

May 1987 \$3.00

QST

entirely by Amateur Radio



Are you ready for Field Day?

See rules inside.



the tempo S-15

...a no nonsense radio that provides more power, broader frequency range and simplicity of operation

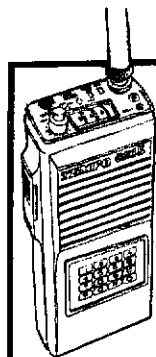
...the kind of hand held most people want...simple rugged, reliable, easy to use. The S-15 offers a full 5 watts of power...power that extends your range and improves your talk power. Its state-of-the-art integrated circuitry provides far more reliability and ease of maintenance than conventional circuitry.

Consider these features before you decide on any hand held:

- 5 watt output (1 watt low power switchable)
- 10 MHz frequency coverage: 140-150 MHz (For export only: B version 150-160 MHz, C version 160-170 MHz)
- Electrically tuned stages. Receiving sensitivity and output power are constant over entire operating range.
- Three channel memory. (1 channel permits non-standard repeater offsets. 200 micro amp memory maintenance (standby)).
- A new "easy remove" battery pack
- One hour quick charge battery supplied (450 ma/HR)
- Plug for direct 13.8 volt operation
- Speaker/microphone connector
- BNC antenna connector and flex antenna
- Extremely small and light weight (only 17 ounces).
- Ample space for programmable encoder.
- Fully synthesized
- Extremely easy to operate
- Its low price includes a rubber antenna, standard charger, 450 ma/HR battery (quick charge type) and instruction manual.

OPTIONAL ACCESSORIES: 1 hour quick charger (ACH 15) • 16 button touch tone pad (S 15T) • DC cord • Solid state power amplifier (S-30 & S-80) • Holster (CC 15) • Speaker/mike (HM 15)

now available!



...the proven Tempo CS-15, plus three new commercial mode Tempo synthesized radios

The CS-15 is a fine quality radio with 5 watt output, 10 MHz receiver coverage, is fully synthesized, and is 10 channel internally programmable. It's also sturdy, compact and affordable.

The new Tempo FMH-15S, FMH-44S & FMT-25S (mobile)

...all feature 16 channels, CPU controlled EPROM PLL, CTCSS encode/decode programmable per channel, priority scan to Channel 1, and time-out-timer.

- FMH-15S...** 138-174 MHz (10 MHz) frequency coverage
1 watt (low)/5 watts (high) RF power output
- FMH-44S...** 400-512 MHz (20 MHz) frequency coverage
1 watt (low)/4 watts (high) RF power output
- FMT-25S...** 138-174 MHz (10 MHz) frequency coverage
25 watts RF power output

Available at
your local Tempo
dealer or from..



Henry Radio

2050 S. Bundy Dr., Los Angeles, CA 90025 (213) 820

Butler, Missouri 64730

(816) 679

TOLL FREE ORDER NUMBER: (800) 421-6631

For all states except California.

Calif. residents please call collect on our regular nu

KENWOOD

...pacesetter in Amateur radio

YES!
220 MHz

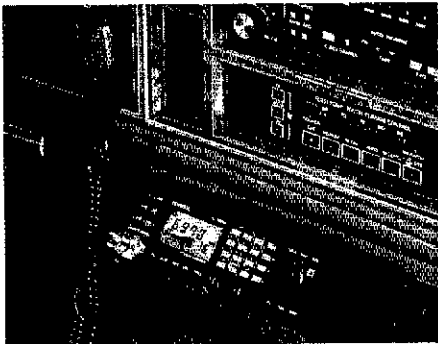
220: Kenwood Style!

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

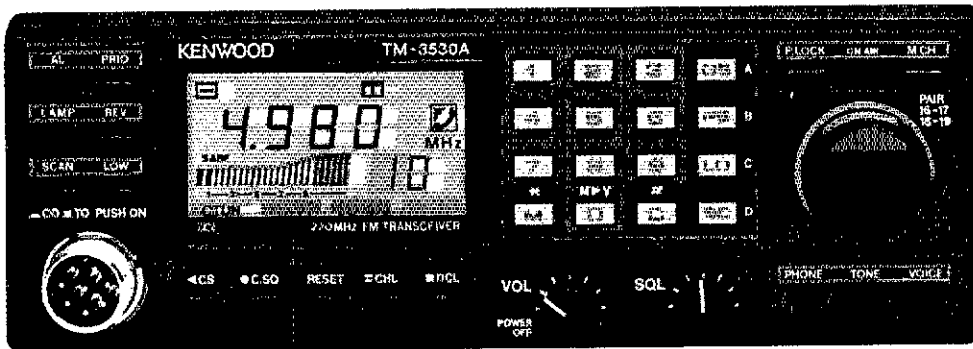
TH-31BT/31A optional accessories:

- **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

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220



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. 761287

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OUR COVER

Beginner and veteran ops—the time for Field Day draws near, so check page 87 for the complete rules. Last year, N6KUS, N6FAX and KF6FX (left to right) tackled antenna raising with more enthusiasm than expertise during their rookie Field Day effort.

In addition to learning new operating skills, these and other California YLs experienced the usual Field Day mishaps—but had lots of fun! YL News and Views, page 70, has the complete story. (photo by Lyle Meek, WW6F)



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OPERATING

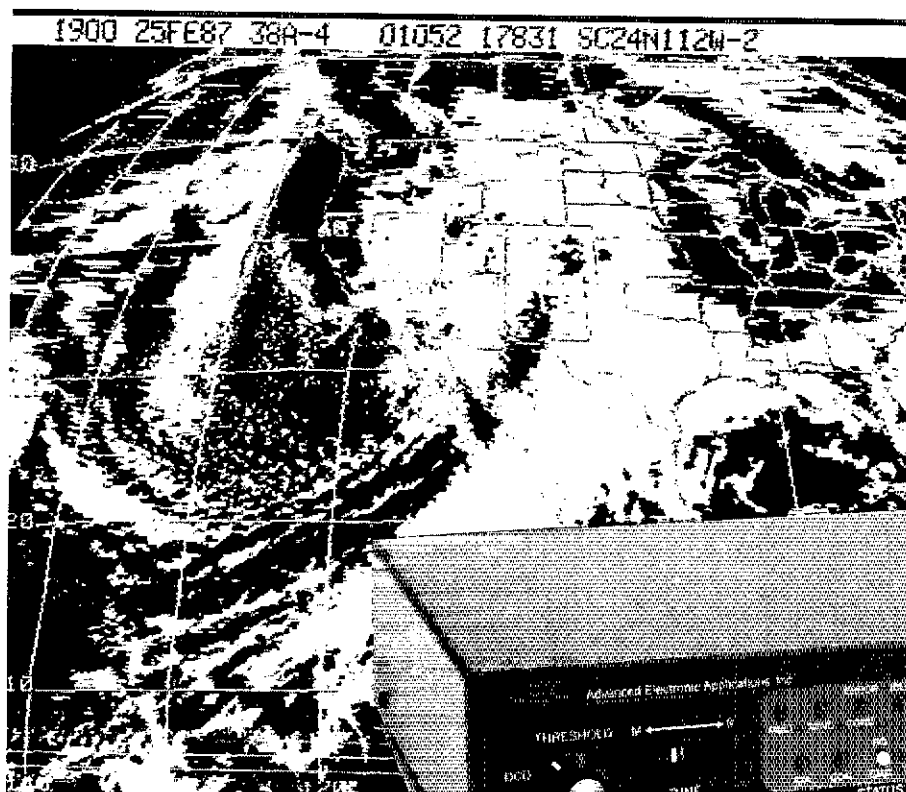
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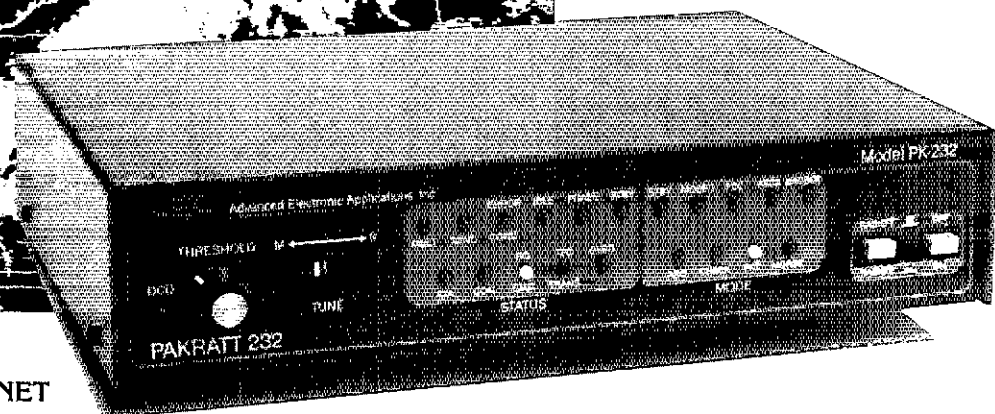
New PK-232 Breakthrough

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



\$319⁹⁵
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.

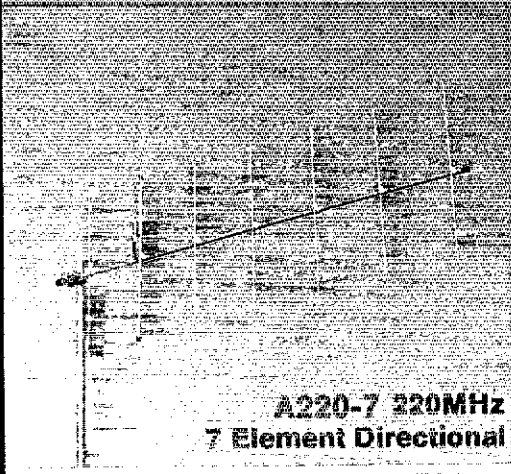


Brings you the Breakthrough

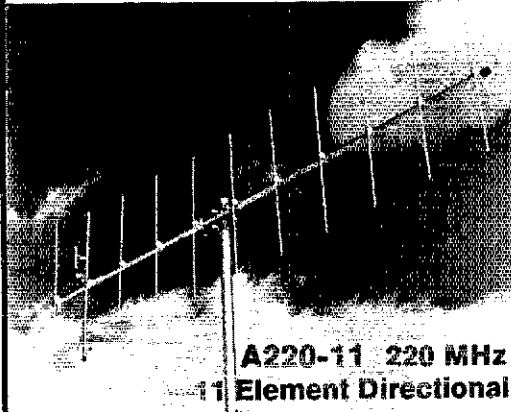
2006-196th St. SW
Lynnwood, WA 98036
(206) 775-7373



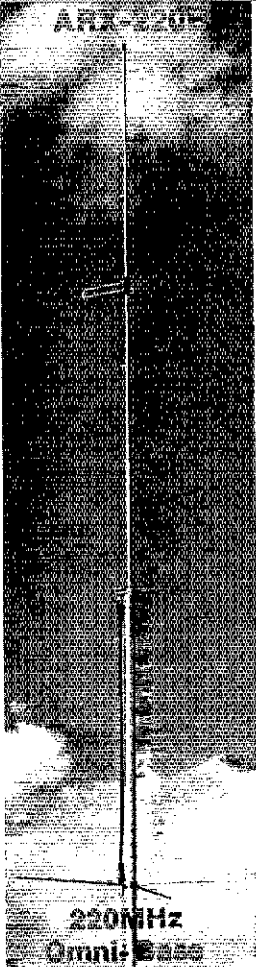
CUSHCRAFT ENHANCERS FOR THE NEW NOVICE BANDS



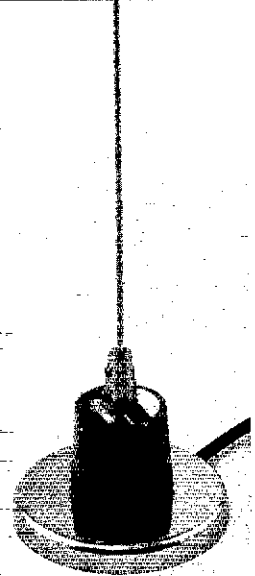
**A220-7 220MHz
7 Element Directional**



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



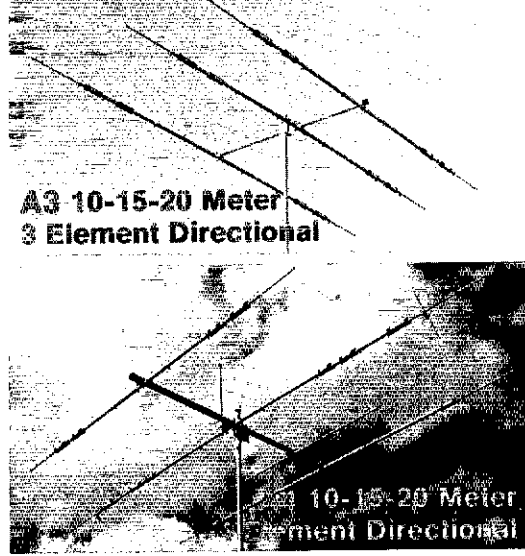
**A220-20
220MHz
Omni-Base**



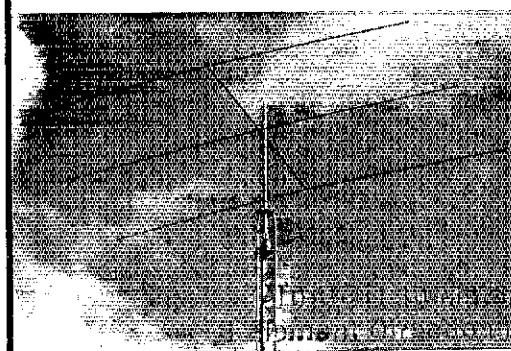
**CS-220
220MHz Mobile**



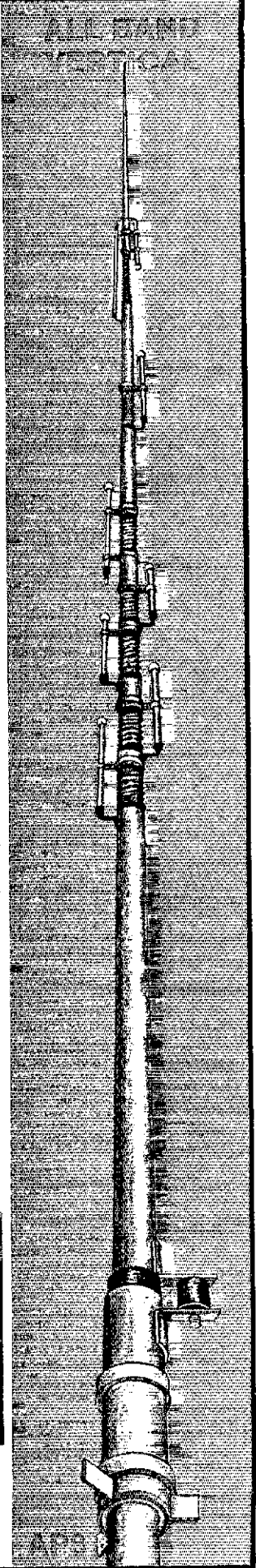
**A220-10
220MHz Portable**



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



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



cushcraft
CORPORATION

P.O. Box 4680
Manchester, N.H. 03108 USA
Telex: 4949472 CUSHSIG MAN
AVAILABLE THROUGH
DISTRIBUTORS WORLDWIDE

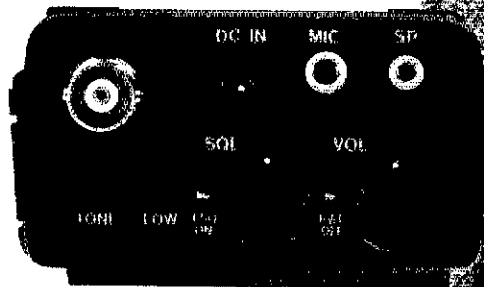
This HT Has it All!

TH-215A/415A

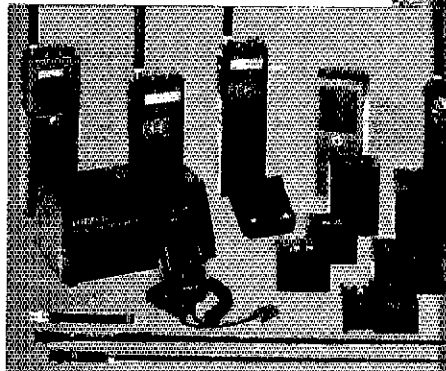
Full-featured Hand-held Transceivers

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 hamshack 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 saver ratio selection.
- **Easy memory recall.** Simply press the channel number!
- **12 VDC input terminal for direct mobile or base station supply operation.** When 12 volts 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.

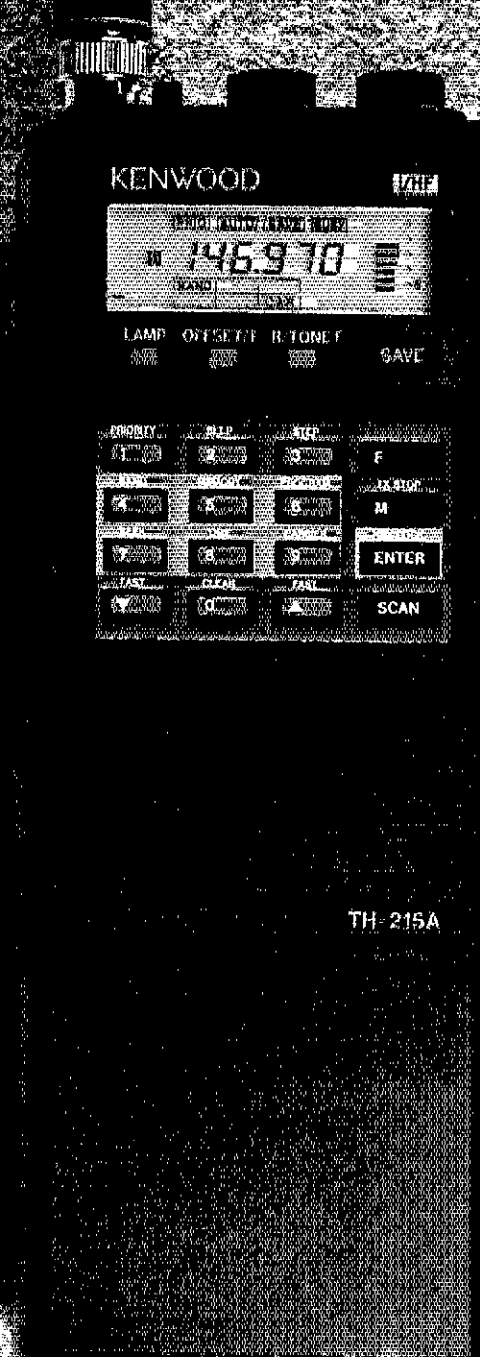


- **Large, easy-to-read multi-function LCD display with night light.**
- **Audible beeper to confirm keypad operation.** The beeper has a unique tone for each key. DTMF monitor also included.
- **Supplied accessories:** Belt hook, rubber flex antenna, PB-2 standard NiCd battery pack (for 2.5 W operation),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

TH-215A shown

KENWOOD

TRIC-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

KENWOOD

...pacesetter in Amateur radio

All New Compact HF!

“DX-citing!”

TS-440S Compact high performance HF transceiver with general coverage receiver

Kenwood's advanced digital know-how brings Amateurs world-wide “big-rig” performance in a compact package. We call it “Digital DX-citement”—that special feeling you get every time you turn the power on!

• **Covers All Amateur bands**

General coverage receiver tunes from 100 kHz—30 MHz. Easily modified for HF MARS operation.

• **Direct keyboard entry of frequency**

• **All modes built-in**
USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.

• **Built-in automatic antenna tuner (optional)**

Covers 80-10 meters.

• **VS-1 voice synthesizer (optional)**

• **Superior receiver dynamic range**

Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m)

• **100% duty cycle transmitter**

Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)

• **Adjustable dial torque**

• **100 memory channels**

Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.

• **TU-8 CTCSS unit (optional)**

Subtone is memorized when TU-8 is installed.

• **Superb interference reduction**

IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.

• **MC-43S UP/DOWN mic. included**

• **Computer interface port**

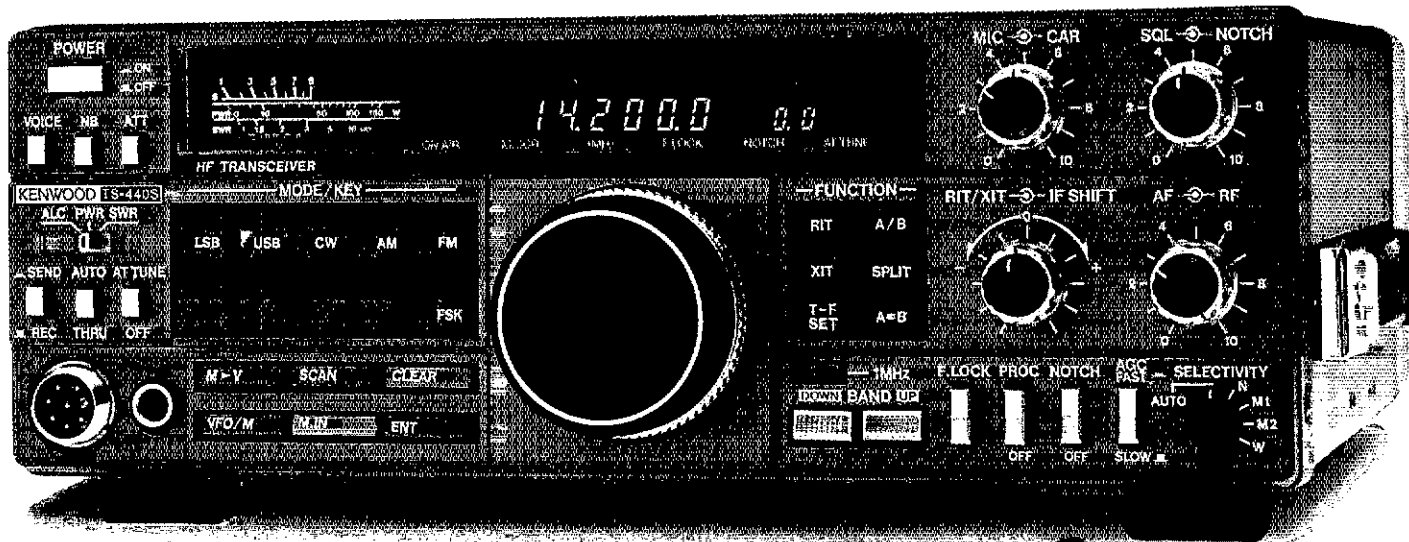
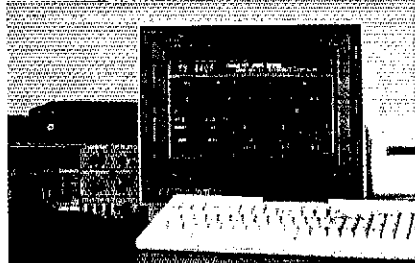
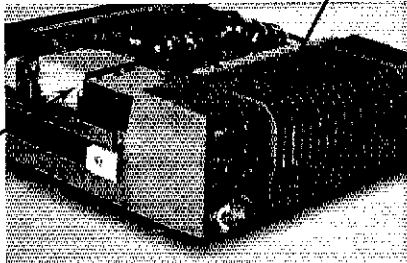
• **5 IF filter functions**

• **Dual SSB IF filtering**

A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, dual filtering is provided.

• **VOX, full or semi break-in CW**

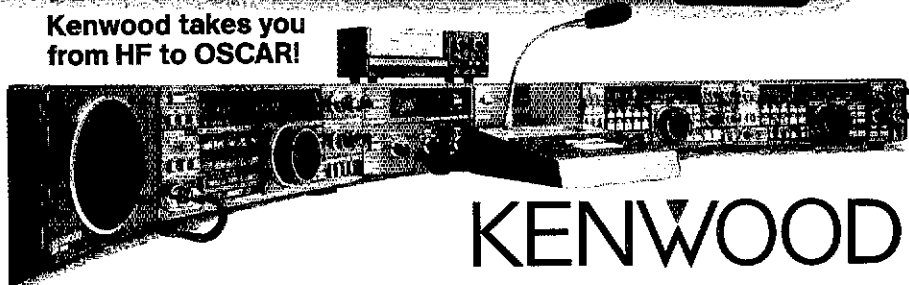
• **AMTOR compatible**



Optional accessories:

- AT-440 internal auto. antenna tuner (80 m—10 m)
- AT-250 external auto. tuner (160 m—10 m)
- AT-130 compact mobile antenna tuner (160 m—10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S/88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
- HS-5/6/7 headphones
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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.

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“It Seems to Us . . .”

220: Write Now!

As reported here last month, the Federal Communications Commission has proposed to take away a valuable portion of radio spectrum that for decades has been allocated to, and used by, radio amateurs: 220 to 222 MHz. This proposal was made in response to pressure from a small segment of the land mobile communications industry, in the aparent (and utterly mistaken) belief that hams would be satisfied with the remaining three megahertz of the 220 band. To add insult to injury, the Commission's proposal was released for public comment just a few days after its long-awaited announcement that most of the 220-MHz band was to be available to Novices, as the League has advocated since 1975.

FCC says there is “light loading” of 220-225 MHz by amateurs. Well, that's just not so. Instead of relying on *Repeater Directory* listings as the sole indicator of activity—listings which, incidentally, have grown at double- and triple-digit rates every year the *Directory* has been published—the Commission should have known that there is a lot of simplex FM, packet, SSB, CW, and control and auxiliary link activity that is not reflected in any published list. This is especially true below 222 MHz, because of the Commission's own rules which for several years confined repeaters above 222! Documenting such activity takes time, and the ARRL staff immediately began canvassing frequency coordinators and others for information so we could provide the Commission with a more accurate picture. It seems we'll also have to spell out for the Commission the enormous increase in band occupancy that has already resulted from the packet radio boom and Novice Enhancement.

Interestingly, serious questions have been raised recently about the validity of land-mobile growth projections that one often hears bandied about. Apparently, a large percentage of land-mobile licenses are for systems that were never put on the air, or are held by firms that have gone out of business or have stopped using radio. Does the pressure for land mobile at 220 come from users of the service? No; it comes from some

manufacturers who have been unsuccessful in hawking their wares in competition with the regular land-mobile suppliers!

The FCC gave us an uncharacteristically short time period in which to prepare a reply to its proposals. I immediately authorized our Counsel to file a request for an extension of time past the original April 6 deadline, to May 21. As you may have already heard, via W1AW bulletin or some other means, this request was granted on April 1 (no fooling!). Reply comments, those filed in response to comments submitted by others, also have a new due date, June 19.

As of this writing, hundreds of amateurs have filed well-reasoned comments opposing this commercial spectrum grab. To those who have filed, thank you! Your arguments are now a part of the official record of this government proceeding. If you haven't yet filed, DO IT NOW! It isn't too late, but DON'T PUT IT OFF! Look at last month's editorial for advice on how to format your submission. Please share a copy of your filing with ARRL HQ. If you've already filed, MAKE SURE YOUR HAM FRIENDS DO, TOO. If they're not League members they may not even have heard about the threat, so don't assume they already know all about it.

A final thought. While what we're fighting is the FCC's own proposal, which makes matters a lot more serious than if it were simply another flaky idea submitted from outside the Commission, FCC does occasionally change its mind in the face of logical and determined opposition. It also responds to the will of Congress, since it owes its very existence to the Communications Act. Among the Commissioners and staff there's seldom unanimity of opinion on allocations matters; often the balance is very fragile, and the outcome may hinge on a very slight shift in the wind. YOUR comments could make the difference—IF you file!

Please join us in the fight to preserve these most precious resources, our frequency allocations.—Larry E. Price, W4RA, ARRL President

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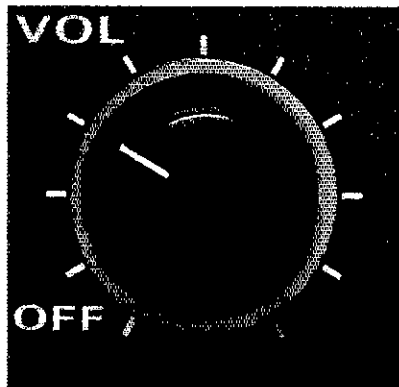
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With controls that couldn't be more straightforward and easy to learn. Which means no



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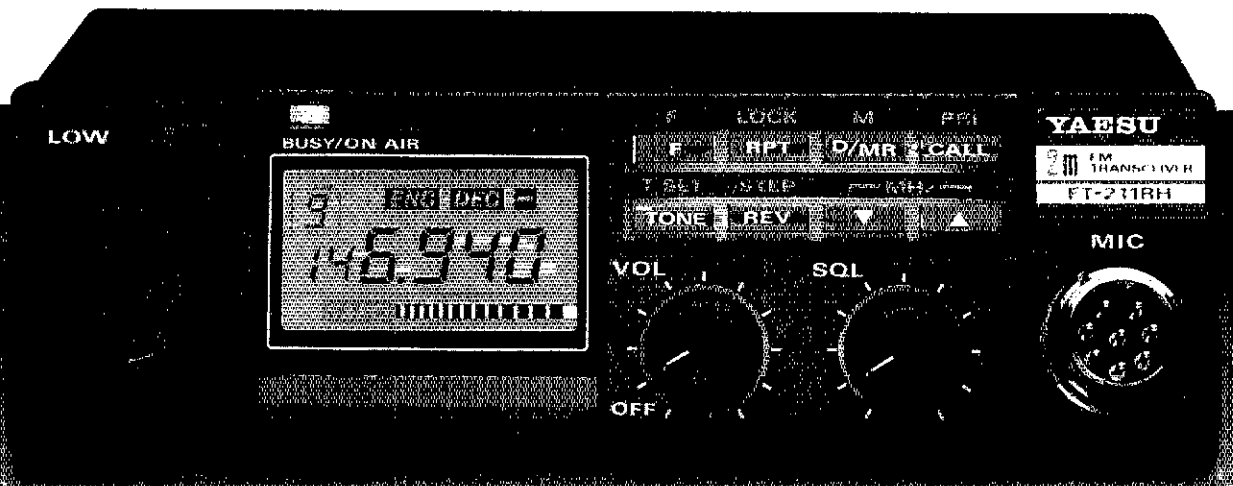
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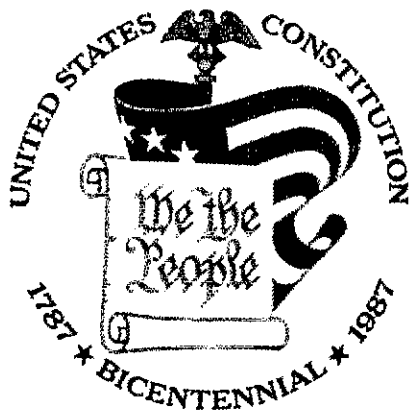
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Hams to Help Celebrate Bicentennial of US Constitution

In the coming months, you'll be seeing a lot of this official logo of the Commission on the Bicentennial of the United States Constitution. That's because amateurs will be very involved with helping our country celebrate the 200th birthday of the US Constitution. That celebration begins on May 25, when NN3SI and W3DOS (Smithsonian Institution and Department of State ARC stations) in Washington, DC and K3MTK in Philadelphia go on the air to commemorate the convening of the Constitutional Convention at Independence Hall in Philadelphia in 1787. Operating frequencies and times

appear in this month's Special Events column. More information is available from the event's coordinator, Walter Van Gieson, KB4LWD, 201 Walden Pl, Raleigh, NC 27609. Keep a sharp eye on QST and other ARRL publications for other commemoration plans as they develop.

Attention Philatelists:

Another ham radio stamp is available. On March 9, Luxembourg issued a special postage stamp in commemoration of the 50th anniversary of its national Amateur Radio society, Reseau Luxembourgeois des Amateurs d'Ondes



Courtes (RL). The 12-franc stamp measures 28 x 36 mm. If you can't get the stamp through a local dealer, you can buy one from the Office des Timbres, Administration des Postes et Telecommunications, L-2020 Luxembourg.



Novice Enhancement, This Issue

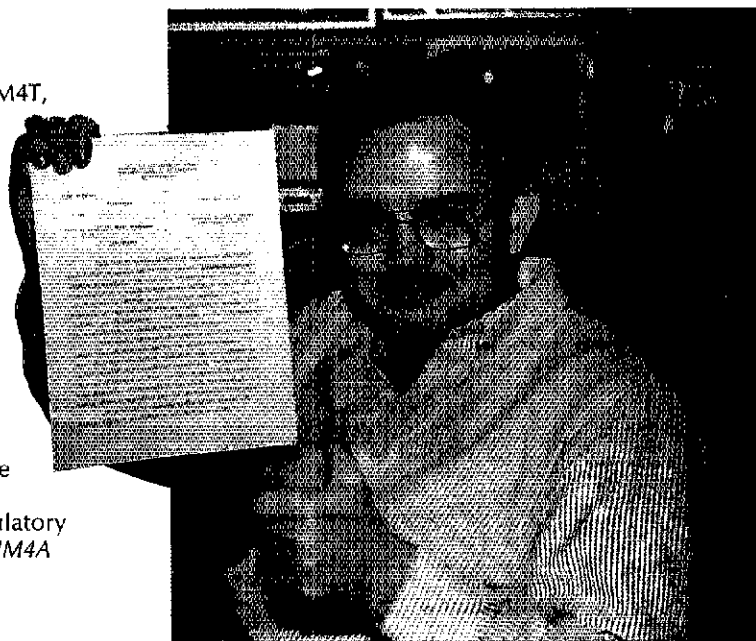
So far, you've learned what new privileges are available to Novices as a result of Novice Enhancement, and the regulatory and testing changes that have accompanied it. Beginning this month, we'll be looking at how to go about putting those new privileges to use. Items you'll find helpful in this issue:

■ "What's Going on in the New Novice Bands?" A practical guide to all the new privileges. See Novice Notes, page 44.

■ "Novices, Welcome to 220 MHz." An introduction to the world of repeaters. See FM/RPT, page 67.



PRB-1 Works! It's no wonder John Thernes, WM4T, is happy. He's holding the Consent Decree signed by the City of Lakeside Park, Kentucky that allows John to have a 65-foot tower plus an 8-foot mast on his property. With the help of PRB-1, an FCC ruling that established a federal interest in local antenna-ordinance matters, John was able to win a lengthy and costly legal battle against the City, whose zoning regulations excluded all antenna towers. See last month's Happenings and League Lines for details. This is a big win for all amateurs, as it could set a precedent for future antenna cases. A copy of the presiding judge's Order is available from the Northern Kentucky Tower Fund, PO Box 17721, Lakeside Park, KY 41017, or from the ARRL Regulatory Information Branch (please include an SASE). (NM4A photo)





WARC Watch: Competition for worldwide frequencies can be fierce. That's why the International Amateur Radio Union (IARU) sent a team to the International Telecommunication Union (ITU) conference in Geneva this past February-March to keep an eye out for HF Broadcasting allocation developments that might be threatening to the Amateur Service. Shown here are IARU observer team members (l-r) Region 1 Director ITRYS, Region 1 Secretary G3FKM and Vice President W0BWJ. Other members of the team, Region 1 Vice Chairman SP5FM and Region 1 Director YU7NQM, are not shown. See last month's League Lines and next month's IARU News for details. *(JATAN photo)*

Ham Cameraman Honored By News Industry

Steve Affens, K3SA, of Olney, Maryland, knows a good news story when he sees one—and he has the credits to prove it. Steve was recently named Cameraman of the Year in the White House News Photographers Association Videotape Contest—for the second year in a row. A news photographer for WJLA-TV for the past 19 years, Steve earned the honor by winning first place in a Day Feature, first place in General News, third place in Series and second place in the



Sound category. When he's not working the White House, Steve works the ARRL CW DX Contest, OSCAR 10, RTTY and 2-meter FM. Congratulations, Steve!

Archie Club Is Radio-Active



Do you know any youngsters who would like to find out more about Amateur Radio? One handout that has proven to be popular is the special-edition Archie comic book, *Archie's Ham Radio Adventure*, a joint educational project of the Amateur Radio industry and the ARRL. In addition to enjoying 32 jam-packed pages of adventure and

games, young people are invited to join the Archie Radio Club (sign-up information is in the comic book), and they'll get a packet of special information about Amateur Radio. To find out how you can get a quantity of the comic books free of charge, contact the ARRL Club Services Department.

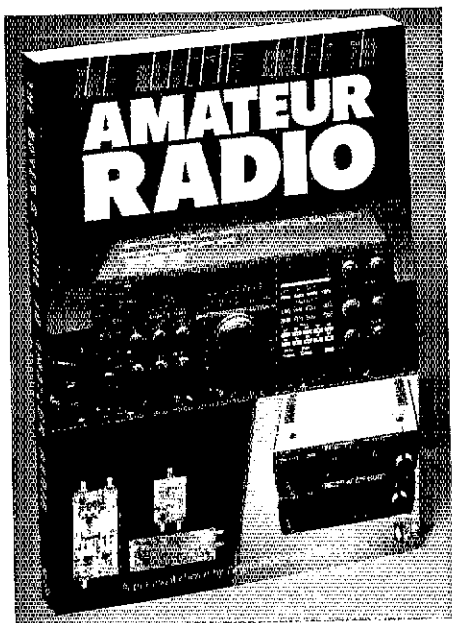


Ship to Shore: These members of the Seven Seas Cruising Association took some shore leave to learn about another kind of waves—airwaves. The group, which usually can be found navigating the Indian Ocean, hit the books in preparation for this ARRL/VEC exam session in late December at the Opua (New Zealand) Cruising Club. The result: 12 Novice and 3 Technician licensees, many of whom are working on upgrading. For information on exam sessions near you, contact the ARRL/VEC. By the way, this month's IARU News column discusses yachting and Amateur Radio, and includes a list of maritime nets. *(NX6F photo)*

W1AW Open House This Month

Is your club or group looking for a place to go on its next Amateur Radio field trip? On Sunday, May 31, ARRL Headquarters and W1AW, the Hiram Percy Maxim Memorial Station, will be open 10 AM-4 PM for tours. Group tours are

by appointment only, so be sure to book ahead with ARRL Membership Communications Services. Don't forget to bring along a copy of your amateur license if you'd like to operate from W1AW.



Guide to Buying Gear: If you're in the market for some ham gear, you might want to check out this RSCB publication first. The book contains about 200 full reviews and product descriptions of modern as well as older equipment, although some of the information applies only to British gear designed for operation under European band plans. See April QST, page 160, for ordering information. (The opinions expressed in this book are those of the author and are not necessarily those of the ARRL.) By the way, March "Novice Notes" (page 47) covers many of the particulars of how to spot a good deal on used 40- and 80-meter gear.

ITHE Spells Goodwill

Traveling to another country? Would you like to spend a day or two in the home of another licensed amateur abroad, or maybe meet with local hams there? How about inviting a visiting ham to your home? If you've answered "yes" to any of the above questions, you should check out the International Travel Host Exchange program. Established by the ARRL in 1984, the ITHE promotes international goodwill and friendship by hooking up visiting amateurs with hams in the host country. If you want to register as a host with the ITHE, or get a list of program participants, send a business-size SASE to Information Services, ARRL.

Put a WAS in Your Packet

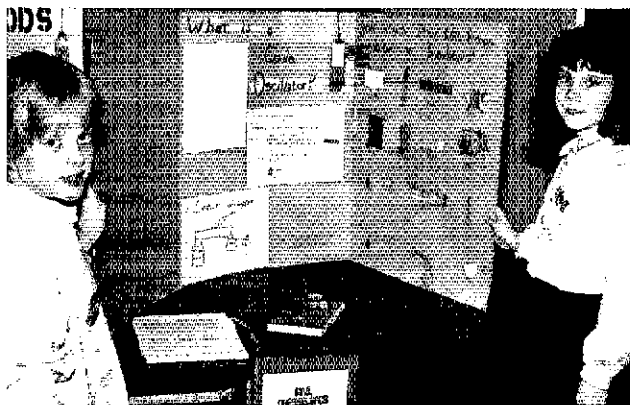
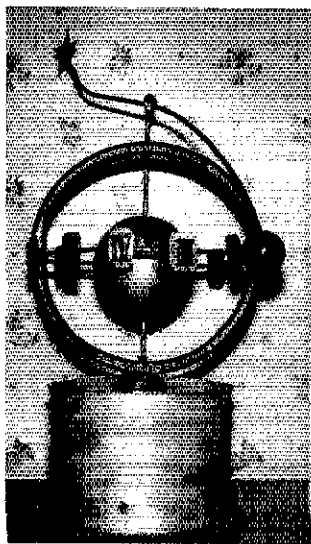
ARRL offers an exciting, new challenge for awards chasers: a packet radio endorsement for the Worked All States (WAS) award. As an added incentive, the first 10 qualifiers will receive a



commemorative plaque. Please note that this will be an endorsement only, not a new, separately numbered award. By the way, the first plaque has been claimed already by Art Blumenthal, KF6EE.

Elusive II: Our report on the elusive Elser-Mathes Cup in this column in March prompted some more extra-terrestrial activity. Joseph Strolin, K1REC, wrote in to tell us of this "Fleeting Award," sponsored by the

STROL-IN Foundation of Norwalk, Connecticut. According to Joe, the Foundation's curator, the award is to be presented to the first radio amateur who works Earth from Mercury, named after the Roman god of travel who serves as a messenger to the other gods. Since the surface of Mercury is about 800° F, a manned amateur operation from that planet isn't likely to take place in the near future—not at least until a new kind of air conditioning—or heat sink—is invented!



Excellent Science Fair Project: What project would demonstrate some aspect of science and keep the interest of viewers? That challenge faced fourth graders Steva Yarbrough (left) and Gail Mayfield at Pleasant View Elementary School in Bettendorf, Iowa, who responded by putting together this hands-on exhibit on Morse code. Gail's dad, NU0G, helped with the code-practice oscillator, the schematic of which came from QST (Aug 1986, p 64), and Steva's father helped with the backdrop and the handouts. What did Steva and Gail learn from this experience? That building a code oscillator is safe, inexpensive and well within the capability of grade schoolers, and that the hands-on approach is a good teaching tool as well as an effective attention grabber.

League Lines

The FCC has granted the ARRL request for an extension of time in General Docket 87-14, which proposes to reallocate the bottom 2 MHz of the 220-MHz band to the Land Mobile Service. *The new date for comments to be received by the Commission is May 21, with reply comments due June 19.* All amateurs should be aware of the vital importance of this docket, and should submit appropriate comments to FCC. For more information on this docket, and how to submit comments, see April *QST*. For further background, see this month's It Seems to Us and Happenings columns.

The ARRL Executive Committee met in New Orleans on March 21. *Some of the major actions taken were:* Authorization of further ARRL actions in opposition to the FCC proposal to reallocate the 220-222 MHz band (General Docket 87-14); authorizations for a request to FCC for additional time to file comments to the FCC inquiry in PRB-3, which seeks to determine if special call signs should be assigned by the private sector (see below); and for filing for a special temporary authority (STA) for 19 designated stations to operate HF packet nodes under automatic control at speeds up to 1200 bauds to perform a controlled study of HF packet networks. Complete minutes of the meeting appear on page 57.

Acting on the Executive Committee's authorization, *the ARRL has filed a request to extend the comment period until July 31 in PRB-3*, the FCC's proposal that seeks to determine if the private sector should issue certain amateur call signs. This would permit the full Board of Directors at the July meeting to evaluate both the wishes of the membership and the specifics of a computer hardware and software feasibility study, which is otherwise not possible in view of the present April 23 comment deadline. Following the July Board meeting, a complete and specific response to the FCC proposal can be prepared. In its request, the ARRL also noted that publication of the PRB-3 notice in the *Federal Register* inadvertently omitted one page of the text, and thus amateurs who reviewed the proposal as printed there may base their judgment on incomplete information.

The 1986-87 edition of the ARRL *Repeater Directory* has sold out! *An incredible 67,000 copies of this edition were sold.* The new 1987-88 edition, with over 12,000 listings plus an expanded packet section, is now available for \$4 plus \$2.50 shipping and handling if ordered from HQ.

Summer's almost here, and when most folks are thinking of swimming and vacations, hams are thinking of Field Day! To give Field Day groups extra opportunities to copy the W1AW Field Day Message, four additional bulletins will be transmitted. An extra CW bulletin will be run at 1400 UTC (10 AM EDT), and an extra phone bulletin at 1500 UTC (11 AM EDT) on both Saturday and Sunday mornings. See April *QST*, p 15, for a detailed bulletin schedule. Also, this year something new has been added to Field Day. In recognition of the long-standing tradition of cooperation between amateurs and the Military Affiliate Radio System (MARS), *certain MARS stations will participate in the 1987 ARRL Field Day to provide bonus points to stations who contact them.* Complete Field Day rules are on page 87.

At press time, HQ was notified that a *reciprocal-operating agreement between the US and Cyprus* was to be effective April 10. No further details were available.

This month we welcome a new ARRL Section to the pages of *QST*: The ARRL West Texas Section (see page 8). The first Section Manager election is being conducted as this is written; ballots will be counted on May 19, at which time a new SM will be announced. Oscar "Gene" Smith, AE5I, has been appointed to serve as West Texas SM until July 1. For a breakdown by county, see February 1987 *QST*, p 52. This month's Happenings contains an explanation of the Section Manager election procedures.

We are considering publication of a book commemorating the League's first 75 years. Potential contributors of interest are: (a) writers having personal knowledge and research material about Amateur Radio history prior to World War II, (b) writers having insight into various facets of Amateur Radio since 1945, and (c) editors with proven ability to be responsible for whole chapters. Please send a brief outline of your ideas, what role you see for yourself, and a short resume to Paul Rinaldo, W4RI, Publications Manager, ARRL HQ.

Qualified volunteers are needed to join the ARRL Education Task Force created at Minute 73 of the January meeting of the Board. Curriculum development is an important part of the group's mission, so we're looking for people who have professional experience in developing and field-testing curricula for the elementary, junior high, high school and/or adult levels. If you're interested in applying your background to the challenge of Amateur Radio instruction, please describe your qualifications in a letter to ARRL President Larry Price, W4RA, c/o HQ.

A Letter to T.O.M.

Dear Mr. Maxim:

I suppose there are some who think it rather strange that I should be writing a letter to someone I never knew, and who has been a Silent Key for over 50 years. I would reply by requesting that they reserve judgment until after reading my letter.

At the time you died, I had just passed my 14th birthday. Please note, I did not say "celebrated." When you were from a poor family in the midst of the Depression, you had very little to celebrate. We youngsters of the '30s knew a lot about friendship, though. When you passed on, Mr. Maxim, I felt I had lost a friend and I was very, very sorry.

My early years were so very typical of most hams and SWLs of that period. I lived in a small town of about 500 people; the nearest ham was more than 30 miles away. I was building crystal sets and experimenting with radio and electrical circuits long before I knew anything at all about Amateur Radio.

My first exposure to *QST* came when I discovered a few copies in a box of other magazines a visiting relative brought us. I read them over and over, and still have them today.

I heard of a ham, W5FKT, who lived in Springdale, some 30 miles away. I talked my Dad into driving me to Springdale, so that I might actually get to see a ham station. Clyde, W5FKT, opened the door and invited me in. I will never forget the beauty of the 250-watt rack and panel transmitter and the Skyrider sitting on the table. Clyde turned the receiver on and I was amazed at the volume and clarity of the signals. Turning on the transmitter he called "CQ 160"; the 866s furnishing power to the class B modulator flashed with their beautiful blue glow as he spoke into the mike. He was answered by a ham over 50 miles away, and when he handed me the mike I was speechless. I managed a few mumbled words and left walking on clouds. I also left with a armload of *QST* magazines and a license manual, loaned to me by W5FKT.

Thus it was that I read of your death, Mr. Maxim. I also learned many other things, like good operating practice, and the fate awaiting those who strayed too far from the straight and narrow—the dreaded Wouff Hong and Rettysnitch.

During those early years I read and reread every old *QST* I could lay my hands on. My favorite articles were the ones by "The Old Man." I also read the construction articles until the schematic diagrams were committed to memory. When I should have been reading the classics for English Literature classes, I was drawing circuits for my first transmitter.

When I called my first CQ, I felt you were standing behind me, Mr. Maxim, just waiting for me to call CQ more than four times without signing so that you could take the Wouff Hong to me. When I heard W5HHR answer my CQ, I was so excited I could not finish the QSO. I made a real mess of it, but was elated that I was finally a ham.



I could not muster up enough courage to try another CQ that day, but I set my alarm for 3 AM and tried again the following morning. Before going to sleep, I spent two hours reading my well-worn old copies of *QST* again. Your words assured me, and gave me hope and encouragement. By morning I had worked two more stations, actually completing both QSOs. I then went outside and sat on the front porch watching the sunrise, thinking how wonderful ham radio was and how lucky I was to be a ham. I promised myself I would learn to send good code, that I would constantly try to improve my operating habits, and would at all costs try to avoid the wrath of The Old Man.

Now, 50 years later, I am just about the age you were when you became a Silent Key. You are still with me every time I turn the rig on. Only last week, while tuning the Extra section of the 20-meter band, I heard a station call "CQ" 26 times before signing his call, and I thought of you and the Wouff Hong.

Please don't get the idea that I think all you do is look down from that great shack in the sky and frown. Often, I see your face when it is nothing but smiles; while gently puffing on your pipe, you are nodding your head, showing how pleased you are. When do I see this look? When an old-timer takes the time to help a newcomer get his ticket. When some hams take time to help others put up a new antenna. When rare or semirare DX stations move into the Novice and General bands to give them a chance at some new DX. When the CW op who normally runs at 30 WPM+ slows up and ragchews for a half hour with someone who can't get his speed up over 15 WPM.

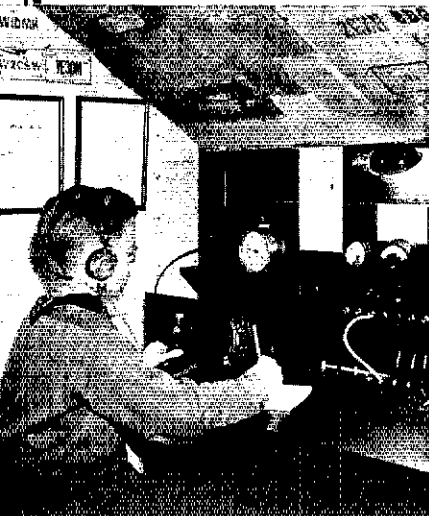
I don't claim to know the answer to our problems, Mr. Maxim, but somehow I feel that every generation of hams need an Old Man, and maybe even a Wouff Hong. Someone to look over our shoulder and constantly remind us to do our best, to improve our fist, to observe good operating habits and to always be considerate of our fellow hams.

So you see, Mr. Maxim, I feel I do know you and that you've been keeping an eye on us all these years. I just wanted to say thanks for doing so much during your lifetime that, 50 years after your death, our hobby is still healthy and strong. It has been a rewarding experience to have known you.

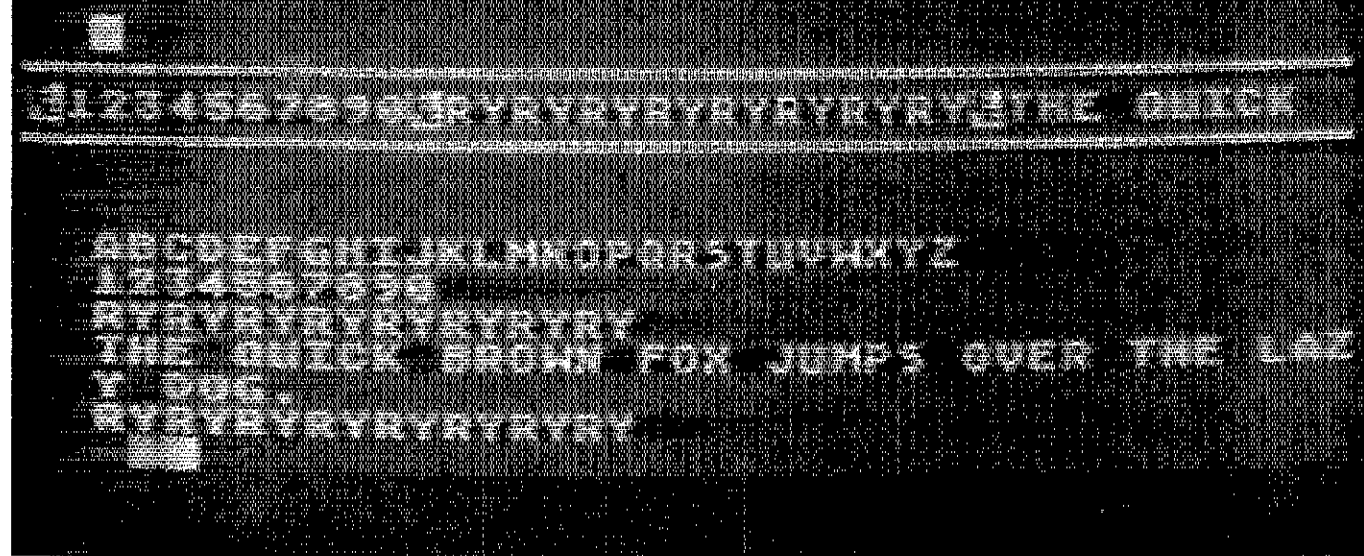
73,

Bruce Vaughan

Bruce Vaughan, NR5Q
PO Box 203
Springdale, AR 72765



Split-Screen RTTY For Atari Computers



Using your Atari computer on RTTY couldn't be easier! This feature-packed program is available in an easy-to-use, plug-in cartridge.

By Rusty Lewis, WA4RKV
112 Benton Dr
Sumter, SC 29150

You don't have an Atari® computer? Well, don't go away! If you haven't looked at the cost of an Atari computer lately, do so. The prices of the various Atari computer models are so low as to make the idea of using one as a dedicated RTTY/CW terminal a very attractive prospect. The software is inexpensive, too. A "plug and play" CW cartridge was already featured in *QST*.¹ Now you've got an RTTY program in the same easy-to-use package.² When using a program contained in a cartridge, you don't have to use (or even have) a disk drive or cassette tape recorder: You simply plug in the cartridge and turn on the computer. Take a look at the setup in Fig 1—what could be simpler?

General Description

This RTTY program runs on the Atari Model 400, 600XL, 800, 800XL and 130XE

8-bit computers. Its split-screen format and use of buffers allow you to prepare text for transmission while receiving incoming data. You can see the program in action in the title photo. The screen is divided into three areas. Received data is displayed in the upper section. Transmitted data crawls in a single-line, right-to-left "Times Square billboard" fashion across the middle of the screen, typical of many commercially available RTTY programs. At the bottom of the screen is the transmit type-ahead buffer. Current operating speed is shown in the upper-left-hand corner. In the upper-right-hand corner is the carriage-return/space-character selection status indicator (discussed later).

Program Design

This is a machine-language program. As such, it operates quickly and allows a little more versatility in using some of the special features of the Atari computers. I developed the program with an Atari 800 and the MAC/65 macro assembler/editor.³ I highly recommend this editor, but any

other assembly language editor that supports the INCLUDE directive can be used if one wishes to key in the rather lengthy program.⁴

The transmit and receive routines are interrupt driven. When the microprocessor is interrupted, it stops its normal duties, determines the source of the interrupt, services that routine and then returns to the main program.

In order to transmit and receive RTTY characters accurately, we must be able to generate the interrupts at the correct time. This can be accomplished by using two of the audio-frequency registers that are normally used to set the pitch for the corresponding sound channels in the computer. These registers can also be used as flexible hardware timers. In this application, the two 8-bit registers are tied together to provide 16-bit resolution, and clocked at a frequency of 64 kHz. Timing is controlled by loading the audio register with the number of clock intervals you want to count and starting the counter. When the audio register count reaches zero,

¹Notes appear on page 20.

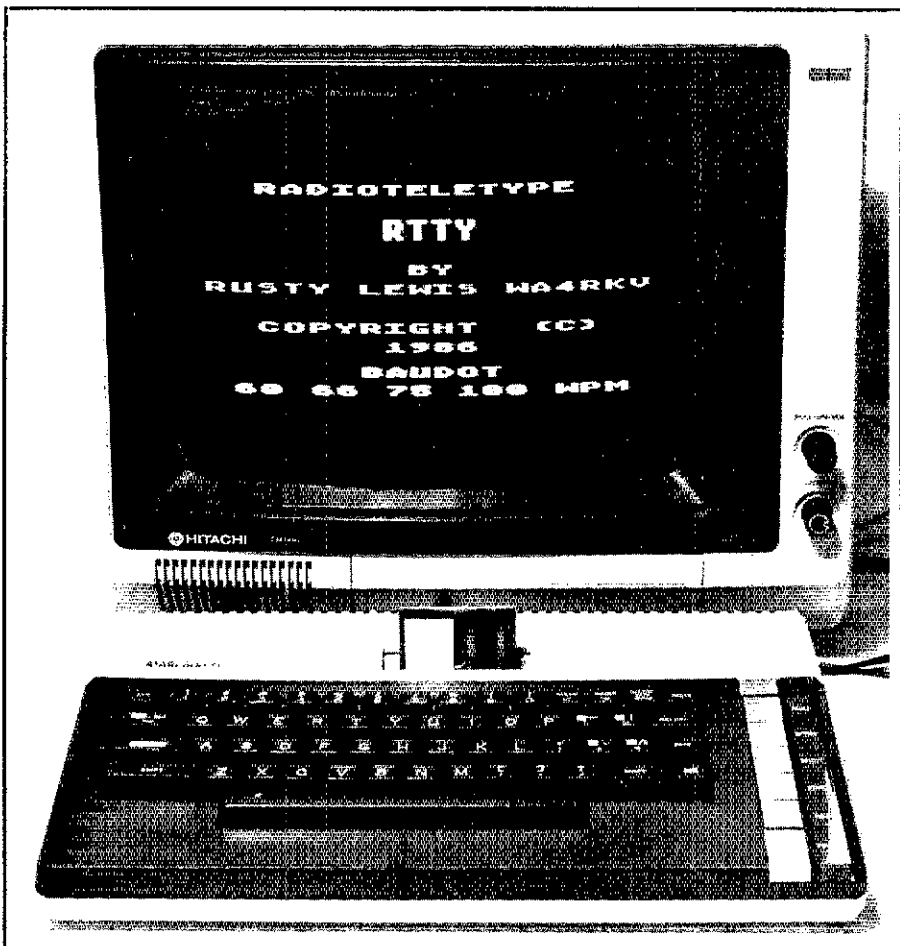


Fig 1—The opening billboard of the RTTY program is shown here. The program is contained in an EPROM mounted on the small PC board plugged into the cartridge slot of the Atari 800XL computer. An unused set of IC pads can be seen to the right of the board.

the operating system (OS) forces a jump to the interrupt routine that handles the transmit or receive routine. Timing can be calculated according to the following formula:

$$\text{Time} = \frac{1}{(256 \times \text{MSB} + \text{LSB}) \times \text{Freq}} \times 1000 \quad (\text{Eq 1})$$

where
 time is expressed in milliseconds
 freq = clock frequency (63921 Hz)
 MSB = most-significant byte value of the frequency register
 LSB = least-significant byte value of the frequency register

A word of caution: When the timing values are changed by the interrupt routine, the values do not become effective until the start of the following interrupt. I have not seen this documented, but the registers are apparently buffered. As a result of this, I spent two weeks trying to determine why

the routines would not transmit and receive correctly!

Transmit Interrupt

The transmit interrupt routine looks into the text buffer to determine if there is a character available to transmit. If one is available, the routine then determines if a letter or figures shift is required before the character is transmitted.

This interrupt also handles transmit mode word-wrapping, which is transparent to the operator. Word-wrapping is accomplished by keeping count of the number of characters transmitted since the last carriage return. When 57 characters have been sent without a carriage return, the routine looks for a space character. When the space is found, a carriage return and line feed are sent, resulting in the receiving station having each line ended with a full word. If a space character is not found by the time 72 characters have been sent, a carriage return and line feed are forced. Though not generally required when computers are used for RTTY, this procedure is followed because there are still many mechanical printers being used.

A carriage return and line feed are sent automatically at the beginning of each transmission. You may also send a carriage return at any time by pressing the RETURN key. Because some programs unshift on carriage returns and spaces, this routine takes into account these circumstances and takes the necessary action.

Receiving Interrupt

The main receiving interrupt action is simple. It has only to decipher the incoming characters and place them in a buffer to be displayed in the upper-text window.

A second receiving interrupt used is that of vertical blanking. In the Atari literature (and here for consistency) this is referred to as the "vertical blank interrupt." For the NTSC standard, this occurs every 60th of a second when the electron beam of the CRT in the TV or monitor is turned off and returns to the upper-left corner of the screen.

The program uses this interrupt during receive to display the data (from the main receiving interrupt) in the upper-text window independently of the main receiving interrupt and main program. The vertical blank interrupt is used to display the data, in preference to having the main receiving interrupt handle both character decoding and display, for several reasons. Displaying the incoming characters requires writing the data to screen memory and then moving that data through screen memory. Word-wrapping for the display is also handled at this level. While all of this can get to be a bit time-consuming, and since I wanted to keep the receiving interrupt routine short and efficient (so it's not waiting on itself), I let the vertical blank interrupt handle the task. One advantage of this approach is that the receive interrupt routine takes place during the deferred portion of the vertical blank interrupt. This means that if a critical interrupt is pending, the routine will not be executed and will be deferred until the next vertical blank interrupt. The receiving interrupt sets this flag, which means the receiving routine will have first priority. Another benefit of having the vertical blank interrupt display the data is that all the action takes place while the CRT's electron beam is off; thus, changes on the screen seem to take place instantly.

Another use for the vertical blank interrupt is to horizontally scroll the text in the transmit buffer across the middle of the screen. This routine operates independently of the transmit interrupt and at a fixed speed (one pixel every other vertical blank period) regardless of transmit speed. Therefore, the routine should not be relied on as an indicator to determine if all the data has been transmitted. At 60 WPM, the scrolling is faster than the transmit speed, but at 100 WPM, scrolling is a little slower. So, if you're transmitting at 100 WPM and typing at 100 WPM (or using buffers) and the program returns to receive mode before

the entire message has scrolled across the screen, don't worry—the entire message has been sent.

Receiving Algorithm

Regardless of the many special features an RTTY program may possess, it's only as good as its ability to decipher the marks and spaces into useful data. The receiving algorithm I employ was derived in part from a routine written by Scott Schram, KN4L, for an Apple® II equipped with a 6522 Versatile Interface Adapter (VIA).⁵

A flow chart for the receiving algorithm is shown in Fig 2. Fig 3 contains the timing diagram and interrupt stages for a typical Baudot character. The routine begins stage zero by looking for a stop bit whose duration can vary between one and two signal elements. The routine does this by sampling the input register once every millisecond, keeping count of the time, but also allowing for some false transient readings caused by noise on the incoming signal. After the stop bit is found, stage one begins by looking for the start bit, which is used for synchronization.⁶ The program again allows for false readings by accepting only a start bit that has two consecutive low readings; then stage two begins. Stage two allows the new timing value to be used. Now that the start bit has been found, all of the timing values for receiving the 5-bit Baudot code are known.

Stage three reads the input register at predetermined times and builds up the character. Each bit is sampled five times and the best three out of five determine if the bit is a mark or space. This means that after the start bit is found, each character is sampled a total of 25 times. This procedure is used for all speeds including 100 WPM. After the character is determined, it is placed into a buffer to be displayed on the screen by the vertical blank routine. Then, the process is started over again with stage zero. This technique yields good results, but feel free to experiment with it as you like.

Interfacing the Computer

A suitable modem ("terminal unit" or "TU" to you OTs) is required. It is connected between the Atari's no. 2 CONTROLLER jack and your transceiver. Radio Shack's joystick extension cable (276-1978) makes an ideal interface cable. Cut the cable to a length suitable for your installation. Fig 4 contains the pin-outs for the Atari no. 2 CONTROLLER jack.

A TTL high (+5 V) is applied to pin 4 of the jack when a mark is detected, and a TTL low (0 V) when a space is received. Pin no. 1 of the CONTROLLER jack is used for RTTY data output, and is high when sending a mark and low for a space.

The program also uses the computer's ability to generate the 2125 Hz mark and 2295 Hz space tones, which can be fed directly to the transmitter. This program incorporates a delay loop that eliminates

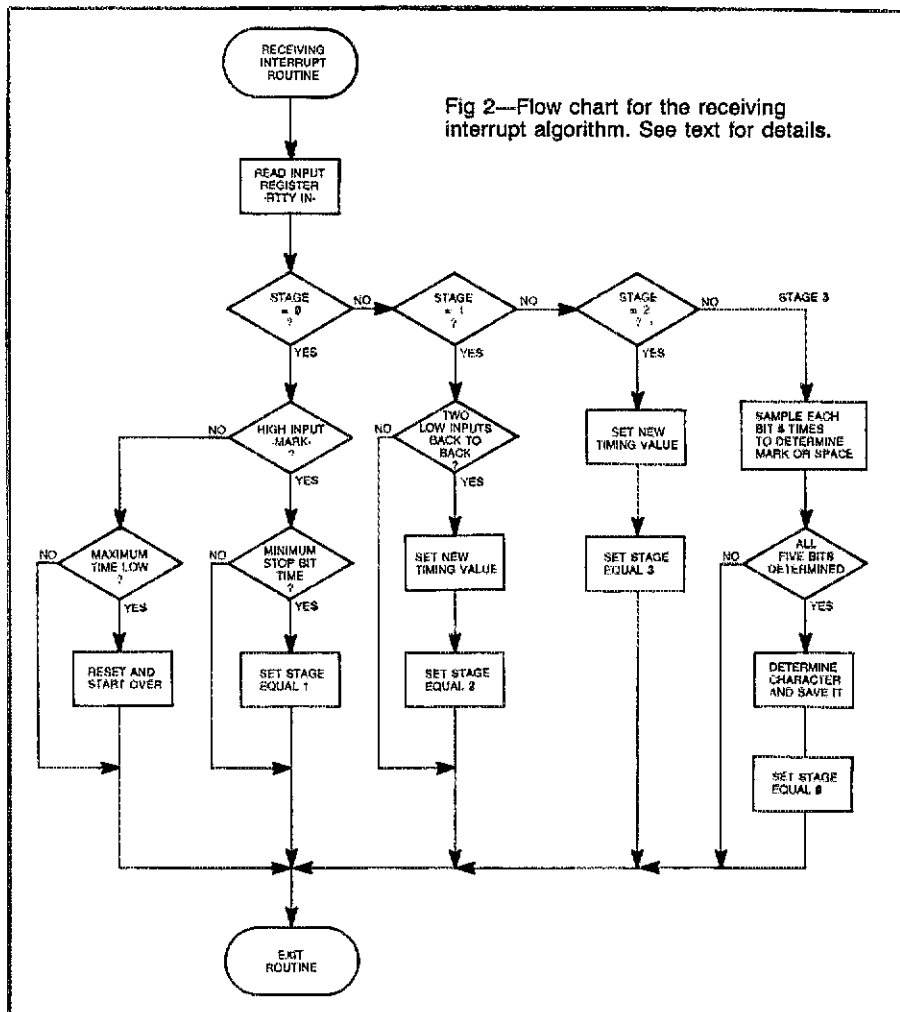


Fig 2—Flow chart for the receiving interrupt algorithm. See text for details.

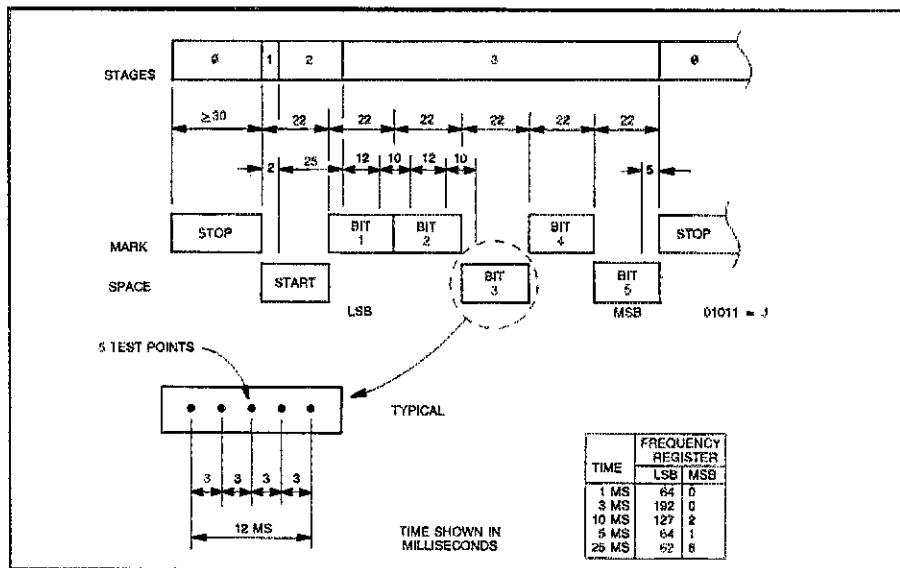


Fig 3—Timing diagram for reception of a typical Baudot character (in this case, J) at 60 WPM. An explanation of this diagram is provided in the text.

the aural-feedback key clicks that occur with each press of a key. Getting rid of these clicks is necessary because in the Atari XL and XE models, the key clicks also appear on the computer's audio channel

and would otherwise be transmitted.

Pin 3 of the CONTROLLER jack is held high (+5 V) during transmit, and low (0 V) in receive mode. An IC or transistor can be driven from this pin and used to key

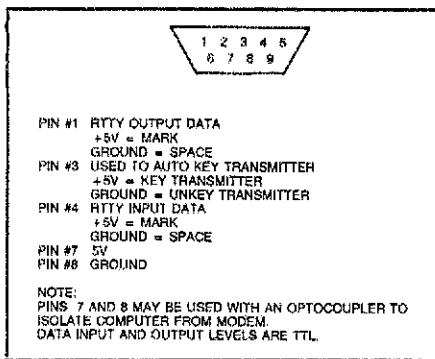


Fig 4—Pin-out diagram for the Atari computer no. 2 CONTROLLER jack. This jack is used as the I/O port for the computer/modem interface. Pin numbers are shown as they appear facing the jack from the outside of the computer. A mating female connector/cable assembly may be made from a Radio Shack joystick extension cable; see text.

the transmitter PTT line directly or by means of a relay.

Using the Program

A list of program commands is presented in Table 1. All of the program's control features are selected by pressing the CONTROL (abbreviated as CTRL) key along with the desired command key. The center screen line displays the status of some CONTROL-key commands. You should familiarize yourself with the CONTROL-key commands before venturing forth on the air. That way, your operation will be smoother and you won't keep the other station(s) waiting unnecessarily while you hunt for the proper keys. For practice, use a dummy load attached to the transceiver and turn the mic gain down.

Note: CTRL S should be used to routinely exit the transmit mode. This causes the program's transmit pointer to point to the end of the text buffer (necessary because of the delete-while-transmitting feature) and allows the entire text buffer to be transmitted. This ensures that all of the text buffer is transmitted. If you must exit the transmit mode quickly, without sending all of the text in the transmit buffer, CTRL X will do it.

To use the program cartridge, first make sure the computer is off. Then, insert the board into the computer's cartridge slot with the *component side* of the board facing the *rear* of the computer. That is, the EPROM faces *away* from you. Use the left-hand cartridge slot on an Atari 800. Turn on the computer and the program's title screen will appear. Pressing the START key causes the computer to display the split screen and enter the receive mode.

Now you can select the playfield color, playfield luminance and character luminance screen attributes using the CTRL C command and + and - keys. Proper color and luminance selection will help

Table 1
Control Commands

Key	Function
START	Press START key to exit title screen and begin receiving.
DELETE	Use this key to edit transmit-buffer text. While in the transmit mode, you may delete back to the last space or last 10 characters, whichever is less.
BACKSPACE	Use this key to edit transmit-buffer text. While in the transmit mode, you may delete back to the last space or last 10 characters, whichever is less.
CTRL T	Starts transmission. There is an approximate 2-second delay between the time the command is issued and the transmitter is keyed.
CTRL S	Stops transmission after transmit-text buffer is empty; then starts receive mode.
CTRL X	Forces exit from transmit mode and starts receive mode. Note: This causes transmit routine to end without sending entire transmit-buffer contents.
CTRL <	Clears user transmit-text buffer. Used to clear buffer and start over without transmitting.
CTRL R	Turns carriage return recognition on and off during receiving. If off, a space is substituted for a carriage return. The status of this command is displayed in the upper-right-hand corner of the screen.
CTRL +	Keys transmitter and sends mark tone. Displays message on center screen line.
CTRL -	Keys transmitter and sends space tone. Displays message on center screen line.
CTRL W	Selects transmit and receiving speed (60, 66, 75 or 100 WPM). Speed is shown in the upper-right-hand corner of the screen.
CTRL B	Transfers transmit buffer to one of the user buffers. Must be used before transmission initiated. Each buffer holds a maximum of 255 characters. Respond to prompt with buffer number (2-6).
CTRL 2-6	Transfers user buffer to transmit buffer. Respond to prompt with buffer number.
CTRL 7	Transfers ROM buffer to transmit buffer. ROM buffer contains a test message composed of the alphabet, the digits 0-9, a string of RYs, and a QBF (Quick Brown Fox) message followed by another string of RYs.
CTRL C	Changes screen colors and luminance. Toggles between playfield color, playfield luminance and character luminance. When in chosen mode, the + and - keys step through choices. Mode displays on center screen line.

optimize the display for character recognition. RTTY operating speed can be chosen using CTRL W; the program default is 60 WPM.

If you now tune in an RTTY signal of the chosen speed, received data will be displayed in the upper text window. The received text will exhibit word-wrapping. You can elect to acknowledge carriage returns or substitute space characters for carriage returns with a toggle (CTRL R). Using spaces allows you to display more text in the receive window. A status indicator in the upper-right-hand corner of the screen indicates the current selection.

With the computer displaying the received text in the upper window, you can enter text into the transmit buffer. Your entries will be displayed in the lower text window. The program disables all keys except the legal Baudot characters. If you make a mistake when entering text, you can use the DELETE BACK SPACE key to erase the error(s). Erasures may be made to as far back as the beginning of the transmit text buffer as long as you're in receive mode. Once transmission has started (CTRL T), you may delete only back to the last space or 10 characters, whichever comes first.

Transmission is performed in *word* mode

as opposed to *character* mode. A word (consisting of one or more characters) is not transmitted until one of two things occurs: (1) The character is followed by a space; (2) the total number of characters in a word (without an intervening space) exceeds 10. In the latter situation, characters are sent one at a time FIFO (first in, first out) fashion as each character after the tenth is entered. Once a space is generated, all remaining characters in that word are transmitted.

If you're a new Atari computer owner, don't be alarmed if—after a period of inactivity at the keyboard—your display starts changing color (or shading with a monochrome monitor). This occurs because no key has been pressed for several minutes. A built-in feature of the Atari computer, called ATTRACT MODE, begins cycling the video output through several screen displays to prevent burning the image on the screen. All you have to do to restore the screen you selected is to simply press any key; the SPACE bar or DELETE BACK SPACE keys are good choices.

User Buffers

This program provides five active user buffers that store up to 255 characters each. Text may be stored in the buffers at any

New Products

time while in the receive mode. To save data to a buffer, the data is transferred from the transmit buffer to a selected user buffer. If the transmit buffer contains more than 255 characters, only the first 255 characters will be saved; the balance will be lost. Text may be transferred easily from one buffer to the next and combined in several ways by transferring the user buffers to the transmit buffer and back to a user buffer. When text is saved to a user buffer, it overwrites any data that is in the buffer. User buffers may be transferred to the transmit buffer at any time while transmitting or receiving.

Data is saved to a user buffer by pressing CTRL B and responding to the prompt with the chosen buffer number (2-6); pressing any other key will terminate the request. Stored data is transferred from the user buffer to the transmit buffer by pressing the CTRL key along with the buffer number (2-6).

CTRL 7 transfers a test message from a permanent, built-in buffer to the transmit buffer. This message consists of the alphanumeric characters, a string of RYs, a QBF (Quick Brown Fox) message and another string of RYs.

Wrap Up

Program operation is user friendly; someone without any previous computer experience should have little trouble using it. I enjoyed developing this program. The task was made easier and a better final product resulted with the help of some friends: Ted Kreipe, KB4FIQ, Brad Corpening, N4IYE, Mike Brooks, N4JUR, Hap Griffin, WA4UMU, Robert Tucker, W4WT and Al Earnhardt, WS4P.

I encourage any of you interested in RTTY to consider using this program. With the close-out prices of some Atari computer models, the computer and program cartridge can be obtained for less than the price of some commercial RTTY software alone! See you on the screen!

Notes

¹S. Stuntz, "A CW Keyboard Program for Atari Computers," *QST*, Feb 1985, pp 32-33. See also, S. Stuntz, "A CW Receive Program for Atari Computers," *QST*, Nov 1985, pp 51-53; *Feedback*, *QST*, Feb 1986, p 53.

²This program is available from the author on disk for \$10, or in an EPROM mounted on a cartridge board for \$15. Please specify Atari computer type when ordering. (Cartridge board subject to supply available from source.) The ARRL and *QST* in no way warrant this offer.

³Optimized Systems Software, Inc, 1221-B Kentwood Ave, San Jose, CA 95129.

⁴The program's source code in assembly language is 16 pages long. It is available from ARRL HQ for \$7 to cover copying and handling costs. Send your check and request to the Technical Department Secretary and ask for the Atari RTTY/Lewis program listing.

⁵S. Schram, "Interrupt-driven RTTY Reader," *Ham Radio*, Sep 1984, pp 72-74.

⁶An asynchronous transmission system allows the receiver to maintain synchronization with the transmitter by transmitting some initial start bits that tell the receiver that the following bits are valid data bits.

SOVONICS AMORPHOUS SOLAR ELECTRIC PANELS

□ A new type of solar panel technology, called "amorphous" because of the atomic arrangement, is used in Sovonics solar panels. In their process, the cell-junction layers are formed by vapor deposition. By using a flexible substrate rather than glass, the manufacturer has developed a continuous roll-to-roll process. A 1-foot-wide, 1000-foot-long sheet of stainless steel is drawn through vacuum chambers where the layers of material are deposited. The result is a 35-lb roll that will produce 40 kW!

The two panels shown can withstand

damage (even gunshot holes) with little or no effect on performance. The larger, braced panel is rated at 13.8 V, 38 W; the smaller, flexible panel is rated at 5 W. Results of ARRL laboratory testing, under Connecticut sun conditions in March, are shown in Figs A and B.

Manufactured by Sovonics, a subsidiary of Energy Conversion Devices, Inc. Distributor: Radiant Distributors, 3900 Dursum, Ada, MI 49301, tel 616-874-8899. Suggested prices: R-100 38-W panel, \$237.50; flexible marine 5-W panel (shown), \$80; flexible 10-W panel, \$165; flexible 30-W panel \$300.—Bruce O. Williams, WA6IVC

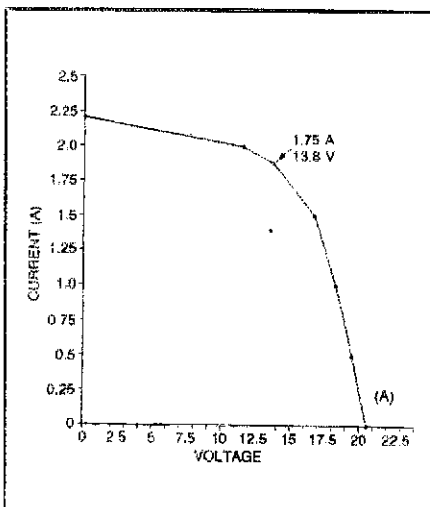
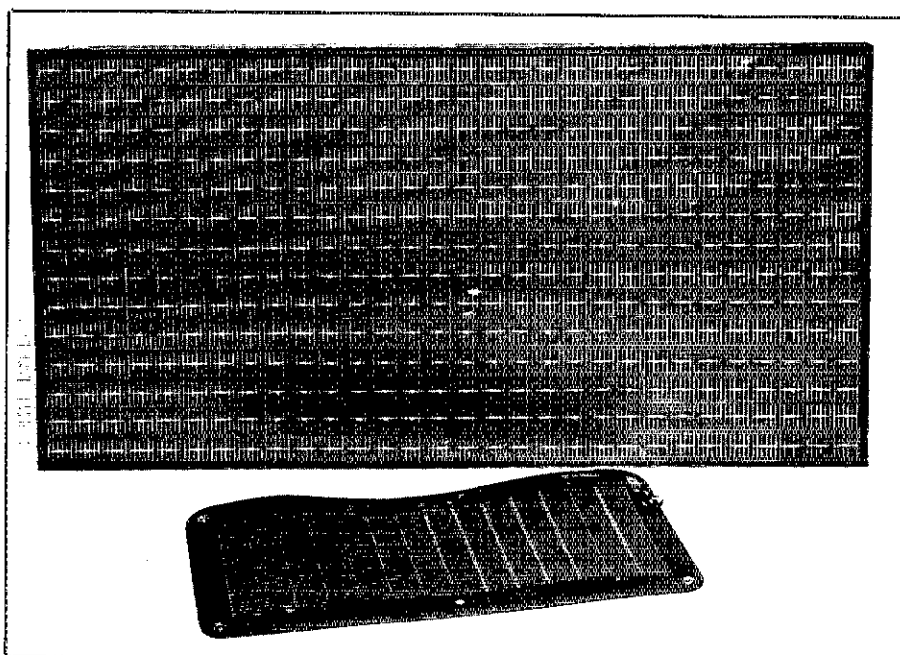


Fig A—Voltage v current, 38-W Sovonics panel.

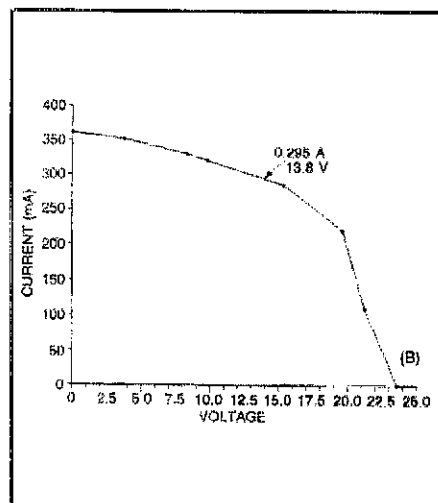


Fig B—Voltage v current, 5-W Sovonics panel.

The Public Service Boom Box

Involved with public-service functions? Here's a unique idea for a portable station.

By Phil McGan, WA2MBQ

124 Haverhill Rd
Salem, NH 03079-1206

It's early morning. The parade starts at noon. It's time to collect the necessary materials and meet the other volunteers. Our local Amateur Radio organization has been called upon—as we have been in past years—to coordinate communications throughout the parade route and assist with crowd control. The activities will be the same as last year, so everything is ready. Or is it?

Did I charge the batteries for my hand-held 2-m transceiver? Where is the ear piece? Should I bring the microphone? I haven't used it since last year's parade! Will I be able to find the mic?

These questions and more enter my mind as the minutes pass, bringing me closer to the parade's deadline. The club's plan is to use the repeater located about 30 miles away. The machine has been maintained throughout the year, but dead spots exist along the parade route where 5 W or less is not sufficient for effective communications.

Two years ago a fire was reported in the midst of the parade. Trying to move the emergency equipment along the crowded route was a chore. It would have been advantageous to have known more about what was going on in the general vicinity.

Evolution of the Box

How many times has the preceding scenario haunted those of us involved in public-service events? Being caught unprepared during a full-scale emergency with little or no time for planning is an amateur's nightmare.

A small percentage of amateurs is able to dedicate their equipment fully for use several times each year for community events. Yet, few hesitate to use any or all of the equipment available for emergency communications should the need arise.

With this purpose in mind, I set forth to design my Public Service Boom Box. There were a few rules up front: Use only my available equipment; do not make major purchases; make the box as compact and efficient as possible; and design it to fit many emergency situations.

Available Equipment

Several years ago, the local Civil Defense group acquired a number of Regency

HR-212 2-m FM transceivers. Before the 212s were distributed to group members (12-channel, crystal-controlled units), two local repeater pairs and a simplex channel (146.94 MHz) were installed in each transceiver. A hefty 12-V dc power supply was acquired with the transceivers.

While the two repeater pairs served the local area, there were several events that took me out of the coverage area. I realized that additional crystals were needed. With a limitation of 12 channels, what frequencies do I order?

A GLB 400B Frequency Synthesizer was the answer. I had purchased one at a hamfest, and it was lying idle in my closet for several years in good condition. A call to GLB netted me a manual and a new mixer crystal. Bingo! With the synthesizer interfaced to the 212 on a spare channel, I now had 144-MHz to 148-MHz coverage in 5-kHz increments.

To monitor police and fire transmissions during the event proved a bit more costly. A scanner would fit my needs, but common sense (and my pocketbook) told me I didn't need channels to cover every band.

I chose the Bearcat BC-140. Frequency coverage on the scanner spanned 29-54 MHz, 136-174 MHz and 406-512 MHz. The BC-140 was also programmable, thereby eliminating the cost of crystals. The Bearcat's bandspread allowed me to tap into most of the public-service broadcasts and four ham bands.

Packaging the Hardware

My biggest challenge was to package all of the equipment in a neat, compact container. I considered many options, but Fig 1 shows my choice of a black, vinyl-covered pressboard box previously used by a salesman as a demonstration kit. The top of the case, complete with a handle, opened upward. The front opened down and two shelves were contained within.

The scanner and power supply were installed on the upper shelf. I secured the 12-V supply to the case by stringing together two sets of three tie wraps. Two holes were drilled in front and in back of the supply. The plastic wraps were threaded up and around the supply and pulled as tight as needed.

The scanner mounted easily to the case



Fig 1—The Public Service Boom Box with open panels. The upper shelf supports a scanner and power supply, while the lower shelf houses the 212 and the synthesizer. A map of the parade route and a list of all participating members fit nicely on the front panel. (photos courtesy Priscilla, XYL of WA2MBQ)

by my attaching four Velcro® pads to each foot of the scanner and mounting the mating pads in the appropriate places on the shelf. On the lower shelf, I placed the 212 on the left-hand side using a standard mounting bracket. The synthesizer was placed to the right, again using Velcro strips.

The box's front cover would not close if the microphone was plugged in, so a mic clip was mounted along the side of the box. To close the box, the connector is slipped off and the mic is stored on top of the radio.

Delivering power to the equipment was another consideration. I installed a one-gang, duplex 117-V ac plug on the shelf behind the power supply and used a standard connector through the back of the box. The 12-V line from the supply runs to a DPDT toggle switch mounted in the center of a blank cover on a second electrical box. At the other end of the electrical cord, outside the box, I mounted a heavy-duty standard electrical plug with a ground.

A second wire was placed through a Romex connector in the back of the box to supply 12 V from my vehicle. I used a male twist-lock Hubbell connector to differentiate this connection from the 117-V ac cord. A toggle switch selects 12 V either from the on-board supply or from an external source.

A 35-ft cable with a matching female twist lock was connected to my vehicle's battery. This allows the box to be used either as a mobile unit, operating from within the vehicle, or as a portable station, operating a distance away from the vehicle. I also built a second dc cord with a twist lock on one end and heavy-duty battery clips on the other for use in other vehicles.

RG-8 coaxial cable runs from both the scanner and the 212 to SO-239 connectors mounted on both sides of the box's top handle. Any number of standard shack or mobile antennas can connect to the box, including simple wire whips (see Fig 2).

Final additions to the box were administrative. A clipboard with pen and paper, a pocket-size *ARRL Repeater Directory* and a listing of public-service frequencies

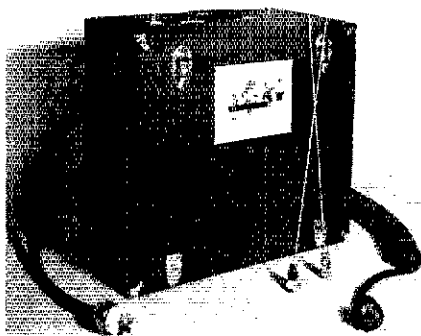


Fig 2—The Public Service Boom Box is sealed and ready to be carried to the next public function. The box can accommodate two whip antennas. One antenna connects to the scanner, while the other attaches to the 2-m rig. A short piece of RG-8 coaxial cable runs from each radio to the SO-239 connectors.

(police, fire, etc) were included for easy access to a portable directory system.

Conclusion

Shack space is allocated for storage of the Boom Box. It occupies a little more room than the separate equipment did before they were assembled in the box. But now, with a quick disconnect of two antennas and the power cord, I can respond instantly to a call for emergency communications.

There are several methods of building a Public Service Boom Box other than the one described. The important thing to remember is that the equipment is now packaged neatly and efficiently, ready for use at a moment's notice should an emergency situation arise.

Phil McGan was first licensed in 1966 as WN2MBQ. He was active on RTTY in the Navy/Marine Corps MARS system for many years. Later, he returned to western New York to work as a reporter and photographer with the Evening Observer. Currently employed by Wang Laboratories in Lowell, Massachusetts, Phil is a technical documentation manager. As an Extra Class licensee, WA2MBQ is an avid CW and DX operator. He currently serves as a Volunteer Examiner, as the Public Information Officer for the NH Section of the ARRL Field Organization and as president of the Greater Lawrence Amateur Radio Fellowship.

New Products

DICK SMITH ELECTRONICS VHF/UHF PREAMPLIFIERS

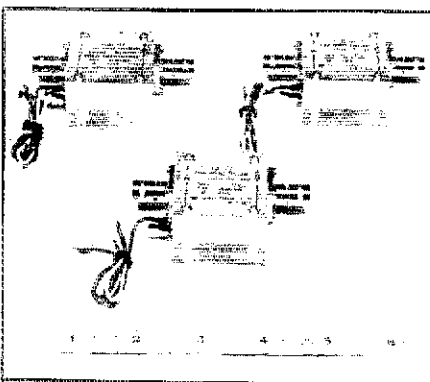
□ A series of three VHF/UHF GaAsFet preamplifiers is offered by Dick Smith Electronics. Made in Japan by Corona Dengyo Co, Ltd, these preamplifiers feature 20-dB gain, min, and a noise figure of 0.8 dB or less. They are supplied with BNC connectors. VSWR is less than 1.5:1. Dimensions are 0.75 × 1.5 × 2.2 inches and weight is only 3.2 oz.

Results of ARRL Lab tests

Catalog No.	Model No.	Freq (MHz)	Gain (dB)	Noise Figure (dB)
D-2956	GS-144	144	21.65	0.48
		145	22.34	0.44
		146	22.81	0.43
		147	23.01	0.42
		148	22.96	0.41
D-2954	GS-220	220	21.48	0.58
		221	21.94	0.55
		222	22.38	0.52
		223	22.76	0.49
		224	23.06	0.49
D-2955	GS-440	225	23.31	0.47
		440	23.17	0.81
		442	23.20	0.77
		444	24.77	0.72
		446	23.33	0.69
		448	23.42	0.64
		450	23.45	0.62

Price class: \$59.95 for any model. Availa-

ble from Dick Smith Electronics, Inc, PO Box 8021, Redwood City, CA 94063, tel 415-368-8844.—Bruce O. Williams, WA6IVC



HIGH-SPEED MINI DRILL KIT

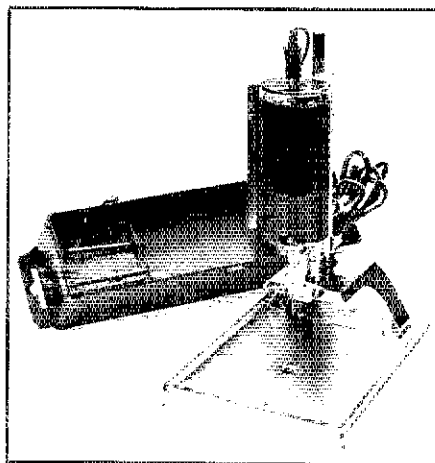
□ Designed for the hobbyist, technician or homebrewer, this mini drill kit provides very high speed—up to 30,000 RPM (depending on input dc voltage)—and high torque. It can be used for drilling, polishing, grinding, deburring, routing, carving and sanding, and it is really great for drilling PC boards. Operates with a 12 to 35 V dc external supply (not furnished).

The kit (cat no. T-4751) comes complete with four high-speed steel twist drills, three

collets (0.4-1.5 mm, 1.7-2.9 mm and 2.8-3.4 mm), grinding wheel (tiny), "spanner and tommy bar" (Australians for "wrench" and a "small rod" used to hold the shaft), dc power cable and plastic case.

The drill stand (cat no. T-4752) for the mini drill kit provides a firm mount for the drill motor. It controls vertical movement of the drill, and can be mounted on a wooden base or atop a variable (12-35 V dc) power supply.

List prices: Drill kit (T-4751), \$14.95; drill stand (T-4752), \$9.95. Available from Dick Smith Electronics, Inc, PO Box 8021, Redwood City, CA 94063, tel 415-368-8844.—Bruce O. Williams, WA6IVC



A Line-Side Regulator for High-Voltage Power Supplies

Build this low-cost regulator using proportional control.

By Greg McIntire, AA5C
Rte 1, Box 136E
Princeton, TX 75077

Some projects never seem to end; they generate projects within themselves. My homemade 4CX1000A amplifier falls into that category. Six years have passed and, although the amplifier works well, it is constantly being modified. One of my other projects was a high-voltage power supply, designed for the amplifier. It produced the intended 3 kV at 1 A. Under idling conditions, however, the supply's output voltage soared to 4 kV. Since the amplifier's tube specification is 3 kV maximum, something had to be done to avoid damaging the tube.

Conventional means of regulating a high-voltage power supply usually involve a choke-input filter on the output side of the supply. For a filter to regulate properly, a minimum current must flow through the filter. The bleeder resistor and the static bias on the tube supply this minimum current. I prefer to apply operating bias to the tube only when the amplifier is keyed. This saves several hundred watts of power dissipation during receive periods, but only aggravates the choke-regulation problem. A swinging choke helps, but a minimum current must still flow through the filter to maintain regulation. A 15-H choke was tried once. After I recovered from the sound of the shotgun blast, the pieces of the high-voltage bridge diodes were swept off the floor and I embarked on a search for a different approach.

Recently, much progress has been made in high-efficiency switching power supply technology. One approach converts input to dc and then switches it with power FETs. A fair amount of circuitry is required to do this and specially designed transformers are typically required. A different approach, known as *proportional control*, uses a triac to switch the input ac. The triac is turned on only when the output voltage falls below a predetermined level. Under full load, the triac is turned on all of the time. This technique is applied in my circuit.

A Detailed Circuit Description

The circuit shown in Fig 1 is a high-voltage regulator. The comparator, U1, compares a reference voltage to the output voltage and alerts a triac in the primary side

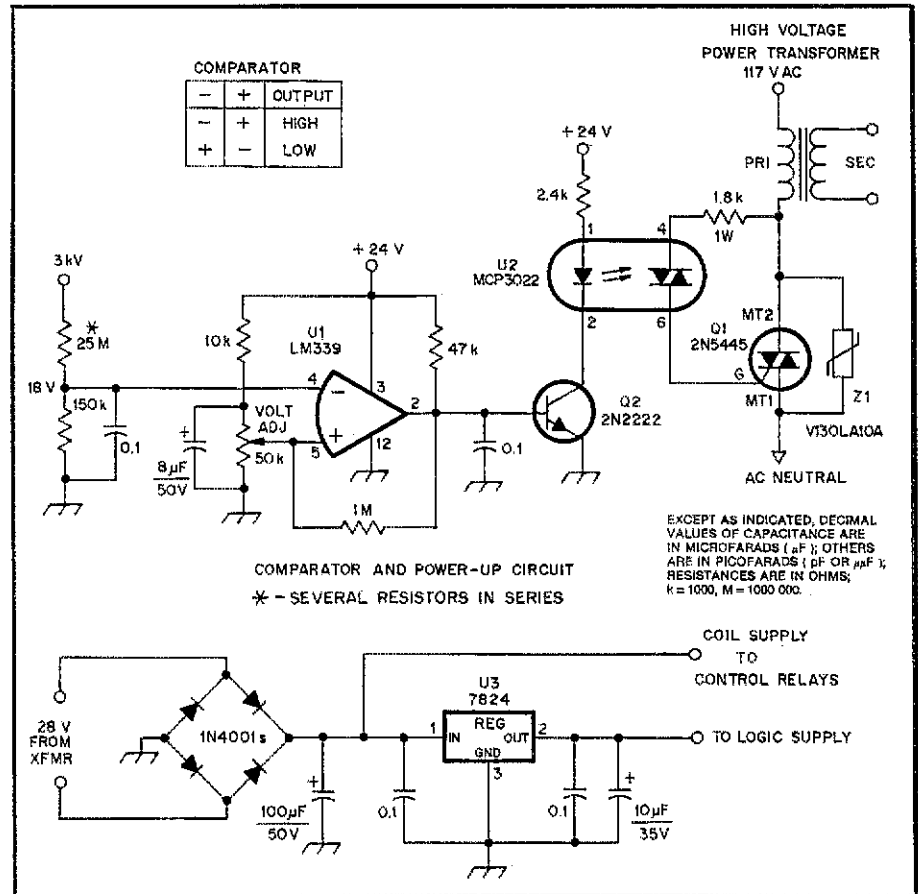


Fig 1—The schematic diagram for the line-side regulator.

Q1—Triac, 2N5445.
Q2—NPN transistor, 2N2222.
U1—Comparator, LM339.
U2—Optoisolator; General Instruments

MCP3022 or GE H11J1-H11J5.
U3—Voltage regulator, 7824.
Z1—Metal-oxide varistor, GE V130LA10A or Panasonic P7074.

of the high-voltage transformer to either turn on or remain inactive, depending on the relationship of the voltages. An LM339 is used in the circuit, but only one section is required and most of the high-speed, sensitive comparators work fine in this application.

The output voltage is divided to keep it within the comparator input-voltage limits. It is desirable to maintain the divided output voltage as high a percentage of the full output voltage as possible. The choice here was 18 V; a higher voltage increases the regulation of the circuit. Originally 5 V was applied, but more swing in the

output was required to trigger the triac.

A 5-V reference from a 3-kV output results in a 600:1 ratio. The LM339 requires only a 3-mV difference on the inputs to change state. This means that a 1.8-V shift in the output results in the triggering of the triac. An 18-V reference changes the ratio to 167:1 so only 0.5 V is required to initiate a trigger. This case applies for a circuit without hysteresis. A 1-megohm feedback resistor was added to my circuit to provide positive feedback and add hysteresis to prevent unwanted oscillations. Hysteresis forces the comparator to switch to the opposite state during transition and pre-

vents the circuit from oscillating for slowly varying waveforms, like the 60-Hz power line. Oscillations were a problem before the hysteresis resistor was added.

In this circuit, the comparator's two inputs are of equal potential. If U1 is operating properly, then this is the most likely region for a high-gain device like a comparator to oscillate. The 1-megohm resistor provides 0.27 V of hysteresis and swamps the comparator trip voltage of 3 mV. The formula used to calculate the swing in voltage necessary to trigger the comparator is shown in Fig 2. The circuit implemented is not exactly in this form, but an equivalent R1 of 11 kΩ can be calculated.

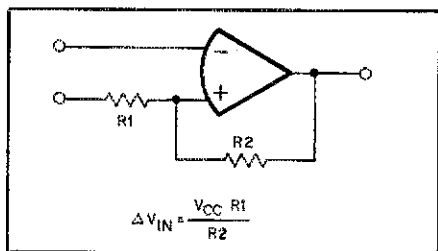


Fig 2—This formula calculates the voltage swing necessary to trigger the comparator.

A voltage divider across the 24-V logic supply generates the reference voltage. The logic supply is produced by following a 28-V transformer I had in the amplifier relay control with a full-wave bridge. The supply is sourced by a three-terminal regulator, U3. Suitable bypassing and input filtering make it unnecessary to Zener or otherwise further regulate the reference voltage. A potentiometer permits adjustment of the final dc output voltage.

The reference voltage is intentionally fed into the noninverting input of the comparator. This scheme permits a gradual powering of the supply by the simple addition of a capacitor across the potentiometer used to provide the reference voltage. Using this configuration, the output voltage rise rate is paced by the rate of the voltage rise across the 8-μF capacitor. A time constant of 0.4 seconds was chosen for this circuit and is slow enough to reduce the current through the diodes when the supply is turned on. This design approach allowed me to eliminate one big power relay, a sequencing relay and a 100-W power resistor from the original power supply.

The output of the comparator turns on Q2. Current flowing through Q2 forward biases the LED in the optotriac driver. (An optotriac device isolates the high voltage and drives the gate of the primary triac.) Different gate current levels are required to trigger a triac in different quadrants. The

operating quadrant is determined by the relationship of the gate voltage to the voltage of main terminal 2 (MT2) as shown in Fig 3. The gate current for quadrants two and three is typically the lowest, with quadrant four requiring the highest drive level. The triggering levels for several high-current triacs, in the 25- to 40-A range, are listed in Table 1. A dc source was required to interface with conventional optoisolators. This required triggering the triac in quadrants one and four. Triggering in quadrant four required 400 mA for one device, while triggering in quadrants two and three required 70 mA. The 1.8-kΩ resistor was selected to limit the optotriac current to 87 mA. The maximum current rating of the optotriac used is 100 mA.

The triac is connected in series with the primary of the power transformer. MT2 is connected to the cold side of the winding, while MT1 is connected to the neutral side of the ac line. A metal-oxide varistor (MOV) transient suppressor is connected in parallel across the triac's MT1 and MT2 terminals (Fig 4) to prevent spikes from damaging the device when the transformer is switched. A typical triac can handle short-term currents of 10 times the continuous rating. These currents can easily be experienced when switching inductive loads.

A common concern with triac or SCR switching is RFI. My initial approach was to use a zero-crossing triggering device. This type of circuit turns on the triac only

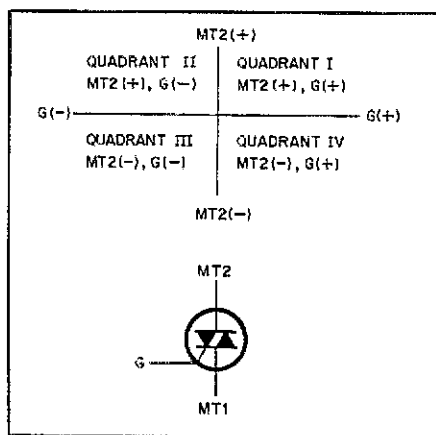


Fig 3—The operating quadrant is determined by the relationship of the gate voltage to the voltage at MT2.

Table 1
Triac Gate Triggering Requirements

(Maximum Characteristic with Respect to MT1 in mA)

Triac	Rating (A)	MT2(+), G(+)	MT2(+), G(-)	MT2(-), G(-)	MT2(-), G(+)
2N5445	40	70	70	70	100
SC128	25	70	70	70	400
2N6164	30	60	70	70	100

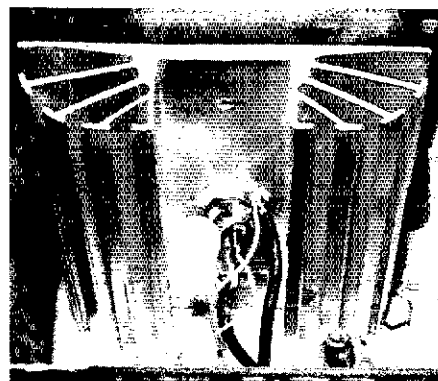


Fig 4—The heat sink, triac and MOV. No. 18 wire was used to connect the transformer primary to the triac; no. 20 wire connects to the triac's gate lead. The MOV is attached in parallel across the triac's MT1 and MT2 terminals to prevent spikes from damaging the triac when the transformer is switched.

at the zero crossing of the 60-Hz input power. Thus, no high currents that may generate RFI are switched. Tests showed that the delay between detecting the need to trigger the triac and the actual triggering was too great (up to 8 ms) most of the time. This caused the power supply to throb at the line rate and caused the lights to flicker. The current surges were only to recharge the filter capacitor; the bleeder resistor was the only load. The triac was switched on all the time the amplifier was under full load; this is not a concern under those conditions. A test with the nonzero crossing optotriac was then made. The device triggers the triac on demand and does not wait for the zero crossing of the line voltage. RFI was expected, but not found. The throbbing was gone. With this method of enabling the triac, the triggering was synchronized to the line. Further investigation of this effect is warranted.

Construction

The control portion of the circuit is constructed on a perforated board with a 0.1-inch spacing. The high-voltage divider is located close to the high-voltage bridge to minimize routing of the high voltage. Be sure to use a high-voltage type resistor for the divider resistor connected to the high voltage. A 22/44-contact edge connector is used to interface to the circuit. This permits rapid removal of the circuit for changes

during design and checkout. The triac is mounted on a 4- × 6-inch heat sink. Q1 requires isolating hardware because the case is used as the MT1 terminal. Other devices, such as Motorola's MAC50A-6 and T6420D, have an insulated case that makes mounting simpler. Only two low-current ac line wires are needed on the circuit board. The high current switching is performed completely at the triac.

Optotriacs became readily available during the course of the regulator's design. Parts are available from many sources. The optotriacs, SC129 triacs and LM339 are available from Digi-Key.¹ Motorola and General Instruments are two other optotriac manufacturers.^{2,3} My completed circuit is shown in Fig 5.

Results and Conclusions

The regulator maintains the output to within 50 V of the 3 kV over the load range of 30 mA to 1 A. Optimization of the hysteresis resistor could probably improve this, but there is not much reason for that in this application. The voltage variation is "in the noise" for a high-power amplifier.

My power transformer only has 117-V primary leads. A 234-V input transformer would permit a triac with half the current rating to be used. These devices are less expensive. Triacs rated from 2 to 40 A are readily available from a number of mail-order firms.

The circuit is universal and can be adapted to a variety of different supply applications. The technique should be applicable to a high current 13.8-V dc supply, for instance. The hysteresis would have to be reduced over that used for the high-voltage power supply application as regulation will be more critical. Overall, if you are interested in good power supply regulation with a reduced parts count, try this circuit.

