, Military Affiliate

Radio System (MARS) stations will be on the air during this year's event—good for another 100 bonus points for one or more QSOs. The usual bonus situations include 100% emergency power, public relations, message origination and/or relay, satellite communications, packet radio and natural power. Field Day rules and details on the MARS operations (including frequencies) are in May *QST*, page 87.

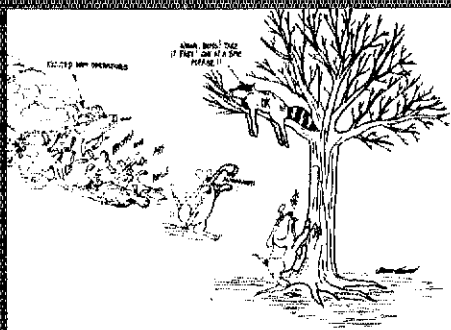
**Tip of the Cap:** Lou Schurrer, WB6OON, of Ventura, California, sent in this postscript to a piece that appeared in this column in March on how hams can identify themselves clearly at public events. Lou agrees that the earlier suggestions of banners, ID badges and magnetic signs are good for getting the public's attention, but adds that a cap such as this one also has good visual impact. Of course, a call sign would add the finishing touch. Our hats are off to you, Lou, and the other members of the Ventura Poinsetta ARC for the suggestion.



**Thanks!** The Hewlett-Packard Foundation recently donated a Model 8970A automatic noise-figure meter and a Model 346A noise source to the ARRL Laboratory. This equipment allows precise noise-figure and gain measurements from 10 MHz well into the microwave region. The ARRL Lab uses the 8970A regularly to test commercial equipment for product reviews and advertising acceptance. Our new noise-figure meter also gets quite a workout during the development and testing of construction projects and circuits published in ARRL books and periodicals. Thanks, Hewlett-Packard!



**Daniel Wolfgang**  
Middletown, CT—Age 11



**Brian Turney, KB4JZG**  
Niceville, FL—Age 15



**Dorian Custodia**  
Sellersville, PA—Age 18

### Youth Art Contest Winners Competing Worldwide

Budding young artists Daniel Wolfgang, Brian Turney and Dorian Custodia are going places. First, they each became the grand prize winner in their age category in ARRL's Youth In Amateur Radio Art Contest (See Oct. 1986 QST, page 12) for which they received a \$100 Savings Bond. From there their artwork went to the national contest sponsored by the National Telecommunications and Information Administration, US Department of Commerce. All three were chosen to represent the US on the international level in the Youth in Electronics Contest, sponsored by the International Telecommunication Union in Geneva, Switzerland. Congratulations, Daniel, Brian and Dorian—and good luck in Geneva!



### Thinking of Operating Overseas?

If you're traveling abroad and would like to operate in the host country, you'll need to get a reciprocal license. The ARRL Regulatory Information Branch maintains an extensive file on **how to apply for an amateur license in virtually every country in the world.** We'll send you the name, address and telephone number of the government agency to contact, and the application forms, if they're available. All we need from you (preferably about two months before you leave the US) is the name of the country or countries in which you wish to operate and a large SASE with 3 units of First Class postage. Figure on the host country taking at least six weeks to process your application (although a few countries may issue a license on a walk-in basis). We'll be listening for you stateside.

### Trivia Quiz

W1AW is the most familiar call sign of ARRL's cofounder, Hiram Percy Maxim. In 1937, shortly after Mr. Maxim's death, the call was reassigned to the Maxim Memorial Station, which is on the HQ grounds in Newington, Connecticut. Our question: What were HPM's other amateur calls? (Hint: There were three.)

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# League Lines

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**The FCC has decertified four more VECs:** Adirondack ARC/VEC (New York), AE4N/Mark4 VEC (North Carolina), Dunedin VEC (Florida) and Director of MARS VEC (Puerto Rico). According to the FCC, these VECs were decertified due to inactivity or failure to provide the FCC with the required annual Cost Recoupment Certification.

**Attention, attorneys.** The Legal Strategy Committee of the League's Board of Directors will present a four-hour seminar at the ARRL National Convention entitled "Land Use Regulation of Federally Licensed Communications Facilities and the Doctrine of Federal Preemption." The seminar will be open to all amateurs at the Convention, to be held July 10-12 in Atlanta, but it is intended primarily for League Volunteer Counsel, other attorneys, and city planners and other officials involved in land use restrictions of communications facilities. The syllabus for the seminar has been submitted for CLE approval to all states with continuing legal education requirements. The only cost will be to offset the printing of bound resource materials for those seeking CLE credit. Details next month.

When you first heard about Amateur Radio, did you go to the local library looking for information? In all too many libraries, perhaps all you found were outdated *License Manuals* and *Handbooks*. Let's share the world of Amateur Radio by donating books to your local library. **ARRL HQ has put together a special set of 20 ARRL publications at a discounted price, which makes it perfect for donations to public or school libraries, or perhaps even as an addition to your own!** The 20 books include the latest editions of *The ARRL Handbook*, *Tune in the World*, *ARRL Antenna Book*, *Antenna Compendium*, *The FCC Rule Book*, the *Gil Cartoon Book*, all *License Manuals* and more. The price? \$90 postpaid. This represents a substantial discount from list price and is available only from HQ.

**The new tariffs against certain Japanese products do not affect Amateur Radio equipment.** Products affected include color TV sets, certain electrical tools and desk or laptop computers.

The seventh edition of *The FCC Rule Book* should be hot off the presses about the time you read this. This edition contains all updated FCC rule makings, including Novice Enhancement, and will have a distinctive fuchsia cover. It will be available for \$5 from your local dealer. If ordered separately from HQ, add \$2.50 for postage and handling.

**Field Day June 27-28!** This is a last-minute reminder to send for your FD entry package. The package consists of a publicity kit, summary sheet, dupe sheet and check list to ensure that your entry is complete. It's available from HQ for a 9- × 12-inch SASE with 4 units of First Class postage. Field Day rules appear on page 87 of May *QST*.

Field Day ops are also reminded that **no credit** is given for contacts made on the 10-MHz (30-meter) band. Although US amateurs have exclusive status on 30 meters, in many other countries the band is shared with other radio services and all amateurs, including those in the US, must avoid interfering with them. Contest-style activity could cause harmful interference and threaten our use of the band. The interference potential is why US amateurs are limited to CW and digital communications only, with a maximum output power of 200 watts.

In the 5th call area, the FCC is about to run out of 2 × 1 Extra Class call signs. When the 2 × 1 calls are exhausted, the Commission will begin issuing 2 × 2 calls beginning with the prefix AA5, such as AA5AB. The 5th call area will thus join the 4th and 6th call areas, which are issuing AA 2 × 2 call signs to Extra Class licensees.

HQ is looking for a **Field Organization Coordinator**. This new full-time position at HQ will be responsible for administering the ARRL Amateur Auxiliary and Interference Reporting System (AIRS), editing *Field Forum* and *Section Leader* and the *Field Services Manual*. The successful candidate will also undergo on-the-job training with the goal of assuming full responsibility for the development and administration of all Field Organization functions next year. Requirements include a bachelor's degree, preferably in English, Journalism, Communications or Liberal Arts; demonstrated writing skills; strong oral communications skills; General class or higher amateur license; and solid experience in the ARRL Field Organization. This is an exciting, leadership position in the Field Services Department, reporting directly to the Field Services Manager. Salary of \$16,120-22,568, depending on qualifications. For more information call Richard Palm, K1CE, at HQ.

Other HQ staff opportunities include: **Club Services Department Manager:** a degree or equivalent experience in Volunteer Management, Psychology, Education or other relevant areas; strong program management and writing skills essential; starting salary \$25,428 to 30,194. **Training Manager:** degree and/or equivalent experience in Education, Radio Electronics; strong writing skills essential; starting salary \$22,334-26,806. **Volunteer Resources Assistant:** degree or equivalent experience in Journalism or Liberal Arts; strong writing skills and some Amateur Radio experience essential; starting salary \$13,754-\$15,132. Resumes and writing samples to Volunteer Resources Manager at HQ.

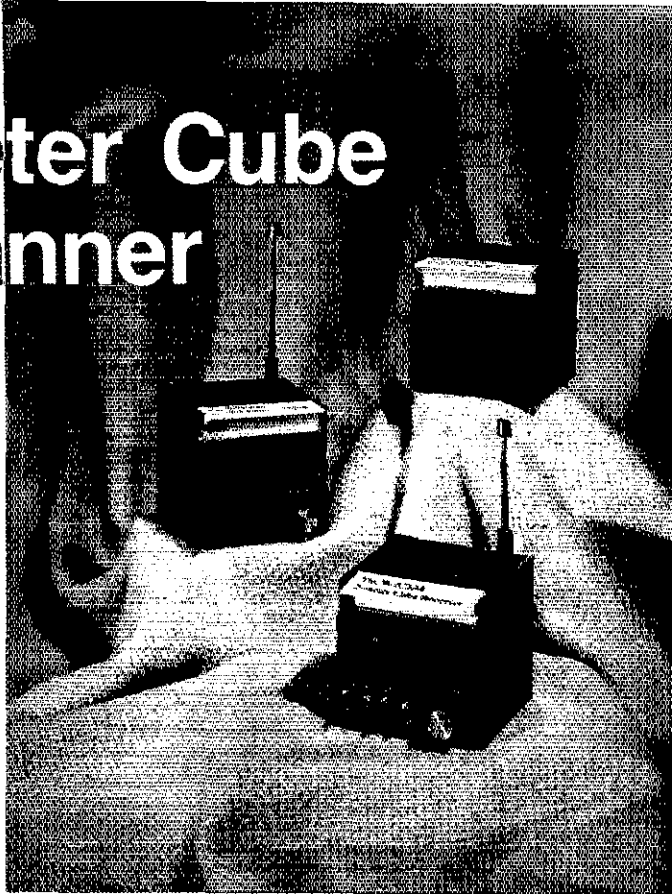
In addition, the Production/Editorial Dept is looking for an **Editorial Supervisor**, to write and edit for *QST* and other League publications. Journalism, English or related degree, Amateur Radio license and supervisory skills required. Starting salary \$18,954-22,740. Contact the Assistant Managing Editor at HQ for more information.



# The W2CXM 2-Meter Cube Receiver and Scanner

Turn an \$18 Weatheradio into a 2-meter receiver? You bet—and you can add squelch and scanning for a few dollars more!

By Steven Powell, N2BU  
Cornell University Amateur Radio Club, W2CXM  
401 Barton Hall  
Ithaca, NY 14853



**W**ould you like to have a 2-meter FM receiver for under \$20? All it takes is a Radio Shack model 12-181B Weatheradio®, one capacitor and a few minutes of work. This article will show you how to do it, why it works and how to perform several other modifications to add advanced features like squelch and scanning. This is an ideal project for new or prospective hams who would like to listen to 2-meter communications without spending much money. You may wish to modify a 2-Meter Cube and then lend it to friends or relatives so that they, too, may become interested in Amateur Radio. If you already own a 2-meter receiver but were thinking of upgrading to a scanning model, this may be just right for you. The 2-Meter Cube Receiver is a great way to monitor local 2-meter action from work or home. The 2-Meter Cube can even be used to monitor packet-radio transmissions!

This project was developed for a Technician/General licensing class sponsored by the Cornell University Amateur Radio Club. The 2-Meter Cube Receiver enables the students to monitor code practice sent over the local 2-meter repeater. The success of the initial project prompted several club members to design the squelch and scanning features.

Converting the radio from the weather band to the 2-meter amateur band provides an opportunity to learn about LC circuits, squelch circuits, variable-capacitance-diode tuning, and digital scanning techniques. This article details the procedures for three

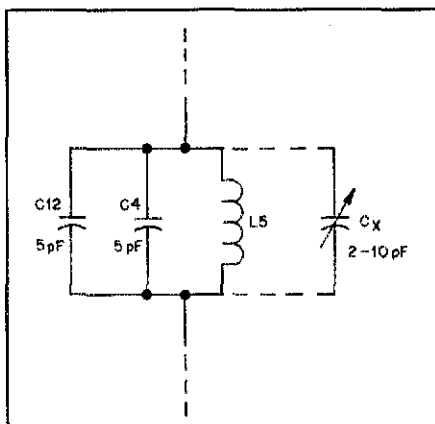


Fig 1—The tuned circuit of the existing local oscillator showing capacitor  $C_x$  added to lower the resonant frequency. (From Radio Shack Weatheradio owner's manual, catalog number 12-181B.)  $C_x$ : 2-10 pF trimmer capacitor (DSE part no. R-2952). C12, C4 and L5 are Radio Shack part numbers.

modifications: The first is frequency retuning to the 2-meter band, the second adds squelch operation, and the third adds four-channel scanning. One, two or all three modifications may be performed, depending on the features desired.

## Modification 1: Frequency Retuning

There are three controls on an unmodified Weatheradio: The white bar on the top of the radio turns the power on, and

the VOLUME and TUNING controls are located on the bottom. The radio tunes from approximately 160 to 164 MHz. The first modification changes the frequency coverage to approximately 145 to 147.5 MHz, which is sufficient to cover all standard repeater output frequencies. Any other 2.5-MHz segment between 140 and 160 MHz may be covered if desired.

Fig 1 shows a portion of the resonant circuit that determines the local oscillator (LO) frequency. The relationship between the LO frequency and the component values is given by

$$f_{LO} = \frac{1}{2\pi \times \sqrt{L5 \times (C4 + C12)}} \quad (\text{Eq 1})$$

This modification consists of adding a trimmer capacitor,  $C_x$ , in parallel with C4, C12 and L5 in order to lower the resonant frequency. The new frequency is given by

$$f_{LO} = \frac{1}{2\pi \times \sqrt{L5 \times (C4 + C12 + C_x)}} \quad (\text{Eq 2})$$

## Modification 1 Procedure

It's a good idea to keep the Weatheradio instruction sheet handy as you go through the modification process. It contains the schematic of the unmodified Weatheradio and other useful information.

Remove the bottom panel and the four screws that hold together the case. Loosen,

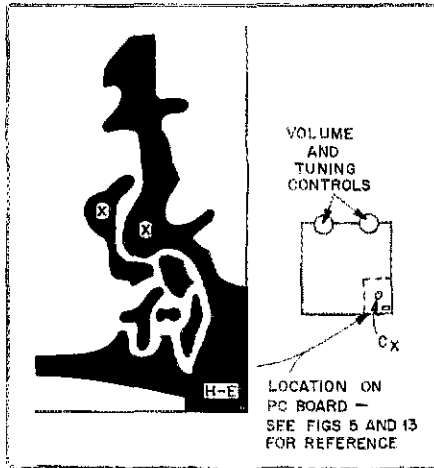


Fig 2—Foil side view of the original circuit board. Solder the trimmer capacitor,  $C_x$ , to the foil at the two Xs.

but do not remove the screw at the base of the antenna. Push the antenna screw through the enlarged hole in the case. Separate the case from the speaker assembly, being careful not to tear off the antenna.

Bend the leads of  $C_x$  and solder it to the foil side of the circuit board at the location shown in Fig 2. Use a generous amount of solder to ensure a good mechanical connection and to prevent microphonics.

Turn the TUNING knob to its lowest frequency (fully clockwise as viewed from the foil side of the circuit board). Connect an RF signal generator set to 145 MHz to the antenna input. Adjust  $C_x$  with a non-metallic tool until you hear the signal.

A low-power 2-meter transmitter may be used in place of the signal generator as long as the transmitter is at least 100 feet from the receiver. It is very easy to adjust the capacitor to the receiver image frequency if the transmitted signal is too strong.

If a signal generator or 2-meter transmitter is unavailable, try this alternative approach: Set the tuning knob to its mid-position and slowly adjust  $C_x$  until you hear a 2-meter repeater. Try to identify the repeater frequency. If it is more than a few hundred kilohertz from the center of the desired tuning range, set the tuning knob to the approximate repeater frequency and readjust  $C_x$  until you hear the repeater

Fig 4—Schematic diagram of the squelch → circuit. Capacitors are ceramic unless otherwise noted. Capacitance is in microfarads. Resistors are 1/4-W carbon-composition type. Resistance is in ohms (k=1000). Part numbers are in parentheses. "RS" designates Radio Shack, "DSE" designates Dick Smith Electronics, 390 Convention Way, Redwood City, CA 94063.

C4—2.2- $\mu$ F tantalum (RS 272-1435, DSE R-4730).

R7—5-kilohm audio taper potentiometer (RS 271-1720, DSE R-1819).

An etched and drilled circuit board is available. See notes at end of article.

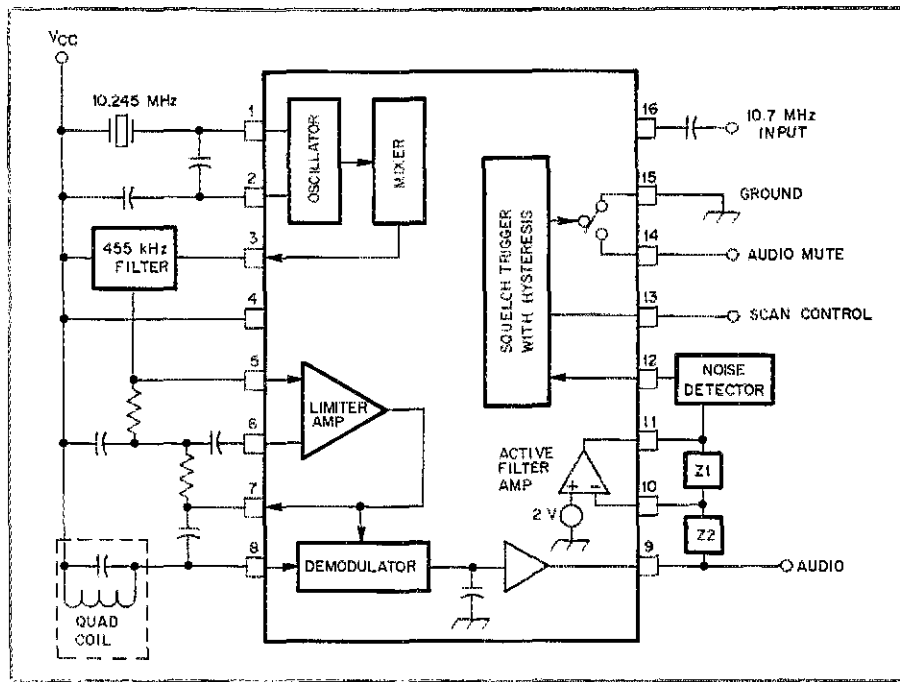
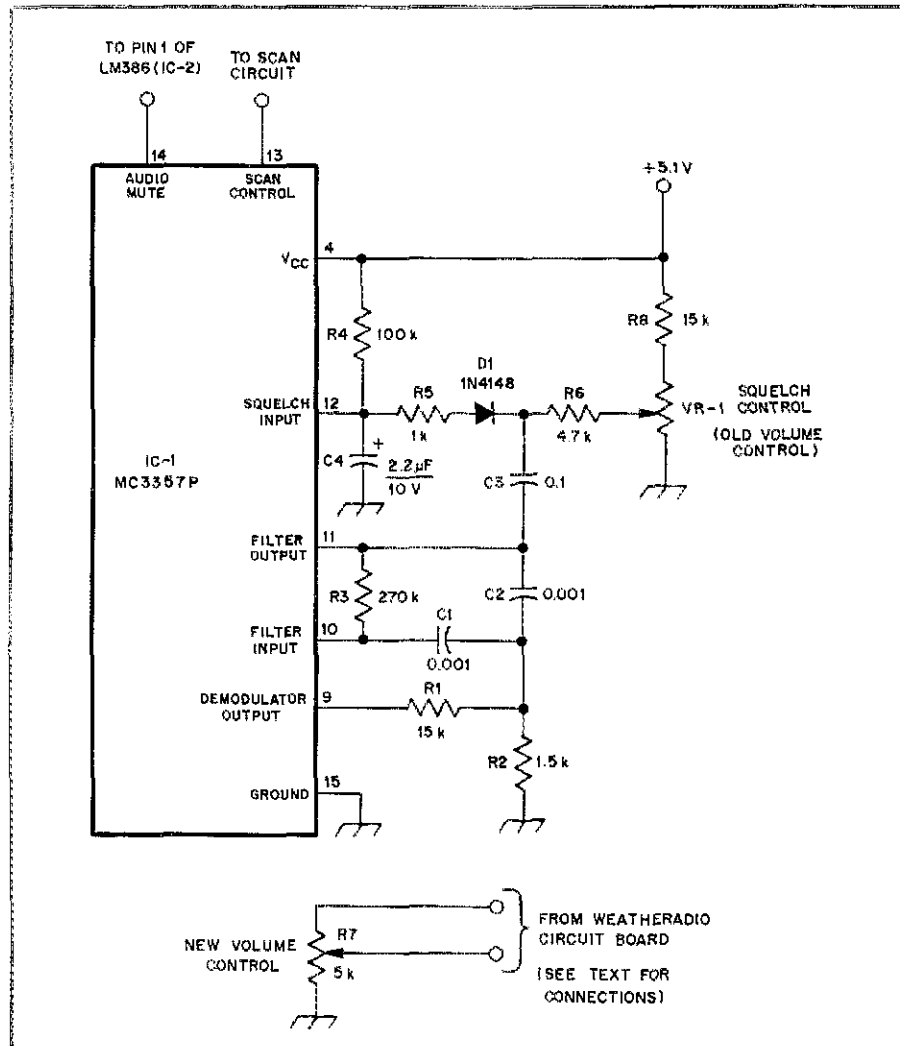


Fig 3—Functional block diagram of Motorola MC3357P low-power FM IF. (From Motorola Linear and Interface Integrated Circuits Handbook, pp 110-113, Motorola Inc, 1983.) This is typical application data; the components outside the MC3357P block are not specific to the unmodified Weatheradio or the 2-Meter Cube.





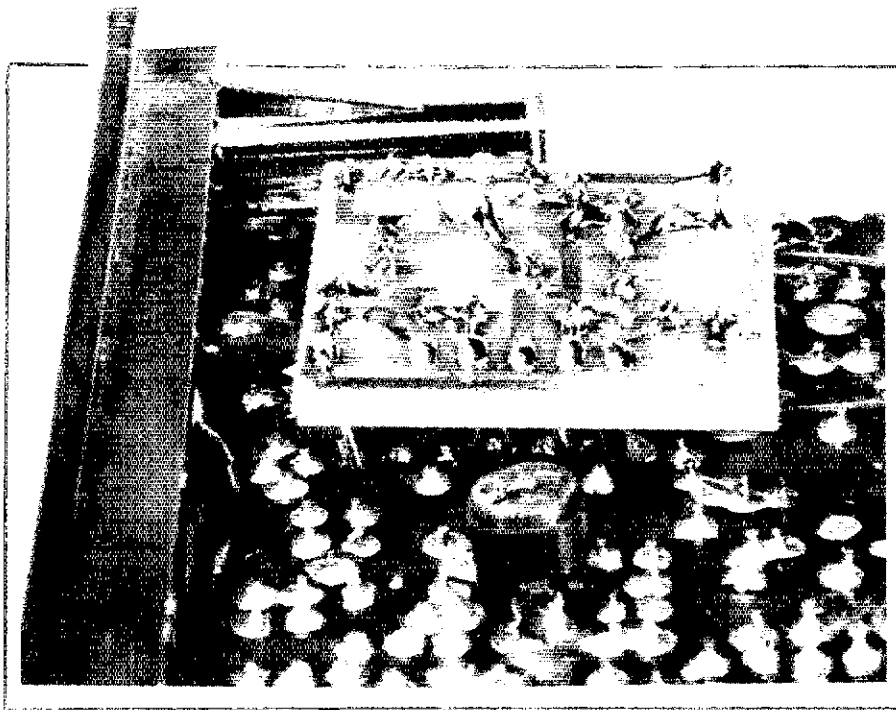


Fig 5—Close-up view of the squelch circuit board mounted on the foil side of the original circuit board. Note the trimmer capacitor,  $C_x$ , at bottom center. (photo by Kevin Wrenner, WB2LJK, and Brian McLeod)

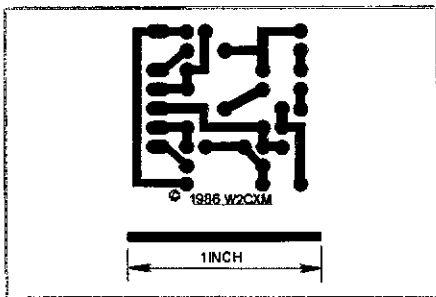


Fig 6—Full-size etching pattern for the 2-Meter Cube Receiver squelch circuit board. Black areas represent unetched copper foil.

again. That's it! You've turned your Weatheradio into a 2-Meter Cube!

Hint: You may want to mark the tuning knob with paint or nail polish to indicate the position of local repeaters and simplex frequencies. This makes frequency changes quick and easy.

### Modification 2: Squelch Operation

After using the 2-Meter Cube receiver you may find that you want to add a squelch circuit to keep the speaker quiet when no signals are present. Since weatherband signals are transmitted continuously, there is no need for squelch in the unmodified Weatheradio. Fortunately, the Weatheradio is based on a Motorola communications IC, the MC3357P, which has squelch capability built in, making the addition of a squelch function quite simple. A block diagram of the MC3357P is shown in Fig 3. The frequency-modulated IF signal enters the chip at pin 16, and

demodulated audio is available at pin 9. Squelch operation is achieved by adding a few components at pins 9, 10, 11, 12 and 14. These components comprise Z1, Z2 and the noise detector shown in Fig 3. Their function is to check for the presence of noise above the normal audio band. If noise is present, pin 14 of the MC3357P is pulled low. The speaker is muted by connecting pin 14 of the MC3357P to pin 1 (MUTE input) of the LM386 audio amplifier.

Fig 4 shows the schematic diagram of the squelch circuit. The resistors and capacitors connected to pins 9, 10 and 11 form the Z1/Z2 combination—a band-pass filter centered at about 8 kHz. (This frequency is above the normal audio passband and therefore only passes noise.) The negative noise peaks are conducted through the diode and decrease the voltage at pin 12 of the IC. Squelch action takes place when the

voltage at pin 12 is less than about 700 mV dc. As a result, pin 14 is pulled low, muting the audio amplifier. When a signal is received, the 8-kHz noise disappears and the voltage at pin 12 rises above 700 mV dc, opening the squelch. The SQUELCH potentiometer sets the squelch threshold by varying the dc bias on D1.

The squelch circuit design presented here has been proven by nearly 100 successful modifications by members of the Cornell University ARC. The 2-Meter Cube becomes much more enjoyable with a squelch function—it is also far less battery-hungry with this option!

### Modification 2 Procedure

The easiest construction method is to mount the squelch components on a small printed circuit board. This subassembly is then attached to the foil side of the original circuit board, as shown in Fig 5. Alternatively, a small piece of perf board and point-to-point wiring may be used. A PC board etching pattern and parts-placement guide are shown in Figs 6 and 7, respectively. Etched and drilled circuit boards and parts kits are available.<sup>1</sup>

A potentiometer must be added for the squelch circuit. This can be installed on the front of the plastic case, but the club's extensive use of the 2-Meter Cube suggests a better arrangement. The volume control is the most frequently used control, and is best located in the front of the case; the old volume control may then be used for squelch.

1) Refer to Fig 7 and solder all components onto the squelch circuit board, or use point-to-point wiring on perf board. Mount any tall components so as to minimize board height.

2) Drill a 3/8-inch-diameter hole in the front of the case for the new volume control. Refer to Fig 8 for the proper location. Attach three 6-inch-long wires to the potentiometer.

3) Remove the case of the radio as explained in the modification 1 procedure.

<sup>1</sup>Notes appear on p 21.

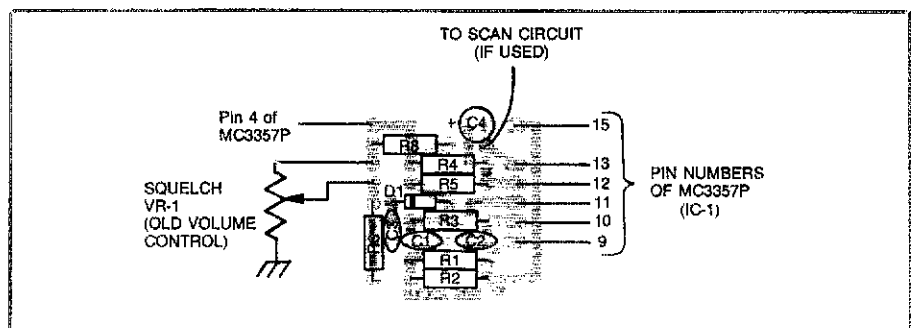


Fig 7—Parts-placement guide for the 2-Meter Cube Receiver squelch circuit. This view is from the component side of the board. Gray areas represent an X-ray view of the unetched foil.

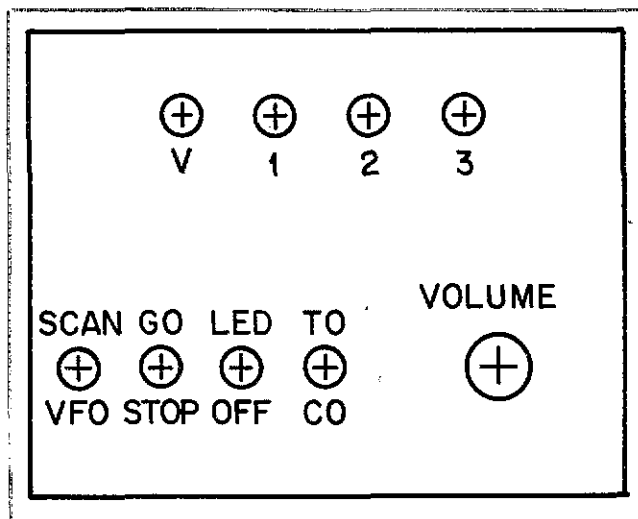


Fig 8—Full-size drilling template for the front of the plastic case. Modification 1 requires no hole drilling; modification 2 requires adding only the VOLUME control hole and modification 3 requires all holes. Photocopy or cut out this drawing and directly mark the case for accurate hole locations. See text for hole diameters.

4) Install the new volume control on the front of the case.

5) Solder a wire between pin 14 of the MC3357P and pin 1 of the LM386. Very small wire, such as no. 30 wire-wrap wire, works well.

6) Cut five 1/2-inch lengths of the same small wire and remove 1/8 inch of insulation from both ends of each. Wrap one end of one of the five wires around pin 9 of the MC3357P and solder it to the pin. Do the same with pins 10, 11, 12 and 13 of the MC3357P—one wire on each pin. Note: The connection to pin 13 is used only for scanning and may be omitted if you do not intend to add this modification. However, if you are considering adding scanning later, add this wire now, as it is quite difficult to do so later.

7) Solder a solid wire (a piece of a component lead works well) securely to pin 15 of the MC3357P. This will serve as a ground connection and mechanical support for the squelch circuit board.

8) Solder a 1-inch wire to pin 4 of the MC3357P.

9) Slip the squelch circuit board, component side down, over the wires from pins 9, 10, 11, 12, 13 and 15 of the IC. Solder the wires to the main-board locations indicated in Fig 7.

10) Solder the wire from pin 4 of the MC3357P to the junction of R4 and R8 on the squelch board.

11) Unsolder the wiper of the old VOLUME control (VR-1 on the Weatheradio circuit board) and bend it up from the circuit board. Solder a wire from the wiper of this control to R6 on the squelch board. Solder another wire from the wiper of the new volume control to the circuit board pad that went to the wiper of VR-1.

12) Unsolder the high side of VR-1 (the right-hand terminal as you look down on the board with the potentiometers toward you) and bend it up from the circuit board. Solder a wire from the high side of VR-1 to R8 on the squelch board. Solder another

wire from one side of the new volume control to the circuit board pad that went to the high side of VR-1.

13) Solder a wire from the other side of the new volume control to the ground terminal of VR-1.

14) Check to make sure that there are no shorts from the new connections to other connections or components. Connect the 9-V battery, press the white bar, and rotate the squelch control. The speaker audio should mute when the squelch threshold is reached. Verify that the new volume control is functional

### Troubleshooting

If you have trouble, start by checking for poor solder connections and again verify that the new connections are not touching

nearby connections. Pin 4 of the MC3357P should read approximately +5 V dc. Pin 12 should read approximately +1 V dc when fully unsquelched and should decrease as the squelch potentiometer is turned. When the voltage at pin 12 drops below +700 mV dc, pin 14 of the MC3357P should go low, causing the audio amplifier to squelch the speaker audio. Make sure that you have connected pin 14 of the MC3357P to pin 1 of the LM386

### Modification 3: Four-Channel Scanning

There are various techniques that may be employed to add scanning to a receiver. If the radio contains a phase locked loop (PLL) frequency synthesizer for its LO, sequentially changing the inputs to the divide-by-N counter in the PLL makes the radio step from one frequency to another. This is the method most often used in the latest 2-meter equipment and generally requires the use of a microprocessor.

Fortunately, there is a simpler scanning scheme that may be used in the 2-Meter Cube. Fig 9 shows a portion of the existing LO including the TUNING potentiometer, VR-2. As the tuning knob is turned, the voltage at the wiper of VR-2 can be set to any value between zero and approximately +1.2 V dc. These limits correspond to the highest and lowest frequencies in the tuning range, respectively. For any frequency in this range, there is a corresponding dc voltage at the wiper of VR-2. This dc voltage determines the capacitance of variable-capacitance diode D3, and therefore the resonant frequency of the local oscillator. To scan several fixed frequencies, VR-2 is replaced by an array of potentiometers, each of which can be set to bias D3 to a different tuning voltage. As one

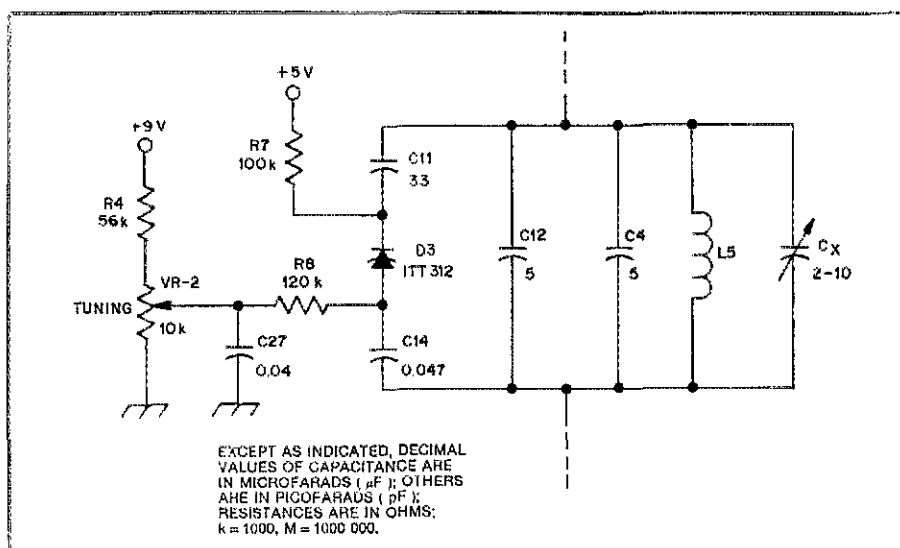


Fig 9—Schematic diagram of the frequency determining portion of the existing Weatheradio LO. Tuning is done by adjusting the dc bias across the variable-capacitance diode, D3, with the VR-2 potentiometer. Note that C<sub>x</sub> is set to a fixed value for 2-meter band reception, as detailed in the first modification. (From the Weatheradio owner's manual, Radio Shack catalog number 12-181B.) All parts shown on this diagram except C<sub>x</sub> use original Radio Shack nomenclature.

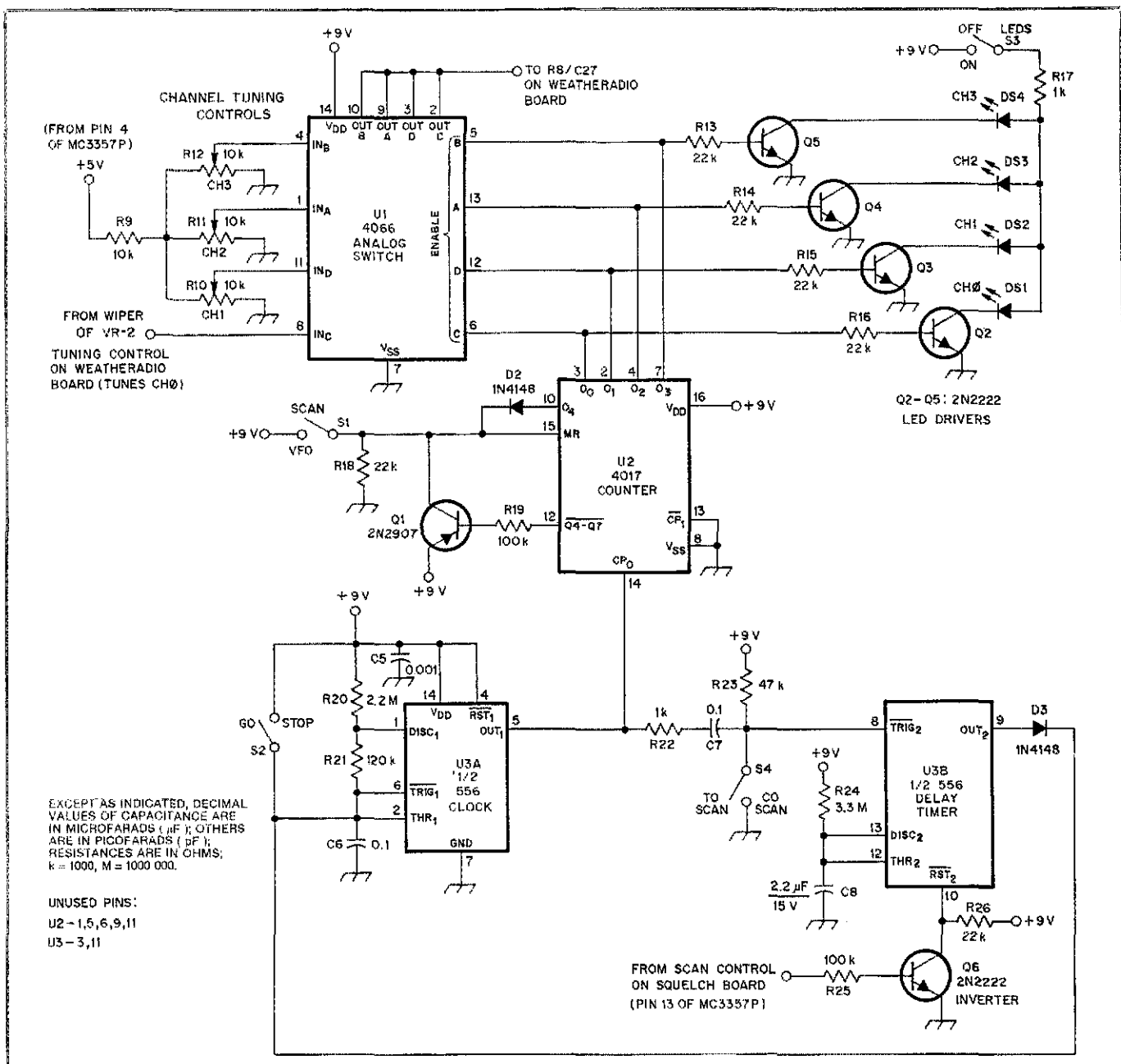


Fig 10—Schematic diagram of the four-channel scan circuit.

D2, D3—Small-signal diode, 1N4148 or equiv (RS 276-1122, DSE Z-3120).  
 DS1-DS4, incl—0.2-inch-diameter LEDs (RS 276-041A, DSE Z-4085).  
 Q1—MPS2907 PNP transistor or equivalent (RS 278-2023, DSE Z-1348).

Q2-Q5, incl—2N2222 NPN transistor or equivalent (RS 276-1617, DSE Z-1308).  
 R10-R12, incl—10-kilohm miniature potentiometers (RS 271-335).  
 S1-S4, incl—SPST microminiature toggle switch (RS 275-624, DSE S-1173).

U1—4066 or 4016 CMOS quad analog switch (RS 276-2466, DSE Z-5666).  
 U2—4017 CMOS decade counter (RS 276-2417, DSE Z-5617).  
 U3—TLC556 CMOS dual timer (RS 276-1704).

potentiometer at a time is switched into the circuit, the radio changes frequency accordingly.

#### Circuit Description

The upper portion of Fig 10 shows the array of potentiometers just mentioned. Note that only three additional potentiometers are required for the four-channel scanning modification. The fourth channel potentiometer (CH0) is the original VR-2 tuning potentiometer. The CH0 frequency is set with the TUNING knob. The CH1,

CH2 and CH3 frequencies are set with a screwdriver through the bottom of the case.

The wipers of all four tuning potentiometers feed the inputs of the quad analog switch, U1. Only one of the wipers is connected to the output of U1 at a time, when the corresponding ENABLE line is high. For example, when ENABLE A is high, the wiper of the CH2 potentiometer is connected to the output. The output of U1 is connected to the variable-capacitance tuning diode by way of R8 and C27 on the original circuit board.

It is important to note that the three additional potentiometers are biased by the Weatheradio's regulated +5 V line and not directly from the 9-V battery as is the remainder of the scanning circuit. Using a regulated +5 V supply keeps the preset frequencies constant as the battery voltage drops. Regulated +5 V dc is conveniently accessible at pin 4 of the MC3357P.

Oscillator U3A produces a clock signal that is high for about 160 ms and low for about 12 ms. Every rising edge advances the counter, U2, and turns on the next

decoded output. The counter turns OUTPUT 0 (O0) high, followed by O1, O2, O3 and O4. A high on O4 resets the counter and the cycle repeats. When power is first applied, Q1 resets the counter to zero if it starts in disallowed states 5, 6, 7, 8 or 9.

As the counter steps from 0 through 3, the corresponding LEDs (DS1 through DS4) are turned on by transistors Q2 through Q5. Each step also selects one of the analog switches in U1, connecting one of the potentiometer wipers and its corresponding dc voltage to the R8-C27 junction in the LO circuit.

Two kinds of scanning are performed by the circuit in Fig 10: carrier-operated scan (CO scan) and time-operated scan (TO scan). Both scanning modes stop the scan whenever a signal is detected and the squelch opens. CO and TO scan differ in how the scan resumes after stopping. With switch S4 set to CO SCAN, the 2-Meter Cube will stay on a channel as long as a signal is present. When the signal goes away, scanning resumes. With S4 in the TO SCAN position, the Cube stays on the busy channel for a time determined by R24 and C8 (about 9 seconds for the values shown), before scanning resumes. This allows the other channels to be scanned even if one or more channels are constantly busy.

U3 operation in the scanning function is as follows: Oscillator U3A generates clock pulses and advances the U2 counter channel by channel until a signal exceeds the squelch threshold. When the squelch opens, pin 13 of the MC3357P goes low, removing the reset signal from Q6 and thus U3B. When CO SCAN is selected, the output of U3B goes high, exceeding the input threshold of U3A. This holds the output of U3A low and prevents the U2 counter from advancing. U3A remains disabled until the 2-m signal goes away. Pin 13 of the MC3357P goes high when the squelch closes, resetting U3B, allowing U3A to oscillate and advancing U2 to the next channel.

If Time-Operated SCAN is selected, a slightly different series of events take place. The rising edge of the U3A output signal still advances U2 to the next channel, but if a 2-meter signal opens the squelch (pulls pin 13 of MC3357P to a low), a positive pulse is generated at the output of U3B on the falling edge of the U3A output. The positive pulse generated at the U3B output disables U3A for a period of time determined by R24 and C8 (about 9 seconds). After this delay, U3A advances U2 to the next channel, resuming scanning. However, if the 2-meter signal on the busy channel goes away during the delay period, Q6 will turn on, causing U3B to go low, and scanning will resume immediately.

### Modification 3 Procedure

Designing the scanning circuit was quite straightforward, but the real challenge was designing a circuit board to fit inside the 2-Meter Cube. Also, the three potentiometers on the scan board had to be accessible to set the frequencies to be scanned.

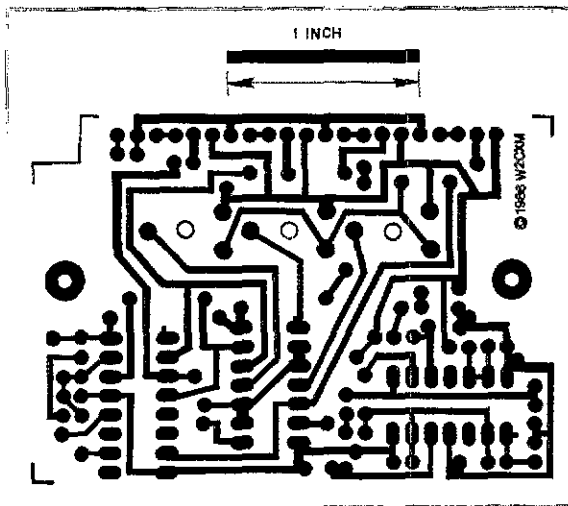


Fig 11—Full-size etching pattern for the 2-Meter Cube Receiver scan circuit board. Black areas represent unetched copper.

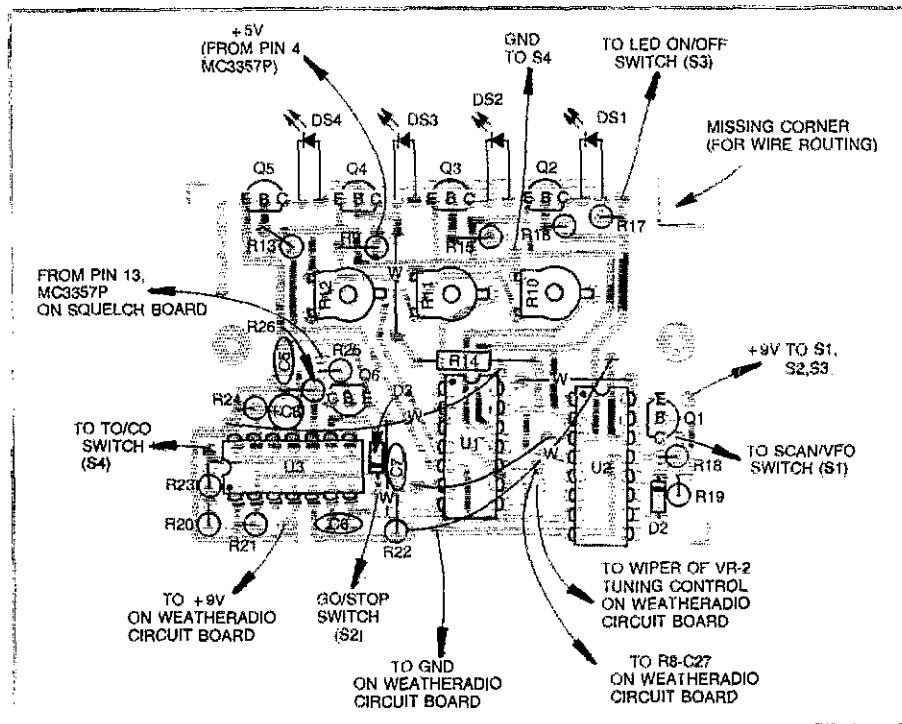


Fig 12—Parts-placement guide for the 2-Meter Cube Receiver four-channel scanning circuit. This view is from the component side of the board. Gray areas represent an X-ray view of the unetched foil.

Several circuit board layouts and locations were considered; the best arrangement was found to be that shown in Figs 11 through 13. The etching pattern and parts-placement guides for this board are shown in Figs 11 and 12, respectively. Etched and drilled circuit boards and parts kits are available from the Cornell ARC.<sup>2</sup>

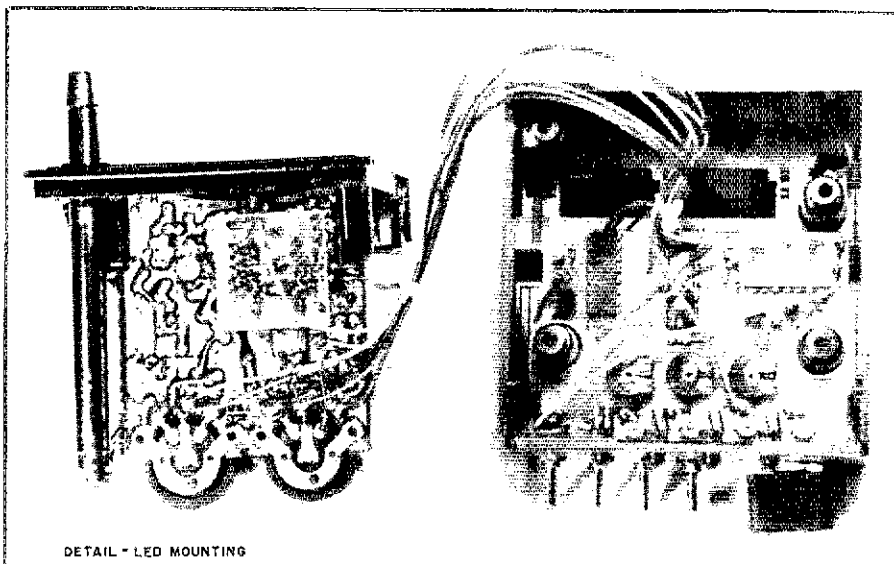
Follow these steps to perform the scan modification:

1) Solder all components onto the scan circuit board as shown in the parts layout of Fig 12. Leave at least  $\frac{3}{4}$  inch of lead on each of the LEDs. Bend the LED leads into an L shape so that the board can fit inside the case (see the detail in Fig 13). Solder the five insulated jumper wires onto the board.

2) Drill eight holes in the front panel for the LEDs and switches using a no. 10 (0.193-inch-diameter) drill. Use the full-size template in Fig 8 to mark the hole locations. Mount the toggle switches in the four lower holes.

3) Remove the case from the radio and slip the scan circuit board over the two mounting studs as shown in Fig 13. Drill a  $\frac{3}{16}$ -inch-diameter hole into the battery compartment at the missing corner of the circuit board (see Fig 13—just behind the left-most toggle switch on the case). This hole will be used to feed wires from the scan circuit board to the toggle switches.

4) Using a no. 22 (0.157-inch-diameter) drill, make three holes in the battery



DETAIL - LED MOUNTING

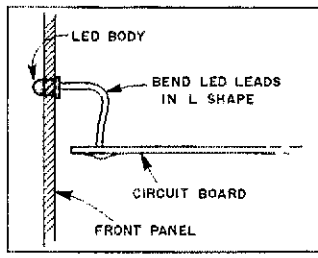


Fig 13—Interior view of the 2-Meter Cube showing the scanning circuit board and connections to the original circuit board. (photo by Kevin Wrenner, WB2LJK, and Brian McLeod)

compartment, each centered on one of the three potentiometer adjustment holes.

5) Solder the 12 interconnect wires to the scan circuit board. Six of these will connect to the switches and six to the foil side of the original circuit board. Position the scan circuit board inside the case as shown in Fig 13. Push the four LEDs through the holes in the front of the case and seat the board firmly.

6) Feed the six wires that connect the scan circuit board to the switches through the 3/16-inch-diameter hole that was drilled in step 3. Solder the wires to the switches.

7) Unsolder the wiper of the TUNING potentiometer (VR-2 on Weatheradio board), and bend it up from the circuit board. Connect the wire from the C input of U1 on the scan board to the wiper of VR-2. Connect the wire from the output of U1 to the circuit board pad that used to go to the wiper of VR-2.

8) Connect the +9 V wire on the scan board to +9 V on the original circuit board. (The red wire on the power switch is a convenient source of +9 V.)

9) Connect the +5 V wire on the scan board to pin 4 of the MC3357P. Connect the ground wire to the original circuit board ground at the ground terminal of the SQUELCH potentiometer.

10) Connect the wire from R25 on the scan board to the pad on the squelch board that connects to pin 13 of the MC3357P.

11) Bend the wires from the original circuit board around the edge of the board near the metal IF transformers. Be careful

not to short any connections together or pinch any wires. Feed the 9-V battery clip through the large slot in the battery compartment and close the case.

12) You may want to letter the new controls with dry-transfer lettering or tape labels.

### Operation

The four LEDs indicate what channel the 2-Meter Cube is tuned to at a given time. The first LED is labeled with a "V" for variable frequency oscillator (VFO). The frequency of the VFO is set by the TUNING control on the bottom of the radio. With the SCAN/VFO switch in the VFO position, the scan circuit is disabled and the radio operates normally. With toggle switches set to SCAN and GO, the radio scans the VFO and channels 1, 2 and 3.

Preset the channel 1, 2 and 3 frequencies by stopping the radio on the desired channel with the STOP switch. Insert a screwdriver through the battery compartment and adjust the corresponding potentiometer on the scan board until the desired repeater or test signal is heard.

The current drain of the 2-Meter Cube at 9 V is about 15 mA squelched and 30 mA at moderate listening levels. The scan circuit adds only 1 mA of additional current drain, thanks to the CMOS circuitry. However, the LEDs will add 9 mA more to the current drain. (The LED OFF switch has been added as a handy battery-saving feature.) A rechargeable 9-V NiCd battery or an external 9-V dc power supply is probably best for those who plan on using their 2-Meter Cubes for extended periods of time. Beware of the wall-transformer type 9-V dc "battery eliminators," as they produce several hundred millivolts of ac ripple, resulting in a 60- or

120-Hz hum in the receiver. It would be better to build a simple 9-V regulated power supply such as the one recently described in *QST*.<sup>3</sup>

### Troubleshooting

In case of trouble, review the circuit description given earlier for a better understanding of the circuit operation. Check that the interconnect wires go to their correct destinations, as shown in Fig 12. Verify that +5 V, +9 V and ground are present on the scan circuit board. Look for the clock signal at the output of U3A with an oscilloscope. Check that the SCAN control line from the MC3357P pin 13 goes low when the squelch is opened. Make sure that the IC and transistor orientations are correct.

### Conclusion

The performance of the 2-Meter Cube is more than adequate to monitor local 2-meter signals. To those who would like better performance, two suggestions are offered. It may be possible to improve IF selectivity by replacing the LC IF filter with a crystal filter. With such a selectivity enhancement in place, the further addition of an FET in the front end to boost sensitivity would turn the 2-Meter Cube into a truly first-class receiver. I welcome correspondence regarding improvements made to individual 2-Meter Cube receivers. The next challenge is for someone to design a matching 2-Meter Cube *Transmitter!*

### Acknowledgment

I would like to acknowledge the technical assistance of Joe Pingree, WB2TVB, without whose help this project would not have been possible.

### Notes

<sup>1</sup>Etched and drilled printed circuit boards and parts kits for each of the modifications are available from the Cornell University Amateur Radio Club, W2CXM, 401 Barton Hall, Ithaca, NY 14853. Send an SASE for current prices.

<sup>2</sup>See note 1.

<sup>3</sup>P. O'Dell, "The Perfect 10: A Power Supply for FM Portables," *QST*, Mar 1984, pp 16-18.

*Steven Powell holds BS and MS degrees in Electrical Engineering from Cornell University. He is employed as a staff engineer with the School of Electrical Engineering at Cornell, where he is responsible for the research and development of electric and magnetic field experiments that are used to probe the upper atmosphere. Steve has designed experiments that have flown on NASA sounding rockets and high-altitude balloons. He has done analog and digital design work for the Watkins-Johnson Company, Inc, a microwave receiving-systems manufacturer.*

*In his spare time, Steve enjoys teaching Amateur Radio licensing classes, improving the performance of 2-meter repeaters and traveling with his wife, Jill, KA8KBF. He is an active member of several radio clubs and is currently the advisor to the Cornell University Amateur Radio Club, W2CXM. The club consists of about 35 Cornell undergraduates, graduate students and staff members with expertise in a variety of subjects including Russian literature, animal science, computer graphics and electrical engineering. Current club interests include DXing, skeds with home, repeater-controller design, helium-balloon supported antennas, and modifying all kinds of radios for operation in the amateur bands. The club operates an active HF/VHF station and a 2-meter repeater.*

# The Magic of MOLI

Properly applied, Moli Energy's rechargeable lithium cell is superior to its nickel-cadmium counterpart. Here's how it works—and how you can use a MOLICEL® battery in your hand-held transceiver.

By Christopher Dollard, VE7FKS

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If you could imagine the perfect hand-held transceiver battery, what would be its characteristics? Your wish list might include features such as longer operating time, smaller size and less weight; a state-of-charge indicator accurate at any time; freedom from the "memory" problems that plague nickel-cadmium (NiCd) batteries; and constant readiness for use. You'd probably want it to retain its charge for years. Such a battery is *not* science fiction, but it may just have a dose of "magic."

Moli Energy, Ltd of Vancouver, British Columbia, Canada, has produced the first commercially available high-energy, rechargeable lithium battery—the MOLICEL power system. Like other lithium batteries, the MOLICEL battery takes advantage of lithium's high electrical energy potential and light weight, but offers the additional benefit of rechargeability.

MOLICEL AA size cells are presently being produced in Moli's pilot plant for limited release to manufacturers, product developers and radio amateurs. By early fall 1987, Moli Energy will be producing the cells in its high-volume manufacturing plant. Why is this new battery of interest to the Amateur Radio community?

First, with the ability to read its state of charge and its long charge retention, the MOLICEL battery is particularly well-suited to the varied and intermittent use typical of Amateur Radio operation. It possesses a higher ampere-hour rating and

higher full-charge voltage than its NiCd counterpart. Second, amateurs have always been at the forefront in applying innovative technologies. Their pioneering efforts have translated into tangible benefits for both consumers and industry over the years. The development of the MOLICEL battery presents another opportunity for amateurs to get in on the ground floor of a new technology. The purpose of this article is to unravel the mysteries of the MOLICEL power system and describe how amateurs can use it.

## Operating Theory

The power cell is the basic building block of all battery systems. By configuring a number of cells in a series and/or parallel arrangement, and perhaps adding a charging mechanism and case, a battery is produced. This is an important distinction to make since the terms *battery* and *cell* are often used interchangeably. A cell is to a battery as a link is to a chain.

A power cell is comprised of three essential parts. The *anode* is the negative electrode, the *cathode* is the positive electrode and an *electrolyte* acts as the carrier of ions between the two electrodes.

The heart of the MOLICEL battery is the lithium (Li) anode. Lithium is a desirable material for power cells because of its high electronegativity and light weight. The cathode material is molybdenum disulfide ( $\text{MoS}_2$ ), a graphite-like sub-

stance, stable and nonreactive.

The electrolyte is the unifying agent, conducting the lithium ions back and forth between the anode and cathode. The electrolyte also oxidizes the lithium anode when unused. This sealing effect prevents the charge from leaking from the anode, resulting in the excellent charge retention of the MOLICEL battery.

Prior to the development of the MOLICEL battery, there were two stumbling blocks that held up development of a viable secondary (rechargeable) lithium cell. First, the oxidization effect discussed above interfered with the ability to recharge the cell. Second, lithium ions tended to chemically react irreversibly with the cathode material. Moli overcame the first hurdle by finding a unique chemical method to replat the lithium anode when a recharging current is applied.

The second key breakthrough lies in the ability of the  $\text{MoS}_2$  cathode material to remain stable while charged with lithium ions. The  $\text{MoS}_2$  cathode also allows the lithium ions to leave when a recharge current is applied to the cell.

The process that occurs in the cathode by which "guest" lithium atoms are absorbed into the "host"  $\text{MoS}_2$ , with no resulting change in the host's structure, is called *intercalation* (see Fig 1). In the case of the MOLICEL battery, the guest lithium ions move from the lithium anode through the electrolyte and embed themselves in the

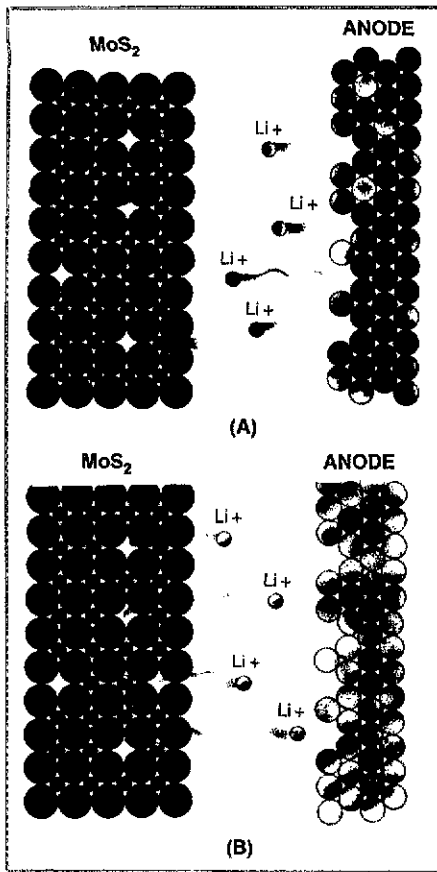


Fig 1—The process that occurs in the cathode by which guest lithium atoms are absorbed into the host with no resulting change in the host's structure is called intercalation. During discharge (A), lithium ions from the anode move across the cell electrolyte and are absorbed into a molybdenum disulfide cathode. B shows what happens during the charging stage of the lithium cell; lithium ions leave the cathode and return to the anode through the electrolyte.

host MoS<sub>2</sub> cathode structure during discharge. The lithium ions do not react with the surrounding host material, but simply insert themselves into "slots" between the cathode's molecular layers. Upon recharge, this process is reversed. The guest atoms abandon the host structure, leaving it in its original state, and return to the anode.

Unlike other cells that use a chemical reaction to create electricity, the MOLICEL battery undergoes a physical reaction. After recharge, the anode and cathode retain their original chemical makeup, a factor critical to long battery life.

The cell voltage varies almost linearly with the amount of lithium ions present in the cathode structure at any given time and thereby relates directly to the percentage of capacity remaining in the cell. This linear relationship results in another significant benefit: the ability to give the user an accurate state-of-charge indication.

The electrodes of the MOLICEL battery are wound in a jelly-roll fashion and con-

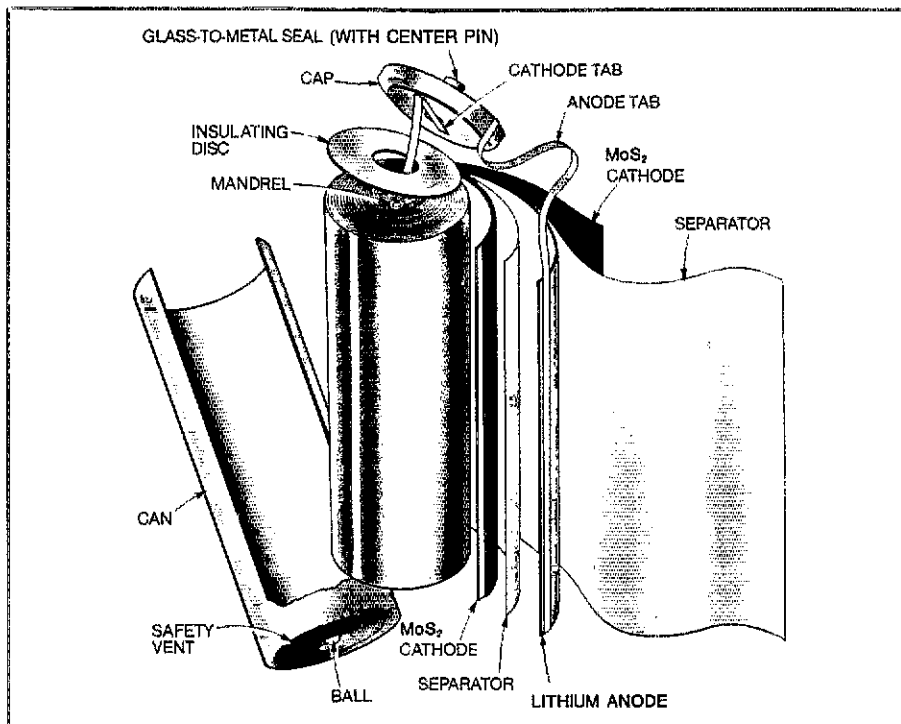


Fig 2—Construction of the MOLICEL cell.

tained within a steel case (see Fig 2). The electrolyte fills the pores of the separator and cathode material. The cell is hermetically sealed by laser welding, ensuring maintenance-free operation.

### Cell Operating Characteristics

A MOLICEL power cell does not behave like other cells. The prime characteristics that set it apart are its voltage slope on discharge, the ability to make capacity versus cycle life trade-offs and impedance variation.

As discussed earlier, the cell output voltage can be sampled at various points on the curve to inform the user of the percentage of capacity remaining (Fig 3). By using

high- and low-voltage sensing cutoff circuits, designers have great flexibility in optimizing the operating mode of the battery for different applications.

If your application calls for high capacity, you would choose a wide voltage operating range, such as 2.4 V dc to 1.3 V dc per cell. This would deliver 0.60 Ah or 1.10 Wh per AA cell (based on an average voltage of 1.8 V) with an effective cycle life of 400 cycles. The wide operating voltage range makes the cell work harder and therefore shortens its cycle life. Conversely, if you require many more cycles at a lower capacity you would choose a narrow voltage range, such as 1.95 V dc to 1.75 V dc. The result, using AA cells, would be 0.15 Ah or

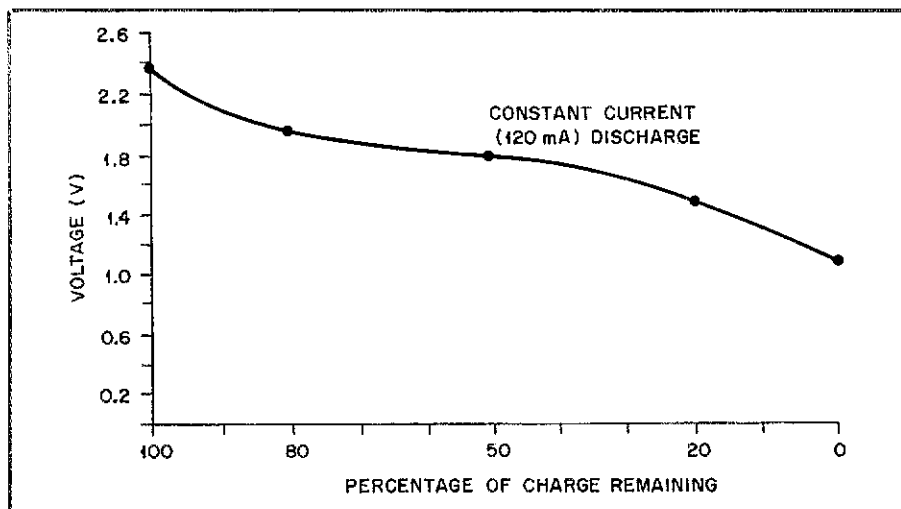


Fig 3—Discharge curve of a single MOLICEL rechargeable AA lithium cell at a constant discharge current of 120 mA.



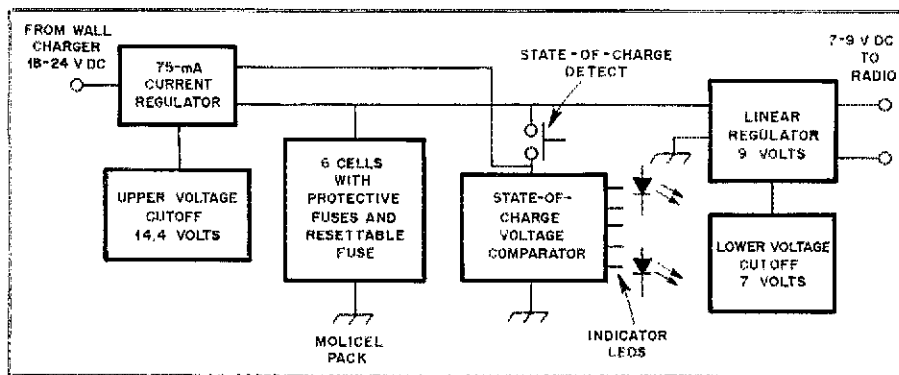


Fig 4—Block diagram of the MOLICEL transceiver battery pack kit.

0.27 Wh with a greatly increased cycle life of 2000.

Nickel-cadmium cells operate most reliably when completely discharged and recharged every cycle. Repeated shallow cycling reduces the effective capacity of the cells, a phenomenon known as the *memory effect*. MOLICEL power cells, on the other hand, are particularly well-suited for partial discharges and recharges over any portion of the voltage range. This type of operation is easily managed by the user, as the state of charge can always be monitored. Since a 25% discharge and recharge counts as only one quarter of a MOLICEL battery cycle, the effective useful lifetime of the battery is generally longer than that of a NiCd with the same specified cycle life.

The cell impedance varies over the discharge cycle—from about 200 milliohms at 2.4 V to 150 milliohms at the midpoint and increasing again to about 240 milliohms at 1.4 V. The resulting battery internal voltage drop must be taken into account when selecting the lower voltage cutoff and in specifying operating time.

### Transceiver Battery Design Considerations

The energy advantage of a MOLICEL battery pack over present NiCd transceiver batteries comes from both a higher ampere-hour rating (capacity) and higher voltage. For best results, the hand-held transceiver must have the capability to convert the higher upper voltage advantage to usable energy while at the same time accommodating its variation. This extra energy can best be used through the design of new radios.

With most existing transceivers, RF output power and current drain increase significantly when the battery voltage rises over the normal operating voltage. In addition, many radios will overheat if the nominal voltage is exceeded by more than 20%.

A good solution is to use a high efficiency dc-dc converter (switching regulator) for the low-current standby mode (typically less than 60 mA) and to use an automatic level control (ALC) circuit in the final amplifier. Dc-dc converter technology has recently improved to the point where miniaturized hybrid products are available that will accept the voltage variation of the

MOLICEL battery while providing a constant output voltage with 85-90% energy conversion efficiency.

Application of the ALC to the final amplifier will regulate the RF output power by limiting drive to the amplifier, reducing its current drain when battery voltage is high. Such ALC must be designed into the radio. It would add little cost to the radio—a similar ALC circuit is already in common use in cellular phones. A dc-dc converter for standby current levels could possibly be incorporated into a practical replacement battery pack.

A simple method of regulation that does not optimize the energy capacity of the MOLICEL battery is the use of a linear series regulator. The primary inefficiency of this method is the dissipation of extra energy in the form of heat.

Several hand-held transceivers, such as the ICOM IC-02AT and the Yaesu FT-209RH, do not have severe input voltage restrictions. These radios do not require a linear regulator because they can operate from power supplies delivering up to 15 V. The maximum supply voltage for

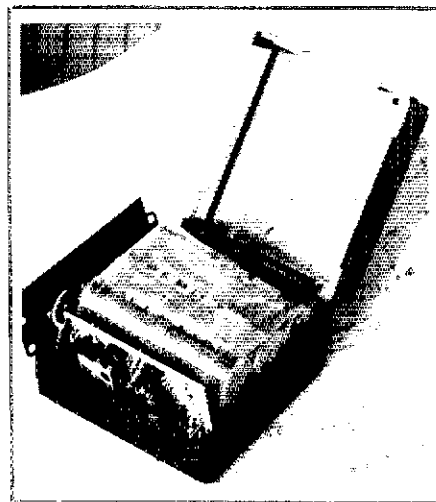


Fig 5—The MoliKit prototype includes an ICOM BP-5 case, the 6-AA MOLICEL assembly, and circuit board. The circuit board consists of the electronics for the state-of-charge indicator, charge/discharge control and linear regulator. The kit offered for sale uses a printed circuit board.

older hand-held models, such as the Kenwood TR-2600 and the ICOM IC-2AT, is from 10 to 12 V. A regulator *must* be used with such radios to prevent damage.

### A Practical MOLICEL Replacement Battery

There is no substitute for hands-on experience when learning to understand and apply a new technology. We have been using a MOLICEL battery pack in an ICOM IC-02AT for several months with excellent results.<sup>1</sup> We have developed the design to the point where it is now suitable for use in several popular amateur hand-held transceivers. A block diagram of this battery pack is shown in Fig 4. Fig 5 shows the internal contents of the MoliKit prototype.

Moli Energy and another Vancouver company have joined forces to make these battery packs available directly to amateurs in kit form. The kit includes six AA MOLICEL cells preassembled and spot welded into a pack configuration, a plastic case (BP-5 size for the ICOM transceivers) with associated hardware, a wall transformer/rectifier to provide 18-20 V dc for charging, a printed circuit board and kit of parts for:

- recharge control with high voltage cutoff;
- a 75-mA current limiter;
- discharge control with low voltage cutoff;
- a state-of-charge voltage comparator with LEDs;
- a 6-cell MOLICEL assembly, complete with fuses; and
- a linear regulator.

All of the parameters associated with these functions can be controlled by selecting specific resistor values.

In our 6-cell pack configuration, we have chosen a voltage range of 13.6 to 6.7. Tests have shown that the voltage drop on transmit is about 1.4 V maximum at the bottom of the cycle because of cell impedance. Therefore, when the battery open-circuit voltage is 8.4, keying the transceiver will result in a battery terminal voltage of 7.0. For an ICOM IC-02AT, the RF output at 7 V is about 2 W. By comparison, the voltage drop using the ICOM BP-5 NiCd pack is about 0.6.

A linear regulator is used to limit the

<sup>1</sup>The MOLICEL battery pack kit, described in the article, is currently available only with plastic cases for ICOM IC-2AT and IC-02AT transceivers. Depending on the demand, kits with plastic cases for the Yaesu FT-209R and the Kenwood TR-2600 may also be made available. Quantities will be limited until the fall of 1987 when shipments from Moli Energy's high-volume plant commence. Price of the pack kit is \$99 US, including shipping. Until November, orders will be limited to one pack per customer. For further information on using a MOLICEL pack with your transceiver, call MoliKit at 604-439-7889 or write MoliKit, PO Box 82460, North Burnaby, BC Canada V5C 5Z1. To order your kit by credit card, call toll free 1-800-663-6658 (USA only). The ARRL and QST in no way warrant this offer.



## QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

Thinking of operating through FO-12, but don't know where to start? May QEX has information on constructing and using an interface for your Kenpro KR-5400A az/el rotator antenna system. A tracking program in BASIC, templates for making your own PC board and information on purchasing boards are included.

The May issue also includes articles on:

- "Computer Interface for the Kenpro KR-5400A—Part 1," by Frank H. Perkins, Jr, WB5IPM
- "Calculate 5- and 7-Element Filter Components," by Edward Wetherhold, W3NQN
- "Solid-State Construction Practices, Part 5," by Bill Olson, W3HQT
- "Windshield-Mounted Antennas," by Bill Conwell, K2PO

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.

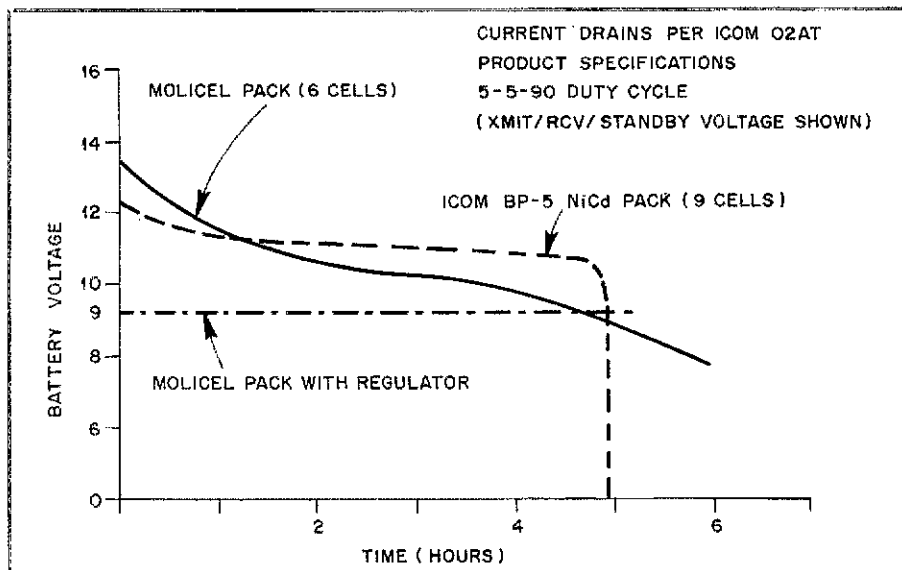


Fig 6—Voltage of a battery of 6 MOLICEL rechargeable AA lithium cells as a function of elapsed time. The curves show MOLICEL battery pack performance with and without a voltage regulator, as compared with an ICOM BP-5 nine-cell NiCd pack. The battery shut-off point is at 6.7 V.

output voltage to 9 because some older radios cannot withstand more than 10 V from a power source. The regulator may also be used with newer hand-held transceivers to limit current drain and thus prolong operating time.

Fig 6 shows a performance comparison between the MOLICEL battery pack and a standard ICOM BP-5 NiCd pack. The area under the voltage curve corresponds to energy used. The area between the cell pack voltage and the regulated output represents the energy dissipated as heat in the regulator. As is, the MOLICEL pack delivers only about 10-20% more operating time than the BP-5 battery pack. If the radios were designed to make use of this additional energy, the MOLICEL pack operating time could be increased to more than 50% over the NiCd pack.

The charging circuit requires a supply of at least 4 V more than the total upper-end voltage of the pack, at a current in the range of 60 mA to 100 mA. The wall transformer/rectifier, supplied with the kit, provides this energy. When full charge has been attained (13.6 V), the supply current is cut off. Full charge time is about 10 hours.

One of the outstanding benefits of the MOLICEL power system is it allows measurement of the state of charge at any time. The voltage comparator, which drives any one of a series of green, yellow and red LEDs dependent upon the pack voltage, is activated by a push-button switch. During recharge, the indicator is on continuously until full charge is reached. When you get accustomed to having a "fuel gauge" on your battery pack, you may never want to use any other battery system again!

### Conclusion

Rechargeable lithium-cell technology

stands on the threshold of a completely new generation of rechargeable power systems. Moli Energy's research and development in rechargeable lithium cells is focusing on increasing deliverable energy, improving low temperature performance, reducing charge time and developing additional cell sizes, both smaller and larger. The company is already working on a 2 Wh, low-impedance AA cell prototype.

The capabilities of the MOLICEL power cell are already beyond the most enhanced nickel-cadmium cell. Existing and future generations of the MOLICEL power system will meet the growing needs of a society making increasing use of portable electronics. This is *your* opportunity to experiment with the "Moli Magic," and explore the many new avenues opening up with this technology.

### Additional Information

Further information on the MOLICEL technology is available from Moli Energy Limited, 3958 Myrtle St, Burnaby, BC V5C 4G2, Canada, tel 604-437-6927.

*Christopher Dollard, VE7FKS, has been licensed for seven years. He was instrumental in the start-up and management of two radio businesses, including the first cellular radio franchise in Vancouver. He is currently a Business Counselor for Tiem Canada, an organization sponsored by Control Data to help entrepreneurs develop ideas into viable commercial enterprises.*

*Noulan Bowker, VE7BLA, an electronics engineer, obtained his amateur ticket 25 years ago. Operating as HS1AIX from Bangkok, Thailand in 1971-73, Noulan used ham radio as a teaching aid when he was an instructor at the King Mongkut Institute of Technology. He is currently the Business Development Manager for the communications and computer markets at Moli Energy Limited.*

## Feedback

In Dr Steven Reyer's article, "The DIGI-CAT" (QST, Apr 1987, pp 40-43), note 6 has the cost of the object code listing for the DIGI-CAT as \$3. The correct price for this listing is \$1. Anyone remitting \$3 will be sent a \$2 refund.—Bruce O. Williams, WA6TVC

## Strays



I would like to get in touch with...

anyone with a schematic/parts list for an AMECO Equipment Co preamp, Model PLF-2. Russ Smith, W6ONK, PO Box 141, Brownsville, OR 97327.

anyone with a manual/schematic for a Superior Instrument Co genometer, Model TV-50A. Eugene Hecker, WB5CCF, PO Box 940, Magdalena, NM 87825.

Unisys Corp hams, for compilation of roster of company amateurs. Frank Pfeiffer, KJ6V. Unisys ARC, San Tomas and Central Expressway, Santa Clara, CA 95052.

submarine veteran hams, to participate in a net on Saturdays at 1800Z on 14.243 MHz. Greg Ocfemia, Jr, KM3I, 419 Brooks Ct, Glen Burnie, MD 21061.

# A New Chip For Charging Gelled-Electrolyte Batteries

Unitrode's sealed lead-acid battery charger IC, the UC3906, does a familiar job better, easier and with fewer parts.

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**A**mateur Radio has become the traditional last resort when other communications means fail. This has not only been a justifiable source of pride, but also a beneficial way to ensure protection of our on-the-air privileges. It is a good idea, therefore, to keep a battery-powered rig in standby, headed up by a healthy, fully-charged battery. Indeed, with so much ham gear running on low-voltage dc, it's a good idea to run the whole shack on batteries. The introduction of the sealed lead-acid cell, and now the UC2906/3906, make it easier than ever.

Before listing all the things that the '3906 can do for your favorite battery (the '2906 is the military version), let's review the facts of life—long life, as it pertains to the lead-acid cell. Lead-acid batteries with a gelled electrolyte are best kept charged and maintained by a charger at a *float* voltage (between 2.25 V and 2.30 V per cell). To obtain a full charge, the battery is charged to about 2.4 V per cell, but holding or forcing the cell to a higher voltage only hastens its demise. Therefore, a good charger must switch back to the float level when necessary. When terminal voltages exceed the float level, the battery is said to be in the *overcharge* region.

During fast charge, the charger must limit the current to a safe level known as the *bulk rate*, then taper off in the overcharge region to about 1/10 that. The bulk rate is designated in terms of the battery's full ampere-hours (Ah) capacity, and stated as a ratio. For example, a battery requiring four hours to charge at the bulk rate is said to be charging at C/4, though it actually takes longer because of tapering.

A battery's Ah capacity can fool you. Manufacturers often refer to it as the *20-hour rate*. Hence, a 20-Ah battery can be expected to deliver 1 A for 20 hours, but not 20 A for 1 hour!

The UC3906 "knows" about this, and a few other matters that may never concern you as a ham. It controls the bulk current, taper and limits the overcharge voltage,

after which it dutifully maintains your battery at the float level. The '3906 knows when the power is on, when your battery needs a fast charge, if a dead battery is connected or the polarity is reversed. It can even allow for the battery's temperature sensitivity.

## A Practical Application

This charger is a modified version of the battery pack and charger published in *The 1987 ARRL Handbook*.<sup>1</sup> The charger in this system lends itself to the use of the '3906, but it is compatible to that presented

<sup>1</sup>Notes appear on page 29.

## Glossary

**Battery**—A group of cells connected together to increase current and/or voltage ratings.

**Bulk Charging Rate**—Current flow during the fast-charging part of the cycle. It is often expressed as the number of hours it takes to charge a cell fully at this rate. Theoretically, C/4 means that it would take four hours for a full charge. For a 10-Ah cell, charging at C/4, the charging current is 10/4 or 2.5 A.

**Capacity (in ampere-hours, Ah)**—A measure of the cell's ability to deliver current over a period of time. It is usually expressed as the 20-hour rate.

**Float Voltage**—Voltage at which a cell may be held indefinitely without damage, 2.25 to 2.30 V per cell.

**Overcharge Voltage**—Voltage to which a cell must be charged to achieve full capacity, about 2.4 V per cell.

**Taper**—A gradual reduction of charging current as full charge is approached.

in the *Handbook*; it simply requires substitution of a revised circuit board. Thus, we already have all the ancillary hardware as well as a proven device to which we can compare our result.

A schematic for the charger is shown in Fig 1. The screened portion is the new board. First, let's walk through a charging cycle and see how the '3906 earns its living. Its initial task is to ensure that power is on and that a good battery is connected. Pin 5 monitors the supply voltage and enables the chip when the voltage reaches 4.5 V or more. Pin 12 senses the battery terminal voltage. If the voltage is too low (a dead battery) or of the wrong polarity, the charger is disabled. If this is the case, pin 11 is pulled high, sourcing a current of up to 25 mA which may be used to operate a signal or initiate a rescue procedure.

Assuming a good battery needs charging, the UC3906 puts two watchdogs to work: One regulates the charge current and the other looks at the battery terminal voltage. The current regulator senses the voltage across series resistor RS, and limits it to 0.25 V by controlling the current through RS. Thus, the bulk charging rate is determined solely by the value of RS. For example, if RS = 1  $\Omega$ , the charger current is 0.25 A.

Battery terminal voltage is sensed at pin 13. This voltage is compared to the '3906's internal voltage reference, nominally 2.3 V. Higher terminal voltages are accommodated by using voltage divider RA and RB, the values of which must be selected so that when the critical terminal voltage is reached, the voltage at pin 13 equals the reference. But how about the two critical voltages, overcharge and float? Well, initially, pin 10 is pulled to ground, placing RC in parallel with RB. This means that the battery voltage has to rise higher than the float level before pin 13 sees 2.3 V. When this happens, pin 10 is latched open and RC is out of the picture.

When the terminal voltage rises to a level that is just below float, the voltage

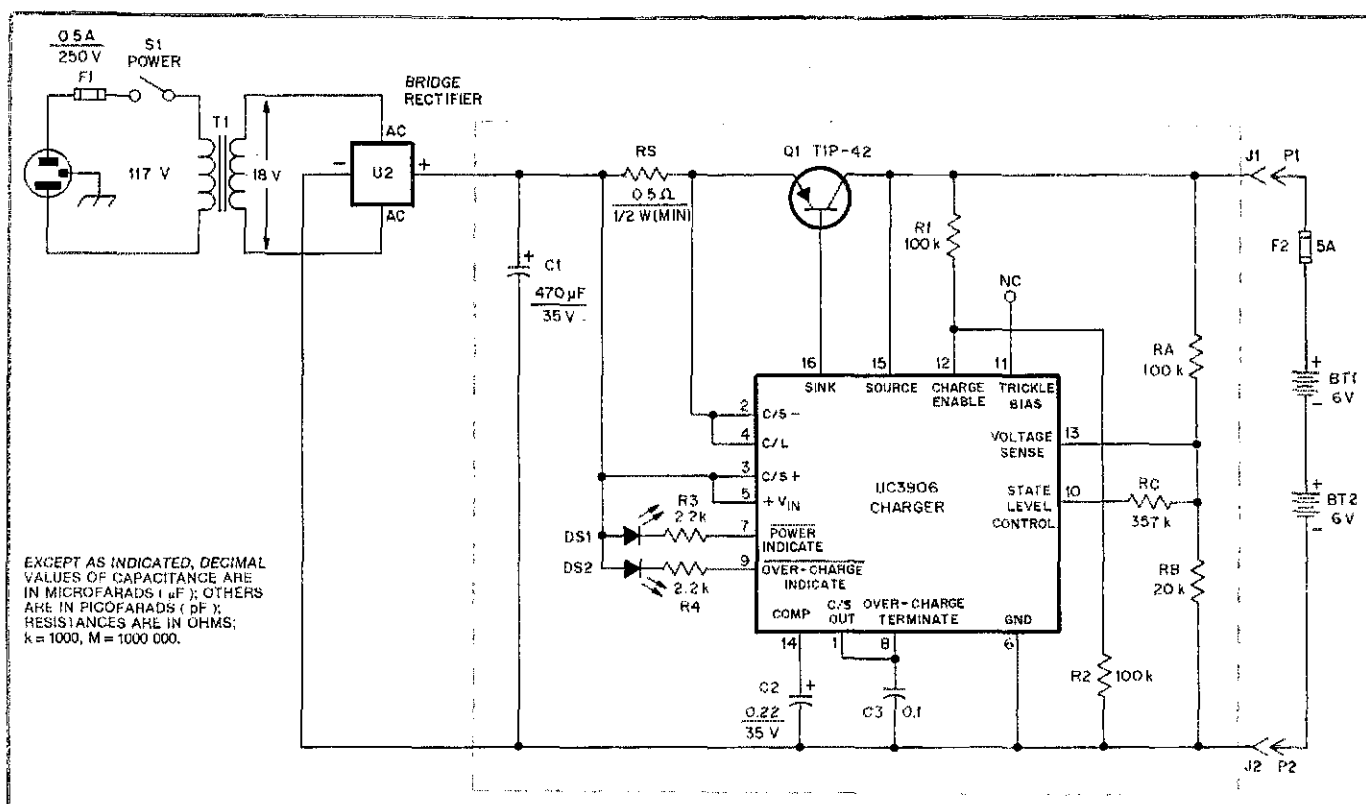


Fig 1—Schematic of the UC3906 charger. All resistors are ¼ W, 5% tolerance unless otherwise noted. Part numbers given in parentheses are Radio Shack catalog numbers. Those in brackets are Mouser Electronics stock numbers. Parts for this project may be purchased from your local Radio Shack outlet or from Jameco Electronics, 1355 Shoreway Rd, Belmont, CA 94002, tel 415-592-8097, and Mouser Electronics, 11433 Woodside Ave, Santee, CA 92071, tel 619-449-2222. The UC3906 is available from Hamilton/Avnet; call 800-421-0404 for a dealer in your area, or A&A Engineering, tel 714-952-2114.

