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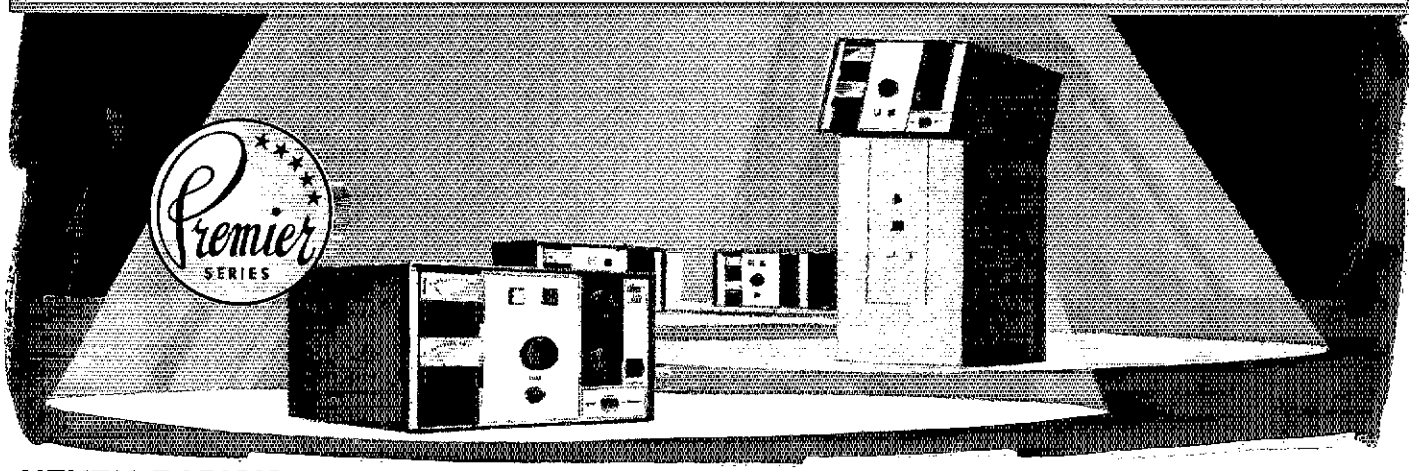
ANNOUNCING
A NEW LINE OF SUPER STARS..HENRY RADIO'S
PREMIER SERIES



HENRY RADIO'S NEW PREMIER SERIES . . . AMPLIFIERS FOR THE DISCRIMINATING AMATEUR WHO REFUSES TO COMPROMISE . . . THE 3K PREMIER AND 3KD PREMIER DELUXE AMPLIFIERS. ALL OF THE MATCHLESS QUALITY AND FEATURES OF THEIR PREDECESSORS PLUS QSK BREAK-IN KEY AND 160 METER BAND.

THE PREMIER SERIES

☆ **The 3K Premier Console** --- all the rugged reliability of the 3K Console plus QSK and the 160 meter band.

☆ **The 3KD Premier Desk Model** --- the same RF deck in a smaller and lighter configuration.

☆ **The 3002-A Console** --- maximum legal power in a two meter block buster.

☆ **The 3004-A Console** --- a unique new approach to high power UHF amplification at 440 MHz.

***Attention:** All HF amplifiers can be modified for 10 meters • All export HF amplifiers are shipped with 10 meter operation included • Please call or write for a complete information packet*

FCC type acceptance pending on 3K Premier and 3KD Premier models.

Henry amateur amplifiers are available from select dealers throughout the U.S. and are being exported to amateurs all over the world. Henry Radio also offers a broad line of commercial FCC type accepted amplifiers for two way FM communications to 500 MHz, as well as special RF power generators for industrial and scientific users. Call or write Ted Shannon for full information.

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AEA • ARCO • ARRL • ASTRON • B & K • B & W • BIRD • CDE • CONNECT-SYSTEMS • CUSHCRAFT • EIMAC • HAL • HUSTLER • HY-GAIN • ICOM • KENWOOD • LARSEN • NYE • TEMPO • VIBROPLEX • YAESU

THE CLASSIC LINE
(Still available as before)

2KD Classic Desk Model ---3.5 – 21.5 MHz. (Two 3-500-Z tubes---the design Henry made famous)

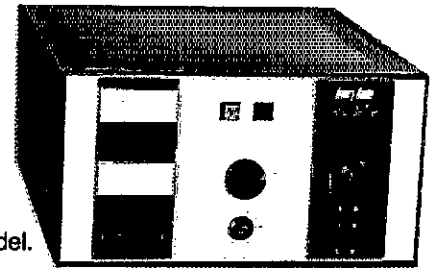
2K Classic Console --- the original and still the standard workhorse.

2K Classic "X" Console --- made heavy duty, rugged and reliable for a lifetime of service.

3K Classic Console with the magnificent 3CX1200A7 final tube.

2002-A..a two-meter desk model using the Eimac 3CX800A7... because this tube is rated at a 15dB gain, only about 25 watts drive is required for full output.

2004-A UHF desk model.



60 YEARS 1925 1985

Henry Radio

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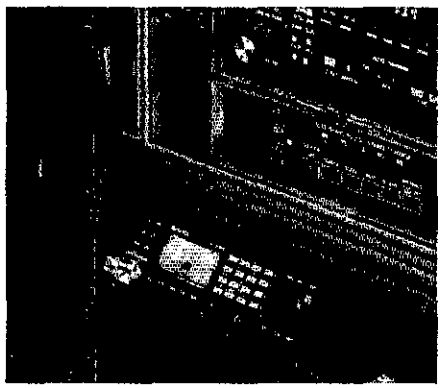
Three Choices for 2m!

TM-2570A/2550A/2530A

Feature-packed 2m FM transceivers

The all-new "25-Series" gives you three RF power choices for 2m FM operation: 70 W, 45 W, and 25 W. Here's what you get:

- Telephone number memory and autodialer (up to 15 seven-digit phone numbers). **A Kenwood exclusive!**
- High performance GaAs FET front end receiver
- 23 channel memory stores offset, frequency, and subtone. Two pairs may be used for odd split operation
- 16-key DTMF pad with audible monitor
- Extended frequency coverage for MARS and CAP (142-149 MHz; 141-151 MHz modifiable)
- Center-stop tuning—**a Kenwood exclusive!**

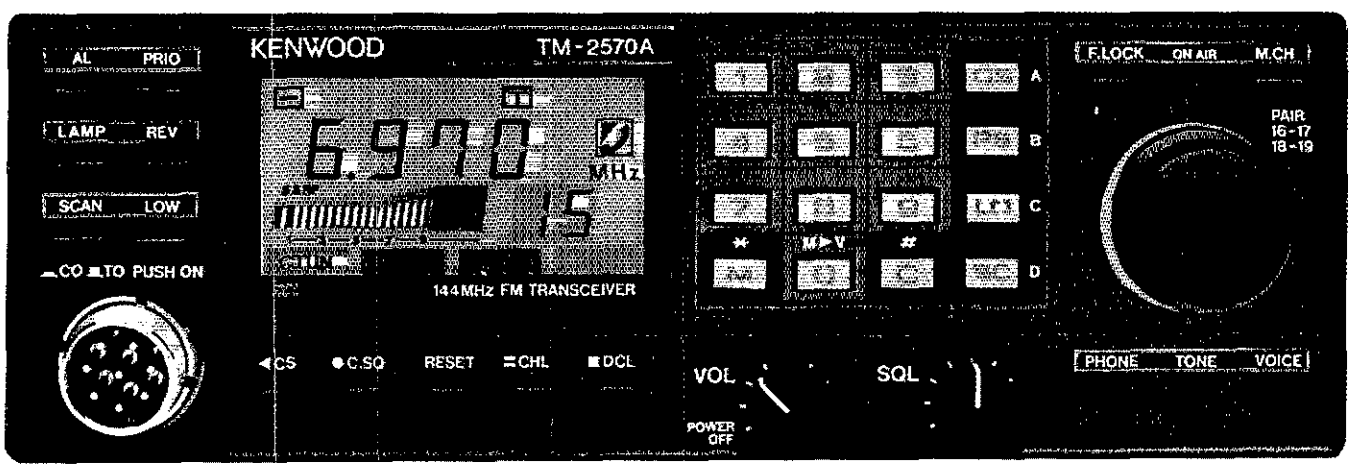


- New 5-way adjustable mounting system
- Automatic repeater offset selection—**another Kenwood exclusive!**
- Direct keyboard frequency entry
- Front panel programmable 38-tone CTCSS encoder **includes** 97.4 Hz (optional)
- Big multi-color LCD and back-lit controls for excellent visibility
- The TM-3530A is a 25 watt version covering 220-225 MHz. The first full featured 220 MHz rig!

DCL Introducing... Digital Channel Link

Compatible with Kenwood's DCS (Digital Code Squelch), the DCL system enables your rig to **automatically** QSY to an open channel. Now you can automatically switch over to a simplex channel after repeater contact! Here's how it works:

The DCL system searches for an open channel, remembers it, returns to the original frequency and transmits control information to another DCL-equipped station that switches **both** radios to the open channel. Microprocessor control assures fast and reliable operation. The whole process happens in an instant!



Actual size front panel

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 for TM-2550A/2530A/3530A
- **PS-50** DC power supply for TM-2570A
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48B** extra DTMF mic. with UP/DWN switch
- **MC-43S** UP/DWN mic.
- **MC-55** (8-pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50B** mobile speaker
- **SW-200A/SW-200B** SWR/power meters
- **SW-100A/SW-100B** compact SWR/power meters
- **SWT-1** 2m antenna tuner

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

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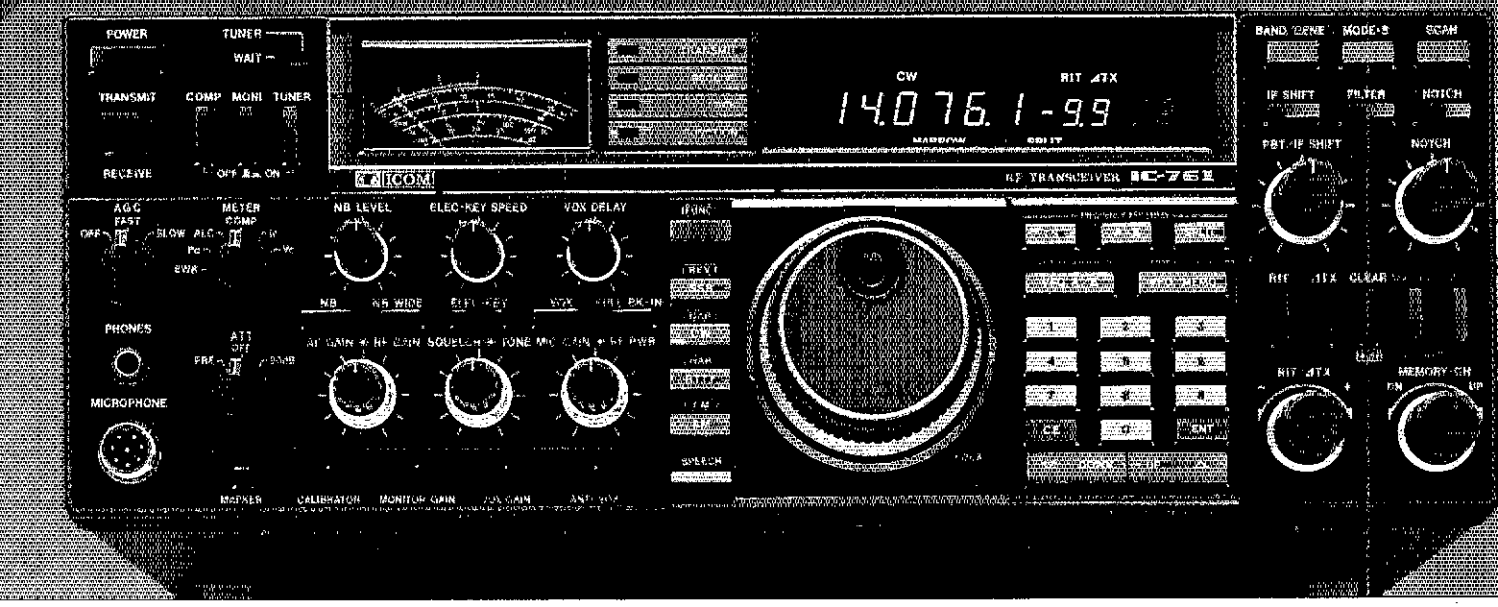
NEW!