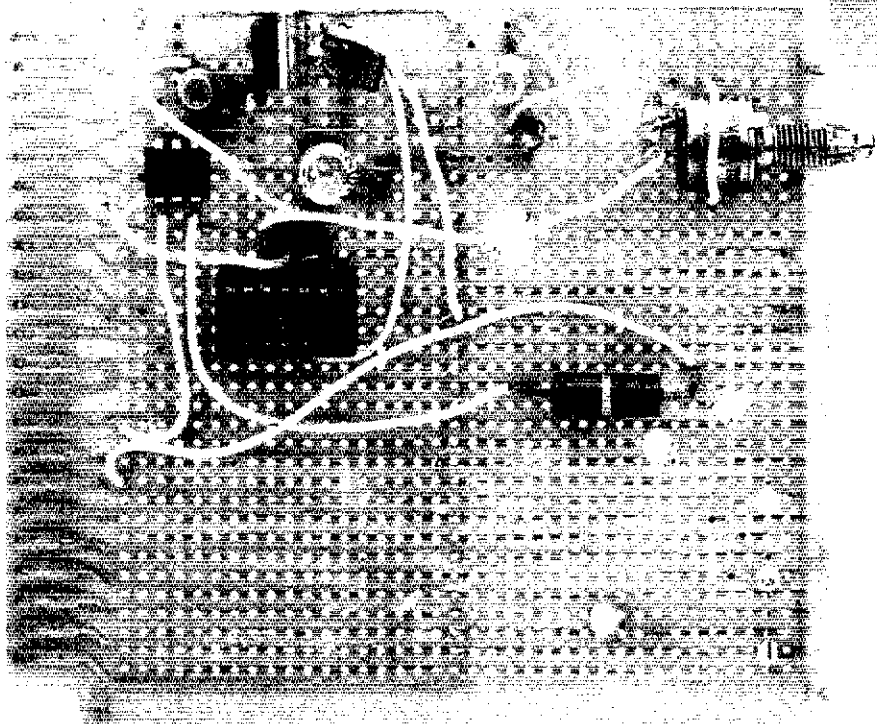



Fig 5—The author's line-side regulator. The potentiometer shown at the top left of the photograph functions as the voltage adjust. The 8-pin DIP is the optoisolator triac driver. The 14-pin DIP is the comparator. Visible to the left of the PC board is the 24-V regulator.

Notes

- ¹Digi-Key, 701 Brooks Ave S, Box 677, Thief River Falls, MN 56701, tel 1-800-344-4538.
- ²Motorola Thyristor Device Data Book, 1985, Motorola Semiconductor Products, Inc, PO Box 20912, Phoenix, AZ 85036.
- ³National Linear Applications Book, 1982, National Semiconductor Ltd, 331 Cornella St, Plattsburgh, NY 12901.

Greg McIntire was first licensed as WB5WRK in

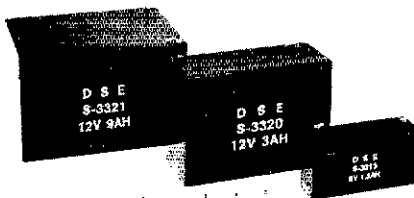
1976 and upgraded to Extra in 1978, receiving the call AA5C. Greg received a BSEE from Iowa State University in 1973 and an MSEE at the University of Texas at Austin in 1976. He is a registered professional engineer in the state of Texas and has worked as a digital designer. Greg is now employed by a major electronics company as a systems engineer. AA5C prefers 160/80/40-m DXing on CW and has worked RTTY. He is currently operating on 6 meters and is accompanied on the bands by his wife, Kay, WD5DYS. Greg holds DXCC, WAZ, WAC and WAS on 160 CW. 


New Products

DICK SMITH ELECTRONICS GEL CELLS

[] A family of "no-leak," rechargeable gel cells is offered by Dick Smith Electronics. Three sizes, ranging from 12 V at 9 Ah to 6 V at 1.2 Ah, are shown above. A fourth size, Model S-3315 (not shown), is rated at 12 V, 1.2 Ah. Specifications for these cells are shown below.

Model	Size (HWD)	Voltage	Capacity	Price
S-3313	2 × 3¼ × 1 in	6.0	1.2 Ah	\$6.95
S-3315	2¼ × 4 × 1½ in	12.0	1.2 Ah	\$7.95
S-3320	3¾ × 5½ × 1½ in	12.0	3.0 Ah	\$13.95
S-3321	3¾ × 6 × 4¼ in	12.0	9.0 Ah	\$34.95



Available from Dick Smith Electronics, Inc, PO Box 8021, Redwood City, CA 94063, tel 415-368-8844. Send \$1 for the DSE catalog. The DSE catalog is unique in that there are 15 pages filled with hard-to-get information on pin connections for ICs, Zener-diode data, circuit ideas, transistor interchangeability data, and much more. —Bruce O. Williams, WA6IVC 

Strays



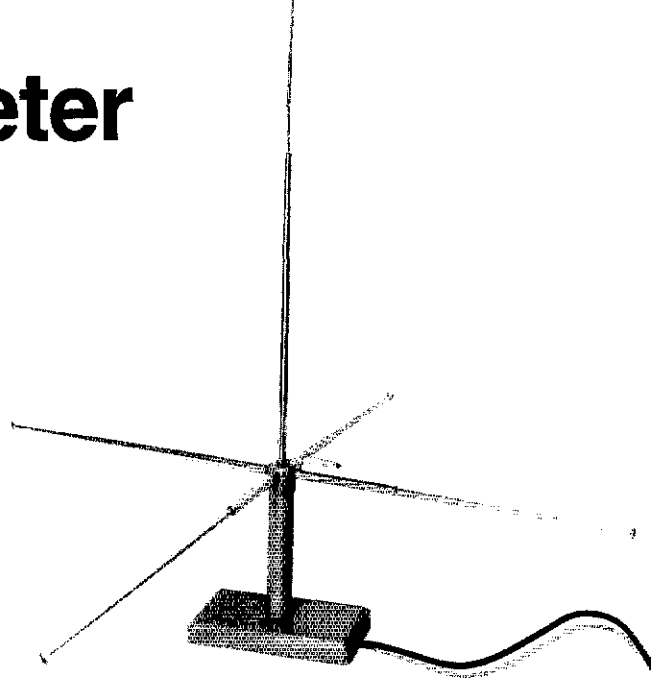
I would like to get in touch with...

- anyone with information on Calrad 65-287 power-SWR meters. Dick Ber, WB5BBU, 9617 Vista View Dr, Austin, TX 78750.
- anyone with a manual/schematic for an EICO resistance-capacitance comparator bridge, Model 950A. Nicholas Libertino, W7PBO, 1765 State St, Hamden, CT 06511.
- anyone with a manual/schematic for a Leader scope, Model 505. Walt Jackson, KB3LH, 281 Irish Rd, Berwyn, PA 19312.
- anyone with a manual for a Jackson Electrical Instrument Co RF signal generator, Model 106. Roger Loken, W7HPQ, 5224 45th SW, Seattle, WA 98116.
- hams operating in covenantal-restricted retirement centers. J. Maurice Thompson, W9KRV, 4936 W-539 N, Huntington, IN 46750.

A Traveler's 2-Meter GP Antenna

Try this low-cost, knock-down portable ground-plane antenna for 2 meters. It is compact, and offers better performance than a "rubber duckie" can provide.

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



I'm sure you've been as frustrated as I have during trips away from home with a 2-meter hand-held transceiver, but without an antenna that would permit access to those elusive, slightly distant repeaters. A frequent cause of repeater inaccessibility is inefficient antenna performance, such as we may expect from the rubber duckie that has become a standard fixture for hand-helds. Unfortunately, the ground system for such a radiator is only the electronics inside the transceiver case. Also, the rubber duckie is a physically short $\frac{1}{4}$ -wavelength antenna that is helically wound. Although this short antenna is entirely practical and desirable for most hand-held use, it has serious drawbacks. This is especially true when the operator (using the short antenna and low power—generally 1 to 5 watts) is located too far from a repeater.

What might we do to improve the range of our hand-held transceivers? The first thought that comes to mind may suggest the use of a portable 3- or 5-element Yagi antenna with a mast. This would be great, provided we were camping or visiting at a friend's residence. But what about motels, hotels and other restrictive environments? A Yagi antenna would be rather impractical, and it would be cumbersome to carry with us.

Some Solutions

A number of alternatives to the rubber duckie exist. For example, we might construct a simple half-wavelength dipole antenna and suspend it vertically at the portable site (motel room, for example). Another approach would be to use a J-pole antenna, such as the fine portable unit described in *QST* by Aurick.¹ For those

who would like to build a portable Yagi for hand-held use, there are the units described some years ago by Campbell of the ARRL staff.² But, what about a ground-plane type of antenna... something that can be dismantled after use and packed into a small container? Such an antenna can be built with a base unit to permit the system to be placed on a dresser or table, near a window, in a hotel or motel room (remember that many buildings have steel frameworks, and there is disruptive plumbing and electrical wiring in the walls). This article describes a practical, compact 2-meter ground-plane antenna. It may be used also on 220 and 432 MHz with minor modifications.

Ground Plane Details

Fig 1 is a pictorial view of the antenna I developed for my use with a 2-meter hand-held. The drawing shows the assembled unit. A wooden base is used to support the upper part of the antenna. A 6-inch section of $\frac{7}{8}$ -inch-OD PVC pipe ($\frac{3}{4}$ -inch ID) serves as the vertical support column for the radials and radiator. A $\frac{7}{8}$ -inch-ID copper plumbing cap fits over the PVC tubing to serve as a mounting fixture for the antenna elements. An impedance-matching loop connects between one radial and the bottom of the radiator element (more on this later). A short length of 50-ohm coaxial cable exits from the base of the antenna for connection to the hand-held.

The antenna elements unscrew from the copper cap, the impedance-matching loop is taken off, and the PVC column pulls out of the wooden base. This permits the user to pack the antenna into a small bag or box for storage until it is used another time. The antenna elements are made from tele-

scoping rods that are available as replacement parts for portable radios and TV sets. My rods are $4\frac{1}{4}$ inches long when collapsed. They extend to 20 inches. Longer rods are also available as surplus.

Construction Data

Ordinary tools may be used for making this antenna. A break-down view of the supporting structure is shown in Fig 2. Perhaps the most difficult part of the job is drilling the side holes in the copper cap (item A of Fig 2). The no. 4 holes (four each) should be 90 degrees apart for best appearance, but it's not a critical spacing for good performance. Lay out the hole positions by marking the spots with a laundry pen. Center punch the cap where each hole will be drilled. This will make it easier to drill into the curved surface of the cap. The top-center hole will be easy to drill. It should be larger than the four radial-element holes to accommodate a no. 4 insulating washer with a shoulder. The radiator element must be insulated from the cap, but the four radial elements are common to the cap. A flat fiber washer is needed over the top hole inside the cap to mate with the shoulder washer that is installed from the top of the cap.

If you can't locate a shoulder and flat insulating-washer set, you may drill a $\frac{1}{2}$ -inch hole in the top of the cap, then glue a piece of unclad PC board or plastic inside the cap to cover the $\frac{1}{2}$ -inch hole. This alternative insulator may then be drilled for a no. 4 screw.

The antenna rods I purchased from Mouser Electronics are threaded at the base ends for a no. 3 metric screw. I did not have the proper screws for the rods, so I rethreaded the rods with a no. 4-40 tap.

¹Notes appear on page 29.

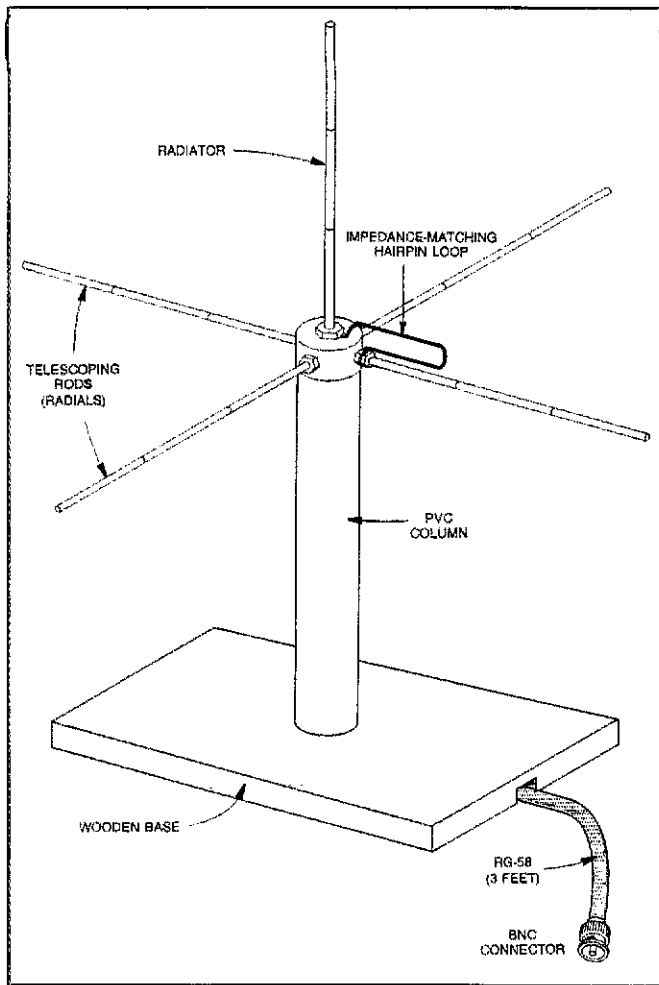


Fig 1—Pictorial drawing of the assembled portable 2-meter ground-plane antenna. The elements may be collapsed and removed from the vertical support member for storage. The impedance-matching loop at the top may also be removed easily, and the vertical column can be pulled from the wooden base. These features permit packing the antenna in a small container when carrying it afield.

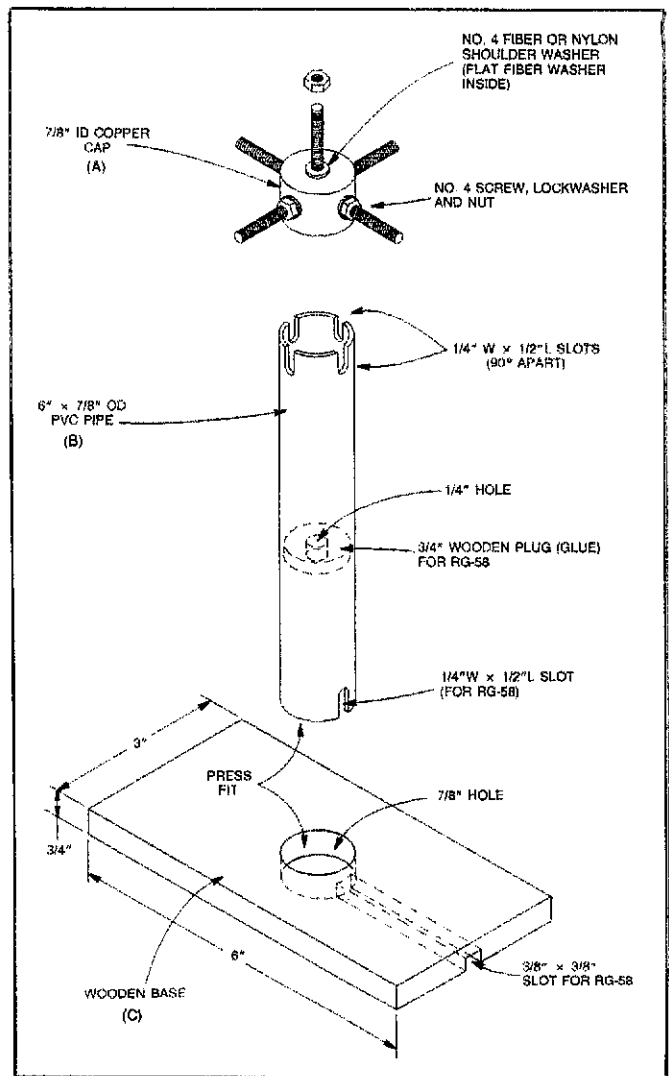


Fig 2—Break-down view of the ground-plane antenna. Ordinary materials are used to construct this unit. All of the components are easy to obtain.

This enabled me to use five 4-40 screws, 5/8 inch long, for attaching the five antenna rods. A solder lug is used inside the cap, for the radiator, and one solder lug is attached inside the cap by means of one of the radial-element screws. The solder lugs provide connection points within the cap for the RG-58 coaxial cable: The shield braid is common to the radials and the center conductor is attached to the bottom of the vertical-radiator element.

You will notice that the PVC column (part B of Fig 2) has four slots at the top end. These are necessary because the cap will not fit over the end of the PVC column without them, owing to the presence of the four radial-element screw heads. Therefore, the slots should also be 90 degrees apart, or at least aligned with the four side screws on the cap. I cut the four slots with a router and small bit. A hack saw may be used for slotting the column. The pieces to be removed from the slots can be snapped off.

A round file will be useful in rounding off the bottoms of the slots.

I glued a wooden plug inside the PVC column about midway through the pipe (dashed lines in Fig 2). This plug has a 1/4-inch center hole through which the RG-58 cable is passed. The plug functions as a strain-relief device to minimize twisting of the cable within the cap section. A fifth slot is located at the bottom of the PVC column. It allows the RG-58 to lie in the rectangular slot in the wooden base (part C of Fig 2) of the antenna. Without the PVC column, and that in the base C, the cable would prevent the base from resting flat on the table.

I cut the slot on the underside of the wooden base by means of my router. This job can be accomplished also by using a wood gouge or chisel. The sides of the slot can be cut with a hacksaw blade to ease the chore. The center hole in the base should be small enough to allow a snug fit between

the PVC column and the base.

Part of this effort can be deleted if you wish to install a BNC female jack on the side of the PVC column. A model I developed in 1984 was structured in that manner. This would eliminate having the cable pass through the wooden base and along the rectangular slot. A connecting cable could then be used between the antenna and the hand-held, thereby eliminating the permanently attached RG-58 line.

The wooden base does not have sufficient weight to keep the assembled antenna upright when there is stress on the coaxial cable. My base has three 5/16- x 2 1/4-inch holes drilled laterally through the nongrooved end of the base. Two similar channel holes are located on the grooved end of the base plate. The five holes are filled with lead to increase the weight of the antenna base. I used a propane torch to melt some large fishing

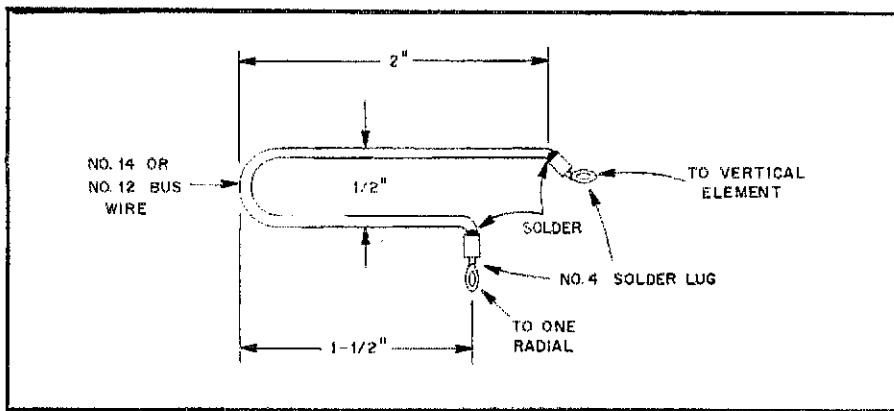


Fig 3—Details of the matching device for the antenna. This impedance-matching loop transforms the 30-ohm feed impedance to 50 ohms for use with RG-58 cable. The loop connects between the radials and the bottom of the vertical radiator.

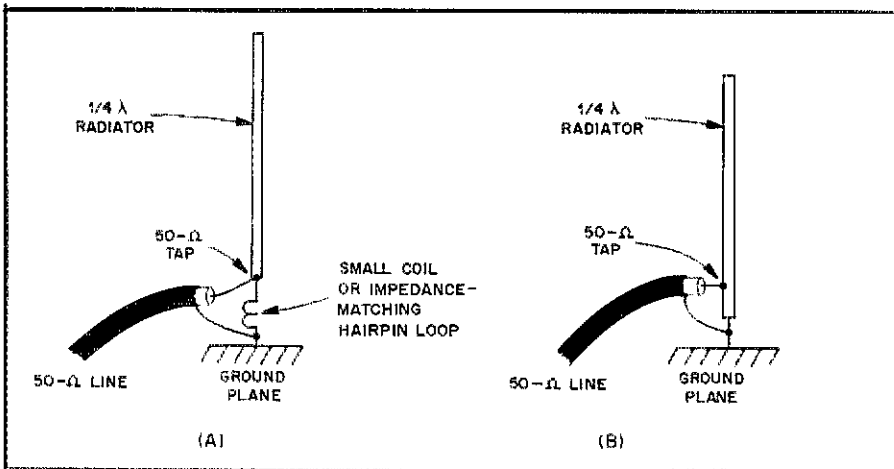


Fig 4—Representation of how the impedance-matching loop provides a 50-ohm tap point on the antenna (A). The equivalent circuit at B illustrates the tap point on a quarter-wavelength radiator (see text).

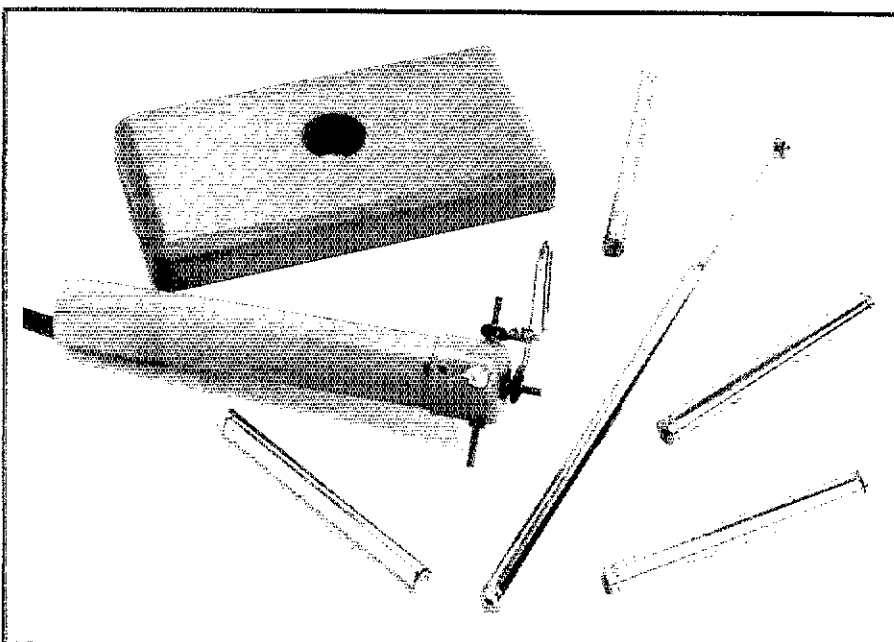


Fig 5—Photographic view of the disassembled antenna. The parts may be stored in a small box or bag for convenient transportation.

sinkers in a small tin can. The can was bent at one point to form a pouring lip. The lead was poured into the antenna-base holes. This corrected the "tipsy" problem. Alternatively, you may choose to hold the antenna base in place on a table or desk with a C clamp.

Electrical Considerations

Be cautious about the method for connecting the RG-58 cable inside the copper cap. The shield braid must not come in contact with the center conductor of the line. I keep the exposed part of the braid short, while making the center-conductor piece (with its insulation) about 1/2 inch long. The solder lug for the radials points downward, and the braid is soldered to the lower end of the lug. Just before the cap is installed on the PVC column I squeeze a generous amount of Dow Corning silicone cement or GE Silastic® compound into the cap. This helps to prevent the shield braid from shorting to the cable center conductor during stress. It also affixes the cap to the PVC column. Allow at least 24 hours for the sealant to set before using the antenna.

Impedance-Matching Loop

The feed impedance of a quarter-wavelength ground-plane antenna is on the order of 30 ohms. For the purpose of matching the antenna to a 50-ohm line, it is necessary to employ some type of matching device. The U-shaped hairpin loop seen in Fig 3 elevates the impedance from 30 to 50 ohms for matching the system to the RG-58 line. One end of the loop is attached outside the cap, under one radial. The remaining end of the loop is connected outside the cap, to the bottom of the vertical radiator. A solder lug is used at each end of the loop for convenience of attachment. In effect, the loop provides the electrical equivalent of a feed line being tapped up on the low-impedance end of the vertical element. Therefore, the vertical element is common to the radials when using the loop. Fig 4 shows the relationship between the two methods described.

Smaller loops or short straps may be made for use on 220 and 432 MHz. I have not worked out the dimensions, but with the aid of an SWR indicator it should be an easy matter to develop the dimensions experimentally. Fortunately, the antenna rods I purchased collapse sufficiently for use on the two higher amateur bands. You may want to keep this in mind when you obtain your rods. If you are a 6-meter enthusiast, there is no reason why this design cannot be used for that band by providing longer rods and a larger loop. I suggest that a heavy metal base be used for 6-meter antennas. This will keep the antenna from tipping over when the longer elements are extended.

Adjustment and Use

I extend the radials of my antenna to

20 inches. Next, I use an SWR bridge to set the length of the vertical radiator for an SWR of 1. A small metal file may be used to nick the radiator rod so that you can set it for the correct length later on. I found that I had to lengthen my vertical element by approximately 2 inches to provide an adequate range of adjustment. This I did by force-fitting and crimping the tip of another rod to the existing vertical radiator.

How does this antenna compare to a rubber duckie? Well, my report is based on relative comparisons, owing to the unknown character of the S-meter calibration of my hand-held. While using the transceiver inside my radio room at Luther, I brought up the 146.79-MHz repeater at Manistee, Michigan (K8CEB), which is some 30 airline miles from this QTH. The repeater signal registered 1/3 scale when using the rubber duckie. I then placed the ground-plane antenna in the same spot and attached it to the hand-held. The repeater signal registered full scale, and it was full quieting. A check of the WD8RZL repeater, about 15 airline miles away, showed less-dramatic results. With the rubber duckie it registered 3/4 scale on the S meter, and went to full scale when using the ground-plane antenna. Although I didn't measure the difference in performance in decibels, in any event, the ground-plane antenna is superior to the rubber duckie in overall performance. It is well worth the effort it took to construct it.

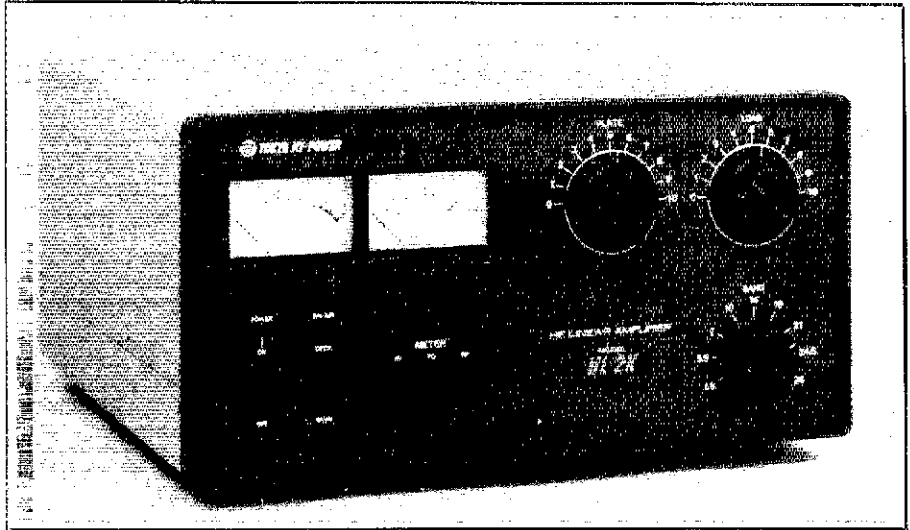
In Conclusion

It may seem like this was a lot of ado about a simple, established antenna concept. However, from the viewpoint of portability (Fig 5) and improved operation afield, the story is worth telling. I am sure that many of you can think of better ways to fabricate an antenna of this kind. I chose the design shown here because all of the materials are available locally at hardware and lumber stores. The antenna rods are offered by many surplus mail-order dealers. A variety of mounting styles are available, such as rods that have flat ends with a screw hole. Others have a small threaded stud on one end. This opens the door to a host of construction techniques for this antenna. However your end product looks, I'm sure you will be glad you constructed a portable GP antenna!

Notes

- 1 L. Aurick, "The Timeless J Antenna," *QST*, Nov 1982, pp 40-41.
- 2 E. L. Campbell, "Two Toter," *QST*, Jul 1971, pp 23-25, and "Portable Beam for Two Meters," *QST*, Oct 1974, pp 36-37.

New Products



TOKYO HY-POWER LABS HL-2K/A HF AMPLIFIER

□ Similar to its baby brother, the HL-1K/A, the HL-2K/A is compact, so it can be incorporated into any ham shack. The unit uses rugged 3-500Z transmitting tubes, and incorporates a built-in, full-wave-bridge high voltage power supply. Two large panel meters are provided. Plate current (I_p) is monitored on the left-hand meter, and the right-hand meter permits measuring of plate voltage (E_p), grid current (I_G) or output power.

For more information, contact ENCOMM, Inc, 1506 Capital, Plano, TX 75074, tel 214-423-0024. Suggested list price: \$1695. —Bruce O. Williams, WA6IVC

LARSEN ELECTRONICS AD-2/70 DUAL-BAND ANTENNA COUPLER

□ Larsen Electronics, Inc has introduced its new AD-2/70 Dual-Band Antenna Coupler that allows simultaneous operation in both 2-m and 70-cm amateur bands with a common dual-band antenna. The AD-2/70



allows use of separate VHF and UHF radios, or separate VHF and UHF antennas to be used with a single port, dual-band radio. Although designed for use in the amateur bands, the unit can be used for commercial VHF and UHF applications, as well.

Cross-band isolation is -50 dB or more, permitting interference-free transmission or reception. Maximum power rating is 200 W PEP composite VHF/UHF power.

For more information, contact Larsen Electronics, Inc, PO Box 1799, Vancouver, WA 98668, tel 206-573-2722. Price class: \$80. —Bruce O. Williams, WA6IVC

Strays



H-E-L-P!

□ Has anyone successfully modified Keith Sueker's WEFAX program ("Real-Time HF WEFAX Pictures on a Dot-Matrix Printer," *QST*, Mar 1986, pp 15-20) to run on an Epson or other printer in conjunction with the Apple computer? If you have, others would appreciate knowing about it. Please send the information to Paul K. Pagel, Senior Assistant Technical Editor, 225 Main St, Newington, CT 06111

I would like to get in touch with...

□ anyone with information on Clipperton-L linears for addition of 10 meters. Mike Thomas, N4SU, 5717 Puerto Vallarta, N Richland Hills, TX 76118.

□ anyone with chassis parts for a US Navy TCS 9-12 HF transmitter and receiver. Byron Bommarito, KB6ETA, 5762 E Ashlan Ave, Fresno, CA 93727.

A Few Thoughts on Emergency Power

Being ready for an emergency requires planning. Here are some important factors to consider in your choice of a power plant and its installation.

By Wendell Tulencik, K8OIP
722 North Third St
Toronto, OH 43964

The words "emergency power" suggest an alternative to the regular ac mains source of electrical power when the latter is not available because of storm damage or failure. During emergencies, it is not unusual for all electrical power sources to be disabled—sometimes for hours, sometimes for days. Loss of electrical service during winter storms is commonplace, and the time required to repair damage and the delay in the return of service may result in conditions that are threatening to life and health.

Of primary interest to you, the radio amateur, is the ability to operate your radio equipment in times of emergency for community service, Field Day or for other reasons. Of equal concern may be the continued operation of the basic essentials: furnaces, refrigerators and lighting. Being able to power a hot plate for cooking, a toaster, coffee maker, small power tools for repairs and, of course, the TV or radio for storm information is also desirable. Of less concern are such luxuries (in an emergency) as an electric stove, oven, clothes washer and dryer, and air conditioner.

Power Requirements

The first step in planning your emergency power installation is to determine the minimum level of power required to provide a minimum level of comfort or capability. As an example, to start a furnace blower motor, at least 600 W is required. Overcoming the static inertia of an electric motor requires more power than sustained running. The gas valve solenoid requirement of 20 W is a minor consideration.

To determine your requirements, consider the typical power usage of common items as shown in Table 1. Once you determine the capability you need, you can start looking for a solution. As an example, if you plan to provide enough power to run your rig (500 W), make coffee (450-1200 W), and have toast for breakfast (450-1500 W), you could be facing a *minimum* requirement of 3 kW! If, in addition, you

Table 1
Power Requirements of Common Electrical Items

Item	Power Required (<i>k</i> = 1000)
Light bulbs	See bulb rating.
Transmitter or exciter	300-500 W
Amplifier	2.0-2.5 kW
Television	200-500 W
Hot plate	600 W-1.2 kW
Refrigerator	1.0-2.0 kW
Sump pump	900 W-1.4 kW
Coffee maker	450 W-1.2 kW
½-in electric drill	500 W-1.0 kW
14-in chain saw	1.0-2.0 kW
Toaster	450 W-1.5 kW
Electric range	5.0-12.0 kW
Clothes dryer	8.0 kW
Water heater	1.0-5.0 kW
Furnace	600 W-2 kW

can't get along without your 1.5-kW linear amplifier, you're looking at 5 kW.

Equipment Options

While it's fun to talk about using solar power on Field Day, and it's fun to do it, this particular source of power is inadequate and just too expensive for the kinds of emergency loads we're considering. Batteries are just about as costly, when you're talking about a 3-kW requirement, and you still must solve the dc-to-ac conversion problem. The only viable option is an engine-powered generator or alternator with sufficient capacity to supply your *average* power requirement. You may have to do some manual power management—you probably can't afford to provide for your *peak* loads.

The type of engine—diesel, gasoline, propane or natural gas—is a major consideration. Generally speaking, a diesel unit will be more economical to operate, and will not present the fire or explosion hazards that other fuels do. The initial cost of a diesel-powered unit, however, can be 50-100% higher than other types. Gasoline or multiple-fueled units provide a more

economical way to generate power in terms of initial cost, but installation and safety considerations may lessen the economic advantage.

Initial Investment

There are several considerations in the choice of the emergency power unit; single voltage v dual voltage, automatic start v manual start, automatic stop for low oil level and battery charging capability are only a few. Your decision on any of these features affects initial cost.

If only a Field Day power supply is desired, there are several choices available in the \$500-750 range. A 2.5-kW alternator can provide power for several transceivers, as well as a limited lighting capacity for night operation. Many of the foreign motorcycle manufacturers provide reasonably priced alternator units in the 500-1200 W range. Remember that the 500-W units are rated at a *maximum* of 500 W ac, but can include a 12-V output for battery charging. These units would probably be adequate for only one rig, with limited capacity for extras such as lighting.

If you wish to operate from home, and feel you need to power a refrigerator, hot plate, furnace, TV and lighting, then a 4-5 kW air-cooled unit with manual or electric start is a good choice. Alternators in this power range will usually run at 3600 r/min and be powered by a single-cylinder gasoline engine. Voltages of 117 and 234 will usually be available. Cost for a unit of this capacity will generally run \$1000, or less.

When Amateur Radio operation is your priority and you require 117 or 234 V and a 60-Hz pulse for timing, a 5-kW electric start unit is desirable. An alternator in this class will be driven by a horizontally opposed, two-cylinder engine for less vibration. It will run at 1800 r/min, be quieter and have other features such as automatic shutdown when the oil level is low. Air cooling or liquid cooling may be provided. Typical price for a unit of this type is \$2500-2700.

If you live in an area where power outages are common throughout the year, and it is necessary to operate all household appliances (but not electric stove, oven, washer/dryer and air conditioning simultaneously), I recommend a compact, two- or three-cylinder, liquid-cooled diesel unit. The power output capability would be 7.5 kW to 10 kW at 117 and 234 V. The unit would feature automatic starting from a 12-V storage battery. The battery would be constantly charged by the commercial utility source, and in the event of an outage, provide automatic starting. The power unit will probably have a 12-V dc charging capability to maintain the battery during emergency use. Units in this class can cost \$4500 to \$5000.

Where outages are rare, the investment for emergency power may seem to be a questionable investment in insurance, yet it does provide a feeling of independence. When storms cause the main power to fail, even for a relatively short time, the lights go out, the TV dims and goes black and the quiet in the house is deafening! The thought of no power for the sump pump might make you appreciate the feeling of assurance you can have if emergency power is available.

Installation Considerations

Engine noise—Any internal combustion engine is noisy and bothersome when communication equipment is being operated nearby. The placement of a power plant is important, regardless of its size. An engine running at 3600 r/min, even with an efficient muffler system, produces noise and vibration. The engine vibrations are conducted through the base upon which the engine is mounted to the ground or walls of the building housing the system. Brick or concrete-block construction will reduce the noise level, but if the generator shack is metal, there is less noise abatement. Metal panels may vibrate in sympathy with the sound source and add to the din! Applying a hardening caulking compound to the vertical edges of the metal panels can eliminate some of the noise, as can the use of sound-deadening material in lining the shack.

The distance between the alternator and the operating position must be considered. Sound intensity varies inversely with the square of the distance from the source. (Does that sound familiar?) The noise at a distance of 50 feet will be one-fourth that at a distance of 25 feet. At 75 feet, it will be one ninth! Locating the alternator at the farthest distance practicable will pay dividends in noise reduction, but may increase the cost of power cabling.

Power cable—The longer the power cable, the higher the power losses. Use the largest gauge wire you can obtain, within reason. I use a three-conductor cable of the type 8-8-8 SE 300 volts to ground (marked XHHW-CDRS). This has proved to be more than adequate for my 5-kW,

117/234-V alternator.

Transfer switching—A transfer switch is a *must*. Merely plugging your alternator into the house wiring during an outage can be *dangerous*. A public-utility transformer is a *stepdown* device—when you energize it from your house wiring, it is a *stepup* device. A 5-kW alternator with a 46-A capacity could be deadly to the lineman trying to reconnect your power. Almost as bad, if the power from the utility should come on while the alternator is connected, the alternator could be damaged.

There are two choices of transfer switches: manual or automatic. The manual switch is a DPDT, center-off type, housed in a heavy steel cabinet with a side lever and three switch positions. When the commercial power fails, the transfer switch is centered to disconnect the commercial source. The emergency alternator is started, and once it is running steadily, the alternator power is connected to the house circuits through the transfer switch, bypassing the commercial power service. If the alternator must be stopped (for refueling, for example) the lever is again centered to disconnect the alternator, but *not* to connect the commercial service. When the alternator is restarted, its output is again connected to the house circuits. A 100-A manual transfer switch costs about \$150. Some houses may already be equipped with such a switch, so check your particular installation.

An automatic transfer switch is more complex. It senses the commercial power failure, activates a relay to remove the load from the commercial source and starts the emergency power unit. After the engine reaches running speed, a relay connects the house circuit to the alternator. In such a system, a fully charged storage battery must always be available. The storage battery is charged from the commercial service during normal use, and by the alternator during emergency use. An automatic transfer switch costs \$300-500.

Fuel and fumes—Fuel consumption must be considered, both from an installation aspect and as a safety problem. Fuel will be used at the rate of 1/2 to 1 gallon per hour in a 2.5 to 5-kW generator. At first, this doesn't seem like much, but if the outage extends over many hours, or even days, supplying fuel can be a problem. There must be an ample reserve—plan on at least 48 hours of operation. If the fuel is gasoline, safe storage can be a problem. Store gasoline in an area separate from the area housing the generator. Transfer only enough fuel at one time to fill the power unit's tank. If you are in an area where propane or natural gas is available, it might be worthwhile to consider these options as a fuel source. Some alternators are supplied with multiple-fuel capabilities (gasoline or natural gas/propane). A special carburetion system is required for natural gas or propane.

Diesel oil is a good fuel, but it is less

volatile than gasoline. In cold climates, electric preheaters may be required immediately before the intake. Diesel fuel can be easily stored in greater quantities than gasoline, and with less of a fire hazard. Operation with diesel fuel, however, creates more noxious odors and a power unit using this fuel should be located far from the house.

All exhaust fumes are lethal. Whether gasoline, diesel, natural gas or propane is used, be sure that exhaust fumes are properly vented out of the operating area. Do not depend on natural ventilation to maintain a safe atmosphere.

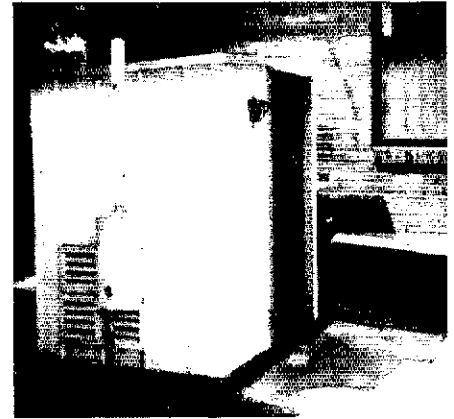


Fig 1—My power shed is separate from the house and garage to minimize noise and fume problems.

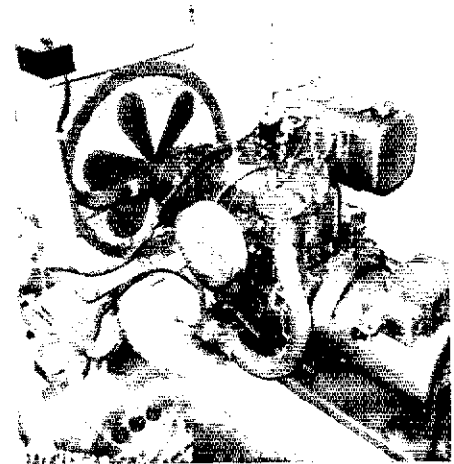


Fig 2—This 5-kW Teledyne Wisconsin alternator can provide all of my emergency needs at a reasonable cost. The fan is reversible: Here, it brings air into the shed.

All internal combustion engines produce heat. The larger the engine, the higher the speed, the greater the heat produced. The combination of fuel fumes and engine heat in a small enclosure can spell disaster! In a closed space, grills and louvers alone are insufficient to carry the heat from the building. A blower or ventilator fan should be used to bring fresh air from outside,

with an exhaust fan installed to expel the heat. In hot weather, a door can be opened to allow better ventilation in addition to the other means.

A Modest, but Adequate System

I have had an emergency alternator for many years. The unit I own, and like, has a rugged 12-hp Teledyne Wisconsin engine and generates 5 kW. The unit is well balanced mechanically. Its heavy-duty starter doubles as a 10-A dc generator. I use an automobile battery for starting. Fig 1 is a photo of my separate power shed, and Fig 2 shows the alternator installed in the shed. The power unit fan is reversible: Here, it brings air into the shed. My power transfer switch can be seen in Fig 3. The unit below the switch is used for remote starting. My fuel shed (Fig 4) is located near the back of my lot, far away from both the power shed and the house.

Operating Suggestions

Over the years, I have learned a lot about operating an emergency system. The items listed below have become standard operating practice for me. Consider them carefully for your own emergency power installation.

- 1) Use only the fuel recommended by the manufacturer.
- 2) Pour fuel through a large-mouth funnel with a fine screen to filter out dirt and other contaminants.

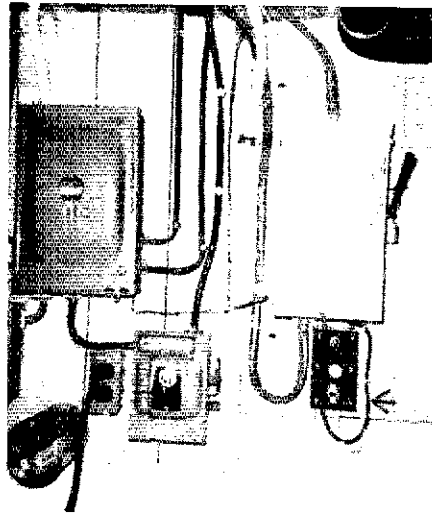


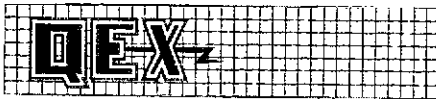
Fig 3—The power transfer panel is on the wall of my basement, near the utility inlet. The transfer switch is at top right. The unit below it is for remote starting in the event of a shutdown. The battery and battery charger are also located in the basement.

- 3) Keep waste cloth or paper toweling handy for blotting spills. Store properly in a covered metal waste bin.
- 4) Keep a supply of lubricating oil handy.
- 5) Have some 50- or 100-ft extension cords available.



Fig 4—All fuel is stored in an isolated aluminum shed. This shed is near the rear of my lot, and far from the house and power shed. (You caught me leaving the cans out!)

- 6) Keep at least one CO₂ or dry-powder fire extinguisher ready for instant use when handling fuel.
- 7) A flashlight with good batteries is a must. Two flashlights are better than one!
- 8) Check fluid levels and start the alternator at least once a week.
- 9) If you have trees close to the house, keep a small chain saw handy.
- 10) Use a small trickle charger to keep the battery charged.



QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

Here is a new meaning to the phrase "Fun with Amateur Radio!" Use your personal computer, a hand-held transceiver and the DTMF-64² decoder to perform a variety of tasks: Use its Touch-Tone™ paging to remotely control a repeater or open your garage door. Then, use the audio frequency counter offered on the next page to accurately read your transmitter's or receiver's operating frequency or tune your electric organ.

- The April issue also includes articles on:
- "The DTMF-64² Decoder," by Ronald P. Kumetz, Jr, N2ENW
 - "Pocket-Sized Audio Frequency Counter," by Mark N. Richey, WA7UGB
 - "Low-Noise Audio Preamplifier," by Mark N. Richey, WA7UGB

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.

New Products

ENCOMM KR-001 COMPUTER ROTATOR CONTROL INTERFACE FOR THE COMMODORE® C64 AND THE KENPRO KR-5400A

□ The most often requested new feature for satellite enthusiasts is automatic control of antenna pointing through a personal computer. Encomm's KR-001 Computer Control Interface provides the hardware interface between the Kenpro KR-5400A az-el rotator system and the C64 computer. The KR-001 plugs into the cartridge port of the C64 computer and operates with the tracking software written by Robert W. McGwier Jr, N4HY, for AMSAT. This software is available only from the AMSAT software exchange. Although tracking software is not available from Encomm, Inc or Kenpro Industries, Ltd, subroutines of the automatic tracking program which apply to the KR-001/KR-5400A combination are supplied with the KR-001 for those who wish to write their own tracking software.

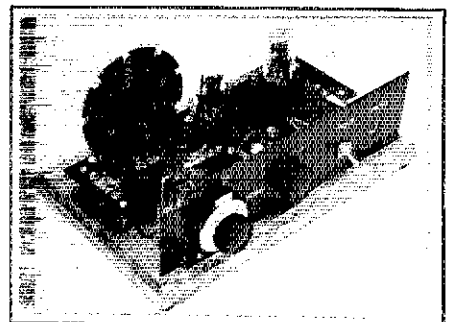
Price class: \$150. Contact Encomm Inc, 1506 Capital, Plano, TX 75074, tel 214-423-0024, for further product and order information.—Bruce O. Williams, WA6IVC

REINARTZ 2 TWO-TUBE RECEIVER KIT

□ Of all the receivers built by hobbyists in the 1920s and later, the "all-band" two-tube receivers with plug-in coils were probably the most popular. The Reinartz circuit, published in QST (June 1921 and March 1922), was the best known. Now a replica of this famous radio is provided in kit form. A stock of authentic parts has been located in Australia, but the supplies are limited.

The radio is mounted on a handcrafted wood base, and incorporates spiderweb-wound, cotton-covered wire coils for four bands: 560-1500 kHz, 1.5-3.6 MHz, 3.45-8.0 MHz, 7.7-19.0 MHz.

Available exclusively from Dick Smith Electronics, Inc, PO Box 8021, Redwood City, CA 94063, tel 415-368-8844. List price, \$99.95.—Bruce O. Williams, WA6IVC



ICOM IC- μ 2AT 2-Meter FM

"Just how small can we make it?" seems to be the theme for hand-held transceiver manufacturers these days. The IC- μ 2AT is ICOM's entry into the tiny-little-hand-held market. While the rig certainly is small, its features rival those of many full-size hand-helds.

Features

The rig has a wide frequency range; the transmitter covers 140-149.995 MHz and the receiver covers 140-163 MHz. The high power output level can be anywhere from 1.2 W to 2.6 W, depending on the battery pack in use. A dual-tone multifrequency (DTMF) keypad and a subaudible tone encoder are included as standard equipment.

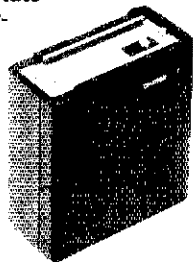
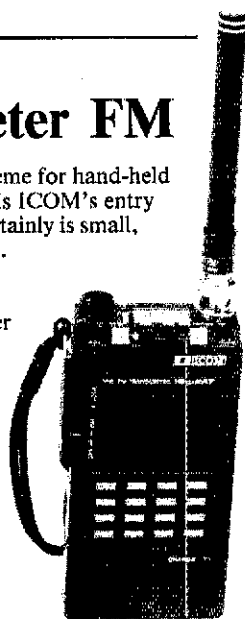
An internal battery provides power to retain memory information when the transceiver is turned off. The owner's manual states that the battery should last one to two years, and that when the battery is discharged the rig will still operate normally, but will not retain memory information. ICOM recommends that the battery be replaced by an authorized service center, and also specifically warns against disassembling the transceiver for any reason. The days of "no user-serviceable parts inside" have definitely come to Amateur Radio, at least as far as pocket-size hand-helds are concerned.

Controls and Indicators

See Fig 1. The operating frequency is selected through three UP/DN switches on the top of the transceiver. Each switch controls a different tuning range step; the switches change the frequency in 1-MHz, 100-kHz and 5-kHz increments. Pushing the switch in one direction moves the frequency *up* by the selected increment; pushing in the other direction moves the frequency *down*. The 5-kHz UP/DN switch also functions as a SCAN switch. In SCAN, the frequency moves up or down in 5-kHz increments. There is no memory scan. The Memory CHANNEL control selects the next memory, either up or down.

Frequency, memory-channel number and field-strength/power level information are shown on a small liquid-crystal display located between the antenna connector and the on/OFF VOLUME control. Four digits indicate the operating frequency: A frequency of 145.450 MHz is shown as "5.45," and a frequency of 146.745 MHz is shown as "6.745." A group of small dots to the left of the first digit indicate which band segment you are on: one dot for 140-150 MHz, two dots for 150-160 MHz and three dots for 160-163 MHz. The five-section LCD bar-indicator shows received signal strength and the transmitter power level, either high or low.

A press-on/press-off switch on the left side of the μ 2AT controls a light for the display. The light stays on as long as you are using the



Hand-Held Transceiver

long as the transmit frequency falls within the 140-149.995 MHz range. The new offset applies to *all* the operating frequencies from then on, and the new offset is retained even after the power is turned off. The standard 600-kHz offset must be reset, if once changed.

A single-control on/OFF VOLUME knob, a separate SQUELCH control, a TX LED, a TONE ON/OFF switch and a CHK push-button switch complete the top-panel control complement. The CHK control is interesting; when it is pressed, the display and the receive frequency switch to the transmit offset frequency selected by the rear panel offset control. This is a handy way to quickly check the input frequency of a repeater, or to confirm that the offset switch is correctly set without transmitting. The TONE switch turns the tone encoder on; the subaudible tone is set by a six-position DIP switch on the bottom of the rig that is accessible only when the battery pack is removed. There are 32 built-in subaudible tones.



The μ 2AT has 10 memories for operating frequencies, but the repeater offset is not part of the stored memory information. Offset is controlled manually by a + DUPLEX/SIMPLEX/- DUPLEX switch on the rear panel of the unit—a system that will be familiar to anyone who has ever used an ICOM IC-2AT. Having to change the offset when flipping through the memories seems like a minor annoyance compared to the convenience of having memories at all. The HIGH/LOW power switch is located

controls, and a timer turns the light off if there is no switch activity for 5 seconds. The light switch is also used with the UP/DN switches to change offset frequency, or to reset the central processor unit (CPU). The frequency offset can be changed from the 600 kHz default to any frequency as

ICOM IC- μ 2AT 2-Meter FM Hand-Held Transceiver, Serial No. 03372

Manufacturer's Claimed Specifications

Frequency coverage:
Transceiver—144-147.995 MHz (guaranteed); receiver 140-163 MHz; transmitter 140-149.995 MHz.
Mode of operation: 16K0F3E.
Frequency display: Four-digit LCD.
Frequency resolution: 5 kHz.
Frequency stability: ± 15 PPM at 0°C to 60°C.

Transmitter

Power output: 1.0 W high, 0.1 W low.

Spurious signal and harmonic suppression:
More than 60 dB.

Receiver

Receiver sensitivity: Less than 0.25 μ V (-12 dB μ) for 12 dB signal + noise + distortion/signal + distortion.
Squelch sensitivity: Less than 0.1 μ V (-20 dB μ)
Receiver audio output at 10% total harmonic distortion: More than 0.25 W.
Color: Black.
Size (height, width, depth): 4.6 x 2.3 x 1.1 in.
Weight: 12 oz.

Measured in ARRL Lab

As specified.
As specified.
As specified.
As specified.
As specified.

Transmitter Dynamic Testing

2.2 W, high;
0.11 W, low
at 148.0 MHz (with BP-22).

More than 70 dB.
See spectral photo.

Receiver Dynamic Testing

0.16 μ V at 146.0 MHz.
0.08 μ V min, 0.24 μ V max.
0.29 W.

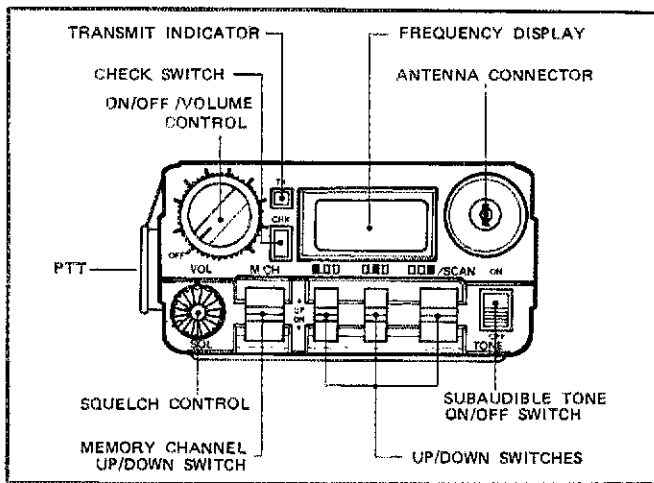


Fig 1—ICOM IC- μ 2AT top-panel controls and indicators.

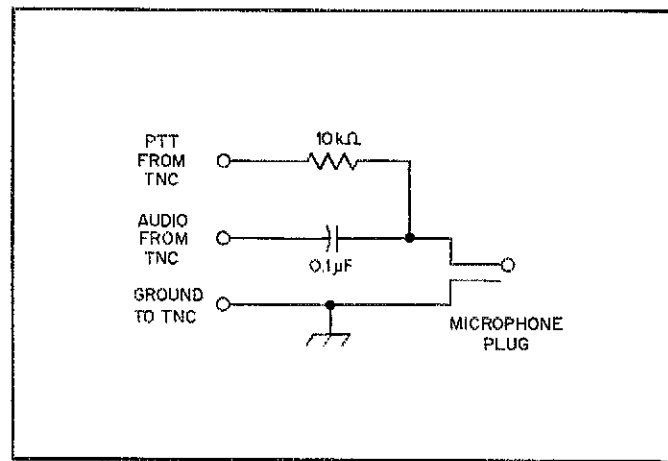


Fig 2—Packet-radio TNC interface for the ICOM IC- μ 2AT and IC-2AT.

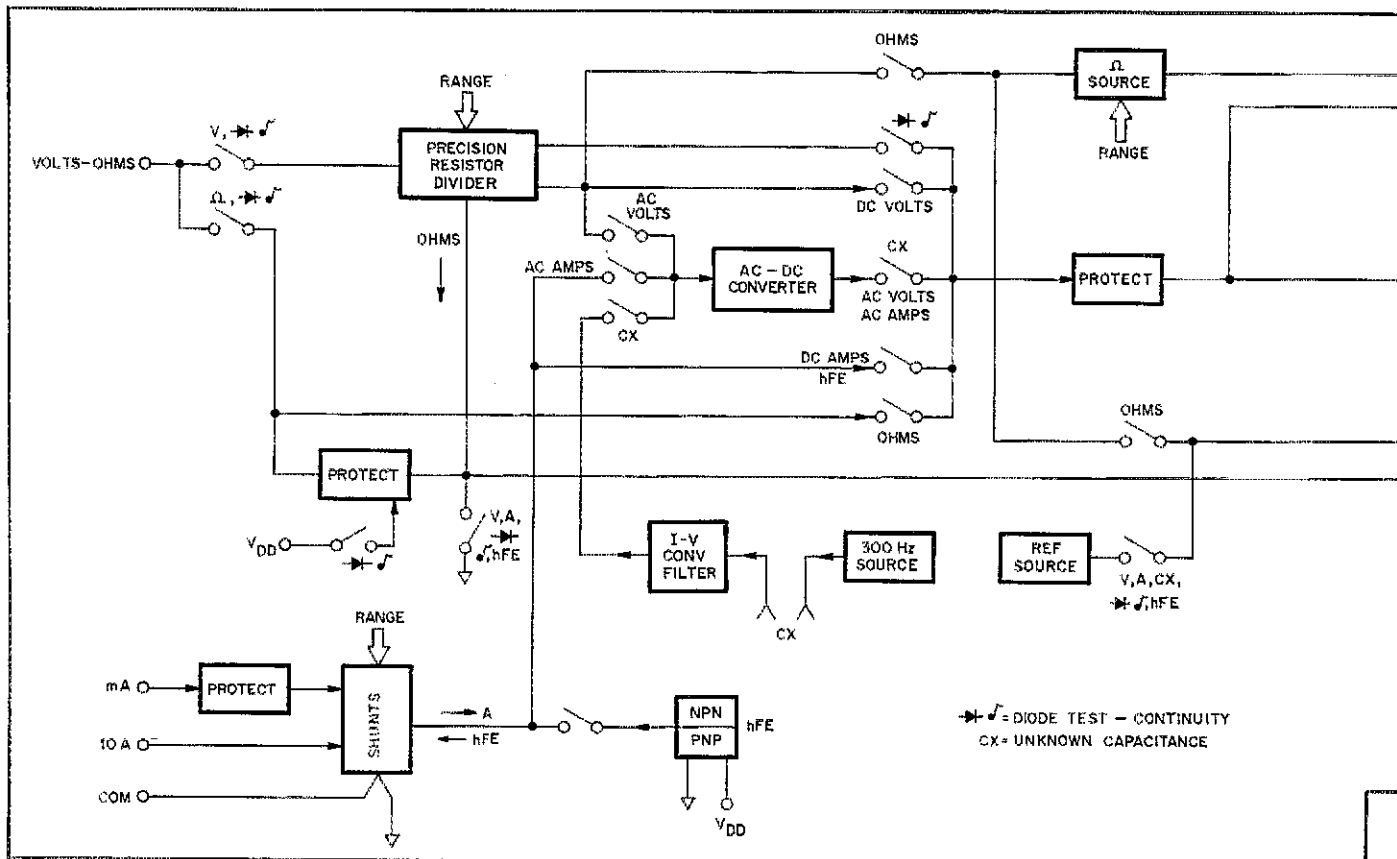


Fig 3—Block diagram of the IM-2320 Digital Multimeter.

on the rear panel near the offset selector switch.

In addition to the display light switch and the PTT switch on the left side of the μ 2AT, there is a Frequency LOCK switch near the PTT switch. The FLOCK switch disables the top-panel controls so that the frequency cannot be changed, but it does not lock the PTT to keep it from being pressed accidentally.

Battery Power

With the BP-21 (120 mAh) battery pack, shown installed on the transceiver in the lead photo, the μ 2AT stands just over 4½ inches

tall. ICOM claims that this battery pack produces a transmitter output of 1.2 W on high power, and that it allows operation for 2 hours.¹ The larger BP-22 (270 mAh) battery pack extends the unit to 5¾ inches, provides output of 1.6 W and allows you to operate for 4.5 hours. I found the operating times listed for the battery packs to be on the conservative side; the rig has a special "battery saver" mode that kicks in if there is no signal received or no switch operation for 30 seconds. This

¹ICOM bases their time estimates on a duty cycle of 10% transmit, 10% receive and 80% standby.

cuts current consumption to a minimum (6 mA, according to the manual). The trickle charger supplied with the review unit charged either battery pack in 15 hours, and the receiver will operate while the battery is being charged.

Accessories

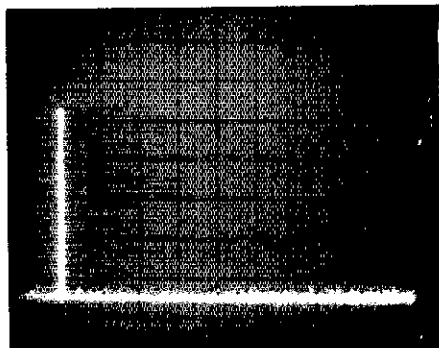
For longer battery life, or higher power, ICOM offers the BP-23 long-life battery pack (600 mAh) that provides a 1.6-W transmitter output and operation for 10 hours, and a BP-24 high-power pack (also 600 mAh) that provides an output of 2.6 W and operation for eight hours. An alkaline battery holder (BP-20)

is available; ICOM claims 1.4 W transmitter output with alkaline batteries. A dc-to-dc converter (DC-25) converts 13.8 V to 9.4 V for the rig, and you can connect the DC-25 to your automobile cigar-lighter socket with a special cable (IC-CP1). Although the furnished trickle charger can charge the battery pack in 15 hours, an optional desk-top quick charger (BC-50) can put a full charge on the battery pack in one hour.

Base-station or mobile users can purchase a speaker/mic or a headset (either VOX or PTT-switch headsets are available), and a belt clip and carrying case are available for portable use. The μ 2AT uses the same type of two-pin

The μ 2AT is pleasant to use. The frequency control switches are not too small, and the rig itself has a very solid, comfortable feel in your hand. I think the rig is actually a bit *too* small with the BP-21 battery pack; I used it mainly with the larger BP-22 pack. The display light is particularly convenient for night mobile use, as are the memories. I could work most repeaters from my car using just the "rubber duck" antenna; when I connected the rig to my ground-plane antenna at home, I could hear repeaters from all over the area and could easily work the WIAW repeater 15 or so miles away.

Connecting the μ 2AT for use on packet



Spectral display of the IC- μ 2AT operating at 144.000 MHz with approximately 2.2 W output power. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. The fundamental has been reduced in amplitude approximately 26 dB by means of a notch filter to prevent spectrum analyzer overload. All harmonics and spurious emissions are at least 70 dB below peak fundamental output. The IC- μ 2AT complies with current FCC specifications for spectral purity.

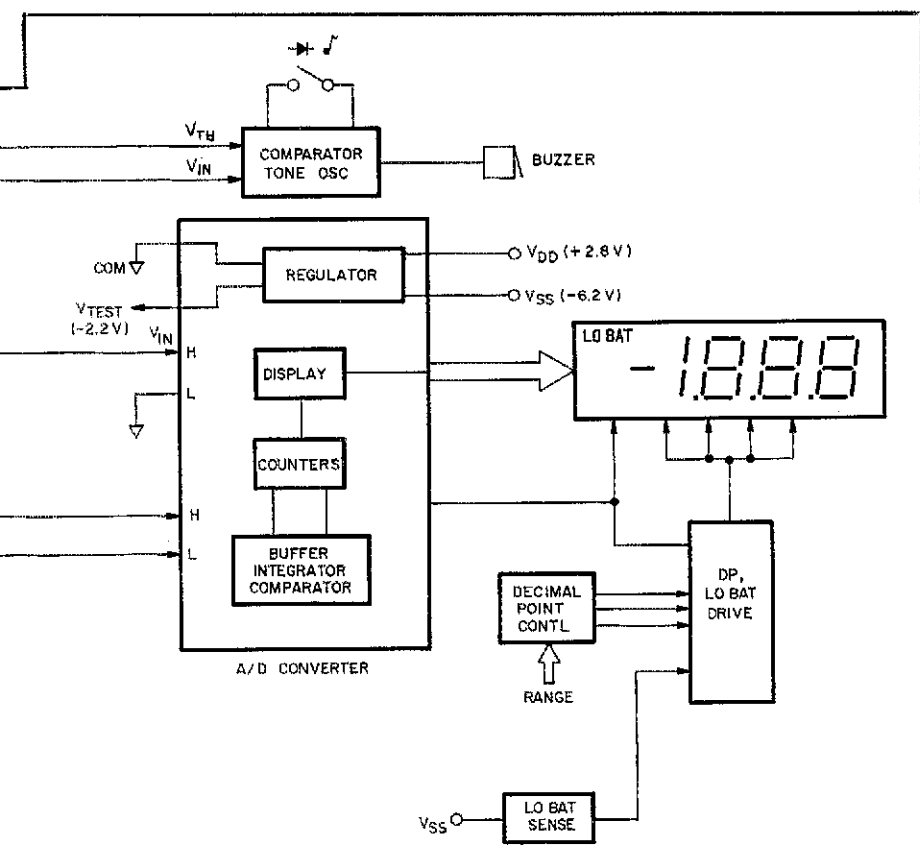
battery pack, \$38, BP-23 battery pack, \$47, BP-24 battery pack, \$49, DC-25 dc-to-dc converter, \$24.—Bruce S. Hale, KB1MW

HEATH MODEL IM-2320 DIGITAL MULTIMETER

I love kits! Of course, I just like to build things, but I feel that kits are challenging and worthwhile for the average builder. Heath Co has always offered a line of peripheral and accessory items that are not only useful in the shack, but give the builder a way of understanding what is "going on" in the equipment. In their normal kit development process, Heath goes through a "proofbuild" phase. The first 10 or so kits for any design are built by volunteers who report any and all problems they encounter, as well as their opinions of the items after construction. When Heath offered me the opportunity to participate in their kit proofing for the IM-2320 Digital Multimeter (DMM), I jumped at the chance.

The IM-2320 is a kit version of the SM-2320 Digital Multimeter that Heath has provided in wired and tested form for some time. It is similar in appearance to most of the hand-held DMMs that have appeared over the past few years. I have never looked inside one of these units to see what's inside, so I was interested in how they are put together. I am very impressed with what I found in this unit. The '2320 includes two circuit boards. Both boards are of excellent quality—solder masked, silk screened and with *gold plated traces*. I was surprised to find that gold plating or flashing is normal practice in the DMM business. Gold does not tarnish and corrode, and provides long life for the switch contacts.

The IM-2320 provides seven different measurement capabilities: dc and ac volts, dc and ac current, resistance, capacitance and transistor gain (h_{FE}). In addition, there is a diode tester and a continuity checker that provides an audible tone if the test-point resistance is 200 Ω or less. The ranges for each



microphone and speaker jacks used on the IC-2AT, so speaker/mics and headsets designed for the IC-2AT should also work with the μ 2AT. An external antenna can be attached easily because ICOM has used a standard BNC connector for the antenna connection.

Operation

I really enjoyed this little rig! I took it just about everywhere with me during the three-week review period. I especially appreciated the extra frequency coverage of the receiver on a winter trip to the Adirondacks—I could get instant weather updates from the 162-MHz NOAA weather radio service.

radio was easy; I was able to use the same keying circuit I used for the IC-2AT. I had to add an ac-coupling capacitor when I used the rig with an AEA PK-232. The circuit is shown in Fig 2. The rig worked well on packet.

While the μ 2AT does not have *all* the bells and whistles of some of the larger hand-held rigs, it is amazing what ICOM has managed to cram into this tiny package. Its features are well thought out and easy to use. It's hard to imagine that anyone would be unhappy with this rig.

Manufacturer: ICOM America, Inc, 2380-116th Ave NE, Bellevue, WA 98004, tel 206-454-7619. Price class: μ 2AT, \$329, BP-22

Table 1
Heath IM-2320 Digital Multimeter Specifications

Dc Voltage

Range	Resolution	Accuracy *	Overvoltage Protection	Input Impedance
200 mV	100 μ V	0.5% of reading + 1 digit.	Dc: 500 V. Ac: 350 V.	10 M Ω .
2 V 20 V 200 V 1000 V	1 mV 10 mV 100 mV 1 V		Dc: 1000 V. Ac: 750 V.	

Ac Voltage

Range	Resolution	Accuracy **	Overvoltage Protection	Input Impedance
200 mV	100 μ V	\pm (1.25% of reading + 4 digits). 40 Hz to 1 kHz.	Dc: 500 V. Ac: 350 V.	10 M Ω , less than 100 pF.
2 V 20 V 200 V 750 V	1 mV 10 mV 100 mV 1 V	\pm (1.25% of reading + 4 digits). 40 to 400 Hz.	Dc: 100 V. Ac: 750 V.	

Resistance

Range	Resolution	Accuracy *	Maximum Test Current	Maximum Open-Circuit Voltage	Overload Protection
200 Ω	0.1 Ω	\pm (0.75% of reading + 4 digits).	2 mA.	2.6 V.	250 V dc/V ac.
2 k Ω 20 k Ω 200 k Ω 2 M Ω	1 Ω 10 Ω 100 Ω 1 k Ω	\pm (0.75% of reading + 1 digit).	250 μ A. 50 μ A. 5 μ A. 500 nA.	1.0 V	
20 M Ω	10 k Ω	\pm (2.0% of reading + 5 digits).	50 nA.		

Dc Current

Range	Resolution	Accuracy *	Voltage Burden	Overload Protection
200 μ A 20 mA 200 mA	0.1 μ A 10 μ A 100 μ A	\pm (1.0% of reading + 1 digit).	250 mV maximum.	250 mA (250 V) fast-blow fuse.
10 A	10 mA	\pm (2.0% of reading + 3 digits).	700 mV maximum.	

Ac Current

Range	Resolution	Accuracy *	Voltage Burden	Overload Protection
20 mA	10 μ A	\pm (1.5% of reading + 3 digits). 40 Hz to 1 kHz	250 mV maximum.	250 mA (250 V) fast-blow fuse.
200 mA	100 μ A			
10 A	10 mA	\pm (2.5% of reading + 4 digits). 40 Hz to 400 Hz.	700 mV maximum.	

Capacitance

Range	Resolution	Accuracy ***	Test Frequency
2 nF 20 nF 200 nF 2 μ F 20 μ F	1 pF 10 pF 100 pF 1 nF 10 nF	\pm (2.0% of reading + 4 digits).	300 Hz

*Add 0.5% if calibrated with supplied reference.
**Add 1.0% if calibrated with supplied reference.
***Add 1.5% if calibrated with supplied reference.

function and the accuracy specifications are shown in Table 1.

The Kit

The kit includes several packets of parts, separated according to board assignments. All electronic parts are of excellent quality. The 1% precision resistors I received with my kit were of a rather dark gray color, and consequently it was difficult to read the color codes. Heath has advised me that the resistor color has been changed in the production kits to make identification easier.

The front circuit board is smaller than the rear board, and mounts to the rear board by means of the function-selector switch. Connections between the two boards are effected through the function-selector switch and a few interconnecting wires. The piezoelectric buzzer mounts on the front circuit board. The liquid-crystal display (LCD) mounts on a small pedestal that is secured to the rear board and positions the display properly in the front panel of the case. The LCD is driven through a conductive black "foam" connector from the IC on the rear board to the actual display. There are very few instructions about this

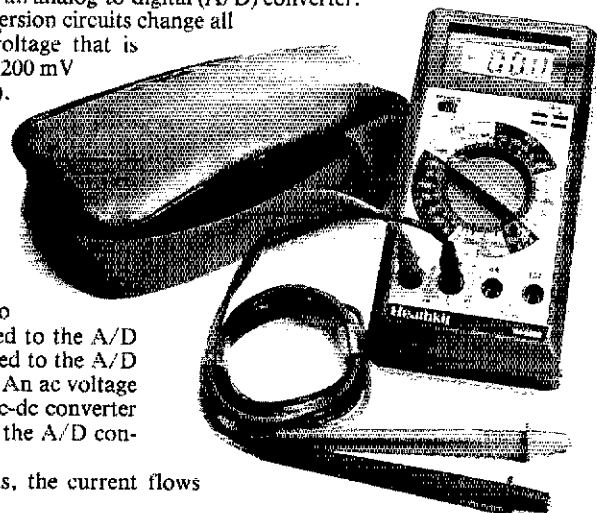
assembly procedure, and I was a little concerned about putting this item together. My fears were groundless, however—it works great!

Circuit Description

Fig 3 shows a block diagram of the DMM. All inputs to be measured are directed through the function range switches to scaling networks or to conversion circuits, and then to the input of an analog-to-digital (A/D) converter. The switching, scaling and conversion circuits change all inputs to a proportional dc voltage that is usable by the A/D converter (\pm 200 mV for all functions except ohms). The A/D converter uses a dual-slope ramp technique to convert dc voltage to a digital display in a single MOS/LSI integrated circuit.

For voltage measurements, the precision resistance divider circuit scales the input to a 0 to 200 mV level before it is applied to the A/D converter. A dc voltage is applied to the A/D converter directly after scaling. An ac voltage is routed, after scaling, to an ac-dc converter and the dc output is applied to the A/D converter input.

For dc current measurements, the current flows



through a precision resistor and the resultant voltage drop is applied to the A/D converter input. For an ac current measurement, the ac voltage drop is applied to the ac-dc converter and that output applied to the A/D converter.

Resistance measurements are made by connecting one of a series of precision resistors in series with the unknown resistor. This series circuit is then connected across a dc voltage source, and the ratio of the voltages across the resistors provides a method of measuring the unknown resistance.

To measure capacitance, a constant ac voltage is applied to the capacitor, and the resultant ac current is detected. The current-related voltage is filtered and applied to the ac-dc converter whose output is applied to the A/D converter for measurement.

Transistor gain (h_{FE}) measurements are performed by injecting a fixed dc input current to the transistor and then sensing the resultant amplified current through a shunt resistor. The current-related dc voltage is then applied to the A/D converter input.

To test diode junctions and continuity, a dc current is applied at the test point. The dc voltage at the test point is then applied, after scaling, to the A/D converter input. During continuity tests, a tone is generated when the test point voltage is low.

A LO BAT indicator is included to show when the 9-V battery is too low for proper operation. The IO BAT indication occurs when battery voltage is less than approximately 7.0 V. The DMM can still be used for a short time; about 10% of the operating time is still available before accuracy is affected.

Assembly

The total time to assemble the '2320 was about four hours. I took a little longer than you probably will. I measured the value of

each resistor before I installed it. I don't trust my old eyes with the color codes used on 1% resistors.

I had no problems during the assembly process. Heath's instructions are up to their usual standards. As a part of the proofbuild program, I reviewed the manual for errors and inconsistencies. I found none. The assembly manual contains about 70 pages, and the separately bound illustrations add another 26 pages. That may seem to be a lot of documentation for such a small project, but believe me, it's all necessary. This is not a simple kit to build, and the technical descriptions provided in the manual are extremely helpful. Everything in the kit fits where it's supposed to with no trimming, drilling, filing or cussin'.

Calibration and Testing

I calibrated the '2320 in accordance with the manual's instructions. A Zener diode, a resistor and a precision 0.01 μ F capacitor are provided with the kit for basic calibration. The exact voltage (to 1/100 V) of the diode is marked on the envelope it comes in. With the Zener diode in series with the resistor, and across a 9 V battery, the DMM is calibrated on the 20 V dc range using the Zener voltage. Similarly, the capacitance checker is calibrated using the precision capacitor on the 20 nF range.

I found that after calibration, the ac and dc voltage accuracies were more than adequate for my ham shack uses. In fact, they were more accurate than the small pre-assembled DMM I've used for the past couple of years. I did experience a problem with the two lowest ranges on the capacitor checker, however. I couldn't get any reading on either range. I followed the troubleshooting instructions, and disassembled the DMM more than


once for resistance measurements. I must have spent three or four hours trying to find the problem. I then called in the experts! I took the DMM to the ARRL Lab and turned it over to the engineers. They spent a like amount of time in troubleshooting before giving up.

I finally called Heath. At their request, I returned the unit for their evaluation. About a week later, Heath called and said they couldn't find the problem either, and that they had halted sales and shipment of the DMMs until the problem was resolved. After another week or so, Heath called and reported that a hairlike shred of copper had formed a bridge under the soldermask on the PC board, shorting two contacts of the function switch together. It was a random-type failure, and not one that calls for any redesign or engineering action. It was a tough bug to find, though.

Heath forthwith returned my DMM, calibrated and operating on all ranges and all functions. I have used it continually in my shack for the past several weeks with no problems. I have compared its readings with other similar equipment both in my shack and in the ARRL Lab and find its accuracy is all I'll ever require.

Conclusions

I now use the IM-2320 as my regular bench meter. Every other meter in the shack has been retired—not thrown out, just retired. If a problem ever develops again with the Heath, I know that I can troubleshoot and repair it without professional help. It's that kind of assurance that you get only from building your own test equipment.


The IM-2320 Digital Multimeter is available from Heath Company, Benton Harbor MI 49022. Recommended list price: \$69.95.
—Bruce O. Williams, WA6IVC 

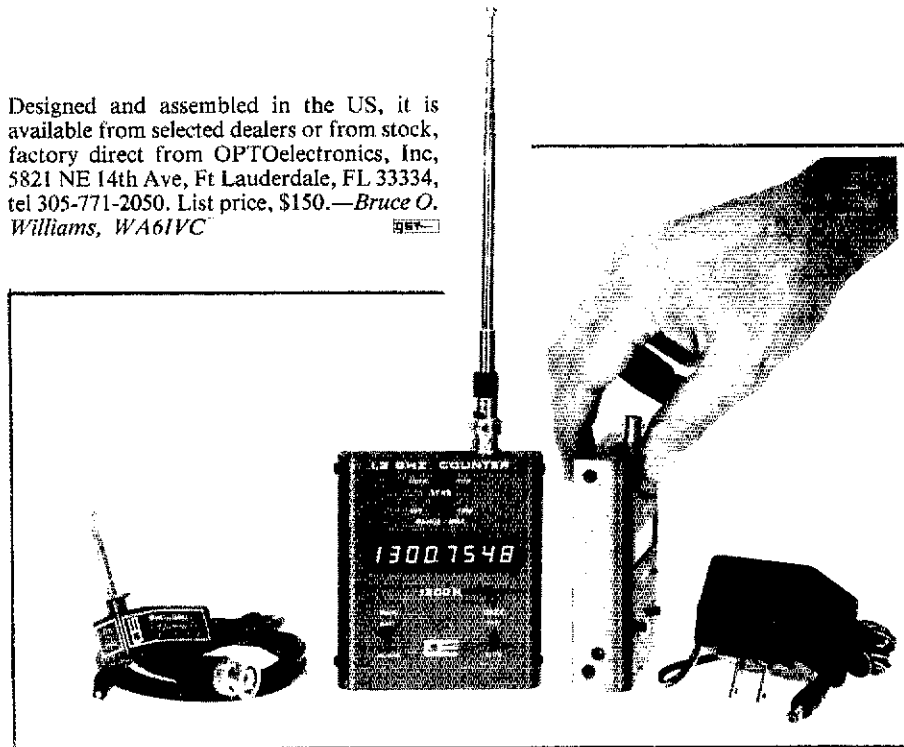
New Products

OPTOelectronics 1.3 GHz FREQUENCY COUNTER

□ The Model 1300H Frequency Counter is housed in an anodized aluminum cabinet $3\frac{1}{2} \times 4 \times 1$ inches in size. The unit has self-contained, rechargeable NiCd batteries, a signal measurement range from 1 MHz to over 1.3 GHz, eight red 0.28-inch-high LED digits and a BNC input signal connector. Switches are provided for ac or battery operation, fast-slow gate time, high or normal sensitivity and range select (1-500 MHz or 500-1300 MHz). Accuracy to $\pm 0.00001\%$, ± 1 count, LSD is achieved with an RTX0 time base. Resolution is 1 kHz in 0.25 seconds or 100 Hz in 2.5 seconds over the entire range.

The 1300H is equipped with internally installed NiCd batteries and a 117 V ac/9 V dc adapter for ac operation and charging batteries. Optional accessories include carrying case, probe and telescoping antenna.

Designed and assembled in the US, it is available from selected dealers or from stock, factory direct from OPTOelectronics, Inc, 5821 NE 14th Ave, Ft Lauderdale, FL 33334, tel 305-771-2050. List price, \$150.—Bruce O. Williams, WA6IVC 



ADD 160 TO YOUR TRAP ANTENNA

□ The popularity of the 160-meter band increases as we reach the bottom of the solar cycle. Therefore, I wanted to add coverage of the top band to my existing Hy-gain® 40/80-m trap dipole and developed an add-on trap to serve that purpose. Perhaps some other hams would be interested in adding that band coverage to their trap antennas.

Fig 1 shows the general layout of a newly constructed trap to accomplish the task. There are no expensive components, and a little labor can put you on 160 quickly.

Fig 2 shows how the trap portion of the coil is adjusted. First, set a dip meter at your favorite 80/75-meter frequency and couple it to the end of the trap. Connect one end of a 100-pF capacitor to the feed-point end of the coil, and use a needle to probe through the coil insulation with the other capacitor lead. Once resonance is found (indicated by a current dip on the meter), unwind part of the coil, drill the necessary holes, rewind the coil and permanently mount the capacitor inside the pipe.

Fig 3 shows the trap before it was mounted on the antenna. Notice that 16 tap points are shown for use in adjusting the loading inductance.

Fig 4 shows how the trap looks on the end of the antenna. In my case, there was room for 21 ft 7 in of wire at each end. The 1890-kHz tap is 91 turns from the end of the trap on my antenna. (Four turns, about two feet, on the coil seems equal to about one foot of antenna length.) Using this information as a starting point, determine the correct tap point for your antenna. (Make sure that you pull the antenna up to its operating height for each SWR measurement—the resonant frequency varies with height above ground.) Remove the extra tap points once the correct one is found, and solder a shorting wire between the correct tap point and the end of the coil. Weatherproof the new trap with a liberal coat of spar varnish.

My antenna has a physical length of 143 ft and an electrical length of 0.5λ .—Harvey Johnson, W9VYW, Milton, Wisconsin

VERTICAL-ANTENNA TIPS: RADIAL MATERIALS, CONNECTIONS AND INSTALLATION

□ Aluminum-mesh gutter covers make good radials for vertical antennas. They usually come in 25-ft lengths and seem to work well in my backyard. The strips are rolled up easily prior to lawn mowing, and they are convenient for portable operation. The strips are easily cut, and they may be bent and crimped together to make longer pieces.—Vince Berkman, W9OES, South Jacksonville, Illinois

□ I have a suggestion for connecting a ground system to a tower or vertical antenna. Copper wire fasteners (such as Servit® connectors, by Burndy; see Fig 5) work well and require much less work than drilling, mounting and painting a circuit board or piece of copper flashing. The nuts are made in a U shape and screw down for a good mechanical and electrical connection. I have been able to put as many as 20 small-diameter

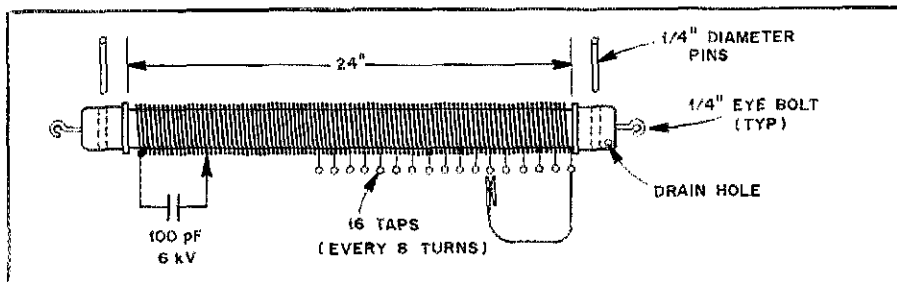


Fig 1—W9VYW's add-on trap for 160-meter operation. Close wind 84 ft (170 turns) of no. 14 AWG TW-insulated wire on the 1½-inch, schedule 40 plastic pipe (2-inch OD) form. Remove a small amount of insulation on every eighth turn and solder on 16 copper-wire tap points as shown. Plastic press fit (¼-inch diameter) pins hold the end caps in place.

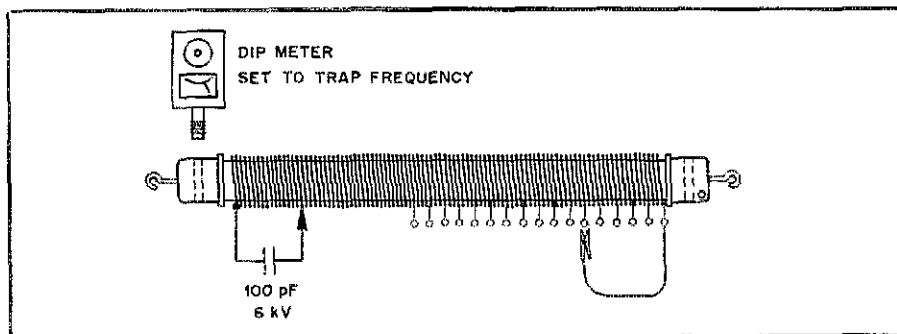


Fig 2—Locate the capacitor tap point for trap resonance (see text). W9VYW connected the capacitor across 24 turns for 75-meter operation at 3900 kHz.

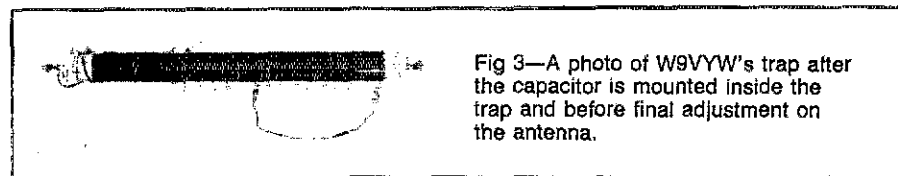


Fig 3—A photo of W9VYW's trap after the capacitor is mounted inside the trap and before final adjustment on the antenna.

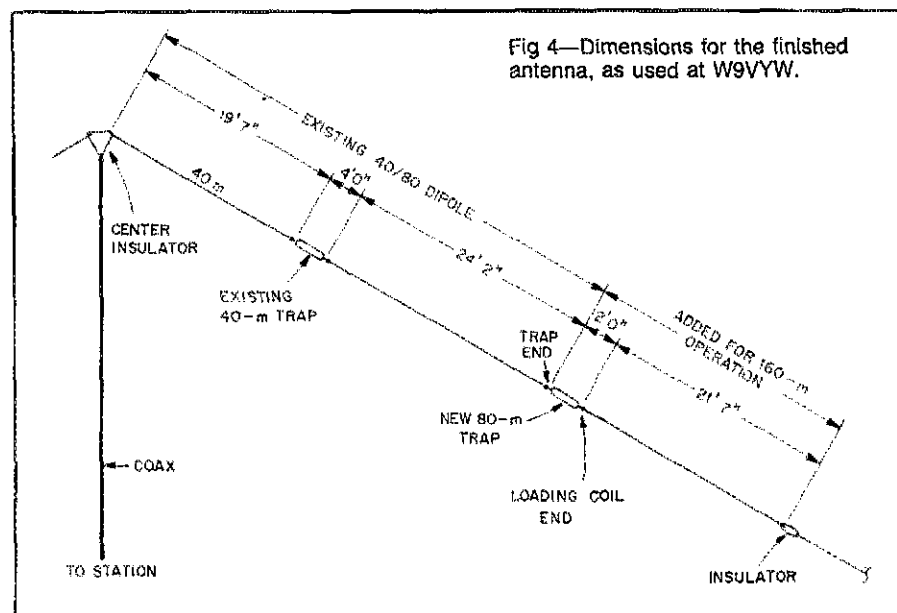


Fig 4—Dimensions for the finished antenna, as used at W9VYW.



Fig 5—A Servit connector from Burndy Corp can be used to ground radials.

wires in a single connector. A piece of flexible braid attaches the wires to the tower. This setup works well for me; it's easy to install and "dirt cheap."—*J. Craig Clark, Jr, N1ACH, Greenville, New Hampshire*

□ Here's an "invisible" method of connecting radials at a hub. Begin with a large hoop made from 3/16-inch-diameter copper tubing, but do not immediately solder the ends together. Make the hoop large enough to clear the antenna or tower base by about 12 inches when in place.

Clear the area at the tower base by lifting the sod in sections and setting them aside in such a way that you can remember the location from which each section came. Next, place the copper hoop on the ground and center it around the antenna base. Use a small length of larger copper tubing as a coupling, and solder it in place to join the two ends of the copper hoop. Prepare copper-wire radials and install them with extra length at the antenna end for connecting to the hoop. Clean the radials where they contact the hoop and solder the connections.

My system is grounded through a 6-ft galvanized pipe driven into the ground a few inches from the hoop and in line with a tower leg. A copper ground strap is soldered to the hoop and clamped to the pipe. The strap is wrapped around the pipe and fastened to it with a stainless-steel draw-up bolt at ground level. I wrapped a 1-inch-wide aluminum strap around the top of the pipe (it protrudes 6 inches out of the ground) and secured it with

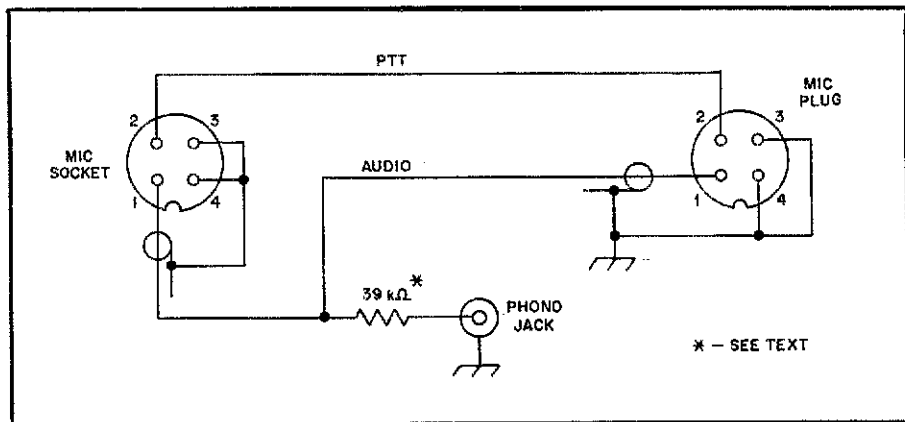


Fig 7—A schematic of KA1PL's phone-patch box. Use shielded cable for the audio lead. KA1PL mounted the mic socket, phono jack and resistor in a 2 x 2 3/4 x 1 1/2-inch metal box.

another stainless-steel bolt. The other end of the aluminum strap is fastened to the tower leg with a third stainless-steel bolt.—*Floyd B. Gribben, VE7XN, Burnaby, British Columbia*

□ Vertical antennas need radials to perform well. While it is work to install the plate which connects the radials to the antenna, that job is insignificant compared to the task of spacing and planting many radials of various lengths. With a little assistance from a fellow amateur, a gasoline-powered grass edger and a wheelbarrow with a large rubber tire, however, the entire bunch can be laid in one day. [WB0IJE refers here to the type of grass edger that cuts with a blade, rather than a flexible cord.—Ed.]

First, use the grass edger to cut a slot (about 2 inches deep and 1/8 inch wide) in the ground for each radial. You can start the blade into the ground very close to the antenna if you cut the slots as you pull the edger backwards. Then, place one or more radials in each slot.

Once the radials have been laid, use the wheelbarrow to close the slots: Fill the wheelbarrow with enough weight so that the ground closes, sealing over the wire, as the rubber tire rolls along the slot. I buried the coax to my antenna using the same procedure. This process works better if the ground is slightly damp. Because the grass is barely disturbed, it takes but a couple of weeks to regain a natural-looking lawn.—*Dale M. Ludwig, WB0IJE, Keokuk, Iowa*

A HORIZONTALLY POLARIZED 2-METER MOBILE ANTENNA

□ Other amateurs may be interested in this mobile antenna I use for SSB operation. Mine is mounted on a mast 19 inches above an old "mag mount." When leaving the car, I simply place the antenna and mount in the back seat—out of harm's way.

Brass tubing is available in some hardware and hobby stores.¹ It comes in sizes from 1/16 to 21/32 inch outside diameter (OD), in 1/32-inch steps. Each size slip fits within the next larger size. It is usually sold in 12- or 36-inch lengths.

The antenna is made from two 12-inch lengths of 5/32-inch tubing and two 12-inch lengths of 1/8-inch tubing. A V-shaped horizontal dipole is formed when the tubes are mounted through a short piece (6 inches or so) of 7/8-inch OD plastic pipe (see Fig 6).

I made it V shaped to reduce the overall size and provide a better match to my 50-Ω coax.

Begin by drilling two 5/32-inch holes through the plastic pipe at right angles to each other. (Position one hole slightly below the other so that the dipole elements cross inside the plastic pipe without touching.) Enlarge the holes of two solder lugs and force each over one end of the 5/32-inch tubes and solder them in place. Push the other end of those tubes through the holes in the plastic pipe until the solder lugs are flush against the pipe. Strip the end of a length of coax, then solder the braid to one solder lug and the center conductor to the other. Use sealant to weather-proof the coax end and feed point.

The antenna is adjusted to resonance by sliding the 1/8-inch tubing in and out of the larger tubing to achieve minimum SWR. If the fit is too loose, nick the end of the smaller tube slightly with diagonal cutters, and force it into the larger tubing. After performing the adjustment, cut the smaller tube to a length that leaves about an inch inside the larger tube and solder it to the larger tube. The element lengths on my antenna are about 20.5 inches each, and the SWR was near unity over most of the 2-meter band, with a slight rise at the high-frequency end.

My antenna was once mounted on the mast of an existing HF mobile bumper mount. It worked well in both locations, but I prefer the mag mount.

I have used this antenna, on numerous occasions, to maintain contact with my XYL on trips of 150 miles or so (with an 80-W amplifier at each end and a 45-ft-high 12-element beam at the fixed station).—*Marland M. Old, W5LAN, New Boston, Texas*

EXTERNAL TS-830 PHONE PATCH CONNECTIONS

□ Here is a simple external phone-patch mixer for those who bought a Kenwood TS-830S only to find that the phone-patch input to the microphone circuit had been eliminated. Wire the connections as shown in Fig 7. To simplify wiring of the connectors, divide the shield wires of the coax into two groups and solder them into pins 3 and 4 as shown. The resistor value is not critical, but should be as shown or greater. The normal MC-60 microphone output is not reduced and the Heath phone-patch transmit gain (using the high-impedance output) is set at about 5.—*J. T. Kroenert, KA1PL, Barrington, Rhode Island*

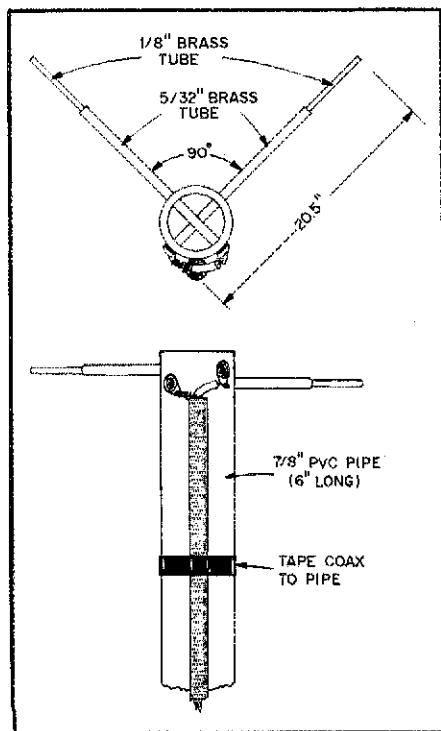


Fig 6—W5LAN's 2-meter mobile antenna.

¹You can also mail order the tubing from Small Parts Inc, PO Box 381736, Miami, FL 33138.

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HF WEFAX FOR THE IBM® PC, PCjr AND C64

□ Elmer Schwittek's WEFAX program just wouldn't work with my setup.¹ The printer behaved erratically and the line timing was off. After modifying the machine language code to the standard IBM dot-matrix format (ESC L 192 3, for a 960-dot line), the printer behaved, but the timing values still resulted in a smeared picture. I don't believe the timing difference is caused by computer clock frequency differences as Elmer speculates, but is caused by printer clock speed differences.

In his article, Keith Sueker points out the problems with printer timing differences and came up with the really unique idea of just stuffing the data bytes down the printer line at a very precise rate controlled by the computer's crystal-controlled clock.² Then, you can construct a delay loop to run out just as the next line of data is ready to begin. Schwittek used the standard printer routine that only sends a byte to the printer after it says it's ready—hence, introducing a delay not controlled by the computer's crystal-controlled clock. There are advantages to using this standard printer routine because it automatically adjusts the feed rate to exactly what any particular printer will accept, but as Sueker notes, it sure upsets the line-to-line timing. There is a straightforward way around this apparent dilemma: That's to do all the "data line" timing from the first of each data line to the start of the next data line, without any of the in-between operations entering into the timing at all.

Most computers have a separate timer chip used for a time-of-day clock, sound synthesizing, and so forth. This timer runs "off-line" without its count being affected by other code execution. The program just sets the count to zero at the beginning of each line. After executing all operations for that line, the program goes back to the counter and waits for it to reach the predetermined line-to-line delay (1.5 seconds for every-third-line WEFAX). Then the program resets the timer to zero and off it goes again. Instead of three interlocking adjustments that change with printers, you have just one—and it shouldn't need adjustment.

With the two very different computers I have (an IBM PCjr and a C64), the timer counts were set based on the published frequency of their clocks, and needed no adjustment. With this arrangement, you can change to other FAX formats (60 LPM or commercial pix) by changing only one number. On the IBM PCjr, I used the time-of-day clock. By resetting it (just during program

```

10 '          K3BC WEFAX.BAS
20 '
30 '
40 CLEAR,&HF000
50 KEY OFF:CLS
60 LOCATE 10,33:PRINT "Is printer ON? If so, please"
70 LOCATE 14,28:PRINT "press any key to continue...."
80 IF INKEY$ = "" THEN GOTO 80
90 CLS
100 LOCATE 13,24 : PRINT "Loading FAX program....."
110 LOCATE 15,24 : PRINT "Check to see if you're on USB..."
120 TP% = 124 'PIXEL SIZE (HORIZONTAL RESOLUTION)
130 TLX = 30 'TIME BETWEEN SUCCESSIVE LINES WITH 1 SEC. = 20. MUST
140 'BE MULTIPLES OF 10. (VERTICAL RESOLUTION)
150 TY% = 0 'YOUR VARIABLE FOR FURTHER DEVELOPMENT
160 DEF SEG = &H2F00
170 FOR F = 0 TO 463
180 READ G : POKE F,G
190 NEXT F
200 FOR F = 464 TO 2450 : POKE F,255 : NEXT F
210 CLS
220 LOCATE 6,22 : PRINT "IF FAX audio signal is present, press"
230 LOCATE 7,22 : PRINT "'G' to start copying (to SYNC you"
240 LOCATE 8,22 : PRINT "must press 'G' during SYNC ticks)."
250 LOCATE 13,24 : PRINT "To stop FAX copy, press SPACEBAR"
260 LOCATE 18,26 : PRINT "To begin again, press 'RUN' [ F2 ]"
280 K = 0
290 CALL K (TP%, TLX, TY%)
300 OUT 67,54 : OUT 64,0 : OUT 64,0
310 LPRINT CHR$(27); "a"; : END
320 DATA &h55,&h8B,&hEC,&h8B,&h76,&h0A,&h8B,&h04
330 DATA &h50,&h8B,&h76,&h08,&h8B,&h04,&h50,&h8B
340 DATA &h76,&h06,&h8B,&h04,&h50,&h8B,&h17,&h2F
350 DATA &h8E,&hD8,&h8F,&h06,&h09,&h00,&h8F,&h06
360 DATA &h07,&h00,&h8F,&h06,&h05,&h00,&h8A,&h00
370 DATA &h00,&hB4,&h00,&hB0,&h1B,&hCD,&h17,&hB4
380 DATA &h00,&hB0,&h41,&hCD,&h17,&hB4,&h00,&hB0
390 DATA &h08,&hCD,&h17,&hB4,&h00,&hB0,&h1B,&hCD
400 DATA &h17,&hB4,&h00,&hB0,&h32,&hCD,&h17,&hB4
410 DATA &h00,&hCD,&h16,&h3C,&h67,&h74,&h06,&h3C
420 DATA &h47,&h74,&h02,&h75,&hF2,&hB9,&hFF,&h00
430 DATA &h8A,&h01,&h02,&hEC,&h3C,&h80,&h76,&hF8
440 DATA &hE2,&hF6,&hB0,&h36,&hE6,&h43,&hE9,&h5C
450 DATA &h01,&hB0,&h1B,&hE8,&hF2,&h00,&hB0,&h04
460 DATA &hE8,&hED,&h00,&hB0,&hC0,&hE8,&hE8,&h00
470 DATA &hB0,&h03,&hE8,&hE3,&h00,&hB4,&h01,&hB9
480 '
490 DATA &h00,&h00,&h8A,&h00,&h00,&hCD,&h1A,&hB0
500 DATA &h00,&hA2,&h00,&h00,&hB9,&hC0,&h03,&h8B
510 DATA &h3E,&h01,&h00,&h8A,&h01,&h02,&h00
520 DATA &hD0,&hD0,&h55,&h60,&h47,&h51,&h8B,&h0E
530 DATA &h05,&h00,&hE2,&hFE,&h59,&hE2,&hEC,&hE8
540 DATA &hA1,&h00,&hB9,&hC0,&h03,&h8B,&h3E,&h01
550 DATA &h00,&h8A,&h01,&h02,&hEC,&hD0,&hD0,&hD0
560 DATA &h55,&h60,&h47,&h51,&h8B,&h0E,&h05,&h00
570 DATA &hE2,&hFE,&h59,&hE2,&hEC,&hB8,&h00,&h00
580 DATA &h8B,&h3E,&h03,&h00,&hA0,&h00,&h00,&hB2
590 DATA &hF0,&hF6,&hE2,&h01,&hC7,&h8A,&h00,&h00
600 DATA &hB9,&hF0,&h00,&h8A,&h45,&h60,&hE8,&h7D
610 DATA &h00,&h47,&hE2,&hF7,&hFE,&h06,&h00,&h00
620 DATA &h80,&h3E,&h00,&h00,&h04,&h74,&h05,&hE8
630 DATA &h59,&h00,&hEB,&h98,&hB0,&h0D,&hE8,&h67
640 DATA &h00,&hB0,&h0B,&hE8,&h62,&h00,&hA1,&h01
650 '
660 DATA &h00,&h8B,&h0E,&h03,&h00,&hA3,&h03,&h00
670 DATA &h89,&h0E,&h01,&h00,&hB4,&h01,&hCD,&h16
680 DATA &h74,&h0C,&hB0,&h0D,&hE8,&h49,&h00,&hB0
690 DATA &h0A,&hE8,&h44,&h00,&hEB,&h1A,&hB0,&h1B
700 DATA &hE8,&h3D,&h00,&hB0,&h4C,&hE8,&h38,&h00
710 DATA &hB0,&hC0,&hE8,&h33,&h00,&hB0,&h03,&hE8
720 DATA &h2E,&h00,&hE8,&h16,&h00,&hE9,&h4F,&hFF
730 DATA &hB0,&h0E,&hE8,&h23,&h00,&hE8,&h3E,&h00
740 DATA &h90,&h90,&h90,&h8C,&hD0,&h8E,&hD8,&h5D
750 DATA &hCA,&h06,&h00,&hB4,&h00,&hCD,&h1A,&h3B
760 DATA &h16,&h07,&h00,&h75,&hF6,&hB4,&h01,&h8A

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¹E. Schwittek, "HF WEFAX On the IBM PC," Technical Correspondence, QST, Dec 1986, pp 46-47.

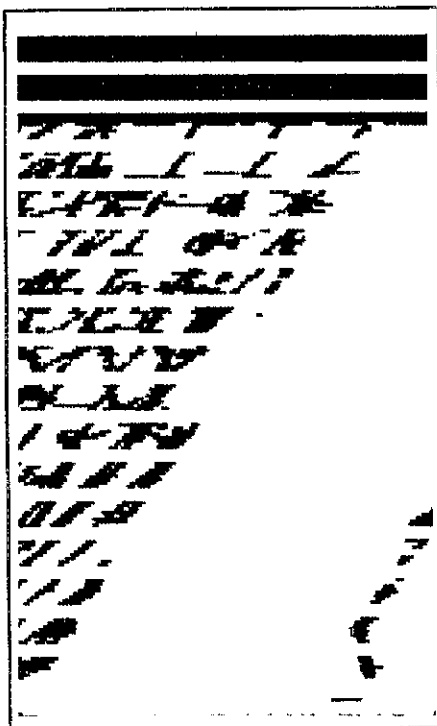
²K. Sueker, "Real-Time HF WEFAX Maps on a Dot-Matrix Printer," QST, Mar 1986, pp 15-20.

execution) to 20 ticks per second, you can use all the standard BIOS routines for the entire program. This helps the program work with other IBM PC-compatible computers, and with most any 8-dot-high dot-matrix printer that uses the CHR\$(27); "L"; CHR\$(n1); CHR\$(n2) format for commanding 960-dot, graphics-mode printing. Of course, the printer must accept data fast enough to finish before the next data line is ready to start. If it doesn't, you can move the start of the next line out by another 1/2 second (10 ticks), or use Sueker's trick of force-feeding the printer to speed it up a little.

The program shown in Fig 1 is designed to be used with the receiver in the USB mode. Memory above the first 128-kbytes of RAM is used to store the machine-language code so it is compatible with the PC and PCjr. (The PCjr has about half the execution speed below this area as it does above.) If your machine has only 128 kbytes of RAM, change line 160 to DEF SEG = &h1F00, and change the last item in line 340 from &h2F to &h1F. Doing this with the PCjr will require the pixel count (line 120) to be changed to 60, and depending on your printer speed, may require a longer line timing in line 130, or a TP% of less than 60. This program has been checked out with two IBM-compatible printers, the Seikosha SP-1000I and Okidata's Okimate 20. The printer DIP switches are set to eliminate automatic line feeds.

Some IBM PC-compatibles may require adjustment of the pixel dwell time, TP%. Also, the clock divisor value may need trimming. The divisor's LSB is the 7th data item (&h0B) in line 910, and its MSB is the third data item (&hE9) in line 920. That is, the divisor is &hE90B (59659 decimal). If the picture leans to the right, the divisor is too large—make it smaller. If the picture leans to the left, make the divisor larger. With an adjustment fineness of 1 part in approximately 60,000, you can get right on. Incidentally, they don't always get the pictures straight on the sending machine, so check for right angles on grid lines as a final check.

There are some programming tricks that are easy to do. You can change the pixel dwell time downward and go every other line (TP% = 60 to 85, TL% = 20) and get a blown-up view of part of the map with better resolution. In a practical sense, the usable resolution is often limited by propagation anomalies (multipath), however. Incidentally, you can connect to port &h201 of the computer by attaching the wires from the demodulator across the black push button Joystick B

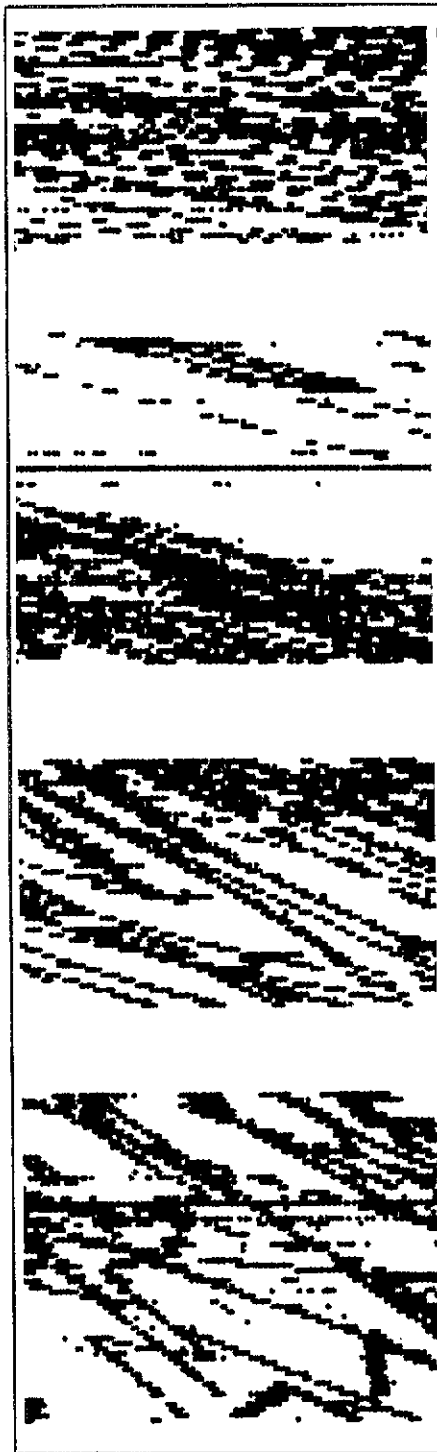


This picture section is leaning to the right, and unwanted line feeds were inserted during reception. The extraneous line feeds were caused by the presence of an unneeded—for the Epson FX-286—printer command; see text.

contacts on an IBM joystick, being careful to locate the ground connection. This relieves you from having to find a DB15 connector.

I also have Commodore 64™ WEFAX programs available for both 8-dot-high (480 and 960 dots across) and 7-dot-high (480 dots across) printers. These programs include disk storage modes, screen modes and real-time printing modes. The 8-dot modes are for the same IBM-compatible printers mentioned earlier; the printers are connected to the C64

The top part of this photo shows the picture section now leaning to the left and squashed because of a change in the MSB of the clock divisor. The next three picture slices depict how altering the LSB of the clock divisor begins to open up the picture.