BT1, BT2—Gelled-electrolyte, lead-acid battery, 6V, 4 Ah (Yuasa NP4-6 or equiv. Available from Glynn Electronics, PO Box 800, Middleboro, MA 02348.)  
 C1—Electrolytic capacitor, 470 μF, 35 V (272-1030).  
 C2—Electrolytic capacitor, 0.22 μF, 35 V (272-1012).  
 DS1, DS2—Red LED (276-062).  
 F1—Fast-acting fuse, 0.5 A, 250 V (270-1271).  
 F2—Fast-acting fuse, 5 A, 250 V (270-1278).

J1, J2—1300 series, Anderson Power Products, 145 Newton St, Boston, MA 02135.  
 P1, P2—1300 series, Anderson Power Products.  
 Q1—Power transistor, PNP, 90 W, TO-220 case, TIP-42 or equiv (276-2027).  
 RA—Resistor, ¼ W, 100 kΩ, 1% tolerance [29MF250].  
 RB—Resistor, ¼ W, 20 kΩ, 1% tolerance [29MF250].

RC—Resistor, ¼ W, 357 kΩ, 1% tolerance [29MF250].  
 RS—Resistor, 3 W, 0.51 Ω, 5% tolerance [28PR003].  
 S1—SPST switch.  
 T1—Transformer, pri 117 V, 60 Hz; sec 18 V, 1.2 A (273-1515).  
 U1—Battery-charger chip, Unitorde UC3906 or UC2906.  
 U2—Full-wave bridge rectifier, 100 PIV, 4 A (276-1171).

regulator takes control away from the bulk-current regulator and goes into the overcharge state. The current then tapers as the voltage continues to rise toward 2.4 V per cell, the point at which the float state is instituted. As the charging current tapers, the voltage across RS drops proportionately. Another watchdog looks at this voltage to see when it goes below 0.025 V. When 0.025 V is sensed, a latch is toggled and pin 10 is ungrounded. Float conditions are established and the battery-terminal voltage drifts back toward 2.3 V per cell, which is maintained until the battery becomes discharged or the power is switched off and back on. Following either of these events, the latch is reset and the cycle repeats itself.

DS1 and DS2 are optional. DS1 is the input-power indicator and lights when the supply voltage equals or exceeds 4.5 V. DS2

is the overcharge indicator and lights when the battery is in the overcharge region (over 2.3 V per cell). When the charger reverts to the float state, DS2 goes out. Since the tapering charging current slows down the process, it is normal for this light to remain lit for several hours.

### Construction Notes

Construction is straightforward. If you start from scratch, I recommend that you refer to the *Handbook*. Lead dress requires *nothing more than ordinary neatness*. Though the circuit board lends itself to perfboard construction, a modified PC board and parts kit is available from A & A Engineering.<sup>2</sup> Their version of this project allows any size battery to be charged.

Q1 requires additional radiating surface for cooling. To facilitate this, Q1 is located

at the edge of the circuit board so that its tab can be screwed down to the metal enclosure. Since the tab is hot electrically as well as thermally, it must be insulated from the case with a thick mica washer and insulated screw. The easiest way to do this is to use a TO-220 mounting kit. Scrape the paint from the area where the tab will be mounted and be sure there are no rough spots or sharp points that could pierce the mica insulator. Mount Q1 first, then position the PC board so that no strain is put on the transistor leads. Fig 2 shows the internal contents of the charger; note Q1's placement.

The values of the voltage divider resistors, RA, RB and RC, are critical. Use of junk-box resistors could seriously shorten the life of your battery. Use metal-film, 1% tolerance resistors. If you can obtain closer tolerance resistors, do so.

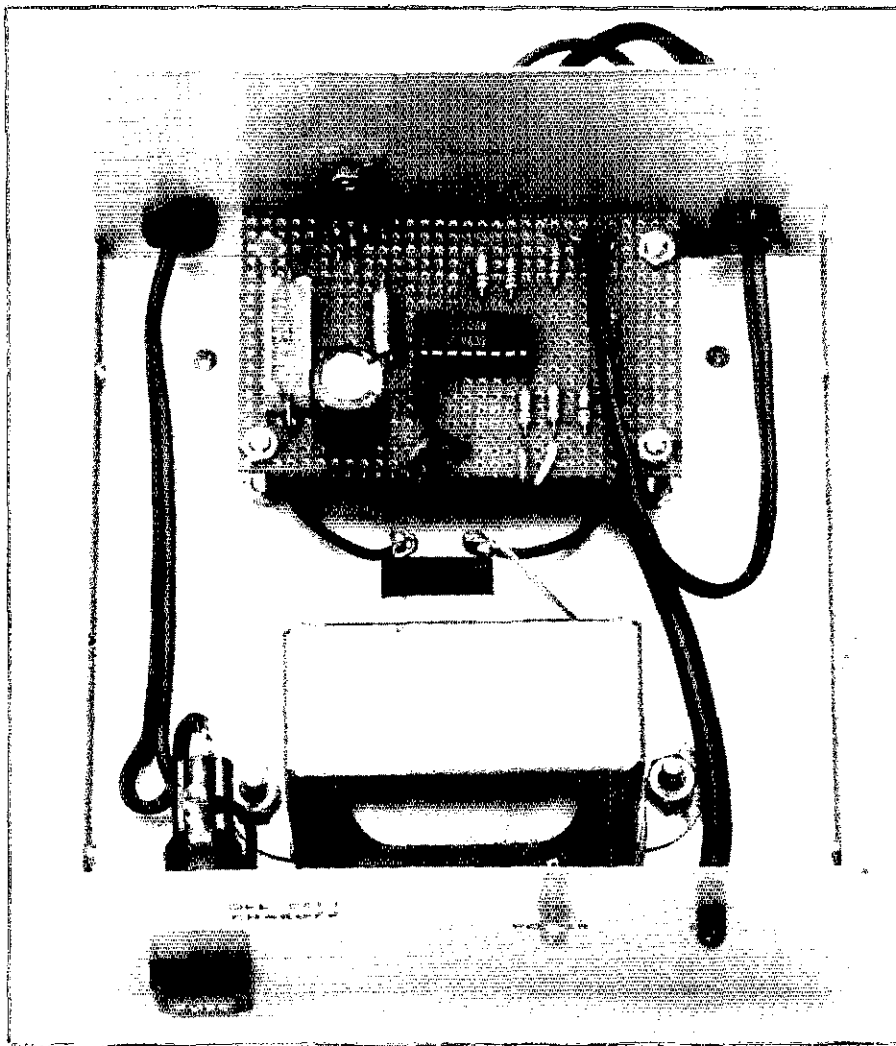


Fig 2—A view of the charger circuit board. This is an ideal weekend project that will provide hours of usefulness and pay for itself when compared to the price of a good battery.

transistor in the '3906 version will work with an emitter-to-collector voltage of less than 1. It is feasible, therefore, to reduce the worst-case supply voltage to as little as 16 V, which means that Q1 runs cooler. This is not necessary if Q1 is well heat-sinked, but is worth considering in a new design. Table 2 lists the operating characteristics of a charger using the values shown in Fig 1.

#### Expanded Uses

The '3906 is more versatile than the Table 2 specifications imply. If your requirements differ, you can still use the circuit in Fig 1 by calculating new values derived from the formulas in Table 3. These formulas are a rationalization of those in the manufacturer's application note.

*A note of caution:* The output-drive current of the '3906 chip is limited to 25 mA. This may not be enough to drive Q1 to meet higher charging-current demands, and a higher gain, more powerful current amplifier may have to be substituted in its place.

Among other complications, the lead-

Table 2

#### The Operating Characteristics of a 4-Ah, 6-Cell Lead-Acid, Gelled-Electrolyte Battery

Overcharge voltage limit	14.445 V
Float Voltage	13.8 V
Bulk Charging Current	0.5 A
Charging Rate	C/8
Disabling (fault) voltage	4.6 V

If not, and you have access to a digital ohmmeter with a 3½-digit resolution, match RA and RB. The ratio is more important than the absolute value and should be close to 5:1 for a 12-V battery. Since you may have to settle for less than a perfect match, it's best to select a higher value for RB. The value of RC, though important, is not as critical and any 1%-tolerance resistor will do. Table 1 is a BASIC program to facilitate calculation of the critical values used in Fig 1.

The value of RS is chosen to provide an eight-hour charging rate (C/8). This is a compromise between the fullest charge and the shortest practical time. All other component values are noncritical, and 5%-tolerance resistors are recommended. C2 introduces a short time delay to prevent circuit oscillation. C3 prevents the latch from being interrupted.

The supply voltage used in the *Handbook* charger is chosen to exceed the minimum required by its LM317T regulator under worst-case conditions. The pass

Table 1

#### C64/128 BASIC Program for Calculating Charger Circuit Values

```

1 REM COMPUTES CRITICAL VALUES FOR LEAD-ACID BATTERY CHARGER CHIP UC2906/3906
3 PRINT "(CLR)";PRINT"UC2906/3906 BATTERY CHARGER CHIP CALC."
4 PRINT"FOR LEAD-ACID BATTERIES.":PRINT
5 UR=2.3:PRINT
10 INPUT "NUMBER OF CELLS=";N
20 VF=2.3*N
30 INPUT "AMPERE-HOUR RATING=";AH
40 INPUT "FAULT VOLTG.(2.3 MIN.)=";VL
50 PRINT:PRINT"RA MUST BE BETWEEN 47000 & 100000 OHMS"
60 INPUT "RA";RA
70 RB=(UR/VF*RA)/(1-UR/VF)
80 UD=1.0467*VF
90 RC=RA/(UD/2.3)-1-(RA/RB)
100 R2=(230000/VL)/(1-2.3/VL)
110 PRINT"RB="INT(RB)
120 RC=RA/(UD/2.3)-1-(RA/RB)
130 PRINT"RC="INT(RC)
140 R2=(230000/VL)/(1-2.3/VL)
145 IF R2<0 THEN PRINT"R2 ERROR, CHOOSE HIGHER FAULT VOLTAGE";GOTO160
150 PRINT "R2="INT(R2)
160 RL=2/AH
170 RH=2.5/AH
180 PRINT"RS= ANY VALUE BETWEEN"INT(RL*1000)/1000" & "INT(RH*1000)/1000
190 PRINT
200 PRINT"TO TRY ANOTHER VALUE FOR RA, HIT ANY KEY"
210 GETA$:IFA$="" THEN210
220 PRINT:GOTO 60

```

**Table 3****Resistor Specifications for the Battery Charger**

RA = Any value between 47 and 180 k $\Omega$

RB =  $RA \left( \frac{1}{N-1} \right)$  where N = no. of cells

RC =  $3.85 \times RA$

RS =  $\frac{0.25}{I_{CHRG}}$  where  $I_{CHRG}$  is the bulk charging current

R2 =  $\frac{2.3 \times R1}{VL \left( 1 - \frac{2.3}{VL} \right)}$  where VL is the

selected low-default voltage; R1 can be any value between 47 and 100 k $\Omega$

**Table 4****Resistor Values for a 14-V Battery Pack**

RA 120 k $\Omega$

RB 20 k $\Omega$

RC 392 k $\Omega$

RS See Table 3

R2 392 k $\Omega$

Note: Above are stock, 1% values.

acid cell is temperature sensitive. To accommodate this characteristic, the voltage reference on the chip has a temperature coefficient that matches that of the cell. Self heating within the chip is negligible. If it is placed in approximately the same environment as the battery, it will compensate for temperature shifts and you don't have to do anything else.

This chip will work with any lead-acid battery it is implemented to serve, including the big, ugly wet battery that starts your car. Use the formulas in Table 3 to determine a new set of values and use a large pass transistor with plenty of drive.

**The Seven-Cell Battery**

There's no such thing, but maybe there should be—you can make one. The seven-cell battery has become the *de facto* standard among glider pilots who depend on batteries to power critical navigational and communications gear during flights that often exceed eight hours duration. (Does this sound like a parallel to a long power outage?) Maybe hams would do well to emulate the pilots.

Here is why a 14-V battery is better:

- Many 12-V radios are designed to work with vehicular batteries that are being charged continuously at about 14 V.
- A 12-V battery on discharge is putting out less than 12 V.
- Power input to your rig's final varies as the square of the applied voltage. Compare a battery that is delivering power at 13 V to one at 11 V. The power ratio is

(13<sup>2</sup> / 11<sup>2</sup>), or almost 40% higher.

If you decide to create a seven-cell battery, be sure the extra cell matches those in the batteries in series with it. Most of all, it should be of the same manufacture. Table 4 lists values that will keep a 14-volter in good shape.

If this seems like a lot of hassle to charge a battery, try comparing the cost of a good battery to the nonrecurring cost of a good charger. (Maybe we should call it a "battery maintainer.") Furthermore, it saves the embarrassment of having to shake your head in frustration when someone is relying on you to get the message through during an emergency.

**Notes**

<sup>1</sup>M. Wilson, ed., *The 1987 ARRL Handbook* (Newington: ARRL, 1986), p 27-34.

<sup>2</sup>PC boards and a kit of parts are available from A & A Engineering, 2521 W La Palma, Unit K, Anaheim, CA 92801, tel 714-952-2114. PC boards and the parts kit (item no. 150-KIT) cost \$49.95. The PC board can be purchased separately for \$7.95 (item no. 150-PCB), and the Unitorde IC, UC3906, is \$7.50. All orders add \$2.50 for shipping and handling. The ARRL and QST in no way warrant this offer.

speech. When speech is recognized, the VOS switches the speaker audio on—otherwise the receiver is kept quiet.

The standard version, shown in the photo, requires hook up to the low level audio input circuit in the receiver. The deluxe version is packaged on a separate circuit board, and includes a relay, keyed speaker leads and extra contacts for control of other circuitry. The deluxe version can drive a speaker directly.

For further information, contact Naval Electronics, Inc, 5417 Jetview Cir, Tampa, FL 33634, tel 813-885-6091. Price class: standard version, \$79; deluxe version \$99. —Bruce O. Williams, WA6IVC

**HIGH-FREQUENCY PRESCALERS FROM NEC**

NEC Corp has developed a family of new digital high-frequency prescalers that divide by 2 (UPB581) or divide by 4 (UPB 582). Applications include frequency synthesis, division and prescaling. Both prescalers are available in two packages: an 8-pin can (package A) and an 8-pin DIP (package C). Both devices can operate from 0.5 to 2.2 GHz (package A) and from 0.5 to 2.8 GHz (package C). Typical performance figures are:

Part No.	Frequency Response (GHz)	Input Level (dBm)	Output Level (dBm)	Supply Current (mA)
UPB581A	0.5-2.8	0-15	-8	50
UPB581C	0.5-2.8	0-15	-8	70
UPB582A	0.5-2.2	0-15	-8	50
UPB582C	0.5-2.2	0-15	-8	70

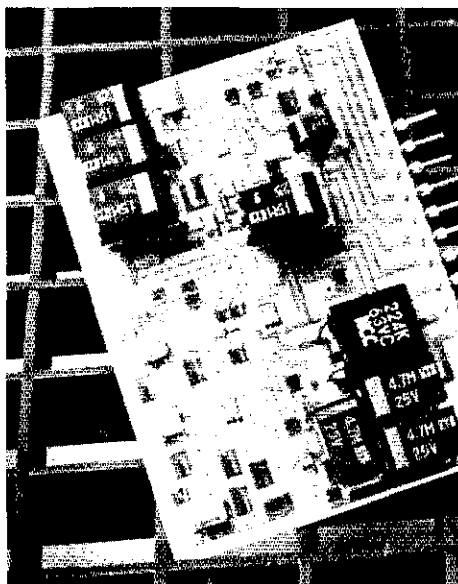
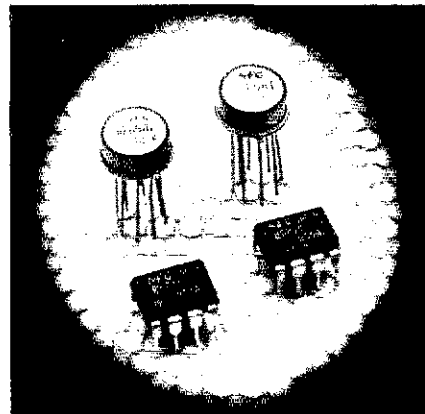
These prescalers are available from California Eastern Laboratories, 3260 Jay St, Santa Clara, CA 95054, tel 408-988-3500. Price class: package A, \$55; package B, \$14. —Bruce O. Williams, WA6IVC

# New Products

**VOICE-ACTIVATED SQUELCH FROM NAVAL ELECTRONICS, INC**

The tiny "Voice-Operated Squelch" (VOS) from Naval Electronics utilizes the latest state-of-the-art techniques in surface-mount and thick-film hybrid circuit technology. It is small enough to install easily in most modern receivers and transceivers to provide commercial communications quality squelch operation.

The circuit incorporates a syllabic rate detector that provides superior squelch operation compared to the usual AGC type squelch supplied with most receivers. The manufacturer claims it is immune to noise, static crashes, heterodynes and steady tones. The circuit looks for signal changes similar to the changes that normally occur in human



# Build Your Own MCM ICs

MCMs (mini circuit modules) are fun to lay out and build. With a few IC headers and some patience, you can develop miniature subassemblies that may be used many times.

By Doug DeMaw, W1FB  
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**H**ave you considered building your own ICs? The idea is not as ridiculous as it may seem! We must accept the fact that none of us are equipped to construct classic monolithic ICs, wherein the circuit elements are developed on a common piece of silicon (substrate). But, it is not mandatory that circuits to be integrated are formed in that manner. With a reasonable amount of imagination and time, it is possible to place your favorite small circuit on a tiny blank DIP header. For lack of a better acronym, let's call these assemblies MCMs (for "mini circuit modules").

You may wonder what the purpose of such an exercise might be. First, we are forced to develop a compact circuit layout, owing to the restricted number of IC-header pins available, plus the small rectangular area of the header. I find that the circuits I have placed on IC headers would typically occupy three times the space on an ordinary PC board. In other words, when there is room to spare, I seem to use it! Miniaturization is beneficial when we wish to build compact gear for portable use, especially for QRP applications.

Another advantage realized from MCMs is that they can be used many times in numerous projects. The same circuits, if built on PC boards, would require complete stripping of the components in order to transplant them on a new PC board. The MCMs can simply be removed from IC sockets and plugged into a socket on some other PC board. This technique should appeal especially to the experimenter or the frugal amateur.

## Some Common Circuits as MCMs

Fig 1 shows a compound, direct-coupled audio amplifier that has been built on a

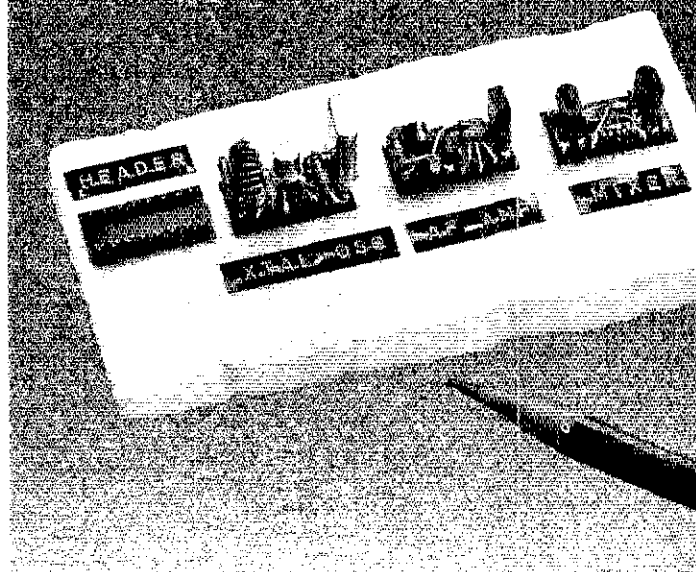
16-pin DIP header.<sup>1</sup> This amplifier has the ability of providing 40 dB of gain, depending on the electrical characteristics of the transistors used. Such an amplifier is suitable for driving a pair of headphones, serving as a mic amplifier or for use ahead of an audio power IC, such as an LM386. Fig 1B shows how the parts are assembled on the header. The heavy outline around the circuit of Fig 1A indicates which components are on the header. C3, for example, is external to the MCM.

## Doubly Balanced Mixer MCM

Diode-ring DBMs are available as commercial units in DIP IC packages. Mini-Circuits has some nice units that come in sealed metal packages for direct insertion into IC sockets. These modules are expensive when purchased in single-lot quantities. If one buys 10 or more units, the price becomes more equitable, but few of us want a drawer filled with DBMs that may never be used! So, the MCM approach becomes worth considering for most of our amateur needs.

Fig 2A shows the circuit of a DBM. The diodes should be matched as closely as possible to ensure proper circuit balance. Diode matching may be done by means of a VOM. Sort through your 1N914 or similar small-signal silicon switching diodes and select four that have the same forward-resistance reading (typically between 7 and 12 ohms). Hot-carrier diodes are even better for use in a DBM, and most of them

<sup>1</sup>IC headers (sometimes called DIP adapter plugs) are available from many surplus electronics parts dealers, including Mouser Electronics, 11433 Woodside Ave, Santee, CA 92071, and ALL Electronics Corp, 905 S Vermont Ave, Box 20406, Los Angeles, CA 90006.



from a given brand and type number are fairly well matched.

Z2 of Fig 2A may be used as a mixer, balanced modulator or product detector. No internal changes are needed, but the exterior circuitry will differ somewhat, depending upon the application. T1 and T2 are miniature broadband transformers. I used two small ferrite balun cores for T1 and T2, but tiny 850  $\mu$  toroid cores allow construction of a more compact MCM.

It is essential to connect the T1 and T2 windings as shown. The black dots indicate the polarity of the windings. Local-oscillator injection for this type of mixer is approximately +7 dBm for best IMD performance. Conversion gain (actually a loss) is on the order of -8 dB for a DBM. At frequencies greater than 40 meters, if the DBM is used as a receiver mixer or direct-conversion (D-C) receiver product detector, it is wise to use an RF amplifier between the antenna and the DBM. If not, the receiver noise figure will be too high for weak-signal reception. In fact, an RF amplifier would be an asset even at 7 MHz.

An ideal DBM would be enclosed in a metal case to minimize stray signal pickup. However, there should be no problems with unwanted pickup of RF energy when using the MCM of Fig 2, provided ordinary PC-board layout is employed. In other words, don't place the DBM close to an unshielded oscillator or antenna lead.

## Crystal-Oscillator MCM

A simple crystal oscillator is presented in Fig 3A. You may prefer to exclude the crystal, Y1, from the MCM. This will make the module more universal in application. I included the crystal for the purpose of demonstrating the practicality of having Y1 mounted on the IC header. An HC-18/U



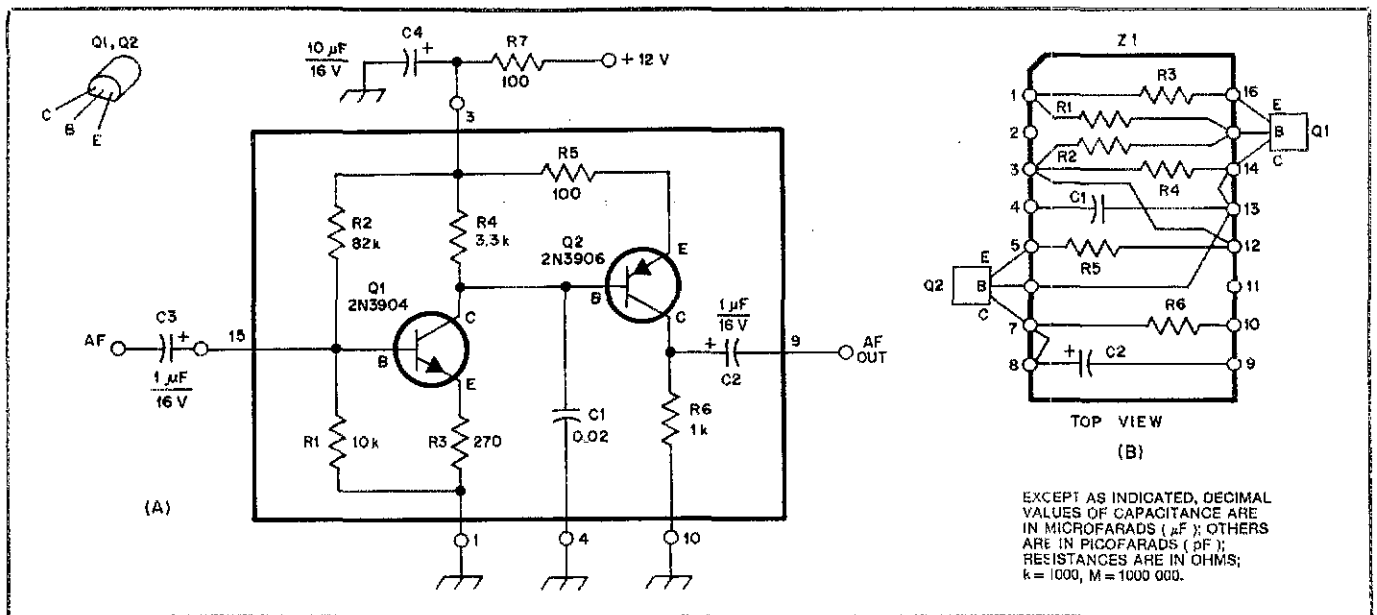


Fig 1—Schematic diagram of a two-stage audio amplifier that can provide up to 40 dB of gain. The drawing at B shows the component layout for the audio MCM.

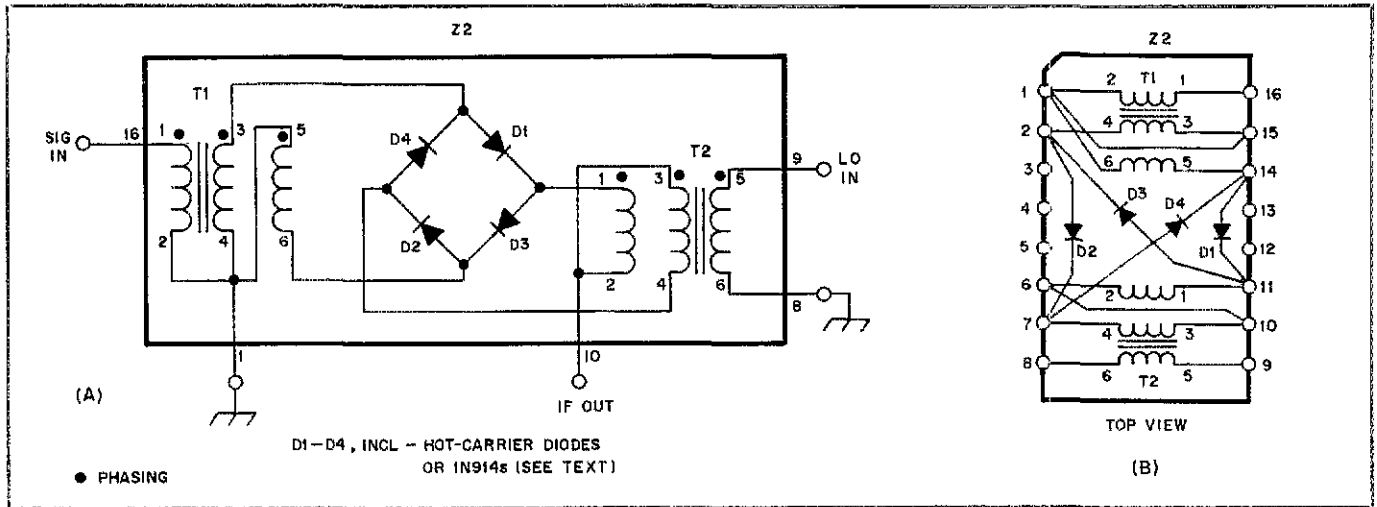


Fig 2—Circuit for a doubly balanced mixer, balanced modulator or product detector. Matched diodes are necessary for best DBM balance. Hot-carrier diodes are recommended for this circuit, but matched 1N914s are suitable. T1 and T2 in my MCM consist of four trifilar turns of no. 30 enameled wire through an Amidon balun core no. BN-43-2402. An FT-23-43 ferrite toroid core may be substituted (smaller) by winding 7 trifilar turns of no. 30 enameled wire on each core.

crystal holder is necessary (small) in order to find room for it on the header. If the crystal will be used outboard from the MCM, you may connect it to pins 1 and 16 (Fig 3B).

The oscillator of Fig 3A is easy to work with. External capacitor C2 is used to control the feedback. It functions in connection with the transistor internal capacitance ( $C_j$ ) to form a feedback network. C2 should have a capacitive reactance of roughly 200 ohms for most small-signal transistors. This equates to 100 pF for operation at 8 MHz. If you wish to convert this circuit to a VXO, you need only to separate pins 1 and 2 (remove jumper) of the header and place a small

inductance (25  $\mu\text{H}$  for 8 MHz) in series with a 75- or 100-pF variable capacitor from pin 1 to ground. Connect the capacitor rotor to ground. This arrangement will provide approximately 6-10 kHz of frequency change.

C3 and L1 are outboard from the MCM. This tuned circuit is resonant at the crystal frequency. L2 is a small link for coupling the circuit to low-impedance loads. For most applications, C3 may be a small trimmer.

#### Oscillator Buffer/Amplifier MCM

It is seldom necessary to use buffering after a crystal oscillator, since changes in load (reactance changes) seldom cause

oscillator pulling. VXOs, on the other hand, may be prone to pulling effects from load changes, and a buffer is useful in that case. VFOs are affected significantly by load changes. Therefore, it is wise to include a buffer or buffer/amplifier after a VFO.

Output coupling from the oscillator should be as light as possible to minimize pulling. Light coupling (C4 of Fig 5A) causes reduced power output from the VFO. As a result of this condition, it is advisable to amplify the VFO output energy to compensate for the power loss. Fig 4A shows a suitable buffer/amplifier circuit that will fit on a 16-pin IC header. Q1 is purely a buffer, and has a gain of 0.9

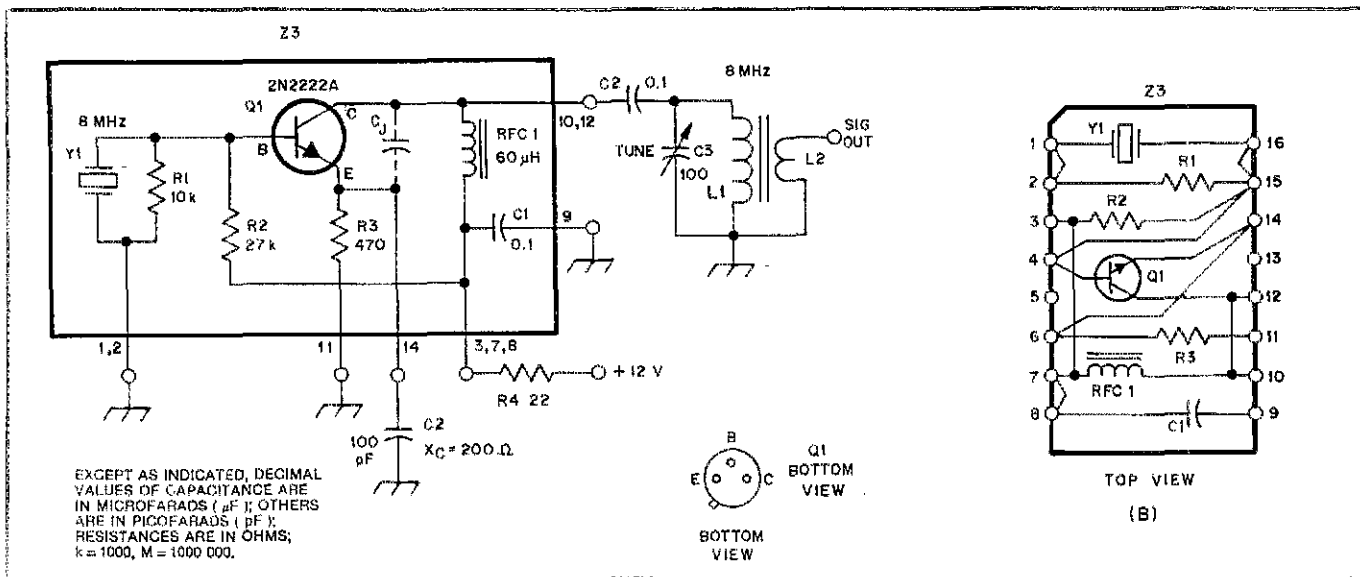


Fig 3—Example (A) of a crystal oscillator that can be built on an IC header. The heavy black line indicates the MCM boundary. All other parts are external to the MCM. L1 is a 5.5- $\mu\text{H}$  inductor (33 turns of no. 28 enameled wire on an Amidon T50-2 core). L2 consists of 6 turns of no. 28 wire. The MCM layout is given at B.

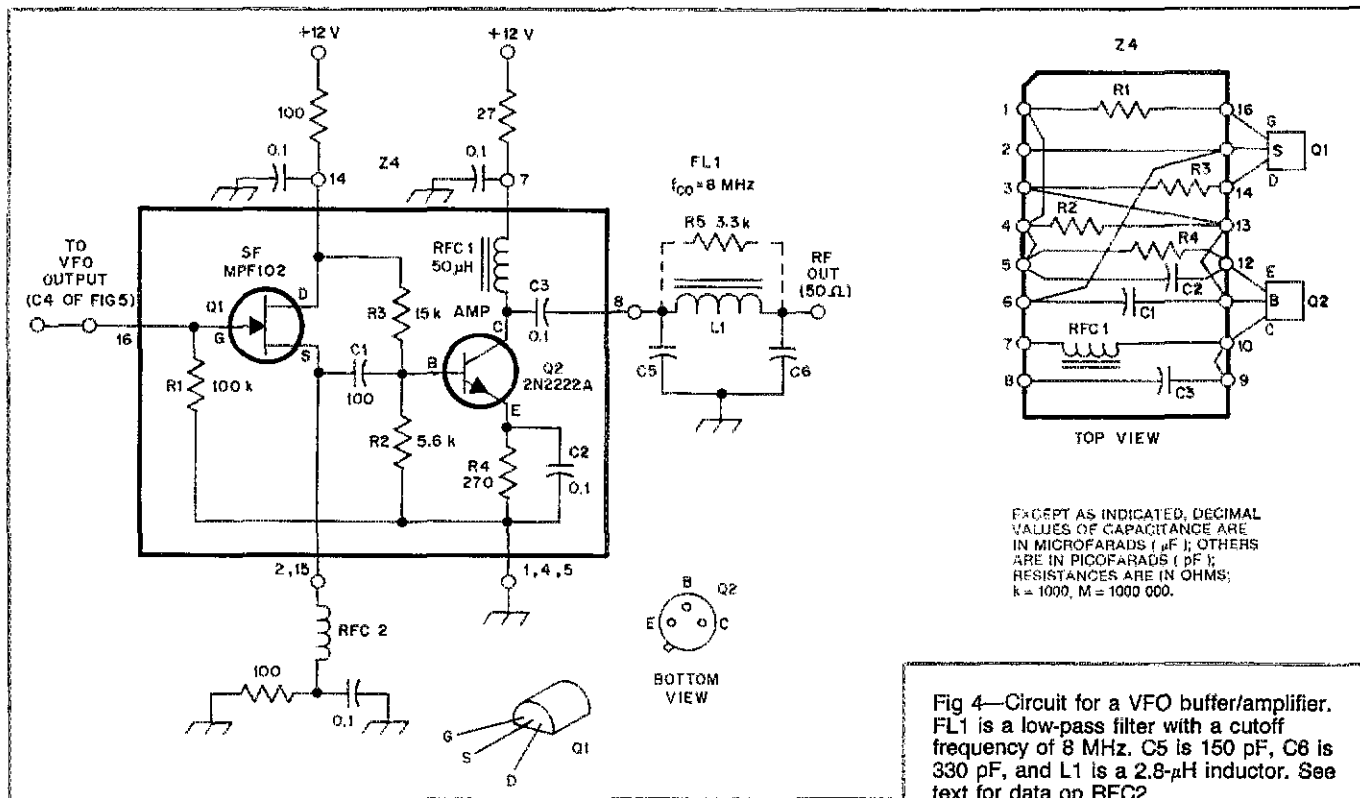


Fig 4—Circuit for a VFO buffer/amplifier. FL1 is a low-pass filter with a cutoff frequency of 8 MHz. C5 is 150 pF, C6 is 330 pF, and L1 is a 2.8- $\mu\text{H}$  inductor. See text for data on RFC2.

typically. This is par for a source follower. It helps to isolate the VFO from Q2 and the circuits that follow Q2. Amplifier Q2 builds up the VFO energy to a level that is suitable for most circuits with which a VFO is used.

External to Z4 of Fig 4A is a pi network that serves as a matching circuit between the collector of Q2 and a 50-ohm load. This network also serves as a harmonic filter. R5 may be added to increase the loaded

bandwidth of the pi network. This may be helpful when the VFO covers a fairly wide frequency range.

RFC2 of Fig 4A is chosen to yield a broad frequency-response peak at the VFO operating frequency. You may assume approximately 10 pF of stray parallel circuit capacitance for RFC2. Thus, for 40-meter operation we will require a 50- $\mu\text{H}$  inductor for RFC2. Should Q2 become unstable, place a 1-kilohm resistor in parallel with

RFC1. The addition of R5 will also aid stability in stubborn cases.

#### Colpitts VFO MCM

The VFO of Fig 5A uses electronic tuning. VVC (voltage variable capacitor) diodes are specified for D1 and D2. This eliminates the need to locate expensive and scarce miniature variable capacitors for tuning VFOs. It is proper to state that long-term VFO drift may be increased through

the use of tuning diodes, as opposed to air variable capacitors. This is because two additional semiconductor junctions have been introduced to the oscillator circuit: Junction capacitance changes with temperature. Normally, the small degradation in frequency stability is acceptable for amateur work. Tuning is done by means of a panel-mounted potentiometer (R3). Smooth tuning will result if a 10-turn Helipot® and dial are used, or if a standard potentiometer is used with a vernier drive. The values for R2 and R4 are chosen for the frequency coverage desired, and this will depend upon the type of VVC diodes used for D1 and D2: VVC diodes come in many capacitance ranges. I have suggested for this circuit a pair of diodes that will provide a fairly linear capacitance swing of 10 to 30 pF.

Outboard components C5, C6 and L1 are chosen for the VFO operating frequency. NP0 capacitors are recommended for best overall frequency stability. C1, C2 and C3, internal to the MCM, are also NP0 ceramic capacitors: the smaller 50-V types are preferred in the interest of fitting them on the IC header.

Q1 of Fig 5A may be any high-transconductance JFET, such as a 2N4416. A dual-gate MOSFET may be substituted by tying gates 1 and 2 together and treating the device like a JFET.

Place a shield compartment around the VFO MCM site on the main PC board of a receiver or transmitter. This will help prevent stray RF energy from entering the VFO circuit and causing frequency instability. The small shield compartment may be fashioned from PC-board sections or from flashing copper.

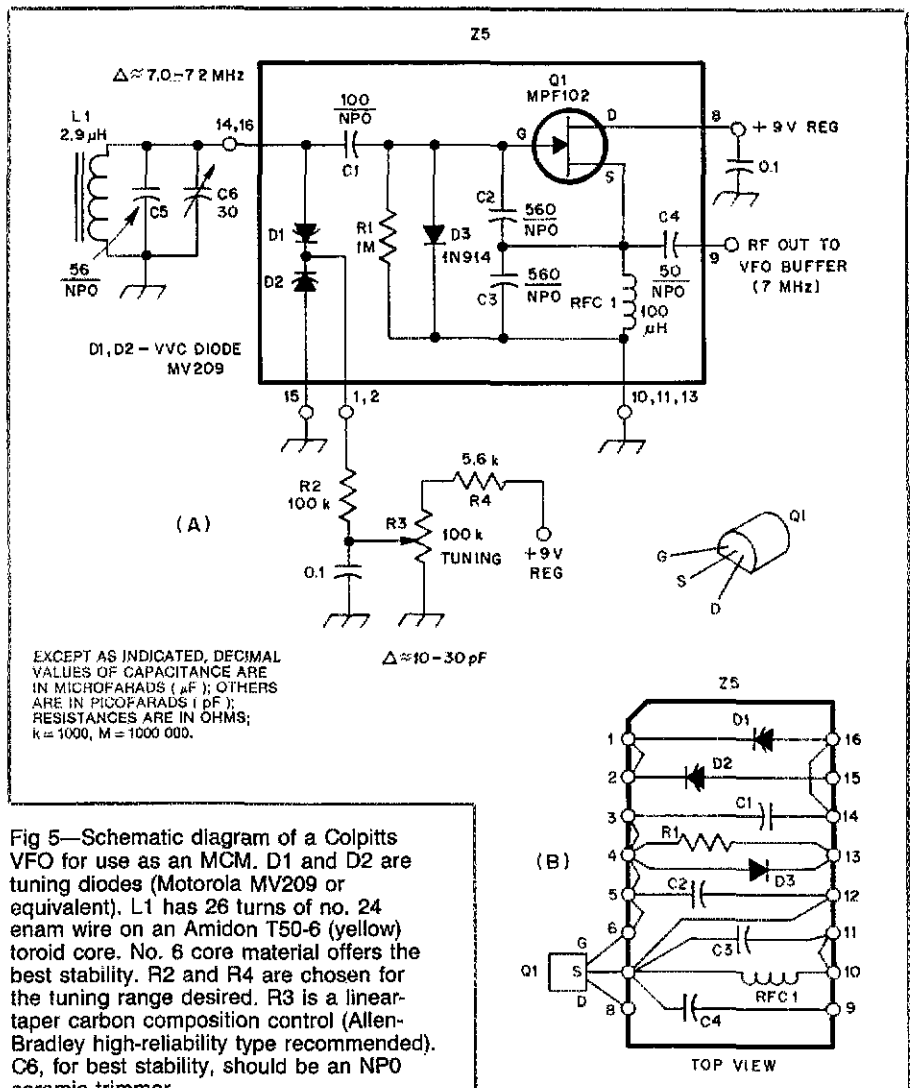
### MCM Practical Considerations

Miniature equipment is not easy to build, and MCMs certainly fit this description. You will need patience during the assembly procedure, but your skill and speed of construction will increase with practice.

Plug the IC header into an IC socket before commencing the MCM assembly. This will prevent the pins of the header from becoming bent or broken. I use an IC socket that has its pins mashed flat against the bottom of the socket. This allows the socket to lie flat on the bench during assembly. A "third hand" type of soldering fixture is useful for keeping the header and IC socket in a fixed position while you work on it. A small bench or drill-press vise may be used as a holding fixture if you don't have a third-hand device.

A magnifying glass is almost mandatory when building MCMs. It will allow you to check frequently for unwanted solder bridges, poor joints and shorting leads on the header. To this end, a pencil soldering iron with a fine tip and low wattage rating (25-30 W) will help to minimize melting the IC-header plastic and the formation of unwanted solder bridges between the header terminals.

The first step in construction is to place



all of the jumper wires on the header (as indicated by the pictorial drawings). Try to use light-gauge wire, preferably with insulation. The small wire from multiconductor telephone cable is excellent for this purpose. Bare wire may be used, provided there are no crossover jumpers on the header.

The general assembly procedure calls for installing the components of the MCM in layers. Some stacking will be necessary, depending upon the complexity of the circuit. After the jumper wires are in place, mount the resistors. If you can find some 1/8-W resistors, use them. This will minimize crowding on the header. I used 1/4-W resistors for the examples shown photographically in this article, as I have no 1/8-W units in stock.

Next in the assembly comes the capacitors, followed by the transistors and, finally, the largest components. I add the RF chokes, toroidal coils and crystals last.

You may protect the tested, completed MCMs by developing a mold and encap-

sulating the components and header top side in casting resin. This will eliminate the possibility of replacing defective components later on, but it will keep dirt and moisture from entering the circuits. I use quick-setting epoxy cement for this purpose when I want to seal and anchor the components on some of my IC headers.

It is to your advantage to look for miniature components in the surplus catalogs and at flea markets. Large, old-style parts do not lend themselves well to MCM construction. Fortunately, the present electronics technology provides a substantial fallout of surplus mini components, and these are ideal for building MCMs.

### A Marriage of MCMs

Four of the MCMs in this article may be used in concert to provide a simple D-C receiver. Fig 6 contains a block diagram of such an arrangement. The example suggests a circuit for 40-meter use. In this case, Z2 serves as a doubly balanced product detector. The output is at audio frequency



## Clear Channel Communications AR-3300 Ranger 10-M All-Mode Transceiver

Novice Enhancement! I've had my Novice license for two years, but I was never interested in operating. The knowledge gained through studying for my license helps me better understand the publications I work on every day in the ARRL Production Department. CW operation never really excited me, and except for my first and last contacts in the 1985 Novice Roundup, I haven't been on the air. The chance to operate 10-meter SSB was different. This was something I was interested in! My husband, Bruce, KB1MW, a die-hard CW operator, has no equipment for 10-meter SSB. How could I get on the air for the Novice band warming on Friday night, March 20 (0001 UTC March 21)? When I was offered the opportunity to review the Clear Channel AR-3300, I jumped at the chance!

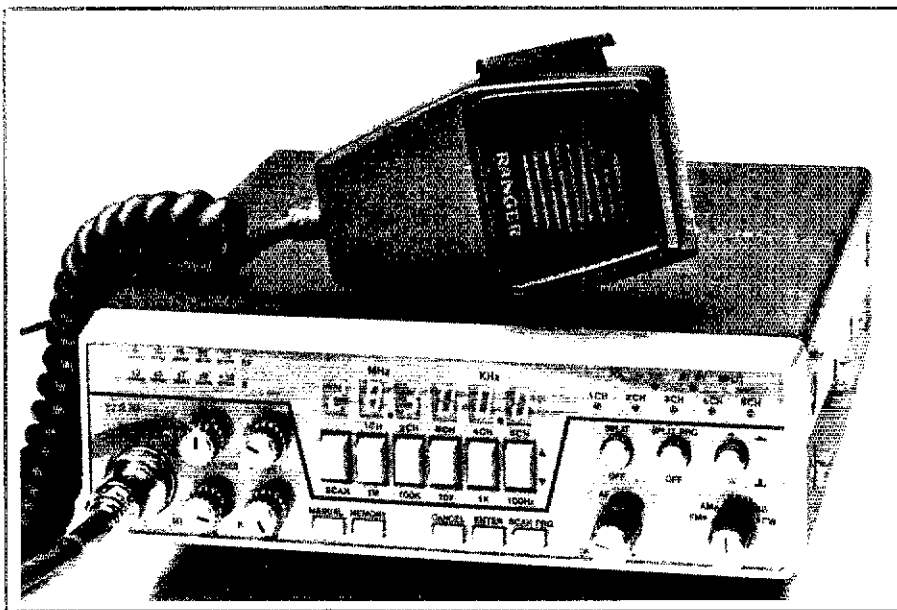
### What Does This Radio Do, Anyway?

The Ranger AR-3300 is an "all-mode" 10-meter single-band amateur transceiver. It covers 28.0000 to 29.9999 MHz and operates in the FM, double-sideband AM, upper or lower SSB and CW modes. Rated power output is 25 W on SSB, 30 W on CW and 8 W on AM and FM. A 100-W-output version is also available. The Ranger has five memories for frequently used operating frequencies, and it can scan through the memories or scan between two preset frequency limits. The rig appears to be designed primarily for mobile use, as a mobile-mounting bracket is included and the rig operates on 13.8 V dc at approximately 7 A, maximum.

### Knobs and Dials

The front panel of the AR-3300 is a bit intimidating to a Novice like me. There is *no* tuning knob—the operating frequency is entered and changed by several front-panel rocker switches located under the LED frequency display. The rocker switches have more than one function. Pressing a switch up causes the frequency to go up one increment at the selected digit; pressing down causes the frequency to be decremented. Each time you press a switch, the radio produces a short beep to let you know something has happened. Five of the rocker switches are also used to enter the memory frequencies; just press up to enter a frequency in the chosen channel. The SCAN switch initiates the scanning function. The AR-3300 is preset to scan in 100-Hz increments—the increment can be changed by pressing the appropriate frequency switch upwards while scanning. Pressing SCAN up causes the radio to scan from the lowest frequency to the highest; pressing the switch down causes the scan to move downward. Upon reaching the band limit, the scan automatically reverses.

There are four control knobs to the left of the frequency-entry switches: MICROPHONE GAIN, RF GAIN, SQUELCH with an integral RESET switch and CLARIFIER. The CLARIFIER can vary the receive frequency  $\pm 500$  Hz. The squelch can be used in all modes, and it is



**Clear Channel Communications Ranger AR-3300 10-m All-Mode Transceiver, Serial No. 86021304**

### Manufacturer's Claimed Specifications

Frequency coverage: 28.0000-29.9999 MHz.  
Modes of operation: AM, CW, FM, USB, LSB.  
Frequency display: Six-digit LED.  
Frequency resolution: 100 Hz.  
Frequency accuracy: 10 ppm.

### Transmitter

Power output: SSB, 25 W; CW, 30 W;  
AM/FM, 8 W.

### Spurious signal and harmonic suppression:

Greater than -50.

### Third-order intermodulation distortion:

Not specified.

### Keying waveform: Not specified.

### Receiver

Receiver sensitivity: For 10 dB signal  
+ noise + distortion/signal + distortion,  
SSB, CW 0.3  $\mu$ V; FM 0.3  $\mu$ V.  
Receiver dynamic range: 100 dB (see text).

### Receiver audio output at 10%

total harmonic distortion:

Greater than 2.0 W.

### Color: Black wrinkle finish.

Size (height, width, depth): 2½ x 8 x 10 in.

Weight: 4 lb.

### Measured in ARRL Lab

As specified.

As specified.

As specified.

As specified.

As specified.

As specified.

### Transmitter Dynamic Testing

28.0 MHz: CW 30.7 W, USB 27.0 W,  
FM/AM 8.8 W.

29.7 MHz: CW 17 W, USB 14.6 W,  
FM/AM 5.4 W.

-55 dB. See Fig 1.

-26 dB. See Fig 2.

See Fig 3.

### Receiver Dynamic Testing

Minimum discernible signal,  
(noise floor, dBm):  
-135.

Blocking dynamic range (dB): 86.

Two-tone, 3rd-order intermodulation distortion dynamic range (dB): 45.

Third-order input intercept (dBm): -67.5.

Receiver quieting ( $\mu$ V for 12 dB signal + noise + distortion / signal + distortion): 0.42.

2.9 W.

used to start and stop the automatic scanning feature. The RESET switch on the squelch knob is the on/off control for the radio's memory backup power. This control must be turned on to retain the memory information. If the control is turned off, everything saved in memory is erased.

To the right of the frequency controls are three push-on/push-off buttons that control the SPLIT feature. The SPLIT provides an offset between the receive frequency and the transmit frequency. With a 100-kHz split set, for example, the receive frequency might be 29.580 MHz, but when the push-to-talk (PTT) is pressed, the transmitter would automatically switch to either 29.480 or 29.680 MHz, depending on the position of the  $\pm$  switch. The function of the SPLIT ON/OFF control is obvious, and the SPLIT LED in the top row of indicators shows when the SPLIT feature is activated. The first time the SPLIT PROGRAM switch is pressed after a RESET, the frequency display shows all zeros. The frequency offset is then selected using the frequency-select switches. The  $\pm$  control selects either positive or negative offset from the receive frequency. The SPLIT feature is most often used on 10-m FM repeaters, but with some quick button pressing, it could be used for DX work.

The AF GAIN with its integral on/OFF switch and the mode switch are located under the split control push buttons. Five momentary-contact push buttons in the lower-center of the front panel control the memory and scan functions. MANUAL is used before starting or restarting several procedures. You must press MANUAL before directly entering a frequency, before entering a new upper or lower frequency range limit, and before beginning the procedure for storing frequencies in memory or setting frequencies for split operation. MEMORY scans the frequencies saved in memory. If squelch is turned down (ccw), it scans to the next channel each time the button is pressed. If squelch is turned up (cw), all memory channels are scanned automatically when MEMORY is pressed once. CANCEL clears the frequency that has been assigned to an indicated channel. ENTER directs the transceiver to accept the displayed frequency as the one you want to use. It is used to change the frequency range or save a frequency in memory.

The status LEDs in the top-right of the front panel provide the following information:

RX indicates transceiver is on and is in receive.

TX lights when transmitting.

SPLIT lights during split operation.

STBY is not currently implemented. It will be used when accessories are available.

Channel LEDs (CH1-CH5) indicate frequency memory information. The LED flashes once when you save a frequency into memory, lights briefly as the channel's frequency is scanned, and lights when that frequency is being used. Two five-segment LED bar graphs display received signal strength (S3, S5, S7, S9 and +30) and transmitter output power (5, 10, 15, 20 and 25).

The dc power connector, SO-239 antenna connector, and jacks for a CW key and external speaker are located on the rear panel, together with a heat sink for the final amplifier transistors. No power supply is provided in the rig.

### Thanks for the Memories

The AR-3300 provides five memory chan-

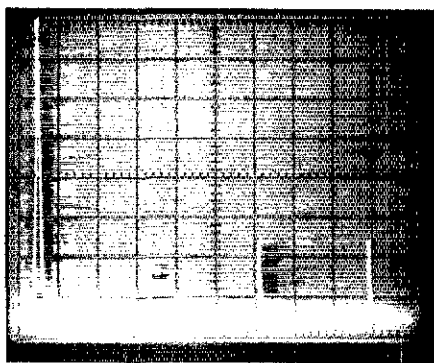


Fig 1—Worst-case spectral display of the AR-3300 operating on the 10-m band. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is approximately 27 W at a frequency of 28 MHz. All spurious emissions are at least 55 dB below peak fundamental output. The two taller pips on each side of the fundamental are mixing products, but are below the maximum level allowable under FCC regulations. The AR-3300 complies with current FCC specifications for spectral purity.

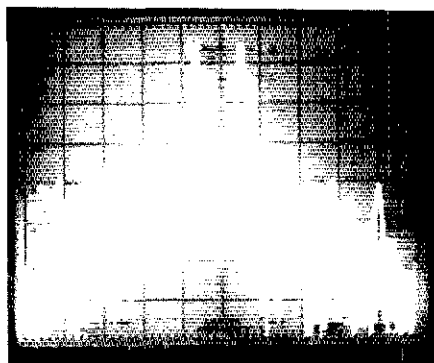
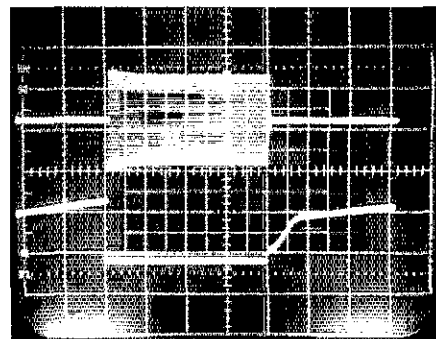
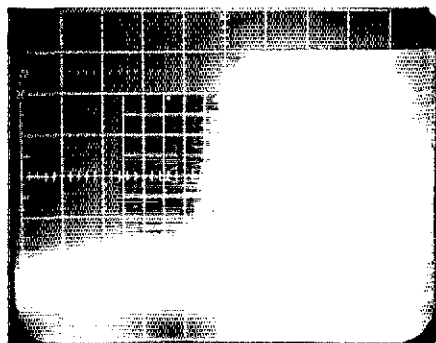


Fig 2—Spectral display of the AR-3300 output during transmitter two-tone intermodulation distortion (IMD) testing. The transmitter is being operated at rated output power on the 10-m band. Third-order products are 26 dB below PEP, and fifth-order products are 36 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz.

nels. Storing information in the memories is fairly easy. First press MANUAL, then select the frequency to be stored, and press ENTER once. The radio beeps and the display flashes once to acknowledge your action. You then select the memory channel number using the frequency select switches. Press ENTER again. Another beep, the display flashes twice and the selected memory LED flashes once. You can program up to five memories. Once the memories are programmed, you can scan them either automatically, or manually. To automatically scan memories, press MANUAL and press MEMORY once. Turn the squelch clockwise until the audio noise is quieted, and the radio begins to scan through the memories. Memories that are not programmed are not scanned. To manually scan memories, press MANUAL and turn squelch counterclockwise until squelch is



(A)



(B)

Fig 3—Keying waveform for the AR-3300. At A, the transmitter is operating at a power output of 25 W on 28.0 MHz. Each horizontal division is 5 ms. The bottom trace is the input key closure; the top trace is the RF output. At B, the waveform is shown in detail; each horizontal division is 10  $\mu$ s. Because of the extremely short rise time of approximately 2.5  $\mu$ s, this signal will cause key clicks and sound choppy. The optional semi-break-in keying accessory provides a much better keying characteristic.

broken, but not off. Press MEMORY. Each time you press MEMORY, the radio moves to the next channel in numerical order.

The scan function can also be used to scan the entire band or between two frequency limits. To program this operation, you press MANUAL and then SCAN PROGRAM. You may now select the scan increment you want (default is 100 Hz) by pressing the appropriate frequency select switch. Then press ENTER and the display flashes once. Now enter the lower frequency limit for the scan, and press ENTER again; the display flashes once again. Now enter the upper frequency limit and press ENTER again. The display flashes twice to indicate the program is complete. Turning squelch clockwise and pressing the SCAN button starts the scan. When the squelch is broken by a station on a memory channel, the radio will pause at that frequency as long as the channel is active, then resume scanning.

There is no memory backup battery in the rig. Memory and scanning information can be retained, however, if the rig is turned off, but the power supply is still energized. The RESET switch on the squelch must remain turned on—once it is turned OFF, all memory information is erased. This means that memory could be retained almost indefinitely in a mobile installation. Memory retention current is only 4.6 mA, so there is slight



danger of the radio discharging your battery overnight.

### The Big Day Arrives

All of these features are nice, but what's the radio really like *on the air*? As the Novice Enhancement weekend drew closer, I became less and less sure of myself. What would I say on the air? Who would I talk to? When Friday, March 20, 7 PM EST arrived (0001 UTC March 21), we tuned the radio up and down the 200-kHz Novice phone subband, looking for just the right QSO. Ah...there's WBIAVA, Virginia Greene, calling CQ...a nice loud signal. I gave her a quick, nervous call and I was off! This wasn't so hard! She sounded good, said I sounded good, and we talked for a few minutes about nothing in particular. When she told me she had to go grade some school papers, I was glad for the break and the chance to regain my composure. I worked a few other stations that evening, then sat down to start writing this review.

### Other Modes

The AR-3300 can also be used on FM and CW. Because Novices have no 10-m FM privileges, and I have little CW skill, I let my husband try the rig out on 10-meter FM. He was able to work easily through a local FM repeater about 10 miles away, even though we were using an inverted V antenna cut for the low end of the 10-meter band. Some other hams he talked to told him that the audio sounded a bit "muffled," but this may have been the result of the hand microphone supplied with the radio. He was also told that the radio sounded like it might be over-deviating. The deviation was about 5 kHz when checked in the ARRL Lab.

The rig *works* on CW, but it has a few interesting quirks. The CW key jack is a shorting type. Normally (with no plug in the jack) the CW key line is shorted to ground. When the key is inserted, the radio will not work in SSB unless the key is closed. The radio cannot be keyed in CW unless the PTT switch on the microphone is pressed. This leads to a very interesting two-handed CW operating position, and QSK is not an option with this arrangement. The other interesting thing is that CW operation is hardly mentioned in the operating manual. The CW position on the mode switch is mentioned, and the power output in the CW mode is specified, but there is no explanation of the PTT/CW key interaction. Bruce thought the microphone had inexplicably gone dead—with the CW key plugged in, you can key the rig with the microphone PTT, but the microphone audio is not connected unless the CW key is down! This seems like a rather poor design arrangement—possibly CW operation was added as an afterthought so that the rig would be "all mode." As I said, it does work after a fashion on CW. There are no CW filters, however, so the received bandwidth is a rather wide 4.2 kHz.

### Problems

In addition to the CW keying problems, we noted a drop in power output at the upper end of the band. There was also a mechanical stability problem. Bumping the radio causes the frequency to vary noticeably, whether in receive or transmit. We contacted the manufacturer and requested information about these problems. The Clear Channel engineer advised us that the problems with instability

had been noted on a few units, and that they were working on them. He also acknowledged the cumbersome CW method, but explained that their feeling is that most operators would not work CW very much, but would probably use the rig in a mobile phone application. When we pointed out that this radio might appeal to a large number of Novices, either as a supplement to their HF CW stations, or as an "one and only" rig for some, the engineer promised to address both subjects.

The next day he phoned us and advised that an auxiliary circuit board had been designed, incorporating semi-break-in CW keying. The accessory unit will soon be available at a low cost (around \$10) for anyone who desires better CW performance. For those owners who choose not to purchase the auxiliary board for CW, a modification will be made to correct the extremely short rise and fall time of the keyed waveform. In addition, they redesigned the VCO and now use a potting compound rather than the beeswax we noted in the original unit, and added vibration and shock damping to the circuit board/cabinet interface. This improves the instability problem by reducing any movement of components on the board.

Clear Channel sent us a modified unit by air. During testing of this modified unit, it provided 30 W across the band. The mechanical stability problem had vanished—a slight warble under direct beating with a screwdriver was the worst we could find. The keying interface improved the keying characteristics, and we pointed out some additional improvements that Clear Channel has agreed to make. In addition, they will provide update information to present owners, and will automatically update any unit returned to their facility, even if it is out of warranty. They state that the updates will be performed in 48 hours, or less.

Clear Channel claims a receiver dynamic range of 100 dB. We were unable to verify this figure. We discussed this with Clear Channel, and they admitted that they may have been a bit optimistic in their specification. The receiver is extremely sensitive (MDS of -135 dBm), and the blocking dynamic range we measured in the ARRL Lab (86 dB) indicates that the receiver is certainly adequate for the intended use. Clear Channel has indicated that they will revise their dynamic range specification to a more realistic value.

The operating manual is a bit light for an all-mode rig. The manual covers SSB operation fairly well, but there is only brief mention of the other operating modes. A schematic is included with the manual.

### The Bottom Line

As a Novice, this is a fun radio for me. It is physically small and less intimidating than some of the other rigs I have seen. Once I got used to the frequency-entry switches, they were not too difficult to use, although I think I would prefer a tuning knob. The switches may be more appropriate for mobile use, and the frequency memories would certainly be useful in a mobile installation, as are the scanning features. This rig might be just the thing for a Novice looking for a single-band mobile rig, or a rig to use on 10-m FM after upgrading to Technician. There are used five-band transceivers on the market for about the same price as this rig new, however.

The Clear Channel warranty is an attractive plus for this rig—one year on parts and labor, and Clear Channel maintains a computerized

owner data base for free update information about the rig. Any rig returned for updates will be modified and returned within a 48-hour period, even if the warranty has expired.

The Clear Channel Ranger AR-3300 is available from selected dealers; for information, contact Clear Channel Communications, PO Box 445, Issaquah, WA 98027, tel 206-392-0419. Suggested price: AR-3300, 30 W, \$499.95; 100-W model, \$630.—*Leslie K. Bartoloth, KA1MJP*

### PAC-COMM TNC-200 TERMINAL NODE CONTROLLER

Like many others, I am curious about packet radio. In addition, I am tired of referring questions about packet to others in the Technical Department at ARRL HQ. I thought that my curiosity could be satisfied, and my knowledge broadened, if I would obtain a Terminal Node Controller (TNC) and experiment with this popular new operating mode.

There are many different TNCs available. One of the more popular is the TNC 2 that was developed by Tucson Amateur Packet Radio Corp (TAPR). TAPR designed the TNC 2 and produced a small quantity of kits, but then returned to research and development. Under license from TAPR, several commercial suppliers offer their versions of the TNC 2. Pac-Comm is a major supplier of TNC 2 kits, and seemed a good source for my kit. Similar TNC 2 kits and assembled units are available from Heath (HD-4040, Product Review, *QST*, Nov 1985), and MFJ Enterprises (MFJ-1270, Product Review, *QST*, Sep 1986). Additional information about packet radio and equipment has been published recently in *QST*.<sup>1-3</sup>

### The Kit

When my kit arrived, an inventory revealed one group of resistors with incorrect values, and a package of capacitors and some semi-conductors missing. A telephone call to Pac-Comm resulted in prompt, courteous service and quick shipment of the missing parts. The kit consists of good quality parts, and includes a rather thick loose-leaf instruction book with a small errata sheet. The solder-masked epoxy circuit board has plated through-holes and silk-screened part locations. In addition to the parts necessary for constructing the TNC, the kit includes a coaxial power plug and a 5-pin DIN plug for the radio connection. The builder supplies the RS-232-C plug and dc power (10-15 V, 250 mA for the NMOS version; 135 mA for the CMOS). The instruction book is clear and concise. If you have successfully built a Heathkit, you should have no problem in assembling the TNC-200.

The Pac-Comm version of the TNC 2 is painted an attractive light blue with dark blue front and rear panels with white stripes and lettering. Front-panel LEDs indicate PWR on, CONNECTION to another station, DCD on, PTT (transmitter keyed) and STATUS (indicates that a packet has been sent but not acknowledged by the receiving station). The rear panel has connectors for the RS-232-C interface (DB-25S), radio (5-pin DIN), dc power (coaxial jack) and a push-button power switch.

<sup>1</sup>H. Price, "What's All This Racket About Packet?" *QST*, Jul 1985, pp 14-17.

<sup>2</sup>H. Price, "A Closer Look at Packet Radio," *QST*, Aug 1985, pp 17-20.

<sup>3</sup>S. Horzempa, "The Shopper's Guide to Packet-Radio TNCs," *QST*, Mar 1986, pp 17-21.

The TNC-200 uses a Zilog Z80<sup>®</sup> micro-processor and a Z80 SIO to perform the serial-interface and packet assembly/disassembly tasks. Modem functions are handled by an MF10 switched-capacitor filter, an XR-2206 modulator and an XR-2211 demodulator. There are 32 kbytes of ROM and 16 kbytes of battery-backed RAM, with the option of increasing RAM to 32 kbytes.

### Construction

I assembled my kit at home. Except for one problem (which resulted from my poor choice of work area), the assembly was quick and easy. Some of the resistor color codes were difficult to see under normal levels of incandescent lighting. As a result, I installed about a dozen resistors in the wrong locations. If I had been in a well-lit work area, or confirmed resistor values with a multimeter, I could have prevented the problem.

### Testing

Although I assembled the kit at home, it was more convenient to do the initial testing in the ARRL Lab. I had ordered a serial interface board for my Apple<sup>®</sup> computer, but it hadn't arrived yet.

The Pac-Comm test procedures are straightforward and thorough. There was a problem with the negative supply in my kit, however. The troubleshooting instructions led me to the problem, and a check with an oscilloscope revealed a faulty LM556 IC, a common and inexpensive part. I replaced it with a locally procured part rather than call Pac-Comm. The TNC-200 worked fine once the faulty chip was replaced. While waiting for my serial interface board, I connected the TNC-200 to a Xerox<sup>®</sup> 820 computer in the lab for further tests and alignment. The TNC operated perfectly once the communications program parameters were set as specified in the TNC-200 instructions.

The TNC has onboard software for counting the modem tone frequencies, but the instructions suggest using a frequency counter if one is available. When I connected the lab's frequency counter, however, its reading differed greatly from the software indication. Jon Bloom, KE3Z, the ARRL Laboratory Supervisor, warned me to expect false count problems because I wasn't in the lab's 100-dB isolation RF-screened room. (The counts could be off because of RFI from WIAW, across the parking lot.) I opted to trust the software and test it "under fire." There have been no subsequent problems and the TNC has performed flawlessly in all my work on

the air, so the software frequency counter must have been correct!

### Computer Interface

When my serial interface card arrived, I installed it in an Apple//e at ARRL HQ, and connected it to the TNC. We use a terminal program named ASCII Express<sup>™</sup>. At first I could copy only about half of the TNC sign-on message. I installed a break-out box in the RS-232-C line, and saw that the Data Carrier Detect (DCD, pin 8 of the DB-25 connector) line went to a false condition when the sign-on message stopped.<sup>4</sup> My terminal program would not connect to the TNC unless that line was held true. Jumper 1 in the the TNC-200 sets DCD true permanently, but I wanted to conveniently change the DCD connection without opening the TNC cabinet. My solution is an eight-circuit DIP switch epoxied into the DB-25 connector hood at one end of the cable. The frame and signal grounds are always connected, but I can switch each of the eight data lines at will. When I open the DCD line, the sign-on message can proceed.

### The Reference Manual and Operation

The Pac-Comm instruction book actually includes two manuals. Assembly instructions appear in the back portion of the book (35 pages), while the front portion contains the 63-page TNC-200 Reference Manual.

To the casual observer, it must look as though the packet-radio operator simply keys copy into a terminal, and reads the return message. The success of packet-radio operation, however, depends on several control parameters being programmed into the TNC before operating. Therefore, the most significant factor in successful packet-radio operation is the operator's understanding of the TNC commands and their effects.

Chapters 1, 4 and 6 of the Reference Manual, together with a command reference sheet, contain the information necessary to interface the TNC and begin simple packet operation. Chapter 6 explains the TNC command set in depth (it takes 21 pages!), and explains the messages from the TNC to the operator. The separate command reference sheet gives only the operator commands, brief descriptions, mnemonics and default settings.

Chapter 5 covers binary file transfers,

<sup>4</sup>A break-out box is a device that allows measurement of the status of each communication line in a typical RS-232-C connection (9 or 24 lines plus frame ground). Construction details for a break-out box appear in Chapter 29 of *The ARRL Handbook*.

multiple connections and HF packet information. Binary file transfers may contain characters that would normally be interpreted as TNC commands. Special techniques allow such files to be transferred without affecting TNC operation.

The current implementation of the AX.25 protocol permits only two-way communication, but it allows a station to make several two-way connections simultaneously. For example, my station, KU7G, can be connected to Jon, KE3Z, and I can add another connection to George, NA1F. I can "speak" to either Jon or George at my whim, but neither can copy any part of my conversation with the other (unless they are monitoring *all* transmissions on the frequency). The TNC accomplishes this by allowing the operator to select one of 10 possible "streams." The 10 streams are designated A through J. A user-defined command (the default is "I") allows the operator to switch streams. This is best explained by the following example. When I turn on my TNC-200, it is on stream A, as indicated by the first two characters of the sign-on message, "A." I connect to KE3Z and the CON LED lights. At this point, I can enter the command mode by entering CONTROL C, then type the stream-switch command, "I", and an identifier for the new stream (A-J). Let's use stream B. Once I type "B", I'm on stream B (CON goes out because stream B is not connected). I can then connect to NA1F (CON lights again for stream B). The exchange looks like this:

```
cmd: C KE3Z
***Connected to KE3Z      (CON lights)
(CONTROL C)
cmd: I B                    (CON goes off)
I B cmd: C NA1F
***Connected to NA1F     (CON lights)
```

To enable multiconnect operation, the USERS command must be set to a number between 2 and 10.

The TNC-200 may be modified and adjusted for OSCAR or HF use, but the process is lengthy. It is best to use an external modem if you wish to switch often between HF and VHF packet operation. An external modem may be connected through the TNC circuit board (the connector is not supplied, although the circuit board has holes drilled for one).

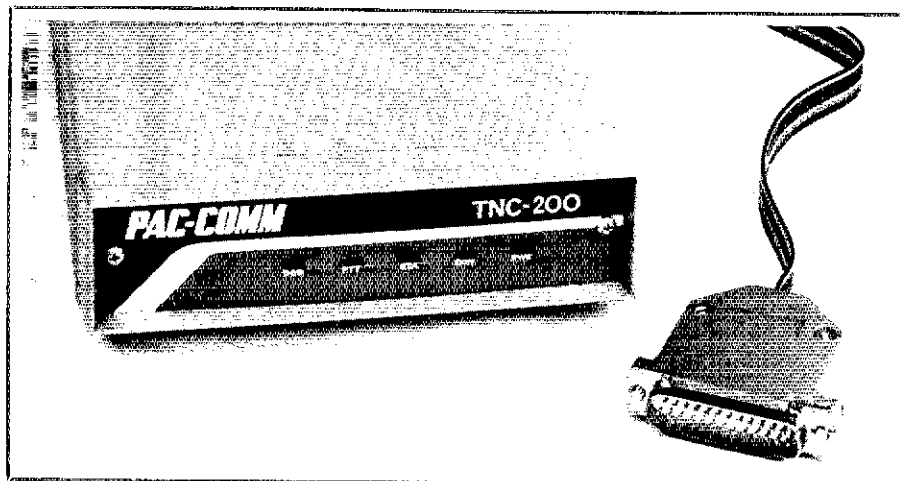
The balance of the reference manual includes information about hardware, troubleshooting, packet protocol and a short bibliography. Hardware is described at the block level, with additional sections about RS-232-C handshaking, jumper functions and pinout descriptions of the various connectors. The troubleshooting section is short, and it assumes that the builder has a basic knowledge of digital-circuit troubleshooting techniques. There are no troubleshooting charts or voltage tables.

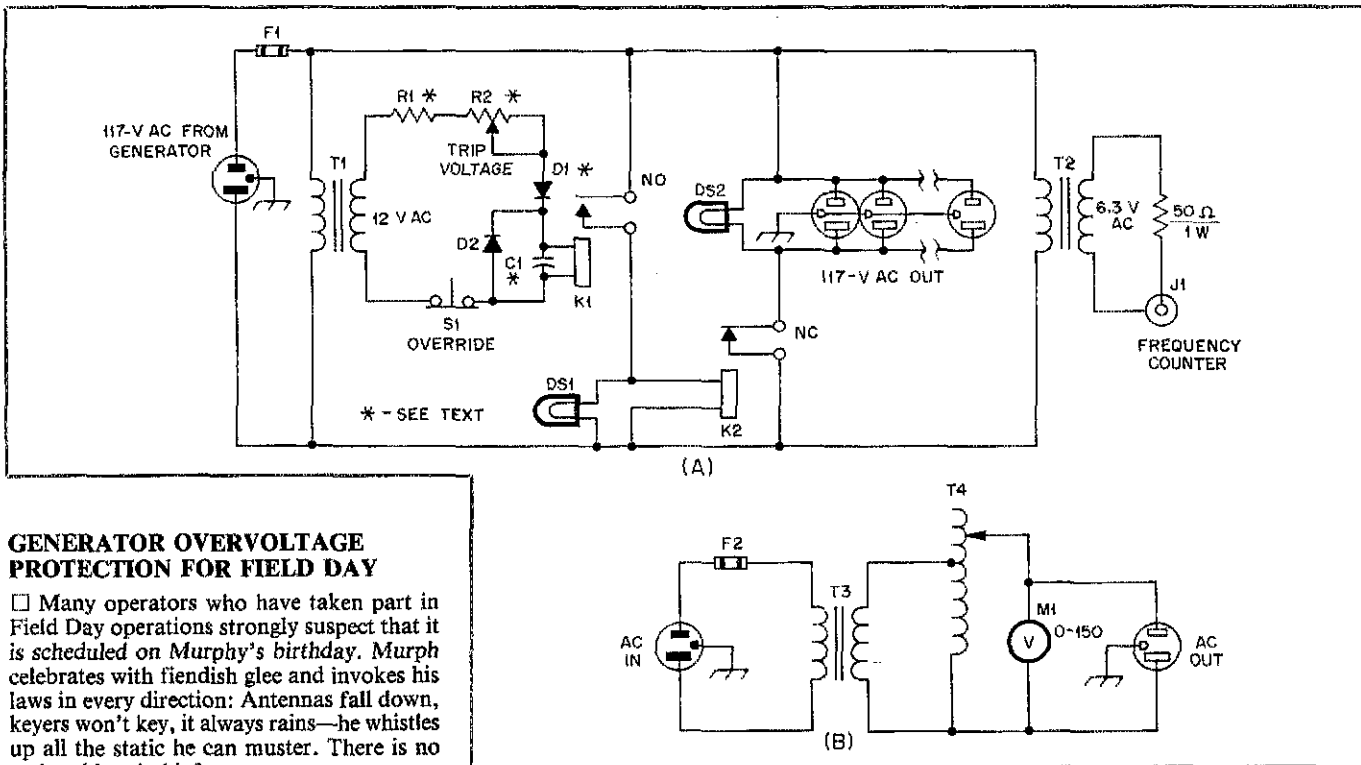
### Conclusion

I am happy with my TNC-200 from Pac-Comm. It is a straightforward reproduction of the TAPR TNC 2, and performs as well as the original. It is available in several forms—as partial kits, complete kits and assembled units.

The TNC-200 is available from Pac-Comm Packet Radio Systems, Inc, 3652 West Cypress St, Tampa, FL 33607, tel 813-874-2980. List prices: CMOS kit with cabinet, \$169.95; NMOS kit with cabinet, \$154.95; Pac-Pro terminal software for the IBM<sup>®</sup> PC and compatibles, \$29.95; terminal software for the Apple Macintosh, \$49.95.

—Bob Schetgen, KU7G





## GENERATOR OVERVOLTAGE PROTECTION FOR FIELD DAY

□ Many operators who have taken part in Field Day operations strongly suspect that it is scheduled on Murphy's birthday. Murph celebrates with fiendish glee and invokes his laws in every direction: Antennas fall down, keyers won't key, it always rains—he whistles up all the static he can muster. There is no end to his mischief.

His one trick that hits hardest is excessive generator voltage. This problem plagued the Columbus ARA four years in a row, and with decent transceivers costing over a kilobuck, people got a bit "antsy" about bringing their "little jewel" out for Field Day use. Our club decided to see if we could do something better than hang witchbane on the generator.

So-o-o, if Murph speeds up the generator, we reasoned, let's shut down the power before the rigs start to smoke. Since no one recalled anything of this nature in past QSTs, we built our own prototype generator-overvoltage protector.<sup>1</sup> It is successful, and we would like to make it public domain. Here it is!

We set several design goals for our protector: (1) it should be uncomplicated; (2) it should be reproducible; (3) it should be built from junk-box parts to reduce cost. The parts specifications are loose and flexible so that you can adapt parts on hand. Nothing is so irritating as finding that a critical component was the only one in existence, and there is no substitute! After considering many alternatives, we settled on a dc power supply, "pilot" relay and power relay as the basic circuit. (See Fig 1.)

The dc power supply samples the line

Fig 1—A schematic for W8ZCQ's Field Day overvoltage protector (A). The test and adjustment circuit appears at B.

C1—4000- $\mu$ F, 25-V, Electrolytic capacitor (see text).

D1, D2—Silicon diode, 1-A, 50-V PIV (minimum).

DS1, DS2—117-V pilot lamp.

F1, F2—Fuse (20 A).

J1—Coaxial jack.

K1—12-V, SPST relay, 117-V contacts (see text).

K2—117-V, SPST relay, 117-V contacts (see text).

M1—ac voltmeter (use a VTVM or other accurate meter).

R1—5-W resistor (see text).

R2—25-W potentiometer (see text).

S1—Normally closed momentary-contact switch.

T1—Transformer, 117-V primary, 12-V 1-A secondary.

T2—Transformer, 117-V primary, 6.3-V 200-mA secondary.

T3—117-V isolation transformer.

T4—150-V variable autotransformer.

voltage and applies it to the coil of any convenient 12-V dc pilot relay. The pilot relay should have a normally open contact capable of switching the 117-V ac coil of the power relay.<sup>2</sup> Begin your construction by choosing the power relay, then choose a pilot relay that meets the control requirements of the power relay. The normally open relay contact should close consistently at some potential less than 12 V. (Thus, the relay serves as a crude voltage reference.)

In our case, a randomly selected 12-V dc relay was tested with a variable power supply and found to pull in reliably at 8.8 V. Hence, we built an adjustable dc power supply that provides from 8.1 to 10.7 V at the pilot-relay

coil when the input line voltage is 117 V.

The most suitable potentiometer in our junk box was 25 ohms, rated at 25 W. It requires a series combination with a 12- $\Omega$  resistor to produce the desired voltage range for the pilot relay. The potentiometer and R1 values must be determined experimentally for each relay.

Our unit was built in a Bud 8  $\times$  8  $\frac{1}{4}$   $\times$  10  $\frac{1}{2}$ -inch cabinet, but there are no firm construction rules. A three-inch shelf inside the box holds the relays. The rectifier diode is rated at 1 A and 1000 PIV. The filter capacitor is 4000  $\mu$ F at 25 WVDC, but any capacitance greater than 500  $\mu$ F should do.

An ac voltmeter is the final indispensable component; the pilot lights and components related to the frequency counter are optional. Such options were incorporated because the parts were available and the features useful: Since a Heathkit frequency counter was available, an outlet was provided for it.

Test and adjust the circuit by driving it through a variable-voltage transformer. Change R1 and the potentiometer, if necessary, to allow adjustment of the trip

<sup>1</sup>Here are some references on related projects.—Ed.]

N. Johnson, W2OLU, "An AC Line Monitor," QST, Jan 1976 p 27.

R. Kaul, W1FLM, "Field Day Generators" (Waveforms), QST, May 1975, pp 44-45.

R. Mason, W8NN, "Expanded-Scale Power-Line Voltage Monitor," QST, Dec 1979, pp 40-41.

W. Stump, WB4AHZ, "Is Your Generator Genin' the Way It's Supposed To?" (a generator frequency monitor), QST, Mar 1982, pp 38-39.

<sup>2</sup>[CARA used a 20-A relay for their power control, but the power relay need only switch the full generator output. For example, a 650-W generator supplies a maximum current of about 6 A. Radio Shack® sells a 12-V dc DPDT relay (no. 275-218) capable of switching 10 A at 117 V. That relay could perform all the functions required of both relays in the CARA circuit for generators up to about 1 kW.—Ed.]

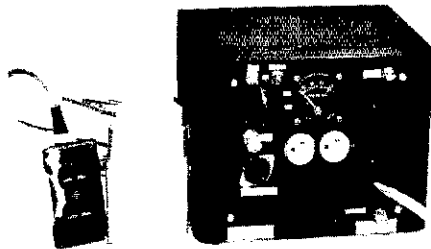


Fig 2—A photo of W8ZCQ's complete system.

potential from about 117 to 130 V ac. In the case of our prototype, the range was from 100 to 135 V. Once you have established the component values, mark the front panel.

At the outset, we only intended to protect one rig. After some of our club "authorities" examined and blessed the new circuit, we decided to protect all CARA Field Day equipment. Out came the hole punch, and another outlet was added for an extension that would serve the rest of the camp.

Field Day soon arrived and passed. The generator output varied from 122 to 128 V and 58 to 62 Hz during the contest (frequency changed in direct relation to the output voltage), and the protector shut down the power twice. Each time, the voltage had reached the 130-V setting, but Murphy had been defeated—no rigs were damaged.—*Dan Umberger, W8ZCQ, Columbus, Ohio*

### "PIGTAILS" MAKE ANTENNA ADJUSTMENT EASY

□ Wire-dipole and inverted-V antennas often need trimming in place, even when carefully cut to calculated measurements. They are easy to shorten, but one may trim off too much, or the calculated length may be too short in the first place. Aside from the initial setup, resonance may drift over time for electrically obscure reasons. Antenna stretching is difficult!

After patching wire onto the ends of several antennas, I developed a versatile adjustment system. First, use only bare wire for the antenna, and cut it somewhat shorter than the calculated length. [Try 2-3%.—Ed.] Next, attach the antenna ends to the guy lines with an insulator made by drilling a plastic pipe coupler with 1/4-inch holes for the antenna wire and guy (Fig 3). Make a pigtail (extension) from the same wire as the antenna and long enough to well exceed the calculated antenna length. [Again, 2-3%.—Ed.] (The antenna should be slightly too short without the pigtails, but slightly too long with them fully extended.) Solder a couple of alligator clips at 90° to each pigtail as shown in the figure. Insert the pigtails through the insulators and attach the alligator clips to the antenna ends.

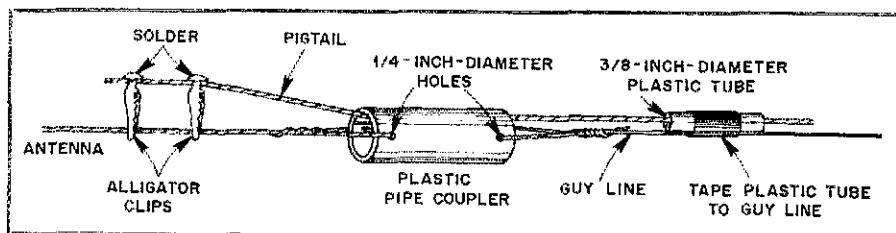


Fig 3—KA6UXR's movable wire-antenna extensions make antenna adjustment convenient.

The antenna resonant frequency is now easily adjusted by moving the pigtails along the antenna ends. The pigtails appear weather resistant, and they make antenna adjustment easy.—*Alex Comfort, MD, KA6UXR, Ventura, California*

### RIGHT- OR LEFT-HAND PADDLE OPERATION

□ Here is a little note for those hams who own paddle keyers. I am a right-handed brass pounder myself, but several of my friends are "lefties." Since the positions of the dot and dash paddles are usually exchanged when the hand of operation is changed, there may be considerable inconvenience when operating from a friend's station.

The problem can be corrected easily by turning the paddle around and placing your hand above the key to operate. Although not quite as comfortable as using the paddle normally, it is a simple practice that works for both left- and right-handed people. It eliminates the need to change paddle wiring for a visitor.—*Robert L. Vandevender II, KR2K, Muncie, Indiana*

### ILLUMINATE YOUR SWR BRIDGE!

□ My Heath® SA-2060A Matching Network is very satisfactory in every respect, except that I missed the convenience of lighted panel meters. It is a simple task to add that feature, so I did not hesitate. A short search through my junk box yielded two "grain of wheat" lamps (for 12 V dc) left over from my model-railroading days. I attached one lamp to the top of each meter case with some cyanoacrylate adhesive and wired them to the accessory jack of my transceiver with some lightweight "zip" cord. The illuminated meters are now easy to read in the dim evening light.—*Gordon Lauder, W9PVD, Webster, Wisconsin*

### MORE ON RFI TO MICRO-PROCESSORS IN AUTOMOBILES

□ After installing my 25-W, 2-meter radio in a 1981 Oldsmobile Cutlass, a "valve knock" became evident when climbing hills. This would not be unusual except that it occurred only while transmitting! I suspected a voltage drop, and rewired the power cable directly to the battery, but there was no improvement—not even at a 1-W input level.

It then occurred to me that my problem was RFI! At the same time, the Jan 1983 QST Hint of W4MJB encouraged me to investigate an RFI cure to the "central processor unit." The CPU is in a metal case that is not grounded to the metal of the car, but "floated" in a plastic cover in front of the right front door, below the glove compartment. The CPU has bypass capacitors and ferrite beads on every edge connection, but

only two of many wires are shielded. Simply grounding the metal case to the firewall with 1/4-inch braid solved the problem. (The braid length is only about 5 inches.)

This problem and cure is important because future vehicles will no doubt have more and more microprocessors. Vehicle designers must be alert to RFI problems at all frequencies.—*Dave Porter, K2BPP, Hope, New Jersey*

### WEATHER PROTECTION FOR VERTICAL-ANTENNA FEED POINTS

□ I have found that in very wet and rainy climates, where the rain is usually wind driven, a weather boot sealed with silicone caulk does not work well. Coax Seal™ and especially electrician's tape do not adhere well to silicone caulk. The driving rain can be blown or wick into the bottom of the boot, then down the cable braid. Here, however, is an excellent procedure for weatherproofing antenna connections (refer to Fig 4):

- Start with clean, dry connectors (as little skin oil as possible).
- Wrap the connection with several layers of electrical tape.
- Apply Coax Seal to the entire connection and down along the coaxial cable.
- Use two heavy-duty wax-coated paper cups, one inside the other, to make a "tent" around the antenna feed point and coax connector. (The cups deflect rain, so that water doesn't sit on top of the connector joint.)
- Lay a sheet of clear plastic wrap over the cups, push it up inside the cups and then pull it down over the sealed connections.
- Press the plastic wrap into the Coax Seal.