ICOM IC-761
A NEW ERA DAWNS

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

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

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

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

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

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

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

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

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

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

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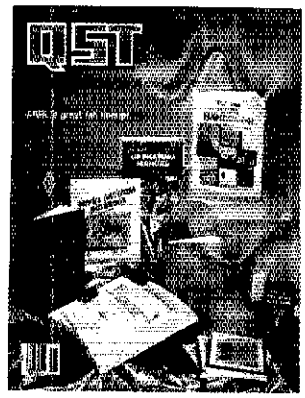

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Whether you're an old-timer or an almost-Novice, you'll find the comprehensive library of League books to be your best guide to ham radio enjoyment and information. These new League books, all available at your local dealer or from HQ, are just some of the titles we've produced with you—the League member—in mind. There's a handy coupon on page 167 of this issue.

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New PK-232 Breakthrough

Six Digital Modes - Including Weather FAX

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

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

$319.95 AMATEUR NET
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Your home computer (or even a simple terminal) can be used for radio data communication in six different modes. Any RS-232 compatible computer or terminal can be connected directly to the PK-232, which interfaces with your transceiver. The only program needed is a simple terminal program, like those used with telephone modems, allowing the computer to be used as a data terminal. All signal processing, protocol, and decoding software is in ROM in the PK-232.

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

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

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

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

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DX THAT STANDS OUT FROM THE CROWD

A3

10, 15, 20,*40 meters

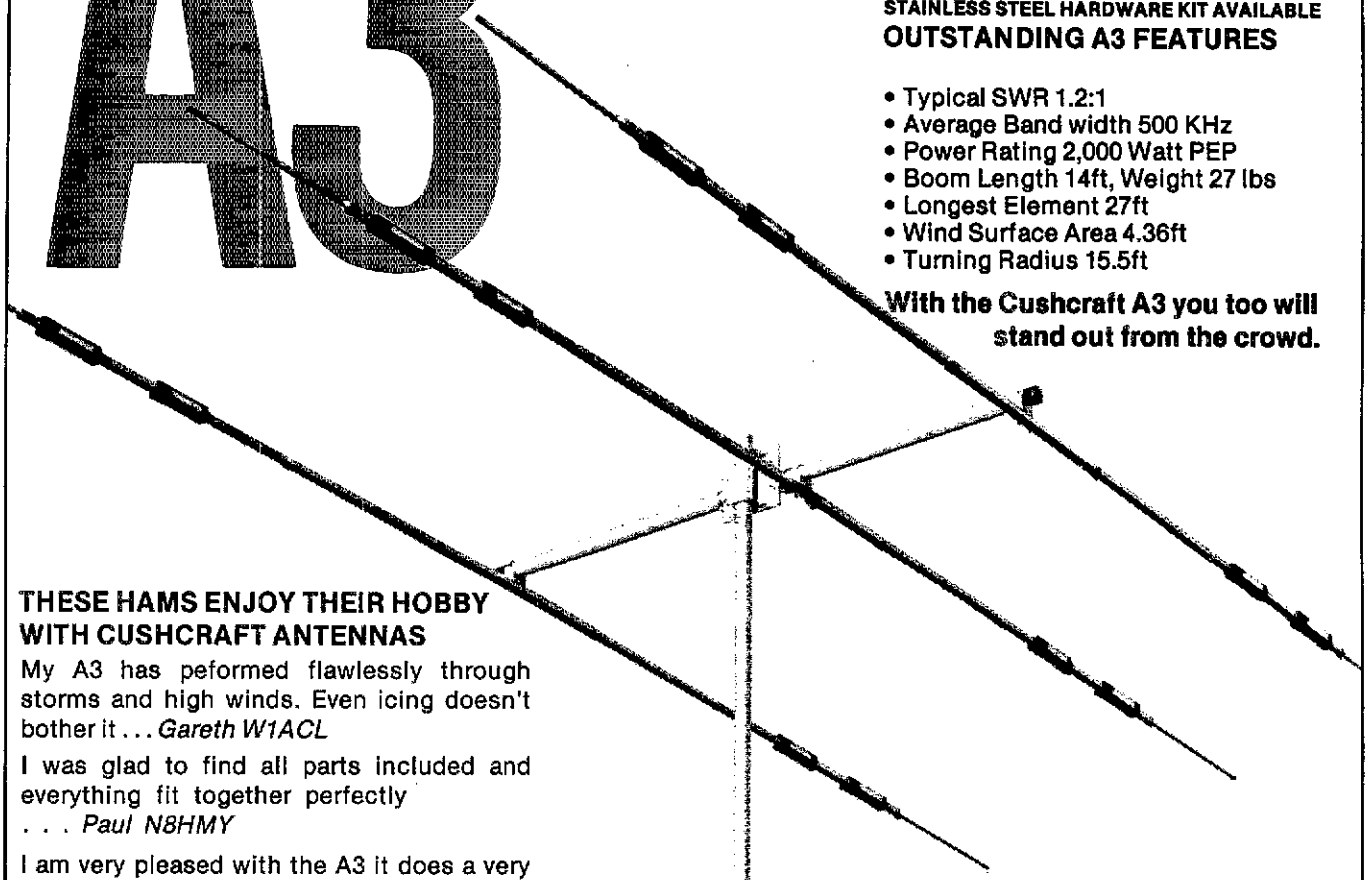
Whether busting pileups, rag chewing or hunting rare DX, the A3 stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

***40 METERS WITH THE A743 ADD ON KIT, STAINLESS STEEL HARDWARE KIT AVAILABLE**

OUTSTANDING A3 FEATURES

- Typical SWR 1.2:1
- Average Band width 500 KHz
- Power Rating 2,000 Watt PEP
- Boom Length 14ft, Weight 27 lbs
- Longest Element 27ft
- Wind Surface Area 4.36ft
- Turning Radius 15.5ft

With the Cushcraft A3 you too will stand out from the crowd.



THESE HAMS ENJOY THEIR HOBBY WITH CUSHCRAFT ANTENNAS

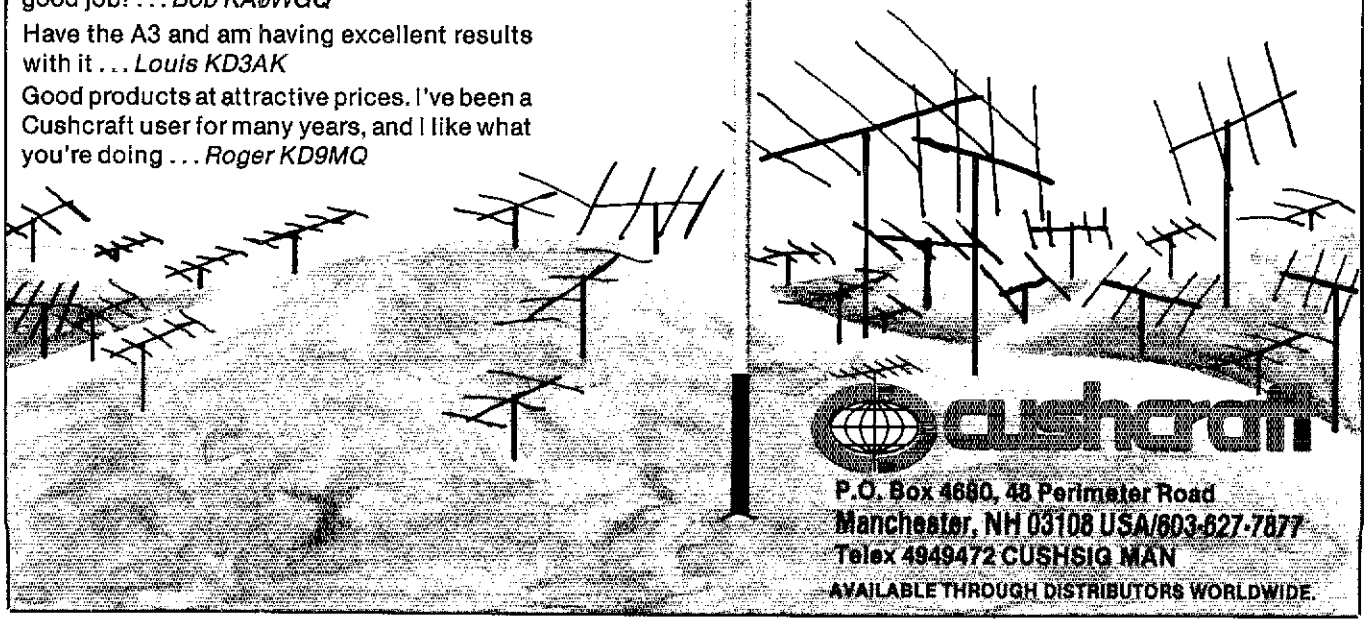
My A3 has peformed flawlessly through storms and high winds. Even icing doesn't bother it . . . *Gareth W1ACL*

I was glad to find all parts included and everything fit together perfectly . . . *Paul N8HMY*

I am very pleased with the A3 it does a very good job! . . . *Bob KA0WGQ*

Have the A3 and am having excellent results with it . . . *Louis KD3AK*

Good products at attractive prices. I've been a Cushcraft user for many years, and I like what you're doing . . . *Roger KD9MQ*



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NEW! 45/35 Watt Dual Bander

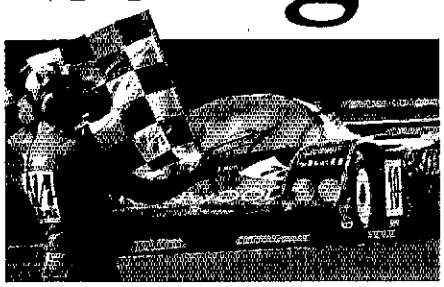
First Again!

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 to 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.**

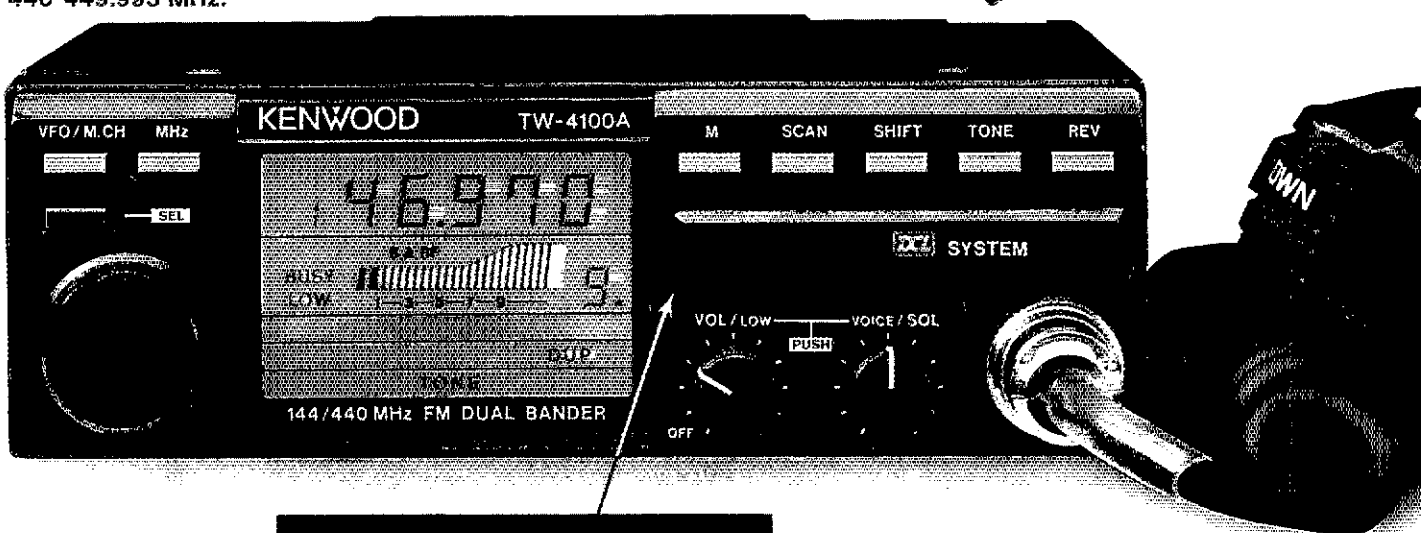


- **New compact size!** Only 5.9" W x 1.97" H x 7.87" D and weighs less than 4 pounds!
- **Proven high performance Kenwood GaAs FET front end receiver.**
- **Easy to operate!** Only 3 knobs and 8 keys on the front panel.
- **Separate antenna ports for VHF and UHF.** Minimizes loss and increases reliability 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 (shown)**
- **MB-11** Extra mobile mount



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

*Please check FCC regulations on repeater operation
**Mag mount is not Kenwood supplied
Minor modification necessary for repeater operation
Specifications and prices subject to change without notice or obligation
Complete service manuals are available for all Kenwood transceivers and most accessories

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NEW!