```

770 DATA &h00,&h00,&hCD,&h1A,&hC3,&h90,&h34,&hFF
780 DATA &hB4,&h00,&hCD,&h17,&hC3,&h00,&h00,&h00
790 DATA &h00,&h00,&h00,&h00,&h00,&h00,&h00,&h00
800 DATA &h00,&h00,&h00,&hE8,&h03,&h00,&h00,&h00
810 DATA &h00,&h00,&h00,&h00,&h00,&h00,&hE0,&h20
820 '
830 DATA &hE8,&hDD,&hFF,&hB0,&h20,&hE8,&h08,&hFF
840 DATA &hB0,&h4B,&hE8,&hD3,&hFF,&hB0,&h33,&hE8

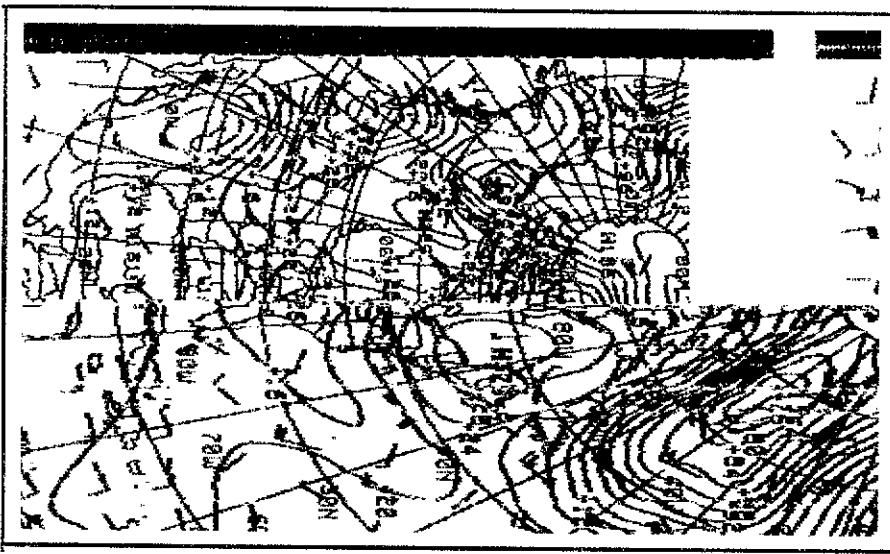
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850 DATA &hCE,&hFF,&hB0,&h42,&hE8,&hC9,&hFF,&hE0
860 DATA &h43,&hE8,&hC4,&hFF,&hB0,&h20,&hE8,&hBF
870 DATA &hFF,&hB0,&h57,&hE8,&hBA,&hFF,&hB0,&h45
880 DATA &hE8,&hB5,&hFF,&hB0,&h46,&hE8,&hB0,&hFF
890 DATA &hE0,&h41,&hE8,&hAB,&hFF,&hB0,&h58,&hE8
900 DATA &hA6,&hFF,&hB0,&h0D,&hE8,&hA1,&hFF,&hB0
910 DATA &h0A,&hE8,&h9C,&hFF,&hC3,&hB0,&h03,&hE6
920 DATA &h40,&hB0,&hE9,&hE6,&h40,&hE9,&h99,&hFE

```

Fig 1—WFX, an HF WEFAX program for the IBM PC and PCjr. As shown, this program works with the Seikosha SP-1000I, Okidata Okimate 20 and IBM Proprinter printers. With some modifications (see text), the program also works with the Epson FX-286 operating in the Epson mode; other FX models should also work with the changes shown. Depending on the computer clock speed, one or two program byte values may have to be changed (see text) to obtain proper line timing. Similar programs, written in machine language and designed for use with the C64, are available from the author.



← The divisor is now correct, and the picture lines are vertical. However, this picture was received out of sync with the sending station. That accounts for the gap off to the right at the top of the picture, and the small section of picture information on the right-hand side. Also, the top part of this picture was captured while using the standard clock speed of the computer; turning on the turbo mode expands the picture horizontally as shown at the bottom. The terms "horizontal" and "vertical" might be confusing here. That's because many pictures (such as this one) are received rotated 90 degrees. If you want to save a particular picture received out of sync, you can "cheat." Use a sharp knife or razor blade to cut the picture, then paste it together on another sheet of paper.

Using WFX With the Epson FX-286 and IBM Proprinter

When Ben's program and accompanying printouts arrived, I was so impressed, I couldn't wait to try the program with my setup! Would it work? I have an Epson FX-286 printer and a PC clone, a Microproducts International XPC-XT turbo model. By setting three DIP switches, the FX-286 is capable of operating in two modes: Epson and IBM Proprinter. The computer's turbo mode allows it to run approximately 40% faster than a standard IBM PC.

Initial results proved only slightly disappointing. First of all, I was getting unwanted line feeds between the printed lines. I determined that was caused by the differences in the printer codes required by the Epson and IBM Proprinter. Switching to the Proprinter mode eliminated the extraneous line feeds. Once that was taken care of, I saw that although the copy was good, the entire picture was leaning to the right. (This indicated a general timing problem, one not related to the use of standard PC speed or turbo speed.) Changing the value of the seventh byte in line 910 (the low-order byte of the clock divisor) had virtually no effect in eliminating the skew. I then changed the value of the third byte in line 920 (the high-order byte of the clock divisor). I knew I'd hit the jackpot because the picture now slanted to the left! Following some empirical determination, I arrived at values of &hE8 for the high-order byte and &hEC for the low-order byte of the divisor. The picture lines are now perfectly vertical.

If your pictures are slanted one way or the other, you may need to use different byte values than those in the original program or those I'm using. (See the accompanying figures for sample printouts I obtained during experimentation with WFX.) First, try manipulating the value of the low-order byte. If that doesn't bring the desired results, alter the second byte value, then play with the value of the low-order byte until the vertical lines in the picture are straight.

The next step was getting the program to work with the FX-286 in the Epson mode. That was done by changing bytes 4 through 8 in line 390 and bytes 1 through 7 in line 400 to &h90. The &h90 is a NOP code (a do-nothing) that replaces the ESC 2 printer command included in the original program. With the Epson FX-286, the presence of this command causes extraneous line feeds (it's the 1/6-inch line feed command) to be generated even with the DIP switch set to allow carriage returns only. The modification described here should permit WFX to work with printers that operate similarly.

Ben supplied the program operating under DOS 2.1. I tried WFX using IBM PC DOS 2.1 and 3.1, BASIC and BASICA. All combinations worked without a hitch. It's *not* necessary to load GRAPHICS.COM before running WFX. Let me warn you that

some TSR (terminate and stay resident) programs such as Borland's SideKick won't coexist peacefully with WFX in its unmodified form. During initial tests, you should boot with a "clean" AUTOEXEC.BAT file (don't load any TSR programs). Once you have WFX running properly, you can experiment to see which TSR programs will behave themselves with WFX. You can get WFX and SideKick to get along by changing line 160 to DEF SEG = &h1F00 and the last byte in line 340 to &h1F.

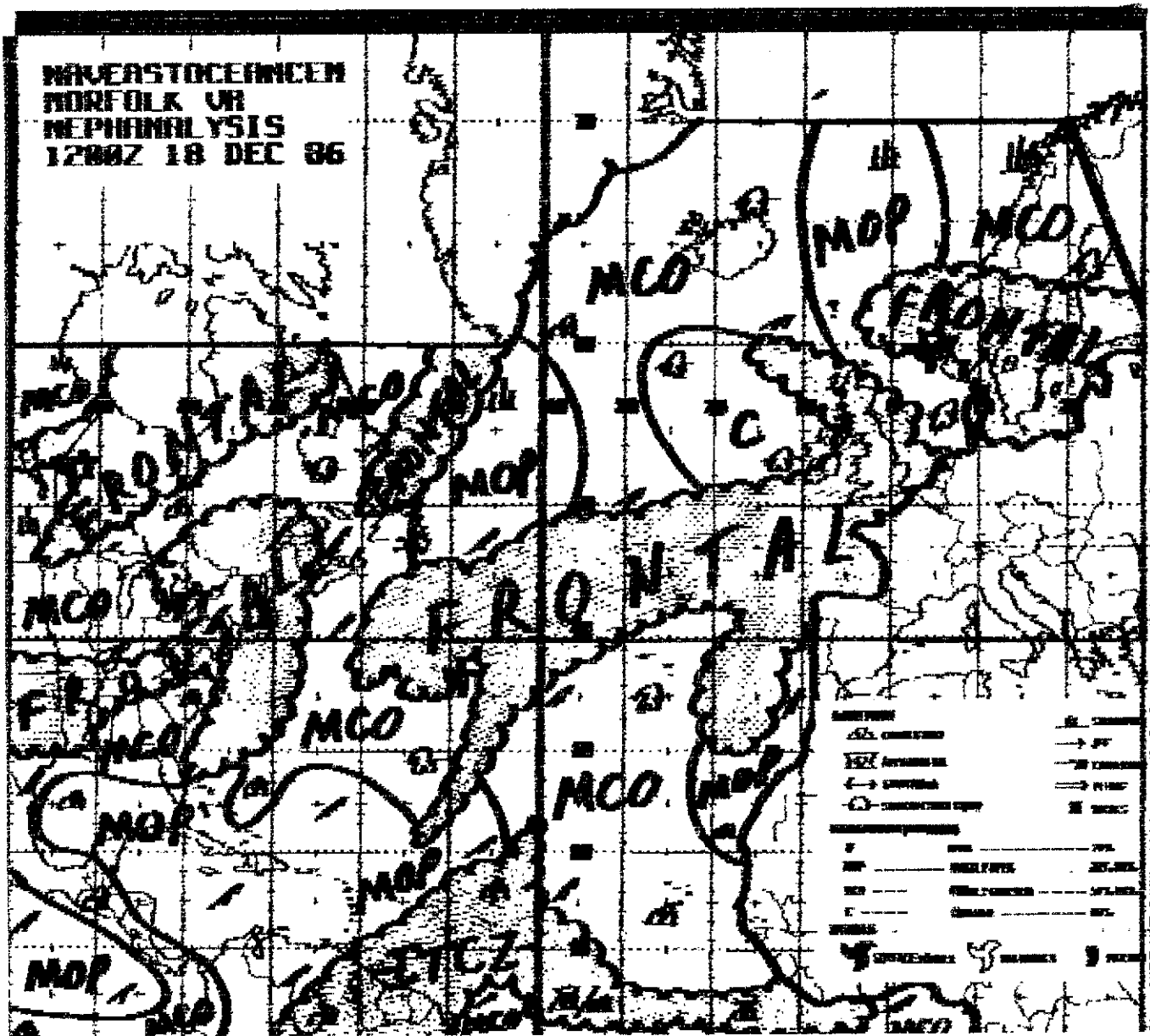
Kicking my PC clone into turbo mode simply expands the picture horizontally (or vertically, if the picture is rotated 90 degrees as many are). Such a procedure won't provide a correct aspect ratio, however, and circles will become ellipses. Using turbo mode is a "quick and dirty" way of getting some magnification, though, and doesn't require any program changes. With TP% = 84 and TL% = 20, a properly magnified section of the picture is obtained.

Make sure you have a good supply of paper and ribbons on hand. If you do a lot of WEFAXing, you'll need 'em! Because the pictures are created slowly, you'll need to set aside a period of free time to experiment with the program, if you're not immediately successful. That free time should be scheduled during periods of good signal reception. For instance, I've found the hours between 10 AM and 2 PM Eastern to be usually reliable for picture reception on 8080 kHz during the winter months (this is being written in January). But, I've occasionally had some good results during early morning and evening hours, too, on 3357 and 4271 kHz. If you have a transceiver with memories, store some WEFAX frequencies in a few of them for easy call-up at any time (see Sueker's article for a list of frequencies).

A few seconds may elapse between the time you press the G key and printing takes place, if your printer is equipped with a large buffer. Lastly, if you're lucky enough to have a four-character call sign, you can readily substitute it for Ben's. We'll leave that little exercise for you to work out.

The demodulator described by Sueker is available from A & A Engineering, 2521 W La Palma Ave, Unit K, Anaheim, CA 92801, tel 714-952-2114. A change has been made to the original circuit to allow it to be used with virtually all types of computers. Bare boards are \$9.85; kits, \$28.15; assembled and tested units, \$39.95. If you need a power supply for this project or others, A & A also sells several models; the no. 137 (\$32.95) is recommended by A & A for use with the demodulator. (See New Products, Feb 1987 QST, p 43). Please add \$2.50 for shipping and handling charges.
—Paul K. Pagel, N1FB, ARRL HQ

NAVERASTOCEANEN
 NORFOLK OR
 NEPHANALYSIS
 1200Z 18 DEC 86



Finally! One example of what we've been looking for!

through a Cardco (+G) interface. While I was unable to stick to standard printer routines in the real-time modes, thereby lowering the probability of the programs working with all printers, I do have real-time modes that have worked with the Gorilla Banana, TRP-100, DMT-105, Seikosha SP-1000I and Okimate 20 with various combinations of Cardco and Xetec printer interfaces. So far, getting the MPS-803 printer to work in real time has eluded me, but that printer does work in all other modes. Since it's unwieldy to publish all these programs, I offer them on disk for a \$5 copying and mail fee, or your disk and a stamped, self-addressed disk mailer.

If you already have the Schwittek program on disk, it is probably easier to enter the IBM PC BASIC program listing of Fig 1 as a modification. I would appreciate any feedback on other computer and printer combinations that work with this program.—Ben Vester, K3BC, 4921 Bonnie Branch Rd, Ellicott City, MD 21043

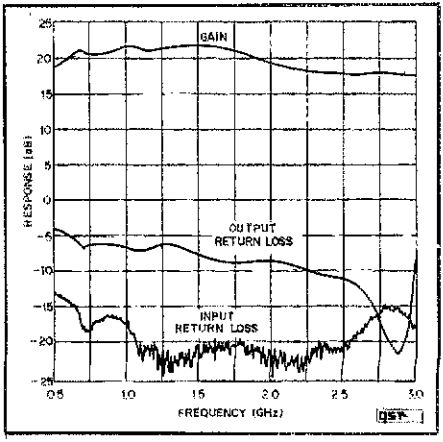
Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you may be reached if necessary. [QST]

Feedback

□ Author Mike Masterson has forwarded some reader feedback on his article, "Three Fine Mice—MOuSeFET CW Transmitters," Dec 1986 QST. On p 20, the text in the second column, eighth line, should read "... voltages and acts with C15 to provide a..." Also, C15 of Fig 1 (pp 20-21) is the 0.1 μ F capacitor in series with the gate lead of Q6, and is located between R3 and the 2.7 k Ω resistor. Lastly, Mike notes that he wound L1 (for 40 meters) with no. 36 enameled wire (not no. 28), and that it would be easier to use no. 36 enameled wire for both 80- and 40-meter L1 coils.

□ Author Al Ward has pointed out an error

in his article, "Monolithic Microwave Integrated Circuits, Part 2," Mar 1987 QST. On page 27, Fig 12, the gain curve labels are off by 10 dB. A corrected Fig 12 is shown here.



What's Going on in the New Novice Bands?

Now that you can communicate using voice, code, data and image modes, what frequencies should you use to contact other hams doing the same thing? Here's what you need to know to be sure you and your friends are on the same wavelength.

By David Newkirk, AK7M

If you're a Novice or Technician and you've been feeling more than just a little bit "enhanced" since March 21, you're not alone: Over 166,000 other Novices and Techs are in the same boat! Technicians, you're set for additional 10-meter fun with data and phone. Novices, you've got voice, data and image transmission privileges in addition to code. In fact, you've got over 90 times more spectrum space to explore now (see the sidebar, "More Novice Frequencies Than Ever Before"). You can even get involved in operating through repeaters. And as word spreads about Novice Enhancement, you'll have a lot more people to contact in the Novice bands—not only more Novices, but hams of higher license classes eager to be in on the fun.

Your new privileges put you in a pleasant predicament: You have many more operating alternatives than you had before. More choices mean that you'll have to make a few decisions each time you fire up your station: Which operating mode should you use? Which band? Frequency? Hmm, those new and expanded Novice subbands seem so wide that a person might get lost up there and never be heard from again! Are you going to have to search all day for a contact or call CQ for three weeks?

Good news! There *is* structure in ham doings on the new Novice frequencies. You *won't* have to worry about rattling around in uncharted territory or about trying to make packet radio contacts where everyone else is operating FM voice. You *can* find your local 220-MHz repeater without

consulting a fortune-teller! In fact, getting a handle on who's doing what—and where—in the new Novice subbands is easy. All you need to know is a little bit about authorized emissions, subbands, informal agreements and band plans. First off, then, let's take a closer look at your new emission privileges and figure out what to call them. They're really very different from the good old Morse code.

YOUR NEW EMISSION PRIVILEGES

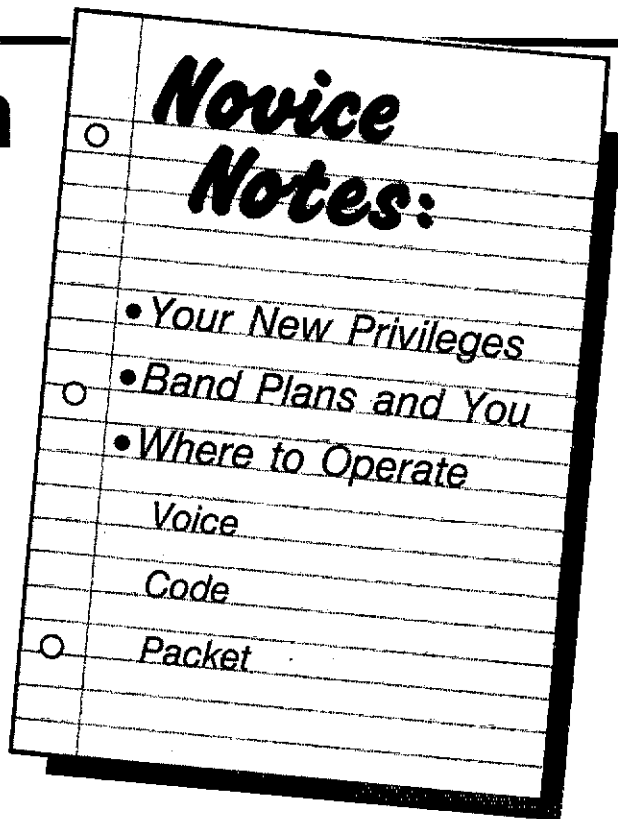
Before 0001 UTC on March 21, 1987, your choice of operating mode was pretty much limited to Morse code. If you got tired of code operation, you could switch over to the code. If this got to you, you

could always try... the code! No longer are your options so limited. Now, depending on which band you choose and which frequency you use within each band, you can operate using voice, data and image modes in addition to code.

These new modes can stand a bit more explaining, since there are several ways of accomplishing each of them. For instance, "voice" can mean FM (frequency modulation) or SSB (single sideband). This is pretty straightforward. It's when you get set to send print, computer data and images that your options *really* take off.

"Data" can mean RTTY (short for radioteletype and often pronounced as "ritty"), AMTOR (*amateur telex over radio*, a special error-correcting form of RTTY) or packet radio. Packet radio—a means of sending computer data via radio—is called "packet" because the communicated data is sent in precisely formatted bursts, or *packets*. (Splitting data communication into just three categories still doesn't tell enough of the story for true data communication hounds. For instance, there's more than one "flavor" of RTTY. RTTY enthusiasts further characterize their radioteletype operation by specifying which code—Baudot or ASCII—they use to send teleprinter data. You can find out more about data communication in *The ARRL Operating Manual*, *The ARRL Handbook* and *The FCC Rule Book*, all available from ARRL or your local dealer.)

Novices can get involved with image communication on FAX (facsimile), SSTV (slow-scan television) and FSTV (fast-scan television). FAX communication is so named because it usually involves the generation of a duplicate, or *facsimile*, of



More Novice Frequencies Than Ever Before

Here's a "before and after" look at how the Novice bands grew at 0001 UTC on March 21, 1987:

Band	Width Before	Width After
3.7 MHz	50 kHz	50 kHz
7.1 MHz	50 kHz	50 kHz
21.1 MHz	100 kHz	100 kHz
28.1 MHz	100 kHz	400 kHz
222.1 MHz	unavailable	1.81 MHz
1270 MHz	unavailable	25.00 MHz
Total	300 kHz	27.41 MHz

Widths in bold show where Novices gained spectrum space through Novice Enhancement. Yes, Novices, you now have over 90 times more spectrum space than you had before. Technicians, get set for data, phone and fun on 10! The next step? Putting your new frequencies to proper use. See the text for how.

a transmitted document, photo or map at the receiving end of a FAX contact. The "slow" in slow-scan television comes from the fact that SSTV systems take 8 seconds to send one still picture. Fast-scan TV is what you're seeing when you watch your favorite television programs. For more about image communication, see *The ARRL Handbook*, *The ARRL Operating Manual* and *The FCC Rule Book*.

There you go—plenty of modes to play, communicate and experiment with. Next, let's figure out where these various activities are likely to be found in the Novice bands, and why they're not likely to be found just anywhere.

SUBBANDS, INFORMAL AGREEMENTS AND BAND PLANS

During your Novice license studies, you were introduced to the radio spectrum—part of the *electromagnetic* spectrum—as a limited resource. Limited? Well, the radio spectrum isn't limited in the same way as is a natural resource like coal or iron; we don't "use up" frequencies by operating on them. But it *is* true that only so many radio signals can coexist in a given stretch of spectrum before they begin to interfere with each other. So, in this sense, the radio spectrum *is* a limited resource.

Unlike what we can do for gas or oil, though, we can't prospect for new radio frequencies and mine them. (We wish!) Instead, we have to find more efficient ways of using what we have. If we want to put twice as many stations in a band on Saturday as were there on Friday, we've got to embrace or invent—and practice—new radio techniques allowing greater "population density" on that band. If we want to use several different transmission modes side by side in a limited Amateur Radio frequency allocation, we have to find a way

to agree upon a plan allowing everyone in that band to do their thing without stepping on each other's toes. (Yes, it's occasionally possible to win expanded bands at periodic World Administrative Radio Conferences, but more spectrum space can't take the place of making good use of what we have.) Making good use of what radio frequencies we have boils down to one thing: *spectrum management*.

Don't let the bureaucratic sound of "spectrum management" put you off. Hams have been leaders in darned good spectrum management for years—and you've already taken part in good spectrum management yourself. It's part of ham radio's fun. Every time you listen on your frequency *before* calling, you're practicing good spectrum management. Each time you reduce transmitter power to no more than what you need to get your message through, you're a one-person spectrum manager. Every time a qualified ham wants to install a repeater and clears the chosen spot in the spectrum with a frequency coordinator *before* putting the repeater on the air, that's good spectrum management.

There's more to spectrum management than these simple measures, of course. The FCC helps hams with spectrum management duties in some bands, for example, by authorizing radiotelephone operation on some frequencies—in phone *subbands*—and not on others. (The characteristics of CW and phone signals are so different that their efficiency suffers if they're used side by side.) The expanded Novice subbands are another example of FCC-mandated spectrum management.

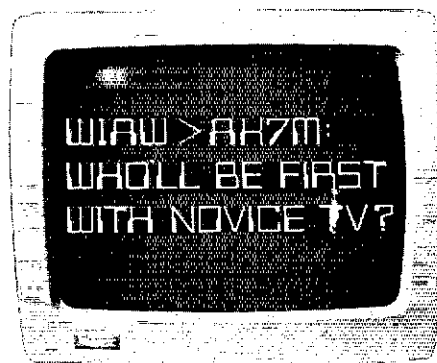
Hams help themselves practice good spectrum management, too—through informal agreements and the adoption of band plans. Informal, or "gentlemen's," agreements (those "unwritten rules" you may have heard about) among hams range from "no CW in the phone bands" (nothing in the FCC rules expressly prohibits CW operation in phone bands, but if you take a listen, you'll barely hear a CW peep on phone frequencies) to "uh-oh—it's time for the Central Area Net; let's move so we don't interfere with 'em." At the heart of most informal agreements lies a sentiment familiar to just about all of us: "Do unto others as you would have them do unto you."

Band plans are quite a step up from informal agreements because they're the result of representative democracy. The band plan process begins with large groups of radio amateurs getting together to take a good hard look at spectrum loading—how many hams are using a band for what purpose, and when. Further meetings are held, opinions are sought; committees haggle, compromises are reached. "Where do the RTTY folk fit in? How about weak-signal CW? Hmmm—repeater users need more space than *that*. What about satellites? Hey, don't forget slow-scan TV!"

If all goes well, the result is a band plan

everyone can live with. Yes, band plans aren't perfect. The democratic process behind them takes time, and it's tough to get absolutely everyone's opinion before wrapping up the final details of a plan. So, band plans sometimes lag reality a bit, especially where emergent technologies and new operating privileges are concerned. Generally, though, band plans serve us well. (The ARRL Board of Directors is one group you'll see associated with plans for a number of HF, VHF and UHF bands. The International Amateur Radio Union [IARU] is another; the ARRL is a member of the IARU.)

Okay, enough politics. What do subbands, informal agreements and band plans do for us—for *you*? Easy: By encouraging us to make structured use of our limited spectrum space, they provide us with good solid advice on where in a given band we're most likely to succeed in our operating activities. Translated, that means "more hams simultaneously doing what they want



to do with a minimum of interference."

How do you use a band plan? No problem: Just get a grasp of its details and operate in accordance with its recommendations. How can you find out the details on band plans and informal agreements covering Novice frequencies? By reading the rest of this article—because we're off on a tour of your new privileges and the band plans in effect for each Novice band.

SPECTRUM STRUCTURE, BAND BY BAND

In the following six sections, we'll cover all of the Novice bands—from 3.7 MHz right up through 1270 MHz. As we discuss each band, we'll quickly review your privileges on that band before covering whatever informal agreements and band plans you can use to enhance your operation there. (You can read the *full* details of FCC's Report and Order concerning Novice Enhancement [PR Docket 86-161] in *Happenings*, pages 64-67 of last month's *QST*.)



3700-3750 kHz (80 Meters)

Your privileges here: A1A emission (CW only) with transmitter output of no more than 200 W peak envelope power (PEP).

Informal agreements and band plans: The ARRL band plan reflects CW operation in this subband.

Comments: Even though 3700-3750 kHz is a CW-only subband in the United States, you'll often hear hams from neighboring countries operating phone here, quite legally. Respect their privileges; they respect yours. Also, when conditions are really good for DX, you may even hear nonamateur stations in the 80-meter Novice subband, because a few nonamateur radio services use 3700-3750 kHz elsewhere in the world.

7100-7150 kHz (40 Meters)

Your privileges here: A1A emission (CW only) with transmitter output of no more than 200 W PEP. (Note for Novices and Technicians in International Telecommunication Union Regions 1 and 3: *Your* 40-meter privileges are 7050-7075 kHz, A1A and transmitter output power of no more than 200 W PEP.† See the ARRL's *FCC Rule Book* for details).

Informal agreements and band plans: The ARRL band plan for ITU Region 2 (the Americas), which includes all 50 US

ITU Region 1 is Europe, Africa, all of the USSR and a portion of the Near East (Israel, for example). Region 2 is North and South America, west to Hawaii; Region 3 is most of Asia and most of Oceania.

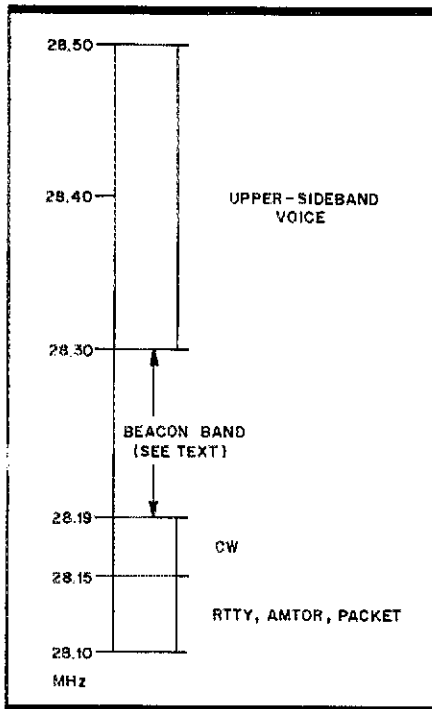


Fig 1—The ARRL band plan at 28.1-28.5 MHz. See text for discussion of how *not* to interfere with the international beacon network between 28.19 and 28.30 MHz.

states, reflects CW operation in the 7100-7150 kHz subband.

Comments: As is the case at 3700-3750 kHz, you'll often hear amateur "foreign phones" in the 7100-7150 kHz Novice subband; peaceful coexistence is the key to making this shared arrangement work. You probably don't need to be reminded of the *real* hassle in this subband: high-powered shortwave broadcasting stations. As long as these stations aren't intentionally using these frequencies to broadcast to us, they have a right to be here, too. Hint: In most places where shortwave broadcasting is allowed in the 7100-7150 kHz segment, ham operation *isn't*; this is why, for instance, you won't be able to work European CW DX in the 40-meter Novice band. Australia and New Zealand are among the countries where amateur operation *is* permitted between 7100 and 7300 kHz on the condition that no interference be caused to broadcasting. In most of the world, however, the upper end of the 40-meter amateur band is 7100 kHz.

21.1-21.2 MHz (15 Meters)

Your privileges here: A1A emission (CW only) with transmitter output of no more than 200 W PEP.

Informal agreements and band plans: The ARRL band plan reflects CW operation in this subband, with a 1-kHz-wide sliver from 21,149.5 to 21,150.5 kHz suggested for beacon operation.

Comments: As is the case at 80 and 40 meters, hams in some parts of the world may operate phone in this segment (21,150.5-21,200.0 kHz); good neighborliness makes this arrangement work. Unlike

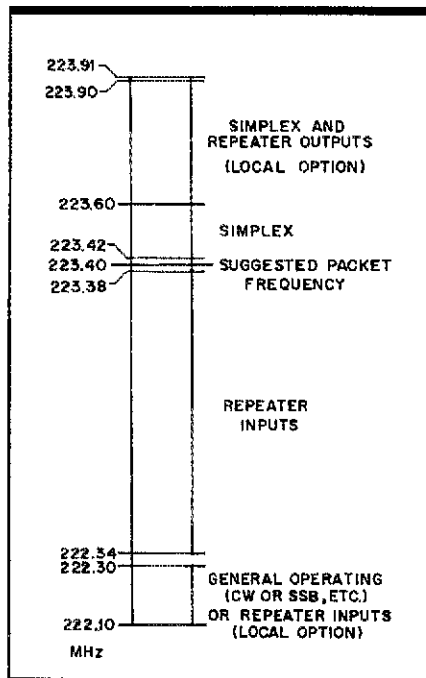


Fig 2—The band plan at 222.10-223.91 MHz. This plan is currently under review by the ARRL VHF/UHF Advisory Committee.

your lower two bands, though, 15 meters is exclusively amateur everywhere in the world, so you shouldn't have to contend with any nonamateur stations here.

28.1-28.5 MHz (10 Meters)

Your privileges here have been greatly expanded. FCC now allows you to use A1A (CW) emission over the entire subband. You've got new F1B emission (frequency-shift keying, or FSK) privileges from 28.1 to 28.3 kHz; these privileges allow you to use packet radio, AMTOR, and Baudot and ASCII RTTY. Your new 10-meter voice privileges (J3E, single-sideband suppressed-carrier phone) extend from 28.3 to 28.5 MHz. Novices and Technicians, your transmitter output power in the 28.1-28.5 MHz subband must be no more than 200 W PEP.

Band plan: See Fig 1. ARRL suggests RTTY, AMTOR and packet operation from 28.10 to 28.15 MHz, CW operation from 28.15 to 28.19 MHz, and SSB operation from 28.30 to 28.50 MHz. The ARRL 10-meter band plan also shows a new, special CW beacon band between 28.19 and 28.20 MHz; when beacons begin operating here in the future, you'll want to avoid using this segment so you won't interfere with the beacons.

Special note about 10-meter beacons: What happened to Novice CW operation from 28.20 to 28.30 MHz? At least 60 beacons worldwide are still operating here.

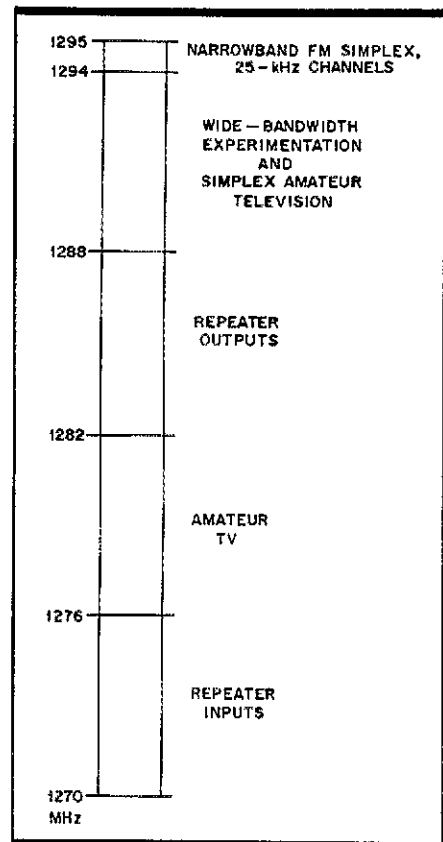


Fig 3—The ARRL band plan at 1270-1295 MHz. This band plan was adopted by the ARRL Board of Directors in 1985.

in accordance with an earlier band plan (roughly speaking, there's at least one beacon every 2.5 kHz or so throughout this range). In time—and in accordance with good spectrum management!—all of these beacons will move into the 28.190-28.225 MHz segment. Until then, ARRL recommends that you avoid operating in the 28.20-28.30 MHz segment to keep from interfering with the beacon network.

Informal agreements: Although the FCC authorizes you to use CW throughout the 28.10-28.50 MHz subband, it's best to keep your CW operation out of the FCC-authorized phone segment (28.30-28.50 MHz) and the RTTY/AMTOR/packet segment (28.10-28.15 MHz) suggested by the ARRL. This is standard (and good-neighborly) operating procedure throughout the ham bands. Concerning SSB phone operation: Although the FCC doesn't specify which sideband you should use, the amateur standard for 10-meter SSB is *upper* sideband emission. When you operate upper sideband phone on 10, be sure to keep your carrier frequency *below* 28.497 MHz so your upper sideband will be inside the Novice subband!

Comments: Because we're "at the bottom of the sunspot cycle" (sunspot minimum), propagation on 10 meters will be limited to local and regional contacts most of the time until sunspots pick up (although there were nice openings to South America and elsewhere during the March 21 weekend!). Sunspots or no, however, get ready for astounding DX on 10 meters between late April and August—that's the season for *sporadic-E propagation*. (You can learn more about sporadic-E DX in *The ARRL Handbook*.) Many superb 10-meter openings go unnoticed because everyone's listening and no one's calling—so if you tune around and you don't hear anyone, don't be bashful: *Call CQ!*

222.10-223.91 MHz (1.25 Meters)

Your new privileges here include all emission modes authorized for these frequencies by the FCC (see ARRL's *FCC Rule Book* for the complete list). Included among these are FM voice (F3E emission), SSB voice (H3E, J3E, R3E), CW (A1A), RTTY/AMTOR/packet modes (F1B), facsimile (A3F and F3F) and slow-scan television (A3C and F3C). Unlike the Novice/Technician 10-meter subband,

there are no FCC-mandated "mode" subbands in the 1.25-meter Novice band. Novices, your transmitter output power in the 1.25-meter band must be no more than 25 W PEP.

Band plan: See Fig 2. 222.10-222.30 MHz is recommended for general operating (CW or SSB, etc) or repeater inputs (local option); 222.34-223.38 MHz for repeater inputs; 223.42-223.60 MHz for FM simplex; and 223.60-223.90 MHz for simplex and repeater *outputs* (local option). How about simplex channels for FM voice? See the sidebar, "1.25-Meter FM Simplex Frequencies." (*The ARRL Repeater Directory* and *The FCC Rule Book* cover the entire 1.25-meter band plan in detail.)

1.25-Meter FM Simplex Frequencies

Here's where to look for simplex FM voice activity in the 1.25-meter Novice subband. Frequencies are given in MHz.

223.42	223.60	223.78
223.44	223.62	223.80
223.46	223.64	223.82
223.48	223.66	223.84
223.50*	223.68	223.86
223.52	223.70	223.88
223.54	223.72	223.90
223.56	223.74	
223.58	223.76	

* National simplex frequency

Informal agreements: Novice 1.25-meter SSB operation will occur just above 222.1 MHz, but in some areas there are FM repeater inputs that have been coordinated all the way down to this frequency, and it's good practice to avoid interfering with them. *Upper* sideband emission is the way to go when you use SSB at 1.25 meters. The suggested primary simplex channel for 1.25-meter packet radio operation is 223.40 MHz; for simplex FM voice, 223.50 MHz.

Comments: There's a 220-MHz article just for you this month in *QST*—see "Novices, Welcome to 220 MHz" in *FM/RPT*, page 67. One of the highlights of the 222.10-223.91 MHz subband is that Novices may participate in repeater operation here. The thing to remember is

that Novices are not allowed to operate *their own* repeaters; they may use repeaters licensed to, and controlled by, others. Hmm—what about a situation in which you, as a Novice, access a repeater input *within* the Novice subband and end up on that repeater's output frequency, *outside* the Novice subband? No problem: This is legal because the repeater transmitter is controlled by a higher-class licensee. (The place to find out the operating frequencies of 1.25-meter repeaters in your area is *The ARRL Repeater Directory*. See the ad on page 124 of this issue.) Finally, this note about 1.25-meter SSB: Although 220-MHz SSB gear was quite scarce when Novice Enhancement took effect on March 21, one manufacturer—ICOM—has just announced a new multimode 1.25-meter rig: the IC-375A. We're hoping that the excitement over Novice Enhancement will encourage more manufacturers to produce equipment capable of 220-MHz SSB operation. In other words (paraphrasing that old saying about the weather), if you don't like what's available for 220, wait a minute! (And watch *QST* for news.)

1270-1295 MHz (23 Centimeters)

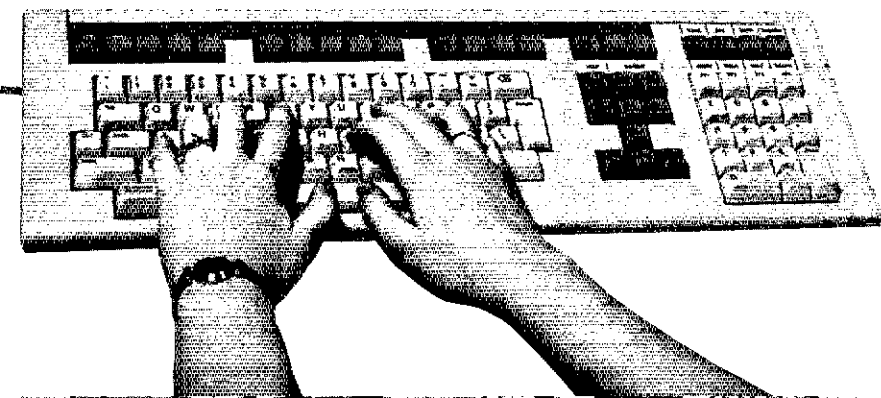
Your new privileges here include all emission modes authorized for these frequencies by the FCC (see ARRL's *FCC Rule Book* for the complete list). Included among these are FM voice (F3E emission), SSB voice (H3E, J3E, R3E), CW (A1A), RTTY/AMTOR/packet modes (F1B), facsimile (A3F and F3F) and slow-scan TV (A3C and F3C). Unlike the 1.25-meter Novice subband, *fast-scan* TV (A3C and F3C) is allowed at 23 centimeters, too. As is the case at 1.25 meters, there are no FCC-mandated "mode" subbands in the 23-centimeter Novice subband, but hams have stepped in with a band plan of their own (see below). Novices, your transmitter output power at 23 centimeters must be no more than 5 W PEP.

Band plan: See Fig 3. ARRL recommends 1270-1276 MHz for repeater inputs; 1276-1282 MHz for amateur television (ATV); 1282-1288 MHz for repeater outputs (paired with 1270-1276 MHz); 1288-1294 MHz for wide-bandwidth experimental work and simplex ATV; and 1294-1295 MHz for narrow-bandwidth FM simplex with channels every 25 kHz. The national FM simplex calling frequency for 23 centimeters is 1294.5 MHz. (You can get a detailed look at the entire 1240-1300 MHz ARRL band plan in *The ARRL Repeater Directory* and *The FCC Rule Book*.)

WHAT'S NEXT?

Well, stay tuned! Next month in *QST*'s Novice Notes: "Plain Talk About Voice Operating." See you then.

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



Emergency Mathematics in Eugene, Oregon

Where 147.86/26 equals "911."

By Gene Williamson, K7DBV

2160 Fairway Loop
Eugene, OR 97401

Imagine this situation: It's noon on a blistering August day. You and two friends are at the 8000-foot level of the North Sister Mountain, and have been climbing since 4 AM. Having reached the peak, you're on your way down when you meet another climber. He asks you to take a look just down the trail at a woman climber who is sick.

Fifteen minutes later, you reach the woman. She's unable to walk or talk, and there's no material with which to make a stretcher. It can't be altitude sickness, as she's just barely able to let you know she hasn't felt well for some time.

If you're Jerry Mohler, WA7QJC, to whom this happened in 1985, you have the answer. In your pack—secreted away, so you don't spoil the ambiance of being all alone in the wilderness—is a 2-meter hand-held radio. You reach for it, only to discover the battery's dead—it was switched on somehow in the pack. All that's left to power a call for Search and Rescue is that clunker of a spare battery that's been kicking around in your pack all summer—and you'll be calling through a repeater 80 line-of-sight miles away.

Sound like an impossible situation? Well, it's not—thanks to a group of Eugene and Springfield, Oregon, hams in the W7LVN Repeater Association. They've built a commercial-grade, computer-assisted repeater (W7LVN/R) dedicated to emergency services. And it works.

"We wanted a repeater that would be nonpolitical, and dedicated to emergency service."

—Jim Walsh, W7LVN

Jim Walsh has held W7LVN—and been an active Eugene ham—since 1946. Over the years he's been active in both SSB and SSTV, building some of the first gear in the



Jim Walsh, W7LVN (left), and Mac Allison, WB7OKL, guide the W7LVN Repeater Association. Their repeater is not a toy—it's very much a tool for emergency services.

area for both modes. In the mid-1970s, Jim was struck with another one of the ideas for which he is "famous": putting together the best phone patching capabilities that could be provided for hand-held rigs.

To him, that meant a ham with a hand-held should be able to access an autopatch from anywhere in the Eugene/Springfield metropolitan area of some 150,000 people. A lot of time, effort and money—combined with the help of many local hams—have made Jim's dream more than come true. And it's getting better every day.

First, the human element. Four control operators—W7LVN himself, WB7OKL, K7OLN and WA7QPC—monitor the repeater on a very closely coordinated, overlapping schedule. When you talk to local hams who've used the repeater in critical situations, time and again you hear "the control operator was right there." These four have also worked together to divide up duties associated with maintaining the repeater, and all four have helped coordinate with local emergency service organizations.

For example, the Eugene Red Cross headquarters is also the site of W7PXL, Eugene's Valley Radio Club hamshack. A cross-section of local hams assists the Red Cross in various emergency situations. The

W7LVN repeater is always made available to those participating in exercises or actual events—just as it's always available to anyone passing through the service area.

W7LVN/R has coordinated operations with the Lane County Sheriff, primarily for search-and-rescue efforts. The repeater is invaluable in filling gaps in the Sheriff's radio coverage of the county. Lane County includes a total area of some 4600 square miles of every terrain, from sandy ocean beaches to heavily wooded mountains.

But the real day-to-day use of the repeater is in obtaining immediate emergency contact with the local 911 Emergency Center. Operators at 911 have been briefed on working with hams calling in on autopatch. They now know that should a ham hang up, he or she can't be called back—even with emergency equipment that automatically locks onto the calling number. And they know that whatever time of night or day an emergency occurs, a W7LVN/R control operator will come on the line quickly to keep the calling ham on frequency until help arrives.

"This is an open repeater, but it's run as a controlled oligarchy."
—Mac Allison, WB7OKL

When W7LVN began putting the current repeater together in 1979, he relied heavily on WB7OKL for technical assistance. He still does. WB7OKL first found a Johnson business-band mobile radio, which provided the beginning of what was soon a commercial-grade system. The hardware is located on Blanton Hill, a 1300-foot rise just south of Eugene. This hill is also home to a half-dozen 100,000-watt-plus FM transmitters, various land mobile users and a Channel 13 television transmitter. The repeater's antenna, in fact, is mounted at the 200-foot level on the same tower as the

television station's transmitting antenna. It's a very severe RF environment, to say the least.

Fortunately, WB7OKL says the Johnson radio contains receiving circuits as fine as any he's seen. The receiver, for example, has cascade FETs in the front end and mixer, as well as helical resonators. That was gross overkill for a "taxi" radio, but very necessary for this repeater. Two cavities in series were also added to act as band-pass filters as well as to provide some preselection.

Once the transmitter and receiver were set up and operating, a duplexer was constructed and the repeater went to using a single antenna. In 1980, a very important wrinkle was added: WB7OKL began writing down everything that was done to the repeater. Documenting all the parameters of operation is crucial. WB7OKL says he lost valuable time in the early going by not documenting everything carefully.

You might imagine that a 2-meter antenna could degrade very quickly in the weather at 1500 feet above sea level. And you'd be very right. First, aluminum compression joints in any antenna system immediately begin to oxidize. This quickly leads to junction rectification (the slightest loose connection acts as a diode in the presence of megawatts of RF) and results in "garbage" in the receiver. Mac went through three different amateur antennas—and discussed his problems with several commercial operators—before finding an antenna system that works like gangbusters.

Since June 1985, W7LVN/R has used a commercial antenna that was custom built—virtually handmade—for their exact system frequency by Scala Electronic Corporation of Medford, Oregon. The Scala is a stacked array that's completely welded with no exposed phasing harnesses or compression clamps. It took a dozen hams from 7 AM to 4:30 PM on a Saturday in June to install it at 200 feet, fed with 7/8-inch Hardline. And the intermod problems have gone away.

If control operators and users are the soul of a repeater's daily usefulness, the heart of the W7LVN repeater is the microprocessor silicon chips of an Advanced Computer Controls, Inc RC-850 computer controller. This controller was reviewed in February 1984 *QST* (page 43). It adds enormous sophistication to any repeater's services.

Briefly, the ACC RC-850 includes three distinct autopatch functions: dialing of emergency numbers programmed into the microprocessor, automatic dialing of up to 90 preprogrammed telephone numbers, and a regular autopatch. Members of the W7LVN Repeater Association are given one of the 90 numbers in the user bank, and can then dial one frequently called number using only one or two digits on their tone pad. "Cover tones" are generated by the



Dialing the 911 Emergency Center from anywhere in the 150,000-population combined metro areas of Eugene and Springfield, Oregon, takes only a hand-held radio when you use the W7LVN 147.86/26 repeater. Here, Jim Walsh, W7LVN, demonstrates his repeater's functions outside the Emergency entrance of Eugene's Sacred Heart General Hospital.

RC-850 to prevent listeners from reading the dialed number, thus protecting unlisted numbers. Additional features include paging capability, message storage and readback, telemetry response and tone pad testing.

Dialing 911 is a critical function of this system. But what do you do when the 911 system goes down? Other sequential numbers have been programmed—912, for example, for the Eugene Police Department; 913, Eugene Fire; 914, Oregon State Police; and so on. The hardware and firmware are programmed to help . . . just as the control operators are.

"It looked like someone small who didn't belong near the highway. When I circled around, I realized he'd been hit."—John Cuff, W7KUT

W7KUT can tell you exactly how helpful control operators can be in an emergency situation. John was driving on a four-lane freeway just north of Eugene, at night, when he noticed someone who'd been struck by another auto. Punching up the repeater frequency, he immediately was contacted by a control operator who called the police. "I was really shaken up," John says, "but everybody on the frequency stayed calm, and the police arrived right away."

The secret to W7LVN/R's control ops is more than just informal scheduling. Each control operator also carries a pager, and all pagers are activated whenever the 911 emergency number is dialed. Paging of a control operator can be done also by the repeater controller when a system-user dials the proper code numbers. Additionally, every 911 call, along with all regular autopatch telephone calls, is taped automatically.

"My batteries were too low to bring up the tones. But a control operator came right on, and the rescue people were there within three minutes."—Ed Watkins, KA7TWC

KA7TWC was sailing his boat on a reservoir west of Eugene when a friend who was on the boat appeared to suffer a heart attack. Fortunately, Ed was near the dock—he could have been as much as an hour out in the middle of the water. But with his hand-held radio and the help of an on-the-spot control op—rescue people were called and arrived dockside to help his passenger in three minutes.

The dream of hand-held autopatch anywhere in town has come true—from a lake, the mountains or a highway north of the city. The repeater was used also to summon police to a busy downtown street corner

when a small, lost child was spotted wandering out into traffic.

Even more enhancements are on the drawing board. For example, Lane County stretches some 120 miles from east to west. And it can have everything from flooding in the west to snow in the east at the same time. So, down the road we will be linking with coastal and mountain repeaters for full, uninterrupted coverage of this second-most-populous county in Oregon.

Also, plans are being made to add an emergency locator transmitter (ELT) receiver to the system. And a recent repeater addition allows monitoring of wind speed and direction at the repeater site. It will be input to the controller, and be available via digitized speech to anyone entering the correct tones. A repeater system can be used as a tool or a toy. The W7LVN group has chosen to make theirs a tool for emergency services.

The support of a lot of local hams keeps the W7LVN repeater operational; some 90 are now members—at \$15 per year dues—of the Repeater Association. It's a loose-knit organization—open and nonpolitical—so that anyone, anytime, is welcome to use the machine. And anyone locally who uses it frequently will be invited eventually by friendly letter to join and help support its activities.

All those people are involved in other ways as well: antenna parties, for instance,

when we need Hardline and an antenna 200 feet up a tower. Technically proficient people are a must when building and maintaining a repeater such as this. Micro-processors won't help a technically bad system. Plus, if our controller ever goes down, we won't have a repeater at all.

Some things to consider if you want to build—and run—a repeater system like the W7LVN machine are:

- Set good rules and follow them. Document every trip to the repeater site and any adjustments made to the machine. And be sure a minimum of two people go each time any work is done.

- Don't do things democratically. Keep your repeater as open as you like to as many people as you want, but limit the decision-making powers to a very few key individuals.

- Above all, watch out very carefully for gray areas in operating today's generation of very sophisticated controllers. Uses such as "reverse patches" and "beacon IDs" could be very legal, but they are also prime candidates for abuse or outright illegality. Take heed when the manual states, "WARNING: Some or all of these uses may not be legal in the Amateur Service."

What is always desirable in Amateur Radio, of course, is the saving of life and property. WA7QJC's experience while mountain climbing fortunately has a very happy ending. Thanks to the W7LVN

repeater and an on-the-spot control operator, and the 911 Emergency Centers of two counties, a rescue helicopter was dispatched to airlift the stricken woman to a nearby hospital. Because of such quick action, the woman climber's medical problems were attended to quickly enough to spare her a lifelong need to be on medication.

"It gives me a real sense of well-being when I'm climbing to know everybody's right there with me."—Jerry Mohler, WA7QJC

The woman thanked WA7QJC in a subsequent letter, but others "own" a share of that thanks: The dedicated crew of control operators and Repeater Association members who are always there on 147.86/26. They're the ones who "always listen for weak signals and help them out."

Because this machine's a tool...not a toy.

Amateur Radio Call Signs

Amateur radio operators often ask the FCC what call signs have been assigned lately. This list shows the last call sign in each group to be assigned for each district, as of the first of March 1987.

For more information about the call-sign assignment in the Amateur Radio Service, see Section 97.51 of the FCC Rules, or write to the FCC, Consumer Assistance Branch, Gettysburg, PA 17326.

Radio District	Group A	Group B	Group C	Group D
	<i>Am Extra</i>	<i>Advanced</i>	<i>Tech/Gen</i>	<i>Novice</i>
0	NX0A	KE0LN	N0HTN	KA0ZMI
1	NJ1F	KC1CV	N1ERB	KA1PQM
2	NV2W	KD2YL	N2GZO	KB2CPS
3	NF3M	KD3BB	N3FIT	KA3RAL
4	AA4ZK	KK4HQ	N4POT	KB4YAE
5	WV5R	KF5VK	N5KGB	KB5CDN
6	AA6BG	KI6PY	N6OZB	KB6QGR
7	NZ7I	KE7YD	N7JAU	KB7ATH
8	NV8Q	KE8KA	N8IBS	KB8BIJ
9	NQ9Y	KE9CR	N9GII	KA9WVC
N Mariana Is	AH0E	AH0AC	KH0AI	WH0AAG
Guam	KH2A	AH2BP	KH2CL	WH2AKT
Johnston Is	AH3A	AH3AC	KH3AB	WH3AAC
Midway Is		AH4AA	KH4AD	WH4AAF
Palmyra, Jarvis Is	AH5A			
Hawaii		AH6HQ	NH6IJ	WH6BOV
Kure Is			KH7AA	
Amer Samoa	AH8C	AH8AC	KH8AD	WH8AAW
Wake Wilkes Peale		AH9AC	KH9AD	WH9AAF
Alaska		AL7IV	NL7KE	WL7BNF
Virgin Is	KP2R	KP2BD	NP2CA	WP2AFK
Puerto Rico	WP4X	KP4MF	WP4DI	WP4GUA

Exam Info

HOW MANY QUESTIONS ON EACH SUBJECT?

Novice Enhancement is, of course, old news by now. However, don't be surprised when you take your written test; new standards included in the docket affect how *all* written exams are designed. Here's a bare-bones table for you to use in figuring how many questions from each subelement will be on your test (as administered by ARRL/VEC teams):

Topic	Element				
	2	3A	3B	4A	4B
A—Rules and Regulations	9	5	4	6	8
B—Operating Procedures	2	3	3	1	4
C—Radio Wave Propagation	2	3	3	2	2
D—Amateur Radio Practices	4	4	5	4	4
E—Electrical Principles	4	2	2	10	6
F—Circuit Components	2	2	1	6	4
G—Practical Circuits	2	1	1	10	4
H—Signals and Emissions	2	2	2	6	4
I—Antennas and Feed Lines	3	3	4	5	4

Total questions 30 25 25 50 40
 Number correct needed to pass (74%) 22* 19 19 17 30

*This is slightly below the 74% required by the FCC for passing a Novice written test. However, the FCC has stated that they will accept 22 questions correctly answered as a passing grade.

For more information on the Novice Enhancement docket, please refer to "Novice Enhancement: New Test Procedures Start Now!" April 1987 *QST*, or contact the ARRL/VEC, 225 Main St., Newington, CT 06111.

FCC Grants ARRL Request for Extension in 220-MHz Docket; May 21 is New Comment Deadline

As first reported in last month's League Lines and editorial, on March 4 the ARRL filed with FCC a motion to extend the comment period an additional 45 days in Docket 87-14, which proposes to take away 220-222 MHz from the Amateur Service. The comment period was to end April 6, but the FCC granted the extension to May 21, with reply

comments due by June 19.

In support of its motion, the ARRL noted that in most rule-making proceedings affecting Amateur Radio, FCC gives a 90-day comment period to permit technical data to be gathered and submitted and to allow time for the amateur press to publicize the proposal. In this case, FCC allowed only a 45-day comment period. The FCC proposal

was also available only after the April deadline of many amateur publications and, thus, some amateurs are not aware of its details. Also, in order to prepare a meaningful response, additional time was needed for ARRL to receive and compile data of band occupancy from local volunteer frequency coordinators.

FCC DENIES RADIO READING SERVICES 220-MHz PETITION

The FCC has denied a petition for rule making, RM-5435, filed by the Association of Radio Reading Services (ARRS). This petition had requested reallocating 500 kHz of the amateur 220-225 MHz band to the radio reading services for the blind and print handicapped.

The ARRL had filed comments stating that the ARRS-proposed use of the band was not consistent with the international and domestic allocations table, because radio reading services are not fixed or mobile services but are more closely akin to broadcasting. The ARRL said that the ARRS did not realize the high cost of establishing and operating new radio stations when the ARRS can find channels available to them via cable systems and subcarriers on broadcast FM stations. In addition, the high level of amateur occupancy of the band makes it impossible to share a segment of the band with a broadcast-type service.

The FCC commented that "FM subcarriers would appear to be well-suited for radio reading services" and, that with the addition of new FM radio broadcast stations and the "growth in alternative media," such as cable television, there should be a growing number of outlets for the ARRS to use.

The FCC agreed with ARRL's comments concerning the high costs of the ARRS establishing and maintaining its own radio stations on the 220-MHz band, and said the ARRS had not taken them into account in their petition.

For these reasons, FCC said the 500 kHz the ARRS had sought was better used in the amateur, fixed and mobile radio services and denied the ARRS petition on January 30.

FCC ALLOWS LOW-POWER GUARD SYSTEMS ABOVE 54 MHz

In General Docket 85-231, the FCC proposed to allow nonlicensed operation of perimeter-protection systems in 54-72 and 76-88 MHz. Presently, only systems operating at 40.68 MHz are permitted. These systems

are designed to detect the movement of objects or persons around facilities such as prisons and nuclear power plants. The protection system consists of leaky cables that constantly emit a radio frequency field and are placed around an area under surveillance. When an object or person enters the field, changes in the energy levels of that field occur, and an alarm is activated when these changes are detected by the system.

Since the protection system must be able to discriminate between different sizes of objects or persons, its most efficient operating range in the frequency spectrum is 30-100 MHz. At frequencies below 30 MHz, the system's sensitivity to humans decreases. On frequencies above 100 MHz, the system becomes too sensitive to small animals, and the signal loss of the cable becomes significant.

This docket is of interest to the amateur community because the company that had petitioned for the rule making, Control Data Canada Ltd, had requested access to the entire 50-88 MHz range, thus posing a threat of interference to amateurs in the 6-meter band. The Commission considered that operation in the 50-54 MHz and 72-76 MHz bands was not feasible due to the characteristics of the telecommunications services that already share these bands, such as Amateur Radio, radio astronomy and aeronautical radio navigation. These services are prone to interference from the operation of perimeter protection systems due to the very weak signals used by the Amateur Service and other services. The FCC had amended the proposal to protect amateurs and other services

by restricting the system to 54-72 MHz and 76-88 MHz. The ARRL filed comments supporting the FCC's version.

The FCC Order not only restricts the frequencies to be used, but also requires type acceptance and denotes some guidelines for installation of the system. In short, this rule making should pose no interference threat to the Amateur Service.

ART COLLINS, W0CXX, SK

Arthur "Art" Collins, W0CXX, founder of the Collins Radio Company, died February 25 at age 77. First licensed as a radio amateur in the 1920s, Collins in 1931 formed the Collins Radio Company, which built quality transmitters principally for radio amateurs. When Admiral Byrd planned his 1933 expedition to the Antarctic, Collins was selected to build Byrd's transmitters.

There were two key inventions by Collins that helped make his transmitters superior to any other commercial manufacturer: the Autotune, a device that enabled the transmitter to be tuned instantly, and the permeability tuned oscillator (PTO), which provided for transmitter stability.

In the 1930s, Collins began building transmitters for Braniff Air Lines, placing the company as a leading supplier of avionics equipment. By the 1970s, it was estimated that Collins equipment was used for communications or navigation by many of the world's airlines.

Prior to WW II, the Collins Company won major US Navy contracts, which launched the company into large-scale electronic produc-

Goldwater Applications Due

Applications for the \$5000 Senator Barry Goldwater Scholarship must be completed and received at HQ no later than June 1. In order to apply, an applicant must be a radio amateur and have been accepted for full-time enrollment in at least a baccalaureate degree program related to communications in an accredited institution of higher education. For further information and application forms, contact the ARRL Foundation at HQ.

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West Gulf Division—Bennett L. Basore, W5ZTN, 924 Will Rogers Dr, Stillwater, OK 74074.
Board Liaison—Paul Vydareny, W82VUK, 259 N Washington St, N Tarrytown, NY 10591-2314.

tion. During WW II, there was Collins communications equipment on most Navy ships. Collins transmitters aboard the *USS Missouri* were used to broadcast the V-J Day surrender ceremonies.

To radio amateurs, the Collins Radio Company is best associated with its early work with single sideband. In 1955, its KWS-1 was virtually the first commercially manufactured SSB transmitter. For decades, Collins equipment was the "top of the line" amateur equipment, and it was a dream-come-true for many amateurs to own it.

During his life, Art Collins was given a number of awards and honors, including the Navy Distinguished Public Service Award, the highest award the Navy can grant to a civilian, the Armstrong Medal from the Radio Club

of America, the David Sarnoff Award from the Armed Forces Communications and Electronics Association, the Outstanding Achievement Award from the American Electronics Association and three honorary Doctorates of Engineering.

After leaving Collins Radio Company in 1971, Collins formed a research-and-development firm in Dallas, where he continued his contributions to the electronics industry.

CRUNCH!! CRUNCH!!

Crunch!! That's the sound of over 400 illegal CB amplifiers being shredded into a pile of scrap metal on March 9 in Charlotte, North Carolina. The amplifiers had a black-market

value of over \$140,000 and were seized by the FCC as part of an investigation against a CB-amplifier manufacturer in Shelby, North Carolina. After a guilty plea by the manufacturer in Federal Court, the amplifiers were forfeited to the US Government. Since there is no legitimate use for the illegal amplifiers, the government destroyed them.

BOSTON FCC FIELD OFFICE MOVES

It's the end of an era for New England amateurs: the FCC Field Office in Boston has vacated its premises. The "1600 Customhouse" address at the corner of India and State Streets is well-known to New England amateurs; the first examinations were administered there in 1913! The new

address is NFPA Building, Batterymarch Park, Quincy, MA 02169, tel recording number 617-770-3922, public number 617-770-4023. Office hours are from 8 AM to 4 PM.

The office of the Boston Regional Director is located at the same site; the phone number is 617-770-4325.

FCC DECERTIFIES METROPLEX VEC

The FCC has cancelled the certification of the New York-based Metroplex group as a Volunteer Examiner Coordinator. Metroplex had been certified as a national VEC, but had never held examinations outside of the second call area. The revocation was caused by delays in forwarding examinations to the Commission and failure to respond to Commission correspondence.

NEW BSA RADIO PAMPHLET

The new edition of the Boy Scouts Radio Merit Badge pamphlet, written by Mike Brown, WB2JWD, and edited by HQ, is now slated for distribution in the late spring, according to the BSA. It will contain the new Novice Enhancement changes. Hopefully, the pamphlet will be on the shelves at the local BSA Council Offices for the summer activity season. If anyone's looking for the new pamphlet, it will have a 1987 copyright and be labeled "Radio Merit Badge—1987 Edition" on the title page.

KENWOOD MOVES TO NEW FACILITY

Trio-Kenwood has expanded and moved into new facilities. The new building spans more than 10 acres in Carson, California and provides over 232,000 square feet of office and warehouse space for all three of its divisions employing 200 people. Previously, its divisions were housed in separate offices. (Amateur equipment is part of Kenwood's Communications Products Division.) The new office is located at 2201 East Dominguez St, Carson, CA 90810. The telephone number remains 213-639-9000.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Southern Texas, Colorado, San Francisco, Sacramento Valley, Los Angeles, Georgia, West Virginia and Washington sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

Petition forms (FSD-129) are available on request from the ARRL Headquarters but are not required. The following is suggested:

(Place and date)

Field Services Manager, ARRL
225 Main Street, Newington, CT 06111

We, the undersigned Full members of the . . . ARRL Section of the . . . Division, hereby nominate as candidate for Section Manager for this Section for the next two-year term of office.

(Signature . . . Call . . . City . . . ZIP . . .)

Are You a Lawyer? Amateur Radio Wants You!

Your legal expertise is needed in the Amateur Radio community to help build and maintain the legal foundations for our hobby. The League's Volunteer Counsel (VC) Program is designed to help stem the tide of overly restrictive regulations on Amateur Radio. You can help if you have an interest in this exciting area of communications law, are a reputable member of the bar of at least one state and are a League member, please contact us. As a Volunteer Counsel, you will be kept well informed about areas of law affecting Amateur Radio. For further information, write to the ARRL Volunteer Counsel Program, 225 Main St, Newington, CT 06111.

If you live in one of the following ARRL Sections, your legal experience is especially needed: Alaska, Arkansas, North and South Carolina, North and South Dakota, North Florida, Idaho, Maine, Mississippi, Montana, Nevada, Utah and West Virginia.

Any candidate for the office of Section Manager must be a resident of the Section, a licensed amateur of Technician class or higher, and a Full member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination.

Petitions must be received at Headquarters on or before 4 PM Eastern Local Time, June 5, 1987.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before July 1, 1987. Returns will be counted August 18, 1987. SMs elected as a result of the above procedure will take office October 1, 1987.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 1987.

If no such petitions are received for a Section by their specified closing date, such Section will be resolicited in October QST. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by the Field Services Manager.

You are urged to take the initiative and file a nomination petition immediately.

Richard K. Palm, K1CE
Field Services Manager

SECTION MANAGER ELECTION RESULTS

Balloting Results: In the Arkansas Section, Joel M. Harrison, WB5IGF, received 361 votes and Nelson Bailey, K5TML, received 182 votes. Mr Harrison was declared elected.

In the Iowa Section, Wade Walstrom, W0EJ, received 320 votes and Rollin J. Sievers, WB0AVW, received 307 votes. Mr Walstrom was declared elected.

In the Kentucky Section, John A. Thernes, WM4T, received 225 votes, Dale Bennett, WA4JTE, received 197 votes and Jack T. Wilson, WA4SAC, received 123 votes. Mr Thernes was declared elected.

In the Mississippi Section, James N. Davis, KK5Z, received 235 votes and J. H. "Hank" Downey, K5QNE, received 200 votes. Mr Davis was declared elected.

In the Montana Section, Kenneth G. Kopp, K0PP, received 142 votes and A. F. "Pete" Peters, KF7R, received 121 votes. Mr Kopp was declared elected.

The two-year term of office of the above newly elected Section Managers began April 1, 1987.

The following Section Managers will begin a two-year term of office on July 1, 1987:

Uncontested

San Joaquin Valley	Charles P. McConnell, W6DPD
Nevada	Joseph D. Lambert, W8IXD
Utah	James Brown, NA7G

SECTION MANAGER APPOINTMENT

Oscar "Gene" Smith, AE5I, has been appointed Section Manager of the West Texas Section for the interim period until the newly elected SM takes office on July 1, 1987.

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 52	Major ARRL Operating Events and Conventions—1987	Jan 1987, p 57
Club Contest Rules	Jan 1987, p 81	New Tech/General Written Exams	Apr 1987, p 29
DX Contest Awards Program	Feb 1987, p 82	Novice Enhancement Report and Order	Apr 1987, p 64
Element 2 Question Pool, New and Revised Questions, Answers	Apr 1987, p 23	QSL Bureaus Incoming	Dec 1986, p 57
Frequency/Mode Allocations	Apr 1987, p 70	Outgoing	Mar 1987, p 67
Golden Jubilee of DXCC Award	Sep 1986, p 60	Reciprocal-Operating Agreements	Dec 1986, p 53
Hamfest Calendar Rules	Sep 1986, p 84	Terrestrial World DX Records (50 MHz-47 GHz)	Mar 1987, p 78
Ham Radio-Related Landline BBSs	Nov 1986, p 58	Third-Party-Traffic Agreements	Dec 1986, p 53
HF World Championship Rules	Apr 1987, p 88	220-MHz Band NPRM	Apr 1987, p 16
License-Renewal Information	Apr 1987, p 70		

AUDITED ARRL FINANCIAL STATEMENTS RELEASED

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

BALANCE SHEET

(Continued)

The audited financial statements reprinted below set forth the League's financial condition as of December 31, 1986, as compared to a year earlier. The statements show an after-tax net gain of \$8,676 on total revenues of \$7,384,174 for the calendar year 1986.

The financial statements and supplementary financial information will appear in the 1986 *Annual Report*, which will be available in July. Affiliated clubs that return the request form sent to them in April will be receiving a copy of the *Annual Report* as soon as it is received from the printer; members may obtain a copy for a \$1 postage and handling fee.

	December 31,	
	1986	1985*
Regular portfolio marketable securities, at cost	2,137,400	2,223,903
Land, buildings and equipment, net of accumulated depreciation	902,591	1,019,094
Other assets	66,784	56,701
	<u>\$8,550,181</u>	<u>\$8,722,067</u>
Liabilities and Fund Balance		
Current liabilities:		
Payable for publishing	\$ 184,963	\$ 411,987
Accounts payable - other	116,191	155,036
Accrued liabilities	413,483	397,733
Deferred membership fees and subscriptions - current portion:		
Life members	331,668	323,000
Term members	1,425,371	1,394,404
Mortgage note payable	5,477	32,428
Total current liabilities	2,477,153	2,714,588
Deferred membership fees and subscriptions - non-current portion:		
Life members	3,646,475	3,534,351
Term members	267,189	413,343
	3,913,664	3,947,694
Due to life membership assets	313,642	234,081
Mortgage note payable	-	5,477
Borrowings under life insurance policy	36,500	36,500
Contributions restricted by donors	74,882	58,063
Total liabilities	6,815,841	6,996,403
Fund balance:		
Designated for Visitors' Center	85,000	-
Undesignated	1,649,340	1,725,664
Total fund balance	1,734,340	1,725,664
	<u>\$8,550,181</u>	<u>\$8,722,067</u>

*Reclassified to conform to 1986 presentation.

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

STATEMENT OF REVENUES, EXPENSES AND CHANGES IN FUND BALANCE

	Year ended December 31,	
	1986	1985
Advertising revenue	\$1,933,345	\$1,969,139
Publications sales	1,975,664	1,845,474
Less: Sales, returns, allowances, discounts and credit card collection charges	64,898	70,778
Net sales of publications	1,910,766	1,774,696
Membership dues and subscriptions to QST magazine:		
Term members	2,637,435	2,523,529
Life members, including net investment income of \$189,995 and \$204,459 in 1986 and 1985, respectively	312,804	324,264
Total membership dues	2,950,239	2,847,793
Interest, dividend and royalty income	177,525	228,246
Membership supplies sales	139,872	140,646
Examination fees	99,625	96,064
Contributions	97,419	3,732
Gain on sale of investments	42,552	6,346
Overseas QSL service income	21,242	21,996
Other	11,587	6,170
	<u>3,540,063</u>	<u>3,349,993</u>
Total revenues	7,384,174	7,093,828
Expenses:		
Operating expenses	6,998,053	6,744,139
Administrative expenses - other expenses authorized by the Board of Directors	177,445	321,733
Total expenses	7,175,498	7,065,872
Excess of revenues over expenses	8,676	37,956
Fund balance beginning of year	1,725,664	1,697,708
Fund balance end of year	<u>\$1,734,340</u>	<u>\$1,725,664</u>

See accompanying notes to financial statements.

One Financial Plaza
Hartford CT 06103

Telephone 203 525 4600

Price Waterhouse



March 6, 1987

To the Board of Directors of
The American Radio Relay League,
Incorporated

In our opinion, the accompanying balance sheet and the related statements of revenues, expenses and changes in fund balance and of changes in financial position present fairly the financial position of The American Radio Relay League, Incorporated at December 31, 1986 and 1985, and the results of its operations and changes in its fund balance and financial position for the years then ended, in conformity with generally accepted accounting principles consistently applied. Our examinations of these statements were made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

Our examinations were made for the purpose of forming an opinion on the basic financial statements taken as a whole. Schedules I-III are presented for purposes of additional analysis and are not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the examinations of the basic financial statements, and in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

Price Waterhouse

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

BALANCE SHEET

	December 31,	
	1986	1985*
Assets		
Current assets:		
Cash (including time deposits of \$300,000 and \$200,000 in 1986 and 1985, respectively)	\$ 578,547	\$ 739,501
Accounts receivable (less allowance for doubtful accounts of \$26,500 in 1986 and 1985)	413,710	378,900
Accrued interest receivable	49,995	59,793
Inventories	288,694	341,140
Prepaid expenses	65,398	45,684
Total current assets	1,396,344	1,565,018
Life membership assets:		
Marketable securities, at cost	3,656,770	3,542,374
Due from current operations	313,642	234,081
Accrued interest receivable	65,235	76,315
Life membership plaques	11,415	4,581
	<u>4,047,062</u>	<u>3,857,351</u>

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
STATEMENT OF CHANGES IN FINANCIAL POSITION

Year ended December 31,
1986 1985

Cash and time deposits were provided by (used for):		
Operations:		
Excess of revenues over expenses	\$ 8,676	\$ 27,956
Items not requiring or providing cash:		
Net gain on sale of investments	(42,552)	(6,346)
Depreciation	208,376	265,798
(Increase) (decrease) in other assets	(10,083)	(11,587)
Decrease (increase) in receivables	(25,012)	68,727
Decrease (increase) in prepaid assets	(19,714)	3,449
Decrease (increase) in inventory	52,446	(99,481)
(Increase) in other life membership assets	(75,315)	(174,863)
Increase (decrease) in current liabilities	(210,484)	317,259
Increase in due to life membership assets	79,561	186,146
Increase (decrease) in deferred membership fees and subscriptions - non-current portions:		
Term members	(146,154)	75,482
Life members	112,124	92,870
Net increase in contributions restricted by donors	16,819	5,604
	<u>(50,312)</u>	<u>751,014</u>
Financing activities:		
Repayment of debt	<u>(32,428)</u>	<u>(29,573)</u>
Investing activities:		
Net proceeds (purchases) of investments		
Regular portfolio	129,055	(1,018,190)
Life Membership Portfolio	<u>(114,396)</u>	<u>100,639</u>
	<u>14,659</u>	<u>(917,551)</u>
Additions to furniture and equipment	<u>(92,873)</u>	<u>(130,082)</u>
Decrease in cash and time deposits	(160,954)	(326,192)
Cash and time deposits, beginning of year	<u>739,501</u>	<u>1,065,693</u>
Cash and time deposits, end of year	<u>\$578,547</u>	<u>\$ 739,501</u>

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
NOTES TO FINANCIAL STATEMENTS

NOTE 1 - ORGANIZATION AND SIGNIFICANT ACCOUNTING POLICIES:

The American Radio Relay League, Incorporated (The League) is a not-for-profit, tax-exempt organization formed to promote interest in amateur radio communication and experimentation. The League publishes documents, books, magazines, newspapers and pamphlets necessary or incidental to its purpose.

The following is a summary of significant accounting policies consistently followed in the preparation of the League's financial statements.

Income Recognition

Revenue from term membership fees and subscriptions is recognized to the extent of acquisition costs when memberships and subscriptions are received. The remaining portion is recognized in revenues on the straight-line basis ratably over the applicable membership or subscription period.

The League recognizes income on donated capital based on the fair market value of the item at the date of donation.

Deferred Life Membership Fees

The by-laws of the League provide for a paid-up life membership in the League for a fee of twenty-five times the annual dues rate. Life membership dues are invested in assets segregated from the regular portfolio. The dues and interest earned on these segregated investments are deferred and recognized in income over the estimated life expectancy of the respective members (approximately 34 years). The amount recognized over the estimated life expectancy is representative of the cost to the League of servicing the life memberships.

Income Tax

The League is exempt from federal and state income taxes under Section 501(c)(3) of the Internal Revenue Code. The League is subject to any federal income tax due as a result of unrelated business income arising primarily from advertising in the QST Magazine.

Investments

Marketable securities are carried at cost. The League intends to hold fixed income securities until maturity, and as a result does not provide for a reduction in the carrying value of the investment portfolio for any excess of book value over the estimated market value.

Inventories

Inventories are carried at the lower of cost or market, cost being determined using the first-in, first-out method.

Land, buildings and equipment

Land, buildings and equipment are recorded at cost. Depreciation is computed on the straight-line method for assets purchased

prior to January 1, 1981. For assets purchased after that date, an accelerated depreciation method is used. Buildings are depreciated over a 40 year life. Furniture and equipment are depreciated over their estimated useful lives ranging from 3 to 20 years.

NOTE 2 - INVENTORIES:

Inventories are comprised of the following:

	December 31,	
	1986	1985
Booklets	\$138,863	\$137,740
Standard Handbooks	75,943	102,495
Membership supplies	54,854	81,953
Tune in the World booklets	<u>19,034</u>	<u>18,952</u>
	<u>\$288,694</u>	<u>\$341,140</u>

NOTE 3 - INVESTMENTS:

Investments restricted to life memberships are comprised of the following:

	December 31,			
	1986		1985	
	Cost	Market	Cost	Market
Corporate bonds	\$1,778,205	\$1,772,519	\$1,801,058	\$1,712,067
U.S. Government and Government agency	659,578	671,235	552,858	555,296
Common stocks	399,404	636,094	389,399	527,942
Preferred stocks	206,549	190,750	206,549	158,689
Certificates of deposit	416,312	416,000	200,000	200,000
Bankers Acceptance	-	-	96,345	100,000
Other investments	<u>196,722</u>	<u>200,664</u>	<u>296,165</u>	<u>298,857</u>
	<u>\$3,656,770</u>	<u>\$3,887,262</u>	<u>\$3,542,374</u>	<u>\$3,552,851</u>

Investments in the regular portfolio are comprised of the following:

	1986		1985	
	Cost	Market	Cost	Market
Corporate bonds	\$1,325,223	\$1,330,708	\$ 909,077	\$ 916,394
U.S. Government and Government agency	121,113	124,138	621,332	629,589
Common stocks	284,285	312,413	109,505	173,959
Certificates of deposit	199,375	200,000	199,234	200,000
Bankers' Acceptances	-	-	384,755	400,000
Other investments	<u>207,404</u>	<u>200,832</u>	<u>-</u>	<u>-</u>
	<u>\$2,137,400</u>	<u>\$2,168,091</u>	<u>\$2,223,903</u>	<u>\$2,319,942</u>

The increase in unrealized appreciation in the market value of investment securities for the year ended December 31, 1986 and 1985 was \$154,667 and \$319,729, respectively.

NOTE 4 - LAND, BUILDINGS AND EQUIPMENT:

Land, buildings and equipment and related accumulated depreciation are comprised of the following:

	December 31,	
	1986	1985
Land and buildings	\$1,130,134	\$1,132,370
Furniture and equipment	<u>1,211,116</u>	<u>1,116,007</u>
	2,341,250	2,248,377
Accumulated depreciation	<u>(1,438,659)</u>	<u>(1,229,283)</u>
	<u>\$ 902,591</u>	<u>\$1,019,094</u>

NOTE 5 - DEBT:

On March 1, 1977 the League signed a \$225,000 mortgage note payable bearing interest at 9.25%, the proceeds of which were used to finance a building addition. The note is secured by property, building and related equipment having a net book value of \$902,591 at December 31, 1986. Monthly installments are \$2,882, including interest through March 1, 1987. Required principal payments are \$5,477 in 1987.

The League is the owner and beneficiary of a \$100,000 life insurance policy donated by a member. The cash surrender value of the policy is \$49,287 and \$47,200 at December 31, 1986 and 1985, respectively. The League has a \$36,500 policy loan against the cash surrender value of this policy as of December 31, 1986 and 1985. The loan bears interest at an annual rate of 6% payable twice a year. Principal payments will commence when the loan value exceeds the cash surrender value of the policy.

NOTE 6 - PENSION PLAN:

The League has a noncontributory group annuity retirement plan which covers full-time employees. The League's policy is to fund pension cost accrued. The total pension expense for 1986 and 1985 was \$186,354 and \$194,846, respectively, which included amortization of past service cost over a 30-year period. Accumulated plan benefits as of the most recent actuarial valuation reports dated June 1, 1986 and June 1, 1985, are as follows:

	1986	1985
Actuarial present value of accumulated plan benefits:		
Vested	\$456,422	\$380,487
Non Vested	<u>115,096</u>	<u>115,080</u>
	<u>\$571,518</u>	<u>\$495,567</u>

At June 1, 1986 and June 1, 1985, net assets available for plan benefits at contract value (as reported by the insurer, including

\$190,848 in 1986 and \$199,856 in 1985 payable to the insurer by the League) are \$769,306 and \$519,109. The assumed rate of return used in determining the actuarial present value of accumulated plan benefits was 7.5% in 1986 and 1985.

NOTE 7 - DEFERRED LIFE MEMBERSHIP FEES:

The following is a summary of deferred life membership fees and subscriptions activity:

	December 31,	
	1986	1985
Current portion	\$ 331,668	\$ 323,000
Non-current portion	3,646,475	3,534,351
Total	\$3,978,143	\$3,857,351
Beginning balance	\$3,857,351	\$3,783,127
Additions:		
Membership fees received	101,540	84,748
Investment income earned	325,885	318,411
	427,425	403,159
Deductions:		
Net transfer to revenue:		
Life members	122,809	119,805
Investment income	169,995	204,459
	312,804	324,264
Administrative expenses	3,829	4,671
	316,633	328,935
Ending balance	\$3,978,143	\$3,857,351

NOTE 8 - VISITORS' CENTER FUND

During 1986, the League received a \$85,000 unrestricted request to be used pursuant to the approval of the League's Board of Directors. This contribution has been designated by the Board for future costs related to the proposed Visitors' Center. In addition, the League received \$1,451 of restricted contributions for the proposed Visitors' Center. Expenditures related to the Visitors' Center of approximately \$9,000 are recorded as other assets.

NOTE 9 - RELATED PARTY:

The Canadian division of the League is incorporated as the Canadian Radio Relay League (CRRL). Effective December 31, 1985 the CRRL assumed responsibility for the Canadian membership activities and established itself as a separate reporting entity and, accordingly, the assets and liabilities of CRRL as of that date were transferred to CRRL. The CRRL, whose Board of Directors is independent from the League's, collects Canadian membership dues, purchases publications from the League at a discount and resells them to its membership. Deferred membership fees and subscriptions of \$84,682 previously collected and deferred by the League on behalf of Canadian members were paid to the CRRL in December 1985. During 1986, the League provided a \$10,000 grant to CRRL. At December 31, 1986, CRRL owes the League \$9,500 under a non-interest bearing loan.

NOTE 10 - CONTRIBUTIONS RESTRICTED BY DONORS:

The League receives contributions from donors which are restricted for specific purposes as specified by the donors. These restricted contributions are administered by designated officials of the League in accordance with the directions of the donors. Unused contributions aggregated \$74,882 and \$58,063 at December 31, 1986 and 1985, respectively. Following is a summary of activity relating to these contributions:

	H. F. Meier Fund	T. Millan Foundation	Victims of Gasoline	Promotion of Radio	Colorado Radio Convention Fund	Project	Hamlet-Larkin Award	Exceptional Merit	Orin Book Award	Total
Balance 12/31/84	\$21,258	\$ -	\$ -	\$5,594	\$4,471	\$20,116	\$ -	\$ -	\$ -	\$51,439
Contributions	3,337	5,000	-	-	-	-	105	-	-	8,442
Disbursements	(1,028)	-	-	(1,071)	-	(182)	-	-	-	(2,281)
Balance 12/31/85	24,567	5,000	1,451	5,007	5,471	19,934	109	10,000	10,000	65,448
Contributions	2,125	4,000	-	(102)	-	(744)	(109)	-	(20,000)	2,270
Disbursements	(1,000)	-	-	-	-	-	-	-	(21,957)	(21,957)
Board designated contribution	-	-	-	-	-	-	-	10,000	-	10,000
Balance 12/31/86	\$25,692	\$10,000	\$1,451	\$4,905	\$5,471	\$19,212	\$ -	\$10,000	\$ -	\$75,631

SCHEDULE I

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

REVENUES

	Year ended December 31,	
	1986	1985
Advertising revenue:		
QST magazine	\$1,883,429	\$1,953,948
Tune in the World	24,578	-
QEX	10,190	-
Booklet	6,491	15,191
Other	8,657	-
Total advertising revenue	\$1,933,345	\$1,969,139
Publications sales:		
Booklets	916,452	784,573
Standard Handbooks	606,247	655,735
Tune in the World	242,985	166,059
QST newsletters	133,920	143,121
QEX publication	39,027	27,145
Newsletter	37,033	26,925
Call Directory	-	41,916
Total publications sales	\$1,975,664	\$1,845,474

Year ended December 31,

	1986	1985
Publications:		
QST magazine	\$1,222,160	\$1,243,535
Booklets	417,926	272,434
Standard handbook	203,397	224,292
Tune in the World production costs	114,544	71,252
QEX production and other costs	46,592	17,178
ARRL Letter	18,640	19,948
Packet radio newsletter	19,922	7,252
Advertising production costs, net of credits of \$16,395 and \$13,738 in 1986 and 1985, respectively	2,053	3,264
Call directory expenses	-	34,243
	2,045,234	1,893,298
Forwarding expenses:		
QST subscriptions	321,766	301,207
QST newdealers	6,479	5,579
Other publications	222,893	207,741
	551,138	514,527
Salaries	2,333,871	2,211,584
Postage	193,033	232,267
Membership supplies	59,407	48,152
Employee insurance and pension costs	310,282	273,578
Stationery, printing and forms	206,716	238,296
Office supplies and expenses	160,510	164,538
Legal and professional fees	108,727	103,717
Promotion and support	61,756	28,245
Light, heat and water	59,707	58,238
Telephone and telegraph	50,108	57,389
Insurance	23,719	16,954
Temporary employees	21,583	19,771
Laboratory expenses	20,737	19,406
Travel expenses:		
Business	43,268	57,686
Membership contacts	32,503	35,620
Overseas	28,091	22,188
	103,862	115,494
Depreciation	209,376	265,798
Payroll taxes	164,152	152,450
Building maintenance expenses	87,774	77,379
Property taxes	54,000	53,836
Computer supplies and maintenance	35,403	26,390
Dues - Region 2 and 3	26,733	23,769
Overseas QSL service	18,302	26,685
Awards	11,685	5,943
House advertising preparation	8,909	11,168
Distribution of films	6,793	5,978
Product review	4,005	7,025
CRRL Headquarters expenses	-	22,268
Headquarters station expenses	2,447	2,563
Other	58,104	65,633
	\$6,998,053	\$6,744,139

See accompanying notes to financial statements.

SCHEDULE III

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
ADMINISTRATIVE EXPENSES - OTHER EXPENSES AUTHORIZED BY
THE BOARD OF DIRECTORS

	Year ended December 31,	
	1986	1985
Division Directors expenses:		
Atlantic	\$ 9,424	\$ 5,486
Canadian	-	8,355
Central	8,210	6,992
Dakota	2,546	2,355
Delta	2,670	2,918
Great Lakes	7,759	9,729
Hudson	4,467	4,903
Midwest	6,481	5,381
New England	7,601	8,248
Northwestern	13,000	9,278
Pacific	9,457	9,691
Roanoke	1,978	8,336
Rocky Mountain	4,314	3,236
Southeastern	7,465	7,713
Southwestern	10,937	10,900
West Gulf	7,441	6,058
	110,754	110,159
Section level expenses	80,648	71,707
Board of Directors meetings	64,114	55,293
Executive committee	18,462	18,476
President's expenses	16,708	12,938
Officers' expenses	15,368	6,248
National traffic system	10,175	12,000
Grants to URRL	10,000	-
Comic Book expense	10,000	-
Digital Communication Committee	7,661	6,073
QSL manager expense	7,525	1,138
Volunteer resources	5,946	5,122
Blue Ribbon Committee	3,250	-
Legal Strategy Committee	2,113	-
Strengthening CRRL	2,078	904
Administration and finance	2,100	7,814
Ad hoc committee on biological effects	1,422	3,832
Publications	1,476	3,460
Membership services	819	3,802
Other committees	720	1,044
Advisory committees	3,270	2,509
Other	-	-
	\$377,445	\$321,733

Moved and Seconded . . .

Minutes of Executive Committee
No. 425
New Orleans, Louisiana
March 21, 1987

AGENDA

1. Approval of Minutes of August 23, 1986 meeting.
2. Ratification of mail votes of December 12, 1986 and March 5, 1987.
3. Studies requested of the Executive Committee by the Board:
 - 3.1 Regarding Article 9, votes required for adoption of amendments, requested by Minute 79, July 1986 Meeting.
 - 3.2 Regarding the procedures used in evaluating qualifications of candidates in ARRL director/vice director elections, Minute 81, 1987 Annual Meeting.
4. FCC Matters:
 - 4.1 Consideration of ARRL action regarding General Docket 87-14, Amendment of Part 2 of the Commission's Rules Regarding the Allocation of the 216-225 MHz band.
 - 4.2 Consideration of ARRL Response to the FCC inquiry in PRB-3, Privatization of Special Call Sign System.
 - 4.3 Consideration of the timing with respect to Board-requested filing (Minute 103, January 1986) reference to amendment of Section 97.313, of the Commission's rules to provide for reverse-order reciprocal call signs.
 - 4.4 Review of draft request for special temporary authorizations for automatic control of HF packet.
5. Consideration of an ARRL position toward HR 911, the Volunteer Protection Act of 1987.
6. Consideration of an ARRL position toward proposed IRS rules regarding lobbying by nonprofit organizations.
7. Local antenna/RFI matters.
8. Review of progress on Board directives:
 - 8.1 By the vice presidents and/or chairmen for the committees.
 - 8.2 By the Executive Vice President, on Board directives affecting Headquarters.
 - 8.3 By the Executive Vice President, on the proposed Visitors' Center.
9. Recognition of new Life Members.
10. Affiliation of clubs.
11. Convention matters:
 - 11.1 Approval of division, state and section conventions.
 - 11.2 National Convention matters.
12. Date and place of next meeting.
13. Other business.

Pursuant to due notice, the Executive Committee of the American Radio Relay League met at 8:30 AM, Central Standard Time, Saturday, March 21, 1987, at the Westin Canal Place Hotel in New Orleans, Louisiana. Present were President Larry E. Price, W4RA, in the Chair; First Vice President Jay A. Holladay, W6EJJ; Executive Vice President David Sumner, K1ZZ; Directors Frank M. Butler, Jr., W4RH; Clyde Hurlbert, W5CH; Paul Grauer, W0FIR; and George S. Wilson, III, W4OYL. Also present were Vice Presidents Leonard M. Nathanson, W8RC and Tod Olson, K0TO; Secretary Perry Williams, W1UED; Counsel Christopher D. Inlay, N3AKD; and Directors Tom Frenaye, K1K1; Jim Haynie, WB5JBP; Fried Heyn, WA6WZO; Stephen A. Mendelsohn, WA2DHP; and Edmond A. Metzger, W9PRN.