(Coax Seal and clear-plastic food wrap stick together, thus forming an air-tight joint.) Wind, freezing rain and other severe weather cannot damage the joint. The great bond that Coax Seal makes with plastic wrap doesn't allow any moist air or wind-driven rain to enter the joint along the cable surfaces. I've had no leakage problems since using this system.—*James Fox, N7ENI, ARRL Technical Coordinator, Portland, Oregon*

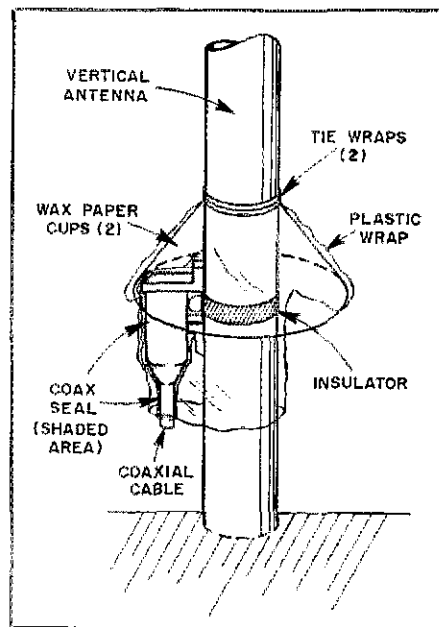


Fig 4—N7ENI's sealed connection on the feed point of a vertical antenna.

# Plain Talk About Voice Operation

Enjoyable and efficient Novice phone operation is more than just grabbing a microphone and yakking. Here's how to do it right.

By David Newkirk, AK7M

**D**id a severe case of "first contact jitters" keep you from enjoying Novice phone fun on March 21? How long did *you* sit in front of your rig with microphone at the ready, everything properly adjusted... and your mouth dry and wordless? "Come on," you told yourself over and over, "what's there to be afraid of? You're an old hand at the code. Phone is just the same—only different!"

Voice operation *is* a bit different from what you've been doing so far with code, and a few early bouts with "mic fright" on your part are understandable. (Gee, now it's your *voice* heading out into the world via radio, not just dots and dashes! And what about operating through repeaters? You've heard that calling and working procedures are very different up there on VHF and UHF FM...)

Relax! Everything you need to know about phone operation just builds on what you already know about code doings—and the differences between SSB and FM operation are easy to pick up and remember. The major difference between voice and code operation is this: Now you can *say* what you want to get across instead of letting your fingers do the talking.

## VOICE COMMUNICATION BASICS

Face-to-face conversation with someone can be pretty rapid fire: Your voice inflec-

tion, facial expression, mannerisms and body language all work to convey "Okay, it's *your* turn to talk" well enough that you rarely have to say so. Full break-in comes naturally! Often, your identity is known by the people you're talking to *before* you speak.

In most two-way radio operation, however, exchanging transmitting and receiving roles with other stations, initiating contacts and identifying yourself entail special procedures because the other operators can't see you. One way or another, you and the people you contact via radio must make your identities—and your intentions—clear. Sometimes context does this for you, but usually you must signify your intentions with special symbols or phrases.

In CW operation, these "special symbols or phrases" are known as *prosigns*, short for *procedural signals*. These include  $\overline{AR}$  after a call to a specific station or at the end of a message,  $\overline{SK}$  at the end of a contact, and so on. Each code prosign has a

## Novice Notes:

- Voice Basics
- Phonetics
- SSB and FM Techniques
- The DX Difference

voice equivalent—one or more procedural words, or *prowords*. (You can see these for yourself in the sidebar "Speaking CW.") You need only use these phrases in place of their CW equivalents; it's that simple. Sometimes—honest—you'll hear other hams *speaking* CW prosigns and abbreviations on voice—saying "Hi" when they mean to laugh, or ending a CQ with "K somebody, please." Such procedure is best described as tacky. You've got a mouth, lungs and brain; use them and say the *words*—that's what phone's for!

## THE Q-CODE ON VOICE, TOO?

The Q-code helps CW operators pass important information with few words and symbols. For instance, QTH? means "What is your location?" and QTR 1937Z means "The correct time is 1937 hours, Coordinated Universal Time." Should you use the Q-code on voice? Well, that depends. Voice operators generally *say* what they want to have understood, while CW operators spell it out or abbreviate. The International Telecommunication Union (ITU) Radio Regulations imply that the Q-code may be used on both CW *and* phone. In code operation, Q-signals do save time and reduce ambiguity, but—apologies in advance for the pun—talk is cheap during voice operation. (Voice operation flows along at something like 150 to 200 words per minute—quite a bit faster than even the most hotshot CW operator.) So, use this approach when operating phone: If you and your contact both speak the same language fluently, it's best just to *say* what you mean with words. Q-signals are best used when operators do not speak a common language. Still, the use of QSL,



## Speaking CW

Voice	Code	Meaning
over	$\overline{AR}$	after call to a specific station
end of message	$\overline{AR}$	end of message
wait, stand by	AS	please stand by
roger	R	all received correctly
go	K	any station transmit
go only	KN	addressed station only
clear	$\overline{SK}$	end of contact
closing station	CL	going off the air

QSO, QRZ and a few other Q-signals has become accepted practice on voice even for crosstown contacts.

## PHONETICS

Many a CW operator has looked up ruefully from the bug, straight key, paddle or keyboard and remarked, "I know the code all right, but this darned thing can't spell!" Code's "spell it out to say it" nature is a blessing in disguise, however: If, during a CW contact, you dutifully send your Ohio location as CHILICOTHE, the receiving operator is almost certain to spell it correctly if *you* did. Such is not the case with phone. (What chance do you have of transcribing "Chillicothe" correctly if someone says it to you without spelling it? Unless you already know how spell it, lotsa luck!) Often, words aren't spelled the way they sound. Even worse from a radio standpoint, some letters and numbers sound alike on a voice communication circuit—especially through interference and noise. Is that 8, A or H? I, Y or 5? E, V, D, B, G, C, P, T or Z? Yikes! There's *gotta* be a solid way of transmitting letters over the air during voice operation—how else is someone going to copy your call sign?

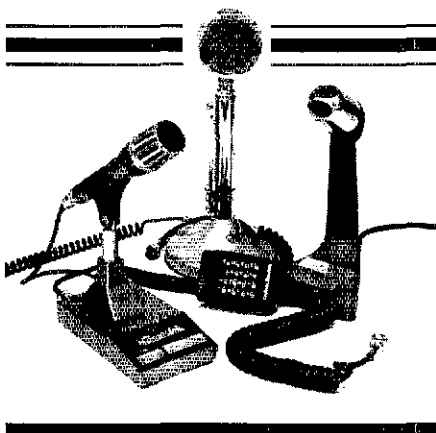
No problem. Just do what sharp voice operators do throughout the world: Use the ITU phonetic alphabet. "Phonetic" has more than one definition, but we're after just this one: "Representing speech sounds by means of symbols that have one value only." And that's what a phonetic alphabet does. See the sidebar "Phonetically Speaking" for the list of phonetic equivalents to each letter of the alphabet.

Use phonetics when you're first trying to get your call sign across to another operator, or when you're passing information that must be spelled out. For example, N9ELJ would sign his call NOVEMBER NINE ECHO LIMA JULIETT. W9BRD would sign WHISKEY NINE BRAVO ROMEO DELTA, and HLØB would say HOTEL LIMA ZERO BRAVO.

The ITU phonetic alphabet is generally understood by hams in all countries, so if you want amateurs everywhere to understand you, stick to the standard phonetics.

This means that KAIMJP should sign KILO ALFA ONE MIKE JULIETT PAPA, not something like KILOWATT AMERICA ONE MEXICAN JALAPENO PEPPER, or KING ADAM ONE MARY JOHN PETER. *Use of non-standard phonetics is often more confusing than using no phonetics at all. Save the "phoney" phonetics for contacts with friends who already know your call sign.*

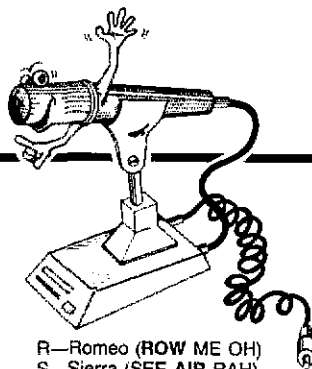
A face-to-face conversation goes pretty slowly if its participants stop to spell words unnecessarily. This goes for radio voice operation, too, so use phonetics only when you must. Once you have established communication, the other operator knows your call sign, so further phoneticization during IDs just slows down both of you. On the other hand, it's sometimes a good idea to



phoneticize the call sign of the other station as you begin a contact, especially when conditions are poor. This lets the other operator know that you've received his or her call sign correctly.

## ON THE AIR WITH SINGLE SIDEBAND

Generally, there are three ways to initiate



a single-sideband or CW contact: Call CQ, answer a CQ, or call another station as its operator concludes a contact. Which should you try? Well, consider two long-time ham sayings: "You can't work 'em if you can't hear 'em," and "It is more blessed to receive than transmit." Corny as these sound, they do contain a kernel of fact. Every time you begin an operating period, snoop around your chosen band for a while. Get a feel for who's there—whether or not the band is open, and to where. Quite possibly, you'll hear someone you want to talk to as you do your band scan. If activity on the band is low, a CQ may be worthwhile.

Band scanning has another important function: It helps you find a clear frequency on which to call CQ. This is not as easy as it first appears, especially if the band is crowded. Listen carefully—perhaps a weak DX station is on frequency. The directivity of a beam antenna may "deafen" you somewhat to signals arriving at the sides and back of the beam, so be sure to rotate your directional antenna as you tune to make sure the frequency is clear.

All set for a CQ? Okay: Call CQ three times, followed by THIS IS and follow this with your call sign three times: CQ, CQ, CQ. THIS IS N7IAL, NOVEMBER SEVEN INDIA ALFA LIMA, NOVEMBER SEVEN INDIA ALFA LIMA, CALLING CQ AND STANDING BY.

What about responding to a CQ or calling a station after its operator completes a contact? Easy: Say the other station's call sign, THIS IS and your call sign. It's a good idea to give your call sign phonetically; use of phonetics for the other station's call sign is optional. Short calls are better than long ones, and repetition of *your* call sign is important. (The operator at the other station already knows his or her call sign pretty well!) Repeat the calling sequence as necessary until you receive a reply, or until the station you're calling has responded to someone else. Here's an example of how WA3VIL might call W1AW: W1AW, W1AW, THIS IS WA3VIL, WHISKEY ALFA THREE VICTOR INDIA LIMA, WA3VIL, OVER.

Now that you've taken the giant step of projecting your voice out into the world through your radio, listening is doubly important. Will the called station respond to you, or will you have to call again? The only way to find out is to let up on the transmit (mic) button if you're using push-to-talk (PTT) transmit/receive (TR) switching. It's a good idea to let up on the mic button every so often to make sure you're not "doubling" (transmitting simultaneously with) the other station. If you're using voice-operated TR switching (VOX), your transceiver or transmitter-receiver pair will switch automatically to "receive" between words or phrases. Whichever TR switching mode you use, get the most out of your voice operation by listening carefully between calls—and by keeping your calls short.

### Phonetically Speaking

These International Telecommunication Union phonetics can help you get voice messages through noise and interference. See the text for how to use them.

A—Alfa ( <b>AL</b> FAH)	I—India ( <b>IN</b> DEE AH)	R—Romeo ( <b>ROW</b> ME OH)
B—Bravo ( <b>BRAH</b> VOH)	J—Juli <sup>e</sup> t ( <b>JEW</b> LEE ETT)	S—Sierra ( <b>SEE</b> AIR RAH)
C—Charlie ( <b>CHAR</b> LEE or <b>SHAR</b> LEE)	K—Kilo ( <b>KEY</b> LOH)	T—Tango ( <b>TANG</b> GO)
D—Delta ( <b>DELL</b> TAH)	L—Lima ( <b>LEE</b> MAH)	U—Uniform ( <b>YOU</b> NEE FORM or <b>OO</b> NEE FORM)
E—Echo ( <b>ECK</b> OH)	M—Mike ( <b>MIKE</b> )	V—Victor ( <b>VIK</b> TAH)
F—Fox <sup>o</sup> trot ( <b>FOKS</b> TROT)	N—November ( <b>NO</b> VEM BER)	W—Whiskey ( <b>WISS</b> KEY)
G—Golf ( <b>GOLF</b> )	O—Oscar ( <b>OSS</b> CAH)	X—X-ray ( <b>ECKS</b> RAY)
H—Hotel ( <b>HOH</b> TELL)	P—Papa ( <b>PAH</b> PAH)	Y—Yankee ( <b>YANG</b> KEY)
	Q—Quebec ( <b>KEH</b> BECK)	Z—Zulu ( <b>ZOO</b> LOO)

Note: The boldfaced syllables are emphasized. The pronunciations shown in this table were designed for speakers from all international languages. The pronunciations given for "Oscar" and "Victor" may seem awkward to English-speaking people in the US.



## The R-S System†

### Readability

- 1—Unreadable
- 2—Barely readable, occasional words distinguishable.
- 3—Readable with considerable difficulty.
- 4—Readable with practically no difficulty.
- 5—Perfectly readable.

### Signal Strength

- 1—Faint signals, barely perceptible.
- 2—Very weak signals.
- 3—Weak signals.
- 4—Fair signals.
- 5—Fairly good signals.
- 6—Good signals.
- 7—Moderately strong signals.
- 8—Strong signals.
- 9—Extremely strong signals.

†This reporting system is also used on CW with the addition of a third digit for "tone." See *The ARRL Operating Manual* for details.

## THE CONTENT OF THE CONTACT

Once you're in contact, what you say is pretty much up to you and the limitations imposed by Part 97 of the FCC rules. Many of your voice contacts will likely be similar to what you've been accustomed to on CW. The difference with voice is that you can get a good conversation going farther and faster once the signal, location, name, rig and weather preliminaries have been taken care of.

According to the FCC regulations, you need identify once every 10 minutes and at the conclusion of a contact. (The exception is when you handle international third-party traffic. Then, you must also identify the foreign station. See ARRL's *FCC Rule Book* for details.) The "10-minute ID rule" is for *your* benefit: You needn't interrupt the flow of conversational voice contacts with unnecessary IDs. Just use OVER or GO AHEAD after each transmission to indicate that it's the other station's turn to transmit.

Want to give a signal report? Say it with words: YOU'RE STRONG, PERFECTLY READABLE AND IN THE CLEAR. Or you can use the "RS" system—it's just CW's RST reporting system minus the third (tone) digit: readability ("R") on a scale of 1 to 5, and signal strength ("S") on a scale of 1 to 9. (See the sidebar "The RS Signal Reporting System" for details.) Troubled by interference? Say: THERE'S A LOT OF INTERFERENCE. Is a thunderstorm coming? Maybe there's TOO MUCH STATIC HERE FOR ME TO COPY YOU. Isn't *saying it with words* a lot better than defaulting to the Q-code? Yep, if you operate efficiently, this voice stuff can be effective *and* easy.

"Easy" brings up the point of privacy. Your voice contacts are easily accessible to unlicensed people—anyone who owns a receiver covering your transmitting frequency can tune you in at HF, VHF and UHF. For this reason, many amateurs are uncomfortable discussing controversial

subjects over the air. Even more important, easy listener access to your voice operation means that you should think twice about giving confidential information over the air. You never know *who* may be listening.

## HOW FM VOICE OPERATION DIFFERS FROM SSB

So far, we've covered voice communication basics and operating procedures for SSB. About the only difference between 10-meter voice procedures and SSB operation at 1.25 meters is that calling and working often take place on different frequencies in the VHF and UHF amateur bands. You call and answer CQs on a *calling frequency*. Once contact has been established, you and your contact move to a *working frequency* to keep the calling frequency clear. Calling frequencies make good sense on the VHF and UHF bands because manual scanning of such wide frequency ranges—"tuning the band" as you do quite naturally on the narrower HF Novice subbands—would mean many lost contacts, missed DX openings and unanswered CQs.

FM contacts at 1.25 meters and 23 centimeters may be made via repeater or by *simplex* operation. Simplex (sometimes referred to as "direct," or repeaterless) operation means that you and the station you're working are talking to each other directly, using the same operating frequency. (Yes, your 10-meter SSB operation—as well as code at 80, 40, 15 and 10 meters—*could* be termed "simplex," but this distinction is rarely necessary there.)

The range of direct VHF/UHF communication is usually limited to your local area by antenna gain, transmitter power and terrain. Repeater communication is a great improvement on this because repeaters are generally located at high elevations. If the repeater can hear you, and you can hear the repeater, you're in business. If you have set up your FM transceiver properly, the repeater will receive

## Adjusting Your Microphone Gain

Most SSB transmitters and receivers have a mic gain control. This control may be located on the front panel, or it may be inside the rig. Because various mics and voices have different characteristics, you must adjust your mic gain control to suit your voice and mic. Procedures for making this adjustment vary from rig to rig, so the best way to learn how to do it is to look in the instruction manual for your equipment.

In most FM transceivers, the mic gain control is *not* located on the front panel. Instead, it's a preset internal adjustment normally requiring no attention. Also, it may be marked DEVIATION instead of something similar to MIC GAIN.

There's no need for you to adjust your mic gain continuously. Usually, you can just set it according to the equipment manufacturer's instructions and leave it alone. Good mic technique on your part (hint!) will ensure that just one MIC GAIN setting will do the job.

What happens if you operate with your mic gain set too high? You've heard such stations on the band: They're the ones with their mic gain set so high that you can hear other people talking in the background, cooling fans whirring, music playing, dogs barking and so on. Don't let this happen to you.

Too much mic gain on SSB can cause *splatter*—transmitter distortion that may interfere with stations on nearby frequencies and make your voice unintelligible. On FM, the result of too much mic gain is *over-deviation*, the effects of which are similar to splatter on SSB.

What if your rig includes selectable *speech processing*? Well, go easy. Speech processing is *supposed* to give your audio more "punch." Properly adjusted, it *can* improve the readability of your signal, especially under poor conditions. But good speech processing requires careful adjustment *and* good mic technique. Make tests to determine the maximum speech processing level for effective operation, and make a note of the control settings for later use. Then, use processing only when you must. Improperly adjusted, speech processing may *guarantee* distortion and splatter, and render your signal less readable *with* processing than without it!



your transmitted signal on one frequency (the repeater *input*) and simultaneously retransmit (repeat) it on another (the *output*) frequency. Pretty slick! (Your transceiver manual may refer to such operation as "duplex." On the HF bands, this is known as "split" operation. Although the variable meaning of duplex makes for lively debate among radio technical folk, we'll use duplex to mean "transmit on one frequency, receive on another" here because your transceiver operating manual will likely use this term.)

The shared nature of repeaters and the technical characteristics of FM require a few operating procedures quite different from those you use for SSB operation. Most of these special techniques are valid for simplex *and* repeater FM operation. Here they are:

- Be sure to *choose your operating frequency according to the appropriate band plan*. If you operate simplex, stick to simplex frequencies. If you want to talk through a repeater, be sure your transceiver is set for duplex operation at the proper *offset* (difference between transmit and receive frequencies). (For simplex calling frequencies, see last month's Novice Notes. *The ARRL Repeater Directory*, available from your local dealer or from ARRL, will fill you in on repeater *and* simplex frequencies in your area. For a detailed look at FM and repeater operation, see *The ARRL Operating Manual*.)

- *CQ calls are out of place on a repeater*. If the repeater is quiet, pick up your mic, press the mic button and transmit your call sign—WIINF or WIINF LISTENING—to attract attention. That's usually all it takes to begin a repeater contact. On busy simplex channels, the same procedure applies.

- Once you've made contact via repeater, *move to simplex*, if possible. Tying up a repeater when you could be using simplex is poor spectrum management. In fact, if you can use simplex to initiate later contacts with a given station, do so, because *not* using the repeater for that purpose is *good* spectrum management.

- Especially on a repeater, *pause* briefly before you begin each transmission. Another station may be waiting to break in or join the conversation. The "courtesy beepers" found on some repeaters encourage users to pause by sounding a second or two after each transmission—just enough time for new stations to identify themselves.

- *Keep repeater transmissions short*. This lets more people share the repeater efficiently. All repeaters promote this by having "time-out" timers: If you talk too long, the repeater goes off the air and doesn't return until you've ceased transmitting—and until a preset period has elapsed. (Your face should be sufficiently red by then!)

## The DX Difference

Crisp operating procedures are necessary when your favorite phone band opens for distant or foreign stations. Many operators will be struggling to contact as many DX stations as possible before the opening fails and propagation once again limits everyone to local or regional contacts. When DX beckons, you'll come into contact with DX *pileups*—crowds of amateurs clustered near a single frequency, struggling to make their calls heard by the operator of a rare DX station.

You can get a piece of the DX action, too—just keep the DX difference in mind. For one thing, a less-conversational operating style is usually necessary during DX contacts. Many overseas operators have an exceptional command of English, but they may not be familiar with many of our colloquial sayings. Because of language hassles, most DX operators are more comfortable with "bare-bones" contacts, and you should be sensitive to this. Shorter contacts are often better during unsettled band conditions, anyway: Fading or interference may cut your communication short if you or the other operator goes on yakking!

Hot band openings—and pileups—may occur at 1.25 meters and 23 centimeters, too, and conditions there may change even more rapidly than at 10 meters. At VHF and UHF, "DX" means stations from outside your local area, not from another country. Because such DX openings may come and go within a few minutes, the content of VHF and UHF DX contacts is often trimmed to just signal report and location. The other details can be left to the QSL card!

There's more on DX and DXing in the *The ARRL Operating Manual*. For now, just keep the DX difference in mind. If you catch DX fever, you won't be alone—radio amateurs have devoted their entire operating careers to DX. Maybe you'll be one of them!

- You needn't say *OVER* or *GO* at the end of an FM transmission—the other operators know you've let up on the mic button because they hear a short noise burst (*sqelch tail*) after you stop transmitting.

- Unless it's the operating practice in your area, don't use the word *BREAK* to interrupt and join a repeater conversation. In some areas, *BREAK* is taken to mean "Emergency! All other stations stand by!"

- On FM repeaters, *RS* signal reports are inappropriate because the power output of a repeater transmitter does not vary with the strength of incoming signals. Rather, weak signals at the repeater sound noisier than strong ones—so it's customary to report the degree to which the repeater receiver is *quieted* by the incoming signal. A signal that completely suppresses received noise is said to be "full quieting."

- During repeater operation, signals are generally so highly readable that it's usually not necessary to express your call sign in phonetics. Be ready to use them, though, if other stations have difficulty understanding you.

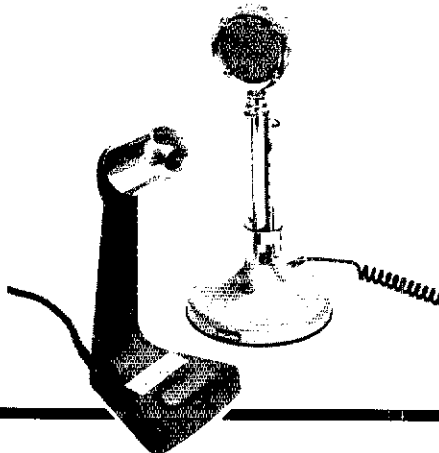
- Keying your transceiver to turn on a repeater without identifying your transmission is illegal. (You may have heard this practice referred to as "kerchunking.") If you don't want a conversation, but simply want to check if you are able to access a particular repeater, just give your call sign followed by *TESTING*. This accomplishes what you want to do, legally.

There's much more to repeater operation than we have space to cover here—topics such as autopatch facilities, tone-accessed repeaters and the value of repeaters in emergency and public-service operation. See *The ARRL Operating Manual* for in-depth coverage of FM and repeater operation—and consider joining a local club that sponsors a repeater. With the help of hams experienced in FM operating, it won't be long before you're talking it up with the best of 'em!

## WHAT'S NEXT?

Now that you can get out there and enjoy your Novice voice privileges *without* clutching your microphone in fright, will you be the first Novice or Technician to work all states on 10-meter phone? That's your homework for this month. Next in *QST's* Novice Notes: "Novice Enhancement Goes Digital." See you then.

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



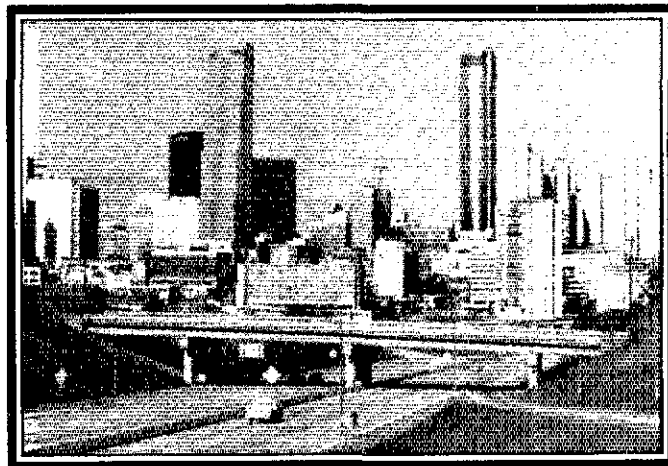


# See Y'all at the 1987 ARRL National Convention

Join the March to Atlanta for this year's National, July 10-12.

By Sandy Donahue, WA4ABY

Vice Chairman,  
ARRL National Convention  
960 Ralph McGill Blvd  
Atlanta, GA 30309



**T**he City of Atlanta is celebrating its 150th anniversary this year. Not so coincidentally, the ARRL is holding its annual convention in Atlanta, also. A certain famous fictional couple were recently overheard discussing the marvelous possibilities of attending their first League National.

"Rhett, darling, what are you reading?"

"Well, Scarlett, this brochure just arrived from the Atlanta Radio Club. It seems they are hosting this year's ARRL National Convention. Do you want to go?"

"Oh, Rhett, I don't want to think about it now. I'll think about it tomorrow... When is it anyway?"

"Love, it's on July 10-12 at the Georgia World Congress Center. You know where that is? Right downtown."

"Rhett, you know very well that I haven't been in Atlanta since they rebuilt after the fire. All those carpetbag Yank..."

"Now, Scarlett," interrupted Rhett, "that was a long time ago. We've got lots of Northern friends now. You have to learn to forget."

"Oh, fiddledee," she exclaimed, "I'll do no such thing... Still it won't hurt to be friendly to our Yankee visitors... Will there be a lot of them?"

"Thousands, Scarlett, and lots of our Southern neighbors as well. Here, why don't you read this brochure. It has all the details."

The brochure Scarlett and Rhett are reading is your invitation to come discover Atlanta and the best in Southern hospi-

ality. To take the first step, obtain a convention brochure. Thousands have been mailed to everyone who attended the last two Atlanta HamFestivals. For Yankees, er, others who haven't been to the Atlanta HamFestival, a call to 404-457-2916 or a note to ARRL National Convention, PO Box 77171, Atlanta, GA 30357 will get you a brochure by return mail.

All activities for the 1987 ARRL

## The 1987 ARRL National Convention at a Glance

Where: Georgia World Congress Center, Hall F

When: Fri-Sun, July 10-12, 1987

Host: Atlanta Radio Club

HQ hotel: Omni International adjacent to Convention Center.

Special rate: \$69 1-4 persons

Official airline: Eastern Airlines, with special fares and bonus frequent-flyer points. For reservations, call 1-800-468-7022; ask for plan [EZ7AP17]

Official rent-a-car: Budget Rent-a-Car

Brochure available: Write to Atlanta Radio Club, PO Box 77171, Atlanta, GA 30357, or call 404-457-2916

Admission: \$7 in advance, \$8 at door  
Saturday banquet: \$20, featuring Stu Gilliam, KI6M, and Roy Neal, K6DUE

Atlanta Radio Club BBS:  
404-393-3083

National Convention will be in Hall F of the Georgia World Congress Center. The hall—114,500 sq ft and totally air conditioned—can amply hold the exhibit area and huge flea market with plenty of elbow room. A dozen meeting rooms are scheduled to host a large variety of informative forums and group meetings. Convention hours are: Friday, July 10—noon-5 PM, meetings and forums; Saturday, July 11—9 AM-4:30 PM, exhibits, flea market and more forums; Sunday, July 12—9 AM-3 PM, exhibits, flea market and forums concluding.

Admission is \$7 in advance and \$8 at the door. Flea-market spaces are available for \$25 until June 20, and \$30 thereafter. Flea-market tables are available for \$13 until June 20, and \$15 thereafter.

The Atlanta Radio Club has obtained a special convention room rate of \$69 for up to four people in a room at the Omni International Hotel, adjacent to the Georgia World Congress Center. Eastern Airlines is the official airline of the ARRL National Convention, with special fares for convention attendees. Additionally, Eastern Frequent Flyers earn bonus points for this convention. Budget Rent-a-Car has extra-low rates for auto rentals that weekend. See the brochure for more details.

Saturday night is the main banquet, with guest speakers Stu Gilliam, KI6M, and Roy Neal, K6DUE. Stu is a renowned comedian who has appeared on countless variety and talk shows for several decades. His humor has been appreciated in Playboy Clubs and comedy clubs around the country. Roy has



Among the highlights of the Saturday night banquet will be Actor and Comedian Stu Gilliam, K16M (left), and former NBC Science Correspondent Roy Neal, K6DUE. A star of numerous TV talk and game shows, Stu is sure to have banquet attendees rolling in the aisles with laughter. Roy, who is currently working on yet another new promotional videotape called *The New World of Amateur Radio*, will be the banquet emcee.

recently retired from NBC as Science Correspondent, and has several Amateur Radio videotape productions to his credit. His dedication to science and education through Amateur Radio was instrumental in convincing NASA to initiate the ham-in-space program.

Roy Neal, additionally, will conduct the ARRL Youth Forum with Bill Pasternak, WA6ITF, of Westlink fame, Dave Marquart, WA7QKD, Idaho teacher and a finalist in NASA's teacher-in-space program, and Steve Mendelsohn, WA2DHF, CBS engineer and ARRL Hudson Division Director. The Atlanta Radio Club will distribute free admissions to area science teachers for handout to their students. Amateur Radio must demonstrate its relevance to today's young people; the Youth Forum's goal is to do exactly that.

There will be other forums, of course—in fact, dozens of 'em—covering every ham radio interest from ATV to YLRL. Amateur Radio celebrities such as Wayne Green, W2NSD, Lew McCoy, W1ICP, Don Search, W3AZD, John Lindholm, W1XX, Dave Ingram, K4TWJ, and Gus Browning, W4BPD, will be attending.

Here's a partial schedule of forums.

#### General-Interest Forums

**ARRL Forum**—ARRL President Larry Price, W4RA, ARRL Executive Vice President Dave Sumner, K1ZZ, and Southeastern Division Director Frank Butler, W4RH.

**Classic Radio**—A miniconvention within the National Convention. Rooms full of antique radios, many operational, and a multitude of informative demonstrations. Sponsored by the Antique Wireless Assn

(AWA) and the Society for Preservation of Amplitude Modulation (SPAM) in cooperation with the Classic Radio Exchange.

**Youth Forum**—Roy Neal, K6DUE, Bill Pasternak, WA6ITF, Dave Marquart, WA7QKD, Steve Mendelsohn, WA2DHF.

**Contest Forum**—Hosted by Dixie DXers Contest Club. Rick Dougherty, NQ41, world-record contest effort from 8R1Z. Plus useful contest tips from expert contesters.

**DX Forum**—ARRL DXCC Administrator Don Search, W3AZD, Gus Browning, W4BPD, and many others. Hosted by the Southeastern DX Assn.

**Novice Forum**—Hosted by Metro Atlanta Telephone Pioneers Radio Club, a continuous forum offering a variety of topics for the new ham.

**Public Service Forum**—A panel discussion with ARRL Public Service Manager Mike Riley, KX1B, and representatives of Red Cross, NWS, APCO, Salvation Army and other public-service organizations.

**Packet Radio Forum**—A variety of packet-related topics presented by GRAPES (Georgia Radio Amateur Packet Enthusiast Society).

**FCC Forum**—Michael Fitch, Chief, and Ralph Haller, Deputy Chief, of the FCC Private Radio Bureau.

**VEC Forum**—ARRL/VEC Manager Jim Clary, WB9IHH, and representatives of many other VECs.

**Legal Forum**—ARRL Counsel Chris Imlay, N3AKD, and John Thernes, WM4T, Kentucky SM, winner in landmark Thernes vs Lakeside Park, KY tower case.

**LO Forum**—Of interest to SMs, ASMs, ECs and other League appointees. Hosted

by Southeastern Division Director Frank Butler, W4RH.

**QCWA Forum**—Leland Smith, W5KL, QCWA President.

**Nostalgia Radio**—Byron Lindsey, W4BIW, presents a memorable review of Amateur Radio in Atlanta and Georgia with recordings and rare photos from the past.

**YLRL Forum**—Hosted by the Metro Atlanta Ladies Amateur Radio Club (MALARC) with an interesting YLRL speaker.

**ATV Forum**—Kip Turner, W4KIP, with a look at fast-scan ATV for beginners as well as experts.

#### Technical Forums

**Lew McCoy, W1ICP, CQ Magazine Technical Rep**—(1) Modern Treatment of Interference Problems, (2) Open Wire Transmission vs Coax—Pros and Cons, (3) 10-Meter Antenna Matching and Propagation.

**Bob Roper, VK5PU**—Predicting propagation with VHF sounding techniques, combined with a rare look at a Russian Woodpecker site.

**Dave Smith, W8YZ**—Transferring maximum power to an antenna, a visual demonstration.

**Louis Rhoden**, an engineer with Georgia Power Company—(1) Electrical Interference, causes and cures, and (2) Solving electrical problems with your electrical utility.

Other meetings and forums will be devoted to SWLing; Computer Programming; Traffic Handling; Army, Navy-Marine and Air Force MARS; RTTY; AMSAT; and more. Alternative activities include tours of Atlanta, crafts display and sale, make-up and color analysis; child-care services are available in the Congress Center, so you can roam the Convention carefree and child-free.

Round out your convention fun by planning your summer vacation in Atlanta. Atlanta offers a variety of family attractions, such as Six Flags over Georgia, Stone Mountain Park, Zoo Atlanta and Whitewater. History buffs can follow the history of the Civil War at Cyclorama, or trace the life of Dr Martin Luther King, Jr at the King Memorial. There is so much to see in Atlanta. You'll leave with Georgia on your mind.

"Rhett, darling, this ARRL National Convention will be the best fun I've had since the last Cotillion and Masked Ball."

"For once we agree, Scarlett. I'm going to call up Ashley and Melanie to see if they want to go with us. Let's see... Ashley is usually on the 22/82 machine..."

"I'm going to ask Aunt Pittypat if she wants to go... Oh, Rhett... what about all those hams out there that won't go to this ARRL National Convention?... Where will they go? What will they do?"

"Frankly, my dear, I don't give a damn."

# Silent Angels: Amateur Radio in the New York City Marathon



By Stephen Mendelsohn, WA2DHF  
ARRL Hudson Division Director

and Richard Moseson, N2BFG  
Assistant Section Manager, Northern New Jersey

The challenge was simply too tempting to walk away from. Fred Lebow, President of the New York Road Runners Club, the sponsor of the New York City Marathon, told his senior staff that he wanted to run the largest organized marathon in the world. From ham radio communications coordinator Steve Mendelsohn, WA2DHF, Fred asked for probably the largest nonemergency amateur communications network ever assembled.

The goals set by Fred and his second-in-command, Alan Steinfeld, KL7HIR, would require 397 hams. The entire event would require 6600 other volunteers and thousands of New York City police officers, firefighters and Emergency Medical Service personnel. The police estimated that an event of this size would bring over 2.5 million spectators to the course. Over 80,000 people applied to enter the race; 22,000 were selected to run. Would the ham radio community rise to the challenge? You bet we did, and it went off without a hitch.

This was the eleventh New York City Marathon run with ham radio assistance. The New York Road Runners Club (NYRRC) had run small marathons (a marathon is a fixed distance of 26 miles 385 yards, not just the name of a race) in Manhattan's Central Park for seven years before Fred Lebow decided to join the nation's bicentennial celebration in 1976 with a race through all five boroughs of New York City.

The 1976 Marathon saw 30 amateurs use one repeater to help 2090 runners start the race and 1549 finish. A single net control managed information from the starting area, every mile point and the vehicle convoy that

rode in front of the race. The single net of 1976 had expanded to 15 nets by 1986.

## How It's Done

The New York City Marathon Communications System has served as the blueprint for organizers of other marathons around the country. Operations revolve around four primary nets. In addition, there are two nets operating at the starting line, a link from the bus-dispatch area to the trouble desk at the starting area (175 buses were needed to take runners from Manhattan to the starting area on Staten Island), two vehicle networks to control the movement of the convoys that ride in front of the race leaders, a major medical simplex net that operates within the finish area, a VIP operators net (hams who act as communicators, or "shadows," for the senior race staff) and four dedicated links for various other functions.

At the starting area, the race director uses ham radio to keep runners going smoothly through the check-in process. Special announcements about weather are constantly relayed to the public-address announcer to keep runners aware of what will be happening around them.

## While out on the Course, There Arose such a Clatter...

At each mile and five-kilometer point, a NYRRC captain works with a ham radio operator to control events around them. The mile captain is in charge of coordinating nonham volunteers and medical staff assigned to the mile point. The ham mile operator provides a radio link from the mile point to the senior course coordinator and organizes the

three to five hams assigned to each area. Generally, one ham is assigned to the logistics net, a second to the medical net and a third to the dropout net. Any remaining hams "patrol" the course for fallen runners, keeping in touch with the captain on a simplex frequency.

During the prerace period, the mile captain uses the services of the radio operators to set up the mile point—making sure that water, cups, tables, blankets and medical supplies are all where they are supposed to be, or ordering more from the resupply trucks that roam the course before the race begins.

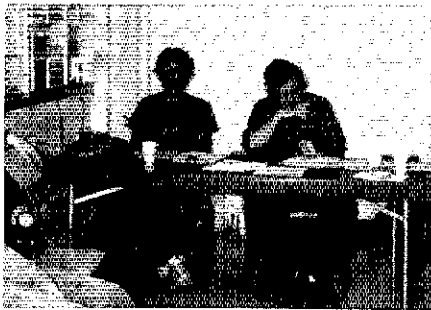
At 10 AM November 1, 1986, the "Stage the race" signal was given to all radio operators. This simple request meant getting over 20,000 runners to the toll plaza of the Verrazano Narrows bridge. At 10:50 all nets are linked, and the start of the race is transmitted to everyone.

## Our Medical, Dropout and Benefits Plan

As the human tide of runners pours through the streets of Brooklyn, the hams along the course fan out to watch for downed runners and summon medical assistance when necessary. They report the downed runner by simplex to the nearest mile point, or, if the runner obviously needs immediate medical help, they call directly into the medical net and have an ambulance dispatched to the scene.

At the finish line is a Family Reunion area set aside for families to meet their runners. If, during the event, a runner decides to drop out, he or she is instructed to tell the nearest ham. All hams are given orange hats with "Amateur Radio Emergency Communications" printed on them. That way, they stand





Peter Florsheim, N2ANC, and Bob Fromowitz, WA2DDB, operate as starting-area net controls. (photos courtesy WA2DHF and N2BFG)

out from other volunteers. The ham takes the runner's number and reports it and other information on the dropout net.

To speed the flow of information to the Family Reunion area from key medical stations where the dropout rate is the highest, amateur packet stations were set up this year. Some quick statistics following the event showed that of the 988 pieces of dropout traffic passed, 635 were on voice while 353 were transmitted by two packet stations in less than seven hours.

With the race now flowing through the first 15 miles of the course, medical NCS KC2KI and K2SE are busy with ambulance dispatches, calls for more medical equipment, running tallies of who has been taken to which hospital, and where key-area doctors are.

Over on the Logistics south net, NCS AI, KA2CHK, and Mitch, WB2JSJ, are playing a unique chess game trying to vector the resupply truck around the race, send people from early checkpoints down the course to help beef up farther mile points that need help, and keep track of the head of the race. Head of race information is passed on to Logistics north NCS Paul, WB2VUK, ARRL Eastern New York SM (and Hudson Division Vice Director), and ANCS John, K2IZ, New York City-Long Island SM, who warn those on the north 10 miles of the course when the onslaught is coming.

#### On Dasher, On Dancer...

As the race speeds through the five boroughs, vehicle convoys consisting of a press photo truck, timing car, press bus for writers and the lead car are running just ahead of the leaders. The movements of all of these vehicles are controlled by WA2DHF, at the head of the men's race convoy, and N2RQ, at the head of the women's race convoy. As overall communications coordinator, Steve is responsible for keeping Race Director Lebow informed of any problems that arise in front of the lead pack and relaying Lebow's instructions on solutions to whatever might arise. This results in five radios going simultaneously—and one heck of a headache afterwards.

#### And Finally...

For the first 250 runners to cross the finish line, a link is set up between the finish line, 25-mile point and the elite baggage-storage area. As mile point 25 calls out runner

numbers, the storage area finds each runner's bag, and gives it to a "gofer." The bag is handed to the runner seconds after he or she crosses the finish line. Each finisher is confirmed by the ham at the finish line itself.

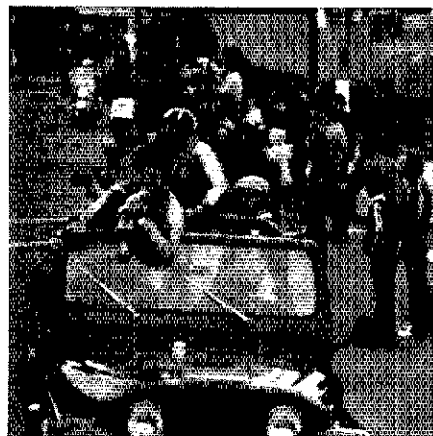
All of this happens if things go well. Runners who falter in the 385 yards between the 26-mile point and the finish line are helped by medical volunteers. To the runners, the aid seems to appear from nowhere. To the hams doing the spotting from a press "bridge" above the finish line, it is all part of the process. The chute-spotting link contains a ham at the 26-mile point, a ham atop the press "bridge" and hams at selected points along the runners' line of march. A ham spotting a fallen runner calls the net control on the Central Park simplex medical net and gives the location. The chief doctor then sends a stretcher team or a single volunteer to aid the fallen runner.

All senior medical personnel have ham radio "shadows" who communicate with them during the entire day. For example, if the race director needs to talk with any of his senior staff, no matter where they are, a 440 repeater is kept open for him. Or, if doctors on the course need to talk with the senior doctor they talk on the course medical net. Amateur Radio provides the thread that ties the entire fabric together.

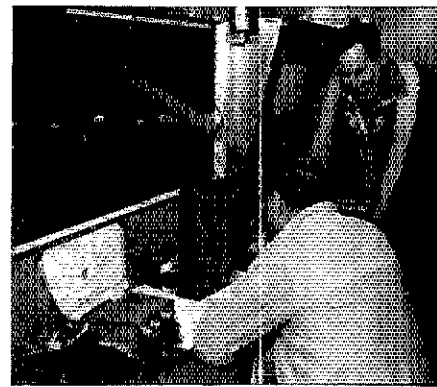
#### The Long Gray Line

By 4 PM, the race is strung out along almost 17 miles of the course. The early mile points have started to close down. To many operators, the greatest sight of the day is the Roselle Park, NJ, Civil Defense truck—the End-of-Race vehicle. Inside the truck, the crew collects data that has been recorded by all of the mile captains, and gives the final okay to shut down.

As race activity winds down and over 15,000 runners are accounted for, activity at the 17-20 mile points slows to a crawl. Operators at the Logistics north NCS position are, understandably, slightly dazed. Over on the Central Park internal medical net, operators sound like players at a bingo game with the quantity of runner numbers being sent to vari-



Steve Mendelsohn, WA2DHF, and Race Director Fred Lebow watch the progress of the race from the pace car at the 10-mile point.



Net controls Stan Zak, K2SJO (former ARRL Hudson Division Director), and Paul Vydareny, WB2VUK (ARRL Hudson Division Vice Director and Eastern NY SM), run the show on the logistics network.

secured the first 22 mile points, and most of our activity has slowed down. The end-of-race vehicle is reported entering Central Park, but the hams in the park remain active until at least 6 PM, keeping an eye on the trickle of runners (walkers really by this time) who follow the End-of-Race vehicle.

#### Last One out, Turn off the Lights

By 7 PM, all mile points are closed down—even though the NYRRRC will keep one scoring lane open until midnight. A trickle of very, very, slow runners continues to flow into the park. All Amateur Radio activity comes to a stop, and we start to dismantle the operations areas. In the communications net-control trailer, we know it is over when Fred Lebow and Alan Steinfeld stop by to thank us.

An activity such as this would not be possible without many special people and massive support from the ARRL Field Organization and clubs such as LIMARC, Staten Island ARA, New York City Repeater Assn, Red Cross ARC and Suffolk County RC from the NYC-LI Section, Westchester Emergency Communications Assn and Yonkers ARC from the ENY Section, and RAVEN, Roselle Park CD, and the Bergen County CD and Bergen ARA from the NNJ section.

Special thanks must go to several individuals who put in hundreds of hours before the race signing up volunteers and making sure they know where to go on race day—including Bob, KW2V, Steve, KA2HXU, Woody, WB2LAP (SK), Willard, K2CFX, Ed, K2SE, Andy, KB7UV, Scott, N5EGX, and the ham radio coordinator for the finish area, Gary, WA2BAU. Without the help of these special people, nothing would have been done on Marathon day. For Steve, WA2DHF, Amateur Radio coordinator for the event, a day off without phone calls was granted. Then came the 397 thank you letters.

For all, it was truly a mammoth event and a lesson in how to serve the public. We have also created a coordinators' notebook that is available for \$2 in postage. It's 35 pages long and crammed with "how to" ideas. If you would like a copy, write to Steve Mendelsohn, WA2DHF, 318 New Milford Ave, Dumont, NJ 07628.



## FCC Reverses Hildebrand Ruling

In 1982 there was an FCC action revoking the license of David Hildebrand, N6BHU, for violation of Section 97.119 of the FCC Rules, which prohibits obscene, indecent or profane language. The Commission said that although it can't censor or interfere with the rights of free speech through radio communications, it can impose sanctions on licensees who violate its rules.

However, a few months later, an FCC Review Board overturned the original ruling. The Board said that Amateur Radio only involves private transmissions and is not a form of broadcasting; since legal cases defining indecent matter were narrowly limited to broadcasting, the legal principles involved could not be extended to Amateur Radio.

This ruling, which in effect permitted indecent language on amateur frequencies, was strongly opposed by the FCC's Private Radio Bureau, which oversees Amateur Radio. The Bureau appealed to the FCC Commissioners to reverse the decision. The ARRL also filed a brief with the Commission arguing for a reversal. In its brief, the ARRL said: "The utterances of Hildebrand in this case were blatantly outrageous to the amateur community. For the Commission to sanction such language would undermine the integrity of the Amateur Radio Service in the United States more than any other single action the Commission could take."

On April 16, as part of the same FCC action that addressed indecency in the commercial-broadcast media, the Commissioners reversed the Review Board's

decision. The Commissioners said that Amateur Radio is "sufficiently like broadcasting" in that its frequencies are shared by many amateurs and there is a risk of children listening to the transmissions. The Commissioners also noted that Section 97.119 of the amateur rules specifically governs indecent transmissions and that amateurs should presume that the Commission's rules will be enforced.

The Commission did not fine Hildebrand or revoke his license, but limited its actions to a declaratory ruling and admonished Hildebrand against future violations. The Commission clearly indicated that similar violations occurring after April 16 by amateurs "would be subject to more severe sanctions."

### FCC DENIES RECONSIDERATION OF EMP PETITION

The FCC has upheld its December 1986 decision not to issue a rule making proceeding on what actions should be taken to shield civilian communications systems from an electromagnetic pulse (EMP). An EMP is an intense burst of electromagnetic energy that is generated by a high-altitude nuclear explosion.

The FCC said that while the issues raised were important, examination of them at this time was unwarranted, since EMP effects were being studied by various organizations, and the public interest would be better served by permitting these studies to proceed unimpeded.

In upholding the request for reconsideration, the Commission noted that the sensitivity of EMP and its national security implications weighed against a public proceeding at this time. This stand was supported by the Department of Defense, which had commented that many of the details related to EMP and its effects were classified information inappropriate for a public forum, and to proceed with an FCC official Inquiry might disclose security information.

### BROADCAST WARC CONCLUDED

The World Administrative Radio Conference (WARC) on shortwave broadcasting concluded in Geneva on March 7. An IARU observer team, headed by IARU Vice President Carl Smith, W0BWJ, attended the Conference and monitored the numerous meetings. A report on the conference appears in IARU News, this issue.

The principal question at the conference was whether a computer-based frequency-planning program, designed to make the use of the present shortwave broadcasting frequencies more equitable, would be approved by the conference. However, when tested the program was deemed a failure in view of the number and quality of the frequencies generated for the countries participating. It will take an estimated three years before the

computer software can be modified and tested. The conference agreed that if the new computer-based program was found acceptable, the system would not be implemented until it had been further reviewed and approved by a subsequent WARC, probably to be held in 1992, if one can be arranged by that year.

How does this affect amateurs? The WARC that will be called to review the computer-based system may also be authorized to make certain frequency reallocations, should the ITU Plenipotentiary Conference in 1989 so decide. Such a WARC could be empowered to consider reallocating some bands now belonging to the Amateur Service.

There was one resolution that directly affects amateurs. A revised and strengthened Resolution 641, introduced by Paraguay at the beginning of the conference, states that the sharing of bands by amateurs and broadcasting services is undesirable and should be avoided, and since 7.0-7.1 MHz is allocated on a worldwide basis exclusively to amateurs, that all broadcasting stations operating on these frequencies should cease immediately.

The IARU observer team closely followed this resolution through committee and while it was being discussed and voted on by the Conference. The resolution was approved, with only China and Pakistan recording a reservation.

ARRL Executive Vice President Dave Sumner, K1ZZ, detailed the threats to various amateur bands in the January 1987 QST editorial. Planning within IARU for a possible future allocations WARC began two years ago. The ARRL and its sister IARU societies have at least another five years to prepare for such challenges.

### FCC EXEMPTS AMATEURS FROM RF RADIATION RULES

In 1979, the FCC issued a Notice of Inquiry on the effects of RF radiation on the health and safety of individuals. At that time the FCC said that, to the best of its knowledge, available experimental data showed there was no danger to the public from RF radiation.

However, the Commission noted that there was substantial controversy about the effects of low-level and long-term exposure to RF radiation. Also, the public has become increasingly aware of the health-and-safety effects of the facilities and equipment the FCC regulates. This has made it necessary for the FCC to seek further information and opinions on its regulatory responsibilities.

In response to this FCC inquiry, then ARRL President Harry Dannals, W2HD, appointed an Ad Hoc Committee on RF Radiation to aid in the preparation of ARRL's comments. The chairman of this committee was Ray Wangler, W5EDZ.

The Committee's report concluded that:

- It could find no reference to any ill effect from RF radiation caused by amateur stations.
- Since Amateur Radio stations operate at irregular times at relatively low power, the RF output had little effect on the RF levels of the general community and posed virtually no hazard to the public or amateur operators.

Because of the above, it was not appropriate to require RF measurements at amateur stations.

Since 1980, the Commission has issued several rule makings on this subject. In 1985, the FCC did add to certain sections of its rules provisions addressing RF exposure in certain services, mostly in the broadcast industry. On February 12, 1987, the FCC issued its second Order. The only information FCC released was a short news release, which stated that certain land-mobile, cellular radio and most auxiliary broadcast services were to be exempt from RF radiation evaluations by FCC. There was no mention of Amateur Radio in the release.

Finally, on April 9, the FCC released the complete text of its second Report and Order and Amateur Radio is completely exempt from submitting RF radiation environmental statements. The FCC agreed with the ARRL's comments that amateur operation would create little likelihood of excessive public exposure to RF radiation due to the relatively low power levels used and intermittent usage

of amateur stations. The FCC also noted that, in the ARRL's reply comments, the League had stated that "it was difficult to find, even for testing purposes, real-life station configurations that generate sufficiently high RF energy levels to even approach ANSI [American National Standards Institute] guidelines."

The ARRL had urged that operator education, through the use of RF safety questions as part of amateur examinations, was the most effective means of assuring compliance with RF exposure guidelines. The FCC agreed, and said it expected the ARRL to educate amateurs about the issue of RF radiation.

The FCC concluded that since amateur stations are not individually licensed by frequency or power output, and were licensed over a 10-year period, it would be administratively impossible to evaluate an amateur station for RF exposure guidelines. Consequently, the Commission found that Amateur Radio operators should not be required routinely to submit, at the time of licensing, environmental information concerning exposure to RF radiation.

### **FCC DENIES NOVICE-EXAM PETITION**

The FCC has denied a petition to temporarily stay the effective date of the new Novice examination requirements until July 21. Martin Schwartz, of Ameco Publishing Corporation, had filed the petition seeking to avoid "significant monetary losses to many small businesses including distributors and publishers, as well as clubs and individuals who purchased materials that were rendered obsolete overnight by the March 21 date [of Novice Enhancement]."

The FCC said that it would grant such a request only if the petitioner could demonstrate that a "failure to grant a stay would lead to irreparable injury" and that "granting the stay would not harm other interested parties and that the stay would be in the public interest." Also, allegations of adverse financial impact are insufficient to show irreparable injury and does not warrant granting a stay. FCC noted that Schwartz did not provide an estimate of the inventory's value which had now become obsolete. In conclusion, FCC noted that others had published materials in reliance on the FCC's new Novice Enhancement rules, and that the grant of a stay would harm them by invalidating their new materials. For these reasons, the FCC denied the petition for stay in an Order released April 23.

### **FCC SAYS NO TO A CONSUMER RADIO SERVICE**

The FCC has decided against amending its rules to establish a Consumer Radio Service within the 462- and 467-MHz bands now assigned to the General Mobile Radio Service (GMRS). In a Notice of Inquiry, PR Docket 86-38 released in February 1986, the Commission had suggested establishing a new service that would permit individuals using hand-held radios to talk with one another briefly over short distances. For example, two individuals attending a large outdoor event together would be able to keep in touch when they are out of sight of each other.

The FCC also asked if GMRS frequency channels could be restructured to accom-

modate this new service, and if any additional band planning or frequency coordination was necessary.

When the comments on the proposal were reviewed, there appeared to be no specific need for this service. Very few comments favored any sort of Consumer Radio Service, and no manufacturers came forward with any comprehensive plans for producing the sort of equipment needed in this service.

Many of the commenters were concerned that the new service would dislocate various public-safety users of GMRS, including services provided by volunteer groups, such as the Radio Emergency Associated Communications Teams (REACT).

Consequently, the Commission concluded there was no reason to dislocate current GMRS users and that the Consumer Radio Service concept did not appear to be needed.

### **FCC ISSUES NOTICE ABOUT CABLE TV LEAKAGE**

The FCC has issued a strong statement saying it is concerned about the excessive levels of RF radiation leaking from cable TV systems. In a public notice, the FCC reminds cable operators that to ensure compliance with the leakage limits set by FCC, all cable operators should have a regular program for detecting, locating and correcting leakage. Formal leakage measurements are required annually for most operators, and excessive leaks that are found are required to be documented and repaired.

Inspections of cable TV systems by FCC have revealed that many systems have either inadequate or nonexistent maintenance programs. FCC reminds all cable operators that they are expected to "make aggressive efforts to minimize leakage and comply with leakage limitations" and that failure to do so "may result in a monetary forfeiture for the willful violation of FCC monitoring rules." Leakage that is detected during an FCC inspection and, in the opinion of the inspectors, could have been prevented had an adequate monitoring program existed, may also be deemed willful and result in a monetary fine.

### **ARRL MEMBERSHIP INCREASES**

ARRL membership figures for March show US full membership up by 835, and US Associate membership up by 290 for a total increase of 1225. This makes the grand total 144,828, an increase of just under 5000 from last year.

### **FUJI/FO-12 TECHNICAL HANDBOOK**

*The Fuji/FO-12 Technical Handbook* is now available in an English language edition from AMSAT-UK. The handbook is a direct translation of the original manuscript written by the satellite's designers in Japan and covers every aspect of the Fuji satellite from its conception to the intricacies of its use. It is available for \$5.50 from AMSAT-UK, R. Broadbent, G3AAJ, 94 Herrongate Rd, London E12 5EQ, England.

### **FCC PROPOSES CHANGES IN BROADCAST STATIONS' CALL-LETTER ASSIGNMENTS**

For the past 55 years, the call letters of broadcast stations west of the Mississippi River began with a "K" and stations east of

the Mississippi began with a "W." There were some exceptions to this rule. For example, the very first broadcast station, KDKA in Pittsburgh, is still using its original call sign. In its proposal the FCC said that there is no longer any justification for maintaining these call sign restrictions, and that broadcast stations should have the option of obtaining a call sign beginning with either prefix letter.

### **NEW PENNSYLVANIA PACKET ORGANIZATION**

The Pennsylvania Packet Association (PaPa) has been organized to serve all amateurs in the state who are interested in packet radio. PaPa intends to promote the coordinated development of packet throughout the state. The near-term goal is to establish a 220-MHz packet trunk across Pennsylvania to improve forwarding of BBS mail and files. For more information, contact Bryan Simanic, WA3UFN, 9 Wild Cherry Dr, Du Bois, PA 15801.

### **W0JCP NEW MIDWEST DIVISION VICE DIRECTOR**

Richard Ridenour, KB0ZL, has had to resign as Vice Director of the Midwest Division due to the demands of his employment. ARRL President Larry Price has appointed Claire Richard "Dick" Dyas, W0JCP, to complete the term of office, which expires on January 1, 1988. Dick previously served as Midwest Division Vice Director between 1975-1985. His address is listed on p 8 of this issue.

### **NEW FCC FACT SHEET ON AMATEUR RADIO**

The FCC has issued a new fact sheet that gives general information about Amateur Radio. The fact sheet is distributed to members of the public who inquire about Amateur Radio. Dated February 1987, it details all of the privileges available to amateurs and explains the amateur license requirements and license classes. It says of the Novice license, for example, "Its elementary written test and its 5 words-per-minute telegraphy requirement make it the ideal license to become quickly involved in Amateur Radio" and details the new Novice privileges due to Novice Enhancement.

### **MANAGEMENT JOB OPENING AT HQ**

We have a full-time, salaried opening for a Club Services Department Manager. We are now seeking applications and resumes from applicants for the position (starting salary \$25,428-30,914, depending on qualifications; reports directly to the Volunteer Resources Group Manager).

The CSD Manager is responsible for ARRL's national-level volunteer recruitment, training, motivation and support programs that guide the local efforts of ARRL affiliated clubs, registered instructors, ACCs, PIOs, PIAs and others. The goal is to develop the effectiveness of these volunteers in achieving the League's objectives in the areas of new-ham recruitment, activating and retaining inactive hams, and disseminating public information.

Candidates should have formal education or equivalent experience in the areas of

## League Advisory Committee Members

This list contains the latest updates on League Advisory Committee members.

### Contest Advisory Committee

**Atlantic Division**—John Carioti, K2ZJ, 6893 Peck Rd, Syracuse, NY 13209  
**Canada**—Bob Nash, VE3KZ, 5260 Fourteen Sideroad, RR 6, Milton, ON L9T 2Y1  
**Central Division**—Gerald Brunning, K9BG, 15 Tilipi Ct, Schaumburg, IL 60192  
**Dakota Division**—Ron Dohmen, N0AT, 125 Magnolia La, Plymouth, MN 55441  
**Delta Division**—Bill Rayburn, K4CX, 289 Taravlaw, Collierville, TN 38017  
**Great Lakes Division**—Randy H. Farmer, W8FN, 8115 S Palmer Rd, New Carlisle, OH 45344  
**Hudson Division**—Bill Inkrote, K2NJ, RD 10, Box 294, Quakertown Rd, Flemington, NJ 08822  
**Midwest Division**—Richard Barnette, KB0U, PO Box 4798, Overland Park, KS 66204  
**New England Division**—Doug Grant, K1DG, 144 Kendall Pond Rd, Windham, NH 03087  
**Northwestern Division**—Dale Jones, K5MM7, Rte 2 Box 488, Bald Peak Rd, Hillsboro, OR 97123  
**Pacific Division**—Gary Caldwell, WA6VEF, 1830 Polk St, Concord, CA 94521  
**Roanoke Division**—David Siddall, K3ZJ, 9763 Oleander Ave, Vienna, VA 22180  
**Rocky Mountain Division**—George E. Schultz, W0UA, 14891 Randolph Pl, Denver, CO 80239  
**Southeastern Division**—James A. White, K1ZX/4, 19620 SW 234th St, Homestead, FL 33031  
**Southwestern Division**—Marty Wall, N6VI, 17780 Ridgeway Rd, Granada Hills, CA 91233  
**West Gulf Division**—Steven Nace, KN5H, PO Box 1492, Dickinson, TX 77539  
**Board Liaison**—John C. Kanode, N4MM, RFD 1, Box 73-A, Boyce, VA 22620  
**Administrative Liaison**—Lisa Arel, 225 Main St, Newington, CT 06111

### DX Advisory Committee

**Atlantic Division**—Tony Gargano, N2SS, 32 Bryant Rd, Turnersville, NJ 08012  
**Canada**—Dr Roland Suran, VE3EJ, 7 Corona St, Toronto, ON M6B 3N3  
**Central Division**—Norman E. Meyers, N9MM, 1544 Horseshoe Bend Dr, LaPorte, IN 46350  
**Dakota Division**—Robert G. Parlin, W0SFU, 1507 Katern La, Minneapolis, MN 55416  
**Delta Division**—Richard A. Roderick, K5UR, PO Box 1463, Little Rock, AR 72203  
**Great Lakes Division**—Ken Schang, W8LU, 46131 Academy Dr, Plymouth, MI 48170  
**Hudson Division**—David Beckwith, W2QM, 151 Whitney Ave, Pompton Lakes, NJ 07442  
**Midwest Division**—James L. Spencer, W8SR, 3712 Tanager Dr NE, Cedar Rapids, IA 52402  
**New England Division**—William C. Poellnitz, K1MM, 44 Sunset Dr, Framingham, MA 01701  
**Northwestern Division**—Jack Bock, K7ZR, 7317 S Jewett Rd, Clinton, WA 98236  
**Pacific Division**—R. W. "Bob" Thompson, K6SSJ, 14703 Eastview Dr, Los Gatos, CA 95030  
**Roanoke Division**—John Parrott, W4FRU, Box 5127, Suffolk, VA 23435  
**Rocky Mountain Division**—Ron Stockton, N0RR, Bonanza Star Rte, Nederland, CO 80466  
**Southeastern Division**—Robert R. Beatty, III, W4VQ, 11 Heritage Cove Ct, Casselberry, FL 32707  
**Southwestern Division**—James T. Rafferty, N6RJ, 5693 Grandview Ave, Yorba Linda, CA 92686  
**West Gulf Division**—John Hawkins, III, K5NW, 1723 Shufords Ct, Lewisville, TX 75067  
**Board Liaison**—Rush Drake, W7RM, Rte 2, Box 372 AC, La Center, WA 98629

<sup>†</sup>Chairman

<sup>††</sup>Vice Chairman

\*Administrative Liaison for all League Advisory Committees

### Emergency Communications Advisory Committee

**Atlantic Division**—Bob Josuweit, WA3PZO, 9 Derwen Dr, Havertown, PA 19083  
**Canada**—Jack Strangleman, VE3GV, 512 Pinetree Dr, London, ON N6H 3N1  
**Central Division**—Bruce Woodward, W9UMH, 6208 Bramshaw Rd, Indianapolis, IN 46220  
**Dakota Division**—Ray Munger, KA0ARP, 2172 Pequaway Lake Rd, Duluth, MN 55803  
**Delta Division**—James J. Leist, KB6W, 2632 Valley Wood Dr, Gautier, MS 39553  
**Great Lakes Division**—Larry Solak, WD8MPV, 9971 Diagonal Rd, Mantua, OH 44255  
**Hudson Division**—Ron Barbera, KA2LAD, 21 Triangle Dr, Setauket, NY 11733  
**Midwest Division**—Larry Staples, W0AIB, 425 W 49 Terr, Kansas City, MO 64112  
**New England Division**—Joseph Steventon, W1KRV, RFD 1, Box 21, Rochester, VT 05767  
**Northwestern Division**—Gene E. Sprague, KD7G, 10716-23rd Dr SE, Everett, WA 98204  
**Pacific Division**—David B. Tyler, N6DRT, PO Box 6017, Albany, CA 94700  
**Roanoke Division**—L. R. Allison, Jr, K4SUG, 5 Gaston Dr, Rte 5, Box 15, Travelers Rest, SC 29690  
**Rocky Mountain Division**—Joe Knight, W5PDY, 10408 Snow Heights Blvd, NE Albuquerque, NM 87112  
**Southeastern Division**—Joel I. Kandel, K1AT, 5463 SW 92nd Ave, Miami, FL 33165  
**Southwestern Division**—Jerry Boyd, KG6LF, 345 B Ave, Coronado, CA 92118  
**West Gulf Division**—Bennett L. Basore, W5ZTN, 924 Will Rogers Dr, Stillwater, OK 74074  
**Board Liaison**—Paul Vydareny, WB2VUK, 259 N Washington St, North Tarrytown, NY 10591-2314

### VHF Repeater Advisory Committee

**Atlantic Division**—Willem Van Aller, K3CZ, 9623 Old Washington Rd, Woodbine, MD 21797  
**Canada**—Dr David Toth, VE3GYQ, 499 Bobbybrook Rd, London, ON N5X 1G8  
**Central Division**—Bob Heil, K9EID, PO Box 68, Marissa, IL 62267  
**Dakota Division**—Eric Foss, KD0Z, 4615 Oakview La N, Plymouth, MN 55442  
**Delta Division**—Jean Giesler, W4TYU, 4544 Lyons View Pike, Knoxville, TN 37919  
**Great Lakes Division**—Bill Creighton, Jr, K8TUT, 40 Angela St, Athens, OH 45701  
**Hudson Division**—Phil Bradley, KB2HQ, 1119 Hedgewood La, Schenectady, NY 12309  
**Midwest Division**—No appointee at this time  
**New England Division**—Bruce Marcus, WA1NXG, 134 E Center St, Manchester, CT 06040  
**Northwestern Division**—Skip Hamilton, KH6DUT, 4025 NW Morgan Pl, Corvallis, OR 97330  
**Pacific Division**—Louis Brydon, WA6OCZ, 10 Sheri Ct, Danville, CA 94526  
**Roanoke Division**—A. Carter Cogle, K4ARO, 1667 Varina Ave, Petersburg, VA 23805  
**Rocky Mountain Division**—Robert Q. Fugate, W8GY, 8820 Delamar Ave NE, Albuquerque, NM 87111  
**Southeastern Division**—James C. Vice, WD4KTY, Rte 1, Box 462, Alexandria, AL 36250  
**Southwestern Division**—Karl Pagel, N6BVU, PO Box 6490, Orange, CA 92613-6490  
**West Gulf Division**—Eilene G. Spiegel, WA5WDW, 2812 Pritchett, Irving, TX 75061  
**Board Liaison**—Lionel A. "Al" Oubre, K5DPG, 601 Sugar Mill Rd, New Iberia, LA 70560

### VHF/UHF Advisory Committee

**Atlantic Division**—Robert Bennett, W3WQC, 626 Lake Dr, Towson, MD 21204  
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**Central Division**—Joseph Schroeder, W9JUV, Box 406, Glenview, IL 60025  
**Dakota Division**—Terry Van Benschoten, W0VB, 2326-11th Ave NW, Rochester, MN 55901  
**Delta Division**—R. A. "Bob" Taylor, WBSLBT, 10715 Waverland, Baton Rouge, LA 70815  
**Great Lakes Division**—David Smith, W8YZ, 530 Hollywood Dr, Monroe, MI 48181  
**Hudson Division**—Barry Siegrird, K2MF, 333 West 57th St, New York, NY 10019  
**Midwest Division**—Jim McKim, W0CY, 1404 S 10th Salina, KS 67401  
**New England Division**—Thomas Kirby, W1EJ, PO Box 455, Palham, NH 03076  
**Northwestern Division**—Lynn Hurd, WB7JUN, 4880 SW 195th Ct, Beaverton, OR 97007  
**Pacific Division**—H. Paul Shuch, N6TX, 14908 Sandy La, San Jose, CA 95124  
**Roanoke Division**—Ted Mathewson, W4FJ, 1525 Sunset La, Richmond, VA 23221  
**Rocky Mountain Division**—Lauren Libby, KX0O, 6166 Del Paz Dr, Colorado Springs, CO 80918  
**Southeastern Division**—Ronald E. Monk, W4ODW, 103 Keller Ct, Niceville, FL 32578  
**Southwestern Division**—E. R. "Chip" Angle, N6CA, 25309 Andreo, Lomita, CA 90717  
**West Gulf Division**—James D. King, W5LUU, 7355 Wild Eagle Rd, San Antonio, TX 78255  
**Board Liaison**—Wayne Overbeck, N6NB, 11552 Gail La, Garden Grove, CA 92640

### Public Relations Advisory Committee

**Atlantic Division**—Eugene Pressler, W3ZKV, 1746 Norristown Rd, Maple Glen, PA 19002  
**Canada**—A. L. d'On, VE3AND, 22 Broadlands Blvd, Don Mills, ON M3A 1J2  
**Central Division**—Jim Romelfanger, K9ZZ, 301½ 7th St, Baraboo, WI 53913  
**Dakota Division**—Curtis R. Swenson, K0CVD, 4821 Westminster Rd, Minnetonka, MN 55345  
**Delta Division**—Jim Buffington, ND5M, PO Drawer 1240, Aberdeen, MS 39730  
**Great Lakes Division**—Jack T. Shepherd, W8OMY, 376 Danhurst Rd, Columbus, OH 43228  
**Hudson Division**—Richard S. Moseson, N2BFG, 19 Linden Ave, Bloomfield, NJ 07003  
**Midwest Division**—Dick Isard, WB0VVZ, 2818 Southland St SW, Cedar Rapids, IA 52404  
**New England Division**—William A. Burden, Jr, WB1BRE, 11 Briand Dr, Nashua, NH 03060  
**Northwestern Division**—No appointee at this time  
**Pacific Division**—Daniel Shafer, KB6LRJ, 1220 Edgewood Rd, Redwood City, CA 94062  
**Roanoke Division**—Wayne C. Williams, K4MOB, 600 Lakedale Rd, Colfax, NC 27235  
**Rocky Mountain Division**—Wilson F. Sellner, WB7RRZ, 930 Western Hills Blvd, Cheyenne, WY 82001  
**Southeastern Division**—John G. Bolton, Jr, WA4PNY, 1325 Belmore Way, Atlanta, GA 30338  
**Southwestern Division**—Frosty Oden, N6ENV, 5442 North Alfoso Dr, Agoura Hills, CA 91301  
**West Gulf Division**—Wayne C. Sellers, W4SYHM, 215 Stephanie Dr, Palestine, TX 75801  
**Board Liaison**—Evelyn Gauzens, W4WYR, 2780 NW 3rd St, Miami, FL 33125

volunteer management, social psychology or education, and be experienced in professional program management, writing, editing and public speaking. Broad experience in Amateur Radio, particularly in license instruction, leadership in radio clubs and participation in the ARRL Field Organization, is desirable. An Extra Class license is necessary.

All full-time employees at ARRL HQ are entitled to a wide variety of benefits. Additionally, HQ offers a very pleasant, informal atmosphere and the opportunity to be at the heart of where the action is in Amateur Radio.

Applications and resumes should be sent to Steve Place, WB1EYI, at ARRL HQ.

## SPECIAL OLYMPICS, PAN AMERICAN GAMES UPDATE

The US has invited all countries participating in the Special Olympics and the 10th Pan American Games (PAX) this summer to temporarily permit a third-party agreement with the US. This would not affect those countries that have permanent third-party agreements with the US. A temporary third-party agree-

ment would permit amateurs to send and receive nonbusiness-related messages to and from the participants in the games.

The Special Olympics will be held July 25 through August 15 in South Bend, Indiana, and the Pan American Games August 1 through 31 in Indianapolis. Various amateur activities will be sponsored locally by the ARRL Indiana Section, under the leadership of Section Manager Ron Koczor, K9TUS, through Section Emergency Coordinator Mike Head, WB9ZQE. A special-event station, W9PAX, will be present at the Pan American games.

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

## CALLING ALL MESSY SHACKS

□ Regarding the 1987 Messy Shack Contest results—what a wonderful contest! I loved each and every winning photo on pages 60 and 61 of April *QST* and only wish that I could have seen each entry! As the poet Keats put it, "A thing of beauty is a joy forever." Truly, beauty is in the eye of the beholder. What is so delightful is that through all of our clutter, we are able to communicate with each other. Many thought that QRM was only on the air! I'm sorry I couldn't tidy my shack up enough to compete.

All hams with messy shacks should remember this: If a cluttered desk indicates a cluttered mind, what does a clean desk indicate? A cluttered desk is a sign of genius! Enough of the sterile, posed photos. This contest really shows what Amateur Radio is all about.

I shared the article with my XYL so that she could recognize how really tidy my shack actually is. For years, *QST* has been so straight that it is a joy to see a sense of humor.—Nate Williams, W9GXR, Middleton, Wisconsin

□ I viewed with interest the pictures of the winners of the Messy Shack Contest. They are making good progress toward Nirvana. I could have won this contest hands down, however, it was impossible to open the door to get a photograph due to the mess in my shack! Therefore, I claim to be the winner of the contest in absentia, hi!—William I. Orr, W6SAI, Menlo Park, California

[Part of the challenge, Bill, was to get inside the shack to take a picture.—Ed.]

□ To say that I was surprised to see the Messy Shack Contest in April *QST* is an understatement. Call me a stick in the mud, but does glorifying a potentially serious fire hazard serve any useful purpose? Is having a shack like those pictured something any ham should want or strive for? Either this was an April Fools' Day joke or the editors of *QST* have temporarily lost their minds! Take another look at these photos through the eyes of a fire marshal and you may see my point.—Michael E. Weber, WB8RDN, Sterling, Virginia

□ I was going to enter the Messy Shack Contest, but I laid my camera down in my shack one day, and I haven't seen it since!—Charlie Cotterman, KA8OQF, Dayton, Ohio

□ The Messy Shack Contest photos in April *QST* were heartwarming and conscience easing. I don't know when I've enjoyed a *QST* feature so much.—John Buntain, WA8TMM, Montpelier, Ohio

□ This evening, I sat down on my couch to read April *QST*. After laughing so hard I rolled off the couch, collapsing on top of my sleeping dog, while simultaneously dousing the dog and the XYL's new carpet with cold beer, I found that I had bruised several ribs in my fall against the edge of the coffee table.

I demand that you give your readers advanced notice before publishing more Messy Shack Contest results!—Larry Yont, W2ELH, Fredonia, New York

□ Never has a *QST* article produced more controversy in this household than the one on the Messy Shack Contest. Despite all of my shortcomings as a husband and a father (I work DX and contests), I never truly believed that my "pregnant closet" was really as bad as the XYL makes it out to be. There is room for three people, and table space for a key, mike, ashtray, logbook, and for a bottle of soda: the paradigm of functionality! I can find any necessities in a matter of moments even though they are not arranged in the most pleasant manner. Holding those pictures in front of me as I viewed my shack for a comparative glance, I proudly proclaim what I already know: What could this be but heaven! And so it must be for the winners of the contest, though I'm not sure I would like to prance about in some of those places!—Paul T. Antos, WB2ABD, Blasdel, New York

[Response to this article was overwhelming. The Messy Shack Contest generated more letters to the Correspondence Editor than any other feature article in years.—Ed.]

## NOVICE ENHANCEMENT— A TWO-WAY STREET

□ March 21, 1987 might well be the most important day to remember in the history of Amateur Radio. This is the day Novices and Technicians joined the mainstream of Amateur Radio on HF sideband. Although I am an avid CW operator, this will be the first opportunity to comfortably communicate on the HF bands with all Novices and Technicians. For the newcomer to CW, a typical QSO (in which RST, name and QTH are exchanged) lasts approximately thirty minutes. If you want an address for a QSL, you better add fifteen minutes. There is not much opportunity to chat. So what do newcomers to HF learn about our hobby?

I am hopeful that the new voice privileges will hold the key to the future growth of Amateur Radio. Novice Enhancement gives Amateur Radio the opportunity to attract more young people into the hobby. With the new voice privileges, I have heard more experienced hams offering tips on operating procedures to the newcomers.

These on-the-air exchanges have given a new dimension to interaction with newcomers. This is the first step, but now we must visit the segments of the HF voice band where the Novices and Technicians can operate. Let's not just welcome them and leave them on their own. Ten meters is a fickle band and it needs more attention, especially during these low sunspot cycle days. Instead of going up to 2 meters for a local ragchew, visit 28.300-500 where Novices and Techs can operate, and become a teacher. This will whet their appetite for even more HF operating

privileges and we will see upgrading and retention of Novice and Technician licenses. Let's welcome these "newcomers" and encourage this new generation to be good operators because they are our future.—Ron Fineman, W3GIS, Rockville, Maryland

## WAS: THE NORFOLK ISLAND PERSPECTIVE

□ In traveling around the world over my 39 years of hamming, I have always been intrigued by operating awards. Worked All States (WAS) is one of those awards in which no matter where one lives, it will always be a "toughie." A check of the latest *Callbook* shows that there are some 430,000 radio amateurs in the USA, give or take a few. What is it that makes WAS so difficult?

The first factor is your own geographical position. In some areas of the world, it can be incredibly hard to get into the East Coast. A check of the list of states shows quite a few "rare ones" in that area. Even the most "common" states can be tough.

From Europe, while some of the East Coast states can be tough, it is the Western states that can be extremely difficult to contact. The states of Wyoming, Idaho, Utah, and so forth bring back to me fond memories of sleepless nights from G-land.

Another factor is the amateur population in each state. A bit of research shows that Rhode Island has 1700 amateurs, Vermont has 1097, Delaware has 1054 and Wyoming has only 992 amateurs within the state line. There are also geographical factors to consider. While California may be easy to work from the Pacific, it can be hard to work from Europe.

Chasing 5BWAS some years ago has convinced me that it has all the magic of DXCC. Working Delaware on 80 meters really gave me a great thrill. It is moments like these which keep the hobby alive for me. The long, hard struggle to work Vermont for the last state on 80 meters was another magic moment. These are the times I like to remember. Now, I am very proud of the 5BWAS plaque on my wall.

I made schedules with amateurs on 160 meters in some of the harder states. Fellow amateurs can be very, very kind and helpful. I will never know just how pleased Bill, KØHA, actually was to be woken up at some ungodly hour of the morning a couple of weeks ago. He showed surprisingly little grumpiness as he came on frequency to give me a solid Nebraska QSO.

Thanks to all the amateurs who helped make the 5BWAS award a reality for me. It is good to have friends. However, I feel that Bill, KØHA, is stretching the bounds of friendship to the limits. In a very nice note with his QSL card, he mentions other amateur bands remaining untapped. The big question for me is whether to put up antennas for the WARC bands. No comment at this stage!—Jim Smith, VK9NS, Norfolk Island

## The Paper Chase

Here's the latest in the burgeoning area of DX awards. Take your pick and get to your bookkeeping!

### Nigerian Society's 25th Anniversary Celebration—Special Award

Check your 1986 logs! The Nigerian Amateur Radio Society was celebrating its Silver Jubilee last year. To qualify, non-Nigerian stations need 5 points; a 1986 contact with each 5N station counts 1 point; a contact with a NARS club station counts 2 points. All bands/modes. Worked/heard log extracts, certified by two licensed amateurs, go either to The Awards Manager, Box 2873, Lagos, Nigeria, or to PO Box 27522, Concord, CA 94520 (\$5 US for Airmail return).

### LZ66 Jubilee Award

This new award is issued by the Bulgarian Federation of Radio Amateurs, in connection with the 60th anniversary of the founding of the first Amateur Radio Club in Bulgaria in 1926. Contacts (heard reports) for July 1-December 31 of last year count. You need 60 counters: an LZ6 station counts 6 points; LZ1 or LZ2 counts 1 point. (Each LZ station may be counted just once.) No charge. Extracts of the station's log, certified by an Awards Manager or two licensed amateurs, must be sent before July 1, 1988 to: Bulgarian Federation of Radio Amateurs, PO Box 830, 1000 Sofia, Bulgaria.

### ACAP Award

The Agrigento Department of the Italian society (ARI) is initiating the "Ancient Castles of Agrigento's District" Award, available to hams and SWLs. Contacts with hams in the district of Agrigento, on or after June 1, 1986, score 1 point on 10-80, 2 points on VHF or the WARC bands. At least four different municipalities of the district of Agrigento must be involved, and stations may be worked only once on each band and each mode (appearing no more than two times in the log). Non-EU stations need 10 points, with full certified log extract. Further details from Badiglio Enzo, IT9QNV, Award Manager, Box 7, 92010 Bivona, AG, Italy.

### IDX Island DX Award

Sponsored by the Whidbey Island DX Club, this award is available to hams and SWLs, for SSB, CW, RTTY, SSB and OSCAR, as well as mixed- and single-band versions. Fifty IDX islands are required for the basic award; certificates are also issued for 100 and 150 islands. All DXCC listings that are bona fide "islands" qualify; on or after Oct 1, 1977. Further details for an SASE to Bill Gosney, KE7C, 2665 North 1250 East (L-M Acres), Oak Harbor, WA 98277.

### European Community Award

This diploma commemorates the 25th anniversary of the European Community, and is awarded by the Reseau Luxembourgeois des

Amateurs d'Ondes Courtes. Each contact with a station from one of the member countries made on or after the day of the country's entry into the European Community counts 1 point (see following list). Stations may be counted once only; no more than 20% of the points may be obtained by contacts with one and the same member country; a contact with special station LXØRL may replace a missing contact with any of the member countries; no band/mode restrictions, except no repeaters. Non-EU stations must amass 50 points. Each member country must be worked at least once, and three LX stations must also be worked. Entry dates: March 25, 1957—DL (Fed Rep of Germany), I (Italy, including IS, IT), ON (Belgium), F (France, including FC), LX (Luxembourg), PA (Netherlands); January 1, 1973—EI (Ireland), G (United Kingdom, including GD GI GJ GM GU GW), OZ (Denmark); January 1, 1981—SV (Greece); January 1, 1986—EA (Spain), CT (Portugal). Send a list, verified by two licensed amateurs, and the application fee of 10 IRCs or \$4 US to the Luxembourg Society, Awards Manager, PO Box 1352, L-1012, Luxembourg.

### RL 50 Award

This award commemorates the 50th anniversary of the Reseau Luxembourgeois des Amateurs d'Ondes Courtes. Contacts during 1987 count. Non-EU stations must score 5 points. A contact with an LX station counts 1 point; stations may be counted only once on each band. Contacts with either LXØRL or LX5ØRL count 5 points. No band/mode restrictions. Send a certified log extract (before July 31, 1988) to the Luxembourg Society, Awards Manager, PO Box 1352, L-1012, Luxembourg.

### Rotterdam Award

Celebrating the 10th anniversary of the award, the Electronica Club Rotterdam (ECR) is issuing a special award during 1987 for contacts during the calendar year. No mode/frequency restrictions, but contacts made through repeaters do not count. Non-EU stations need 5 points. Each ECR contact is worth 1 point; PI4RDM (club station) counts 3 points per band (contact with the station is not compulsory). If you contact the station and a club SWL is present, you get an extra point. A summary list, verified by two other hams, and 15 IRCs go to ECR, Box 22160, NL-3003 DD Rotterdam, Netherlands.

### BARTG Awards Program

The British Amateur Radio Teleprinter Group offers several interesting awards based on teletype operation: the Quarter Century Award (QCA), for having worked or heard Amateur Radio stations in at least 25 different countries; the Century Award, for having worked or heard at least 100 stations; and the Members Award, for having worked or heard at least 25 different BARTG members on any band. Additional details on these and a new

RTTY awards book are available from Peter Adams, G6LZB, 464 Whippendell Rd, Watford, Herts WD1 7PT, England.

### PETER I

The March 20 edition of *DXpress* (the Dutch society publication) aptly describes the way Kaare and Einar utilized SMØAGD's method of coping with massive pileups. "The scheme did not work out well for everyone, but the way they operated with 10-kHz sections, enough space was left for the non-DXers. This new method of channelized operation can only be done with double VFO-equipped transceivers or memory channels, and probably will be the future style of DXpedition operation. With crowded band conditions, new techniques must be developed to help."

### MOST-WANTED COUNTRIES

The *DX Bulletin's* 1986 survey resulted in close to 700 responses worldwide, reflecting operations and QSLs before summer of last year. To quote VP2ML: "The top 20 most-wanted countries should come as no surprise to experienced DXers: Albania, Burma, Andamans, Vietnam, South Yemen, Bouvet, Afghanistan, North Yemen, Laos, Kampuchea, Spratly, Bangladesh, Bhutan, Libya, South Sandwich, South Georgia, Marion, UAE, Glorioso, Mt Athos. The good news is that five of the top 20 have already been active this year, at the bottom of the cycle: Libya, Glorioso, Andamans, UAE, Kampuchea."

### DEFINITION OF DXers

According to the March *Southern California DX Club Bulletin*, DXers are "the 'creme de la creme' of Amateur Radio. We are the most enthusiastic, build the best stations, have the best club bulletins, the most successful gatherings and camaraderie. DXers are at the forefront of technology and the first to incorporate it into their stations. Only our type of hams guard the lonely nights in quest of achievement. Yes, only we comprehend the contester and DXpeditioner." [Besides, we have the most fun.—Ed.]

### THE CIRCUIT

□ **CT3:** DF7DQ/NT7D will be active as DF7DQ/CT3 from Madeira through June 10, all HF bands CW/SSB. QSL via DARC or direct to Peter Zoller, Hermannstrasse 5, D-5800 Hagen 1, Fed Rep of Germany.

□ **KH8:** At year end, K6JAJ operated from Tutuila on American Samoa. Gary is planning to go to Howland Island (KH1) this summer with K6RKK, commemorating the last trip of aviatrix Amelia Earhart. QSL via 3744 Jurupa Ave, Riverside, CA 92506.

□ **FM2:** K1FJM and WA1AYS will operate all modes from Martinique on HF and 6 meters June 11-16. QSL to K1FJM.

□ **Awards:** K1BV is planning on publishing a comprehensive DX Awards directory and would welcome your input: Ted Melinosky, 525 Foster St, South Windsor, CT 06074.

□ **C3ØLEF:** KV4AM and WY4A from June 20 'til mid-July; all bands. (Check 12 and 32 kHz from the bottom of the band edges.)

□ **St Barts:** Bill, K2IBW, notes FJ as the new



prefix for St Barts, only. (Your column editor notes that Bill has HOWS DX as his license plate! Any more of you out there?)

□ **E19FG/ODS:** WA3HUP now manages cards for Henry. Mary Ann notes that the only logs *not* lost in the mail include the period 0955Z Jan 18 to Jan 31, 1986.

□ **XE0DX:** Cards for the ARRL phone multioperation go via KD5GY, who also hopes to operate from either St Martin or another Caribbean rarity.

□ **VP2MU:** AA4NC, AA4GA and WB6SHD operated from Montserrat in March 1987, to the tune of 7700 contacts! QSL as follows: VP2MU (contest only) via N4IZE, AA4GA/VP2M via AA4GA, AA4NC/VP2M via AA4NC, WB6SHD/VP2M via WB4QBB. Mark, WA0MHJ, operated this station Apr 29-May 12, 1986. Mark wants to know who operated July 12-13, Oct 15-26, and Nov 29-30, 1986.

□ **VR6HJL:** G4AAL operated ashore from Henderson Island last summer; documentation is awaiting acceptance by the DXCC desk.

□ **Conditions:** Lee, of *KH6BZF Reports*, goes out on a limb in March saying that Cycle 21 isn't over as yet.

□ **Help:** WA1DFL is looking for QSL routings for SV0AM/SV5, Aug 1980.

□ **Single Signals:** Code buffs at the March Orlando Hamcation were wowed with demonstrations of a really great audio filter in kit form (subject of a recent *QST* cover award). Check with AFtronics, Inc, Box 785, Longwood, FL 32750.

□ **Clubs:** New officers for the Southeastern DX Club, headquartered in Atlanta, GA include Pres K4TEA, VP K4PI and Sec'y K4JAG.