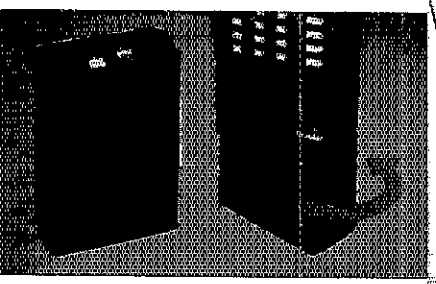
Ultimate Affordable HT!

TH-205AT

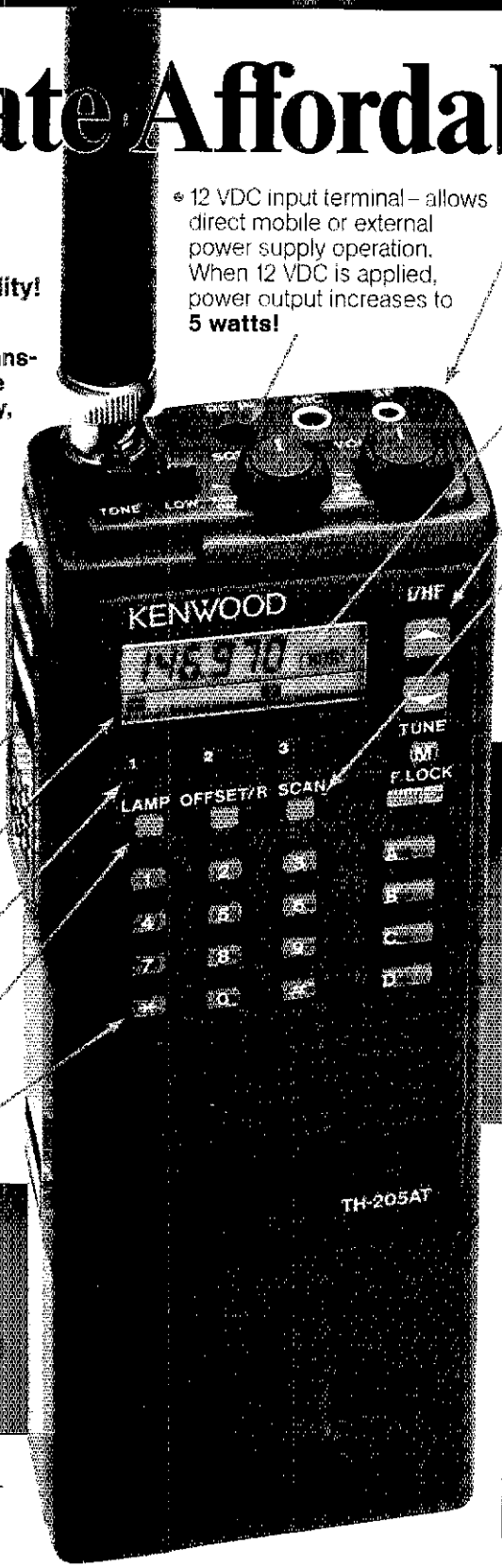
Affordable 5-watt hand-held transceiver. Ultimate Affordability!

It's here now! The affordable, "Kenwood Quality" hand-held transceiver. Standard features include a large, easy-to-read LCD display, wide-range power requirements (operates on 7.2 VDC–16 VDC), 3-channel memory, built-in battery saver circuit, and, when operated on 12 VDC, a robust five watts of power! The die-cast metal rear panel/heat sink assures cool, reliable operation. Receiver frequency coverage from 141–163 MHz is also standard–you can even listen to the "weather channels" at 162.40 or 162.55 MHz!

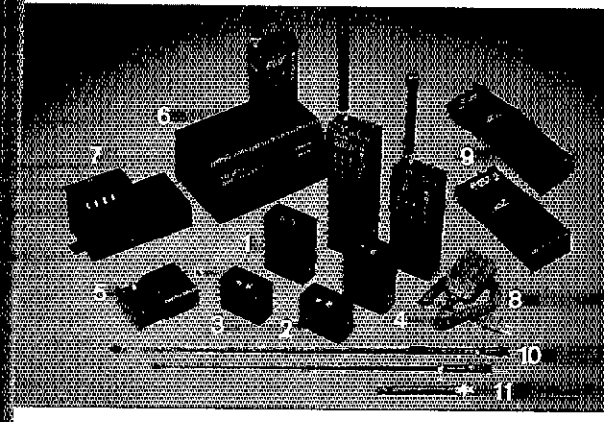
- Monitor switch–to check frequency when PL encode/decode switch is on.
- Extended frequency coverage for certain MARS and CAP operations.
- 3 memory channels store frequency and offset. And so easy to use! Simply press the memory channel number to recall your favorite channels!
- Night light, offset/reverse.
- 16-key DTMF pad for repeater autopatch is standard.



- NEW! Twist-Lok Positive-Connect™ battery case. A wide range of quick-change commercial duty battery packs are available.



- 12 VDC input terminal – allows direct mobile or external power supply operation. When 12 VDC is applied, power output increases to **5 watts!**
- Heavy-duty final amplifier and heat sink. The die-cast rear panel assures reliable operation. With the optional 12-volt PB-1 battery pack, the TH-205AT provides 5 W output. The standard 8.4 volt PB-2 provides 2.5 W output. (500 mW low power).
- Large, easy-to-read LCD display. Frequency, offset, memory channel, TX, RX, and battery indicator.
- Frequency UP/DOWN keys. Used to select frequency or scanning direction.
- Scan function
- Automatic battery saver circuit extends battery life. No buttons to push!
- Supplied accessories include: Rubber flex antenna, belt hook, 8.4 V, 500 mAH NiCd battery pack, wall charger.



Optional Accessories:

1) PB-1 12 V 800 mAH NiCd batt. pack (5 W output). **2)** PB-2 8.4 V 500 mAH NiCd batt. pack (2.5 W output). **3)** PB-3 7.2 V 800 mAH NiCd batt. pack (1.5 W output). **4)** PB-4 7.2 V 1600 mAH NiCd batt. pack (1.5 W output). **5)** BT-5 AA manganese/alkaline battery case. **6)** BC-7 Rapid charger for PB-1, 2, 3, or 4. **7)** BC-8 Compact battery charger. **8)** SMC-30 Speaker microphone. **9)** SC-12, SC-13 Soft cases. **10)** RA-3, RA-5 Telescoping antennas. **11)** RA-8B StubbyDuk antenna • TSU-3 CTCSS encode/decode unit • VB-2530 2 m, 25 W RF power booster • LH-4, LH-5 Leather cases • MB-4 Mobile bracket • BH-5 Swivel mount • PG-2V DC cable • PG-3C Filtered cigar lighter cord.

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Vice Director: Paul Vydareny, WB2VUK,
259 N Washington St, N Tarrytown, NY 10591-2314
(914-631-7424)

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Vice Director: Claire Richard Dyas, WØJCP,
PO Box 386, Oxford, NE 68967-0386 (308-824-3138)

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Box 62, Unionville, CT 06085 (203-673-5429)

Vice Director: Robert Weinstock, KN1K, PO Box 331, Cambridge, MA 02238 (617-492-9225)

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Vice Director: Mrs. Evelyn Gauzens, W4WYR,
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Vice Director: Wayne Overbeck, N6NB,
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11837 Judd Ct, #114, Dallas, TX 75243
(214-437-1363) business

Vice Director: Thomas W. Comstock, N5TC,
1700 Dominik, College Station, TX 77840
(409-693-1181)

*Executive Committee Member

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Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 16 divisions of the League are further arranged into 74 administrative "sections," each headed by an elected Section Manager. Your SM welcomes reports of club and individual activity. ARRL Field Organization appointments are available covering a wide range of Amateur Radio volunteer interests. Whatever your license class, your SM has an appointment available. Check with your SM (below) for further information.

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Manitoba — Jack Adams, VE4AJE, 227 Davidson Ave E, Dauphin R7N 2Z4 (204-638-9270)
Maritime-Nfld — Leigh Hawkes, VE1GA, Box 864, Armdale, NS B3L 4K5 (902-443-6360)
Ontario — L. P. Thivierge, VE3GT, 34 Bruce St W, Renfrew K7V 3W1 (613-432-5967)
Quebec — Harold Moreau, VE2BP, 80 Principale, St Simon Co, Bagot J0H 1Y0 (514-798-2173)
Saskatchewan — Gordon Kosmenko, VE5GF, 59 Kowalchuk Cres, Regina S4R 6W7 (306-543-7923)

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South Dakota — Roland Cory, WØYMB, 1010 7th St, W, Mobridge 57601 (605-845-2400)

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

THE AMERICAN RADIO RELAY LEAGUE, INC

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

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

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

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

Membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA
Telephone: 203-666-1541 Telex: 650215-5052 MCI. MCI MAIL (electronic mail system) ID: 215-5052

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

"It Seems to Us ..."

Petitions, Rulemakings and Such

Confused about how FCC rules are made? You have lots of company. It's a complex, and somewhat slow, process, made that way in large part to protect the rights of the citizens who might be affected by rules changes—that is, to protect *you*. These rights spring from the due process clauses of the Fifth and Fourteenth Amendments of the Constitution, something to keep in mind as we celebrate the Bicentennial of that precious document.

Like other federal agencies, the Federal Communications Commission is obliged to observe the provisions of the Administrative Procedure Act in the conduct of its business. The evolution of administrative law is a fascinating subject in its own right, deserving of more than the limited treatment we can provide on this page. Briefly, to cope with the increasing complexity of the business of government, Congress has created a number of independent agencies and has delegated quasi-legislative powers to them. The agencies follow procedures that provide interested persons with an opportunity to participate in the rulemaking process. In turn, while an affected party can challenge an agency action in court, the court will not substitute its judgment for that of the expert agency. Rather, it will only review the action to ensure that it was taken within constitutional and statutory limits, that required procedure was followed, and that it was not arbitrary, capricious, or an abuse of the agency's discretion.

In Amateur Radio matters, the FCC rulemaking process often begins with the filing of a petition for a rules change. The petition may come from an individual or group; sometimes the League files such a petition if the Board of Directors, or the Executive Committee acting on behalf of the Board, so instructs. According to the FCC rules of procedure, unless the petition is "moot, premature, repetitive, frivolous, or plainly [does] not warrant consideration by the Commission" it *must* be given a file number (beginning with the letters "RM") and placed on public notice. Any interested person then has 30 days to comment, sending a copy of their comments to both the FCC and the petitioner; following the filing of such comments, there is another 15-day period for the filing of replies. After these periods have expired, FCC is free to deny the petition, or to initiate a rulemaking proceeding or a further inquiry into the subject of the petition. There is no limit to how long the Commission may take in deciding the fate of a petition, though in recent years the Commission staff has tried to dispose of them reasonably quickly in one way or the other.

An important thing to remember about petitions for rulemaking is that in assigning one an "RM" number, the FCC is not saying much, if anything, about its merits. If you hear something referred to by a number like "RM-9999," keep in mind that it's simply one man's or one organization's opinion and is most definitely *not* an "FCC proposal"! The Commission's role at this stage is little more than that of a file clerk; the real review of a petition's merits comes after the public comment period.