- 1) On motion of Mr. Wilson, the Minutes of the August 23, 1986 meeting were adopted as printed.
- 2) On motion of Mr. Wilson, the mail votes of December 12, 1986 and March 5, 1987 were ratified.
- 3) Studies requested by the Board:
 - 3.1) As concerns the number of votes required for adoption of amendments under Article 9, ARRL Articles of Association, Mr. Price reviewed the history of the Article, last amended in 1966. Since that time, the president reported, no difficulty with the Article was apparent, nor could record be found of member dissatisfaction with the present rule. After further discussion, on motion of Mr. Grauer,

it was decided to advise the Board that no change was required in By-Law 9 save for deletion of the reference to "air mail," a class of service no longer provided domestically.

3.2) With regard to a study of procedures used in evaluating the eligibility of candidates for election to the offices of director and vice director, as requested in Minute 81 of the January 1987 Board Meeting, Mr. Price reported preoccupation with the release of three major matters by the FCC in the past several weeks had precluded proper preparation for study at this meeting. Whereupon, it was ruled without objection that the matter is carried forward to a future meeting.

4) FCC Matters:

4.1) As concerns General Docket 87-14 which would amend Part 2 of the FCC Rules, so as to reallocate the frequencies 220-222 MHz to the government and non-government Land Mobile services, after extended discussion on motion of Mr. Butler it was unanimously decided:

To reaffirm the ARRL's long-standing position that the Amateur Radio service needs the entire 220-225 MHz band in order to perform its public-interest missions;

To set defense of this allocation as the ARRL's highest priority;

To muster every available resource for this task;

To accept the kind offer of the Canadian Radio Relay League that it file its own independently drawn Comments to the FCC, supporting the preservation of 220-225 MHz as a primary amateur allocation; and

To ratify wholeheartedly the officer/staff actions already taken in response to General Docket 87-14.

4.2) Moving next to consideration of the FCC inquiry in PRB-3, Privatization of Special Call Sign System, the President reported that he had assigned studies on various aspects of the matter to special and standing committees.

4.2.1) Messrs. Butler and Wilson, the members of the Special Committee, presented a report, "Conditions Under Which The ARRL Could Support Privatization of the Call Sign Program." There ensued an extended discussion and "fine tuning" of the paper. On motion of Mr. Butler, the amended Special Committee Report was accepted; Mr. Wilson requested to be recorded as desiring retention of a deleted statement: "FCC must not charge additional fees for licensing activity." The majority held that the words were not relevant to the call sign question. During the course of the above discussion, the Executive Committee was in recess from 10:30 to 10:56 AM and, for luncheon, from 11:53 AM to 12:57 PM.

4.2.2) Mr. Metzger, as chairman, reported for the Administration and Finance Committee, on appropriate fees and startup expenditures for a Special Call Sign Coordinator (SCSC) program. The committee recommended that the Commission rather than the SCSC is the proper body to announce the program, should it come into being, by a mailing to all amateurs.

4.2.3) On motion of Mr. Wilson, the following action was unanimously adopted:

"Considering the complexities of the issues presented, and uncertainty as to the effectiveness of the ultimate result in view of the apparent inadvertent omissions in Federal Register publication of PRB-3, and considering the apparent misconceptions in the amateur community as to the possible impact of the program, Counsel is directed to seek an extension of time for filing until July 31, 1987."

4.3) The Executive Committee next considered the timing of a request for rulemaking to adopt reverse-order reciprocal call signs. The request had been authorized at Minute 103 of the January 1986 Board Meeting. Later, the Executive Committee delayed the matter until certain points were cleared up. After discussion, the consensus was there were no remaining obstacles to submission of the request to the FCC; Counsel could proceed at will.

4.4) At this point the Committee reviewed a draft of a request for Special Temporary Authorization (STA). Under the STA, 19 stations specifically listed in the application would be permitted to

operate HF packet nodes under automatic control at speeds up to 1200 bauds to perform a controlled study of HF packet networks. (The final outcome of PR Docket 85-105 last year was to allow automatic packet operations above 50 MHz but not on the HF or MF bands. However, the way was left open for an STA leading to such a study.) The Interim Operations Plan for Skipnet, on which the STAs will be based, was carefully drawn up over the past year so as to include all the HF packet pioneers who requested to participate. After discussion, on motion of Mr. Wilson, it was agreed to file the application for a one-year special temporary authorization as outlined.

5) After consideration of HR 911, the Volunteer Protection Act of 1987, the Executive Committee took no action on the bill in its present form. Staff will monitor its progress; should certain deficiencies perceived in the measure be corrected, the ARRL could adopt a position at a later date.

6) On motion of Mr. Grauer, the Committee went unanimously on record as opposing draft rules of the Internal Revenue Service which could inhibit lobbying on issues of importance to amateurs.

7) Counsel Inlay reported on several local antenna and Radio Frequency Interference matters.

8) Review of progress on Board directives:

8.1) By the vice-presidents and/or chairmen for the committees:

8.1.1) Mr. Holladay reported that the post-Board meeting of the Membership Services Committee would be held at Visalia, California on April 3, 1987. The similar meeting of the Special Study Committee on Advisory Committees had not yet been scheduled.

8.1.2) For the Legal Strategy Committee, its chairman Mr. Nathanson reported an organized attack on restrictive covenants; a planned continuing education course for volunteer counsel in connection with the National Convention in Atlanta on July 11-12, 1987; and a planned meeting of the LSC at that time. A consensus was reached that QST editorial mention of local antenna cases should not imply ARRL endorsement of local fund-raising activities in support of these amateurs.

8.1.3) Mr. Olson reported that the Publications Committee would meet in Newington on March 28, 1987.

8.1.4) The Administration and Finance Committee met March 14-15, 1987 at Orlando, Florida. Mr. Metzger, as its chairman, presented its Minutes, including discussion of the forthcoming video, New World of Amateur Radio under the direction of Roy Neal, K6DUE, formerly of NBC; several internal administrative matters; and the financial side of PRB-3, as reported above.

8.1.5) Mr. Frenaye, as Secretary, reported for the Volunteer Resources Committee; its first meeting of 1987 will be April 26 in Dayton, Ohio.

8.2) The Executive Vice President presented a chart, "1987 Annual Board Meeting Action Items," and answered questions from the group on items therein. At its conclusion, the Committee was in recess from 2:35 to 2:55 PM.

8.3) Mr. Sumner also presented the progress report on the Visitors' Center. Dr. Owen Garriott, W5LFL, former astronaut who was "the first amateur in space" has agreed to serve as chairman of a committee to advise on exhibit planning for the proposed ARRL Visitors' Center. A lot of work has been done on the funding plan, now nearing completion. Some possible names for the Visitors' Center, slogans, and elements of a campaign logo were discussed though not finalized.

9) On motion of Mr. Grauer, the names of 39 newly elected Life Members were recognized, and the Executive Vice President was directed to list their names in QST.

10) On motion of Mr. Butler, the following clubs were declared affiliated, all in category I except where indicated:

Chestnut Ridge Radio Club, Teaneck, NJ
Harrison Amateur Radio Club, Cadiz, OH
Hilltop Amateur Mastertie System, Marina del Rey, CA

(continued on page 74)

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.

SAVE 220 MHz!

□ It seems that once again we face the loss of our valuable VHF frequency allocation to the ever increasingly voracious Land Mobile Service. This time they are asking for "only" two MHz from our 220-225 MHz band. What about next month, or next year? When will they want the rest? How about 420-430 MHz? Why not 440-450 MHz? Every time one of the commercial services wants more frequencies, the amateur allocations are the first to be viewed as a possible source, despite our long record of public service.

If you value your frequencies, *write!* Write to the FCC, to your ARRL Director and Vice Director. Consider that we need these frequencies for what will be an explosive growth of 220 MHz after Novice Enhancement takes effect and for our public-service activities. Consider the alternatives for use of 220-222 MHz by the Land Mobile Service and other services. Let the FCC and others know your thoughts. Above all, don't just sit there and hope that someone else will do it for you—they can't! Only you can voice your own opinions. Remember, silence is also an opinion and if we let FCC Docket 87-14 take place without opposition, this will only be the first of many avulsions of our frequencies! —George G. Manning, K2RRR, Croton-on-Hudson, New York

[FCC Docket 87-14 is a proposal which, if enacted, would take away 220-222 MHz from the Amateur Radio Service and reallocate it to the Land Mobile Service. All amateurs are strongly encouraged to file comments with the FCC in opposition to this proposal. The FCC will be accepting comments until May 21. For guidelines on how to file comments, see April *QST*, p 14.—Ed.]

GOLDEN JUBILEE DXCC SHINES

□ When the new Golden Jubilee DXCC award was announced, I was not impressed. But listening to the local DX alert frequency on 2 meters and hearing the local fellows working countries to complete this award, I finally became interested in this award and am now nearing completion of it.

The Golden Jubilee DXCC award has accomplished several things. Fellows who have just been listening for years must get on the air and operate for this award. Many DXers sit around and complain that there isn't any DX to work. This award has proven them very wrong.

I would encourage the ARRL to come up with another "one-time" award next year that would not require submission of QSL cards because it would be lots of fun.—Bob Scott, WB8JEY, Delaware, Ohio

[Stand by, Bob, for the Bicentennial of the US Constitution WAS.—Ed.]

THREE CHEERS FOR VEs!

□ Periodically, I see in the Correspondence column a letter about someone commenting on the performance of an ARRL Volunteer Examiner (VE) team. I have never taken a test

from a VE team because I achieved Extra Class in 1977, long before the VE program was established. However, commenting as a VE, I really enjoy watching people upgrade because they work so hard. People know that if they are prepared, then they will pass. As VEs, we do not receive any pay, so the benefit received is the pleasure of helping others.—Steven O. Putman, N8ZR, Fairborn, Ohio

□ The article on page 62 of March *QST* says that the FCC feels the VE groups are doing an "outstanding job." I would like to add my comments.

On January 10, I took and passed the Amateur Extra Class license examination. This test was administered by a VE team headed by Glenn, WØIJR and Karen, KAØCDN, Schultz. The ARRL has reason to be proud of teams like these; they did an outstanding job and were very professional in conducting the various tests. Dedicated people like these are real assets to the VE program, and they deserve our thanks for their efforts. In my opinion, the VE program is a re-sounding success.—Donald J. Shearer, WØJRN, Littleton, Colorado

TAKE A LIST

□ As I listen across the bands, I hear more and more DX being worked on DX nets or lists. To some degree, I can understand that lists benefit certain rare DX stations who are unable to operate split frequency, or who have a limited ability to speak or understand English. Still, I don't understand the increasing need to work DX stations on lists. Whatever happened to independent operation in which some degree of operating skill is needed in order to make a QSO rather than simply waiting in line as contacts are handed out? Even worse, some net controls spoon-feed contacts and reports to stations who can't make valid contacts on their own. Is this the spirit of Amateur Radio? Apparently so!—Mick Watson, W7UZ, Milwaukie, Oregon

HAM RADIO AND PACKET— PERFECT TOGETHER!

□ Last night I was in QSO with a couple of packet radio buffs—now I am really excited! As an electronics engineer, my experience in data communications has long exposed me to protocols and to the importance of error-free communication.

Clearly, packet radio is state-of-the-art. I would encourage the ARRL to publish more on packet radio. Packet and computers are servants to be mastered. What a challenge and an opportunity!—Dave Taylor, WA6PBJ, Scottsdale, Arizona

THE FIRST SOLDERING IRON

□ I have been reading an excellent book on

the historian Herodotus, and thought this information might be of interest to members of the League.

We tend to think of the soldering iron as a modern invention—not so! The book, *The World of Herodotus* by Aubry de Selincourt, states as follows: "... in addition to specific inventions, such as bronze casting, the lathe, the level, the square and the key by Theodorus of Samos and the soldering iron by Glaucus of Chios, brilliant work was done in the early part of the fifth century...."

The author does not mention whether Glaucus of Chios was a ham. Upon inspection, there is no Glaucus of Chios in any *Callbook!*—Rupert Wood, WB4ZOF, Bethesda, Maryland

SOLVING THE NOVICE DROP OUT PROBLEM

□ A short time ago the FCC released figures which revealed we had lost 10,000 Novices in two years. These were startling figures, and they created quite a furor throughout "hamland." In this case, to say that we "lost 10,000 amateurs" is wrong. We didn't lose them because we never really had them.

The main problem lies in the standard Novice training classes. They may be out of step with reality. Many classes operate under the assumption that when a student can copy 5 WPM and pass the written test, he or she can go ahead and get on the air. A typical Novice class ends when the code and written tests are completed. The students are given a pat on the back and told "see you on the air," and it's over. These students are literally abandoned at what should be the mid-point of the course.

Those with amateurs in the family or friends to help them complete their training will make it. The shy, the very young and those not technically inclined may fall by the wayside. Let's face it, it takes a lot of "guts" to set up a station and go on the air. Is it any wonder so many Novices drop out?

Well, all hope is not lost. Training programs should be expanded to cover those things the old-timers used to teach around the furnace, such as setting up a station and making the first contact. Clubs might maintain a pool of equipment to loan to those who can not afford to buy their own gear at the time. Clubs might also want to give each student graduating from the class a free one-year membership to the club. It's just another way of integrating new Novices into Amateur Radio and giving them a chance to meet other hams.

Things must change. It will take planning; however, when implemented, the benefits will be many and the dropout rate will surely take a turn for the better. Only then will we be able to say that we are *teaching* Amateur Radio.—Robert R. McKay, N8ADA, Dayton, Ohio

The DXCC Award in Retrospect

In the Spring of last year, HQ entertained a visit from Jim and Kirsti Smith, VK9NS/NL, a visit which resulted in the following on ARRL awards chasing from the DXer's point of view. In this Golden Jubilee DXCC year, it seems appropriate to share extracts from Jim's view of that world standard in DX achievements—the DXCC Award.

In browsing through some old *QST*s, I read the first announcement of the DXCC Award, on page 59 of September 1937. (At that time back of my mind I knew that I had read the short article before. However, this time my immediate reaction was to think "little did they know what they started.")

The beauty of this award was in its international outlook; anyone could apply, and the rules seemed reasonable. (Clause 3 beat me, however, since the traveler at that time had to be starting DXCC all over again with each move. And, for a traveling-type DXer, I often wished that thought had been given to the operator identity.)

Rule 1 stated that all contacts must be with stations in the authorized amateur bands using amateur calls. (To prove it, ARRL bounces cards from operations without documents to prove authorized operations, or words to that effect.)

Rule 2 noted that all stations contacted must be land stations. Shipboard contact couldn't be counted. This was a very wise move, but there were a lot of arguments to come—about ships tied against wharves, and so on. (My VR4CQ/KW6 card of some years ago was bounced; it seems that the contacts were made from a yacht.)

Rule 3. All stations must be contacted from the same call area. Later on, this was to lead to a bit of soul searching as a W1 had to move to W6 on a job transfer and then had to start all over again. (This rule was later modified, of course.)

Rule 4. The ARRL Countries List would be used in determining what constituted a "country." (The word country is really a misnomer. The DXCC Award has never really been about countries, but rather about areas, following certain ground rules.) I am just as happy chasing reefs, little enclaves in some land or whatever is on the list at the time. The main thing is that all DXers are doing the same thing. However, if a country is no longer available for some reason or other, the operator of today isn't given the chance I had so many years ago at Burma, Bouvet or Albania.

Rule 4A. In case of countries no longer in existence, credit will be allowed for these if they were recognized as a separate country at the time of contact. Well, there isn't much wrong here, and the distinction between current and deleted countries was good thinking.

Rule 5. Confirmations must be submitted for all countries claimed. This is a clause that has stood the test of time, and I would not even bother applying for DXCC based on certified log entries. Sorry about that. QSL

cards are still the ultimate proof of the QSO; otherwise who needs them?

Rule 6. Contacts may be made over any period of years, provided only that all contacts be made from the same call area (or country where no call area exists) and by the same station licensee. I think the time scale was a sensible one. Did you hear about the W who suddenly remembered that many years ago he had worked a certain country, searched old logs and finally located the QSO. All those years later he was still able to get a card, thus completing the ultimate—working the complete DXCC list.

Rule 7. The Century Club Award, and *QST* listing for confirmed contacts with 75 or more countries, is available to all amateurs. Yes, this is the stuff of the true Amateur Radio outlook, and I for one am happy to apply for DXCC from time to time from various areas.

Rule 8. Following the first listing of any station in *QST*, confirmations from additional countries may be submitted as received. I suppose, it is here that it all really starts. If they had added "a maximum of 100 countries is all that is required for DXCC, no further claims to increase totals will be considered." That would have been that. No Honor Roll, no chasing that elusive 101st country. No more thinking only one country to complete the list.

Rule 9. Stations reaching the 100 confirmation mark will be enrolled in the DXCC automatically. That DXCC award is still one of the most popular achievement awards in Amateur Radio today.

Rule 10. This covered sufficient postage.

Rule 11. Concerned applications and where to send confirmations, etc.

So, that was where it started, apart from emphasizing that the *QST* Countries List would be the only official confirmed list. [Editor's Note: For many years, the annual printing of the valid countries list appeared



in *QST* along with the rules for the ARRL International DX Competition; this predated the ready availability of the famous Operating Aid No. 6. The June 1982 installment of this column, "Roots," goes into depth on the start of it all.] Despite what must have been a lot of acrimony, and of course lots of discussion on the bands, the jump to the "one country-one point" idea came into reality.

In the October 1937 issue there was the first listing: W8CRA 112, W1BUX 105, W1TW/W1CMX 104, W6CXW 101, G6WY 100. (G6WY had misunderstood things, only sending in 100 confirmations. His next salvo corrected things and he headed the list in the December 1937 issue with 114 credits.) In addition, with over 75 countries, were 9 US, 1 VE and 1 G operators. Can we DXers today say that it was a bit easier in those days? It was the start of a great award, with marvelous forethought. These early applicants must have had to work very hard for their countries, with equipment that was primitive by current standards.

When reading these things, there is the strange feeling that it really isn't 50 years ago. It is all happening now. Despite a lot of mutterings, I think things work well today. Of course, there is the push for a "new one" to be recognized from time to time. It would be a pretty dull affair, after all, without the odd hassles.

In writing this I have remembered my chase for FQ FF FD, for the ZD1 ZD2 and for VQ1 VQ2, and so on—the countries that are no

Troster's Tips for Easy Listening Procedures 2

You are out there (still all alone), working through your first DXpedition. You realize your inexperience may cause you to not always use procedures that make for maximum efficiency (ie, maximum contacts). Relax. Try this. Do you recollect watching golf professionals on Sunday afternoon TV (boooo)? Ah, those effortless, beautiful swings. These pros may knock the ball into the deep rough, or a sandtrap, but blast beautifully onto the green. Their shots always go straight and they always make the 2-foot putts! It looked so easy when the pro did it. You raced out to your local golf links and (with the picture of those easy pro swings firmly in mind) you were amazed that your relaxed approach did indeed increase your skills—at least for the first two holes. If you don't play golf, substitute tennis, or something.

Now, translate those memories to DX operating. Remember when you were home listening to some world-class DX ops making several QSOs per minute. Just like the pro golfers, nothing bothers them. There are always callers who are zero beat, and "policemen" giving directions. And, of course, some nut has to call "CQ DX" on the frequency. Unfortunately, there is often malicious interference, too. The QRM comes and goes in different forms, but a top operator just keeps rolling along for hours. There is that smooth rhythm, using the same assuring procedures, checking the openings to different areas, making it all sound so easy and effortless. What could be mass DX hysteria is under full control of the old pro DX op.

Remember that "picture" of those world-class DX operators, and do likewise.—W6/SQ

more. After 39 years of DXing I can still find things to keep my interest, still find ways to improve my station, still find the energy and enthusiasm to chase DX.

Who says Amateur Radio is dull and without challenge?

THAILAND UPDATE

AH2AK/HSIAOL (Bruce Strong) furnishes the following update.

Thailand recently granted the Radio Amateur Society of Thailand (RAST) permission for a second club station to be operated every Fri-Sun. RAST has assigned the call HS0B to this station, but it is felt that most operators will most likely use their personal call signs. The new station is located inside the capitol city of Bangkok and will reflect either HS0 (club call) or HS1 (first district). In Thailand, individual suffixes have been assigned, and the numeral reflects the area within Thailand that the station is operating from. HS1XXX, HS5XXX and HS9XXX would all be the same person, but operating from different parts of Thailand. Bruce feels that RAST, IARU, the Thailand Government, the Thai PTT and Thai Security Council are all to be congratulated for the progress they've made in restructuring Amateur Radio within Thailand. He hopes they won't stop there and that home stations will soon be permitted.

THE CIRCUIT

□ **KH6EJ:** Hawaii's oldest active amateur is Bill Seymour, who celebrated his 90th birthday this past January. Bill was licensed in 1936 as K6NZQ, Aloha!

□ **3B8CF:** Jacky spent 6 months in the USA and holds KB1PR. He is very active on CW from 1430Z to 1500Z on 21027. (See accompanying



Left to right are FH4EC, FH4ED, W6QL and W6KG at the Colvins' QTH on Mayotte Island, FH/W6KG. FH4ED went on from there to generate huge pileups in the Gloriosos.

photo.) DK7PE reports that 3B6/3B7/3B9 are "off limits" because of difficulties with the drug trade.

□ **Colvins:** S79KG in January from the Seychelles was a winner for Lloyd and Iris, with 9000 contacts, and 130 countries, in 18 days of operation. By coincidence they operated from the former QTH of VQ9R, but had to use their own antennas. Seychelles was a snap in January, what with G4LJF operating S79LJ during most of the month!

□ **China:** WINH reminds us that there were more China stations in 1932 than now, with the majority showing up in Shanghai.

□ **Tonga:** N7AOU reports a 0020Z 10-meter FM opening (29.6) featuring A35PP.

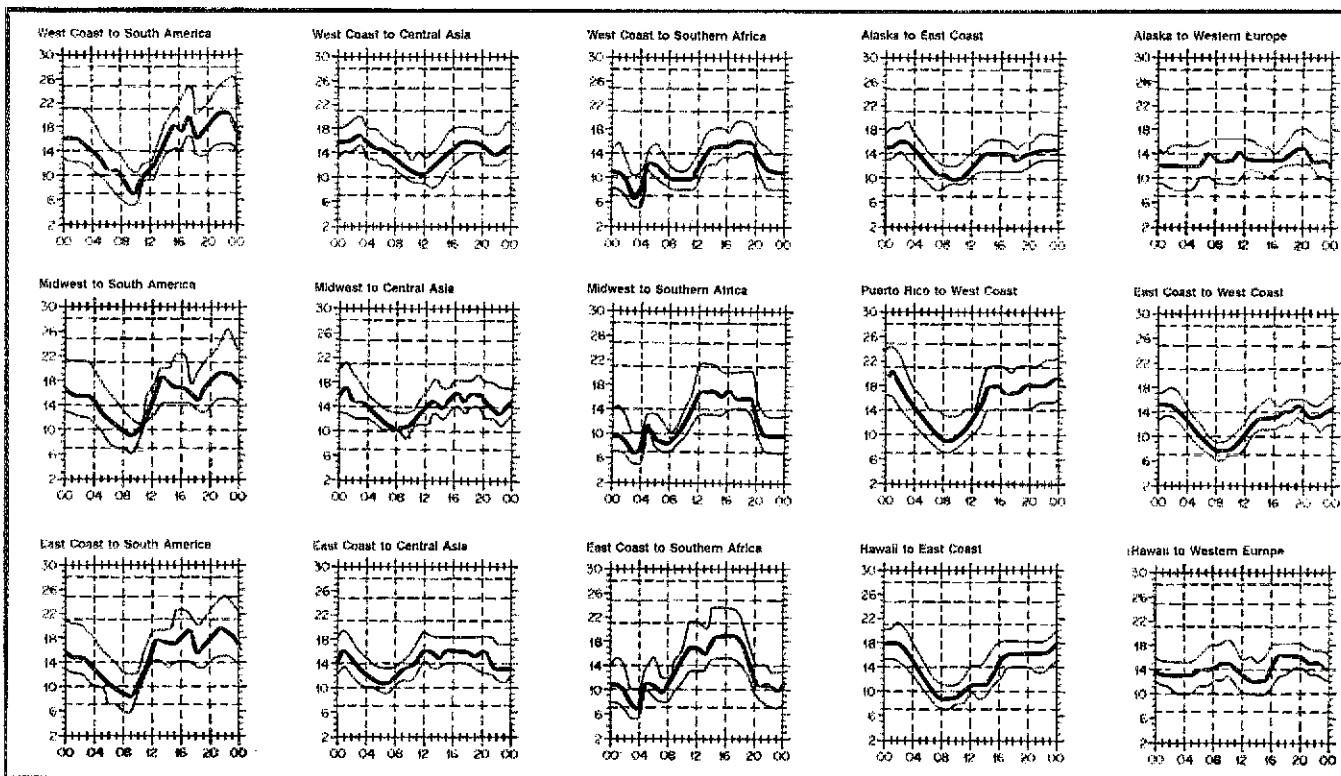
□ **Zambia:** With the exemption of Amateur Radio equipment from taxation in effect (and a Novice class license to be implemented soon), the Radio Society of Zambia asks for donations

of HF and 2-meter transceivers and antennas, and 2-meter repeaters. If you can help increase 9J stations on the air, please contact Daniel Soko, 9J2DS, RSZ Secretary, Box 72116, Ndola, Zambia.

□ **Israel:** In July, the Israel Philatelic Service will issue a special postage stamp honoring Amateur Radio. Further details from the country's society, the Israel Amateur Radio Club (IARC), Box 4099, Tel-Aviv 61040, Israel. Note, too, that Australia and Israel share a third-party-traffic agreement. Check out the Fri/Sat 0430Z net on 14.280 MHz.



3B8CF (left) with 3B8BH in Quatre Bornes, Mauritius. See Circuit item, this issue. (tnx DK7PE)



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 OTF). See April 1983 QST, page 63, January 1977

□ **KP4CZ:** Jim suspects recent *Callbooks* are in error. His correct address is Box 1556, Villalba, Puerto Rico 00766-1556. Any cards for his former 9J2JI go to that same QTH.

□ **San Andres:** N3JT/HKØ managed 6k contacts during 4 days of operation last fall. Jim adds that they were in addition to 4 phone patches, 1 dose of sunburn and 11,000 mosquito bites! Special thanks to HKØBKK, the HK society and the Ministry of Communications for licensing assistance.


□ **Help!:** KDØS/WAØQLH is looking for some hot tips on the operator of XW8DO, in Feb 1971.

□ **DX Is!:** KA5TUF is back after a 40-year hiatus, and finds the world takes on a different, more personal perspective after making that first DX call. It has shrunk and become a part of his radio room. DX chasing is exciting and alive! Bill recently visited Rio and enjoyed a visit with PY1BVY, PY1ZT and PY1QN.

□ **Mali:** TZ6MG uses the following manager: Eddy Eliveld PA-3656/R-41, Drontermeerstraat 70, 8226 HL Lelystad, The Netherlands. Cards also okay via the Bureau and also via PB 2095, 8203 AB Lelystad, The Netherlands. Eddy notes that Dennis is active on 80, 40, 20 and 15 meters.

□ **Samoa:** K6JAJ/KH8 operated from the Island of Tutuila Dec 26, 1986-Jan 2, 1987. QSL Gary Haugen, 3744 Jurupa Ave, Riverside, CA 92506. (This summer he anticipates a stop at Howland Island, KH1.)

□ **CT3:** N5RM and K5MM are planning a big multi-single operation in the CQWPX, hoping to be on the air May 26-Jun 3.

□ **G3SZA:** Contrary to rumors, Dave is *still* working hard for a QSO from Zone 26 and will let the whole world know it when he works his 40th Zone on 160 meters. (tnx K8MFO) 

QSL Corner

Administered By Joanna Hushin, KA11FO

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

AY3F (LU6FAZ)
CXØXY (CX2CS)
FR/G/FH4EC (FR5DO)
J73D (W2OB)
KC6CS (JE1JKL) via JARL, or
direct 3-16-6 Shibakubo,
Tanashi City, Tokyo,
188 Japan.

KC6MR (J11TZK)
LU6UO/Z GACW, Carlos Diehl 2025,
1854 Longchamps,
Buenos Aires, Argentina.

PJ9J (W1AX)
TK5UC (F6AOI)
T5ØDX (I2JSB)
VK9XS (VK9NS)
VK9YS (VK9NS)
VKØDS (VK9NS)
VKØGC (VK9NS)
VU2LAM (UY5XE)
V31DX (N5DD)
W1BIH/PJ2 (W1AX)
XE2BJC (WB6JMS) for contacts after
Oct '86.
5T5NU (F6FNU)
SZ4ET (N5DFT)
8P9AY (K1COW) David W. Penttila,
Oakland Shores, Spencer,
MA 01562.
9J2EZ (I4FGG)

Special Notes

H44/VR4 Solomon Islands

Any former H44/VR4 stations or anyone who knows of a former H44/VR4 are asked to write the Solomon Islands QSL Bureau, Box 418 Honiara, Solomon Islands.

DXers are urged to send their QSL cards direct to an H44/VR4 station or the H44/VR4 QSL Bureau.


C5 The Gambia

Most of the active hams come to The Gambia on a short-term basis, rarely exceeding two years. Cards sent to The Gambia via the outgoing bureau are normally forwarded by sea mail and may take a year or more to reach The Gambia Bureau.

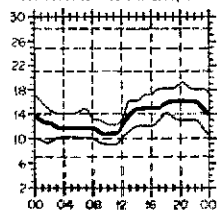
Therefore, the following may assist in confirming a C5 contact.

- 1) QSL directly by airmail.
- 2) Enclose a self-addressed envelope and 2 IRCs.
- 3) Check the validity of the C5 call worked in the international *Callbook*.

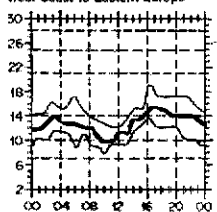
All QSL cards received by the Radio Society of The Gambia will be distributed promptly to such members who either still are in The Gambia or whose forwarding address is known. All other cards can be returned only if return airmail postage, 2 IRCs, has been enclosed. There is no outgoing sea mail from The Gambia, so cards will be returned by air.

□ QSL Corner, Dec 1986 *QST*, p 57, contains information and addresses for the ARRL Incoming Bureau. March 1987 *QSL Corner*, p 67, contains information on the operations of the ARRL Outgoing Service. For additional information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St, Newington, CT 06111. 

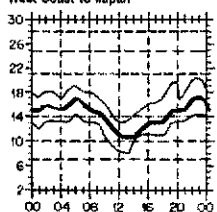
West Coast to Western Europe



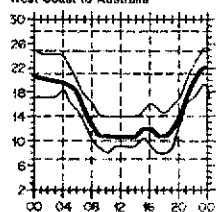
West Coast to Eastern Europe



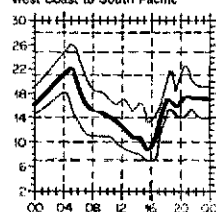
West Coast to Japan



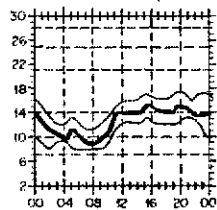
West Coast to Australia



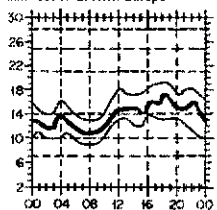
West Coast to South Pacific



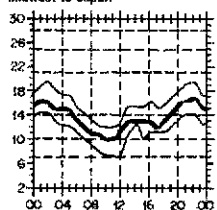
Midwest to Western Europe



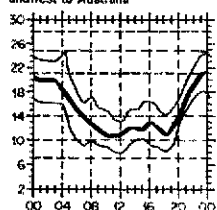
Midwest to Eastern Europe



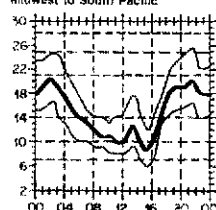
Midwest to Japan



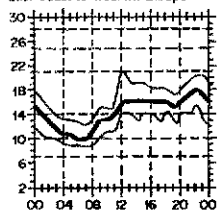
Midwest to Australia



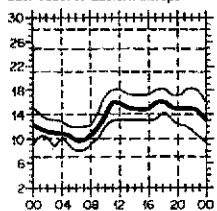
Midwest to South Pacific



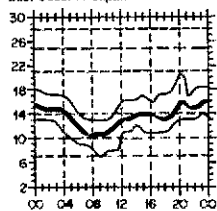
East Coast to Western Europe



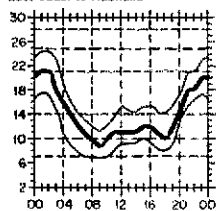
East Coast to Eastern Europe



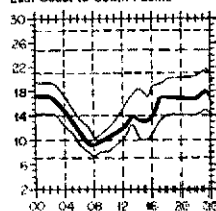
East Coast to Japan



East Coast to Australia



East Coast to South Pacific



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 May 16 to June 15, 1987, assume a sunspot number of 13, which corresponds to a 2800-MHz solar flux of 75.

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 February 1 through February 28, 1987. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DJ2OS/105	H89AAM/158	JR1MOO/139	VE7AHB/104	KC2NB/292	KV3J/165	K6ETM/104	WA7WOC/127	W9PPH/101
DK0AC/124	H89BHY/111	JR3HZW/256	XE1F/107	WA2JTY/168	AA4OV/106	WU6I/144	NR8Y/135	WB9IFE/102
DL1BE/107	H89EY/110	JA8UBH/110	Y36SG/104	K3EX/104	N4LZL/104	K7AU/101	WA8OSE/292	KA9PER/104
DL18V/256	IV3IEU/107	JH8WAH/137	YU2OU/102	K3RY/100	WA4AXW/105	K7ETZ/100	KC9UI/100	W0DCB/116
DL3SBI/130	I7UVX/104	JA8BKX/270	4Z4NL/106	K3SKE/105	WA5QAQ/101	N7FTB/106	N9RD/237	WB0DLT/105
G4MZF/W4/10T	IK7CJV/217	SM5BCO/343	K2KIB/163					

Radiotelephone

DL3SBI/130	H89AAM/143	I5RRZ/271	JA8UBH/103	XE1ALH/100	W2ATO/116	WD4PBF/123	W6KCB/101	NK3Q/100
EA5EYP/106	H89CTG/107	IK7AFM/252	JH8WAH/127	YB6NH/105	WA3MKS/101	KA5WOO/109	WU6I/131	KA9LTR/161
FK8DH/272	H89CZV/102	IK7JCV/204	JA0BKX/102	N1BEX/KH2/120	KD4TM/101	WA5HAX/105	KD8SC/101	N0CIB/141
G4YZQ/118	HK6IMU/105	IT9CUE/199	KC6HA/110	KC2NB/289	N4GYA/103	KB6HEL/DU/109	N8HHT/102	W0DCB/115
GM4WEV/125	I2UPG/257	IK0EIM/163	SM7BFT/110					

CW

DK0SR/133	FE6IGW/110	I3FDZ/122	OK3CWA/107	N1BXC/100	KV3J/154	WA4YLD/109	WB6FZN/101	W8CFG/103
DL1SV/173	G4WSX/110	JE7BQR/105	ZP5JAL/114	WB1AEL/114	AA4EL/103	N6ASQ/100	N8MK/101	N0CIB/139
F6GID/188	I2OEB/104	JA0BKX/257	ZS2RM/197	K2KIB/150	WA4AXW/104			

RTTY

EA5CVR/102	VE3UR/103	W2FG/107	KJ4MR/100					
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160 Meters

OK3DWJ/103	SM6EHY/103	9Y4VU/108	K1ST/100	W4OWJ/151	W6DAO/100	W7AWA/100	AB9O/105	K8GVB/105
OK3CQR/107	ZS5LB/103							

5BDXCC

JR3GWZ	CX6CW	N3NA	N8AVK	NE6I	JH1EDB	SM5DAC		
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Endorsements

Mixed

A71AD/300	JA1NGM/165	SM6LIF/262	WB1AEL/139	N3COB/130	NV4O/231	K6RK/322	K8UNP/244	NJ9X/135
CT1SH/225	JH1ED/286	SM7IDF/270	KA2DYB/176	N3ELN/131	NE4F/267	WB6CLL/183	KB8MF/175	NM9H/133
CT4YN/271	JH1FS/326	SM7KIL/180	KB2G/224	W3FGS/155	NK4L/296	KB6HT/307	N8BEF/207	W9IOP/174
DF2IS/207	JA2AAQ/335	SP2AJQ/323	KA2OOQ/154	W3GOH/313	W4DZZ/313	N6FT/271	N8DE/315	W9MP/261
DJ2AA/347	JA3THL/313	SP5EWY/317	KB2OR/125	W3LMZ/320	W4RIM/328	N6IZM/229	N8MK/137	W9OKL/302
DJ2ZM/126	JA5PUL/317	TP3SV/323	N2AC/308	W3YFI/255	WA4CTC/207	N6VF/310	NE8R/282	WA9VKN/232
DKAZZ/176	JA7ARD/319	VE3IRF/202	N2UN/301	WA3HOL/151	WA4YLD/175	NE6I/268	WB6VZ/334	WB9BZE/125
DK0SR/167	JA7BJS/320	VE5RA/312	N2WK/128	WA3LJP/310	WB4MAI/301	W6ZID/283	W8HN/342	K0GVB/332
DL2GBM/137	JA7GLB/321	VK2COP/127	NB2P/220	WB3FMA/175	WB4PUD/297	WA6AIL/259	WBMEP/250	K0II/262
DL7WL/306	JA8ZQ/337	XE1OW/302	W2FCR/317	AE4Z/320	WN4KKN/186	WA6TLA/318	W8YMB/260	KB0U/309
EA8RL/275	LA2KD/252	XE1VIC/285	W2FR/321	K4JYS/307	WS4E/267	WJ6O/199	WA8SX/200	KC0DA/250
G4DYO/315	OH2BGD/331	YS1GMV/311	W2KI/277	K4JW/276	WK6E/280	W6ZG/280	WB8RNY/223	KE0AA/283
G3SJJ/323	OH2BM/363	ZL1AMO/336	W2TS/280	K4MEF/150	K5ZD/231	K7NO/315	WB8PKF/304	KS0Z/280
HA5JV/252	OY6FRA/130	ZL2SV/201	WA2AOG/275	K4TEA/320	K5GL/310	K7TUH/125	W8EVZ/306	N0CIB/224
H89G/292	OY7ML/326	ZSRRM/315	WA2CBU/260	K4XL/341	W5NF/269	K7WE/262	K9BIL/306	N0RR/327
I2JR/316	OZ1TL/201	K1KOB/285	WA2TMP/226	KI4M/304	W5OG/293	KM7E/186	K9SM/341	W0BF/290
I2LDD/324	PA0RL/281	K1UCA/132	WB2ABD/262	KJ4CQ/165	WB5BR/250	ND7B/206	K9VAL/312	W0HZ/342
I2QEA/264	PY2DSQ/291	KR1R/250	WB2AO/319	KJ4MR/128	WD5DEQ/193	W7FPT/261	K9YNF/213	W0LW/353
IT9JLA/313	SL0ZG/281	W1IKB/320	W1PNR/304	KZ3H/161	WS5O/181	W7KJ/175	KD9CQ/180	W0YVA/226
JA1ADN/346	SL0ZZI/159	W1PNR/304			K6LRN/151	AD8J/280	NF9E/130	

Radiotelephone

A71AD/300	I2KAJ/265	JA3DY/318	SM7IDF/212	W2FCR/317	K4ADN/201	KF6EN/203	N8BEF/206	KS9R/271
DF7QD/260	IK2AWT/202	JA4CUY/306	SV8RX/269	WA2AOG/229	KJ4CQ/165	N6ARS/153	NE8R/282	N9JK/306
DF8TK/152	I3DHN/307	JA5PUL/316	VE4BJ/315	WB2AIO/287	N4SR/318	N6MU/315	WA8OSE/289	N9NB/162
DJ2AA/331	I5BDE/303	JA7ARD/317	XE1OW/302	KA3DLT/180	NK4L/285	WA6AL/258	WB8PAT/129	NF9E/129
DL5SBA/163	I5WRI/312	JA7BJS/317	XE1VIC/285	KA3HXO/266	NV4O/197	WB6RSE/287	WB8RNY/223	W9LA/332
EA3AOC/313	IK8GC/151	JA7GLB/320	YS1GMV/311	KC3EK/251	WA4PMF/177	WB6VIN/278	WB8PKF/296	W9OKL/302
F5JA/326	I0CEP/315	JA8ZO/326	ZL1ALE/307	KC3VE/262	WB4MAI/276	K7JXR/252	K9BIL/302	W9RY/321
G3SJJ/322	JA1ADN/338	JA8ZQ/337	ZL1AM/336	N3EHD/170	KB5GL/306	KD7PS/204	K9W/309	WA9VKN/232
G4DYO/315	JA1NGM/165	LU3AJW/316	KA1KOB/264	N3TO/273	W5YU/332	KM7E/187	K9SM/331	WB9RPY/174
H89AHA/332	JH1ED/285	PY2DSQ/289	KA1HBV/203	KA1SK/185	W3GG/330	ND7B/191	K9VAL/309	WB9RY/232
I1TBE/321	JH1FS/326	SM5BCO/343	W1PNR/304	W1PNR/304	WA3HOL/150	W7KSK/124	KC9YX/224	KE0AA/282
I2JR/316	JA2AAQ/333	SM6LIF/262	WB1BVQ/256	AE4Z/309	AE4Z/309	K8UNP/209		N0RR/323

CW

DJ2AA/260	IT9VDQ/259	OY7ML/248	SP5EWY/291	KA2DIV/261	N4FKZ/271	AC5K/173	WA6TLA/311	WD8PKF/221
DL1PM/308	JA2AAQ/287	OZ3Y/307	VE3IRF/169	KB2G/223	N4JF/310	K5ZD/202	WB6RSE/307	K9BIL/267
DL7WL/291	JA3DY/295	OZ4RS/128	YV1TO/149	N2UN/277	NK4L/241	W5LVD/297	WK6E/179	N9NB/169
EA8RL/254	JA5PUL/283	PY2RRG/207	K1KOB/174	WA2AOG/125	W4PBC/177	W5OG/260	K7NO/254	K8HOW/149
F6CRT/285	JH7ARV/255	SL2RG/254	N1AFC/174	WB2ABD/204	WB4MAI/265	KB6HT/189	WA7HCE/155	KM0Q/151
F8HW/206	JA8ZQ/299	SL8ZZI/158	W1AOQ/200	KZ3B/198	WB4OSN/297	N6MU/286	K8NA/280	N0RR/312
I1SBU/290	LA2KD/204	SM7IDF/199	K2QIL/224	KZ3H/136	W3B/136	W8ZD/267	N8DE/261	W0CAW/251
IK2CIH/141	LA4DCA/199	SM0BZH/270	K2UO/310	W3GG/274				

RTTY

I2JR/144	W1DA/175	K4AGC/148	WA4WIP/154	W0HAH/175				
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DXCC Notes

Peter I Island

Peter I Island (3Y), located in the Bellingshausen Sea off the Antarctic continent, was accepted as an addition to the ARRL DXCC Countries List in 1983, pending the first creditable operation. The January and February 1987 operations by 3Y1EE and 3Y2GV have been accepted for Peter I credit. Submission of cards will be accepted June 1, 1987 and after. Thus, the current country count will increase to 317. Golden Jubilee credit for Peter I may be claimed immediately.

Building the 10-GHz Horn Antenna

Last month, I discussed some of the theory behind pyramidal horn antennas. This month, I'll show you how to build one yourself from readily available materials.

The first design parameter is usually the required gain, or the maximum antenna size. These are, of course, related, and the relationships can be approximated to the following:

$$L = \text{H-plane length } (\lambda) = 0.0654 \times \text{gain} \quad (\text{Eq 1})$$

$$A = \text{H-plane aperture } (\lambda) = 0.443 \times \sqrt{\text{gain}} \quad (\text{Eq 2})$$

$$B = \text{E-plane aperture } (\lambda) = 0.81 A \quad (\text{Eq 3})$$

Note that gain should be expressed as a ratio for these calculations; 20 dB gain = 100.

Let's calculate the dimensions for a 20-dB-gain horn for use at 10.368 GHz. Using Eq 1 through Eq 3, it is easy to determine the dimensions. One wavelength at 10.368 GHz is 1.138 inches. The length (L) of such a horn would be $0.0654 \times 100 = 6.54 \lambda$. At 10.368 GHz, this is $6.54 \lambda \times 1.138 \text{ inches}/\lambda = 7.44 \text{ inches}$. The corresponding H-plane aperture (A) would be 4.43λ (5.04 inches), and the E-plane aperture (B) 4.08 inches.

The easiest way to make such a horn is to cut pieces from brass sheet stock and solder them together. Fig 1 shows the dimensions of four triangular pieces for the sides and a square piece for the waveguide flange. (You could use a standard commercial waveguide flange if you have one.) Since the E-plane and H-plane apertures are different, the horn will not be "square." You'll need two pieces of brass cut to the dimensions given for side A and two for side B.

Sheet thickness doesn't matter; 0.02 to 0.03 inch works fine. Brass sheet is often available from hardware or hobby shops. If you can't find material locally, one source is Small Parts Inc, 6901 NE Third Ave, Miami, FL 33138, tel 305-751-0856.

Note that the triangular pieces are trimmed at the apex to fit the waveguide aperture (0.9 x 0.4 inch). This necessitates that the length, from base to apex, of the smaller triangle (side B) is shorter than that of the larger (side A). Note that the side length, S, of the two different sides of the horn must be the same if the horn is to fit together! For such a simple looking object, getting the parts to fit together properly requires a little thought.

Although the dimensions can be calculated with a little simple geometry, it is easier to draw out templates on a sheet of cardboard. The templates can be used to build a mock antenna to make sure everything fits together properly before going on to cut the actual metal parts.

First, mark out the larger triangle (side A) on cardboard. Then determine at what point its width is 0.9 inch and draw a line parallel to the base as shown in Fig 1. Now measure

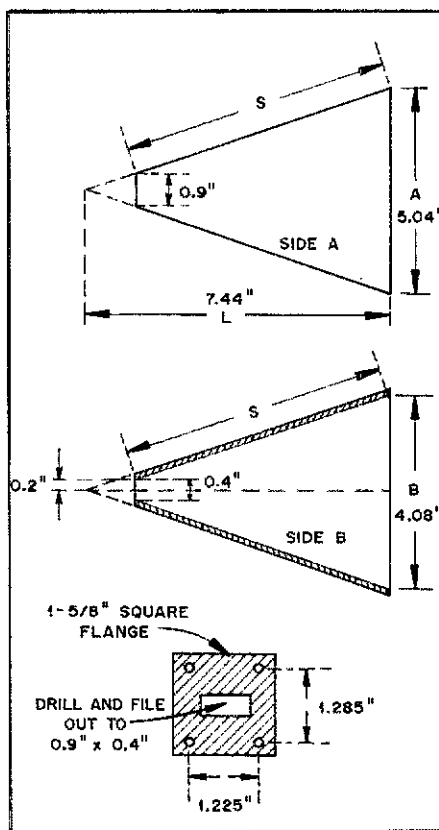


Fig 1—Dimensions of the brass pieces used to make the 10-GHz horn antenna. Construction requires two of each of the triangular pieces (side A and side B).

the length of the side S; this will also be the length of the sides of the smaller (side B) pieces.

Next, mark out the shape of the smaller pieces by first drawing a line of length B and then constructing a second line of length S. One end of line S is an end of line B, and the other is 0.2 inch above a line perpendicular to the center of line B as shown in Fig 1. Don't worry; this is much easier to do than to describe! These smaller pieces are made slightly oversize (shaded area in Fig 1) so you can construct the horn with solder seams on the outside of the horn during assembly.

Now it's time to see if everything fits. Cut out two cardboard pieces for side A and two for side B and tape them together. The aperture at the waveguide end should measure 0.9 x 0.4 inch, and the aperture at the other end should measure 5.04×4.08 inches.

If all is well, use the cardboard templates to mark out pieces of brass sheet. The brass sheet should be cut with a bench shear if one is available because using scissors-type metal shears tends to bend the metal. Jig the pieces together and solder them on the outside of

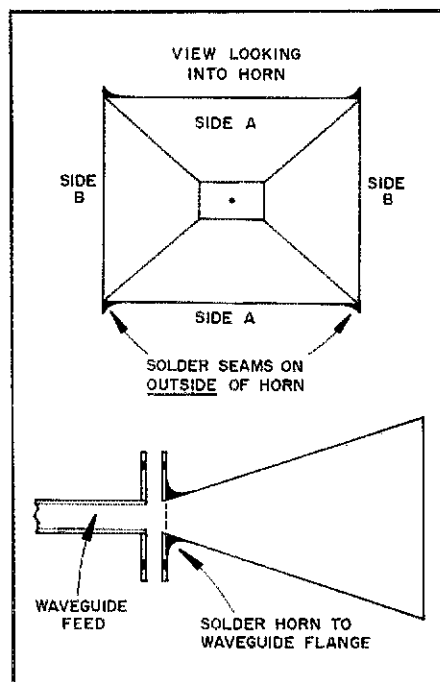


Fig 2—Assembly of the 10-GHz horn antenna.

the seams. It is important to keep both solder and flux from contaminating the inside of the horn; they can absorb RF and reduce gain. Assembly is shown in Fig 2. The horn can then be soldered to a standard waveguide flange, or one cut out of sheet metal as shown in Fig 1. Make sure that the transition between the flange and the horn is smooth, and it's all finished—a 20-dB-gain antenna for about \$51 CQ DX.

MICROWAVES IN VIRGINIA...

On Jan 31, 1987, the first meeting of the Blue Ridge Microwave Society (BRMS) was held at the studios of WBRA-TV in Roanoke, Virginia. The purpose of the society is to promote activity above 1 GHz. Twelve amateurs attended the first meeting, at which Dennis Sweeney, WA4LPR, discussed a 10-GHz PLL circuit of his own design. The group is interested in narrowband 10-GHz techniques. For more information about BRMS, contact Stanley Dillon, WB4YJC, PO Box 507, Martinsville, VA 24114.

...AND NEBRASKA

According to the Midwest VHF Report, published by Roger Cox, WBØDGF, there is new 10-GHz activity in the Lincoln, Nebraska area. Charlie Conner, KØNG, has a 10-GHz beacon on his tower that can be turned on by request. KØNG recently worked KCØQR over a 9.25-mile path on FM using horn antennas and 10-15 mW.

Want a More Enjoyable and Productive 6 Meters? Let's Make 50.200 MHz Work

Following most June VHF QSO Parties, there arises a chorus of comments: Why don't they move the contest away from 50.110? No similar comments arise regarding operation on other bands, nor are they heard following other contests. The complaints come from a relatively small group of avid 6-meter DX chasers who make the band their principal home through thick and thin band conditions alike. Since I consider myself one of those very much wedded to the pursuit of 6-meter DX, I think that I can understand the frustration these people feel. They stick with the band for months, and even years, looking for new countries which might show up at a time coincident with favorable propagation conditions. The June VHF QSO Party is deliberately scheduled when sporadic E is capable of providing DX opportunities. Aware of this, and the knowledge that the contest will bring forth a flurry of activity, some enterprising souls pick this time to journey to interesting spots within one or two E-hops. In some cases, they go to countries that few, if any, 6-meter operators have worked. The contest also provides incentive for regular residents of a few nearby countries, still needed by many, to get on the air. In many instances, they have done little 6-meter operating since the glory days of the peak of the last solar cycle. In any case, there is a good possibility that some choice DX will be available, if only the propagation is present and the QRM isn't too heavy. If 6-meter DXers are fortunate, the band will open up before the contest and give them a shot at the new prize before the din begins. All too often, however, it's Saturday evening or sometime Sunday when propagation smiles on them. And, frequently, the opening lasts for only a few minutes.

In the meantime, the contest stations have appeared, as if from out of nowhere. After all this is a contest isn't it? These stations, many multiop, are often operated by people who don't work 6 meters at any other times than during the three major League-sponsored VHF contests. Their objective isn't to work that rare country. To them, it's the number of contacts and multipliers they amass that counts. What's the best way to work lots of stations in a contest? Why, to have a dominant signal, in the middle of the activity, and keep calling "CQ Contest," of course. Follow this simple approach and the stations will line up to work you. Keep the string going as long and as often as possible in a well-known tenet among successful contesters on any band. If a DX station calls, fine, it's another new grid square. Work the station as rapidly as possible and continue calling "CQ Contest." Whatever you do, don't relinquish the frequency and break your string.

Quite obviously, there is a clash of objectives and operating techniques here. The dedicated 6-meter DXer's purpose for being



W1XX provides another rare grid square to alert VHFers. This one was FM26 with an operation from Virginia Beach, Virginia during The 1986 Roanoke Division Convention. (W4GF photo)

on during the contest is to work one or two new countries, even if these are the only contacts made the entire weekend. What's important to the contest is lots of contacts and as many multipliers as possible.

So why the problem? Can't the contesters work in some part of the band not frequented by DX operators? But, as already noted, any good contesteer will plunk down as close as possible to the center of activity. Almost anyone who knows anything about 6-meter SSB and CW operation knows that "Everybody is on 50.110"—just as on 2 meters, "144.200 is where the action is."

So, back to the original question, "Why can't those who establish the contest rules mandate that contest operation take place somewhere farther up the band?" The answer is that to do so would be completely unworkable and unenforceable. Attempting to institute such a rule would lead to all sorts of post-contest accusations about where a particular station was operating and why "he should be disqualified and the award given to the next highest scorer—me, the complainant." Would any contacts be allowed around 110, even with DX stations? What about the DX station? Often, it is on because of the contest and wants to work lots of people. If all of the contest activity is moved to some other part of the band, the resident DX operator might not find out before becoming discouraged and giving up because, "even though the band appears to be open, there is little activity." As for the DXpeditioners, they would be at the new center of activity, and the same problem would exist.

There is an answer, and making it work is up to those of us who regularly operate 6-meter CW and SSB, not those sponsoring contests. We have habitually continued to do most of our operating on or near 50.110, despite the fact that for several years it has been urged, in these pages and elsewhere, that

50.200 be used as the domestic calling frequency. Indeed, this frequency is listed as the "Domestic Calling Frequency" in the Band Plan section in the last several ARRL Repeater Directories. The term "calling frequency" conveys the concept that short contacts should take place on or near that spot. As is the case with other calling frequencies—144.2, 220.1 or 432.1—for longer-winded exchanges, the participants should QSY to a nearby spot to hold their QSO. The "domestic" part denotes the frequency's use for contacts within the 48 contiguous US states and the populous portions of Canada. Certainly, that definition includes all local and single-hop E_s work within these regions. The 6-meter band plan, as published in the ARRL Repeater Directory, also calls out 50.110 as the "DX Calling Frequency." It's the place that most of the DX stations believe they have the best chance of being heard.

The only practical way to keep contest stations from monopolizing 50.110 and nearby parts of the band come next June 13 and 14 would appear to be for us active users of 6 meters to start now, and move most of our routine operations to the vicinity of 50.200. If this shift in activity is well in place by the time the contest rolls around, it won't take the contesters long to find out that's where everybody is. Sure, we should drop down to 110 frequently and try to rout out a DX station or two. Depending on our inclination, we can then either go back up band and re-join the fray or keep a vigil in case another interesting catch pops up.

The use of the higher part of the band, say above 50.130, for local and relatively strong signal E_s QSOs will have benefit at times other than during contests. All too often, the chance to make a choice DX contact is lost by S9+ signals holding a protracted conversation right on top of the weak DX station. Never was this demonstrated more aptly than during W6JKV's visit to the Azores last summer.

Impractical, some will say. The use of 50.200 has been suggested before, and little has happened. That has certainly been true so far. All I know is that a calling frequency well up from the lower band edge is working on 2 meters and, while 144.200 is far too crowded, especially during major meteor showers and E-skip openings, activity is much better distributed on that band than it is on 6 meters. The other approach of mandating that contest operation take place higher in the band is certainly impractical. The only other course is the status quo, which many find unsatisfactory.

Thus, it's up to those of us who regularly operate 6 meters. Let's resolve now, as the season is just getting underway, to move most of our operations to the area of 50.200 and not engage in domestic QSOs below about 50.125. By doing this, by the time the contest rolls around, 6-meter operating should be

much more pleasant and productive for everyone—DXer and contester alike. But, no one else can bring about this improved situation for us. Only we can do it.

CU around 50.2!

TWO MORE EME FREQUENCY BARRIERS FALL

For many years, the highest frequency that amateurs had used the moon as a reflector was 2300 MHz. W3GKP and W4HHK pioneered that work in 1970. In recent years, W4HHK has renewed his activity on that band and made several QSOs. Now, we have proof positive that EME is practical on still higher frequencies. A group including W7CNK, WASTNY and KA5JPD has been working on a project to accomplish moonbounce on both the 9-cm (3300-MHz) band and 5-cm (5650-MHz) band. Using a 16-foot dish at W7CNK's QTH in Oklahoma City, they have succeeded in obtaining echoes, first on 9 cm and later on 5 cm. On February 21, they used a TWT producing about 50-W output on 3450 MHz and a 1.5-dB-NF preamp. This set up yielded echoes about 8 dB above the noise. Then they reconfigured the system for 5760 MHz, a more optimum frequency for the TWT, resulting in an output of 100 W. With this and a 2-dB-NF preamp, they received echoes the first time they pressed the key. Strength of the returns was about the same as on the lower band, 6 to 8 dB above noise. WASTNY described an interesting phenomenon observed during the tests on the higher frequency. When thin clouds drifted across the moon, the signal sounded almost like aurora.

W7CNK, WASTNY and KA5JPD are to be congratulated, as they have written another fine chapter in the history of Amateur Radio's exploration of our bands. But they are not resting on their laurels. Work goes on toward establishing two-way contacts via the moon on these frequencies.

EME ANNALS

For the past several years, the May column has included the EME Annals. This box was originated by this conductor in an attempt to document the growth of moonbounce. It took a lot of digging to put together the first box, and I hoped that it would be self sustaining after that. I thought that the EME community would seize on the EME Annals as a means of showing what they have done and, more importantly, what the mode is capable of. Unfortunately, while a few moonbouncers have been very good about submitting data, most have not. In past years, I have been forced to make telephone calls and pour through various newsletters in order to have an even chance of reflecting current accomplishments. Despite these efforts, I'm afraid the box is woefully out of date. Incidentally, this lack of response does not apply to the state boxes or the Six-Meter DX Standings. The moonbouncers' failure to submit timely information leads me to the conclusion that most do not feel that the EME Annals is a worthwhile feature of the column or that it provides a useful and an appropriate measure of the status of the mode. Thus, I have reluctantly decided that running the box, even once per year, is not a good use of valuable QST space. This decision is not final, however, and I await your comments and reports. In the meantime, I'll retain the file of the handful of updates received for this year's box and keep the data base in the computer, just in case I'm flooded with protests and updates. Remember, the EME Annals lists the total number of different EME stations (not QSOs) worked, US states and DXCC countries worked via EME, along with an indication of WAC. If these are not the appropriate items to document accomplishment, let's hear some suggestions.

ON THE BANDS

6 Meters—It is unusual, this time of year, for sporadic E to be the principal propagation mode cited in letters and phone calls. But that is what the mail and other communications have been about lately and the same thing applies to 2 meters, as well. W5QZJ Junction, TX EM00 says that 6 meters was open for him 13 evenings during February. All of the openings were between 0000 and 0300Z and most were into Arizona, California and Nevada. Pat contrasts this with February 1986 when no US E_s were observed, the only break being a contact with HC2FG in Ecuador. This assessment is echoed by another Pat, that inveterate propagation watcher WA5IYX San Antonio. Using the 88-108-MHz FM broadcast band, he noted nine instances of E_s propagation, for a total duration of 360 minutes, during the month. This contrasts with none during the previous February. Another FM report comes from one who, unfortunately for all of us, must confine his hamming to listening to the FM band. K3ZO is currently attached to the US Embassy in Managua, Nicaragua and doesn't have much hope of obtaining permission to operate in that country. Being situated about 1000 feet above the city, Fred regularly receives El Salvador FM stations about 240 miles away. Like WA5IYX, he has caught several E_s openings, including one lasting over an hour that provided fine quality stereo classical music from KKED 90.3 MHz Corpus Christi, TX. That was on February 4 between 0000 and 0100Z. Heard, also, were several Mexican and Colombian stations between 2300 and 2400Z February 16.

KA3B has put out a very complete directory of 6-meter activity including beacons, repeaters and active stations by grid. To receive a copy, send five dollars to Harry A. Schools, 1606 South Newkirk St, Philadelphia, PA 19145. Any excess money will be donated to SMIRK or used to fund the purchase of 6-meter equipment for DX stations wishing to become active on the band.

2 Meters—As mentioned in the 6-meter section, most of the news of the lower VHF bands this month concerns E_s or, as 2-meter operators usually refer to it—"E-Skip." Last month, this column carried news of an opening on February 10. One good 2-meter E_s opening during February is unusual, but two is nothing short of extraordinary. In fact, the one on the 15th (UTC) seems to have been more widespread and produced many more contacts than the earlier one. A correspondent not heard from recently, K7ICW Lost Wages, lists contacts with Oklahoma stations WB5DSH, N5FEQ, K5CBL, KB5EK, K5SW and WA5VSE—the first four in EM15 and the others in EM25. Also worked was Texas station W5ROR EM23 along with two Arkansas stations: KA5BPB EM25 and K5YY EM35. Al also heard W5SEW DM95 in the Texas Panhandle and WA5QXF EM25 in Oklahoma. All of this occurred between 0057 and 0135Z February 15. N6CW, whom I had the pleasure of meeting on a recent trip to San Diego, comments that the two openings he caught in February are twice as many as he heard all last summer. From the other end of the path, K5SW, who seems to catch most 2-meter E_s openings, lists, for the 15th affair, K7CA, K7ICW, W7HP, NW70, W7KYT, N7IR, N7BPA and W7LGV—all DM26 in the Las Vegas area. In addition, Sam worked K6PVS DM14 for the second time in a week. NO8Y Wichita, KS reports that his neighbor, WB0VZW, worked K6PVS with S9 signals at 0105Z and that another local, WB0HYV had his first success with 2-meter E_s, completing contacts with K6PVS and N6CW.

W3WN, whose call was mistakenly printed as W3UN last month, continues to call the Maryland-Ohio Net each Sunday, Tuesday and Friday evening at 2045 local time on 144.170.

Doc says in the March *SWOT Bulletin* that the winter conditions have not been kind to the group producing weak signals and high noise levels. Conditions should be back to normal by the time this reaches mailboxes, however. Keep up the good work, Doc! Incidentally, the same issue of the *Bulletin* carries a reprint of a design for a halo, using copper tubing. I'll send anyone a copy for an SASE to the address at the top of the column.

The Higher Bands—If sporadic-E is the principal item in reports on 6 and 2 meters, microwave activity is the dominant theme for the higher bands. From all around the country, individuals are writing to tell of present and planned activities on 13 cm and above, and microwave clubs are springing up all over. The latest of these to come to my attention is the Gulf Coast Microwave Society, centered in the Houston area. Those interested may contact Mark Allen, KA5YPU, at 713-367-9209 or Steve Gomez at 409-835-4132. That makes three such groups that I know of in Texas alone. In the neighboring state to the north, K5PJR, WASICW and W5UGO have been busy extending their 5-cm (5.650-GHz) range. W5UGO's letter states that, just before the end of the year, K5PJR succeeded in establishing contact with WASICW while the latter was operating at Granite, OK a distance of 286 miles. This betters the 267-mile mark set by K5FUD and K5PJR in 1977. For some time that was the world record for the band but it has since passed overseas (See The World Above 50 MHz for March). Nevertheless, this recent work represents a North American record. In his letter, Larry says that in various combinations of portable work the three have made over 100 5-cm contacts at distances ranging from 80 miles to the above 286 miles. He says that every path they have tried to date has produced successful contacts.

One not heard from in a long time is WD4MBK. Charles writes that he is installed in a new QTH in Berkeley Lake, GA affording some space and a good horizon shot in all directions. Being within the prescribed distance from the PAVE PAWS installation at Warner Robbins, GA, he had to secure a permit from the Air Force for high-power on 70 cm. Having accomplished this, he now has 850-W output and eight 19-element home-brew RIWs. He and K4CAW Raleigh, NC still call the regular 2100 (local) Wednesday night net on 432.090. In addition to moving, Charles says that he has been spending lots of time on the beacon system which is now operational. So far it consists of 1 W on 432.0715, 2 W on 1296.2145, 100 mW on 2304.3575, 1 mW on 3456.572 and 8 W on 5760.9295 MHz, with other outputs to follow. All outputs are phase locked to a 108.01788-MHz stable oscillator. The system is installed at K4MSK's QTH in the mountains of North Carolina at 4777-feet msl in grid locator EM85md. Charles consistently hears the 5760-MHz beacon in Atlanta, a distance of 115 miles. On some occasions the signal has been so strong that he could copy it with an open waveguide.

In the February 432 and Above EME News, K2UYH says that new stations are appearing on 70-cm EME every month. Some of the latest include IN3HER (70 and 23 cm), K9UIF, JA1JRU on SSB and IK6EIW. Al also notes that the East Coast VHF Society is being revived and one of its current projects is to put his dish on 13-cm EME. They have 100 W of circularly polarized power from a solid-state amplifier and plan to be operational under the club call WA2WEB May 9 and 10. On a sadder note, Al reports that veteran Polish moonbouncer SO1MN has become a Silent Key. For many EMEers, he was the first Polish 70-cm EME contact. Karl will be missed by the community.

Packet-Radio Networking Leaps Forward

For several years the concepts of higher-level protocols have been discussed within the packet community. At present, a packet user must specify all the routing information required to get a packet from point A to point B. A network-layer implementation handles the routing for the user. Let's look at some of the network implementations under consideration.

NET/ROM

The W6AMT network of digipeaters in California is testing a new firmware program for the TNC 2. Called "NET/ROM," the new firmware supports networking capabilities (commonly referred to in packet-radio circles as "layer three" and "layer four").

Developed by Ron Raikes, WA8DED, and Mike Busch, W6IXU, of Software 2000, Inc, NET/ROM runs on a standard TAPR TNC 2 terminal-node controller, or on any of the commercially available TNC 2 "clones." NET/ROM is distributed in the form of a 27C256 EPROM, which simply plugs into the ROM socket of the TNC 2 in place of the standard TAPR firmware ROM. NET/ROM is intended for use primarily at wide-coverage digipeater sites. It is not appropriate for end-user or mailbox stations.

A NET/ROM node provides the normal functions of an ordinary AX.25 digipeater, plus a set of sophisticated higher-level networking capabilities. A NET/ROM node user may display a list of other known network nodes; establish a transport-level circuit to a distant node; and connect to another end-user or mailbox in the vicinity of the distant node. Compared with conventional AX.25 multihop digipeating, NET/ROM's true store-and-forward packet switching technology can provide an order-of-magnitude improvement in throughput, especially over long paths. Routing from the local node to the distant node is handled automatically, and even includes alternate routing to circumvent network outages.

NET.EXE

Another approach to the implementation of higher-level protocols is that taken by Phil Karn, KA9Q, in his NET.EXE program for the IBM PC. Essentially, Phil argues that there is no need to tie ourselves down to the AX.25 link layer protocol when a layer-four (transport) protocol is operating to ensure end-to-end data integrity. Phil's approach, as embodied in his NET.EXE program, allows several possible link-layer protocols (including AX.25).

NET.EXE executes the Defense Advanced Research Projects Agency (DARPA) suite of protocols. Included in these are IP, the Internet Protocol; TCP, the Transmission Control Protocol; ARP, the Address Resolution Protocol; FTP, the File Transfer Protocol; and SMTP, the Simple Mail Transfer Protocol. All of these are above the link layer in the hierarchy of protocols. At the link layer, NET.EXE supports simple serial data transfer via SLIP, the Serial Line

Interface Protocol, and nonprotocol serial I/O.

One of the most interesting aspects of the NET.EXE system is that it can do more than one job concurrently. TCP, which is used to provide end-to-end data integrity, can support multiple connections. NET.EXE also supports multiple applications processes. Using the multiconnect protocols, you could, for example, initiate a file transfer to another computer using FTP, and while that transfer is taking place you can chat with the operator of the remote computer using TELNET (the terminal-to-terminal "chat" protocol). Or perhaps chat with the operator of a *different* remote computer. Or receive forwarded mail. Or receive a file. Or... (You get the idea.)

TEXNET

This networking protocol uses datagrams with node-to-node acknowledgments. User selection of node resources is performed on the basis of SSIDs. For example, connecting to the node with the node's call sign and an SSID of 1 will attach the user to the National Weather Service interface. Connecting to SSID 4 will let the user access the network, at which point the user can command the network node to list the other known network nodes, establish a circuit through the network, display node-activity statistics or access the message system.

The TEXNET network nodes under construction are two-port devices, with a 2-meter port for user access and a 70-cm port for node-to-node linking. The nodes will be

operated from a battery and charger, providing emergency communication capabilities. Linking between nodes will be performed at 9600 bit/s.

The TPRS development team includes George Baker, W5YR, Tom McDermott, N5EG, and Tom Aschenbrenner, WB5PUC. TPRS expects to make printed-circuit boards and software available this summer.

Virtual Circuit Networking

A virtual circuit (VC) networking proposal based on CCITT X.25 was introduced by Terry Fox, WB4JFI, at the Third ARRL Amateur Radio Computer Networking Conference in 1984. Other early VC supporters were Gordon Beattie, N2DSY, Tom Moulton, W2VY, and Howard Goldstein, N2WX. Advocates of this approach point out that X.25 is an international standard in widespread use in commercial and government-owned packet-switched networks. Furthermore, unlike a datagram network, the network (not the endpoint) takes responsibility for delivering all packets where they are addressed and in the right order. One advantage of VC is that once a virtual circuit is established through a network, subsequent packets have less overhead in the packet headers, whereas datagrams contain the full address every transmission.

It was Howie who wrote the code for an X.25-based VC network protocol resident in a TAPR TNC 2 that was demonstrated at the Fifth Networking Conference at Orlando in 1986. A number of groups are experimenting with this networking protocol, but a final, field-tested package has yet to be released. Howie has written dual-port networking code for the PAC-COMM dual-port TNC, that will be released soon.

Shoot-Out at the Net Corral

Feast has replaced famine. We now have four different initiatives in amateur packet-radio networking: NET/ROM datagram, TCP/IP datagram, TEXNET datagram and X.25-based virtual circuit. The ARRL Ad Hoc Committee on Amateur Radio Digital Communication has decided that networking protocols must compete in field trials until such time as one demonstrates its superiority over the others. Once the facts are in, the Digital Committee will make a recommendation to the ARRL Board of Directors on a networking standard. This is not a matter merely for the market to decide, as users convinced that they need a networking protocol as soon as possible will favor whatever is working first. There are long-term and international aspects to this decision. It would be tragic if a short-term standard (de facto or otherwise) had to be thrown out because of lack of foresight. Similarly, whatever we pick should consider the needs of users in other countries. The ARRL, as the packet-radio clearinghouse for the International Amateur Radio Union (IARU), must continue to develop protocols worthy of acceptance by all IARU member-societies.

PX: Spring in Chester

Program 150 is a Commodore Amiga version of MINIMUF 3.5 (an MUF calculator) written by Ron Jacobs, WA1FSV (56 cents postage required).

Program 151 is an ARRL Sweepstakes Contest logging and duping program for the Commodore 128 and 64 computers (with disk drive) by Bill McClellan, KV0I (73 cents postage required).

Program 152 is a six-band Worked All States award tracking program for the Commodore 128 computer (with an 80-column RGB monitor) by David Bauer, KT0Q (56 cents postage required).

To obtain a listing of any PX program, send a business-size SASE with 39 cents postage (unless noted otherwise) to ARRL, Dept PX, 225 Main St, Newington, CT 06111 (CRRL members can send their SASEs to CRRL, PO Box 7009, Stri E, London, ON N5Y 4J9). Use a separate SASE for each program request and write the PX program number of the desired program at the lower left-hand corner of the SASE. Please do not send correspondence other than PX requests to Dept PX.

Novices, Welcome to 220 MHz

This month's installment of FM/RPT is dedicated to Novice class hams, who, with their newly enhanced operating privileges, now can join the rest of us in the FM and repeater mode of Amateur Radio communications.

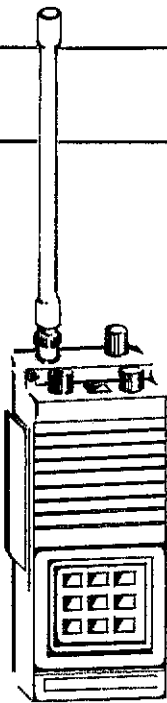
Welcome to 220-MHz FM or, more specifically, 222.10 to 223.91 MHz FM!

In the 222.00- to 225-MHz segment of the band, frequency modulation (FM) is used almost exclusively in two modes—the "simplex" mode and the "repeater" mode. If you have exercised your high-frequency (HF) operating privileges to any extent, you are already familiar with the simplex mode of operation. In the simplex mode, a station transmits and receives on the same frequency while in contact with another station that is also transmitting and receiving on the same frequency.

One difference between Novice HF simplex and 220-MHz simplex is that on HF, Morse code (CW) and single-sideband (SSB) voice are used, whereas on 220 MHz, voice FM is used. Another difference is that on HF, simplex operation is conducted on any available frequency within the Novice band. On 220 MHz, specific frequencies, the "simplex channels," are available for simplex operation. The simplex channels have been selected by gentlemen's agreement, so as not to interfere with the repeater mode of operation. The primary or "National" simplex channel is 223.50 MHz. Other simplex channels are 223.42, 223.44, 223.46, 223.48, 223.52, 223.54, 223.56, 223.58, 223.60, 223.62 and so on, every 20 kHz up to 223.90 MHz.

All of the simplex channels are not available for simplex operation in all areas. In highly populated areas, some of these simplex channels have been reassigned (by local gentlemen's agreement) for repeater operation. Also note that with Novices now able to use all modes between 222.10 and 223.91 MHz, some of these simplex channels may be reassigned again for other Novice modes, such as CW, SSB and packet radio.

Propagation on 220 MHz is different from what you are used to on HF. The primary medium of propagation on HF, the F2 layer of the ionosphere, normally has no effect on 220-MHz propagation. Rather, normal 220-MHz propagation is dependent on line of sight—that is, what you see is what you get (more or less). If the antenna of one 220-MHz station can "see" the antenna of another 220-MHz station, then 220-MHz communications between these two stations is possible. Depending on the local terrain and the station equipment (whether a base, mobile or portable installation is involved and the amount of power it is running), the maximum distance you can expect to cover is 25 to 50 miles. The 220 MHz "repeater" mode can extend this coverage many times over.



Extended Coverage via the Repeater Mode

A repeater is usually located above the average height of the local terrain, such as on top of a mountain or tall building. As its name implies, it repeats signals and, thus, improves the operating range of stations that are mobile, low-powered, or located in nooks and crannies (stations that are at a disadvantage when it comes to line-of-sight propagation).

A repeater operates on two frequencies. It listens on one frequency (its "input" frequency), and transmits on the other frequency (its "output frequency"). If the repeater hears a signal on its input frequency, the repeater turns on its transmitter, and retransmits that received signal on its output frequency. To use a repeater, your transceiver transmits on the repeater's input frequency and receives on the repeater's output frequency. (Such split-frequency transmitting and receiving is called "duplex" operation.)

By gentlemen's agreement, the separation between the repeater's input and output frequencies is 1.6 MHz. For example, a repeater with an input frequency of 222.86 MHz has an output frequency of 224.46 MHz (222.86 MHz + 1.6 MHz = 224.46 MHz). Also by gentlemen's agreement, repeaters are spaced 20 kHz apart. For example, if one repeater operates using an input frequency of 223.02 MHz, the next repeater up the band will have an input frequency of 223.04 MHz [223.02 MHz + 20 kHz (or 0.02 MHz) = 223.04 MHz].

These gentlemen's agreements are known as "band plans," and have been agreed upon by various repeater groups throughout the United States and Canada. *The ARRL Repeater Directory* is published annually (see page 124 for ordering information) and lists the currently active repeaters by locality, as well as all of the band plans. If you want to know which repeaters are operating in your locality or in a location you are traveling through, *The ARRL Repeater Directory* is the place to look.

Luckily, the input frequencies of most 220-MHz repeaters are within the portion of the band in which Novices are permitted to transmit and, although approximately two-thirds of the 220-MHz repeater outputs are outside the Novice portion of the band, no one needs a license to listen to any frequency. Therefore, any Novice can transmit on a repeater input frequency and be repeated legally. However, Novices are not permitted to be the licensee or control operator of a repeater.

Station Equipment

At the present time, there is a limited

amount of commercial equipment available for 220-MHz FM. Mobile and hand-held transceivers are available from ICOM and Kenwood in a variety of forms, while only hand-held equipment is available from Yaesu. All commercial transceivers are capable of transmitting at or below the Novice legal limit of 25 watts. Prices for new mobile transceivers are in the \$450 to \$500 range, while new hand-held transceivers are in the \$225 to \$400 range.

Only ICOM has a base transceiver available at this time. For a base installation using a mobile transceiver, you use an ac-to-dc power supply that is able to handle the transceiver's voltage and current requirements in the transmit mode. Refer to the transceiver's manual for these requirements.

Signal polarity used on 220-MHz FM is vertical, mainly because a vertically polarized antenna is easier to install and maintain on a motor vehicle than is a horizontal antenna. Vertically polarized 220-MHz mobile antennas come in a variety of shapes and sizes from Antenna Specialists, Cushcraft, Hustler, Larsen and Valor, while a similar variety of base 220-MHz antennas are available from AEA, Cushcraft, Hustler, Hy-Gain and KLM. The price range for new antennas is \$30 to \$55 for mobile installations and \$45 to \$140 for base installations.

Exercising the Privilege

Using 220-MHz FM is fairly simple. Tune your transceiver to a simplex frequency or a frequency that is occupied by a repeater, squeeze the PTT switch on your microphone, and announce your call sign ("This is KB9NM"). If you wish to talk with a specific station, call that station followed by your call sign ("K1XA, this is KB9NM"). In either case, if someone wants to talk to you, they will transmit on the frequency and call you back. That's all there is to it! (For a detailed description of all of the nuances of FM and repeater operating techniques, refer to the FM and Repeaters chapter, written by yours truly, in *The ARRL Operating Manual*.)

The End of the Beginning

This has been an introduction to a new world of Amateur Radio communications for the Novice ham. As Novices take up residence in this new world, the world will evolve.

The 220-MHz evolution started on March 21; stand by for further developments.

REPEATER LOG

According to January 1987 reports received, repeaters were involved in the following public-service events: 413 vehicular emergencies, 36 public-safety events, 27 medical emergencies, 17 drills/alerts, 13 weather emergencies, 12 fire emergencies, 3 criminal activities and 1 power failure.

The following repeaters were involved (followed by the number of events): W2VL 40, NK2W 8, WA2ZWP 6, W3UER 14, WA4BVW 35, K4ITL 3, WA6BJY 7, WD6DII 15, KA6EEK 61, W6FNO 304, K8DDG 5, KD8GL 5, WA8ULB 5, K9LSB 14. □



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VE3SR Appeal Moves Ahead

On February 28, lawyers for Jack Ravenscroft, VE3SR, filed an appeal with the Supreme Court of Ontario. For those of you unfamiliar with the case, Jack is the Ottawa-area amateur who was convicted of being a nuisance and taken off the air for allegedly interfering with a neighbour's electronic equipment. The conviction threatened to set a dangerous precedent for users of all radio transmitters. For this reason, amateurs and others have donated over \$60,000 for Jack's continuing defence.

The appeal is based on points of law rather than on the technical merits of the case. Jack's lawyers argue

1) that Jack's conduct did not amount to actionable nuisance because (a) the interference was intermittent, (b) the neighbour rejected measures which would have reduced or eliminated the interference and (c) as was established at Jack's trial, the interference was clearly the result of the RF susceptibility of the neighbour's equipment;

2) that the conviction violated the principle of statutory authority, which holds that when the Parliament of Canada authorizes an activity and outlines procedures to be followed should problems arise out of that activity, and no negligence is involved, that activity is immune from prosecution under the law of nuisance; and

3) that the conviction, under the law of nuisance which is a provincial law, infringes on the Parliament of Canada's exclusive right to regulate radio communications, and is therefore unconstitutional.

Jack wrote to us early in March. He misses being on the air. "Consider my frustration during the last part of January when Peter Island appeared on the scene. This was to be country 360... It was inhuman, listening to my arch-rivals acquiring contacts! DXers will understand."

Still, Jack was in good spirits, encouraged by the support he had received. "Our sincere thanks to those who assisted us. And not only to Canadians. We extend thanks to amateurs in the United States, England and many other countries, some as remote as Papau New Guinea, who have been most generous."

Jack noted, "We have come a long way... However, we still need your continuing support." To date, Jack's legal expenses are about \$50,000. If the appeal fails, he will have to pay the court's award to his neighbour, his neighbour's legal expenses and interest. The address of the JRSD Fund is Box 8873, Ottawa, ON K1G 3J2.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the British Columbia Section: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Name of the incumbent appears on page 8 of this QST. A petition, to be valid, must carry the signatures of five or more Full members of the League residing in the British Columbia Section. It is advisable to have more than five signatures. Photocopied signatures are not acceptable. Signatures must be on the petition. Petition forms, FSD-129-C are available from the CRRL Headquarters office in London, Ontario, but are not required. The following form is acceptable:

(Place and date)

CRRL Secretary Box 7009, Station E
London, ON N5Y 4J9

We, the undersigned Full members of the League residing in the British Columbia Section, hereby nominate... (name and call sign) as Section Manager for this Section for the next two-year term of office.... (signatures and call signs) ... (addresses including postal codes)

A Section Manager must be a resident of his or her Section and a licensed radio amateur holding a Canadian Amateur Certificate or higher, and have been a CRRL Full member for a continuous term of two years at the time of nomination. Petitions will be received at the CRRL Headquarters office until 1600 EDT 1987 June 05. If only one valid petition is received, the person nominated will be declared elected. If more than one valid petition is received, a balloted election will take place. Ballots will be mailed from CRRL Headquarters on or just before 1987 July 01. Returns will be counted after 1987 August 14. A Section Manager elected as a result of these procedures will serve for a two-year term, to begin on 1987 October 01.

If no valid petition is received, the British Columbia Section will be resolicited in 1987 October and November QST. You are urged to take the initiative and file a nominating petition immediately.

Harry MacLean, VE3GRO
CRRL Secretary

SECTION MANAGER ELECTION RESULT

Congratulations to Bill Gillespie, VE6ABC, who was recently re-elected Alberta Section Manager. Bill, who also serves as CRRL Midwest Director, ran unopposed, as there was no balloted election.

DOC ENDS SCHEDULED EXAMS

DOC has officially informed CRRL that its Amateur Radio examinations question bank has been stocked with multiple-choice questions for

all examinations except the Digital Amateur. CRRL will receive a printout of the questions, which it may publish, and will be consulted before questions are added or changed. The current practice of scheduling Amateur Radio examinations four times a year will end on June 01. After that, examinations will be scheduled as required, at the discretion of DOC District Offices. Several different examinations will be available. Examination papers will be reused. DOC also officially informed CRRL that it is studying the certification of private examiners. As reported in this column last month, a project designed to determine the best way of doing this is under way in Ontario and Quebec.

NOTES FROM ALL OVER

☐ Quebec's first HF PBBS is on the air. Jean Serge Labelle of Laval is offering CRRL, ARRL and IARU bulletins, and store and forward message service, from VE2ED in Laval, daily at 1900-2300 EST/EDT on 3633.8 kHz.



CRRL Ontario Director Ray Perrin, VE3FN (right), presents the 1986 Amateur of the Year Award to Ralph Cameron, VE3BBM, in recognition of Ralph's untiring efforts in connection with the Jack Ravenscroft case.

☐ To commemorate the 150th Anniversary of Coburg, Ontario, Coburg amateurs will be using the special prefix VX3 June 22-July 05.

☐ A Manitoba amateur was stopped by the RCMP recently and asked to produce a licence to justify having Amateur Radio equipment in his car. Section 9 of the Radio Regulations, Part II, is open to various interpretations. For this reason, it may be a good idea to carry a copy of your station licence—and even your operator's licence—whenever you operate mobile.

☐ The CRRL 1987 *Canadian Repeater Directory* will soon be available. To reserve your free copy, send a self-addressed no. 10 business envelope and 36 cents postage to CRRL Headquarters in London, Ontario.



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The International Amateur Radio Union—since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

Yachts and Amateur Radio

The almost mutual love affair between cruising yachts and Amateur Radio continues unabated. I say "almost" because there continues to be some abuse of Amateur Radio by those who want its advantages without having paid their dues—that is, without having obtained a legitimate Amateur Radio license.

The virtues of Amateur Radio in yachting and the subject of getting a license and the "unfairness" of requiring a Morse examination is periodically and energetically debated in some of the yachting publications, notably in *Latitude 38*, a West Coast pub-

lication which allows its readers to express themselves generally without restraint.

Several months ago, we published a list of maritime nets, a list that generated a modest amount of interest and correspondence. These are the nets that are in use by those who find themselves, like the ancient mariner, alone, alone, all, all alone—except for Amateur Radio. Thanks to Ash Nallawalla, VK3CIT/ZL4LM, and Roger Krautkremer, W6SOT, for this update on the nets. However, if you find any errors or omissions (and I'm sure there are some), blame me!