□ **YASME:** Worked 30 or more of the manifold Colvin DXpeditions? If so, check with W0MLY for details on the YASME Award.

□ **Forecast:** W6EL's miniprop user-supported



YB2BNJ (trnx NN8R)

program is worth checking into; it's available for 16-bit PC/MS-DOS and 8-bit CP/M systems. Sounds like a good DX tool. Write to Shel Shallon, 11058 Queensland St, Los Angeles, CA 90034-3029.

## QSL Corner

Administered By Joanna Hushin, KA1IFO

### The ARRL DX QSL Bureau System (Incoming)

Within the US and Canada, the ARRL DX QSL Bureau System is made up of call area bureaus that act as central clearinghouses for QSLs ar-

iving from foreign countries. These "incoming" bureaus are staffed by volunteer workers. The service is free, and ARRL membership is not required.

### How It Works

Most countries have "outgoing" QSL bureaus that operate in much the same manner as the ARRL-Membership Overseas QSL Service. Members send cards to their outgoing bureau, where they are packaged and shipped to the appropriate countries.

A majority of the DX QSLs are shipped directly to the individual incoming bureaus, where volunteer workers sort the incoming QSLs by the first letter of the call-sign suffix. One individual may be assigned the responsibility of handling from one to three letters of the alphabet.

For detailed information on the operation of the bureau serving your district, please send an SASE for a prompt reply.

### Claiming Your QSLs

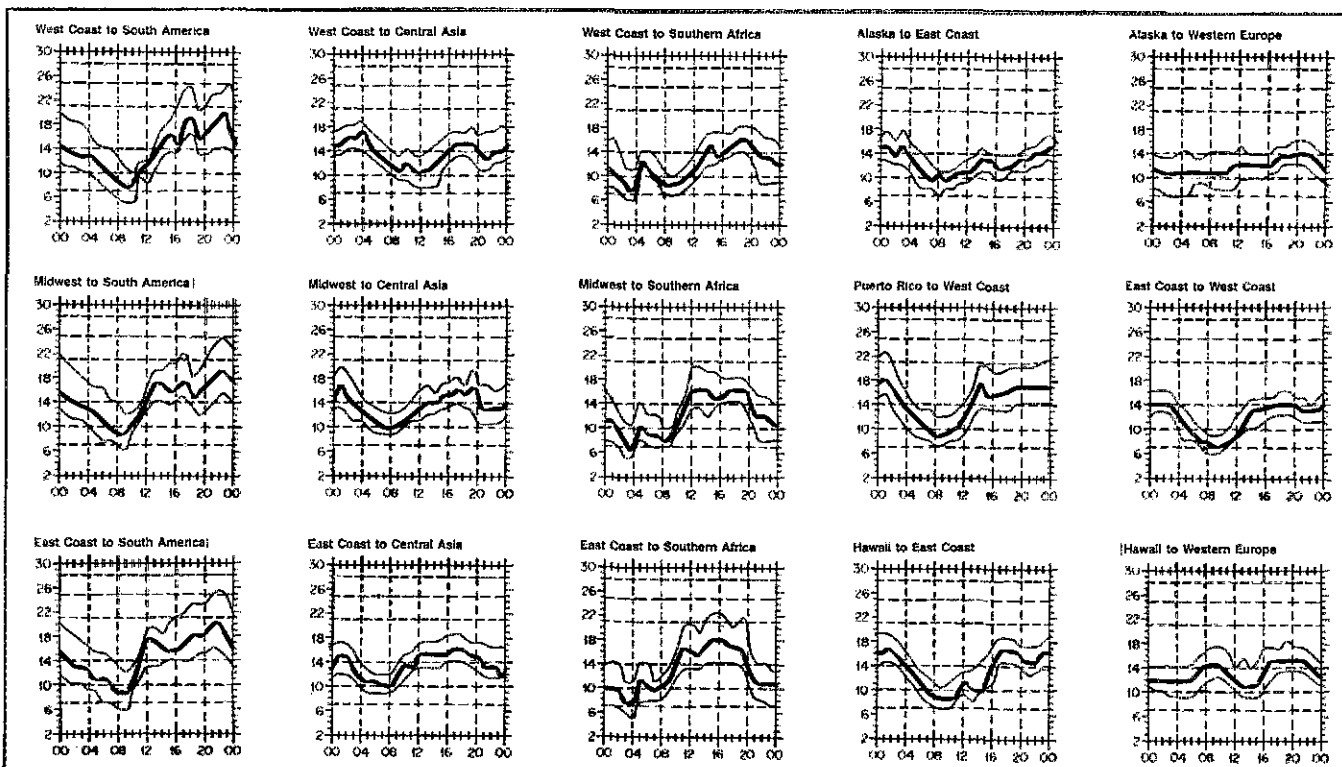
1) Send a 5- × 7½-in SASE to the bureau serving your district.

2) Neatly print your call sign in the upper left-hand corner of the envelope.

3) A preferred way to send envelopes is to affix a First Class stamp. If you expect to receive more than 1 oz of cards, please affix postage accordingly.

4) When requesting *any information* from the bureau serving your district, always include an SASE for a prompt reply.

Some incoming bureaus sell envelopes or postage credits in addition to the normal handling of SASEs. They provide the proper envelope and postage upon prepayment of a certain fee. The different stages of presorting and sorting cards take time. It may be six to eight months, or longer, before you receive your cards.



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as the lowest curve (optimum traffic frequency, or FOT). See April 1983 *QST*, page 63, January 1977



**Helpful Hints**

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. Remember that the people who work in the area bureaus are volunteers. They are providing you a valuable service. With that thought in mind, please pay close attention to the following DOs and DON'Ts.

**DOs**

Do keep self-addressed 5- x 7½-in envelopes on file at your bureau, with your call in the upper-left corner, and affix at least one unit of First Class postage.

Do send the bureau enough postage to cover envelopes on file and enough to take care of possible postage-rate increases.

Do respond quickly to any bureau request for envelopes, stamps or money. Unclaimed card backlogs is the bureau's biggest problem.

Do notify the bureau of your new call as you upgrade. Please send envelopes with old call. Please put only one call on an envelope.

Do include an SASE with any information request to the bureau.

Do notify the bureau *in writing* if you *don't* want your cards.

Do be appreciative of the fine efforts of these volunteers.

**DON'Ts**

Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many cards coming from overseas bureaus are over a year old.

Don't send your outgoing DX cards to this bureau (see "ARRL Membership Overseas QSL Service" in this column in March 1987 QST).

Don't send envelopes to your "portable" bureau. For example, K9CH/4 sends envelopes

to the W9 bureau, *not* the W4 bureau.

**ARRL DX QSL BUREAU SYSTEM**

First Call Area: all calls\*—W1 QSL Bureau, Mt Tom Repeater Assn, Box 216, Forest Park Station, Springfield, MA 01108.

Second Call Area: all calls\*—NJDXA, PO Box 599, Morris Plains, NJ 07950.

Third Call Area: all calls\*—C-CARS, PO Box 448, New Kingstown, PA 17072-0448.

Fourth Call Area: single-letter prefixes—Mecklenburg ARS, PO Box DX, Charlotte, NC 28220.

Fourth Call Area: two-letter prefixes—Sterling Park Amateur Radio Club, Call Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls\*—ARRL W5 QSL Bureau, PO Box 44246, Oklahoma City, OK 73144.

Sixth Call Area: all calls\*—ARRL Sixth (6th) District DX QSL Bureau, PO Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls—Willamette Valley DX Club, Inc, PO Box 555, Portland, OR 97207.

Eighth Call Area: all calls—Columbus Amateur Radio Assn, Radio Room, 280 E Broad St, Columbus, OH 43215.

Ninth Call Area: all calls\*—Northern Illinois DX Assn, Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls\*—W0 QSL Bureau, Ak-Sar-Ben Radio Club, PO Box 291, Omaha, NE 68101.

Puerto Rico: all calls\*—Radio Club de Puerto Rico, PO Box 1061, San Juan, PR 00902.

US Virgin Islands: all calls—Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St Thomas, VI 00801.

Hawaiian Islands: all calls\*—John H. Oka,

KH6DQ, PO Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls\*—Alaska QSL Bureau, 4304 Garfield St, Anchorage, AK 99503.

Guam: AH2, KH2, WH2 and KG6 calls—MARC, Box 445, Agana, GU 96910.

SWL—Mike Witkowski, WDX9JFT, 4206 Nebel St, Stevens Point, WI 54481.

**CRRL DX QSL BUREAU SYSTEM**

QSL Cards for Canada (VE, VO and VY) may be sent to CRRL Central Incoming QSL Bureau, Box 51, St John, NB E2L 3X1. Or, QSL cards may be sent to the individual CRRL Incoming QSL bureaus.

VE1\*—L. J. Fader, VE1FQ, PO Box 663, Halifax, NS B3J 2T3.

VE2—A. G. Daemen, VE2IJ, 2960 Douglas Ave, Montreal, PQ H3R 2E3.

VE3—The Ontario Trilliums, PO Box 157, Downsview, ON M3M 3A3.

VE4\*—Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.

VE5—B. J. Madsen, VE5FX, 739 Washington Dr, Weyburn, SK S4H 3C7.

VE6\*—N. F. Waltho, VE6VW, General Delivery, 9714-94th St, Morinville, AB T0G 1P0.

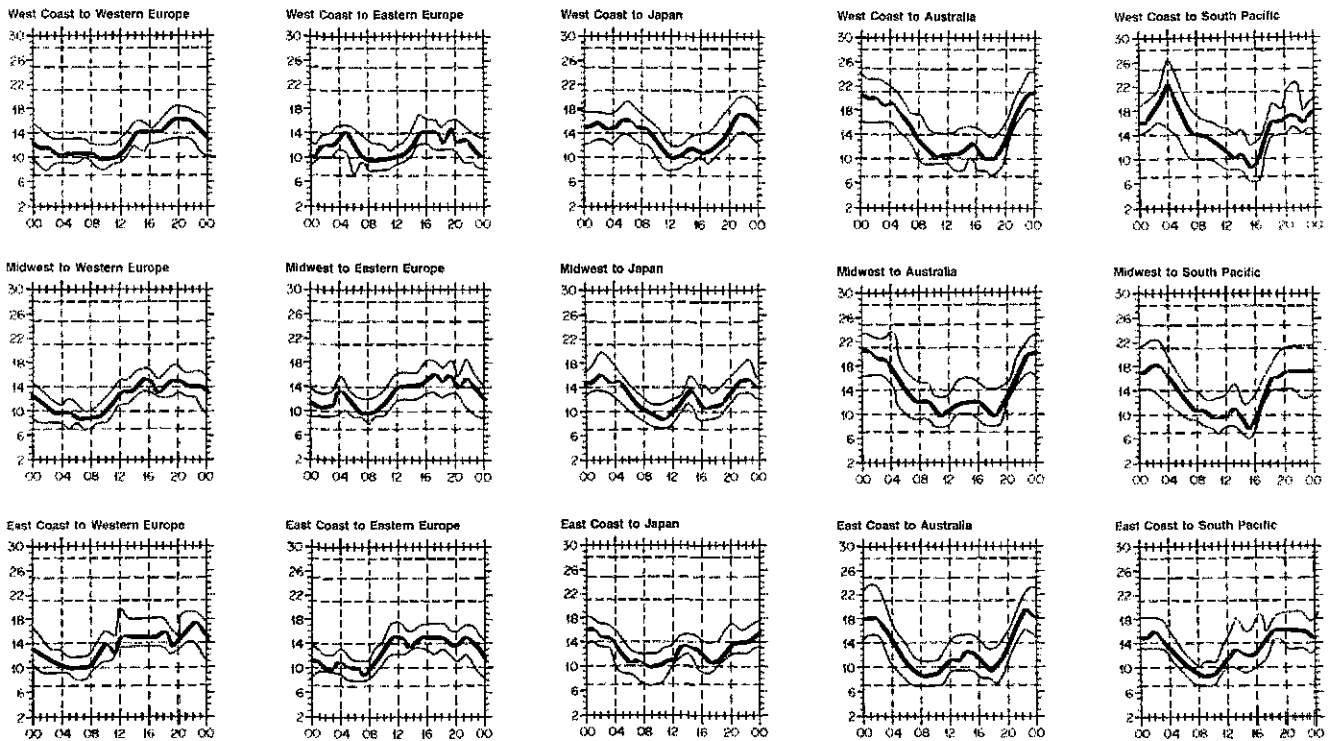
VE7\*—Alex Ivsic, VE7CNE, 1107-7434 Kingsway, Burnaby, BC V3N 3B7.

VE8\*—Rolf Ziemann, VE8RZ, 2888 Lanky Ct, Yellowknife, NT X1A 2G4.

VO1, VO2—Roland Peddle, VO1BD, PO Box 6, St John's, NF A1C 5H5.

VY1—QSL Bureau, W. L. Champagne, VY1AU, PO Box 4597, Whitehorse, YT Y1A 2R8.

\*These bureaus sell envelopes or postage credits. Send an SASE to the bureau for further information.



QST, page 58, September 1977 QST, page 35, and January 1979 QST, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for June 16 to July 15, 1987, assume a sunspot number of 13, which corresponds to a 2800-MHz solar flux of 73.

# 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 March 1 through March 31, 1987. An SASE will bring you the rules and application forms for participation in the DXCC program.

## New Members

### Mixed

DA2PW/104	IK2AFF/232	JA3RAR/260	VE3ADP/135	YT3T/163	NQ2F/138	KI4EZ/132	WD4LOO/121	WM6P/147
DK1DN/113	IK2BHX/146	JL3VW/107	VE3OU/112	YU3KE/172	WB2HUV/108	KS4S/100	VV4S/102	KA7KDB/161
EA7PS/129	IK2FEO/104	JM3ADQ/106	VE3OZZ/100	ZC4EE/108	WA3EBA/101	N4EAH/109	KC5DX/208	KC7MM/113
F6GPG/275	IK2GNW/115	JH4JNG/137	VE4ACF/112	5H3RB/104	AA4AV/209	N4JVL/107	KF5AU/103	K8FC/252
F6HBR/124	IK2GSN/168	JF7JEM/109	VE4SI/105	KA1UC/111	AA4RV/300	N4KVF/116	KG6WX/103	KA8CC/115
G3RTE/301	JA2ERL/107	OK1DGN/106	VE6AXB/114	N1DCI/103	AA4SY/110	W4NBA/109	N6AMI/104	KB8EE/167
G3RVM/107	JE2ARR/106	SM7PRF/105	VE7CI/112	KC2FC/274	K4YFH/136	W4ROM/126	N6MYX/107	WD8LR/125
HA9PR/125	JG2UUS/109	SM0RNR/121	XE1CI/291	KR2I/100	KC4MK/110	WA4SSJ/106	W6ZKM/336	WA9YY/103
HA8UB/225								

### Radiotelephone

DL5OAH/103	JL3VW/107	TI2LC/103	YB0PR/106	NF1G/102	N2DHP/101	AA4JO/105	KC5DX/123	KD8EE/167
HG5AAS/105	JM3ADQ/106	TI2LCR/128	YB0ZAB/119	W1EGS/100	K3SKE/100	NE4A/262	KG6WX/101	KQ8M/287
IK2GSN/150	JF7GGE/137	TZ6WC/105	YT3T/101	K2KIB/108	N3DYW/103	WD4FZC/108	NW7O/220	NW8C/109
I4VJC/101	JF7UEM/109	VU2SMN/108	5N9GM/220	K2OQA/128	AA4AV/186	WD4JMC/123	K8FC/184	K9GBN/103
JA3RAR/245	OK3YCZ/102							

### CW

DL3HBH/106	HA7SU/109	JH4JNG/111	OK1DWJ/103	WA2DSC/155	KC4MK/109	WA4QQV/121	K8FC/147	KQ8M/234
F9QI/122	HA8ZJ/107	JH7DFZ/106	SM0RNR/106	KA3NSW/101	NE4A/194	K5MOY/103	K8MC/236	WB8CNL/236
G3RTE/234	IK0GGW/110	JH8HZG/108	VE3OZZ/100	W3NB/105	WN4KKN/150	NS6V/104	K8PO/107	KA0RDM/102
G4QK/103	JA1KWC/102	OK1DGN/106						

### RTTY

PY6ACP/101

### 160 Meters

G3BDO/103	SV0AA/102	K4TEA/100	W4VQ/100	W6AJJ/100	K8GG/102	W9YYG/102	WB9NSZ/104	NA0Y/116
OK1DXS/102	W3FM/110	KB4AA/100	KASW/103	W7MB/100	K8CFU/100			

### 5BDXCC

K8BU	N6ADI	YU3CC	KD5ZM	VE3JCV	I8IGS	I1CAW	KB5IM	N4AXT
IS0FPH	YU3OY	YU3AT	I4AVG					

## Endorsements

### Mixed

DJ4UF/250	JJ1DWT/307	XE1OX/310	K2KIB/180	AK4N/301	W4FNS/286	KM6K/289	N8CPF/255	W9IL/250
DK0AK/125	JA4VAD/304	YU3PD/159	K2PK/276	K4BXU/150	W4HG/283	N6GG/341	N8DLR/235	W9LJR/202
DL5KAT/229	JA6GWU/224	ZS6AZQ/202	NA2G/261	K4LRX/309	WA4OBO/309	W6ECJ/137	N18C/225	W9MCR/318
DL7MAT/231	KP4AZ/294	4X4JJ/201	W2IX/256	W2II/250	WF4I/250	W6NNV/338	W8DWP/276	W9UJ/227
EL2AY/178	K80C/KH2/236	AD1C/287	W2JQ/179	K4SE/310	WJ4T/283	W6YFW/244	W8JRK/140	W9V1Y/173
G4GIR/295	I48XM/178	KA1CSL/141	W2NU/178	K4VNM/182	K4SDOB/188	W6GPP/255	W8UVZ/318	W9AVL/125
G4JW/264	OH3SG/289	KA1EJ/299	W2SEG/225	KC4DY/300	KB5M/266	KA7AUH/311	W8CZA/297	W9ACQ/219
G4QK/158	PY2DBU/285	KB1ER/199	WA2MZX/149	KD4S/309	KE5OD/125	KB7WD/157	K9ALP/269	K0CVD/301
HA8RT/200	SM6AVM/282	KE1F/302	WA2SLK/125	KJ4BK/273	KF5AL/205	N7RT/321	K9EMF/268	K0YST/310
HB9AFI/309	SM6BGG/292	KE1K/280	WB2GHI/225	KT4G/307	NA5S/260	W7GUR/314	NF9V/185	KB0G/272
HB9KU/312	SM0BSB/187	KT1J/276	N3BNA/259	N4CRI/277	W5FX/135	W47HX/151	K9GX/313	KY0AJ/316
I3VJW/226	SV1JA/200	NE1C/225	W3FM/323	N4DAZ/301	W5NJ/312	K8ICE/271	K9PPW/142	W0BX/269
I8WYD/250	VE2GZ/160	W1HOF/251	W3ZBF/223	N4PB/315	WA5KBH/150	KF8K/220	KC9DJ/252	W0JLC/291
JA1QXY/317	VE4MT/202	W1SK/251	AA4AM/270	N4XR/314	WB5NXH/155	KQ8M/294	KR9P/300	W0MHZ/259
JA2BJC/250	VE7EIK/200	W1ULE/125	AA4VK/310	NX4Y/273	WD5ETI/174	KR8Y/232	N9BMS/265	W0S/306
JA1SDV/292	XE1MDX/304	W1VH/309	AK4H/228	W4FL/266				

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DX9CO/315	I4CSP/284	P29JS/307	KE1K/269	AA4V/318	N4CRI/267	NA5S/260	K7SP/313	WB8CZA/292
DF1AG/230	I8LEL/318	PT7JZ/265	KT1J/266	AA4VK/308	N4DDZ/221	N15D/175	KA7AUH/309	K9FD/230
DK6BT/131	I8WYD/250	PT7NK/259	W1FJ/309	K4DUJ/323	N4PB/315	W5NJ/217	N7RT/297	KA9TNZ/200
DL2IX/239	JA1DM/333	PZ2ES/175	W1RR/311	K4KST/225	W4APQ/273	W5UYD/316	NK7Y/224	N9BMS/250
DL3ML/212	JA1MDK/305	SM6AVM/282	K2MFN/214	K4PI/307	W4ASV/261	K6LM/304	NSTJ/307	W9DH/329
E8AVV/272	JA1WSK/315	SM6BGG/291	K2OVS/228	K4SE/309	W4JFE/313	K6MA/311	W7JUR/307	W9HHS/130
EL2AY/177	JJ1DWT/301	SM6CTQ/310	KB2VK/305	KB4QR/183	W4WMO/312	KB6J/305	W7HX/202	W9IT/320
F3HU/207	JF2MVI/125	SM7BYP/310	KC2FC/274	KC4DY/300	WA4ECA/293	KD6LV/141	W7UZA/296	W9PFD/175
G3YJ/271	JA3FYC/267	VE3ST/321	W2EKQ/291	KC4LA/127	WA4LP/177	KM6K/281	K8CMO/316	W9VA/233
G3YJ/314	JA4VAD/284	XE1CI/290	W2GA/321	KD4RH/261	WA4OBO/303	W6HXW/316	KB8T/205	W9XQ/311
G4GIR/276	JA7PL/315	XE1JRV/128	W2IX/256	KD4S/309	WB4LFM/317	W6OB/259	N8DE/286	K0VRW/295
G4JW/258	JA8HQ/312	XE1MDX/304	WB2QM/317	KF4NO/270	WB4M/154	W6YFW/242	W8CT/310	K0ZZ/286
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HB9BIN/157	JA9CX/283	Y00SY/161	W3YJ/289	K14UJ/135	WW4E/289	WA6PRS/131	W8GS/271	W0PT/277
HB9KU/259	K80C/KH2/226	ZL1AMO/306	W3ZBF/174	KQ4O/306	K5HW/207	WD6BS/310	W8UVZ/299	W0YK/294

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DL6QW/278	JJ1DWT/228	SM6CTQ/286	4X4JJ/134	K2OWE/280	N4CRI/207	NG6W/249	K8ZH/306	W9XX/304
F6GOS/149	JA2BCJ/209	SM7BYP/287	9Y4VU/273	K2PK/270	W4JFE/268	K6JG/307	KJ8G/262	K0CVD/290
G4GIR/263	JA3MCD/278	SM0BSB/187	AD1C/275	K4MGT/280	K4MGT/280	K6LM/293	W8DA/282	KB0G/239
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I1VJW/208	JA6BSM/308	VE3EPN/152	W1GNR/261	W2FXA/260	K5LM/298	N7EPD/184	K9PPW/134	W0PT/277
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VE3WV/338  
V66RU/363  
XE1AE/350  
ZL1HY/364  
ZP5CF/357  
W1CKA/343  
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K2BZT/351  
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W2TP/347  
W2YVJ/346  
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N6DX/324  
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N6MM/322  
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W6RFK/319  
W6TLA/318  
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K8TL/330  
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W8LE/327  
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N9MM/320  
W9GB/341  
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W1GL/323  
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W1RED/321  
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K2JUV/343  
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N2DT/313  
N2VJ/311  
N2KW/314  
N2MF/313  
N2OO/316  
W2CC/321  
W2HI/338  
W2TA/318  
W2AJO/311  
W2AION/319  
WB2BNJ/319  
K3NZ/318  
N3RL/311  
W3CCG/325  
W3YD/313  
AA4AR/312  
AA4M/313  
K4PVZ/319  
N4CC/315  
N4IA/319  
N4RF/316  
N4RU/315  
W4DZZ/313  
W4JFE/334  
W4LVM/318  
W4OZH/319  
W4TK/326  
WA4VDE/312  
WB4HOK/312  
K5NW/318  
N5EA/324  
N5TP/328  
N5UR/319  
W5DJ/330  
W5HDS/348  
W5XJ/325  
W5ZPA/313  
DL7CW/332  
K6JV/331  
F6EXV/312  
G3MXJ/326  
G3YJ/316  
HB9BGN/312  
I00UD/314  
I30BO/311  
JA0CAK/316  
JA1AG/344  
JA1RLV/318  
JA1SY/313  
JA1VN/318  
JA2DJH/318  
K8WV/311  
JA3JQ/317  
JA5AQ/313  
JA7EHU/326  
JH1CJQ/325  
JH1OJU/314  
JH7DNO/311  
K9AM/313  
OH2EE/311  
OH2K/315  
OH2DB/319  
OZ5D/330  
P00LEG/311  
SM0LJ/315  
SM3DXC/315  
SP2AJQ/323  
SP5EYV/317  
SP6BZ/325  
VE3DR/312  
VE7DP/316  
XE1GSM/312  
YV5AHR/334  
YV5BX/346  
4X4FU/326  
AA1K/314  
K1HMO/312  
K1KM/312  
K1MM/317  
K1VJH/312  
K1VR/319  
K1ZS/327  
W1IAS/348  
W1TRC/316

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W6EL/344  
W6HYG/349  
W6KTE/343  
W6RKP/350  
W7JFO/335  
K8CFU/348  
W8GMF/345  
W8MPW/350  
W9D/335  
W9DQW/344  
W9J/340  
W9NZM/345  
W9SFP/347  
W9AUNU/338

314	W8CUO/344	K4XO/331	LA3XI/323	JA1EOD/331	I8KNT/315	I2SLA/325	IT9HLO/313	JA1JWP/312
DJ4PT/331	W8GKM/333	N4WF/333	OE2EGL/334	JA1JAN/327	JA2AH/327	I5AFC/321	JA1FNA/320	JA2KLT/324
DJ9ZB/329	W8JBI/347	N4WW/331	PA0HBO/353	JA1OYY/320	JA2APA/318	I7KBI/314	JA8XM/316	JA3AQ/316
DK2BL/332	W8JIN/354	W4OM/354	PP5UG/335	JA2ADH/331	JA7GLB/320	IT9KZW/318	JA8ZQ/326	JA3GM/317
DL7FT/341	W8ZET/345	W4QAW/333	PY5GA/329	JH1GZE/322	JA7LJ/319	JA5PUL/316	JA9BJ/327	JA4FWM/315
EA2HX/344	K9KA/333	K5UR/331	SM4EAC/331	KH6OR/347	JA7JH/325	JA7BJS/317	JR7TEQ/314	JA5AQ/311
F2MO/343	K9LKA/336	W5HE/337	SM5DQC/328	LA7JO/325	JA7MA/330	JA8BIO/323	LA5HE/343	JA7ARD/317
G3JEC/337	W8BW/338	W5MQ/332	VE3GS/332	LU1BR/320	JA8JF/319	JP1JK/320	LA9GJ/312	JA1EIG/325
G3NLY/338	W8PNS/342	K6GA/333	VE3NE/334	OZ5EV/321	LU2AH/318	KP4CL/338	ON6HE/312	JR1AIB/314
G3TJW/331	W9NDA/359	K6IR/328	VE3WJ/338	PY2CYK/335	ON5NT/324	LA8CJ/316	PP5YC/318	KP4CK/334
G3UML/338	W8TKD/339	N6AR/337	Y51O/345	SM6AEK/332	OZ7OP/328	LU3AJW/316	SM2EKM/324	LA7ZO/316
G5VT/359	W8GAA/343	N6NA/342	YV5AJK/345	VE1YX/320	PY2BW/324	OE2GKL/324	SM6VR/328	OK4JR/324
I0XJ/334	W8GKL/350	N6R/333	YV5AXQ/340	VE3SR/340	PY2BU/325	PY2DSC/327	VE3EJ/316	WQ2RZ/322
I1APQ/330	W8QGI/346	W6CCB/331	YV5CWO/325	VE7AAQ/332	SM5AZU/336	PY2TM/313	VE3UX/332	PA0LEG/311
I2LAG/333	W8SFU/339	W6CHV/351	ZL1ARY/331	VE7WJ/322	SM5BCO/343	SM0CCM/317	VE3EJ/327	SM0ATN/325
I4LCK/332	W8OAH/334	W6ISQ/339	ZL3QN/330	VK6HD/330	SM6ECC/326	SM5RK/334	ZS6BBP/331	SM5BFC/313
I5FLN/331		W6KOE/332	W1DND/328	YV5DF/327	SM6EHC/326	UA1CK/340	K1UO/315	VK5WO/333
I6FLD/346		W6LQC/330	W1FXX/322	ZL1AW/328	VE3BX/326	UA6JD/320	K2UFM/322	XE1GBM/312
I8YRK/337		W6PTJ/343	W1XJ/343	K1NJE/327	VK6LJ/327	UA9VB/331	K2UO/315	YV5AHR/334
I93PRK/334		W6YMV/343	W1JRI/343	W1NGE/327	K1LHT/328	VE3MC/318	K2YIY/319	9T4UJ/317
JA1JRK/332		W6AHL/332	W1JRP/327	W1NGE/327	K1RAW/322	XE1KS/329	W2LZX/314	K1MM/314
JA4ZA/339		DJ9RQ/322	W2FGD/338	W1AQER/320	K1DQ/330	9H4G/322	WB2NYM/326	K1ST/312
JA8ADQ/334		DL1HH/338	W2FPA/329	K2UU/325	W1HGA/330	K1CMJ/319	K3KA/313	W1SD/333
OA0AS/335		DL8NU/335	W2FAJ/335	N2SS/330	W1LQC/325	K1QMV/326	N3UN/314	W1VKQ/313
OH3SR/334		EA4DO/335	W2MPK/328	W2GBC/335	KB3PJ/323	W1JJ/315	W3ACE/317	K2GPL/322
K01MP/340		EA4LH/333	K8IFF/333	W2IYX/323	W3RX/330	K2KGB/326	K4GUD/320	K2YLM/332
ON4SZ/353		EA8JJ/331	K8LJG/326	W2XN/348	WA3ATP/331	KM2P/326	K4KC/334	W2CC/321
ON8XA/335		F3DJ/347	W6JTD/334	W3AC/338	W4LSP/325	W2FG/331	K4YT/323	W2GQF/324
OZ3PZ/328		F6AOI/331	K9MM/333	W3AP/322	K4XJ/324	W2MIG/321	WA4XR/337	WA2VEG/325
PY2PC/338		F9IE/334	W93X/351	N4CC/324	N4CQ/324	W2PSU/323	W4PZV/328	WB2SNJ/319
PY3BXW/334		G3KMA/331	W9ZR/329	K4FJ/334	W4AVY/333	W2SY/326	WA4QBX/323	K3RX/316
SM5FC/333		G3ZBA/330	AJ0X/335	LU3YLW/4/322	WA4MMO/324	K4CEF/323	WB4NDX/318	W3FWD/338
UBSWF/337		G5FA/331	N4KG/323	N4KQ/323	K5GJ/326	K4MEZ/323	WB4OS/325	W3IF/320
VE3GMT/334		G13JIY/351	N4MM/332	N4MM/332	W5GQ/344	K4XG/325	K5AQ/327	AA4AR/312
VK4QM/349		I1GEA/329	W4BRE/334	W4BRE/334	W5LZZ/335	N4ZC/328	K5JW/328	K4AEB/312
VK6MS/359		I1RBJ/335	W4EEU/337	W4EEU/337	W5RRK/330	W4BBL/331	N5AN/320	K4XH/323
YV1KZ/333		I2LPA/329	W4SSU/342	W4SSU/342	W5SJJ/332	W4BFR/326	W5EDX/329	N4NX/316
YV5ANF/345		I2YBC/324	W44CXZ/321	W44CXZ/321	K6EC/333	W5JJA/340	W5WJ/318	N4XX/324
ZL1AA5/329		I7HH/330	K5OS/330	K5OS/330	K6SVL/327	W5QOU/334	WA4JT/317	W5AAQ/326
ZL3NS/340		IT9GAI/335	K6OVC/331	K6OVC/331	K6XJ/326	W5RNG/337	K5JEA/342	W4ELB/325
Z56RM/347		IT9ZGY/343	W5UR/333	W5UR/333	W6KUT/341	K6AXC/322	K5LM/325	W4FRU/307
W1SP/348		JA1ADN/336	K6UJO/328	K6UJO/328	W6YB/333	K6DT/323	W5RO/332	WA6OET/328
W2GK/340		JA1BN/335	N6AW/330	N6AW/330	WA6WZO/319	K6JAD/323	W5TX/333	K8LZ/320
W2QW/343		JA1BRK/336	W6KPC/336	W6KPC/336	K7RO/322	K8JR/331	K8JR/331	K8NA/317
W3EYW/346		JA1MIN/336	F5JA/326	W6XPC/328	KN8Z/330	N6OC/316	W6KZS/331	K8SQE/321
W3GG/330		JA2XW/331	F5VU/328	K7NN/329	W8CNL/328	NS6C/316	KE7LU/332	W8NXP/333
K4AIM/350		JA3APL/331	F9GL/341	W7EKM/328	W8COG/328	W6AXH/323	W7DQ/320	K9DXO/319
K4HEF/359		LA8LF/339	F9MD/340	W7KR/341	W8KST/332	W6GTL/323	W7EZ/325	K9IKP/318
K4HJE/334		OE3WVB/329	GMB9QA/335	W8CFG/329	W9GU/328	W6KON/326	W7FP/318	K0KTP/316
K4JRB/343		ON6KL/332	HB9AHA/332	W8KST/335	W9KQD/327	W6UY/325	W7YR/318	N6CR/315
K4MQG/340		PY2ED/331	I0MPF/330	W8VHY/332	W9LQ/333	WA6RTA/327	WA7DRP/321	N6ET/324
K4PDV/343		SM6CVX/330	I1RB/343	N9AF/333	W0CSZ/340	K8NN/320	K8PYD/325	W6BCQ/332
W4DPS/334		UB5WE/327	I5UA/352	W9BEK/340		K6ZG/321	K8JG/316	WA6OGW/316
W4EPZ/337		VE3XN/333	I7SCA/336	W9LA/332		W8JX/331	W8JX/331	K7BCX/320
W4MGN/340		VO1CU/324	IK7CBN/323	N0RR/323		WA8AJ/337	K9HMB/317	K7OXB/318
K5UC/355		Y03JU/334	IT9JT/334	NA0Y/343		W88EUN/327	K9RF/323	N7US/318
W5SZ/338		YS1RRD/325	JA1AAT/332			DL1JW/338	W9RXJ/323	W7BKR/318
W6SIEV/334		YV5AIP/348	JA1ELY/323			DL4YAH/312	W9ZRX/324	DL7FP/320
K6CXY/344		ZS6JM/354	JA1IBX/335			DL6KG/330	W0QLX/324	EA1QF/312
K6JG/337		ZS6YQ/347	JA1OCA/329			DL8KS/320	W0SR/320	EA4JF/324
N6UC/333		6W1DY/332	JA1UQP/331			DL9DY/331		EA7IR/328
W6BSY/351		W1GKK/350	JA2AAQ/333			EA1IY/326		EA7LQ/319
W6FW/343		W11CU/333	JA2JW/338			EA3NO/326		F2VX/321
W6GR/337		W1SEB/333	JA3BQE/326			EA3TT/318		F6DLM/312
W6HFL/345		K2BS/340	JA3CMD/320			EA8LD/315		I0DUD/314
W6RGG/345		G3RCA/325	JA3MNP/324			G3RCA/316		I0MBX/316
W6ZKM/336		W2GKZ/340	JA4AFT/329			I1FNX/316		I1BSN/311
W7CMQ/342		W2GLF/352	JA6BSM/327			I1HAG/318		I2BXC/322
W7EPA/340		W2HZ/335	JA7HZ/326			I1UW/325		I0OLK/328
W7JYZ/348		W2SUA/332	JH1IFS/326			I2AT/333		I3EVK/330
W7UPF/335		WB2VEG/330	KH6BB/336			I3ADI/325		I4USC/313
K8DR/338		K4BBF/333	KV4FZ/330			I8ACB/317		I6KKW/312
		K4PQV/329	LA1ZI/327			I8JN/324		I5PAC/330

# Strays

**QST congratulates...**

□ Fred Crosher, K6JWQ, of Potomac, Maryland, on receiving the Security Engineer Officer of the Year award from the Bureau of Diplomatic Security, US State Department.

□ the following radio amateur on 60 years as an ARRL member:  
 • Leon Faber, W7EH, of Phoenix, Arizona

□ Stephen Jones, KF5LP, of Mesquite, Texas, on receiving the Dallas Police Department Life Saving Bar and Police Shield awards.

□ Ronnie Milsap, WB4KCG, of Nashville, Tennessee, on winning the 1986 Male Country Vocal Grammy award.

□ Ray Kowalski, Chief of the Special Services Division, FCC Private Radio Bureau, on receiving the first Eugene C. Bowler Award from the National Association of Business and Educational Radio.

**I would like to get in touch with...**

□ the person who left their 2-m hand-held transmitter on a flight to Chicago. Bob Lukaszewski, KB9MS, 1038 Martingale, Bartlett, IL 60103, tel 312-289-1824 (after 6 PM Central).



## Band Plans Revisited

Band plans have been the subject of this column on several occasions. The subject is being addressed again because of some changes that have been suggested. Although one of these suggestions is confined to 6 meters, it serves as a basis for discussion of the general subject of band plans, how they are developed and their purpose.

For several years, 6-meter operators have been guided by the band plan shown in the table. Recently, two organizations have suggested changes. The Southern California Six Meter Club (SCSMC) has proposed some rather sweeping changes in the arrangement of the 6-meter band, principally the calling for FM simplex channels on the low end of the band and moving all repeaters down 1 MHz. The other proposal comes from the New York Packet Federation, which merely seeks the addition of five dedicated packet channels just below 52 MHz. They also suggest addition of packet channels on other VHF bands through 70 cm.

The current band plans for the frequencies above 50 MHz are based on work accomplished by the VHF/UHF Advisory Committee (VUAC) and the VHF Repeater Advisory Committee (VRAC). Like all ARRL Advisory Committees, these two groups were established by the ARRL Board of Directors to provide advice on various specialized facets of our hobby. They are made up of people knowledgeable in the particular facets from

### Current 6-Meter Band Plan

50.000-50.100	CW and Beacons
50.060-50.080	Automatically Controlled Beacons
50.100-50.600	SSB and AM
50.110	SSB DX Calling Frequency
50.200	SSB National Calling Frequency
50.400	AM Calling Frequency
50.600-51.000	Experimental and Special Modes
50.700	RTTY Calling Frequency
50.800-50.980	Radio Control
51.000-51.100	Pacific DX Window
51.100-52.000	FM Simplex
52.000-52.050	Pacific DX Window
52.000-54.000	FM Repeater and Simplex

different parts of this country, plus one from Canada. In order to function, each Advisory Committee must receive information and suggestions from individuals and groups acquainted with the problems facing the area of Amateur Radio covered by that Committee. These are then turned into recommendations submitted to the Board for consideration.

It must be emphasized that band plans, even when sanctioned by the ARRL Board of

Directors, are not binding and they should not be taken as the ARRL dictating to amateurs. They are intended only to act as guidelines to help us gain the most from operation on our VHF and UHF bands, with an emphasis on minimizing difficulties between the various modes. Also, no matter how well thought out and coordinated they may have been when they were established, band plans should not be considered permanent. Things change. New technologies, such as digital communication, evolve and old ways of doing things fade. Nevertheless, we should not be too much in a hurry to scrap what we have and cause people unnecessary effort and expense to implement a change merely because a few people think it is a good idea, or that it appears to solve a problem in a particular region of the country. If there is a need to revamp our current band plans for any of the VHF bands, the change is best brought about through the process that has served us well so far.

These two proposals are being aired to get the process of their consideration underway. Your comments on them, or any other ideas you may have, will be of great help to the VUAC and/or VRAC in their evaluation. Direct all communications on this subject to ARRL Headquarters Liaison for Advisory Committees, and distribution to all of the committee members will be taken care of. I would appreciate a copy as well.

### CENTRAL STATES VHF CONFERENCE

Always one of the major summer events on the VHF scene is the conference sponsored by the Central States VHF Society. This year's conference will take place July 24-26 at the Roadway Inn, Arlington, Texas. That's between Dallas and Fort Worth and only a short distance from the Six Flags Amusement Park. This fact should be of interest to many families.

Of interest to the VHFer of the house will certainly be the technical presentations being assembled by WASTKU. On Saturday, two simultaneous sessions will be run. One will be aimed at helping newcomers to the world above 50 MHz learn about what to expect and how to make the best use of their stations. K5YY, of both DX and VHF fame, will lead off this session with a discussion of equipment and procedures. Also on the program will be W3EP providing information on the various propagation modes present on the VHF and UHF bands, and W9IP with practical advice on how to take maximum advantage of meteor scatter. Remember the tremendous tropo of last Thanksgiving? NOØY will present his analysis of this record-breaking event. Satellite techniques are not forgotten, with W5IU showing how to set up an effective station for that increasingly important facet of Amateur Radio.

For the more advanced, K5BYS will tell us how to build simple, yet effective, test equipment to measure frequency and power. N6TX will reveal the mysteries of the Smith Chart, and KP4JU promises to share his latest findings on correction factors for Yagi antenna elements. Power amplifiers for 2-4 GHz will be the sub-

ject of WØPW's talk, while KØRZ will discuss the construction of equipment for 3445 MHz. KK7B will talk about that very important element of any VHF, UHF or microwave setup—the oscillator. EME, and how diversity can help it, will be the subject of KL7WE's talk. The North Texas Microwave Society, a red-hot group in the growing amateur involvement in this interesting and important part of the spectrum, will let us know what they have been doing and how they have been doing it. One of the ways they have been doing it is to tap the wealth of the Dallas-area surplus stores—some of the best in the country. Conference attendees will have a chance to find out for themselves and come home with some useful goodies. On Thursday, July 23, a visit to the area's best surplus outlets will be conducted by WASVJB. Anyone who knows Kent is aware of his talents for acquiring and using surplus gear.

There will be the usual antenna-gain competition and noise-figure measurement. Antennas from 144 through 1296 MHz will be measured and plans are underway to extend this all the way to 10 GHz. A relatively new, but very popular, event will be the Friday evening flea market. It's a great opportunity to bring some things that you no longer need and pick up some great stuff someone else no longer needs. The Saturday evening banquet will, as always, be one of the high spots of the Conference. The Central States VHF Conferences are famous for the interesting and varied activities planned for the families of attendees, and great plans are taking shape so that this year will be no exception.

Central States VHF Society President Al

Ward, WB5LUA, and Vice President Wes Atchison, WASTKU, promise to put on a great Conference. I hope to see many of you there. For further information, send a business-size SASE to Al Ward, WB5LUA, Rte 9, Box 132, McKinney, TX 75069.

### ON THE BANDS

**6 Meters**—By the time this reaches you, the 1987 sporadic-E season should be well under way, and we will probably be beginning to form opinions about it. While writing this column in early April, it's impossible to know what's ahead, but initial indications point toward a very interesting season. As they did last year, however, events down under during our winter months may provide a clue to what lies ahead for us. VK5LP, who conducts a column similar to this one for the Australian magazine *Amateur Radio*, says that their season began in late October with transequatorial-type openings to Japan. Some of these, based on Japanese reports, were mentioned in earlier columns, but it appears that these openings were far more numerous and widespread than previously thought. On October 26, JA4MBM is reported to have worked east coast VKs as far south as Sydney. The following day, the Alice Springs area, in the central part of the country, got in on the action. Over the ensuing months, many straight E<sub>s</sub> contacts with ZL were made, plus numerous ones around Australia. To provide additional spice, such exotic spots as FK8, VKØ, P29 and ZK2 put in regular appearances. If you're intrigued by these 6-meter reports, wait till you hear what transpired on 2 meters. More



about that in the next section.

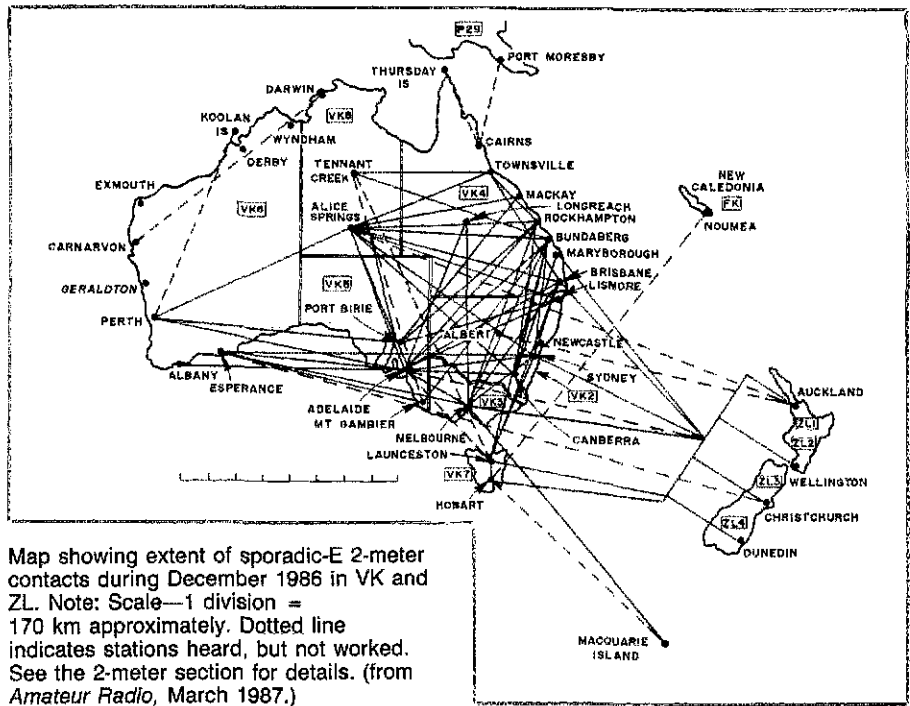
Meanwhile, on our side of the world, early openings point to a bang-up season. WSDZF/4 Miami reports that the band was open to the Caribbean April 6, 7 and 10, with YSIECB very active working stations along the southern tier of states, and TI2CF on as well. W5FF near Albuquerque laments that he heard YSIECB too, but could not break through the Gulf Coast stations calling him. Believe it or not, with all of the countries Lee (K5FF) and he have, they still need El Salvador. But Fred's big news concerns events of April 5. At 2252Z, after hearing the LU2FMO beacon 2 minutes earlier, he worked LU8AHW. The Far East doesn't get all of the north-south propagation. But that was not all. Both W5FF and KN5S Las Cruces, NM, about 250 miles south of Fred, called the answering machine to report contacts with Argentine stations: LUs iDVT, 3EO and 6DLB. These contacts were between 2300 and 2345Z April 9. Both reported XE1FE Mexico City in very strong at the time, suggesting that the propagation mode was transequatorial linked up with Sporadic-E. Another encouraging report comes from WJ5P Hattiesburg, MS. Lee says that, at 0150Z April 8, he had a brief contact with XE1GE south of Mexico City. In addition to pointing to very interesting propagation, these reports are also encouraging in that they demonstrate the continued activity of such stalwart 6-meter DXers as YSIECB, TI2CF, XE1GE and the LUs.

WA5IYX San Antonio, in his always complete propagation report, mentions that XE1GE was in on April 5 plus many Mexico City FM broadcast stations at about the same time. Pat also says it should be possible to work the Mexico City area on 2 meters if only some one were on.

The news I have on summer DXpeditions puts the team of K1FJM and WA1AYS at Martinique (prefix FM) and KA3B at Bermuda (prefix VP9), both for the Contest. W6JKV will certainly be going somewhere interesting for the Contest and probably at least one other rare spot, but I did not have any definite information as of the deadline for this column. Keep tuned to 6 meters and 28.885 MHz.

The Pack Rats are returning to competition in the June VHF QSO Party. This year will find them operating W3CCX on all bands from 50 MHz to 24 GHz from Spruce Knob, West Virginia.

**2 Meters**—As outstanding as the E-skip conditions in the Australia/New Zealand area were during their summer months of December through March, experiences on 2 meters were even more so. There is even speculation concerning a possible E-layer contact on 70 cm! To quote VK5LP's column VHF UHF An Expanding World in the March issue of *Amateur Radio*, "Two metres has once again provided an incredible number of contacts all over Australia and New Zealand." The best way to appreciate the number and distribution of the openings is to look at the accompanying map of the area. I published a similar map in this column a year ago, but this year's map shows even more widespread 2-meter E<sub>s</sub> contacts. One of the reasons for the increased number and widened geographical range of contacts has been the missionary work and encouragement provided by VK5LP. With our larger population, we should be able to do even better, provided we get the propagation. The moral is: Be on the lookout for 2-meter E skip. Keep a receiver on 144.200 MHz and don't use that frequency for local chitchat. Watch 6 meters for signs of very short skip—under about 600 miles, but not necessarily in your immediate area. Watch for telltale signs on the TV channels, especially Channels 5 and 6, and watch the 88- to 108-MHz FM band as it is probably your best advance tip-



Map showing extent of sporadic-E 2-meter contacts during December 1986 in VK and ZL. Note: Scale—1 division = 170 km approximately. Dotted line indicates stations heard, but not worked. See the 2-meter section for details. (from *Amateur Radio*, March 1987.)

off of an opening on 2 meters. There is nothing to match the thrill of 2-meter E skip. Don't miss out. When you do encounter an opening, by all means move off 144.200 MHz. There would be many more 2-meter E<sub>s</sub> contacts made if people would spread out instead of QRming each other.

Some interesting propagation into the Caribbean is reported by WA4OWC and W4ZD. Both George and Bev tell of an outstanding tropo opening between south Florida and the US Virgin Islands, Puerto Rico and Grand Turk. During the evening of March 26, WA4OWC worked W4UWH/KP2 on 2 meters, who was in all night and also the following two evenings. The next morning, he worked VP5D on both 2 meters and 70 cm. On the 28th, he worked W4UWH/KP2 again along with KP4EOR and KP4EKG. The latter was also worked on 70 cm. W4ZD came across the opening with a CQ in 144.200, which was answered by VP5D. How's that for a pleasant surprise? Later in the evening KP4EOR was worked, and the following morning, with Dave's signals S9+, Bev hooked up with W4UWH/KP2. Bev laments the fact that WA1JXN had left the Bahamas just one week before. Incidentally, he says that DJ1PJ/C6A has bought Lance's Bahamas array and should continue the 2-meter activity from there.

NY7C believes that it is possible to work from the coast of Oregon to the Alaska coast, possibly in the vicinity of Seward. He asks that KL7s who might be interested in 2-meter or 70-cm portable operation from promising spots get in touch with him. Address: David Palmrose, 9200 SW 91 St, No. 8L, Portland, OR 97223.

**The Higher Bands**—Again this month, the big news for the upper reaches of the world above 50 MHz has to be the EME work going on in Oklahoma and Texas. Last month's column reported the successful reception of moon echoes by a team consisting of W7CNK, WA5TNY and KA5JPD. Now, just one month later, comes the first two-way contact on 3456 MHz. It took place April 5 between W7CNK/5 Oklahoma City and a team in the Dallas area consisting of WA5TNY and KD5RO. These bands certainly appear to be practical for amateur moonbounce. Once again, congratulations to all involved in this worthy project.

Among the many interesting items for moon-

bouncers on 70 cm and above that appeared in K2UYH's March 432 and Above *EME News* is a note that DL9KR is the first non-North American station to qualify for a 70-cm WAS. W5RRCI Mississippi provided the final state back in January.

## VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is given to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in italics for each band listing. Initial qualifiers are shown first, followed by those with endorsements, for February 14, 1987 through April 13, 1987. An SASE will bring you the rules and application forms.

<b>6 m (50 MHz)</b>		<b>1.25 m (220 MHz)</b>	
100		50	
198	K1GPI	18	WB8ART
199	K7ICW	19	WS4F
200	K7JXU	<b>70 cm (432 MHz)</b>	
201	K13W	50	
202	NALTA	84	W2GU
203	WA8NOK	85	WS4F
204	W4A1AX	86	W2DRZ
205	W0BFOY	87	WS4SH
206	WB4WXE	88	WA8NOK
207	W0VD	89	WSHUQ
208	K2DNR	90	W0VD
209	KN6B	G4NBS	60
W1WHL	200	W1JR	160
K2OVS	125	W5AFY	140
N2AHN	175	KBWW	140
K4CKS	200	KBZW	80
KB4DZK	125	N8DJB	60
NW5E	175	KC0QR	70
W5FF	325	W0RAP	160
K1GO	175	<b>23 cm (1296 MHz)</b>	
N7BUP	125	25	
W8LLY	150	38	W2DRZ
W8BYFE	150	39	WS4SH
K9LCR	150	40	WA5VJB
<b>2 m (144 MHz)</b>		<b>5.7 GHz</b>	
100		5	
163	WD4AHZ	15	
164	W3ZR		
165	WSHUQ		
166	W2DRZ		
167	WA8NOK		
168	KA5SPD		
169	W0VD		
170	YU4WEU		
171	KJ4GK		
AF9Y	200		
NB9F	125		
W9JGV	125		
KM0A	175		

## Activity Reports—More Record QSOs

Traditionally a slow time for UHF activity, late winter this year was a time of intense microwave activity and record contacts in a number of areas.

### 5.7-GHz News

In a note from the Northeast Oklahoma Microwave Society (NOMADS), W5UGO reports that a new 5.76-GHz North American DX record was set on Nov 22, 1986 when K5PJR worked WA5ICW at a distance of 286 miles. W5UGO also worked WA5ICW over a 196-mile path during the same session. W5UGO comments that summertime conditions generally seem a bit better than wintertime on 5.7 GHz, though the difference is not great. Since January 1986, more than 100 QSOs have been made using propagation modes, including troposcatter, rain scatter, tropo ducting and reflection from buildings. As of Jan 14, 1987, the standings are: K5PJR, 17 grids and 5 states; WA5ICW, 15 grids and 4 states; W5UGO, 14 grids and 4 states.



K5PJR (right) and WA5ICW after their record breaking 5.7-GHz contact.

### Aeronautical Mobile on 1296 MHz

Aeronautical mobile is not a common mode of operation on any band. During the January VHF Sweepstakes, N6IDN (Ernst) and N6GVP (Ann) decided to try 1296-MHz aeronautical mobile operation, realizing that although these contacts would not count in the contest, increased activity levels would provide an ideal opportunity for airborne tests.

No changes to the airplane were authorized, so an extra battery and an internal antenna had to be used. The station consisted of a homemade transverter with a 144-MHz IF and a rotatable 8-element loop Yagi. The station was strapped into the left-rear seat of a Cessna 172. Flying at 6000 feet, N6IDN and N6GVP made contacts over the Pacific coast between Los Angeles and San Diego, with signal levels 60 to 70 dB over the noise. In 45 minutes, they worked almost as many stations as a well-situated ground station could work in a day.

Aeronautical mobile operation does present



N6GVP working aeronautical mobile during a 1296-MHz SSB contact at 2000 feet over the Pacific coastline near Los Angeles.

some unique problems. Despite strong signals, the high noise level in the Cessna made it difficult to hear SSB stations. In addition, drastic course changes necessitated by the structure of the restricted airspace around Los Angeles made it difficult at times to maintain uninterrupted contacts. Ernst comments that next time they will try using an omnidirectional antenna, since signals were so strong that a directional antenna is not needed.

### Moonbounce on the Higher Microwave Bands

Moonbounce is now common on the bands through 1296 MHz, and a number of stations are also active on 2304 MHz. WA5TNY, KA5JPD and W7CNK have been experimenting on the higher bands as well. In late February, W7CNK heard echoes on 3.4 GHz that were 6 to 8 dB above noise. Equipment consisted of KA5JPD's 50-W output traveling wave tube (TWT), a preamp with a 1.5-dB noise figure (NF) and W7CNK's 16-foot dish antenna. In early March, WA5TNY heard echoes on 5.7 GHz using the same dish, 100 W output from a TWT and a 2-dB-NF preamp. Signals were again 6 to 8 dB above noise.

Going to even higher frequencies, I understand from PA0EZ, who recently visited this QTH, that I4BER can hear his own echoes on 10 GHz using a few hundred milliwatts of power and a large (commercial) parabolic dish.

### 47-GHz News

Lynn Hurd, WB7UNU, has written with details of a 47-GHz contact made by members of the Friday Noon Microwave Society. On Mar 6, WB7UNU, W7TYR and W7ADV in Portland, Oregon worked WA3RMX and K7RUN in Beaverton, Oregon at a meeting of the Tektronics Employees Radio Amateur Club. The path was 5.42 miles and may constitute a North American record on the 47-GHz band. Lynn comments that the frequency was 47.040025 GHz (nice counter!). Linear transverters were used at both

ends. In Portland, transmit power was 44 microwatts into a 9.5-inch dish, while at the other end of the link transmit power was 3.5 mW into a 28.5-inch dish. Receiver noise figures were 15 dB. Other points of interest were that, at the Beaverton end, contact was made through plate-glass windows (3 dB extra loss) so the operators could work in comfort! The contact lasted 20 minutes or, as Lynn puts it, "until we all ran out of things to say."

With some signal strength margin left and bigger dishes in the works, there are definite plans to continue this work. Much longer DX should be worked in the near future.

### 10-GHz News

A number of readers have written in recently describing their work on 10-GHz narrowband systems. Glen, N6GN, has a homemade system putting out 100 mW of SSB on 10.368 GHz. He uses a series of phase-locked oscillators ultimately referenced to a 10-MHz ovenized standard. Absolute frequency accuracy (out on a hilltop) is  $\pm 100$  Hz!

Kees, PA0KKZ, now a resident of Ontario, Canada, is working on a frequency synthesizer for 10 GHz. Kees has a long history of experience on 10 GHz, starting in 1973. He made the first 10-GHz contacts from Holland to England and from Belgium to England in 1975 and 1976. He hopes to have his system completed by the end of April.

Alois, OE6AP, writes that narrowband activity on 10 GHz is high in Europe. He uses a 70-mW "DL1RQ transceiver" with an IC-202 for the IF. The photo shows Alois, at left, on top of a 2000-meter-high peak in the Austrian Alps. From this same peak, he has worked into Bulgaria, a distance of 425 km.



OE6AP (left) at 2000 meters above sea level in Austria. From this site, he has worked into Bulgaria (425 km) on 10-GHz SSB/CW.

## On-Hands DFing

The October 1986 installment of this column proposed an automated direction-finding system that tied inexpensive direction-finding equipment together with amateur packet radio to determine automatically the location of transmitters causing interference to amateur repeaters and other operations. The system is still on the drawing boards locally. An exceptionally awful New England winter has stymied efforts to put the system together and test it out in the field (snow field?).

On the other side of the continent, where the winters are usually milder, Pat Barthelow, WB6ZSB, who has experience with traditional direction-finding techniques, is considering experimenting with a packet-radio direction-finding system. His letter to me follows. It is being printed here as an open letter to all readers in the hope that others who have experimented in this field will share their thoughts with all of us.

I saw your FM/RPT report in October '86 QST. Glad I did because I've been exploring a similar concept for my own use and for the Naval Postgraduate School Amateur Radio Club (K6LY). I would like to exchange ideas

and information if I could.

Some researchers from the University of California use direction finding to track animals in our county, ranging from California condors to mountain lions and magpies. Their needs seem to merge with my project. If an automated network of tracking (direction finding) sites could be developed, an immense number of man-hours could be saved by people doing this kind of research. Right now, the trackers walk in the range area with Yagis and radio receivers (VHF at 152 MHz) to do their tracking—very time intensive. They are very interested in my idea (same as yours) of automating the system.

Direction finding is not as easy to implement as it may seem to the uninitiated, and I am sure problems of automating the system will take some time to work out. Our area (Monterey County) is very mountainous and multipath reception of VHF signals is very common.

Computer algorithms could be used to analyze direction-finding data that are sent to a central location by packet-radio systems. Each network would have to be individually studied and calibrated in order to discover false arguments produced by unique sources,

such as terrain and receiver interaction. The dynamics of azimuth variations would have to be analyzed, and software could then do signal processing to get true fixes. Have you done any of this analysis? With mountaintop sites and mountain-valley topography, is it feasible to get true azimuths from multiple sites and, therefore, fixes on a moving target, such as an animal?

I know some direction-finding equipment has EIA-232-D interfaces already built in, but don't know any brand names. The Dick Smith unit (Dick Smith Electronics K-6345 Radio Direction Finder) seems to be radically less expensive (\$100) than other units. Does it work well? [See QST, Product Review, Aug 1986, page 41—Ed.]

I also do research for the Navy in oceanography and have already used direction-finding techniques to track drifting buoys in the ocean. Packet radio seems to offer more opportunities for data acquisition in this field. Quite an exciting time in Amateur Radio, isn't it?

Hope to hear from you soon.—Pat Barthelow, WB6ZSB, 810 Airport Rd, Monterey, CA 93940

### NOVICES ON 220 MHz

The influx of Novices to the 220-MHz FM band has begun. At first, the Novices who showed up were using the 220-MHz transceiver of a higher-class, family-member ham; however, reports indicate that the radio dealers are experiencing an increased demand for 220-MHz equipment, so we can expect newly equipped Novices to join the 220-MHz ranks shortly.

ARRL Headquarters has received numerous inquiries concerning which frequency(ies) Novices should use for simplex packet operations in the 220-MHz band. The ARRL offers the following interim guidance pending any future revision of the ARRL 220-MHz band plan.

Use 223.40 MHz as a national packet simplex frequency except in those areas where frequency coordinators have coordinated repeaters for other uses. (The ARRL repeater data base shows that two repeaters use this frequency—W3AVK, Williamsport, PA, 223.40 input/221.80 output, and W9MAB, Gurnee, IL, 221.80 input/223.40 output.) Packet simplex operations should not cause interference to repeaters or other uses already coordinated, and another simplex frequency that is not in use locally should be selected from the simplex frequency list below.

223.42	223.52	223.62	223.72	223.82
223.44	223.54	223.64	223.74	223.84
223.46	223.56	223.66	223.76	223.86
223.48	223.58	223.68	223.78	223.88
*223.50	223.60	223.70	223.80	223.90

\*223.50 is the national simplex frequency. This frequency should not be used for packet simplex.

If duplex packet operation is needed, use input and output frequencies in the 222.32-

223.38 MHz and 223.92-223.98 MHz bands, respectively, as assigned by the local frequency coordinator.

Locally, one ham has already established a digipeater on 220 MHz to accommodate Novices, and plans are under way to link a 2-meter PBBS to the Novice 220-MHz band. (The source for a portion of this item was *Gateway, the ARRL Packet Radio Newsletter*.)

### FREQUENCY COORDINATOR NEWS

#### New Utah Coordinator

John Lloyd Jr, K7JL, has been elected frequency coordinator for the state of Utah according to a January 29 news release. John replaced Greg Reed, WB7TSY, who served in the post for several years. The new Utah coordinator can be contacted at 11560 South Sandy Creek Dr, Sandy, UT 84070, tel 801-571-8900. (from the *Western Washington Amateur Relay Assn Coordinator*)

### REPEATER LOG

According to February 1987 reports received, repeaters were involved in the following public-service events: 393 vehicular emergencies, 30 public-safety events, 29 medical emergencies, 11 fire emergencies, 5 power failures, 5 search and rescues, 4 drills/alerts, 4 weather emergencies, 1 criminal activity.

The following repeaters were involved (followed by the number of events): W2VL 59, NK2W 8, WA2ZWP 8, W3MUM 1, WA4BVW 31, WA6BJY 7, WD6DIH 15, KA6EEK 62, W6FNO 263, KE6KI 1, K6TZ 21, K8DDG 6.

### 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	This issue, p 51
Club Contest Rules	Jan 1987, p 81
DX Contest Awards Program	Feb 1987, p 82
Element 2 Question Pool, New and Revised Questions, Answers	Apr 1987, p 23
Field Day Rules	May 1987, p 87
Frequency/Mode Allocations	Apr 1987, p 70
Golden Jubilee of DXCC Award	Sep 1986, p 60
Hamfest Calendar Rules	Sep 1986, p 84
Ham Radio-Related Landline BBSs	Nov 1986, p 58
HF World Championship Rules	Apr 1987, p 88
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License-Renewal Information	Apr 1987, p 70
Major ARRL Operating Events and Conventions—1987	Jan 1987, p 57
Novice Enhancement Report and Order	Apr 1987, p 64
QSL Bureaus	This issue, p 54
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220-MHz Band NPRM	Apr 1987, p 16



## CRRL Officers and Directors

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## RABC Moves in on RF Susceptibility

RABC, the Radio Advisory Board of Canada, is a respected but diverse group representing the interests of manufacturers of electronic equipment, Amateur Radio, commercial carriers, broadcasting, municipalities and even the RCMP. All 15 members, however, were unanimous in endorsing a set of recommendations which, if implemented, would effectively deal with most problems created by the RF susceptibility of electronic equipment. What were the RABC recommendations? We quote from its *Report*:

1. RABC strongly recommends to the Minister of Communications that legislation be sought at the earliest possible date extending the power of the Minister to encompass the regulation of immunity of electronic equipment. This legislation should include both the authority to impose requirements for the repair or replacement of, or restitution for susceptible equipment and the

authority to impose immunity standards.—

2. Further, RABC recommends that preparation of regulations imposing requirements for the repair or replacement of, or equitable restitution for susceptible equipment whenever it malfunctions in the presence of signals from licensed radio transmitters commence so as to permit their implementation as soon as the enabling legislation is adopted.

3. RABC views as an immediate necessity and recommends the establishment by the Department of Communications of a "point of technical reference" office to provide assistance towards the equitable resolution of exceptional complaints prior to their getting out of hand. This office should also provide a liaison service between affected parties and the executive level of companies regarding critical immunity incidents involving their products.

4. RABC, in its advisory role, has

identified the urgent need for and is prepared to consider becoming involved in an educational program to coordinate industry and government efforts in the preparation and dissemination of information on the theory and practice of isolation of susceptible equipment from the electromagnetic environment in order to improve the ability of the service industry to effect such repairs.

5. Recognizing that uniform standards are a prerequisite to the voluntary adoption of immunity measures by the industry, RABC reaffirms its support for immunity standards—writing programs such as CSA's (Canadian Standards Association's) and recommends the continuation of these programs on a priority basis.

The recommendations have been forwarded to the Minister of Communications. Now we'll begin to press for some early action.

## PACKET RADIO PROBLEMS ON 14.1 MHz: IDEAS NEEDED

Many amateurs have contacted CRRL to ask about packet operation just above 14.1 MHz. Amateur Radio bands are not divided into CW and phone subbands, as is commonly thought. They are divided into FSK and phone subbands; you can operate CW anywhere. This means that US packet operation just above 14.1 MHz is legal because it is in the US FSK subband. Canadian packet operation just above 14.1 MHz is usually legal as well because those using packet radio there have obtained a special endorsement from DOC. (Those who have not done this can do so easily; the endorsement is given on request.)

At the IARU Region 2 General Assembly in Buenos Aires, Argentina, CRRL endorsed the Region 2 band plan, which recommended that packet radio operation take place on 14.07-14.099 MHz. Canadian packet users, however, say that packet radio and the conventional RTTY found on 14.07-14.099 MHz are not compatible and, in any event, they want to be able to communicate with US packet users operating just above 14.1 MHz. DOC is reluctant to force Canadian packet users to move to below 14.1 MHz, partly because they do not want to discourage a new technology, and partly because they expect to be moving away from regulations that limit certain modes to certain parts of the amateur bands.

So there will have to be a compromise, and it will have to come from within the amateur community. The most commonly heard suggestion is for packet radio users to voluntarily limit their operation to 14.1-14.11 MHz. What do you think? Contact your nearest member of

the CRRL Board, listed above, and let him know.

## CRRL NOTES

□ The CRRL Board of Directors will hold its 1987 Annual Meeting in Toronto on August 29.

□ 1986 was the first year in which CRRL, as a financial entity, was entirely independent of ARRL, keeping CRRL membership dues in Canada and simply purchasing QST from ARRL. As a result of careful management and a successful membership-development campaign, CRRL ended 1986 in a strong financial position. Members and others interested in the details may obtain a copy of CRRL's 1986 Audited Financial Statement by requesting it from CRRL Headquarters. A self-addressed, stamped envelope would be appreciated.

□ Even though CRRL's membership-development campaign ended last December, CRRL membership continues to increase. At press time, CRRL membership was just under 5600.

□ Rules for the CRRL "Worked All QST Award" have been modified. Working any combination of eight stations with a "QST" suffix will qualify you for this award. QSL cards are no longer required. A copy of log entries, certified by you and two other radio amateurs, will do the trick.

□ There's a new "QST" station on the air. Ben Keane, VO2CZ, of Labrador City has become trustee of VO2QST. Thanks, Ben!

□ *The Canadian Amateur Radio Regulations Book* by Mitch Powell, VE3OT, is now available. This workbook contains over 240 questions on regulations and operating practice which have appeared or are likely to appear on DOC exams, and their answers. Cost is \$10.75

postpaid from CRRL Headquarters.

## NOTES FROM ALL OVER

□ Jack Ravenscroft, VE3SR, has been advised that his appeal will not be heard until October. Meanwhile, there are indications that the plaintiffs in Jack's case have been seeking financial support from manufacturers of consumer electronic equipment.

□ Stewart Beal, VE3MWM, would like to get in touch with amateurs and others who are receiving high-resolution pictures from the GEOS and TIROS-N weather satellites operating on 1.7-1.71 GHz. There is a need to coordinate comments on a DOC Discussion Paper that will propose a second and possibly conflicting use for this band.

□ Montreal Amateur Radio Club reports that the City of Cote St-Luc, Quebec has passed a by-law which permits Amateur Radio towers to a height of 80 feet with a 5-foot setback to the perimeter of a beam antenna. Wire antennas can be erected with the ends run to a tree or other natural height including existing telephone or power poles, but no extra poles are permitted. No word yet on how this by-law fits in with the generally accepted notion that only the federal government can regulate Amateur Radio antennas.

□ 1987 is the 100th Anniversary of Muskoka, Ontario, and Dave LaRoche, VE3DFA, has decided to put it on the map. Work Dave any time during 1987 and you'll receive an attractive commemorative certificate.

□ Congratulations to VY1CW and VE1ASJ who, after three years of trying, made the first-ever Yukon-New Brunswick contact on 160 metres. GFT

## Susima and Srima from Sri Lanka

Meet Susima (KA3KJF) and Srima (KA3NEH) Abeyangunawardene from Sri Lanka. As the photograph clearly shows, these YLs are identical twins. Originally from Sri Lanka and now living in Maryland, the YLs were born in a small city in the south of Sri Lanka, then known as Ceylon. Their father was a doctor, and their mother, according to the existing traditions of Sri Lanka, was a full-time housewife whose duty was to provide a stable home environment for the husband and children. A sister, who married a doctor, now lives in Paxton, Massachusetts. It was she who, after their father's death in 1975, persuaded the twins to come to the States with their mother to live. "It was a decision we have never regretted even though we miss the rest of our family and friends still residing in Sri Lanka," says Susima.

Susima and Srima's educational experiences are impressive. As children, they attended a girls' school in Colombo, Ceylon was a British colony for 150 years, and, in the British tradition, all the "good" schools were not coeducational. They received Bachelor of Science degrees in Physics and Mathematics from the University of Ceylon in Colombo, and then returned to their high school to teach.

The twins first became interested in electronics when they studied high school physics. Unlike the Ceylon boys' schools, there was no radio club or any extracurricular activities vaguely considered to be boys' hobbies. Because of their interest in electronics, astronomy and photography, a friend (as well as a rival on the tennis court) introduced the YLs to a radio engineer employed by the Sri Lanka Broadcasting Corporation. The OM had long since given up trying to master code, but nonetheless had retained his fascination for Amateur Radio. "We are forever indebted to him for his unselfish encouragement and for the time he spent with us instructing us in the practical aspects of Amateur Radio," the YLs fondly recall.

Susima became active on 40 and 20 meters, working mainly on CW with a dipole for 40 meters and a three-element Yagi for 20 meters. Their original call signs were 4S7SU (Susima) and 4S7SI (Srima). Unfortunately, their work at the Ceylon Institute, studying for their PhD degrees and a routine round or two of tournament tennis did not permit them much time to work HF bands or participate in the many contests. "Our main interest at that time was to contact people in 'far away places' and just talk to them via Amateur Radio," remembers Srima.

One of the more interesting contacts Susima had while operating from 4S land was when she answered a CQ one night about 10 PM. It was from an amateur in Sweden who was planning a vacation in Sri Lanka with his family and had been trying to make a contact with a 4S station. After the contact, that same night Susima had an eyeball with



Lookalikes from Sri Lanka, Susima, KA3KJF (left) and Srima, KA3NEH, are anxiously waiting to be back on the HF bands.

the OM from Sweden when he arrived in Colombo. Susima continued to contact him with regular skeds once he returned to Sweden from his vacation in Sri Lanka. "Thanks to his generosity, we received lots of electronic goodies which were in scarce supply in Sri Lanka at the time," says Srima.

Many amateurs have experienced the special reward which comes from rendering valuable service in time of an emergency when normal communications break down. That friendship which Amateur Radio fosters is something Susima and Srima deeply cherish. "We became friends with an older American couple who were amateurs, when they were sailing around the world in their trimaran. When the couple reached Colombo, the lady was diagnosed as having a detached retina. While she was in the hospital, her husband took his rig, which had been damaged by sea water, to be repaired by 4S7LM. It was 4S7LM who introduced us to Ralph and his wife, Bertha, and we visited her in the hospital. The doctors had advised Bertha not to return to the boat as the natural movement even when anchored would retard her recuperation." The twins invited Bertha to stay with them. Bertha convalesced with the YLs for about six months until she could join Ralph. She told many stories, and the YLs became particularly interested in her details of life in the US. It was at that time that the YLs were contemplating a permanent move to the US.

That move has been a rewarding one for the Sri Lanka YLs. In early 1980s, both YLs became licensed and now hold Advanced class tickets. They currently are employed at Computer Sciences Corporation System Sciences Division as computer-programmer analysts, where they specialize in projects connected with NASA's space program. Both are members of the Goddard Amateur Radio Club in Maryland, where they participate in Field Day activities, swapfests and other activities organized by the club. Retransmission of the Shuttle-to-ground trans-

missions, before the *Challenger* tragedy, was one of the many activities the Goddard ARC organized, and the YLs operated the club station during these retransmissions.

Both Susima and Srima particularly enjoy working on emergency radio operation, such as the Mexico City earthquake. A friend requested the twins to investigate the welfare of a Sri Lanka embassy official reportedly visiting in Mexico during the disaster. "With the help of other club members who were already standing by with equipment, we were able to get information about the official." The able assistance that radio operators were able to give intrigued Susima and Srima. Although the twins had heard of and read about Amateur Radio's contribution to public assistance, it became more meaningful to them when they were able to actually be a part of an emergency operation.

As one might expect, these YLs are very much involved in their careers and many extracurricular activities. "Even though we own a home, the covenants which govern the installation of outside antennas of any type have unfortunately prevented us from being very active on HF," says Srima. But, these clever amateurs manage to be heard with what they call "limited success" on a Slinky dipole. They have recently made an application to the architectural committee for permission to erect a tower and beam in their backyard. "We are keeping our fingers crossed hoping that permission will be granted," they say with anticipation. Susima has hinted that she would like to participate in contests and complete WAS and WAC.

Although Susima and Srima are this country's gain, when they emigrated from their native land, Sri Lanka lost two-thirds of its licensed YL population. Until a few years ago, there was only one YL with a 4S7 call. 4S7YL recently became a Silent Key, and DXCC/YL hunters will have to wait until a YL goes there as a guest operator.

The twins admit that their radio activities have been sadly limited because of less-than-ideal antennas, but hopefully they will soon have permission to erect a beam for the higher bands. "One amateur told us that, when we changed our calls from 4S7 to KA3, we lost at least 10 dB, but we don't mind. Amateur Radio is exciting no matter where or who you are."

### YLISB TO MEET IN DES MOINES, IOWA JUNE 21-JUNE 28

WA0AVW and XYL Marilyn will welcome all YLISB members as well as nonmembers to the annual convention in Des Moines in June. The week's activities will include tours of the city and nearby agricultural areas, crafts and gifts from the boutique supervised by Marilyn, a visit to the "Living History Farm," a banquet on Saturday featuring entertainment and awards, and a farewell breakfast on Sunday. For additional information, contact Rex White, WA0AVW, 3023 Fairman Ave, Rhodes, IA 50234.



**President:** Richard L. Baldwin, W1RU  
**Vice President:** Carl L. Smith, W0BWJ  
**Secretary:** David Sumner, K1ZZ  
**Assistant to the Secretary:** Naoki Akiyama,  
 N1CIX/JH1VRQ

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 Tokyo 170-91  
 Japan

The International Amateur Radio Union—since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

## HFBC-2 and Another WARC

Evaluating the results of HFBC-2 (Geneva, Feb 2-Mar 8) requires the same perspective as describing a glass partly full of your favorite beverage: Is it half full or half empty? Was HFBC-2, like HFBC-1, a partial success or a partial failure? It was either or both, depending upon the point of view of the evaluator.

The high-frequency broadcasting conferences were scheduled to complete a portion of the work of WARC-79 that was left unresolved. From the broadcasters' point of view they did not get everything they desired, even though there was some area of compromise resulting in agreement on possible ways to resolve the signal-to-noise and signal-to-interference problems that plague them. The unresolved items are being referred to the Plenipotentiary Conference in 1989 with a request to hold a "competent WARC" in 1992.

HFBC-2 had no authority to review or plan any additional frequency acquisition over that already granted in WARC-79. At the opening plenary session, International Telecommunication Union Secretary-General Richard Butler reminded the conference that their discussions must be confined to the bands allotted exclusively to the broadcasting service. This limited the discussions to those bands currently occupied and the expansion bands already provided by WARC-79. The greater amount of discussion was directed to the 6, 7, 9, 11, 13, 15, 17, 21 and 26-MHz segments. At least two of these, 7 and 21 MHz, should catch the attention of all amateurs.

The Republic of Paraguay filed a document that included emphasis that the use of the 7.0-7.1 MHz band by broadcasters was prohibited. Resolution 641, as enacted by WARC-79, stated that "the band 7,000 to 7,100 kHz is allocated on a worldwide basis exclusively to the amateur service." The proposal by Paraguay was designed to give effect to Resolution 641 by including a date of 1 January 1990, after which broadcasting services must cease use of this band.

When this was brought up in committee for discussion, thanks to some effective "groundwork" on the part of the IARU observer team and strong support by many of the delegates (several of whom are active amateurs), the resolution was amended to include the following statements: "... resolves that the broadcasting service shall be prohibited in the band 7,000-7,100 kHz and that the broadcasting stations operating on frequencies in this band shall cease such operation" and "... urges the administrations responsible for the broadcasting stations operating on fre-

quencies in the band 7,000-7,100 kHz to take necessary steps to ensure that such operation shall cease immediately." The Secretary-General was instructed to bring this resolution to the attention of administrations.

When this amendment to Resolution 641 was brought before the plenary sessions, a mild attempt to dilute the stronger language was defeated effectively by strong statements

from Norway, Switzerland, Paraguay, Papua New Guinea and others in support of the proposed revision. The resolution was amended and accepted by consensus (no vote was taken), with Pakistan and China taking a reservation, as was their position in 1979. With the passage of this language, the protection of 7.0-7.1 MHz as exclusively amateur was strengthened to the maximum possible extent.

Like HFBC-1, HFBC-2 was a confrontation of individual country interests, sometimes typified by differences in size or supported by common philosophical interests (also known as international politics) that resulted in delay and confusion. As the conference entered its final week, an effort to realize some degree of accomplishment resulted in the formation of a special ad hoc committee to formulate and propose a possible compromise solution. This, too, was not totally successful, as there were numerous major points of disagreement, such as the distinction between national and international broadcasting requirements, implementation of controls to reduce interference, introduction of SSB as a replacement for AM, and the regulation of power, frequency occupancy and hours of operation. These were referred to the requested competent WARC.

For the present, amateur frequencies have neither shrunk nor expanded. However, the Conference recommended that the ITU Administrative Council take the necessary steps to request the Plenipotentiary Conference (Nice, 1989) to consider whether or not to hold a WARC, the agenda of which should include the possibility of extending the HF frequency spectrum allocated exclusively to the broadcasting service. This is enough warning that the Amateur Service must renew its efforts that proved so successful in 1979.—W0BWJ



Among those attending an IARU reception in honor of the delegates at HFBC-2 were (l-r) IARU Region 3 Secretary JM1UXU and JARL President JA1AN, both of the Japanese delegation, and ITU Secretary-General Butler. (photo courtesy JA1AN)



Four of the five members of the IARU observer team at HFBC-2 (l-r): Vice President W0BWJ, Region 1 Secretary G3FKM, Region 1 Vice Chairman SP5FM, and Region 1 Director H1RYS. Not shown is Region 1 Director YT7MM. (photo by Terri Smith)

### 50TH ANNIVERSARY OF THE LUXEMBOURG SOCIETY

On March 7, Réseau Luxembourgeois des Amateurs d'Ondes Courtes celebrated its 50th anniversary with a special banquet at which presidents and representatives of many Region 1 societies expressed congratulations. 1987 is also the 50th anniversary of RL as a member of IARU. In recognition of this milestone, IARU Vice President W0BWJ presented the President of RL with a commemorative plaque. [IARU]



## Prospective Hams Need Answers; Your Club Can Help

The word "novice" can be intimidating. No one likes to be referred to as a beginner. Remember the first day of classes at a new school? Not only were you a stranger, but you didn't know what to expect from the class. It was the double whammy—you had to make friends and you had to make As.

The Club Services Department at League HQ wants to ease this transitional period from prospective ham to licensed operator. You can help. Think of your club as sort of a ham radio welcome wagon. You have the opportunity to make the initial contact with prospective hams that either write to or call League HQ and request information about Amateur Radio and radio clubs in their area. All you need to do is send us ZIP code areas for your club and request the prospective ham list. If we have prospective hams for your ZIP code areas, we'll immediately send you a computer printout containing the prospective hams' addresses.

The Club Services Department currently sends a prospective ham packet to everyone who calls or writes to us requesting information on Amateur Radio. The packet contains: (1) a cover letter explaining what's in the packet, (2) a Novice Enhancement sheet that explains the new operating privileges for Novice and Technician class operators, (3) a complete ARRL publications list, (4) a slow-speed Morse code practice schedule for W1AW, (5) *Amateur Radio, A National Resource* brochure, (6) an invitation to join the ARRL and (7) a computer printout of Special Service Clubs, Affiliated Clubs, ARRL-registered instructors and active Volunteer Examiner teams in their geographical area.

Some prospective hams tell us that when they call a club contact person either no one answers or, if someone does answer, enthusiasm is lacking. Prospective hams also write to League HQ and comment that they've written to several ARRL-affiliated clubs in their area, but have never received a response. They gain the perception that newcomers are not wanted.

You can change that with a simple phone call or a written invitation to prospective hams to attend one of your club's meetings. An attractive club brochure or flyer listing your club's contact person, the club's meeting place, time and date of the meetings and any Novice class offered would place a written reminder into the prospect's hands. It's also a good way to advertise your club's various activities!

From mid-December 1986 to mid-February 1987, League HQ received 1006 telephone and written requests for information about Amateur Radio. The Club Services Department mailed out a prospec-

tive ham packet to all 1006 people who requested information. But, an envelope full of printed matter is not enough. You can make the difference by adding a personal touch. Why wait? We hope to put a list of prospective hams in your club's mailbox soon. Write for that list today!

### STUDY HAM RADIO ON THE AIR

*The following is courtesy of Paul Nemenz, N8HEX.*

Lou Rugo, W8BOO, instructs the Advanced theory class on 15 meters (21.400 MHz) Monday nights for Twenty Over Nine ARC club members. Any other interested hams in the Youngstown, Ohio area are welcome to check in.



Lou Rugo, W8BOO, instructing his on-the-air class

Lou was first licensed in 1955 and is a past president of the Twenty Over Nine Club. He has taught the Tech/General and Advanced theory classes for six years. The Advanced theory class has been taught on the air since October 1986. On-the-air classes consist of explanations for each question contained in the *ARRL License Manual*. Any other questions or comments are answered before continuing on in the *License Manual*. It's one way to hold a class and let folks stay home at the same time!


### JAKE MCHENDRIX NAMED HAM OF THE YEAR

*Many clubs have various ways of recognizing members who make an outstanding contribution to the hobby. Here is an example of what one club did.* The Northern Kentucky ARC has a Ham

of the Year award for people who contribute to Amateur Radio in a special way. Jake McHendrix, WD4PBF, was recognized in 1986. Joe Dunnett, WA4WNF, the 1985 award winner, presented Jake with a plaque that has both Joe's and Jake's name inscribed on it. Jake was first licensed in 1979 and has been active in all phases of the hobby. He's an avid DXer, and frequently takes part in the Kentucky Traffic Net and the Amateur Radio Emergency Service. Jake is an Emergency Coordinator for Boone County and is currently serving as Disaster Chairperson for the Northern Kentucky ARC.

### CALLING ALL CLUBS

Sometimes it's easy to write an article about club activities while forgetting the great amount of effort and personal sacrifice that went into making that activity a success. Club Spectrum is your column. Help us to learn more about the people behind the scenes—the people in your club that make the whole thing work. We'd like to share stories of these go-getters with other readers of this column. Let's chew the rag a bit and learn about each other.

We have a great hobby with lots of interesting people from different backgrounds to keep us intrigued and curious on and off the air. Send a story about a leader in your club to ARRL, Club Services Dept, 225 Main St, Newington, CT 06111. 

### Welcome, SSCs!

Clubs are granted SSC status after demonstrating effective programs in six areas: (1) Public Relations, (2) Emergency Communications, (3) Training, (4) Technical Advancement, (5) Operating Activities and (6) ARRL Membership Recruitment. The number in parentheses is the number of club members. Welcome aboard!