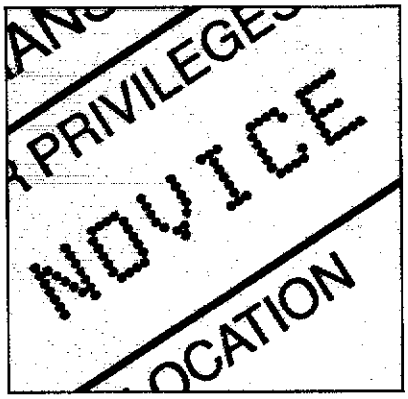
If the FCC staff finds that a particular petition does have merit, it may be used, either by itself or grouped with other petitions on the same subject, as the basis for issuance of a Notice of Proposed Rule Making (NPRM). (The Commission needn't wait for a petition from outside; it may also issue an NPRM on its own.) Here things begin to get serious, for in releasing an NPRM the Commission is saying, in effect, "Here's what we intend to do unless you convince us otherwise." Usually, on an NPRM affecting Amateur Radio FCC allows at least 90 days for public comment. An NPRM is referred to by docket number: eg, "the NPRM in PR [for Private Radio] Docket No. 86-397." A docket may include a series of Notices in addition to the initial NPRM, culminating in an Order announcing the disposition of the matter.

After considering the record of the proceeding, including the public comments, the Commission may abandon its proposal, modify it in some way, or adopt it as is. As long as its final action is based on "substantial evidence in the record," FCC has broad discretion and there is no guarantee that it will abide by the wishes of the majority of those commenting; remember, it is presumed to be the expert. With a few exceptions, rules changes cannot take effect until at least 30 days after publication.

At each step, there are procedures for requesting reconsideration of a Commission action. Ultimately an agency action can be challenged in court once the administrative remedies are exhausted, but after 40 years of working within the Administrative Procedure Act the players know the rules and successful court challenges are rare. If the agency truly functions as a dispassionate expert, the system works and both the public interest

(continued on page 13)

You've made a great start. Now, let Yaesu really get you going.



Finally. The 220-MHz, 1.2-GHz, and 10-meter phone bands are open to Novice operation.

And to work these bands, Yaesu's offering you a complete range of innovative HF, VHF, and UHF radios. Each with performance that Novices—and Extra Class operators, too—can really appreciate.

HT power perfected. There's a good reason you'll find the 220-MHz FT-109RH on more belts than any other. It simply out-classes the rest.

With a powerful five watts to get you out. A battery saver to keep you going. And a wealth of microprocessor-controlled features you'd expect only from a radio many times its size.

HT power in its smallest form. Finally, a miniature HT that you can really take seriously.

The FT-33R fits easily into your jacket pocket. But unlike the others, it features microprocessor control for quick, simple, and surprisingly intelligent operation.

And what other mini HT features five-watt output, a rugged aluminum-alloy case, and rain-resistant seals?

Two for the road. Our 220-MHz FT-311RM and 1.2-GHz FT-2311R are two of the most popular mobiles for two popular reasons.

One, they're built for performance. With slick microprocessor-controlled functions to get you around fast. And far.

And two, unlike most mobiles, they're built for simplicity. Because the last thing you need is a radio that interferes with your driving.

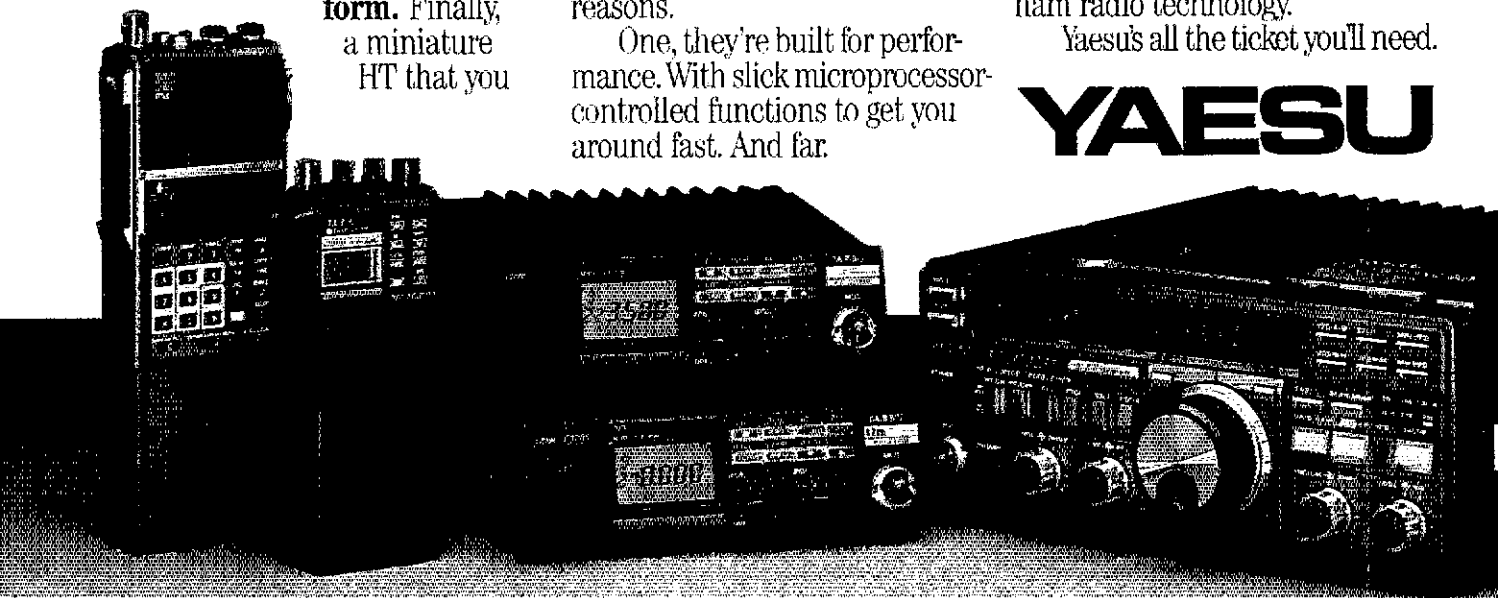
World-class operation. With our FT-757GX Mark II, you're ready to tackle the HF bands with all the full-featured performance an experienced operator demands.

Plus, when you upgrade to General Class, you won't have to upgrade your radio. Because with the FT-757GX Mark II, you've already started with the best. It's a great way to get maximum HF performance for your dollar.

Tune in to Yaesu. You've earned your ticket to the exciting world of amateur radio. Now, discover the exciting world of ham radio technology.

Yaesu's all the ticket you'll need.

YAESU



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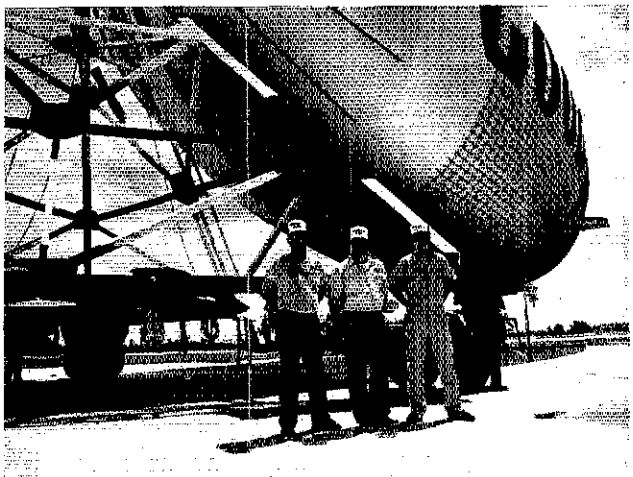
Prices and specifications subject to change without notice.

UP FRONT in QST



A Field Day First: As a novel way to introduce Novices to their new privileges, the Graf-1 Project took wings over Field Day. Impetus was provided by a Florida threesome: Chuck Bachus, KA4KVI, Mike Spivak, WB4RFC, and Bob Fivey, N4ORN, who received permission from Goodyear to operate from the airship *Enterprise*. Support for the operation was provided by Kenwood USA Corporation. The group reports that they were able to provide 160 contacts on 10 m, 2 m, 70 cm and 220.

More Field Day reports begin on page 74.

Pennsylvania Amateur Wins Goldwater Scholarship

The ARRL Foundation Scholarship Committee has announced the winners of five scholarships for 1987-88 academic year. One young ham so honored is William Sands IV, KA3FXX, of Pennsburg, Pennsylvania, winner of the "Scholarship To Honor Senator Barry Goldwater." Other winners were: Ray Gomez, Jr, NØGNA, "Paul and Helen Grauer Scholarship"; Peter Jaworski, KC2KK, "Perry Hadlock Memorial Scholarship"; Stephanie Dougherty, N8FIT, "You've Got a Friend in Pennsylvania Scholarship"; and Robert Hulka, KA9AKJ, "Edmond A. Metzger Scholarship." Congratulations all!

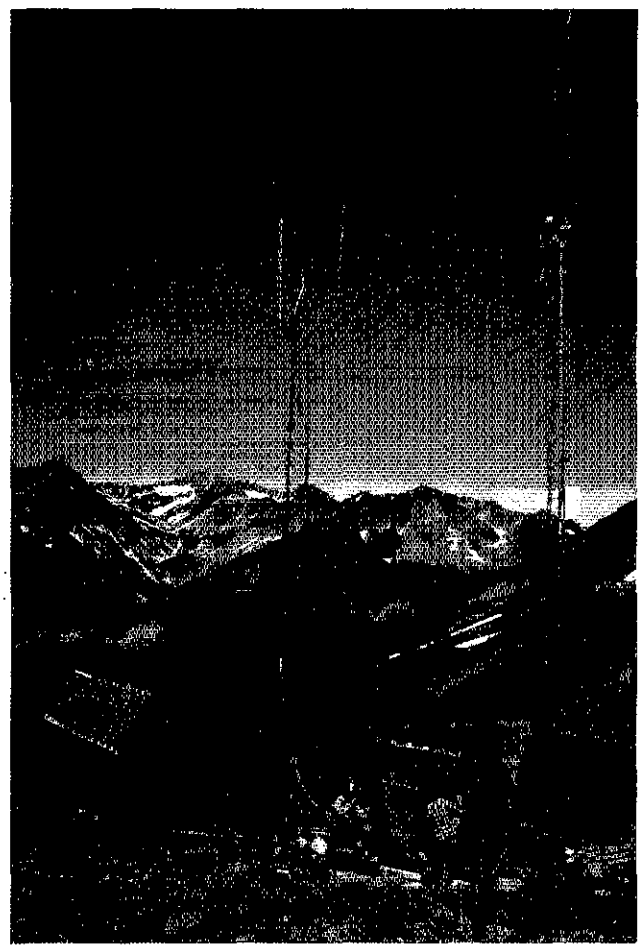
The family that hams together . . .: Ernie Wheatley, W1UHI, and his son Don, KA1LX, at a Border ARC picnic in Newport, Vermont this past summer. W1UHI, who will be 100 years old on October 29, is still active on the bands and, according to Don, sends "mean CW." *(photo courtesy K1THP)*

Federal Judge Affirms Validity of PRB-1

A federal judge, relying on PRB-1, has struck down a local zoning ordinance affecting an Amateur Radio antenna. Andrew B. Bodony, K2LE, brought suit to overturn denial by the village of Sands Point, New York of his application for a building permit for an 86-foot tower.

District Judge Jacob Mishler found PRB-1 to be a proper exercise of FCC authority and found that the village was precluded from applying its 25-foot limitation on "accessory buildings" to Bodony's proposed antenna.

This is the first time a local zoning ordinance has been declared invalid on the basis of PRB-1, and further strengthens the position of radio amateurs fighting unreasonable local ordinances.