RSGB's 75th

1988 will mark the 75th anniversary of the Radio Society of Great Britain, and they plan to make it a memorable occasion.

The Society is planning a major convention, designed in part to improve the public's understanding of Amateur Radio. They will also play host to a number of overseas guests, as well as supporting a number of special-event stations. Other plans include a series of demonstration stations, a display of historic Amateur Radio equipment, video presentations and a special women's program. We'll have more information at a later date.

Maritime Nets

Time (UTC)	MHz	Net Name/Designator	Days	Area Covered	Time (UTC)	MHz	Net Name/Designator	Days	Area Covered
0100	3.935	Gulf Coast Hurricane	Dly	US Gulf Coast	1345	3.968	EC Waterway Net	Dly	US East Coast
0100	21.407	Pac-Indian Ocean Net	Dly	Pac/Ind Oceans	1400	7.292	Florida Coast Net		Florida
0100 +	14.313	Mar Mobile Svc Net	Dly	Pacific	1400	3.963	Sonrisa Net	Dly	Baja/Cal
0200	14.305	Cal-Hawaii Net		CA/HI/Pac	1500	7.193	Alaska Net		Alaska
0200	7.290	Hawaii PM Net	M-F	Hawaii	1545	14.340	Marquesas Net		S Pac
0220	14.315	John's Weather Net	Dly	S Pac	1600	7.2385	Baha Cal Mar Net	Dly	Baja/Cal
0300	14.313	Seafarer's Net		Pac/W Coast	1600	14.313	Coast Guard MM Net	M-F	Atl/Car/USA
0300	14.106	Traveler's Net		Aust/IndOcean	1630	7.285	Serape Net	Su	Mex Coast
0330	14.040	EastCoast MM CW		East Coast	1630	21.350	Pitcairn Net	F	S Pac
0400	14.115	Canadian DDD Net	Dly	Pacific	1700	14.340	Cal-Hawaii Net	Dly	Cal-Haw.
0400	14.075	Pac CW TFC Net	MWF	Pacific	1700	7.240	Bajco MM Net	M-F	Gen Am/Panama
0430 +	14.314	Pac Mar Net		Pacific	1700	14.313	International MM Net	Dly	Atl/Med/Car
0500	21.200	VK/NZ/African Net	Dly	Pac/Ind Oceans	1700	14.329	Skippers' Net	Dly	Pacific
0500	14.280	US/Aus TFC Net		Pacific	1730	14.292	Alaska Net	M-F	Alaska
0530	14.303	Swedish Maritime Net		Pacific	1730	14.115	Canadian DDD Net	M-F	Pacific
0630	14.180	Pitcairn Net	M	S Pac	1800	14.285	Marquesas Coffee Net	MW	Pacific
0630	14.320	S African Mar Net	Dly	Atl/Ind Ocean				Sa	
0700	14.313	International MM Net		Atl/Med/Car	1800	14.303	UK Maritime Net		Atl/Med/Car
0700	14.265	Pacific Island Net		Pacific	1800	14.305	Confusion Net	Dly	S Pac
0700	14.310	Guam Area Net		West Pac	1800	14.313	MM Service Net	Dly	Atl/Car/Pac
0715	3.820	Bay of Islands Net	Dly	Aus/NZ/S Pac	1800	7.076	S Pac Cruising Net	Dly	S Pac
0715	3.815	S Pac MM Net			1800	7.197	S Pac Sailing Net	Dly	S Pac
0800	14.315	Pac Inter-Island Net	Dly	S Pac/SE Asia	1830	14.342	Manana MM Net	M-Sa	W Coast/E Pac
0800	14.303	UK Maritime Net		Atl/Med/Car	1900	7.255	West Pacific Net		W Pac
0900	14.313	Med MM Net	Dly	Mediterranean	1900	7.285	Ahamaru Net	Dly	Hawaii
0900	7.080	Canary Island Net		Atlantic	1900	14.329	Bay of Isl Net	Dly	New Zealand
1000	14.330	Pac Gunkhohlers Net		S Pac	1900	3.990	Northwest Mar Net		Pac NW
1000	14.313	German MM Net	Dly	Atl/Med	2000	7.060	VK Maritime Net		Aus/S Pac
1030	3.815	Caribbean Wx Net	Dly	Car	2130	14.318	Daytime Pacific Net		Pacific
1030	14.265	Barbados Cruising Net		Atl/Car	2130	14.290	East Coast Waterway		E/C USA
1100	3.770	Maritime Wx Net	M-Sa	NE Canada	2200	21.350	Pitcairn Net	Tu	S Pac
1100	7.0825	Caribbean MM Net	Dly	Car	2200	21.404	Pac Maritime Net	M-F	Pacific
1100	14.313	Intercon Net	Dly	N/S/C America	2230	3.815	Caribbean Ex Net		Caribbean
1130	21.325	S Atl Roundtable	Dly	S Atl/Ind Ocean	2300	14.313	Intercontinental Net	Dly	N/S/C America
1200	7.115	Caribbean MM Net			2310	14.285	Cal-S Pac Net	M	S Pac
1200	14.040	MM CW Net		East Coast US	2330	21.325	S Atl Roundtable		South Atlantic
1200	14.320	So East Asia Net	Dly	SE Asia/Indonesia	2400	14.320	SE Asia MM Net	Dly	S & W Pac, SE Asia
1245	7.268	EC Waterway Net	Dly	US East Coast					
1300	21.400	Trans Atl MM Net	Dly	N Atl/Med/Car					

Field Day, California YL Style

Field Day 1986 is history, but the stories of fun and adventure continue to be told wherever amateurs gather. Many participate in Field Day seriously and with competitive spirit, while others enjoy the social aspects of just getting together for a weekend outing. Regardless of one's personal approach, the intent is to have a good time and demonstrate Amateur Radio skills and perhaps learn something new.

Those thoughts were precisely what a group of California YLs, ages 25 to 74, had in mind during early 1986. Sarah Davis, N6FAX, Irma Osborne, KF6FX, Marie Mappus, N6KUS, Pam Meek, N6MHU, Pam Bender, KB6LVI, and Karen Tersarkisoff, KA6ZDB, decided to participate in Field Day with a special "YLs Only Operation." For several years, the women and their OMs have been members of the "Low Powered Hams," a group that combines weekend camping with Amateur Radio operation. During favorable weather, the group packs radio and camping equipment, and heads for weekend get-away rural retreats. Until recently, a routine weekend consisted of the OMs experimenting and operating their radio gear while the YLs "assisted." Essentially, the gals focused on matters other than technical radio, such as meal planning. The tides turned during early 1986 when the women began to muse about the possibility of a YLs-Only Field Day that would give the OMs an opportunity to "assist."

"The OMs were more excited about the idea than we were, at first, and immediately volunteered to do the cooking and all the support work, just what we had done for them in the past," remembers Pam, N6MHU. "I think their ulterior motive was to get many of us YLs licensed and/or upgraded, and involved in the HF portion of Amateur Radio."

At the time the YLs were planning for Field Day 1986, only three were licensed. By the time Field Day arrived, however, all six YLs were licensed, and the group could boast of one Novice, two Technicians, two Generals and one Advanced class operator.

Throughout the winter, the YLs planned and discussed their upcoming Field Day operation, with the emphasis being on the logistics of equipment choices, antenna plans, etc. As spring approached, the group went camping again on weekends. This time, the YLs paid very careful attention to how the OMs set up and operated the portable station. "We observed what the OMs were doing and how they were doing it," recalls N6MHU.

As Field Day drew closer, the YLs firmed up their plans, chose an IC-740 for their rig, and a dipole, inverted V and vertical antennas for 10-80 meters. "I couldn't wait to get there and set up," said KA6ZDB, housewife and community center director, "even though I wasn't sure if I really wanted to do it!" Karen's comments reflect those of all of the women. No one in the group had any prior contesting experience or experience operating on any of the HF bands. The group's retired teacher, N6KUS, said "Even though I didn't have any HF or contest experience, I couldn't



From left to right: KF6FX, KA6ZDB, KB6LVI, N6FAX, N6MHU, N6KUS (WA0JRB photo)

wait to begin. I knew it would be fun." For Pam, KB6LVI, it was the joy of finally being an Amateur Radio operator with a chance to be a part of a team effort with good friends.

Field Day finally arrived, and setting up the station was easy. The OMs "stayed out of the way," but were available to assist in throwing a line into the top of a tree so the dipole could be pulled up and into place. With a pink face, N6MHU admitted, "The OMs did, however, suggest that the dipole might work better if the coax was attached. We had left the feed line for the dipole laying on the ground!" (Sound familiar?)

When the contest started, the YLs spent most of their time tuning around the band and answering stations calling. "Lack of experience was really our biggest problem," said Pam Meek. The next obstacle was learning to pronounce the phonetics of the call sign. "Try saying KILO FOXTROT SIX FOXTROT X-RAY 10 times as fast as you can," suggests N6MHU. "We eventually posted a large poster next to the rig, which helped everyone keep their tongues going in the right direction."



N6MHU on the mike, with KB6LVI keeping the log. The YLs increased their QSO rate to 6 per minute during the second day of the contest. (WW6F photo)

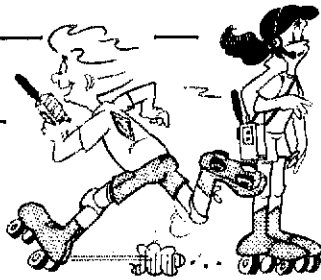
In spite of a slow QSO rate, the YLs started to relax and enjoy themselves and, like real troopers, hung on into the night. They decided that in view of what seemed to be poor band conditions, they would call it a night and get an early start Sunday morning. During the night, gusty winds came across the mountain-top, and the women crawled out of cozy sacks to secure the vertical antenna before it blew over and was permanently damaged. By 5:30 AM, all were bright-eyed, raring to go and enthusiastically back on the air. Their QSO rate on Saturday had been a modest 5-6 per hour, but on Sunday these pros were now running QSOs at a 5-6 per minute rate. "We finally got a handle on the contesting procedures and were really moving," says a proud N6MHU. When the contest ended, all were reluctant to pull the plug. Marie, N6KUS, was heard saying, "Don't pack up. Where can we go next?"

Nonetheless, camp was broken and, with gear carefully packed, the group headed home, their heads spinning with memories. KF6FX proudly stated, "I think we did a darn good job considering our lack of experience." "But the weekend was too short. We needed more time," said Marie. "Field Day is not boring when you can be involved like we were," Pam concluded. The group concurred that Irma must upgrade and earn a more pronounceable call sign! KF6FX is too much of a tongue-twister!

The YLs returned home excited about their adventure into new areas of Amateur Radio, and surprised to find out just how much fun and challenging these events can be. Field Day was barely over when they began to discuss how they could better their QSO rate, where they would locate for Field Day 1987, how they might improve on their signal, what chores the OMs would take care of, ad infinitum. Field Day 1987 hopefuls: Beware! The California YLs will return!

SPRING FLING MINICONVENTION SCHEDULED FOR FT MYERS

Ever thought of having an eyeball with those YLs you've talked with on the air, but have never met? The last weekend in May provides an excellent opportunity. YLs will gather May 29-31 for a miniconvention at the Lani Kai Resort Hotel in Ft Myers, Florida. The convention begins Friday evening with a get-acquainted dinner and entertainment that includes a singalong. On Saturday, registration will be followed by a luncheon and fashion show and scheduled tours of the area, plus planned time for shopping and on-your-own activities. Saturday night's banquet will feature entertainment and gifts, and promises "plenty of surprises." Sunday's brunch will conclude the miniconvention. Meal reservations will be required, so make your plans early. A hospitality room complete with amateur station will be available to registrants for meeting their friends, chatting on the air and leaving messages. For further information and reservations, contact Myrtle Farnsworth, N2AKC, 142 Kihade Trail, Medford Lakes, NJ 08055, or Jan Scheuerman, WB2JCE, 3818 SE First Pl, Cape Coral, FL 33904.



Elmers, Young and Old

Neill Johnson, KAØWQA, 14, had just passed his Novice exam. During the interminable period of waiting for his ticket, he kept asking his dad, Jeff, for help in locating the right gear for the shack. While he had encouraged Neill in his new hobby, Jeff didn't much know the difference between a dipole and a fishing pole. Neill was afraid that he'd get his ticket, but have no way of getting on the air.

"There's a physics professor I see at work," Jeff said to Neill. "Maybe he knows somebody who can help." The physics professor, Al Kaske, KAØRDM, is well qualified to answer questions about Amateur Radio. He is an Advanced class licensee and holds a PhD in Electrical Engineering. He teaches at Hamline University in St Paul, Minnesota, where Jeff works in administration.

In typical helpful ham fashion, Al answered Jeff's questions and even volunteered to accompany Jeff and Neill to the local ham store and to help them set up Neill's rig and antenna. "I have a friend who will help, too," Al said. Al's friend turned out to be another college professor, Keith Champlain, WØMICY, who teaches at the University of Minnesota. Keith is an Amateur Extra who, like Al, holds a PhD in Electrical Engineering.

The next Saturday found Neill, Al, Keith and Jeff holding an "antenna party." Keith had his wrist rocket slingshot, rigged with a spinning reel, to shoot the string connected to the 40-meter dipole over the ash tree in the backyard and the blue spruce in the front. Neill was grinning from ear to ear, hardly able to wait to get his eager fingers on the key of his "almost new" ICOM 701 transceiver.

Al and Keith were having a great time, too. "We old guys need an excuse to use this thing once in a while," Al chuckled as he loaded up the slingshot. With an experienced eye, he was able to fire the weight dead center over the highest tip of the spruce, the string trailing along like smoke from a miniature rocket. "But this isn't right. It's supposed to be 25 below zero and snowing," he joked. He and Keith started telling stories about stringing antennas at Keith's cabin in near-arctic blizzard conditions in northern Minnesota in mid-January.

Jeff stood around, fetching a tool, a roll of tape or whatever else was called for by the others. He was a bit puzzled by it all. Any hobby that had two university professors spending their Saturday helping out a 14-year-old must be pretty special. He had never been exactly clear about the original source of Neill's interest in becoming a ham. Neill just said "It sounded like a really neat thing to do." Now Jeff was getting more curious about his son's new hobby.

Soon, Neill was getting QSL cards, the first



There's more than one way to raise an antenna. This ham shows how it's done using the bow-and-arrow approach. (photo by Rita Armour and KU7G)

from Al, then from as far away as Australia. He was also busy introducing (over the air) some of his new ham friends to each other.

One evening after dinner, Neill was reading the latest issue of *QST*. He exclaimed to his dad, "Hey, I know this guy! That's Fred Hird, KCØRX. You know, the guy who once took me to a meeting of our radio club. He's the one down the block with the antennas all over his roof. He gave me a bunch of back issues of *QST* and some equipment." (See Sep 1986 *QST*, page 13, for a short piece on Fred.)

"Now, my 14-year-old is talking about his 79-year-old friend," Jeff thought. He decided


to give Fred a call and thank him for helping Neill with his hobby. "Don't thank me," Fred said. "Neill helped me in getting ready for my move to Iowa. He carried heavy things and helped me box up stuff."

Ham radio was definitely something special, Jeff thought, and decided he might become an amateur. Neill gave him a copy of *Tune in the World with Ham Radio* for his birthday and a brand new CW key. Neill also built him a code-practice oscillator. Soon, Jeff was watching the mailbox for the arrival of his Novice ticket.

Al Kaske pointed out how unusual it is to see a youngster lead a parent into Amateur Radio. "Usually, it's the parents that involve the kids, not the other way around. And usually it's us older hams who are supposed to be helping the younger ones link up with the broader ham community. Not with Neill, though. He's the one who deserves the lion's share of the credit."

What makes this story different is that the more experienced Elmers knew how to let the young Novice use his energy and enthusiasm to everyone's benefit. And, perhaps, that's what we need: to let a few more younger hams help lead the way in building the Amateur Radio community. Are there some more "Young Elmers" like Neill Johnson out there? You bet there are!

A REMINDER

If you write to me, the conductor of this column (address at the top of the page), make sure to include an SASE, or I won't be able to reply. I am more than happy to respond, but I can't pay postage on all the letters. Thank you and 73.—N7DDM 

Strays



I would like to get in touch with...

any General class licensees who are 10 years of age or younger. Sharat Muthyala, N8IAW, 1802 Vine Street, Midland, MI 48640.

anyone who has built a helium maser. Bill Copeland, WB6RVE, PO Box 163, Perris, CA 92370.

anyone with a service manual for a GR-100 transceiver. Damita Dodanawatawana, 10A Elibank Flats, Elibank Road, Colombo 5, Sri Lanka.

Coming Conventions

ATLANTIC DIVISION/NEW YORK STATE

May 15-17, Rochester

The 1987 edition of the Rochester Hamfest/Atlantic Division/New York State Convention will feature outdoor flea markets at noon on Friday, indoor and outdoor space available. Indoor space for non-commercial sellers is available by advance reservation only. Indoor flea-market space setup starts Friday at 1 PM. Open for business Saturday and Sunday at 7 AM with commercial exhibits on both days only. Location is the Monroe County Fairgrounds, E Henrietta Rd (Rte 15A) and Calkins Rd. Hotel Hq is the Rochester Marriott Thruway. Both locations are near NY Thruway exit 46. VE license exams on Saturday. Advance registration is required before May 8. Contact A. G. deBlicke, KW2X, 59 Bay Knoll Rd, Rochester, NY 14622. Programming begins at 9:30 AM Saturday. Featured speakers are Phil Anderson, W0XI, President, Kantronics and Paul Rinaldo, W4RI, Editor, QST and Publications Manager of the ARRL. Also featured is Vern "Rip" Riportella, WA2LQQ, President of AMSAT and Editor of *Amateur Satellite Report*. A League forum will be presented by Directors Turnbull, Mendelsohn and Atkins. A code contest will be held at 11 AM and 1:30 PM. Banquet on Saturday, with guest speaker Dr Ronald A. Parise, WA4SIR, Astro Payload Specialist, Computer Sciences Corp. Registration is \$6 in advance, \$7 at gate. Banquet \$14. Outdoor flea-market permits, \$5 per space. Indoor market space is \$16 per table. To order tickets, write to Rochester Hamfest Tickets, 174 Croydon Rd, Rochester, NY 14610. For all other info, call 716-424-7184 or 716-424-1100 days.

May 2-3

Louisiana State, Baton Rouge

May 16-17

Atlantic Division, Rochester, NY

May 29-31

Oregon State, Seaside

June 5-7

Texas State, Arlington

June 13-14

Georgia State, Albany

ARRL NATIONAL CONVENTIONS

July 10-12, 1987—Atlanta, Georgia

Sept 9-11, 1988—Portland, Oregon

OREGON STATE CONVENTION

May 29-31, Seaside

The 1987 Seaside Pacific Ham Convention will be held at the Seaside Convention Center. Hours are 7 PM-9 PM Friday (seminars only), 9 AM-4:30 PM Saturday and 9:30 AM-2 PM Sunday. Preregistration is \$5 each, \$7 at the door. Teens with parents are \$2, under 12 free. Banquet speaker is film producer Dave Bell, W6AQ. Also featured is Leland Smith, W5KL, National QCWA President. Greg Milnes, W7AGQ is the emcee. Special features include 24 scheduled seminars, over 100 indoor flea-market tables and exhibitors. The center is two blocks from the beach with activities for kids and adults. VE testing at 9 AM and 1 PM on Saturday, walk-ins at 1 PM (space available only). For registration and housing info, call Doc at 503-738-6461, or write to SEA-PAC Ham Convention, PO Box 920, Seaside, OR 97138. All other info via Randy,

KZ7T, at 503-297-1175, or Al, WB7SIC, at 503-640-5456 evenings.

TEXAS STATE CONVENTION

June 5-7, Arlington

The Ham-Com 87 and Texas State ARRL Convention will be held in the Arlington Convention Center located at the heart of the DFW Metroplex, on 1-30 adjacent to the Texas Rangers baseball stadium. Features include free hospitality at 5 PM Friday, Saturday 7 AM-5 PM and Sunday 7 AM-2 PM. Admission is \$7 in advance for single, \$10 for family; at the door is \$8 for single, \$11 for family. Programs and Forums with indoor flea market. All major dealers. Women's and children's programs. Talk-in on 147.14. For more info, contact Ham-Com Inc, c/o John Fiset, WA5OHG, Box 25028, Dallas, TX 75225, tel 214-521-9430. ~~W7E~~

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in QST of prizes of any kind and games of chance such as bingo.

Alabama (Birmingham)—May 16: The Birmingham Hamfest and Civil Defense RACES Program is sponsored in part by the Birmingham ARC and Civil Defense. Location is at the Boutwell Auditorium and Exhibition Hall, 1930 Eighth Ave North. Admission is \$4. Doors open 9 AM-5 PM Saturday and 9 AM-4 PM Sunday. Talk-in on 146.28/88. Features include Banquet Dinner Saturday night, license exams, forums and flea market. For more info, contact Dan Morgan, 632 Stonehaven Dr, Birmingham, AL 35226.

Alberta (Edmonton)—May 30-31: The NAMAO Hamfest is sponsored by the Northern Alberta Radio Club. Features include flea market, banquet, dance and pancake breakfast, plus much more. RV parking, no tenting or hook-ups. Send SASE for registration form to NARC, Box 163, Edmonton, AB T5J 2J1, tel 403-438-9205.

Arizona (Sierra Vista)—May 1-3: The Cochise ARA will hold its 1987 Hamfest at the club's training facility on S Moson Rd, which intersects Rte 90 five miles east of the 90/92 junction in Sierra Vista. Tailgaters free. Talk-in on 146.52 or 146.16/76. Primitive overnight RV camping for club members.

For further information, contact Don Morgan, W7ACI, PO Box 1855, Sierra Vista, AZ 85636, tel 602-458-5293.

California (Sacramento)—May 30: The Sacramento Valley Hamswap 87 is sponsored by the North Hills Radio Club and will be held at the American River College Stadium parking lot at 4700 College Oak Dr. Doors open for sellers at 7:30 AM, buyers at 8 AM. Spaces are \$6 per vehicle. Refreshments available. Talk-in on 144.59/145.19, 223.18/224.78. For further info, contact Jim Pratt, N6IG, 1180 Arroyo Grande Dr, Sacramento, CA 95864, tel 916-483-2208.

Colorado (Colorado Springs)—May 16: The Pikes Peak RAA will hold its 1987 Swapfest beginning 8:30 AM. Location is the Rustic Hills Mall at Palmer Park and Academy Blvd. Free admission. Table rentals \$8 in advance, \$10 at the door. Talk-in on 146.37/97. VE testing on site. For info or reservations, call Al N0CMW, 303-473-1660, or write PPRAA Swapfest 87, PO Box 16521, Colorado Springs, CO 80935.

Colorado (Grand Junction)—Jun 20: The Grand Mesa Repeater Society will hold the eighth annual Western Slope Amateur Radio and Computer Swapfest from 9 AM-4 PM at the National Guard Armory, 482-28 Rd. Admission is free, but swap tables are \$5 each. Features include an indoor swapfest, Amateur Radio exams, auction and refreshments. Talk-in on 146.22/82 and 449.20. For swap table reservations and further info, send an SASE to Les Scott, NV0F, 2105 Yellowstone Rd, Grand Junction, CO 81503, or call 303-242-5296.

Connecticut (Newington)—May 31: The Newington Amateur Radio League will hold its fourth annual flea market 9 AM-2 PM at Newington High School, Willard Ave (Rte 173). Admission is

\$2 at the door, tables \$8.50 (\$10 after May 23) indoors; \$5 for tailgaters (weather permitting). Featured will be guided tours of ARRL HQ, Amateur Radio exams, all types of new and used ham gear as well as computer equipment. Talk-in on 146.52, 144.85/145.45 and 223.24/224.84. For exam info or table reservations, send SASE to Les Andrew, KA1KRP, 23 Grove St, West Hartford, CT 06110, tel 203-523-0453.

Illinois (Chicago)—May 17: The Chicago ARC will hold its annual Mini-Hamfest from 9 AM-3 PM at North Park Village, 5801 N Pulaski. Admission is \$1. Half table \$3, full table \$5 (admits one seller). For info, call 312-545-3622.

Illinois (Godfrey)—May 16: The First Annual Lewis & Clark Radio Club Hamfest is sponsored by the Lewis & Clark Radio Club located on Hwy 67-111 at the Lewis & Clark Community College campus. Admission is free. Doors open 6 AM-3 PM. Talk-in on 145.130, 145.230, 443.000. License exams start at 1 PM. Food and free parking available. For more info, contact Lewis & Clark Radio Club, PO Box 553, Godfrey, IL 62035, or Harold Elmore, KC9GL, tel 618-466-1909.

Illinois (Kankakee)—May 17: The Kankakee Hamfest is sponsored by the Kankakee ARS and will be held at the county fairgrounds 8AM-4PM. Admission in advance is \$2.50, \$3 at the door. Activities include commercial exhibitors, FCC booth, outdoor flea market, food and free parking. Fly-in at the Kankakee airport, free shuttle services available. Talk-in on 146.34/94. For info and reservations, contact KARS, Rte 1, Box 361, Chebanse, IL 60922, tel 815-932-6703.

Illinois (Pulaski)—May 17: The Chicago ARC will hold its annual Mini-Hamfest 9 AM-3 PM at North Park Village, 5801 N Pulaski. Admission is \$1. Half

table \$3, full table \$5 (admits one seller). For info, call 312-545-3622.

Illinois (Knoxville)—May 17: The Knox County ARC is sponsoring their Knox County Hamfest 7 AM-3 PM off exit 51 on I-74 to the Knox County Fairgrounds. Admission is \$3, \$4 at the door. Talk-in on 146.40/147.00 and 146.52. Food and refreshments also available. For more info, contact Keith L. Watson, WB9KHL, 119 S Cherry St No. 3, Galesburg, IL 61401, tel 309-342-3885 days, or 309-289-6446 nights.

Illinois (Quincy)—May 17: The Western Illinois Amateur Radio Club will hold its second annual Tri-State Swapfest in conjunction with a Fly-in Breakfast sponsored by the Experimental Aircraft Assn. The event will be held at Haerr Field, six miles west of Quincy at the junction of Rte 61 and 24. An Amateur Radio tailgate flea market will be featured along with aircraft exhibitions, airplane rides and official VEC exams for all Amateur Radio license classes. Flea market set-up begins at 8 AM. Gates open for general admission at 9 AM. Breakfast will be served until 11 AM. Talk-in on 147.03. For more info, contact The Western Illinois ARC, PO Box 3132, Quincy, IL 62301.

Indiana (Muncie)—Jun 7: The Muncie Area ARC will hold its annual hamfest at the Delaware County Fairgrounds 8 AM-3 PM. Admission is \$3, \$4 at the door. Tables are \$5 with electricity, camping with full hookup, \$5 per space. Talk-in on 146.13/73. VE testing 9 AM-11 AM. Free parking with security and food available. Set up after 5 PM Sat. For more info, contact Gary Barton, WB9HFG, 300 Riverview Dr, Yorktown, IN 47396, tel 317-759-8682.

Indiana (Wabash)—May 17: The Wabash County ARC will hold its 19th annual hamfest at the Wabash County 4-H Fairgrounds on State Rd 13. Donations are \$3.50 in advance, \$4 at door. Inside tables are \$10. Tables sold in advance or on a first-come basis only. Unlimited outdoor flea-market space. Free parking. Gates open 5:30 AM. Women's activities available. Radio exams included. Talk-in on 147.63/03, 146.52 and 146.94/94. For advance tickets, write to Don Spangler, W9HNO, 235 Southwood Dr, Wabash, IN 46992, tel 219-563-5564.

Kansas (Salina)—Jun 7: The CKARC Hamfest is sponsored by the Central Kansas ARC, located at the 4-H building in Kenwood Park. Admission is \$3. Doors open 9 AM-4 PM. Talk-in on 147.63/03. Features include food, ARRL Forum, QCWA meeting, MARS, Kansas Sideband and Weather Nets, Repeater Council meeting and Emergency Coordinators meeting. For info, contact Jim McKim, W0CY, 1404 S 10th, Salina, KS 67401, tel 913-827-2927.

Kentucky (Erlanger)—Jun 7: The Northern Kentucky ARC announces "HAM-O-RAMA" held at the Lions Park. ARRL, Packet, Antenna and DX Forums, Indoor exhibit for major vendors. Outside flea market. Vendors set up at 6 AM, general public at 8 AM. Food and refreshments available. Admission is \$5; under 13 free. Flea-market spaces are \$3; tables not provided. Vendor space indoors is \$10, with tables provided. Location is I-75 to exit 184B (Rte 236 East). Go two miles to Dixie Hwy (State Rtes 25 and 42). Go one mile to Sunset Ave. Turn right on Sunset to end of street. Talk-in on 147.855/255 and 147.975/375. For more info, contact WA4WNF, c/o NKARC, PO Box 281, Florence, KY 41042.

Maryland (West Friendship)—May 24: The Maryland FM Association's annual Hamfest will be held at the Howard County Fairgrounds. Take I-70, 30 miles west of Baltimore. Gate open 8 AM-3 PM. Inside tables by advance registration \$7; \$10 at the door, if available. Donation \$3. Talk-in on 146.16/76, 222.16/223.76 or 449.1/444.1 For tables or info, contact Jim Clifford, N3FBV, 7461 Terry St, Ft Meade, MD 20755, tel 301-674-4752.

Massachusetts (Dalton)—May 17: The Northern Berkshire ARC will sponsor a flea market at dawn at the Alton American Legion Field on Rte 9. Admission is \$1 per person. Space is free. Food available. For more info, write to the Northern Berkshire ARC, PO Box 591, Williamstown, MA 01267, tel 458-8452 days, 458-8267 evenings.

Michigan (Cadillac)—May 16: The Wexaukeer ARC will hold its 27th annual Swap Shop at the Wexford Civic Arena, junction of US 131 and 13th St. Talk-in on 146.97. Doors open 9 AM-2 PM. Ad-

mission \$3. Food available. For table reservations and info, write the Wexaukeer ARC, PO Box 163, Cadillac, MI 49601, tel 616-797-5491.

Michigan (Chelsea)—Jun 7: The Chelsea Swap and Shop will be held at the Chelsea Fairgrounds. Gates will open for sellers at 5 AM and for the public at 8 AM-1 PM. Donation is \$2.50 in advance, \$3 at gate, under 12 and nonham spouses are free. Talk-in on 146.98. For more info, write to Robert Schantz, 416 Wilkinson St, Chelsea, MI 48118, or call 313-475-1795.

Michigan (Midland)—May 30: The 13th annual Hamfest sponsored by the Central Michigan ARC will be held at the Midland Community Center. Features packet-radio demonstration, electronics and equipment and license exams. Open to public 8 AM-1 PM, \$3 admission. Food available. Dealers welcome. Talk-in on 146.00/60. For more info, send a SASE to CMARA Hamfest, PO Box 67, Midland, MI 48640, or call 517-631-9228.

Minnesota (St Paul)—Jun 6: The North Area Repeater Assn will sponsor the Upper Midwest's Swapfest and Exposition for Amateur Radio at the Minnesota State Fairgrounds. Free parking of self-contained campers. Call wide area repeaters 25/85 or 16/76 for directions. Exhibits, commercial dealers, outdoor flea market and license exams. Admission \$4 in advance, \$5 at door. For more info, contact Amateur Fair, PO Box 857, Hopkins, MN 55343, tel 612-566-4000.

Missouri (Columbia)—May 23: The Columbia Hamfest is sponsored by the Central Missouri Radio Assn at the Holiday Inn West, at Stadium Blvd and I-70. Admission is \$5 for 2 tickets, \$3 at door. Doors open 8 AM-4:30 PM. Talk-in on 146.16/76 and 226.42/224.02. Features include flea market, forums, dealers, exhibits, exams and more. For more info, contact Joyce Maggi, KA0KSL, Rte 10, 4 Bon Gor Ct, Columbia, MO 65202, tel 314-449-8741 or 314-332-1121 ext 283, or the Holiday Inn West, 314-445-8511.

New Hampshire (Nashua)—May 15-17: The 13th Annual Eastern VHF/UHF Conference will be held at the Rivier College, located near Rte 3, a short distance north of the Massachusetts border. Sponsored by the Northeast VHF Assn. Features include hospitality room, swapfest, technical talks and more. Preregistration \$14 to David Knight, KA1DT, 15 Oakdale Ave, Nashua, NH 03062 before May 4. Registration at the door is \$20. The Saturday night banquet is \$15, also before May 4. First-time attendees only \$10. Novices only \$7 with show of license. College rooms (single) available for \$17 per night, includes buffet breakfast; \$29 for double. Make all checks payable to Eastern VHF/UHF Conference. For other housing, motels and hotels are nearby.

New Jersey (Old Bridge)—May 17: The Old Bridge Radio Assn is sponsoring their Old Bridge Computer and Hamfest at the Old Bridge Skating Arena, Rte 516 and Cottrell Rd. Doors open at 6 AM for sellers, 8 AM-3 PM for buyers. Admission is \$5 buyers, \$12 sellers; advance save \$1. Features include new and used computers, radio and equipment plus more. License exam at 9 AM. Talk-in on Old Bridge repeater 147.12/72 and 52. For more info, contact Chris Mohr, N2DHN, 50 Harrison Pl, Parlin, NJ 08859, tel 201-727-3983.

New Jersey (Paramus)—May 18: The Bergen ARC is holding a Ham Swap 'n' Sell from 8 AM-4 PM at Bergen Community College, 400 Paramus Rd. Tailgating only. Bring your own tables. Amateur license exams included. Sellers \$5, buyers free. Talk-in on 79/19 and 52. For more info, contact Jim Greer, KK2U, 444 Berkshire Rd, Ridgewood, NJ 07450, tel 201-445-2855 eve.

New York (Old Westbury)—May 17: The Long Island Mobile ARC is sponsoring their Long Island Hamfair at the New York Institute of Technology on Northern Blvd. Sellers 7:30 AM, buyers 9 AM-3 PM. Admission \$5 sellers, \$3 for hams. VHF Tune-up Clinic is featured. Food and refreshments. Talk-in on 146.25/85. For more info, contact Hank Wener, WB2ALW, tel 516-484-4322.

New York (Owego)—May 2: The 28th Annual Southern Tier Hamfest will be held at the Treadway Inn, Rte 17 at exit 65. Talk-in on 146.16/76. Gate admission \$4; under 14 free. Dinner and gate tickets \$15 in advance. Technical program, ARRL Forum, vendor displays and all-day flea market. For more info, send SASE to PO Box 7082, Endicott, NY 13760.

New York (Rome)—Jun 7: The Rome Radio Club is sponsoring the Rome Ham Family Day just off NY Thruway exit 32 at the Lewis House. Admission is \$3. Activities include flea market, presentations, food and beverages, contests and a sit-down dinner. Talk-in on 146.28/88. Food available all day. For more info, contact Rome Radio Club, PO Box 721, Rome, NY 13440.

New York (Skaneateles)—May 30: The Amateur Radio and Computer Fest, sponsored by Skaneateles Lions Club, will be held at the Allyn Arena, Jordan and Austin St. Features include vendors, ham gear and computer displays, exhibits, VE license upgrades, programs plus much more. Activities available, food and refreshments. Talk-in on 147.00 and 442.30. Vendor setups at 6 AM (no Friday night setups). VE exams Novice through Extra, walk-ins only. Bring photocopy of license, upgrade certificates and \$4.35 cash, money order or certified check to W5YI/VEC. Testing starts at 11 AM. Advance tickets by May 16. Admission is \$2.50 in advance, \$3 at gate. Indoor 8-ft flea-market tables are \$8, \$10 at the gate. Kids 12 and under free, if with an attendee. Indoor vendor booth space 8 x 10 ft, first booth \$55; additional booths \$50 each. For reservations, info or write list, contact Hank Bryand, 315-685-7658, or tel Skaneateles Hamfest, 49 Elizabeth St, Skaneateles, NY 13152.

North Carolina (Durham)—May 23: The Durham FM Assn will hold its annual Hamfest 8 AM-4 PM on the lower rear deck at South Square Mall. VE exams, vendors and free tailgating. Talk-in on 147.825/225.

Nova Scotia (Halifax)—May 22-23: The Halifax and Dartmouth ARC is sponsoring their "Down East Fleamarket 87," held at Saint Mary's University. Pub night on Friday, free admission. Saturday doors open 9 AM-1:30 PM. NSARA annual meeting 1:30 PM-3:30 PM. Transmitter hunt 3:30 PM-5:30 PM. Dinner and dance 7:30 PM-1 AM. Sellers setup at 6:30 AM Saturday. Tables are \$3 each, plus admission of \$2 per person. Commercial sellers rates available on request. Refreshments are available. Talk-in on 146.64, 146.85 and 146.15. Reservations are required for the banquet at \$15 per person. Contact Jack Guilfoyle, VE1OU, 6339 Almond St, Halifax, NS B3L 1V4. Tables reservations: Arnie Brown, VE1AOG, at 902-435-3344.

Ohio (Akron)—Jun 7: The Goodyear ARC Hamfest is sponsored by the Goodyear ARC on Wingfoot Lake Park, Waterloo Rd, east of Akron off Rte 224. Admission is \$3 in advance, \$4 at the door. Doors open 8 AM-5 PM. Talk-in on 146.64, 146.985. For more info, contact D. R. Buckwalter, KC3CL at 216-796-3448 or 216-821-4409.

Ohio (Athens)—May 17: The Athens County ARC will be held 8 AM-3 PM at the City Recreation Center on East State St. Admission is \$4. License exams at all levels. If you wish to take exam, mail a completed 610 Form and \$4.35 check payable to ARRL/VEC to John Cornwell, NC8V, 101 Coventry La, Athens, OH 45701. Free outdoor flea-market space. Indoor space by advance registration only. Contact Walt Jones, N8DDL, 17 Berkley Dr, Athens, OH 45701, tel 614-593-7871. Talk-in on 146.34/94. General info: Carl J. Denbow, KA8JXG, 63 Morris Ave, Athens, OH 45701.

Ohio (Medina)—May 10: The 4th Annual Medina 2-Meter Hamfest is sponsored by the Medina MJM, Inc, located at the Community Center Fairgrounds. Doors open 8 AM-2 PM. Admission is \$3 in advance, \$4 at the door. Special women's activities. Talk-in on 147.63/03. For more info, contact Clarence Miller, 620 Oak St, Medina, OH 44256, tel 216-725-4492.

Ohio (Randolph)—May 17: The Portage Hamfair is sponsored by the Portage ARC and located between State Rte 224 and I-76 on State Rte 44. Admission is \$3 in advance, \$3.50 at the door. Doors open 8 AM-4 PM. Talk-in on 145.39. Full breakfast and lunch served. ARRL, ARES Forums, plus more. Women's and nonham activities. For more info, contact Joanne Solak, KJ30, 9971 Diagonal Rd, Mantua, OH 44255, tel 216-274-8240.

Oklahoma (Broken Arrow)—May 15-17: The Green Country Hamfest is sponsored by the Broken Arrow ARC and Tulsa ARC at the Votec Southeast Campus at 111th St, South and 129th E Ave. Admission is \$4 in advance, \$12 per household, \$5 at the door. Doors open 6 PM-10 PM Friday, 9 AM-5 PM Saturday, 9 AM-1 PM Sunday. Talk-in on 146.31/91 and 52. Features include ham, non-

ham and children's programs. For more info, contact Green Country Hamfest, PO Box 4970, Tulsa, OK 74159, 918-428-3887 (ext 202) or 918-663-0385.

Ontario (Kitchener)—June 6: The Central Ontario Amateur Radio Flea Market is jointly sponsored by the Guelph ARC and Kitchener-Waterloo RC at Bingham Park, 1380 Victoria St North. Doors open to vendors only at 6 AM, all others 8 AM-2 PM. Admission is \$3, under 12 free. Table rental for vendors \$5 per 8 ft. No outside vendors. Displays, computer software and hardware, refreshments and concession included. For further information, contact Ray Jennings, VE3CZE, at 519-822-8342, Gord MacPhail, VE3IH, at 519-822-4367, Rocco Furfaro, VE3HGZ, at 519-824-1157, Chris Christiansen, VE3BYU, at 519-743-9022, Paul Modray, VE3CHM, at 519-579-3057, Eric Enns, VE3BB, at 519-885-5216 or write to Guelph ARC, PO Box 1305, Guelph, ON N1H 6N9, or Kitchener-Waterloo ARC, PO Box 812, Kitchener, ON N2J4C2.

Pennsylvania (Ephrata)—May 24: The Ephrata Area Repeater Society will be holding its second annual hamfest. Location is 803 Oak Blvd, Amateur exams from 9 AM. Setup time for sellers is 7 AM, buyers 8 AM. Admission is \$3, Tailgating is \$2, 2 spaces, 8-ft tables are \$5, electricity at tables is \$1, XYLs and children free. Refreshments available, ATV and Packet Seminars. Talk-in on 145.450, 146.32 and 444.850. Inside tables not occupied by 9 AM subject to resale. For more info, contact Ephrata Area Repeater Society, 1655 West Main St, Ephrata, PA 17522, tel 717-733-0719.

Pennsylvania (Pittsburgh)—Jun 7: The 33rd Annual Breeze Shooters Hamfest will be held at the White Swan Amusement Park, Rte 60 (Parkway West), near the greater Pittsburgh International Airport. Free admission and flea market, family amusement park. Doors open 9 AM-4 PM. 2-meter check on 146.32. Directions on 146.28/88. Registration \$2 each, 3 for \$5 and 7 for \$10. Under-roof vendors by advance reservation. For more info and table reservations, contact Bud Faulhaber, N3DOS, 1059 Balmoral Dr, Pittsburgh, PA 15237, tel 412-366-5097.

Pennsylvania (Tamaqua)—May 17: The Tamaqua Transmitting Society & Anthracite Repeater Assn is sponsoring their Tamaqua Hamfest at the New England Fire Co, one mile west of Tamaqua. Doors open 9 AM-4 PM. Admission is \$3. Activities include free tweak and peak service, ARRL info booth, CW receiving contests, VE exams 9 AM-12 PM. Food and refreshments served. Talk-in on 146.670, 147.105 and 146.52. For more info, contact K3NYX, 127 Market St, Tamaqua, PA 18252, tel 717-668-0300 days or 717-668-5198 evenings.

Quebec (Sorel)—May 24: The Quebec Provincial Hamfest will be held at the Tracy Curling Club. Admission is \$4; outdoor tables are \$6, indoor \$8. Limited quantity, so please reserve before May 15. Doors open at 9 AM, 7 AM for exhibitors. For more info, write to Sorel-Tracy ARC, PO Box 533, Sorel, PQ J3P 5N6, Canada.

Rhode Island (Woonsocket)—May 16: The RI Amateur FM Repeater Service, Inc, is holding their Spring Flea Market and Auction at the American Legion Fairmount Post 85, 870 River St. Doors open at 9 AM, and spaces are \$5 each. Some spaces under the pavillion available on a first-come basis. Auction 12 PM-5 PM, admission is free. Food and beverages available. Talk-in on 34/94 and 52. For further information, contact Rick Fairweather, K1KY1, Box 591, Harrisville, RI 02830, tel 401-568-0566 (7-9 PM).

Tennessee (Humboldt)—Jun 7: The Humboldt ARC will sponsor its annual hamfest 8 AM-4 PM at the Bailey Park, 22nd Ave. Admission \$1. Flea market, women's activities, parking for RVs. Talk-in on 37/97. Food and refreshments available. For further information, contact Ed Holmes, W4IGW, 501 N 18th Ave, Humboldt, TN, tel 901-784-3490.

Tennessee (Knoxville)—May 23-24: The Radio Amateur Club of Knoxville is sponsoring their hamfest 9 AM-5 PM Sat and 9 AM-3 PM Sun. Admission is \$4. Activities include approx 30 dealers, forums on packet, how to become a ham, ARRL and DX, and entertainment for children. Talk-in on 147.90/30. For more info, contact George B. Nichols, 12434 Buttermilk Rd, Knoxville, TN 37932, tel 615-694-4806.

Texas (Abilene)—May 16: The Key City Amateur Radio Club is sponsoring their Fly-in/Drive-in

Hamfest at the Abilene Municipal Airport, three miles south of I-20 on Loop 322 and Hwy 36, just east of town and across from the West Texas Fairgrounds. Aircraft tie-down and parking nearby. Talk-in on local repeaters. Dealer set up 6 AM, registration 8 AM. For more info, contact Bill Jones, N5DOX at 915-698-4606, or W. K. Wiggins, WBSZOO at 915-673-1332; no collect calls please.

Utah (Lookout Pass)—May 15-17: The Tooele County ARC will hold its 3rd annual campout Hamfest/Swapfest, located 30 miles south from Tooele on State Hwy 36, then west on the Old Pony Express Rd for 8 miles. Talk-in on 146.98. VE exams Saturday at 2 PM. Women's and children's activities with lunch available for a nominal charge. For more info, contact Ed Allen, WB7UAO, 863 Buzianis Way, Tooele, UT 84074, tel 801-237-5866 day or 801-882-3978 evenings and weekends.

Virginia (Manassas)—Jun 7: The Ole Virginia Hams present the Annual Manassas Hamfest at the Prince William County Fairgrounds 8 AM-4 PM. General admission \$4, under 12 free. Tailgating \$5 per space. Activities include YL Program, ARRL Booth and CW Proficiency Awards, breakfast, lunch and refreshments at moderate prices. Talk-in on 146.37/97 and 52. Indoor exhibit spaces available. Contact Joe Schatter, K4FPT, at 703-368-8599, or Bob Zaeptel, K4HJF, at 703-368-3763. For additional info, write Ole Virginia Hams ARC, Inc, PO Box 1255, Manassas, VA 22110, or call John Gunsett, K14VP, 703-361-5255, or Gene Roberts, N4HFW, 703-361-3983.

Virginia (Roanoke)—May 24: The Roanoke Valley ARC is sponsoring their Hamfest 8 AM-5 PM. Admission fee is \$3.50 in advance, \$4 at the door. Talk-in on 146.385/985, 146.52. Features include VE tests at 8 AM, women's activities, inside and outside flea market, food and refreshments. For more info, contact Dick Wilmoth, WD4OGL, 4632 Elva Rd NW, Roanoke, VA 24017, tel 703-362-3933 or 703-366-2973.

Washington (Wenatchee)—Jun 6-7: The Apple City Radio Club is sponsoring the "Come Have A Picnic With Us Hamfest" at the Rock Ranch Dam, 7 miles north of Wenatchee on US Hwy 97. Featuring a Saturday evening banquet, a Sunday potluck dinner, a swapshop, ARRL VE license tests, and free camp/trailer space. For more info, contact the Apple City Radio Club, c/o Merton Hiatt, 1002 N Surry Rd, Wenatchee, WA 98801.

West Virginia (Bluefield)—May 17: The Bluefield Hamfest is sponsored by the East River ARC. Doors open 9 AM-3 PM. Location is at the Bluefield Recreation Center, ½ mile north of US 460 near the Virginia/West Virginia state line. Walk-in exams at 9 AM only, bring copy of license, 2 IDs, completed 610 Form and \$4.35 for all exams except Novice. Exams at Bluefield State College, Bluefield, WV, the first building on the right after entering campus. Look for signs.

Moved & Seconded

(continued from page 57)

Houston Amateur Mobile Society, Houston, TX
Iberville Repeater Assn., Inc., Plaquemine, LA
La Porte Amateur Radio Club, La Porte, IN
Lewis & Clark Radio Club, Godfrey, IL
Liberty County Emergency Communications Amateur Radio Club, Hinesville, GA
Long Island Contest Club, Deer Park, NY
Maryland Apple Dumpling Radio Amateur Radio Society, Wheaton, MD
North Ottawa Amateur Radio Club, Ferrysburg, MI
Orrville Amateur Radio Society, Orrville, OH
Packet and Repeater Klub, Libby, MT
Peninsula Amateur Radio Club, Long Beach, WA
Potter Junior High School Amateur Radio Club, Fallbrook, CA (Category III)
Public Safety Amateur Radio, Jackson, MS
Quaboag Valley Amateur Radio Club, Wheelwright, MA
San Benito Amateur Radio Club, San Benito, TX
Schaumburg UHF Amateur Repeater Society, Ringwood, IL
Serious Hams Amateur Radio Club, Pensacola, FL
Spa Amateur Radio Association, Hot Springs, AR

Tri-County Tri-Banders, Pennington, NJ
Turkey Island DX Club, Ottumwa, IA
Upper Kittitas County Amateur Radio Club, Cle Elum, WA

With the election of these clubs, the League has 1682 clubs in Category I, 14 in Category II, and 123 in Category III.

1) Convention matters:

11.1) There followed a discussion of coming conventions. On motion of Mr. Hurlbert, established policies regarding state conventions and regarding conflicts in dates with the ARRL National Convention were unanimously reaffirmed. Whereupon, on motion of Mr. Wilson, the following conventions meeting these policies were approved:

North Florida Section, August 1-2, 1987, Jacksonville FL
Northwestern Division, August 22-23, 1987, Tacoma, WA
Great Lakes Division, August 29-30, 1987, Saginaw, MI
Virginia State, October 3-4, 1987, Virginia Beach, VA
Kansas State, October 10-11, 1987, Wichita, KS
Tennessee State, October 24-25, 1987, Chattanooga, TN
South Florida Section, November 20-22, 1987, St. Petersburg, FL
Southwestern Division, September 2-4, 1988, Anaheim, CA
Southeastern Division, November 18-20, 1988, Tampa, FL

11.2) Mr. Butler reported briefly regarding the program for the ARRL National Convention in Atlanta, GA, July 11-12, 1987; without objection, the plans were approved. As a matter of collateral information, it was reported that the ARRL 1987 Second Board Meeting will be held July 9-10 in the Westin Peachtree Plaza Hotel, near the Georgia World Congress Center.

2) The Executive Committee will meet next on call of the President.

3) Other business:

13.1) On motion of Mr. Grauer, a nominee for the office of Honorary Vice President was unanimously found to meet the criteria for that office set forth in the Standing Orders, and the nomination was ordered forwarded to the Board for consideration at the 1988 Annual Meeting.

13.2) On motion of Mr. Wilson, the Committee wholeheartedly commended all members of the Hq. staff who had played a role in production of the April issue of QST, particularly as concerns covering the 220 MHz matter and Novice Enhancement (Applause).

13.3) The Secretary reported that the first ARRL Humanitarian Award given posthumously to Victor C. Clark, W4KFC, would be presented to Hester Clark, WA4PAE, at the annual banquet sponsored by the Vic Clark and Washington Chapters, Quarter Century Wireless Association, at the Key Bridge Marriott Hotel, Rosslyn, VA on March 28, 1987 (Applause).

There being no further business, on motion of Mr. Holladay, the meeting adjourned at 5:00 PM.

Respectfully Submitted:
Perry Williams, WIUED
Secretary

Life Members Elected March 21, 1987

Rodney C. Adams, KA1OUJ; Jane A. Allen, KA5JVF; Dan Amoroso, KA3MNF; Brad Anbro, KA9LTR; Avery C. Baswell, Jr, W4MQK; Robert E. Bishop, KB7GJ; Norma J. Bollinger, NC3X; Robert S. Bollinger, NC3T; John Breazeale, N2EXR; Robert J. Byers, WA6D; Blaine Caudill; WA4EIC; William M. Colony, KA7KLI; John M. Ciullo, N1ID; Jack W. Forbes, WB6QDC; David R. A. Horn, KK5I; James Kerr, N8GHP; Alan Lim, WB6BM; Toni A. Nessen, N6GYI; Robert M. O'Connell, NF2Z; Michael H. O'Marah, KA7MUL; Charles H. Otnott, III, WD5BJT; William A. Painter, WA4QCH; Howard L. Pomeroy; James W. Rutten NW0D; Robert Savoy, KK3V; Alan B. Smith, KA5VUJ; Louise F. Smith, N5HBI; Willis K. Smith, WD4CHP; Kenneth D. Stein, KD2WG; Alan Terrell, N4KGT; Mark Van Hooser, WB0FNA; Alan R. Viegas; Gedas G. Vysniauskas, WD8BYA; Frederick V. Weir, W2UB; M. Ybarra, KG6DU; Kathleen Willfong, KB6ONI; James L. Willfong, II, WB4AYE; M. S. Young, KG9T; Stephen R. Zumbun, W6SHO.

Amateur Satellite Communications

Fun, Games and (Hopefully) Education on OSCARs, Part 3

Last month I explained what was required to excel in AMSAT's receive sensitivity test, the ZRO Test. This month let's pick up a new direction within the general topic of satellite techno-sport.

Amateur Radio has, at its heart, the notion of public service. Indeed, in the public consciousness, the image of amateurs rallying to provide vital communications during emergencies is one we actively promote. And in no small measure is that image unwarranted. In the future, Amateur Radio satellites could play a significant part in emergency communications in any of several ways. AMSAT's Phase 4 geosynchronous satellite plans include a significant public service component at their heart.¹

There are possibilities and opportunities for experiments leading to real life-saving techniques that can commence now using current satellites. To dramatize this, to gain experience and proficiency in the field and to promote productive use of space resources, AMSAT is considering broadening its techno-sport base well beyond just the ZRO Test I've addressed over the past two months. In the future, satellite users can look forward to a fascinating new type of techno-sport that is both fun and fairly easy, but has some important implications for the whole field. I am talking about radiolocation by satellite.

In a techno-sport context, radiolocation by satellite is simply the game of trying to locate a hidden transmitter by using its satellite uplink signal together with special information about the satellite. In a real-world emergency, this technique can be used to locate downed aircraft or other vehicles in distress. In 1975, AMSAT pioneered a similar concept using the AMSAT-OSCAR 7 spacecraft. This led to the development of NASA's Search and Rescue Satellite (SARSAT) system.^{2,3}

SARSAT made its first save after locating a downed Canadian aviator on September 10, 1982. Since then, SARSAT and its Russian counterpart, COSPAS, have together saved over 500 lives, mostly in remote territory. The principles are simple and, as will be shown, can be easily and reliably transported to Fuji-OSCAR 12, the newest OSCAR, which was launched in 1986.

Most aircraft and many ships have emergency locator transmitters (ELT) aboard. In an emergency the ELT is automatically activated. When its signal is detected by a SARSAT/COSPAS-equipped satellite, the ELT's location can be determined almost immediately, depending on the precise circumstances. Rescue units can then be dispatched quickly to the scene. The essential elements to this scenario are these: The lost vehicle has a radio aboard, but it is out of range of terrestrial VHF or UHF direction-finding (DF) equipment. But the SARSAT/COSPAS satellites, listening on the ELT frequencies of 121.5, 243 or 406 MHz, easily pick up the ELT transmissions and relay them to ground analysis sites. Here the Doppler shift of the ELT signals heard by the SARSAT/COSPAS satellites is analyzed, and a position is computed for the vehicle in distress.

The ELT's emissions can be detected anytime an ELT is within the satellite's footprint, which

is about 4000 miles in diameter. Once an ELT emission is detected, the signal is transponded (relayed) to a Local User Terminal (LUT) in real time for analysis and computation of the ELT's QTH. Using the older version's system, the relay takes place in real time, requiring both the ELT and the LUT to be in the footprint concurrently. On newer versions, the satellite makes a time/frequency record of the ELT and dumps the record to the LUT on command. The LUT can thus obtain Doppler data on ELTs that the satellite has "seen" previously in its travels. Moreover, on the newer systems, the potential ambiguities inherent in the data provided by the older versions are quickly resolved within a few minutes from a single satellite.⁴

The SARSAT/COSPAS satellite contains a simple transponder that listens on 121.5, 243 or 406 MHz and regenerates the downlink at 1544.5 MHz. The analysis sites, established by the US, USSR, Canada and France, subject the resulting Doppler shift to careful scrutiny. The result is a quick determination of the ELT QTH, even in extremely rugged terrain.

Doppler shift is related to the closing or diverging velocity of the satellite to or from the ELT. Fig 1 shows the general shape of the curve of frequency versus time resulting from a SARSAT/COSPAS satellite approaching and then diverging from an ELT. The SARSAT/COSPAS ground station would receive a set of frequency and time data such as that which produced this curve. At acquisition of signal

(AOS), the Doppler shift is maximum and positive; the signal heard on 1544.5 MHz is up-shifted.⁵ The Doppler shift decreases until the satellite reaches its closest point to the ELT at the Time of Closest Approach (TCA). At this point, the satellite moves in a tangential line to the ELT. Thus, the satellite is neither converging nor diverging from the ELT and the observed frequency is the actual ELT emission frequency, f_0 . Then, the satellite begins to move away from the ELT and the Doppler effect causes the observed frequency to be below the actual frequency as shown in the figure. Finally, at Loss of Signal (LOS), the Doppler shift has caused the observed frequency to be at its lowest.

The mathematics underlying the ELT QTH determination are fairly simple. Knowing the ELT frequency, the observed frequency and the position of the satellite at various times is sufficient. The angle between the path of the satellite and the ELT at any instant is found by calculating the arc-cosine of the ratio of observed frequency to ELT frequency multiplied by the ratio of the speed of light to the satellite's velocity.⁶

Using the same principles, SARSAT/COSPAS radio-location techniques can be performed on FO-12. FO-12 has an uplink on 2 m and a downlink on 70 cm. Using the Mode-JA transponder, it should be possible for a clever, well-equipped amateur to locate a hidden transmitter to within a small region in just a few minutes.

To test this theory, AMSAT will begin a series of demonstrations on how the technique works in the near future. Simultaneously, AMSAT will publish a guide to calculations and required instrumentation. At a minimum, the equipment required will include a precision frequency counter to measure the downlink frequency, a digital clock and a computer to display the position of the satellite and to provide a detailed ephemeris of its time and position.

To make the demonstrations more interesting, AMSAT will format the event in the guise of a techno-sport competition. Certificates will be offered and the most accurate participants will be specifically cited for their achievements.

Next month we'll investigate yet another radio location by satellite technique using the so-called time-difference of arrival (TDOA) principle. For more information about AMSAT and OSCAR satellites, send a business-sized SASE to AMSAT, PO Box 27, Washington, DC 20044.

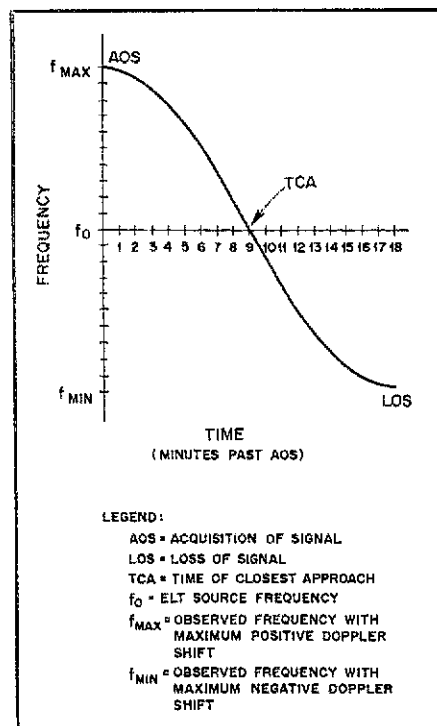


Fig 1—ELT typical Doppler-shift curve as observed by a typical SARSAT.

¹J. King, V. Riportella and R. Wallio, "OSCAR at 25: The Amateur Space Program Comes of Age," *QST*, Dec 1986 and Jan, 1987.

²AMSAT Satellite Report, No. 43/44, Oct 11, 1982.

³AMSAT Newsletter, Vol VIII, No. 1, Mar 1976.

⁴A more detailed system analysis will appear in a future edition of *QEX*, the advanced experimenter magazine from ARRL and AMSAT.

⁵Assuming the ELT is on 406 MHz and the 1544.5-MHz downlink Doppler shift is subtracted out, the net Doppler shift for the ELT, as heard from SARSAT/COSPAS, is about +10 kHz, maximum. Satellite velocity in orbit is about 4.5 miles per second.

⁶The *QEX* article will discuss potential ambiguities and how in practice they are eliminated or mitigated.

It is with deep regret that we record the passing of these amateurs:

WIABS, Donald R. Stevens, Suncook, NH
 KIBBE, Ernest M. Hardy, S Darmouth, MA
 WICBU, James Colby Coose, Stockton Springs, ME
 WB1DTZ, B. R. Suddam, Wilbraham, MA
 WIGPB, Lesley E. Salisbury, Belfast, ME
 WA1MHP, Wayne M. Richardson, St Albans, VT
 WIRGF, Zigmund J. Kondzior, Wilson, CT
 WIRNA, Robert L. Scott, Swanton, VT
 K1TVY, William P. McIntosh, Bristol, RI
 K1WQI, Maurice E. Sawyer, Saint Albans, ME
 WB2APZ, J. Benson Carr, Selkirk, NY
 W2AVA, William E. Harrison, Bayside, NY
 N2BLT, Clifford H. States, Burlington, NJ
 W2DHI, William H. Schnaars, Maywood, NJ
 KD2FM, Milton D. Mosher, Bridgeport, NY
 *K2GL, Hazard E. Reeves, Tuxedo Park, NY
 WB2HYQ, Gregory J. Mustakas, Milltown, NJ
 W2IQJ, A. Spence Hogan, Ocean Grove, NJ
 W2JF, Anton C. Frey, Staten Island, NY
 W2JIO, Robert W. Gunderson, Old Bridge, NJ
 N3ARV, Charles E. Kemp, Jr, Wilmington, DE
 W3BYV, Stuart D. Kreisher, Reading, PA
 W3CFT, William E. Barnett, Jr, Glen Burnie, MD
 W3CYR, Hugh K. Lloyd, Wheaton, MD
 WA3DMU, James Cording, Jr, Philadelphia, PA
 W3ELZ, Carl B. Buchanan, Homer City, PA
 W3FUB, Harold E. Bennett, South Williamsport, PA
 W3GFB, John Herbst, New Britain, PA
 W3HUF, Eugene P. Smyser, Waynesboro, PA
 W3IGS, Samuel A. Jordan, Sr, Philadelphia, PA
 W3JHS, J. Gordon Barnes, Cambridge, MD
 WA3LPK, Kevin McKewe, Severna Park, MD
 KA3MON, Rodney S. Moore, Broomall, PA
 K3ZKW, John Willard, Telford, PA
 K4CYE, Dora G. Dixon, North Miami, FL
 WA4DIY, Roy T. Quick, St Petersburg, FL
 KF4DP, Robert A. Wells, Fredericksburg, VA
 W4DPO, Noel O. Alexander, Le Noir City, TN
 N14E, Bill Copeland, Albany, GA
 K4E2D, Harold C. Janke, Melbourne, FL
 W4GPA, Harold I. Downs, Cordova, TN
 E4HHU, George F. Chastain, Prafttown, NC
 W4HN, Howard W. Mehrling, Miami Springs, FL
 K4JLL, Willard M. Ewing, Cape Coral, FL
 W4KPK, Virgil H. Byrd, Alexandria, VA
 N4LAL, Michael Namey, Tampa, FL

*W4LOT, John A. Saulich, Gulf Breeze, FL
 WD4LYA, J. Scott Sandstrom, St Petersburg, FL
 KJ4N, Irvin W. Peters, Jr, Hayesville, NC
 K4ROH, Raoul D. Storace, Holiday, FL
 WB4RTH, John J. C. Braun, Saint Cloud, FL
 WB4TTC, Mary E. Blankenship, Madison, TN
 W4VFL, Carter G. Cooke, Mountain City, TN
 W5AXT, John R. Monts, Dallas, TX
 W5CO, John W. Thomas, Shelby, MS
 WD5ETB, W. W. Northcutt, Cement, OK
 KF5FX, Dale W. Hartzler, Athens, TX
 W5GGZ, Leon Helms, Sr, Florence, MS
 W5HUX, Donald B. Riblet, Houston, TX
 W51Y, Burton W. Renager, West Memphis, AR
 W5KTL, Edwin J. Gaetz, Bellaire, TX
 W5NJO, Linwood R. Keech, Fort Worth, TX
 *K5OAF, Kenneth E. Smith, Jr, Corinth, MS
 WA5OVU, Igor Jiejn, Denver City, TX
 WA5RQC, Horace C. Robinson, Baton Rouge, LA
 W5RT, Paul N. Jett, Sr, San Antonio, TX
 W5TAB, Kenner E. Day, Rolling Fork, MS
 W6AKV, Frank Walker, Cocoa Beach, FL
 W6AYH, George Buford, Inglewood, CA
 W6BGW, Robert W. Hutchinson, Spokane, WA
 WA6FKU, Robert G. Smothers, Concord, CA
 W6IHW, Frank M. Cobb, Glendale, CA
 W6L, Thomas G. Eckles, San Diego, CA
 W6JA, Ronald E. Oakley, Verdi, NV
 K6JAN, Frederick J. Lawson, Los Angeles, CA
 W6KHC, Fred W. Tann, Oxnard, CA
 W6LWB, Edward J. Behrens, Adrian, OR
 N6LXV, Dan Lundberg, Hollywood, CA
 W6UUV, Jack M. Glessner, Grass Valley, CA
 *WA6UVK, Edward C. Silva, Oxnard, CA
 W7AH, Joe Grahn, Phoenix, AZ
 N7CED, Richard Springsteen, Kennewick, WA
 W7CJB, Woodrow W. Davey, Missoula, MT
 WA7LFS, Ralph L. Frandsen, Salt Lake City, UT
 K7MGL, Walter J. Sulier, Cottonwood, AZ
 W7OJO, Leslie S. Blewett, Butte, MT
 K7UXB, Al J. Mack, Phoenix, AZ
 K7UYU, Hank Wolf, Reno, NV
 W7ZLL, William F. Moore, Spokane, WA
 *K7Z2, Donald R. Riebhoff, APO New York
 N8BEU, Jerry Van Dyke, Martin, MI
 W8JJW, Chester W. Spearing, Cincinnati, OH

W8JT, William H. Buchanan, Cincinnati, OH
 W8SKG, Elmer E. Hilberg, Wickliffe, OH
 W9ARK, Myron J. McKee, Boca Raton, FL
 W9BE, Byron C. Sharpe, Glencoe, IL
 K9BUX, Frank Harvell, Kenosha, WI
 N9CWC, Thomas Leaton, Elmhurst, IL
 W9FMY, Hubert C. Payne, Mount Vernon, IL
 W9JTU, J. Kenneth Young, Evansville, IN
 W9RSA, William M. Kittson, New Berlin, WI
 W0AX, Thomas R. Donovan, Palm Bay, FL
 *W0CXX, Arthur A. Collins, Dallas TX
 K0FIT, Charles O. Patterson, Hastings, NE
 W0FRK, Lee J. Reptogle, Garnett, KS
 WA0MLN, Gerald M. Gaasch, Albion, MN
 W0MUX, Martin A. Rich, Kirkwood, MO
 W0PZZ, Beverly L. Smith, Napton, MO
 WB0UEB, Theodore J. Ciurej, Omaha, NE
 WB0YBC, William D. Norton, Jr, Grandview, MO
 K0ZQL, Tyler G. Rude, St Paul, MN
 VE1CAZ, Alexander Gibbons, Cumberland County, NS
 VE2PAR, R. Parsons, Montreal, PQ
 VE3ASC, Ian W. MacDonald, Weston, ON
 VE3CGY, Russ Neal, Windsor, ON
 VE7ANO, C. B. Helmkay, Barnett, BC
 VE7BPA, Frederick J. Lonsdale, Comox, BC
 VE7YS, Bernie Des Ordons, Vernon, BC
 ZLIWE, Max Farrell, Auckland, 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

May 1937

- Our performance in the Ohio River flood disaster was excellent, but Editor Warner points out we cannot rest on laurels. Increasing use of commercial radio is putting our bands under heavy pressure. Better operating practices would also help our stature.
- The Communications Department, concerned about laxity in regulatory observance, signals a get-tough policy by disqualifying some 160 entrants in the DX competition because of off-frequency operation.
- Don Mix offers a means to help solve the problem—a 100-kc. electron-coupled oscillator for frequency checking, as used at his WITS. He explains calibration using b.c. stations on even 100-kc. spots.
- W1DF adds a modulator for the low-power five-band transmitter he described in last December's QST, a rig which was popular with readers.
- In the first of a two-part series, Ross Hull summarizes two and a half years of propagation studies on the ultra-high frequencies. Recordings and observations show air-wave bending phenomena, which Ross has detailed in an extensive technical paper for the International Scientific Radio Union.
- A conference of Western Hemisphere nations in Havana this autumn will take up regional regulatory matters in the radio field. Proposals have been made to switch our 1715-2000 kc. band to 1750-2050, thus aligning the low end harmonically with other bands. Also, Latin countries want to use a part of 7 Mc. for voice operation.

□ Worldwide, we face problems. Proposals for the 1938 Cairo international meeting are being submitted, and include one by Japan to set 50 watts maximum power for amateurs. Belgium, Italy and Sweden are among the group asking for substantial cuts in our major bands.

- W3GS has built "ultra-midjet" equipment for u.h.f. work—transmitter and receiver each in a 4 x 4 x 2-inch box. The tiny 955 tube is the secret.
- Twelve controls give plenty of flexibility in measuring techniques for the versatile oscilloscope W1BY assembled using the 913 cathode-ray tube.
- It has taken this long to check and tally the 860 entries during last November's Sweepstakes. This is the first under the new operating schedule for 40 hours maximum time, as compared with the previous no-limit 9-day marathon. A survey shows medium power is still the norm—one third of the contestants use one or a pair of type '10s in the output.
- With the increasing interest in long-wire directive antennas, W8LUQ provides us with helpful design methods for "Vs" and rhombics.

25 Years Ago

May 1962

- Go for it! That's the reaction of members to the proposal for a building fund drive to move Hq. from the overcrowded space in West Hartford to a new structure in Newington, Conn. A subscription pledge blank is prominent in this issue.
- The arrival of spring turns thoughts to the outdoors, and W1YDS describes a hand-held packaged transceiver for 420-Mc. he takes to Connecticut

hilltops. It's just the ticket for getting started on the 24 meter band.

- If you want to know about what time to listen for Oscar after the news of a successful launch, W8FKC and W8CWL show how to do it with a minimum of equipment and calculations.
- Sixteen pages are required to report results of the 1962 Sweepstakes. W5WZQ was top scorer with 1,376 contacts. Eighty entrants worked all sections.
- W6EOT gets "transceiver" frequency control by a simple adapter which feeds the receiver setting to the transmitter input for rapid dial excursions.
- The Nittany (Pa.) ham club used radio despatch to offer rides in a "get-out-the-vote" campaign, with obvious success when 88% of those eligible turned out.
- The Correspondence Section is filled with comment on the new *Handbook*, produced for the first time on offset rather than letterpress, and with no-gloss paper. A heavy majority is complimentary, the most common remark being "easy on the eyes," but some express dislike and the hope QST will never switch to such paper.
- To believe it, you have to see W6EI's complete kilowatt sideband station contained in a small suitcase. Nine 6DQ5s in parallel do the job, and he says neutralization was no great problem.
- Newcomers starting on v.h.f. have off-frequency problems too. W1ICP finds, and so illustrates a set of simple wavemeters to aid those building their own gear.
- Cambodia, Indonesia, Thailand and Vietnam remain on the list of countries with which amateur communications are prohibited.
- A picture story shows the progression of Hq. locations, from the four-room third-story setup in downtown Hartford, to a second-story operation in the suburbs, thence to the present complete building in West Hartford. The new location in Newington will house a building designed specifically for League needs.—WIRH

Wheels Are Turning!

If you've been reading this column during the past few months, you've noticed quite a bit of attention being given to the Blue Ribbon Committee on Emergency Traffic's final report to the ARRL Board of Directors. We're pleased to see that many of you are in agreement with the committee's report and are interested in seeing its recommendations bear fruit.

The following is an unsolicited manuscript received at HQ from USAF Major David C. Miller, KØRJL.

Major Miller is presently Chief, Base Operations and Training Division, Minot AFB, North Dakota. He is a command pilot, Base Liaison with the Civil Air Patrol and the installation MARS Director. First licensed in 1959, he is an Extra Class licensee.

We hope his thoughts on gateway stations and jump teams stir your imagination and heighten your interest in this possible public-service program!

I applaud the Blue Ribbon Committee on Emergency Traffic for taking on the tough task of restructuring the Amateur Radio public-service communications programs (as published in the past two Public Service columns). They have formally addressed some concepts which have only been dreamed about for years. The time is now right to formulate some details on how to make these ideas work.

The committee alluded to two main types of emergency-communications groups: the gateway stations and the emergency-communications response teams. The response teams were also referred to as "jump teams." I envision the gateway stations as being the controlling or dispatching function, while the jump teams are the front-line operators on-scene at disaster locations. This concept can be local though international in scope.

Recent international emergencies, such as the Mexico City earthquake, used these concepts. The majority of traffic was passed between certain gateway stations in the United States to and from deployed stations in or around the disaster area. In a local tornado-watch scenario, the deployed teams may be Amateur Radio operators with 2-meter

mobile units who are passing weather advisories to a gateway station located in the county Sheriff's office. Each of these scenarios requires the responsible leadership of a gateway station that is in communication with a disciplined response force deployed into a stressed area. I envision this gateway-jump team relationship as a concept that can be structured at the local, Section, Division, Area (Eastern, Central, Pacific) and national levels. The operating requirements and equipment standards would be more stringent at upper levels than at local levels. Local communications could be very informal, indeed, and still provide a viable emergency service to its respective community. Participants at national levels would need sophisticated equipment and almost a paramilitary type of discipline.

The local organization can be tailored to some fairly specific needs. For example, the Buoys and Gales Hurricane Hunters may have different communications requirements than the Flakey Snowshoe Blizzard Blitzers. However, the Buoys and Gales club may wish to upgrade their equipment and training to qualify to represent the ARRL Southern Florida Section, while the Flakey Snowshoe club may wish to upgrade to represent the Montana Section. Likewise, either group could upgrade to a Divisional status. As these groups continue to upgrade to national specifications, they become more standardized and interchangeable. This does not mean, however, that they lose individual identity or specialty.

Special communications groups, whether they be gateway stations or jump teams, should be encouraged and identified. For example, the Dustspeck Radiators may be a group of retired military personnel living near Thunderbucket Air Force Base. Because of their retired military status, they qualify for space-available military airlift which may be the only way to deploy into a disaster area. Likewise, the Bar Harbor Dits and Dahs may have the capability to deploy a schooner to East Flounder Flock

Island in the aftermath of a hurricane.

The proficiency of personnel also needs to be considered. Whether a person is attracted to gateway station or jump team duties, some characteristics are common to both. Traffic handling ability is a must. Maturity, dedication, ingenuity and time for training are also accepted as prerequisites. Experience level, class of license and affiliation with other volunteer services (for example, MARS and CAP) can also become significant factors. Although many local groups can serve quite well with Technician-class licenses and hand-held radios, qualifications for higher levels are going to require operators to be able to exploit sophisticated systems such as packet radio and satellite communications, operate on almost any Amateur Radio frequency available, be proficient in both voice and CW procedures, and be able to interface with the communications functions of other agencies. Again, a high degree of emotional and mental stability is required of both gateway operators and jump-team members.

Physical health, however, may separate gateway station operators from jump-team members. Although team members should not be considered as "Radio Rambos," ready to parachute into steaming jungles with a machete in one hand and a hand-held radio in the other, there are certain physical demands on a deployed radio operator that are not quite as demanding on a gateway station operator. Let's face it, an Amateur Radio operator in a body cast and a heart pacemaker 500 miles from the nearest available hospital could easily become an emergency under high-stress conditions. This is not to say that those with physical limitations cannot participate in the program; keep in mind that several key leadership roles would be available at the gateway station.

I hope that some of these ideas can provide useful spin-offs as this exciting reorganization continues. Again, my congratulations to the Blue Ribbon Committee for a tremendous initial effort.—David C. Miller, KØRJL

YOUR CONDUCTOR'S CABOOSE

You and the Agencies or... Which Way Do We Go, George?

Following is the third, and last, installment of the D-CAT (Disaster Communications Action Team from Houston, Texas) public-service presentation to prospective ARES members and Leadership Officials. The previous installments can be found in July and September 1986 QST.

During this presentation you have read what is expected of an emergency coordinator, how to train volunteers and how to develop a successful emergency-communications plan, as well as the importance of interfacing with other emergency groups. All three of these elements are especially important, for without organization and planning, the result is chaos.

Let's use this final installment to discuss the

fourth and perhaps most important aspect of a totally successful disaster communications effort—developing a close professional relationship with your "client" agencies and organizations. A client by definition is an entity with a particular need that you can fill and is willing to have you fill that specific need. Note that the operative phrase here is "specific need." In terms of disaster communications, a client is an agency, either governmental or private, that perceives the need for a reliable communications backup system in the event of a disaster or emergency.

We are referring to law-enforcement, fire and medical-aid groups, disaster preparedness, the Red Cross and the Salvation Army. If the agency or organization is not in the commercial communications business, and the efforts of your volunteers will not result in a person or company making money, then these are potential agencies to contact. Others include local, state, regional,

or even national governmental agencies charged with the responsibility for the health and welfare of its citizens in times of disaster. With a little imagination, you can come up with quite a list of prospective clients for this well-trained team of communicators you are putting together.

Consider this: If you put a business together in the best possible way, offering a service that is unequaled by any competitor's efforts, but have no outlet for that service, do you think that business will succeed? I can't see it happening.

You must have clients. Your efforts must extend that unique service to the right people, at the right time, and in the manner that best serves the specific need of that client.

So, once you find the people, establish a general plan and begin practicing the tenets of that plan, you are left with one final task: You must identify potential clients for that service then sell—that's correct, I said sell—that client

on the idea that you can best provide a service he needs.

Here's the tough part: In a city the size of Houston with the public and private services available to maintain the health and well-being of the citizenry, it becomes very difficult to establish in the minds of potential clients a real-time need for disaster communications from an outside group.

And to a lesser degree, those of you in the more rural areas are faced with a similar problem. What do you do to sell the potential clients? What exactly do they need to know to make your service attractive enough to be desirable? Let's look more closely at this.

First, before that Cypress Creek or Fire Department official can decide whether he needs you (here the "you" is your disaster communications group), he must understand clearly who you are. The ARRL has a number of visual aids and brochures available that do just that. (Videotapes and slide/tape presentations are available free of charge to ARRL members and affiliated clubs. Contact the ARRL Club Services Department for an audiovisual catalog and request form.)

Once this official knows who you are, he or she will want to know what you can do for them or their particular organization that cannot already be done with available public-service communications. Again, the visual and printed aids from the League can help you demonstrate the potential service. When you have made the potential client aware of who you are, and what your group can do, it becomes your turn to garner information from them, and in doing so hopefully close your "sale."

You need to know when the potential client would want your services. Are you needed before a disaster actually occurs? Do you have anything to offer the client at times other than during or after a crisis?

You need to know how the potential client wants his communications handled. (Notice, especially with this last point, that you and the potential client begin thinking in terms of an established customer relationship.) He now has the opportunity to visualize you in service and doing his thing in a way he wants it done. This should clinch the relationship.

Let's run these four points again.

First, let the client know who you are as an organized group.

Second, fill him in on your group's special abilities and experience in emergency and disaster communications.

Third, determine from the client when he would need to use your special abilities.

And, finally, establish the exact way in which the client wants his communications handled. Your emergency- and disaster-communications team now has purpose in the form of a committed client.

What do you do with the information? You go back to your group and revisit your Action Plan. There, you make as many alterations as necessary to fit the group's abilities, equipment and personnel to the stated desires of your new client.

Finally, train your group to fit the changes and amplifications of the basic plan so they will know how to handle communications the way the client wants it done.

Be totally clear on one extremely important point: Short of breaking FCC regulations, you and your entire team must be prepared to handle communications in what, to you "old salts," may appear completely wrong way at worst, and very different from the "norm" at best. You must meet the needs of the client or that client will simply go away.

If your group cannot adapt to the reasonable needs and specifications of the client, be sure that

he will look elsewhere for someone who can, or is at least willing to try. The only attraction your group holds for any client is the unique communications services offered. Remember what I said earlier: In business, the person with the need is called a client. Disaster communications is a "business." It is the business of saving lives.

In all your planning, practice and actual service, remember this key to success: *co-operation!* So long as cooperation exists between your group and your client, your people will remain active and interested. And when that disaster comes, your operation will be successful and smooth.

IN SERVICE...

□ Saipan—Dec 3, 1986. Amateur Radio operations on Saipan were literally blown off the air December 3, as Typhoon Kim's 110-150 mi/h winds devastated the island. Amateur Radio is a valued emergency-communications resource following major disasters, and are often augmented by Amateur operators from neighboring communities when local Amateurs have their hands full or are otherwise affected by conditions.

In this case, there were no local ham neighbors that could easily come to the island to lend assistance. In spite of this and the wind damage sustained by the island, Saipan was relatively fortunate. First and foremost, there was no loss of life. Additionally, most of the island's telephone system had recently been converted to underground cabling, and "normal" long distance service was almost totally restored within two weeks when the satellite uplink dishes were finally repaired and realigned.

Power was disrupted to all of the island as power poles and trees were flattened. With the resultant loss of refrigeration and other essential power dependent services, this turned out to be the major problem for the island.

Amateur Radio was also affected. With the downing of antennas and towers, and the disruption of power, not one Amateur station remained on the air. The local 34/94 repeater was off the air after its antenna blew away and disappeared, leaving the end of its coax in a pool of water.

The "puddle" antenna was sufficient for KB6CC to make contact with KG6SL, Burt Thompson (no relation), one of the first amateur stations back on the air. With no commercial power, Thompson pulled his pickup truck close to a window of his ham shack and powered his station with jumpers to his truck battery.

For an antenna, he used a long wire—his former telephone line strung from his hilltop QTH down to the main road. Logging, traffic handling and paperwork were all done by candlelight. The major contact off the island via Amateur Radio was through the efforts of the Pacific Inter-Island Net. However, by the time other Amateurs were back on the air, there was little in the way of emergency traffic for them to handle.

KB6CC, an Assistant Director with the ARRL Pacific Division, is also a reservist with the Federal Emergency Management Agency (FEMA). He was sent to the island only a few days after Kim struck and took along a complete portable packet radio station, but it was unusable on HF due to the poor propagation and unbelievable RF noise caused by the emergency generators providing AC power to the hotel where most of the FEMA workers stayed. —Scott Thompson, KB6CC

□ Denver, CO—Dec 11-12, 1986. The communications efforts for the 1986 Parade of Lights were cosponsored by the Aurora Repeater Association, Aurora, Colorado, and the Colorado ARES. The parade was held on two

evenings and followed a two-mile route through downtown Denver. The route presented the radio amateurs with several problem areas that had to be overcome.

Downtown Denver is a high-RF area with many commercial transmitters and telephone/television microwave systems. All the tall buildings with steel skeletons seem to absorb the low-power hand-held radio output. The hand-held radio signals that did get through were often covered by intermodulation, especially mobile telephone and paging services. The W0HE repeater was used until the parade started. The parade was then serviced by a simplex cross-band operation on 2 meters and 70 centimeters. The cross-band provided more flexibility and coverage was increased in the high RF interference areas.

A special thanks to all who participated in the communications. Judy Dallin, N0FVF, and Jim Dallin, KD0NT, were the Amateur Radio coordinators. —Ron Upton, WB0WSI

□ Washington DC—Jan 22-26. The Washington DC metro area was hit by two blizzards that left 25 to 30 inches of snow. These storms overwhelmed local road-clearing capabilities, stranding thousands of motorists and rendering major transportation routes impassable. The Woodbridge Wireless, Inc. Amateur Radio Club operated its repeater (WB4FQR/R) in an emergency-net mode continuously from the 22-27th of January and provided emergency transportation for stranded motorists and medical personnel reporting to and from Potomac Hospital in Woodbridge, Virginia. Club members with four-wheel drive vehicles in contact with the net transported an ill child to the Potomac Hospital Emergency Room, reported traffic and conditions and kept police informed of accidents. Radio clubs throughout the metro area provided countless hours of community service and remained in contact with one another on emergency nets. —James R. Carwile, Jr., W4AKOF, EC for Woodbridge Wireless, Inc.

Gus Stoppa, N4MLE (right), and his neighbor, Rick Reinhart, owner and driver of the vehicle, receive instructions on the next run for the Potomac Hospital during a heavy snowfall in January. (WD4DQF photo)



Field Organization Reports February 1987

ARRL Section Emergency Coordinator Reports

Thirty-three SEC reports were received, denoting a total ARES membership of 17,929. Sections reporting were: AR, GA, IA, KS, LA, ME, MI, MN, MO, NE, NF, NJ, NY, OH, OK, OR, PA, SD, SDG, SFL, SK, STX, SV, UT, VA, VT, WA, WI, WMA, WNY, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	101	90.00	582	1201
TCC Central	82	96.40	417	848
TCC Pacific	110	98.21	522	1100
Summary	293	94.87	1521	3149
Cycle Four				
TCC Eastern*	106	94.64	662	1314
TCC Central	78	92.90	443	900
TCC Pacific	105	93.75	657	1307
Summary	289	93.76	1762	3521

*TCC Eastern operates both cycles 3 and 4.

TCC Roster

N1BHH W1EFW K1EIC WA1FCD K1GRP KN1K KA1MDM KA1MKJ KT1Q W1QY K1SEC KA1T KW1U N2AKZ WB2EAG WA2FJJ W2FR W2GKZ NN2H KB2HM N2IC W2LW W2RQ WA2SPL KA2UBD N2XJ W2YGW W3ATQ N3OQY N3DPF K3KF WB3GZU W3PQ K3QT KB3UD AA4AT WA4CCK N4EXQ WD4FTK N4GHI WB4HML WA4JDH W4JL N4KB K4MTX WB4PNY W4UQ K4ZK N5AMK N5BB N5BT W5CTZ N5DFO W5GHP K5GM AE5I W5JOV AJ5K W5KLV KD5KQ W5QVK KD5RC KA5SPT ND5T N5TC W5TFB K5TL W5TNT W5VMP KB5W N5QSW K5XV W5YDD W6EOT KF6CA KU6D K6INH K6LL WF6Q K6UYK W6VZT KA7CPT NN7H W7EP KB7FE W7GHT W7LYA KF7R W7VSE KF6O KA7MUL W7TGU WB8O W8PMJ W8QHB N8XX W8BYDZ W8YP W8CBE W9EHS KA9FEZ W9JLU KA9RII WB9JLU AD9A KC9D K9DJ KA9EPY K9EZ W9FRG K9JG N9JA W9GRW W9HI KA9NL WABOYI KS9U VE3AWE VE3FAS VE3GSQ VE5CHK

National Traffic System

Net	Sess	T/c	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	28	1041	37.2	.707	92.0	
CAN	28	833	28.8	.655	100.0	
PAN*	55	515	9.4	.453	95.8	
Region Nets						
1RN	56	629	11.23	.542	96.6	100.0
2RN	56	589	10.51	.574	99.3	100.0