Northwest ARS, Houston, TX (117)

The following renewing Special Service Clubs have reaffirmed their commitment:

Brazos Valley ARC, Inc, Houston, TX (77)

Coconino County ARC, Flagstaff, AZ (27)

Dallas ARC, Dallas, TX (356)

Fox River Radio League, Aurora, IL (188)

Green Fox ARC, Ripon, WI (22)

Radio Club of Tacoma, Puyallup, WA (379)

Richmond ARC, Richmond, VA (125)

It is with deep regret that we record the passing of these amateurs:


KA1CCM, John M. Keane, East Weymouth, MA  
 WA1DFW, John S. Dusza, Westfield, MA  
 K1DSV, Harry G. Miller, Lexington, MA  
 W1EDE, Robert S. White, East Greenwich, RI  
 K1IELX, Brian E. Greenwood, Groveland, MA  
 W1FVG, Henry G. Knobel, Jr., New Canaan, CT  
 K1JPW, Charles F. Kirby, Tyngsboro, MA  
 W1MNI, C. Gerald Scovill, Moody, ME  
 W1PMC, Benson C. Chase, Nantucket, MA  
 K2CD, Norman C. Bauman, Kenmore, NY  
 K2CIU, Lewis E. Howard, Mattapoisett, MA  
 K2DAP, Paul Isenberg, Jr., Moorestown, NJ  
 WA2FVQ, James Gibbons, Colonia, NJ  
 WA2GJK, Arthur B. Canfield, Rome, NY  
 WA2JWM, Fred E. Dexter, Sarasota, FL  
 W2KFP, Martin J. Toohey, Albany, NY  
 W2KHO, Mancer H. Gleason, Homosassa, FL  
 W2KL, Carl Young, Staten Island, NY  
 W2MQS, Charles S. Howard, Tuckerton, NJ  
 K2TLI, Hugo A. Gorenflo, Sr., Oakhurst, NJ  
 N3CH, Michael C. Cumiskey, Ingram, PA  
 WA3CRR, Charles L. Fields, Altoona, PA  
 W3DTZ, William J. Greer, Glenshaw, PA  
 W3EU, Ervin L. Maneval, Wapwallopen, PA  
 W3UED, Ben A. Chuchla, North Versailles, PA  
 W3UIY, Harry B. Baker, Johnstown, PA  
 \*K3VDY, Llewellyn P. Thomas, Upper Marlboro, MD  
 W3WK, William Y. Keane, Joppa, MD  
 WB4ADQ, Sanford G. McCosh, East Point, GA  
 W4BND, William H. Horton, Chattanooga, TN  
 K4DDM, Leonard H. Gilberg, Albany, GA  
 W4HEH, R. Lynn Smith, Southport, NC  
 N4JSK, Corwin Q. Wadsworth, Birmingham, AL  
 N4JTY, William Frank Hale, Fairhope, AL  
 K4JYT, Robert C. Ridle, Hayes, VA  
 KD4KK, Laurence E. Leonard, Mount Dora, FL  
 K4LWW, Nathan E. Gaither, Halifax, NC  
 W4MOK, Joseph W. Janoski, Dawsonville, GA  
 WD4MTF, Lionel Victorine, Franklin, NC  
 W4OSS, Charles W. Golden, Spring Hill, FL  
 W4PTA, George W. Vick, Mobile, AL  
 W4PTA, Howard E. Cope, Independence, VA  
 K4SKX, Earle S. Younce, Mobile, AL  
 NY4S, Richard Weeks, Sr., Macon, GA  
 WB4YRH, Ernest M. Phillips, Clarksville, TN

KD5AO, Chester F. Dean, Albuquerque, NM  
 W5BDL, Harvey L. Haysler, Blue Eye, MO  
 W5CCA, Loyd B. Mathis, Oklahoma City, OK  
 W5COB, Charles A. Francis, Pearland, TX  
 W5EDX, H. Frank Jordan, San Antonio, TX  
 W5EYV, Ariel A. Cooper, Refugio, TX  
 W5HJC, Lonnie L. Powell, Jr., Houston, TX  
 WA5MXA, Roger B. Barnes, Bryan, TX  
 W5QO, Frederick J. Mehrtens, Bryan, TX  
 W5ZIS, Lloyd Weathers, Victoria, TX  
 WD6DAQ, Vernon E. Clark, South Gate, CA  
 W6EKQ, Louis E. Edises, Agoura, CA  
 K6RPH, Larry Webster, Madera, CA  
 K6UUL, Harry C. Gorman, Tulare, CA  
 W6VIZ, William G. Baker, Sonoma, CA  
 W6WZB, Jasper I. Wilson, Ventura, CA  
 K7CEM, Edwin M. Brown, Salem, OR  
 N7CZX, Harold A. Rhodes, Olympia, WA  
 N7HKX, Luis R. Montes, Tacoma, WA  
 W7HOF, Harm Cramer, Brewster, WA  
 KB7MI, LeRoy O. Hogberg, Las Vegas, NV  
 KA7OHD, Philip J. Chase, Scottsdale, AZ  
 W77YB, Richard A. Cadonau, Ocean Park, WA  
 K8GQM, Wendell B. Slinger, Milford, OH  
 W8OQL, James E. Wayne Buxton, Kenton, OH  
 K8RTT, Joseph D. Stinson, Lakewood, OH  
 E8ZRE, John J. Mahoney, Chesaning, MI  
 K9CWA, William K. Long, Anderson, IN  
 W9DCY, Edward J. Mick, Cottage Hill, IL  
 WA9HLW, Margaret L. Bailey, Greenwood, IN  
 W9HXE, Karl O. Pearson, Villa Park, IL  
 W9LZ, Harold C. McGee, Indianapolis, IN  
 KA9PSA, Janet P. Underwood, Fillmore, IN  
 W9RL, LeRoy Dailey, Shelbyville, IL  
 WA9SBK, William B. Sigmund, Columbus, IN  
 W9YJX, Hugh J. Life, Winchester, IN  
 W9YCF, Orris A. Wise, Auburn, IN  
 W9YYW, Walter J. Glish, Wauwatosa, WI  
 W0GLA, Frank N. Mayer, Rapid City, SD  
 WA0JIL, Donald W. Todd, Guthrie Ctr, IA  
 WA0PHW, Charles W. Ruhlemann, Sioux City, IA  
 W0QGI, Lloyd D. Harvey, Knoxville, IA  
 K0SGE, Robert L. Bobst, Earlham, IA  
 \*W0BUKF, Earl F. Campbell, El Dorado Springs, MO  
 W0VVM, William R. Stocking, Manchester, MO

VE1AOY, Medard Arsenault, Pokemouche, NB  
 VE1R1, Floyd A. Lewis, Yarmouth, NS  
 VE3BG, A. Fred Hale, Bracebridge, ON  
 VE3BME, James E. Richards, Chatham, ON  
 VE3DBH, Philip R. Hutton, North Bay, ON  
 VE3FQQ, G. Ken Reid, Barrie, ON  
 VE3JJI, Richard A. Hedges, Scarborough, ON  
 VE3HWI, Tom Dymond, Toronto, ON  
 VE3ITB, Cyril Chivers, Simcoe, ON  
 VE3MS, John Herring, Mississauga, ON  
 VE3WB, William Benson, Ottawa, ON  
 VE4AME, Douglas M. Street, Portage la Prairie, MB  
 VE4AMI, Cliff P. Hansen, Minitonas, MB  
 VE5WW, George E. Ferguson, Regina, SK  
 VE7AED, Ernest Doe, Salmon Arm, BC  
 VE7CB, Alf G. Sheffield, Sidney, BC  
 VE7CB, Ralph Hoskins, Sidney, BC  
 VE7DG, Dan Gentry, Burnaby, ON  
 VE7DNG, Ross G. Stephen, Creston, BC  
 VE7EHF, Arthur F. Docking, Kelowna, BC  
 VE7LJ, Les Jones, Victoria, BC  
 DL7BA, Gunther Kuhne, Elchingen, Fed Rep Germany  
 G5RP, E. Wake, Oxon, Great Britain  
 SM4ENK, Gustav Lindsten, Falun, Sweden  
 ZL3AP, H. Chas Tomlinson, North Canterbury, New Zealand

\*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ.

**Note:** All Silent Key reports sent to HQ must include the name, address and call sign of the reporter as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in QST. 

## 50 Years Ago

June 1937

- How honest are our signal reports? The Editor decries giving a T8 to a T2 signal from rare DX when the purpose is to be sure of receiving a QSL.
- The Bureau of Standards adds some new services from WWV so the list will include the standard musical pitch, one-second time ticks, and ionospheric propagation data.
- Jim Lamb's full-range superhet selectivity system employs electro-mechanical i.f. circuits for continuously variable band-width from below 100 cycles to over 10 kc.
- W9DNP carefully inspected every one of the hundreds of pieces of lath which went into his 100-foot wooden tower, guyed only at the center, and proved its strength by climbing to the top.
- Noteworthy actions of the May Board of Directors' meeting: requesting F.C.C. to move the 10-meter voice section to 28.5-30 Mc.; the green light for building a W1AW deluxe station in memoriam to Hiram Percy Maxim; authorizing a national convention in Chicago, the first national in some years.
- The Board also approved Communications Manager Handy's proposal for strengthening amateur capability in disaster communications, highlighted by appointment of local emergency coordinators and 25-kc. calling segments in each major band.
- Get ready for another Field Day! Up to 20 watts input merits a multiplier of 3; 20 to 60 watts, 2; anything above 60 watts, multiplier of one. And don't forget to notify your district F.C.C. inspector, as required by the regulations for portable operation.
- Two descriptions of portable rigs show indeed that summer is upon us. W3ECP improves on a unit

featured in a 1935 QST, primarily adding crystal control for stability. W4CVQ's battery-operated station, though with only a 6F6 output tube, saw successful use in the recent flood emergency.

- But some of us persist in socking a tube with far more input than called for in the specs, so Ed Hughes of RCA outlines design principles and even tells us how far above the ratings we can safely go in certain circumstances.
- W3AWH gives us some practical receiver hints and kinks for building our own, such as combining an autodyne circuit and a pre-selector, and a system of regeneration in the mixer stage.
- W3DQ goes 10-meter mobiling in style—an HRO with vibrator supply, and a commercial (Harvey UHX-10) transmitter with dynamotor power.
- D4BIU finds that a Colpitts circuit performs much better than the Hartley arrangement in an electron-coupled oscillator and permits safe use of relatively high power.


## 25 Years Ago

June 1962

- Herbert Hoover, jr., W6ZH, was elected president of the League at the May Board meeting. A prominent national figure, e.g., former Under Secretary of State, "Herb" Hoover has been an active ham for nearly 50 years. Retiring president W0TSN found his legal practice too demanding of time to continue, but was named president emeritus.
- Another ham satellite flight is imminent, and Project Oscar has lined up coordinators in major countries to facilitate reporting.
- But the Echo balloon is attracting attention as well, and K2QBW continues his recommendations

on how to bounce ham signals off it. He believes sporadic enhancements of the reflected signal offer the best chances.

- W0VVM has been chasing satellite signals since Sputnik, and shares his many ingenious ideas for antennas and tracking devices. The earth-oriented user of beams can profit from the information as well.
- Building a receiver for immunity to cross-modulation requires compromising other features. W0DAN discusses noise figure characteristics of tube and transistor front ends.
- Early response to the Building Fund drive is flooding the Hq. mail room with yellow pledge forms, off to a good start towards the \$250,000 goal. Architect's plans and specs are now in the hands of several contractors for bids.
- FCC has agreed with the League's proposal to restore the full kilowatt limit on 420 Mc., except for very small areas of the country near certain government installations.
- Used radioteletype machines are becoming more and more available, prompting increased amateur interest in the RTTY mode. W0AGD assists the newcomer with answers to most of the basic questions on how to get started, and includes a simple f.s.k. adapter.

- Field Day multipliers for the 1962 event are 3 for power less than 30 watts; 2 if between 30 and 150 watts, and 1 above the latter figure.
- Aimed at the Novice looking forward to his General ticket, W1ICP describes a 150-watt rig as a Novice "gallon" and still useful when the higher grade license permits operation on additional band segments.
- W1HDQ makes use of trim-mount screws to install a "no-holes" mobile turnstile antenna for v.h.f.
- The "every member get a member" campaign started off in high gear, quickly exhausting the initial supply of "booster" pins for recruiters.—W1RW 

**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.

**California (Vandenberg AFB)—Jun 21:** The Satellite ARC will hold its annual Father's Day Swap-Fest on Father's Day. Features include a Santa Maria-style barbecue and swapmeet for ham gear. The location is Union Oil Company Newlove Picnic Ground, south of Santa Maria on US 101. General admission at 9 AM, barbecue at 1 PM. Admission is free. Swap tables available. Talk-in on 144.54/145.14, 146.52 or 146.55. For barbecue tickets and general information, write to Santa Maria Swap Fest, PO 5117, Vandenberg AFB, CA 93437.

**Idaho (Coeur d'Alene)—Jun 13:** The Kootenai ARS is sponsoring their Hamfest at the Coeur d'Alene Airport. Admission is free. Doors open at 7 AM-4 PM. Talk-in on 146.38/98 and 146.52. Food and tables available. No reservations are needed. For more info, contact Neil Chamberlain, tel 208-765-3144.

**Illinois (Granite City)—Jun 14:** The Egyptian Radio Club is sponsoring their EGYPTIANFEST at the Egyptian Radio Club's Clubhouse and grounds. Tickets are \$1 in advance, \$2 each or 3 for \$5 at the door. Flea-market space 10 ft. \$2 on a first-come basis. VE testing from 10 AM-2 PM, walk-ins accepted. Free parking. Talk-in on 146.16/76 and 52. For advanced tickets, write to Egyptian Radio Club, PO Box 562, Granite City, IL 62040.

**Illinois (Princeton)—Jun 7:** The Starved Rock Radio Club will hold its Annual Hamfest at the Bureau County Fairgrounds. Talk-in on 147.12/72 146.07/67 and 146.52. Admission is \$4 at the gate. Free camping. For more information, contact Ken Stasiak, WB9ZFO, PO Box 134, Lostant, IL 61334, tel 815-368-3284.

**Illinois (Willow Springs)—Jun 14:** The Six Meter Club of Chicago is sponsoring their 30th Annual Hamfest. Admission is \$3 in advance, \$4 at the door. Doors open from 6 AM-3 PM. Talk-in on 146.52 or 146.37/97. Features include flea market, ARRL and dealers, refreshments. For more info, contact John Trepina, K9QYT, 5015 West 31st Pl, Cicero, IL 60650.

**Indiana (Crown Point)—Jun 21:** The Lake County ARC will hold its 15th Father's Day Hamfest at the Lake County Fairgrounds. All tickets are \$3. Talk-in on club repeater 147.60/00 and on 146.52. Gate opens at 8 AM local time. Contact Ken Brown, WD9HYF, 918 Chippewa Dr, Crown Point, IN 46307.

**Indiana (Terre Haute)—Jun 14:** Wabash Valley Amateur Radio Assn is sponsoring their 41st annual hamfest at the Vigo County Fairgrounds located on US 41, 1/2 mile south of I-70. Saturday overnight camping (\$5 fee); Sunday free, outdoor flea market. Covered flea market. \$3 for 12 x 12 space. Some ac and tables available on first-come basis. Food and refreshments. Advance tickets \$2 or 3 for \$5, or \$3 at gate; under 12 free. Free parking. Talk-in on 147.69/09 and 146.52. FCC exams at Red Cross Bldg, no walk-ins. Preregistration absolute must. For tickets and information, SASE to WVARA Hamfest, PO Box 81, Terre Haute, IN 47808.

**Kansas (Pittsburg)—Jun 6:** The Pittsburg Repeater Organization, Inc. will hold their 1987 hamfest in the Lincoln Park Pavilion from 10 AM to 5 PM. Examinations 8 to 10 AM. Free covered-dish dinner at 1 PM. Talk-in on 146.34/94. For further information, contact Ken Johnston, KC0VZ, PO Box 1303, Pittsburg, KS 66762.

†ARRL Hamfest

**Louisiana (New Orleans)—Jun 20-21:** The Jefferson ARC will hold their annual hamfest at the Rummel Catholic High School, 6 blocks southwest of Interstate 10 and Causeway intersection. Free admission. New equipment dealers, swap tables, forums, ladies' activities and food. License exams 10 AM Sunday. Walk-ins permitted. Phone inquiries to Bill, WA5MJM at 504-887-5022. Correspondence to AMACOM-87, PO Box 73665, Metairie, LA 70033.

**Maryland (Frederick)—Jun 21:** The Frederick ARC will hold its 10th Annual Hamfest at the Frederick Fairgrounds. Hours are 8 AM-4 PM. Admission is \$3, tailgaters are \$2 extra. YLs and children free. Gates open for exhibitors at 8 PM on June 20. Overnight security and parking provided. First exhibitor table is \$10, each additional table is only \$5. For more info, write to Clyde C. Wachter, Jr, WB3KQV, 7317 Ridge Rd, Frederick, MD 21701.

**Michigan (Grand Rapids)—Jun 6:** The Independent Repeater Assn is sponsoring its annual hamfest at the National Guard Armory, 44th St, 1/2 mile west of US 131. Talk-in on 147.765/165. Doors open at 8 AM-4 PM. Dealer setup starts at 6 AM. Free tables for dealers and sellers. Early breakfast at nearby Dennys. Hamfest rates at nearby Super 8 Motel, tel 800-843-1991. For table reservations, write or call the Independent Repeater Assn, 562 92nd St SE, Byron Center, MI 49315, tel 616-455-3915.

**Michigan (Monroe)—Jun 14:** The Monroe County Radio Communication Assn is sponsoring their Hamfest at the Monroe County Community College Administration Building on Raisinville Rd. Hours are from 8 AM-3 PM. Advanced sale tickets \$2.50, \$3 at the gate. Trunk sales \$2 per space. Table space 50 cents per foot. Talk-in on 12/72. For tickets or space reservations, contact Elaine Wessel, KA8RNK, PO Box 237, Monroe, MI 48161, tel 313-279-1571.

**Nebraska (Chadron)—Jun 7:** The Pine Ridge ARC is sponsoring their annual hamfest at Camp Norwesca, next to Chadron State Park, beginning at 9 AM. Potluck dinner at noon. Saturday night picnic will be at Red Cloud Campground, south of Chadron State Park, at 6 PM with food furnished (free-will offering). Talk-in on 04/64. For further information: Pine Ridge ARC, PO Box 1116, Chadron, NE 69337.

**New Hampshire (Manchester)—Jun 20:** The New Hampshire FM Assn is sponsoring their Radio/Electronic Flea Market from 9 AM until closing. Admission is \$1 per person, \$5 for sellers. Activities include exams, walk-ins accepted. Talk-in on 142.52. For more info, contact Steve Morin, WB1BXB, tel 603-663-4019, or Dick Desrosiers, W1KGG, 173 Maplehurst Ave, Manchester, NH 03103, tel 603-668-6868.

**New Jersey (Dunellen)—Jun 20:** The Raritan Valley Radio Club is sponsoring their hamfest at Columbia Park. Gates will open 8 AM. Seller spots \$5 for one space, \$10 for multiple space; no tables supplied. Admission \$3, spouse and children free. Food and drink available. Talk-in on 146.025/625 and 146.52. Advance tickets may be purchased from any club member. For further information, contact Dave, KA2TSM at 201-763-4849 or Bill, KD2XK at 201-467-7342 (8 AM-5 PM).

**New Jersey (Park Ridge)—Jun 13:** The Gilfer SWL Fest/Flea Market will be held rain or shine from 9 AM-3 PM. Shortwave only. Free admission for all visitors. Sellers \$3 (tailgate only, bring own table). Reservation deadline June 1. Location: Gilfer Shortwave, 52 Park Ave, Park Ridge, NJ 07656. For further information, please call 201-391-7887.

**New York (Cortland)—Jun 20:** The Skyline ARC is sponsoring their 5th Annual Cortland Hamfest from 8 AM-5 PM. Location is Interstate 81, exit 12, midway between Syracuse and Binghamton. Admission is \$3. Talk-in on 147.825/225 and 147.630/030. Food and parking available. Rain or shine. For more info, contact Skyline ARC, PO Box 5241, Cortland, NY 13045, tel 607-749-3766 days or 607-844-4815 evenings.

## Coming Conventions

June 5-7

Texas State, Arlington

June 13-14

Georgia State, Albany

July 25-26

West Virginia State, Jackson's Mill

August 1-2

Northern Florida Section, Jacksonville

August 7-9

West Gulf Division, Austin, TX

August 22-23

Northwestern Division, Tacoma, WA

August 29-30

Great Lakes Division, Saginaw, MI

ARRL NATIONAL CONVENTIONS

July 10-12, 1987—Atlanta, Georgia

Sept 9-11, 1988—Portland, Oregon

## GEORGIA STATE CONVENTION

June 13-14, Albany

The Albany ARC will sponsor their convention at the Heritage House Motor Inn and Convention Center (Best Western Motel). Free admission. Tables are \$5 each. Doors open 10 AM-4 PM Saturday and 8 AM-2 PM Sunday. Talk-in on 146.82, 444.5 and 29.68. Features include ARRL VEC Exams, General Forums, AMSAT, Packet Radio, Digital Communication, and much more. For more info, contact John Crosby, K4XA, c/o Albany ARC, PO Box 1205, Albany, GA 31702, tel 912-883-7910. (957)

**New York (Queens)—Jun 14:** The Hall of Science ARC is sponsoring their Hamfest from 9 AM-3 PM at the Hall of Science parking lot at Flushing Meadow Park, 47-01 111 St. Admission is \$4 for buyers, \$6 per space for sellers. Talk-in on 144.300, 223.600 or 445.225. Food, free parking. For more info, contact Stephen Greenbaum, WB2KDG, 718-898-5599, or Arnie Schiffman, WB2YXB, 718-343-0172.

**North Dakota (Minot) Jul 10-12:** The International Hamfest Committee is sponsoring their hamfest at the International Peace Gardens on US/Canadian Border. Admission is \$12. Doors open 6 PM July 10th-1 PM July 12. Talk-in on 146.25/85 or 146.52. Special features include Packet Forum, ARRL Forum, Camping, and much more. For info and reservations, William Feist, WB8BZH, c/o Book Trader, Dakota Square Mall, Minot, ND 58701, tel 701-838-1694, 701-839-5328.

**Ontario (Burlington)—Jul 11:** The Burlington ARC is sponsoring their 13th Annual Ontario Hamfest from 8 AM-5 PM. Admission is \$3.50 in advance, \$5 at the door. Refreshments, Packet Events and Flea Market. Talk-in on 146.21/81 and 146.52. For more info, contact Ontario Hamfest, PO Box 836, Burlington, ON L7R 3X7, Canada.

**Oregon (Beaverton)—Jul 25-26:** The Willamette Valley DX Club is sponsoring their Annual Northwest DX event at the Greenwood Inn. Activities include DX programs, hospitality and much more. For registration and information, contact the



## Fun, Games and (Hopefully) Education on OSCARs, Part 4

Last month, I introduced the idea of hidden-transmitter location using OSCARs and the SARTAT/COSPAS series of international satellites. This month, I'll continue with the theme of locating a hidden transmitter using a satellite. As before, this discussion is within the context of Techno-Sport, an AMSAT concept for learning interesting and useful tools and methods in radio and space technology while having fun in the process.

Measuring the Doppler shift of an emitter (such as Fuji-OSCAR 12) or a reflecting object (such as your automobile when illuminated by the local constable's radar) is a convenient and easy means of detecting relative motion. The problem is that when the relative motion is low (in terms of wavelength and velocity), Doppler shift is low, too. Thus, with police radars, there is a lower limit to the relative velocity that can be measured. Similarly, if the frequency of a satellite source is low enough or its relative motion is sufficiently low, the Doppler shift may be too low to measure with any useful degree of accuracy.

For example, when AMSAT-OSCAR 10 was first launched, one of the first orders of business was to locate it precisely. This was not as easy as it may seem, because, even though the Air Force's SPACETRACK system can and does track thousands of objects the size of AO-10 at geosynchronous altitudes,<sup>1</sup> the most sensitive tracking systems are reserved for important defense missions. The more common, lower-priority tracking systems are hard-pressed to track an object the size of AO-10 several tens of thousands of miles distant. So, AMSAT engineers devised their own means of tracking AO-10 that did not rely on radar, per se. Because AO-10 moves relatively slowly (especially at apogee, the highest point in its orbit), the Doppler shift method is not suitable. Instead, AMSAT engineers measured the round-trip transit time for pulses originated on the ground.

This system is simple in concept and, except for the sophisticated number-crunching techniques applied to the resultant data, simple in practice. A pulse is sent to AO-10 on its 70-cm uplink. Simultaneously, a clock is started. The AO-10 Mode B transponder receives the pulse and regenerates it on the 2-meter downlink. The returned pulse is received by the originating station and the clock is stopped. Because the transponder delay time is known (from prior measurements made on the ground), and the propagation velocity of the radio wave is known, it is easy to convert the measured round-trip transit time into a range (distance) from the earth station to the satellite at that instant. The result of this measurement does not determine the position of the satellite, merely a range. To be slightly more precise, the satellite has been determined to lie on the surface of a sphere, the radius of which is the measured range.

To isolate the satellite's position to a relatively small domain on the surface of the sphere requires more measurements. One approach is to make additional measurements from other locations. Thus, a series of incongruent spherical surfaces is determined. Ideally, they all will intersect at a point—the location of the satellite

at that instant. A real-time computer analysis could, in theory, provide real-time tracking this way. In practice, however, the measurements are fed into a computer program and the orbital characteristics themselves are determined.<sup>2</sup> Given this, the position of the satellite can be predicted at any time in the future, because the motion is fully understood in time and space.

The uncertainties in measuring range to the satellite and reducing range to location are many and varied. Moreover, because of irregularities in the data and miscellaneous uncertainties, what normally results is a series of onion-skin-like probability densities. The outer shell represents high probability that the satellite is contained within the volume of that shell. That is, the more precisely one says he knows the location, the more likely he is to be wrong. Conversely, it's easy to say the satellite lies within a 1000-mile sphere, but quite difficult to say it's within a 10-mile sphere. As more data is added and the measurements are refined, the volume of space representing an arbitrary uncertainty value decreases. If the process of data collection and analysis were to continue indefinitely, the onion would shrink to a point of 100% certainty.

Using these and similar methods, AMSAT engineers were able to locate AO-10 to within a few cubic miles over a range of about 25,000 miles.<sup>3</sup> A more advanced version of this technique may be employed in the future.

What would happen if we turned the situation around a bit? In the foregoing example, the locations of the tracking stations were well known, but the orbit was initially unknown. Suppose the opposite were the case. Let's say the orbit is well known, but your location is unknown. Could you determine your own location? The answer is definitely yes. In fact, a vast array of satellites (called Global Positioning Satellites, GPS) is in use by the government and private sectors for precisely that purpose. With GPS, several satellites are in view of your location at any given time. You have a special receiver with a powerful portable computer built in. The GPS send precise time signals. The computer in your receiver measures the arrival time of the signals. By comparing the arrival time of the signals from several satellites, whose precise orbits and positions the computer knows, the computer can work backwards to determine *your* position to within a few dozen feet.<sup>4</sup>

By rearranging the knowns and unknowns a bit, one can structure an interesting Techno-Sport challenge for those OSCAR enthusiasts who like to test their technical talent in an interesting and educational event. By adding some accuracy incentives, a healthy competitive event results. This is how it might be structured.

An "unknown uplinker" sends a signal on the uplink of AO-10 (or Phase 3C). You're listening on the downlink. You know exactly where AO-10 is (from your AMSAT orbital data and your computer), thus you know how long it took for the downlink signal to reach you.<sup>5</sup> But, you don't know how long it took the uplinker's signal to reach the satellite, so you can't locate him.

Now suppose the signal is one that carries special timing information. Let's say the uplinker

takes a WWV signal he receives on HF and retransmits it on the uplink. You listen to WWV on one receiver, and the downlink on the other receiver. *Voilà!* The difference in arrival times of the signal direct from WWV and the signal as relayed by the uplinker through the satellite contains most of the information you need to determine the uplinker's location.

The other piece of information needed is your distance from WWV. More precisely, you need to know the radio path distance from your location to WWV. Because you probably hear WWV via skywave, the exact path length may be difficult to ascertain. This adds one of the major uncertainties to the determination of the uplinker's location. But, with reasonable care in measurement, an estimate of the location should be possible in an hour or less of measurements. Moreover, by combining your measurements with someone else's at a widely disparate location in a cooperative determination, the uncertainties involved should be reduced.

The solution to the problem lies in establishing the distance from the uplinker's location to the satellite, because all of the other distances are known.<sup>6</sup> When you hear the WWV signal relayed by the satellite, you can determine how far away from the satellite the originator is. Because the satellite is moving, if but slowly, the transit time between the satellite and the uplinker changes, too. By carefully logging the changes in path length, the uplinker can be located by using a succession of intersecting spheres as described earlier. With time, the uncertainty in the exact location is reduced until a good guess can be made as to where the "unknown uplinker" is.

I'll be off until September. When I return, I'll discuss in more detail the workings of this newest technique in radiolocation by satellite in the Techno-Sport context. To get more information on this and other AMSAT satellite projects, write to AMSAT at the address given below.<sup>7</sup>

### Notes

<sup>1</sup>About 22,300 miles.

<sup>2</sup>An ephemeris is generated that provides a mathematical means for describing the satellite's position along with the time it will appear at that position. The Keplerian data provided by NASA via AMSAT is a special form of this data.

<sup>3</sup>That is, a few cubic miles out of a potential volume of over 60 trillion cubic miles of space!

<sup>4</sup>Several automobile manufacturers have demonstrated GPS systems in prototype cars. A receiver, computer and special map projection on a CRT show your exact location even while you're moving. Other companies are mounting devices on their vehicles that will report their position to headquarters so each vehicle can be closely monitored.

<sup>5</sup>Radio waves travel at about 186,300 mi/s in a vacuum. That works out to about 1 foot per nanosecond, or about 1017 feet per microsecond. Measuring a microsecond in your typical ham shack is a lot easier than it formerly was, thanks to inexpensive digital counters.

<sup>6</sup>Your location, the satellite's location, WWV location and all the distances between them can be determined.

<sup>7</sup>Information about AMSAT can be obtained by sending a business-size SASE to AMSAT, PO Box 27, Washington, DC 20044. ☐



## Building upon Public Service Plans

Amateur "public service" Radio—seen by some hams as boring, bothersome and befuddling—is *potentially* one of the most potent of radio activities. It can bring in interested new hams, motivate advances in technology and give the public a real awareness of the meaning of amateur service. An aware public will call on amateur services more often, thereby giving amateurs more reason to keep their frequency allocations, reason to request reciprocal public support and, in short, more strength in *every* aspect of the hobby.

Now is a time of strong movement forward. In 1987, Amateur Radio operators will see radio's most exciting advances, more diverse ways to learn, experiment, provide public service, and have loads of fun! Amateur Radio is on the brink of a really vigorous surge, not just among its own ranks, but particularly in the context of the world surrounding it—the larger world of other citizen radio modes and commercial media, served agencies and the public. Amateur Radio interaction with that larger world—of which hams are also a part—is the subject of this article.

### APSCOM

ARRL's Blue Ribbon Committee (BRC) on Emergency Message Traffic completed its study after a year of work. The committee was formed to review ARRL public-service functions and the present national, disaster-communications posture of the Amateur Radio Emergency Service and the National Traffic System (ARES/NTS). Upon the BRC's recommendation, the ARRL Board of Directors approved in principle the formation of a national public-service and emergency-communications steering committee, named APSCOM (Amateur Radio Public Service Communications Committee). This permanent committee would initiate three big steps toward fully integrating amateur public service in North America: (1) to study procedures for unifying all voluntary Amateur Radio public-service efforts under ARRL, including those of ARES, NTS, RACES, SKYWARN, etc; (2) to develop plans for implementing mobile emergency and equipment ("jump") teams; and (3) to develop a system of "gateway stations."

### Program Integration

The objective of APSCOM to provide a focus for all of Amateur Radio's public-service efforts, including activities not affiliated with ARRL, is a bold move made at an advantageous time, amidst a rising tide of expansion and integration in the Amateur public-service Radio realm. The integration occurs among hams, between amateurs and other communications people, between Amateur Radio and "served agencies," and between amateurs and the public at large.

In the BRC's Final Report to ARRL Directors, specific attention was drawn to this

new cohesion appearing among hams themselves. In the words of BRC Chairman, Tom Comstock, N5TC: "The Amateur community is rapidly becoming interconnected on both VHF and HF frequencies by high-speed digital communications. Both formal and informal traffic is routinely passed around the nation, untouched by human hands. Traffic handlers are routinely handling third-party traffic by digital means."

AMSAT may widen the integration among amateurs even more, intending to orbit a geostationary oriented digital-mode satellite devoted to public-service communications in the next five years. Amateurs will access it with a 1.5-meter dish, a medium-power, dual-band transceiver, a TNC and a laptop computer. The satellite's "footprint" would cover about 1/3 of the earth's surface. A satellite project of this nature would provide continuous, high-speed emergency communications capability across North America.

Beyond the amateur world itself, the merging of computers and radio has brought interest in the hobby from individuals and corporations in computer and telecommunications fields. A growing perception of Amateur Radio as a leading-edge, technically germane medium opens fresh possibilities for corporate and grant funding of Amateur Radio endeavors.

APSCOM would, as part of its job, meet with counterparts from government and other served agencies to discuss how Amateur Radio can best serve their needs, and weigh the possibility of ARRL's administering all voluntary Amateur Radio public-service-oriented efforts on a national basis. Previously, served agencies had the impression that Amateur Radio comprised a number of disparate, special-interest groups. They were rather confused just trying to understand, let alone access, Amateur Radio services. You can easily imagine the seeming complexity to the listener if you have tried to explain the function of ARES/NTS/RACES/MARS, all functioning at the local, state, regional, area and transcontinental levels, to someone other than a seasoned traffic handler. Even other communications pros had a hard time knowing who was who. APSCOM would be able to speak for all public-serving amateurs.

The specific advent and growth of digital radio communication has certainly not been lost on Amateur Radio's served agencies. The National Communications System utilized packet radio last August during Night Tango Exercise XV, citing it as "extremely valuable in high-volume message handling during emergencies." The National Disaster Medical System (NDMS) used packet radio almost exclusively for administrative communication during its 1985 and 1986 drills, state and regionwide. Packet radio is now being used to communicate with hurricane-hunting aircraft. During the recent emergency in San Salvador, satellites were used. Amateur

Radio's continued movement toward integration is the single biggest asset in its public-service appeal.

### Developing Mobile Emergency Teams

Emergency and equipment teams represent a new program. These teams can also be referred to as "action teams," "jump teams" or "response teams." Response teams bring together several Amateur Radio operators, technicians, support people, mountain guides, pilots and drivers, liaisons to various US and foreign government agencies, bilingual communicators, whoever is needed. They are ready to move quickly to disaster situations and establish emergency communications, using portable radio gear.

These action teams must maintain a high level of proficiency and training and execute evaluated drills. Team membership is incumbent upon continual improvement of communication and activity. Response-team operations require a diligent, careful and wide-based recruitment program among all areas of the Amateur Radio Service. Those not experienced in traffic handling, yet skilled in contesting, DXing, general digital transmission modes or field communications operations, including direction finding, are candidates for jump-team service.

Jump-team trainers may also interview unlicensed individuals who display good aptitude or experience in other aspects of jump-team work. Such candidates, after earning an Amateur Radio license, have the opportunity to enjoy one of the richest kinds of radio training format available. The context of action-team training entails practical handling of radio gear in the field, strong demands for precision in operating several leading-edge transmission modes, and instilling the courtesy and the efficiency of the top notch A-1 operator we all might long to be! (To be continued.)—*PenDell Pittman, N0DZA, Twelfth Region, Cycle 2, Net Manager*

### IN SERVICE...

□ Winston-Salem, NC—Jan 31. At 8:45 PM, ARES for Forsyth County received a call from the Red Cross to request back-up communications for emergency vehicles that were transporting victims of an apartment-complex fire. EC N4MBI set off the low-level alert on the WA4GIC repeater to summon the help of two radio amateurs. WA4JXG and WA4UJM responded and operated from the Red Cross vehicles and maintained contact with W4NC, the Forsyth ARC station at Red Cross Headquarters. Operations were completed at around 11:30 PM.—*Richard B. Batte, N4MBI, EC Forsyth County*

□ Pickerington, OH—Feb 8. Fourteen radio amateurs provided communications assistance for the Columbus Roadrunners in their 15-



and 3-mile runs. Around 250 runners participated. The weather was cold (dropping to 24 degrees) with almost blizzard conditions at times. In addition, there was a barn fire just a short distance off the course. The initial response was just prior to the start, but tanker trucks had to return several times (through the runners) for additional water. Amateur Radio communications may have helped to avert a serious problem.—*Robert R. Adams, W8BKO, DEC, Ohio*

□ Gulf of Mexico—Feb 9. A fishing vessel in the Gulf of Mexico began to sink, and the captain, realizing his boat was too far out to contact the Coast Guard on normal marine frequencies, made a call for help within the 20-meter SSB Amateur Radio frequencies. A few stations heard the distress call, but WA1NSJ in Bristol, Connecticut managed to copy the signal clearly for the longest period of time. An Amateur Radio operator in New Hampshire contacted the Coast Guard while WA1NSJ telephoned the captain's wife in Florida. Propagation between the Northeast and Gulf of Mexico changed, but by then the Coast Guard's rescue effort was under way. The fishing boat and all passengers aboard were rescued and safely returned to the Florida coast early on February 10.—*Richard Ladisky, WA1NSJ*

□ Lawton, OK—Feb 10. Afternoon thunderstorms were predicted that Saturday, but no storm watches had been issued. But, if you have ever been in danger during severe weather, you can get a downright uneasy feeling. Lawton-area hams began looking skyward in the late afternoon.

Shortly after 5 PM, Doppler radar showed severe weather developing about 15 miles west of Lawton. W5VVC reported heavy hail and a wall cloud forming northeast of town. Within minutes a formal, weather-watch net opened on the local repeater. WB5HEN, AE4W and KE5K were feeding vital information to the net about the funnel on the ground and pinpointing location and direction of travel. Meanwhile, television weather reporter KF5DA telecasted the radar image of the funnel and warned the viewing public.

It was a classic example of cooperation and coordination, and Amateur Radio was a big part of it! The storm caused over a million dollars of damage, but only a few minor injuries. With telephone lines down for several days, volunteer members of the Lawton/Ft Still Radio Club provided the Red Cross with a vital communication link.—*Dick Young, KE5EA, Public Information Assistant, Oklahoma*

□ Jones County, MS—Feb 28. The Pine-Belt ARES net opened an emergency, net session during the severe weather and tornado that hit Jones County. District Emergency Coordinator AJ0X put out a call for radio operators to report to the Emergency Operations Center at the Civil Defense building. Recent countywide simulated-emergency tests had prepared the ARES group to make an organized response.

Interagency communications were set up with the hospital, police and sheriff's departments and Civil Defense. Health-and-welfare traffic was handled via 75 meters and 2 meters. The Red Cross requested Amateur Radio operators to ride in their food vans to provide communications until their command

post was set up in the field. Some 30 operators from the Laurel ARC and approximately 14 from the Hattiesburg ARC were on hand to help many others throughout the weekend.—*J. Steven Grantham, N5DWU*

### SPOTLIGHT ON SERVICE

□ The Red Earth Loppet is a large cross-country ski race, and 650 skiers participated in the 1987 race, held on March 7. Taking place in Marquette County in Michigan's Upper Peninsula, the race was actually three races in one. Skiers chose to take the 14, 24

or 48 km race. "Loppet" is Norwegian for "ski race," and the name "Red Earth" derives from the area's historical iron-mining heritage. The unusual weather (60°F) several days before the race melted snow and created a "sloppet" in several low-lying areas. Volunteers shoveled snow onto the trails and banded together to ensure another successful race.

Amateur Radio played a vital part in this year's event. The communication system was designed primarily for the health, safety and welfare of all skiers, spectators and volunteer workers. Secondary traffic included race progress reports, logistical aid and other requested information from race officials. Thirteen radio amateurs were positioned at strategic locations along the route—*Randy Leppala, WD8AKF, EC Marquette County, MI*



W8OLE (lower left) assists a search and rescue team during the Red Earth Loppet.



KB8BCD (left) and N8GBA report progress of skiers from the 45.5-km post. (photos by WD8AKF)



N8HXG and KO8U use a map and markers to follow the progress of the race and to keep track of race personnel and rescue units.







AA3B busy at the controls of W3SK, EPA multiop.

weather conditions can be summed up in a word: "Brrrrrrrrrr."

But, the elements didn't prevent hot QSO rates in the warm ham shacks. Just look at the 170k single-op WA3AXV score, Ron, far outdistancing the opposition. A nice effort from FN20 put Roger, K2SMN, in second place with just over 98k, followed closely by KA1ZE and WA1STO.

Just when we thought the contest was scheduled to avoid the Super Bowl, look what happens. In the multioperator category, the N2 Super Bowl team ran, passed and kicked for 427k points, only 32 touchdowns ahead of everybody else! The three-man act at WA2OMY finished a respectable second, however, topping the 200k mark (find the hidden pun and win a prize). West of the

Mississippi, the Dean of VHF contesting, WA0TKJ, finished ninth with 90k multiop points. Other top ten scores are shown in the boxes.

In the club competition, it is no surprise to see the Mt Airy 'Rats ahead of the unlimited pack, with 1.6 mil, their 26th consecutive gavel. What a record! But, look at the medium club category: surprise, surprise! The Delaware Valley VHF Society, with only 15 entries, fought off the greater numbers of the Rochester (NY) VHF Group, to cop top honors and a gavel. The North Texas Microwave Society had a nice club aggregate score of 90k, finishing third.

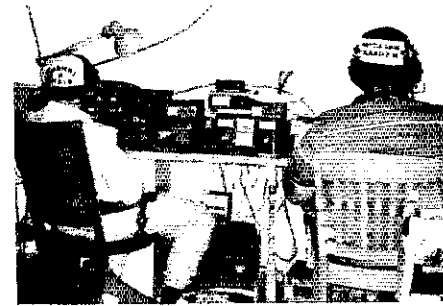
In the local club category, the gavel again goes to the Murgas ARC with 197k. Pretty good score for only six entries!

A number of entrants commented on the tug-of-war with the football playoffs on television. In '88, we'll try to schedule the contest on the "off" weekend, just before Super Bowl XXII. This will probably put the contest a week later than usual.

Next VHF stops: Spring Sprints, June VHF QSO Party...etc.—W1XX

### SOAPBOX

I couldn't find a single person to work on 10 GHz! (WB1FVS). Had fun as usual, though ice on the antenna and equipment failures kept my score below my goal (WA1STO). Conditions were best during the first few hours, but went downhill from there (N1ABY). I've never heard so many stations with blowout bands! I blew out my 220 transverter after 2 QSOs! (WA4PFN). The local Radio Shack owner



The Indiana multiop crew, KA8MRI/9, are busy winning the Central Division Leader slot.

thanked me. All high pass filters sold out over weekend! (WA1OUB). The new 903-MHz assignment offers interesting experiences and seems to be noticeably different from the 432- and 1296-MHz bands (W1EJ). 90 percent of my contacts on 1296 MHz were random. That made it all worthwhile (N1EMH). Operated 2 meters till the antenna iced up. Ran the snowblower till the engine quit. The football game was pretty good, though! (K1KA). Thanks to W1XX/3 for operating in FN01. I operated near a cozy woodstove in my brothers basement; set up extra phones for my nephew to listen in, and now he seems hooked! Another Novice one day? (W1QK). I built a snow mound to mount a mast for a 3-element 220 beam and 3-element 6 meter beam...the backyard die-hard method! (KA1LMR). Did better than last time; I love the Jan contest (WA1EGF). Still haven't gotten used to the new scoring, but really like grid

### Multiplier Leaders by Band

#### Single Operator

50 MHz	144 MHz	220 MHz	432 MHz	902 MHz	1296 MHz	2.3 GHz	3.4 GHz
KA8IFC 58	NJ0H 66	WA2TEO 22	K9HMB 33	N3CX 3	WD5AGO 17	KD5HO 11	WB5AFY 2
K1TOL 51	WA3HMK 51	WA3AXV 20	K1FO 32	W1JR 3	KD5HO 12	WA5TKU 5	WB5LUA 2
WD8CTX 50	KTBW 50	KA1ZE 20	W2DRZ 31	WA1JOF 3	K2SMN 12	WA5VJB 4	WA5VJB 1
N2CEI 49	WA8TJL 50	WA1STO 19	W0RRY 26	WB3FAA 3	K2TXB 12	WB5AFY 4	WB8ISK 1
WA4NJP 46	W2DRZ 50	K8DIO 19	WD8ISK 26	N1EMH 2	WA3AXV 12	WA3AXV 2	
WA1OUB 44	K2TXB 49	N4MM 19	WB2DNE 25	W1EJ 2	W2DRZ 10	WB2YEH 2	10 GHz
WB8IGY 43	K2GAL 48	W2DRZ 18	K5UR 25	WB9EEA 2	K9HMB 10	AF1T 2	W6OYJ 2
WB8ISK 42	K9HMB 47	N2EQL 17	N2WK 25	W2EIF 2	KE5ED 10	WA3NUF 2	K2DNR 2
W2DRZ 36	K1RZ 46	KB8ZW 17	K8DIO 25	W0RSJ 2	WA1OUB 9	WB2ONA 2	WB8ISK 1
WA3AXV 35	W7UDM 46	WB8ISK 17	KA1ZE 24	WB1FKE 2	WB5AFY 9	W5ETG 2	WA5VJB 1
WA1STO 35	AA4KP 45	N2BJ 16	K3HZO 24	WB2YEH 2	WA1JOF 8	AK3O 2	KSIS 1
W3IFM 34	N0LL 45	WA3NUF 16	K2TXB 24	K2SMN 2	W0RRY 7	N3CX 2	
WA2TEO 33	WD8ISK 45	K3HZO 15	WA8TJL 23	VE3ASO 2	N2BJ 7	W3ICC 2	
WA1VRH 33	K3ONW 45	K9HMB 15	W3IP 23	W1QXX 1	NK0P 6	N4MW 2	
K9HMB 31	K3NXH 44	W2EIF 15	KB8ZW 22	W1RIL 1	K5SW 6	WA3JUF 2	
W0UC/9 30	N3EAX 42	KB3QM 14	NR8S 22	K9MKB 1	K9MKB 6	WB1FKE 2	
N0LL 30	W3IP 42	WB3JO 14	K2SMN 22	WB8ISK 1	WB3JO 6	W0RSJ 2	
K5UR 29		K8ZES/2 14	WA2TEO 22	AF1T 1	K3HZO 6	WA3LBI 2	
			WA2TIF 22		WA3NUF 6	WB5LUA 2	
					WA5VJB 6	K3BPP 2	
						WB3JO 2	

### Multiplier Leaders by Band

#### Multioperator

50 MHz	144 MHz	220 MHz	432 MHz	902 MHz	1296 MHz	2.3 GHz
N2SB 57	WA0TKJ 63	N2SB 27	N2SB 37	VE3LNX 9	WA0TKJ 28	N2SB 6
W1XX/3 56	W1XX/3 56	WB2IEY 27	W1XX/3 34	N2SB 6	W3KWH 15	VE3LNX 3
KA8MRI/9 43	N2SB 56	W1XX/3 26	W2SZ 32	W1XX/3 4	N2SB 13	WB2IEY 2
W2SZ 40	VE3LNX 51	VE3LNX 22	WB3CZG 32	WB3CZG 2	VE3LNX 11	WB2PSI 2
WA0TKJ 39	N4EQT 49	W2SZ 21	WB9MSV 31	WA2OMY 2	W1XX/3 10	KA6ZVP 2
WA2RQC 37	WB3CZG 49	W1NY 21	WA0TKJ 30	WB2ELB 2	WB3CZG 7	WA2OMY 2
W1NY 36	W3KWH 45	WB3CZG 20	VE3LNX 30	N0KV/6 1	WB2PSI 6	
WA8DQR 35	WA2OMY 44	N2AHN 19	W3KWH 29	WB2IEY 1	WA2OMY 6	10 GHz
WA2OMY 33	N2AHN 43	WA0TKJ 17	WA2OMY 29	WB2PSI 1	W1NY 6	WB3CZG 4
N4EQT 32	W2SZ 41	WB2ELB 16	N2AHN 24	KC4IH 1	WB2ELB 5	N2SB 2
WB3CZG 31	WB9MSV 38	WB9MSV 16	W1NY 24		WA2RQC 5	WA2OMY 1
WA0DCB 28	KA8MRI/9 37	WA2RQC 15	WA2RQC 22		KA6ZVP 5	KA6ZVP 1
WB0VYU 28	W1NY 35	WA2OMY 15	KA8MRI/9 20		N0KV/6 5	
N2WM 27	WA0DCB 34	WB2PSI 15	WA0DCB 20			
W3KWH 27	KA3ETI 33	KA8MRI/9 12	N4EQT 19			
VE3LNX 27	WB2ELB 32	KA3ETI 11	N4HB 18			
W3KKN 26	N4VC 32	W3KKN 11	WB2PSI 17			
WB9MSV 26	WB2PSI 31		KA3ETI 15			
	WA2RQC 31		WB2ELB 15			

## Top Single Band Scores

50 MHz	144 MHz	220 MHz	432 MHz	902 MHz	1296 MHz
N2CEI 26,754	K2TXB 21,952	WA3AXV 5,720	K1FO 10,888	WA1JOF 96	WA3AXV 2,496
KA8IFC 15,254	K2GAL 16,656	KA1ZE 3,160	KA1ZE 5,712	W1JR 84	K2SMN 2,352
WA1OUB 8,096	KC3FT 16,646	WA2TEO 2,904	WA3AXV 5,250	N3CX 84	K2TXB 2,064
WA1STO 7,035	NJ0H 15,317	WA3NUF 2,624	N2WK 5,000	WB1FKE 72	WD5AGO 1,428
K1TOL 5,916	KA2WKA 13,755	WA1STO 2,622	K2TXB 4,848	WB2YEH 48	KD5RO 1,248
WA3AXV 5,635	WA3LBI 13,600	N2BJ 2,560	K9HMB 4,686	W1EJ 48	WB3JOY 1,188
WA1VRH 5,313	AA4KP 13,455	N2EOL 2,520	WA2TIF 4,532	W2EIF 40	KE5ED 1,000
WA2TEO 5,082	K2SMN 12,236	W2EIF 2,430	K3HZJ 4,512	K2SMN 40	WA3NUF 960
W3IFM 4,930	*N2SB 34,328	N3CX 2,236	N2BJ 4,464	W0RSJ 32	WA1OUB 936
*N2SB 15,818	*WA2OMY 21,736	WA3NWL 2,080	W2DRZ 4,340	W1QXX 24	WA3JUF 760
*W1XX/3 14,224	*N2AHN 17,845	*N2SB 8,154	WA3NWL 4,212	N1EMH 24	*WA0TKJ 4,056
*W2SZ 8,320	*W1XX/3 17,248	*WB2IEY 4,050	*N2SB 17,908	AF1T 24	*N2SB 2,860
*W1NY 7,128	*W2SZ 16,154	*W1NY 3,864	*WA2OMY 8,062	*VE3LNX 540	*W3KWH 1,080
*KA8MRI/9 5,805		*WA2OMY 3,750	*W1NY 6,960	*N2SB 456	*VE3LNX 968
		*W1XX/3 2,600	*N2AHN 6,192	*W1XX/3 64	*WA2OMY 912
			*W1XX/3 5,712	*WA2OMY 48	
				*WB2ELB 16	

\*indicates multioperator

squares. Didn't get enough time on the air at the right times, but had lots of fun! (N2CSY). The lack of sporadic E made for a loony contest. Come on, June! (KA3B). Thanks for a great contest. My age is 16, and I have been a ham for 4 years. Will operate from W2DRZ for the June contest (N3EYD). First the beam fell down, then I blew up my rig. After that, things got steadily worse! (N3ESJ). Positively the worst conditions I've ever

experienced in any contest over the past 12 years (WB2BJH). Strange results at the QTH this year! 50 MHz and 432 MHz way down this year (WA3UJE). Heard one of my neighbors working a VE3; he might have been on Uranus, for my money... (KA3CXG). Static was the only thing I could hear, at times, but it made it challenging (N3EYD). One day I'll make it big! (N4NFR). Lots of meteor bursts heard second day, with a number

of 6-meter stations taking advantage (K4DZP). Don't know if it was bad condx or lack of activity, but was very lonely down here. Not much heard from the North, not even the big gun in north Carolina (WD4AHZ). Need QRP category (KB4OLM). Lousy conditions; if it weren't for 2300 and above, I wouldn't have any score at all (KD5RO). I think an HT is not the best rig to use in this contest (WB5BYK/6). It pays to stay on the

## A Mid-Winter Night's Dream (in FN01)

It all started after analysis of our W1XX minigroup's grid square maps from our 1986 contest efforts—we hadn't once worked FN01 in central Pennsylvania. Bart, KB9NM, got a gleam in his eye and exclaimed: "Let's go to FN01 in January." It was all downhill from there.

A few phone calls later proved the axiom that hams are everywhere. While exploring leads on places from which to operate, a helpful lady from the Pennsylvania Forestry Office responded: "Oh, you want to talk to my husband Evan, N3DEO, to set up at the repeater site, the highest point in the county." Jackpot! Result: The Cameron County Amateur Radio Club would be delighted to have us as their guests. And, they'd gladly turn off WA3WPS/R during the contest, of course.

That led to several 75-meter QSOs with N3DEO to coordinate the trip. Bart made an excursion to the location, Whittimore Hill, elevation 2200 feet. His 80-watt 2-meter signal to a 5-el Yagi back to central Connecticut confirmed it was a dynamite location. Since W1XX/3 was now a definite go, we alerted several newsletters to our plans.

Thursday before the contest, K1GX, W1XX, KB9NM and KA3V (better known for his CW DXploits as TG9ML) piled into the 30-foot, rented motorhome. On board: equipment for 6 meters through 1296 MHz and everything to sustain us for five days. After nine hours on the road, we arrived close to our destination at midnight. We parked the RV at a railroad yard to sack out. When asked the next morning, "Hey Bart, did you hear the freight trains?" he replied, "What trains?" After breakfast, we met our hosts and began the winding, twisting ascent up the mountain. The Forestry Service had plowed the road just the day before. It took five "pedal to the metal" runs to negotiate, in the snow, the steepest part of the road to the summit. It was tough and go. All day Friday and

Saturday morning everyone was busy putting up the five 30-foot masts (no towers) and antennas for the four operating positions. Six meters was housed in a cement block storage building, two UHF positions (4 bands) in the motor home, and 2 meters in a trailer provided by N3DKA. Wind-chill was a constant  $-5^{\circ}\text{F}$ .

Seconds before the contest, a fire broke out in the RV's generator compartment knocking out the 5-kW power source. Quick to the rescue, N3DEO secured permission from the state to use the commercial power from the Forestry Service radio.

Pure pleasure of operating followed, even though it was mighty cold (the fire knocked out heat in the RV). So what if the 220 antenna mast bent in half Sunday morning during the 40-mi/h winds? It was back up again in 15 minutes.

The real heroine was Mary, KA3MMN,

who showed up with hubby N3DKA and hot coffee, domestic rabbit stew and venison—a gourmet's delight. Forget the beans and franks we brought along!

Results: 711 QSOs and a total grid square count of 186. Our biggest thrill was giving out the rare FN01 multiplier. This was confirmed by the hundreds of QSL cards received that universally said: "First FN01. Please QSL."

We'd like to acknowledge the gracious assistance and hospitality of the Cameron County Amateur Radio Club (who also provided crack operator Elwood, KA3MMM) and the Pennsylvania Forestry Service. We couldn't have done it without you!

We were sure lucky with the break in the weather. Potentially devastating snow storms inundated the East the following week and weekend. Who knows, we might do it again next year.—W1XX



The UHF bands at W1XX/3 were operational in the RV. Left, Paul (K1GX) is busy moving a station from 432 to 1296 MHz (both antennas on the same mast). Right, John (KA3V) takes a break from 220/903-MHz activity. (N3DEO photo)

whole contest (WA6KLLK). No skip at my location! (W7UGK). If you could get the NFL to schedule the playoffs on a different weekend, it might help (W7IDZ). Slim pickins on 220 (KC8CF). Six cans of "Jolt" cola, more and more 220, makes for an interesting contest (KB8JI). Would be nice to see

an incentive for the "grid-square expeditioners." Possibly a handicap similar to a Field Day one (K9LRCR). Celebrated my birthday by working the contest (N9EOM). I should have gotten on earlier (WA9WXC). My first contest. Where does everyone go after contest time? (KA9CQC). Worked

harder this year for about the same score as last year. Six meters is sure stubborn! (WA0DCB). The only things hot in this contest were the chips and picante sauce, since the bands were as cold as the beer! (WB0BYU). Did have a good time. Maybe next year we'll go hill-topping! (WD0EMY).

## Scores

Call, score, QSOs, multipliers, bands worked (A = 50 MHz; B = 144 MHz; C = 220 MHz; D = 432 MHz; 9 = 902 MHz; E = 1296 MHz; F = 2.3 GHz; G = 3.4 GHz; H = 5.7 GHz; I = 10 GHz; J = 24 GHz; K = 48 GHz; L = Light).

1		2		3								
<b>Connecticut</b>	KA1ZE 89,232-818-104-ABCDE WA1STO 85,905-877-105-ABCDE WA1VRH 32,588-459-71-AB K1FO 10,688-167-32-D W1QK 10,411-359-29-B KB1I 7,567-172-39-8D WB2EP/1 6,699-193-33-ABD N1ABY 1,957-103-19-A KB1XD 884-111-6-BCD W1WHL 690-55-12-B K1WVX 581-59-9-B RH6CPAW1 189-27-6-AB N1AEH 80-40-2-B WB1FVS (+KA1KEW) 15,300-307-45-ABC	<b>Eastern Massachusetts</b> WA1JOF 21,448-245-50-ABCDEF W1JR 16,328-178-52-ABCDEF WB1FKE 13,899-194-41-ABCDEF WA4PNF/1 11,778-266-39-ABCD W1GXT 9,252-185-38-ABCDEF W1QXQ 8,613-179-33-ABCDEF KA1DHO 7,285-189-31-ABCD KX1C 5,348-145-26-ABCD K1DAT 3,336-139-24-AB KA1SU 2,147-108-19-ABD K1TQ 1,564-63-21-ABCD K1VZI 1,098-89-7-ABCDE A16E 814-74-11-B WA1WEB 426-71-6-B K1CHY 396-38-9-ABCD N1BZF 392-49-8-A	<b>Maine</b> W3HQ 5,468-116-42-ABCDEF K1TDL 5,916-116-51-A WA1TRE 2,892-85-31-ABCD N1DYR 546-39-14-B	<b>New Hampshire</b> WA1OUB 49,116-471-84-ABE AF1T 29,330-294-70-ABCDEF K1TR 20,956-337-52-ABCD AC1J 14,514-292-41-ABCD WA1YHO 9,272-205-38-ABCD W1EJ 9,056-182-32-ABCDEF N1EMH 8,720-142-40-ABCDEF W1ENE 4,278-186-23-B KA1BS 4,092-186-23-B K1KA 3,948-188-21-B KB1OV 1,313-78-13-8D W1FJH 1,264-79-16-B KB1NW 1,008-83-12-ABD KA1LMR 638-44-11-ABCDEF N1DSY 423-47-9-B WA3ETD 408-51-8-B W1GUA 352-31-11-ABD N1DYL 128-32-4-B WB1AAZ 32-16-2-B KA1KFX 24-12-2-B W1TF 24-12-2-B N1DYF 24-11-2-B KB1NX 10-5-2-B KA1JDI 2-2-1-B	<b>Rhode Island</b> A1JK 3,040-169-19-B WA1HYN 2,142-111-18-BC K9SB/1 1,584-92-17-B	<b>Vermont</b> W1AIM 4,142-87-38-ABCD WA1ZOF 1,404-78-18-B WA1WJ 275-25-11-A	<b>Western Massachusetts</b> K1ISW 11,808-245-36-ABCDEF N1DPM 9,843-170-37-ABCD KA1KRU 8,100-324-25-B NA1W 6,727-177-31-BD K9ES 4,028-212-19-B K1SF 3,458-122-26-ABD K1BE 3,104-169-16-ABD W1CJ 3,075-178-15-BCD W1YJ 3,045-145-21-AB KA1MDA 2,864-187-16-BC WA1MBA 2,860-98-22-BDE KA1MPS 2,430-99-18-ABCD WA3ECC 2,120-104-20-ABD WB1FID 1,938-94-17-ABCD KB1TF 1,860-124-15-AB WB1ABF 1,840-115-16-AB	<b>N1AX</b> 1,800-190-12-B <b>K1OSG</b> 1,600-103-15-8D <b>WA1OCK</b> 1,524-136-12-ABCD <b>W1UWX</b> 1,390-103-10-8CD <b>W1NMQ</b> 1,264-72-16-ABCD <b>N1PF</b> 1,248-70-16-ABD <b>WA1PAD</b> 1,020-85-12-B <b>NC1B</b> 996-72-12-8D <b>K1NWE</b> 972-108-9-B <b>KA1KPH</b> 806-87-8-BD <b>W1RIL</b> 798-29-14-ABCDEF <b>WA1EGF</b> 688-77-8-BD <b>WA1JWJ</b> 558-60-9-BD <b>NE1T</b> 524-113-4-BC <b>N1DOP</b> 520-115-4-BC <b>N1ABJ</b> 504-111-4-BC <b>W1NLE</b> 440-88-5-B <b>K1BXE</b> 420-70-5-BCD <b>K1JDL</b> 420-105-4-B <b>WB1FIQ</b> 368-45-6-BCD <b>W1ALL</b> 316-84-4-B <b>WA1HFF</b> 318-48-6-BD <b>AC1T</b> 288-58-4-BD <b>KA1CRX</b> 264-28-2-AB <b>KA1MPA</b> 201-68-3-BD <b>W1RED</b> 184-48-4-B <b>KB1MU</b> 184-92-2-B <b>KB1TH</b> 172-88-2-B <b>WB1GLZ</b> 172-43-4-AB <b>K1MAL</b> 170-85-2-B <b>W1FDLH</b> 164-82-2-B <b>W1FAS</b> 149-74-2-B <b>N1CM</b> 120-60-2-B <b>N1GDR</b> 118-58-2-B <b>NB1Q</b> 117-31-3-BC <b>W1PHU</b> 112-56-2-B <b>KA1NVN</b> 110-55-2-B <b>N1EFP</b> 100-50-2-B <b>WA1YYK</b> 100-50-2-B <b>N1FJ</b> 98-49-2-B <b>ND1P</b> 90-18-5-B <b>K1I</b> 80-40-2-B <b>KA1DNX</b> 68-34-2-B <b>KA1JW</b> 66-33-2-B <b>N1EIZ</b> 58-29-2-B <b>KA1OUR</b> 56-25-2-B <b>N1SR</b> 36-9-4-A <b>WA1ECR</b> 18-9-1-D <b>WA1PGT</b> 8-4-1-D <b>W1NY</b> (AC1T,KA1KPH,N1DPM,NC1s,BJ,W1KK,WA1VQC,WB1FCG,ops) 135,786-858-122-ABCDEF <b>WB1HAB</b> (+KA1MEW) 10,944-239-38-ABCD <b>WB1ETS</b> (+N1AEH) 3,780-146-21-ABCD	<b>Southern New Jersey</b> K2SMN 98,532-622-102-ABCDEF K2TBS 73,254-602-87-BCDF WB2YEH 41,608-448-58-ABCDEF W2EIF 41,275-398-65-ABCDEF N2FY 24,824-339-54-ABCD K2GAL 20,511-357-53-BE K3GY5 19,557-352-41-ABCDEF WB2HRW 18,950-342-50-ABD W2PAU 16,323-359-41-ABD N4JIS/2 16,092-243-49-ABCDEF KA2WKA 13,785-393-35-B KS2T 13,572-211-52-ABCD KC2J 10,836-246-36-ABDE W2EA 10,608-258-34-ABD WA2GTJ 9,363-275-27-ABCD W2EKB 6,600-248-24-ABCD KA2RWA 5,472-241-19-BD WA2WJL 3,824-239-16-B WB2JVB 3,512-204-14-ABCDF WB2VLA 3,200-185-16-ABC KA2CQX 2,640-118-8-ABCDF W2SPV 2,088-153-12-ABC WB2JHG 1,952-54-16-DE W2FGY 1,920-180-12-B N2RF 1,580-120-13-AB KA2MSM 1,287-97-11-BD WA1KQ/2 1,220-61-10-D N2GBY 1,164-97-12-A N2FT 1,062-59-9-B WB2QNH 837-93-9-D WA2MGV 688-58-8-ABCDF KA2KFO 635-127-5-B WA2PFC 496-50-8-ABCDF AB2Y 444-89-4-BD WB2ODD 322-46-7-A WB2EFL 234-39-6-AB N2QDQ 182-48-4-B WA2RCB 132-66-2-B K2LCO 130-65-2-B WB2RXM 104-26-2-C N2AWC 74-37-2-B WB2ZST 44-22-2-B W3ELJ 36-18-2-B N2SB (+KM3T,WA2VYA,WB2NPE,RVX,WB2ZAR) 427,929-1374-201-ABCDEF N2AHN (+KA2VAD,KQ2Q,N2s,FFA,FWP,NN2E) 100,219-702-103-ABCDEF WA2KCB (+WA2JSG) 7,480-244-25-ABD KB2AJN (+N2FHL,WA2RUG) 855-74-9-ABC	<b>Western New Jersey</b> W2DRZ 78,590-402-145-ABCDEF K2OS 46,886-419-93-ABCDEF K2ZS/2 39,852-306-91-ABCDEF N2WK 30,888-356-86-BDE N2BJX 17,189-256-59-ABD WA2WVL 16,932-255-51-ABCDEF K2AN 16,403-281-47-ABCDEF WB2ODH 15,984-333-48-AB K2SPO 15,236-234-52-ABCDEF NM2J 13,536-242-47-ABCDEF WA2ZNC 11,382-253-38-ABCDEF KC2GJ 10,710-255-42-AB WA2ALW 7,843-228-31-ABCDEF DL7KQ/W2 7,678-202-38-BD WB2JWF 6,528-204-32-AB W2UJL 6,498-203-32-B WB2FNF 6,300-201-28-ABCDEF NO2D 5,518-141-31-ABD KC2TJ 4,557-126-31-ABD W2YO 4,313-174-47-AB KA2J 4,186-211-17-ABCDEF	<b>KS2Z</b> 3,850-175-22-B <b>WA2MYG</b> 3,860-132-20-BCD <b>KA2VWQ</b> 3,450-138-25-B <b>WA2TMC</b> 3,198-114-28-ABD <b>NB2T</b> 2,886-158-17-B <b>WA2JBD</b> 2,560-147-18-ABD <b>KA7GWQ/2</b> 2,400-100-24-A <b>W2GWL</b> 2,304-96-24-B <b>W2VVG</b> 2,288-182-14-AB <b>W2EQW</b> 2,249-173-13-AB <b>N2EVG</b> 2,249-153-13-ABCD <b>KA2BC</b> 2,240-54-32-ABCD <b>WA2JRE</b> 2,119-163-13-AB <b>N2FBN</b> 2,087-146-13-ABD <b>WB2SUN</b> 1,790-151-10-BCD <b>KA2OMQ</b> 1,547-109-13-ABD <b>KA2ENE</b> 1,342-100-11-ABD <b>K2JD</b> 1,298-88-12-ABD <b>K2KWK</b> 1,188-106-11-B <b>K2MP</b> 1,139-67-17-AB <b>K2SA</b> 1,120-120-8-BD <b>N2BKS</b> 1,102-58-19-B <b>AF2K</b> 1,032-172-6-B <b>K2JA</b> 928-116-8-AB <b>WA2YPT</b> 928-116-8-AB <b>W2DHV</b> 824-103-8-AB <b>WB2BWT</b> 792-44-18-A <b>KA2JRK</b> 794-103-7-8D <b>N2C5Y</b> 702-78-8-B <b>N2QDD (FN13)</b> 618-103-6-B <b>WB2YJH</b> 618-77-8-AB <b>KA2NME</b> 585-117-6-B <b>WA2HVT</b> 629-78-8-BD <b>K2QKQ</b> 520-130-4-B <b>KA2POA</b> 510-102-5-AB <b>KA2OMX</b> 500-87-5-BC <b>WA2MSA</b> 480-110-4-BD <b>KA2KRV</b> 480-52-8-ABC <b>N2A</b> 464-29-16-B <b>W2PHT</b> 408-102-4-B <b>WB2EKP</b> 392-98-4-B <b>K2RAW</b> 375-75-5-B <b>KA2AC</b> 360-120-3-B <b>W2AV</b> 351-27-13-B <b>KB2BOL</b> 342-57-8-AB <b>N2TW</b> 332-83-4-B <b>WA2ELC</b> 324-81-4-B <b>WA2NFY</b> 318-79-4-B <b>K2QR</b> 300-15-10-D <b>K2DCU</b> 298-74-4-B <b>W2HG</b> 280-56-5-B <b>WA2ENW</b> 276-48-8-A <b>N2GDR</b> 248-62-4-B <b>N2AL</b> 244-61-4-B <b>N2GDL (FN02)</b> 238-59-4-B <b>KJ2P</b> 224-68-4-B <b>KA2GBX</b> 189-63-3-B <b>W2DUC</b> 120-30-4-B <b>N3CKH</b> 100-25-4-B <b>WB2JOR</b> 50-25-2-B <b>WA2UJK</b> 10-10-1-B <b>WB2PSI</b> (+K2s,MP,OEQ,KA2s,WLT,WMK,N2s,AJK,AJX,AJY,W2s,AV,IMQ,WQ2s,YMS,ZK2,ZQN,WB2s,BYP,KA0,CQJ,WQ2s) 468-96-ABCDEF <b>WA3VRE</b> (K2s) 80-768-468-96-ABCDEF <b>WA2RCR</b> (+W2CRS) 55,690-409-110-ABCDEF <b>WB2ELB</b> (+KA1YE,KB2AVH) 41,440-400-80-ABCDEF <b>WB2IEY</b> (+KA2UDH,WA2YTM) 17,938-185-59-ABCDEF <b>WA2AAZ</b> (AB2F,KA2s,JCQ,SCJ,UXM,WA2SOK,ops) 1,330-95-14-AB <b>K2GXT</b> (+N2s,AEC,TW) 420-105-4-B	<b>N3EAX</b> 32,560-400-75-A <b>WA3JUF</b> 32,007-340-47-B <b>AK3O</b> 31,396-393-47-A <b>WA3LBI</b> 28,896-463-41-B <b>K3IUV</b> 25,640-330-40-A <b>KB3B</b> 22,128-329-48-A <b>WB3SJ</b> 21,942-248-53-A <b>WB3FAA</b> 21,105-243-87-A <b>W3IT</b> 20,992-386-41-A <b>WA3HMK</b> 19,839-369-51-B <b>KC3FT</b> 16,646-287-28-B <b>WB3IGR</b> 16,448-372-32-A <b>K3ESJ</b> 16,306-366-31-B <b>WB3DNI</b> 15,934-331-31-B <b>N3ADC</b> 15,732-295-46-A <b>WA3AGA</b> 14,700-318-35-A <b>WB3CL</b> 14,646-360-28-A <b>WB3KPV</b> 13,000-245-40-B <b>K3ONW</b> 11,700-260-45-B <b>N3AOG</b> 10,971-290-23-A <b>WB3CXU</b> 10,036-222-26-A <b>K3AFR</b> 9,801-289-27-A <b>W3NHF</b> 9,234-284-27-B <b>KB3E</b> 9,024-231-32-B <b>K3A</b> 7,778-229-32-A <b>KB3WZ</b> 7,124-274-28-B <b>K3BPP</b> 6,840-193-15-A <b>WA3JUSG</b> 5,907-150-33-B <b>WB3CPU</b> 5,680-238-20-B <b>N3CFE</b> 5,652-188-18-A <b>W3CJU</b> 5,100-258-15-A <b>W3GXB</b> 4,731-191-19-B <b>N3EHS</b> 4,718-195-15-A <b>KA3EEO</b> 4,902-94-39-A <b>W3ICC</b> 3,675-155-15-B <b>K3E3C</b> 3,468-24-17-A <b>K3CMA (FN20)</b> 3,158-178-13-A <b>K3GAS</b> 3,150-151-15-A <b>K3LVB</b> 2,992-121-42-A <b>WA3TEM</b> 2,952-247-9-B <b>KB3XG</b> 2,835-139-15-A <b>W3BRU</b> 2,862-158-17-A <b>K3Y3T</b> 2,018-168-12-B <b>N3EAV</b> 1,800-100-18-B <b>K3VIT</b> 1,820-88-10-A <b>N3EXA</b> 1,507-137-11-B <b>K3VYJ</b> 1,449-154-7-AB <b>WB3FYT</b> 1,388-59-21-AB <b>KB3QJ</b> 1,266-52-21-A <b>WA3ADI</b> 1,034-78-11-A <b>WB3HQ</b> 915-61-15-B <b>N3ESI</b> 888-110-8-B <b>WA3JMM</b> 880-117-6-AB <b>W3AWA (WA3KFT,op)</b> 318-90-8-AB <b>KB3GL</b> 784-98-7-B <b>N3E7B</b> 762-90-8-AB <b>N3ESJ</b> 738-91-8-AB <b>K3PHY</b> 711-195-3-AB <b>WB3HHO</b> 688-134-4-AB <b>K3ZJG</b> 628-122-4-BC <b>N3AHP</b> 595-71-7-AB <b>K3DMA (FN11)</b> 532-37-14-AB <b>WB2B/H/3</b> 480-80-6-B <b>W3JUF</b> 455-60-5-B <b>W3ZSD</b> 420-70-4-B <b>W3GAD</b> 411-137-3-BC <b>WA3JHT</b> 404-70-4-BC <b>KA3BET</b> 360-72-5-B <b>K3KT</b> 344-88-4-B <b>W2GGB</b> 344-58-2-B <b>KA3NYU</b> 320-16-2-B <b>WA3COT</b> 300-57-4-BC <b>RA3FOQ</b> 270-135-2-B <b>N3ELS</b> 268-132-2-B <b>WA3JMT</b> 248-70-2-B <b>N3EPO</b> 248-124-2-B <b>N3BPJ</b> 248-82-3-AB <b>WA3EYD</b> 198-28-7-AB <b>KA3FP</b> 189-47-4-BC <b>KA3MB</b> 188-31-5-AB <b>WB3HTT</b> 182-91-2-AB <b>WA3AC</b> 177-89-2-B <b>KA3KNA</b> 174-87-2-B <b>KA3DK</b> 188-56-3-B <b>K3DLS</b> 180-40-2-C <b>N3ESB</b> 160-74-2-B <b>K3WAJ</b> 140-70-2-AB <b>A3E1</b> 140-36-4-B <b>K3ETC</b> 140-36-4-B <b>WA3NBS</b> 138-46-3-AB <b>WB3MN</b> 132-66-2-AB <b>KA3JHA</b> 128-32-2-B <b>N3CJH</b> 128-32-4-B <b>W3RCL</b> 120-80-2-B <b>K3CJL</b> 98-31-3-BC <b>WA3VFM</b> 84-47-2-B <b>KA3PXB</b> 70-14-5-A





# Results, 1987 Novice Roundup

"What a great way to have fun and increase my code speed to boot!"—KB4VOD

By Billy Lunt, KR1R and Mary Schetgen, N7IAL  
Contest Manager, ARRL Assistant Contest Manager, ARRL

Novice Roundup is more than just a contest. It is nine days of code practice, propagation study and confidence building all packed into one—and that's just what the contest doctor ordered! For some, it is that little push we needed to give us the courage to answer those CQs or even initiate a QSO by calling CQ ourselves. For others, it is just what we needed to increase our code speed for that upgrade test! This contest also gives all of us the opportunity to learn about propagation by experimenting with different bands and times, while looking for those new multipliers. But whatever the case, we all benefit from making new friends while we are having fun. Fun is the key to success in contesting. If we are having fun, we can easily learn those new techniques of operation and tweak our old skills without even realizing that we are actually hard at work learning and contesting.

The NR is one of the most rewarding events that the League sponsors primarily for Novices and Technicians, but all classes of amateurs can enjoy and participate in it wholeheartedly. As noted above, many things are accomplished while piling up those QSOs and multipliers. These comments express just a few of many such triumphs: "I managed to work 47 states in the 3.7-MHz Novice band and had over 200 contacts"—NC1R. "These Novices sound like they are ready to upgrade, judging by their code speed"—KA1NDS. "As my first contest ever, I found NR to be refreshing, enjoyable and exciting!"—KA2NWO. "I logged more contacts this week than during the entire time that I've been a ham!"—N2GUG. "A very, very good way to practice CW. I love CW"—KA3MMG. "I was able to complete my Worked All States during the contest"—KB4TBX. "I hadn't been on the air in 5 years. The 90 minutes that I spent in the Novice Roundup were enjoyable and gave me the incentive to get back on the air!"—KA9EFX. "Never saw so much traffic on the Novice bands by all classes of amateurs"—N9FIS.

NR 1987 showed a great increase in participation as well as an increase in scores. There was a total of 412 entrants this year: 211 Novices, 126 Technicians, 42 Others and 33 Checklogs. Many familiar calls were noticed in the score listings this year as repeat NR participants.

Four of 1986's Novice top tenners are back in the lineup for 1987. KA7HBK upped his score by about 17k to claim first place again this year. 1986 second-place winner WB1DEU



Twelve-year-old Valerie, KB5AJS, smiles from her operating position in STX. Valerie was the second-highest-scoring Novice in her section. Using the code-copying talents she acquired in NR, she upgraded to General one week after the contest.



Scott, KA2YVU, takes a break on his way to second-place Novice finish in WNY.

## Division Leaders

Novice	Division	Technician
Call	Division	Call
KB2BRL	Atlantic	N2GGW
KA9SPA	Central	N9GBU
KA0WBQ	Dakota	KA0RVW
KB5BAX	Delta	KA5ZRG
KA8JBK	Great Lakes	KA8SDE
KA2NWO	Hudson	WB2VBV
KA0SIX	Midwest	KA0WKT
WB1DEU	New England	KA1ORB
KA7HBK	Northwestern	N9FMA
KA7ICF	Pacific	KB6PIQ
KB4URZ	Roanoke	KB8ABE
KA5DIU	Rocky Mountain	N7IPG
KB4TSA	Southeastern	KB4VOD
KB6OYE	Southwestern	KB6ZLK
KA5IFE	West Gulf	KB5BEK

## Novice Top Ten

Call	Score
KA7HBK/N	66,948
WB1DEU/N	54,825
KA0SIX/N	44,784
KA0VYA/N	39,192
KA0YBS/N	36,050
KA8JBK/N	35,700
KA9SPA/N	32,731
KB2BRL/N	31,453
KA7ICF/N	29,444
KB4URZ/N	27,852

## Technician Top Ten

Call	Score
KA8SDE/T	30,784
KB8ABE/T	24,830
KA0RVW/T	20,601
WB2VBV/T	19,856
KA8RAO/T	19,631
N2GGW/T	15,768
KB4TBX/T	14,256
N9GBU/T	13,356
KA5ZRG/T	13,268
KA0WKT/T	12,474

was back again for the number two spot in 1987. KA0SIX bettered his last year's score by 10k to move up the ladder from number 10 in '86 to a third place win in '87. KA0VYA and KA0YBS were close on his heels for fourth and fifth, with last year's third-place winner, KA8JBK, slipping to sixth this year. There were lots of new faces in the Technician race this year. The only repeat performance in the top ten was KA8SDE, upping his score slightly to move from third place last year for the 1987 first-place Technician win. Newcomer KB8ABE with 24k claimed the second-



Bruce, KA1ORB/T, is busy logging QSOs for his first-place NH win.

place spot, while KA0RVW edged out fourth place WB2VBV and fifth place KA8RAO for the third-place honors. Great going! Certificates for all Novice and Technician entrants will be out soon. See you again in '88!

### SOAPBOX

I truly enjoyed the Novice Roundup and appreciated all the cooperation from higher classed hams who gave their time to encourage the Novices and Techs (KA1ASD). The QRM was bad, band conditions bad, but I loved every minute of it (KA1NJW). Greetings from New Hampshire; I like being a "rare" state (KA1ORB). Wow... what fun! Biggest thrill was W1AW answering my CQ NR. Special thanks to Dave, KIMBO, who let me borrow his rig when mine broke down one day before the contest (N1DVH). All stations should send call/license class. I contacted a lot of folks only to discover they were E or A, but not CQing as such (WB2DVU). Thanks for having something for the Novices (KA2RWL). Had a ball during NR. Would be nice to see a QRP endorsement for future contests (N2GGW). Having only a couple dozen QSOs in my log, I decided to enter the contest. Took a couple of days to get into the swing of things, didn't set the world on fire, but had a truly enjoyable experience (WA2LHW). This was my first, serious, CW operation after nine years of yakking on 2 meters; what a blast! (WD6CQV/2). Had

fun... my first contest with my "little 5 watter." Met a lot of nice people. Thanks for making my retirement (hobby?) fun (KA3OUL). This is a great way to help Ns and Ts "break the ice" for code QSOs (KA3PXO). I am not concerned about the score; I just enjoyed operating (KA3QAZ). I worked many FB operators and received many nice NR QSLs. Would you believe that I finally got up the nerve to get on the air for NR, and then had to be out of town until Thursday night? (WA4TCC). It had been over a year since I worked CW; just what I needed to get brushed up (KB4KOJ). Great contest; can't wait till next year. Last day was wildest; like trying to cross 8 lanes of traffic, blindfolded! (KA4OHV). The contest was most useful in helping me evaluate my signal as reported from many places, and in helping me learn propagation characteristics of different bands at different times (KB4URZ). Radio quit... oh, well! (N4PAU/T). Just didn't last long enough (KB4VOD). Next time I'll do better (with more air time and better antenna) (KA5BPA). I am a medical student and could not work the limit, but I am hooked on contesting (KA5WGL). Spent 26 hours leaning on my arm while sending CW, only to end up with "Morse Elbow" (KB5BAX). I hope there is no minimum number of contacts for the contest. Spent a lot of radio time for only 2 contacts (WH6BKQ). It was a thrill to learn that people could read my shaky fist. I am looking forward to next year's Roundup and hope to be a much better operator (KB7ABS). It would help if more hams sent "QRL" before trying CQ (KA7YYR). Wish we had the same WX for NR we have for FD. In Montana, we had 5 major storms move through during NR (KA7HBK). Surprising what a dupe sheet reveals! (N8FBG). Must have worked half of the ARRL staff over the week! (KA8SDE). Great Roundup! (KA8RLD). I built a new rig and thought this might be a good way to test it out. I was amazed on the reports I received (K8HJI). It was a traumatic event in my life, similar (in trauma only) to my first step into manhood, where you finally get what you want, but you don't know what to do when you get it! (KB8ANB). I had a very good time in your contest and learned a lot (KA0ZEG). The bands were crowded, but it made it more competitive (KA0YWO). Rig broke right in the middle of the contest. Tough luck, huh? Do you have a prize for the least amount of QSOs? (KA0YVV). Thoroughly enjoyed contest despite a few mishaps with my tuner and vertical (KA0YPM).

### FEEDBACK

Please note the following correction to the results of the 1986 Novice Roundup on page 82 of the 1986 June QST. Delta Division Leader for Novice is KA5KHV, not KA0KHV as listed.



Steven, KB4UKN, nine-year-old Novice from VA, is ready for more QSOs.



Nine-year-old Charles, KB4UWA/N, second-place Novice in NFL, hopes to upgrade to Technician soon.

### Scores

Score listings indicate call sign, score, numbers of QSOs, multipliers (number of ARRL Sections + DXCC countries) and total hours.

Call Sign	Score	QSOs	Multipliers	Total Hours
KA10VM/N	2,992	88-34	8	
KA1NN/N	2,175	75-29	22	
N1DVH/T	1,280	64-20	11	
KA1PGA/N	1,008	42-24	17	
W1MX (N1ENDT,op)	450	25-18	8	
KA1PGC/N	345	23-15	30	
KA1PBY/N	74	41-18	30	
<b>Maine</b>				
KA1OXO/N	8,178	174-47	20	
KA1NWQ/T	6,644	151-44	22	
KA1DOD/N	5,633	116-43	8	
<b>New Hampshire</b>				
KA1ORB/T	10,339	211-49	28	
KA1NVP/N	4,446	114-39	14	
KA1NXT/T	3,956	92-42	29	
N1ELO/T	210	21-10	2	
KA1OEO/N	178	16-11	10	
N1DOS/T	9	3-3	1	
<b>Rhode Island</b>				
WB1DEU/N	54,825	630-85	30	
KA1NJW/T	9,845	179-50	20	
KA1OYJ/N	70	10-7	6	
<b>Vermont</b>				
KA1OIO/N	21,514	347-61	30	
KA1LDS/T	4,620	100-72	15	
KA1OVA/N	975	39-25	13	
KA1PKP/N	374	22-17	23	
<b>Western Massachusetts</b>				
KA1QBA/N	4	2-2	1	
KA1OAZ/N	1	1-1	1	
<b>2</b>				
<b>Eastern New York</b>				
KB2AUR/N	3,468	87-34	25	
N2FRW/T	2,210	65-34	19	
<b>NYC-Long Island</b>				
WB2VBV/T	19,656	312-63	21	
KA2NWQ/N	19,260	311-60	30	
N2FBR/T	9,933	203-44	28	
KA2ZNV/N	5,236	99-44	23	
WA2JUJ/T	4,270	122-35	30	
KB2ALM/N	3,844	124-31	10	
KA2JJJ/T	3,690	92-40	16	
KA2RSJ/N	1,431	53-27	24	
N2GUG/T	448	28-16	15	
<b>WA2JVE/T</b>				
198-18-11-21				
<b>Northern New Jersey</b>				
WA2FEH/N	14,823	243-61	26	
KB2BMB/N	4,646	101-46	15	
WA2LHW/M	2,394	63-39	27	
KA2WGY/T	1,144	44-26	15	
KB2BVP/N	450	30-15	10	
N2GMZ/T	425	25-17	70	
KA2RLN/N	196	14-14	3	
<b>Southern New Jersey</b>				
WB2REN/N	21,450	390-55	30	
KA2WRE/N	5,124	122-42	14	
KA2ZVY/N	2,523	87-29	20	
WB2YEH/T	1,014	39-26	14	
KA2TDC/N	455	25-13	13	
KB2BTD/N	104	13-8	2	
<b>Western New York</b>				
KB2BRL/N	31,453	433-71	30	
N2GGW/T	15,768	292-54	29	
KA2YVU/N	14,421	253-57	28	
KA2RWL/N	10,965	200-15	18	
KA2SUG/N	9,155	159-45	30	
<b>WD6CQV/2/T</b>				
1,232-44-28-18				
KA2TVX/T	540	30-18	6	
KB2CHV/N	9	3-3	5	
<b>3</b>				
<b>Eastern Pennsylvania</b>				
N3LR (KA3QGN/N,op)	27,458	416-66	29	
KA3OGL/N	26,047	402-66	30	
KA3NTZ/N	8,514	198-43	19	
KA8EFA/N	1,078	34-22	12	
KA3NJJ/T	958	44-28	7	
N3FCM/T	224	16-14	10	
N3FBI/T	192	18-12	4	
KA3QKJ/N	100	10-10	15	
KA3CCG/N	54	9-8	7	
<b>Maryland-DC</b>				
KA3IKJ/N	3,990	90-38	9	
KA3OHLT	3,535	101-35	16	
KA3QAZ/N	1,647	61-27	23	
KA3MMG/N	1,320	45-24	23	

(continued on page 70)

# Announcing The Second ARRL 10-GHz Cumulative Contest

**Objective:** To promote amateur microwave activity.

**Region:** USA and Canada.

**Eligibility:** Licensed amateurs operating in the above region.

## Rules

1) **Object:** To work as many amateur stations in as many different locations as possible from as many locations as desired on the 10-GHz band.

2) **Contest Period:** 8 AM to 8 PM local Saturday and 8 AM to 8 PM local Sunday for the weekends of Aug 22-23 and Sep 19-20.

3) **Categories:** Entries are not broken down into any categories.

4) **Exchange:** Six-character Maidenhead Locator (see Jan 1983 *QST*, p 49, or write to Special Requests at HQ for a reprint). Signal report is optional.

### 5) Miscellaneous:

A) Scheduling contacts is both permissible and encouraged.

B) Stations are encouraged to operate from more than a single location. For purposes of the contest, a change of location is defined as a move of at least 16 km (10 miles). A station may be reworked for additional credit by either end of the contact moving to a new location.

C) Contacts may not be duplicated on the second weekend (that is at least one end of the QSO must be from a different location).

D) Contacts must be made over a minimum distance of 1 km.

E) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period. The intent of this rule is to prohibit "manufactured" contacts.

F) Contacts with aeronautical mobiles do not count.

### 6) Scoring:

A) Distance points. The distance in km between stations for each successfully completed QSO is calculated. Distance points = distance in km.

B) QSO points. Count 100 QSO points for each different unique call sign worked. Portable indicators added to a call sign are not considered as making the call sign different and unique.

C) Total score = Distance points + QSO points.

D) There are no multipliers.

E) In making the distance calculations, a string (or ruler) and map may be used. However, calculations by computer program are preferred. Several such programs are available in the commercial market, including *The ARRL World Grid Locator Atlas* (\$4). For purposes of making calculations, stations are defined as being located in the center of the 6-character locator subsquare (most computer programs make this assumption).

F) Scoring example. On the first

weekend, KB9NM operating from Mt Greylock, MA works W1VD (distance 97 km) and W1LJ/1 (distance 107 km).

On the second weekend, KB9NM/1 operating from Pack Monadnock, NH works the following stations: W1VD (154 km); W1XX/2 (205 km); W1LJ (157 km); and AA2Z (147 km).

Distance points =  $97 + 107 + 154 + 205 + 157 + 147 = 867$

QSO points =  $100 \times 4 = 400$  (W1VD, W1LJ, W1XX, AA2Z)

Final Score =  $867 + 400 = 1267$

### 7) Registration and Reporting:

A) Prospective entrants are encouraged to register their intent in advance with ARRL. Send to ARRL HQ your name, call, address and home telephone number. A few weeks prior to the contest, you will receive the offi-

cial log forms plus a printout of all those preregistered. This will facilitate the arranging of schedules. Schedules may also be set up by use of the HF calling frequency of 3813 kHz on the evenings of Tuesday, Wednesday and Thursday before the contest weekends starting at 7 PM local. Also, 144.230 and 146.55 MHz can be monitored during the contest to arrange schedules with other stations. Paired stations should move off these frequencies once contact has been made.

B) Logs should indicate the exchange information plus distance of contacts in km.

C) Logs must be submitted no later than 30 days after the end of the contest to ARRL, 225 Main St, Newington, CT 06111.

8) **Awards:** Suitable awards will be presented.