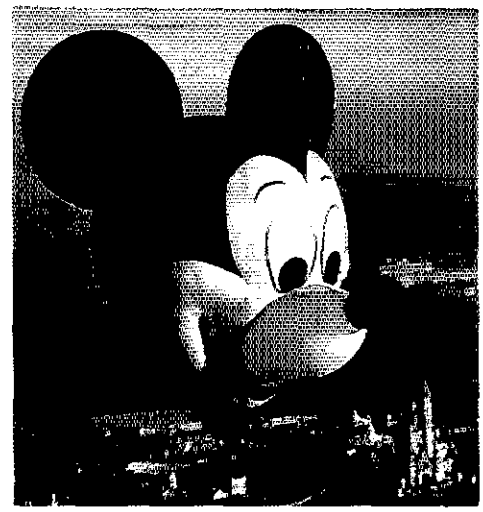
Mile-High Repeater: Jutting into the pristine skies of the Colorado Rockies, this solar-powered repeater provides surprisingly long-range coverage. This month's FM/RPT column, page 57, tells how the Durango ARC built it and how they maintain it—even in winter!

He Made It!

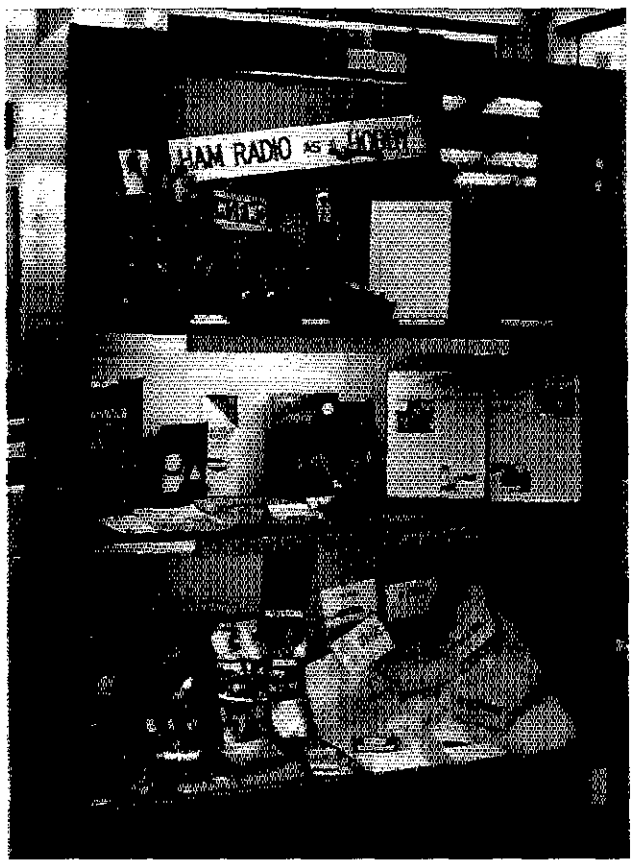
In April Upfront, we reported that Hartley "Russ" Alley, NAØA was bicycling his way East, from Colorado to Massachusetts for his 50th high schoool reunion. Fifty-six days, 2238 miles, 1 flat tire and 105 on-the-air and eyeball QSOs later, he arrived at English High in Lynn, Massachusetts, to whistles, applause and banners from friends, fellow hams, relatives and nearly 100 students.

Russ credits hams for providing radio companionship during the long stretches of wide-open spaces, advice as to the best motels and restaurants along the route, assistance for injured bike and biker, and alerting other hams on local and packet bulletin boards along the route.

He's quite busy these days presenting a slide show of the trip to radio clubs and bicycle groups. Any interested clubs should contact him at: PO Box 4009, Boulder, CO 80306, tel 303-494-6559.



The Mouse That Soared, Postscript: As it turns out, ham radio and hot-air balloons did combine in July's Upfront column when Mickey Mouse visited Newington—and not just because those well-known ears flew over ARRL HQ. Mickey—also known as "Earforce 1"—was designed by Stan Starr, KY4Q, an art director/designer for Walt Disney World Company, as part of the Walt Disney World 15th anniversary celebration. In the photo, Mickey soars above his home QTH in Orlando, Florida, in preparation for national and international appearances through 1988. Mickey is composed of 500 assembled pieces, or a total of 2080 square meters of fabric. The balloon and basket measure 30 meters in height—not your usual "mouse's eye" view! *(photo courtesy © 1987 The Walt Disney Company)*

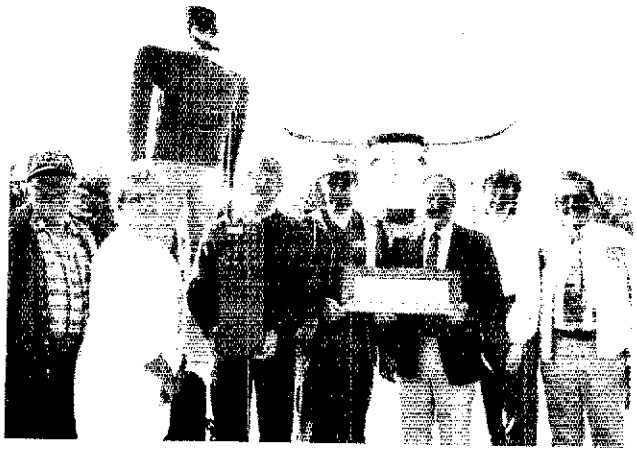


Reading, Researching and Radio: A display case in the Bethpage (New York) library sported QSL cards, Field Day photos, equipment and ham radio publications for one month, thanks to the efforts of John Montepaone, W2DJS. John also changed the items periodically to show the variety of Amateur Radio. Most important, the display contained a list of clubs and phone numbers for contacts for information on becoming a ham. Is your club sponsoring a Novice class? John's approach can be just what you need to fill every seat!

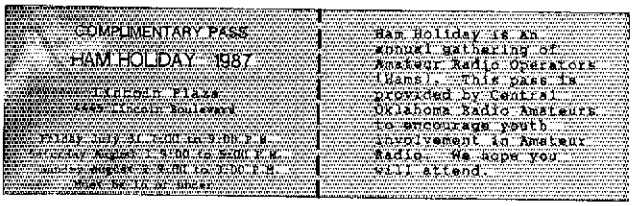
Courage Cards Support Rehabilitation Programs

The Courage Center is offering original art holiday greeting cards. Among the works of art featured are many by artists with a disability. Among the Center's other programs is the Courage Handi-Ham System. For more information, contact the Courage Center, 3915 Golden Valley Rd, Golden Valley, MN 55422, tel 612-588-0811.

U Bet I Lik CW: Frank Philpot, KE8MM, of Dearborn Heights, Michigan, saw this license plate, which he says expresses his feelings about Morse code. Wonder how many times the owner of the car has to explain what the plate means?



Paul Bunyan Joins Ham Ranks: Since Paul Bunyan and Babe the Blue Ox are visited by 3,125 carloads of tourists a day, the Paul Bunyan Radio Club of Bemidji, Minnesota thought it fitting that he be able to talk to the many radio amateurs among his visitors. In September, club members, along with city officials, presented Paul with his own "license" and hand-held transceiver.You'll find them displayed in the Chamber of Commerce Building.


COMPLIMENTARY PASS

HAM HOLIDAY 1987

Ham Holiday is an annual gathering of Amateur Radio Operators (hams). This pass is provided by Central Oklahoma Radio Amateurs to encourage youth involvement in Amateur Radio. We hope you will attend.

With Our Compliments: This summer, 150 youngsters attended the annual Ham Holiday at no admission charge—courtesy of the Central Oklahoma Radio Amateurs. Three hundred complimentary passes, printed for only $13, were distributed at computer stores, record shops, radio stores and Scout troops. Wow! That's a 50% turnout rate! John Thomason, WB5SYT, Oklahoma PIO, offers these suggestions for your group's next hamfest: in addition to distributing passes to stores and Scouts, try school classes, non-hams and senior citizens. This free ticket now may lead to another kind of ticket later.

"I Am Iditarod": Alaska artist and Iditarod veteran Jon Van Zyle honored the volunteers who provided support for the grueling, 1000-mile-long dog-sled race. As shown on this airline timetable cover, which is also being offered as an attractive 16- × 20-inch poster, the QST call-sign suffix embraces all Alaska radio amateurs, with special thanks to those with an active role in race communications. For details of how ham radio assisted during this year's Iditarod, mush on to this month's Public Service column on page 71.

Arctic Amateur Operation Planned

The Polar Universal Natural Science (PUNS) Expedition will return to Ward Hunt Island in February 1988 to complete their program of scientific research and to make an attempt to reach the North Pole, some 450 miles distant, without support or resupply.

Base Commander Laurence Howell will again operate as GM4DMA/VE8 on all bands from 1.8 to 30 MHz and possibly on 144 MHz. On the 1986 expedition, there were no problems with the radio equipment, but coax losses were high: wolves and arctic foxes took a great liking to the silicone-treated coax, eating large lengths of it to supplement their sparse winter diet.

"It Seems to Us..."

(continued from page 9)

and the right of the individual to due process are served.

Sometimes we're asked what the League position is on a petition pending before FCC—an "RM." In general, unless the petition threatens amateur allocations, the League's policymakers—that is, the Board or the Executive Committee—will not have developed a position. Dozens of petitions relating to Amateur Radio are filed with FCC every year; rather than invest time, energy and other resources in reacting to each of them, particularly in view of the short comment period and the resulting difficulty in getting meaningful feedback from the membership, we generally prefer to respond to membership input and to take initiatives—such as the filing of our own petitions—based on that input. Of course, if and when an Amateur Radio matter gets to the NPRM stage there is ample opportunity for assessing membership opinion and the League almost invariably submits comments.

In short, as a US citizen you have the right to ask the FCC to change the rules that affect you. You also have the right to comment on proposals made by others, and to expect that your comments will be taken into consideration. As an ARRL member, you additionally have the right to rely on the League to perform this watchdog function on your behalf, and to make proposals to your Director which, if they meet with favor with a majority of the Board, will go forth to FCC with the full weight of the organization behind them. Either way, you have a voice in the workings of your government—the sort of voice that was a dream, then became reality, some two centuries ago.—*David Sumner, K1ZZ*

League Lines

VHF enthusiasts should note the date of the upcoming VHF Sweepstakes, *January 23-25*. This is scheduled to be an "off" weekend for pro football, one week before the scheduled Super Bowl. Complete rules will appear in December *QST*; the club competition rules, with some revisions, will appear in January *QST*.

The delegates to the InterAmerican Telecommunications Conference (CITEL), meeting in Lima, Peru, have adopted a ***proposal for a hemisphere-wide multilateral reciprocal operating agreement.*** The United States and a number of other countries have already signed the agreement. The agreement will have little effect on US amateurs, since the US already has reciprocal operating agreements with nearly all Central and South American countries. The important exception is Mexico, which worked for adoption and therefore is expected to sign the agreement, thus establishing reciprocity with the US.

Interested in helping your fellow amateur? ***The Amateur Auxiliary to the FCC's Field Operations Bureau in*** your ***area still needs a few good men and women*** to assist them in their monitoring activities. The hours can be long, and the warm fuzzy feelings that Auxiliary members report can't be counted on your W-2 forms, but it's all very much worthwhile. Contact your Section Manager or Luck Hurder, KY1T, at HQ for info.

During the holiday season, the dedicated traffic handlers of the ARRL's National Traffic System are often swamped with overloads of messages generated by individuals, message booths at shopping malls and military personnel overseas. Take the time ***now*** to familiarize yourself with formal NTS traffic procedures. Better yet, check into your local or Section net or Packet Bulletin Board to determine the traffic loading in your area before the deluge hits. Contact your Section Manager or Luck Hurder, KY1T or Steve Ewald, WA4CMS at HQ for further details on traffic handling in your area.

QST congratulates ***Alex Felker, N4LF,*** who has been named by FCC Chairman Dennis Patrick as the ***FCC's new Chief of the Mass Media Bureau.*** His main responsibilities will involve broadcast rulemaking. Felker has worked for the FCC for nearly 15 years and holds a Master's degree in Engineering.

New working paper on emissions released. ARRL Publications Manager Paul Rinaldo, W4RI, has authored a paper concerning the emissions designators in Section 97.61 of the amateur rules. The paper traces the history of emission designators and concludes that the 1979 WARC emission designators have proven to be unsuitable for authorizing emissions in the amateur service. A more flexible method is needed to encourage amateurs to experiment with new emissions without the delay and administrative burden on the amateur community of petitioning the FCC for rule making, as was the case with the F8E emission, or requesting special temporary authority each time. Rinaldo suggests alternative methods, such as emissions being specified by selected words and abbreviations. These designations should specify permissible types of information rather than particular modulation techniques, which should be left to experimentation.