3RN	28	390	13.92	.500	96.0	100.0
4RN	56	750	13.39	.496	83.9	100.0
RN5	56	788	14.07	.518	92.0	
RN6	46	287	6.24	.300	100.0	92.7
RN7	56	362	6.82	.424	92.6	100.0
8RN	56	332	5.92	.318	92.8	100.0
9RN						
ECN						57.1
TEN	56	842	15.04	.572	88.7	
TWN	56	300	5.36	.390	73.9	100.0
TCC						
TCC Eastern	101	1201				
TCC Central	82	848				
TCC Pacific	110	1100				
Cycle Three						
Area Net						
EAN	28	502	17.93	.852	96.9	
Region Net						
1RN						100.0
2RN	28	320	11.42	.755	95.7	96.4
3RN	28	96	3.43	.320	77.0	96.4
4RN						92.8
8RN						100.0
ECN						92.8
Cycle Four						
Area Nets						
EAN	28	1284	45.86	1.279	96.4	
CAN	28	1014	36.21	1.097	98.8	
PAN	28	864	30.86	.952	99.4	

Region Nets

1RN						89.2
2RN	41	146	3.53	.360	64.6	92.8
3RN						100.0
4RN	56	727	12.98	.520	100.0	100.0
RN5	56	632	11.29	.620	86.8	98.2
RN6	54	367	13.10	.623	96.0	100.0
RN7	56	335	5.98	.652	84.2	100.0
8RN	54	369	6.83	.407	89.0	96.4
9RN	56	507	9.05	.462	96.2	98.2
TEN	56	486	8.68	.539	78.1	100.0
ECN	56	190	3.39	.410	61.0	100.0
TWN	51	314	6.16	.396		96.4
ARN	28	104	3.71	.105	100.0	96.4

TCC

TCC Eastern	106	1314
TCC Central	78	900
TCC Pacific	105	1307

*PAN operates both cycles one and two. TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, AZ, CT, MA, ENY, EPA, GA, IA, IL, IN, KS, KY, MD, ME, MN, MO, MS, NC, ND, NE, NH, NJ, NY, OH, OK, ONT, OR, PA, RI, SE, SC, SD, SDG, SF, SFL, SJV, STX, TN, UT, VA, VT, WA, WI, WMA, WNY, WPA, WV.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ.

325	109	K3CNP	N8HMX
KC9CJ	VE4LB	95	N7GGJ
172	K4NLK	WA1JVJ	83
WB5SRX	KA8TK	W4ANK	K9ZBM
171	10B	94	KA8NLJ
WB4DVZ	KT1Q	N1AKS	82
165	W3FA	VE4PO	AA4AT
N4GHI	KA1MDM	W4PIM	K4MTX
W2QNL	N3DPF	AC5Z	W1PEX
142	107	KB1AF	81
KN7U	WA1FCD	WB4WJ	N4KSO
138	WB2QVQ	KD2UJ	93
K2YQK	105	WB4ZTR	N3OQY
KD9CL	W7VSE	WA4EIC	W3YVQ
N8DPF	KA2UBD	WD4COL	N2EQM
136	NE2W	AA4JV	KA1KTH
N2EIA	105	W4CKS	80
135	N7FXJ	WD9DZU	W2RRX
KA3DLY	NX5E	92	KF4FG
134	WA4JDH	WD4KBW	AA4HT
W9FZW	WB4HRR	VE4IX	KL7OB
WA4QXT	KZ9Q	VE3DPO	W2RRX
132	K8UQY	N08A	ND2S
KA2F	104	WD5GKH	91
WX4H	WA5GKJ	KA2MYJ	79
KA2F	103	K4VVK	KA7AID
VE3ORN	W9DM	W9DM	W8FRG
WB1GXZ	103	WB8DOB	KA9RII
NC9T	KA2F	K8PQ	W7VSE
KB4WT	WB1GXZ	W5VMP	WA3YLO
WB2IDS	NC9T	WB2RBA	KA5SPT
126	90	WA2ERT	78
VE4AJE	102	KC4VK	N2AKZ
124	W2ZHV	WA2EPI	ND9N
KA8CPS	WB5YOD	WB8SYA	W3VWV
122	NG1A	89	W8WK
N4EXQ	N5AMK	WA6ZUD	KA1HFO
KW1U	WB8JGW	K2MT	KA1MKJ
121	101	W7GHT	77
KA8EPY	WA4PFK	NW7K	N8CLS
WF5O	K2KBT	W8OYH	WA8TFC
WA2FJW	WA2SPL	W5CITZ	WA4RNP
W8FFA	W8EHS	WA2JBO	KC2ZO
120	WA2FJW	K2ZVI	NJ4L
KA9FFO	W8FFA	WD8QXT	NF8B
115	100	88	76
WB2EAG	K4JST	VE7BNL	KB7FE
114	W6INH	KA4TLC	NF2N
K4ZK	W9CBE	87	KA2ZYX
113	NN2H	W4JL8	K2EB
WA2VJL	99	N4JRE	K2YAI
K5MXQ	113	N7BHL	KA1EXJ
W2MTA	N6MCY	86	75
1RN	N9BDL	WD8GUF	NT8B
2RN	N1EDD	W9HBI	KB4LB
3RN	112	WB8KQC	KA1TBW
4RN	98	N8FOO	W11WV
8RN	111	WB4WQL	NR8C
ECN	N2XJ	85	W6VOM
110	N3EMD	97	KI4YV
N2XJ	N2XJ	W8IKT	KA4GUS
KD7ME	KD7ME	WB1CBP	N7BVG
110	N5DFO	N2ABAT	KA8RNY
W9YCV	N5DFO	W7LBK	W1RWG
NQ2H	110	WB2VUK	VE3GT
AA4MP	96	WB8KWC	N3AZW
WB1HIH	KJ9J	K8SI	W5KLV
			N8EFB

73	KA8KHS	W0MZI	KA1LMR
WA6WJZ	70	VE3CYP	KA8PKY
KB2BKE	K2ZM	KA8MTX	W0QUD
K4ZN	WB2OMP	W2FR	K5UPN
N2DXP	W4SME	KA1EKQ	W86GBZ
N4PL	N2GPA	WD8KBW	WD8RHU
K3NNI	69	64	59
KC3Y	KA2ZNTZT	KA8ARP	KB2ATJ/T
KA8BCB	N8AHA	N8AHA	57
N2DXP	KA8NT	KD8WI	VE2EO
WA8VLC	KI4BR	63	W4MMM/T
KP4DJ	N1DHT	KB4BZA	WB2NLU/T
72	W4HON	WA4ZHC	53
WA4CCK	KB4JPN	W8YMB	KA8TND/T
AA4GL	68	K8PCK	52
NG2T	WATZC	KA8FSM	N2GQS/T
N4KFA	W4FMZ	WB4HSX/T	47
WA4LLE	KA8ODQ	W8YMB	48
AJ5K	VE3GSQ	KB5ADE	W1YOLT
KA1PHX	N8AEH	N5JHI	N8HMR/T
N8FHP	K8JDI	62	43
71	N6CVF	67	43
WA4RUE	WD4ALY	N44Y	KA7MUL
WA9WUD	N44Y	W4TYU	KD8NH
K6UXO	66	KA4YHS	N8BKE
KB2AKY	KA4FZI	K2HNW	WB8DYS/T
KA4YEA	NJ9S	K8ND	45
N2CER	WB9PFZ	K8ND	KA8JUV/T
N3EGF	KD8YL	61	KA2JMA/T
WA8QCA	N8GOC	N8GOC	KA8HJ/T
VE7EJW	KD8YL	61	41
KA8EJU	WA3GYW	N1CPC	KA9CTW/T
N1CVC	WB8GFM	N8FWA	40
KU2N	KA2ZKWT	60	N6FWG/T
KBZ	85	N4KSS	KA8ZRH/T
N8EVC	WA3UNX		

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

Call	Orig	Rcvd	Sent	Dlvd	Total
W4DUG	2795	71	2805	4	5675
W3CUL	620	2933	1096	41	4690
W3VR	385	1004	1024	21	2434
WA4JDH	0	610	622	4	1236
WB5YPY	0	715	78	396	1189
WD4KBW	0	491	513	6	1010
KA8FEZ	0	441	489	1	931
N4GHI	44	406	351	64	865
WF6O	7	405	371	20	803
K4JST	0	490	284	1	775
N3AZW	23	348	361	20	752
N3DPF	133	233	354	24	744
KW1U	3	395	320	21	739
KA2UBD	1	364	356	5	726
WA4QXT	67	288	336	28	719
KC9CJ	10	380	115	224	709
W5DAD	---	---	---	---	704
K8DKM	270	79	337	17	703
KT1Q	3	429	254	7	693
KA1MDM	2	350	305	10	667
KA8RII	34	299	314	15	662
WB8MA	41	295	307	19	652
N4EXQ	14	327	250	53	644
KABCP5	15	297	267	65	644
W2MTA	6	351	251	2	615
KB4PW	277	39	282	4	602
W1PEX	0	138	419	31	586
K4DOR	35	254	284	5	576
WB2IDS	48	213	212	75	547
WX4H	0	284	260	3	547
W7VSE	0	270	250	5	525
WB8WNU	115	153	225	22	515
W8HLX	---	---	---	---	514

Results, 53rd ARRL November Sweepstakes

By Billy Lunt, KR1R and Mary Schetgen, N7IAL
 Contest Manager, ARRL Assistant Contest Manager, ARRL

Shooting for the sweep is the ultimate goal for the serious contester in this event. Even making the top ten or winning the entire contest is not complete without that satisfying feeling of scratching the last ARRL section off your multiplier check list for the "clean sweep"! Ever since the early days of Sweepstakes, contestants have been trying to accomplish each time out what only a relatively small percentage of participants manage to do each year. If your goal is to work all sections with the least number of contacts, or in the shortest length of time, or just working them while piling up a big score, it still gives you that same satisfying feeling known only to those "who have worked them all." This year, only 15% of the 1594 entries managed to get that "satisfying feeling." On CW,

100 single ops and 9 multiops made a sweep, but only 25 of them did it with low power. On the phone weekend, sweeps were made by 90 single ops and 32 multiops but only 21 on low power. This means that 85% of us will just have to push a little harder next year if we want to join those select few.

Phone remains the most popular mode this year, boasting of 831 entries. Single-op phone entries totaled 725, and the remaining 106 played multiop. Interestingly enough, phone operators seemed to prefer low power to high power (about 60% were low power). Low-power CW, also, remains a favorite among the 701 brass pounders who ran no more than 150 watts during the contest. Out of the 746 logs received for the CW weekend, only 45 entries tried their

luck at multiop.

During the CW weekend, the place to be was Puerto Rico! Randy, K5ZD, was guest op at NP4A, Pedro's super station, and walked away with first-place honors, beating second place K6NA by 27k. Third on the totem pole was K5GO with 165k points. It was East Coast against West Coast for a close battle on the low-power scene, with only 364 points separating first place, K3RR, from second place, KZ6E. N6ND wasn't far off the top mark with nearly 132k points to win third place. Oklahoma multiop K5CM took top honors among the multiop crews by beating Wisconsin's leader, W0AIH/9, by 36k. The W8LT crew took third-place honors while only missing the second place spot by 148 points! What a close battle!

Single Operator Top Ten

CW		Phone	
Call	Score	Call	Score
NP4A (K5ZD,op)	195,656	N6BV	262,108
K8NA	167,980	N2IC	260,480
K5GO	165,760	W7EJ	257,372
N5AU (N5RZ,op)	164,428	W5WMU	253,968
N2IC	163,540	WS4Q	252,636
VE7CC	163,096	N8SM	249,084
K5RX (KR0Y,op)	162,800	W7WA	243,460
K3LR	162,504	K0DD	240,056
N6TR/7	162,208	W3LPL	236,504
K0RF	162,060	(WD4AXM,op)	
		N5AU (WB5VZL,op)	235,616

Low Power Top Ten

CW		Phone	
Call	Score	Call	Score
K3RR	134,976	KE5CV	201,724
KZ6E	134,812	N5DX	
N6ND	132,904	(K5GO,op)	194,620
W2GD	132,756	K5FUV	143,704
KY2P	127,724	WB0IKN	132,312
W2TZ	125,800	W7ZRC	131,572
KB1W	122,056	NTSV	125,800
W0IJR	116,216	K7LXC	124,468
K4XU	115,884	W7YAG	115,048
KV0I	114,912	K0SCM	110,320
		KQ8M	108,624

Multioperator Top Ten

CW		Phone	
Call	Score	Call	Score
K5CM	172,280	K5LZO	267,288
W0AIH/9	135,864	WB8JBM	228,068
W8LT	135,716	K0UK	226,736
W1OD	130,536	K5CM	219,188
KE7C	128,772	W0CEM	216,524
K0WA	126,874	A17B	194,620
K0SR	126,096	K1TO	191,552
K8AQM	120,960	K1NG	190,032
VE3ART	120,672	K5RVK	186,028
W5EHM	112,712	NN7L	183,616

Division Leaders

CW

Division	High Power	Low Power	Multioperator
Atlantic	K3LR	K3RR	NB3I
Canada	VE7CC	VE3VN	VE3ART
Central	K9KM	K9WA	W0AIH/9
Dakota	WA3PWL	K3WT	K0SR
Delta	K5GO	KZ5D	K5MC
Great Lakes	K8CC	KQ8M	W8LT
Hudson	N2NT	W2GD	K72B
Midwest	K4VX/0 (AH2U)	KV0I	K0WA
New England	K1ZZ	KB1W	W1OD
Northwestern	N6TR/7	W7ZRC	KE7C
Pacific	N6BT (WA6VEF)	W6JTI	WR6O
Roanoke	K4POL	AA4FF	K4IX
Rocky Mountain	N2IC	W0IJR	K8QFF
Southeastern	NP4A (K5ZD)	N8GG/4	N4NWT
Southwestern	K6NA	KZ6E	WA6WZO
West Gulf	N5AU (N5RZ)	N5AW	K5CM

Division Leaders

Phone

Division	High Power	Low Power	Multioperator
Atlantic	W3LPL (WD4AXM)	N3AOE	NM2L
Canada	VE7CC	VE2MS	VE4UM
Central	WB9HAD	AH2U	W0AIH/9
Dakota	K0DD	WA0VOX	—
Delta	W5WMU	N5DX (K5GO)	N4TG
Great Lakes	W8LT (WD8IXE)	KQ8M	WB8JBM
Hudson	KD2RD	KS2G	K5NA
Midwest	K4VX/0 (KM9P)	K0SCM	W0CEM
New England	W1WEF	N1CC	K1TO
Northwestern	W7EJ	W7ZRC	A17B
Pacific	N6BV	W6JTI	W6BIP
Roanoke	N4ZC (N5TR)	K4JEX	KC4DY
Rocky Mountain	N2IC	WB0IKN	K0UK
Southeastern	KV4FV (N6OP)	WC4E	W4AQL
Southwestern	KC7V	W6UQF	KF6OG
West Gulf	WS4Q	KE5CV	K5LZO

Maybe "QAW," if it's not already taken (K5RF). I seriously doubt whether computers will replace a fast pencil and a reasonably agile mind in doing the paperwork for this contest (W6SZN). A plethora of South Dakota stations! Also, many thanks to VE8AW for allowing me to breathe again. So good to see 21-MHz activity once again (K9UTY). I would like to see a category for QRP operation in future SS (WB9TBU). Enjoyed the contest very much. Forty meters was in great shape. Being a newer ham, it's nice to be able to work 45 states on 40-meters in 13 hours (ND9X). With one antenna (40-meter loop at 25 feet) and low power, managed to work all US sections except VT. Just wanted to have fun and see what low power and no beam could do, all without calling "CQ SS" (W8AWP). With two complete kW stations at my fingertips, I don't know why my score was down this year! (KM0L). Please schedule more contests during the winter so I'll have something to do when the weather is 35 below zero! (KK0Q). Super... best yet! Worked OR, RI and

SCV, in that order, on 15 meters—Wow! (VE1BEI). It's pretty hard to run up a decent score with a precocious 3-year-old son demanding equal "bee-dee-lee-bee-dee" time with the keyer (VE3CUI).

Phone

All in all, Sweepstakes remains my favorite contest. Next year I'm going for some power so I can compete with the "powerhouses" (WB2ROV). Why do all of the calls seem to sound alike at 4 in the morning? (WB3JFS). My contest activity limited; XYL expecting "bundle of joy"! (NX4N). I've never worked a contest before this one, but will enter the 10 meter one next (WD5COS). Why couldn't BV2B call me in a DX contest instead of SS? (NN5E). I was glad to see that courtesy is not dead on the ham bands. Several times I heard contestants take the valuable time out to patiently explain the contest to others who were not aware of what was going on (K5EQ). As usual, a lot of fun, but those

guys are still saying "TNX OM!" (KA6V, YL). Upgrading from General to Extra license since last year's SS made a big difference in my making more contacts (WA6GDS). Being in Wyoming is like running "B" power level when it comes to remaining at a frequency. The big pile-up tends to hold your frequency for you (K7MM). Great contest! Made 267 QSOs from my apartment QTH using only a G5RV antenna (KA0OXN). Where were all the VEs? I heard only two (N0HJZ).

FEEDBACK

Please refer to May 1986 QST, pp 80-85, for the following corrections. KR0Y should have been listed as the operator of K4VX, the number 2 US CW winner. WD8LXE was the winner in the high power, CW category. K5KJ was an operator at K5RR, Northern Texas multioperator winner. W8EG1 should have been listed with the following line score: 19,500-150-65-8-A.

Scores

CW scores are listed first, followed by phone. Within each call area, scores are listed by ARRL sections. Within each section, single operator scores are listed first in descending numerical order, followed by multioperator scores. Each line score lists call sign, final score, number of QSOs, number of sections worked, hours operated and output power used (A = 150 watts or less, B = more than 150 watts). Example: in Connecticut, K1ZZ worked 967 stations in 73 sections for a final score of 141,182 points. He operated for 24 hours and used more than 150 watts.

Call Area	Call Sign	Score	QSOs	Sections	Hours	Power			
Connecticut	K1ZZ	141,182	967	73-24-B	24	>150			
	W1WIEF	140,748	951	74-24-B					
	K1XA	134,174	919	73-24-B					
	K1WA	111,298	752	74-20-A					
	K1CC	107,744	728	74-18-B					
	K8HVT	92,304	641	72-18-B					
	W1GNR	89,480	830	71-20-B					
	K1IN	88,608	824	71-28-B					
	K1DW	82,080	809	70-21-B					
	N1CC	82,052	882	73-17-A					
Rhode Island	K11U	122,248	825	74-23-B					
	KM1X	102,096	709	72-22-B					
	K9BS1	48,888	388	63-18-B					
	K1VSJ	41,138	307	67-15-A					
	K1DS	23,954	203	59-8-A					
	W1RFQ	9,800	70	70-8-A					
	K2MM	2,856	51	26-3-A					
	N1EIA	640	20	18-13-A					
	Vermont	W3SOH	50,700	390	85-18-B				
		NB1A	16,390	149	85-18-A				
Western Massachusetts		KB1W	122,058	836	73-24-B				
		KY1H (AK4L,op)							
		KZ1M	113,734	779	73-24-B				
		KX1T	78,880	562	70-23-A				
		KX1T (+WA1VE1,K2R2,N3BA0)							
		KX1KPH (+NC1B)	61,118	463	66-23-B				
			57,548	417	69-19-B				
		Eastern New York	N2NT	152,884	1033	74-24-B			
	K5NA		132,904	898	74-24-B				
	W2XL		97,090	865	73-22-B				
KU2Q	93,878		843	73-24-B					
NJ2L	81,760		560	73-24-A					
K2TR (WB2KMY,op)	85,262		447	73-11-B					
W2DW	80,680		410	74-12-B					
K2HA	43,112		317	68-20-A					
AA2Y	22,420		190	59-8-A					
W2NRD	20,580		147	70-17-A					
NYC-Long Island	N2FZJ	14,278	121	59-20-A					
	KB2ACE	11,844	128	47-11-A					
	KW2D (+KC2GK)	73,008	507	72-20-A					
	W2ARQ (+W2PKY)	63,504	441	72-24-B					
	WA2UKP (+WA2JQK)	37,520	280	97-22-B					
	Delaware	K3UW	87,408	607	72-17-B				
		N8NA	81,344	426	72-13-A				
		W9NX	48,248	326	74-13-A				
		K3HBP	29,304	222	69-12-A				
		K0SG	12,240	240	51-9-B				
Kentucky		K3RR	134,976	912	74-19-A				
		AA3E	91,584	636	72-19-B				
		K3PK	69,828	508	69-24-B				
		K3SF	66,640	478	70-18-B				
		N2EY	65,682	482	68-21-A				
	W4JLD	62,100	450	69-19-A					
	N6CO3	45,580	340	67-11-B					
	W4MVP	39,380	303	65-15-A					
	W3EPU	36,790	283	65-18-A					
	K3CM	36,050	275	70-21-A					
Northern New Jersey	N3DFP	36,010	277	65-11-B					
	W3ESR	33,824	262	65-15-A					
	K3TX	32,940	270	61-9-B					
	W3DYA	30,828	247	62-17-A					
	Alabama	W2FA	150,248	1078	74-24-B				
		W4NTI	40,200	300	67-18-A				
		Georgia	K4BA	111,288	752	74-24-B			
			KB4GID	34,020	315	74-24-A			
			AA4LR	15,498	149	52-21-A			
			N4DJJ	1,588	28	28-7-A			
AA4GA			1,500	30	25-2-A				
Kentucky			N4TY	128,016	889	72-24-B			
			K4FU	105,376	712	74-22-B			
			N4XM	99,758	674	74-23-B			
	WB4FOT		88,184	604	73-24-A				
	W4MT4		85,100	575	74-18-B				
	KF4AV	39,390	303	65-11-A					
	K14QJ	14,900	149	60-11-A					
	AA4RX	4	2	1-1-A					
	North Carolina	K4PQL	130,088	891	73-24-B				
		WA2TBA	116,920	805	72-23-B				
Arkansas		K5GO	185,760	1120	74-24-B				
		K5JH	4,080	80	34-5-A				
		KA5GDU	1,040	26	20-7-A				
		West Indies	NP4A (K5ZD,op)	195,656	1322	74-24-B			
			Virginia	AA4FF	101,972	689	74-24-A		
				W4YE	80,084	558	72-18-B		
				W9L74	78,280	559	70-23-B		
				W4XD	71,540	511	70-23-A		
	N3OS			64,448	487	66-21-A			
	K8E1			56,700	405	70-20-B			
K4FFP	45,848			317	72-18-A				
K2NA	45,014			317	71-9-A				
W3Y1	34,580			288	65-16-B				
WD4ELJ	28,116	213		66-18-A					
Tennessee	N4ZZ	150,220	1015	74-24-B					
	K4LT4	131,862	902	73-24-A					
	AA4DO	87,640	610	72-24-B					
	K3CQ	81,792	678	71-23-B					
	K4OAC	72,136	508	71-16-B					
	N4IR	47,472	344	69-9-A					
	AA4MN	23,760	180	65-12-B					
	AA4DL	18,950	175	57-11-A					
	W4FLV	18,038	167	54-14-B					
	N4TG	1,455	65	65-5-A					
Florida	K1ZX	153,478	1037	74-24-A					
	N8GG4	106,880	762	70-24-A					
	WD4AHZ	68,302	481	71-23-B					
	K1SSH	58,304	408	69-17-B					
	K4XB	48,240	340	66-26-B					
	K4WK	40,748	304	61-18-B					
	AA4VT	32,774	241	68-20-B					
	AA4RO	29,964	227	65-13-B					
	K04D	25,740	198	65-10-B					
	South Carolina	W9LO	75,880	542	70-22-B				
W8OKX4		30,378	249	61-9-B					
Maryland-DC		K8C23	139,860	945	74-24-B				
		K3NA	128,238	859	71-21-B				
		K3ZZ	114,594	807	71-24-B				
		K3SA	102,268	691	74-20-B				
		K3HPG	67,392	468	72-14-A				
		K3XG	52,328	412	72-14-B				
		W3AZ	55,780	388	70-17-B				
		K3NS	42,680	307	70-7-A				
	N3DC	37,400	275	68-18-B					
	W3EE	35,880	290	62-14-A					
Pennsylvania	K3TM	28,082	207	63-5-A					
	W3TFA	18,200	160	60-24-A					
	N3AM	5,880	121	49-2-B					
	W3VPL	5,082	77	33-3-A					
	W3HDM	2	1	1-1-A					
	W3EAX (KA1GD,KA3HTJ,NJ1,KC3OH,ops)	15,808	153	51-11-A					
	W3JRU (+KC3AJ)	6,888	82	42-3-A					
	West Virginia	W3LR	182,504	1088	74-24-B				
		K3VK	91,688	628	73-23-A				
		W3JA	42,160	310	68-24-A				
W3WC		37,890	285	71-15-A					
K3UA		13,700	137	50-2-B					
W3HDM		4,818	73	33-2-A					
K3TUP (+N3BJ)		70,580	543	65-15-B					
Kentucky		N4TY	128,016	889	72-24-B				
		K4FU	105,376	712	74-22-B				
		N4XM	99,758	674	74-23-B				
	WB4FOT	88,184	604	73-24-A					
	W4MT4	85,100	575	74-18-B					
	KF4AV	39,390	303	65-11-A					
	K14QJ	14,900	149	60-11-A					
	AA4RX	4	2	1-1-A					
	North Carolina	K4PQL	130,088	891	73-24-B				
		WA2TBA	116,920	805	72-23-B				
Arkansas		K5GO	185,760	1120	74-24-B				
		K5JH	4,080	80	34-5-A				
		KA5GDU	1,040	26	20-7-A				
		West Indies	NP4A (K5ZD,op)	195,656	1322	74-24-B			

UV	72-6-1A	WBOES	7,128-81-44-16-A	K7ABV	31,024-277-56-8-B	WB9RTJ	44,784-311-72-17-A	K6FRP	86,800-620-70-19-A
Alaska		W6PFR	2,000-40-25-4-A	N7IBG	13,824-128-54-13-A	N8FU	43,920-305-72-13-A	W1XE	82,944-578-72-24-A
AK		W6GFP	1,880-40-21-8-A	K47KLH	3,400-100-42-17-A	W8LNU	41,400-300-69-13-A	W2FV	81,420-590-69-18-A
AKMU	161,320-1090-74-8-B	N8ME (+ N8DRW,K6RUB,W6TCO,W6AUYB)	60,416-472-64-24-A	W7LR	198-11-9-1-A	W8PN	40,280-305-66-14-A	N6K	57,620-430-67-22-A
AKD	86,948-601-74-20-A	Orange		Nevada		K6MR	30,870-245-63-5-B	K6DZR	80,256-349-72-21-A
AKID	87,784-593-74-24-A	K2BE	194,612-922-73-21-A	NF7P	149,828-1011-74-24-B	K1FR	25,982-228-57-6-A	K8BU	48,580-347-70-14-A
AKM	73,296-509-72-24-A	N8PE	86,832-603-72-19-A	N7CK	22,388-193-58-5-A	W8MVN	25,074-189-63-10-B	NQ3I	12,954-127-51-4-A
AKN	53,820-390-69-22-A	W8HAL	41,340-318-65-13-A	Oregon		W8WAG	13,952-218-57-12-A	W8ETT	10,192-104-49-3-A
AKBER/S	7,740-90-43-4-A	NX6M	24,182-189-64-20-A	N8TR7	162,208-1098-74-24-B	W8ABRCN	11,750-125-47-5-A	K9MWM	5,538-71-38-8-B
AKIC (+ W6SN,W5EW)	12,274-769-73-24-B	W6SX	5,576-68-41-2-A	A17B	156,382-1078-74-24-B	K6ZRFH	9,792-102-48-7-A	K1BJ	5,092-67-38-4-A
AKIX	111,000-750-74-22-B	W6GFR	2,240-40-28-7-A	K5MM7	155,400-1050-74-22-B	W8VZE	178-11-8-1-A	K8GFF (+ K8LMD)	17,584-157-59-20-A
AKL	86,592-618-72-24-A	W6WZD (K6BFH,KD7EY,ops)	64,800-450-72-18-A	W7WHO	102,584-693-74-24-B	W8SMC (K8BGF,N8s,HBI,HTJ,NK8B,NR8C,W88CVC,W88PWG,ops)	67,248-467-72-23-A	Iowa	
AKBL	67,392-468-72-19-A	KF8OG (+ W6GWM)	47,744-373-64-15-B	K7KJM	84,918-598-71-23-A	West Virginia		W8EJ	136,900-926-74-24-B
AKH	20,160-168-60-8-A	Pacific		K7DBV	51,100-365-70-19-A	W4NW8	79,056-549-72-13-A	KF8H	94,572-668-71-18-B
AKI		AH6AZ	83,220-570-73-17-B	W7UQC	13,348-142-47-15-A	W8LD	77,184-538-72-18-A	W8GVY	67,592-497-69-23-B
AKJ	123,078-843-73-24-B	AH6EK	15,730-143-55-21-A	K7GDN	10,584-108-49-9-A	W3YCG	1,428-34-21-4-B	NU8Q	51,830-365-71-21-A
AKK	114,610-785-73-24-A	K6BEX	2,392-46-26-4-B	KA7OLK	4,200-60-35-21-A	W3JHDHM	330-15-11-1-A	W8JTC	8,080-101-40-6-A
AKL	56,196-446-63-13-B	Santa Barbara		Utah		9		Kansas	
AKM	49,504-384-69-15-A	W2KVA/8	64,680-580-73-21-B	W7CFL	104,244-714-73-24-B	Illinois		K8Q8	129,352-874-74-24-B
AKN	33,000-250-66-13-B	W6VFG	61,828-434-71-20-A	NR7T	19,764-183-54-4-B	K9CM	136,160-920-74-24-B	K8BU	115,292-779-74-20-B
AKO	29,008-259-58-6-A	W6TKF	14,200-142-50-6-A	K7CU	3,300-50-33-3-A	K9O	111,296-831-74-24-B	N8LU	58,236-422-69-22-A
AKP	17,710-161-65-15-A	W6TIO	1,890-79-27-12-A	N7HUJ	176-11-8-2-A	K9LJN	108,780-735-74-24-B	N8CLV	40,424-298-69-18-A
AKQ	11,000-100-55-3-B	Santa Clara Valley		Washington		K9O	106,642-751-71-24-B	K9VGB	39,390-303-65-20-A
AKR		N8BT (W6GVEF,ops)	160,728-1066-74-24-B	W7WA	161,912-1094-74-24-B	K9U	108,886-691-73-24-A	W8AWP	38,400-280-70-20-A
AKS	182,800-1100-74-24-B	N8SJ	101,908-698-73-22-A	N7TT	129,944-878-74-24-B	K9UJ	100,048-876-74-24-A	K8QFZ	28,380-215-66-21-A
AKT	148,000-1000-74-24-B	W6IO	75,024-521-72-19-A	K7QQ	113,812-789-74-22-B	K9UJ	94,170-645-73-24-A	W8YRN	17,920-180-56-13-A
AKU	116,352-808-72-21-B	AD8E	72,432-525-72-18-A	K7HBN	100,544-728-74-22-B	K9UJ	88,356-597-74-23-A	NK8V	14,804-138-54-5-B
AKV	114,552-774-74-24-A	AJ6V	41,860-322-65-5-B	W7BUN	100,448-876-74-21-B	K9O	85,410-585-73-23-A	N8S	1,810-35-23-6-A
AKW	114,484-784-73-21-B	K6KM	36,380-262-70-14-A	KR7G	90,720-630-72-19-B	K9WA	78,292-529-74-21-A	K8WA (AB8S,W8CEM,W8DOX,ops)	128,874-869-73-24-B
AKX	108,186-741-73-21-B	N8NF	27,690-190-72-20-B	NG7P	72,313-524-69-24-A	K9UJ	69,154-487-71-20-A	Minnesota	
AKY	107,456-736-73-18-A	W6ZJ	23,058-189-61-13-B	NN7L	70,176-518-68-12-B	K9UJ	68,544-428-68-14-B	NF8K (W8WDW,ops)	135,342-927-73-24-B
AKZ	87,680-680-74-23-A	W6SN	10,528-112-47-3-A	W7LKG	68,588-483-71-19-B	K9UJ	65,274-473-89-16-B	N8AT	122,998-831-74-22-B
AKAA	81,542-627-73-12-A	N8YU	9,844-107-46-10-A	K7LXC	53,318-392-68-12-A	N9CW	58,344-428-68-14-B	N8AA	122,840-630-74-23-B
AKAB	57,420-435-66-17-A	W6IGU	4,802-49-49-10-A	K7WA	49,980-357-70-15-A	K9HDE	56,274-473-89-16-B	K8JBD	115,736-782-74-22-B
AKAC	47,302-355-67-16-A	San Diego		N7DGM	47,058-346-69-22-A	NASJ	56,344-428-68-14-B	K9UJ	115,340-796-73-22-B
AKAD	36,790-283-65-10-B	K6NA	137,900-1135-74-24-B	N8CHU	38,016-288-68-16-A	KA8LTH	52,852-362-73-22-A	W8QRBW	111,744-776-72-20-B
AKAE	31,690-240-66-10-B	N8ND	162,504-898-74-24-B	W7UJW	16,808-173-48-9-A	W89TR	47,570-355-67-22-A	K3WT	101,376-704-72-24-A
AKAF	31,000-250-62-6-A	W6KUT (N8W,ops)	111,444-753-74-24-A	K7SS	10,952-74-74-6-A	NASD	47,124-357-68-9-A	W8QIT (N8EOB,ops)	79,520-568-70-24-A
AKAG	27,648-216-64-13-B	W6UJF	107,448-726-74-24-A	W7BYK	7,896-99-47-7-A	W8IL	45,500-325-70-14-A	K8NV	65,664-456-72-16-B
AKAH	25,848-229-56-6-B	K6ZH	72,420-510-71-14-A	N5JB	7,812-93-42-6-A	W8ZTK	39,996-303-66-14-A	N8CIB	61,640-460-67-13-B
AKAI	24,528-219-58-8-A	A88E	33,768-252-67-8-A	N7EPD	1,026-27-19-2-A	W8TMT	32,500-250-65-10-A	K8FZG	58,504-412-71-20-A
AKAJ	18,070-137-55-9-A	W6JXA	33,184-244-68-10-B	KE7C (+ K071,WB7QJ)	128,772-882-73-24-B	K9PPW	30,420-234-65-9-A	K8TTO	46,179-368-63-6-B
AKAK	10,858-118-48-11-A	N8BCEC	28,272-228-62-16-A	W7DK (K47SBJ,KE7LE,KD7LJ,KG7V,N7EPD,NK7E,W6PBL,WB7QJ,ops)	62,376-452-69-24-A	K9RR	29,648-243-61-10-A	W8BF	45,158-337-67-9-B
AKAL	7,800-100-38-3-A	W6SCD	27,846-221-63-18-A	Wyoming		W8ZEN	28,350-225-63-14-A	K8GB	26,990-223-65-11-A
AKAM	3,138-58-28-8-A	W6WYM	25,132-206-61-15-A	K7MM	82,844-582-71-23-A	W8RW	27,652-223-62-6-B	K8BT	20,288-221-64-9-A
AKAN	338-13-13-4-A	W6SHHCV8	9,200-100-46-10-B	W1WAI	50,116-374-67-17-A	W8EYJ	22,144-173-64-13-A	W8MHC	18,590-169-55-4-A
AKAO	57,458-458-63-22-A	N8NNI	520-20-13-2-A	K7ZV	12,296-116-53-11-A	K9BCL	20,300-175-58-7-A	W8YUC	13,608-128-54-10-A
AKAP		San Francisco		N7GVV	5,828-67-42-12-A	W8HBI	17,500-175-50-8-A	W8WVV	8,800-100-44-4-A
AKAQ	88,184-604-73-24-A	W6UTI	113,864-768-74-24-A	8		N8D9	15,390-135-57-13-A	W8WGB	6,970-85-41-7-A
AKAR	8,118-99-41-8-A	W6BIP	100,048-878-74-21-B	Michigan		W8REC	15,276-114-67-15-A	W8HW	2,520-45-28-1-B
AKAS	5,106-70-37-9-A	K6LAN	57,682-397-73-17-A	K8CC	151,848-1028-74-24-B	K9BG	13,160-140-47-4-A	K8VW	900-30-15-2-A
AKAT	172,280-1180-73-24-B	San Joaquin Valley		W8RFR	113,296-776-73-21-B	AK9Y	9,720-216-45-11-A	K8SR (+ AB8P,W8BHC)	126,096-852-74-24-B
AKAU	152,292-1029-74-24-B	W6H8	138,658-949-72-24-B	K8MNV	82,860-661-74-24-A	W8AGM	2,800-50-28-3-A	K8LTC (W8BS,HRX,SNP,ops)	91,580-654-70-23-B
AKAV	124,812-844-74-18-B	W6REC	24,338-198-61-5-B	W8UFP	82,560-580-71-24-A	K89MX	792-22-18-9-A	Missouri	
AKAW	124,812-844-74-24-B	Sacramento Valley		K8DO	76,964-542-71-24-B	K9CC	112-8-7-1-B	K4VX (AH2U,ops)	142,080-960-74-24-B
AKAX	108,832-734-74-23-B	N8IG	150,388-1016-74-24-B	W8TJQ	76,788-526-73-22-A	K9CG	40-5-4-1-A	K8BL	126,392-854-74-24-B
AKAY	107,800-725-74-17-B	N6JG	129,798-877-74-24-B	K8SS	75,118-529-71-24-A	AF9M (+ K8S,CGJ,SPW,KD9KU,NA9I,W8BRCZ)	47,610-345-69-16-A	N8MU	114,610-785-73-24-A
AKAZ	107,800-725-74-17-B	N6SG	106,708-721-74-24-B	W8VPC	74,022-507-73-22-A	K9G (+ AK9N)	13,500-135-50-7-A	W8H8B	97,236-666-73-24-A
AKBA	91,580-645-71-10-B	A88GM	93,732-642-73-23-A	W8QCM	63,072-438-72-23-B	Indiana		K8RWL	93,980-635-74-23-A
AKBB	88,868-602-72-24-A	K6BFB	39,336-298-69-20-A	KJBA	61,184-478-64-17-A	KE8I	120,176-812-74-24-B	K8DEQ	45,288-333-68-10-B
AKBC	83,440-596-70-24-B	W8HNR	10,400-100-52-4-B	K8RDJ	52,080-372-70-20-A	AJ9C	91,780-620-74-22-B	AK8M	15,300-150-51-5-A
AKBD	65,748-463-71-17-A	N8JM	1,320-30-22-2-A	K8JM	51,456-384-67-11-B	W8JOC	74,448-517-72-24-A	NV8D	8,550-95-45-9-A
AKBE	42,228-306-69-17-A	W8RO (+ K8T)	23,760-198-60-12-B	K8SIA	48,576-352-69-11-A	W8E9E	28,550-225-59-4-B	W8XK (+ K8MAT)	107,448-726-74-24-B
AKBF	40,068-299-67-12-A	7		K8CV	48,620-370-63-14-A	K9BCL	14,301-227-63-17-A	North Dakota	
AKBG	36,790-283-65-10-A	Alaska		W8BAAX	38,500-275-70-13-B	W8AGM	5,896-67-44-3-A	W83PWL	143,412-969-74-24-B
AKBH	24,522-201-61-19-B	NL7DQ	55,300-395-70-19-A	N8CQA	37,092-281-66-14-A	K89MX	792-22-18-9-A	K8KQ	42,120-324-65-18-A
AKBI	22,176-176-63-13-A	NL7GP	45,012-341-66-19-A	K8CBA	33,930-261-65-19-A	AG9E	40-5-4-1-A	W8LHS	1,218-29-21-1-A
AKBJ	21,640-182-60-7-A	KL7UR	45,012-341-66-19-A	K8DD	32,696-244-67-4-B	W8AGM	2,800-50-28-3-A	Nebraska	
AKBK	21,180-183-65-10-B	KL7UJ	32,508-256-65-20-A	W8BPD	32,340-245-66-14-A	W8WV	11,740-755-74-24-B	KV8I	114,812-798-72-24-B
AKBL	19,240-185-52-17-A	KL7VJ	32,508-256-65-20-A	W8BPP	32,340-245-66-14-A	W8WV	11,740-755-74-24-B	K8SCM	113,184-786-72-24-A
AKBM	15,782-141-56-6-A	KL7WP	4,488-66-34-5-A	W8BPP	32,340-245-66-14-A	W8WV	11,740-755-74-24-B	W8BSY	53,592-408-68-18-A
AKBN	894-26-17-15-B	AL7QW	4,488-66-34-5-A	W8BPP	32,340-245-66-14-A	W8WV	11,740-755-74-24-B	K8SW	39,440-290-68-15-A
AKBO		AL7TQ (+ W87BJF)	99,804-673-74-24-B	NK8Q	18,512-178-52-8-B	W8WV	11,740-755-74-24-B	K8MZV	27,170-209-65-15-A
AKBP		WA7USX/KL7 (+ W8SDNT)	60,658-446-68-23-B	K8OT	13,568-138-57-6-B	W8WV	11,740-755-74-24-B	South Dakota	
AKBQ		Arizona		W8E9I	13,224-118-57-7-A	W8WV	11,740-755-74-24-B	K8DD (W8PEV,ops)	114,768-797-72-24-B
AKBR		K8LL	161,024-1088-74-24-B	K8EP	12,932-122-53-5-A	W8WV	11,740-755-74-24-B	K8ERM	34,058-259-65-4-A
AKBS		K7OX	148,740-1005-74-24-B	W8VHY	12,784-138-47-6-A	W8WV	11,740-755-74-24-B	K8JW	24,948-198-63-11-A
AKBT		W7ZMD	73,292-502-73-20-A	K8VDX	9,990-111-45-12-A	W8WV	11,740-755-74-24-B	W8GNSY	19,836-178-59-16-A
AKBU		W7FYT	88,160-480-71-21-B	W8S5	9,990-111-45-12-A	W8WV	11,740-755-74-24-B	KSZT	528-22-12-4-A
AKBV		W7YS	64,894-457-71-21-A	K8AQM (+ KN8R,N8L,W8IQ,W8JDN)	120,960-240-72-24-B	W8WV	11,740-755-74-24-B	VE	
AKBW		K7CV	52,920-378-70-10-B	W8CSD (+ A88M)	81,460-439-70-18-B	W8WV	11,740-755-74-24-B	Maritime-Newfoundland	
AKBX		N7GPL	48,714-353-69-18-A	W8MRM (K8BEGC,KE8CG,N8HSN,N8SFF,W8FRD,W8BAFO,W8S8,KZ0,KZD,ops)	16,008-176-54-20-A	W8WV	11,740-755-74-24-B	W8E8I	35,490-273-65-15-A
AKBY		KD7E	47,854-337-71-22-A	Ohio		W8WV	11,740-755-74-24-B	VO1QU	11,564-118-49-4-A
AKBZ		NN7A	44,472-327-68-18-A	K8AZ (K8NZ,op)	139,890-945-74-24-B	W8WV	11,740-755-74-24-B	VO1QST (VO1AW,ops)	8,450-65-65-10-A
AKCA		NNTA	32						

VE3DMU 4,740-79-30-10-A
 VE3ART (VE3s ABG,DAO,GAS,OB,
 VE8CC,ops) 120,872-1676-74-21-B
 VE3ZAP (VE3s DCM,DDW,FAS,FJG,GSQ,
 KPF,KOD,MTB,ops) 83,638-589-71-20-B

Alberta
 VE6DZ 50,292-381-68-17-A
 VE6MI 15,660-145-64-11-A

British Columbia
 VE7CC 183,098-1102-74-24-B
 VE7YU 48,060-329-70-18-A
 VE7IQ 29,480-220-67-9-B
 VE7KGW 8,288-148-56-24-A
 VE7EKS 1,780-40-22-12-A

Yukon-NWT
 VE8GD 16,047-141-57-13-A

K1D3 18,550-175-53-2-B
 AC1J 11,776-127-44-5-A
 K1IH 8,300-75-42-4-A
 K1TR 3,782-61-31-3-A
 W2UP 2,728-44-31-1-B
 K1CF 18-3-1-B

Rhode Island
 K1IU 107,818-748-72-21-B
 K8SS/1 93,432-687-68-22-B
 KM1X 85,260-608-70-17-B
 K1VJS 76,484-531-72-19-B
 K2NM 16,854-159-59-8-A
 KA1MPF 14,994-147-61-18-A
 K2IA 8,190-105-39-5-A
 N1EIA 4,480-70-32-14-A
 KING (+K1G) 190,032-1284-74-24-B

Vermont
 WB1GQR 181,770-1245-73-24-B
 W8SOH 53,360-278-60-12-A
 KD2EN/1 24,692-198-62-18-A
 N8TA 10,810-115-47-9-A
 K2IQI (K2QZV,K2ENV,K2B,WA1MAG,
 WA2AZA,WB2PYU,ops) 71,284-502-71-21-B

Western Massachusetts
 K1RQ (WA1ZAM,op) 165,316-1117-74-24-B
 KY1H 90,988-678-73-24-B
 KZ1M 51,952-382-68-20-A
 WA1HFF 29,846-243-61-17-A
 KB1R 28,060-230-61-15-A
 N1DMU 13,874-129-53-5-A
 WB1EYL (+KS1N) 109,152-758-72-22-B
 N1XZ (+N3BAO,WA1VE1) 101,430-735-68-22-B
 W1YK (KA1s ODA,OGH,KB1YB,KM1P,
 N1DXG,NA1Q,NE1O,N2JQ,WA1NVS,ops) 85,100-575-74-24-B
 KA1KPH (+NC1B) 57,510-405-71-18-B
 KA1NYD (+N1EIN) 7,038-153-46-24-A

2
Eastern New York
 KC2AG 109,788-773-71-24-B
 W2APR 56,516-388-71-16-B
 N2BZP 49,140-351-70-20-B
 WB2ROV 39,680-320-82-24-A
 WA3AFS 36,564-277-68-10-B
 W2DOW 25,830-205-83-7-A
 KD2NE 20,682-174-59-8-A
 KC2PF 15,888-148-53-7-B
 W2NRD 11,368-98-68-4-A
 K5NA (+KA2ZPD,K2QZ) 15,854-1053-74-24-B
 W2XL (+N2JL,WA2STM) 15,292-1030-74-24-B
 KY2J (+KA2TIP) 122,692-829-74-24-B
 WA2JQK (+WA2UJK) 34,580-240-72-17-B

NYC-Long Island
 KD2RD 122,544-828-74-24-B
 K2RS 56,000-400-70-15-A
 K2AU 53,340-381-70-15-B
 KC2KJ 23,600-200-69-9-B
 K2RY 15,808-152-58-13-A
 N2RQ 10,148-118-43-8-A
 W2KTF 9,978-116-43-4-A
 K2HVN 7,888-63-61-4-A
 KD2SX 4,388-84-26-3-B
 K2OV5 2,900-50-29-3-A
 N2GBS 1,288-38-18-5-A
 KA2RYI 1,088-32-17-5-A
 WA2JG 884-26-17-3-A
 N2FI 30-5-3-1-A

Northern New Jersey
 K07PK 120,820-815-74-24-B
 K0D1J 67,080-479-70-22-B
 N2DTL 38,940-295-68-15-A
 WA2UDT 24,348-219-67-7-A
 K4BNC 14,200-100-71-10-B
 N2FVP 8,448-96-44-12-A
 WB2HJW 8,034-103-39-3-B
 WA2ASQ 4,440-60-37-4-A
 K2ZQ 2,500-50-25-3-A
 KR2Q (KA2s EYH,HJH,W2QR,WA2NWX,
 WB2GJE,ops) 16,536-318-52-23-A

South New Jersey
 N2MM 177,800-1200-74-22-B
 ND2P 64,860-470-68-20-B
 W8SY (WB2DIN,op) 61,628-434-71-14-B
 WA2WJL 58,856-412-69-18-A
 W2PAU 51,612-374-69-13-B
 WA2LBT 39,932-298-67-23-A
 K2LOO 24,050-185-66-16-A
 W2EA 23,912-196-61-10-A
 WA2RCB 23,400-195-60-7-B
 W2LYL 19,936-178-56-4-A
 K2KED (WB2YOF,op) 15,974-163-49-9-A
 K2OSV 15,288-147-58-9-B
 K2TD 13,700-137-50-4-B
 N2WV 12,138-119-51-5-B
 KA2KFO 10,780-110-49-18-A
 KD2AE 3,430-49-35-5-A
 KA2MSM 3,190-55-29-4-A
 WB2QNH 2,444-47-28-1-B

WestLB 218-12-9-1-A
Western New York
 K2ZL 140,748-951-74-22-B
 AJ3K 112,184-758-74-24-B
 AP2K 105,412-722-73-24-B
 NA2A 75,168-522-72-22-B
 W2FXA 48,308-331-73-13-B
 N2CIC 47,600-680-70-17-B
 W2MTA 45,440-355-64-13-A
 N2M2 33,150-265-85-23-A
 NE2W 32,262-283-57-14-A
 KB2NU 30,058-221-68-8-B
 WA2PNQ 28,784-257-56-17-A
 W2VDX 26,344-178-74-17-B
 NA2Q 23,560-190-82-7-A
 KD2PC 21,708-201-54-14-A
 N2PSE 19,580-163-60-17-A
 KB2DM 18,590-143-85-10-B
 W2TZ 10,412-137-38-3-A
 K2UC 7,600-100-38-5-A
 NK2H 7,332-78-47-4-B
 W2HG 7,140-102-36-2-B
 N2WQ 4,590-51-45-7-B
 K2YFP 286-13-11-3-A
 NM2L (+KA2NIL,KC2RN,N2EGK,NQ2J,
 W2TGF,WB2s WBU,WMB) 98,884-668-74-24-B

3
Delaware
 K3WUW 95,708-674-71-18-B
 W3N3X 26,000-200-65-10-A
 N8NAJ/3 25,752-222-58-8-A
 AC3T (KA3B,op) 10,812-108-51-7-B

Eastern Pennsylvania
 K3SF 154,656-1074-72-20-B
 WB3FAA 75,040-538-70-15-B
 KB3YJ 55,232-396-71-20-A
 AA3B 40,300-325-62-8-B
 AE3T 40,180-287-70-8-A
 KY3T 35,376-268-66-16-B
 W3FV (+NET) 35,052-254-69-13-B
 N3ESI (N3ESJ,op) 30,500-250-61-22-A
 WA1MKE 30,492-242-63-10-A
 KA3PKN 30,380-253-60-15-A
 K3TX 30,000-250-60-24-B
 KB3JK 25,800-215-90-12-B
 WB3EPU 23,600-200-59-12-A
 KZ3X 23,424-192-61-9-A
 N3CZL 23,002-217-53-11-B
 KC3ZG 15,600-150-54-24-A
 WB3AAK 11,928-142-42-8-A
 K3WW 10,952-74-74-12-B
 KA3LCF 10,682-109-49-10-A
 KA3OZA 10,578-123-43-17-B
 W3KOL 10,332-126-41-13-A
 W3RCL 7,440-93-40-9-A
 WA3TQJ 4,536-63-36-3-A
 KA3BB 3,702-63-27-8-B
 WA3LGG 2,900-50-28-9-A
 K3LIA 1,412-34-19-3-A
 N3CZB 1,232-28-22-4-A
 KC3M 988-22-21-1-A
 KA3BET 273-21-13-3-A

Maryland-DC
 W3LPL (WD4AXM,op) 236,504-1598-74-24-B
 K3NA 182,644-1114-73-24-B
 K3ZZ 135,752-958-71-24-B
 W3EAX 118,300-845-70-19-B
 KC8C/3 105,284-731-72-11-B
 N3AOE 81,834-577-71-24-A
 N3GB 43,282-323-67-7-B
 K3SA 22,200-185-60-4-A
 KN3T 19,100-181-50-4-B
 W6AXX 17,490-165-53-10-B
 WB4FDT 15,300-150-51-3-B
 N5EYI 10,752-112-48-7-A
 K3TM 3,710-53-35-1-A
 KC3AM (+K3JVJ) 75,040-536-70-23-B
 WB3JRU (+KC3AJ) 2,810-45-29-2-A
 K3ZJ 138,900-925-74-16-B

Western Pennsylvania
 K3TUP 86,400-610-70-9-B
 WB3JFS 56,080-440-69-18-B
 K3LL 23,010-195-59-10-A
 NA3H 11,788-111-53-6-B
 K3YRA 9,478-103-46-8-A
 N3AEP 5,852-77-38-6-A
 W3QH 4,940-65-38-6-A
 WA3PCX 98-5-6-1-A
 K3UA (+W3FSB) 2,050-41-25-1-B

4
Alabama
 N4KG (KC4ZV,op) 194,820-1315-74-24-B
 W24F 58,940-438-65-5-B
Georgia
 KA6AI 52,768-388-68-13-A
 K4KGV 37,400-275-68-20-B
 KE4XT 32,562-243-67-15-A
 N8LM 23,790-195-61-15-A
 AA4LR 18,866-153-61-11-A
 W9UIX/4 1,550-31-25-8-A
 WA4QL (+ops) 114,172-782-73-24-B

Kentucky
 ND4Y 180,456-1236-73-24-B
 AA4RX 158,212-1069-74-21-B
 WB4FDK 45,360-324-70-22-B
 KB4SRE 45,114-309-74-13-A
 KB4AMA 36,038-273-68-20-A
 K14DC 14,872-143-52-4-B
 K4FU 10,952-74-74-9-B
 KF4AV 216-12-9-1-A

North Carolina
 N4ZC (N3TR,op) 201,576-1362-74-24-B
 K4JEX 82,490-665-73-15-A
 KJ4TI 30,096-228-68-18-A
 KB4OEN 10,622-113-47-18-A
 AF9D 8,880-70-62-8-A
 WB4AQK 7,980-95-42-7-A
 N4UH 5,894-71-42-1-B
 WA2TBA 4,950-75-33-1-B

Northern Florida
 N4EEB 208,152-1412-73-24-B
 WA4WKQ 72,662-497-73-16-B
 WC4E 88,524-483-74-12-A
 NX4N 23,316-201-60-14-B
 KD1U 19,320-181-60-14-A
 N4NWT 12,826-121-53-13-A
 AA4WE 930-31-15-6-A

South Carolina
 WB4GME 42,030-345-61-15-B
 W6IOK/4 21,384-182-66-6-A
Southern Florida
 K1ZX 151,258-1038-73-17-B
 WA4ZME 26,113-251-56-7-B
 KO4J 26,398-199-87-16-B
 KW1K 16,740-155-54-10-B
 WK4F 9,248-68-88-8-A
 K9OCU 3,584-54-33-7-A

Tennessee
 N4ZZZ 214,304-1448-74-24-B
 K3CQC 80,088-562-71-20-B
 AA4DD 46,088-334-72-18-A
 AA4MN 37,940-271-70-9-B
 W4AY (WA4ZZL,op) 13,224-228-58-6-A
 W4FLW 10,028-108-46-6-A
 KB4EX 8,064-96-42-10-B
 N4TG (+N4OHV) 151,258-1038-73-22-B
 KB4FHE (+KB4TSV,NA4Y) 33,672-244-69-10-B

Virginia
 KX3Q 180,856-1222-74-24-B
 N3JT 149,628-1011-74-21-B
 K3ZJ 136,900-925-74-16-B
 W3YV 80,216-542-74-7-B
 AA4FF 72,432-503-72-20-B
 K4BAM 58,700-405-70-17-A
 WA4CYR 51,520-368-70-22-A
 AA4UJ 48,300-350-69-12-B
 KX4V 43,808-296-74-11-A
 W4DELJ 31,418-231-66-8-B
 W8LT/4 28,050-275-51-8-A
 W4JLS 22,320-180-62-12-A
 K4ARDH 21,358-181-58-14-A
 N4BN 18,526-157-59-10-A
 WA3RGH 16,740-310-54-5-A
 N4XD 10,272-107-48-4-B
 W4YE 7,000-100-35-3-A
 W4XD 6,888-82-42-4-B
 WD4RQJ 4,218-68-31-5-A
 KC4DY (+N4s FHL,GNN,JEJ,op) 133,052-899-74-24-B
 AA4UC (+KB4QMD) 32,370-249-65-22-A

West Indies
 KV4FZ (N6OP,op) 216,376-1462-74-24-B
 KP4BKY 51,740-398-65-20-B
 WA4JN/KV4 12,872-132-48-7-A

5
Arkansas
 N5DX (K5GO,op) 194,820-1315-74-24-A
 K5FUV 143,704-1012-71-24-A
 W5QUB 108,200-763-70-24-A
 K5FJL 26,532-198-67-14-B
 KA5ZH 15,402-151-51-11-A
 W5KL 8,978-102-44-5-B
 WA5TDL (+N5DZQ,WA5ZGI) 80,808-1092-74-22-B

Louisiana
 W5WMMU 283,989-1716-74-24-B
 K5SM 181,258-1038-73-22-B
 N5FYJ 32,340-245-66-22-A
 W5B5SD 25,984-224-58-12-A
 W5CD 23,232-178-66-7-A
 KE5LQ 20,664-163-64-12-A
 W5BTD 6,958-71-48-9-A
 W5EW (+K5MC,N5JZ,W5CN) 140,748-951-74-21-B
Mississippi
 K5BBA 82,052-562-73-16-B
 W5QL 37,536-272-69-11-A
New Mexico
 A19X 108,780-735-74-18-B
 KE5BL 83,080-577-72-19-B
 N5DVF 79,804-562-71-10-B

K5L 23,250-204-67-10-B
 N5EPA 16,874-143-59-5-A
 K5SX 5,080-101-45-28-B
 KP5P 2,600-50-25-10-B
 N5HH (+K5QQ) 161,610-1092-74-24-B

Northern Texas
 N5AU (WB5VZL,op) 235,816-1587-74-24-B
 K5RR (N5RZ,op) 228,680-1545-74-24-B
 K5RQ 225,996-1527-74-24-B
 KE5GV 201,724-1363-74-24-B
 K5NV 186,332-1250-74-24-B
 N5TV 128,800-850-74-24-B
 K5KJ 87,024-568-74-1-A
 N5UA 83,472-564-74-1-A
 KC5DX 78,866-557-69-1-A
 N5JB 69,438-488-71-1-A
 N5RM 68,618-484-72-1-A
 N5SE 56,334-379-72-1-A
 K5MR 49,632-376-66-1-B
 W5LMG 42,842-308-69-1-B
 N5IWA 40,040-288-70-2-A
 N5CR 28,516-281-40-2-A
 K7CW 27,488-218-63-2-A
 K5WV 21,824-178-62-1-A
 W5MS 18,000-150-60-1-A
 KC5PU 11,200-112-60-1-B
 K5EQ 3,696-68-28-2-B
 W5AE 476-17-14-1-A
 W5ONL 96-8-6-6-B

Northern Texas
 N5AH (+KM5X) 142,820-965-74-24-B
 W5SJ (+WQ5V) 102,200-700-73-24-B
 W5AH (+KM5X) 71,808-544-68-24-B
 W5CJ (+WQ5V) 71,808-544-68-24-B
 W5CQ (+KF5FM) 85,200-600-71-23-B

Oklahoma
 KM5H 87,840-610-72-15-B
 KB5ZQ 23,438-189-62-9-B
 WB5OSM 18,372-167-58-11-B
 W5KP 13,420-128-56-7-B
 N5HB 8,550-95-45-7-B
 W5DOS 3,840-65-26-5-B
 K5CM (+N5s CG,KV) 219,188-1481-74-24-B
 W5CQ (+KF5FM) 85,200-600-71-23-B

Southern Texas
 W54Q 297,836-1707-74-24-B
 N5RM 249,084-1863-74-24-B
 KE5FI 188,039-1257-74-24-B
 K5BU 183,224-1238-74-24-B
 K5GB 111,890-765-73-14-B
 KC5CP 78,516-517-74-24-B
 K5FF 68,256-474-72-26-B
 W55AM 55,664-513-64-19-B
 W5LXG 30,600-225-68-10-B
 W5KD 28,040-210-62-11-B
 K5NH 22,016-176-84-8-B
 W5DGBX 21,240-180-58-15-B
 W5UFA 13,936-134-58-11-B
 W5NR 7,476-89-42-8-B
 N6ZR 1,162-32-18-3-B
 K5LZO (+K5D5P,KE5V,N5VW,N5MU,
 N5TD,WB5N,WB5RUS) 267,288-1805-74-24-B
 K5RVK (+N5EA,W5ASP,V5AVL) 188,822-1261-74-24-B
 W5EHM (KB1CM,KA5s W5SS,ZVJ,KF5AV,
 W5HJ,ops) 125,856-874-72-30-B
 N5JJB (+W5EP) 34,980-268-68-22-B

6
East Bay
 N6BV 262,108-1771-74-24-B
 K6EZ 105,696-734-72-19-B
 K5BH 103,304-699-74-19-B
 W6RF 75,522-540-69-15-B
 W6BG 65,854-478-69-15-B
 W6BSY 38,554-521-74-13-B
 N6EK 35,224-259-68-16-B
 W6BMRQ 26,412-213-62-16-B
 K5GO 4,708-107-44-5-B

Los Angeles
 N6HC 140,160-960-73-19-B
 WA6GDS 75,336-516-73-22-B
 WB6JUE (+WA6SF) 58,892-402-73-19-B
 WA6LW 44,880-330-68-22-B
 W6RBB 42,240-320-68-16-B
 N6EI 27,060-205-66-7-B
 W6BNFO 25,090-193-65-16-B
 N6BP 24,960-195-64-15-B
 W6EIG 22,968-174-66-15-B
 K6BKT 15,700-157-50-8-B
 N6IC 13,800-100-68-7-B
 W6BXP 11,250-125-45-10-B
 K6DJ 10,300-103-50-17-B
 N6GEM 9,312-97-48-6-B
 W6QFP 5,212-98-47-13-B
 W6PFE 5,068-79-36-10-B
 K6ML 4,736-64-37-4-B
 W6CN 2,312-34-34-8-B
 W6BFW 476-17-14-5-B
 K6MLO 416-16-13-4-B
 N5WQ 340-12-10-2-B
 W6LAX 58-7-4-1-B

San Diego
 W6VPS (N5HJC,AJ6F,K6R3,N6s
 DMV,HCS,JXQ,CUE,W6s CN,OES,W6FI,
 X6N,K7QCY,ops) 87,912-594-74-24-B



PHONE

1
Connecticut
 W1WEF 204,684-1383-74-24-B
 KA1VC 158,436-1057-74-22-B
 N0RA 115,344-801-72-21-A
 N1CC 103,580-720-72-21-A
 KH8VT 90,720-648-70-19-B
 KH6CP/W1 84,980-590-72-24-A
 KA1JNR 76,254-537-71-12-B
 K1NYK 73,840-526-70-24-A
 KB1HY 70,418-489-72-14-B
 W1BIH 64,878-437-74-11-B
 W1GNR 63,838-444-72-19-B
 KG1D 59,820-428-70-12-A
 K1CC 58,558-437-67-7-B
 N1JW 56,984-419-68-13-B
 KA1MWX 54,848-396-69-17-A
 K1K 39,798-297-67-3-B
 K1BV 39,576-291-68-7-B
 KA1DBK 35,480-280-58-19-B
 WA1FGN 27,900-225-62-20-A
 W1EHC 22,800-190-80-8-A
 KA1TJ 22,330-203-59-12-B
 W1TKG 18,792-174-54-15-A
 KB1WR 15,498-149-52-10-A
 W1PWR 12,980-140-46-7-A
 K1ZZ 11,780-120-49-2-B
 K1IN 11,400-200-57-10-B
 K1DI 8,664-76-57-4-A
 WB1DQT 8,648-84-46-4-A
 NF1U 4,288-67-32-4-A
 WA3VIL 2,200-44-25-4-A
 KJ4KB/1 1,200-30-20-2-A
 AA2Z 224-14-8-1-A
 NF1R 100-5-4-1-A
 KB1TH 72-6-6-2-A
 WA1MBK 2-1-1-1-A
 K1WA (+K1DM) 191,552-1312-73-24-B
 K1DW (+K1KNC,KA1DA) 108,720-755

W6GAA (WA6BIL,WB6JCD,ops)	42,504 308- 89-22-A	Nevada	W8FEM	13,230- 105- 63-10-A	AH2U	106,412 718- 74-15-A	K9VGB	20,520- 171- 60-10-A
K6IC5 (+cp)	1,368- 38- 18- 7-A	NW7B	K8DD	12,342- 121- 51- 2-B	K8HDE	102,240 720- 71-17-B	N0BY	13,622- 139- 48-10-B
Orange		N07M	W8CEI	11,800- 116- 50- 6-A	W9BQJ	87,024 588- 74-24-A	W9CEM (+ A25,K8WA,W9BWHB)	218,524-1463- 74-24-B
K16DU	42,090- 345- 61-13-A	N07K	K8BZE	10,494 99- 53-12-A	W9LNU	64,386 441- 73-14-A	N18S (+ K0DFH,N8S FYQ,HLV)	83,232- 578- 72-21-B
WB6HAL	41,600 320- 65-20-B	N07L	W8TJQ	10,494 99- 53- 7-A	W9LW	55,074 412- 67-14-B	NK0V (+ N00GN,N1N0N,KC00X)	58,320 405- 72-19-B
N60CX	30,550 235- 65-23-A	N07M	KY8I	10,336 136- 38- 6-B	N9A9E	52,824 372- 71-18-B	Minnesota	
NF8H	25,116 182- 69-16-A	N07N	KM0W	9,876 114 41-11-A	W9ADRE	51,404 362- 71-13-B	N8AT	125,948- 851- 74-17-B
WA6GFR	18,880- 160- 56-20-A	N07P	W8PFD	8,268 106- 39-10-A	K0CUM	33,920 265- 64-13-A	W9A0VX	94,720 640- 74-24-A
KY6V	5,550 75- 37- 5-A	N07Q	K8KUH	7,344 102- 36- 3-B	K9FR	33,500 250- 67-10-A	N8CIB	91,542- 627- 73-11-B
KF0G (+ N6RJ,WA60WM)	165,812-1119- 74-24-B	N07R	W8DKZ	6,800 100- 33- 4-A	K9GH	32,294 241- 67-19-B	K0TT	90,082- 617- 73-14-B
WB6YPX (KB6CIC,K16X,WM6H,ops)	127,440 885- 72-22-B	N07S	W8S	4,960 80- 31- 8-A	N9BBM	30,492 231- 66-19-A	AC0W	80,372- 568- 71-24-A
W8YNT (K8HRT,K866ART,KC0KBNV, WB60WD,W8CECP,ops)	33,280- 256- 65-23-A	N07T	K8SM	4,900 70- 35- 4-B	N8BI	25,752 208- 64-11-A	K0FZG	77,380 530- 73-24-A
Pacific		N07U	KE8X	4,756 58- 41- 3-A	N9ABF	26,108 214- 61-18-A	K9JL	64,944 451- 72-14-A
AH6AZ	75,896 534- 72-18-B	N07V	W8QIV	3,740 55- 34- 4-B	K909	24,682 209- 58- 5-A	W90QT	18,928 169- 56- 7-A
AH6FL	10,948 119- 46- 5-A	N07W	W8VWY	3,200 50- 32- 2-A	W9RPM	19,152 171- 56- 5-A	K9JUL (N8EOB,op)	62,964 477- 65-24-A
Santa Barbara		N07X	K8SOS	3,132 50- 27- 3-A	W9REC	18,216 138- 66-18-A	KM80	54,648 414- 66- 9-B
N8MB	117,530 805- 73-21-B	N07Y	W8ABY	2,800 50- 28- 6-A	K9BQL	17,584 157- 56- 4-B	W8BRWB	52,164 378- 69- 6-B
W2KV/V6	94,170 645- 73-24-B	N07Z	W8WBL	2,730 78- 35- 3-A	N9AD	14,840 140- 53- 2-A	W8MHJ	41,904 291- 72- 7-B
W8F6V	80,784 561- 72-21-A	Utah	K8BSOS	1,156 54- 17- 3-A	W9AYR	13,000 130- 50-11-A	K90V	33,184 244- 68- 9-A
K8VMN	53,108 374- 71-19-B	W7CFL	W8BAFO	788 24- 16- 4-A	W9RWF	12,584 121- 52- 9-B	K8E2Q	32,000 250- 64-15-A
W8G6H	11,300 113- 50-10-B	W7CFL	K8KGV	360 15- 12- 2-A	W9RWF	11,712 122- 48-14-A	W8BF	30,220 233- 65- 4-B
N8SX	3,200 50- 32- 3-A	KE7KD (+ N7GPO)	N8CEO	10 5- 1- 1-A	W9RWF	11,712 122- 48-14-A	K8SR	27,280 252- 65- 6-B
Santa Clara Valley		W7CFL	W8SH (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	11,322 111- 51- 6-A	K9RPI	9,600 100- 48-10-A	W9RJK	23,790 195- 61-13-A
N8BT (W86VEP,op)	233,248-1576- 74-24-B	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	1,122 111- 51- 6-A	N9IA (AH2U,op)	7,144 94- 38- 9-A	K90T	21,480 179- 60- 9-A
K16CQ	76,796 526- 73-24-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	K9RIMX	2,184 42- 26- 1-B	K90T	21,480 179- 60- 9-A
K9VGV	37,672 277- 68-11-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8NF	26,840 185- 72-15-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8SV	20,820 190- 54- 5-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
KF6AB	11,628 114- 51- 8-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8VE	2,024 44- 23- 5-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
San Diego		W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8ND	100,930 682- 74- 9-B	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8UCF	85,118 583- 73-24-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8CDA	48,082 334- 68-17-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8GUFY	39,440 290- 68-15-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8JXA	27,872 208- 67- 7-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
K87FZ	26,820 215- 61-20-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8KWM	21,350 175- 61-13-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
AA6EE	19,782 157- 63- 8-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8JHC/6	3,200 51- 32- 4-B	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
K8NA	1,188 27- 22- 1-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
San Francisco		KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8JTI	95,472 663- 72-24-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
K8I1A/6	42,228 308- 68- 8-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
K8LRN	13,420 122- 55- 6-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W82CHO	1,854 37- 21- 1-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8BIP (+ W86PYN)	86,478 809- 71-21-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
San Joaquin Valley		KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8H	230,584-1558- 74-24-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
K8RW	84,064 592- 71-15-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8REC	48,512 342- 68-11-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8XK	34,300 245- 70-13-B	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8NPZ	10,584 108- 49-15-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W8SX	240 12- 10- 1-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
Sacramento Valley		W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
A16V	227,032-1834- 74-24-B	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
KV8H	188,460-1145- 74-24-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
KF6A	121,852 824- 74-24-B	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
K8SG	101,178 693- 73-21-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8JV	81,906 581- 73-18-B	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W860	74,632 626- 71-20-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8IG	73,112 494- 74-17-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8GJC	44,388 328- 69-17-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
N8IM	32,860 230- 71-11-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
AA6GM	8,820 98- 45- 5-A	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
W80VHW	32 8- 3- 1-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
7		W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
Alaska		KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
KL7ISO	14,804 182- 46-20-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
K17WP	794 14- 8- 1-A	KE7KD (+ N7GPO)	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
WA7USX/KL7 (+ AL7GI,W8DNT)	54,912 416- 65-16-B	W7CFL	W8S (KA8S SMA,UN0KN8 P,R,N8S GVO,G2C,NU8M,ops)	179,672-1214- 74-24-B	N9JD (+ K9GZ)	1,042 102- 690- 74-22-B	K90T	21,480 179- 60- 9-A
AL7CQ (+ WL7BFJ)	34,320 265- 65-19							

Rules, June VHF QSO Party

June 13-15 will mark the weekend of what traditionally has become the biggest VHF bash of the year. Weather is usually ideal for mountaintopping, and the bands are usually hot for making lots of contacts. As usual, Maidenhead grid squares worked per band constitute the multipliers. Grid square maps are available from ARRL HQ for \$1. Official summary sheets and log sheets are also available from ARRL for an SASE. Send for yours today.

Note that Novices can now play in VHF contests. Look for Novice participation especially on 1¼-meter FM simplex and up from 222.1-MHz SSB/CW. Significant Novice efforts will be recognized with certificates.

Rules

1) **Object:** To work as many amateur stations in as many different 2° × 1° grid squares as possible using authorized amateur frequencies above 50 MHz.

2) **Contest Period:** Begins 1800 UTC Saturday, June 13, and ends at 0300 UTC Monday, June 15.

3) Categories:

(A) Single operator: One person performs all operating and logging functions.

(1) Multiband.

(2) *Single band:* Single-band entries on 50, 144, 220, 432, 902, 1296 and 2304-and-up categories will be recognized both in QST score listings and in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also see Rule 9, Awards.

(3) *QRP portable:* Run 10-W output or less using a portable power source from a portable location. The intent of this rule is to encourage operation from "remote" locations, not to have home or fixed stations run low power.

(B) Multioperator: Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters (1000 feet).

4) **Exchange:** Grid square locator (see Jan 1983 QST, page 49). Example: WIAW in Newington, CT would send FN31. Exchange of signal reports is optional.

5) Scoring:

(A) *QSO points:* Count one point for each complete 50- or 144-MHz QSO. Count two points for each 220- or 432-MHz QSO. Count three points for each QSO on 902- or 1296-MHz QSO. Count four points for each 2.3-GHz-or-higher QSO.

(B) *Multiplier:* The total number of different grid squares worked *per band*. Each 2° × 1° grid square counts as one multiplier on each band it is worked.

(C) *Final Score:* Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score (see scoring example).

6) Use of FM:

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted. This prohibits use of all repeater frequencies. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from con-

VHF-UHF-EME LOG									
CALL USED <u>VE3OCX</u>		ARRL SECTION or COUNTRY <u>Ont.</u>		log sheet <u>1</u> of <u>2</u>					
Date <u>6/13/7</u>		50 QSOs per side		Number each new multiplier as worked		Grid square <u>FN03</u>			
FREQ.	MODE	DATE/TIME UTC	STATION WORKED	COMPLETE EXCHANGE		LIST NEW MULTIPLIERS	POINTS		
				SENT	RCVD				
144	A/A3	2045	VE3AQS	FN03	FN03	FN03	1		
		2057	K2EXA	"	FN31	FN31	1		
		2059	W2ZEB	"	FN12	FN12	1		
		2147	K2GK	"	FN12		1		
		2133	NE2L	"	FN20	FN20	1		
		0138	VE3FSU	"	FN04	FN04	1		
		2r43	W2ZNS	"	FN13	FN13	1		
		0152	N2WR	"	FN13		1		
		0159	W2IDU	"	FN93	FN93	1		
		2207	K3ONW	"	FN19	FN19	1		
		0235	VE3C2M	"	FN25	FN25	1		

Properly completed sample log sheet.

Scoring Example

Band (MHz)	QSOs	QSO Points	Grid Squares
50	25 (x1)	25	10
144	40 (x1)	40	20
220	10 (x2)	20	5
432	15 (x2)	30	10
1296	6 (x3)	18	3
Totals	96	133	48

Final score = (QSO points) × (total no. grid squares):
(6384 = 133 × 48).

test monopolization. There are no restrictions on the use of 223.50 MHz.

(C) Only recognized simplex frequencies may be used, such as 144.90 to 145.00; 146.49, .55 and .58; and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory*, may be used for contest purposes.

7) Miscellaneous:

(A) *Stations may be worked for credit only once per band from any given grid square, regardless of mode.* This does not prohibit working a station from more than one grid square with the same call sign. Such a roving station, however, must submit a separate entry for each grid square from which operation takes place. In this situation, the entrant may opt to waive rule 7 (C) and use a single different grid square. Crossband QSOs do not count. Aeronautical mobile contacts do not count.

(B) Partial QSOs do not count. Both calls, the full exchange and acknowledgment must be sent and received.

(C) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC); one operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(D) Only one signal per band (6, 2, 1¼, etc) at any given time is permitted, regardless of mode.

(E) While no minimum distance is specified

for contacts, equipment should be capable of real communications (ie, able to communicate over at least 1 km).

(F) Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

(G) A station located *precisely* on a dividing line between grid squares must select only one as the location for exchange purposes. A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) Above 300 MHz, contacts are permitted for contest credit only between licensed amateurs using coherent radiation on transmission (eg, laser) and employing at least one stage of electronic detection on receive.

8) **Reporting:** Entries must be received no later than 30 days after the end of the contest (July 15, 1987). No late entries can be accepted.

9) Awards:

(A) Single operator

(1) Top single-operator score in each ARRL Section.

(2) Top single operator on each band (50, 144, 220, 432, 902, 1296 and 2304-and-up categories) in each ARRL Section where significant effort or competition is evidenced. (Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers.) For example, if WBØTEM has the highest single-operator all-band score in the Iowa Section and his 50- and 220-MHz scores are higher than any other IA single op's, he will earn a certificate for being the single-operator Section leader *and* endorsement stickers for 50 and 220 MHz.

(3) Top single-operator *QRP portable* multiband and single-band score in each ARRL Section where significant effort or competition is evidenced.

(B) Top multioperator score in each ARRL Section where significant effort or competition is evidenced. Multioperator entries are *not* eligible for single-band awards.

10) **Condition of Entry:** Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

11) **Disqualifications:** See January 1987 QST, page 81.

Field Day Rules

1) **Eligibility:** Field Day is open competitively to all amateurs in the ARRL Field Organization (plus Yukon and NWT). Foreign stations may be contacted for credit, but are not eligible to compete.

2) **Object:** To work as many stations as possible and, in so doing, to learn to operate in abnormal situations under less-than-optimum conditions. A premium is placed on skills and equipment developed to meet the challenge of emergency preparedness and to acquaint the public with the capabilities of Amateur Radio.

3) **Dates:** June 27-28, 1987.

4) **Field Day Period:** From 1800 UTC Saturday until 2100 UTC Sunday. Class A and Class B (see below) stations who do not begin setting up until 1800 UTC Saturday may operate the entire FD period of 27 hours. Others must begin their setup no earlier than 1800 UTC Friday, and may operate no more than 24 consecutive hours; ie, once on-the-air FD operation has started, it must end 24 hours from that point.

5) **Entry Categories:** Field Day entries are classified according to the maximum number of simultaneous transmitted signals, followed by the designation of the nature of the individual or group participation. Below 30 MHz, once a transmitter is used for a contact on a band, it must remain on that band for at least 15 minutes. During this 15-minute period, the transmitter is considered to be transmitting a signal, whether it is or not, for purposes of determining transmitter class. Switching devices prohibited.

(Class A) Club/nonclub portable: Club groups (or nonclub groups with three or more licensed amateurs) set up specifically for Field Day. Such stations must be located in places that are not regular station locations, and must use no facilities installed for permanent station use, nor any structures installed permanently for FD use. Stations must be operated under one call sign (except when the Novice/Technician position is used) and under the control of a single licensee or trustee for each entry. All equipment (including antennas) must lie within a circle whose diameter does not exceed 300 meters (1000 feet). All contacts must be made with transmitter(s) and receiver(s) operating independent of commercial mains. Entrants who, for one reason or another, operate a transmitter or receiver from commercial mains for one or more contacts will be listed separately at the end of their class.

Any Class A group whose entry classification is two or more transmitters (non-Novice) may also use one Novice/Technician operating position (Novice bands only) without changing its basic entry classification. This station (including antennas) should be set up and operated by Novice and Technician licensees and should use the call sign of one of the Novice/Technician operators.

(Class B) One- or two-person portable: Non-club stations set up and operated by not more than two licensed amateurs will be placed in Class B. Other provisions are the same as for Class A. One- and two-person Class B entries will be listed separately in the results.

(Class C) Mobile: Stations in vehicles capable of operation while in motion and normally operated in this manner, including antenna.

MARS Bonus Points

Amateur Radio and the Military Affiliate Radio System (MARS) have always been synonymous in providing emergency communications. In recognition of this long-standing tradition of cooperation, MARS stations will this year participate in the ARRL Field Day to provide bonus points for entrants.

A bonus of 100 points will be earned by Field Day stations who contact at least one MARS station. Additional contacts will count for normal QSO credit. FD entrants should check the "other" box for bonus points on the Field Day summary.

MARS stations from each of the three services will transmit on the following MARS frequencies. Listening frequencies inside the amateur bands will be announced.

Amateurs are cautioned in operating "split" to be sure they are transmitting on the proper frequency. MARS stations will identify their call signs and send signal reports for the exchange.

Air Force	Navy-Marine Corps	Army
80 m—3229.5 kHz	80 m—4042.5 kHz	80 m—4018.5 kHz
40 m—7528.5 kHz	40 m—7382.5 kHz	40 m—6997.5 kHz
20 m—14,528.5 kHz	20 m—14,385.0 kHz	20 m—13,997.5 kHz
15 m—20,874.5 kHz	15 m—20,998.5 kHz	15 m—20,995.5 kHz

Send for Your FD Package

Send to HQ a 9- x 12-inch self-addressed envelope with 4 units of First Class US postage or 4 IRCs for the official Field Day Entry Package. This package includes 1 Publicity Kit, 1 Field Day Summary Sheet, 1 large dupe sheet with instructions and a check list to ensure that your entry is complete. If you require more dupe sheets, indicate so in your request and affix 1 unit of additional First Class postage to your SASE for each two additional dupe sheets requested.

This includes maritime and aeronautical mobiles.

(Class D) Home stations: Stations operating from permanent or licensed station locations using commercial power. Class D stations may count contacts only with Class A, B, C and E Field Day groups for points.

(Class E) Home stations—emergency power: Same as Class D, but using emergency power for transmitters and receivers. Work stations in Class A, B, C, D and E.

6) **Exchange:** Stations in any ARRL Section will exchange their Field Day operating class and ARRL Section (see page 8 in any QST). For example, if your club group was planning to operate in the three-transmitter, Class A category from Missouri, you would send "3 A Missouri." Foreign stations send RS(T) and QTH.

7) Miscellaneous Rules:

A) Operators participating in FD may not, from any other station, contact for point credit the FD portable station of a group with which they participated.

B) A station used to contact one or more FD stations may not subsequently be used under any other call during the FD period. Family stations are exempted.

C) Each phone and each CW segment is considered as a separate band. All voice contacts are equivalent, and Packet/RTTY/ASCII is counted as CW. A station may be worked once on each band. Crossband contacts are not

allowed. The use of more than one transmitter at the same time in a single band is prohibited, except that a Novice/Technician position may operate on any Novice band segment at any time. No repeater contacts.

8) **Scoring:** Scores are based on the number of valid contact points times the multiplier corresponding to the highest power used at any time during the FD period, plus bonus points. Phone contacts count one point each, and CW contacts count two points each. Power multipliers: If all contacts are made using an output power of 5 W or less and if a power source other than commercial mains or motor-driven generator is used (eg, batteries, solar cells, water-driven generators), multiply by 5. If any or all contacts are made using an output power of 150 W or less, multiply by 2. Multiply by 1 if any or all contacts are made using an output power over 150 watts. Batteries may be charged while in use for Class C entries only. For other classes, batteries charged during the FD period must be charged from a power source independent of the commercial mains.

A) **Bonus Points:** The following bonus points will be added to the score (after the multiplier is applied) to determine the final score. Only Class A and B stations are eligible for bonuses. Just check the box on the Field Day summary sheet to indicate that you qualify for the bonus, and attach the necessary proof.

1) **100% emergency power:** 100 points per transmitter for 100% emergency power. All equipment and facilities at the FD site must be operated from a source independent of the commercial mains.

Example: A club operating in Class 3A, using 100% emergency power, may claim 300 bonus points.

2) **Public relations:** 100 points for public relations. Publicity must be obtained or a bona fide attempt to obtain publicity must be made, or operation conducted from a public place (eg, a shopping center). Evidence must be submitted in the form of a clipping, a memo from a BC/TV station stating that publicity

(continued on page 90)

Contest Corral

Conducted By Mary Schetgen, N7IAL
Assistant Contest Manager, ARRL

MAY

2

Utah QSO Party, Apr *QST*, p 97.

2-3

County Hunters SSB Contest, Apr *QST*, p 97.

Florida QSO Party, sponsored by *Florida Skip Magazine*, 1400Z-1900Z May 2, and 0001Z-0500Z and 1500Z-2300Z May 3. 160-2 meters. Suggested frequencies: CW—3.555 7.055 14.055 21.055 28.055 MHz; phone—3.945 7.279 14.279 21.379 28.579 MHz. Phone and CW are separate contests. Use separate logs. Work each station once per band and mode. No crossband, crossmode or repeater contacts. FL classes are: A—those operating portable on emergency power and running 100 W or less output inside FL, but outside their home counties; B—all other stations operating in FL. Indicate single-op or multiop. For exchange, FL stations send signal report and county. Others send signal report state/province/country. FL stations count 1 point per QSO. Multiplier is the total states (49 max), provinces (12 max) and DX countries (27 max). All others count 2 points for each FL QSO. Multiply by total of FL counties worked (67 max). FL class A stations multiply final score by 1.5. Certificates and plaques. Include a summary sheet and a dupe sheet with logs. Mail by June 6 to *Florida Skip Contest Committee*, c/o North Florida ARS, Box 9673, Jacksonville, FL 32208.

6

West Coast Qualifying Run, 10-35 WPM, at 0400Z May 7 (9 PM PDT May 6). W6OWP 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 it 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.

8

ARRL Spring Sprint, 902 MHz. See Apr *QST*, p 98, for details.

9

WIAW Qualifying Run, 10-35 WPM, at 0200Z May 10 (10 PM EDT May 9). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See May 6 listing for more details.

Nevada QSO Party, Apr *QST*, p 97.

9-10

CQ-M Contest (Peace to the World), Apr *QST*, p 97.

A. Volta RTTY DX Contest, Apr *QST*, p 98.

14

ARRL Spring Sprint, 1296 MHz, 7 PM until 11 PM local time on May 14. Exchange six-character Maidenhead Locator. (See Dec 1986 *QST*, p 30, or write to Special Requests desk, ARRL HQ, for a reprint. Enclose a business-size SASE.) QSO points equals the distance in km for each successfully completed QSO. In making the distance calculations, a string (or ruler) and a 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). Final score equals sum of QSO points (distance in km). Other usual VHF/UHF rules apply. Send logs to ARRL before Jun 20.

16

Armed Forces Day. This year marks the 38th

anniversary of communications tests between the Amateur Radio community and the Military Communications System. Special commemorative QSL cards will be issued to amateurs achieving a verified two-way radio contact with any of the participating military radio stations. Those who receive and accurately copy the Armed Forces Day CW and/or RTTY message from the Secretary of Defense will receive a special commemorative certificate.

Crossband Radio Contacts. The military-to-amateur crossband operations will be conducted from 1300Z May 16 until 0245Z May 17. Military stations will transmit on military frequencies and will announce the specific amateur band frequencies being monitored. Limit contacts to three minutes. The following stations will transmit on the designated frequencies: AAE, Fort Sam Houston, TX; LSB—4021.5 kHz, 7309.5 kHz; CW—9990 kHz; USB—20,992.5 kHz; RTTY—9990 kHz. AAG, Presidio of San Francisco, CA; LSB—4023.5 kHz; CW—6988 kHz, 13,994.5 kHz; RTTY—13,994.5 kHz. AIR, Washington, DC; LSB—4025 kHz, 7315 kHz; CW—6995.5, 13,997.5 kHz; RTTY—7306.5 kHz, 13,986.5 kHz; USB—14,408 kHz. NAM, Norfolk, VA; varied emissions—14,400 kHz. NAV, Cheltenham, MD; RTTY—7372.5 kHz; SSTV—14,389.5 kHz. NMH, Alexandria, VA; CW—4015 kHz; LSB—7346.5 kHz; RTTY—14,440 kHz; USB—20,937.5 kHz. NPM, Portsmouth, VA; varied emissions—7393 kHz. NPG, Stockton, CA; LSB—4001.5 kHz, 7301.5 kHz; CW—4010 kHz, 6970 kHz, 7365 kHz, 10,259.5 kHz, 13,975.5 kHz, 20,998.5 kHz; RTTY—13,927.5 kHz; USB—14,375 kHz, 21,460 kHz. NPL, San Diego, CA; RTTY—7382.5 kHz; SSTV—14,385 kHz. NZJ, El Toro, CA; RTTY—7375 kHz; USB—14,480 kHz. WAR, Fort Meade, MD; LSB—4018.5 kHz; CW—6997.5 kHz, 13,992.5 kHz; USB—14,403.5 kHz, 20,995.5 kHz; RTTY—13,992.5 kHz.

CW Receiving Test. Conducted at 25 WPM. A 10-minute call-up will begin at 0250Z May 17, followed by the text at 0300Z. The following stations will transmit the message on the indicated frequencies: AAE, Fort Sam Houston, TX; 4018.5, 6988 and 9990 kHz. AAG, Presidio of San Francisco, CA; 4021.5, 7309.5 and 13,994.5 kHz. AIR, Washington, DC; 6995.5 and 13,997.5 kHz. NAM, Norfolk, VA; 4005, 7393 and 14,400 kHz. NAV, Cheltenham, MD; 7372.5 and 14,389.5 kHz. NPG, Stockton, CA; 4010, 7365 and 13,927.5 kHz. WAR, Fort Meade, MD; 4028.5, 6997.5 and 14,403.5 kHz.

RTTY Receiving Test. Transmitted at 60 WPM using 170-Hz shift. A 10-minute call-up will begin at 0300Z May 17, followed by the text at 0345Z. Stations and frequencies are the same as for the CW receiving test (see above). Submit CW and RTTY test messages exactly as received. Indicate time, frequency and call letters of station copied. On the same page as the message text, include your name, call sign and complete mailing address. Entries must be postmarked by May 23. Stations copying AIR send entries to Armed Forces Day Test, 2045ISG/DOJ/M, Andrews AFB, DC 20331-6345. AAE, AAG or WAR entries go to Armed Forces Day Test, Commander, USAISC, Attn: AS-OPS-OA, Ft Huachuca, AZ 85613-5000. NAM, NAV or NPG entries go to Armed Forces Day Test, Naval Communication Unit, Washington, DC 20390-5161.

16-17

Southern California 6 Meter Club QSO Party, sponsored by the Southern California 6 Meter Club, from 1200Z May 16 until 1200Z May 17. All modes. Work station once per mode. Scoring count 1 point per QSO times grid squares worked equals total score. Send logs to Southern CA 6 Meter Club, PO Box 448, Cypress, CA 90630.

ARI Italian International Contest, sponsored by the Associazione Radioamatori Italiani, from 1600Z May 16 until 1600Z May 17. Work Italian stations including San Marino, Vatican City and SMOM, once per mode and band. Classes: single operator CW, single operator SSB, single operator mixed mode, multioperator single transmitter and SWL.

Bands: 28 21 14 3.5 1.8 MHz. Exchange RS(T) and QSO number starting with 001. Italian stations will send RS(T) and two letter (province). European stations count 2 points per QSO with Italian stations. Non-European stations count 4 points per QSO with Italian stations. Multipliers are Italian provinces. Work once per band. Final score is total of QSO points times total of multipliers. Use separate logs per band. Include summary sheet. Awards. Send logs before 40 days after the contest to either Giorgio Beretta, 12VXJ, via Sciesa 24, 20135 Milano, Italy, or to Contest Manager, c/o ARI, via Scarlatti 31, 20124 Milano, Italy.

World Telecommunications Day Contest, sponsored by the Liga de Amadores Brasileiros de Radio Emissao, beginning 0000Z Sat May 16 until 2400Z Sun May 17. Contest objective: to contact as many ITU Zones as possible in order to win ITU Plaque for your country. Bands: only 160/80/40/20/15/10. Categories: Single-op/single transmitter/all band operation (no spotting nets in this category). Multi-op/single transmitter/all band operation (after band change, station must remain there for at least 10 minutes). Number exchange: RA(T) report plus ITU Zone (eg, 5913 on phone, or 599913 on CW). Contacts between stations on different continents: 2 pts on 10/15/20 meter bands and 4 pts on 40/80/160 meter bands. Stations on same continent but different country: 1 pt on 10/15/20 meter bands and 2 pts on 40/80/160 meter bands. Contacts between stations in the same country are permitted for zone multiplier, but have no point value. Same station may be worked once on each band. Multipliers: 75 geographical broadcast zones established by the ITU. Scoring: total QSO points \times sum of all multipliers worked on each band. Awards: ITU Plaque to country with the highest aggregate score. Certificates. Logs required, separated sheet for each band. Send logs to LABRE, ITU Contest Committee, Box 07-0004, 70 000, Brasilia DF, Brazil. Deadline for entries is July 31.

16-18

Michigan QSO Party, sponsored by the Oak Park ARC, from 1800Z May 16 until 0300Z May 17 and 1100Z May 17 until 0200Z May 18. Work stations once per band and mode. MI-to-MI QSOs allowed. Work portables/mobiles again as they change county. No repeater QSOs. Exchange signal report, QSO number and QTH (county for MI stations, state or country for others). Suggested frequencies: CW—1.810 3.540 3.725 7.035 7.125 14.035 21.035 21.125 28.035 28.125; phone—1.855 3.905 7.280 14.280 21.380 28.580 50.125 146.52. Count one point per phone QSO and two points per CW QSO. MI stations multiply by sum of states, countries and MI counties worked (max 85). Others multiply by number of MI counties worked (max 83). QSOs with club station W8MB count five points. VHF-only entrants may add multipliers from each band for total multiplier. Mail logs by July 1 to Mark Shaw, 27600 Franklin Rd, Apt 516, Southfield, MI 48034.

17

Abegweit Award Day Contest, sponsored by the Prince Edward Island ARA, from 1200Z until 2400Z May 17. VE1 and VO1 stations must confirm contacts with Prince, Queens and Kings Counties. All other VE/W stations must confirm contact with any three PEI stations, regardless of county. All DX must confirm contacts with any two PEI stations, regardless of the county. Frequencies will be: phone—3.800 7.200 14.250 21.300; CW—3.700 7.100 14.050 21.100. Awards. Send a copy of your log (certified by two other amateurs) to Box 1232, Charlottetown, Prince Edward Island, TMS CIA, Canada.

23-24

ARRL Spring Sprint, 50 MHz. See Apr *QST*, p 97, for details.

25

WIAW Qualifying Run, 10-40 WPM, at

2000Z (4 PM EDT) May 25. See May 6 and 9 listings for more details.

30

QRP ARCI Hootowl Sprint, sponsored by QRP ARCI, 0500Z to 0900Z May 30. Exchange: Members give RST, state/province/country and QRP ARCI number. Others: RST, state/country/province and power output. Stations may be worked once per band. Each member contact 5 pts; others 2 pts. Multipliers: S/P/C once per band at 1 pt each, total for that band, then total S/P/C pts for all bands, for multiplier total. Power multipliers: 4-5 W output $\times 2$, 3-4 W output $\times 4$, 2-3 W output $\times 6$, 1 to 2 W output $\times 8$, less than 1 W output $\times 10$. More than 5-W output counted as checklog. Highest power in any band determines the power multiplier used to score the log. Bonus multipliers: natural or battery $\times 1.5$, type of power must stay the same throughout contest to qualify for this multiplier. Antenna bonus: single element, nonrotatable antenna (dipole, vertical, etc) $\times 1.5$. If qualified for both of above multipliers, then do not multiply by them; multiply score by 2.5 instead. Bonus points: all 10 US call districts—add 200 pts; 5 Canadian provinces—add 200 pts; 5 non-US/VE countries—add 200 pts; home-brew transmitter—300 pts; homebrew receiver—500 pts; home-brew transceiver—800 pts; any three of above, then double your bonus points for them. Earn all bonuses, then triple your bonus points for them. Frequencies: 1.810, 3.560, 7.040 14.060 21.060 28.060 50.360. Bands: Only 160/80/40/20/15/10/6 will be counted. Call: CQ CQ QRP DE (Call Sign).

Scoring: QSO points (total all bands) \times s/p/c multiplier \times power multiplier \times bonus multiplier (if none, use 1), then add bonus points to equal claimed score. Separate log sheets for each band, available from QRP ARCI for SASE. For results, send SASE. Certificates. Log deadline is Jun 30. Send logs to QRP ARCI Contest Chairman, Eugene Smith, KA5NLY, Pentagon PO Box 46599, Washington, DC 20050-6599.

30-31

CQ WW WPX Contest, CW. See Mar QST, p 91. **National 6 Meter Invitational Net Activity Day Contest (SIN)**, from 1400Z May 30 until 2400Z May 31. Open to all 6-meter operators. Exchange call, SIN number and grid square. Count 3 points per QSO with SIN member and 2 points per QSO with nonmember. Final score is sum of QSO points times number of different grid squares worked. Certificates. Send logs by Jul 1 to Lisa Lowell, KA0NNO, PO Box 547, Hugo, CO 80821.

JUNE

3

West Coast Qualifying Run, 10-35 WPM, at 0400Z Jun 3 (9 PM PDT Jun 2). See May 6 listing for more details.

7

WIAW Qualifying Run, 10-40 WPM, at 0200Z Jun 8 (10 PM EDT June 7). Refer to May listings for more details.

13-15

ARRL June VHF QSO Party, this issue, p 86.

20-21

All Asian DX Contest, phone.

19-20

SMIRK QSO Party

20-21

Nine Land CW Contest

24

WIAW Qualifying Run

27-28

Field Day, this issue, p 87.

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 **June 1** to make the **August** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Special Events

Conducted By Mary Schetgen, N7IAL
Assistant Contest Manager, ARRL

Rensselaer, New York: The Conventual Franciscan Friars of St Anthony-on-Hudson will operate WB3HDJ, every Sunday from **May 1 to Oct 4**, to commemorate the 75th anniversary of the Friars establishment in Rensselaer. Frequency: 14.280 only. For certificate, send your QSL and First Class postage (no envelopes needed) to Franciscan Mission Amateur Station, St Anthony-on-Hudson, Rensselaer, NY 12144.

Louisville, Kentucky: The Louisville ARTS will operate the Run for the Roses station, W4CN, from 2400Z to 0500Z **May 1**, and from 1300Z to 1700Z **May 2**. Suggested frequencies: phone—14.250 21.325; Novice—21.125. For a commemorative certificate, send a QSL and no. 10 SASE (folded certificate) or 9- \times 12-in (39 cents postage) SASE for unfolded certificate to W4CN, Box 7391, Louisville, KY 40207.

Conway, Arkansas: The Faulkner County ARC will operate W5AUU on **May 2**, from 1500Z to 2000Z, to celebrate the annual Toadsuck Days Festival. Suggested frequency: phone—14.250. For certificate, send QSL and no. 10 SASE to W5AUU, 319 Ash St, Conway, AR 72032.

Bayonne, New Jersey: The Bayonne, OEM ARC will operate W2ODV on **May 2 and 3**, from 1400Z to 2100Z, to commemorate the first two-way police-radio installation in 1933 by the Bayonne Police Dept and IEEA. Suggested frequencies: 3.870 7.270 14.270 146.520 144.830/145.430 W2ODV/R 222.680/224.280 W2KB/R. For certificate, send QSL and large SASE (39 cents postage) to W2ODV, Bayonne OEM ARC, 16th St Firehouse, Bayonne, NJ 07002.

Sacramento, California: The California State Railroad Museum will operate WB6RVR on **May 2 and 3**, from 1600Z to 2400Z, to commemorate the 4th anniversary of steam train operations at this site. Suggested frequencies: phone—7.250 14.250 21.400; CW—7.125 21.150. For commemorative QSL, send your QSL and SASE to California State Railroad Museum, Attn: Steam Trains, 111 "I" St, Sacramento, CA 95814.

Laurel, Maryland: The Laurel ARC will operate W3GFS on **May 9**, 1400Z to 2000Z, to celebrate the 4th Annual Main Street Festival. Suggested frequencies: lower 25 kHz of 40 and 20-meter General

bands. For 8- \times 11-in certificate, send QSL and SASE to LARC, Box 1436, Laurel, MD 20707.

Mundelein, Illinois: The Lake County, IL RACES, in cooperation with Boy Scout Troop 273, will operate from 1400Z to 2100Z **May 9**, in celebration of the Centennial of Fort Sheridan. W9FUL will be in continuous operation in the low end of the 20-meter General phone band; on the hour operation in the new Novice/Tech 10-meter phone band and, locally, 2-meter phone—146.550; packet—145.010. For certificate, send 9- \times 12-in SASE and QSL to the Lake County RACES, Box 642, Mundelein, IL 60060. Deadline for certificate is July 4.

Palm Springs, California: The Coachella Valley ARC and the Desert RATS will provide support communications for the Gordon Bennett Balloon Race, starting 0500Z **May 9**. The control station, WA6ZUF, welcomes sighting reports on the following frequencies: 3.945 7.275 14.310. The Mt San Jacinto repeater on 145.490, 220 Condor Connection and WY6I-1 packet system will be monitored. QSL via WA6TWT, Box 208, Cathedral City, CA 92234.

Owensboro, Kentucky: The Owensboro ARC will operate K4HY from 0000Z **May 9** to 0530Z **May 10** to celebrate their International Barbeque Festival. Suggested frequencies: phone—7.245 and new Novice 10 meter phone frequencies. For certificate, send SASE to N4EKG, 1615 East 23rd St, Owensboro, KY 42303.

Lakehurst, New Jersey: The Jersey Shore ARS will operate W2DOR from 1700Z **May 9** to 1800Z **May 10**, to honor the 50th anniversary of the crash of the airship *Hindenburg*. Suggested frequencies: phone—3.875 7.275 14.275 21.425 28.525; CW—3.706. Write to JSARS, Box 295, Toms River, NJ 08754, for certificate information.

Ogden, Utah: The Ogden ARC will operate W7UR from Promontory Summit, Utah to commemorate the driving of the golden spike that connected the East and West railroad systems in 1869. **May 10**, 0001Z to 2400Z. Frequencies: 3.970 7.270 14.280 21.375. Send SASE for QSL to Ogden ARC, Box 3353, Ogden, UT 84409.

Bethlehem, Connecticut: The Hen House Gang

will operate W1FHP starting **May 10**. Various frequencies and times. Listen for call sign. Send your QSL and First Class postage (no envelopes) to Hen House Gang, c/o Robert J. O'Neil, Hard Hill Rd, Bethlehem, CT 06751.

Pasco, Washington: The Tri-City ARC will operate W7VPA **May 14-16**, in conjunction with the Products Industrial Exposition '87. Daily operations from 1800Z to 0200Z will be on the General 20 and 80 meter phone bands. For certificate, send QSL and SASE to TCARC, Box 73, Richland, WA 99352.

Tangier Island, Virginia: The Maryland Apple Dumpling RAS will operate KT4A, **May 15-18**, with continuous "DXpedition-style" operations. The British attack on Ft McHenry, which inspired the writing of the *Star Spangled Banner*, was staged from Tangier Island. Suggested frequencies: phone—3.937 7.237 14.237 21.237 146.55 and local repeaters; CW—7 and 37 kHz above the lower band edges. For special QSL, send your QSL and SASE to K3KMO, Box 60, Damascus, MD 20872.

Pentagon, Washington DC: The Pentagon ARC will operate K4AF on **May 16** in celebration of Armed Forces Day. Suggested frequencies: phone—7.235 14.235; CW—7.035 14.035. QSL via PARC, 1947HSG/MWR, Room 5E367, Pentagon, Washington DC 20330.

Damascus, Virginia: N4AKZ will operate **May 16**, 1500Z to 2000Z, to commemorate the 50th anniversary of the Appalachian Trail. Suggested frequencies: phone—7.235 14.235. For commemorative certificate, send QSL and SASE to Dave Patrick, KB4SMR, Box 546, Damascus, VA 24236.

Centreville, Michigan: The St Joseph County ARPSA will be operating, under various members' call signs, on **May 16**, from 1200Z to 2400Z, in celebration of Michigan's Sesquicentennial Birthday. Suggested frequencies: 3.930 7.230 14.250 21.350 28.550. For certificate, send QSL and SASE to Lynn Norris, KB8AET, 535 E Main St, Burr Oak, MI 49030.

Millington, Tennessee: Military Club Station W4ODR will be operating from 1300Z to 2300Z **May 16** in recognition of Armed Forces Day. Suggested frequencies: phone—7.230 14.280 21.370; CW—21.145 28.145; 2-meters—146.52 simplex. For

certificate, send QSL to W4QDR, Box 54278, Naval Air Station Memphis, Millington, TN 38054.

Charleston, South Carolina: The Charleston ARS will be operating WA4USN from the deck of the aircraft carrier *USS Yorktown CV-10*, in recognition of Armed Forces Day from 1000Z to 2200Z May 16. Suggested frequencies: 3.850 7.250 14.250 29.350. For special QSL send your QSL and SASE to Special Event Station, 346 Parkdale Dr, Charleston, SC 29407.

Grandview, Missouri: The Southside ARC will operate from the old Harry Truman farm site, in celebration of Harry's Heydays, 1900Z-2400Z May 16, and 0001Z-0200Z and 1700Z-2200Z May 17. Various call signs; listen for "CQ Harry's Heydays." Frequencies: 7.240 14.240. For certificate, send 9- x 12-in SASE to Southside ARC, Box 1142, Grandview, MO 64030.

York, Pennsylvania: The York ARC will operate W3EDU from 1400Z to 2400Z May 16, and 1400Z to 1900Z May 17, from the site of the Colonial Court House/ Continental Congress location. Suggested frequencies: 3.875 7.275 14.250 21.350 28.550. For certificate information, contact Millard Martin, 2070 Thelon Dr, York, PA 17404.

Washington CH, Ohio: Members of the Fayette ARA will operate from the Fayette County Historical Museum, under various call signs, on May 16-17, May 23-24 and May 30-31. Continuous operation in the Novice and General bands. For special QSL, send your QSL and SASE to FARA, 1222 E Paint St, Washington CH, OH 43160.

Charity Island, Michigan: Saginaw Valley ARA will operate K8DAC from 1200Z May 16 to 1700Z May 17. Suggested frequencies: phone—3.975 7.275 14.300 21.390; CW—3.650 7.050 14.050 21.050; Novice—3.725 7.125 21.150. For certificate, send large SASE to Art Penney, WB8DIT, 4955 Clemson Ct, Saginaw, MI 48603.

Glasgow, Scotland: The Mid Lanark ARS will be operating GB2NTS, from Greenbank Gardens, Clarkston, Glasgow, May 16-17, from 0900Z to 2100Z. Frequencies: various frequencies in 10/15/20-meter bands, normally 14.150 to 14.200. This event is part of a series of events in conjunction with the National Trust for Scotland historical/heritage preservation activities taking place throughout the summer. For special certificate information and listing of other events, contact John McGill, GM3MTH, Box 20, Motherwell, Scotland.

Baltimore, Maryland: The Maryland Mobileers ARC will operate WA3PJK from the submarine *USS Torsk* 1300Z May 16 to 2000Z May 17. Suggested frequencies: 3.880 7.240 14.240 and the 146.805 Crownsville, MD repeater. Send QSL and large SASE to Maryland Mobileers ARC, Box 784, Severna Park, MD 21146.

St Louis, Missouri: Ham operators of the Union Electric Co will operate KA0AWS on May 17, from

1900Z to 2400Z, to commemorate the Page District Works Headquarter's many years of operation. Frequencies: 3.950 7.230 14.235. Send a 9- x 12-in SASE with your log number to KA0AWS, 241 Tapestry Dr, St Louis, MO 63129.

Baltimore, Maryland: The Bay Area ARS will operate KM3I on May 23, to commemorate the anniversary of Samuel Morse's first broadcast from Washington DC to Baltimore, MD. Operation will be CW on 40/20/15 meters, 25 kHz from low end of band. For commemorative certificate, send log information and 8- x 10-in SASE to BAARS, Box 805, Pasadena, MD 21122.

Bishop, California: The Bishop ARC will operate KA6AMT on May 23, from 1800Z to 2400Z in celebration of Mule Days. Operation will be in the 20/40/80 General phone bands and packet on 145.01. For certificate, send QSL and 9- x 12-in SASE to BARC, c/o Mule Days Committee, Box 1024, Bishop, CA 93514.

Tuckerton, New Jersey: The Old Barney ARC will operate KT2W from 0001Z May 23 through 2359Z May 24 to commemorate the 75th anniversary of the Tuckerton Wireless Tower. Suggested frequencies: phone—3.890 7.250 14.280 21.380 28.480 144.220 146.52 and local repeaters; CW—160-10, 50 kHz up in CW bands. Send SASE to KT2W, Box 345, Tuckerton, NJ 08087.

Green River, Wyoming: The Sweetwater County ARC and Emergency Management Amateurs will operate N7ERH and N7IQO starting at 1900Z May 23 until 1900Z May 24, to commemorate the John Wesley Powell Expedition down the Green River. Suggested frequencies: phone—3.923 7.260 14.300 21.400 28.700; CW—3.710 7.125 21.110 28.125. Send 9- x 11-in SASE to N7ERH, Box 717, Green River, WY 82935.

Little Falls, Minnesota: The Minneapolis ARC will operate W0CKF from 0000Z May 23 until 2400Z May 24 to commemorate the 71st anniversary of the club. Suggested frequencies: phone—7.240 14.260 21.400 28.400; CW—3.725 7.125 21.125. For QSL, send your QSL and SASE to Rich Westerberg, N0HJZ, 11024 Drew Ave, Bloomington, MN 55431.

Festus, Missouri: The Jefferson County ARC will operate KC0JH May 23 and 24 to celebrate the centennial of Festus, MO. Suggested frequencies: phone—25 kHz inside General class bands; packet—2 meters. For certificate, send QSL and no. 10 SASE to H. Selby, Rte 2, Box 26 B, Dittmer, MO 63023.

Charleston, South Carolina: The Trident ARC will operate N4EE to commemorate the Piccolo Spoleto Festival's 10th season. From 1400Z May 23 to 2200Z May 24 and from 1400Z May 30 to 2200Z May 31. For certificate, send QSL and large SASE to IARC Special Event Station, Box 73, Summerville, SC 29484-0073.

Westminster, Maryland: The Carroll County ARC will operate K3PZN on May 23, 24 and 30, at 1300Z to 0100Z, and May 31, 1300Z to 1900Z, in celebration of Carroll County's Sesquicentennial. Frequencies: lower 50 kHz of the General phone bands. For an 8 1/2- x 11-in certificate, send QSL and SASE to Carroll County ARC, Box 2099, Westminster, MD 21157.

North Freedom, Wisconsin: The Morse Telegraph Club will be commemorating the S.F.B. Morse's "What God hath wrought" message, on May 24 and 25, from 1500Z to 2300Z, both days. Frequencies: CW only, 44 kHz up from low end of CW bands, 80-10 meters. Call sign: AD9E. Send QSL and SASE to R. L. King, KA9GNY, 411 Lynn Ave, Baraboo, WI 53913.

San Rafael, California: The Marin County ARC will operate W6SG from 1500Z May 24 to 0300Z May 25 to commemorate the 50th anniversary of the Golden Gate Bridge. Suggested frequencies: phone—3.900 7.250 14.275 21.350; CW—3.715 7.115 14.050 21.115. For special QSL, send your QSL and no. 10 SASE to MARC, Box 1231, San Rafael, CA 94901.