9) **Disqualifications:** See Jan 1987 *QST*.

## Exam Info

ARRL/VEC

225 Main St, Newington, CT 06111

### GRANDFATHERING TECHNICIANS

When Novice Enhancement went into effect recently, the exam structure for Technician and General class licenses changed as well. Previously, exam candidates had to pass a 50-question Element 3 test to get to Technician; no additional written test was necessary for General.

Beginning March 21, the Element 3 Technician/General class question pool was split into two pools, becoming Element 3A for Tech and Element 3B for General. The testing requirements for each license class now include one 25-question written test each for Tech and General. Since Techs whose licenses were valid as of March 21, 1987 passed a now obsolete 50-question test that covered both Technician and General class material, they were grandfathered so that they would not have to take an additional written test to get to General. This way, they must pass only the 13-WPM test for General class, just like before the rules changed. There are, however, a few other areas that must be addressed.

Tech licenses issued after the rules changed carry element credit for Elements 1A (5-WPM code test), 2 (Novice written) and 3A (Tech written) only. No credit is conveyed for Element 3B. That means that if you applied to renew your Tech license—for which you passed the original 50-question written test—that was due to expire, say, in mid-1987, the renewed license from FCC will leave you seemingly shortchanged. Not quite so.

You'll still be credited with Element 3B if you present to the VE Team that will administer your next test the *original* Tech license that shows an effective date earlier than March 21, 1987. (Even if the license term itself has expired, the license—not a photocopy!—still serves for this kind of identification.)

The responsibility for documenting a claim for element credit lies strictly with the candidate; ARRL/VEC examiners will otherwise administer all exam elements needed for an upgrade if the candidate cannot document his/her claim.

Another special situation involves anyone who passed the "old" 50-question Element 3 test before March 21, 1987 but whose tickets took effect on or after that date. To be credited with Element 3B now, these folks must present to their administering VEs the *original* CSCE that shows they passed the old Element 3 test. The certificate must have been issued on or after February 13, 1987 and before March 21, 1987.

Finally, hold onto your pre-March 21 Element 3 CSCE even if you do not currently aspire to climb the licensing ladder further. The certificate is valid for credit for up to one year, but it will retain for many years its value as verification that you passed the Tech test under the old rules. Save yourself an additional test later on; place the certificate in a safe place so you'll have it when you need it.

Some VECs have examination procedures that also comply with FCC regulations. Check with the VE Team that will administer your test in advance so that any confusion can be averted. Additional information on written-element credit can be found in Exam Info, Feb 1987 *QST*. Also refer to "Novice Enhancement: New Test Procedures Start Now!" in Apr 1987 *QST*.

## JUNE

### 1-5

**Operation Search Contest**, sponsored by the Ad Hoc Committee for the Advancement of Amateur Radio in the New York School System in association with the ARRL Hudson Division Educational Task Force. Open to all school clubs and others. All mode. Awards to clubs achieving highest score in each mode and to individual contacting the most schools (all modes). From 1500Z Jun 1 to 1459Z Jun 5. Exchange: RST/school/club name/city/ARRL affiliation (yes or no)/UTC. Scoring: 1 pt for each contact both stations (nonclub to school club, club to nonclub). 2 pts for each school club contacted in your city. 3 pts for each school club contacted in your state. 4 pts for each school club contacted in another state in your division. 5 pts for contacting school club in another state and another division. Multiplier: 2 pts for each ARRL Affiliated Club contacted. Total: QSO pts (each mode) plus ARRL pts. Logs must be submitted for all operators and signed by Club Trustee. All licensed operators must also sign their own logs. Entries must be received by July 1, 1987. Mail all entries to Operation Search Contest, c/o Martin Smith, KA2NRR, 1021 East 81 St, Brooklyn, NY 11236.

### 2

**West Coast Qualifying Run**, 10-35 WPM, at 0400Z Jun 3 (9 PM PDT Jun 2). W6WP prime, W6ZRJ alternate. Frequency is approximately 3.590. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

### 7

**W1AW Qualifying Run**, 10-40 WPM, at 0200Z Jun 8 (10 PM EDT Jun 7). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Jun 2 listing for more details.

### 13-14

**World Wide South America CW Contest**, sponsored by *Antenna-Eletronica Popular* magazine, from 1500Z Jun 13 until 1500Z Jun 14. CW only, 80-10 meters. No crossband QSOs. Single operator, single band or multiband; and multioperator, single transmitter classes; SWL. Exchange signal report and serial number. Work stations once per band. QSO with own country—0 points (multiplier credit only); QSO with same continent—2 points; QSO with different continent—4 points; QSO with South American station (only for DX stations)—8 points. Multiply total QSO points by total number of DXCC countries worked plus total number of different South American prefixes worked on each band. Separate logs per band. Mail logs (with SAE/IRC for results) by Aug 31 to WWSA Contest Committee, PO Box 18003, 20772 Rio de Janeiro, RJ, Brazil.

**7th Cervantes Contest**, sponsored by the Union Radioaficionados Espanoles, Alcala de Henares, from 1200Z Jun 13 to 2200Z Jun 14. All modes and bands, 80-10 meters. Multiband operator only; multiband SWL. Contact same station only once per day. 1 pt for EA or EC contacts. ED or EF contacts in Alcala de Henares for 2 pts. EA4URE station contact in Alcala worth 5 pts. Multipliers: all countries in every band, districts of Spain, EA4URE and stations with ED and EF prefixes, as above. Exchange: R/S and serial no. starting with 001. 15-minute minimum (except ED and ER stations) in each band, before changing band. Call "CQ Cervantes contest." Final score: contacts x multipliers. SWLs submit 200 contact minimum heard. Deadline for logs is July 30 to URE Local Delegation of 28880 Alcala de Henares, Box 201, Madrid, Spain.

### 13-15

**ARRL June VHF QSO Party**, May QST. p 86.

### 19-21

**SMIRK QSO Party**, sponsored by the Six Meter International Radio Klub, Inc. From 1900 CDT Fri Jun 19 (0000Z Jun 20) to 1900 CDT Sun Jun 21 (2400 Jun 21). Exchange call sign/SMIRK no./grid square. No crossband, multiop or partial contacts allowed. Scoring: 2 pts per SMIRK contact made, 1 pt non-SMIRK contact. Total SMIRK score plus non-SMIRK score multiplied by total number of different grid squares equals claimed score. Only new contest log forms acceptable. Provide a legal-size SASE for copy of log. Certificates issued for high scorers in ARRL sections/foreign state/province/prefecture/UK shire county/region/country. Must be paid-up SMIRK member to receive contest award. Others may exchange SMIRK no. for points. Failure to provide name, call, SMIRK no. on log are grounds for disqualification. Send log requests and SASE to Lisa Lowell, KA0NNO,

Box 547, Hugo, CO 80821. Entries must be postmarked no later than Jul 6, 1987.

### 20-21

**9-Land CW Contest**, sponsored by the Joliet ARS, from 1700Z Jun 20 until 1700Z Jun 21. Everyone works everyone. Work stations once per band. Entry classes: single op, single transmitter; multiop, single transmitter; multiop portable, maximum two transmitters. Exchange serial number and state/province/country. Suggested frequencies: 1.805 and 60 kHz up from lower band edges of 80, 40, 20, 15 and 10 meters. Novices: 25 kHz up from lower Novice band edges. Count 2 points per 9-land QSO (IL/IN/WI), 1 point for others. Multiply by total states, provinces and countries worked. Add 1 bonus multiplier for each group of 20 9-land stations worked. Awards. Dupe sheets required for more than 200 contacts. Logs must be postmarked by

## W1AW Schedule

April 5-October 25, 1987

MTWThFSSn = Days of Week

Dy = Daily

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0200, 1300, 2300; TThSSn: 2000; Sn: 0200
	Fast Code Practice	MWF: 2000; TTh: 0200, 1300; TThSSn: 2300; S: 0200
	CW Bulletins	Dy: 0000, 0300, 2100; MTWThF: 1400
	Teletprinter Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Voice Bulletins	Dy: 0130, 0430
EDT	Slow Code Practice	MWF: 9 AM, 7 PM; TThSSn: 4 PM, 10 PM
	Fast Code Practice	MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM
	CW Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 7 AM
	Teletprinter Bulletins	Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM
	Voice Bulletins	Dy: 9:30 PM, 12:30 AM
CDT	Slow Code Practice	MWF: 8 AM, 6 PM; TThSSn: 3 PM, 9 PM
	Fast Code Practice	MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM
	CW Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Teletprinter Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Voice Bulletins	Dy: 8:30 PM, 11:30 PM
MDT	Slow Code Practice	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM
	Fast Code Practice	MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM
	CW Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Teletprinter Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Voice Bulletins	Dy: 7:30 PM, 10:30 PM
PDT	Slow Code Practice	MWF: 6 AM, 4 PM; TThSSn: 1 PM, 7 PM
	Fast Code Practice	MWF: 1 PM 7 PM; TTh: 6 AM; TThSSn: 4 PM
	CW Bulletins	Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM
	Teletprinter 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.

Teletprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz. Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.

Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

On Monday, Wednesday and Friday, 1300 through 2100 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz; on Wednesday at 2200 UTC they are beamed south.

Code practice texts are from QST, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from February 1987 QST, pages 9 and 85" 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 85.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Tuesdays and Saturdays at 2230 UTC, Keplerian Elements for active amateur satellites will be sent on 45.45-baud Baudot on the regular teletprinter frequencies.

Teletprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1500 UTC transmissions, and 2200 UTC on TWThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8 AM to 1 AM EDT and on Saturday and Sunday from 3:30 PM to 1 AM EDT. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 PM Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teletprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on May 25, July 3 and 4, and September 7.

July 20, 1987. Send logs to John Fixari, NM9X, Rte 1, Box 140 H3, Lockport, IL 60441.

**All Asian DX Contest**, phone, sponsored by the Japan Amateur Radio League, from 0000Z Jun 20 until 2400Z Jun 21. (CW contest will be Aug 22-23). 160-10 meters. Entry classes: single op, single band; single op, multiband; multiop, multiband. No cross-band QSOs. Single ops may have only one transmitted signal at any given time. Multiops may have a maximum of one signal per band. Exchange signal report and a two-digit number denoting the operator's age. YL stations may send 00. Count 1 point per QSO with Asian stations on 7-28 MHz, 2 points on 3.5 MHz and 3 points on 1.9 MHz. Multiply by the number of different Asian prefixes (WPX Rules) worked per band. Note: JD1 stations only on Ogasawara count for Asia. Use separate logs for each band. Mark multipliers the first time worked. Provide a complete summary. JARL Asian Countries list: A4 A5 A6 A7 A9 AP BV BY EP HL/HM HS HZ/77 JA-JS JDI JT JY OD S2 TA UA/UN/UV/UW-UZ/RA/RN/RV-RW/RZ9-0 UD UF UG UH UI UJ UL UM V85 VS9M/8Q VU XU XV 3W XW XX9 XZ YA YI YK ZC4 5B4 1S 4S 4W 4X/4Z 7O 9K 9M2 9N 9V and Abu Ail. Enclose SAE and IRC for results. Mail logs to arrive by Sep 30 (Nov 30 for CW) to JARL, POB 377, Tokyo Central, Japan.

24

**WIAW Qualifying Run**, 10-35 WPM, at 1300Z Jun 24 (9 AM EDT Jun 24). See Jun 2 and 7 listings for more details.

27-28

**Field Day**, see May QST, p 87, for rules. Please

note: Field Day is the fourth full weekend in June.

## JULY

1

**West Coast Qualifying Run**, 10-35 WPM, at 0400Z Jul 2 (9 PM PDT Jul 1). See Jun 2 listing for more details.

**Canada Day Contest**, sponsored by the Canadian Amateur Radio Federation, 0000Z-2400Z Jul 1. Everybody works everybody. 160-2 meters, phone and CW. Entry classes: single op, all bands; single op, single band; multioperator. Work stations once per mode on each band. No crossmode contacts. Exchange RS(T), serial number starting with 001 and province/state/country. VE1 stations must also send their province. Count 10 points per VE QSO, 4 points for other countries. VE0 counts as Canada and 1 multiplier. 20-point bonus for working any CARF stations using TCA or VCA suffix. Multiply by total VE provinces worked per band on each mode (VO1/VO2 VE1-PE1 VE1-NB VE1-NS VE2-8 VE0 VY1; max 26/band, both modes). Suggested frequencies: 1.825-1.875 3.525-3.775 7.025-7.070-7.155 14.025-14.150 21.025-21.250 28.025-28.500 50.040-50.125 144.090-146.520 MHz. Suggest phone on the hour and CW on the half hour. Awards. Summary sheets available for an SASE. Mail logs within 30 days (include SASE or SAE/IRC for results) to CARF Contest, c/o Mr John Clarke, VE1CCM, 16 Keefe Ave, Sydney, NS B1R 2C7, Canada.

11-12

**IARU HF Championship**, Apr QST, p 88.

13

**WIAW Qualifying Run**, 35-10 WPM, at 0200Z Jul 14 (10 PM EDT Jul 13). See Jun 2 and 7 listings for more details.

18-19

**CQ World-Wide VHF WPX Contest**, sponsored by CQ magazine, from 0000Z Jul 18 until 2400Z Jul 19 (48 hours). Use all authorized bands from 50 MHz-1296 MHz (6 meters-23 cm). Use all modes, except no repeater or satellite contacts. Exchange call sign and grid square. A station in a call area different from that indicated by his call sign is required to sign portable. Multipliers are the prefixes worked per band. Count 1 point per QSO on 50, 70 or 144 MHz; 2 points per QSO on 220 and 432 MHz; 4 points per QSO on 902 and 1296 MHz. Work stations once per band, regardless of mode. Multiply total QSO points times the total number of prefixes worked (the sum of the prefixes worked per band). Classes are: single operator, single band; single operator, multiband; single operator, single band, low power; single operator, multiband, low power; single operator, portable (with temporary power source); multioperator, single band; multioperator, multiband; multioperator, portable (with temporary power source); FM only. Low power is defined as 25-W PEP output or less. Trophies and certificates. Send entries before Aug 31 to SCORE, PO Box 1161, Denville, NJ 07834, or to CQ Magazine, 76 North Broadway, Hicksville, NY 11801.

26

**WIAW Qualifying Run**

USA

# Special Events

Conducted By Mary Schetgen, N7IAL  
Assistant Contest Manager, ARRL

**Burlington, North Carolina:** The Alamance ARC will operate K4EG May 30-31 from the 12th Annual Fiddlers Picnic site at the Alamance Historical Museum. Frequency: phone—7.250. Operations: May 30 from 1430Z-2100Z and May 31 from 1700Z-2100Z. For certificate, send QSL and large SASE to AARC, Box 3046, Burlington, NC 27215.

**Portsmouth, Virginia:** The Portsmouth ARC will operate W4POX from the *Lightship Portsmouth* at the Portsmouth Seawall Festival June 5-7 from 1500Z-0200Z each day. Frequencies: 3.890 7.230 14.290. For special commemorative QSL, send your QSL and 9- x 12-in SASE with 2 units of First Class postage to W4POX, 2800 Greenwood Rd, Chesapeake, VA 23321.

**Zephyrhills, Florida:** The U'-All Welcome Repeater Assn will operate member stations June 6-7 1200Z-2000Z each day to commemorate the 100th Anniversary of the Founding of Pasco County, Florida. Suggested frequencies: CW—3.725 14.050 21.150. Phone—3.950 7.250 14.250 21.400. For certificate, send QSL and SASE to E. Phinney, WB4UMT, 1840 S Allen Rd, Zephyrhills, FL 34248.

**Madison, Ohio:** The Wireless Institute of Northern Ohio (WINO) will operate K080 in celebration of Ohio Wine Month Jun 6 from 2300Z-0300Z at the frequencies 3.860 and 7.235 and Jun 7 from 1500Z-1900Z at the frequencies 7.235 and 14.235. For special 8 1/2- x 11-in certificate, send legal-size SASE to K080-WINO Weekend, 7126 Andover Dr, Mentor, OH 44060.

**Orlando, Florida:** Walt Disney World ARC will operate WA4ABQ in celebration of the 15th Anniversary of Walt Disney World from 1200Z Jun 6 to 0000Z Jun 7. Suggested frequencies: 3.835 7.235 14.335 14.290 21.360 28.360. For certificate or QSL, send SASE to Walt Disney World ARC, Box 22737, Lake Buena Vista, FL 32830.

**Detroit, Michigan:** The Metropolitan ARC, K8NOW, will operate Jun 7 from 1500Z-1900Z on the following frequencies: 3.900 7.235 14.300. Event to commemorate Michigan Sesquicentennial. For special QSL, send SASE to Mark Kenward, AK8L, 16021 Novara, Detroit, MI 48205.

**Cumberland, Maryland:** The Mountain ARC will

operate from the Western Maryland Railway Station Jun 12-14 during all-day activities. Station W3YMW will operate in the lower end of the 75-40-20-15-10-meter General phone bands. Special steam train certificate is available, unfolded, for your QSL and 9- x 12-in SASE or folded for your QSL and business-size SASE to Mountain ARC, Box 234, Cumberland, MD 21502.

**Brookfield, Illinois:** The Chicago Suburban Radio Assn will operate N9BAT from the Brookfield Zoo as part of the West Suburban Council BSA Scout-O-Rama. Operations will be Sat Jun 13 from 1500Z-2300Z. Suggested frequencies: 7.250 14.250. A 2-meter station will operate on 146.55. CW operations for Novices will take place on the half hour at 7.120. For special QSL of the Brookfield Zoo, send QSL and no. 10 SASE to N9BAT, Special Event, Box 88, Lyons, IL 60534.

**North Platte, Nebraska:** The North Platte ARC will operate W0CXH from 1700Z-2300Z Jun 13-14 during the Nebraska Land Days celebration at the homesite of "Buffalo Bill" Cody. Suggested frequencies: phone—7.250 14.290 21.400. RTTY—14.090. For certificate, send SASE to NPARC, Box 994, North Platte, NE 69103.

**West Mineral, Kansas:** The Wichita ARC will operate W0SOE Jun 20 and 21 at the site of Big Brutus, the largest coal shovel in the world, located in Cherokee County, Kansas. Suggested frequencies: phone—3.875 7.250 14.250 21.325. Send QSL and SASE via Wichita ARC, W0SOE, 707 N Main, Wichita, KS 67203.

**Rancho Cucamonga, California:** The Inland Empire ARC will operate Jun 22-26 at 1700Z-0800Z each day, in honor of the Annual West Coast Jamboree for Girl Scouts. WA6ZEF will be operating in the General class phone portions of the 75-40-20-15-meter bands. Operations in the Novice/Technician 10-meter phone band, also. Special Girl Scout commemorative certificate available for QSL and no. 10 SASE via WA6ZEF, 1248 N Cypress Ave, Ontario, CA 91762.

**Cobourg, Ontario:** The Heritage ARC will be operating VX3 from Jun 22 to Jul 5 to commemorate Cobourg's Sesquicentennial. Continuous

operations on the frequencies: phone—3.800 14.200 21.250; CW—3.550 14.050 21.025; RTTY—14.180. 2 m—146.550. QSL via Barry Coleman, VE3AAR, 156 Maher St, Cobourg, ON K9A 4S3, Canada.

**Benedict, Nebraska:** The Blue Valley ARC will operate WA6HOU from 1800Z Jun 26 to 1800Z Jun 28 to commemorate the 30th Anniversary of BVARC and the Centennial of Benedict, Nebraska. Suggested frequencies: 3.980 7.290. For special QSL and certificate, send QSL and SASE to BVARC, Box 44, Benedict, NE 68316.

**Delphos, Ohio:** The Ottawa ARC will operate W8MCB from 1700Z Jun 26 to 2300Z Jun 28 to celebrate 175th anniversary of the fort established during the War of 1812. Operations in the General portions of the 80-40-20-meter bands. For certificate, send SASE to Paul Baumgarte, WD8RJR, RR 3, Box 341, Delphos, OH 45833.

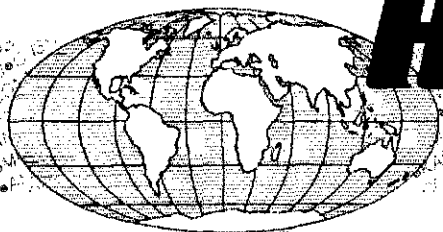
**Deadline:** The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by July 1 to make the September issue. Please include the name of the sponsoring organization, the location, dates, times(Z), 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- x 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.





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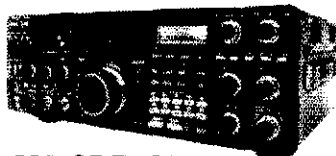


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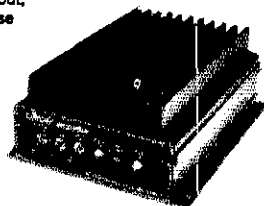
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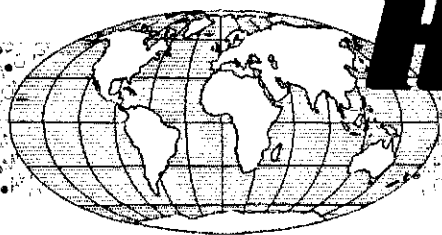
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138 - 174 MHz  
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1.2 GHz Transceiver:  
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**ARE YOU READY FOR  
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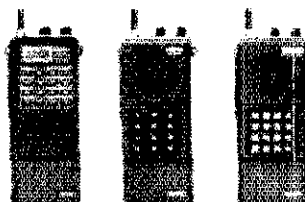
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The Latest in ICOM's Long  
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AT Model  
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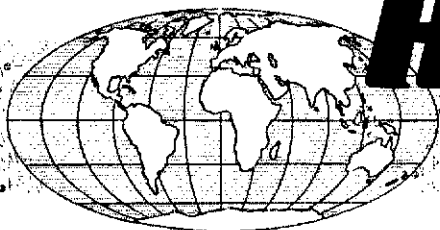


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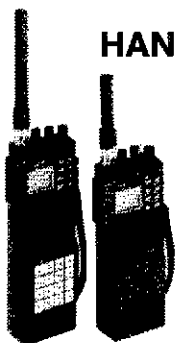
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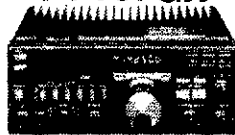


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Compact HF Mobile Transceiver

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## Fastest Shipments in the Industry.

### MA SERIES CRANK-UP TUBULAR TOWERS

Will handle 10 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT		NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD		SUGGESTED HAM PRICE
	MAX.	MIN.			Top	Bot.	
MA-40	40"	21'6"	2	242	3"sq.	4 1/2"	\$ 735.00
MA-55U	55"	22'1"	3	435	3"sq.	5"	\$1,245.00
MA-55MDP*	55"	22'1"	3	620	3"sq.	5"	\$2,640.00
MA-77U	71"	22'10"	4	645	3"sq.	8"	\$2,385.00
MA-77MDP*	71"	22'10"	4	830	3"sq.	8"	\$3,780.00
MA-85MDP*	85"	23'6"	5	1128	3"sq.	10"	\$5,090.00

Shows w/ optional MARR 550 rotor base and motor drive



\*MDP models complete with heavy-duty motor drive with positive pull down.

### FREE STANDING CRANK-UP TOWERS

Will handle 18 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT		NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD		SUGGESTED HAM PRICE
	MAX.	MIN.			Top	Bot.	
TX-438	38"	21'6"	2	355	1 1/2"	15"	\$ 925.00
TX-455	55"	22'	3	670	1 1/2"	18"	\$1,395.00
TX-472	72"	22'8"	4	1040	1 1/2"	21 1/2"	\$2,295.00
TX-472MDP*	72"	22'8"	4	1210	1 1/2"	21 1/2"	\$3,695.00
TX-489	89"	23'4"	5	1590	1 1/2"	25 1/2"	\$3,995.00
TX-489MDPL*	89"	23'4"	5	1800	1 1/2"	25 1/2"	\$5,995.00

\*TX-472MDP includes heavy-duty motor drive with positive pull down. TX-489MDPL comes with heavy-duty motor drive with dual level wind and positive pull down. (Both motor drive models include limit switch brackets).

### FREE STANDING HEAVY-DUTY CRANK-UP TOWERS.

Will handle 30 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT		NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD		SUGGESTED HAM PRICE
	MAX.	MIN.			Top	Bot.	
HDX-538	38"	21'6"	2	600	1 1/2"	18"	\$1,195.00
HDX-555	55"	22'	3	870	1 1/2"	21 1/2"	\$2,095.00
HDX-572	72"	22'8"	4	1420	1 1/2"	25 1/2"	\$3,595.00
HDX-572MDPL*	72"	22'8"	4	1600	1 1/2"	25 1/2"	\$5,495.00
HDX-589MDPL*	89"	23'8"	5	2440	1 1/2"	30 1/2"	\$7,195.00

\*Includes heavy-duty motor drives with dual level wind and positive pull down. HDX-572MDPL includes limit switch brackets only. HDX-589MDPL includes limit switches and limit switch brackets.

### FREE STANDING "LOW PROFILE" COMPACT CRANK-UP TOWERS.

Will handle 18 sq. ft. antennas at 50 MPH winds. (TMM-433HD handles 24 sq. ft.)

MODEL NO.	HEIGHT		NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD		SUGGESTED HAM PRICE
	MAX.	MIN.			Top	Bot.	
TMM-433SS*	33" w/o mast	11'4"	4	315	10"	18"	\$ 985.00
TMM-433HD*	33" w/o mast	11'4"	4	400	12 1/4"	20 1/4"	\$1,195.00
TMM-541SS*	41" w/o mast	12'	5	430	10"	20 1/4"	\$1,295.00

\*Hy-Gain and some Alliance rotors when installed inside tower will restrict retracted height by approx. 24" Most Kenpro models allow full retraction.

Standard bases included with all towers (except MA-770, 770-MDP and 850-MDP).

- ALSO AVAILABLE: • Motor drives for most towers  
• 5' to 24' antenna masts • Coax arms • Service platforms  
• Mast raising fixtures • Special bases • Limit Switch Packages

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Ham Radio Outlet (All Locations) • U.S. Tower (209) 733-2438

Prices are FOB factory, Visalia, CA. Prices and specifications are subject to change without notice.

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his crew are sure to be a valuable addition to Amateur Radio preparedness in central Illinois. Members of IARAS, an affiliated club from the Carbonade area completed an ESDA Radiological monitoring mission with an instrument calibration and testing session on Saturday, March 7th. Many of the units tested were found to be inoperative or would not calibrate. This underscored the importance of periodically testing all emergency equipment which is not used on a day to day basis. Headquarters has indicated that the EC handbook has been out of print, but that the revised edition is going to the printers as I type this. Copies are to be sent out to all ECs who did not receive them with their original EC materials as soon as they are printed. If you are a recently appointed EC and have not yet received a copy of the EC handbook by the time you read this, please contact W9EBCQ, Traffic: K0FFZ, 300 N. 205 W. HILL, 197 W. BEHS 155, W9HBI 133, W97MD 125, W9NXC 1, 18, K9GPH 17, K9JBI 113, W9HOT 113, W9AVLC 93, NN9M 89, K9AEWN 53, K9ACTWT 39, W9KRC 36, W9BTVD 27, W9DZUJ 27, K9KRC 26, N9DOY 25, W9OBU 23, W9RTD 20, K9QEW 12, W9VEYJM 10, W9BFRF 9, W9ARUM 8, K9D9TK 5, W9IL 4, K9BVCV 2, W9BHQW 2.

INDIANA: SM, Ron Koczor, K9TUS—ASM; W9UMH, SEC: W9BZOE, STM: W9UJU, ACC: K9TUS, TC: K9PS, SGL: W9AVQO, BM: K9C9A, PIO: K9BLOM, COO: K9JG, SEC: N9WB, Net Managers: ITN K9D9U, QIN K9CJ, ICN K9WD, VHF W9PMT, IWN K9BREC.

Net	Freq	Time	Daily UTC	QNI	QTC	QTR	Sec
ITN	3910	1330/2130/2300		3543	485	2451	89
QIN	3656	1430/0000/0300		565	362	1349	62
ICN	3705	2315		86	30	456	21
IWN	3910	1310		1713		345	31
IWN VHF	Bloom/Kokomo	2095				414	62
Hoosier VHF	Nels:	6452	360	4499		194	

Appointments: N9DUJ, EC Elkhart City, K9B9N, OPS: N9SG, OPS: K9IGL, OPS: K9AZDM, K9AZDM, W9PFFZ, PL: A, B, I; W9JUJ, orig. 0: rovd, 405: sent 385: divd, 2: total, 792. Silent Keys: K9CEG, Vincennes; K9PAA, Evansville; NM9B, Indianapolis. Thanks to the packet ops who are keeping me up to date. Many are working with ways to integrate packet into our emergency and traffic systems. It's a powerful technology looking for ways to be used. SSC of the month is FCA Amateur Radio Club in Indy, the state's newest SSC. Club was organized in 1980, has 60 members and operates a club station set up for HF, VHF, RTTY, SSVT and packet. Club operates two repeaters, takes part in PD and assists with the Indianapolis hamfest. They have a loaner rig which is given to newcomers to help them get on the air. They are having a club contest this year to encourage operation in the new Novice part of 10 meters. As a matter of fact, several clubs are doing something to encourage the new Novices and Techs to join the fold. A great idea! That's the way to have them learn what is right about this hobby. Don't forget to send me your Field Day messages. Good luck out there and have fun! June is a good hamfest month with Muncie (the 7th), Anderson (the 13th), Terre Haute (the 14th) and Lake County (the 21st) doing their thing. Get out and support them. Next month (July 11/12) is the Indianapolis hamfest and state ARRL convention activities, including the Saturday night banquet. Keep your ears peeled for the Special Events stations, W9PAX, from the Pan Am Games and W9AB, from the Special Olympics. Both activities will focus your attention on Indiana. Both will involve massive amateur radio participation. Congratulations to the coordinators of both Station reports or March: W9JJK 277, W9JZV 185, K9PFFZ 125, K9WVJ 92, N9JS 77, K9SHH 60, W9QCF 53, K9B9N 36, W9DHI 36, N9BZZ 34, W9PFFZ 30, K9WD 29, W9PMT 25, W9UMH 25, K9ZBM 24, W9IHR 23, K9QMI 23, W9ZGC 20, W9BMS 17, N9DTG 14, W9DWD 14, W9BTZ 12.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK, STM: K9UTQ, ACC: K9FOZ, BM: W9JSW, COO: NC9G, PIO: K9ZZ, SGL: AG9V, TC: K9GDF. Frequency Coordinator W9SJOE requests updated information for all Wisconsin repeaters. A young Wisconsin student, N9GZS, has been nominated by N9GHZ as a Maxim Award candidate. By making some minor changes in his sleep schedule, K9J has worked 105 continents in 4-1/2 months on 160 meters. K9VU helps Pleasant Radio Club members combine League book orders, saves postage costs. W9BEKI claims to have 222 countries confirmed using only satellites. Fox Cities ARC has been officially designated as a Special Service Club. June 4th through 6th, CWRA will again be helping Special Olympics. See you June 5th when the Wisconsin Chapter of OQWA meets for a delightful dinner and interesting meeting. Fischer's Supper Club, Lake Delton, social hour begins 11:00 AM, guests and visitors are welcome. June 20th, Milwaukee City of Festival's Parade needs more ham communicators, contact EC W9SMM for details on how you can assist. June 21st (Father's Day), CWRA will hold its Sweetest and Family Picnic at Stevens Point's Bukolt Park with free admission, ARRL booth, excursions at Blue Top Supper club with N9JW at 9:00 AM and the Wisconsin Association, celebrating its 27th year, will have a 1:00 PM meeting. June 27th, walk-in exams begin 9:00 AM at WCTI, Pewaukee with W9JKZ. On June 27th and 28th, earn 100 bonus Field Day points by sending a proper message to me or Section Emergency Coordinator, W9OAK. Traffic: W9B9PY 1265, K9C9J 845, K9R11 591, W9VCY 228, K9GDF 188, W9CBE 183, N9BBL 154, W9WVS 146, W9DND 111, W9UCL 108, N9BCX 106, W9ODV 100, W9BIC 76, K9AKG 59, K9UTQ 58, AG9G 53, K9BHL 45, W9B9NR 39, K9JPS 36, K9FHI 35, K9SKLZ 34, W9PFI 32, K9G9 27, W9JJD 26, K9MWT 25, K9BED 24, W9DND 13, W9PVD 5. (Feb.) K9YP 10.

### DAKOTA DIVISION

MINNESOTA: SM, George Fredericksen, Jr., K9TJ—SEC: K9AAR, STM: K9GCI, Boy! The weather here in Minnesota has been great this year. It's like we have had spring since December. Not much in the way of news for the month of March. Hopefully when this article gets out, Minnesota will have a new law in its books, that deals with the new technology in VHF and UHF radio gear. That is capable of receiving the police frequencies. In Minnesota it's illegal to have anything in the car that is capable of doing so. In so many words, a licensed amateur having a radio (not a scanner) VHF or UHF radio in the car hopefully will not have to worry about it being taken away. The Senate passed its bill 611 100% and it is now on the way to the House for bill 1420. Congratulations to Judy W9BWNJ, who is our Ham of the Month for March. TXN Judy for the good work. A special TXN for the News Letters that were received from the following: Arrowhead RAC of Duluth, Brainerd ARC, Ground Wave of St. Paul, Mankato ARC, New Ulm ARC and the Scotch Hams. Don't forget, that along with all the necessary equipment for Field Day, you also need a cooler of refreshments and a loaded shot gun for those Minnesota mosquitoes. 73's TXN K9BFFP.

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/RTTY	3620	6:30P	777/1/14	W9BLUT
MSN/1	3685	6:30P	438/142/31	K9E-PY
MSN/2	3685	10:00P	259/47/31	NC9E
MSN	3710	6:00P	375/98/31	K9BDDQ



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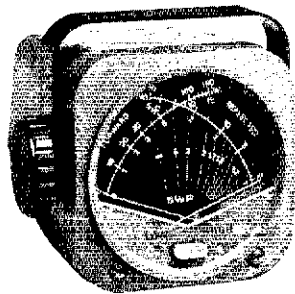
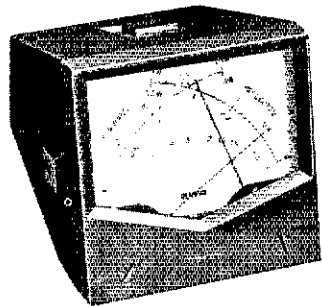
NC Call (919) 993-5881

NOON to 10:00 PM EST



# Superior Communications Accessories

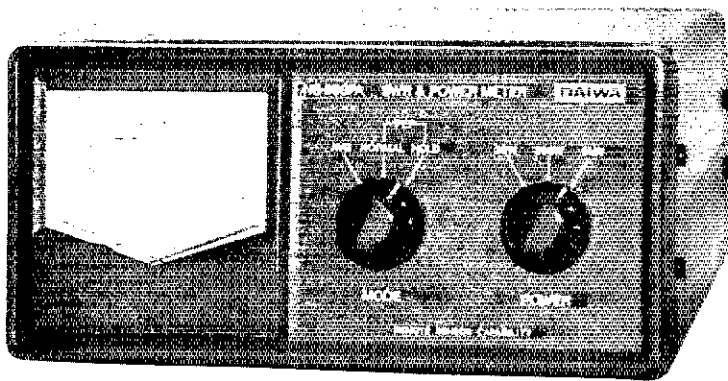
## DAIWA Cross Needle SWR/Power Meters For Utmost Quality and Convenience



Compact  
Model CN-520

Base/Mobile  
Model CN-460M

Base  
Model NS-660PA



See table below for full range of models.

### COAXIAL SWITCHES

PAT. No. 38-000803



	CS-201	CS-201G	CS-401	CS-401G	CS-4
Frequency:	800 MHz	1.3 GHz	800 MHz	1.3 GHz	1.3 GHz
Connectors:	SO-239	N Type	SO-239	N Type	BNC type
VSWR:	Below 1:1.2				
Insertion Loss:	Less than 0.2 dB				

### POWER SUPPLIES

Model	I <sub>max</sub> /I <sub>CONT</sub>	Variable Output VDC
PS-61XM	5.8A/7.5A	9-15
PS-120M	12A/10A	9-15
PS-30XM	31A/24A	1-15
PS-60MD*	66A/44A	13-8
PS-660W	66A/44A (Low V) 28A/22A (High V)	3-16 Variable 6-30 Variable



PS-61XM

\*Sub-DC Outlets: 10.6A/1-15 VDC

### ANTENNA TUNERS



CNW-419

Frequency Range:	CNW-419	CNW-919	CL-680 (no metering)
Power Rating:	1.8-30 MHz (17 bands) 200 W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz) 10-250 ohm	140-150 MHz 200W CW 10-26ohm	1.8-30 MHz (17 bands) 200W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz) 10-250 ohm



LA-2155W

### POWER AMPLIFIERS

Band:	LA-2035F	LA-2065R	LA-4040R	LA-2155W
Input Power:	144-148 MHz	144-148 MHz	430-450 MHz	144-148 MHz
Max. Output Power:	0.5-3 W	0.5-3 W	10 W	10-35 W
Pre-Amp (Gain):	30 W plus	60 W plus	95 W	30-150 W

DK-210



**ELECTRONIC KEYER**  
Sharpen your "fist" with Daiwa precision!

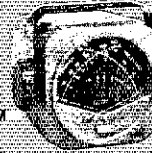
### Cross Needle SWR/Power Meters for All Bands

CN-720B



Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-720B	1.8-150 MHz	20/200 W/2 kW	SO-239
NS-660PA	1.8-150 MHz	30/300 W/3 kW	SO-239
NS-663PA/N	140-525 MHz	30/300 W	SO-239/N Type
NS-668	900 MHz-1.3 GHz	1.5/15/60 W	N Type

### MOBILE/BASE CROSS NEEDLE SWR/POWER METERS



CN-410M



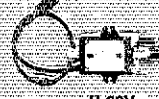
NS-448

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-410M*	3.5-150 MHz	15/150 W	SO-239
NS-448**	900 MHz-1.3 GHz	3/20 W	SO-239
CN-460M*	140-450 MHz	15/150 W	SO-239
CN-485**	140-450 MHz	15/75 W	SO-239
CN-520	1.8-60 MHz	200 W/2 kW	SO-239
CN-550	144-250 MHz	20/200 W	SO-239

\*Back lit with mobile bracket \*\*Separate sensor type

### REMOTE EXTERNAL SENSORS (For indoor/outdoor use)

Permit operation over range of 1.8 MHz through 1.3 GHz. Optional for use with NS-660 series meters.  
U-66V, 1.8-150 MHz, Max. 3 kW, SO-239 Connectors  
U-66V, 140-525 MHz, Max. 300W, SO-239 Connectors  
U-66V/N, 140-525 MHz, Max. 300W, N Type Connectors  
U-66S1, 900 MHz-1.3 GHz, Max. 60W, N Type Connectors  
SC-20 60 ft. Cable with connectors for use with remote sensors



U-66V

### AF-606K

Four stages of filtering...variable bandwidth over broad range...razor sharp CW reception...built-in speaker...PLL Tone Decoder (country)

### AUDIO FILTERS

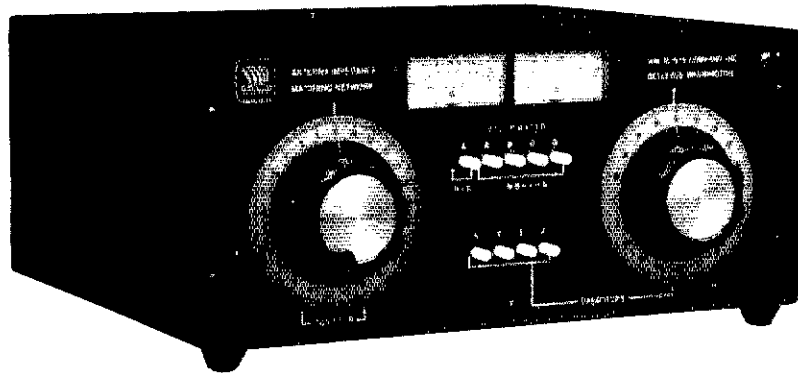


AF-606K



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MNAMWXNT 3860 8:15P 4172/77/26 KEOGI  
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MN Emergency Freq 3860 Bulletins: 3685 & 3880  
MN/MSO: 3620 Traffic: WBOVWJ 606 WAOTFC 406  
KAEJFP 358 KDCCL 252 NFOCO 213 KASBSY 154 KTRJ  
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KAPDM 39 KDNH 33 KBYQX 32 WDOGUF 21 KCBT 21  
KCOSE 18 WOKY 17 KACDC 12 NOKU 11 NDCUO 10  
KASDI 6.

**NORTH DAKOTA:** SM, Bill Kurtli, NDAFP—The Mawville picnic will be June 7. The Peace Garden hamfest will be June 10-12. At the RRRA meeting in Fargo, KAOWTY hosted a very interesting tour of the Dakota Clinic Electronics Dept. and led discussion on electronics in modern medicine. KDYX and KAOFSM were awarded certificate of merit awards by S.M. The Grand Forks club will be holding an emergency drill on June 24. NDBXT is the ND VC test coordinator. The Dickinson club is planning to update their 146.82 repeater. Congrats to KADHPE to general: KADUAX, KA4JQZ to advanced; NDBTX, NDFBA, and KQEMA to extra. We are still looking for official observers, official bulletin stations, and public information assistants. Let's start planning our next winter antenna projects now.

NET FREQ TIME QNRQTC/SESS MGR  
GOOSE RIVER 1990 9:00AM(Sun.) 115/9/5 WSCDD  
WX NETS 3883 3 sess daily 715/21/73 WSGFE  
DATA 3883 6:30PM 484/12/28 KAFBSM  
NORTH 40 146.64 0300UTC(Mon.) 390/5 NQGH  
Traffic: KAOFSM 111.

**SOUTH DAKOTA:** SM, R. L. Cory, W0YMB—SEC: KADPKY. STM: KD0YL. ASST SM, OBS: N0ABE. Asst SM: W0FPR. The novice class at the Lake Area Radio Klub at Watertown has brought 12 novice licenses to our hobby. Congratulations to all of them and to the Watertown Club Moberge Area ARC had a station set up at the Farm and Home Show and created much interest among young people by having a computer display incoming CW signals on a monitor. South Dakota hams will get the Air Force decision by late May or June as to the location of the Over the Horizon Radar system. Make plans to attend the Dakota Division Convention at Watertown on Sept 18-19-20. We now have a total of eight nets that report each month. Traffic as reported to the section tlc Mgr for March was received 308 sent 832 and del. 114. Traffic: NDDPF 596, K0ERM 292, K0ZBJ 149, K0IAE 112, WA0JEN 92, WA0VRE 53, KD0YL 49, W0MZI 44, N0ABE 43, W0COMF 32, KADPKY 30, WDBBMR 18, W0YMB 14, W0RWE 11, K0UEH 4, K0EIR 1.

## DELTA DIVISION

**ARKANSAS:** SM: Joel M. Harrison, W5BISG—ASM: K5IUR. SEC: N5BPU. STM: W9OK. AGC: N5SD. SGL: W5LCI. TC: W5FD. Repeater Coordinator: W5BFD. The attendance at the Delta Division Convention in Little Rock was over 2500. Again, a big thanks to the CAREN Club for their help and sponsorship. M. L., W5OKR, loaned a Volume 1 ARRL Handbook to someone at the Little Rock Hamfest last year and has not had it returned. If you know the whereabouts, please contact M. L. as he would like it returned. Congratulations to K5OVC on being in the first 100 stations to qualify for the Golden Jubilee DXCC. Assistant Technical Coordinators are needed in northeast, southeast, southwest, and west Arkansas. Please contact Elmer Wingleid W5DF at 26 Belmont Dr., Little Rock, AR 7204 or meet if you know anyone who may be interested. Attendance at the Mid-America Amateur Radio exhibit sponsored by the Hot Springs ARC has been excellent. March Traffic: W5OFU 98, W5OK 62, W5MH 36, W5UAU 25, W5RIT 18, W5BISG 18, W5KL 10.

**LOUISIANA:** SM, John "Wondy" Wandergem, K5KR—ASM: K5CX. SEC: N5ADF. SGL: K5SSL. OOC: K5EQK. TC: N5JM. PACKET: N5SS. New officers of the Lafayette ARC. Pres: Stu-W5DFDD. V.P.: Francis, W5LWP. Sec: Betty, K5DKF. Tres: Don, K5RAU. June, N5HBG, the Lafayette Hamfest Chairlady deserves another big cheer for running a super hamfest. Welcome aboard to Ed Crump, K5CX, of the Central ARC in Alexandria who was appointed as the ARRL Assistant Section Manager for Louisiana. Mark your calendar for the New Orleans Hamfest on June 20-21 sponsored by the Jefferson ARC being held at the Rummel High School in Metairie. Details in this QST in Hamfest Calendar Section. Congrats to Richard, K5BTF, on passing the certification exam and appointment as ARRL Official Observer in the Amateur Auxiliary to the FCC's Field Operation Bureau. The Baton Rouge QCWA Chapter reports reaching 105 members. They meet Sundays at 8:30 AM on 3905 kHz with Bill, W5URR as net control. The QCWA breakfast held at the Lafayette hamfest was filled to capacity. El, W5MD, QCWA Chapter 109 President, presented long-time license certificates to Jerry, W5FCG, Eddie, W5EX1, and Howard, K5BLV. Congrats to Joe, K5MMV, for winning the QCWA-109 1986 activity participation. Traffic: LTN: 25 sessions, 72 msg, 189 checkins. DRNs: 765 msg in 62 sessions. La 100% by WA5LHL, K5WOD, WA5WBZ, WA5V, WA5TQA, KF5VV, KA5VZP.

**MISSISSIPPI:** SM, James N. Davis, K5SZ—ASM: W5TRD. SEC: W5SID. STM: N5AMK. SGL: NCSY. ACC: K5VXV. PIO: W5NM. OOC: K5K. BM: AJDX. TC: W5SSXK. VHF Coord: N5DVU. Congrats to N5JSR, N5LU, upgrade to Gen, KASV DX, K5BBI & K5APKA to Tech and N5FZ & Public Safety Amateur Radio of Jackson on receipt of Official club status. Best to WA5WRE for speedy recovery FM tower fall. CAND (W5KLV), sess: 31, QTC 796, Miss. Rep. 100% by N5AMK. DRNs: (W5YDD) Sess: 82, QTC 765, Miss rep 100% by N5AMK, K5JZ, W5HKW, K5SW, K5E5C, W5ACS, K5ZFM, MSBN (W5JP) Sess: 31, QNI 1168 (New record) QTC 44, MTN: (K5SW) Sess: 31, QNI 183, QTC 46, MMN: (W5JL) Sess: 31, QNI 406, ATC: 9, GCSBN (W5GHS) Sess: 31, QNI: 1168, QTC 20, MSN (W5YR) Sess: 22, QNI: 110, (New record), QI C: 20, Rankin County ARES (K5F5) sess: 4, QNI: 42, QTC: 2, Packet BB: 017, Sent 1, Del 1, ARRL Info Net (K5Z) Sess: 3, QNI 57, Hattisburg ARES (W4KGJ) Sess: 5, East Miss FM Net (N5SM) QNI: 20, Audubon County ARES (W5DHL) Sess: 6, QNI: 91, Missoula Nat (W5DC) Sess: 5, QNI: 175. K5OS announces candidacy for Delta Div Vice-Dir. Much info avail from HQ ARRL to club sects for ur local high school libraries. Traffic: N5AMK: 427, W57COQ: 54, W5LHA 16, W5SH: 208, W5HKW: 17, W5WZ: 64, K5TZ: 118, P5HR N5AMK with 107 points. Field Day just around corner.

**TENNESSEE:** SM, John C. Brown, N04Q—ASM: WA4GLS. ACC: WA4GLS. OOC: W9FZW. SEC: WA4GZZ. SGL: WA4GZZ. STM: NG4J & STC: W4HHK. The novice enhancement program is well under way by this time and I hope that all you older heads take the time to drop down into the new bands of the novice and techs and make a few contacts and give some encouragement to the struggling amateurs in that part of the band. Operating procedures are one of main things where some help might be needed. The 220 MHz part really needs usage and occupancy for record purposes. This is especially true in view of possible loss to the land mobile service. All need to mark your calendars for the 1987 \*FIELD

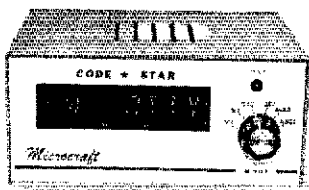
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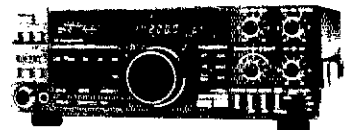
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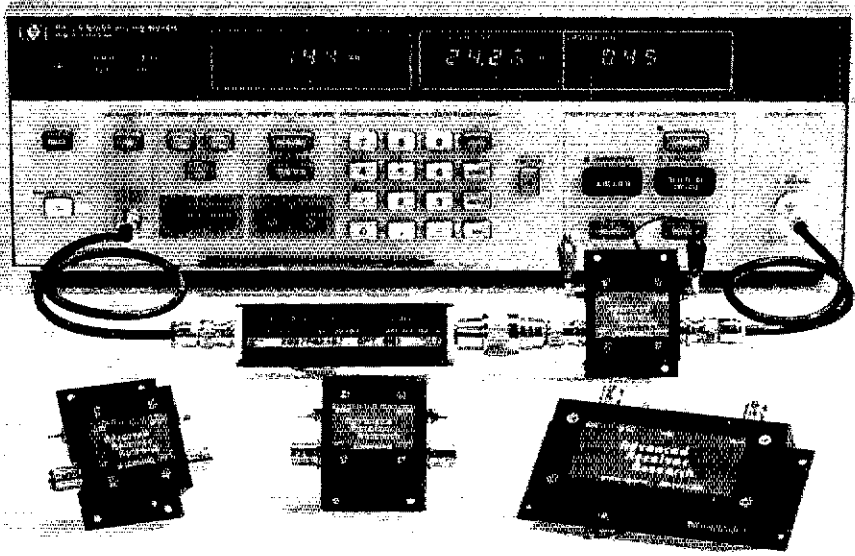
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P50VDG	50-54	< 0.5	24	+12	GaAsFET	\$79.95
P144VD	144-148	< 1.5	15	0	DGFET	\$29.95
P144VDA	144-148	< 1.0	15	0	DGFET	\$37.95
P144VDG	144-148	< 0.5	24	+12	GaAsFET	\$79.95
P220VD	220-225	< 1.8	15	0	DGFET	\$29.95
P220VDA	220-225	< 1.2	15	0	DGFET	\$37.95
P220VDG	220-225	< 0.5	20	+12	GaAsFET	\$79.95
P432VD	420-450	< 1.8	15	-20	Bipolar	\$32.95
P432VDA	420-450	< 1.1	17	-20	Bipolar	\$49.95
P432VDG	420-450	< 0.5	16	+12	GaAsFET	\$79.95
<b>Inline (rf switched)</b>						
SP28VD	28-30	< 1.2	15	0	DGFET	\$59.95
SP50VD	50-54	< 1.4	15	0	DGFET	\$59.95
SP50VDG	50-54	< 0.55	24	+12	GaAsFET	\$109.95
SP144VD	144-148	< 1.6	15	0	DGFET	\$59.95
SP144VDA	144-148	< 1.1	15	0	DGFET	\$67.95
SP144VDG	144-148	< 0.55	24	+12	GaAsFET	\$109.95
SP220VD	220-225	< 1.9	15	0	DGFET	\$56.95
SP220VDA	220-225	< 1.3	15	0	DGFET	\$67.95
SP220VDG	220-225	< 0.55	20	+12	GaAsFET	\$109.95
SP432VD	420-450	< 1.9	15	-20	Bipolar	\$62.95
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DAY" exercise. I am sure that you will remember to take a novice or technician out and introduce them to long standing emergency and fun exercise. I am looking forward to getting the activity report for the extra total score. I have not had an excessive number in the past. Points are too hard to come by, so send in the report. Your SM will be looking for your report. Also suggest that all field day operators be sure and get down in that part of the bands for contacts. Please Note, all volunteer examiners. "Remember it takes two to administer a NOVICE examination now." Now that the summer season is well under way, make sure to keep in mind the proper precautions for thunder storms and that devious lightning strikes. What with the possible big advance in the costs of all our amateur radio equipment, hope this does not place the equipment out of the reach of some of our potential new amateurs. There has been a lot of activity in the minutes of the executive committee and board of directors relative to privatization of special call sign system. One big problem such a procedure will multiply many times over is the self policing of the amateur bands. The trouble we are having now would be nothing compared to what it could be then. Something to think about. It is hoped that none of you out there were caught by those unethical persons that are trying to separate some of the amateurs from the ever short money supply by trying to make you believe that they can do something about getting your license renewed for a fee. You do not need to pay anyone to do that. Just fill out the FCC form 610 and send it in to P. O. Box 1020, Gettysburg, PA 17325. Send no money please. Traffic activity for the period of the 1987 Sessions 71, QNI 4520, QTC-200, VHF - Sessions 48, QNI-1099, QTC-517; CW-Sessions-40, QNI 279, QTC 89, CW net Honor Roll is W4LVP, N4OZB and NG4J. Traffic: W9FZW 204, WA4FMR 119, W4DDK 86, K4WOP 64, K4WOP 58, K4WWQ 57, K4WOP 47, NN4S 28, W4PFP 13, NN4D 12, KA5KDB 12, K14V 9, KE4LS 7, N4DZB 7, WA4HKU 7, W4PSN 7, W4EWR 4.

### GREAT LAKES DIVISION

**KENTUCKY:** SM, Dale Bennett, WA4JTE—This is my last column and I wish to express my thanks to all who have helped me these past 18 months. I know you will give John, WM4T, the same support as you gave me. Enjoyed seeing everyone at the state convention in E-Town. Thanks to those who attended the ARRL/KY Section forums. Very good packet forum put on by KF4NB. Thanks, Glen, Congrats to Tom Lykins, WD4RWU on becoming the new manager of MKPN. Thanks to Rosie, KA4SAA, for the fine job on MKPN. Thanks, Russ, KA4GBZ, for moving KTN to avoid two section nets meeting at the same time. Several Novice 10-Meter Nets are being formed. NKARC meets 8 PM EST on 28.410. Have heard of others, but no details. If you have started a net, send WM4T the info. Traffic: K4VHF 130, WD4RWU 111, K14QH 106, KA4SAA 57, K4AVX 35, KA4ITX 35, K4HOE 28, WA4SWF 18, W4WQZ 16, KA4GBZ 11, WD4CQF 10, WA4AVV 8, KK4ET 6. Late KYN now meets on 3600 MHz at 0245 Z daily.

**MICHIGAN:** SM, James R. Sealey, WB8MTD—Silent Key, WA8LWN, WB8MTD, our SM, is experiencing a bit of a medical problem. By the time you read this column, Jim will be well on his way to recovery. This column is being prepared by WB8QV, GLEC. Preparations are under way for the U.P. Hamfest to be held at the Marquette Convention Center July 26th. The MI ARRL State Convention will be held in Saginaw, August 29-30, in conjunction with the GL Division Convention. Hope to see many of you there. The new Novice and Tech. Privileges are going over well. Many are on the air for the first time. There is talk in Club New Letters and on Nets about involving these new operators in the NTS, ARES, and packet radio. 10 Meter SSB activity seems to be on the upswing with more new operators on every day. All areas are reporting SKYWARN training sessions for our current storm season. The NWS in Lansing is now part of the ECKN network in South Western Michigan, giving the direct line to spotter networks. The NWS regional office in Ann Arbor has installed a packet station for gathering and dissemination of WX info as well. State RACES Director, WD8DHS, reports that the SS-2 certificates are being returned from Md. now in about 2 weeks. The RACES membership in MI, is reaching new levels under the "New RACES Program." In a recent news release Governor James J. Blanchard said, "I urge all citizens to learn more about protecting themselves from tornadoes and other forms of severe weather." The Michigan Emergency Packet Network (MEPN), on 145.09 MHz now extend across the lower part of the state. The SEC and other local EOC's are on the network. The network, BBS, NBT, is used for NTS traffic, ARRL Bulletin messages for League Clubs and ARES leaders, and all those interested in emergency radio communications. WX watches and warnings are also put forth on this network. U.P. DEC, WD8PAF, reports 30 active packet stations in the U.P. They are working toward a network that will link the upper and lower halves of the State together. Packet networks are now extending well up the East and West coasts of the State from Ohio and Indiana. Traffic: KA8CPS 381, WD8KQC 240, W8QHB 194, AF8V 87, W8RNO 69, WB8SYA 54, K6HAP 49, W8HX 47, W8YQ 46, N8JX 45, W8BDH 44, W8ECV 42, W8EOJ 39, N8HWL 37, N8HHH 31, K8UPE 26, W8COP 25, W8CU 15, N8EX 15, K18O 14, N8CNY 14, W8VZ 12, W8ULM 9, W8WJV 9, W8MVB 7, W8VIZ 7, K8BTU 6, K8ZJU 5.

**OHIO:** SM, Jeffrey A. Maass, K8AND—ASM: N8AUH, SEC: WD8MPV, STM: KF8J, BM: W8ZM, ACC: KJ30, TC: K88MU, CQC: AD8J, SGT: N8QVK.

NET	QTC Sess.	Time(Local)	Freq.	MGR
BN(E)	320	130	1845	3.577 NBEVC
BN(L)	216	126	31	3.577 K8TVK
BNR	298	89	31	1800 3.605 W8EK
BSSN	416	168	62	0945,1900 3.873 K8OZ
ONN	213	32	29	1825 3.708 WD8KAW
OSN	360	89	31	1810 3.577 N8AEH
OSSBN	2417	690	93	1030,1615, 3.9725 W8BJGW
				1830
OSSN	244	89	31	0645 M-F 3.577 KA8GJV
				0800 S-Sn 3.577 K8RGJV
				1500 Sun. 3.875 WD8MPV

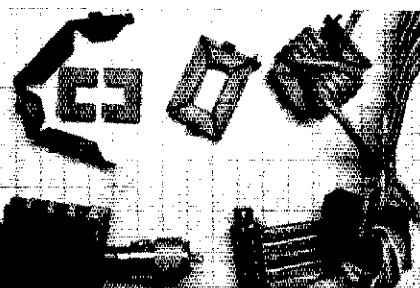
Ohio Section ARES Net (Akron) June 7, Hicksville/Delaware June 14 (?) VE exam session: Ohio Section of the ARRL Field Organization, was mailed during the first week of April, and was the best yet. Sixteen pages of information, co-edited by N8AEH and K8BTNA. The OSJ is mailed to all ARRL appointees and A-

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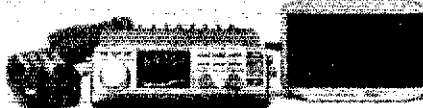
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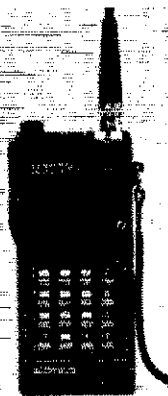
TM-411A Compact 25W 440 MHz FM Mobile  
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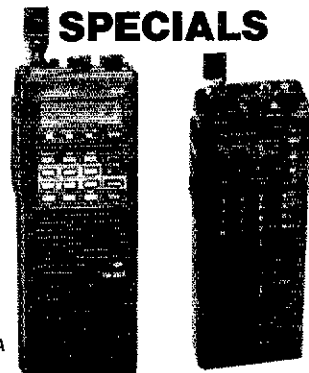
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# KENWOOD

ALL NEW  
FM mobile!

## Here's One for You!

### TM-221A/421A

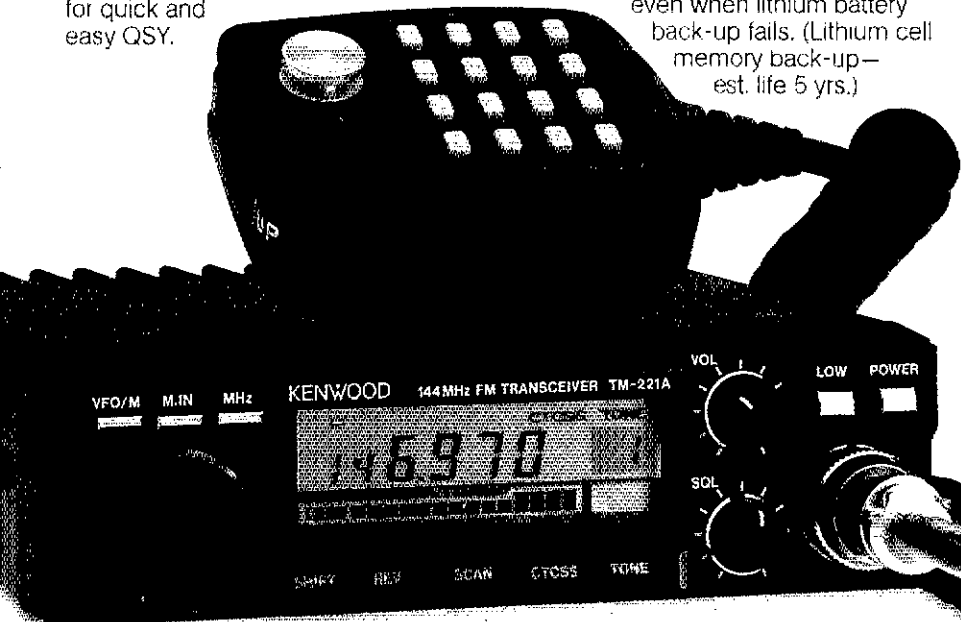
#### 2 m and 70 cm FM compact mobile transceivers

The all-new TM-221A and TM-421A FM transceivers represent the "New Generation" in Amateur radio equipment. The superior Kenwood GaAs FET front end receiver; reliable and clean RF amplifier circuits, and new features all add up to an outstanding value for mobile FM stations! The optional RC-10 handset/control unit is an exciting new accessory that will increase your mobile operating enjoyment!

- **TM-221A provides 45 W. TM-421A is the first 35 W 70 cm mobile!** Both models have adjustable 5 W low power.
- **Selectable frequency steps** for quick and easy QSY.

- **TM-221A receives from 138-173.995 MHz. This includes the weather channels!** Transmit range is 144-148 MHz. Modifiable for MARS and CAP operation. (MARS or CAP permit required.)
- **The TM-421A covers 438-449.995 MHz.** (Specifications guaranteed for Amateur band use only.)
- **Built-in front panel selection of 38 CTCSS tones.** TSU-5 programmable decoder optional.
- **Simplified front panel controls**—makes operating a snap!
- **16 key DTMF hand mic., mic. hook, mounting bracket, and DC power cable included.**
- **Packet radio compatible!**
- **Kenwood non-volatile operating system.** All functions remain intact even when lithium battery back-up fails. (Lithium cell memory back-up—est. life 5 yrs.)

- **14 full-function memory channels** store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2 m is automatically selected.** There are **two channels** for "odd split" operation.
- **Programmable band scanning.**
- **Memory scan with memory channel lock-out.**
- **Super compact:** approx. 1-1/2"Hx5-1/2"Wx7"D.
- **New amber LCD display.**
- **Microphone test function on low power.**
- **High quality, top-mounted speaker.**
- **Rugged die-cast chassis and heat sink.**



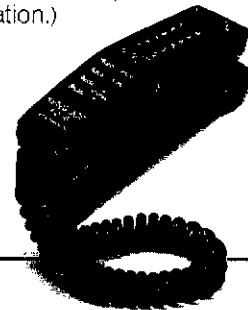
#### Optional Accessories:

- **RC-10** Multi-function handset remote controller
- **PG-4G** Extra control cable, allows TM-221A/TM-421A full duplex operation
- **PS-50/PS-430** DC power supplies
- **TSU-5** Programmable CTCSS decoder
- **SW-100A** Compact SWR/power/volt meter (1.8-150 MHz)
- **SW-100B** Compact SWR/power/volt meter (140-450 MHz)
- **SW-200A** SWR/power meter (1.8-150 MHz)
- **SW-200B** SWR/power meter (140-450 MHz)
- **SWT-1** Compact 2 m antenna tuner (200 W PEP)
- **SWT-2** Compact 70 cm antenna tuner (200 W PEP)
- **SP-40** Compact mobile speaker
- **SP-50B** Mobile speaker
- **PG-2N** Extra DC cable
- **PG-3B** DC line noise filter
- **MC-60A, MC-80, MC-85** Base station mics.
- **MC-55** (8-pin) Mobile mic. with gooseneck and time-out timer
- **MA-4000** Dual band antenna with duplexer (mount not supplied)
- **MB-201** Extra mobile mount

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

#### RC-10 Remote Controller

Optional telephone-style handset remote controller RC-10 is specially designed for mobile convenience and safety. All front panel controls (except DC power and RF output selection) are controllable from the RC-10. One RC-10 can be attached to **either or both** TM-221A and TM-421A with the optional PG-4G cable. When both transceivers are connected to the RC-10, **cross band, full duplex repeater** operation is possible. (A control operator is needed for repeater operation.)



# KENWOOD

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2201 E. Dominguez St., Long Beach, CA 90810

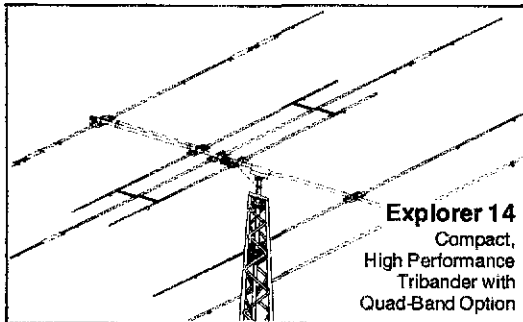
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## Broadband Tribanders

State of the art antennas to maximize the performance of your ham gear.

### Explorer 14

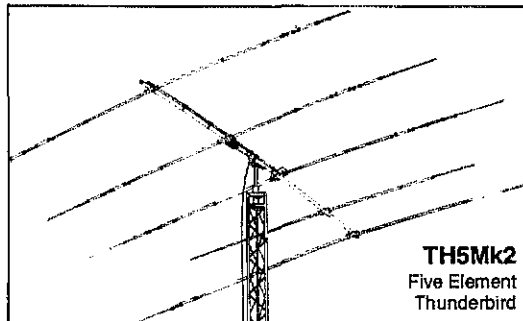
Unique PARA-SLEEVE design (patent pending) achieves exceptional broadband performance in this compact antenna. Forward gain and front-to-back ratio outperforms other antennas of the same size. Surface area is 7.5 sq. ft. (.69 m<sup>2</sup>). With a 14 ft. (4.3 m) boom the turning radius is only 17 ft. (5.3 m). The ideal choice where space is limited. Great for roof mounts or small towers. Optional kit for 30 or 40 meters.



**Explorer 14**  
Compact,  
High Performance  
Tribander with  
Quad-Band Option

### Five Element Thunderbird TH5Mk2

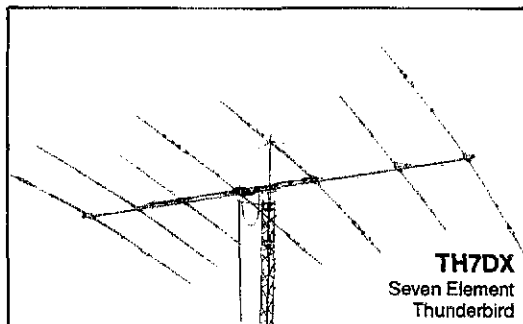
Broadbanding is achieved with our unique dual driven element system. Five elements on the 19 foot boom (5.8 m), with four active elements on each of the three bands. A rugged antenna with 7.4 sq. ft. (.68 m<sup>2</sup>) of surface area. Turning radius is a manageable 18.4 ft. (5.6 m).



**TH5Mk2**  
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### Seven Element Thunderbird TH7DX

Successor to the legendary TH6DXX. Five active elements on 10 meters and four elements on both 15-20 meters. The TH7DX represents the ultimate in high-performance arrays whether you're comparing other large tribanders or stacked monobanders. Surface area of 9.4 sq. ft. (.87 m<sup>2</sup>), a 24 ft. (7.3 m) boom and a turning radius of 20 ft. (6.1 m). Conversion kits for TH6DXX available.



**TH7DX**  
Seven Element  
Thunderbird

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KA2JMA 15, K2TWZ 14, N2GQS 11, N2FLS 5.

**NORTHERN NEW JERSEY:** SM, Robert R. Anderson, K2BGJ—ASM (VE Liaison); N2XJ, ASM (FO Info) N2BFG. SEC: N2BMM, STM: KA2F, OO/AAG: KA2BZS, ACC: KY2S, PIC: WB2NQV, SGL: W2KB, TC: K2BLA and BM: N2CXX. March appointments are: WA2EXX replacing WB2HVF as DEC of Essex County, and WD2ADH as DEC of Middlesex County. ECs: KA2AL, KA2BTD, KD2LW, K2DZL, WA2BIF, WA2INW, and WA2UFC. WD2AHD as NM of the TCETN; OESs: KA2ALS, KA2BTD, KD2JUC, N2BSC, N2EVD, WA2BIF, WA2EXX, WA2GYK, WA2INW, WA2UFC, WB2WYS, and WD2ADH. ORSs: K2TZC, K4HGW, KB2QO, KB2WI, N2CXX, W2UH, WA2EPI, WA2HPD, WA2INE, WA2PAC, WA2ZNT, WB2VUF, and WD2AHD. In Bergen County, we are now close to obtaining the goal of having an EC for each municipality. The ORSs are not new to traffic handling. They are a result of the efforts by our new traffic manager to sign up giving deserved recognition to many of the dedicated individuals who have been handling NJ traffic all along. The TCETN is again active with WD2ADH as Net Manager. K2BIM has been appointed RRN Packet Manager by K2DZL. N2J staff. NJU was represented by KA2F, N2XJ and WB2QMP at a Hudson Division level Traffic Improvement Committee meeting held on 3/14/87. The Neptune ARC and the Ocean Monmouth ARC have renewed their status as Special Service Clubs. The Chestnut Ridge RC of Teaneck is now an ARRL affiliate club. Congratulations to the following who were newly licensed or upgraded during March sessions conducted by Raritan Bay RAC, NNJ VE Board, Bergen ARA, Ocean/Monmouth ARC, and Sussex County ARC. Novice: A Bekiarin, R Swenson, and H Simmonds. Technician: KA2JKB, KA3QES, S Voyce, KA2BCT, KA2BJV, KB2BVI, KB2CJH, KB2BDN, KA2GZ, KA2US, P Zauke, J22AK, K2DZL, KA2LTL, KB2CIS, KB2CGE, KA3PYD, and KB2BPA. General: KA2VCV, KA9YCB, KA2YCC, KB2BWS, KA2YQO, A Tencza, KB2BMB, KB2BUH, W Kenan, and WB2QGH. Advanced: N2GYD, K2HMN, KA2IRQ, WB2JGZ, WA2JVM, WA2KBN, N2CJS, WA2YCJ, KB2BRP, N2GOI, WA2ZGE and N2GOT. Extra: WB2CGI, WD2AHD, KA2ZJH, N2FUD (12 Yr old), K2HKW, KB2IB, N2GPE, and W2HUX. 5 of the 6 Techs at Sussex ar YLs! Traffic data (P indicates VHF Packet Liaison):

### MIDWEST DIVISION

**IOWA:** SM, Wade Walstrom, W6EJ—ASM: WB6AVW, SEC: KD0BG, STM: KC0XL, OOC: W6VX, ACC: NU0P, BM: K0BII, TC: K0DAS, SGL: AK0G. A big "Thank You" goes to WB6AVW for his contribution as Iowa Section Manager. We are fortunate that he is now serving as ASM. Welcome, also to NU0P as the new ACC. I encourage all to use packet in submitting news and reports to the SM via WA0RTJ-1. Participation in the Iowa and Zero District QSO Parties seemed to be up a bit this year. Thanks to those who participated. The Cedar Valley ARC sponsored their own 1040 Contest. The Turkey Island DX Club in Ottumwa has become an ARRL affiliated club. Congratulations to W6EJ and WB2J for being the only 0 district station in the first 100 to earn the Golden Jubilee of DXCC Award and to N6FLI on upgrading to Advanced and K0GV8 to Extra. Some new calls in the section include KA0ZHE, KA0ZIE, KA0ZEY, and KA0ZKW. Field Day plans should be well under way by now. Do not forget the Novice transmitter!

Net QNI QTC Freq Time Day Mgr  
la75M-Noon Sess 1200 72 3970 1830 Dy WB6JFF  
Eve. Sess 808 36 3970 0000 Dy N6AEF  
ITEN (5 sess) 134 11 3970 2330 Sun KD0BG  
TLCN (62 sess) 227 103 3580 0030 Dy W6VLS  
W.C.ARES (22 sess) 300 147 69 0030 M-F K0CNI  
Traffic: W6EJ 11, W6VX 15, K0BII 95, K0KPT 88, K0KPT 62, W4JL 43, WB6JFF 31, WB6AVW 31, KC0XL 22, KB0RE 16, W6BW 11, KA0GSA 11, KA0VBA 8, WB6MCK 7, NU0G 6, N0DKG 4, KA0VOW 4.

**KANSAS:** SM, Robert M. Summers, K0BFX—SEC: NB0LD, STM: W0OYH. 1987 has gotten off to a very sad start with the deaths of some of our most active members of the traffic gang, and now word of another of this fine group, Dick, WB0I, is on the ailing list. Dick has suffered a couple of strokes this past month. Traffic net reports for Feb are as follows: K5BN QNI 1215 QTC 103, KPN QNI 539 QTC 36, KAWN QNI 811 QTC 675 and KMWV QNI 831 QTC 585, CSTN QNI 2299 QTC 66, QKS QNI 275 QTC 59, QKS-SS QNI 46 QTC 15 and Ks RTTY net QNI 27 QTC 1. KA0CUF would like to see more of those RTTY stations trying a bit harder to make the net sked. THANKS again to N6FNL, WB0I, KX0I, K5BU for their work in TEN (Regional CW Network). Packet repeater KA0CXK-WMDC is operating around the Mound City area according to the MNCI Traffic Office Enhancement Bulletin. Good news as of late, should produce lots of code and theory classes. Let us make sure our new graduates get on the air. Congratulations to N6FTY on the birth of a new male harmonic. No doubt this harmonic will be able to be heard any morning about 2 or 3 AM, frequency yet to be determined. N0HAF is also a new proud papa in the KC area. A male harmonic also. Traffic: W6FRC 413, W6FIR 168, K0BFX 128, WB0ZEN 82, NB0Z 72, W6FDJ 61, W0OYH 59, W4OZHO 52, W6QMT 49, W6MYM 23, N6GZT 16, W6PB 8, W0TQ 5.

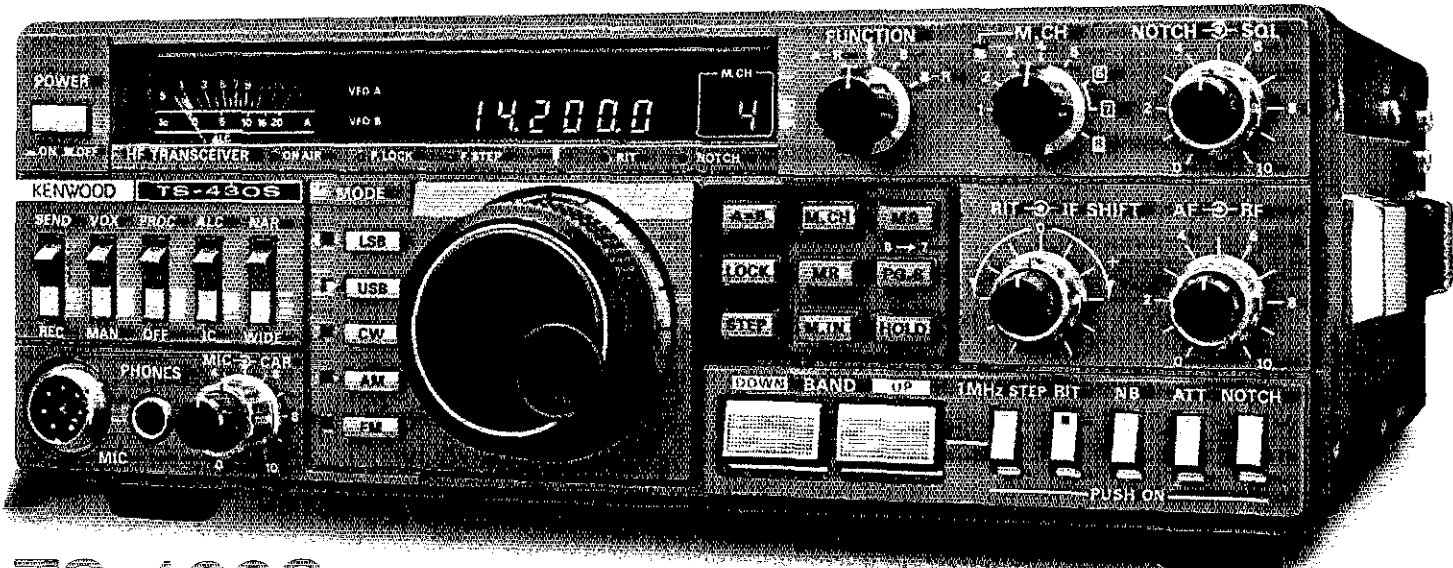
**MISSOURI:** SM, Ben Smith, K0PCK—New Section Field Appointments for the month are: KA0WZX OES and OBS and KDBAJ, OES. For the last three years of amateur radio booth at the Missouri State Fair the Central Missouri Radio Association had been in charge of the operation. After the booth was discontinued due to any other organization to sponsor the operation the CMRA trustees of the operating funds. The balance of \$141.70 was donated to the Handi-Hams System in the name of the amateur radio operators of Missouri. KA0DFN, president and Net Manager of the International Order of Handicapped Radio Amateurs has been re-appointed to a three-year term as a representative of the President's Committee on Employment of the Handicapped. Silent Key reported, WB0IE. If your club is holding FCC Exams send the information to the Section Bulletin Manager, WB0TEG and the date will be sent out in the Section Bulletins. Nets reporting: (March)

NET SES QNI QTC DAY TIME(PM) FREQ(MHz) MGR  
MON 62 217 172 Dy 7:00/9:45 3.585 K0SI  
MOSSB 31 799 90 Dy 6:00 3.963 K0CRB

# KENWOOD

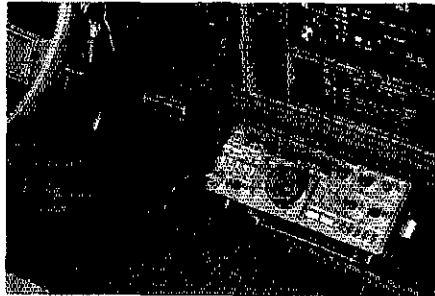
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## “Digital DX-terity!”



## TS-430S

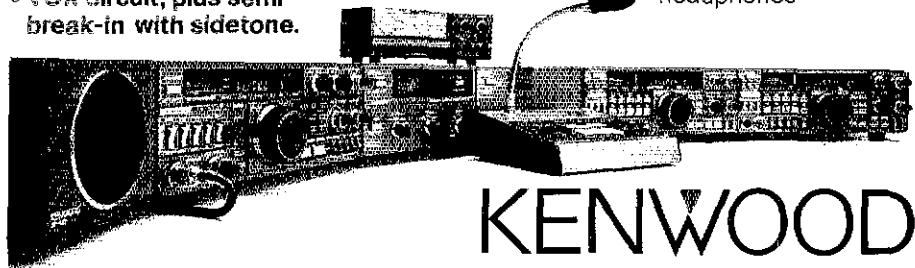
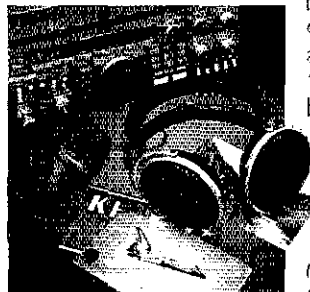
**Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!**



- **Reliable, all solid state design.** Solid state design permits input power of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.
- **Memory channels.** Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.
- **Programmable, multi-function scan.**
- **Speech processor built-in.**
- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**

### Optional accessories:

- PS-430 compact AC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands
- AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands
- TL-922A 2 kW PEP linear amplifier
- FM-430 FM unit
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters
- YK-88SN (1.8 kHz) narrow SSB filter
- YK-88A (6 kHz) AM filter
- MC-42S UP/DOWN hand mic.
- MC-60A/80/85 deluxe desk mics.
- SW-2000/200A SWR/power meters
- SW-100A SWR/power/volt meter
- PC-1A phone patch
- HS-4, HS-5, HS-6, HS-7 headphones



# KENWOOD

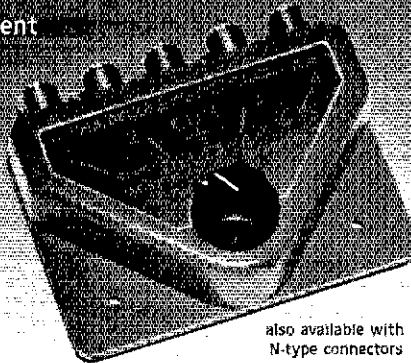
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Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

# Alpha Delta Model DELTA-4 Lightning Surge Protected 4-Position RF Coax Switch

Superior RF switching and equipment protection for amateur, military and government communications stations.

- Exclusive center "off" (ground) position internally disconnects and grounds all antenna circuits for maximum protection when operator is away from the station — an Alpha Delta first!
- Incorporates the famous replaceable Arc-Plug™ cartridge for continuous protection of the active antenna circuit. Unused antenna circuits are automatically grounded. — an Alpha Delta first!
- The Model DELTA-4 Switch features a custom designed cast housing with constant impedance micro-strip cavity construction for outstanding performance through UHF. No lossy wafer switches are used.



also available with N-type connectors

- Positive detent ball bearing switch drive tells you which position you're in . . . without guessing . . . without looking.
- DELTA-4 handles full legal power.
- Designed and produced in the U.S.A. by Alpha Delta.

Model DELTA-4 4-position coax switch (UHF connectors) . . . . \$69.95

Available from your local Alpha Delta Dealer or direct. Add \$4.00 shipping and handling (U.S.A. only). Exports quoted.

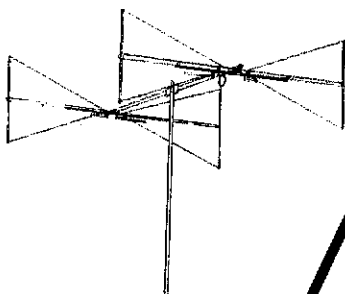
See Data Sheet for surge limitations.



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The HF4B "Butterfly"™  
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Butternut's HF verticals use highest-Q tuning circuits (not lossy traps!) to outperform all multiband designs of comparable size!

### Model HF6V

- 80, 40, 30, 20 15 and 10 meters automatic bandswitching.
- Add-on kit for 17 and 12 meters available now.
- 25 ft. tall

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- Designed for the low-band DXer
- Automatic bandswitching on 80 and 40 meters
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- 32 feet tall - may be top loaded for additional bandwidth.

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405 East Market Lockhart, Texas 78644

MEOW	31	696	81	Dly	8:30	3.963	K0DSQ
HBN	22	275	15	Mon-Fri	12:05	3.880	K0DSQ
MTTN	19	23	14	Mon-Sat	6:30	3.370	N0BKE
PHD	5	171	9	Mon	9:03	146.443	W4KJUH
SLAN	5	373	7	Mon	8:00	146.317.91	K0VEX
ZAEN	7	91	8	Tue	8:00	147.847.24	N0BE
HRABN	30	418	5	Dly	8:00	146.191.79	K4BLN
ARESN	4	46	2	Thu	9:00	147.855/255	N0FGW
MOFON	4	25	2	Wed	8:15	222.424.02	A0BO
CMEN	5	81	1	Wed	9:00	146.167.76	K0PCK
LOZBC	26	525	0	Mon-Sat	6:00AM	146.137.73	W0RTL
SWARC	5	132	0	Tue	7:00	146.317.91	K0RUD
LOZFM	4	75	0	Fri	9:00	146.137.73	W0RTL
SARN	5	82	0	Tue	9:00	146.437.03	W0ENW
TCN	4	36	0	Thu	9:00	147.087.63	K4BLO
JCCCN	4	34	0	Wed	8:00	146.407.00	W0CRI

Traffic: W0BMA 330, K0SI 202, K0PCK 128, W0HTN 75, W0UOD 55, W0DYJX 69, N0BKE 34, K0ORR 35, W0EYA 35, N0BR 27, K9OCU 26, K0GL 23, N0SS 19, W0DELL 13, W0BCJB 11, K0JUA 2, W0ATU 1.

NEBRASKA: SM, Vern Wirka, W0GOM-STM; Jerry Kohn, W0EGK, SEC; Michael Fuhrdanz, N0FER. In Nebraska, the month of March 1987 contained just about every kind of weather... rain, hail, a tornado and two blizzards. The record setting blizzard of March 28 and 29 kept attendance down at the Nebraska ARRL Convention but 250 did manage to get snowed in at the Keamey Holiday Inn. Heavy rains occurred before the snow in Eastern Nebraska which caused lowland flooding along streams and rivers. Due to the flooding, Red Cross officials requested amateur radio assistance in damage assessment of the affected areas. Jim Stafford, N0AH, and Mitch Gagne, N0AZF, conducted the survey from the Red Cross communications van and Walt Brown, K0DMB, handled the communications duties at the Omaha Red Cross amateur radio station. Section Emergency Coordinator, Michael Fuhrdanz, N0FER, and Walt Brown, K0DMB, conducted presentations on amateur radio at the Nebraska State Civil Defense Workshop in Grand Island on April 10. Larry Martens K0SW, of Fremont, is now the Net Manager of the Dodge County ARES 2 Meter Net which meets Wednesday evenings on the Fremont repeater, 146.07-67.67 MHz, 1900 local standard time, 1930 local daylight time. Traffic: K0KIM 273, W0KIC 85, K0BCT 45, W0BOK 21, W0GOM 14, N0BA 11, K0BGB 9, W0BGM 5, K0BZX 2, W0BRC 2.

### NEW ENGLAND DIVISION

CONNECTICUT: SM, John T. Ronan, K3ZJJ—STM; K1EIC, SEC; K1ECL, ACC; K3IM, OOC; NA1I, TC; W1HAD, BM; K3ZJJ, PIO; KX1B, SGL; W1AH.

NET	SESS	ONI	QTC	MGR
NVHFN	28	209	56	K1CE
CPN	31	371	113	K1BHT
WESCON	31	351	183	WB1GXZ
CSN	22	190	105	WB1GXZ
RASON	31	202	37	K1JJAN
CN	56	251	195	K1EJR

"We couldn't have done it without the Ham Radio operators!" Dr. Rinaldi, Director of the April 4 Stamford Marathon was justified in his praise of the Stamford AFA and the 40 operators who participated. Well earned congratulations goes to Jim Pennypacker, WA1CMF, organizer and SARA Pres. as well as KA1POT, N1AWJ, WA1PDK and many others. Fr. Edwardo, K2VVO, visited W1LFR at his Weston QTH and stopped by ARRL HQ to meet W1RA, K1ZZ and Kit Co. Fr. Edwardo has been reassigned from the Vatican to Kit Peak, NM, leaving only semi-active HV1CA and HV3SJ to represent Vatican City. Re-elected at the annual TSARC meeting were K3ZJJ Conf. Dir. and KB1H, WA1PDK Vice Dirs. Thanks to N1CUP K1CVF KA1GXM FARA visited Moore Special Tool Co. to view computer aided manufacturing. Ed, W0GMS, and XYL Martha visited renowned DXer KH6L at his Honolulu QTH. The SARC auction was an unqualified success with WA1FOK as the humorous auctioneer. Some 80 bidders attended. The SARC Roundtable has moved to 28.485 at 7:30 PM on Tuesdays to include Novices. The April 4 ARRL Conn. QSO Party was once again a popular success. W0CQ unfortunately spent several weeks at the GNARC WA1GOC/R. repair site—Norwalk Hospital Art is now home and recovering. KA1FVY is organizing the next FARA Novice class to start May 3. Congratulations to W8EVH who has become DEC Dist. 7. Ernie organized W0TON ARES earlier this year. KA1NYZ of Cricket Wireless Assoc. is organizing the Glastonbury H.S. ARC. Tri-City ARC held a banner VE Exam in March with 30 applicants and a 2/3 pass rate, thanks to K511 (Chairman) KF1B KY1F WB1ESJ K1IC W0BSIV NE1A. Among the successful were WA1RHS KA1AF KA1JQW (Extra) K4BDIN N1AKW K4SGIS WA1WYN (Advanced) KA1NUI WB1HKM KA1OJ KA1LU (General). K1VJ secured a place on the DXCC Honor Roll by being VU4APR on Andaman Island after days of effort. W1LFR bagged VU4APR on the first try—and really wasn't sure who it was until later! SCARA held a spectacular introductory class for its Novice course on April 15 with a two-way ATV demonstration by W1NRE. W1NRE's daughter was surprised to find herself live on ATV when she answered a two-meter autopatch call from the classroom! Traffic: KA1MDM 493, WB1GXZ 243, N1EDD 198, KA1MKJ 184, W1EFW 113, KA1KTH 96, W1YOL 95, KA1GWE 82, KA1BHT 76, K1CE 53, W0BSIV 39, KA1JAN 36, KY1F 35, KB1ZC 33, K1AGE 30, KA1ASD 30, N1BOW 29, W1BDN WA1NLD 13, W1CUH 3, W1QV 2.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM; K9HI, SGL; K3HI, OO/AA; KA1KF, SEC; KB1PA, PIO; K1HLZ, BM; KB1AF, STM; KW1U, TC; KA1IU, ACC; KA1KCU, EMASS Hot Line - 437-0111. Westlink 449-2226.