The working paper is available free from HQ upon receipt of an 9- × 12-inch SASE containing $1.04 postage.

Executive Committee meets in Montreal. This meeting probably marked the last time the ARRL Executive Committee will meet in Canada, as the Canadian Radio Relay League becomes fully autonomous on January 1. The event was marked with appropriate ceremonies and remarks at a luncheon attended by a number of CRRL representatives. Complete minutes of the Executive Committee meeting appear on page 62.

HQ has upgraded its facsimile (FAX) capabilities. The new unit is compatible with nearly all new generation FAX machines. The FAX is located in the Regulatory Information Branch and can be accessed between 8 AM and 5 PM EST by calling HQ and asking for extension 215 or the FAX machine.

When ***King Juan Carlos of Spain*** visited the Jet Propulsion Laboratory in Pasadena, California on September 30, Amateur Radio was given some recognition. His Majesty, who holds the call ***EAØJC,*** was greeted there on behalf of US radio amateurs by ARRL First Vice President Jay Holladay, W6EJJ, who presented him with a copy of the new ARRL *Operating Manual*.

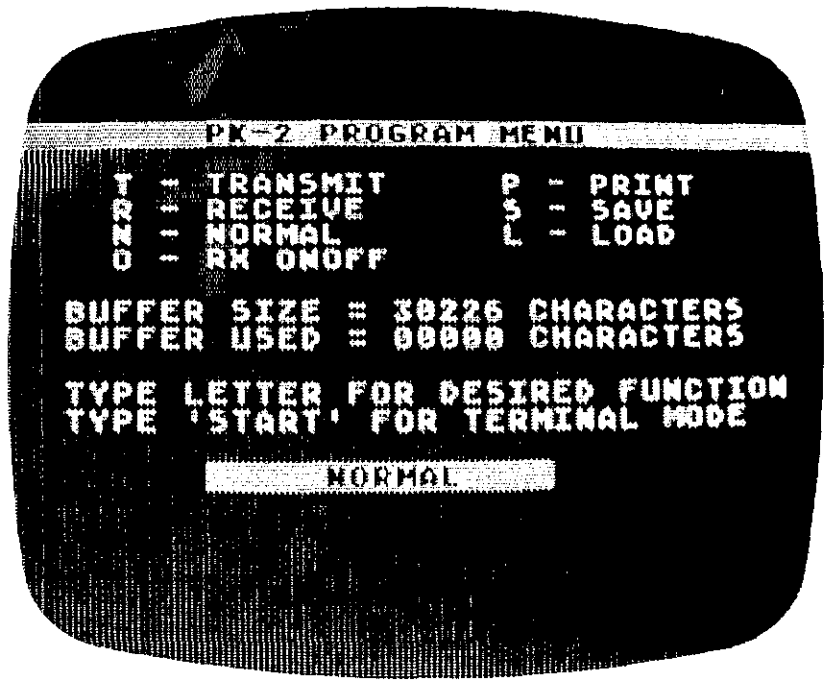
Want a copy of an amateur-related FCC public notice, proposal or rule making? Such documents are available from HQ upon request from the Regulatory Information Branch at HQ. Be sure to include the FCC docket or RM number if known and a large SASE with three units of first-class postage.

Interested in the "cutting edge" of packet radio, VHF/UHF and microwave technology? Check out the three conference proceedings advertised on page 101. Some of the ideas presented may be controversial but the purpose of publishing the proceedings is to provoke thought and discussion in order to lead to technical advancement!

A Packet Terminal for Atari Computers

Okay, you've got CW and RTTY "plug and play" for your Atari. Now round out your operation with a packet program!

By Stephen Stuntz, NØBF
1656 South California St
Loveland, CO 80537



The inner menu of the packet program. See Table 1 and the text.

Do you want to share in the excitement of packet radio, but haven't done so because of the extra equipment required? How about putting that inexpensive Atari® computer to work? You can employ the same easy-to-use cartridge approach for packet radio that's proved so popular on CW and RTTY.[1-4]

Normally, the Atari 850 interface accessory is required to provide an RS-232-C connection between an Atari computer and the TNC. Some TNCs, however, provide a TTL-level option (0-5 V) that allows you to connect the TNC to the Atari's controller jack. My program takes advantage of this option and communicates directly with the TNC at TTL voltage levels. That eliminates the need for an 850 interface and its added cost ($100 or more).

Program Basics

Written in assembler, the packet terminal program requires only 16 kbytes of computer RAM to compose, assemble and execute. The program works on any Atari 8-bit computer, including the models 600, 800, 600XL, 800XL, 1200XL, 65XE and 130XE. The heart of the program consists of a keyboard and screen loop, and an ASCII interrupt loop.

Keyboard and Screen Loop

A simplified flowchart of the keyboard and screen loop is shown in Fig 1. This loop checks the keyboard for a keypress, and stores a 10-bit representation of the character in the transmit buffer. The asynchronous ASCII format described in *The ARRL Handbook* is used to represent each character with 10 bits.[5] The 10 bits contain data in the following format:

- A start bit equal to 0.
- A 7-bit ASCII code with the least significant bit (LSB) first.
- A parity bit equal to 0.
- A stop bit equal to 1.

For example, 0010000101 is stored in the transmit buffer when the letter "B" (ASCII 1000010) is typed.

The keyboard and screen loop also checks the receive buffer for data, and sends it to the screen. The program stores eight data bits in the receive buffer for each character received by the ASCII interrupt loop. The eight data bits are grouped as follows:

- A 7-bit ASCII character with the LSB first.
- One parity bit.

This data is converted to an ASCII character by stripping the parity bit and reversing the order of the remaining bits. The character is then sent to the screen. The letter "B" appears in the receive buffer as 0100001 with space parity, and is converted to the ASCII representation 1000010.

ASCII Interrupt Loop

The ASCII interrupt loop (see Fig 2), sends and receives data at 300 bauds. The loop is designed to sample each bit three times, so it is executed with an interrupt 900 times per second (300 × 3).

Each time the ASCII interrupt loop is executed, it determines if any data was written to the transmit buffer by the keyboard and screen loop. If data is present, it is sent to pin 1 of controller jack no. 1, and on to the TNC.

The ASCII interrupt loop also determines if the voltage on pin 2 of controller jack no. 1 should be sampled. A sample is taken eight times for every character; each sample sets a bit to 1 if a 5-V level is present, and to 0 for 0 V. The resulting eight bits are stored in the receive buffer and are sent to the screen by the keyboard and screen loop.

The waveform for a character sent on pin 1 is identical to the same character received on pin 2 (see Fig 3). A character can be sent and received simultaneously. This feature is useful during troubleshooting and program verification. With pin 1 connected to pin 2, the program and the computer are working correctly if typed characters are printed on the screen.

Printer, Disk and Cassette Operation

The program can send messages to a printer, and save them on disk or cassette tape. Messages stored on a disk or cassette tape can also be transmitted. Incoming data is saved by temporarily storing it in a buffer and then sending the buffer contents to the printer, disk or cassette. Similarly, outgoing data is sent by first loading it from the disk or cassette into a buffer, then sending the buffer contents to the TNC.

When the SELECT key is pressed, you exit terminal operation and a menu is dis-

[1]Notes appear on page 17.

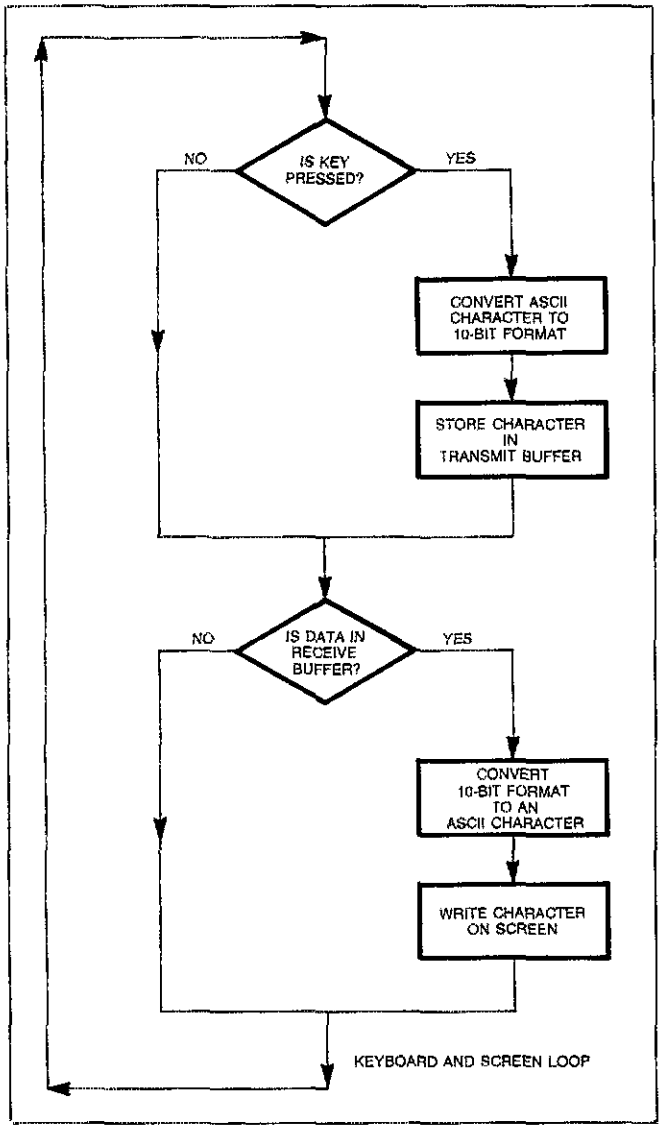


Fig 1—Keyboard and screen loop flowchart.

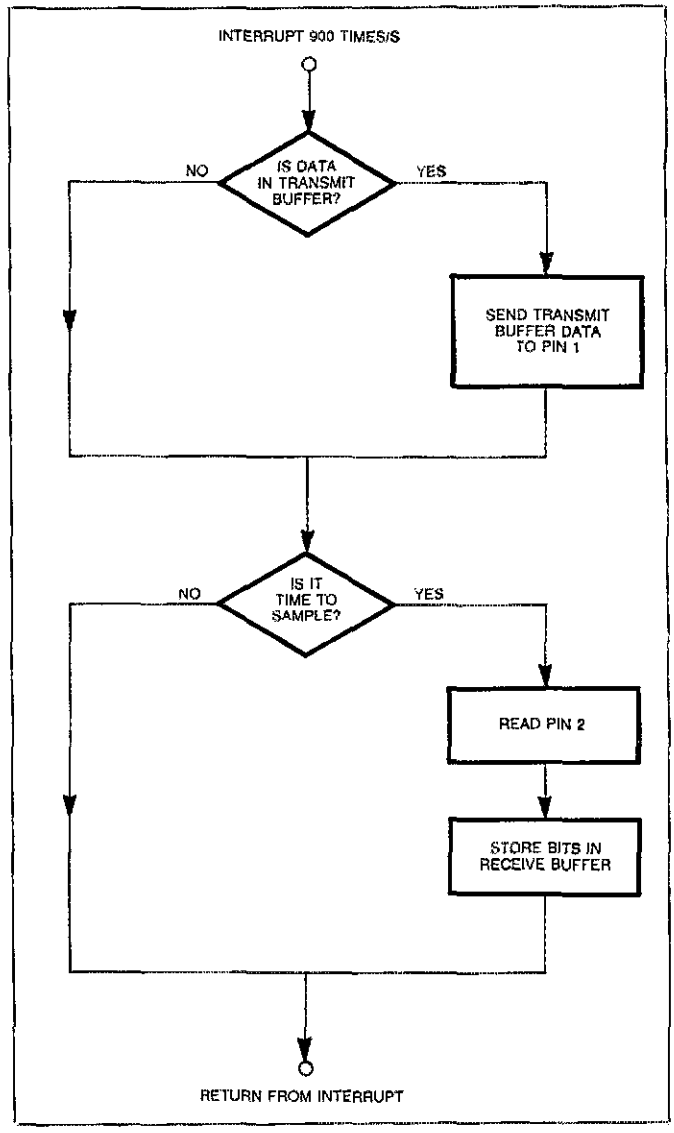


Fig 2—ASCII interrupt loop flowchart.

played (see photo). The menu options are listed in Table 1. Among other things, these options allow you to print or save a message, or load a stored message for transmission. Pressing the START key returns you to normal terminal operation.