Washington DC: Amateur Radio celebrates the Bicentennial of the *Constitution of the United States*. Stations in Washington DC, and Philadelphia, PA will celebrate the meeting of the Constitutional Congress. Washington stations will be NN3SI, W3DOS, the Smithsonian Institution station and Dept of State station, respectively. The Philadelphia station will be K3MTK. Starting 1500Z May 25, in the lower third of the 20/40/75 meter General bands. Identify yourself as a "Constitution" station. For Washington contacts, send QSL and no. 10 SASE to NN3SI, Communications Exhibition, National Museum of American History, Smithsonian Institution, Washington DC 20560. For Philadelphia contacts, send QSL and SASE to K3MTK, 7258 Walnut Ave, Pennsauken, NJ 08109. Write "Constitution" on lower-left corner of envelope.

Gulfport, Mississippi: The Confederate Signal Assn of South Mississippi will be operating from 1800Z May 30 to 1900Z May 31 on the following frequencies: 21.150 21.350 28.150 28.350. QSL via W. R. Jeffrey, KA4CRT, Box 923, Gulfport, MS 39502-0923.

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 June 1 to make the August 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.

Field Day Rules

(continued from page 87)

was given or a copy of material that was sent to news media for publicity purposes.

3) **Message origination:** 100 points for origination of a message by the club president or other FD leader, addressed to the SM or SEC, stating the club name (or nonclub group), number of operators, field location and number of ARES members participating. The message must be transmitted during the FD period, and a fully serviced copy of it must be included with the FD report. The message must be in standard ARRL message form or no credit will be given.

4) **Message relay:** 10 points for each message received and relayed during the FD period, up to a maximum of 100 points. Copies of each message, properly serviced, must be included with the FD report.

5) **Satellite QSO:** 100 points can be earned by completing at least one QSO via satellite during the FD period. The repeater provision of Rule 7C is waived for satellite QSOs. A satellite

station does not count as an additional transmitter. On the summary sheet, show satellite QSOs as a separate "band."

6) **Natural power:** FD groups making a minimum of five QSOs without using power from commercial mains or petroleum derivatives can earn 100 points. Intuitively, this means an "alternate" energy source of power such as solar, wind, methane or grain alcohol. This includes batteries charged by natural means (not dry cells). The natural-power station counts as an additional transmitter. If you do not wish to change your entry class, take one of your other transmitters off the air while making the natural-power QSOs. A separate list of natural-power QSOs should be enclosed with your entry.

7) **WIAW message:** A bonus of 100 points will be earned by copying a special ARRL FD bulletin sent over WIAW on its regularly announced frequencies just before and during FD. See League Lines, this issue, and April QST for FD Bulletin Schedule. This message can be received directly from WIAW or by any relay method. An accurate copy of the received message should be included in your FD report.

8) **Packet radio:** 100 points can be earned

by completing at least one QSO on packet radio during the FD period. The repeater provision of Rule 7C is waived for packet radio QSOs. A packet station does not count as an additional transmitter. On the summary sheet, show packet radio QSOs as a separate "band."

9) **Reporting:** Entries must be postmarked by July 28, 1987. No late entries can be accepted. A complete entry consists of a summary sheet and a list of stations worked on each band/mode during FD, plus bonus proof. The list of stations worked on each band or mode may take the form of official ARRL dupe sheets or an alphanumeric listing of call signs worked per band and mode. This list may be computer-generated. Incomplete or illegible entries will be classified as checklogs. A copy of FD logs should be kept by your FD group, but should not be sent in unless specifically requested later by ARRL.

10) **Condition of Entry:** Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

11) **Disqualifications:** See January 1987 QST, page 81.

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, Bill Gillespie, VE6ABC—ASM: VE6AMM. SEC: VE6AFO. DC: VE67Y. ST/MD/CSM: VE6ABC. Edmonton amateurs (NARC) provided radio communications for Mincr and Bantam Hockey and many watched some excellent games while sending in scores. Thanks to Ed, VE6BOK, for getting the event handled. Calgary amateurs (CARA) provided communications for Nordic Ski Team and will be assisting the Girl Guides on the Air at the end of this month. Band conditions still not too good on 80 meters. Traffic: APSN QNI 1068, QTC 51, Informal 84. ATN: QNI 287, QTC 82. Personal totals: VE6CHK 84, VE6GUS 33, VE6AKY 6, VE6YW 5, VE6EJ 2, VE6WH 1.

BRITISH COLUMBIA: SM, Ernie Savage, VE7FB—British Columbia Public Service Net 3729 kHz., D130Z Daily, NM-FR, VE7DDF, reports quite high 212 low 136 total 5031. B.C.E. N/3650 kHz., at 0300Z QNI 963 QTC 256. NM Ferret VE7EJU, reports a perfect score representation to RN-7 as VE7EJU, VE7EJU, 75N, 78N and 78GM. Glen Temple Communication Unit's Banquet to install new officers for 1987/88 was President Len, VE7DNI, Secretary George, VE7FRE. One hundred or more attended the gala affair. B.C.'s SM was driven to Richmond ARC meeting by Jack, VE7CFJ. In a grand old vehicle 1931 Model A Ford Sedan. Not sure if peoples look was for ME or the car. But it was a thrill for me. Surrey ARC enjoyed the field trip to B.C. Hydros' Communication Center. Zero Beat, Victoria SWS Editor Eric VE7CCJ is sure turning out a fine paper. Pleaced to read HAMS HAPPENING in September will be in Nanaimo again. B.C. 73. Traffic: VE7BN1 317, VE7EJU 143, VE7EJW 76, VE7ANJ 65, VE7XA 57, VE7B 29, VE7FME 25, VE7CCJ 13, VE7BZL 6, VE7BNH 5, VE7DJ 4.

MANITOBA: SM, Jack Adams, VE4AJE—March in like a lion, at least 15 inches of snow the last (4) days. At least no wind that spring is just around the corner. What's happening in the amateur fraternity? Difficult to relate to any specific happenings this time of the year (winter hum drum). There is considerable excitement in Packet radio in and around the Winnipeg area but as time goes on & more rural operators get the bug we should see digipeaters spring up, a very interesting mode for traffic handling and BBS system. There has been a number of complaints of Packet sneaking up into the phone portion of the Canadian bank on 20 meters 14.100 to 14.115. Do we actually need to operate in the Canadian Phone band?? Section reports MTN (CW net) 28 sessions, 342 QNI, 81 QTC: MMWX - 28 sessions 781, 31 QTC, WRIN - 8 sessions 450 QNI 1 QTC. MEPN - 28 sessions 1083 QNI, 29 QTC. Individual traffic: VE4RO 118, VE4EJ 93, VE4IX 73, VE4LB 31, VE4TE 30, VE4BI 23.

MARITIME/NEWFOUNDLAND—SM, Leigh Hawkes, VE1GA—ORS: VE1VX. OES: VE1BZC. Field Organization appointments are available, if you are interested and would like to help build this section, please contact me. Please check our QST mailing label. If our call sign does not appear on it, notify CRRL HQ in London. Without a call sign, you are classified as an associate member and will not receive ballots for CRRL elections. Winter storms have claimed areas of VE1AFU, VE1BLC, and VE1JJ. HARC/DARC Annual Fleamkt May 22-23. Contact VE1OU for info. DARC Swap Shop Sun at 2000L moved to VE1NZ now available to areas of NS, NB, and PEI via UHF/VHF link. H/D Slo CW Net meets Tues at 2000L on 7045 VE1CH1 NCS. Vac: VE1AG, VE1YV to KH6. VE1CFK to W4. VE1BZC to W4. Traffic: VE1BKM 109, VE1BPM 6, VE1QR 2, VE1BX 10, VE1WA 18, VE1AL 6, VE1VX 10.

ONTARIO: SM, Larry Thivierge, VE3GT—SEC: VE3GV. ST/MD/CSM: VE3EAO. NMs: VE3AJN, VE3BUO, VE3CYP, VE3DCX, VE3DQK, VE3GSO. After almost 40 years of operation on 3770 kHz the Ontario Phone Net has shifted frequency to 3742 kHz. The move, taken after consultation with net members, was necessitated by heavy QRM to the frequency including a very strong adjacent carrier from a suspected Caribbean country. VE3CP advises that the Net first commenced operation back in November of 1947. Present Net Manager VE3BUO is quite pleased with the results to date. From all reports the first Guides on the Air (GOTA) was a great success. VE3WV and VE3MLA completed QSO number 800 on 144.55. Congratulations to the Thornhill FIAC on their 10th anniversary on the 17th of May. Belated congrats to the White Caners who celebrated their 20th anniversary of net operations and to the ONTARS Net who celebrated their 15th anniversary. New amateurs are VE3APR VE3DCK. At their annual flea market and hamfest the Niagara Peninsula ARC conducted the first code exam in Canada for DCC credit. 17 candidates were examined with 10 letters of attestation being issued to successful candidates. Examiners were VE3OCF VE3OIF VE3LVW. New EC appointments: VE3LPM, Brampton; Caledon: VE3NGG, Cnatham; VE3ODV, Mississauga; VE3SV, Kingston. Ontario's ARES membership stands at 552. Packet radio is catching on fast in the Kingston area with VE3NF VE3NFW VE3NVW VE3MPZ and VE3SV all active. Final Local and Section Net totals for 1986 show 1,992 sessions, 18,277 checkins, 6,441 messages handled in 27,021 minutes. Many thanks to all participants who helped make it happen. The Cornwall Standard-Freeholder newspaper carried an interesting story, complete with pictures, of amateur radio contacts during the Canada and Ontario Valley ARCS. Featured were: VE3MYO, VE3OAF, VE3NPR, VE3VNW, VE3JCD, VE3HLU, VE3KJ, VE3EKN, VE3FH, VE3FSC and VE3MFP. Traffic: VE3GSO 330, VE3FAS 314, VE3DCX 181, VE3GNW 168, VE3OCF 157, VE3ORN 129, VE3DPO 111, VE3CYNR 94, VE3SAWE 78, VE3GT 75, VE3WV 68, VE3WG 67, VE3BUO 55, VE3KX 46, VE3DQK 39, VE3BCZ 27, VE3GFN 25, VE3EAM 19, VE3BZ 15, VE3CZ 13, VE3GOL 11, VE3AJN 10, VE3BAJ 10, VE3VM 9, VE3FGU 7, VE3PQ 7, VE3JFF 4. (Jan.) VE3SAWE 47, VE3KK 30, VE3EFX 2.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. NM: VE2EDO. TC: VE2ED. OO: VE2DNN. New appointee as Official Observer: VE2DNO. Welcome aboard. Bob, Quebec's first PSSB—(bilingual) is on the air. Jean, VE2ED, is offering CRRL, ARRL and IARU bulletins on a 3.638 MHz, daily at 1900-2300 EST/EDT. Felicitations a Mario, VE2WA, qui a obtenu un certificat de 50XC, ainsi qu'a VE2GHZ pour un endorsement de 176 en SSB. Avec regret je dois vous annoncer le deces de VE2PD. Traffic: VE2EDO 62, VE2BP 56, VE2EC 52, VE2WH 29, VE2EMF 8.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WY—Nanticoke ARC 2 meter net Monday 8 PM on 147.390. They also have TVI

committees consisting of KW3Z K3SRY K3ZXP WA3RBP and W3XU. W3LQE of PSARC is on his way to the DXCC Golden Jubilee Award. Go for it, George. This winter's snow storms have given amateurs over the state the opportunity to hone their skills as emergency operators and to find and correct faults in the system. The DTN needs people from N.C.C. and Kent Co. to join in. Come on fellows we need your help. Monday thru Friday 6:30 local 3.905. DEPN Saturday 6 PM same freq. Correction: Call of new DEC N.C.C. is N3FDL not N3FOL. Sorry. DTN stations 289 traffic 42 in 20 sessions. Traffic W3QQZ 73, W3BDUJ 54, WA3WYV 32, K3JL 29, KA3IXV 25, W3PVO 16. (Jan.) W3PQ 40. PSHR K3JL.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KO3B, KA3A, K3ZVF. ACC: KC3QB. SEC: WA3PZO. SGL: WA3IAO. STM: KB3UD. PIO: W3AMQ. TC: W3PFA. Salutations of the month go to the Eastern PA Section staff, listed above. They've made a special commitment to serving the community and ARRL and they enjoy the satisfaction of working as a team for all of us in Eastern PA. Brian Beiler, KC3QB, president of Reading RC, is our new Affiliated Club Coordinator. Have some technical questions? Technical Coordinator W3PFA and his Assistant TC's can help. Have some technical answers? Become an ATC yourself! Either way, drop W3PFA a note at his CBA. Another new appointment brings K3WPI in as a Public Information Assistant. Penn Wireless, Warminster, Bucks Co. ARES, and District 1 ARES responded to Red Cross during a chemical spill and apartment fire. ARES Districts 1, 2, and 9 held Skywarn conferences recently. Many ARES leaders are excited by the possibilities of bringing more novices into emergency comm, given their increased numbers. Hamfest season is here with a flourish. DCARA on May 3 is followed by both Warminster and Tamaqua Transmitting on May 17 and Ephrata Area Repeater Soc on May 24. Please support our great clubs by attending hamfests this season whenever you can, and say hello to us at the ARRL table at sanctioned events. PECCO ARC's K3LDD packet BBS is on 145.07, while Mid-Atlantic's W3JOE board is on 145.09. KC3LM will attend Pack Rats ARRL night this month. ORS's W3DP and W3AED presented a program on traffic handling for Harrisburg RAC. Happy 56th year to Reading RC! Here are some chances to improve our code speed. Warminster's CW practice net now meets 7:30 PM Wednesdays, 147.09F. South Mt. Repeater Assn. started a bulletin net on 145.43 at 7 PM Mondays followed by CW practice. Central PA Repeater Assn sends CW drill after their Tuesday 9 PM net on 145.47. TCOOII! Do I hate the taste of crow? Though more clubs from EPA than WPA showed in the PA QSO Party scores, with several very strong entries, Erie won the club trophy. Congratulations, Erie. And expect to get burned off the face of the spectrum this year! Thanks to Nittany ARC for another fine test. KC3LM is working with Nittany towards a Novice award for 1987. January nets (QNI/QTC/Sessions): EPA/PATN/581/140/31; EPA/471/109/ 62; PTTN/255/83/31; MARCTN/169/52/13; MARCARES/ 58/34; SEPA/TN/13/4; DGARES/102/74; DSESN/71/74; DGAFES/71/118; STAF/304/67/31. January traffic: N3AZW 412, N3CDD 155, K3BUD 109, N3CQ 102, N3AW 97, KA3DJ 97, W3IPY 75, A3B 69, K3BFW 50, W3KAG 50, K3DQA 48, N3DRM 41, K3WPI 41, KA3JCI 32, W3BKP 30, K3UR 23, N3EFW 22, W3AQN 21, K3TX 18, N3ERE 16, WA3CKA 15, W3ADE 14, W3DP 14, K3EBZ 14, W3JXK 14, K3OM 14, W3FAF 12, K3YM 11, WA4U 5, KY3D 3, W3VA 3.

MARYLAND-DC: SM, John A. Barolet, KJ3E—Both nominees for election to the Section Manager position beginning July 1 withdrew themselves from the election process prior to the close of nominations. Since there were no other nominees, KJ3E will remain as Section Manager temporarily. There will be another period during July and August for nomination of a Section Manager. What does the SM do other than write this section news column? He leads the ARRL field organization in the section, principally through the efforts of the section-level staff. This staff in MDC includes ASM N3EAF, SPC K3CXK, PIC K3CXK, ACC K3VAC and sec the section. ARRL BM N3DRB, OOC K3CEK and STM KJ3E. If you don't know the function of these leadership positions ask the SM for the ARRL Field Organization brochure FSD 300 (286); it is free, informative and inspirational. The SM is also a member of the ARRL division director's cabinet, in this case W3ABC, the Atlantic Division Director. The cabinet provides the director with input from the division sections. Finally, the SM serves the ARRL section members by responding appropriately to their requests, by appointing those interested and qualified to positions of responsibility, and by forwarding member requests for ARRL action and policy change through the director to headquarters when the SM cannot effect the action himself. Thus the SM leads and sees the section. ARRL members: Call on him when appropriate; his address and phone number is on page 8 of QST. Recently I attended a Frederick ARC meeting at which W3EJFE, Baltimore City/County EC, described his personal experiences as an ARES operator at a triage center very near the AMTRACK train wreck site. His talk was graphic and informative; ARES operators need to be prepared to experience shock where human death and injury are present AND they need to be prepared to hand-carry complete emergency stations (usually more than an HT) to sites at and near the disaster. ARES vehicles could not approach the AMTRACK site because it was jammed with emergency vehicles. W3EJFE showed a portable 15-watt 2 meter receiver and antenna power supply. A power supply contained in a bric-a-brac sized tool box. In another container he would carry message pads, writing equipment, small hand tools, and a portable antenna. The hand-carried portability idea certainly impressed those at the meeting. KA3DRO has submitted his resignation as MDC ACC; we appreciate his several years of service in this important position. Interested in appointment to the position? Ask KJ3E for details. New MDC appointments: W3DQI, EC of the newly organized Laurel Coordinating Area; K2EB and WA3UIJ ORS; N4KF3, ATC. WITH THE NETS: Net/Mgr QND/QTC/QNI: MDD/W3FA 55/195/438 (MDD Brass: W3FA/88 WA3QY/O77 K3NNI/77 K3CY/64) MFN/N3EAF 31/ 63/1169 W3FN/N3KCY 28/14/18) W3OAW/VE3BFK 20/29/258. MDCOP/N3CQY 4/5/63. HOCOCARES/K3NNI 2/2/22. PSHR: W3FA 108, W3YVO 81, WA3YLO 79, K2EB 76, K3NNI 73, K3CY 73, N3EGF 71, WA3GYW 66. TRAFFIC:KCY 195, W3FA 179, K3K 126, K3NNI 107, N3CZ 103, NA3Q 93, KJ3E 85, N3DE 79, WA3YLO 76, W3LDD 74, WA3UIJ 63, N3EGF 52, W3YVO 45, N3RO 43, K3TJ 35, K2EB 34, W3DQI 19, W3BFBK 19, KX3UO 17, W3FZV 10, WA3GYW 10, N3DRB 7, N3BP 4, W3ZNV 2, K3EF 2, K3CZJ 2, WA1QAA 2, K3C3DW 1.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—

SEC: K2QJL. STM: WB2UJW. ACC: K2IXE. TC: KA2RAF. PIO: VACANT. SGL: KA2EML. BM: WB2UJW. OOC: WA2HEB. ATC's N2BQT, K2JF, KA2RJA and WB2MNF. The KB1BD-1 PBBS on 145.07 in Plainsboro has been designated the Packet Node Station (PNS) for our section. If you have NTS traffic that you'd like to pass via packet, please put the message on this board and it will be handled, either by auto-forwarding or by NTS representatives who regularly check the board for traffic. This month marks the 50th anniversary of the explosion of the airship Hindenburg at the Lakehurst Naval Air Station. In commemoration of this event, the Jersey Shore ARS will be operating a special event station from the site of the explosion. Details are supposed to be in this issue of QST under "Special Events." DVRA conduct a VE session on May 9 at the Hopewell branch of the Mercer County Library in Pennington at 12:30 PM. To pre-register or for further info contact Don Wright, AA2F at (609) 737-1723. Until next month, 73. Traffic: W21AL 94, N2CER 81, WA2HEB 49, NG2T 44.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—STM: W2MTA acting. Many thanks to W2MTA who has had to step down as STM. Apologies to ORS: W2WZ, W2BZ, W2JAE, K2LHO, W2MVH, K2NV, K2OC, K2QJL, W2OW, K2QZ (EC) N2GG Franklin, K2KWB Broome, K2KJL Essex. Many thanks to WB2EXL, W2FEY, N2FMA, K2DJJ and WA2TCZ who have had to step down from their appointments. PACKET RADIO integration into the National Traffic System continues to advance in the Section — both KC3BQ and W2ICZ are serving as Packet Node Stations to provide an interface between packet traffic flow and the liaison station functions to the section nets, with occasional auto-forward as required. The fun of defining and reporting packet traffic to the Region Packet Manager, K2H2M, continues to elate all concerned. More PNS are needed in the broad hinterlands of Western New York. Contact W2MTA if you wish to learn more as either a PNS or a liaison to the other modes besides Packet Radio. PSHR: N2ABA N3DPF N2EJA N2EJV WA2FJJ W2FR N2HJ WB2IDS W2MTA K2JN W2B1UW WB2QW WB2RBA N2DS K2ATVY KA2UBD K2DUJ NE2W K2YAI KAZZKM KAZZ2Z. HAMFESTS: Owego (STARC) May 20, Rochester State & Atlantic Division Convention May 15-16-17, Skaneateles May 30, Rome (Westmoreland) June 7, Cortland June 20, Batavia (Alexander) July 12, Trumansburg (Finger Lakes) Aug 22, HAM-O-RAMA Sept 12, Elmira (Horseheads) Sept 26, Syracuse (State Fair Grounds) Oct 17. Traffic net booth will be at the Rochester event on the main floor—WB2QW. BPLs for the February Valentines Day massacre go to N3DPF, N2EJA, WB2IDS, W2MTA and KA2BD. Clubs: Officers: Owego: ARS: ARS N2ZS, KA2CQI, WA2BSF, KA2FSP, KA2MHZ. Chenango Valley ARC has re-discovered the "L & H Antenna." I CONGRATS to K2ZJ recently appointed to the Contest Advisory Committee by W4RA for the Atlantic Division; TO RAWNY now a Special Service Club (#8 in WNY); Horseheads "MINIFEST" Feb 28 had 640 at the Gate! IS HAM RADIO A PAROCHIAL HOBBY? Recently heard in antenna restrictive ordinance discussions, "It doesn't effect me!" UPCOMING EVENT: NVOAD 14 states conference at Buffalo May 27-29.

NYSEMO	093-008-04	NYSR	019-008-04
K3YMN	358-409-30	NYSR	179-092-26
W3NDM*	36-117-40	JCRAC	302-01-27
MFN		BRYS Net	334-004-28
NYPON*	642-883-28	LCARES	046-000-04
ESS	342-076-28	Mohawk V	011-040-08
NYSPTEN	577-095-28	VHF THIN	053-001-04
OCTEN/E	605-128-28	OCTEN/L	249-091-28
QNet	412-005-27	CNVNT	207-076-28
STAR*	258-070-28	WDNL*	410-191-28
W3DNE*	544-311-28	NYS/E*	321-164-28
NYS/E*	427-344-28	*NTS Net w/packet	

Traffic: N3DPF 744, KA2UBD 726, W2MTA 615, WB2IDS 548, N2EJA 505, W2BZ 445, WA2FJJ 319, WA2FE 268, NE2A 268, W2MTA 252, N2HJ 210, N2DS 203, WB2UJ 136, WB2RBA 178, K2YAI 177, K2JN 171, W2ER 142, K2DUJ 115, KAZZ2N 114, KA2DDB 100, KA2ZKM 98, W2UZE 80, WB2NLU 74, N2EJV 67, WB2UJ 67, N2DYT 48, KA2TVX 44, NE3B 30, K2QF 29, KA2DQA 27, W2PZH 26, W2PFS 20, KA2TVY 18, AF2K 13, WA2OEP 12, K2IUT 4, K2VR 3. (Jan.) KA2DQA 40, WB2UJ 33.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—NET: QNI QTC SESS KHz T/D MAN
WPACW 236 122 28 3585 8:00P WA3UNX
WPAFTN 349 217 28 3983 6:00P WA3HLN
KFN 216 149 24 3983 1:00P N3EMO
PFN 182 222 28 3958 5:00P WA3HTH
WPA2MTN 300 130 28 144.28/88 8:00P KA3BGC
NWP2AMTN 439 35 27 44.53/45.731 10:00P KC3NY
WPARTTYN 8 73 4 3640 9:00 WA3ZSG

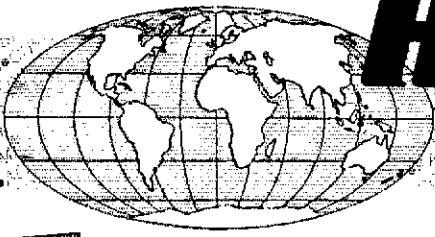
We have to announce one Silent Key W3D7Z, Bill Greer of Glenawh. Our sympathies are with his family. I would appreciate any reports of Silent Keys you can list them. The staff for WPA is STM W3NVAW, SEC WA3UJW, BM K3CET, TC N3EFN, OOC K3XV, PIO K3CSTO, ACC AK3J, SGL W3D7W. Any one requesting an appointment in one of the different categories (i.e. ORS, OBS, OO) should contact the staff member in that section of the operation. Remember to receive an appointment you must be an ARRL member. The section will soon be advised about a drill by NDMIS (National Disaster Medical Service) that is being planned. I don't have any facts yet, but I have been contacted by a rep. and will be advised of the plans shortly. Please send me details of any of your ARES and RACES activities so we can do a RECORDED REPORT. We need more OCS, BMS, etc. and we should have a PIA, BM and other appointees to spread the word about what the amateur does especially during any emergencies. We do need more ORS operators especially in the remote parts of the section where the amateurs are very few. Although we are not located here in Pgh. Traffic: N3EMO 353, W3UDX 284, W3OKN 245, N3CZW 760, WA3UNX 109, WA3BDW 92, K3D3AC 81, K3SMB 63, N3FM 58, W3NGO 54, W3RUL 40, K3CET 39, WA3KUM 31, K3LTV 26, W3RUL 24, WA3QNT 20, K3Q3M 19, W3SN 16, N3EKJ 15, W3TTN 13, W3AHH 10, K3BVN 5.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH. STM: K9CNP. OOC: W9TT. BM: K9ELI. SGL: W9KPT. PIO: N9EWA. ACC: W9BSFT. TC: N9RF. ASM: A9AD. Congratulations to KA9EJ, N9CST, and W9LX all of whom made BPL qualifying him for the BPL medalion. W9SYYE reports that IESDA Comm. Ofcr. Ross Pickett was the featured

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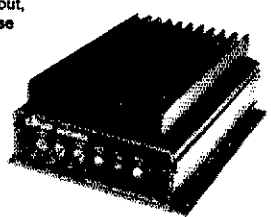
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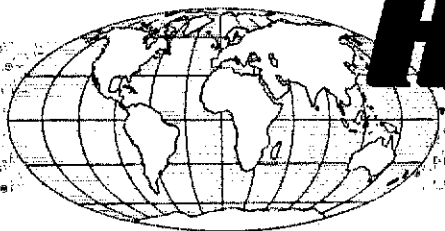
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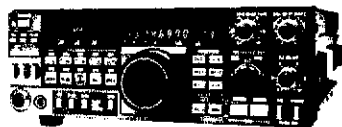
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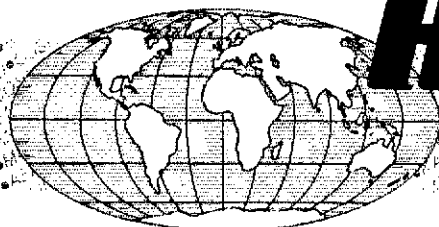
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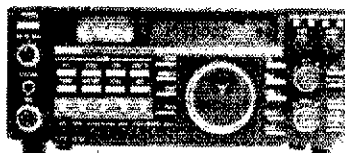
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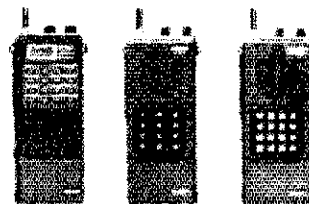
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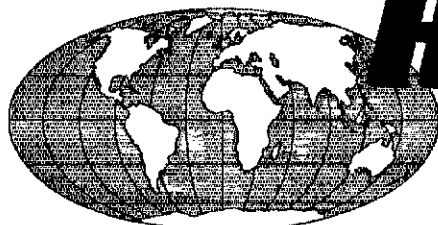
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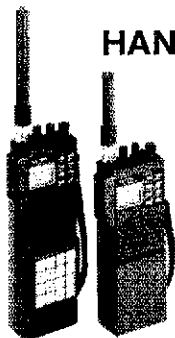


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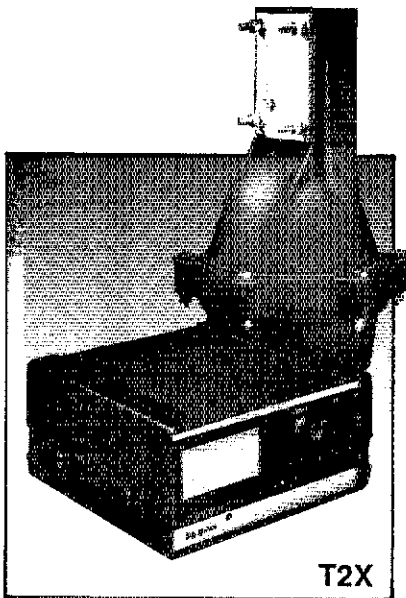
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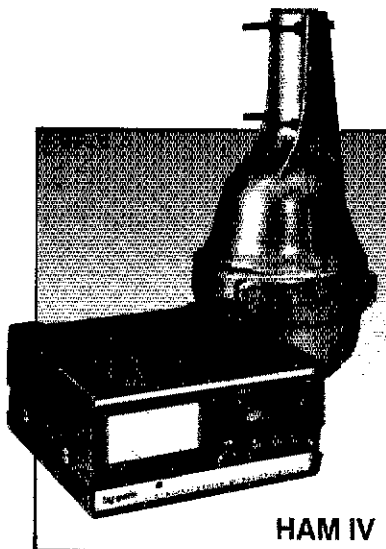


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should receive this monthly honor roll please notify KADAR, KD0CI or KC0T about him or her. Other News: The Paul Bunyan Wireless Assn. has moved their net from 28.633 to 28.333 effective March 22 every Sunday night at 9:00 PM to allow the Novices to take part in it. And speaking of moves the Nets which met on 3929 are now on 3880 the times are the same so see you there. Our deepest sympathy to the families of the following Silent Keys: W0PV, Carl Alvar of Silver Bay, and K4KJ1, Edwin Rychner of Wadena. On a happier note, N0GCH Fieldard is upgraded to Advanced from General, and there was a call change for Dean, K4BYZ, to N4HSR. I hope everyone is gearing up for Field Day. It's not that far away. And with that I like to thank the following for their News Letters. Arrowhead ARC, Ground Wave ARC, Feedline of Bayview, Mankato ARC, New Ulm ARC, and Scotch Hams ARC. Take life one day at a time and enjoy this hobby of Ham Radio, regardless if the wife says "you spend too much time at that radio." '73's TNX K4BFP.

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/RTTY	3620	6:30P	770/12	WA0LUT
MSN/1	3685	6:30P	433/178/28	K4EPY
MSN/2	3685	10:00P	268/37/28	NC0E
MSSN	3710	6:00P	352/78/28	K40DDQ
MSPN/N	3860	12:05P	585/230/28	WB0WNU
MSPN/E	3860	5:30P	1010/175/28	K4BFP
MNAMWXNT	3860	6:15P	351/182/23	K00GI
PICO NET	3925	9:00A	4585/489/153	W0BAC

MN EMERGENCY FREQ: 3860 BULLETINS: 3685 & 3860
MN/MSC: 3620. Traffic: WB0WNU 615, WA0TFC 427, K4EPY 367, KD0CL 270, K4BSY 246, N6POD 202, W9DM 142, KT91 129, W0GRW 90, K4AHP 75, K4AJF 73, W4ONE 65, N0CLS 60, K40DDQ 60, K00GI 59, N4HSR 56, KD0CI 54, K4BFP 44, K4BYZ 44, N1BB 30, KD0NH 22, W0KYG 20, KC0T 16, WA0LUT 15, WB0UKI 11, K4BDC 10, N0CRO 9, K4BPM 9, K4V11 5, N0FKU 3, KC0FT 2, K40PQ 1.

NORTH DAKOTA: SM, Bill Kurth, N0AFP—The Mayville picnic will be on June 7 and Peace Garden Ham Fest on July 11-13. Special Congrats to K4W7XD, N4HNS, and N8GUU who upgraded to general. K4BEM and K4BYT to advanced; and W0EJU and K40TTC to extra. The Devils Lake Ham Fest was a success. There were 73 registered. In the test session 21 took tests and 14 upgraded. At the Packet Meeting it was decided to organize together with Manitoba for digi links, etc. Hawknest digi and bulletin board are in operation thanks to WB0HW. Thanks to everyone in the VC test program. It sure beats the old system when we had 2 tests in the state every year or had to drive to St. Paul. Novice classes were held in; Fargo, Mayville, Devils Lake, Maddock, Bismarck, Minot, and Jamestown. Traffic: W0CDO 87, K0SFM 59.

Net	Freq	sessions	QNI	QTC
Goose River	1.983	7	141	6-W0CDO
WX Nets	3.883	27	911	29-W0FFE
Data	3.883	27	561	27-K4BFSM

SOUTH DAKOTA: SM, R. L. Cory, W0YMB—STM; KD0YL. ASST SM: N0ABE, W40FPR. SEC: K4KPY. The bill in the South Dakota Legislature for the unfair cost of Amateur Radio Call letter license plates is dead for this year. Amateur Radio has very few friends in the South Dakota Legislature. I would like to start a program to educate them on the fact that we provide a public service as most of them know nothing about us. Rapid City Hams have installed packet at the NWS at Rapid City Regional Airport. Randy Sorenson, WB0HAT, has been elected president of the Sioux Empire ARC. Medicine Butte Repeater ASSN met in Chamberlain on Jan 17 with 41 present and sent a delegation to Pierre to join our group in meeting with Legislative committee on License Plate Bill. Dakota City Chapter #02 of OCWA is starting a 855 net. Contact K4ERM for details. Traffic for Feb. by S. Dak. stations totaled Orig. 271 Rec 478 sent 710 Del 133 total 1645.

DELTA DIVISION

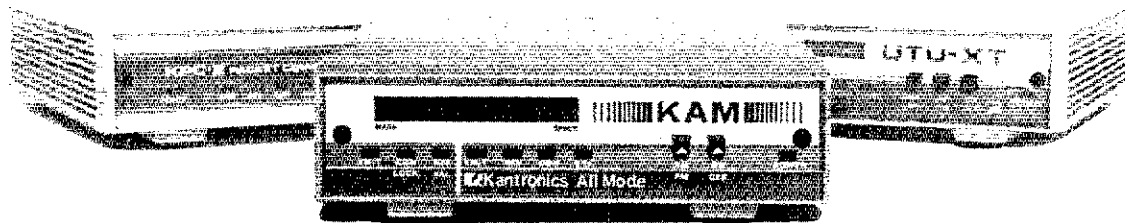
ARKANSAS: SM, Joel M. Harrison, W5IGF—ASM; K5UR. SEC: N5BPU. STM: W90K. ACC: N5D. SGL: W5LCI. TC: W5FD. Repeater Coordinator: W5FDP. The Arkansas Hamfest and APRIL Delta Division Convention was a big success and I enjoyed seeing each of you. Congratulations and thanks go to chairman W5LUY and committee. New OBS for Northwest Arkansas K45HQ. K65KI has completed a first for Arkansas and probably most of the world. Halph received traffic via QSCAR 12. Packet then relayed the message directly to the city destination via Packet. A 100% Packet handling of the message including Satellite! The Ark EC net is now on 3987.5 KHz. Time remains the same at 5:30 PM Sunday's. If your summer plans include a trip to Hot Springs this year, you don't want to miss the amateur radio exhibit at the Mid-America Museum. The Hot Springs ARC has set up a very impressive station and display. Why haven't you been joining the Ark CW net (OZK)? You HAVE missed a treat! Traffic: W5QFU 93, W5RIT 63, W5UAU 38, W90K 25, W5IGM 22, W55IGF 18, W5KL 4, W5RXU 4, K65K 3, W5B5 2.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—SEC: N5ADF. ACC: K5DPG. SGL: K5SSL. OOC: K5QK. TC: N5JM. PACKET NESS. Congratulations to the new officers of the West Louisiana ARC in Leesville. Pres: Irv-WB5NAA. V.P. Jesse-WB5JZQ. Treas: Bob N5EBH5. Sec: Jim N5FAE. Leesville's new packet Digi on 145.01 call LSV or WB5NAA-1. The Louisiana Council of Amateur Radio Clubs Linking committee has recommended a 440 Mhz repeater link from New Orleans to Shreveport. Equipment for the Baton Rouge and Alexandria sites has already been obtained. Details on the plan will be presented at the next LCARC meeting at the Baton Rouge Hamfest. The Baton Rouge ARC promises a bigger and better Hamfest on May 2 & 3rd in celebration of the club's 50th anniversary. Same location at the Catholic High. A Saturday night get together dubbed a "Hambalaya" will feature a crawfish boil and Cajun band. Jefferson ARC in Metairie election of officers: Pres: John N5IWB. V.P. Randy W5UB1. Treas: (again) Bob K5GQ. Sec: Sam K55VC. Club net Sunday 9AM 3950 KHz. Repeaters W5GAD 147, 285 and 444 000. Club meets 4th Thursday 7:30 PM in the ballroom at the Metairie Playground. Traffic: DRN-5 Feb 87 788 msg 56 sessions. LA represented 89% by W5LHL, K5WOD, W5WBZ, W5AV, W5ATQA and K5ZP.

MISSISSIPPI: SM, Jim Davis, K5SZ—ASM: W5TRD. SEC: W5IKD. SGL: No appointment at press time. ACC: K5YV. PIO: W5NM. BM: K5JB. TC: W5SKC. OOC: K5K. STM: N5AMK. VHF Coord: N5DWU. Due to resignation of K5ST, K5SZ appointed SM by ARRL until regular term begins 1 Apr 87. On 28 Feb 87, a killer tornado struck the rural area of Jones and Clarke Counties, in the Glade, Powers and other counties southeast of Laurel, MS. On advice of K5JX, Miss. Sideband net activated into emergency session by K56K, at 3.8625 Mhz. Handling H & W traffic in and out of area. Assisting were W56C, AG5Z, N5ATF, N5JSH, W5BTK, W4KJ, K5QNE, W5LSG, N5DWU. These hams and others were on duty immediately after wind ceased and stayed with it until all H & W completed. A resounding "WELL-DONE" to all participants. Last count: 9 fatalities, damage to homes, schools and businesses at \$28.5 million. Thanks to Jackson Club for

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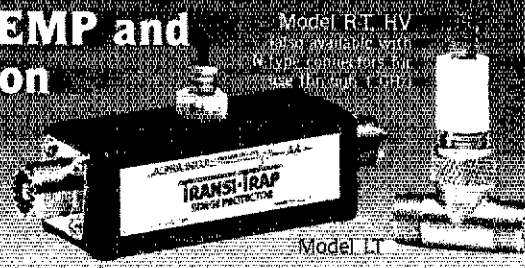
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great Hamfest 14-15 Feb. Gets better every yr. CAND (W5KLV) sessions: 28, QTC: 833. Miss. reserved 96% by N5AMK, KT5Z, W5HKW, KB5W, KE5EC, W5AS, M5BN, WJ5PJ sessions: 28, QNI 1500, QTC: 36. MTN: (K5OAF now SK) W5 miss you, Kan. (KB5W) sessions: 28, QNI: 168, QTC: 78. MNN: (WJ5L) sessions: 28, QNI: 675, QTC: 9. GCSBN (W5CR) sessions: 28, QNI: 1054, QTC: 14. Miss/Slow Net: (W5CR) sessions: 28, QNI: 100, QTC: 16. Rankin County ARES: (KF5IZ) sessions: 1, 3, QNI: 132. Missoula Emergency Net: (W5SO) sessions: 4, QNI: 124, QTC: 3. Traffic: N5AMK, 400, W5ACS: 7, WQ5H: 198, KB5W: 242, W5WZ: 48, and KT5Z 94. Public Service Honor Roll: N5AMK: 102. Section leadership directory: SM: Jim Davis, K5KZ, POB 332, Senatobia, MS 38668. (601) 562-6051; ASM: James A. Amundson, W5TRD, 40 Crossgates Dr. Brandon, MS 39042; SEC: Alan Clark, W55IKD, 559 Bradford Dr. Jackson, MS 39208; PIO: Lanny Outlaw, WN5M, POB 87, Baldwyn, MS 38824; TC: Bill Ford, W55SKK, 169 Cottage Row Dr. Vicksburg, MS 39180; STM: Joe C. Teaster, N5AMK, Rt 2 223 St. Benton, MS 39039; ACC: Brent Lamb, K5VXV, 112 Tate St. Vicksburg, MS 39180; GM: Joe Wood, AJBX, 1302 Hill Drive, Laurel, MS 39042; Duane Tutor, K5SK, 207 S. Liberty St. Pontotoc, MS 38883.

TENNESSEE: SM, John C. Brown, N4OQ—ASM: WA4GLS. ACC: WA4GLS. COJAA: W9FZW, SE4C: WA4GZQ. SGL: WA4GZQ. ST: NG4J. ST: W4HK. The subject of the various Amateur Radio Clubs becoming ARRL has long been a subject near and dear to your section manager. I have always had the policy that whenever a Club reaches that status, either your Section Manager or one of the Section staff will make a journey to meet in person with the club to make the presentation. I don't think there has been a case wherein this policy has not been followed. I don't remember how many Tennessee Clubs have reached that status since first becoming TN Section Manager. Several I know, it was my pleasure to again deliver the Affiliation Charter to the USN Millington, Military Amateur Radio Club Station last Monday night. As has always been the case, Club spirit and enthusiasm were high and excitement in the air. The club had worked long and hard to reach that status. The normal turnover that is inherent in military was debated and persistence paid off. Again congratulations to the W4ODR NAs Memphis. Will be looking forward to more things from YOU. The activity on the packet front is still going at full speed. The activity on the packet front is still going at full speed. The action of the various packet Organization are getting things pretty well lined up. The big problem now is that the Section staff is going to have to keep humping to keep up with the momentum that is developing with THE NEW MODE OF COMMUNICATION AND TRAFFIC HANDLING. If you have never handled any formal traffic this way, you are in for a surprise. Fast is the WORD for it if you are in that type of communication, you know where I am coming from. In the traffic department for this period, we have live stations that made the CW Honor Roll for this time: N4OZB, W4LVP, W4ACNW, NG4J and N4OSZ. Congrats to the fine bunch. Traffic for the section was as follows: Low Frequency: sessions-71, QNI-3245, QTC-162; VHF-sessions 62, QNI- 2983, QTC-707 and CW -sessions-44, QNI-239, QTC-45. Individual station activity for the period was as follows: W9FZW 224, and a BPL, K4WVQ 132, W4DDK 112, W4FMR 105, NN4S 75, W4TYU 31, W4TYV 23, WA4HKU 19, N4OZB 15, W4PPP 14, KE4LS 13, KA5KDB 12, WA4CZ2 11, W4EWR 7 and W4PSN 3. (Jan.) W4DDK 80. Wouldn't YOU like to see your call listed here. Just give me a call between the 1st and 6th of each month. CUL.

GREAT LAKES DIVISION

KENTUCKY: SM, Dale Bennett, WA4JTE—Congrats to John, WM4T, on becoming the new SM of KY. Know you will do a fine job, John. Looking forward to working with you. A good time was had by all at Cave City. Looks like a good place to have the fest. Enjoyed talking to everyone. Tnx to those who attended the KY & ARRL meeting. Some very interesting exchanges. Sorry to hear of the passing of WALMU, Bob, at Somerset. Know the nets will miss him. Expecting a lot of activity with the new Novice Frequency's. How about some local ten meter nets to encourage novices to check into the traffic nets. Let's all get on 16m Meters and get the new Novices off to a good start. Traffic: K4VHF 117, K4GDH 65, KA4SAA 46, K4HOE 46, KA4MTX 44, KA4VX 41, WA4AVV 19, W4PKX 8, KA4GBZ 7, WD4CQF 6.

MICHIGAN: SM, James R. Sealey, WB9MTD—New EC appointment for Lenawee Co.: N8ASE. Motor City RC announces the winner of its annual Field Day Award for 1985. SEMARA, operating under callsign K8BY1, with a percentile rank of 98.5. The award is presented each year in memory of Ivory J. Olinghouse, W8ZBT, MI SCM from 1970-76, to the top percentile-ranked affiliated club in MI Section. MCR's monthly bulletin, by the way, is now called "The Spark Gap", with W8RCM the winner of their little naming contest that I reported in an earlier column. Congrats to NBCCD and others of the Midland ARC for their excellent "hands-on" intro of Amateur Radio to the fifth graders at Adams School and for the fine PR in the Midland Daily News that resulted. Some interesting developments reported in the March issue of Edison RAA's newsletter. They are in the process of acquiring and resurrecting the long-inactive RADAR UHF repeater system. The plan is to operate it on 442.80 MHz from the original location atop Oakwood Hospital in Dearborn where it will provide a command channel for RACES purposes during drills or actual emergencies. Also included in the plans is the relocation of the Wayne repeater (147.14) from Eloise to the Oakwood site for better coverage, all of which should significantly enhance emergency communications in Wayne County. Special credit here to Wayne Co. EC/RACES Director K2BV for his part in all the negotiations involved. This year's U.P. Hamfest will be July 25 at NIMU in Marquette. All indications point to the event being in the usual high standards. SEMTNI is by now solidly established as an integral and vital part of MI's NTS organization, with delivery outlets in the Metro area virtually assured on a daily basis. NM N8AHA not only has the net running efficiently but has been going "above and beyond" with his programs at club meetings around the area, recruiting new traffic handlers in significant numbers and generally stirring up interest in this worthwhile public service activity. Traffic (Feb.): KABCPS 644 (BPL), W8QHB 248, N8AHA 123, N8CNY 83, K8GXV 66, W8BSY 64, W8ADHB 55, W8DRHU 49, K8HAP W8SCW 47, N8HHF 46, K8UPE 41, W8MBJ 35, W8VJZ 33, W8KQC 32, W8EOI 30, W8RNO 19, N8HWL 17, N8EBG K8BTU W8JRM 13, W8AMVH 11, W8BEZ W8WJV 9, W8REN W8VY 6, K8OD 5.

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: N8AUH. SEC: W8BMPY. STM: KF8J. EM: W8ZM. ACC: KJ3O. TC: KB8MU. OOC: AD8I. SGL: N8CVK.

NET	QNI	QTC	Sess	Time(Local)	Freq	MGR
BN(E)	292	120	28	1845	3.577	N8EVC
BN(L)	170	69	28	2200	3.577	K8TVG
BNR	276	79	28	1800	3.505	W8EK
BSSN	410	223	55	0945,1800	3.873	K8CZ
ONN	200	45	28	1825	3.708	W8KWB



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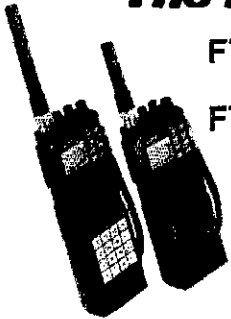


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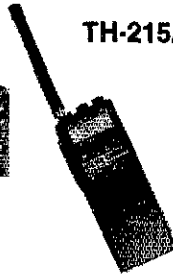


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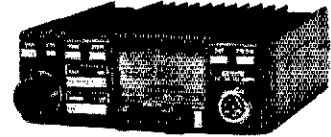


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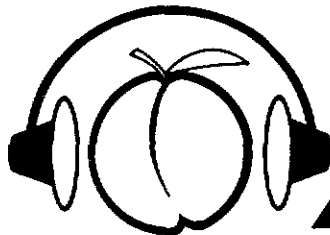
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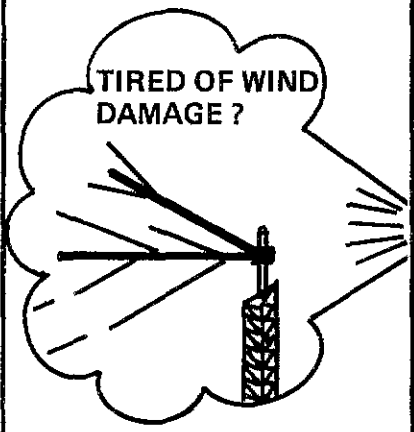
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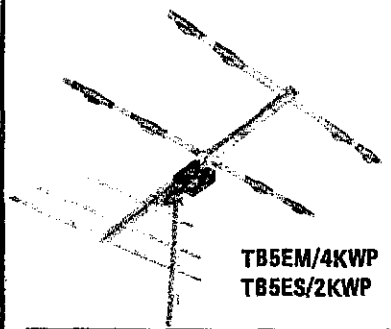
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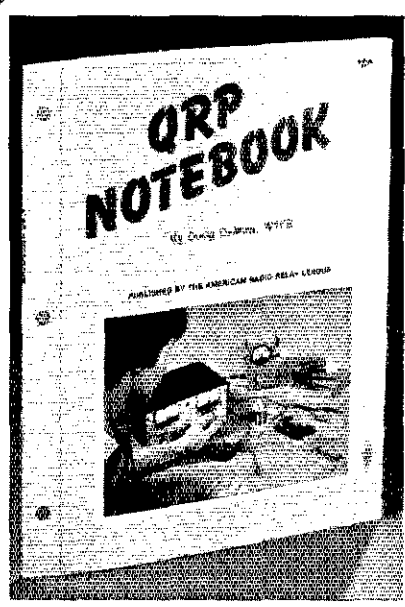
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**Doug DeMaw's
QRP Notebook!**

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).

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Ohio Section ARES Net
Hamfest in May: Medina County, May 10; Athens County, May 17; Portage Hamfest, May 16; exam sessions: Maumee May 9; Hillsboro May 10; Columbus May 18; Cincinnati May 16; Canton May 30. Contact me for details. N8CVK has stepped down as Ohio Public Information Officer (PIO), but will retain his title as Ohio State Government Liaison (SGL). This means that I am searching for a new volunteer to serve as Amateur Radio's Public Relations coordinator. Are you interested? Contact me for details. Hal Gruber, W8MGP is stepping down as Editor of the Cincinnati ARA's "Mike and Key" newsletter after thirty seven (that's right, 37!) years at the helm. As anyone who has served as a newsletter editor knows, this takes real dedication in service to one's fellow Amateurs. Congratulations, Hal, and enjoy your well-earned free time! The Fayette ARA of Fayette County has elected new officers: Pres KA8YPA, VP W8BNGK; Sec/Treas KABITE; Editor KABMTZ. New officers for the Champaign-Logan ARC: Pres W8CDBB; VP KA8YUM; Sec/Treas N8FFJ. The Parma RC exhibited Amateur Radio to the public during a Scout-A-Rama at the Paramatown Mall. In addition to a demonstration of our hobby, they also awarded door prizes to the lucky ones among those who stopped to look and ask questions. They chose to award ARRL "Tune In The World" Novice kits and code practice oscillators. Can your club do this? Good idea! Many clubs are making some changes to make our newly-vocal Novice licensees feel welcome. Some have linked new or existing 220 MHz repeaters to their 2 meter machines; others have slowed down the CW rate to a rate Novices can actually speed in Lorain County. QES N8CDN reports that they are in the process of seeking a major grant to allow the upgrading of the Amateur Radio facilities at the Red Cross Chapter. This will give them capabilities on 180 meters through 440 MHz. If you know of any available grant funds anywhere in the state, let me know and I will pass on the word to deserving clubs or ARES groups. The Sixth Anniversary of the Tristate Amateur Traffic Net (TATN) was celebrated with a wide-area net on February 2 using the Fairfield 145.19 linked repeater system. I had the opportunity to participate from my QTH northwest of Columbus, receiving traffic from stations in Cincinnati and Dayton directly, and fielding questions on the then-new Novice Enhancement program. I am adding to note the following Silent Keys: W8AJW, KB8AB, W8TXV. The Amateur Radio stations listed below have helped to uphold our responsibility to the public and have reported handling radiogram traffic during the month of February 1987. Traffic: KV8Q 503, W8BJGW 321, W8EYQ 308, KA8KHS 293, KB8JD 230, W8B0 223, W8BKFN 221, W8CQK 208, N8EVC 203, W8ZOL 183, W8QXT 181, N8AK6 177, K8TVG 170, K8DHD 169, N8GEC 148, W8JLK 137, K8ND 132, N8XX 129, KA8GJV 126, KF8J 125, K8OZ 123, W8BWWY 122, W8QZK 121, W8BRAD 115, K8DKU 108, W8FFA 102, W8SKP 96, N8EVB 95, K8BFW 92, W8EK 82, W8SSJ 81, W8BDMF 78, W8BKW 73, K8DKR 71, N8FB 55, K8TW 50, N8FVH 48, N8AEH 47, K8CF 45, K8CNR 45, N8BA 42, W8BHHZ 40, W8BKW 40, K8XK 40, K8BUZ 39, KA8CGE 36, W8QZM 33, W8BHL 31, K8EY 31, W8MPV 31, K8EF 29, N8GZE 29, N8BC 28, N8BX 28, K8J0 26, N8FFH 25, K8DLC 24, N8CJS 23, N8DZA 23, N8GHS 22, K8LQM 22, K8BD 21, W8EZN 20, W8JLW 20, K8BHB 19, W8BRSM 19, N8FBE 19, KA8UYM 18, W8DYS 17, K8J0V 17, K8CJ 17, KABRX 17, W8BYFD 17, K8BQQF 16, KA8WMD 16, K8ZBP 15, KA8TNT 15, K8BWH 15, N8KB 14, W8GXT 14, K8BYV 14, W8RG 13, W8BYS 13, K8DXZ 12, N8GOB 12, K8BVI 12, W8BCSP 12, W8DAJW 11, W8AKW 10, KA8SM 10, W8SM 10, N8CJ 10, N8VH 10, K8BY 9, N8AJU 9, W8BAW 8, W8BDKO 8B, KABDFP 7, N8YV 7, W8BHD 7, N8HKO 6, W8MPL 6, K8EEN 5, N8K 5, KA8YI 5, K8BAO 4, K8BANC 4, N8AUG 4, W8CKK 4, N8BFB 4, K8ECL 4, W8CYE 3, N8GOL 3, W8PWP 3, KA8SN 3, N8CDN 2, N8GIO 2, N8HIL 2, W8LT 2, KA8MFH 2, N8MN 2, KA8RF 2, W8GDM 1, N8GSM 1, N8HOT 1, KA8MFG 1, W8NED 1, KA8SZH 1, KA8VYT 1, (Dec.) N8MN 9, (Jan.) N8MN 17.

HUDSON DIVISION

EASTERN NEW YORK: 8M, Paul S. Vydareny, W2VUK—STM & ASM; K2ZM, SEC; W2ZYH, BM; W2EAG, TC & CO/FR; KC2ZV, ATC; W2EAG, SGL; K2ZHC, PIO; K2ZTM, NET; W2EAG, FREQUEN; W2EAG, MANAGER
ESS 6 PM 3:50 W2WSS
CDN 6:30 PM 146.34/94 W8ZCM
HVN 7:30 PM 144.635/135 W8EAG
NYPN 5 PM 3:913 KA2JBD
NYSM 10 AM 3:877 W8EAG
NYSEL 7:10 PM 3:877 KU2N
SDN 9:30 PM 147.66/06 K2ZVI

NET LISTINGS(QNI/QSP): AESN 66/3; CDN 528/120; ESS 342/78; HVN 235/75; NYPN 642/693; NYSE 427/344; NYSL 321/164; NYSM 358/409; SDN 312/99; CLUB NEWS: Albany ARA welcomes new members KB2CD, K3BIL, KA2AFC, Catelet Min ARC reports new members KA2YB, KA2YD, KA2YF. CNR heard W2DPV and KA2ND describe the early days of ham radio. Overlook Min ARC's K5NA is offering free pizza to any OMARC member who works him on 5 of 8 bands while he is K5NA/KP2. PEARL heard W2EAG talk on traffic handling. Rip Van Winkle ARES was organizing ham radio booth for Expo at Col/Gm Community College. Saratoga RACES heard Hudson Division Director WA2DHF talk on the call sign docket. Schenectady ARA heard Tim Schrom of the NWS talk on Skywarn. WARA had a report from WA2DHF. WECA planned its WECA-FEST 87. Thanks to W8JDS for a job well done as NM of NYPN and congrats to KA2JBD new NM. So thanks to NM of NYPN and congrats to KA2YB new NM. Wait for a new ENY Club newsletter to be out shortly. W8NHC has the new ENY newsletter editor. FEB, PSHR, W8EAG NQ2H KA2MYJ W8ZVIJ WA2JBO K2ZVI N2EQM KC2ZO K2ZM K2HNW KB2ATJ. Traffic: W8EAG 290, W8ZVIJ 227, WA2JBO 191, KC2ZO 170, KA2MYJ 132, NQ2H 119, K2HNW 76, K2ZM 73, KA2TQW 57, K2ZVI 48, N2FCJ 39, N2EQM 36, KB2ATJ 35, KA2NGJ 8.

NEW YORK CITY-LONG ISLAND: SM, John H. Smales, K2IZ—ASM/VE; W2NL, SEC; KA2RGI, ACC; KA2J, AD, OCC; NB2T, TC/RFI; WA2YNK, STC; K2MT, SGL; WA2HYS, PIO; KA2WJ. The following are traffic nets in and around the section:
NCVHF 148.745/r 1930 M-F K2HPG mgr
BAVHF 148.670/r 2000 M-F K2YQK mgr
SCVHF 145.370/r 2000 M-F Sun KA2JMA mgr
NYSM 3677khz 1000 Daily W8EAG mgr
NYSV 3677khz 1900 Daily KU2N mgr
NYSJ 3677khz 2200 Daily K2ZM mgr
NYPN 3913khz 1700 Daily KA2JBD mgr
ESS 3590khz 1800 Daily W2WSS mgr
BBS 145.010 Packet NodeA12Q Station
All times are local, please note that A12Q is the packet node



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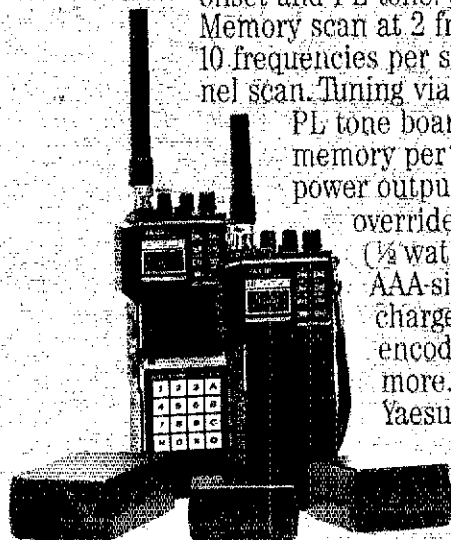
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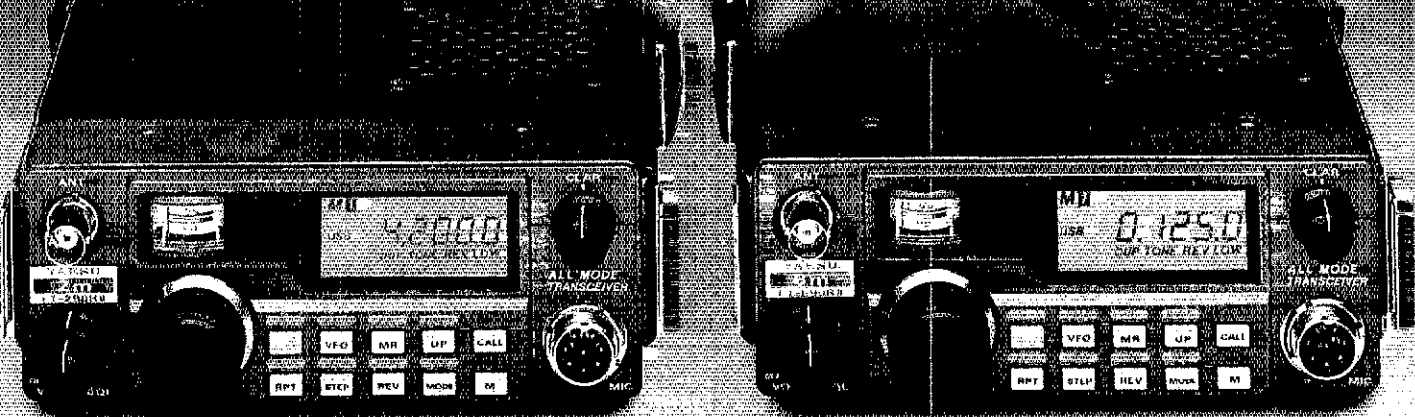
PL tone board (optional). PL display. External PL selection. Independent PL memory per channel. PL encode *and* decode. Expanded Rx coverage.* LCD power output and "S"-meter display. Battery saver circuit. Push-button squelch override. Eight-key control pad. Keypad lock. High/low power switch (½ watt on low power.) ■ Options available: Dry cell battery case for 6 AAA-size cells. Dry cell battery case for 6 AA-size cells. DC car adapter/charger. Programmable CTCSS (PL tone) encoder/decoder. DTMF keypad encoder. Mobile hanger bracket. External speaker/microphone. And much more. ■ So get the intelligent mini HT that's built for life's realities: Yaesu's 2-meter FT-23R, or 440-MHz FT-73R.



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MRF433	12.5W	12.00	30.00	
MRF449/A	Q 30W	12.50	30.00	
MRF450/A	Q 50W	14.00	31.00	
MRF453/A	Q 60W	15.00	35.00	
MRF454/A	Q 80W	15.00	34.00	
MRF455/A	Q 60W	12.00	28.00	
MRF458	80W	20.00	46.00	
MRF475	12W	3.00	9.00	
MRF476	3W	2.75	8.00	
MRF477	40W	11.00	25.00	
MRF479	15W	10.00	23.00	
MRF485*	15W	6.00	15.00	
MRF492	Q 90W	16.75	37.50	
SRF2072	Q 65W	13.00	30.00	
SRF3682	Q 110W	25.00	54.00	
SRF3775	Q 75W	14.00	32.00	
SRF3795	Q 90W	16.50	37.00	
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MRF224	40W	136-174	13.50	32.00
MRF237	4W	136-174	3.00	—
MRF238	30W	136-174	13.00	30.00
MRF239	30W	136-174	15.00	35.00
MRF240/A	40W	136-174	18.00	41.00
MRF245	80W	136-174	28.00	65.00
MRF247	75W	136-174	27.00	63.00
MRF607	1.75W	136-174	3.00	—
MRF641	15W	407-512	22.00	49.00
MRF644	25W	407-512	24.00	54.00
MRF646	40W	407-512	25.50	59.00
MRF648	50W	407-512	33.00	69.00
SD1441	150W	136-174	74.50	170.00
2N1447	100W	136-174	32.50	78.00
2N591	25W	136-174	13.50	34.00
2N6080	4W	136-174	7.75	—
2N6081	15W	136-174	9.00	—
2N6082	25W	136-174	10.50	—
2N6083	30W	136-174	11.50	24.00
2N6084	40W	136-174	13.00	31.00

MISC. TRANSISTORS & MODULES				
MRF134	\$16.00	MRF497	14.25	
MRF136	21.00	2N1522	10.50	
MRF138Y	70.00	2N3866	1.25	
MRF137	24.00	2N4048	10.50	
MRF138	35.00	2N4427	1.25	
MRF140	89.50	2N5590	10.00	
MRF148	35.00	2N5642	13.75	
MRF150	89.50	2N5643	15.00	
MRF172	82.00	2N5646	18.00	
MRF174	80.00	2N5945	10.00	
MRF208	11.50	2N5946	13.00	
MRF212	16.00	2SC2097	29.50	
MRF221	10.00	2SC2237	13.50	
MRF280	7.00	2SC1969	3.00	
MRF261	9.00	S10-12	13.50	
MRF262	9.00	SAV6	34.50	
MRF264	13.00	SAV7	34.50	
MRF408	14.50	SC1019	59.90	
MRF428	55.00	SC1027	47.50	
NE41137	3.50	M57737	47.50	

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a helping hand by contacting him right away. Traffic: N6GOC 570, WBFR 190, W6FRG 178, K5SUJ 101, K6BFX 82, W6OCYH 77, W6FDJ 70, W6HI 69, W6HCOZ 57, W6CMT 49, W6BZLN 48, N6EYE 39, N6BZ 26, W6MYM 20, N6GZT 19, N6K05 18, W6PB 12, W6CHJ 4.

MISSOURI: SM, Ben Smith, K0PCK—SEC: K9OCU, STM: K6SI, BM: WB2TE, SGL: K0DJU, TC/RM: K4CHS, ACC/PIC: K15Y, OO Coordinator: W6BRH. The first Ham of the Year Award presented by the Kansas City Amateur Radio Club goes to W6RDX. On February 21 a building on Stone Mountain housing a commercial radio transmitter and the Eastern Ozarks ARC Repeater was destroyed by fire. The St. Charles ARC has started two new nets and everyone is invited to check in. The nets are: a slow speed net Monday evenings at 8:30 PM on 21.150 MHz and a 10 meter net on Thursday evening 9:00 PM on 28.510. New Field Appointments for the month are: PIA, K0BZ, and OES, K0JAA, W6AIB and W6DQJH. SEC, K9OCU has appointed W6BVLU and K6SJK as ECs. If your county does not have an EC, contact K9OCU. He would work with the amateurs in that county to fill the position. It's the time of year when amateur radio clubs are at their most different community projects. Send me the information so we can report these events in the Missouri Section News.

NET	Sec	QNI	QTC	Day	Time/Freq	Freq/MHz	Mgr
MON	56	307	217	Dly	7:00P-4:45	3.585	K6SI
MEOW	26	601	139	Dly	5:30	3.963	K6D9C
MOSSB	28	758	97	Dly	0:00	3.963	K6DRB
HBN	20	324	26	Mon-Fri	12:06	3.880	K6D9C
MTTN	16	44	17	Mon-Sat	8:30	3.370	N6SKE
RRABN	27	449	12	Dly	9:00	146.19/79	K6ALLN
PH	4	118	11	Mon	9:00	146.43	W6AKUH
SLAN	4	275	5	Mon	9:00	143.31/81	K6WEX
ZAEH	4	1	1	Tue	9:00	141.24/24	N6CZ
NEMOE	12	77	3	TU-Sat	7:30	144.53/13	N6CYB
JCCCN	4	38	3	Wed	9:00	148.40/7.00	W6DRI
ARES	4	60	2	Thu	9:00	147.855/255	N6FOW
CMEN	4	45	1	Wed	9:00	146.16/76	K6PCK
LOZBC	24	377	0	Mon-Sat	6:00AM	146.13/73	W6RTL
SWARC	4	199	0	Tue	7:00	148.31/91	K6DUL
LOZFM	4	74	0	Fri	9:00	146.13/73	W6RTL
TCN	4	50	0	Thu	9:00	147.09/69	K6BLO
SARN	4	34	0	Tue	9:00	146.43/73	W6ENW
MOFON	4	28	0	Wed	8:15	222.42/4	A180
MOARES	27	0	0	Thu	8:30	146.205/825	W6DELL

NEBRASKA: SM, Vern Wirka, W6BQG—STM: Jerry Kohn, W6DEGK, SEC: Michael Ruhnradt, N6FER. Another severe storm season is upon us and ARES groups throughout the section will be spotting severe weather. With increases in ARES activities all ECs are asked to please file a monthly report with our SEC N6FER. The 3900 Club Hamboree is scheduled for May 29-30-31 in South Sioux City, Nebraska. Hamboree information can be obtained during the weekly on the air meeting of the 3900 club. The club meets every Sunday morning at 0900 local time around 3.896 MHz, plus or minus QR/M. Also Hamboree information can be obtained from Dick Pilmer, W6FZO. Please beware of official-looking letters offering to renew your amateur license for a fee. These letters have been showing up in the Nebraska Section. They have nothing to do with FCC. There are no fees to renew your amateur license. All it takes to renew an amateur license is a properly filled-in FCC Form 610 addressed to the FCC PO Box 1020 Gettysburg, PA. 17325. Lincoln Amateur Radio Club members provided communications for parts of the Inaugural Banquet and Ball for Nebraska Governor Kay Orr, W6DYO. KE6JU and W6DEGK were assigned to the Chairman of Arrangements, Chief of Security and the Co-Chairman of the Inaugural Ball Committee, respectively. The Nebraska Novice Net meets Monday through Friday at 0145 UTC on 3.737 MHz. The Nebraska Novice Net welcomes all check-ins. The Blue Valley Amateur Radio Club of Nebraska is running a contest to name their club newsletter. Also the Blue Valley Amateur Radio Club is celebrating their 30th year as a club in 1987. Traffic: K6DKM 703, W6KK 88, W6BTE 54, K6ABCB 33, W6BOK 29, W6DEGK 26, N6BA 14, W6DCRD 12, W6BOOX 8, N6BOW 6, W6N1K 5, W6BQPM 5, W6BQGM 5, K6TUH 4.

NEW ENGLAND DIVISION
 CONNECTICUT: SM, John Ronan, K3ZJ—STM: K1EIC, SEC: K1ECL, ACC: K6M1M, OOC: N4TI, TC: W1HAD, BM: K3ZJ, PIO: KX1B, SGL: W1AH.

NET	SESS	QNI	QTC	MGR
NUTMEG	28	101	71	K1EHC
CPN	29	299	102	K1BHT
CHJ	48	214	174	K1E1R
WESCON	26	390	240	W61GXZ
CSN	20	191	79	W61GXZ

A meeting of the major digipeater operators was held in Southington on Feb. 26 for the purpose of establishing a State Wide emergency communication network. Present were W1FUR (Insurance City Group), K1JCL, K1B1-1, W1GB-1, K11KE, W1OPS-1, K1A2BCD-1, N1API, W1AW-S, K1CE, KE3Z. The proposed net would include cross-band high speed linking utilizing two-port digipeaters would then distribute traffic locally via 145.07/03 utilizing two port digipeaters. Congratulations to newly formed Weston ARES: W8EVH (Pres.), W1LRR (VP), W1OR (6), K1A1SH (T), K1ATA, W1TSE, K6AMDG, W8EVH and W1LRR successfully deflected a Weston antenna zoning ordinance using the APRIL PRR package. SARA's Feb. meeting featured CS3VE from The Gannett WARC provided an Amateur Radio demonstration to Waterbury Boy Scout troops at Camp Mattatuck on Feb. 7 with K1A1ON, K6MJK, K6MKT, K6TKM, K6A1D1G participating. WARC's Hot Air Hour has moved to 28.400 on Th at 0100Z to take advantage of Novice Enhancement. FARA's Repeater Antipatch is up and running with speed dial codes for members. FARA's HAGNY is now N1JC, the first Hungarian to make U.S. Extra. GNARC has set up a complete HF and 2-meter station at the Norwalk Red Cross thanks to K1REC. The ECARA traffic net is a great success thanks to K6AMP. NM. The net meets M-F 8 PM on 14.225R. ECARA held its annual dinner on March 9. In Feb. FARA toured the Bridgeport Hospital to view the latest in electronic medical equipment thanks to "Doc" Nevin K1JJ. W1NU has worked every ham in the country plus 40 deleted countries using 100 watts or less! This also includes Peter I Island. CARA sponsored the Connecticut OSO Party in April which was a popular success. Congrats to W1MIQ on his 90th birthday. Essex Civil Prep. donated \$100 to the SARC repeater fund. N1JA and W61GTP are working on a SARC 2-meter digipeater. PVRA has installed a courtesy tone on the 147.180 repeater which is activated during emergency conditions for priority break-ins. BEARS recently graduated 26 new Novices. K21Z, appeared on Educational TV in a program on Amateur Radio in public education—a topic Peter has done much to advance through BEARS. Traffic: K61MDM 667, W6EFW 304, W61GZ 246, N1EDD 233, K61MKJ 190, K61GWE 142, N1DMV 126, K61TH 81, W1YOL 82, K61ZC 87, K1CE 85, W1WP 57, W6BSIV 50,

KY1F 40, K1A0E 39, K1AJAN 34, K1A1BHT 20, W1BDN 26, W6ZSG 26, N1BOW 18, K61XD 13, K1A0CZ 12, W1C1U 10, W1QV 8.

EASTERN MASSACHUSETTS: SM, Luck Hurdner, KY1T—ASM: K9HI, SGL: K3HI, OOO/AA: K61KF, SEC: K61PA, PIO: K1HLZ, BM: K61AF, STM: K61WU, TC: K61AU, ACC: K61KCU, EM/SS Hot Line 437-01, Westlink 449-2226.

NET	MGR	TIME	LOC/DY	QTC	QNI
EMRI	N1AJJ	3658	1902200	DY	178
EMRIPN	W61FCD	3880	1730	DY	97
EM2MN	K61AMR	145 23	2000	DY	219
N6EPP	K1BZD	3945	0830	SN	29
HHTN	NG1A	04/64	2830	DY	147
EMRIS	N1CVE	3715	1800/2030	DY	15
CITN	K61AF	745/045	1930	DY	134

Bulletin Manager K61AF reports 464 bulletins were sent by EM/SS DBS people, with W1ZHC/PBBS topping the list - FBI Section Traffic Manager K61WU says we have not one or two but THREE new liaison stations (K61HFO, W61KLG AND W61GIA), who are helping to assure the smooth transition of messages from net to net. We need more! Let your Net Manager, or K61WU know if you can help. W61GIA is very much excited about having the Boston Museum of Science committed to September 26 & 27 for this year's Amateur Radio exhibit. Contact him at 527-2144 if you or your group is able to assist with this year's effort. "Nice work/congrats!" to K61WU, W61FCD, NG1A, K61AF, K61HFO, W61TBY, K61PHB, K61BBU AND N1CVE who all made the Public Service Honor Roll. It's nice to see new callsigns on the PSHR as more of you realize how to report your scores and be recognized for ur public service communications efforts! Eastern elementary school students are learning the line point packet radio, and resending "packet pen-pal" messages to other elementary schools in New Hampshire. They'd v'y much like to talk to you and hear from you, so be sure to set a good example of proper operating technique, regardless of the mode - you never know who is watching! Technical Coordinator, K61U reports that the Digital Equipment Corp's club has been reactivated after a lapse of some years. It's an exciting time for Amateur Radio now, as volunteer examiners find more and more newcomers as well as old timers who are finally upgrading and joining in on the fun! Traffic: K61WU 739, W61FCD 313, K61AF 292, W1CE 264, W61TBY 262, K61HFO 251, N1BHH 151, W1ZHC 143, K1SEC 130, NG1A 128, K1A0B 110, K61PHB 108, N1CVE 97, K1BZD 87, K1BA 80, K1GTP 78, KY1T 69, N1AJJ 63, K61LH 50, W61KLG 47, K61TD 40, K61AMR 33, W61FNM 23, W1DMH 22, K1LCO 14, K61ON 14, W61SNH 13, K1BZD 11, N1DYZ 10, K61EYD 10, KY1B 7.

MAINE: SM, Cliff Lavery, W1RWG—ASM: Bill Mann, W1KX, SEC: W1KX, PIO: W1KX, TC: W1JTH, ACC: K61FKS, OOC: W1KX, PIO: W1KX, TC: W1JTH, ACC: K61FKS, and other Maine hams held a testimonial luncheon on March 21 for George Sterling, W1AE, to celebrate his 75 years as a licensed amateur op. Congratulations to Wes, N1BIR, on his new call, N11Y, and also to K1GUP, net manager of the Sea Gull for past 15 yrs, upgrading to amateur extra, and Sally, K6BUVQ, SEC, upgraded to advanced. George, W1HNT, pres of Katahdin Radio Club, reports a contact with a Georgia club concerning 50th anniversary of the opening of the Appalachian Trail; there will be a complete report here next month. As Section Manager, let me be the first to welcome the Pine State Amateur Radio Club on its application for affiliation, and I am looking forward to attending their first annual hamfest, June 6-8. The Blaine Section has elected the following: Pete, N1AKP, pres; Bob, K1M2B, VP; Irvin, N1AKP, Sec; Bud, K61KAP, Treas; Mike, K62EJ, Mem at Large; Activities Mgr, open Club meets at the Red Cross building, 524 Forest ave, Pltnd. Appointments: Walt K61ODT, ORS; Ken K1BEA, EC of Knox County; Ted W62ERT, EC of Hancock; Bob W61OJB, EC of Sagadahoc. Traffic: K61AJOJ 202, W61CBP 179, N1DA 89, W1SD 87, W62ERT 67, K61W 46, W1RWG 43, W1JTH 42, W1VEH 28, N1EJD 20, W1KX 19, W1GCB 16, KY1E 16, K61ODT 15, W1BMX 14, W61YBN 12, W1OTQ 7, N62K 6, K61CNG 2, PSHR: W61CBP 113, W62ERT 86, W1RWG 63.

NET	SESS	CHECKINS	TRAFFIC	MANAGER
Sea Gull	23	857	126	K1GUP
Pine Tree	28	320	111	N1AH
N1AHH-1 BBS (Jan)		1100	426	N1AHH
Aroostook E	4	59	—	W1YNYZ
CMEN (Jan)	9	163	—	W1WCV
RACES	4	65	21	W1RWG
Me Pub Svc	4	185	—	K6BUVQ
MPSN (Jan)	2	81	—	—

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 PSHR will make his annual pilgrimage to Aroostook City for FD at Presosco.

NEW HAMPSHIRE: SM, Bill Burden, W61BRE—ACC: K11M, STM: W1TN. This month may be remembered for the emergency on two highly significant actions regarding Amateur radio: the Novice Enhancement approval with its opportunities for the hobby and the distressing 220 MHz spectrum grab. NPRM! Both have stirred section members to action: the Novice Enh to prepare to welcome new members of the fraternity and the 220 NPRM to respond to the FCC with comments and facts. Are we training more new Novices? YES! Teachers in Concord and Claremont are working with students, many reports of one-on-one training, classes completing and classes just starting. K61LDS reports 7 grads from her class in Nashua with 4 more coming, W61UXA training 3 people during lunch hour at work, K61CJ has worked with several individuals recently who are testing. The effort is steady, but the demand to help is not. If you are interested, instructor availability in some areas-concord is most interested. With the arrival of spring come the Walk-A-Thons, Bike-A-Thons, and other public-service activities. Now we can get the Novices on the air on 220 and 10 M to work these activities! Good tactical net training for ARES! Congrats to Bob, N1CIR, and Claire, N1DRE, who were selected to as one of the Ham operator teams to support the American Lung Assoc. Trans American Bike Trek from Seattle, WA to Atlantic City, NJ. They will provide safety and comm support to the bikers during the trek. The NH QSO party was a great success with most club stations on air and many more calls heard this year. K61XO reports that the ECARA club in Manchester held it's first VU Exam and had 21 applicants with a pass rate of about 60%-tnx for helping guys Congrats to new CVFJA officers-Pres K1VNE, VP K61BGT, Treas K61KX, Sec N1EMF. Our newest club, the Souhegan Valley ARC has it's first class of officers Pres W1FJH, VP W61NXP, Sec K61JDS, Treas W1UPL; they are off and running! W61DSW will be giving a packet talk and demo at the April GBARA meeting. CNHARC provided comm support for the annual Fly-in at Alton Bay with 8 members working on the project. Also, club pres N1LT presented a program on Ham radio to the Lacma and Moultonboro CAP groups. This was the month for the NHARA state meeting. K11M chaired the meeting and we had a good club rep and section staff turnout (actually, I'd like to see more of the section staff attend?!?!). W61GXM is still working on his pro-

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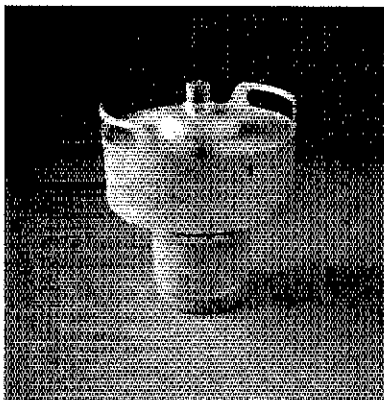
Ken Warren, Chief Engineer at KWAV reports that their 10 kW FM transmitter went on the air in November, 1972, equipped with EIMAC power tubes. The original tubes are still in operation after over 13 years of continuous duty!

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The prime considerations in any handheld transceiver are smooth operation, top-quality construction and performance, and long-run customer support. Initially, consider a unit that's comfortable to carry and operate, then review its less obvious and internal attractions. Extensive use of VHF and UHF bands, for example, always encourage high intermod immunity. That is, the ability to copy a weak signal without undue noises or squelch "falsing" when you're physically near other signal sources such as radio pagers, mobile phone relays, etc. Likewise, sincere factory-backed service is the single most important factor separating one manufacturer's products from others. **ICOM handhelds are proud pacesetters in all of the previously discussed areas: a reflection of ICOM's dedication to keep you communicating through all the exciting times ahead.** Three styles of ICOM handhelds are now available to fit your needs...

The new and exciting ICOM MICRO

(IC- μ ZAT) handheld has acquired immediate popularity, as it combines all of today's most respected assets in an easy-to-operate and extremely versatile package. Liberal use of narrowband filters plus high gain/low noise circuits ensure **maximum weak signal sensitivity, selectivity and intermod immunity.** Those designs, like all models of ICOM handhelds, are complemented by fold-out pc boards mounted inside a **steel window frame-type subcase** for physical protection and electrical shielding. The complete unit is enclosed in a high-impact case.

As supplied with its attendant BP-22 slide on/off battery pack, the ICOM MICRO (IC- μ ZAT) measures only 5.6 x 2.2 x 1.1 inches (H, W, D) and produces 1.6 watts output. Replacing that battery pack with ICOM's optional BP-21 reduces the transceiver's overall height to 4.6 inches while lowering RF output to 1.2 watts: the perfect shirt pocket or ladies' handbag companion. Alternately, substituting ICOM's optional BP-24 battery pack increases the IC- μ ZAT's height to 6.6 inches while raising RF output to 2.6 watts for fringe/remote area use. Assuming the ICOM MICRO's (IC- μ ZAT's) supplied 4-inch miniduck is then exchanged with a popular BNC-fitted gain antenna such as ICOM's optional $\frac{5}{8}$ wave whip, **the transceiver's effective radiated power increases above that of much larger five-watt units.** Mixing and matching accessories thus allows the ICOM MICRO (IC- μ ZAT) to "change face" on a moment's notice: a truly versatile transceiver!

Operating the ICOM MICRO (IC- μ ZAT) merely involves step-tuning any of its 10 memories to a desired frequency (even 162MHz NOAA weather!) using its top-mounted rocker switches. Each memory continuously retains its

last selected frequency. The ICOM MICRO's (IC- μ ZAT's) transmitter offset is selected by a rear panel "simplex/+/-duplex" switch. If "odd split" operation is desired, hold the display's nightlight button, switch the transceiver on, then step-tune the .600 (kHz) reading to any desired separation. The ICOM MICRO's (IC- μ ZAT's) PL tone frequencies are standard and can be selected via a mini DIP switch inside its battery retaining plate. A 440MHz MICRO, the IC- μ 4AT, is also available for 70cm enthusiasts.

ICOM's IC-02AT, IC-03AT, IC-04AT and IC-12AT transceivers continue their reign of supremacy as today's most deluxe and full-featured handhelds. These advanced technology units include direct keypad operation, memory storage of frequency, standard or odd repeater splits plus PL tones. Three scanning modes and priority channel operation "round out" these popular units. Their operation may be simple or sophisticated as personally desired and/or expanding with your future interests. A pocket guide is also included with these top-quality units for initial operating convenience.

ICOM also continues producing the ever-popular and easy-to-operate IC-2AT, IC-3AT, and IC-4AT units. These "basic style" handheld transceivers are perfect for budget-conscious amateurs desiring to expand their VHF/UHF horizons using top performers of time-proven design.

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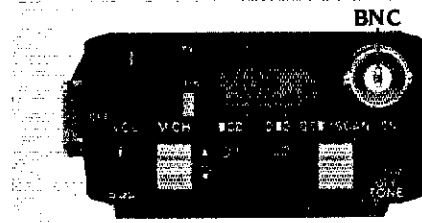
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programmable memories, transmit offset capability from the back panel including odd offsets, an LCD readout on the top panel for easy readability, up to three watts of output (optional), 32 built-in subaudible tones AND wide-band receive coverage from 138 to 162.995MHz in 5kHz steps for MARS

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Personalize your ICOM MICRO. The MICRO utilizes most existing ICOM handheld accessories, plus it hosts a new line of versatile accessories including the BP-24 2.6 watt high-power battery pack, BP-23 long-life 1.6 watt battery pack, BC-50 desktop rapid charger, and a variety of carrying cases.

See the ICOM MICRO at your local ICOM dealer. Play your cards right with ICOM!

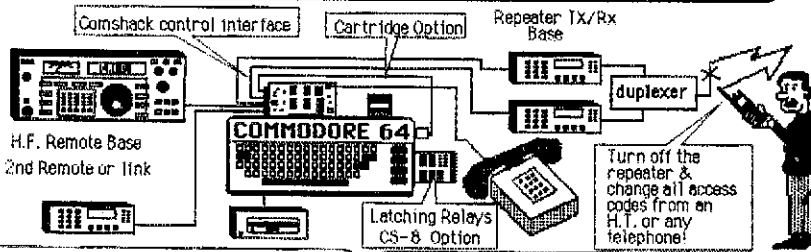


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- *Generates random code practice @ any speed with voice readback after each 20 random code group!
- *Set CW speed/pitch/courtesy beep from your H.T.
- *Input up to 22 vocab words & letters as ID or mail box message @ speed dial rates from H.T.
- *Easy 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 1 (row & col. control card)
- *10 H.F. Memory channels/enter or recall
- *Automatic USB/LSB/FM/AM mode select
- *Scan up/down, fast, or 100hz steps
- *Control CS-8 relay/latch/master reset /Status
- *H.F./V.H.F. Monitor only or iX 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 1 \$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

posal to the FCC for "instant" licensing for Novices - is this an idea who's time has come? Happy 80th birthday to Jim, W1FZ. Jim was first licensed in 1952, has been a GBARA member for over 50 yrs, and still teaches Novice classes. Traffic-NH had 100% on FRN again in Feb- Commitment and perseverance of a few - CAN YOU HELP? Well, John, W1TN, was on vacation this month, so I did the traffic report - any errors are mine (come home, John!) The tic count on WB1DSW is all via packet and other rpt's are now indicating packet activities on NTS. Traffic: GSPN 153, GSPM 234, TSEN 28, MSOVT 32, MCEN 6, W1PEX 588, N1CPX 426, W1FYR 294, W1FHB 210, WB1DSW 207, N1AKS 203, N1NH 139, KK1E 109, K6JX 99, W1ALE 95, WB1GXM 93, KA1TQY 71, NE1J 65, WA1YB 62, K1PQW 61, KA1LMR 51, KA1LBW 44, KA1NXP 42, K1IM 41, K1QIC 22, W1TN 13, KA1HPO 10, N1DQA 5, (Jan) KA1LBW 19

VERMONT: SM, Frank I. Sutor, W1CTM - ASM: KO1R, STM: AET1, SEC: W1TQY, PIC: WA1YDY. Club station construction/operating activity is on the increase and has added to our section ability to provide public-service communications. Twin State Radio Club has a complete station at Montpelier Museum of Science in Hanover, NH. The station is operated on Saturdays (1200-1500 L) and club meetings are also held at the museum - contact N1EMF. The VT Emergency Management Station in Waterbury is nearing completion thanks to CVARC - contact W1AIM. The BARC station at the Burlington Red Cross now has an ICOM 271H 2-meter rig and is open during M-F (0800-1600 L) plus weekends - contact W1CTM. Clubs are urged to contact local Red Cross chapters for use of facilities. CVARC is working on a tone alert project - contact N1PC for details. Results of VT QSO party will be available next month. Do you know who our slow ham radio was? KT1Q found out when he contacted K6YB (tech-up) - checked his old log! SEC (W1KRV) now has 138 ARES members statewide and has appointed N1COE as VT Phone Emergency Net Manager. Check into this net for weekly ARES updates on Sundays at 1800 (L) on 3967 KHz. 1-87 issue of Traffic Cell has an article on our own K2KBT (Joe). Milton Hamfest set an attendance record (280) and also upgrade the following: Extra: KD2EM, KD2EN; Advanced: KA1PEB, WB1EY; General: KA1QV and WD2AKP; Tech: KA1KL, KA1PLO. Novice/Tech activity is gaining momentum with the following nets: BARC ARES Net on 28.35 MHz (USB) at 1000 L on Saturdays - contact N1COE; NH Novice Traffic Net on 28.4 MHz (USB) - contact KB1XJ; NH Novice Ham Net on Mondays at 2030 L on 28.5 MHz (Novice) 146.85 MHz (tech-up) - contact WB2JL; VE exams: 5-2 (BARC-WB2JL) and 5-18 (CVARC-K1HK). Feb Net report: CAR 24 564 39, GMM 24 452 24, VPHN 4 79 7, VTN 28 242 203, TSEN 4 47 11, BARC SEN 4 90 0, Traffic: KT1Q 693, WA2SPL 387, WA1JWV 149, N1DHT 125, K2KVQ 98, AET 72, WKRV 42, NB1A 19, W1OAK 14, K1IK 6.

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD - STM: KA1EXJ, TC: KA1JJM, PIO/ACC: K1BE, SEC/SGL: WB1HH. Field Day preparations have begun by most of the clubs. NOBARC has KA1NYD and N1EIK chairing their preparations and N1ABF and WB1HB doing the honors for MARRA. MARRA has already reserved Mt. Wachusett. Looks like they're serious. CMARRA, NOBARC, Mt. Tom ARR and MARRA have code and theory classes in progress for various classes with "Bimmers" for the "new kids on the block." Congratulations to QVARC for their affiliation with the league. Glad to have you aboard, Mt. Tom ARC is very active and has applied for Special Service Club status. WMSN has changed frequency to 3562 at 1930 hrs local. Traffic: W1UD 187, KA1EXJ 92, W1KK 80, N1FJ 79, WB1HH 44, W1SJV 28, KA1IFC 89, KA1EKQ 55, W1ZPB 10.

NORTHWESTERN DIVISION

ALASKA: SM, Jim Moody, Jr., N1CZ - SEC: KL7JIM, STM: KL7T, TC: AL7L, NMs: KL7GID, KL7AF, KL7JKW, DECs: KL7WM, KL7JFT. Now that the nice weather is upon us and hard to stay indoors, it is time to ensure that the traffic nets maintain your support. Take some time to check-in, get acquainted, and handle the traffic. The Anchorage ARES/RACES net meets on 147.90/30 at 0500Z Fridays and the Mat-Su ARES net meets on Mondays at 0500Z, also on 147.90/30.

Alaska Pacific	14292	1800	statewide
Sourdough Wx Net	3915	0330	N, Alaska
Motley Group	3933	0800	statewide
Seasaw Net	3900	0500	SE Alaska
Snipers Net	3920	0300	statewide

IDAHO: SM, Don Clower, KA7T - SEC: N7BI, STM: W7GHT, PIO: WB7PFO. I would like to welcome KA7ENV, John from Castelford, as the new DEC for S. Central Ida. and N7GUC, Gordon from Twin, as the new EC for Twin Falls. If you would like to become involved in ARES and live in the Twin area please contact Gordon or John. The Ada county ARES group met on 2/26 and are going to be involved in the state nuclear drill in Mar. Kootenai Area ARES activities: K7FX, pres; N7IOJ, 1st VP; N7GPM, 2nd VP; also, a new voice was elected to the board. VE exams will be given in Boise on 4/25 & 5/30 at Borah High at 9:00 AM. The state ARES net meets on Sun. afternoon at 8:00 PM MST on 3.990 MHz. Net Reports:

NET	FREQ.&TIME	SESS	QTC	QNI
ID CD	3.990 8:10am m-t	20	26	710
Farm	3.935 7:00p	28	18	2208
IMN	3.637 8:00p	27	62	273
NWTF	1.6936 98 7:30p	23	47	937

Traffic: W7GHT 287, N7BHL 161, NW7K 54. General: For your local nets consider using 10 meters, plus that Novices have voice privileges on ten meters. 73s, Don

MONTANA: SM, Les Belyea, N7AIK - K0PP has been elected as the Montana Section Manager, so, newsletter editors, please see that he is put on your mailing list. The Packet and Repeater Klub from Libby has applied for ARRL affiliation. 100% of the members of this group are active and members. Believe this is the only one in the section. KC7AA (Glendive) has agreed to serve again as the LYARS president. N7GKP of Helena has made a multistate listing (map) of packet repeaters, send a SASE for a copy. Many members from the Great Falls Area AFC are taking a CPR course from the county AFC.

NET	SESS	QNI	QTC	MGR
MTN	28	2074	120	KF7R
IMN	27	273	62	WA7GQO
OREGON	4	58	1	K0PP

OREGON: SM, Randy Stinson, KZ7T - STM: W7VSE, SEC: N7CPA, PIO: KC7YN, SGL: KA7KSK, ACC: WB7TWD, RFI: AK7T, OO: N7SG, 5TC: N7EIM. The Salem Hamfest was a great success. There were more people than last year and they had more seminars than the year before. This was the first hamfest that people had not to miss. Rush Drake, W7RM, the new Northwest Division Director. The next big ham convention in Oregon will be Sea-Pac at Seaside on May 30-31, 1987. Packet is getting bigger and more interesting. On February

Audio Blaster for IC02AT/IC04AT/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!

Model AB1-\$19.95

12V DECODE-A-PAD RS-232 123456 789ABC

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/IC20/C128; works with all computers!

"DECODE-A-PAD" Model DAP \$89.95

Model RAP Radio under control

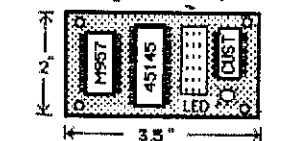
DIME Keypad Rows & Columns Control-Two latches.

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

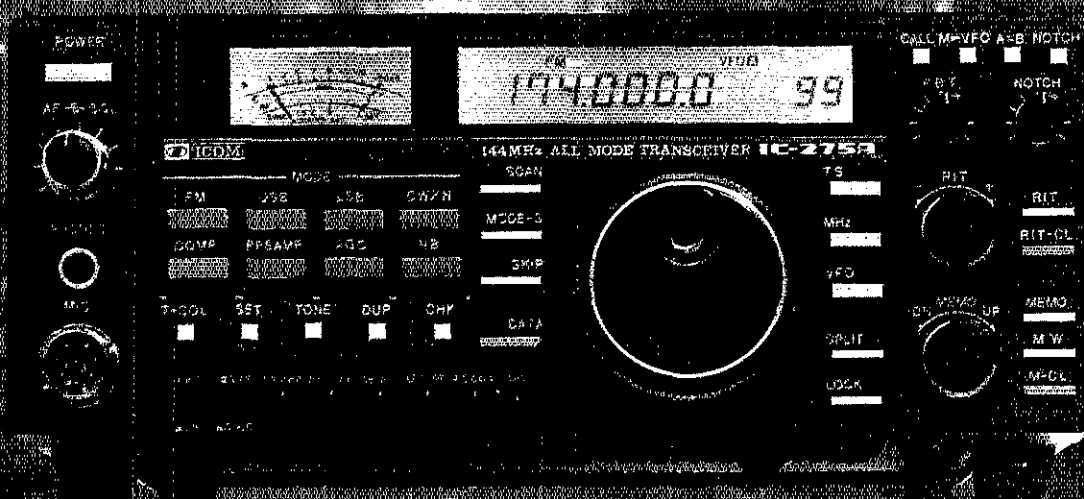
M957 Teltone 5 to 12v 15ma

(SSI-201 replacement)/Inc 3.58 Mhz Crystal/ 22 pin socket, Data Sheet, Sample circuits, decoder specs, all 16 touchtones, BCD/HEX.

No filters required

Model TTK \$22.95

UHF/VHF Base Station Transceivers



ICOM IC-275 THE VHF SUPERSTAR!

- All Mode Operation: FM, SSB, CW, Packet
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- Packet Compatible (with front panel DATA switch)
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- DDS (Direct Digital Synthesizer)

When you're ready to experience all the multimode excitement 2 meters offers today's amateur, you're ready for the glamorous new IC-275. Its FM capabilities are unlimited, its wideband receiver coverage (138 to 174MHz, Tx 140.1 to 150MHz) includes public services and NOAA weather bands, plus CAP and MARS, and its SSB/CW operations are an OSCAR enthusiast's and VHF DX'er's delight. No other VHF transceiver is comparable to the IC-275 in features, performance, reliability and ease of operation.

Outpacing the Competition. The IC-275 includes dual VFOs, 99 tunable full function memories, true passband tuning, crystal resonant notch filter, noise blanker, built-in SWR bridge, semi or full CW break-in, multifunction meter, velvet-smooth tuning knob and an easy-to-read amber LCD readout with variable backlight.

Four Scanning Modes. Full spectrum, programmable limits, mode scan and memory scan with selectable lock-out (scans 99 memories in five seconds!).

An FM'er's Dream Rig. Separate knobs for band tuning and memory selection. Standard repeater splits built-in; odd splits programmable. Includes 32 built-in subaudible tones, and actual subaudible frequency is displayed. Unit supplied with HM-12 up/down scanning mic and DC cord.

It's Packet Ready with rear connector for audio input/output and front panel data switch that reduces switching time to less than 5 ms and mutes the mic.

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Exciting New Options include a tone squelch unit, speech synthesizer, an OSCAR module that allows tracking with a companion IC-475, FL-83 500Hz 10.7491MHz CW filter and an AG-25 mast mounted preamp.

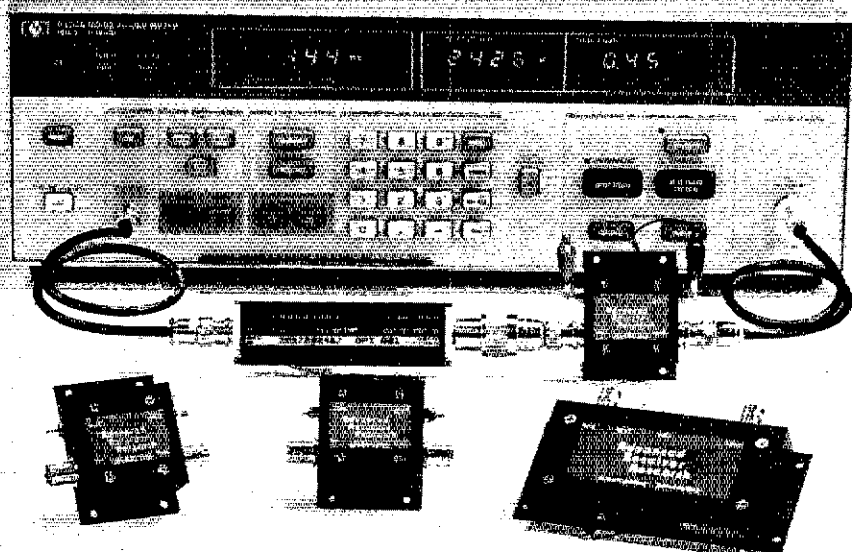


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P28VD	28-30	< 1.1	15	0	DGFET	\$29.95
P50VD	50-54	< 1.3	15	0	DGFET	\$29.95
P50VDG	50-54	< 0.5	24	+12	GaAsFET	\$79.95
P144VD	144-148	< 1.5	15	0	DGFET	\$29.95
P144VDA	144-148	< 1.0	15	0	DGFET	\$37.95
P144VDG	144-148	< 0.5	24	+12	GaAsFET	\$79.95
P220VD	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

Inline (rf switched)						
Receive Only	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
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	\$59.95
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
SP432VDA	420-450	< 1.2	17	-20	Bipolar	\$79.95
SP432VDG	420-450	< 0.55	16	+12	GaAsFET	\$109.95

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13th at 6:00 PM local time Tom, N7CPA, who lives in Newberg, Oregon accessed the N4CCQ Worm Hole Mailbox in Silver Springs, Maryland. He went through 7 digipeaters to San Jose, California linked via a satellite to the N4CCQ Mailbox. Tom did this on a Handheld hooked to an 11 element beam. We think it was one of the first cross country links in the Northwest. We have two new appointees Randall Schaub, W7AWJ, will be Official Bulletin Station and Roger Stevaert, K7RXV, will be Assistant Technical Coordinator. Traffic (P = Packet): W7VSE 525, N7BGW 247, W7B7VSN 127, N7FXJ 115, W7FBP 44, N7ELF 38, KM7R 36P, N7CPA 25P, KA7EEE 22, KA7AD 14, W75ZM 10P, (Jan.) W7ODG 54.

WASHINGTON: SM, Brad Wells, KR7L—STM: KD7ME, SEC: KA7INX, OOC: N7DVR, ACC/ASM: KC7PH, SGL: KD7AC, BM: N7CAK, TC: W7BUN, ASM: KD7G, The W7DXC Totem Tabloid states W7LVI was the first from this Section to garner the DXCC Golden Jubilee Award. Morris had it by the third week in January. All CW, N7FSW worked it by February 10, all SSB, N7HHU, the Yakima County EC, has a Local Memorandum of Understanding between ARES, Yakima County Sheriff's Dept and DEM, KA7VEE, the Snohomish County EC has an ARES CW net on 21.125 MHz at 7:00 PM each Wednesday. Both Spokane County ARES and Kitsap County ARES are running nets around 28.400 MHz to encourage Novice operators to participate. Thanks to W7RIM, the Gonzaga Prep ARC received a grant from the ARRL Foundation to help install an OSCAR satellite station. V.E. testing: North Seattle Community College May 9th, Room 3343 at 10 AM; Mike & Key Club at the Good Neighbors Bldg. in Renton May 16th at 1:00 PM. Plan on attending the Central Washington State Hamfest by W7AQ Yakima Amateur Radio Club. Hours: Saturday 9 AM-5 PM and Sunday 7 AM-3 PM at the Central Washington State Fairgrounds in Yakima. Talk-in frequencies of 146.81 and 146.85. Sessions on traffic handling and emergency communications in addition to a luncheon meeting for EC's and DEC's. More information, contact KA7LJQ or KA7ZMR at (509) 678-4798. The Radio Club of Tacoma was officially renewed as an ARRL Special Service Club. Congratulations to Bob Huntsman, N6CHU, of Spokane and Dick Miles, K7RNZ, of Bremerton on becoming Assistant Technical Coordinators. The Kitsap County ARES was called out in February to search for a lost senior citizen and a professional job was done by all. 1986 year-end ham census for Washington: Extra-1206, Advanced 2983, General-3687, Technician-2567, Novice-2542, Total amateurs-12988. Sorry to report KA7JUB was resigned as EC Island County. His replacement is KA6ITF, Puget Sound area. Don't forget the Technical Net by W7JWJ on 146.52 MHz at 8 pm on Monday-Wednesday-Friday. Kitsap ARES used a portable repeater to provide communications for the Chilly-Hilly Bike event involving over 1500 people. Help is needed for the Special Olympics at Fort Lewis on May 29-31. Contact K6DOW at (206) 271-5314 to volunteer. Clubs: Auburn AHC meets 4th Monday at 7:30 PM. Contact Keith Carlin, N7ACW 886-1108. Sea-Tac Repeater Group meets 2nd Saturday at 8:00 AM. Contact Gary Hart, W7WWJ 255-7958; Vashon Island ARC meets 3rd Monday at 7:30 PM. Contact Ward Silver, N9AX 567-4160. Traffic: K7RZ 167, W67WQW 148, W7GCBN 129, N7GGJ 125, KR7E 104, W7GC 92, W7GB 84, K7SUX 65, N6EQZ 63, W7APS 32, W7LBK 32, KA7FMD 28, W7IEU 8, N7GDW 7, N7FXM 2, Category 2: KD7ME, KR7L.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, N6DHN, EC: W6LKE, STM: K6APW, OOC: NY6Z, TC: N6AMG, NBARA new officers are W6BYY, Pres: W6JPA, VP: N6GHR, Sec: W6CN, Treas: W6JYJ, N6FUS, KA6JPD, Dir: MDAHC is celebrating their 40th year. Members W6LKE, K6ZM and K6TI met with the city of Danville to steer them clear of a 25-foot tower height ordinance. EBARC was named the Pacific Division's 1986 Large Club of the Year. Congrats to this very nice group. Their Sister City Ham Club in Shinjima, Japan, sent very nice letters commemorating the 25th year of their affiliation. Officers for 1987 are N6IJJ, Pres: W6CDL, 1st VP: K6JEC, 2nd VP: N6NVD, 3rd VP: W6CO, Sec: W6JW, Treas: LARK's newsletter is now available on the W6YHU-Y BB. Their repeater fund has gone over the top, and the new controller will soon be installed. HRC's new officers are N6MON, Pres: K6GMH, VP: N6MQQ, Sec: W6BLG, Treas: BARC's new officers are KA6BPP, Pres: K6EIA, VP: K2GMV, Sec: N6ERR, Treas: Traffic: W6WOM 187, W66DVB 123.

NEVADA: SM, Joe Lambert, W8IXD—Many Nevada hams took advantage of Sporadic E Feb. 15 to get new states on VHF. 1270 MHz actively picking up in L.V. area. W8IXD pushing campaign in Nevada to light NPFM 87-14 re 220 MHz. K7HRW and W8BGP covering Northern Nevada. WADG reports Western Airline in Reno on 147.30 Tues. & Fri. 5:45 PM. Airc in L.V. area on FAX net 145.39. Mon 7:30 PM and LVRAC net, 146.94 on Tues. 8:00 PM. LVRAC 96-94 repeater now in great shape. Las Vegas hams supporting the multi-dept. police footrace from Bakker, CA to Las Vegas with communications (coordinated by N7CXD). K7HRW classes big success with 8 of 10 students passing Novice test 2/12. 4 of these passed Tech 2/21 LVRAC's Feb. mts. featured a "Show-n-Tell" program with members bringing home brew equip. March mtg. featured a video program on Field Day. K7ZHD broke his arm and is recuperating at home. Best wishes for a speedy recovery.

PACIFIC: SM, Army Curtis, AH6P—Aloha and hafa adai to all of the Pacific. Congrats to AH6HB on receiving Boy Scout's Silver Beaver Award. Maui ARES members provided public safety comm for Maui Marathon, including AH6AM, AH6AZ, AH6CU, AH6GP, AH6GQ, KH6H, KH6HH, KH6HM, KH6SO, KH6IU, KH6XS, N6HPO, N6GVE, W6H6FT, W6H6LW & W6HC. EARC members K6CZD, KH6FD, KH6TL, N6HEE, KH6OV, N4ESX, KA4INK, KH6BIO & W4X4 provided comm reports for the Chinese Lantern parade, then 2 days later was up long before crack of dawn to support the Great Aloha Run. Participating were KH6OV, KH6FD, N6HDY, KH6UM, WAZ6FH, KH6WG, KH6NJ, N5HRN, KH6JCA, KH6HJA, KH6CZ, N4ESX, N6HE, KA4INK, KH6BIO & W4X4. Congrats to all. Are you getting involved in your groups activities? The EARC net reports QTC 27, QNI 404. Look for the net now on 146.80. Traffic: KH6S 50, KH6H 31, N4ESX 23, W4X4 6.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—ASM: N6JTJ, STM: W6WJZ, SGL: N6IG, ACC & TC: W6RFF, BM: W6BFX, SEC: NR6A, DEC North: KF6KJ, DEC Sac Metro: W6CFQ, DEC M. Locs: N6AUB, DEC Cent: K6BNS SECTION NET. First Sunday each month, 8 PM., on 146.085, input up W6RFF. There are several changes in the Section Staff to report this time. From the Yuba/Sutter area, Ron Murdock, W6BFX has taken on the job of Bulletin Manager for the section just days after accepting an appointment as an Official Bulletin Station. What he needs now are more OBS assistants to help him get the news out. Section Emergency Coordinator Deane, NR6A has split the Sierra Foothills District, forming the Central Sierra District and the Mother Lode Counties District. Taking over as District EC for the former is Dave Carlson, K6BNS, and as DEC for the latter is Ron Monet, N8AUB. Nevada County has a new EC, Jim Heath, K6BSX,

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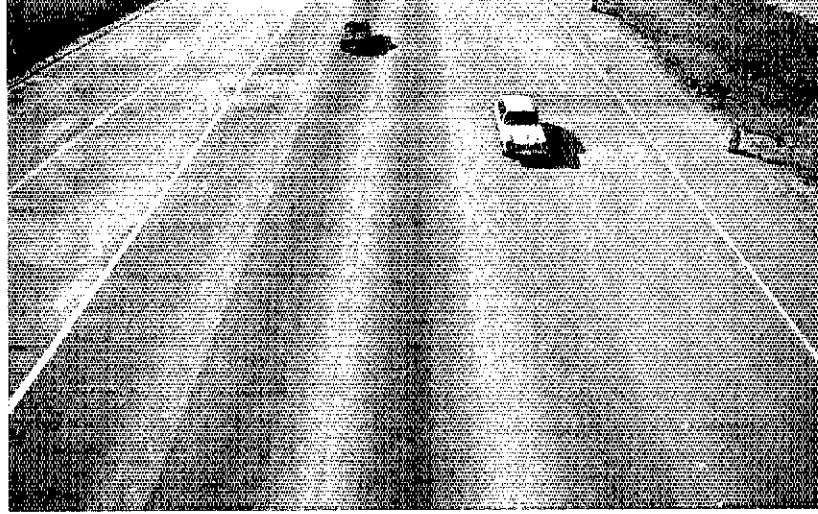
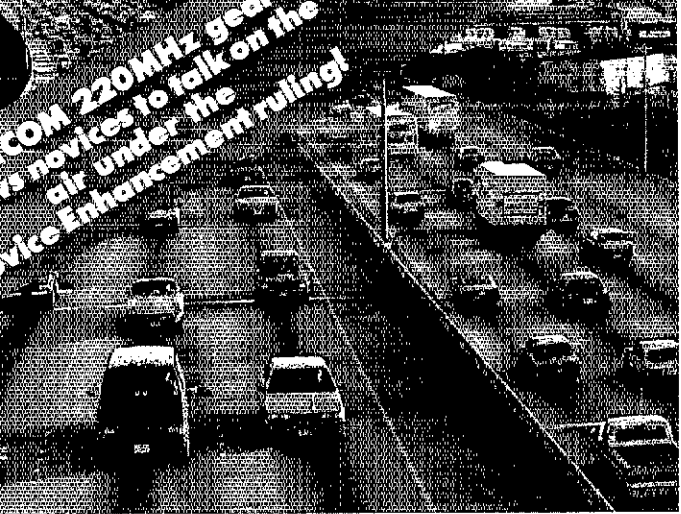


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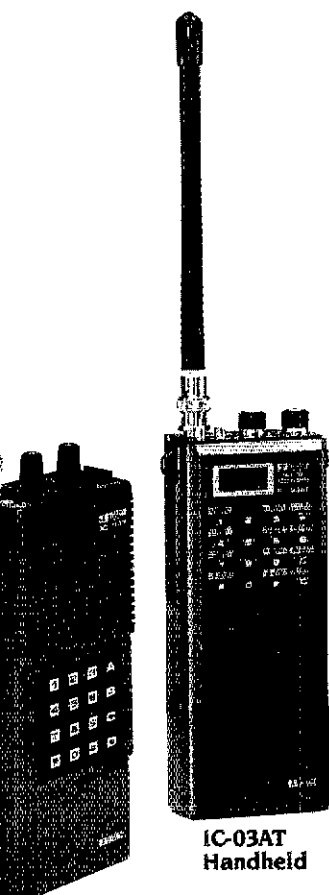
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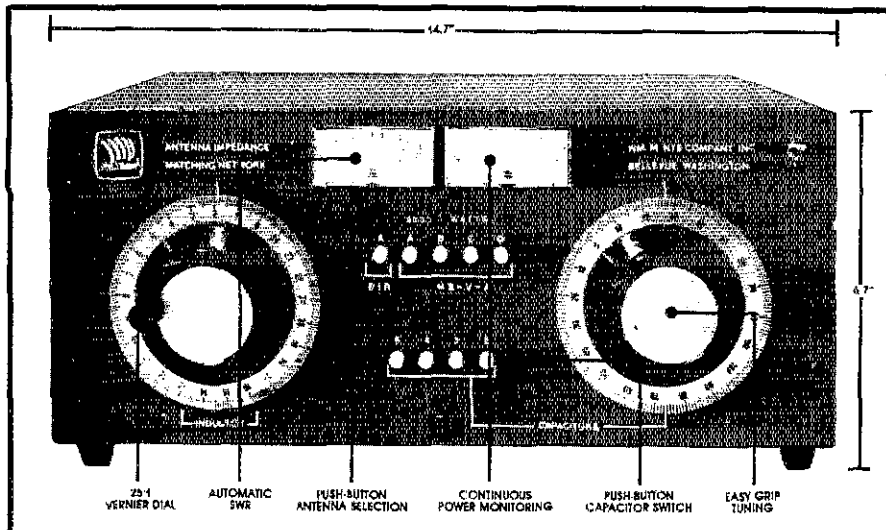
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and in Amador County the new EC and RACES Radio Officer is Bill Anderson, W6GN. Taking over Bill's spot as AEC is Bill Ryland, WA6VZG. Soon I hope to be able to announce a new Official Observer Coordinator and several new OOs to help the Novices and Technicians with their new privileges. We now have several going through the approval process. Traffic: N6CVF 302, N6LUY 251, K6SRF 91, WA6WJZ 70, WA6ZUD 76, WD6BZQ 42, K16GW 18, WB6SQ 8.