NET	MGR	FREQ	TIME(LOC)/DY	QTC	ONI
EMRI	N1AJJ	3658	1900/2200	DY	204
EMRIPN	WA1FCD	3880	1730	DY	86
EM2MN	KA1AMR	145.23	2000	DY	188
NEEPEN	K1BZD	3945	0830	SN	9
HHTN	NG1A	04/64	2330	DY	162
HTRIS	N1CVE	3715	1600/2030	DY	41
CITN	KB1AF	745/045	1930	DY	90

Congratulations to new Emergency Coordinator & Official Emergency Station W1HWO. Ben's long-time enthusiasm and expertise will provide the town of Brewster with much-needed ARES emergency communications capabilities. KA1KF reports that members of the EMASS Amateur Auxiliary to the FCC's Field Operations Bureau met with officials of the ECARS network during the month in Kingston to work out certain plans to increase the Auxiliary's effectiveness. Bill also says that there is an increasing number of EMASS Amateurs applying for membership in the Auxiliary - FBI ARRL State Government Liaison K3HI reports that he is still keeping an eye out for legislation that (either by design or coincidence) affects the Amateur Radio Service. W2CAP and KQ1K are in the process of establishing Amateur stations in Harwich and Yarmouth Schools. With Novices now able to operate so many modes, it's become a LOT easier to "sell" our service to prospective Amateurs. I got into an eyeball QSO last week with a young fellow (who turned out to be a State Trooper). We got comparing notes about our respective mobile radios. He was amazed at the

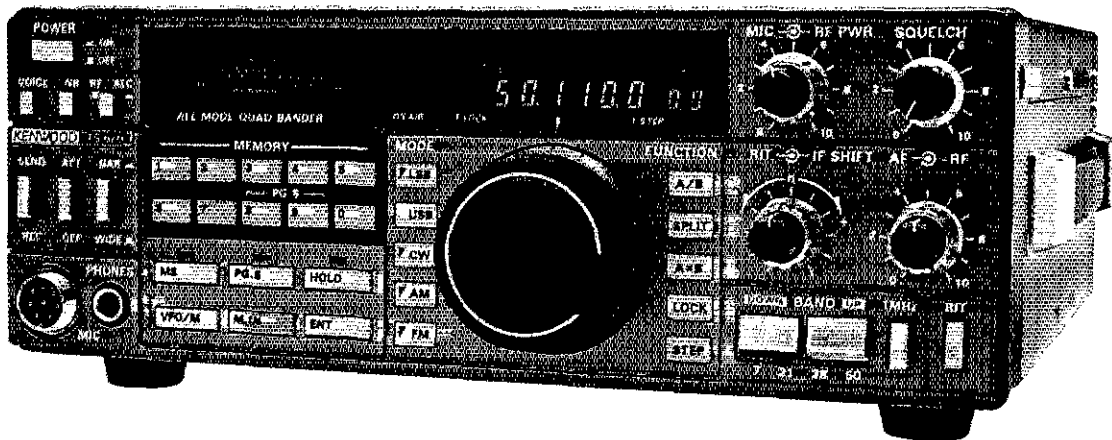
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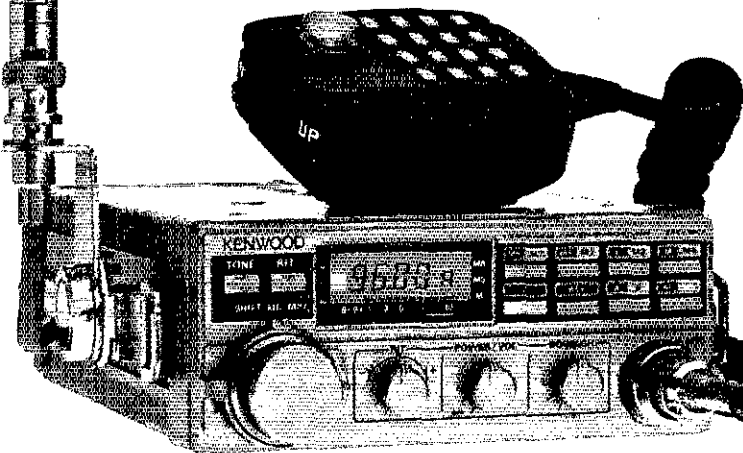
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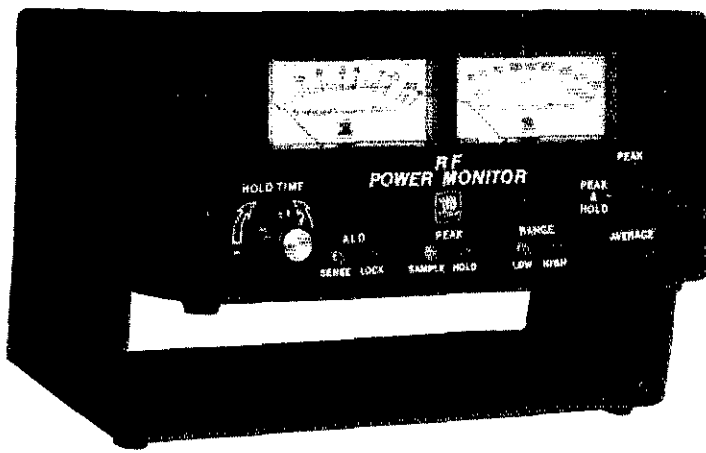
- TM-221A: 2 m, 45 W, with expanded receiver coverage (138-174 MHz). Modifiable for MARS or CAP operation. (MARS or CAP permit required.)
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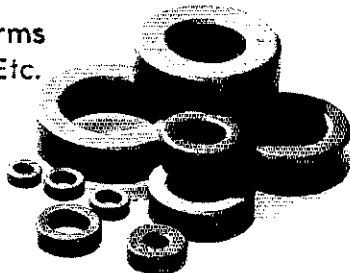
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capabilities that a Novice can now have by just passing two simple examinations - times have certainly changed for the better. Section Tfc manager KW1U reports that of the 32 stations reporting traffic this month, the top NINE are packet stations. Marcia also says that WA1FCD, KB1AF, NG1A, KA1PHP, WA1KLG, WA1TBY, KN1K N1CVE and KA1BBU all made the public service honor role this month - congrats! Traffic: K1BC 735, KW1U 535, KN1K 356, KB1AF 318, WA1TBY 269, WA1FCD 246, W1CE 193, NG1A 190, W1ZHC 144, N1BHF 139, WA1KLG 127, KA1PHP 116, KA1AO 95, N1CVE 85, K1BJ 81, KA1BBU 75, N1AJJ 73, K1SC 70, K1BA 61, KA1AMR 48, KA1EID 37, K1T 36, WB1GIA 32, K1LCO 22, N1BZD 18, KA1KUH 16, N1DVZ 15, KA1LH 15, WA2KFE 10, WA1SNH 7, WA1FNM 6, KA1EDY 4. Have you expressed your opinions to your SM lately?

**MAINE:** SM, Cliff Lavery, W1RWG—ASM: Bill Mann, W1KX. SEC: KA8UVQ. STM: AK1W. BM: W1JTH. ACC: KA1FK8. OOC: W1KX. PIC: KY1E. SGL: K1NT. TC: K1PV. Large sections of the Maine Section were inundated the first part of April by the worst floods in its history. Amateurs responded and conducted coms professionally. Grant, WB4ZSP, activated hams in Penobscot County through the EC, Paul, N1DJ; EC of Kennebec Cty, Win, W1WCI; EC of York Cty, Larry, WB1CIM; EC of Franklin Cty, Dennis, KA1CNG; and EC of Androscoggin, Nate, WA1SAZ. Ray, W1BMX, and Sel, W1CJUV, manned the radios at the temporary shelters in the Auburn and Lewiston armories. Coastal counties down east were not hit hard. The Aroostook Radio Club has elected their new officers: Scotty, WAYNZ, pres; Mel, WA1YI, VP; Cathy, KA1DOS, Sec; Ron, KA1KME, Treas; and Henry, KA1VWX, tech mgr. Congrats to Gally, KA8UVQ, our SEC, who studied for and passed the Extra exam. "Skeet," KA1LPW, reports that "things are going smoothly for the '87 Windsor Hamfest." Phil, W1JTH BM, reports 91 transmissions plus 7 Maine bulletins on packet. There were 10 APRIL 5 ME 2 prop by 5 OBS. Traffic: WB1CBP 183, ND1A 101, W1RWG 53, W1JTH 46, AK1W 45, WA2ERT 44, KA1ODT 23, W1BMX 32, WA1YNZ 22, KA1JOJ 20, W1KX 19, W1VEH 18, W1GCB 17, NB2K 6, KY1E 6. PSHR: WB1CBP 95, WA2ERT 89, W1RWG 77.

NET	SESSIONS	CHECKINS	TRAFFIC	MANAGER
Pine Tree	31	402	120	ND1A
Aroostook E	3	85	1	WA1YNZ
CMEN	9	196	12	W1WCI
FACES	5	88	22	W1RWG
Me Pub Svc	5	77	2	KA8UVQ

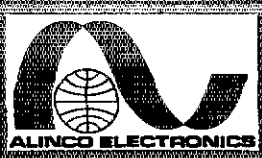
Hamfests: Deerfield (NH) May 9, Bangor June 6/7, St. Albans Aug. 7/8/9, Windsor Sept. 12. Field Day is June 27, and the SM will make his annual pilgrimage to Aroostook City for FD at Presque Isle.

**NEW HAMPSHIRE:** SM, Bill Burden, WB1BRE—TC: W1JY. SGL: N1AIX. March roared in with Novice Enh, new section appointments and new nets! The NH Novice Tfc Net began this month with NCS-KB1XI reporting 20+ checkins each session of the first week. The net meets at 7 PM local on 28.4 each weekday evening. Many new Novices on 10M SSB and 220. NH had 29 new Novices through mid- Feb-but that number increases now! A new emergency net has started on the Moose Mtn net on 147.24 for in contact WB1GXM. Also a new 220 net in Somersworth on 222.8/224.0 (usable by Novices!) reported by GBRA member N1EX. Some changes and additions to the section staff-ASM for Dx and contesting: W1NH, SEC: K1ACL, DEC for Seacoast: WA1PEL, EC: W1OKU. Congrats to all! If you would like join the NH team, drop me a note. We operated the APRIL booth at the IRS fleamarket in Hudson and saw many familiar faces. Several people looking to get into Ham Radio stopped to chat and we pointed them in the direction of an instructor, NARC ran a VE session in Nashua on the same day and Ken K8UXO, VE Chairman reports that they had 42 applicants with 26 upgrades. I visited K1OJC and the Mt. Washington club at a breakfast meeting in March. Ar has been very active with packet experiments lately. The 220 MHz NPRM was the subject of my visits to NARC and the IRS groups with many questions and concerns expressed. We tried something new and had a "conference" on the 220 NPRM on the New England Network with 9 repeaters linked, over 40 inquiries and an estimated 200 listeners all over NE! Finally, with the help of W1HMT, we were able to place letters on the 220 problem in the hands of our congressional delegation. Are we getting more new Novices? Well, 5 members of W1HJT's class got their tickets-KA1PJI, KA1PJS, KA1PJJ, KA1PMN, and KA1PMO-welcome to the fun! KA1DS reports 6 more grads of her class for total of 13. Her next class (total class full at this writing) CNHARC Novice instructors N1EEB, N1EEA, W1WNJ, and N1LT busy with their students while AK4L handles the upgrade class. Several applicants for OBS appointments this month-a valuable service of making APRIL bulletins available on phone, cw, RTTY and packet nets. Dave, WA1FHB had two packet articles accepted-one for QST and one for the Section Leader pub-congrats! Kudoa to Mary Ann NA1D for her DX column in the GBRA newsletter. Dick W4PAS reports that the Thursday night ARES net on 146.85 (Derry) is very active with new ARES members joining regularly. SUGGESTION-many newsletters are looking for articles. Try sending a note describing your latest antenna installation, your first 10M or 220 voice contact, or your recent experience in a contest! Include a B+W pix if you can. YOUR article can help make your club's newsletter! And finally, another 100% on FRN for NH-TNX, TFC HANDLERS! TRAFFIC: (W1TN bk from FLA-Whew!) GSFM 256, N1N 103, GSPN 85, MSOVP 24, W1PEX 717 BPL, N1CPX 415, N1AKS 176, N1NH 96, W1ALE 93, NE1J 90, KB1X 87, K1PQV 81, K8UXO 75, WA1YZN 68, W1FYH 62, KA1LMH 61, K1M 50, KA1NXT 34, N1ALM 33, KA1LBW 32, W1TN 26, WB1GXM 24, K1TQY 22, K1JNJ 6, N1DQA 5, N1CMD 5, K1ACL 2.

**RHODE ISLAND:** SM, John (Bob) Vota, WB1FDY—Congrats to our new Section Manager and good luck for your next 2-year term. I know the membership will be behind you at all times. Traffic: KA1JXH 238, PSHR 100, W1EOP 264, KA1KML 167. TNX to all for the help that they gave me as SM of RI. I hope you all will also help out the new SM of RI. As of this date, we are still waiting for ballot results. 73's CUL.

**VERMONT:** SM, Frank I. Sultor, W1CTM—ASM: KD1R. STM: AE1Y. SEC: W1KRV. PIC: WA1YOY. The top 3 VT QSO Party winners were W1AIM (Chip), K1ZHI (Bob) and WB1GQR (Mitch). Top Club winner was W2DM1 representing the Central Radio Club (Wincham). Trx again to all participants. N1BRT (Fred) held a demo for East Montpelier Elementary School students. SEC (W1KRV) continues to increase ARES activity by publishing his bulletin. Presently, Joe has 144 ARES members of all corners of the state. For more info on how you can participate, contact W1KRV an/or chok into the statewide ARES net on 3967 kHz on Sundays at 1800 local. In addition, club emergency information is available from the following: Upper Valley ARC (KA1XE), Burlington ARC (NB1A), Central VT ARC (KA1LDJ), Burr & Burton ARC (WB2MIC), VT Tech ARC (WA1LYR). Green Mountain Wireless Society (W3ZCE), Conn Valley FM Assn. (N1CB), DEC-NB1A (Kevin) indicates an IBM Burlington Club Weather Net operations guide is available for use by other clubs if needed. KA1NWW (Bill) is very active on the Novice HF bands. The poor





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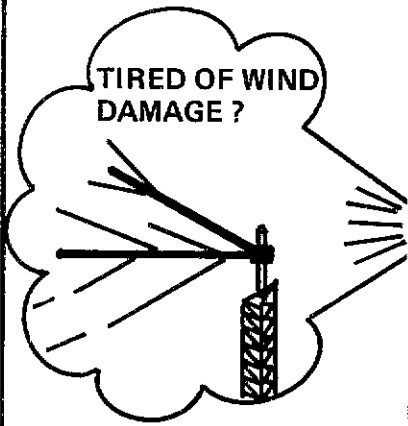
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propagation mystery of the 34/94 (Mt. Mansfield) repeater has been solved as the ice damage has been corrected. A new repeater has started on 147.2/84—contact K1HKI. Trx to all for your letters to FCC delending our use of 220-222 MHz band. The WIKOO-3 Packet Bulletin Board System (PBBS) is now operational on 145.03 MHz. Rumor has it that NH SM (WB1BHE) is planning to defect to VT when he retires. Good choice. Bill! Our section had a 98% participation in NTS First Region, cycle 2. Good luck to all Field Day participants on 6/27 and 28 and lets support the VHF QSO Party on 6/13-14. March traffic report: K11Q 822, WA2SP1 269, N1DHT 144, WA1VJ 97, W1KRF 75, AE1B 69, K2KBT 61, N1BIA 17, W1OAK 9, VTN 21 235 152, V5BN 25, 204 54, GMM 26 447 33, VTPHN 5 85 9, CAR 26 644 48, BARCSN 4 75 1, HHN 13 78 0, CVMFN 5 83 10, TSEN 5 64 7.

**WESTERN MASSACHUSETTS:** SM, Bill Voedisch, W1UD—OO/RF: N1CM, P1O/AQ: K1BEL, SEC/SGL: WB1HH, TC: KA1JIM, STM: KA1EXJ. Congratulations to the members of the CMARA, HACRA, MTARA, MARA, NOBARC, PMARA and QVARRA. These clubs worked in close liaison with their local Civil Defense during the flood disaster that hit Western Massachusetts. Letters of commendation are forthcoming from CD. NOBARC and MTARA had flea markets and both were a great success. CMARA furnished communication for the St. Patrick's Day parade. They are also sponsors for an Explorer Post. Each week they hold code and theory class. There also sporting a new communications van. Congratulations to the Mt. Tom ARA. They have qualified for Special Service Club status and have been appointed a Special Service Club. Traffic: KA1FC 117, KA1HJ 103, W1KRC 65, N1EGM 75, KA1OFC 48, KA1EKO 33, N1EJ 33, W1VSJ 30, WB1HH 28, WA1OPN 7, W1ZPB 4, W1UD 102.

**NORTHWESTERN DIVISION**

**IDAHO:** SM, Don Clower, KA7T—SEC: K7REX, STM: W7GHT, OOC: WB7CYD, ACC: N7BI, P1O: WB7PFO. I would like to thank George, N7BI, for doing an outstanding job as the SEC. George has decided to take on the job of ACC. If your club would like any type of assistance, drop George a line. Dan, K7REX, has accepted the SEC position and is now looking for a DEC for S.W. Idaho. The Ada County ARES group had a meeting last month, and decided on 146.88/28 as the primary freq. In case of a local disaster, and the back-up freq. is 145.44 simplex. Many Idaho hams traveled to Walla Walla Mar. 29th to attend the Southwest. Good stories and tall stories abounded. Bill, W7QMU, the Vice Dir. of the N.W. Division was there and gave a talk on 220 MHz. Bill also attended our ARES meeting and provided valuable advice. Many txs to Bill. Traffic: W7GHT 201, N7BHL 112, NW7K 61, PSHR: W7GHT, N7BHL, NW7K.

NET	FREQ	TIME	SES	QNI	QTC
FARM	3937	8 PM da	31	2273	25
ID CD	3990	8:10 AM M-F	22	851	34
IMN	3635	9 PM da	31	330	86
NW7N	146.38/98	7:30 PM da	31	1052	47

General: The Ada county ARES group is organizing a Field Day exercise at the old patient center. Special emphasis will be given to Novices and Novice activities. N7GIV, K7REX, N7HOT are organizing this event, if interested contact one of them. 73s Don.

NET	SESS	QNI	QTC	MGR
MTN	31	2115	108	K7FR
IMN	31	330	86	WA7GQO
MSN	5	103	2	K0PP

Traffic: WB7WVD 74, N7A1K 23.

**OREGON:** Randy Stimson, K2ZT—STM: W7VSE, SEC: N7CPA, P1O: W7VN, SGL: KA7KSK, ACC: WB7WTD, RF: AK7T, OOC: N7SO, STC: N7ENI. We have one new club starting up and a club that hasn't been active for two years is going to become active again. The new club is in Beaver, Oregon, and it all started because five scouts wanted to get their radio merit badge. Three of the scout Dads decided it would be fun to become Hams. They contacted me to find them some Hams to instruct them and in doing so enough interest was created to start the new club, lots of luck. The second club is in Tillamook, Oregon, which is 20 miles north of Beaver. With all the calling we did looking for hams to teach the people in Beaver, they decided to reactivate their club. Good luck to you people also. I would like to say a few things about Field Day. Even though it is somewhat of a contest, there should be some of the new equipment. Also you should let the public know what you are doing and maybe even hold your Field Day in close to the public and invite them and the news media out. If there was an emergency chances are it wouldn't be on top of some hill. Please think about it. Traffic: WB7VSE 453, N7BVGW 260, KA7EE 77, N7FXJ 56, WB7VSN 32, KA7AID 32, W7HLF 20, (Feb.) W7HLF 20.

**WASHINGTON:** SM, Brad Wells, K7RL—STM: K7DFE, SEC: KA7INX, BM: N7CAK, TC: W7BUN, OOC: N7DVR, ACC: ASM: KC7PH, SGL: KD7AC, ASM: KD7G. The VHF QSO party, with emphasis on portable operation, represents an opportunity to put "rare" grids on-the-air. Field Day, on the 27th & 28th is an excellent opportunity for clubs and individuals to test their emergency preparedness and have lots of fun. June 13-14-15 is the Tri-land Bike Trek. Contact W7AKA (206-226-4115) to help. Many thanks to D7C, N7HGE, and all of you who gave your support to S.B. 5055. A good turnout at both the Senate and House hearings plus much use of the statewide toll-free hotline. Unfortunately, the bill was temporarily killed by the House Committee Chairman, Dean Sutherland (17th Dist.). Fast work by W1PRT, K1LIF, and KA7NRA saw the bill amended to H.B. 170 which is being returned to the House. The fate of both is unknown at this time (April 10). Attend the Central Washington Hamfest, June 6-7, by the Apple City ARES. Location is Hocky Reach Dam, 7 miles north of Wenatchee on Highway 97. Equipment displays, swapshop and VE testing. Banquet dinner Saturday night (speaker-W7RM) plus pollack on Sunday. Contact K7EVL for info. My apologies to those clubs whose meetings I have been unable to attend. My work schedule is 9 AM - 7 PM Saturdays and 9 AM - 2 AM Sunday, Monday and Tuesday. Time off, except scheduled vacation, must be taken without pay. For this reason, the few weekends I take off to attend hamfests. I'm normally available on WARTS WIN NTN, and NWSSB nets throughout the week. WB7WOW is an Official Bulletin Station and AK7H passed the test for Official Observer. All Field Appointees are eligible for an ARRL call badge listing their appointment. Contact me for details. Clubs: Vashon Island ARC meets 3rd Monday at 7:30 PM. Contact NOAX (567-4180). Valley ARC meets 3rd Thursday in Puyallup Loxary. Contact W7EJH (847-1016). Washington nets  
WIN 3987 KHz Daily 9:30 AM

NTN	3970 KHz	Daily	12:00 NOON
WARTS	3970 KHz	Daily	6:00 PM
NWSSB	3945 KHz	Daily	6:30 PM
WSN	3590 KHz	Daily	6:45/9:45 PM
WCN	3702 KHz	Daily	7:00 PM
EWTN	146.64 MHz	Daily	5:30/9:30 PM
PSTS	146.92 MHz	Daily	5:30/10:30 PM
WEN	3987 KHz	Sat/Mon	9 am/6:30 PM
Swap/Shop	3930 KHz	Sun	10:30 AM

VE testing: Radio Club of Tacoma of Tacoma clubhouse June 13-contact WB7UN. Red Cross Bldg in Spokane June 10-contact N7PS. Traffic: K7F7 252, K7GXZ 176, W7IGC 172, WB7WOW 163, W7GB 144, WA7CBN 130, N7GJG 95, N6EQZ 74, K7SUX 55, N7DIP 38, KA7PMD 26, W7LBK 24, N7IJJ 14, WA7YEN 10, KE7P1 10, K7CLL 8, W7IEU 6, W7LZ 6, KA7VEE 2, N7FXM 2. Category 2: KD7ME KD7G.

**PACIFIC DIVISION**

**EAST BAY:** SM, Bob Vallo, W6RGG—ASMS: W6ZF, N6DHN, EC: W6LKE, STM: K6APW, OOC: NY6Z, TC: N6AMG. Congratulations to WA6KTL, and his XYL Mae, on celebrating their 60th wedding anniversary. It looks as if the East Bay Section will be heard from during field day, as all of the section clubs are already making their plans! EBARC is now a certified non-profit corporation, and has protected their assets (and their members) with a \$1 million liability insurance policy. Other clubs should take note and consider similar actions. Many clubs find the collection of dues to be less than easy. NBARA featured a banner headline in their "QRZ NBARA" as follows: "This is it: Get paid or it's QTA." Even I can figure that one out! HRC mourns the loss of long-time member W6PSV. MDARC's new officers are WB6PQM, Pres; K7EX, VP; N6NVA, Sec; KB6MAF, Treas; WA6DQM, EC; K7GY and KA6IVF, B/D. LARK recently published a listing of 39 new and returning members! I wonder if their membership committee would be willing to share their techniques with us? BARC ran some very "official" looking call sign and repeat a sanction applications, available on April 1, in their "Log Book." You had to see them to get them. W6VOM 103, W6VOM 62, Traffic: WB6DOB 171, W6VOM 105, W6BUZX 27, (Feb.) W6BUZX 22.

**NEVADA:** SM, Joe Lambert, W8XID—QRS: K7QBP, P1O: KA7JUC, P1A: N7EAG, ATC: KD7Y, W6ZLC, ATO: NW7O, DEC: N7ZAD, DEC: WB6BFU, EC: W6JBB, TC: K7ICW, ACC: N7ZFF, OES: K7ZOK, OBS: AF1 OBS/ATC: AD7K, EC: KA7BHM, OBS: N7OK, ATC: N7GOF, ASM/SEC: K7HRW, ACC: W4HMV, STM/NNM: W7BS, EC: KA7JAO, EC: NK7N, BM/ORS/OBS/AEC/OES: WB5PTO. The above list of Nevada Section appointees are given so that you will know who to get in touch with regarding matters of the ARRL. I want to thank them for all the work they do, and hope they continue. Anyone interested in a field appointment, please let me know. SM, and Division Director met with some of the Reno clubs, also meeting with special interested groups on April 11 and 12. All the clubs are gearing up for Field Day. If interested, in Southern Nevada contact W7O for Field Day in town, and N7CXD for one that is being held near Ft. Charleston. K7HRW can supply info in Northern Nevada.

**PACIFIC:** SM, Army Curtis, AH6P—Aloha and haia adai to all of the Pacific. Are you ready for some AM once again on 160? KH6B reports the first band of crystals have been ordered for 1890 KHz. He is hoping to see some "old time" rigs once again on 160 for local QSO's. Want to join in the fun? Give Dean a shout. The EARC 2 meter net continues in great shape with March reporting 31 sessions, 435 checkins and 29 pieces of traffic handled. This is a great way to learn and develop traffic handling techniques on phone. Check em out! KL7VA reports some good openings on 10 meters to ZL and VK land. See, its only dead when nobody transmits! We here in Hilo are very sad to see WH6AXL departing, but our loss is Kauai's gain! Aloha Kimo and come see us when you can. Traffic: KH6S 51, N4ESX 29, W4XJ 11.

**SACRAMENTO VALLEY:** SM, Bob Watson, W6IEW—ASM: N6JTL, STM: WA6WJZ, SGL: N6IG, ACC & TC: W6RFF, SEC: WB6PFX, SEC: N6BA, OOC: W6BO, DEC North: KF6KJ, BM: Sac Metro: W6CFC, DEC Mother Lode: N6AUB, DEC Central Sierra: K6EN5, SECTION REPORT: First Sunday each month, 8 PM, on 146.085, Input via Yuba/Sutter repeater WB6XMR, Net Control: W6IEW or W6RFF. I am very happy to announce more new Section appointments and now all we need is a Public Information Officer to complete the top level staff. Four people have studied the material and passed the exam to become members of the FCC Amateur Auxiliary and Official Observers. They are Ed Merritt, KF6EN; Hugh Nickels, WB6YKI; Mill Smith, W6EHF and John Canaris, WY6O. In addition, John, WY6O, has agreed to take on the responsibility of being the Official Observer Coordinator for the Section. Thank you all! With the new privileges now available to Novices and Technicians they will need lots of help. In the KEEP IT ON THE AIR REPORT, I mention it, its great to get all the reports of classes and exams from all over the country so many clubs including Yolo ARC, Nevada County ARC, Sierra ARC, Golden Empire ARES, Sierra Foothills ARC, Trinity County ARC, Amador County ARC. How many did I miss? Do I get your newsletter? After more than 50 years as a ham it still seems strange to me that we complain about QRM on the bands but do our best to get newcomers to join us there. Traffic: N6LJY 247, K6SFR 67, N6CVF 69, WA6WJZ 51, WA6ZUD 32, W6RFF 21, W6BSRQ 16, K16G 13, KB6COH 8.

**SAN FRANCISCO:** SM, Bob Smith, NA6T—Newest MBX/BBS in Section is KE6LF-1 on 145.01 MHz in Eureka. The digi path is via N6JUB-1 and KA6NEQ-1. Mice in the 93-93 rpt. in Marin, could this be a different type of JAMMING? All the Clubs in Sonoma county participated in the EC Drill in April. If you are a member of the EC/ES Group working? Need any help, contact your local EC for information. A 100N time is here and YOUR club will be helping provide communications—ARE you helping this year or is the other guy doing it? The SFRC had a booth at the SF Computer Show that demonstrated Packet Radio. 4 digi's in use and lots of interest from the attendees. New members? use Hams? HARC is participating in the CDF VIP Program this year. Get out and support this CLUB Activity and your ARES organization. Contact JIM, KA6OQJ, for information. 6CPA is planning another Mini-DXpedition, where will they end up? Contact Lyle, W6W6, if you have a good location. We all might take a lesson in the SFRC. We have had interviews on TV, RADIO, and in newspapers. Use your clubs PR-Person to SELL amateur radio and Public Service! Traffic: KK1A 132, N6WFR 35.

**SAN JOAQUIN VALLEY:** SM, Charles McConnell, W6DDP—SEC: WC6B, STM: N6AWH, TC: WA6EYV, ACC: W6DDP, Asst. SMs: W6TRP and K6YK. 1987 officers of the Lodi ARC are Pres WB4AYE, VP KB6UW, S/T K6PJV. The club meets the 1st Wednesday of each month in Lodi. 1987 officers of Central Cal. Amateur Comm are Pres WB6C, VP WA6HMB, Sec WB6JIT, Treas WA6JIL. The club operates 144, 220, and 440 MHz repeaters and meets the 3rd Monday in Fresno. K16OR and N6CNY are EXTRA, WA6EFL, WA6PIC, N6LQO, W6DFXP, W6SWYU, KB6DRN, N6HEZ, N6ONF, K6IXA.

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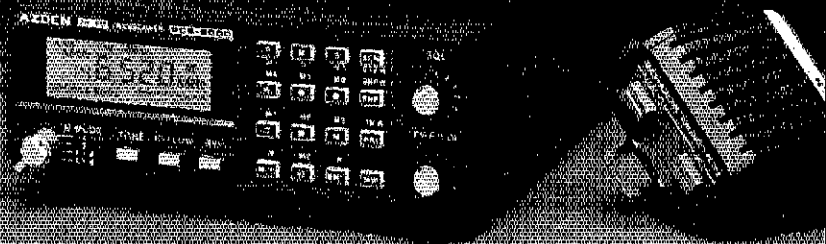
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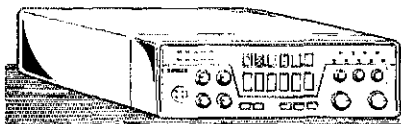
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SANTA CLARA VALLEY: SM, Glenn Thomas, WB6NW—SEC: WA6OCV, TC: WA6PWW, STM: N6LJI, PIO: WB6NLA, ASM: N6JQJ & NS6S, ACC: W6MKM, BM:(vacant), OOC:(vacant). The Emergency Responders Institute (ERI) held in March was a resounding success. Nearly 130 Amateurs, and also a number of federal, state, and local officials attended. Seminars were given on ARES, RACES, packet radio, NTS, publicity methods, how (and when) to call the local authorities on an autopatch, astiscan ATV, the California Department of Forestry Fire program, Station Army, American Red Cross and the FINDER program among other things. The "cloakroom" discussions among the various attendees were also very informative. Thanks to all who attended, with special thanks to the ERI staff and also to the video crew. The credit for designing, coordinating, and actually running the ERI goes to Dave Larson, N6JQJ, our Assistant Section Manager for Training. Great job, Dave!...speaking of training projects, Larry, N7EQN of the National Weather Service, with Dave, N6JQJ's assistance, is putting a class on Weather Observations and How to Make Them for presentation in the near future to us...the Gabilan AFC heard Kit, WA6PWW, speak on VHF/UHF Mountain topping. As was pointed out, this is different from the "hill topping" as it is done on the east coast (there are REAL mountains east of the Rockies)...John K6CZV concluded his Novice class, sponsored by the Lockheed ARC, by graduating 7 new novices! Johns total is now 51 new novices...speaking of Novices, the SPECS group has linked their high level 220 repeater on 224.36 to their popular 2 meter W6ASH/R, so that novices can participate in local ARES/RACES activities. What is YOUR group doing to welcome novices and other new licensees?...San Mateo county has a new DEC who is Craig Smith N6ITW. Craig has been quite active for the last several years as an AEC in Menlo Park, and also as owner/trustee of a high level UHF ARES repeater. Congratulations on your appointment. Call AF5R: WB6LJ, KB6LQ, CQ reports on the 1000 W6YBV 199, NR7E, WBKZT 61, N6LJI 14, W6PHI 11, KA6SXW 9, KB6LWG 9, WA6HAD 6, W6NJR 1. (Feb.) NR7E 80.

### ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W, STM: K4NKL, BM: K4VWV, ACC: WC4T, PIO WA4OBR, TC: K4ITL, SGL: KE4ML. This month is the month for Amateur Radio to SHINE. It's FIELD DAY. Everyone plan to participate in the most important event of the year. Show the public what Ham Radio is all about. Get the public involved. Tie up all the loose ends and make sure you have the FD log sheets in hand. This year a new twist: Bonus points for contact with MARS stations. Info/frequencies in May QST. Silent Keys: WQ4C, W6MCL, Congrats to all who participated in the Charlotte Ham Radio Picnic on the K4KPF. Frow AA4YM. New appointments: QES KA6PBU. The K4EG ARES group was called to assist in providing communications for a land search for a missing person. Is your group ready for this type of activity? Get ready NOW. The SECTION would like to RECOGNIZE and SALUTE the EMERGENCY COORDINATORS this month. As follows: AA4UO, A4BK, K4CF, K4GLP, KAHPV, K4IRD, K4JHF, K4PDD, K4SWN, K4RKC, K4ABQM, K4E4L, K4AKNU, K4APY, K4APZ, K4ATLC, K4B4ME, K4B4EF, K4F4CH, K4F4R, K4ME, K4QZR, K4J5W, K4J4W, N4BEX, N4CID, N4FAX, N4FEY, N4VIT, N4JGD, N4JRE, N4JYG, N4LUD, N4NAB, N4NBE, N4NIE, N4NIN, N4TKA, W4L2O, W4L2Z, W4L2Y, W4R4QF, W4SOT, W4T4Y, W4YMI, W4L4Z, W4AMOK, W4ASLC, W4BAQK, W4B4FR, W4B4SGA, W4B5FT, W4D4CY, W4D4FQ, W4D4FR, W4D5HT, W4DQGS, W4DRMS, W4DBOO, W4D5HK, W4C7J, WR4E, W4V4Z, W4NHV. Does your county have an ECN? If NO, write AB4W for application form. KB4BME reported a tornado in Dare County and few injuries and some property damage. Amateur Radio was asked to provide communications for the NC Highway Patrol. A/R provided another public service. Novices on 28/220 have made a big splash. Let's make sure they are welcomed and are trained in the correct way to be prepared for an emergency. It would be nice to see 10 meter traffic being established on a local level. Congrats to new NM of CN/NC/NV/WV. Many thanks to retiring NM NJ4L for a FB job WELL DONE. GSN doing very well each day at 6 pm on 37.15. All Novices/TCs invited to check in. Be sure to send SM Field Day message listing location, number of participants and number of ARES members for Bonus points. VE Exams: Lexington June 20. Don't forget the VHF Contest 13-14. Traffic: K4NKL 337, NJ4L 303, AB9Y 158, AAAMP 151, KA4EYF 144, AA4TE 108, WB4WII 66, AK1E 55, W4D4HT, K24YV 50, WA4MNR 49, KA4TLQ 47, K4SWN 46, N4MNM 38, W4EHP 31, W4D4MRD 25, N4LST 21, N4LUC 17, WB4NVO 17, KB4NWX 17, W4D4CYN 16, N4JEO 10, NC0CJ 9, K4ODY 8, W4L2Z 8, W4L2Y 8, W4J5E 4, W4J5F 4, W4D4DQJ 3, W4E4QK 3, N4TK 1. (Feb.) K4JHF 39, N4JEO 8, NAUE 3. Totals: 35 SAR's Traffic: 1,915. Congrats to New PSHR Honor Roll Member K4NKL.

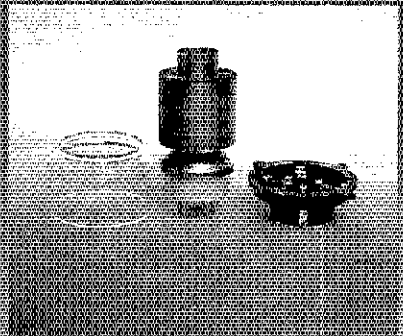
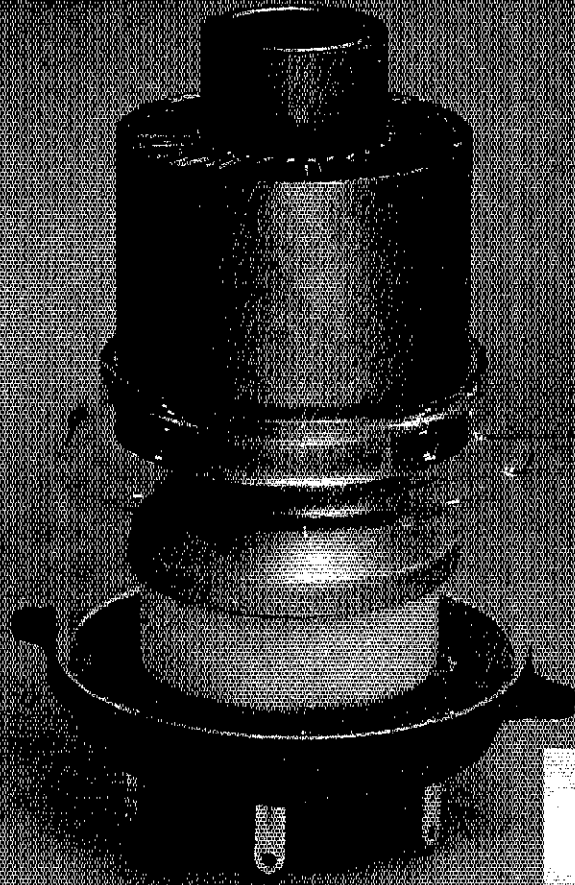
SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ— Do you send me a SAR (Section Activity Report) each month? All amateurs in the Section are encouraged to send me a SAR. Even if you handle only a few pieces of traffic each month, your report is valuable. If you do handle some traffic and check into your local net, you are missing a chance to make the Public Service Honor Roll (PSHR) and by doing so, be recorded in QST. When you don't get credit for the work you do, Amateur Radio loses credit. IF YOU DO IT BE CERTAIN YOU REPORT IT TO ME! You can use the SAR card, FSD-210. Front side for your station activities and traffic; back side for your PSHR info. The card is available from me or my staff. If you prefer, send the same info to me by radiogram or packet. Even if you are a Novice or Technician, you play an important role in our Section. Let me hear from you—within the first five days of each month. REPORT YOUR ACTIVITY! Traffic: K2N 173, KB4BZA 108, W4ANK 67, WBKJ 78, W4FMZ 65, KA4LRM 52, W8AUDJ 28, KA4YEA 22, WA4JWS 8.

VIRGINIA: SM, Claude Feigley, W3ATQ-STM:KB4WT, SEC:N4EXO, ACC:N4T4S, OOC:W4HU, SM:AB4U, TC:WB4AME, SGL:W4UJM, PIO:AA4VH

VTN	1 PM	3907	KB4NGO
V5BN	6:30 PM	3680	N4KSO
VN (EARLY)	7 PM	3680	N4KSO
VN (LATE)	10 PM	3680	WB4KSG
VLN	10:15 PM	3947	N4M
SVEN	7:15 PM	146.82	KJ4FS

Please note the change in Net Mgrs for the V5BN and V5N with N4KSO replacing N4LJ and K4LBR, taking over from K4VWK. Many thanks to Scott, K4VWK, and Mark, NN4L for the fine job they have done for the Section under their tour





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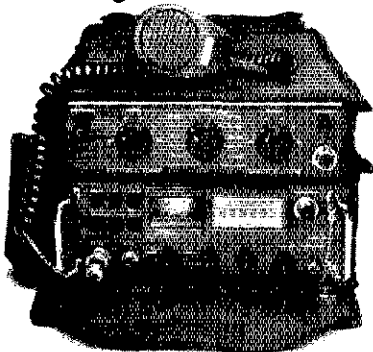
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of duty as Net MGRS. HURRAY!!! for the first time in many months all of the major Section appointments are manned. The latest appointee is David Norden, AA4VP as the Public Information Officer. Dave is the Director of the Eggleston Library at Hampden-Sydney College, as well as, the editor of the excellent newsletter of the Southside Amateur Radio Assoc. Those needing assistance in preparing news releases contact Dave for suggestions. Sorry to report WD4RFs, EC for Alexandria has left the section due to change in job location. OCC: W4OR reports OOOs W8RT, L.J., KB4WT and W4HU active, and K4KPT, WD4MVZ and KC4VR as new OCC appointees. Other new appointments are K4KPT as ATC and KA4TWI as OES. With the granting of 28 MHz frequencies to Novice licensees and the improving DX propagation all stations working DX are urged to have envelopes on file with their DX bureau. Contact the SM, W3ATQ if you need info on how to file your envelope for DX QSL's. N4EXG reports the ARES program continues to grow with 935 stations enrolled as ARES members. WB4ZTR sez his XYL, KB4UNO, upgraded to General and Jr. Op, KB4UKN passed 13 WPM code. ARES members in Districts 3, 6, 12 and 15 participated in a simulated rescue drill with the Appalachian Search and Rescue teams with some very nice handling by Fred and Ed. Traffic: skeds: June 6 Portsmouth ARC contact WB4BAB; June 20 Manassas contact W4PAS; July 11 Virginia Beach contact KA4UNC; July 18 Richmond contact WU4G. Plan now to attend the Manassas Hamfest June 7 and the Virginia Section Convention at Virginia Beach Oct. 3-4. Traffic continues to stay fairly heavy with 44 stations reporting a traffic count of 5231 for the month. ATTENTION PACKET OPS; the Virginia Packet Radio Assoc. (VPPA) is requesting that all persons planning to install a new digipeater coordinate their frequencies thru VPPA. Please coordinate their frequencies thru VPPA. Please coordinate thru Bob Martin, K4LKQ, in Lynchburg. This arrangement has the blessing of both the CPRA and the ARES coordinator. Traffic: K4DOR 734, N4EXG 672, N4GHI 581, KB4WT 309, AA4AT 279, W3ATO 256, K4IST 227, K4MTX 220, W4BPY 187, KB4NGO 165, WD4FTK 157, K4JIM 117, K4BR 110, WD4EDB 100, WB4KSG 95, WD4MIS 94, WB4ZNB 83, W4JLS 82, AA4GL 81, WD4OCW 72, WA4L TO 72, NN4I 70, N4KSO 56, NT4S 50, WB4ZTR 49, N4NCO 38, K4VWC 36, K4BGZ, 31, N6ANQ 29, K4GR 27, KB4PW 23, W4TZO 17, N4FNT 13, K4JUM 13, KB4TRI 13, K4AXF 12, WB4UHC 11, K4MLC 9, N4KSS 8, N3RC 8, K4W 8, WB4KIT 7, W4YE 4, KB4UKO 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW, STM: K8BG, SGL: K8BS, TC: K8CG, ACC: W8ACTO. Rpt Coord: W8BOZT. Even though the Wx was bad, the Chas. H.F. turned out GOOD. Hope we have better luck Wx wise next year. K8ABAN is new EC for McDowell Co. WV now has 597 ARES members and 26 active ECs. JAX Mill H.F. July 25 & 26. Spread the word about the new dates.

Net	Freq	Time	QNI	QTC	Sess	W8YP
WVFN	3885	8:00	117	16	31	W8YP
WVMD	7235	11:45	824	35	31	W8FZP
Hillbilly	14290	Noon Su	154	20	5	W8YP
WVN	9567	7:00	186	82	31	K2BQ
WVNN	3730	5:15	132	37	30	K8BTIK
WVRN	3640	8:30	329	51	31	K8LG

Traffic: W8YP 278, K8BWNO 268, K8UOY 103, K8BFI 97, K8TPF 95, W8FZP 90, K8BTIK 83, K8QEW 46, K8KT 44, W8JWX 28, WD8HC 27, K8BG 24, N8FXH 21, WD8LDY 19, N8CG 10, K8BGF 5.

## ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ4I—ASM: KA0MQA, SEC: W8QFB, STM: K8BZ, ACC: W8DUV, OCC: K0LUD, BM: K8BZM, PIO: N8DF, TC: N8DF, SGL: W8DGL. The new STM is K8BZ, he takes over the seat with vast knowledge of NTS & Colorado Section traffic experience. My trx to N8DZA, you will still be hearing from him as he continues with TWN & PAS. The Novice Enhancement Program is getting under way in Colorado with many new amateurs appearing on 10 meters and 220 MHz. Get on the bands and welcome them. Much work and planning is being done by RMPRA and individuals packeteers to perfect and enlarge the packet capabilities of the Colorado Packet Network. W1HAB, KE8LT & K8GUZ are presently working with experimenting with the 450 MHz band for packet. By late May or June, SARES will have begun installation of five new 2 meter-220 links across the Western Slope. The new equipment is possible through a grant of Personal Trust fund gift SARES. Superfest sponsored by NCARC is set for June 5th & 7th Larimer City Fairgrounds, Loveland. The Annual Western Slope Swapfest is set for June 20th, Nat'l Guard Army, Grand Junction. Don't miss them. NETS: CWN; QNI 98, QTC 91, QNF 418, 30 sess. CWXN QNI 2517, QNF 2790, 31 sess. NCTN: QNI 248, QTC 96, QNF 270, 25 sess. SCTN: QNI 259, QTC 45, QNF 189, 31 sess. Traffic: N8BQP 2113, WA8HJZ 2052, K8RFX 435, K8BZ 144, N8HMX 91, N8DZA 36, N8HMR 44, W8NFW 29.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS, SEC: K5VEJ, DEC: W5HCB, STM: N8ST, NMs: WASUNO, RGL: W5QNR, TC: W8YJ, ACC: K5BEM, Southwest Net (SWN) meets daily on 35837083 at 0230 UTC and handled 211 msgs with 24 Mexican and 100 American Net members. Net meets daily on 9939 at 0100 UTC and handled 61 msgs with 1332 checkins. New Mexico Breakfast Club meets daily on 3939 and handled 178 msgs with 1053 checkins. Yucca 2-mtr Net 78/18 handled 15 msgs with 479 checkins. Caravan Club 2-mtr Net 66/06 handled 0 msgs with 171 checkins. SCAT Net 66/06 handled 13 msgs with 687 checkins. Info Net 13/73 with 90 checkins. KN5D EBS, 2109 total connects. Lots of us looking forward to the Flagstaff, "Pi Tuthill" Hamfest July 24-25-26th. FB newsletter from the Northern New Mexico Radio Club and our thanks to NS4CP. Congrats to KF5SR and her crew for an excellent swapfest in Albuquerque. Certainly enjoyed our visits with the Hobbs, Roswell & Alamogordo groups. Traffic: W5DAD 104.

UTAH: SM, Jim Brown, N47G—SEC: Rich Fisher, N57K, STM: John Sampson, W7COX. Time is approaching for Field Day! Support your local club, or form your own group, but participate—it's always fun, and it will sharpen your skills. N577K and N71Z attend the Dayton Hamfest. Davis Co. N57K, W47QPC and K87AGM for help. N7BOE now back on HF after two month absence. 73 de N47G. Traffic: WA7ME 77, N7ASY 52, N47G 26, N57K 20, W7COX 8.

WYOMING: SM, Dick Wunder, WA7WFC—This is my last report as Section Manger, and I would like to thank all of you who have helped make the past six years a pleasurable and memorable experience for me. As I look back over the years at the challenges and accomplishments that our Section Leadership Team, and ARRL members, have helped me with, I have a feeling of pride in the efforts to further amateur radio. I could not have made the journey without your support and help. Effective April 1, I turned the reins over to Jim Raiser, N7GVV, in Gillette. I hope you will provide Jim with the same enthusiasm and support during his term as Section Manager. Wyo Cowboy Net held 22 sessions with 873 QNI and 8 QTC. Traffic: N7H 325, K7HBB 8.

## SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, Jr. WA4RNP—STM:



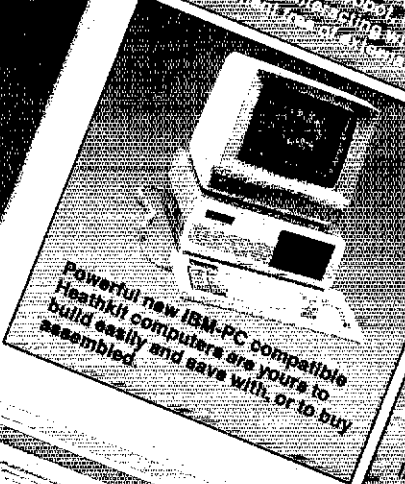
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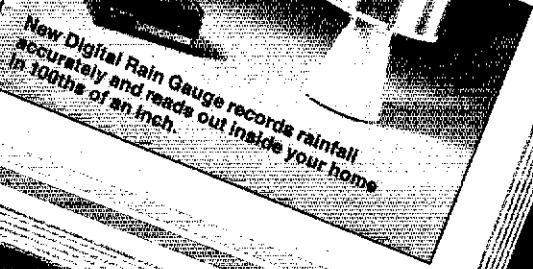
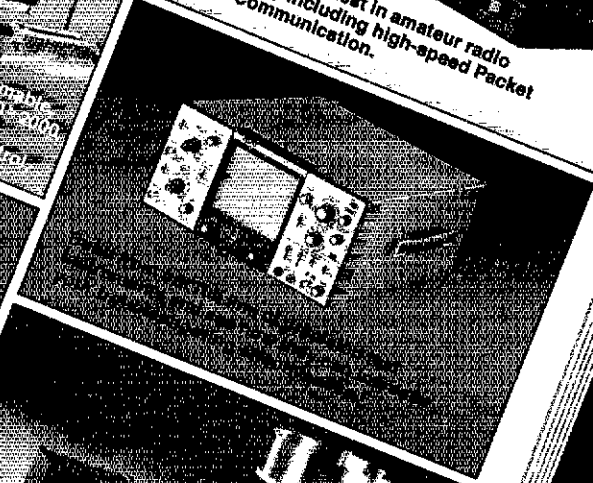
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pand their world through Amateur Radio. The System matches students with one-to-one helpers, provides instruction material and support, and loans radio equipment.

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NAJAW, SGL: KA4WVU, BM: KF4VY, OOJA AJX; AA4BL, TC: NA4U, ATC: WB4BYG, ACC: WA4RNP, "Act" SEC: WA4RNP. It was good to see so many of you at the B'Ham "Fest." Its almost time for our annual outing with Mr. Murphy and the "Bugs." Of course its official name is "Field Day," and I hope everyone is planning to attend the activity closest to them. It is a fine way to check out your emergency gear and polish up your skill in dealing with an emergency situation. I will be operating at W4CUE as usual. Hope to hear from each group out there. My congratulations to the West Alabama ARS, the Tuscaloosa ARC, and the Huntsville Area Young Ladies ARC for making SSC again. Traffic: CAND reports 798 messages in 31 sessions with DHNS rep 100% by WA4JDH, W4CK8, and NW4X. DRNS reports 92 messages in 62 sessions with Alabama rep 95% by WA4JDH, W4CK8, NW4X, and W4WJF. AEND reports 52 messages passed in 31 sessions with other nets represented by WA4JDH, W4CK8, AA4YJ, WD4NYL and N4DCS. AFNB reports 54 messages passed in 31 sessions with RN5 represented by WA4JDH, W4CK8, NW4X and AA4YJ. AENM reports 106 messages passed in 32 sessions. Brass Pounders League: WA4JDH, W4CK8 and WA4RNP. Totals: WA4RNP 977, W4CK8 136, NW4X 66, WA4RNP 60, W4WJF 37, KA4OZ 34, W4DGH 10, WB4TVY 6 and K4HJX 2. Very Seven Three, Joe.

GEORGIA: SM, Eddy Kosobucki, K4JNL—SEC: NC4E, STM: WB4WQL, ACC: WA4ABY, BM: WB4ZQJ, OOC: NA4I, PIO: WB4DEB, SGL: W4BTZ, TC: WD4PAH, Dalton & Columbus Hamfests huge successes. Gud WX & attendances. Albany hosts the GA State Convention on June 13 & 14 at the Motor Inn & convention Center. WB4ZQJ has been appointed the new Bulletin Manager. If you desire an Official Bulletin Station Appt. get in touch with Warren, Making PSH in March. W4BDVZ, WD4COL, W4PIM, AA4JY, KF4FG, WA4LLE, KB4JPN & W4HON. Liberty County Emerg Communications ARC in Hinesville now an ARRL affiliated Club. Officers are: Pres: KB4SXN, VP: NX77, Sec: N1E1Z, Treas: KB4JSH, Trustee: KF4UM, NM: N4COZ. Novice Enhancement in the section has stirred up a lot of activity. If these novices need help in any way please help. Remember when we all needed a helping hand, & there was always somebody out there to help? Congrats to KB4JPN elected Pres of Southern Section of Country Cousins. K4VN rved QCWA 50 yr Golden certificate. QCWA net on Sat at 9 AM on 3632.5 W4OQ & K4URK are the Sent Keys. The sections sympathy to the families of Guilmett ARS. Officers are: Pres: N4JY, VP: WB4ZWK, Sec: KB4LPS, Treas: NG4I, Act Mgr: NKØX, Editor: WB4HJG, Trustee: WB4GKI. Remember Field Day on June 27 & 28. With over 60 clubs in the section let's let the country know that GA is very much alive. Don't forget to get ur reports into the ARRL HQ for compiling. Once again thx to all the newsletter editors for the very excellent monthly publications. Technical articles being written are of great value to all. Remember that July is the month for the ARRL National Convention in Atlanta. Wud be a gud idea right now to make ur hotel reservations because there will be a crowd. God bless & 73. Traffic: WB4DVZ 323, W4PIM 219, WD4COL 142, W4WXA 92, KF4FG 57, WA4LLE 79, WB4WQL 66, AA4JY 48, KA4HE 34, WA4ZHC 29, W4HON 18, N4MWR 14, K4BAI 11, NAU2 5, K4EV 6.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—STM: KB91T, OOC: K4JJE, BM: KB4LB, SEC: WA4PUP, ACC: WD4RJC, PIO: WA4PUC, SGL: KC4N. We welcome Cotton, KB91T to our list for the NEFL Section this month. He replaces Ron, WB4GHU. Our STM is a traffic handler on many CW nets, and he's been heard on FMTN at Noon, too! One of his duties is to report monthly to the ARRL the info from all nets in his section. Another job is to appoint the NM's when they are elected or selected by the members of the various nets. Since Florida is a two-section state, he coordinates this work w/K4ZK who is STM for SFL. Many of the nets in FL are State nets, in that members come from both sections. Often, the Net Managers are elected from alternating sections each year. We're sorry to have Ron leave our group, but I'm sure we will be hearing from him on VHF and Packet. By this time, next month, I hope to see an appointment of a new TC for our section. This is a task that will be long for ATC's in various areas of the section to help local groups with problems that arise in each area. ARRL is now sending all questions of a technical nature to the sections rather than searching for the answer at HQ. The talent in the field is great and it will be these ATC's who will have to learn the strengths of their club members to provide the source for the answers needed. We will be canvassing the clubs to locate the best people to assist this effort. If you are asked, please do so. You'll be giving much needed help to your club's members! Traffic: W4XH 813, WA4QXT 542, N4PL 409, KB91T 403, WD4IO 298, AA4H 224, KC4VK 137, KB4LB 136, WA4EYU 124, W4AD 124, W4WIF 112, W4AC 102, N4CMU 93, K4AJV 86, W4K1X 66, N4FO 58, N4JH 44, NA4DI 35, K4ACD 35, KB4FY 34, W4GUJ 33, WA4SXW 33, WB4TZR 29, NS4C 27, N2AOX 27, W4MGO 22, NQ4P 22, W4UEA 14, K4CY 18, W8IM 17, WB4GHU 16, KF4GY 14, WD4HPB 14, KA4KAH 13, WD4FJY 11, WB4AWG 9, WD4RJC 4.

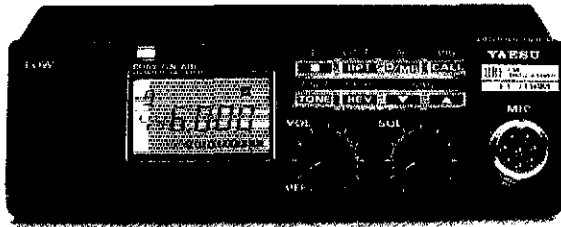
SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: WASS, STM: K4ZK, TC: K14T, BM: WD4KBW, PIO: W4WYR, SGL: KC4N, OOC: W4TAH, ACC: UNFILLED. WD4KBW reports 69 bulletins received and 113 sent by AA4BN 26, W4DL 42, WA4EJC 61, WT4F 10, KA4GUS 13, K4IEK 18, and WD4KBW 12. I am sorry that George, WA4NBE must resign as ACC due to health problems. Many thanks for a job well done, George! For several years I have worked to get CW traffic handlers to support the phone nets and for the phone operators to support the bulletins CW traffic handling. One of the goals of NTS operation is for traffic handlers in cycle two to support cycle four and vice versa with no additional training. That is, traffic handlers should be MULTIMODE. Recently I heard a phone operator state that CW is less dependable than phone. This has certainly not been the case as I have seen it - phone, CW, packet or any mode are equally reliable if careful operating procedures are followed. Actually if two CAREFUL operators are working under good band conditions there will likely be no errors regardless of the mode used. Also many messages move from one mode to another as they are relayed so it is difficult to know where an error occurred. However, if in an originating station the error has been substituted for "0" or a "9" for a "1" I figure I know where the error occurred - Hi. Even packet is subject to error - I received a message taken off a bulletin board in which there was no address, city, state or area code given. So don't worry about the mode - use them all with confidence AND use proper operating procedures including counting the check to be sure the message was transmitted and received correctly! It is not how fast the message was sent that is important, but rather was it transmitted and received correctly. Congrats to N4MML who has upgraded to Amateur Extra Class and to N4PFL who upgraded to general. Congrats also due KB91T who has been appointed the Section Traffic Manager for Northern Florida. Special thanks to WB4GHU the former SFL. Besides his work as STM he did an outstanding job of editing the most recent edition of the Florida Traffic Handler's Routing Guide. Word from W1NJM is that he returns to Connecticut April 7

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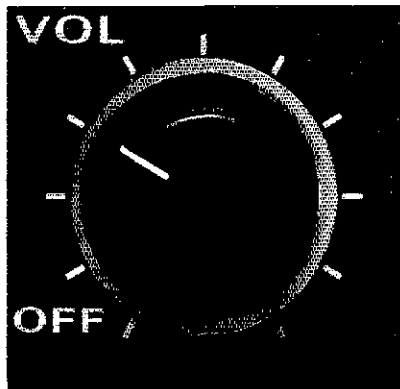
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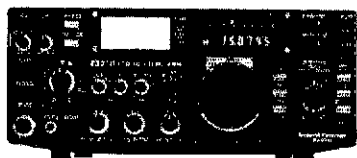
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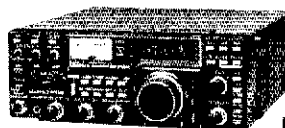
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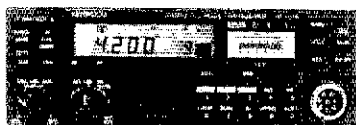
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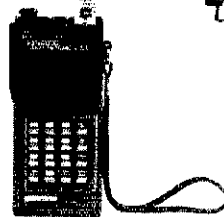


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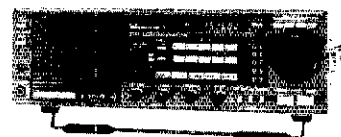
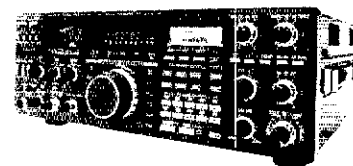


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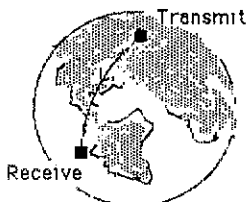


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and will see us in Southern Florida in the fall. N4ILN reports that a simulated disaster drill involving a communications failure within the University Hospital in Tamarc was held with communication provided by W4IB, W4NDT, W4TVC, K4JUC, W4NVY, N4ILN, K1PSK, W2KHV, KF4RO and KA4ZWG. KF4JA reports that the Boy Scout Southwest Florida Council Camporee held at Camp Dr. Franklin Miles in Charlotte County April 3, 4, and 5 used radio communications for the first time. WA4PIL was in charge - other hams helping were K4OVC, KF4JA, W4PIW, W8BAZM, WD4CHP, K9ALX, WD9AEP, W3IJR, KA4HL, KA4MBM and KB4LTT. WA4PIL's 11 year old grandson, KB4LTT was active on the 220 band as a result of the new novice enhancement privileges. His efforts also resulted in a new novice prospect. The ARRL Information Net held a traffic handlers forum during one of their net sessions - I was especially pleased at the very large number of checkins for the forum. The net meets on 3940 KHz at 8AM Saturday morning - please QNI and/or listen. 73 de WA4PFK. Traffic: W3CUL 2771, W3VR 1012, K4EJUK 733, WA4PEK 502, WD4KBW 407, W4NVU 384, KF4JA 375, W4DL 348, K4ZK 303, K4IA 295, WA4EIC 239, KA4FZI 231, K4ZVW 226, AA4BN 208, WB4WYG 179, KA4GUS 147, KA4NFX 146, KB4MON 142, WA4NFK 139, KJ4WJ 123, WA4RUE 112, W4SME 98, KA4SH 94, N4KB 94, WD4CHO 90, W4TF 88, W4TAR 88, W4SAND 78, WD9AEP 78, KB4KX 67, N4E 66, N4MML 64, KB4LPL 59, KA4YHS 59, KF4RL 59, WA4RLV 56, WB4AID 51, N4HAS 48, K5IHH 41, WB4GCK 40, W4VOE 37, W1NJM 36, W3TL 31, K4FOU 26, WA4NBE 22, W4NDHD 22, N1EGR 21, N4ORZ 21, WD4NXX 19, K4OVC 17, K9AKY 17, K4VIS 16, W4VWJ 14, W3IJR 13, K9EHP 12, W4MFD 11, N4OIA 10, WD4MPV 8, KD4GR 8, KB4EWO 7, W4NSY 6, KB4FO 6, N4NZI 5, KA4GDU 5, WK4F 5, WB4VLR 4, NX5Q 4, AA4JF 3, KA4YHF 3, W8OM 3, W4TKQ 3, KB4KAW 3, KB9DS 2, AA4CH 2, N4ORN 2, KA4KVI 2, N2EF 2, N4PFQ 1, N4ILN 1. (Feb.) WA1BWV 14.

### SOUTHWESTERN DIVISION

**ARIZONA:** SM, Jim Swafford, W7FF—STM: W7EP. NM's: K6L, KA7HY, W67CG, W7XE. Tucson, has changed call sign to KE7WD. Bob, K7RDH travelled to ITU K during April and operated G4K7RDH. N7AOU, back in Phoenix reports two-way mobile F5TV QSO between K5BJ and N4P41. This may be a "first"! He also reports F5TV repeater on 4341253 MHz, in/out at QTH of WB7CAM near Baseline Rd & 48th St. KA7MUL again made BPL and PSRR in March. W7YS reports W7GYX is now a Silent Key. Bill also made Golden Jubilee DXCC along with K6FM and N27D of the NADXA. ND7B passed the O.O. certification test and is brand new member of our Volmop program. Congratulations, John. New OBS in Phoenix, WA7KQE is copying the ARRL bulletins on RTTY and putting them out on ATEN. FB job, Kirk J.B., WA7AHF also done in Tucson on the TRW two mir. net. Am continually amazed and gratified at the number of "good guys" we've got working for us in this Section! Last minute walk-ins for the SARC VE exam in Scottsdale June 20 can telephone KA7UYQ at 952-9596 for possible available slots. (trx. Desert Aire Waves). Many AZ hams sent comment letters to FCC relative to NPRM 87-14. Lets hope we did some good. Your SM plans to re-locate to summer home in Pinetop during June. Wire antennas thru the pine trees should allow signal to be heard around the Section. KE7WD, KD7RK, and W7LBW all from Tucson, will also make the move up to the cool country. ARA's "Squeelch Tail" is looking for a new Editor, Betty, WA6HRX who has done such a great job has had to resign due to other pressing commitments. Many clubs getting ready for the 1987 Field Day. Your SM will welcome receiving messages from F.D. operations. You also can get bonus points for this. KE7GP reports in NCARL news letter "Holbrook Radio Telegraph," of progress on construction of upgraded repeater for future use on Woodruff Butte. So. Mtn. Swapmeet in Phoenix March 15 was another big success. AFCA had their meeting and finalized plans for Ft. Tuthill, July 24, 25 & 26. Dont forget the SW Division Convention in Scottsdale Oct. 9-11. Barry Goldwater, K7JUGA is scheduled to speak at the banquet. Also understand a tour of his great hamshack will be available for visitors attending the convention. That's all, see you next time. 73 Jim.

NET QNI QTC MGR  
ATEN 986 172 KA7HEV  
ACN HF 611 89 WB7CAG  
ACN VHF 384 63 WB7CAG  
SWN 241 211 K6LL

Traffic: KA7MUL 621, W7AMM 228, KN7U 312, W7EP 174, K6LL 150, W7KCM 89, WB7CAG 85, KE7KZ 77, W7GAG 49, KE7EO 46, W7KXE 20, K7JKM 17, K7POF 16, WB7LQQ 14, K7RDH 12 N7ETP 9.

**LOS ANGELES:** SM, Bob Poole, AJ6F—ASM: K6IYK. SEC: AK6Y. STM: W6INH. SGL: K6KSY. OOC: K6BMG. TC: WB0QPO. Always active, the San Fernando Valley Club, W6SD is among the first to form an ad-hoc local interference committee; these committees are intended to address specific interference problems, especially on VHF. For more information on forming an LIA contact the SM. Congratulations to the Relay Repeater Club, KA6NCR, in their renewal as Special Service Club; this club supported the annual Mayfield High 5/10/15 K walk/run/bike event according to KF6UF. Welcome to the Hilltop Amateur Mastertie System in their recent confirmation as an ARRL affiliate. The Sub Club announces its net on 28.325 (novices note!) MHz each Thursday night at 20:30 local, USB. I certainly enjoyed meeting with Mike Riley, KX1B, the ARRL Manager of Public Service; Mike was here to meet with many of the Field Organization during a trip to the Los Angeles area. W6QFK-2 BBS is now operational from the San Gabriel Valley Area, WB7HU, Earl, SY5CP; the BBS on 145.07 MHz as a low-level mode serving the area. The WB7NQR system reports activity for the month of March, including 298 individual, 8 band, and 1 emergency; Les, KB6LTL, is the first AEC in the area to furnish the complete activity report to the SM using packet radio (nice going, Les). WA6UVV, a regular on the FNO system ran up a total of 62, while KA8ZDL (a recent traffic AEC) reported 53 events. As a resident of Torrance, I would like to extend my personal thanks to all those who showed up at the City Council meeting in support of Amateur Radio in opposition to a proposed antenna ordinance; special thanks to W7FF and W1UUG in neighboring sections for their input on similar cases (special mention to SGL Mel Hughes and PIA WA6XAM of the Palms ARC for their input to Mayor Geisser and City Attorney Remington, William). With three days notice, the Downey ARC diehards (KB6AC), N6ATW, K6CDX, KF6DB, WB6DLR, K6JFX, KF6NC, W6OZO and WB6SZK) responded to the Lion's Bike-A-Thon and handled the communications chores beautifully; why do they call this 50 mile race the "Tour d'Sewer"? The TRW Club reports an important rules change in the Swap Meet; NOBODY is allowed on TRW property prior to 0600 and the seller's lot is ABSOLUTELY not to open 'til 0700. Please help keep our Swap Meet privileges intact by observing these rules; contact WA6RAY for other details. The Southern Calif. Six Meter Club announces an extension of the regular net on 16m Meters for encouragement of novice operators to become interested in Six and upgrade to the privileges allowing operation there; the net will be a crossband affair in conjunction with the regular



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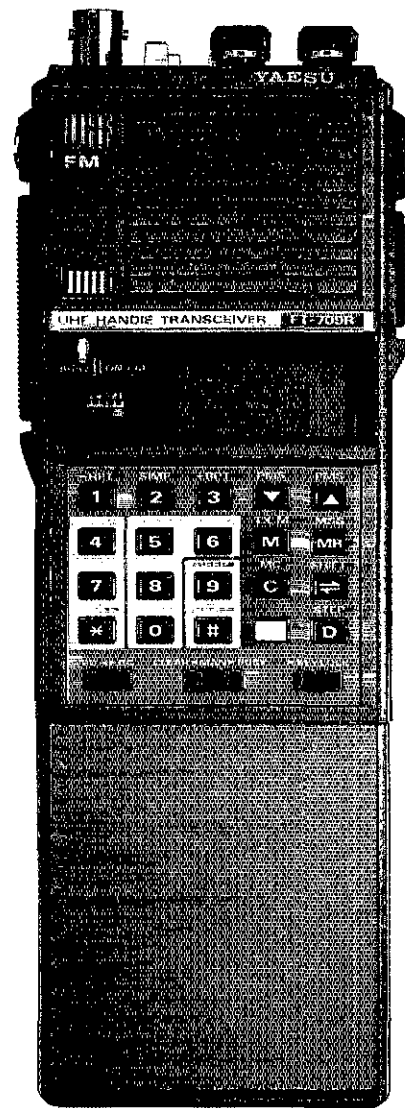
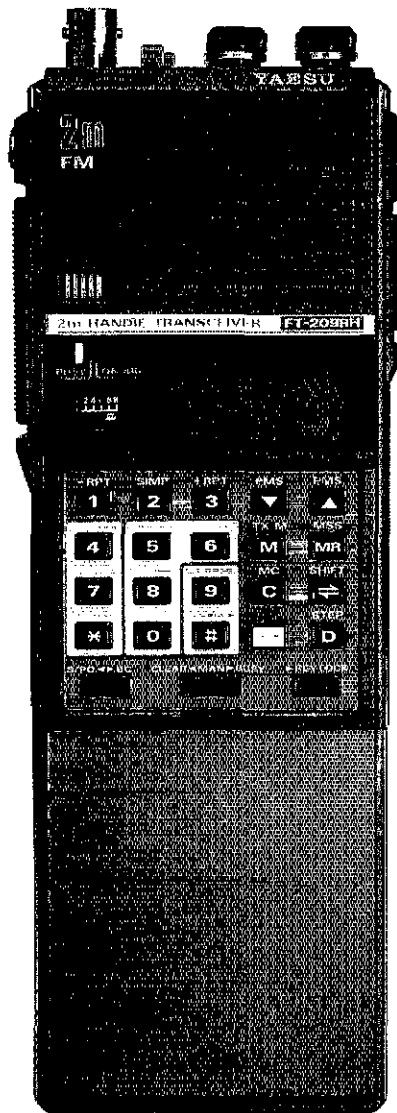
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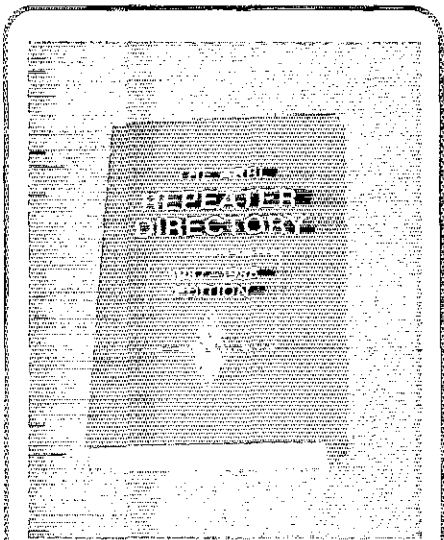
## 440 MHz



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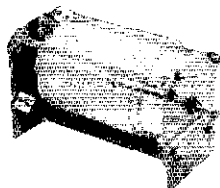


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six meter net on 50.150 SSB (the ten-meter frequency for novices listening on six will be 28.400 USB). Net time is Tuesdays at 2030 local. Plan to join the PVARC in the annual July Fourth "Country Fair": PVARC will again set up and demonstrate amateur radio to the communities in the South Bay. The Southern California Digital Communications Council (SDCCC) voted to provide coordination "guidance" to the area packet community; as such, the coordination is "soft" inasmuch as the technical committee and the council will indicate the advisory usage of the new packet channels allocated to the mode in the area. Traffic News from STM: Thanks for the help this month from the SCN gang. Fighting poor conditions and high-noise levels. Yours truly lost his 20-meter beam during recent winds and had to miss my east coast skeds for a few weeks. Things back on schedule now and antenna working better than ever. Traffic: KGUYK 534, W6INH 188, N6LHE 168, N7CZF 121, W6BVPY 79, K6YBV 29, W6NKE 23.

**ORANGE:** SM, Joe H. Brown, W6UBQ—ASM: Riv. Co. W6LKN Bob (714-686-3823). ASM: Org Co, Ralph, W6JBI (714-776-9272) ASM: SB Co, Tony W6QHB (714-981-1836). ACC: Mark K6BGNZ has resigned due family and career obligations. This very vital position in the field organization is now open. ATTNI CLUB LEADERSHIP. We must recruit for someone to administer this program. For info call 714-687-8394. Organized Amateur Radio Groups, working together is the answer to the enhancement of our hobby. CLUB NEWS: The PVARC working on a local interference Committee. Fine show no club should be without one. Words of wisdom if you meet a newcomer on the repeater, get an address, so we can send a copy of the club bulletin to him, and invite him to join us at the next club meeting. Shirley, N6LFA, Frn Muriel K6BJP Pres SOARA. Preparations for Field Day are now being made. Volunteers, equipment and a site are needed. Have fun. Please volunteer and make this a successful event. Fullerton RC rpts a record turnout. T-HUNT is becoming a more popular. Try it, find out why? Inland ARC, 1987 Officers. Pres Ken W6AZEF, VP Ralph W6M6V. Sec Kelly K6BMZS. Club membership for the year 1987 and the activities are growing. Good show, Buena Park ARC Tor Report, about 250 have attended the meeting on Tue 7/17. March. The Torrance City Council may to act on a twr ordinance that would prohibit amateur towers. After the amateurs presented their case, The Mayor suggested the City Attorney and 3 members of the ham community meet to work out an acceptable compromise. The battle was won but the war is not over. Amateurs will have to stay on top of the situation. The Bishop ARC Pres reports, if all goes well, we will have a Digipeater "back-bone" path down the middle of the state from Reno to Los Angeles. Sounds like fun! TC reports, John KD7XG, The packet BBS sysops in the Inland Empire have formed an informal "council" to discuss BBS-related issues and coordinate BBS operations in Western Riverside/San Bernardino counties. As a result we hope that packet, about 250 have attended the meeting on Tue 7/17. local BBS system. In preparation for SKIPNET STA, the KD6SQ dual-port packet BBS has been set up temp at the KD7XG QTH. STM: ERNIE WA6QCA, PSHR, WF6O, W6BQBZ, WA6QCA, K6BHJKT, K6TNDT/2, BFL, WF6O good show again Dan. NTS info? (714-673-7378, Msc tie for W6UBQ use BBS KD7XG-1, will check mail daily.

NET	FREQ	SEC	QNI	TFC	TIME	MM
SCN/1	3598	21	283	250	1830	WF6O
SCN/2	3598	26	136	39	2015	WF6O
SCN/V	146.645	31	352	231	2100	WA6QA

SEC: Ken, W6AZEF reports SB Co ARES/RACES going great. Traffic: W6LUB (DECC) is a train and organizing. Riv Co now has mobile Comm unit cabinet used by Ray, W6GKOM (EC ARC Chapter) and the ability Mike N6XZB (Rive Co Fire) to get the job done, the van is in service with a complete Amateur Station, plus packet and ATV. Traffic: WF60 566, K6GJUK 110, WA6QCA 85, AD0A 84, W6BQCB 20, N6GOT 64, K6ZCE 45, K6A2TND 29, W6BQCB 20, W6BZ 11.

**SAN DIEGO:** SM, Arthur R. Smith, W6INI—STM: N6GW. SEC: W6INI. PIO: K6GLF. TC: N6JZE. Mark your calendar for the SW Div Conv Oct 9-11, 1987, in Scottsdale AZ. On March 20, at 1801 PT, the 220 band and 10m Novice Band came to life with newcomers. Not only Novices but others with higher-class licenses are regularly appearing on 220. It's not too late to continue the battle against General Docket 87-14. Although the FCC filing deadline has passed, it is vital that you now write to your two U. S. Senators, and your Congressmen. Explain your concern with the squawking interference and value of 220 in the S D County Disaster Plan. Do it be technical. June is "Join-Your-Radio Club" month. North Shores ARC 1st Tues-Palomar ARC 1st Wed - South Bay ARC, Convalr ARC 1st Thu - 220 Club 2nd Mon - SD Packet RC 2nd Tues - ARC of El Cajon, Imperial Vly ARC 2nd Thu - Poway ARC 3rd Tue - PT Loma ARC 3rd Wed - SD Rptr Assn (SANDRA), Cubic ARC 3d Thu - Escondido ARC 4th Mon - SD DX Club 4th Wed - GCWA (call). Call 465-9926 for info. NCTN: 30 sessions, 76 mgs. Traffic: N4KRA 128, N6GW 36.

## WEST GULF DIVISION

**NORTHERN TEXAS:** SM, Phil Clements, K5PC—Asst. SM: W5MXQ. SEC: W5QKQ. PIO: K5HGL. TC: W5NLN. QCC: W5SVP. We have openings on our Section Staff for Section Traffic Mgr, Affiliate Club Coordinator and State Government Liaison. For details, send radiogram or write me. My address is on page 8 of this issue. W6AHLI is now KD5Z. Congrats, Kevin! The 7290 Tc. Net had March QNI of 2797, QTC of 577 in 48 sessions. The 7290 Net Mgr is KA5AZK. The Central Area Daytime Net had March QTC of 796 in 31 sessions. DRN5 was represented 100% by N.T.X. stations KD5RC, W5VMP, KA5AZK, K5MXQ, and W5YQZ. W5KLV is the GAN-D NM. I am looking forward to seeing you at Ham-Com '87 the first weekend in June in Arlington. Should be another record turn-out; look out, Dayton, here we come! Due to record low temperatures this spring, it appears that the tornado and hurricane season will be a late this year. Let's be ready to cover all contingencies. W5CFQ, our Section Emergency Coordinator is still looking for a few good hams to serve as county Emergency Coordinators in the following counties: Throckmorton, Stephens, Eastland, Brown, Mills, Hamilton, Limestone, Navarro, Henderson, Kaufman, Wood, Cherokee, Shelby, Harrison, Marion, Bowie, Camp, Franklin, Delta, Upshur, and Gregg counties. Our goal is 100% ARES coverage in our Section by year's end. We need your

help. PSHR for March, KA5QVY, W5SEEH, KM5L, K5ASYW, KGUPN, KA5SP1, KB5ADE, W5VMP and K5MXQ. Traffic: W5TNT 276, KA5SP1 208, N5GFV 198, K5MXQ 174, W5OYL 160, KD5RC 136, W5VMP 126, KD5Z 124, W5YQZ 124, KA5AZK 114, K5UPN 113, KB5ADE 79, N5UIU 65, KM5L 37, KA5QVY 34, K5EYV 28, W5SEEH 28, KA5YV 18, W5ERT 14, N5JHF 10, KB5UL 6.

**OKLAHOMA:** SM, Bill Goswick, K5WG—ASM/ACC: N5BN. BM: W5AS. QCC: K5WVG. PIO: W5BSYV. SEC: W5ZTN. SGL: W5NZS. STM: KV5X. TC: W5GMJ. Congrats to Bob Tierney, W5BSZP, on being appointed the NE District Emergency Coordinator. Bob brings impressive credentials to this position. Many thanks to John Campbell, K5ENA, for all that he accomplished while serving as NE DEC. We are fortunate to have so many well-qualified amateurs willing to serve in positions of responsibility in the Oklahoma Section. Field Day preparations are being made by many groups state-wide. Make plans to participate in the activities in your area. Those of you who handle traffic are reminded to turn in your Station Activity Report to me or the STM, Sam Sitton, KV5X, by the fourth day of the month so that your traffic totals can be listed here. Any field appointees who would like to obtain the new name/call badge contact me for the necessary form. Several appointees have obtained the new badges and they are very good-looking. Any League member who is interested in obtaining a field appointment contact me or the appropriate Section-level leader listed above. Traffic: W5AS 356, N5XSE 290, KV5X 297, W5AOLU 131, K5GBN 79, N5KHU 51, N5SV 38, W5YV 30, W5QGC 27, W5VOP 26, K5CAJ 25, W5AZOO 24, K5FRD 23, N5FEM 15. Brass Pounder's League: W5AS, N5XE.

**SOUTHERN TEXAS:** SM, Arthur R. Ross, W5KR—ASM: N5TC. SEC: K5DG. PIO: W5LUBZ. STM: K5QEW. QCC: W5ZVL. ATC: N5ZU. BM: K5CVD. SGL: K5KJN. San Antonio RC bulletin rpts Special Events Stn at the Alamo was a success. K5EHO upgraded to Extra, N5HIF upgraded to Advanced with new call K5F5I; 40 plus students attended opening session of new classes for Novice and Tech/General. QCC W5ZVL attended state emergency management meeting at Austin. Bay Area ARC PICAYUNE INTELLIGENCE RPTs club officers: KA5PBK, Pres: KA5OVO VP: N5JQU, secy/Treas: K5UJ and N5YH conducted last Novice exams under old rules. 2 passed, Hill Country ARC, Kerrville, rpts N5AFI operating digipeater on 145.01 MHz in Mason County, directed to Junction (west), Austin (east) and distant points other directions. ORS KA5IDT rpts he, K5ZLM, K5EAL 1 and N5JEN of Houston ECHO Sec and Northwest ARS supplied communications for 26-mile Woodland Marathon and 10 km run; planning similar operation for Equestrian Cross Country Jumping Trials at Bellville. Golden Crescent ARC, El Campo, NEWSBIT vol 1, No 1, rts KA5JTM, K5FLW, K6KDK and one new op (no call yet) working on digipeater. DRN5 NM W55YDD rpts 765 mgs in 62 sessions in March; STX represented 100% by W5CZT, K5D5Q, N5DFO, W5KLV, K5RGR, K5HGHG, W5V5X, W5B5EPA, W5B5FQU, W5ASZY, N5BHQ, K5QEW, W5BHQZ, W55YDD. STM K5QEW rpts 7290 Net in March field 48 sessions, passed 577 messages with 2,797 check-ins; NTS liaison always 2 per session; NM is KA5AZK, W5ES bulletin, El Paso ARC rpts ops of new repeater, ORS KA5IDT rpts he, K5ZLM, K5EAL 1, K5EYU, KA5OJF, K5EYV, KY0F, K5B5OV, K5TRW, K5LTV and K5B5YD. ORS W5KLV in March gave 7 ARRL bulletins, 5 propagation forecasts, 4 DX bulletins, 6 CRRIL bulletins 125 readings on 3 nets. Brazos Valley ARC (Pt Bend and Harris Counties) rpts digipeaters operating on 145.07 MHz in Baytown, Galveston, Richland and Houston. CAND NM W5KLV rpts 796 messages in 31 sessions in March; DRN5 represented 100%; STX stx helping: W5KLV, W55YDD, W5B5FQU, W5B5EPA, N5DFO, K5D5KQ, K5W5OB, N5XSV, Kendall ARS, Boerne, rpts holding practice for SKYWARN and emergency procedures. Sun City ARC, El Paso, rpts K5EYV upgraded to Extra. Extra ops will be held on 145.07 MHz will provide communication for March of Dimes Walkathon; N5KDD upgraded to General, D-CAT, a Disaster and Communications Action Team, is a club with a purpose and applying for SSC designation. EC N5FHF rpts El Paso emergency and training net stays active. Bryan ARC rts N5BZL, KA5RCT and W5A5MO teamed up to take gasoline to a stranded motorist. PIO W5A5UZ announced K1TU is new PIA for Houston ECHO Society; also advises that ARRL HQ has pre-printed NEWS RELEASE forms, available by sending request to WA1VMC at HQ. Traffic: W5KLV 423, W55YDD 334, W5CZT 320, W5HIF 131, W5B5J 88, W5B5EPA 87, ACSZ 62, W5B5GE 40, W5AZVL 32, W5KR 11, N5ZJ 2. (Feb.) W5KR 32. (Jan.) W5KR 15.

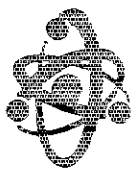
**WEST TEXAS:** SM, Oscar "Gene" Smith, A5B—This is the first West Texas Section news and I don't have much, as I have just been appointed as interim SM until the election decides who will take over. I am just trying to fill the void between now and after the election, June 30, 1987. On the first of July, our new elected SM will take his or her office. Everyone be sure and turn in your ballot. We have two good people running. There will be no appointments until the new officer takes over. Those of you that have appointments in the North or South Texas Sections, just hang in there. The newly elected SM will take it from there. Good luck to both candidates! Vote!!! We are in storm time of the year, so all be prepared to act if any bad weather comes.