Table 1
Program Options

Option	*Action*
T	Transmit a message from the buffer to the TNC.
R	Receive a message from the TNC and pass it to the buffer.
N	Resets to normal terminal mode and clears the buffer.
O	Toggles receive selection on and off.
P	Print message in the buffer.
S	Saves the message in the buffer as a disk (or cassette) file.
L	Loads the message from a disk (or cassette) file into the buffer.

Operation

I developed this program using a Kantronics KPC-1 TNC with its TTL option selected. Fig 4 shows the connections required between the Atari computer and the KPC-1. The connections should be the same for other TNCs with TTL capability and a standard DB-25 connector.

After making the connections between the computer and the TNC, simply load and run the program (or plug in the cartridge) and begin packeteering! The following steps show how to strike up a QSO using the Kantronics KPC-1 TNC. If you use another type of TNC, some procedural changes may be required.

1) Turn on the computer.

2) Turn on the TNC.

3) Press the asterisk (*) key when PRESS (*) TO SET BAUD RATE appears on the screen. This sets the data transfer rate to 300 bauds.

4) Type SC 0 to prevent split words.

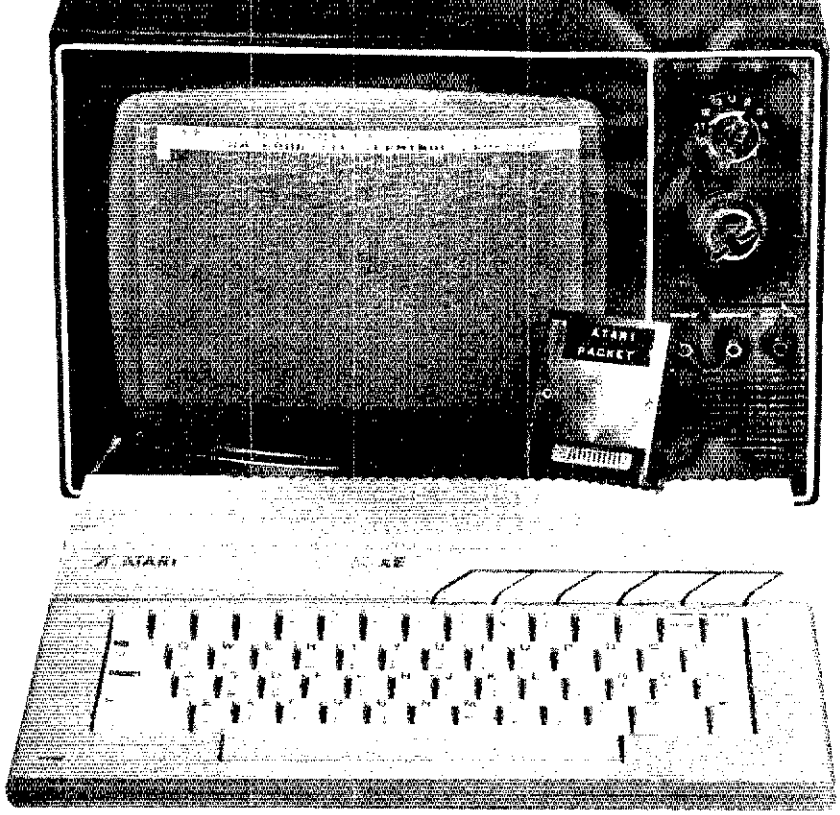
5) Type C NØBF to connect with NØBF, for example.

6) ***CONNECTED WITH NØBF*** appears on the screen if you connect to NØBF. You are now in a packet QSO!

7) Type CTRL C and D to disconnect.

Getting the Program

Cartridge, disk and cassette-tape versions of this program are available from me, or you can obtain the program listing from the ARRL.[6,7] You can make your own cartridge by following the instructions in my previous article.[8] I use the same type of cartridge with this program that I used in that earlier article. The cartridge pro-



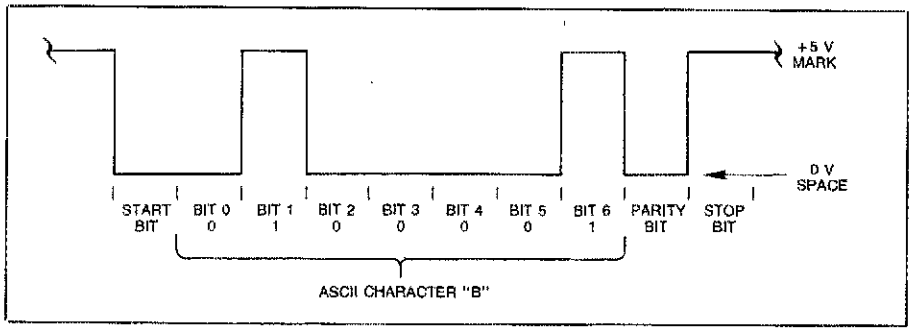


Fig 3—The character "B" waveform at pin 1 during transmit, and pin 2 during receive.

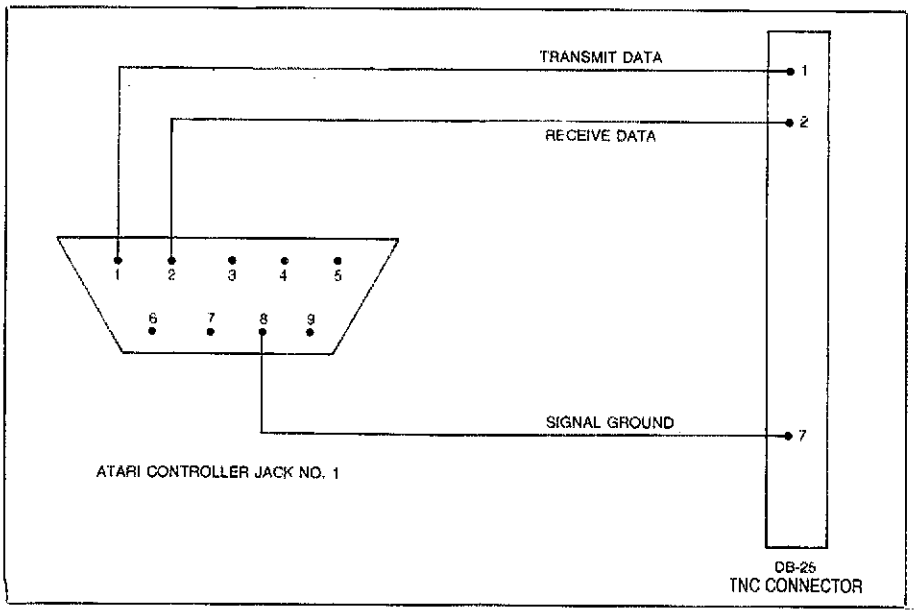


Fig 4—Atari computer to TNC interconnection diagram.

gram version is easiest to use, by far, because it only requires inserting the cartridge and turning on the computer. What could be easier?

The program's file-handling subroutines are set up for disk operation and must be modified if you're going to use it with a cassette-based system. If you decide to go this route, the following steps must be performed:

1) Plug in an assembler/editor cartridge.
2) Enter and save the program.
3) Enter ASM to assemble the program.
4) Enter BUG and G4000 to execute the program.

Summary

This program has worked flawlessly for several months. After working many packet stations and bulletin boards, I have identified additional enhancements that I feel might be useful:

- Control my station from a remote location.
- Send and receive binary program files.
- Add a screen editor to modify buffer messages.
- Ring an alarm when my station is called.

I'm afraid that by the time I add these, I'll have identified 10 more additions I'd like to make!

One of the exciting features of packet radio is the ability to manipulate information with the computer. The possibilities are endless! Give this program a try, and tinker with some of your own enhancements. It's an inexpensive way for you to share in the excitement of packet radio!

Notes

[1]S. Stuntz, "A CW Keyboard Program for Atari Computers," *QST*, Feb 1985, pp 32-33.
[2]S. Stuntz, "A CW Receive Program for Atari Computers," *QST*, Nov 1985, p 55.
[3]S. Stuntz, "A CW-Program Cartridge for the Atari Computer," *QST*, Aug 1986, p 34.
[4]R. Lewis, "Split-Screen RTTY for Atari Computers," *QST*, May 1987, pp 16-20. [The cartridges now supplied by Rusty have an additional feature: EEPROM (electrically erasable programmable read-only memory). Message buffer contents and screen attributes can be saved and recalled later even if the computer has been turned off and on.—Ed.]
[5]M. Wilson, ed., *The 1987 ARRL Handbook* (Newington: ARRL, 1986), p 19-16.
[6]This program is available from me on disk, cassette or EPROM for $15, or as a ready-to-go, plug-in cartridge for $35. The ARRL and *QST* in no way warrant this offer.
[7]A program listing is available from the ARRL for $5 to cover copying and handling costs. Send your check and request to ARRL-TD, 225 Main St, Newington, CT 06111, and ask for the Stuntz Atari Packet program listing.
[8]See note 3.

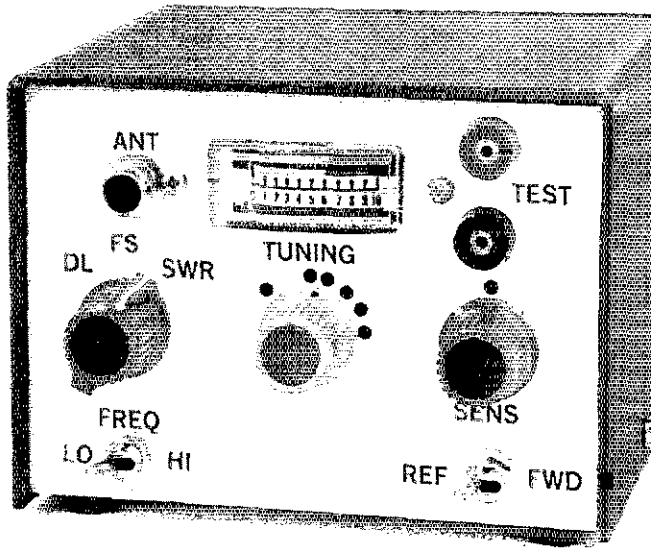
Strays

I would like to get in touch with...

☐ anyone with operating instructions for an Electronic Measurements Corp Model 801 resistance capacitance bridge. Raynald Gilbert, 2604 Mont-Joli St, Sainte-Foy, PQ G1V 1C3, Canada.

Build This QRP Omni Box

Man does not live by rig alone! Combine your QRP accessories into one package for field or home use.



By Doug DeMaw, W1FB
PO Box 250
Luther, MI 49656

Do you need to carry a number of small QRP-support gadgets with you during portable operation? If so, you may be interested in how I solved my "bag-of-accessories" problem by building the most needed support units into one cabinet. A secondary advantage of unitizing these circuits is that only one panel meter and one cabinet are required. This represents a saving in dollars—an appealing fringe benefit.

You need not incorporate all of the circuits I chose for my Omni Box. On the other hand, you may prefer to add some accessory circuit that I don't find necessary for my QRP operations: The road to innovation is open to you! Whatever your pleasure, I'm sure you will be impressed with the convenience of having all of the necessary accessory items gathered together in a single housing. This is particularly handy for camping, Field Day, vacations and casual travel. Moreover, the Omni Box can be a convenient gadget for home-station use as well.

Fig 1 shows all of the circuits in my Omni Box. The instrument contains a field-strength meter, dummy load, SWR bridge, frequency standard and continuity tester.

Field-Strength Meter Section

An indication of relative field strength is helpful when checking antenna performance and patterns. This instrument may be used as a tune-up indicator, or as a relative output-power monitor. Still another application is that of a frequency meter to ensure that the transmitter is providing output in the correct amateur band. The circuit may be used also as a RF "sniffer" when troubleshooting a transmitter.