SAN FRANCISCO: SM, Bob Smith, N6AT—Novice Enhancement is Law. Now all Novice and Tech amateurs can use Packet, SSB, etc. What a chance for the younger "computer-types" to be recruited into amateur radio. If you're not helping in a novice class now, why not start one? Need some help, contact myself or your local club training co-ordinator. N6JB-1 is now about 2/3 as high, so the Eureka Packeteer's are looking for a higher site to complete the link to Eureka on 148.0 MHz. SCRA has 150 cards available for its members, see N1AL for info. THE SWAP MEET at Sebastopol is on for Sept. 19. REXDA has again challenged SCRA in the "Great Field Day" Cup, how will read the rules better this year? Need to confirm WAS, 5BWAS, VUCC, see Steve, WA8LY of SCRA, he can help you. HP in Santa Rosa has 19 members in the Company Club, with almost as many radios at the new Club station purchased by HP for their use. Anyone have any OLD x-mitting Tubes for loan or donation? See Al, K6DIA, in Crescent City. K6UZP wrapped up the Golden Jubilee DXCC award in the SF Section on 2-10-87. Traffic handler's in the section need help, see W6RNL in the North and KK1A in the South if you are interested in NTS, Packet, etc.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DDP—SEC: W6BU, STM: N6AWH, TC: WA6EXV, ACC: W6DPD. Asst. SMs W6TRP and K6KY, 1987 officers of the Stockton-Delta ARC are: Pres KA6LJ, VP WB6SJJ, S/T WA6WRP. The club meets the 2nd Wednesday at UOP in Stockton. The Local ARC has 2m FM simplex net on 148.335 MHz each Tuesday at 1830 hours. WB6LGM and WA6LGD are SILENT KEYS. WA6EXV and WA6QYR earned VUCC on 10 GHz. KA6ZRK is N6OPY. N6MXF has a TR 430. N6EMW, N6EWZ, and N6LOO are Advanced, K6BPIQ, K6BPKH, N6ORI, and K6B6EA are Tech. K6BPKJ, K6BPKI, K6BPKG, K6BPKK, K6BPKL, K6BPKM, K6BPKN, and K6B6PVC are Novices. It is time to begin planning for Field Day, June 27-28. Traffic: N6MCY 69, N6AWH 38, WA6YAB 22, W6DPD 12.

SANTA CLARA VALLEY: SM, Glenn Thomas, W68W, SEC: WA6OCV, TC: WA6PWW, STM: N6JLJ, PIO: W68NLA, ASM: N6JQJ & N68S, ACC: W6MKM, BM: (vacant) OOC: (vacant). WA8HAD is teaching two prospective novices and says, "Now with enhancement things change again." N6JLJ is assembling a class of numerous potential novices, mostly active technical professionals. Andy (our STM) is also planning to establish a 220 MHz traffic training net to help novices get integrated into plus service communications and provide them with a good way to improve their CW skills so that they may upgrade. Experienced NCS stations are hereby solicited...our ASM for training, Dave N6DQJ started a section training net. It is heard on the K6FB (145.45), W6BADZ (146.115), and N6ITW (440.1) repeaters. Any other systems that are interested are invited and welcome to link in also. The net happens at 8:30 PM local time every Tuesday, and has a "Larry King" radio talk show kind of format where a "guest" speaker is questioned, first by Dave, and then by others on the net, concerning a subject of interest to us all. The first guest wuz very true, and the hot topics were the novice enhancement and the latest grab for our 220 MHz band by land mobile. Other subjects planned for the future include packet radio for beginners, SW WAFR, traffic handling for beginners, and others. Dave has done one heck of a good job on the ERI, and now on this net... Sharon N6MWD and W6WNI gave an excellent presentation on the FINDER program to Santa Clara County EC's and key people. It was a very productive meeting as lots of info flowed in both directions! A hearty "well done"!!!. Kit WA6PWW, our section Technical Coordinator spoke at the Gabilan ARC on VHF contesting...the FARS group went on a tour of the National Weather Service facility in Redwood City...EMARC heard N6N0TV/WA6IXT on MARS (remember MARS?)...the SLAC ARC is getting involved in emergency communications...social thanks to WA6PWW, N6KJ, K6BBA, W6MILC, and N6OIM for helping to create an example of formal comments to the FCC on the 220 grab for distribution via packet radio (and other means)...for all of you who send monthly reports, ECs, ORS's, etc, the new due date for your reports is now the middle of the month each month. This is to give those who need to digest and summarize a bit more time to do so...FIELD DAY is next month, it's not too early to start planning! PSHR: W6NJR, K16AP, OO reports: K6BFPW Traffic: W6YBV 236, W6KJZ 94, N6JLJ 35, W6PHI 21, K6SXXW 14, K6B1WG 10, WA8HAD 9, (Jan.) W6YBV 206, K6SXXW 15, WA8HAD 8, W6PHI 3, K6B1WG 2.

ROANOKE DIVISION
NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W, STM: K4NLM, BM: K4RWV, ACC: WC4T, PIO: WA4OBR, TC: K4ITL, SGL: KE4ML. As this report is for May QST, just a reminder that Field Day is one month away. Make your final plans now to participate in the largest League event of the year. Send SM a radiogram of number of club or group participants as well as number of ARES members present and send in ARRL message format. Look forward to your reply. Got very nice report from our new OOs AA4TW and WU4S. ATC WA5DJJ advises that he is on packet radio from the rare mountain counties of NC. Also advised that club is more active and presenting a book on amateur radio to school. League now has the Archie Funny Book for prospective Novices. Make contact with a school science teacher and start a Novice class. Congrats to the Novices on their new privileges. TC K4ITL reports that ice storm did major damage to the link repeater system. Hopes to have back to normal in 2-3 weeks. SEC AB4W reports that Sherron Harris Nuclear Plant exercise went well and lot was learned. He advises that Amateur Radio will play major part in their plan. Have been advised that tactical communication will be needed for the NC Olympic Games this summer. RARS and Cary Clubs coordinating the effort. BM K4RWV and AB4S giving talks and discussion on packet radio for next several months on the link repeater system. Any comments or suggestions, mail to K4RWV or this SM. League Planning Meeting is May 18/19 in Roanoke. VA and topic will be Radio Clubs. Make your plans to attend NOW. WA4MC HAM CHATTER and WA4UQC report Silent Key: N4AQM. Congrats to our STM K4NLM on his retirement and being able to enjoy ham radio to its fullest. SGL KE4ML is keeping careful eye on legislature for any bills being introduced concerning amateur radio. VECs reporting numbers up for hams upgrading with the recent rules changes. Good luck to all. Traffic: K4NLM 343, N4JL 336, WB4HFR 216, K4IWW 201, AA4MP 182, AB4Y 140, KA4EYF 137, KA4TL 122, WD4HTE 118, AA4TE 80, K4GI 73, K4YV 71, WB4WIL 56, K4SWN 48, N4MMIM 38, WD4MFD 37, AK1E 36, NE4J 35, N4JRE 30, WA4HF 28, WD4DQY 26, K4F4L 25, N4CJ 21, N4LUO 21, WA4MNR 20, K4JDD 17, WD4RMC 13, WB4CYN 12, WD4EQK 10, KA4FOY 8, NT4K (Jan.) AB4Y 146.



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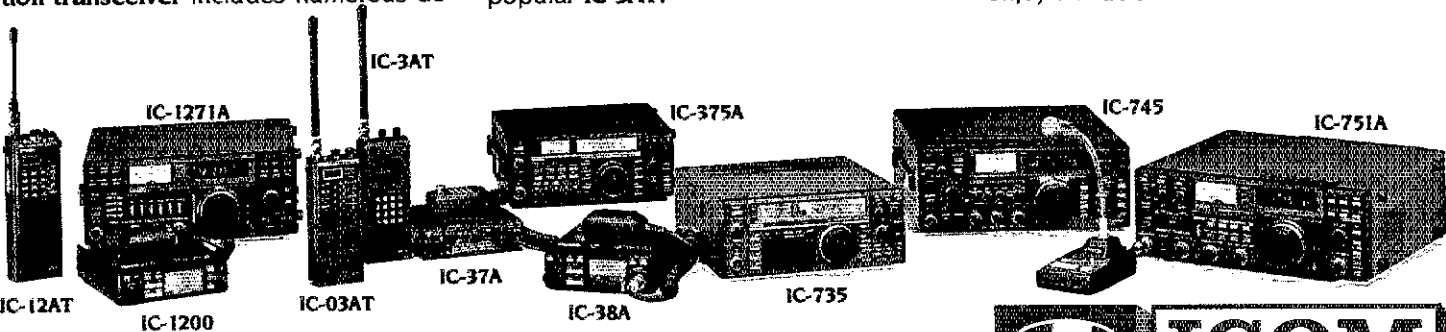
lux features and is expandable with your future interests. FM mobiling pleasures begin with ICOM's new 10 watt IC-1200 which is easy to install and operate. Every amateur enjoys handheld portable operations, and ICOM's deluxe IC-12AT handheld is ready to go.

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SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ—Use the Public Service Reporting Form! As we function in our amateur radio activities day in and day out, we usually do not stop to document and report the public service nature of our ventures. ARRL prepared the Public Service Activity Reporting Form (FSD-157) to make your reporting easy. This form is designed for quick completion by the project leader. When your club, net or group is involved in a communications emergency, alert, special exercise, test, drill or other communications activity including ARES exercises, be sure to report the details on FSD-157. If you wish, send the completed form to me and I will forward to HQ—or send it directly to HQ with a copy to me and the SEC, K4SUG. If a copy machine is not close, use three forms and carbon paper. Blank forms can be obtained from the SEC or me, if not available locally. If you do it, report it! Traffic: K4ZN 228, W4ABZ 114, W4ABZ 88, K4ALRM 65, WB4UDK 66, K4AYEA 45, W4OKT 36. Nets (Spot-Freq): W4SCS 6541/933, GPD2MN 3861/464, BR2MN 2936/122, YORK 2890/479, Carolina Lancaster 941/82, State Line 251/11.

VIRGINIA: SM, Claude Feigley, WB3ATQ—STM: KBWAT, SEC: N4EXQ, ACC: NT4S, OOC: W4HJ, BM: AB4L, TC: WB4MAE, SGL: W4UMC. A complete listing of Section NT5 nets can be found in last month's QST. Please note that the Section has a new SGL with Frank Brooks, W4UMC accepting that appointment. Frank will be keeping watch on any legislation by the State government that would impact our operations. REMINDER! The Roanoke Division Planning Meeting will be held at the Sheraton INN, Salem, Va., May 16-17. Room reservations are to be made direct to the Sheraton. Meeting reservations are to be made to Ronnie Bratton, RVARC, Box 2002, Roanoke, 24004. Every club should have a rep attending the important meeting, as well as all interested ARRL members. This is your chance to be heard. Wendy, the daughter of WB4PNY, and her husband, Ed, saw a novice with the call KB4WVK. The radio family would like to have their photo in the CQ Novice column. Lots of ATV activity in Lynchburg with N4NCC, KB4ILD, AA4UM, KB4MPX, WB4ONL, and WB4ASE active and in Northern Va. Many stns are using their ATV repeater. Congrats to the Shenandoah Valley Amateur Radio Club on becoming the Section's 6th Special Service Club and to the Richmond ARC on having their appointment renewed. N4EXQ, SEC, reports WA4QVW as EC for New Kent County. KB4PW reports the Roanoke ARES had a traffic training operation lasting 3 days at their Field Cross Center, operations were on both HF and VHF with 10 ops handling 231 msgs, their SKYWARN net was activated by the National WX Service club to flooding condx on Feb. 28 with N4JED and K4AYUY continuing outstanding service. As of this date, Mar. 8, only 8 1987 Annual Reports have been received from the Section's affiliated clubs, please contact the ACC or the SM if your club has not received their report forms. VE exam schedule: May 2, South Peninsula ARC, Hampton, contact N4LIC—May 9, SVARC, Middletown, contact NC4B—May 23, Woodbridge ARC, contact Don Floss—May 23, Richmond ARC, contact W4AJ—June 6, Portsmouth ARC, contact WB49AB—June 20, Old Va. Hams, Manassas, contact W4PVA. This was a record breaking month with 50 stations submitting traffic reports this is the highest number of reports received during my term as SM. The total traffic count was 8100 with N4GEG, K4JST, K4B4W, K4DOR and N4EXQ making BPL. K4JST's total of 725 was done largely on HF AMATEUR and PACKET handling Fla. State Fair etc. Enjoyed seeing many of you at Manassas but missed many in the crowd crunch. Hope to see many of you at the Division Planning Meeting, May 16-17. DXers why not try for the DXCC Golden Jubilee Award, see Sept. 1986 QST for details or contact the SM. Traffic: N4GHI 865, K4JST 775, N4EXQ 644, KB4PW 602, K4DOR 578, W3ATQ 484, K4MTX 404, WB4PNY 420, AA4AT 306, KB4WT 273, K4IBR 249, W4ACCK 209, W4JLS 200, AA4GL 189, N4V4Q 169, W4DALY 148, W4DFT 121, KB4NGC 119, W4B4S 118, W4H 112, W4OCW 109, KB4TRI 108, WB4ZNB 88, W4B4NIS 87, K4JST 82, W4B4R 71, WB4EDB 70, W4T2C 66, N6ANQ 53, K4JMF 48, K4YWK 43, K4KPT 42, NT4S 38, N4KSS 35, K4AXF 32, K4BGZ 32, W4BK1 32, WB4UHC 29, N4KSO 22, N4NCQ 20, W4FLT 18, K4MLC 12, K1GGS 10, N3RC 8, W44TVS 8, N4FNT 7, W4YE 4, N4JSP 1.

WEST VIRGINIA: SM, Karl S. Thompson, KBKT—SEC: KBQEW, STM: KD3G, SGL: KBBS, ACC: WBACTO, TC: KBCC, Rpt Coordinator: WB8OZT, Fayetteville H. F. on 2/22 was a big success, with good attendance and every one having a great time. Upcoming Hamfest in WV: Bluefield 5/17, Jackson's Mill 7/25 & 7/26, Wheeling 7/19, Ripley 8/7. Please pass the word around about the new dates for Jax. Mill.

NET	FREQ	TIME	QNI	QTC	Sees	NM
WVFN	3865	8:00	1434	148	28	WBYP
WVMD	7235	11:45	784	51	28	WBFPZ
WVFN	3567	7:00	274	31	28	K2G
WVFN	3640	6:30	207	43	28	K8LG
WVNN	3730	5:15	126	24	28	K8BTIK
Hillbilly	14290	Noon	18	10	4	W8YP

Traffic, K6BWNQ 486, K8BZ 200, W8YP 176, W8FZP 160, KB8FI 125, K8BTIK 72, KB8UQ 71, K8BG 61, KBQEW 55, N8FXH 38, N8CG 37, K8TFP 35, K8KT 28, K8BOGF 24, WB8JW 22, WD8BHC 15.

ROCKY MOUNTAIN DIVISION:

COLORADO: SM, Bill Sheffield, K0QJ—ASM: K4MCA, SEC: WB8QJ, STM: N8DZA, ACC: WB8UW, OOC: K0CUD, BM: K4BCZJ, PIO: N8FOE, TC: N8CF, SGL: W8DQGL. The Colorado Section and the Denver FCC Office has signed a local agreement of cooperation between the Sections Official Observer program and the Amateur Auxiliary of the FCC. We are the second state to sign a local agreement which complements the national agreement. If you are interested in helping out as an Official Observer please contact the OOC: K0CUD or myself for further info. The Novice Enhancement Program is now in effect. There are some changes that all amateurs should be familiar with (See April QST for the full text of this program.) Right on the heels of the Novice Enhancement came the NPRM from the FCC to reallocate a portion of the 220 MHz band. (See May QST for the full text of this proposal and ARRL's strenuous opposition to the 220 MHz reallocation proposal.) I urge all amateurs to read it and help support the league's position. I am sending you this proposal to the FCC. A Amateur from the state of Pikeas Peak ARC Swapfest is May 18th, Rustic Hills Shopping Mall, Colorado Springs. Hope to see you there. 73, K0QJ, NE, E, Cot: QNI 1050, QTC 42-inf 124, QNF 854, 27 sess. CWXN: QNI 79, QTC 78, QNF 369, 25 sess. CWXN: (no totals) HNN: QNI 2052, QTC 149-inf 434 QNF 1380, 28 sess. NCTN: QNI 240, QTC 108 QNF 349, 28 sess. SCTN: QNI 210, QTC 86, QNF 288, 24 sess. Traffic: N8HMX 155, W8BBSZ 150, K4MNL 129, KB0Z 98, N8HMR 97, W8BFFV 73, A0WV 47, W0NFW 33.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS, SEC: K6YEJ, DEC: W5D5HCB, STM: N8ST, NMS: W5U5NO K6LL, W5QNR, TC: W8GY, ACC: K45BEM, Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 158 msgs with 274 checkins. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 51 msgs with 1292 checkins. New Mexico Breakfast Club meets daily on

3939 and handled 120 msgs with 949 checkins. YuCCA 2-mtr Net 7818 handled 7 msgs with 445 checkins. Caravan Club 2-mtr Net 6500 handled 0 msgs with 148 checkins. SCAT Net 66106 handled 4 msgs with 704 checkins. Info Net 13773 with 124 checkins. The NEW MEXICO RADIO AMATEUR DIRECTORY for 1987 has been published and a line job by K45BEM, W5UR making a good recovery after surgery. Vy sorry to report the passing of W5LFT. New digipeater ready to go to Buck Ridge near Fiorwell when the snow clears. Traffic: W5DAD 704.

UTAH: SM, Jim Brown, N47G—SEC: Rich Fisher, NS7K, STM: John Sampson, W7OCX. Expect to see more NTS activity on 2M packet as the year progresses—packet is a natural for record traffic. You packet types, go ahead and jump in, take some NTS traffic. NS7V's son Roy is now KB7AGY. Oliver, KB7AKJ has confirmed 19 states on 80, 40, and 15 CW. 73 de N47G. Traffic: WA7MEL 87, N7IE 63 (Feb) and 57 (Jan), NS7K 31, N47G 22, W7OCX 10.

WYOMING: SM, Dick Wunder, WA7WFC—ASM: Steve Cochran, K47AWS, SEC: Jim Anderson, W7VTK, Wyo. QJWA chapter holding net on Sat. at 8:00 AM on 3923 KHz, W7MZW net control. The Wyo Hamfest is July 10-12 at State Fairgrounds in Douglas & sponsored by Sheridan ARL. Congrats, Novice & Techs on new privileges. The need for "E" Licenses has increased so let's offer our assistance. K47FDL reports the Albany County RACES will be on QNL. KB7JZ reports the Sheridan County Emergency 2 Meters Net had 43 QNL. K77AR reports the Wyoming Cowboy Net held 20 sessions with 831 QNL and 12 QTC. Traffic: NN7H 391.

SOUTHEASTERN DIVISION

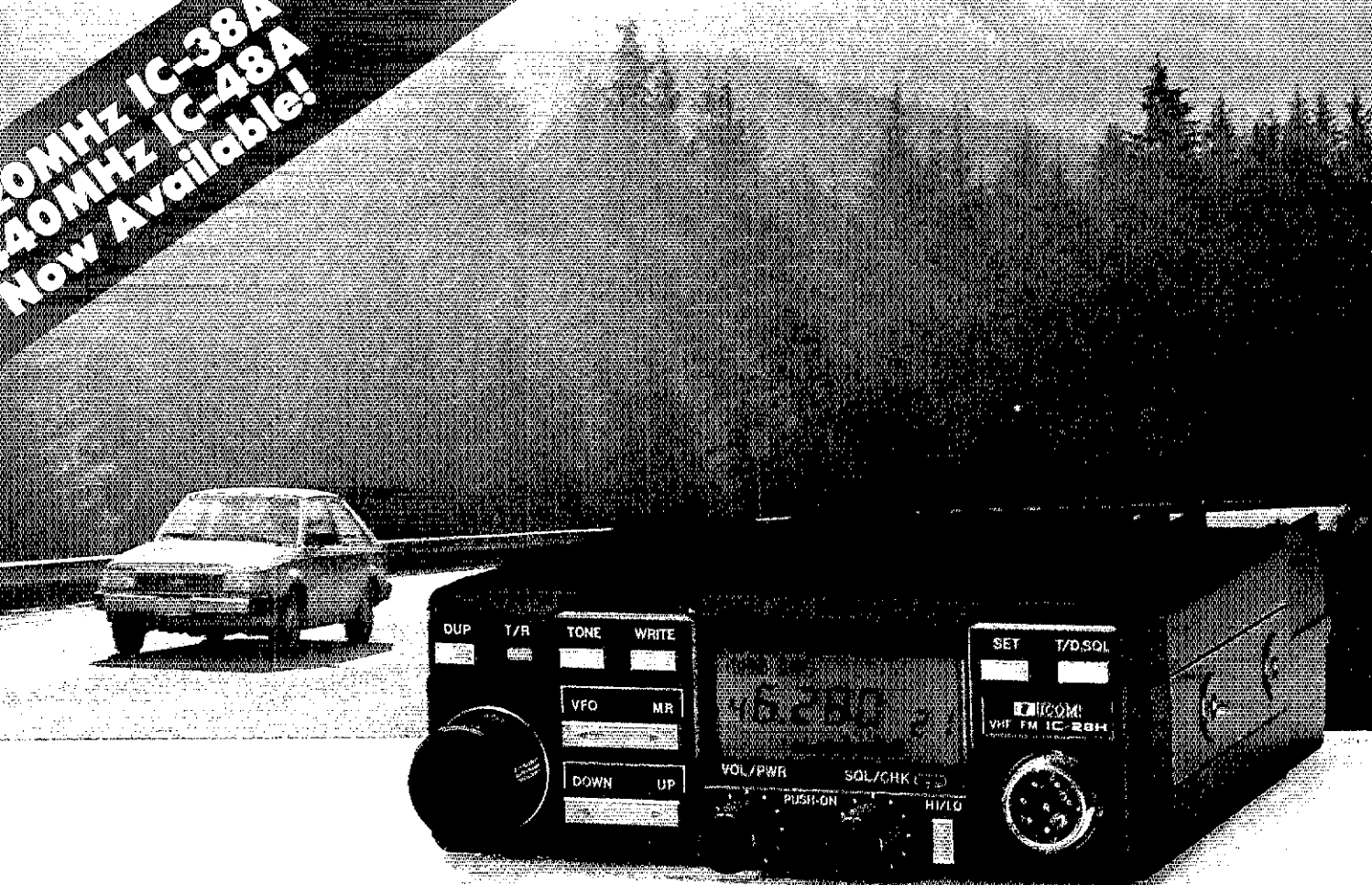
ALABAMA: SM, Joseph E. Smith, W4ARNP—STM: N4JAW, SGL: K44WVU, BM: K44VU, OOC/A AUX: AA4AL, TC: N4AU, ATC: WB4BYU, ACC: W44RNP, "act" SEC: W44RNP. From Huntsville comes the new officers of HAYLARG: President WB4QOS, Jo Ann Tunstall, Vice President N4UGC, Marlie Handy, Secretary N4OWS, Aise Davis; and Treasurer WB4DJW, Elizabeth Nickles. Our newest Official Bulletin Stations are N4AHN, Ray Gant and K44WZ, Leroy Bell. Also the latest Official Emergency Station is WB4DQC, "Jimmy" Forrest of Dothan. Remember to check into the section nets and give them a little of your time. I have one Silent Key report this month: KB4GCG, George R. "Chap" McCahan of New Brockton, Ala. He will be missed. Traffic: G4ND reports 833 reports in 28 sessions with NTS rep 100% by WA4JDH, W4CKS, and N4V4X. DRNS reports 788 messages in 56 sessions with Alabama rep 96% by WA4JDH, W4CKS, N4W4X, and W4WJF. AEND reports 76 messages passed in 28 sessions with other nets represented by WA4JDH, W4CKS, N4W4X, AA4YJ, and N4DCS. AENB reports 75 messages passed in 28 sessions with RN5 represented by WA4JDH, W4CKS, W4QAT, N4W4X, and WA4ZPZ. AENR reports 106 messages passed in 32 sessions. Brass Pounders League: WA4JDH, PSHR, WA4JDH, W4CKS, and W44RNP. Totals: WA4JDH 1236, W4CKS 140, WA4ZPZ 79, W44RNP 65, N4W4X 60, K44OZ 34, W4WJF 31, W4DGH 12, WB4TVY 6, and K4HJX, 2. Very Seven Three, Joe.

GEORGIA: SM, Eddy Kosobucki, K4JNL—SEC: NC4E, STM: WB4WGL, ACC: WA4BYU, OOC: N441, PIO: W4D4BE, SGL: W4B7Z, TC: W4DPAH. First of all I want to thank Bob Good, K4J section, for the time he has devoted as a staff member of the GA section. His work is keeping him away from the hobby & therefore has resigned his ASM & SM positions. I'm for all u have done in the past Bob. Feb PSHR reports from: WB4DVZ, WB4WOL, W4PIM, W4D4CQ, AA4J, K4F4G, W44LLE, W4HON, KB4JPN & W44ZCH. NC4E rpts that the ARES prog in the section is better than ever. I'm for all DECs, ECs, AEGs & ARES members who devote their time to EMERGENCY COMMUNICATIONS. We'll be signing up more at the booth in Atlanta. Come by & take time to fill out a form. Coastal Area Repeater Society in Savannah has been officially designated a Special Service Club. I'm sure many more clubs in the section can also qualify. Get with ur club officers & contact ACC, WA4BYU for info. According to the section NMS checkins & tc picking up. Send all tct rpts to STM, WB4WOL by the 5th of ea mo. Now that we have Novice Enhancement let's all become Elmers & help these hams so they don't get into trouble. Remember when u started years ago, that there was always a helping hand. They are licensed & with a little help & coaxing they will upgrade. The committees for the National Convention are hard at work trying to make this one the best ever, if they call on you for help, please volunteer. Once agn tnx to the gang at Gwinnett County for the hospitality shown me during my recent club visit. Field Day is next month. I hope that you report active in the GA SECTION HAS IT DROPPED? TREMENDOUSLY. Let us see the other side of the more than 60 clubs in the section that we care the other side out for this FB week-end. It's a lot of fun. CU on one of the nets? Traffic: WB4DVZ 293, WB4WOL 185, W4PIM 182, K4F4G 100, W44LLE 85, W4WXA 53, AA4JV 54, W4D4CQ 45, W44ZCH 35, W4HON 31, W4D9N 18, K44ATM 17, K4EV 16, N4MWR 16, K4AHHE 12, K4BAI 6.

NORTHERN FLORIDA: SM, Roy Mackay, N4ADI—ACC: Giff W4DRIQ, BM: Wilma, KB4LB, OOC/HFI: Jim, K4JJE, SGL: John, KC4N, SEC: Rudy, WA4PUP, PIO: Petey, WA4PUO. Missing from this list this month is Ron, WB4GHU, who has had to resign his STM post. He has been active since 1984 when he took over from WF4F, Phil, when he became our SM. Ron will continue to be active on VHF and Packet and we will miss him on HF. Hopefully, before this reaches the pages of QST, we will have a new STM in the Section. I was pleased to see that you have picked up the idea for a NATIONAL PACKET TRAFFIC SYSTEM. I've seen comments from STM's and others about a standardized procedure and ID's. There are a few Traffic Handlers who are on Packet in our NFL Section and I hope this action will bring some of those who are interested in Packet to become part of this network and get involved with message handling. It is the ability to handle messages that makes the Emergency Communications part of Amateur Radio function so well. And so it will be when our traffic can be packeted and hard copy obtained for all our messages. A new section leadership position will probably need to be made to interface with the Region Packet Manager. So, if you have comments and thoughts to make, we will be glad to hear from you. We congratulate the NTS Eastern Area Staff in putting together the ideas so we can call all to it into a formal pattern to assure fast and proper delivery of traffic in this new mode. Try it! You may like it! 73, ROY, N4ADI. Traffic: WA4QXT 719, W4X4H 547, W4DHO 502, N4PL 428, KB9LT 361, K44VK 282, N4GMU 153, KB4LB 153, AA4HT 143, KB4FY 129, K4AJV 122, WA4EYU 118, W4CD 113, W7YWF 92, W4EABQ 90, N4JAQ 86, W4KIX 74, W3QQ 73, N4FO 67, K44YLH 65, W44SXW 53, W4GUJ 46, N4DI 45, K4CQ 41, W4UEA 35, N4JHI 35, K4AKH 31, NS4C 30, WB4TZR 29, W4DTV 25, W4MGO 23, WA4PUP 23, N4DY 20, NQ4P 19, K4G4Y 16, WB8IM 15, W4DHP 11, N2AOX 10, WB4AWG 9, W4D4FY 7.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS, STM: K4ZK, TC: K4I4, BM: W44KBW, PIO: W44WYR, SGL: KC4N, OOC: W44AH, ACC: W44NE, W44NBE, W44KBW

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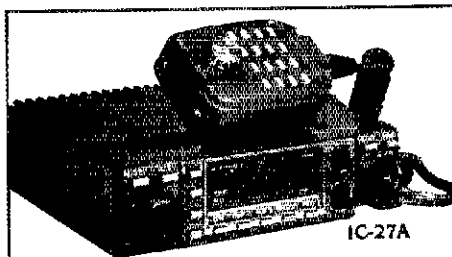
inches deep). Great for mobile installations where space is limited.

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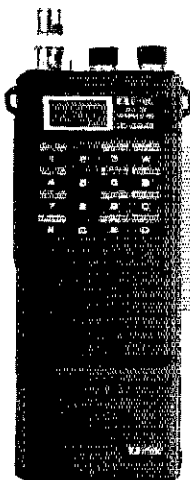
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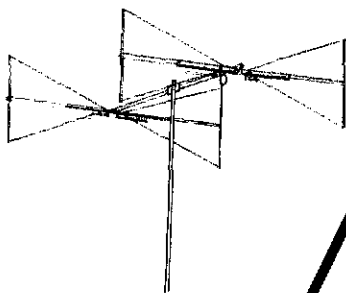
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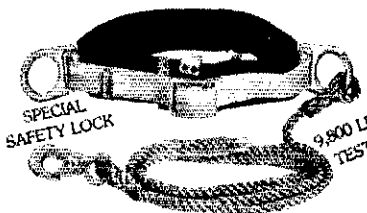
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220MHz. To get away from the crowd, ICOM has the IC-3AT 220.000-224.990MHz handheld with 1.5 watts output, thumbwheel selection and a DTMF pad.

440MHz. For 440MHz operation, ICOM has two handhelds available, the versatile IC-04AT and the IC-4AT. The IC-04AT and IC-4AT offer full coverage from 440.000-449.995MHz. The IC-04AT includes an LCD readout, 32 PL tones standard, DTMF direct keyboard entry, three watts output, (optional 5 watts output with IC-BP7 battery pack), 10 memories and three scanning systems. The IC-4AT has a DTMF pad, thumbwheel selection and 1.5 watts output.

1.2GHz. ICOM announces the IC-12AT 1260.000-1299.990MHz handheld, the first 1.2GHz handheld available. The IC-12AT features 10 memories, an LCD readout, DTMF direct keyboard entry, two scanning systems and one watt output.

Accessories. A variety of interchangeable accessories are available, including the IC-BP8 800mAh long-life battery pack, HS-10 boom headset, CPI cigarette lighter plug and cord, HM9 speaker mic (for IC-02AT, IC-04AT and IC-12AT), leather cases, and an assortment of battery pack chargers.



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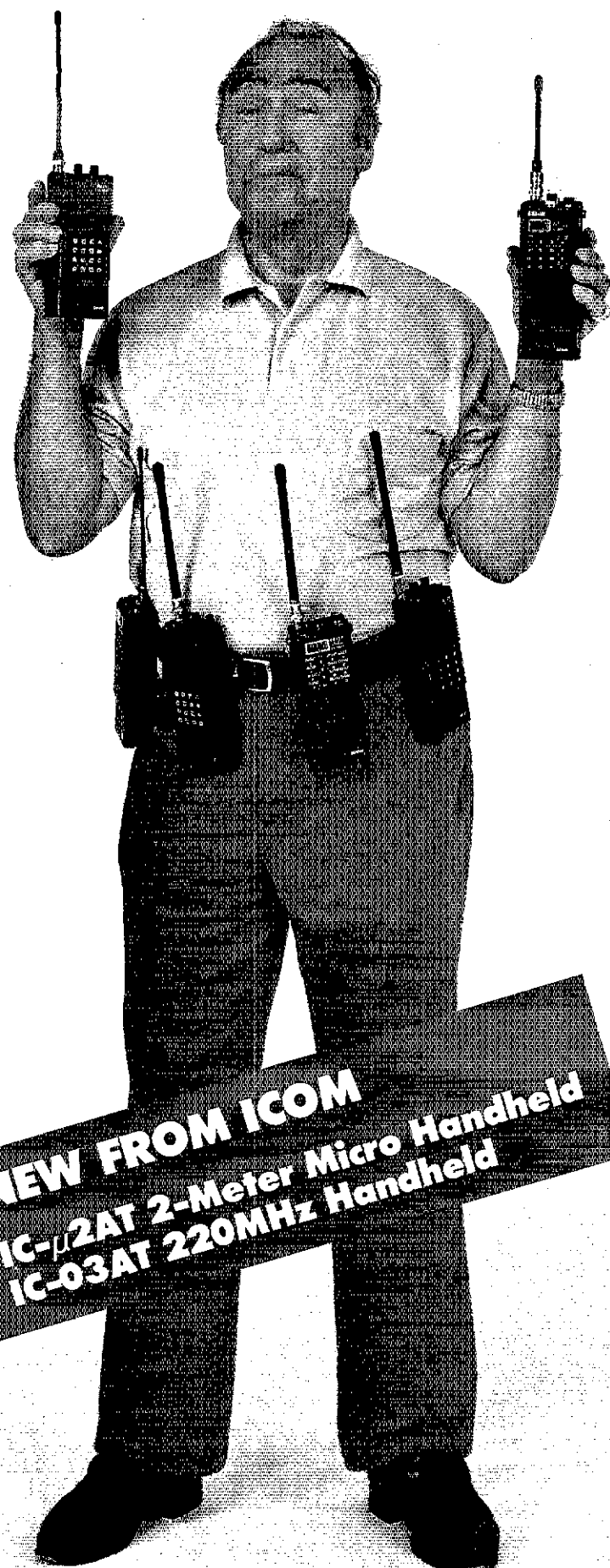
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IC-48A FM Mobile 25w	459.00	Call \$
IC-4AT FM HT	339.00	Call \$
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220 MHZ

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Repeaters

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TS-940S Gen. Cvg Xcvr	2049.95	Call \$
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TS-830S Xcvr	1099.95	Call \$
TS-530SP Xcvr	899.95	Call \$
TS-430S Gen. Cvg Xcvr	819.95	Call \$
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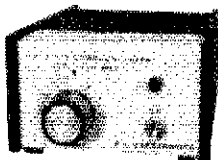
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• **Graphic display of operating features.**

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• **Low distortion transmitter.**

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

• **Semi or full break-in (QSK) CW.**

• **40 memory channels.**

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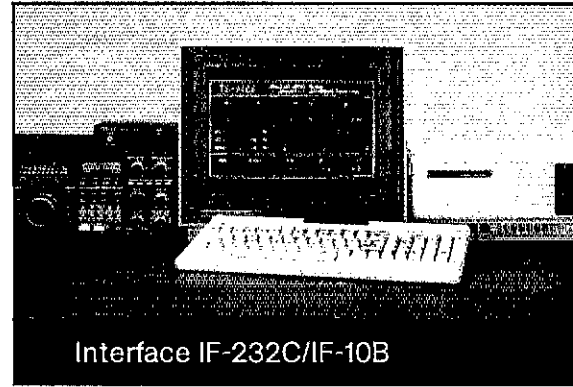
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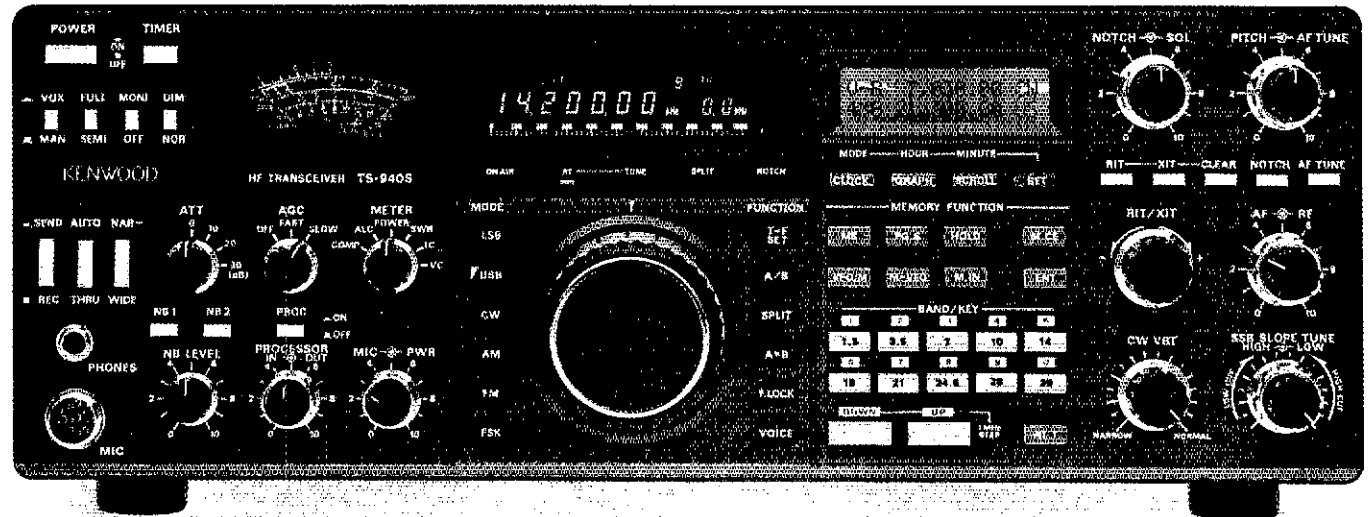
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reports 71 bulletins received and 171 sent by AA4B 26, W4DL 41, W4A1C 117, W4F 13, K4AGUS 24, K4EJC 24, K4EJC 117, W4F 13, K4AGUS 24, K4EJC 22, and W4DKB 9. The following message was received as a QNC on QFN—BT Am in Hospital and will be there for about two weeks this will end my net participation for the winter x thanks to you all for your help and cooperation x it has brought ham radio to the attention of and got respect from a great many campers here x will see you in November 73 BT Eric Stabler, VE3ISD. A later QNC indicates that VE3ISD suffered a heart attack with condition fair as of this writing. W4DUG and the Florida State Red Cross are the links to the ham radio community who assisted with the fair traffic. The City of Palms Ham Radio Club held in Fort Myers, March 7th, an area that is especially active in traffic handling! The second annual Traffic Handlers Luncheon and Traffic Forum was held at the Sizzlin Steak House and was a roaring success! There were 25 plus in attendance with 18 traffic handlers from QFN! It was one of the more interesting traffic forums and is typical of what happens there KB9L1, AA4HT and WC4D were there from Northern Florida. George Hart, W1NJM, the "father" of the National Traffic System was also there! Many thanks to Miss Phil, KA4FZ1, and Doc, W44HDH, for organizing it. Incidentally, W44HDH, the Tuesday night host for QFN for the past 22 years is trying to get back into QFN with ANYONE who can provide him with info please do ASAP. Remember to list on and/or QNI the ARRL Information Net on 3940 kHz every Saturday morning at eight AM. Scheduled NCs are W4WYR, W4DKB, W4TAH, W4ARIQ, W4A4NE, Special thanks to W4TAH who has subbed so much lately. 73 de W4APFK, Traffic: W4DUG 5675, W3CUL 4960, W3V 2434, W4DKB 1010, KF4JA 513, K4EUK 392, W4APFK 389, K4SCL 368, K4ZK 310, W4NFC 274, W4A4EJC 274, AA4BN 216, K4JWZ 155, K4AFZ 152, K4IA 149, W4ARJE 130, K4AGUS 129, W4B4WYR 128, K44NFX 128, W4DL 88, W4SME 81, K4JWZ 81, K44MOM 80, K44KXV 77, K4KB 76, W1NJM 74, W4SND 73, K44SH 67, W44HS 64, W44HS 64, K44RL 56, N4H4S 53, N4E1 51, N4MML 51, K4FOM 47, W4KRU 45, N1E3N 38, W4ACGK 38, W44NXX 37, K4YB 35, K4SHJ 34, W4BAID 28, K4B4PL 28, W4F 27, W3JUR 25, K4SAKY 24, W44VVJ 20, N4CRZ 19, K4OVG 18, W44HDH 17, W4MFD 12, W4S4EP 12, W3TLV 11, W4MFPV 10, K4DG4 7, N4NZI 6, K44YHF 6, W8OM 6, W4K4 5, N4PKN 5, N4XG 5, K4JV4 4, K4EHP 4, K42KNZ 4, N4LLN 3, K44GDU 3, W4NSY 3, N4PCF 2, K4BAKAW 2, K4EWO 2, W4PAQ 1, W4ROA 1, N4LLZ 1, N2FEL 1, AA4CH 1, J4n, W4HAW 480, W4SS 125, N4KB 81, K4B4M 31, W3TLV 21, N4LLZ 2, W4DWN 1.

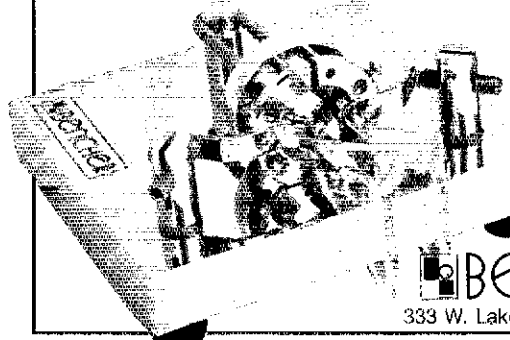
WEST INDIES: SM, A. L. Valdejuili, WP4CSG—It's time to remind you again that we need volunteers to assist with communications in case of an emergency, be it local or regional. In the event of a natural disaster in our area, which is not too far from a real possibility, where life and property are at risk, our communication skills and assets may signify the difference between responsive and responsible reaction by the authorities, with dealing with this sort of situations, and a disorganized reaction to the emergency. By contacting your local ARES representative you assure that you will be providing the much needed assistance at the right place at the right moment. Show you care!! Contact Lou Bear (KV4JC) in St. Croix, Bob Dennison (VP2VI) in St. Thomas, and Tony Purcell (KP4IG) in P.R. to offer your services to ARES. These are dearly needed. You might also want to practice your traffic-handling skills for the moment when a disaster strikes and these need to be put to practice. You may do this by joining the action in the National Traffic System (NTS), of which all the local and sectional nets are a part. Check the ARRL Net Directory, NET DIRECTORY (VP2VI NM) Sessions 26, QTC 1, QNI 70, WINS (KP4EJM) Sessions 28, QTC 28, QNI 103, WINC (KP4JW NM) Sessions 27, QTC 30, QNI 854. Traffic: KP4DJ 80.

SOUTHWESTERN DIVISION
ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP, NM's: K6LL, K47HEV, W7CAG. Two new volunteers came forward to join the field organization. Congrats to Kirk, W4TKQE, new OBS in Phoenix, and to Charles, KY7P, appointed ATC in Tucson. AFCA made a grant to TRA for approximately eight hundred bucks to allow final implementation of new packet radio Digipeater on Mt. Bigelow. This will connect California digipeaters to Texas and New Mexico. Watch for it soon. Kudos to AFCA. Numerous Pima Co. A.C.E.S. members have been undergoing refresher training on the emergency services van under the direction of Ray, K7OMR. He has recently been appointed Pima Co. Radio Officer. W7YS sent card marked "vacationing in KH-6 land." Lucky guy. KH6PP made it back to Tucson from Hawaii in February to attend the TAPR annual meeting. That's dedication! The South Mtn. Swapmeet will have come and gone by the time you read this, so will report on it next month. Oliver, W7WGW, is new proxy of AARC, Phoenix. Congratulations. SARC Scottsdale named John, ND7B "1988 Ham of the Year." John is hard at work on the Southwest Div'n Convention Committee and has also volunteered for an OC appointment. NN's Flagstaff made trip to Mexico in Feb. in connection to the OC appointment. Including an XE2 call sign. Art was in the new West Texas Section back in Jan. and worked W1AW from there on SKN. He was first QSO between W1AW and the new section. N7FVK, new OES in Flag reports on CCARC participation in Special Olympics there. FB. Welcome to all Novice/Tech licensees on 1, 1.25, and 24 meter bands. Let's all welcome them to their new frequencies and encourage them to upgrade. K47MUL again made BPL and also PSHR. This is getting to be a "ho-hum" operation. Congrats, Mike. Your SM visited the OPRC club in Tucson and the CARA in Sierra Vista during Feb. Good groups. Lots of enthusiasm. K7YM of the CADXAss'n worked Feb. OPRC meeting, W4K4EJC had no such luck! Gotta get a better 80/40 meter antenna system. 73 JIM, NET QNI QTC MGR SWN 274 158 K6LL ACN (hf) 648 102 W7CAG ACN (vhf) 340 10 W7CAG ATEN 1000 136 K47HEV Traffic: K47MUL 508, KN7U 214, W7EP 188, K6LL 167, W7AAM 140, KB7FE 123, W7CAG 66, K47HEV 55, W7KCM 49, W7GAQ 33, N7ETP 31, W7KXE 27, KE7EO 25, W8JLQ 16, K7POF 8, K7JKM 7.

LOS ANGELES: SM, Bob Poole, AJ6F—ASM: W6IYK, SEC: AK6Y, STM: W6INH, SGL: K6KSY, OOC: K6BMG, TC: W6DQPO. The Hams of Torrance are steadfastly banding together to preclude a crippling antenna ordinance; aimed at satellite dishes, this new proposal would require approval by the planning commission, the local neighbors, \$\$\$ if you want to appeal the process, etc. An ad-hoc committee has been formed to deal with the problem. Active in the forum has been KN6H, W6AFIP, W6A6NO, N6D6S, W6AFJA, W6ATT and AJ6F. Thanks to the SCFAN volunteers for helping with the mailing and thanks to Headquarters for providing some of the labels. Special thanks to Tom, W6CLF for printing services rendered. We're anxiously awaiting the results of this effort. I am very proud to be a member of the VHF Hilltoppers Radio Club which had a very nice gathering in Culver City recently; it is always a pleasure to see the faces belonging to the voices on the radio (and to meet their families, too). The San Fernando Valley ARC has successfully renewed their Special

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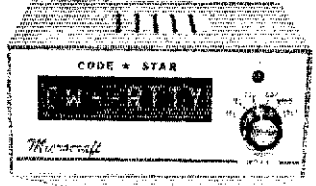


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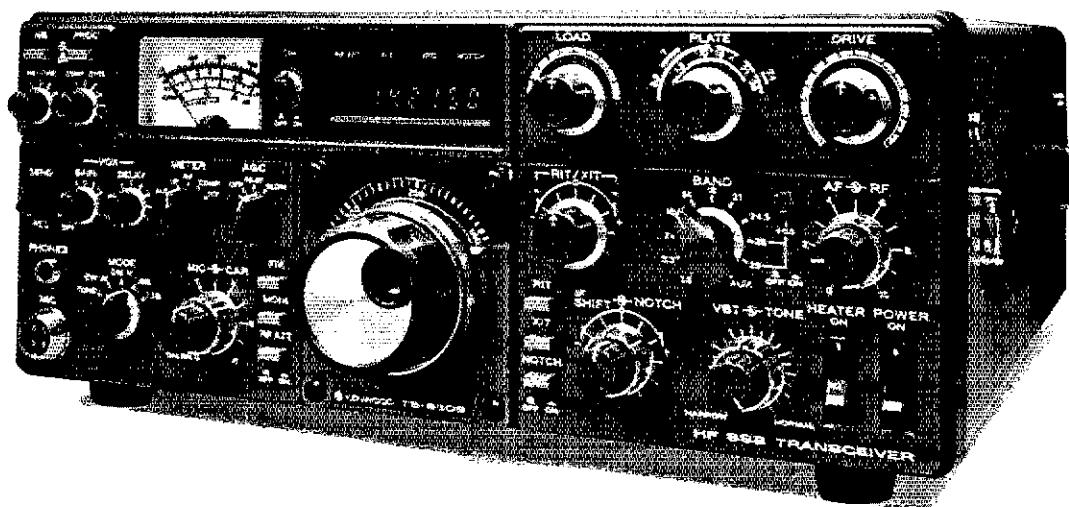
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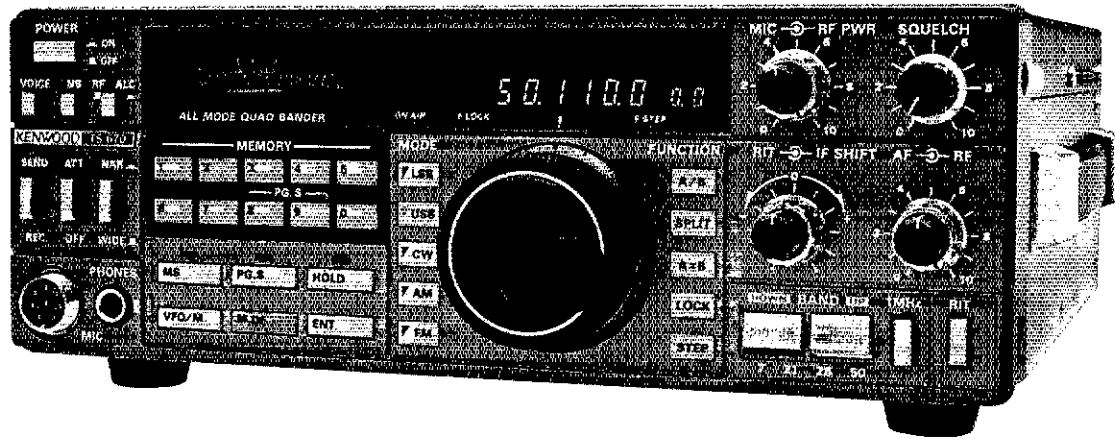
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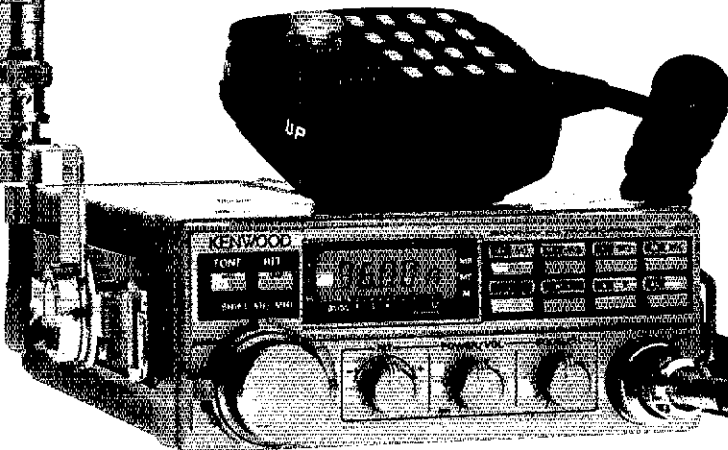
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Service Club status; congratulations to the fine men and women in SFVARC. The Lockheed AEC, W6LS, continues to provide monthly W6LS, continues to provide monthly APRIL VEC license exams in Burbank on the first Saturday of the month; Santa Barbara Club for the Santa Barbara Club for the Los Angeles Marathon; SBARC brought their elegant communications van to the event at the Coliseum. As usual, Scott, KN6F, headed up the communications for the event and did a fine job. (Scott was assisted by no less than 240 hams in this event.) I forgot to mention last month that the Downey ARC participated in their city's annual Christmas parade with 15 of their members providing much of the vital communications that were needed for the event. Thanks to URAC for allowing me the privilege of presenting my show 'n' tell on the ARRL Field Organization. All I can say about the annual International DX convention in Visalia is WOW! Thanks to the NCDXC for being such great hosts. W6BM1K and 12 others from the Rio Hondo ARC provided communications for the Presbyterian Hospital 10K run in addition to Public Service. The RHARC sponsors regular T-hunts (congratulations to N6MI for his win on Feb. 22). The San Gabriel Valley ARC now sponsors a Packet BBS in their area, W6QFK-1 on 145.07 (last time I looked). Contact Joe Locassio regarding how you can help the W6AM museum foundation; Joe is usually around on 145.38(-) during commute hours. Congratulations to Bryant, N6NOP for stepping up to the job of President of the Palos Verdes ARC. The Pasadena ARC, under the leadership of Allen, KC7O, has an ambitious public service schedule for 1987; come out and enjoy working with these folks, N6DBS and several of the Los Angeles County DCS (RACES) members. The Los Angeles County DCS (RACES) members Super Bowl Sunday 10K run in addition to Public Service with the effort by those in charge of the communications. Mike described some of the colorful costumes and activities that were there to add to the enjoyment of all. KB6LTL reports the following activity for the W6FNO/R System: 251 vehicular, 7 fire and 5 medical emergencies handled during the month of February. The group also assisted in tracking down the whereabouts of an individual lost in the mountains who was later found unharmed. One interesting emergency was reported by a ham who used the repeater system to effect his own "rescue" when he became stranded in the high desert with a flat tire and stuck on the shoulder of the road near the thriving metropolis of Zzyzx, thus saving the potential discomfort of spending a winter night on the desert in his car for the month. On Feb. 14, approx. 1:00 PM local time a traffic accident on I-5 was reported to WESCARS net on 7250 kc. There were serious injuries and band conditions were very poor. KA6ULB was listening and able to receive and relay the information to the State Highway Patrol with the proper location. He was able to affect a speedy response by the proper officials for the necessary aid. A big thanks to Fred. KA6ULB. Traffic: N6LHE 284, N7CZF 247, K6UYK 165, W6INH 144, W6VVPY 124.

SAN DIEGO: SM, Arthur R. Smith, W6INI—TC: N6JZE, STM: N6GWN, SEC: W6VNI, PIO: K6GLE. Plan now for the SW Div Conv Oct 9-11, 1987, in Scottsdale AZ. N6NR has retired as the Section's Technical Coordinator. Rick played an important part in convincing HQ of the need for Asst T Cs. Thanks for a job well done! The new TC is N6JZE. Welcome aboard, Del. The 220 Club of San Diego has taken the lead in welcoming Novices to the 220 band by providing a Novice Forum Club meetings as well as a standing invitation to use the Club's repeater on 224.9(-) MHz. Novices & Technicians are invited to join the ARES 10m (SSB) net now on 28.375 MHz (Sun 10 AM). Novices are also welcome to the ARES 220 net on 224.9(-) at 7 PM Sat. An ARES CW net for Now/Tech operates Sun 9:30 AM. 3725 kHz. How is your club's "Adopt-A-School" program coming along? N6BUK and W6FPPY put on a successful packet demonstration for the Calif Dept of Forestry with a station at it's El Cajon headquarters and one at a fire camp location in the field. NCTN: 27 sessions, handled 122 msgs. A CW 4 sessions, 11 check-ins. Traffic: N4KRA 192, KU6D 84, N6GWN 86.

SANTA BARBARA: SM, Byron Looney, K6FI—Sorry no Section News last month...SM traveling. Mack, W6WRA, passed the tests and is newest CO in SB Section. KF6OY reports Santa Ynez gang ready to work with annual 100 mile Bicycle Ride. W6RRC reports that Angie, W6DMK, licensed almost ten years and never on the air anxiously awaiting 220 voice privileges. Maybe this will bring out many of those novices that look early retirement. Central Coast ARC in San Luis Obispo considering a 220 repeater. Watch for mucho ARES assistance to State OES on the Parkfield Earthquake. We are now within the window of USGS prediction. WA6OCV, recipient of tenth Santa Luisa RC Scholarship to CSTI Earthquake Management School. Susan is SEC of Santa Clara Section. Who's next? Many novice classes in progress throughout the section. How about some General classes? Traffic: W6NOR 62, K6GWC 50, N6FOW 26, K6YO 24, KB6KWC 11. (Jan.) KB6KWC 12.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. SM: K5MXQ, SEC: W5GPO, PIO: K5HGL, TC: W5LNL, BM: W5QXK, OOC: W5BJP. We have openings on our Section Staff for Section Traffic Mgr. and Affiliated Club Coordinator. If you can serve in either of these two positions, please let me know my address and tel.# are on the bottom of page 8 of this issue. It looks like an early and active tornado season this year. Let's be ready for quick response to any communications emergency. Jim, KL7CB, leaves us for a four day of duty in California. He will be missed on our traffic circuits; good luck, Jim! Vernon, there will be no assignments in few counties between the North and West Texas Sections to provide better public service and make for a more logical division of our ARES districts. Willbarger, Baylor, and Throckmorton Co's. will be in North Texas and Shackelford and Callahan Co's will be in the West Texas Section. The transition to a three-Section system was anything but smooth and orderly, but please bear with us, and all the problems will be ironed out. You members out in West Texas will have your own Section staff beginning July 1, 1987, when your newly elected Section Mgr. will take office. Until then, consider yourself covered from here; anything that can be done for you, just let me know. PSHR for Feb: W6WMP, K5AER, K5CB, K5JPN, N5JH, K5SPT and K5MXQ. Traffic: W5TNT 265, K5SPT 185, W5JH 185, K5MXQ 129, W5CWL 115, W5VMP 91, W5GS 90, K5UPN 82, K5ML 76, N5JUI 73, K17CB 58, N5JH 40, KB5ADE 34, K5BSL 28, W5ERT 18, W5EEH 12, K5CSG 8.

OKLAHOMA: SM, Bill Goswick, K5WG—ASST/ACC: N6SN, BM: W5AS, OOC: K5WG, PIO: W5B5Y, SEC: W5ZTN, SCL: W5N2S, STM: K5VX, TC: W5QMJ. Congrats to Carl Drumeller, W5JJ, on being named a Senior Member of the Radio Club of America. A prolific writer, Carl has an intense interest in feedlines and antennas, and has developed a keen understanding that ranks him among the leading professional engineering journeymen in the field. Carl was elected, along with 13 of his peers, at the January 27th meeting of RCA. Official Bulletin Stations reported participating in 35 net

sessions and transmitting 55 bulletins during February. All OBBs are reminded to report their activity to W5AS monthly. Amateur classes are being offered in the Vici area by K5O0D, and in the Ponca City area by KA5ZJM and WN5LUJ. Please notify me of any novice/upgrade classes that are planned. The Edmond Amateur Radio Society has designed a good-looking QSL card with the special service club logo for its members. EARS has installed its new FT-757 hf rig at the club station and expects to have a full complement of antennae up soon. Traffic: W5B5FX 538, W5A3 280, N5XE 268, K5V5 193, W5R8 174, NQ5W 117, K5GBN 90, W5OUV 73, N5IKN 71, W5IFB 48, K5D5S 35, KA5GWS 30, W5VOR 29, K5CAY 25, W5VLW 25, W5AQO 24, W5AOG 22, N5FEM 18, KF5FD 7, N18W 4, NQ5Y 3, N5DWN.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KFR—ASM: N5TC, STM: K5QEW, SCL: K5KJN, SEC: K5DG, OOC: WA2VJL, TC: NZ5U, PIO: WA5UJZ, ACC: W5B5YD, BM: K5CVD, TIC: WA5UJZ reports KA6JDT has received his fourth award for work in Public Service, this one from KX1B of ARRL HQ: Northwest ARS, Houston, guest speaker, Harris County DA, detailed operational procedures of "good guys" and "bad guys," including commercial use of packet radio by the White Plains. PIA N5IKW of Sam Houston ARK, Cleveland, reports new Novices K5B5ZC, K5C5C, K5B5CB, K5B5CBH, K5B5CBJ, K5B5CBK and K5B5CJ busy on 80, 40 and 10; N5JUY upgraded to Advanced, N5JNM up to Extra; congratulations all around, N5JNM up to Extra; congratulations all around, KA5PTN reports Golden Crescent ARC, El Campo, officers for 1987 are: W5B6JW, Pres: KA7LZV, V. Pres: KA5PTN, Secy/Treas: upgrades are KA5WOT and W5B6JW to Advanced, N5IEH to Extra. KA5UIC to Technician, WA5EUJ to General; new repeater on 145.277 going in soon. CAND Mgr W5KLV February report 833 messages in 28 sessions; DRN5 represented 100%; STX stations - W5B5FQ, N5DFO, K5DKQ, W5B5EA, N5V5, W5KLV, W5B5DZ, San Antonio ARC, W55C, has renewed status as SCL. N5KSR reports that he ran 174 toll-free phone patches for US service personnel in the Antarctic during Christmas-New Year holidays, thanks to the generosity of U S Sprint. Heart of Texas Ham Operating Group, Brady, listened to EC N5KAO talk about emergency operations; N5HGF appointed Asst. EC. OBB W5KLV reports 10 ARL bulletins, 28 satellite bulletins, 4 propagation forecasts, 4 DX bulletins, 3 CRRL bulletins given 102 readings on 9 nets. Brazos Valley ARC (Fort Bend and Harris Counties) awarded the Order of the Key to WA5F in recognition of his service to the club. B-VARC has public service missions scheduled through June. DRN5 Mgr W5B5YD February report: 788 messages in 58 sessions; STX represented 100% by W5C7Z, K5DKB, N5DFO, W5KLV, K55VZ, K5R9, W5B5EA, W5B5FQ, WA5ZJY, N5BHQ, K5QEW, W5B5HZ, W5B5YD, PIA KA5EEA reports Graham ARC operated a special events station at Washington-on-the-Brazos State Park; W5D5JZ upgraded to Advanced, is now KF5SP. Kendall ARS, Boerne, demonstrated Amateur Radio Emergency Service capability; KB5TX at Kendall County court house contacted local Amateurs, with KF5GA (Kerrville) and W5CPL (Fredericksburg); W5FCW and W5VHR described the "play-by-play" for county officials. Beaumont ARC 1987 officers: N6SF, Pres: W5KWA, V Pres: KD5TB, Secy: K5UJA, Treas: Cameron County DEC K5CZA and Texas Southmost ARC (Harrington) provided public service communication for Rio Grande Valley Live Stock Show in Mercedes; Winter Texans gave much help, too. TTNM W5CAKJ wants more action on packet; 12 of his 142 February messages moved via packet. Traffic: W5B5YD 153, W5KLV 387, W5C7Z 254, N5DFO 178, W5B5FQ 153, A1K 150, W5GKH 142, W5B5J 76, W5B5EA 60, AC5Z 60, WA2VJL 44, K5GD 14, KA5UYV 13, W5BGE 14, W5UJZ 6, N2S5 2. (Jan.) K5DG 2.

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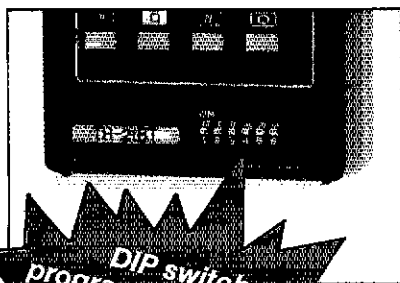
Kenwood's TH-series HTs pack convenient, reliable performance in a package so small, it slips into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and weighs 260 g (1.57 lb) with PB-21.

• **Expanded frequency coverage (TH-21BT/A).**

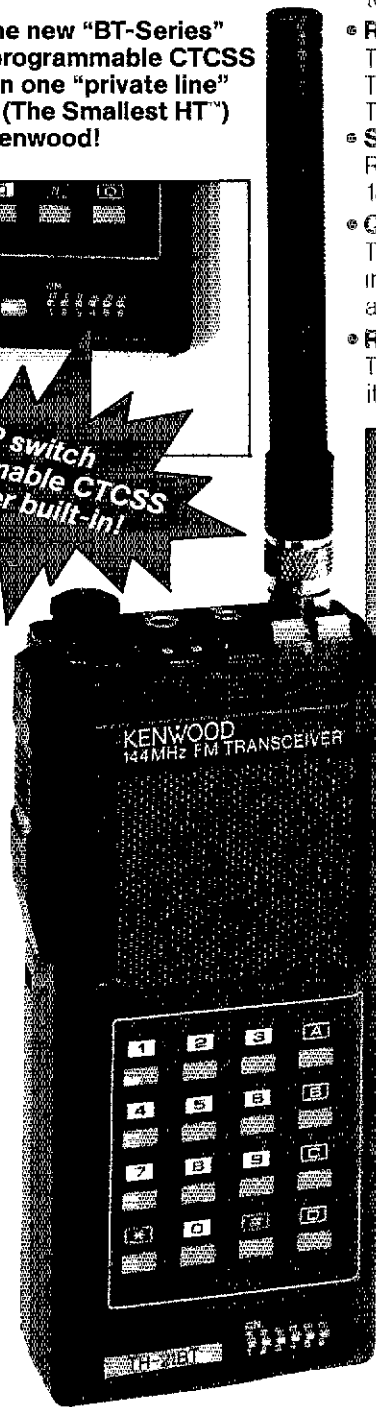
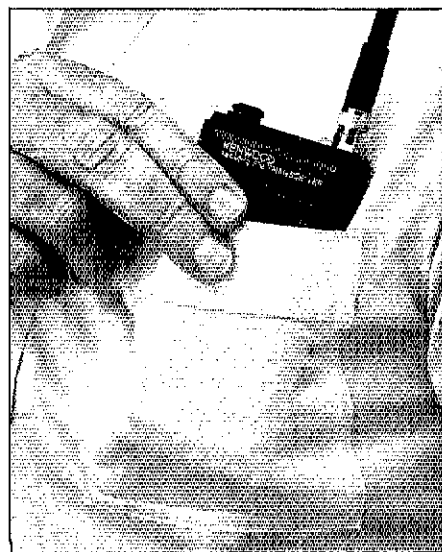
Covers 141.000-150.995 MHz in 5 kHz steps, includes certain MARS and CAP frequencies.

TH-31BT/A: 220.000-224.995 MHz in 5-kHz steps.

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DIP switch
programmable CTCSS
encoder built-in!



• **Easy-to-operate, functional design.**

Three digit thumbwheel frequency selection and top-mounted controls increase operating ease.

• **Repeater offset switch.**

TH-21BT/A: ±600 kHz, simplex.
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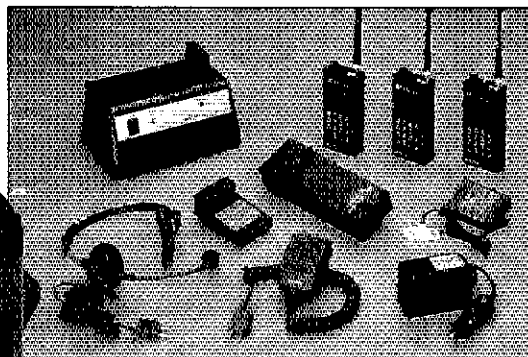
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• **Rugged, high impact molded case.**

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Optional accessories:

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- SMC-30 speaker microphone
- PB-21 NiCd 180 mAh battery
- PB-21H NiCd 500 mAh battery
- BC-2 wall charger for PB-21H
- BC-6 2-pack quick charger
- 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
- BH-3 belt hook
- AJ-3 thread-loc to BNC female adapter
- RA-8A/9A/10A StubbyDuk antenna
- TU-6 sub-tone unit (TH-21AT/A only)

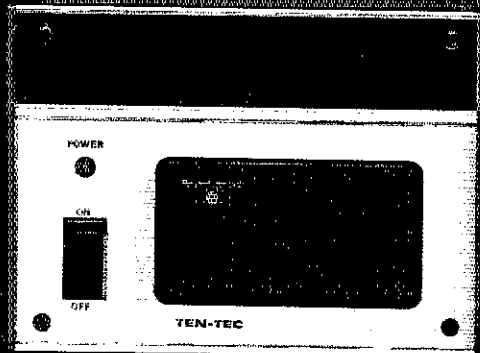
More information on the Smallest HT™ is available from Authorized Kenwood Dealers.

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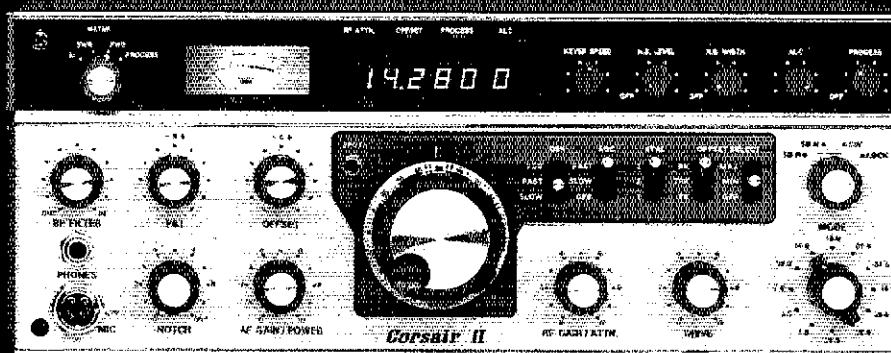
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TH-series transceivers shown with optional StubbyDuk antenna. Specifications and prices are subject to change without notice or obligation. Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.

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MODEL 561 CORSAIR II

CORSAIR II HF TRANSCEIVER, Model 561 . . . \$1345

Receiver performance that only a permeability tuned oscillator can deliver . . . superb signal to noise ratio, outstanding adjacent signal rejection. Three, frequency tuning rates using dual range offset tuning. QSK with a changeover time of 30 ms or less for superior CW or AMTOR operation. Twelve position band switch for operation on all nine HF bands, from 1.8 to 30 Mhz, plus 40 KHz overshoot on band edges.

RECEIVER

Sensitivity: 0.25 μ V for 10 dB S/N ratio.

Selectivity: 16 pole crystal ladder filter, 2.4 kHz bandwidth, 1.6:1 shape factor at 6/60 dB. Three position, mode independent, switch selects standard 2.4 kHz, optional 1.8 kHz, 500 Hz or 200 Hz filters.

Notch filter: Greater than 50 dB notch, adjustable from 200 Hz to 3.5 kHz.

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Passband tuning (PBT): Tunes 2nd IF frequency 3 kHz.

Noise Blanker: Switchable on/off with adjustable threshold and blanking

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PLUS: Built-in antenna pre-amp, spot button, selectable AGC fast, slow and off and much more.

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Built-in lambic keyer. Speed adjustable 8-50 WPM with 40 character programmable memory.

Multi-meter: Reads Ic, Power out, SWR, speech processing level.

Built-in speech processor, with level control, standard.

Variable ALC, adjust power output continuously from 100% to 25% and retain full ALC action.

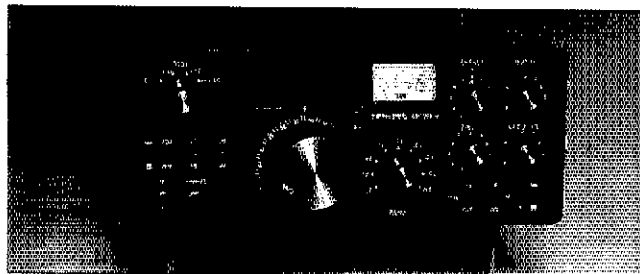
PLUS: Rear panel connectors for station control, AFSK, QSK, phone patch, auxiliary antenna, PTT, standard CW key, and more.

POWER REQUIRED: 13.8 VDC, Base or mobile at 20 A.

Size: HWD 5.25" x 15.25" x 15".

REMOTE VFO, Model 263 . . . \$219

Uses the same PTO design as the CORSAIR. Adds complete TX/RX



ARGOSY II, SSB/CW HF TRANSCEIVER, MODEL 525D . . . \$695

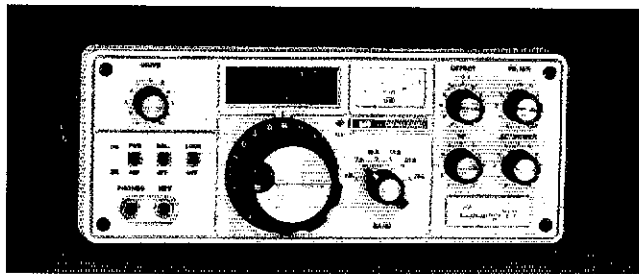
A unique combination of small size, simplicity and low cost. Great for mobile, portable and base station use. Operates 80, 40, 30, 20, 15 and 10 meters, in 500 kHz segments, plus 40 kHz overshoot at band edges. 100 watts input with solid state, no tune, final. 12 to 14 VDC at 500 mA, RX, 9A TX. Optional RX filters, 250 Hz, 500 Hz or 1.8 kHz. RX sensitivity .3 μ V 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

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THE ULTIMATE HF MOBILE ANTENNA SYSTEM

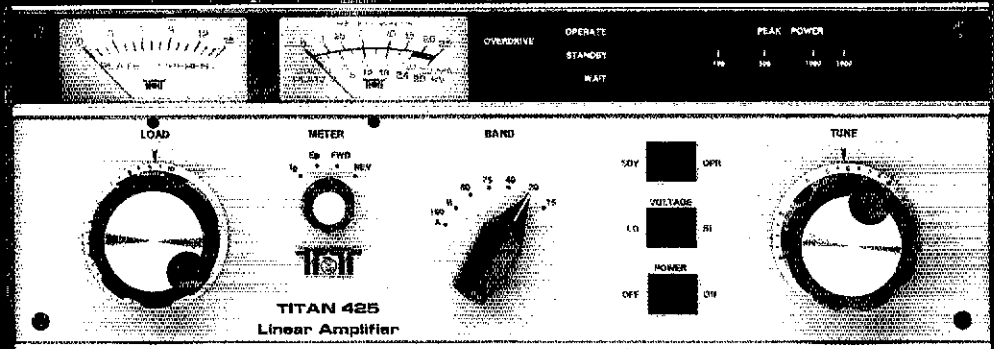
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MODEL 263G REMOTE VFO



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".

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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".

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Metering: Full time plate current meter. Multi-meter, selectable for plate voltage, grid current, power out or reflected power.

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Size and weight: HWD 5.25" x 15.25" x 15". 17 lbs.

POWER SUPPLY (Supplied with TITAN)

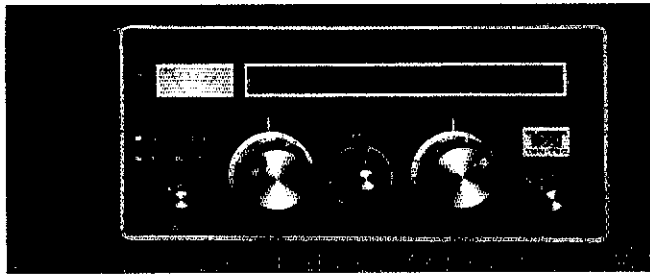
Primary power: 220-250 VAC @ 20 amps, maximum.

Conservatively designed for cool operation under full load using a Ten-Tec, tape wound, Hypersil® transformer.

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Size and weight: HWD 8.25" x 13.4" x 10.25". 45 lbs.

UPS shippable.



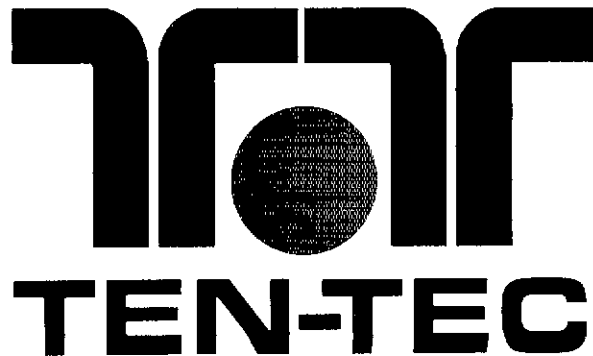
1.5KW ANTENNA TUNER, Model 229B . . . \$299

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.

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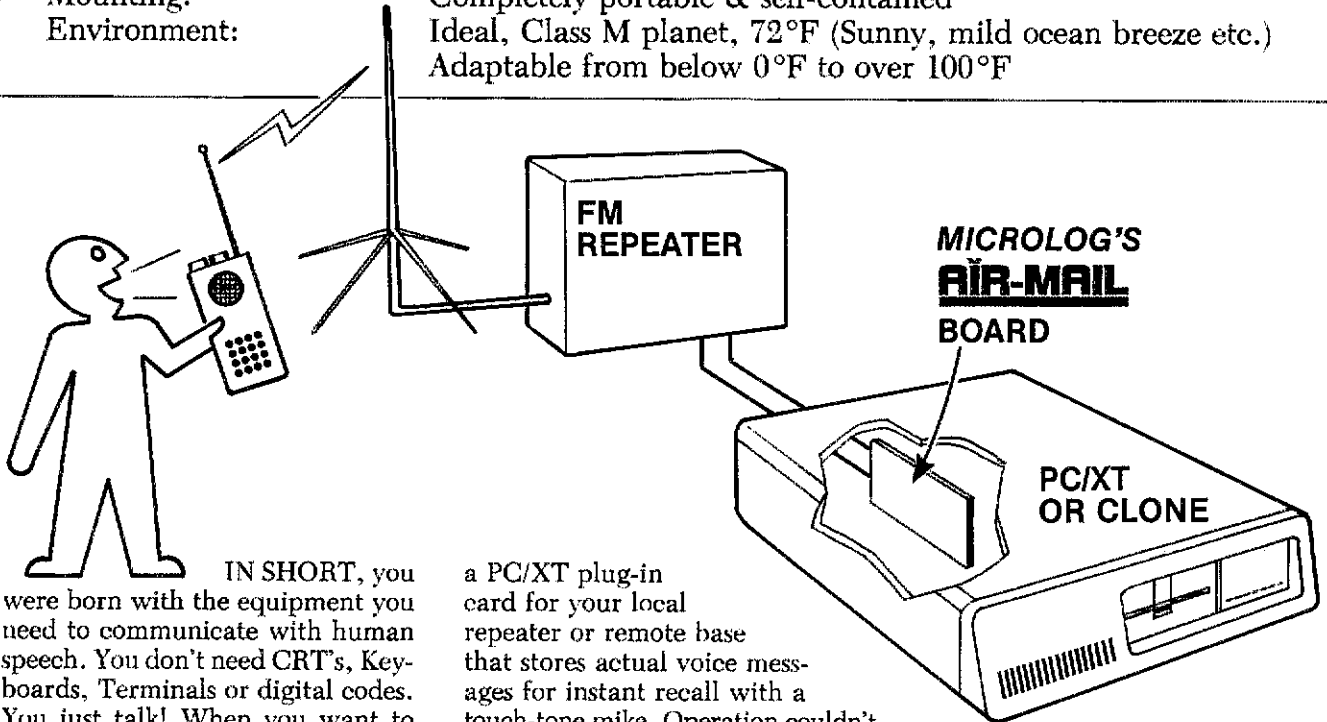


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Code:	Any language
Output level:	0 to >100 db
Power Supply:	Draws power from main life support system
Mounting:	Completely portable & self-contained
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IN SHORT, you were born with the equipment you need to communicate with human speech. You don't need CRT's, Keyboards, Terminals or digital codes. You just talk! When you want to leave a message for someone on a fancy electronic mailbox, wouldn't you really rather use voice? Who needs all the mysterious miscellaneous digital stuff just to tell your buddy Fred that "You'll be over Saturday morning for the antenna party"? Why bother with anything but normal speech? That's the conclusion we at Microlog came to. So, we got busy and designed just that,

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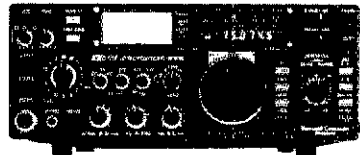
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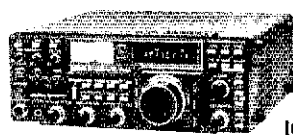
IC-28A
IC-28H



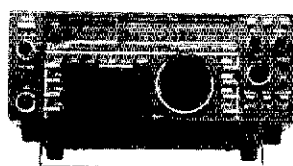
IC-3200A



IC-02AT
IC-04AT
IC-2AT
IC-3AT
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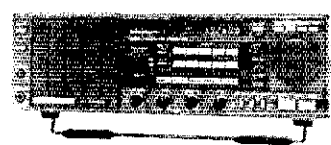
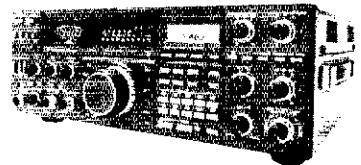
TH-21AT
TH-31AT
TH-41AT



TM-2530A
TM-2550A
TM-3530A

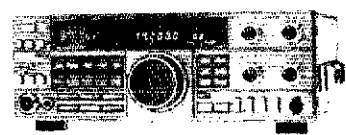


TS-940S



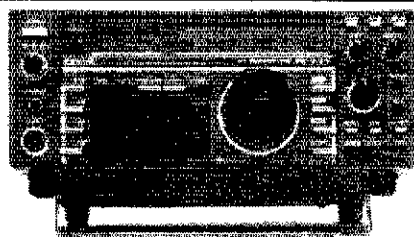
R-2000

TS-440S



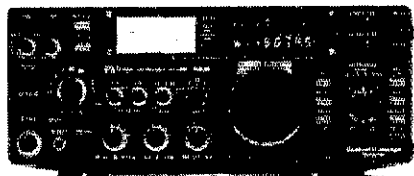
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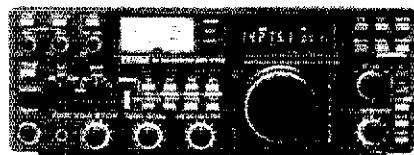
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IC-735 HF transceiver/SW rcvr/mic	999.00	799 ⁹⁵
PS-55 External power supply	199.00	179 ⁹⁵
AT-150 Automatic antenna tuner	445.00	349 ⁹⁵
FL-32 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	



IC-745 9-band xcvr w/1.30 MHz rcvr 1049.00 899⁹⁵

PS-35 Internal power supply	199.00	179 ⁹⁵
EX-241 Marker unit	22.50	
EX-242 FM unit	44.00	
EX-243 Electronic keyer unit	56.00	
FL-45 500 Hz CW filter (1st IF)	66.50	
FL-54 270 Hz CW filter (1st IF)	53.00	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99 ⁹⁵
FL-53A 250 Hz CW filter (2nd IF)	108.00	99 ⁹⁵
FL-44A SSB filter (2nd IF)	178.00	159 ⁹⁵



IC-751A 9-band xcvr/1.30 MHz rcvr 1649.00 1399

PS-35 Internal power supply	199.00	179 ⁹⁵
FL-32 500 Hz CW filter (1st IF)	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99 ⁹⁵
FL-53A 250 Hz CW filter (2nd IF)	108.00	99 ⁹⁵
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	

Other Accessories:

IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	169.00	154 ⁹⁵
PS-30 Systems p/s w/cord, 6-pin plug	299.00	269 ⁹⁵
OPC Opt. cord, specify 2, 4 or 6-pin	10.00	
MB Mobile mount, 735/745/751A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	63.00	
PP-1 Speaker/patch	159.25	149 ⁹⁵
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	124 ⁹⁵
AT-100 100W 8-band auto. antenna tuner	445.00	389 ⁹⁵
AT-500 500W 9-band auto. antenna tuner	559.00	489 ⁹⁵
AH-2 8-band tuner w/mount & whip	625.00	549 ⁹⁵
AH-2A Antenna tuner system, only	495.00	429 ⁹⁵



Other Accessories - continued:

GC-5 World clock	91.95	89 ⁹⁵
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6-meter VHF Portable

IC-505 3/10W 6m SSB/CW portable	549.00	489 ⁹⁵
EX-248 FM unit	55.50	
LC-10 Leather case	39.50	

VHF/UHF base multi-modes

IC-551D 80W 6-meter SSB/CW	799.00	719 ⁹⁵
EX-106 FM option	140.00	126 ⁹⁵
BC-10A Memory back-up	9.50	
IC-271A* 25W 2 meters ... CLOSEOUT	859.00	699 ⁹⁵
AG-20* Internal preamplifier	64.00	
IC-271H 100W 2m FM/SSB/CW	1099.00	969 ⁹⁵
AG-25 Mast mounted preamplifier	95.00	
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	1049
IC-471A* 25W 430-450 ... CLOSEOUT	979.00	769 ⁹⁵
AG-1* Mast mounted preamplifier	99.50	
IC-471H* 75W 430-450 ... CLOSEOUT	1399.00	999 ⁹⁵
AG-35* Mast mounted preamplifier	95.00	

*Preamp \$9⁹⁵ with 271A/471A/471H Purchase

Accessories common to 271A/H and 471A/H

PS-25 Internal power supply for (A)	115.00	104 ⁹⁵
PS-35 Internal power supply for (H)	199.00	179 ⁹⁵
SM-6 Desk microphone	44.95	
EX-310 Voice synthesizer	46.00	
TS-32 CommSpec encoder/decoder	59.95	
UT-15 Encoder/decoder interface	14.00	
UT-15S UT-15S w/TS-32 installed	92.00	

VHF/UHF mobile multi-modes

IC-290H 25W 2m SSB/FM, TTP mic	639.00	569 ⁹⁵
IC-490A 10W 430-440 SSB/FM/CW	699.00	599 ⁹⁵

VHF/UHF/1.2 GHz FM

IC-27A Compact 25W 2m FM w/TTP mic	429.00	369 ⁹⁵
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399 ⁹⁵
IC-37A Compact 25W 220 FM, TTP mic	499.00	439 ⁹⁵
IC-47A Compact 25W 440 FM, TTP mic	549.00	479 ⁹⁵

PS-45 Compact 8A power supply 139.00 129⁹⁵

UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	

IC-28A 25W 2m FM, TTP mic	459.00	399 ⁹⁵
IC-28H 45W 2m FM, TTP mic	489.00	429 ⁹⁵
IC-38A 25W 220 FM, TTP mic	489.00	429 ⁹⁵
IC-48A 25W 440-450 FM, TTP mic	489.00	429 ⁹⁵

HM-14 TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-3200A 25W 2m/440 FM w/TTP	599.00	529 ⁹⁵
UT-23 Voice synthesizer	34.99	

AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	

RP-3010 440 MHz, 10W FM, xtal cont	1229.00	1089
IC-120 1W 1.2 GHz FM Mobile	579.00	499 ⁹⁵
ML-12 1.2 GHz 10W amplifier	379.00	339 ⁹⁵
IC-1271A 10W 1.2 GHz SSB/CW Base	1229.00	1069

AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	104 ⁹⁵
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	119 ⁹⁵
UT-15S CTCSS encoder/decoder	92.00	

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Hand-helds

IC-2A 2-meters	279.00	249 ⁹⁵
IC-2AT with TTP	299.00	259 ⁹⁵
IC-3AT 220 MHz, TTP	339.00	299 ⁹⁵
IC-4AT 440 MHz, TTP	339.00	299 ⁹⁵
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IC-04AT for 440 MHz	449.00	389 ⁹⁵
IC-u2A 2-meters	299.00	269 ⁹⁵
IC-u2AT with TTP	329.00	289 ⁹⁵

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A-2 5W PEP synth. aircraft HT 599.00 499⁹⁵

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LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

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BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
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EX-310 Voice synthesizer	46.00	
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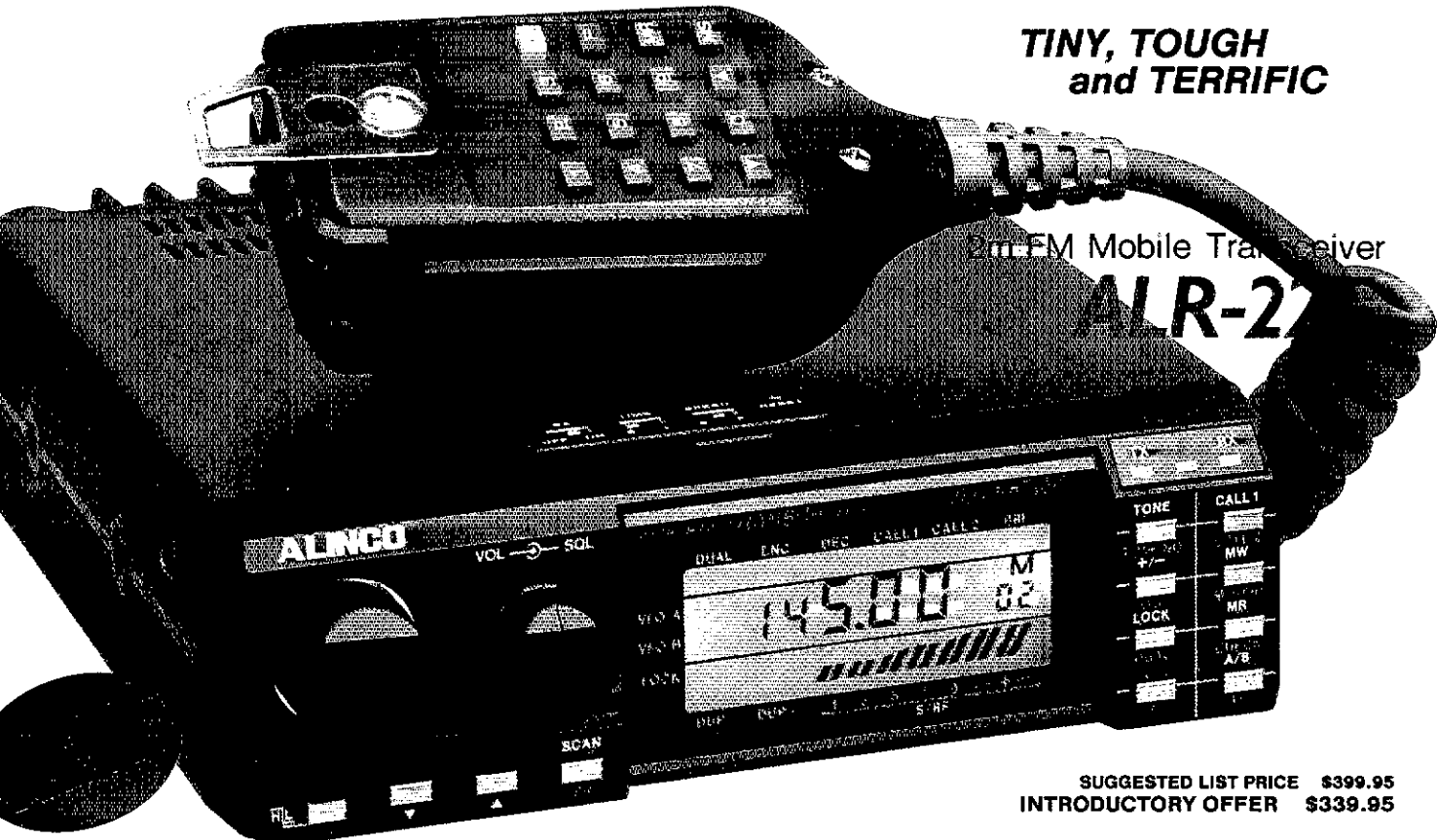
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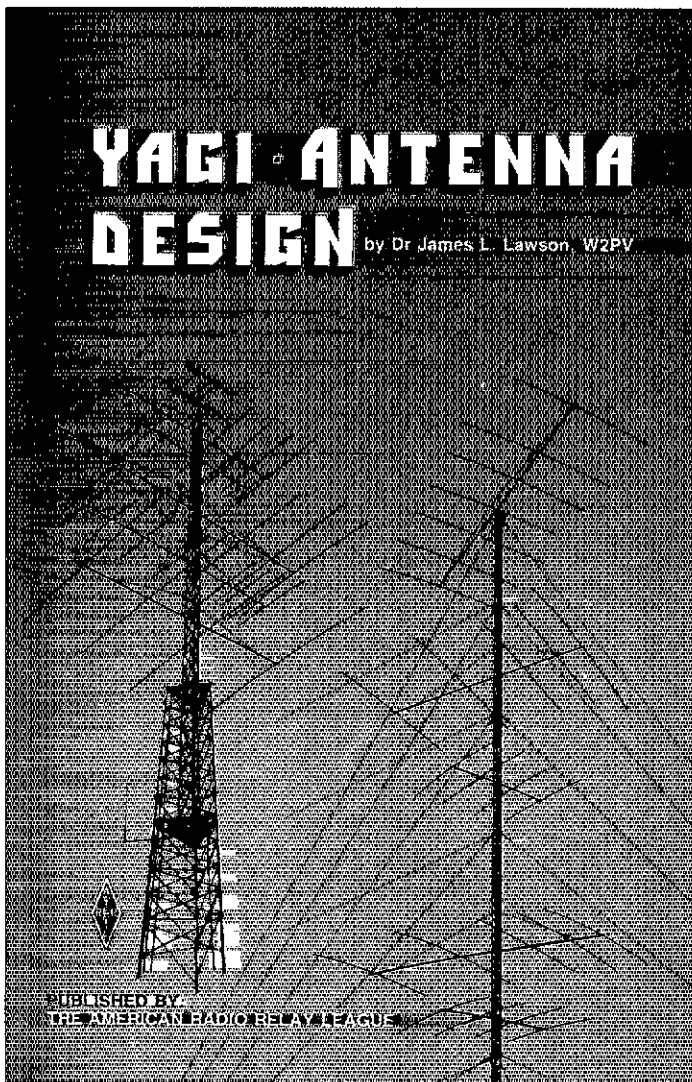
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Yagi Antenna Design is based on the series in **Ham Radio Magazine** by the late Dr. James L. Lawson, W2PV. Jim was a highly competitive person and this carried through to his Amateur Radio hobby and work with antennas. Although this book is primarily 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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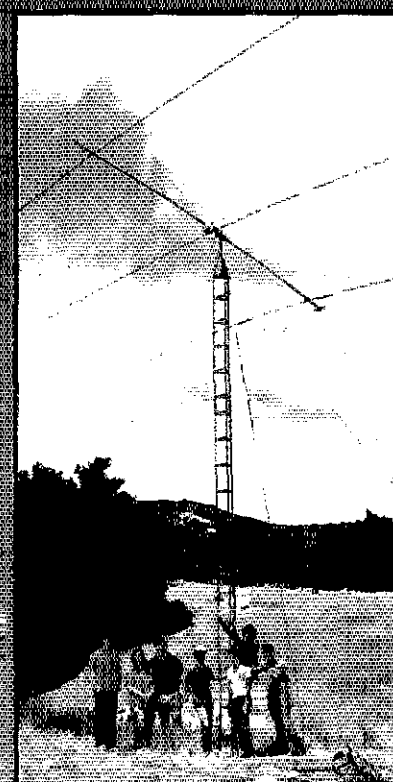
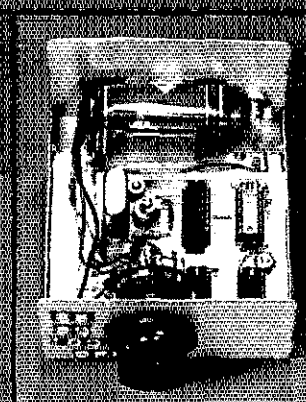


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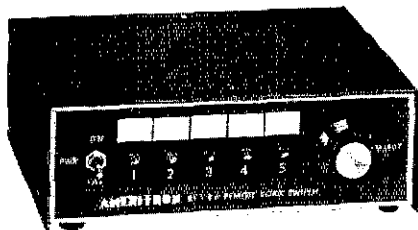
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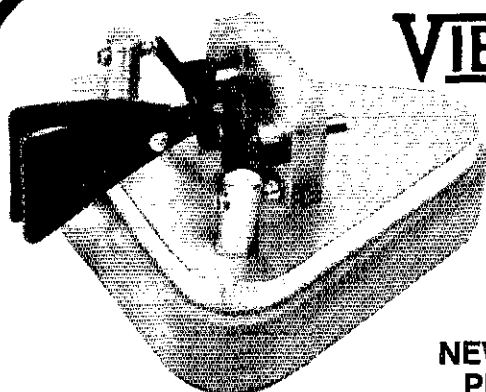
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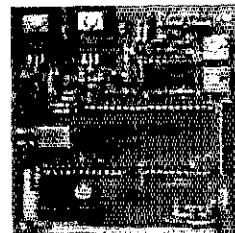
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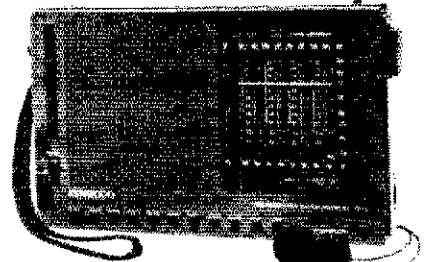
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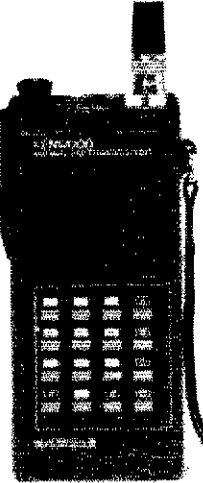
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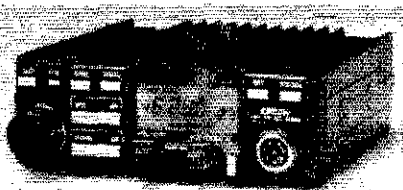
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100 watts	100A	100B	100C	100D	100E	
250 watts	250A	250B	250C	250D	250E	
500 watts	500A	500B	500C	500D	500E	
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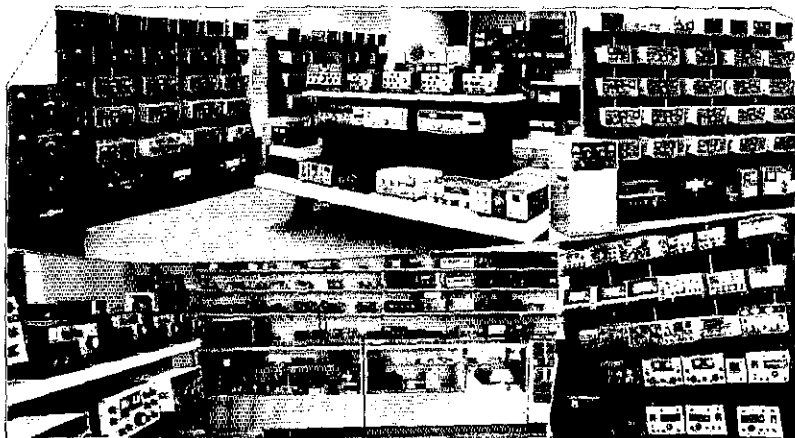
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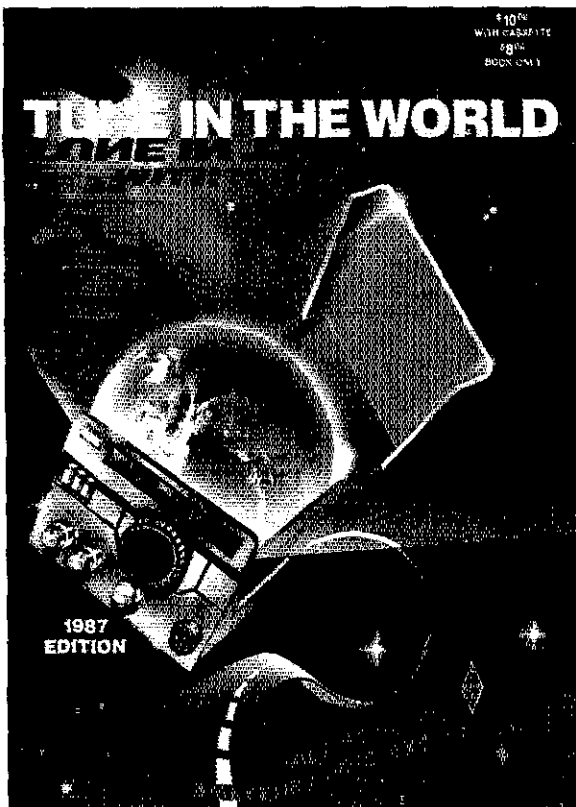


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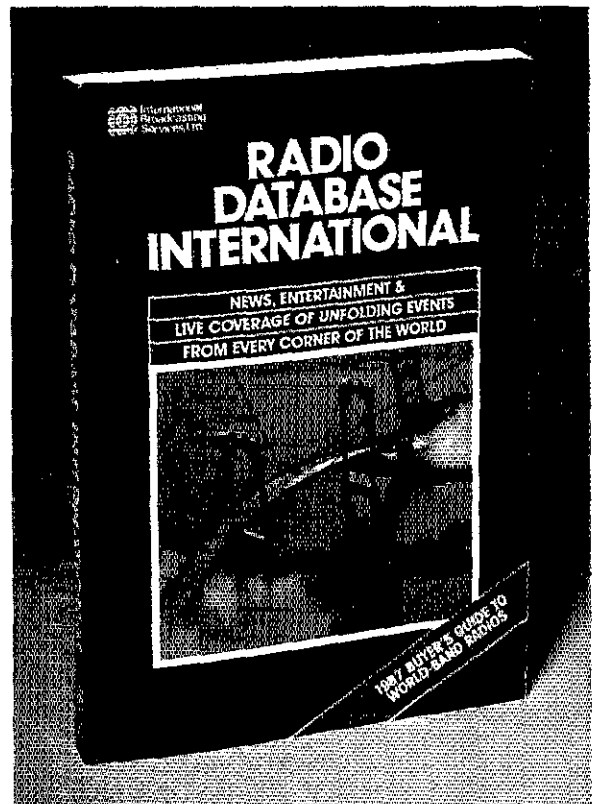
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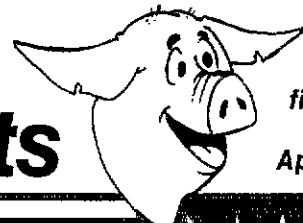


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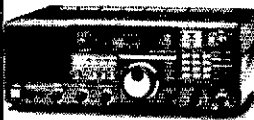


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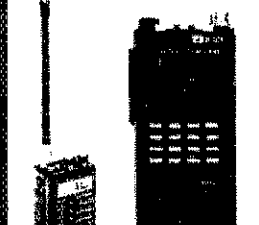
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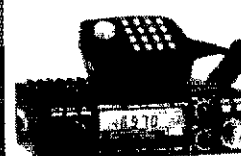
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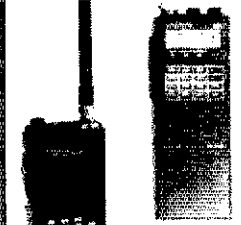
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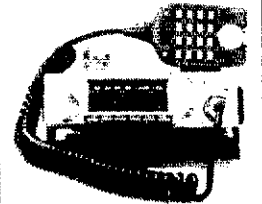


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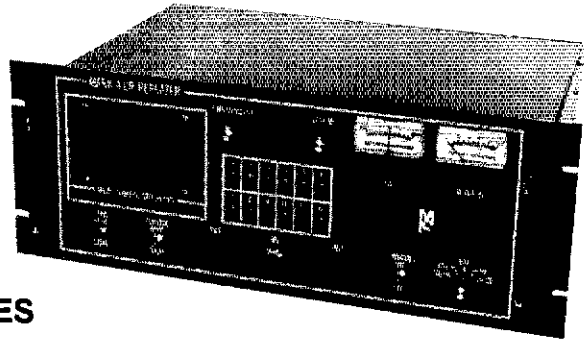
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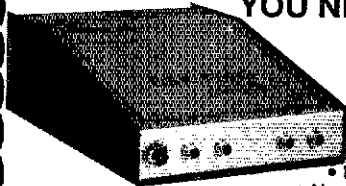
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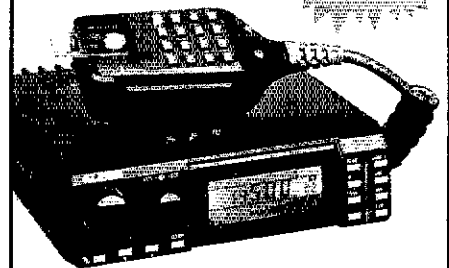
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ANNUAL FLEMINGTON, NJ Hamfest by Cherryville Repeater Association II, Inc. will be held Saturday May 9 at Hunterdon Central High School Field House on Route 31. Doors open at 8:00 AM, with breakfast served on site starting at 6:30 AM. Talk-in: 146.52, 147.975/375, 147.615/015, 222.52/224.12 and 449.850/444.850. For table reservations, call 201-788-4080 or write Bill Inkrote, K2NJ, RD-10 Box-234 Quakertown-Croton Road, Flemington, NJ 08822. FCC Exams will be given; send FCC 810 Form, copy of current license and \$4.35 (checks to ARRL/AEC) to CRA II, Inc., Box-308 Quakertown, NJ 08822.

1987 "BLOSSOMLAND BLAST" Sunday, September 20, 1987. Write "BLAST", P.O. Box 175, St. Joseph, MI 49085.

NORTHER 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 147.90/30 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 ARRL booths. Large Flea market and many exhibitors. \$2.50 in advance and \$3 at the gate. Take exit 308 off I-57 to Rt. 45 South 1 mile. For further info contact Frank DalCanton, KA9PWW, R.R. 1 Box 361, Champaign, IL 60922.

THE FOXHUNTING SOCIETY of Illinois will sponsor the Greater Chicagoand Team Foxhunt #18 on May 30th. Amateur Radio Clubs are welcome to compete. The hunt starts at the Cermak Plaza Shopping Center at Harlem & Cermak (22nd St) in Borwyn, IL. The hunt will start at 8PM on 146.18 MHz. A traveling trophy is presented to the winning team. For full hunt rules & info write to: Mike Brost, WA9FTS, 5127 N. Monterey Avenue, Norridge, IL 60656.

QUEENS NY - SUNDAY June 14, The Hall of Science ARC Hamfest will be held at the Hall of Science parking lot-Flushing Meadow Park, 47-01-111 Street, 9AM to 3PM. Donation-Buyers \$4. Sellers \$6 per space. Talkin 144.300 simplex link 223.600 repeat and 445.225 repeat. For further information call at night Steve Greenbaum, WB2KDG, 718-898-6599 or Arnie Schilfman, WB2YX 718-343-0172.

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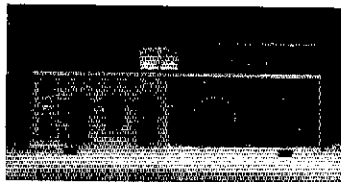
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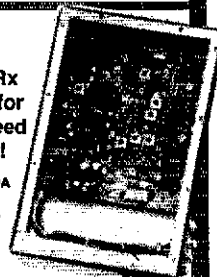
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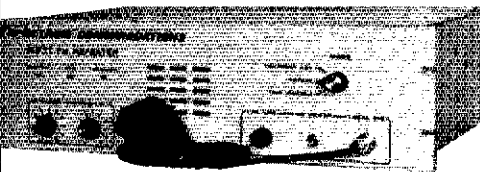
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MFJ TUNERS

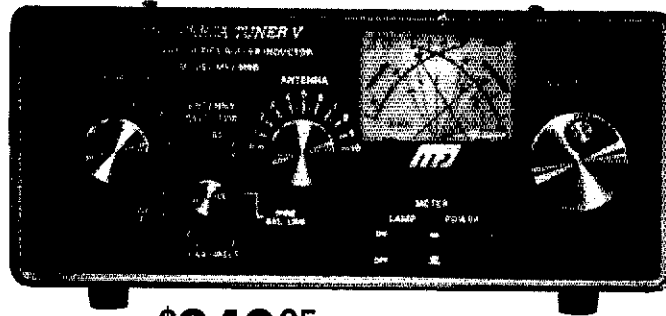
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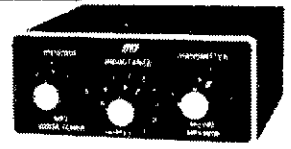
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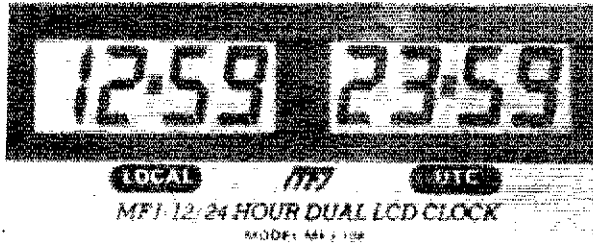


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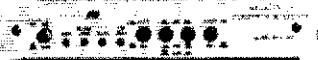


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RX NOISE BRIDGE

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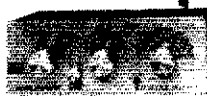
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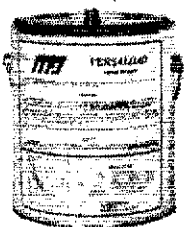
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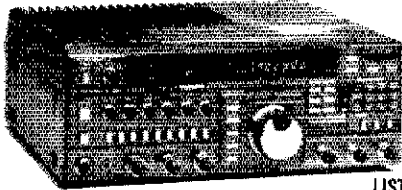
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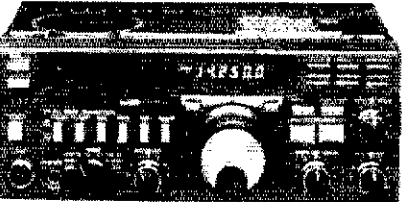
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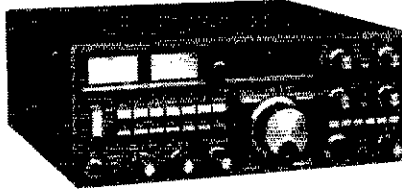


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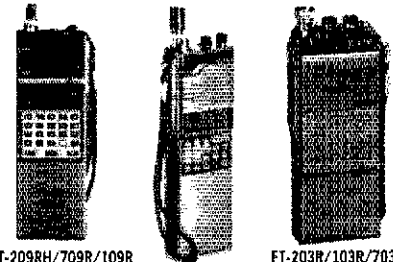
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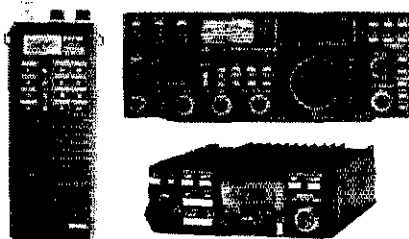
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7544 \$17			

Boost Your Contest Power!

THE NEW LK-500ZC

This self-contained, full QSK high frequency linear power amplifier is capable of amateur continuous operation at output power levels of 1500 watts. It is manually tunable from 1.8-2.4 and 3.5-22 MHz continuous. The HF tank coil and Centralab bandswitch are silver-plated.

INTERNAL POWER SUPPLY

All 500 Series amplifiers have a Peter Dahl Hipersil plate transformer and a separate filament transformer. The fullwave bridge rectifier system—unlike other systems that utilize weak voltage doublers—uses computer grade electrolytic capacitors.

COMPATIBILITY GUARANTEED

Customer feedback in 1986 insisted on system compatibility. Responding to this challenge, a special Plug and Play Harness to hook your favorite radio to the LK500 is offered as an accessory. Of course, all Amp Supply amplifiers have our famous ATI-6 tuned input systems, assuring a perfect 50 ohm load to your transceiver.

AUTOMATIC LOCK OUT "NEW"

All the new LK-500ZC Series amplifiers are equipped with the ALO which stops amplifier operation when it senses an unacceptable SWR, improper tuning, or overcurrent on the tubes.

2-SPEED FANS

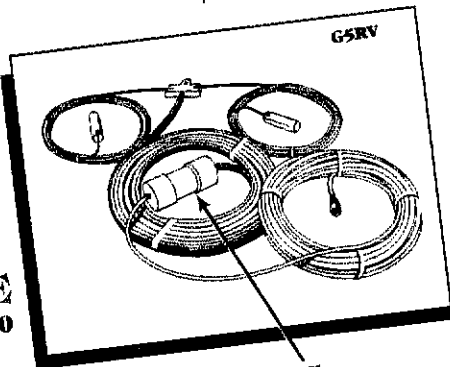
Most manufacturers have had to compromise on fan speed, one of the noisiest and objectionable aspects of amateur radio operation. But, our 500 Series amplifiers are different; they are the result of our perfected system of customer communication and engineer response.

THE LK-500ZC WITHOUT QSK

A version of the 500ZC is available without the Jennings vacuum antenna changeover relay and a companion sealed relay QSK system. A super buy at \$1199.00!

THE LK-500NTC NO-TUNE

Our no-tune amplifier is the same dependable amplifier as the LK-500ZC with the new ALO system and full QSK, and completes our popular 500 Series. This desirable version allows you to merely switch to your favorite amateur band and transmit at full power. We have preset internal capacitors and coils for each of the traditional six amateur bands. The LK-500NTC is also available for special MARS and commercial channelized frequencies.



SALE
\$49.50

New Matching Transformer

THE G5RV ANTENNA

Reg. \$60.00 SALE \$49.50

The G5RV Signal Injector™ antenna is an excellent all band (3.5-30 MHz) 102 ft. dipole. On 1.8 MHz the center and shield of the coax at the transmitter end may be joined together and the antenna may be used as a Marconi with a tuner and a good earth ground. The proper combination of a 102 ft. flat-top and 31 ft. of 300 ohm transmission line achieves resonance on all the amateur bands from 80 to 10 meters with only one antenna. There is no loss in traps and coils. The impedance present at the end of the 300 ohm line is about 50-60 ohms, a good match to the new RG8X mini foam coax.

- 2 KW PEP
- Completely assembled
- Use as horizontal or "V" configuration
- Consists of: 102 ft. copper antenna wire, 31 ft. 300 ohm transmission line, 70 ft. RG-8X coax, 2 end insulators, 1 center insulator, 1 PL-259 and sleeve, connector and the new transformer coupler.



SPECIFICATIONS LK-500ZC

Frequency Range: 160 Meters 1.8-2.2 MHz, 80 meters 3.5-4.5 MHz, 40 meters 7.0-7.5 MHz, 30 meters 10.1 to 10.15 MHz, 20 meters 14.0-14.9 MHz, 17 meters 18.0-19.2 MHz, 15 meters 21.0-21.5 MHz, Export models: 12 meters 24.8-24.9 MHz, 10 meters 28.0-29.7 MHz.

Drive Power: 100W Nominal for 1500 Watt SSB PEP output, 125W Nominal for 1500 Watt CW output.

RF Output SSB 1.5 KW PEP continuous, CW 1.2 KW Average continuous, RTTY, SSTV 1 KW Average 1.5 KW PEP.

Plate Voltage: RTTY/AM/SSTV/CW/SSB 3.2 KV DC

Harmonic Suppression: -50 dB minimum.

Intermodulation Distortion Products: -33 dB down minimum.

Circuit Type: Class AB₂ grounded grid. Type of Emission: SSB, CW, RTTY, AM, SSTV

Duty Cycle: Amateur continuous duty in all modes at specified output.

Output Circuit: Pi-network (silver plated tubing HF coil).

Power Requirements: 115/230 VAC, 30/15 amps (230 VAC factory wired and recommended).

Dimensions: 8" H x 14" W x 16" D (including knobs).

UPS Shippable: 59 lbs.

Warranty: Two years on amplifier.

LK-500ZC Full QSK \$1395.00 Reg. \$1295.00 SALE

LK-500ZC Without QSK \$1199.00 Reg. \$1099. SALE

LK-500NTC No-Tune Version \$1695.00 Reg. \$1595. SALE

Plug & Play Harness (Specify your radio) \$9.95

AT3000 Matching 3K Tuner \$499.00

LK-550 New 3 Tube w/Power Pac \$1895.00

LK-450 New Single 3-500Z Amp \$899.50

Add an automatic SWR lock-out brain to your present amplifier (any brand). Self contained plug and play.

ALO-1 Accessory \$ 94.50

Trade in amps accepted. Reconditioned and guaranteed trade-in amps available. We now have a full line of wire antenna and accessories.

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For fastest delivery, send cashiers check, money order, or order by credit card. Personal checks, allow 18 days to clear. North Carolina residents, add 4% sales tax. Hours: Monday-Friday 9:00 a.m. - 5:00 p.m. E.S.T.



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National Tower Company

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Hours 8:30-5:00 M-F 913-888-8864

ROHN FREE BASE STUDS WITH EACH BX TOWER

25G	10' section	\$52.90
25AG2 & 3	model 2 or 3 top section	\$63.00
25AG4	model 4 top section	\$70.00
45G	10' section	\$117.00
45AG3 & 4	model 3 or 4 top section	\$129.00
55G	10' section	\$161.00
TB3	thrust bearing	\$56.25
M200	10' mast, 2" o.d.	\$12.00
BX-40	40' self supporting [6 sq.ft.]	\$178.00
BX-48	48' self supporting [6 sq.ft.]	\$238.00
BX-56	56' self supporting [6 sq.ft.]	\$319.00
BX-64	64' self supporting [6 sq.ft.]	\$411.00
HXB-40	40' self supporting [10 sq.ft.]	\$216.00
HXB-48	48' self supporting [10 sq.ft.]	\$293.00
HXB-56	56' self supporting [10 sq.ft.]	\$373.00
HXB-64	64' self supporting [10 sq.ft.]	\$453.00
HDXB-48	48' self supporting [18 sq.ft.]	\$367.00

WE STOCK A COMPLETE LINE OF "ROHN" ACCESSORIES
ALL OF OUR ACCESSORIES ARE MANUFACTURED BY "ROHN" HYGAIN/TELEX ANTENNAS

HF ANTENNAS		Tribands
TH3JRS	3 element "Junior Thunderbird"	\$233.00
TH5MK2S	5 element "Thunderbird"	\$438.00
TH2MKS	2 element "Thunderbird"	\$213.00
TH7DXS	7 element "Thunderbird"	\$567.00
TH6DXK	conversion kit to TH7DXS	\$189.00
EXP 14	Explorer 14 triband beam	\$385.00
QK710	30/40 M conv. Exp 14	\$96.00

Monoband		
105BAS	"Long John" 5 element 10 mtr.	\$165.00
155BAS	"Long John" 5 element 15 mtr.	\$253.00
205BAS	"Long John" 5 element 20 mtr.	\$430.00
304BAS	4 element 20 meter	\$317.00
7-1S	"Discoverer" rotary dipole 30/40mtr.	\$160.00
7-2S	"Discoverer" 2 elem. 40 meter beam.	\$399.00
402BA	2 element 40 meter	\$159.00
7-3S	While Supply Lasts - Motor Freight converts 7-2S to 3 elem. beam.	\$251.00
Multiband Verticals		
18HTS	"Hy-Tower" 10 thru 80 meters	\$477.00
14RMO	roof mt kit for 12 AVQ, 14AVQ and 18AVT/WB	\$45.00
18VS	base loaded, 10 thru 80 meters	\$37.00
12AVOS	trap vertical 10 thru 20 meters	\$59.00
14AVO/WBS	trap vertical 10 thru 40 meters	\$80.00
18AVT/WBS	trap vertical 10 thru 80 meters	\$129.00

Multiband Doublets		
18TD	portable tape dipole 10-80 meters	\$132.00
28DQS	trap doublet 40 and 80 meters	\$75.00
58DQS	trap doublet 10 thru 80 meters	\$141.00
VHF ANTENNAS		Beams & Verticals
23BS	2 meter 3 element beam	\$26.00
25BS	2 meter 5 element beam	\$31.00
28BS	2 meter 8 element beam	\$44.00
214BS	2 meter 14 element beam	\$53.00
64BS	4 element 6 meter beam	\$80.00
V-2S	collinear gain vertical 138-174 MHz	\$53.00
V-3S	collinear gain vertical 220 MHz	\$53.00
V-4S	collinear gain vertical 430-470 MHz	\$64.00
GP62A	base, 2 mtr. ground plane	\$29.50

VHF & UHF Mobiles		
HR144GR1	fiberglass 2 mtr 3/8-24 mt	\$76.00
HR144GR2	HyBander 2mtr 3/8-24 mt.	\$68.00
HR144MAG	HyBander 2 meter	\$24.00
HR86	ferrite balun for 10-80 meters	\$24.50
OSCAR LINK ANTENNA		
215S	70cm, 435 MHz	\$97.00
218S	Complete Oscar link system	\$243.00

CUSHCRAFT ANTENNAS		
A3	3 element triband beam	\$216.00
A743	7 & 10 MHz add on kit for A3	\$74.50
A744	7 & 10 MHz add on kit for A4	\$74.50
4218X1	18 element 2 mtr, 28' 8" boomer	\$101.50
A4	4 element triband beam	\$290.50
AV4	40-10 mtr. vertical	\$94.50
AV5	80-10 mtr. vertical	\$101.00
ARX2B	2 mtr. "Ringo Ranger"	\$35.00
ARX450B	450 MHz, "Ringo Ranger"	\$35.00
A144-11	144 MHz, 11 ele. VHF	\$47.50
A147-11	11 element 146-148 MHz beam	\$47.50
A147-22	22 element "Power Packer"	\$128.50
A144-10T	10 element 2 mtr. "Oscar"	\$50.50
A144-20T	20 element 2 mtr. "Oscar"	\$74.50
215WB	15 element 2 mtr. "Boomer"	\$81.00
220B	17 element FM "Boomer"	\$94.00
230WB	144-148MHz, 30 element	\$216.00
32-19	19 element 2 mtr. "Boomer"	\$94.00
424B	24 element "Boomer"	\$81.00
R3	20-15-10 mtr. vertical	\$267.00
10-4CD	4 element 10 mtr. "Skywalker"	\$108.00
15-4CD	4 element 15 mtr. "Skywalker"	\$121.50
20-4CD	4 element 14 MHz "Skywalker"	\$270.00

HUSTLER ANTENNAS		
48TV	40-10 mtr. vertical	\$79.00
58TV	80-10 mtr. vertical	\$105.00
68TV	6 band trap vertical	\$124.00

ROTORS		
Alliance	HD73 [10.7 sq. ft.]	\$104.00
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CDE	AR40 TV, 3 sq ft.	\$140.00
CDE	CD45-II (8.5 sq. ft.)	\$189.00
CDE	HAM IV [15 sq. ft.]	\$279.00
CDE	T2X [20 sq. ft.]	\$333.00

ROTOR CABLE		
(2-18 & 6-22)	4080 - per foot	\$0.18
(2-16 & 6-20)	4090 - per foot	\$0.35
RG8U	Mini 8 low loss foam per foot	\$0.17
	500' roll	\$79.00
RG8U	Columbia superflex \$29/100' or 500' for	\$125.00

Uniden Bearcat



BC100XL
\$179.00
16 ch 9 band, aircraft, search & squelch, scan delay, ch lockout, LCD, W/adaptor-charger, carry case, earphone, nicad batteries, 2 antennas.

BC145XL . . . \$99.90
16 channel 10 band, programmable, 2 digit LED, priority, memory backup, Ch lockout, weather search, AC/DC.

BC50XL 10 Ch, 10 band, hand held. . . \$119.90
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BC70XL NEW 20 chan, 10 band, HAND HELD. . . \$159.90
BC140XL 10 chan, 10 band, AC/DC . . . \$85.90
BC175XL 16 ch, 11 band aircraft. . . \$159.00
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45 ch, 7 band, programmable, aircraft, alarm clock, search/scan, priority, dual level display, lockout, scan delay, AC/DC. (both cords included)

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\$219.00
55 channel 11 band, aircraft & police, search or scan, priority, ch lockout, scan delay, permanent memory backup, LCD display.

C403 4 chan, 3 band, crystal, AC only . . . \$49.90
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R1075 15 chan, 6 band, programmable, AC only . . . \$89.90
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Dual conversion superhet, audio alarm & seq, LED visual alarm, city/hwy, volume control, 2 cords plus deluxe mounting kit.

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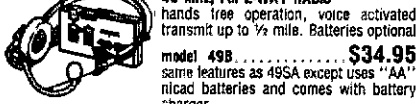
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49 MHz, FM 2-WAY RADIO
hands free operation, voice activated transmit up to 1/2 mile. Batteries optional

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same features as 49SA except uses "AA" nicad batteries and comes with battery charger

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Output: 13.8V DC - 3 amp constant 5 amp surge, electronic overload protection w/instant auto reset, fuse protected.

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Fully regulated, 7 amp constant, 10 amp surge capacity.

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Fully regulated, 25 amp surge capacity, 13.8 VDC, 20 amp constant, with meter.

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Regulated 4.5-15VDC-25 Amp constant 27 amp surge, instant auto reset, dual meter for current & voltage.



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WANTED YAESU FT-7B portable in good or excellent condition. C. Keith, 351 Ferdinand, Longwood, FL 32750, W4STX.

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COLLINS KWM-360, 360 Hz, 140 Hz Filters, Keypad, NB, Processor, Fact Mods, Service Manual, 1 ship, mint \$2100. Robt. Root, 213- 928-1665 eve.

WANTED: DRAKE MN2700 Antenna Tuner. Call 509-534-7750, Betsy KE7PL.

ARRL 87-88 REPEATER DIRECTORY for \$5 total. Send to Marshall Hill Enterprises, Bradford, NH 03221.

SOLAR MODULES. Operate 12VDC equipment from free sunlight. Ideal for remote repeaters. Great for Field Day, 20W, 40W and 70W weatherproof modules. Paterson Solar Electric, P.O. Box 4628, Westbrook, MA 01581.

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WANTED TWO 9974's for Alpha K4NBN "No Bad News," 904-733-9518.

WANTED: YAESU FT 2700 RH dual detectors. Jim WB2REM, 23 Pennrod Ave., Trenton, N.J. 08638 or call 609-771-8070.

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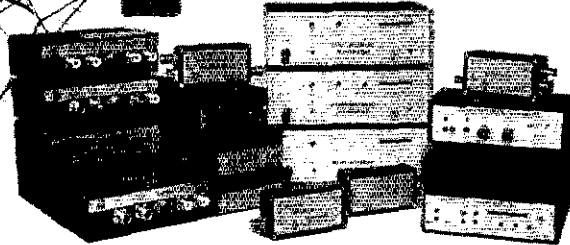
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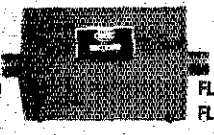
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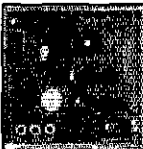
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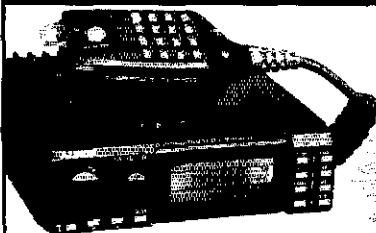


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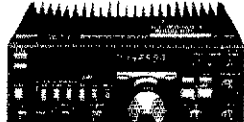


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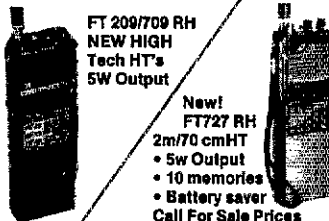
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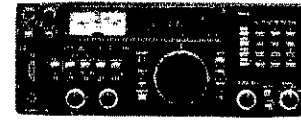
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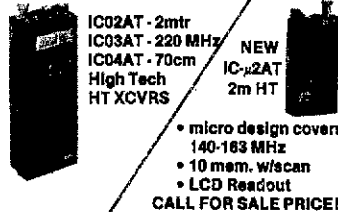


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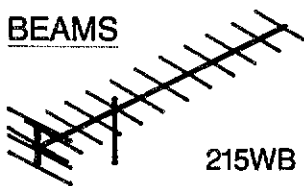
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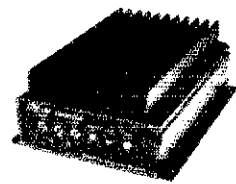
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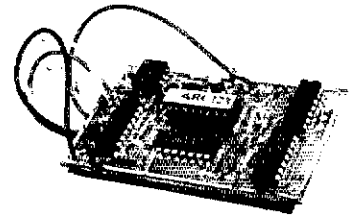
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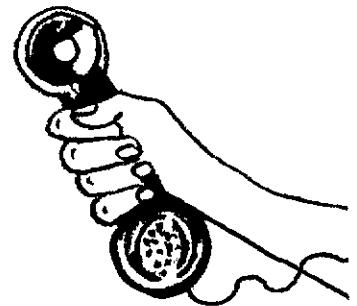
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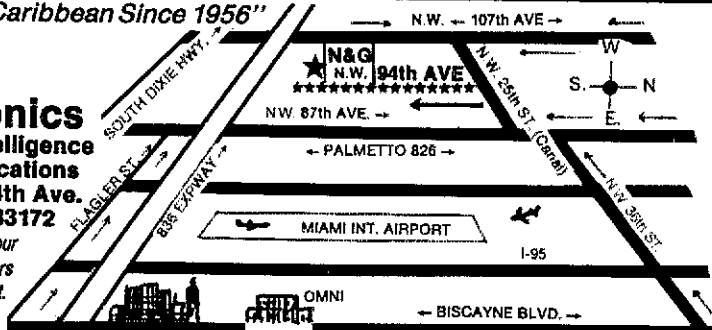
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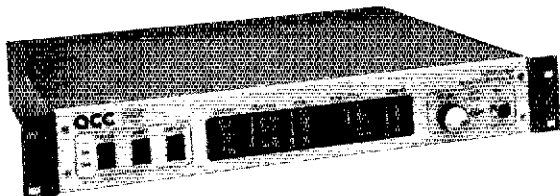


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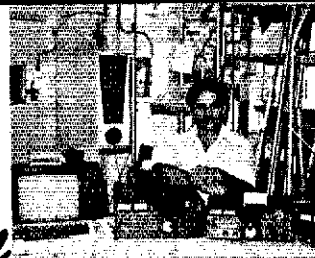
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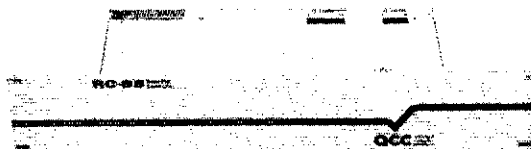


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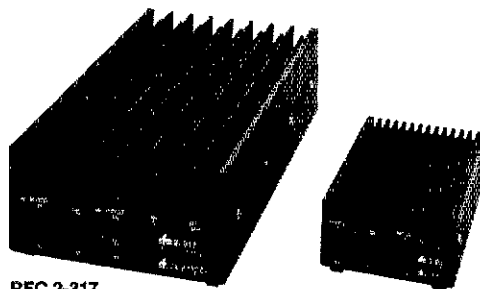
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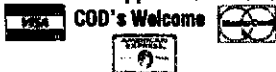
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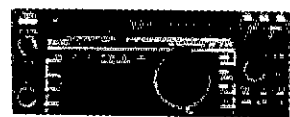
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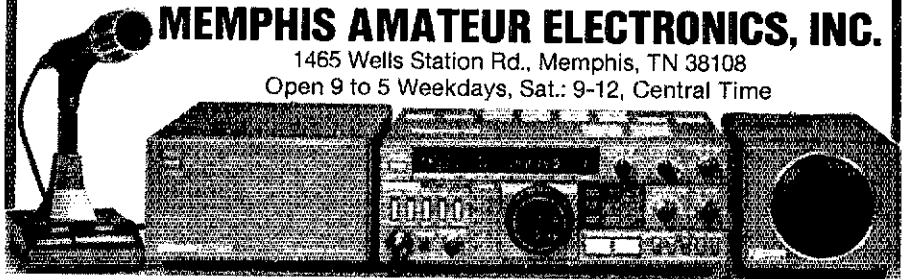
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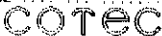
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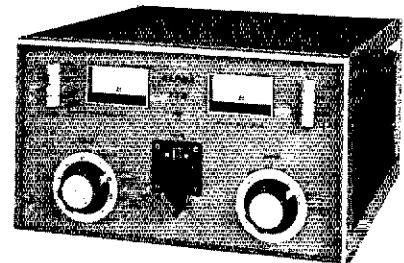
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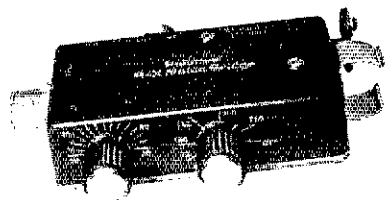
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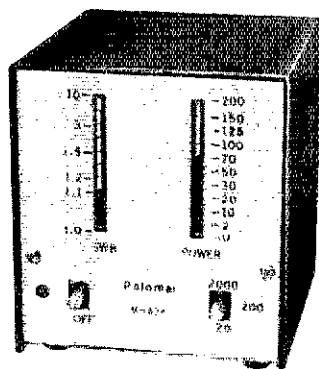


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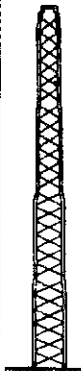
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HG54HD	54 ft	18 sq ft	\$CALL
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Masts—Thrust Bearings—
Other Accessories Available
—Call! Prices Shown Are
Your Total Delivered Price
In Continental U.S.A.!



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	Price*
HGX40	40 ft	10 sq ft	238	\$359
HGX48	48 ft	10 sq ft	303	\$459
HGX56	56 ft	10 sq ft	385	\$539
HDX40	40 ft	18 sq ft	281	\$429
HDX48	48 ft	18 sq ft	383	\$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" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

Model 25G	Model 45G	Model 55G
50' \$ 629	\$1118	\$1488
60' 689	1259	1669
70' 749	1379	1829
80' 909	1539	2019
90' 979	1809	2189
100' 1059	1969	2369
110' 1259	2099	2769
120' 1329	2259	2959



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
MA350 mast	22'	50'	10 sq ft	899
TX438	22'	38'	18 sq ft	829
TX455	22'	35'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2058
HDX556	22'	55'	30 sq ft	1879
HDX572	23'	72'	30 sq ft	3229

Note: US Towers Shipped Freight Collect From Visalia, CA Factory
*Note-towers rated at 50 mph to EIA specifications

RG-213U

\$ 29/ft \$279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

\$ 19/ft \$179/1000 ft

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086

\$ 39/ft \$379/1000 ft

- Same specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HARDLINE/HELIX®

Lowest Loss for VHF/UHF!

1/2" Alum. w/poly Jacket. \$.79/ft.
1/4" LDF4-50 Andrew Helix® \$1.79/ft.
3/8" LDF5-50 Andrew Helix® \$3.99/ft

Special connectors below.
Helix® is a Registered Trademark of the Andrew Corp.

Coaxial Cable Loss Characteristics (dB/100 Ft)

Cable Type	Impad.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.6	5.8
9086	50	.4	.64	1.7	3.1
1/2" Alum	50	3	5	1.2	2.2
1/4" Helix	50	2	4	.9	1.6
3/8" Helix	50	1	2	.5	.9

HARDLINE & HELIX® CONNECTORS

Cable Type	UHF FML	UHF MALEN	FML N	MALE
1/2" Alum	\$19	\$19	\$19	\$25
1/4" Helix®	\$25	\$25	\$25	\$25
3/8" Helix®	\$49	\$49	\$49	\$49

COAX CONNECTORS

Amphenol Silver PL259	\$1.25
UG21B N Male	\$2.95
9086/9913 N Male Connector	\$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga	\$.10/ft.
1/2 mile 18ga copper-clad steel wire	\$30
Dog bone end insulator	\$.79 ea.

Van Gordon

1:1 Balun	\$11	Center Insulator	\$6	
Dipole Kits		D80	\$31.95/D40	\$28.95
Short Dipole Kits		S080	\$35.95/S040	\$33.95
All-band Dipole w/ladder line			\$29.95	
G5RV all band antenna			\$49.95	

ALPHA DELTA
DX-A 160-80-40 Sloper \$49

CUSHCRAFT

A3 3-el Tribander	\$229
A4 4-el Tribander Beam	\$299
A743 & A744, 3D/40 mtr KIT for the A3 & A4	\$279
R3 20, 15, 10mtr Vertical	\$275
AV5 80-10mtr Vertical	\$109
D40 40mtr Dipole	\$159
40-2CD 2-el 40 mtr Beam	\$299
A50-5 5-el 6 mtr Beam	\$85
215 WB NEW 15-el 2 mtr Beam	\$85
230 WB NEW 30-el 2 mtr Beam	\$229
4218 XL 18-el 2 mtr Beam	\$105
3219 19-el 2 mtr Beam	\$99
2208 17-el 220MHz Beam	\$99
4248 24-el 432MHz Beam	\$85
ARX2B 2 mtr Vertical	\$39

hy-gain

Discoverer 2-el 40-mtr Beam
Discoverer 3-el Conversion KR
EXPLORER-14 SUPER-SPECIAL
QK710 30/40 mtr. Add-On-Kit
325 2 mtr Base Vertical
V45 440MHz Base Vertical
TH5MK2S Broad Band 5-el Triband Beam
TH7XS 7-el Triband Beam
TH3JRS 3-el Triband Beam
205BAS 5-el 20-mtr Beam
155BAS 5-el 15-mtr Beam
105BAS 5-el 10-mtr Beam
204BAS 4-el 20-mtr Beam
64BS 4-el 6-mtr Beam
12 AVQ 20-10 mtr vertical
14 AVQ 40-10mtr vertical
18 AVT/WB 80-10mtr Vertical
18HTS 80-10 mtr Hy-Tower Vertical
23BS 3-el 2 mtr Beam
25BS 5-el 2 mtr Beam
28BS 8-el 2 mtr Beam
214BS 14-el 2-mtr Beam
28DQ 80/40 mtr Trap Dipole
58DQ 80 mtr Trap Dipole
BN86 80-10 mtr KW Balun W/Coax Seal

HUSTLER

6BTV 80-10 mtr Vert	\$129	5BTV 80-10 mtr Vert	\$109
4BTV 40-10 mtr Vert	\$89	G7-144 2-mtr Base	\$119
G6-144B 2-mtr Base	\$89		

Mobile Resonators 10m 15m 20m 40m 75m
400W Standard \$15 \$17 \$19 \$22 \$26
2KW Super \$20 \$22 \$25 \$29 \$39
Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

HF6V 80-10m Vertical \$129 Delivered

- Full Legal Power
- Highest Q Tuning Circuits

HF2V 80-40m Vertical \$129 Delivered

- Full Legal Power
- Automatic Band Switching

Accessories:

RMK II Roof Mtg. Kit	\$49
STR II Stub-Tuned Radials	\$29
TBR160 160m Coil Kit	\$49
30m Add-on Kit	\$29
20m Add-on Kit	\$39
17/12m Add-on Kit	\$27

FREE UPS on ACCESSORIES when purchased w/antenna

HF4B "Butterfly" 20-10m Compact Beam \$189, Delivered

- Unique Design Reduces Size
- No Lossy Traps
- Turns W/TV Rotor

HIRAGE/KLM

KT34A 4-el Broad Band Triband Beam	\$399.95
KT34XA 6-el Broad Band Triband Beam	\$589.95

CREATE ANTENNAS CALL FOR DISCOUNT PRICING!

ROTORS

Daiwa MR 750 PE (16.1 sq ft rating)	\$289
Additional Motor Units	\$89
Alliance HD73 (10.7 sq ft rating)	\$119.95
Alliance U110 (3 sq ft rating)	\$49
Telex CD 4511 (8.5 sq ft rating)	\$Call
Telex HAM 4 (15 sq ft rating)	\$Call
Telex Tailtwister (20 sq ft rating)	\$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	\$Call
Kenpro KR500 Heavy Duty Elevator Rotator	\$189
Kenpro KR5400 AZ/EL Rotor Package	\$319

ROTOR CABLE

Standard 8 cord cables \$.19/ft
(vinyl jacket 2-#18 & 6-#22 ga)

Heavy Duty 8 Cord cable \$.36/ft
(vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS

10 FT. STACKED SECTIONS

208	\$45.00	45G	\$118.00
258	\$52.00	55G	\$160.00

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDDOVER 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.
45G Double Guy Kit. \$269.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	\$ 15/ft
1/4 EHS Guywire (6650 lb rating)	\$ 18/ft
5/16 EHS Guywire (11,200 lb rating)	\$ 29/ft
5/32 7 x 7 Aircraft Cable (2700 lb rating)	\$ 15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	\$ 45
1/4 CCM Cable Clamp (1/4" Cable)	\$ 55
1/4 TH Thimble (fits all sizes)	\$ 45
3/8EE (3/8" Eye & Eye Turnbuckle)	\$6.95
3/8EJ (3/8" Eye & Jaw Turnbuckle)	\$7.95
1/2 x 9EE (1/2" x 9" Eye to Eye Turnbuckle)	\$9.95
1/2 x 9EJ (1/2" x 9" Eye & Jaw Turnbuckle)	\$10.95
1/2 x 12EE (1/2" x 12" Eye & Eye Turnbuckle)	\$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle)	\$13.95
5/8 x 12EJ (5/8" x 12" Eye & Jaw Turnbuckle)	\$16.95
3/16" Preformed Guy Grip	\$2.49
1/4" Preformed Guy Grip	\$2.99
6" Diam - 4 ft Long Earth Screw Anchor	\$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	\$1.69
502 Guy Insulator (1/4" Cable)	\$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	\$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	\$ 29/ft
HPTG4000 Guy Cable (4000 lb rating)	\$ 49/ft
HPTG6700 Guy Cable (6700 lb rating)	\$ 69/ft
9901LD Cable End (for 2100/4000 cable)	\$8.95
9902LD Cable End (for 6700 cable)	\$9.95
Socketfast Potting Compound (does 6-8 ends)	\$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 In OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	\$38	\$49	\$69	\$89
18 in Wall	\$39	\$69	\$99	\$129
25 in Wall	\$89	\$129	\$189	\$249

ORDER TOLL FREE 1-800-272-3467

Texas, Alaska & for information 1 (214) 422-7306

TEXAS TOWERS

Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 • Plano, Texas 75074

Mon-Fri: 9am - 5pm
Sat: 9am - 1pm



(Prices & Availability Subject to Change Without Notice)

(Antenna/tower product prices do not include shipping unless noted otherwise)

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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 with 25 Watts
- 7-Digit Telephone No. Memory
- Direct Frequency Entry
- 23-Channel Memory

KENWOOD

NEW

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 5m, 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



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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-12AT

- 140-163 MHz
- 10 Memories
- 1W, 1.5W optional
- 32 tones built-in



IC-03AT

- 220 to 224.995 MHz
- 2.5W, 5W Optional
- Built in subtone
- 10 Memories



Kantronics




KAM

Kantronics All Mode

- CW, RTTY, ASCII, AMTOR, HF & VHF Packet
- RS-232/TTL, Universal Compatibility
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MFJ-1274
TNC 2 PACKET RADIO

- VHF and HF Packet
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- AX .25 Level 2 Version 2 Software
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- More!

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ARE YOU CONFUSED ABOUT YOUR NEW PRIVILEGES? CALL US FOR THE UP-TO-THE-MINUTE INFORMATION AND ASSISTANCE WITH YOUR GEAR.

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- Make any RS-232 compatible computer or terminal a complete digital operating position.
- Morse, Baudot, ASCII, AMTOR, Packet
- Loaded with features.

ASTRON CORPORATION



Power Supply

- RS7A \$48
- RS12A \$68
- RS20A \$88
- RS20M \$105
- VS20M \$125
- RS35A \$133
- RS35M \$149
- VS35M \$165
- RS50A \$189
- RS50M \$215
- RM50A \$219
- VS50M \$229

HF performance you can have a real field day with.

With Yaesu's FT-757GX/II, you can enjoy full-featured HF performance just about anywhere.

On vacation. During field day. On the road. Or in your shack.

Because the FT-757GX/II packs all its HF performance into one highly compact, action-ready case. A case so small, it even fits under airplane seats.

Of course, you've probably noticed a similarity to its predecessor, the FT-757GX. That's purely intentional. And now its performance is even better.

With new features like memory storage of operating mode. Slow/fast tuning selection. Automatic step-change according

to mode. IF notch filter. 10 memories. And VFO to VFO scan.

Plus you get an iambic electronic keyer. Woodpecker noise blanker. 600-Hz CW filter. AM and FM modes. AF speech processor. And 25-kHz marker generator. All at no extra charge.

Three microprocessors. Dual VFOs. Single-button VFO/memory swap. Receive coverage from 500 kHz to 30 MHz. Transmit coverage from 10 to 160 meters, including WARC bands. All-mode coverage (LSB, USB, CW, AM and FM). 100-watt RF output.

QSK operation. Massive heatsink and duct-flow cooling system for continuous RTTY

operation for up to 30 minutes.

Computer Aided Transceiver (CAT) System for computer control via optional interface (software is available from your Yaesu dealer).

Of course, the FT-757GX/II offers the kinds of options you'd expect from Yaesu, too. Including standard and heavy-duty power supplies, automatic antenna tuner, and more.

So no matter where you work the DX, take along Yaesu's FT-757GX/II. The full-featured HF rig you'll have a real field day with.

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

...pacesetter in Amateur radio

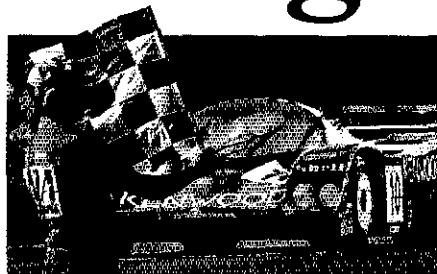
First Again!

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.**

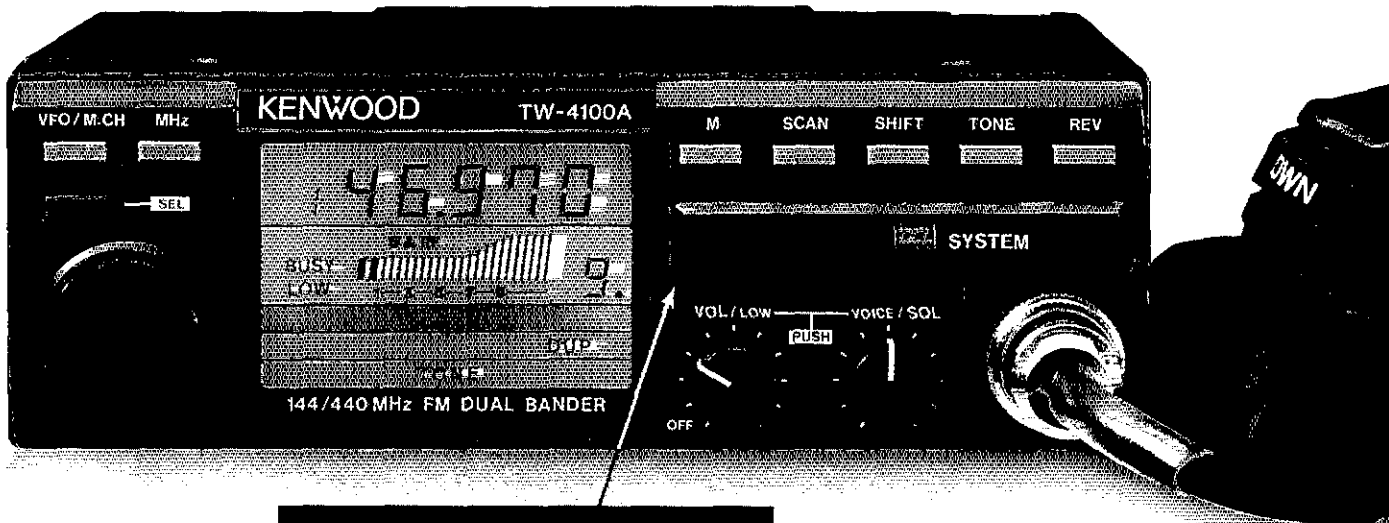
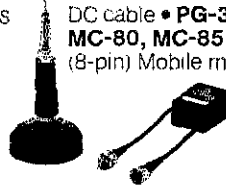


- **New compact size!** Only 5.9" W x 1.97" H x 7.87" D and weighs less than 4 pounds!
- **Proven high performance Kenwood GaAs FET front end receiver.**
- **Easy to operate!** Only 3 knobs and 8 keys on the front panel.
- **Separate antenna ports for VHF and UHF.** Minimizes loss and increases reliability 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

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

*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 Trio-Kenwood transceivers and most accessories.