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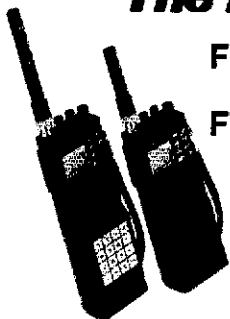
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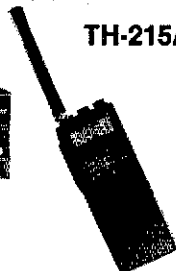


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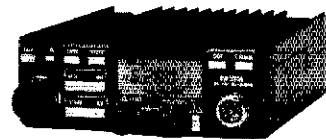


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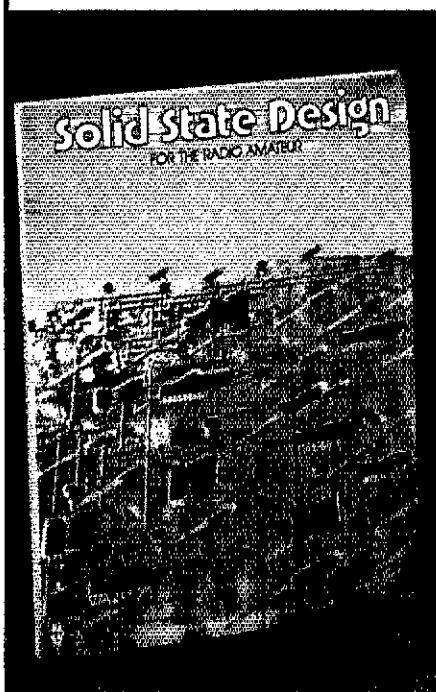
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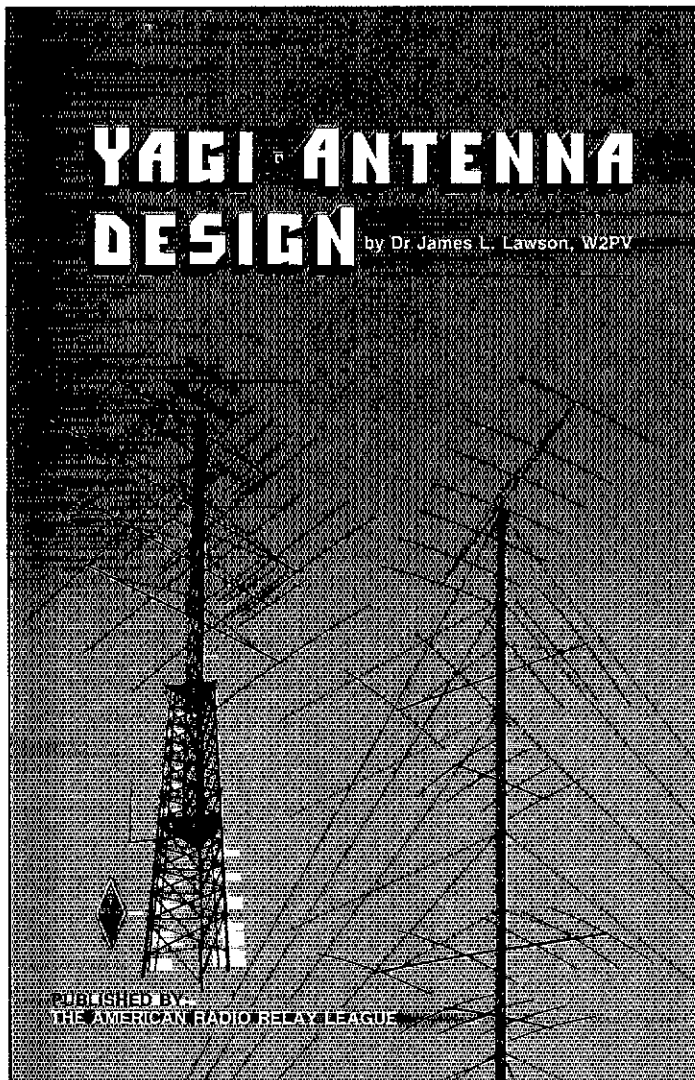
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**Solid State Design for the Radio Amateur** was first released in 1977 as a theoretical and practical guide for the radio amateur interested in using solid-state devices in RF design work. In the just released second printing, the occasional errors and omissions which inevitably creep into a work of this magnitude have been corrected, making this publication even more valuable not only to amateurs, but professional RF designers as well.

**Solid State Design** is among the select few technical books that have sold more than 50,000 copies. Why has it achieved this enviable sales milestone? For one thing, its 9 chapters and 256 pages are chock full of good basic information on circuit designs and their applications. Much of the data such as transistor modeling, cannot be found in other publications. Some of the topics covered are: basics of transmitter design, power amplifiers, matching networks, receiver design basics, advanced receiver concepts, modulation methods and test equipment. 1st edition, 2nd printing. \$12.00 in US funds. Add \$2.50 for shipping and handling (\$3.50 for UPS).



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**Yagi Antenna Design** is based on the series in **Ham Radio Magazine** by the late Dr. James L. Lawson, W2PV. Jim was a highly competitive person and this carried through to his Amateur Radio hobby and work with antennas. Although this book is primarily the work of the author, credit should be given to its editors: Bill Myers, K1GQ; Clarke Greene, K1JX; and Mark Wilson, AA2Z. This ARRL publication stands to be a "classic" that should be added to every radio amateur's technical library. The book is available only in hard cover, and is printed on high quality textbook paper. There are over 210 pages of detailed information on Yagi design. For more detail, refer to the column at right. The retail price is \$15.00. Please add \$2.50 (\$3.50 for UPS) for postage and handling. Also available at your favorite ARRL dealer.

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# ANTENNA

## BOOKS



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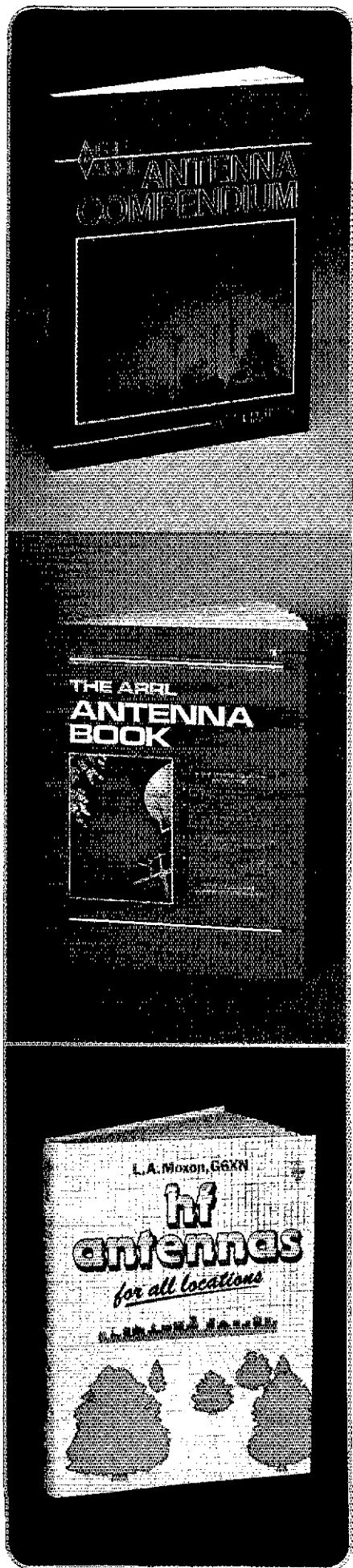
**HF ANTENNAS FOR ALL LOCATIONS** by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; the Antenna and its Environment; Single-element Antennas; Horizontal Beams; Vertical Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Paperbound **\$12.00**

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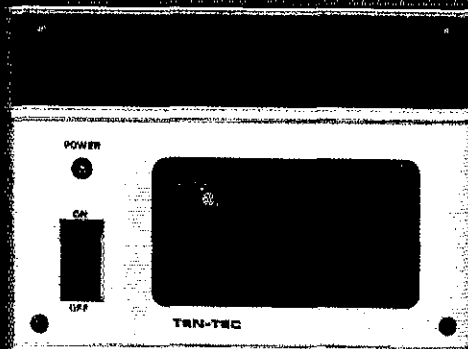
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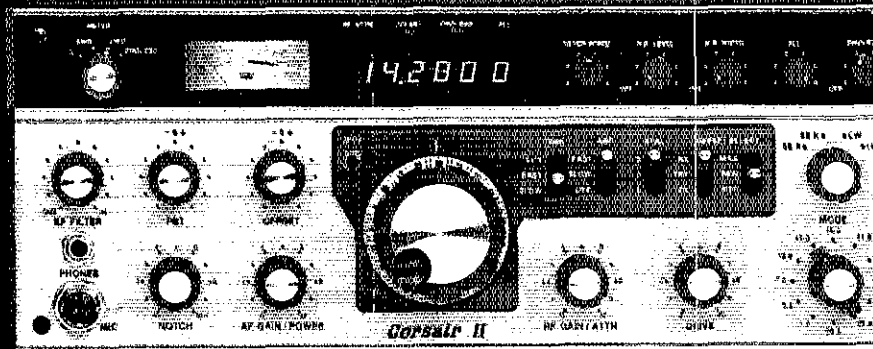




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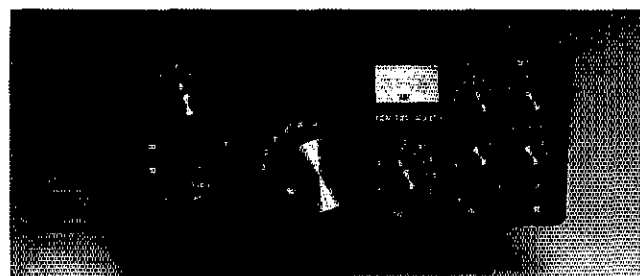
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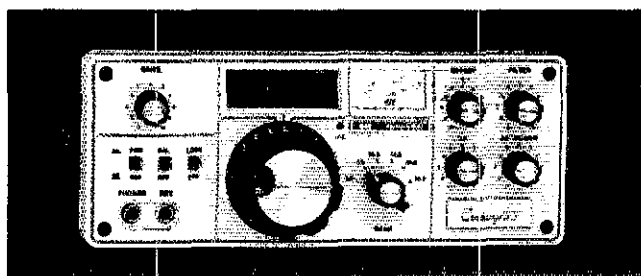
## ARGOSY II, SSB/CW HF TRANSCEIVER, MODEL 525D . . . \$695

A unique combination of small size, simplicity and low cost. Great for mobile, portable and base station use. Operates 80, 40, 30, 20, 15 and 10 meters, in 500 kHz segments, plus 40 kHz overshoot at band edges. 100 watts input with solid state, no tune, final. 12 to 14 VDC at 500 mA, RX, 9A TX. Optional RX filters. 250 Hz, 500 Hz or 1.8 kHz. RX sensitivity .3uV for 10dB S + N/N typical. Offset tuning range, 6 kHz. Variable notch filter, greater than 50 dB rejection, 200 Hz to 3.5 kHz. Optional noise blanker. Famous Ten-Tec QSK CW, of course. Clutter-free front panel allows single-hand operation without even looking at the rig, even with fat fingers. Isn't that different! Weighs in at a mere 8 pounds! HWD 4"x9.5"x12".

Model 225 115/230 VAC 9A power supply . . . \$129.00

Model 222 Mobile Mount, w/quick release . . . \$27.50

Model 223A Noise blanker (plug-in) . . . \$37.50



## CENTURY/22, CW Transceiver, Model 579 . . . \$389

Put the fun back into hamming. This is a top notch, 50 watt, CW transceiver. Features found in only the best rigs are included. Full break-in QSK, excellent RX selectivity on CW (also tunes LSB/USB) and 100% solid state circuitry. Broadband "no tune" RF amp. Operates 80, 40, 30, 20, 15 and the lower 500 Khz of 10 meters. Power required, 12 to 14 VDC at 6A. Size HWD 4" x 10" x 10.5". Weight 6 lbs. Great for portable, mobile or base station operation. POWER SUPPLY for Century/22. Model 979 115VAC . . . \$98, 979E 230VAC . . . \$110

### THE ULTIMATE HF MOBILE ANTENNA SYSTEM

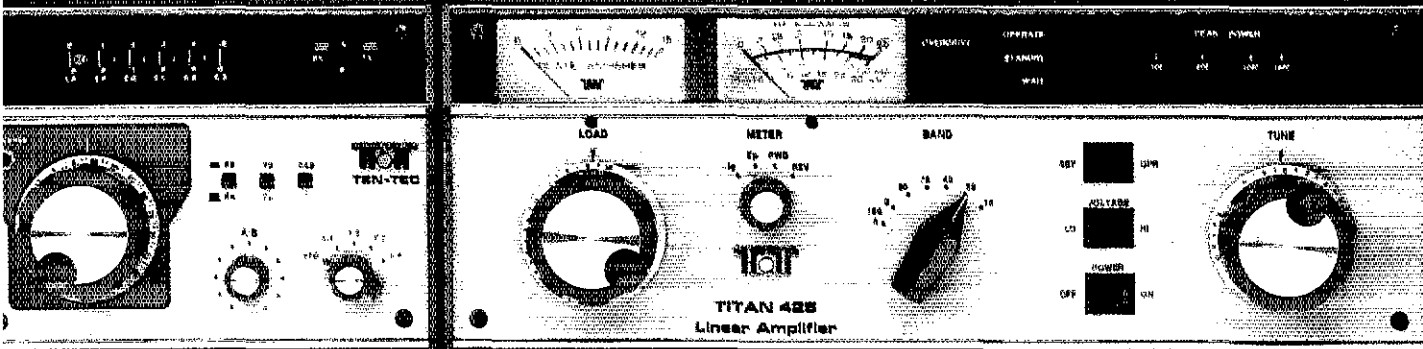
. . . From \$28.00 - \$40.00 per band.

HF mobile is a world of compromise! Give yourself a chance. Choose the finest, environmentally protected, antenna system. Loaded to the best height for radiation efficiency, and to clear most overhead obstacles. Upper SS whip is vertically adjustable for "no tears" tuning. Lowest wind resistance too, less whipping and de-tuning. Standard 3/8" x 24 base fitting screws into all standard mounts. Typical height 78" or less.



# Our outstanding SSB performance equals our CW and DIGITAL reputation!

**WARRANTY**



**MODEL 263G REMOTE VFO**

**MODEL 425 TITAN**

frequency control. Front panel switch selects, CORSAIR transceiver, 263 transceiver, CORSAIR TX/263 RX, 263 TX/CORSAIR RX. You can also listen to both frequencies simultaneously. A balance control is provided for priority adjustment. Also makes provision for Xtal control. Connects to CORSAIR with cables provided. Size is HWD 5.25" x 7.5" x 12".

**MATCHING SPEAKER/POWER SUPPLY Model 960 . . . \$229**

A highly regulated and filtered, 22 amp. supply. Includes protective circuit breaker and primary power fuse. Can use either 115 or 230 VAC, 50/60 Hz. Size is HWD 5.25" x 7.5" x 12".

**TITAN HF LINEAR AMPLIFIER . . . \$2685**

"BOOM BOX" EXTRAORDINAIRE! Remoted power supply makes possible, this compact, desk top linear amplifier. Puts out a solid 1500 watts SSB and CW, 1000 watts continuous power on RTTY, AMTOR or SSTV. Lightning fast QSK for "break-in" CW and super AMTOR performance.

**RF DECK**

Drive power: 80 watts typical.  
Four LED status indicators, including "overdrive" warning.

**Hi/Lo plate voltage switch.**

**Metering:** Full time plate current meter. Multi-meter, selectable for plate voltage, grid current, power out or reflected power.

**Vernier drive, tune and load controls.**

**Peak power indicator:** Ultra quick 10 element LED bar-graph display.

**Amplifier tubes:** Two Eimac® 3CX800A7, ceramic, external anode, air cooled triodes in grounded grid circuit. Plate dissipation, 1600 watts.

**Frequency coverage:** 160, 80, 40, 20 and 15 meter bands plus 18 and 24 MHz standard, 10 meter kit supplied upon proof of authority to transmit.

**Size and weight:** HWD 5.25" x 15.25" x 15". 17 lbs.

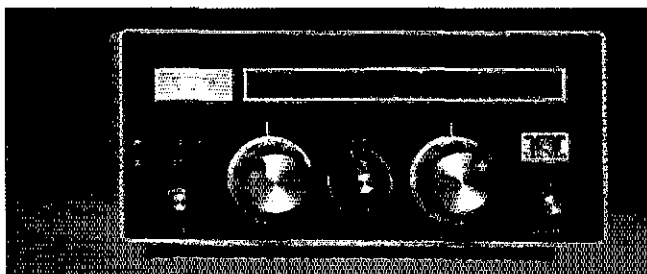
**POWER SUPPLY (Supplied with TITAN)**

**Primary power:** 220-250 VAC @ 20 amps, maximum.

Conservatively designed for cool operation under full load using a Ten-Tec, tape wound, Hypersil® transformer.

**Hi/Lo blower speed switch.**

**Size and weight:** HWD 8.25" x 13.4" x 10.25". 45 lbs.  
UPS shippable.



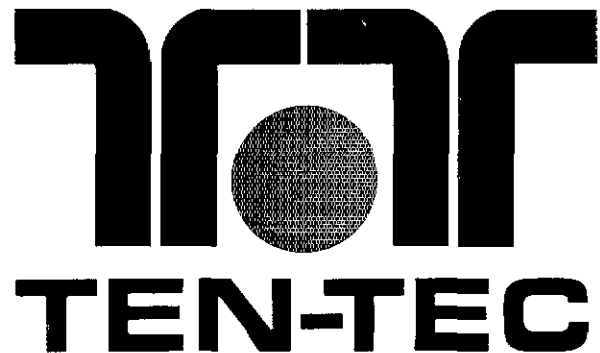
**1.5KW ANTENNA TUNER, Model 229B . . . \$299**

Designed to match your 50 ohm, un-balanced coaxial, transmitter output to virtually any un-balanced antenna. General coverage from 1.8 to 30 MHz. Handles all the power the law allows.

- Reversible "L" network circuit for best match and bandwidth, at either hi or lo, antenna impedance.
- Avoids false load indication.
- Ceramic insulators and coil forms throughout. Silver plated switch contacts and roller inductor coil.
- Built-in SWR bridge.
- System by-pass switch.
- 4 Position antenna select switch.
- HWD 5.5"x13"x11", 9 lbs.
- For balanced feedline order accessory balun. Model 3229 . . . \$15

**The term of the TEN-TEC WARRANTY IS ONE YEAR...as always!**

**...America's Best Kept Secret!**



Highway 411 East  
Sevierville, Tennessee 37862  
615/453-7172

## Understanding Automatic Antenna Tuners

One of the most popular yet often misunderstood accessories in modern amateur radio setups is the fully automatic antenna tuner. While this item plays a significant role in any station's overall performance and enjoyment, inquiries regarding its specific use and operation continue surfacing during conventions and ICOM Day discussions. Answering those questions in a "shared knowledge" manner thus inspired this Tech Talk's topic.

The basic purpose of an automatic antenna tuner is matching an antenna's transmission line-presented impedance to that of a transceiver's output. This technique is usually referred to as **obtaining a low SWR for full band coverage**. Many of today's multiband dipoles, beams, and verticals exhibit narrowband characteristics, for example, and must be pretuned for SSB or CW band segments before outdoor installation. Attempting subsequent operations in their less favored or "high SWR" range creates an impedance mismatch that restricts RF power output from their connected transceiver.

An antenna tuner utilizes a large multitapped coil and two variable capacitors to counteract undesired capacitive or inductive reactances and re-establish a matched condition between the transmission line and the transceiver. While this impedance matching doesn't eliminate coax cable losses, it does allow a station's transceiver to efficiently deliver its full output to the antenna system. This impedance matching arrangement has also been proven beneficial in reducing harmonic radiations and TVI.

The basic inner operation of all automatic antenna tuners is similar in nature. Initial band selection determines the

proper coil tap to be utilized while reversible motors position the variable capacitors at their point of lowest SWR. "Correction voltage" applied to the motors is derived from the tuner's SWR sensing circuits which, in turn, are activated by RF energy from the transceiver.

Manual antenna tuners perform similar impedance matching functions; however, the station operator must personally monitor SWR readings while trial-and-error selecting coil taps and rotating capacitors to find a proper impedance matching point. The convenience and enjoyment of an automatic tuner "following your lead and readying everything for action" creates a **deluxe setup that's a pleasure to operate**.

There are presently two design variations in automatic antenna tuners: the totally "hands off" unit, and the operator-adjustable unit. "Hands off" units typically exhibit a limited impedance matching range and can't be operator fine-tuned. Operator-adjustable units usually exhibit a comparatively wider tuning range and offer greater overall station flexibility, but improper settings must be minimized.

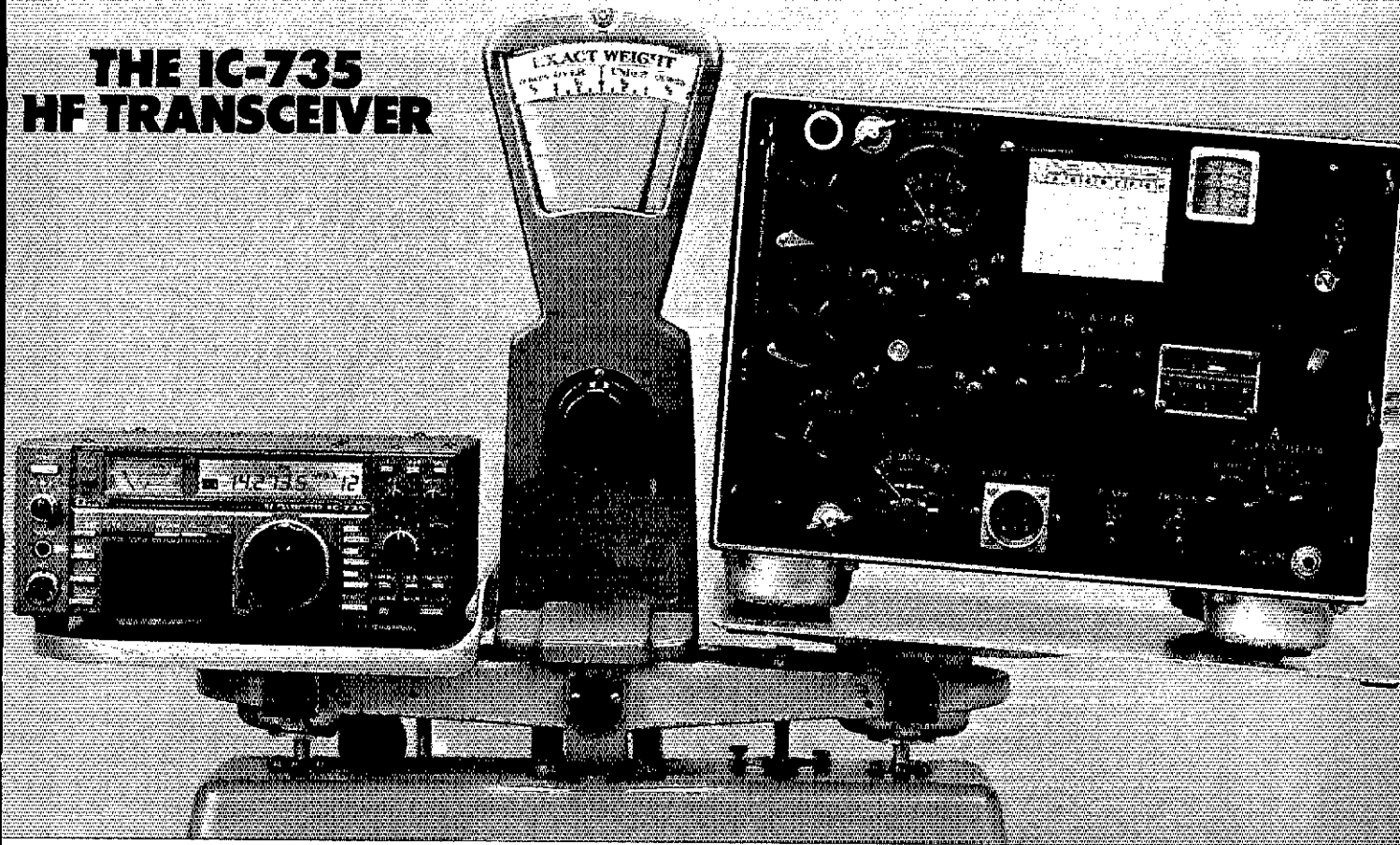
**ICOM's fully automatic AT-500, AT-100, and AT-150 antenna tuners incorporate the best features of previously discussed concepts in their designs.** They can be used as a strictly automatic/hands-free unit or operator-adjusted when desired. Additionally, each tuner includes an automatic **four-selection antenna switch** and a transceiver interfacing cable for fully automated station operating convenience. The AT-500 and AT-100 handle 500 and 100 watts, respectively, and operate automatically with all ICOM HF transceivers (LDA option required for IC-730). The AT-150 handles 100 watts and mates

with the compact IC-735 for true "dream station" performance.

Operating an AT-500/AT-100/AT-150 equipped ICOM station is an amateur's delight. When a particular band is selected on the station's transceiver, the "slaved" tuner connects the required antenna and internal coil tap. Transmitting a brief low power signal then allows the tuner to adjust its capacitors for an optimum impedance match, and the station is ready for action. If additional "tweaking" is desired, a top access hatch permits indirectly fine tuning capacitor settings. Four LEDs (two for each capacitor) provide direct assistance by indicating the resonant point of each control. Merely ensure the tuner's AUTOmatic/Preset (Manual operation) switch is in its **AUTO** position, then rotate the controls until all LEDs extinguish. If a particular antenna exhibits exceptionally high SWR, the tuner may be switched into preset/manual operation. The previously mentioned internal controls may then be (**slowly**) adjusted while monitoring SWR on the transceiver's meter. Two capacitor-adjusting controls are provided for each band; thus, one band's antenna settings will not disturb another's. Two helpful hints: when **manually** presetting, always start with adjustments in **midrange**. When auto tuning reluctant antennas, try "**Walking**" the tuner by allowing it to fully retune in 25kHz steps rather than 300kHz jumps. Remember, also, all tuners have their limits.

Inclusion of an automatic antenna tuner in any HF setup truly opens an exciting new world of enjoyment. A smooth operating station also inspires investigation of new pursuits and modes. Naturally, ICOM wants you to enjoy amateur radio's many rewards in **TOP style!**

# THE IC-735 HF TRANSCEIVER



## BUY YOUR HF FOR PERFORMANCE, NOT BY THE POUND

- All HF Band Transceiver/  
• General Coverage Receiver
- HM-12 Scanning Mic Included
- 12 Memories/Frequency and Mode
- 105dB Dynamic Range
- All Modes Built-In USB, LSB, AM, FM, CW

The IC-735 is a heavyweight when you compare features and performance. Other transceivers may weigh more than the advanced IC-735 compact HF transceiver, but inch-for-inch and pound-for-pound, the IC-735 outweighs them all.

**Ultra Compact.** Measures only 3.7 inches high by 9.5 inches wide by 9 inches deep and weighs only 11.1 pounds. Without question, the IC-735 is the best HF transceiver for mobile, marine or base station amateur operation.

**All Amateur Band Coverage.** It's a high performer on all the ham bands, plus it includes general coverage reception from 100kHz to 30MHz. May be easily modified for MARS operation.

**12 Memories.** Frequency and MODE may be easily stored and retrieved in the 12 tunable memories.

**Exceptional Receiver.** To enhance receiver performance, the IC-735 has a built-in receiver attenuator, preamp, and noise blanker. PLUS it has a 105dB dynamic range and a technologically advanced low-noise phase locked loop for extremely quiet rock-solid reception.

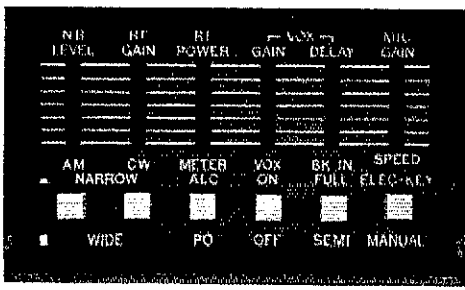
**Simplified Front Panel.** Controls which require infrequent adjustment are placed behind a unique hatch cover on the front panel of the radio. The hatch cover is designed to protect seldom used controls from being accidentally knocked off line, but also provides easy access. The large LCD readout and con-

veniently located controls enable easy operation, especially important for the mobile environment.

**More Features.** FM built-in, HM-12 scanning mic, program scan, mode scan and memory scan. Switchable AGC, automatic SSB selection by band and RF speech processor. Continuously adjustable output power up to 100 watts, 12V operation, 100% duty cycle and deep tunable notch filter.

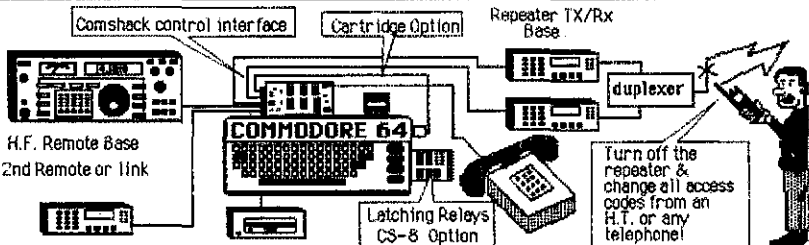
**Options.** A new line of accessories are available, including the AH-2 mobile antenna system, AT-150 whisper quiet automatic bandswitching antenna tuner for base station operation and the PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

See the IC-735 performance heavyweight at your local authorized ICOM dealer.



## \*\* Super ComShack 64 \*\*

Repeater Controller/Dual Remote/Autopatch/Shack Control



### Super Repeater Controller

- \*Remotely programmable with Touchtones/ change up to 9 sets of access codes from H.T. or telephone!
- \*Synthesized speech; high quality natural sounding human male or female voice
- \*Dual Remote base/ Control freq./mode/scan/on/off
- \*Autopatch fast access & speed dial tone or pulse
- \*Program voice ID message/courtesy beep from H.T.
- \*Automatic voice clock & user programmable timers
- \*Multiple commands can be executed at once (up to 16 digits per command string)
- \*Sub-audible tone compatible/8 relay control opt.
- \*Alarm clock & auto-execute command string!
- \*Optional autoboot cartridge (no disk drive needed)
- \*Send control commands from any telephone!

### Special Club Features

- \*Generates random code practice @ any speed with voice readback after each 20 random code group!
- \*Set CW speed/pitch/courtesy beep from your H.T.
- \*Input up to 22 vocab words & letters as ID or mail box message @ speed dial rates from H.T.
- \*Easy to maintain C64 computer/ low cost repair!

### Autopatch Specifications

- \*300 Touchtone loadable Autodial numbers plus 10 Emergency Autodial (quick access)
- \*300 Reverse patch call signs uploaded from your H.T./general or directed page modes
- \*Incoming caller receives voice message to enter 3 digit code to selective page a call sign (D.P. mode)
- \*Two access codes for autopatch priority access
- \*Enable/disable 50 area codes + wild card \*\*s
- \*Full or half duplex (repeater on/off)
- \*Storage of MCI/Sprint access codes
- \*Call waiting allows switching to second call
- \*Touchtones are regenerated onto the tel./speed dial
- \*Touchtone or dial pulse modes
- \*Reverse patch active in all modes

### Dual Remote Base Specifications

- \*H.F. CAT remote : Yaesu FT-757/767/980  
Kenwood TS-440/940, Icom IC-735
- \*2nd remote: Yaesu FT-727/FT-767(UHF & VHF);  
Kenwood 811/711 - serial data ... or use 7950  
TS-2530/70 with RAP I (row & col. control card )
- \*10 H.F. Memory channels/enter or recall
- \*Automatic USB/LSB/FTM/AM mode select
- \*Scan up/down, fast, or 100hz steps
- \*Control CS-8 relay/latch /master reset /Status
- \*H.F./Y.H.F. Monitor only or TX enable modes
- \*All control inputs are voice confirmed including frequency, mode, scan status, time, outputs on/off
- \*VHF remote, as link input, & repeater can be active

### System Options

- \*8 Latching Relay control (CS-8) \$ 79.95
  - + 3 DPDT 2A relays, 5 open collector outputs
  - + user defined 2 letter function name & state
  - + automatic PTT fan control/master all off code
- \*Optional CMOS auto-boot 72k EPROM Cartridge programmed with your parameters \$99.95
- \*Keypad Control for VHF remote; RAP I \$149.95
- \*Super ComShack Manual (credit later) \$15.00

### MODEL CS64S-\$349.95 (wired and tested)

includes: computer interface, disk, cables & manual, duplex & simplex versions are supplied (some features not applicable when using simplex )  
add \$4.00 shipping / Ca. residents add 6%

### MASTERCARD/VISA/CHECK/M.O./COD

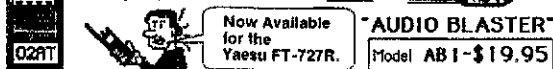
Use of this device with a transceiver operating in the 2 meter band or on any frequency below 220 Mhz is not permitted unless a separate control link is provided.

### Engineering Consulting

583 Candlewood St.  
Brea, Ca. 92621  
tel: 714-671-2009

### Audio Blaster for IC92AT/IC94AT/IC2AT/FT208/FT209

Module installs inside the radio in 15 Min. Boost audio to 1 watt! Low standby drain/Corrects low audio/1000's of happy users. Miniature audio amplifier. Used by Police, fire, Emergency, when it needs to be loud!



Now Available for the Yaesu FT-727R.  
"AUDIO BLASTER"  
Model AB1-\$19.95



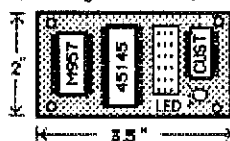
### Touchtone to RS-232 (300 baud interface)

Program your computer in basic to decode multidigit "strings", sound alarms, observe codes. Simple to install; includes basic program for C64/VIC20/C128; works with all computers!  
"DECODE-A-PAD"  
Model DAP \$89.95



Model RAP Radio under control  
"DTMF Keypad Rows & Columns Control + Two latches."  
Will control frequency of any keypad entry radio such as the Models 7950/2530/IC04-AT/RM2. Easy to install in parallel with existing keypad/Use with ComShack 64 as a freq. controller or Pro Search rotor control box/A versatile board for all remote control applications. Two 4 digit decoders included for latching relays on/off or momentary.  
"REMOTE-A-PAD"  
Model RAP-1 \$149.95  
SEE PG. 30; JULY 1986 "QST"

### Touchtone 4 Digit Decoder & on/off latch all 16 Digits/low power



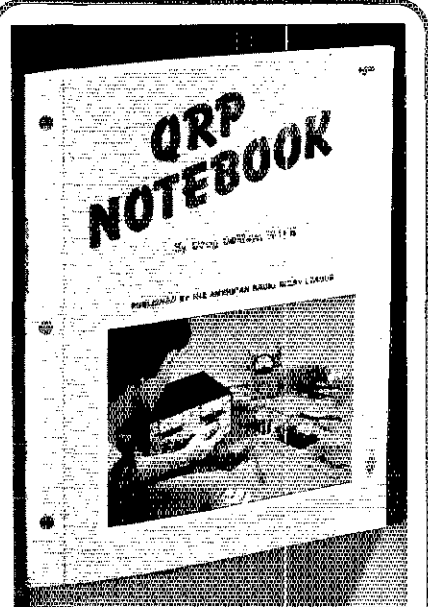
### Repeater on/off Master control

Wired and tested +5 to +12 Volts/  
User programmable to 50,000 codes/  
All 16 digits/Send code once to turn on, again to turn off/ Momentary & Latching output/drives relay/LED latch indicator/Optional 4 digit extra custom latch IC's \$8.95 each/add as many latches as you want to your external board.  
Model TSD \$59.95



### Touchtone Decoder Kit

M957 Teltone 5 to 12v. 15ma (SSI-201 replacement)/inc 3.58 Mhz Crystal/ 22 pin socket, Data Sheet, Sample circuits, decoder specs, all 16 touchtones, BCP/HEX.  
No filters required  
Model TTK \$22.95



## Doug DeMaw's QRP Notebook!

Doug DeMaw, W1FB, has been writing articles about QRP operating and equipment construction for many years. In this ARRL publication, Doug presents construction projects for the QRP operator, from a simple one-watt crystal-controlled transmitter to more complex transceiver designs. Rather than simply presenting a collection of completed units, Doug guides you through the project "building-block" style. This way, you gain an understanding of how the circuits operate and learn how the building blocks might be put together in other configurations.

Experimentation and low-power operating go hand in hand. Construction of a complete modern transceiver is a major undertaking, but some of the circuits in this book can be put together in an evening or a weekend from a few dollars' worth of parts. Once built, the equipment can be tested and improved as your understanding and skill grow. Many of the simpler circuits can be used later as parts of the more complex projects.

The QRP Notebook contains 112 pages. #0348, copyright 1986, \$5.00, plus \$2.50 postage and handling (\$3.50 for UPS).

THE AMERICAN RADIO AMATEUR ASSOCIATION  
ARRL  
NEWINGTON, CONNECTICUT 06111



# GET ON THE AIR WITH THE BEST

All Novices Can Now TALK on 220MHz, 10 meters and 1.2GHz.

ICOM extends congratulations to privilege-enhanced Novices, and invites everyone to extend their horizons with ICOM!

ICOM is the only amateur radio manufacturer hosting a full product line especially geared toward privilege-enhanced Novices (and Technicians joining 10-meter activity). Whether your interests include 1.2GHz, 220MHz, HF bands, FM, CW, or SSB, choosing ICOM gear means going First Class!

Explore 1.2GHz DX attractions and local activities with pacesetter ICOM gear. The all mode IC-1271A base station transceiver includes numerous de-

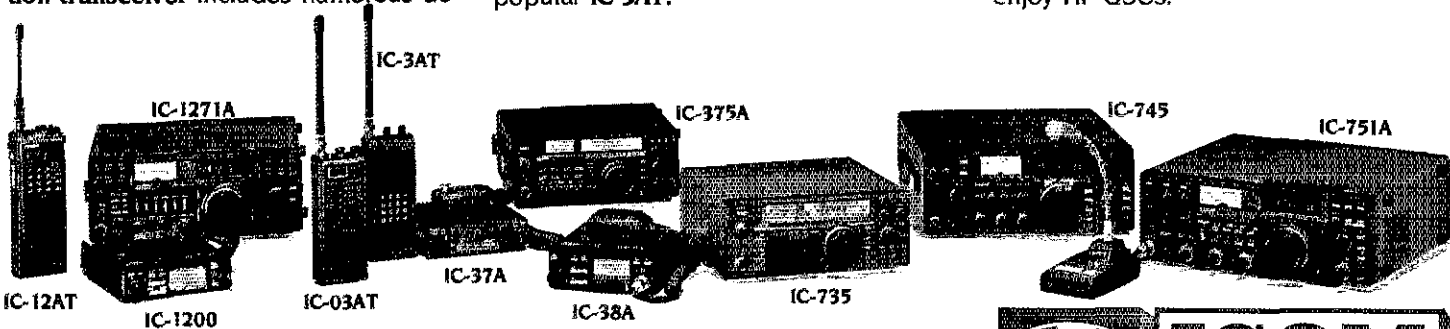
lux features and is expandable with your future interests. FM mobiling pleasures begin with ICOM's new 10 watt IC-1200 which is easy to install and operate. Every amateur enjoys handheld portable operations, and ICOM's deluxe IC-12AT handheld is ready to go.

Experience 220MHz activities using top quality ICOM equipment. For your multi-mode interests is the new IC-375A 25-watt base station transceiver: a true masterpiece of modern technology. ICOM's ultra slim IC-37A and compact IC-38A are ideal 25-watt mobile units. For a versatile and rugged handheld, choose the deluxe IC-03AT or the ever-popular IC-3AT.

Enjoy HF QSOs worldwide and depend on ICOM transceivers for top communications performance. The exciting new IC-761 offers you superb "everything in one cabinet" operation. Or there's the ICOM deluxe midsize transceivers, the IC-751A and IC-745. The IC-735 is today's most popular fixed/mobile rig. Also, friends, all ICOM HF transceivers include a full one-year warranty.

ICOM Accessories are interchangeable. Use them with ICOM's 2-meter and 440MHz gear when you upgrade!

Get on the Air with ICOM and explore 1.2GHz, experience 220MHz, and enjoy HF QSOs.



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 ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. M4987

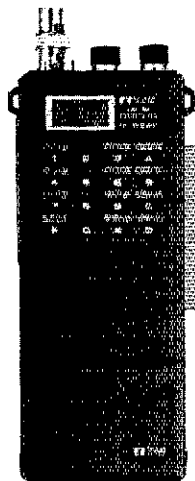
# ICOM DAY!

Presented by:

## Rivendell Electronics

8 Londonderry Road  
Derry, New Hampshire 03038  
(603) 434-5371

**SATURDAY**  
**JUNE 13, 1987**  
**9:00am till 5:00pm**



## WIN!!

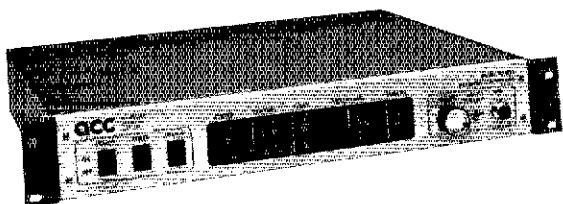
★ Prize drawings each hour!  
Come and register to win!

## Grand Prize

### IC-02AT 2-Meter Digital Readout Handheld

(No purchase necessary to win.)

- ★ Special pricing
- ★ ICOM personnel to demonstrate new equipment
- ★ See the new line of ICOM equipment



## "The RC-850 Repeater Controller ... still the leader of the pack!"

The RC-850 controller offers your group the most advanced repeater control technology available anywhere. Through ongoing hardware and software enhancements, even our first customers enjoy new features that keep it ahead of the pack.

With the '850, your repeater becomes fully remotely programmable. From command codes to the repeater's operating schedule, virtually everything can be easily changed. Touch-Tone programming from your radio or the phone with synthesized voice readback, or programming from your home computer via modem or packet.

The autopatch supports local and radio-linked remote phone lines, extending your patch coverage to match your RF coverage. You don't even need a phone line at your site! The 250

autodial slots meet everyone's needs, with up to 35 digit storage for personal MCI/Sprint codes.

The easy-to-use mailbox lets you include phone numbers, times, or frequencies in messages. The controller is so smart, it'll leave you a message if you miss a reverse patch or an alarm.

Selective call capabilities range from CTCSS and two-tone to display paging, so you can always be available without having to listen. Voice response telemetry lets you remotely meter your site. Its continuous measurements with storage of updated min and max readings let you find out how cold it gets, how high the reflected power reads . . . and when.

Individual user access codes, with callsign ID, offer secure access to selected functions to completely prevent horseplay.

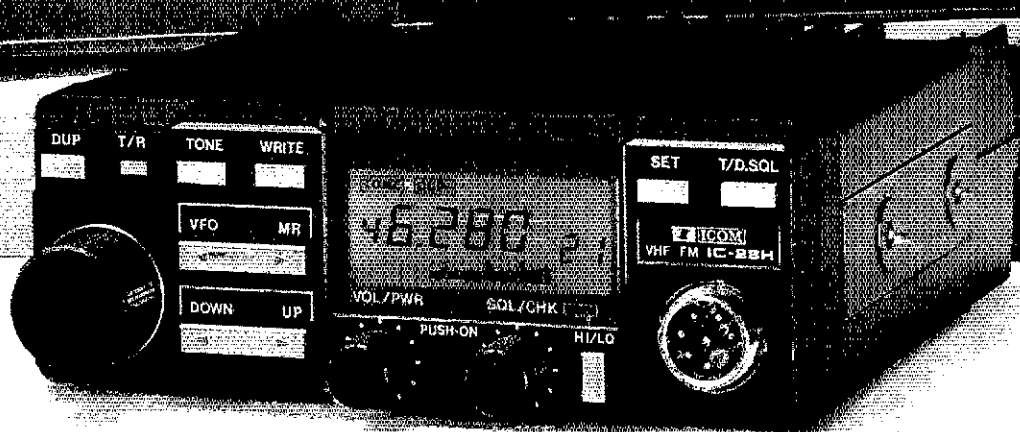
The industry's top-of-the-line controller, now better than ever, for *your* repeater.

**acc** advanced  
computer  
controls, inc.

2356 Walsh Avenue, Santa Clara, California 95051  
(408) 727-3330



220MHz IC-38A  
440MHz IC-48A  
Now Available!



# ICOM IC-28A/H

## THE ONE FOR THE ROAD

- Compact Size
- Simple to Operate
- Large LCD Readout
- 25 Watt IC-28A
- 45 Watt IC-28H
- Packet Compatible
- 21 Memory Channels

The IC-28H has all the features you need for carefree 2-meter mobile operation. The only thing it doesn't have is a big price.

**45 Watts.** The IC-28H provides a full 45 watts of powerful output. The IC-28A 25-watt version is also available. Both units have a selectable low power.

**Large LCD readout.** A wide-view LCD readout can be easily read even in bright sunlight. An automatic dimmer circuit reduces the brightness for evening operation.

**Wideband Coverage.** The IC-28H performs from 138-174MHz (specifications guaranteed from 144.00-148MHz) and includes weather channels. Ideal for MARS and CAP operation.

**Compact Size.** The IC-28H measures only 2 inches high by 5½ inches wide by 7¼ inches deep (IC-28A is 5¼

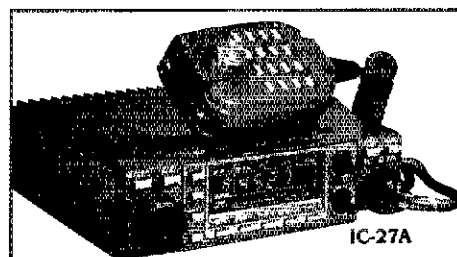
inches deep). Great for mobile installations where space is limited.

**21 Memory Channels.** Store 21 frequencies into memory, or lock out certain memory channels. All memories are backed up with a lithium battery.

**Scanning.** Scan the entire band or the memory channels from the provided HM-12 mic.

**Easy to Operate.** With only 11 front panel controls, the IC-28H is simple to operate.

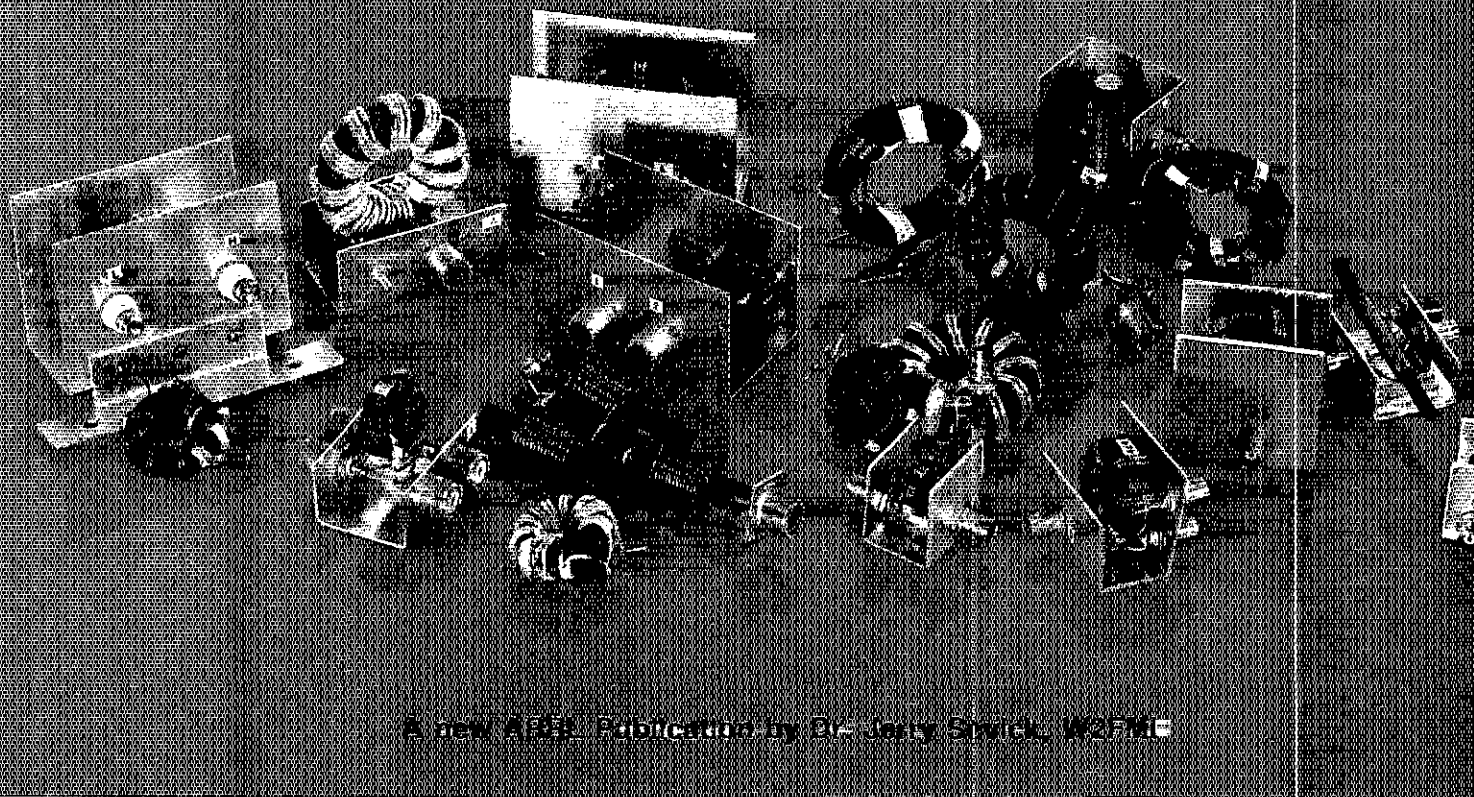
**Available Options.** IC-HM14 DTMF mic, PS-45 13.8V 8A power supply, UT-29 tone squelch unit, SP-10 external speaker, IC-HM16 speaker mic and HS-15/HS-15SB flexible boom mic and PTT switchbox.



The IC-27H 45 watt and IC-27A 25 watt ultra compact 2-meter mobiles continue to be available.



# TRANSMISSION LINE TRANSFORMERS



A new ARRL Publication by Dr. Jerry Sevick, W2FMI

Despite the popularity of transmission line transformers in both commercial and amateur applications, little practical design information has been published concerning these devices. The lack of data was made abundantly clear to Jerry Sevick, W2FMI when he began designing matching transformers for the short vertical antennas that are the subject of his classic series of articles that appeared in *QST*. In order to fill in the gaps of available knowledge, Jerry decided to study the subject of transmission line transformers in depth and the results of his findings are contained in this new ARRL publication!

*Transmission Line Transformers* covers types of windings, core materials, fractional-ratio windings, efficiencies, multiwinding and series transformers, baluns, and limitations at high impedance levels. There is also a chapter on practical test equipment. This book is must reading for everyone interested in antenna and transmission line theory. Copyright 1987, 128 pages \$10 hardcover only.

## CONTENTS

### Chapter 1 Analyses

- The Basic Building Block
- Analyses of 4:1 Impedance Transformer
- A Simple Analysis
- The Ruthroff Analysis

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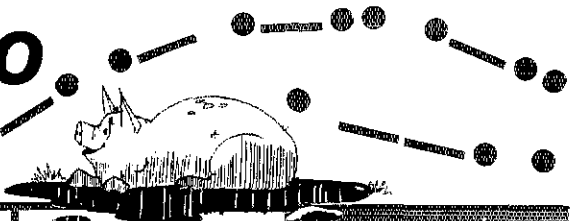
### Chapter 11 Summary Statements

### Chapter 12 References



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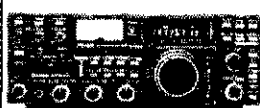
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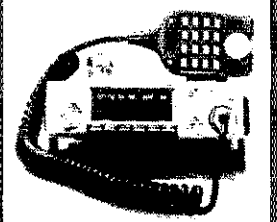
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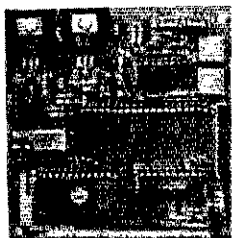


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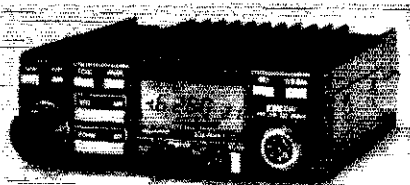
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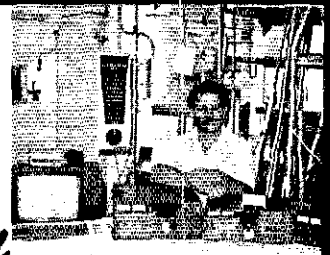
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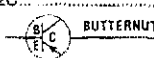
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All other accessories in stock.

## Mosley

TA-33 / CL-33..... \$235.00 / 265.00  
TA-33Jr / TA-40KR..... 179.00 / 189.95  
Pro 57 / Pro 67..... 465.00 / 579.00

## ALPHA DELTA

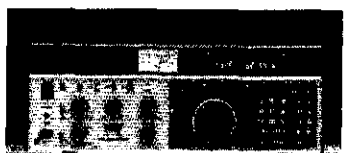
DX-A / DX-D Slopers..... \$46.95 / 57.00  
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Delta-4 / Delta-4N Coax Switches..... 65.00 / 75.00  
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HF Mobile Masts, Resonators, & Mounts  
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**NEW!** 200W Full featured  
HF Transceiver. Microprocessor  
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## MIRAGE

VHF & UHF AMPLIFIERS

Full line of VHF & UHF Amplifiers

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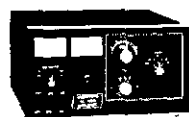
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Tuners, meters, keyers,  
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HF linear amplifiers and  
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KDK FM-240



SANTEC  
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Crank-up towers. Self-supporting, steel, galvanized,  
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Sold: 12 ga. / 14 ga.....0.10 / 0.08  
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### COAX AVAILABLE IN PRECUT LENGTHS WITH CONNECTORS ATTACHED.

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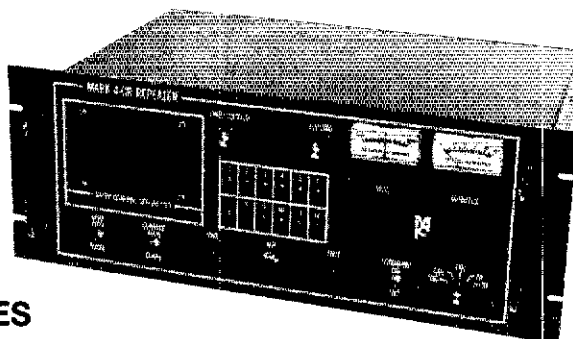
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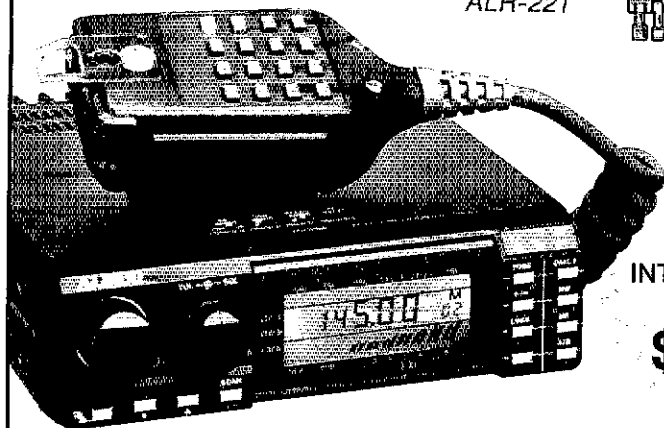


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**Tiny, Tough,  
and  
Terrific**



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5½" W x 1⅞" H  
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• **TOUGH** -  
Full 25 watts  
of power

• **TERRIFIC** -  
Sensitivity  
less than 0.16uV

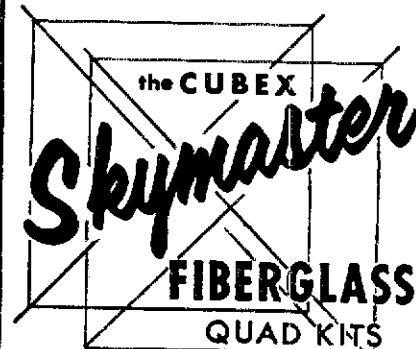


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**\$229.95**

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- 8 Fiberglass Arms, 1 pc. White 13 ft.
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- 16 Wraplock Spreader Arm Clamps
- 1 CUBEX QUAD Instruction Manual (Boom and wire not included)

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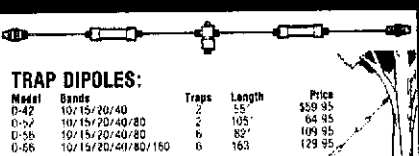
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# MULTI BAND TRAP ANTENNAS



## TRAP DIPOLES:

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	15'	\$59.95
D-52	10/15/20/40/80	2	105'	64.95
D-56	10/15/20/40/80	6	82'	109.95
D-58	10/15/20/40/80/160	6	163'	129.95

## TRAP VERTICALS - "SLOPERS":\*

Model	Bands	Traps	Length	Price
VS-41	10/15/20/40	1	28'	44.95
VS-52	10/15/20/40/80	2	22'	59.95
VS-53	10/15/20/40/80	3	42'	69.95
VS-64	10/15/20/40/80/160	4	73'	84.95

\*Can be used without radials  
\*Feed line 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 leadline works all bands - Instructions included - 10 day money back guarantee!

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Model	Band	Length	Price
D-15	15	22'	18.95
C-29	29	33'	19.95
G-40	40	40'	22.95
D-80	80/75	130'	25.95
D-160	160	160'	34.95

Includes assembly instructions, Deluxe center connector, 14 ga Stranded CopperWeld Antenna wire and End Insulators.

## 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

## DELUXE CENTER CONNECTOR

- NU RUSI Brass Terminals
- NO Jumper Wires Used
- NO Soldering
- Built-in Lightning Arrestor
- With 50-239 Receptacle
- Handles Full Power
- Completely Sealed, Weatherproof
- Easy Element Adjustments
- Commercial Quality



CE-1  
\$8.95

## DELUXE ANTENNA TRAPS: 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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Model	ETS-180	ETS-210
Base For Bearing (Top)	2"	2"
Max. Opening Width (Up)	27"	210"
Actual Height	47"	59"
Angle	60°	80°
Legs	Adjust. 0/18° Step	Adjust. 0/18° Step
Weight	22 lb.	28 lb.

BOHM 20G	10' sect	41.50
20AG	10' sect	48.00
20B	10' sect	81.50
20C	10' sect	82.10
20D	2-3' top sect	115.50
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20J	10" mast	22.25
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20L	short base	43.50
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AND MORE!		
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A3	3 el. triband	224.00
A4	10, 15, 20 remote tuned	
A5	5 band trap vert	275.95
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A95	2mt. vert. ring	60.00
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## ANTENNA



CR2A	
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CABLE IS NOT INCLUDED

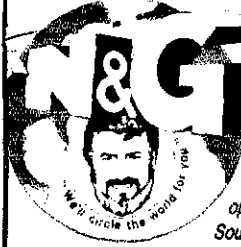
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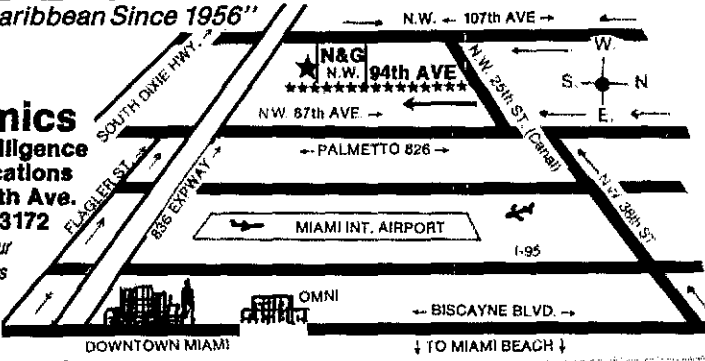


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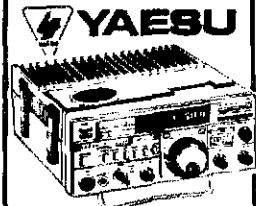


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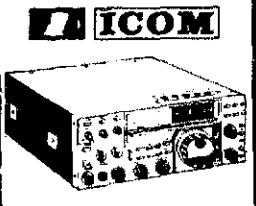


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all mode transceiver



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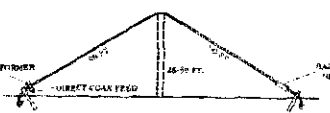
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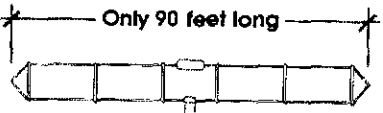
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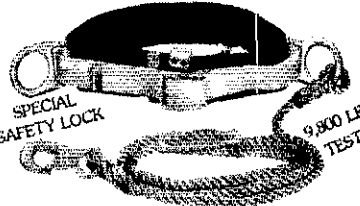
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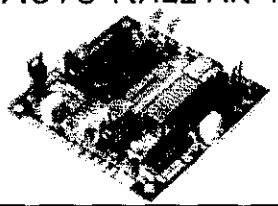
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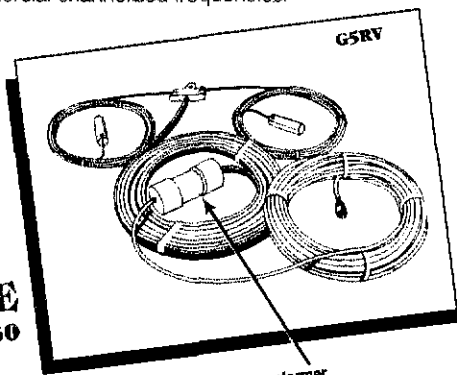
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**RF Output** SSB 1.5 KW PEP continuous, CW 1.2 KW Average continuous, RTTY, SSTV 1 KW Average 1.5 KW PEP.  
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**THANK YOU** for attending Warren, Ohio Hamfest. See you August 16, 1987. W.A.R.A.

**HAMFEST TICKETS.** Printed Quickly, Cheaply! Samples SASE. Howelab, Box 73, Folly Beach, SC 29439.

**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.

1987 "BLOSSOMLAND BLAST" Sunday, September 20, 1987. Write "BLAST", P.O. Box 175, St. Joseph, MI 49085.

**NORTHERN NEW JERSEY** - Sussex County ARC Hamfest, Sunday, July 19th, Sussex County Fairgrounds, Augusta, NJ 8:00 AM. Indoor/Outdoor space. Acres of parking. Refreshments. Talk-In 147.80/30 and 146.52. For information call Donald Stickle, K2OX, 201-663-0677.

**KANKAKEE HAMFEST** - The annual Kankakee Hamfest will be held at the Kankakee County Fairgrounds on May 17, 8AM-4PM. FCC and AARRL booths. Large Flea market and many exhibitors. \$2.50 in advance and \$3 at the gate. Take exit 309 off I-67 to Rt. 45 South 1 mile. For further info contact Frank DalCanton, KA9PWW, R.R. 1 Box 361, Chebanse, IL 60922.

**THE 9th ANNUAL TSRAC Wheeling Hamfest/Computer Fair**, Sunday, July 19, Wheeling Park, 9 AM to 4 PM. WV's largest. Dealers welcome 30,000 square feet under roof; 5 acres flea market. Family activities at Park. Admission \$3 in advance - \$4 at door. To reserve space contact: Carl Williams, WD8PFS, 9 East High St, Flushing, OH 43977, 614-968-3652; for tickets, TSRAC, Box 240, Rd 1, Adena, OH 43901, 614-546-3930.

**NOVICE CRYSTALS WANTED** by the Midland ARC for novice equipment loan program. Will pay shipping to put your old, dusty FT-243 type crystals to good use. Write Dennis, N8ERF, 644 Whitethorn, Midland, MI 48640.

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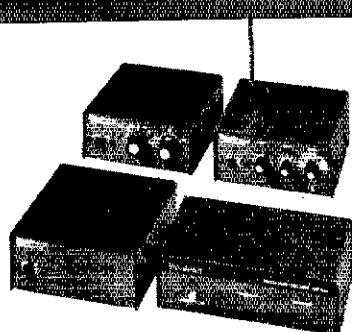
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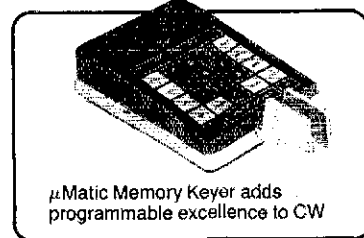
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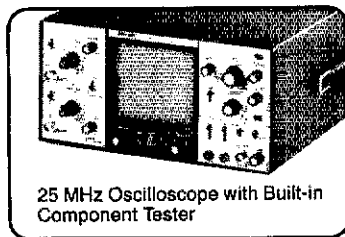
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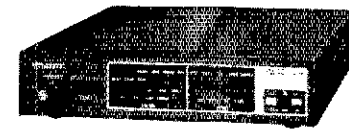
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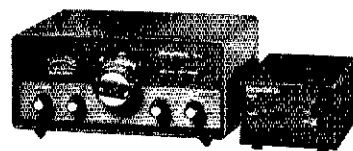
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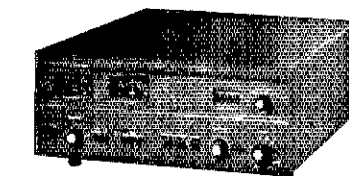
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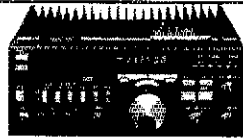
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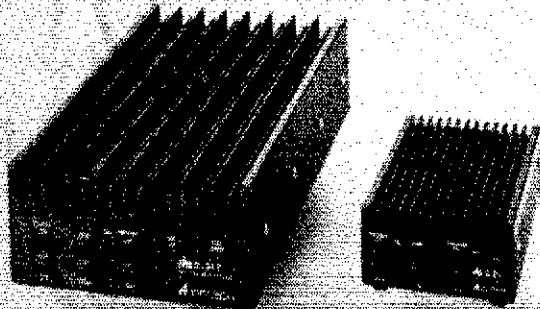
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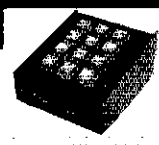
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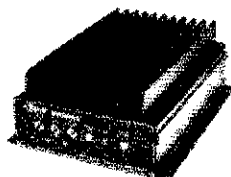
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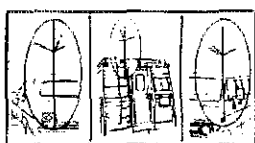
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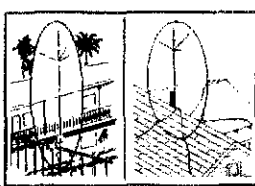


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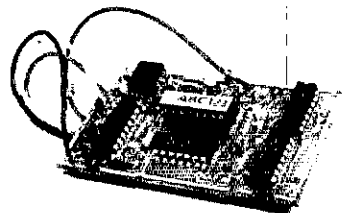
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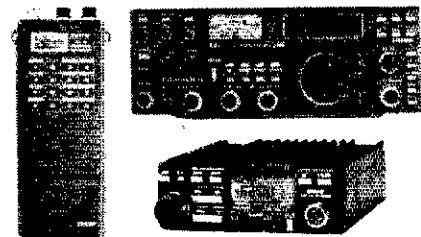
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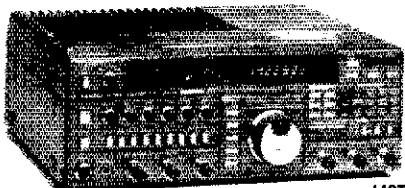
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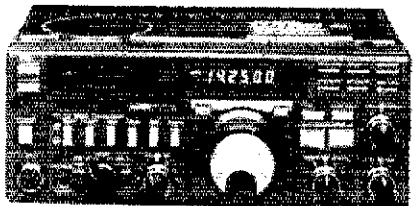
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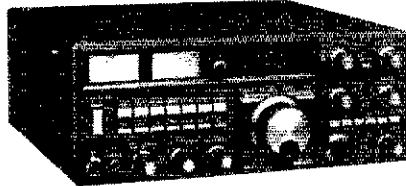


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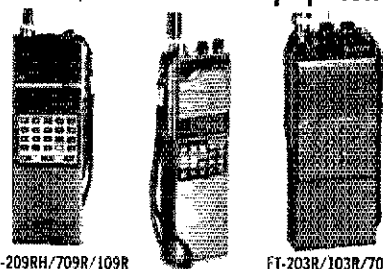
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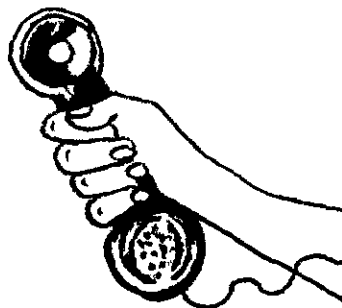
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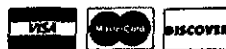
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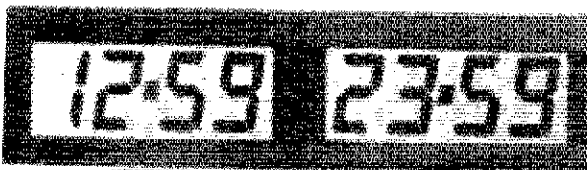
# MFJ ACCESSORIES

## MFJ 24 HOUR LCD CLOCKS

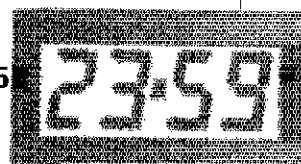
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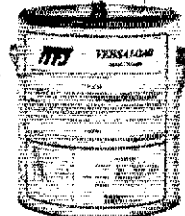
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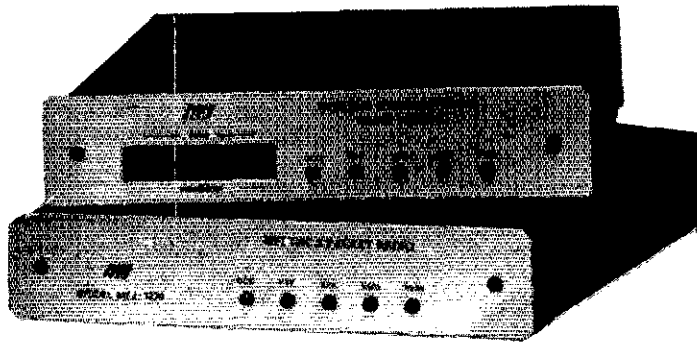
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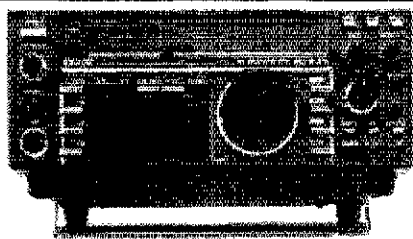


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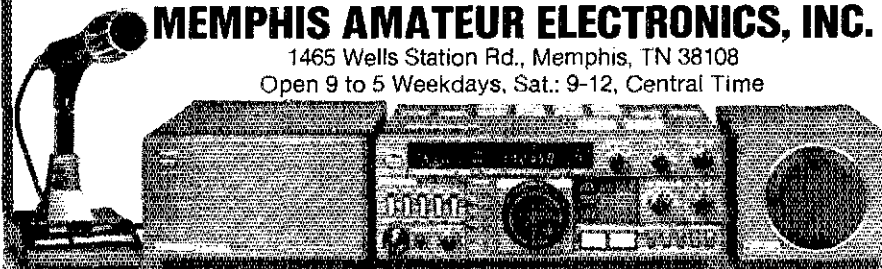
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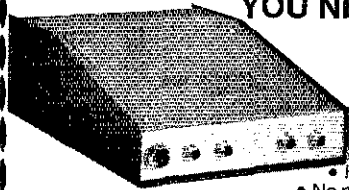
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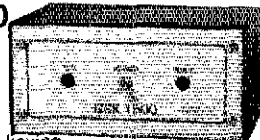
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Add \$4.00 UPS Shipping

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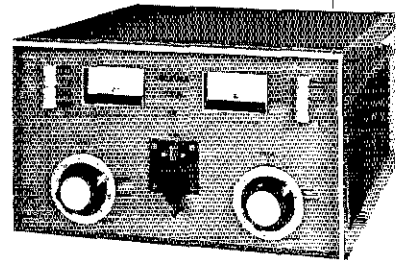
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**SPECIAL SALE — ALL ALPHAS**

Model	List	Sale
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374A	\$2595	
76A	\$1985	
76PA	\$2395	
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**Solid Brass MORSE KEY KIT**

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- Ball race bearings for smooth, trouble-free performance
- Solid silver contacts
- Machined hardwood weighted base with non-slip feet

Kit ..... \$59.95

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plus \$5.00 postage and handling. Mass. residents add 6% tax. Please send NAB for further information.



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**7/8" -50Ω**

**\$150/Foot**

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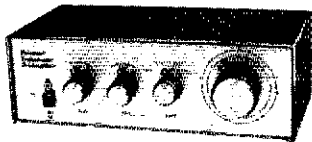
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## PREAMPLIFIER

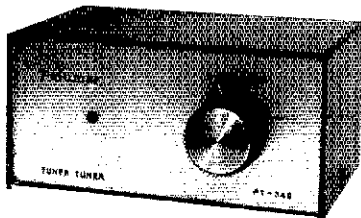


Can't hear the weak ones when conditions are bad? Receiver lacks sensitivity on 20, 15 or 10? Get the world famous Palomar pre-amplifier. Tunes from 160 to 6 meters. Gives 20 db extra gain and a low noise figure to bring out those weak signals. Reduces image and spurious responses too.

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## TUNER-TUNER™



- Tune your tuner without transmitting!
- Save that rig!

Do you use an antenna tuner? Then you need the new Palomar Tuner-Tuner to tune it to your operating frequency without transmitting. Just listen to the Tuner-Tuner's noise with your receiver. Adjust your tuner for a null and presto! you have 1:1 SWR. It's as simple as that.

Easy to install. Works with all rigs. Eliminates tuneup damage. Your rig will love it!

Model PT-340 \$99.95 + \$4 shipping/handling in U.S. & Canada. California residents add sales tax...



Send for FREE catalog that shows our complete line of noise bridges, SWR meters, pre-amplifiers, loop antennas, VLF converters, audio filters, baluns, RTTY equipment, toroids and more.

# PALOMAR ENGINEERS

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Phone: (619) 747-3343

## ADVERTISING DEPARTMENT STAFF

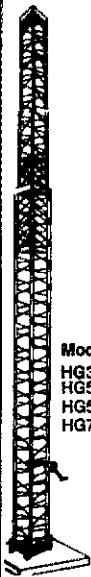
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Sandy Gerli, AC1Y, Deputy Adv. Mgr.  
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# ANTENNA/TOWER SALE!

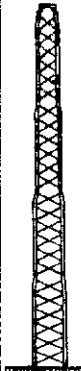


## hy-gain CRANKUP SALE!

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!

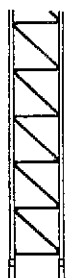
FREIGHT PREPAID

- 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*
H8X40	40 ft	10 sq ft	226	\$359
H8X48	48 ft	10 sq ft	303	\$459
H8X56	56 ft	10 sq ft	385	\$539
H8B40	40 ft	18 sq ft	281	\$429
H8B48	48 ft	18 sq ft	363	\$529

\*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" (88 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' \$ 620	\$1119	\$1489
60' 889	1259	1669
70' 749	1379	1829
80' 909	1539	2019
90' 979	1809	2189
100' 1059	1869	2369
110' 1259	2049	2769
120' 1329	2259	2969



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, Thrust Bearings, 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
TX465	22'	35'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2059
HDX955	22'	95'	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/HELIX®

Lowest Loss for VHF/UHF!

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	90	4	.64	1.7	3.1
1/2" Alum	90	3	.5	1.2	2.2
1/2" Helix	90	2	.4	.9	1.6
3/4" Helix	90	1	.2	.5	.9

### HARDLINE & HELIX® CONNECTORS

Cable Type	UHF	FML	UHF	MALEN	FML	MALE
1/2" Alum	\$19	\$19	\$19	\$25	\$25	\$25
1/2" Helix®	\$25	\$25	\$25	\$25	\$25	\$25
3/4" Helix®	\$49	\$49	\$49	\$49	\$49	\$49

### COAX CONNECTORS

Amphenol Silver PL259 .....\$1.25  
UG21B N Male .....\$2.95  
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Van Gardon  
1-1/2 Balun .....\$11 Center Insulator.....\$6  
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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  
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### hy-gain

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Bumper Mounts - Springs - Folding Masts in Stock!

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HF6V 80-10m Vertical \$129 Delivered  
• Full Legal Power  
• Highest Q Tuning Circuits

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• Automatic Band Switching

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TBR160 160m Coll 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

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- Unique Design Reduces Size
- No Lossy Traps
- Turns w/TV Rotor

### MIRAGE/KLM

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KT34XA 6-el Broad Band Tribander Beam .....\$589.95

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Additional Motor Units .....\$69

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Telex CD 451 (8.5 sq ft rating) .....\$Call  
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Telex Tallwister (20 sq ft rating) .....\$Call  
Telex HDR300 Heavy Duty (25 sq ft rating) .....\$Call  
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Kenpro KR5400 AZ/EL Rotor Package .....\$319

### ROTOR CABLE

Standard 8 cord cables \$ .19/ft  
(vinyl jacket 2-#18 & 6-#22 ga)

Heavy Duty 8 Cond cable \$.36/ft  
(vinyl jacket 2-#16 & 6-#18 ga)

### ROHN GUYED TOWER SECTIONS 10 FT. STACKED SECTIONS

20G	.....\$45.00	45B	.....\$116.00
25G	.....\$52.00	55B	.....\$160.00

ALL ACCESSORIES IN STOCK—CALL

### ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	\$ 999.
FK2558	58 ft.	13.3 sq. ft.	1049.
FK2568	68 ft.	11.7 sq. ft.	1099.
FK4544	44 ft.	34.8 sq. ft.	1319.
FK4554	54 ft.	29.1 sq. ft.	1399.
FK4564	64 ft.	28.4 sq. ft.	1499.

25G Double Guy Kit .....\$249.  
45B Double Guy Kit .....\$269.

\*Above antenna leads 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
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3/8EE (3/8" Eye & Eye Turnbuckle)	.....\$6.95
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### PHILLYSTRAN GUY CABLE

HPT62100 Guy Cable (2100 lb rating)	.....\$ 29/ft
HPT64000 Guy Cable (4000 lb rating)	.....\$ 49/ft
HPT66700 Guy Cable (6700 lb rating)	.....\$ 69/ft
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9902LD Cable End (for 6700 cable)	.....\$9.95
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### GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	\$29	\$49	\$69	\$89
18 in Wall	\$39	\$69	\$99	\$129
25 in Wall	\$69	\$129	\$189	\$249

## ORDER TOLL FREE 1-800-272-3467

Texas, Alaska & for information 1 (214) 422-7306



# TEXAS TOWERS

Mon-Fri: 9am - 5 pm  
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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)

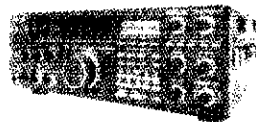
# MISSOURI RADIO CENTER

# 1-800-821-7323

702 NW Business Park Lane, Independence, MO 64014-0116

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## KENWOOD



### TS940S "DX-celence"

- Programmable Scanning
- High Stability, Dual Digital VFO's
- 40 Channel Memory
- General Coverage Receiver

## KENWOOD



### TS440S "DX-CITING"

- 100% Duty Cycle
  - 100 memories
  - Direct Keyboard Entry
  - Optional Built-in AT
- On Sale Now, Call For Price!

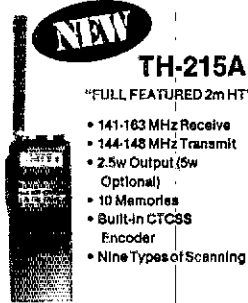
## KENWOOD



### TM-3530A

- 220 MHz MOBILE FM TRANSCEIVER
- 220-225 MHz w/25 Watts
  - 7-Digit Telephone No. Memory
  - Direct Frequency Entry
  - 23-Channel Memory

## KENWOOD



### TH-215A

"FULL FEATURED 2m HT"

- 141-163 MHz Receive
- 144-148 MHz Transmit
- 2.5w Output (5w Optional)
- 10 Memories
- Built-in CTCSS Encoder
- Nine Types of Scanning

## YAESU



### FT-757GX "CAT SYSTEM"

- All Mode Transceiver
  - Dual VFO's
  - Full Break-in CW
  - 100% Duty Cycle
- CALL FOR BEST 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

## YAESU

### FT23/73R

- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-164 MHz, 440-450 MHz
- 600 MAh Standard Opt. 5w New "super handle"



## YAESU

### FT-109RH

220 MHz H.T.

- 5 Watts Output
- Battery Saver
- 10 Memories
- Multiple Scanning Routines
- Power Meter

## ICOM



### IC-735 "NEW"

Can you put a price tag on reliability? Now ICOM offers a ONE YEAR WARRANTY on its HF Transceivers & Receivers purchased after August 1, 1986

## ICOM



### IC-751A "NEW"

- 100 KHz - 30 MHz
- FM Standard
- 32 Memories
- QSK (Nominal Speed 40 WPM)

## ICOM



### IC-38A

- Full 25W, 5W low
  - 21 memories
  - Subtones built in RX 215-230 MHz
- CALL FOR BEST PRICE

## ICOM

### IC-122AT

- 140-163 MHz
- 10 Memories
- 1W, 1.5W optional
- 32 tones built-in

## Kantronics



### KAM

Kantronics All Mode

- CW, RTTY, ASCII, AMTOR, HF & VHF Packet
- RS-232/TTL Universal Compatibility
- Transmit and Receive CW 8-99 wpm, RTTY/ASCII 45-300 Baud, ARQ, FEC, SELFEC, Listen ARQ, VHF and HF Packet



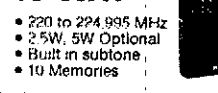
### MFJ-1274

TNC 2 PACKET RADIO

- VHF and HF Packet
- Precision Tuning Indicator
- AX .25 Level 2 Version 2 Software
- TTL Serial Port
- More!

# MFJ

## ICOM



### IC-03AT

- 220 to 274.995 MHz
- 2.5W, 5W Optional
- Built in subtone
- 10 Memories



## NOVICES

ARE YOU CONFUSED ABOUT YOUR NEW PRIVILEGES? CALL US FOR THE UP-TO-THE-MINUTE INFORMATION AND ASSISTANCE WITH YOUR GEAR.



### PK 232

- Make any RS-232 compatible computer or terminal a complete digital operating position.
- Morse, Baudot, ASCII, AMTOR, Packet
- Loaded with features.



### Power Supply

- RS7A ..... \$48
- RS12A ..... \$68
- RS20A ..... \$88
- RS20M ..... \$105
- VS20M ..... \$125
- RS35A ..... \$153
- RS35M ..... \$149
- VS35M ..... \$165
- RS50A ..... \$189
- RS50M ..... \$215
- RM50A ..... \$219
- VS50M ..... \$229

• MOST ORDERS SHIPPED SAME DAY •

# 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.

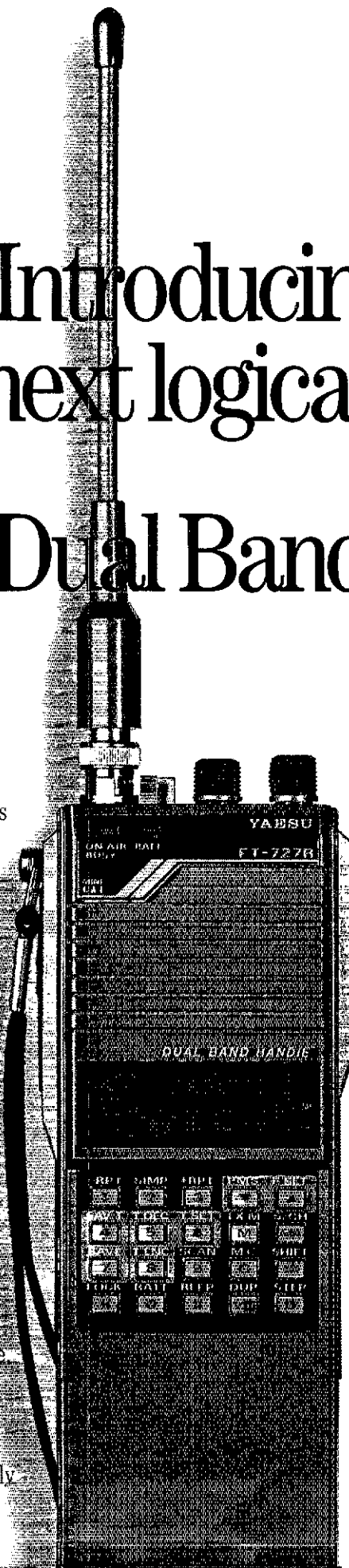
Work the bands quickly and easily with a wealth of microprocessor-controlled commands:

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

### Yaesu Cincinnati Service Center

9070 Gold Park Drive, Hamilton, OH 45011  
(513) 874-3100

Prices and specifications subject to change without notice.

# KENWOOD

YES!  
220 MHz

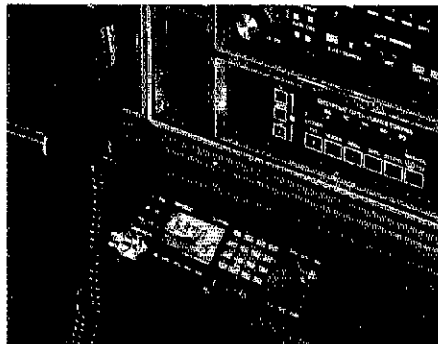
## 220: Kenwood Style!

### TM-3530A

The first comprehensive 220 MHz FM transceiver

TM-3530A—25 watts of 220 MHz FM—Kenwood style! Features include built-in 7-digit telephone number memory, auto dialer, direct frequency entry and big LCD. All this makes the TM-3530A the most sophisticated rig on 220 MHz!

- First mobile transceiver with telephone number memory and auto-dialer (up to 15 seven-digit telephone numbers)
- Frequency range 220-225 MHz
- Automatic repeater offset selection—a Kenwood exclusive!
- Direct keyboard entry of frequency
- 23-channel memory for offset, frequency and sub-tone



- Big multi-color LCD and back-lit controls for excellent visibility
- Optional front panel programmable 38-tone CTCSS encoder includes 97.4 Hz

- Frequency lock switch
- Digital Channel Link (DCL) option
- High performance GaAs FET front end receiver

### TH-31BT/31A

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

- 1 watt high, 150 mW low
- Super compact and lightweight (about 8 oz. with PB-21!)
- Frequency range 220-224.995 MHz in 5-kHz steps
- BT Series has built-in tone
- Repeater offset:—1.6 MHz, reverse, simplex
- **Supplied accessories:** rubber flex antenna, earphone, wall charger, 180 mAh NiCd battery and wrist strap
- Quick change, locking battery case

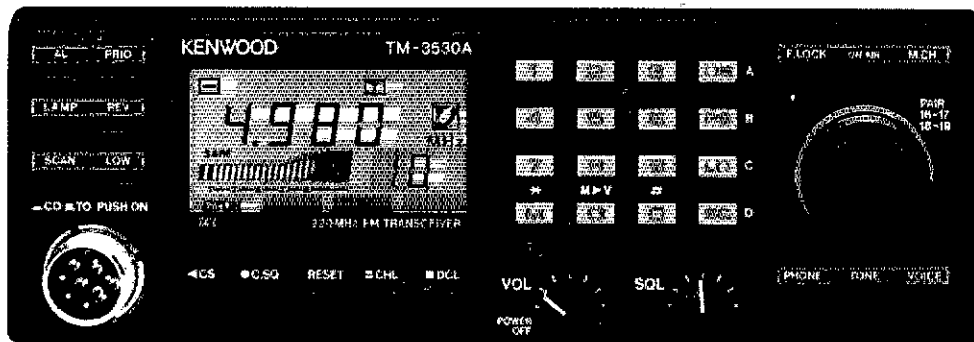
TH-31BT/31A optional accessories:

- HMC-1 headset with VOX
- SMC-30 speaker microphone
- PB-21 NiCd 180 mAh battery
- PB-21H NiCd 500 mAh battery
- DC-21 DC-DC converter for mobile use
- BT-2 manganese/alkaline battery case
- EB-2 external C manganese/alkaline battery case
- SC-8/8T soft cases with belt hook
- TU-6 programmable sub-tone unit
- AJ-3 thread-loc to BNC female adapter
- BC-6 2-pack quick charger
- BC-2 wall charger for PB-21H
- RA-9A StubbyDuk antenna
- BH-3 belt hook

- 16-key DTMF pad, with audible monitor
- Center-stop tuning—another Kenwood exclusive!
- New 5-way adjustable mounting system
- **Unique** offset microphone connector—relieves stress on microphone cord
- HI/LOW power switch (adjustable LOW power)



TH-31BT with DTMF pad shown. Optional RA-9A attached



TM-3530A optional accessories:

- TU-7 38-tone CTCSS encoder
- MU-1 DCL modem unit
- VS-1 voice synthesizer
- PG-2N extra DC cable
- PG-3B DC line noise filter
- MB-10 extra mobile bracket
- CD-10 call sign display
- PS-430 DC power supply
- MC-60A/MC-80/MC-85 desk mics.
- MC-48B extra DTMF mic. with UP/DOWN switch
- MC-43S UP/DOWN mic.
- MC-55 (8 pin) mobile mic. with time-out timer
- SP-40 compact mobile speaker
- SP-50B mobile speaker
- SW-200B SWR/power meter
- SW-100B compact SWR/power meter

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

# KENWOOD

KENWOOD U.S.A. CORPORATION  
Communications & Test Equipment Group  
2201 E. Dominguez St., Long Beach, CA 90810