Refer to the field-strength meter circuit in Fig 1. Two operating ranges are provided. When S3 (FREQ) is open (LO), the tuning range of C1 provides coverage of 2.6 to 10.5 MHz, thereby permitting tests on 80, 75, 40 and 30 meters. When L1 is placed in parallel with T3 (HI), the effective circuit inductance is 1.5 μH. This provides coverage from 6.9 to 25.4 MHz for use on 40, 30, 20, 15 and 12 m. See Table 1.

Table 1

Approximate TUNING Dial Settings for the Field Strength Meter

FREQ LO Range

Band	*C1 Setting*
80 m	12:30 (o'clock)
40 m	2:30 "
30 m	3:00 "

FREQ HI Range

40 m	10:00 "
30 m	12:30 "
20 m	2:00 "
15 m	2:30 "
12 m	3:00 "

C1 is a miniature broadcast-band radio variable capacitor.[1] You may use any capacitor that provides 365 to 400 pF of maximum capacitance. The minimum capacitance (plates unmeshed) should be 20 pF or less. You may also use the variable capacitor from a transistor AM radio by placing both sections in parallel; this provides approximately 225 pF of maximum capacitance. Using this small a capacitance value will limit the tuning range of the field-strength meter, so fixed-value capacitors must be shunted across C1 to cover the low end of each range. Also, the calibration data in Table 1 will not be applicable.

The secondary winding of T3 provides low-impedance coupling to D1 and D2. The link also prevents excessive loading of the tuned circuit, and helps ensure a workable Q on both ranges (too low a Q will restrict the sensitivity of the instrument).

D1 and D2 function as a voltage doubler. The rectified RF voltage causes current to flow through the indicating meter, M1. Therefore, the greater the field strength, the higher the meter reading. C1 is adjusted for a peak meter reading, and R6 is used as a sensitivity control to keep the meter from being driven offscale. A 24-inch whip antenna connected to J1 should suffice for most field-strength tests.

Dummy-Load Section

A dummy load is important when we need to check transmitter performance or make tuning adjustments. In the dummy-load circuit of Fig 1, I use four 200-ohm, 2-W resistors (R1-R4, incl) in parallel to provide a 50-ohm load. RF voltage across the dummy load is rectified by D3 and filtered by C4. The resulting dc voltage is applied to M1 through S1. R5 isolates the dummy load from the metering circuit and makes the meter response more linear. The meter provides a visual indication of the transmitter output energy.

The meter may be calibrated in watts by applying a known power (say, 5 W) to the load and adjusting R6 (SENS) for a full-scale reading on M1. The power is then reduced in 1-W steps, and the meter reading noted at each step. These readings are logged for future use (see Table 2). I placed

[1]Notes appear on page 22.

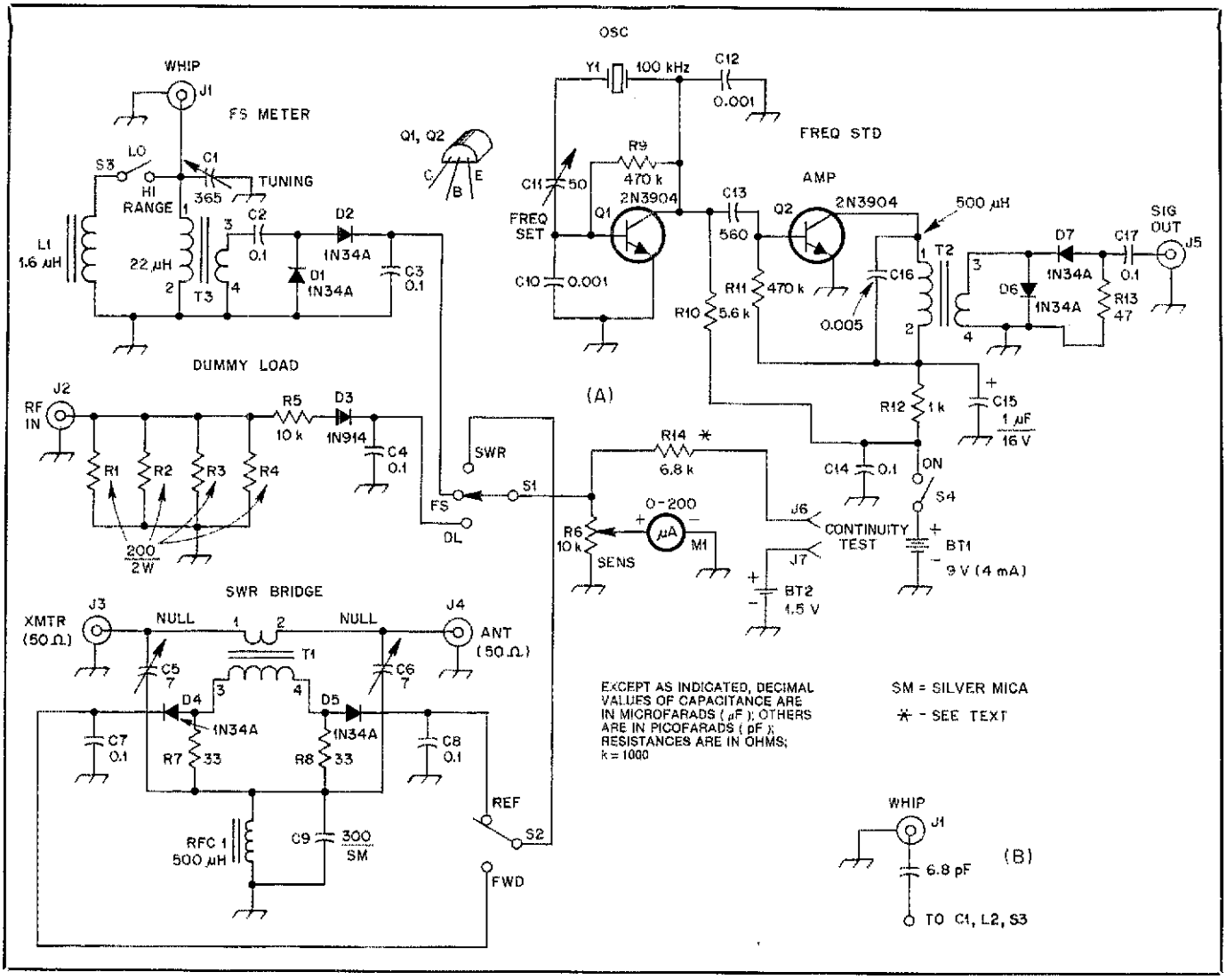


Fig 1—Schematic diagram of the Omni Box circuits. Fixed-value capacitors are miniature chip or disc ceramic types, except for C15, which is electrolytic. Fixed-value resistors are ¼-W carbon composition except for R1-R4, incl, which are 2-W units. Numbered parts that do not appear in the parts list are identified for circuit-board layout convenience.

C1—Miniature 365-pF variable (see Note 1).
C5, C6—Miniature 7-pF piston trimmer or equivalent unit with low minimum capacitance (see text).
C11—50-pF trimmer (Radio Shack 272-1340 or equiv).
J1-J5, incl—Single-hole-mount phono jack.
J6, J7—Pin jack for test leads.
L1—1.6-µH inductor, 18 turns of no. 24 enam wire on an Amidon T-50-6 (yellow) powdered-iron toroid.
M1—Miniature 200-µA dc meter (see text).
R6—Miniature 10-kΩ linear-taper carbon.
RFC1—Miniature 500-µH RF choke (1 mH also suitable).
S1—Single-section, three-position rotary switch.
S2, S3, S4—Miniature SPDT toggle or slide switch.
T1—Broadband transformer. Secondary winding is 30 turns of no. 26 enam wire on an Amidon FT-50A-61 ferrite toroid (125 μ_i). Primary is a two-turn winding of no. 24 enam wire over secondary winding.
T2—500-µH primary winding. Use 36 turns of no. 26 enam wire on an Amidon FT-50-43 ferrite toroid (850 μ_i). Secondary winding has 10 turns of no. 26 enam wire.
T3—22 µH primary winding. Use 20 turns of no. 26 enam wire on an Amidon FT-37-61 (125 μ_i) ferrite toroid. Secondary winding consists of 5 turns of no. 26 enam wire.
Y1—100-kHz fundamental crystal, 30-pF load capacitance. International Crystal Co type GP. See note 3.

marks on the front panel to allow resetting of R6.

Depending on the type of SWR bridge you use in your Omni Box, the dummy load may be a part of the bridge circuit. This will simplify the project.

SWR Bridge

You have some choice in the type of SWR bridge you use.[2] You may prefer to use the resistive-bridge circuit described in the referenced article. The circuit shown here is similar to the toroidal-transformer (QRO) bridge described in that article, but it is more sensitive to make it suitable for power levels from 350 mW to 25 W.

D4 and D5 rectify the forward or reflected voltage (selected by S2) to provide a dc voltage for the meter. Trimmer capacitors C5 and C6 form a voltage divider with C9. These trimmers are used to null the bridge with a 50-ohm load connected to J3 or J4. A coaxial-cable jumper may be connected between J3 or J4 and J2 (dummy load) when nulling the bridge circuit.

To null the bridge, set S2 to FWD, connect the 50-ohm load to J4 and apply trans-

Table 2

Calibration for a 200-µA meter with SENS at Mid-scale

RF Power (W)	*Meter Scale*
5	10
4	9
3	8
2	7
1	5
0.5	3.5
0.25	1.5
0.1	1

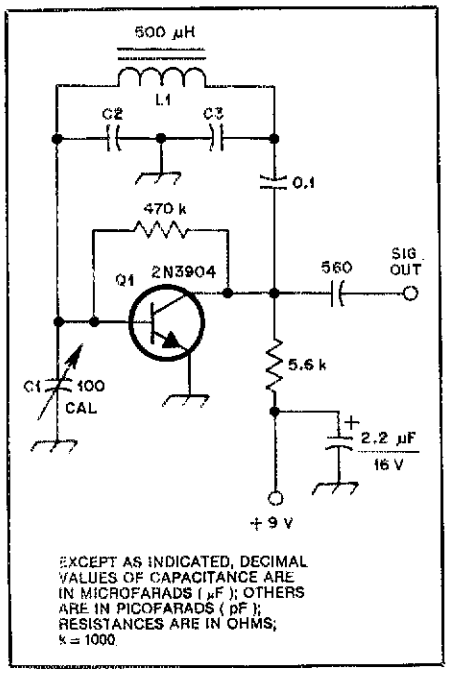


Fig 2—Suggested circuit for a 100-kHz LC oscillator. C1 is a 100-pF ceramic trimmer. L1 consists of 85 turns of no. 32 enam wire on an Amidon FT-50-61 ferrite toroid core. C2 and C3 are 0.01-µF, high-Q capacitors, such as polystyrene or Mylar® units. C1 is adjusted to zero beat the oscillator output with WWV. A coating of coil cement should be applied to L1.

result in greater sensitivity for the Omni Box functions than the specified 200-µA unit. This increased sensitivity can be particularly beneficial when using the field-strength and SWR-bridge circuits. Most imported meters with a 50- or 100-µA movement are in a conventional format, and are easier to read than the smaller, edge-reading types.

100-kHz Frequency Standard

There may be no more useful accessory than a secondary frequency standard. Many home-brew QRP transmitters—particularly those with VFOs—are prone to frequency changes as the ambient temperature varies. The problem is not limited to homemade gear. I have used several pieces of commercial QRP gear that exhibit frequency-calibration problems. Also, shock or vibration can shift a trimmer capacitor or a slug-tuned-core setting. Out-of-band or out-of-license-class-segment frequency excursions can be avoided by making periodic transmitter dial calibration checks using a properly calibrated receiver. I like to know my operating frequency, so I always carry a secondary frequency standard with me on QRP expeditions.

The frequency-standard circuit in Fig 1 holds its calibration quite well. Q1 is a 100-kHz crystal-controlled oscillator. C10 and C12 are feedback capacitors that ensure circuit oscillation. These capacitors may need to be changed slightly from the values shown, depending on the characteristics of the crystal you use.

Q2 is a broadband amplifier that increases the 100-kHz energy sufficiently to permit D6 and D7 to generate strong harmonics of the crystal frequency. The diodes generate harmonics by distorting (clipping) the signal from Q2. This is particularly important when using the 100-kHz markers above 40 meters: Weak markers may not be discernible in QRN and QRM.

T2 is tuned broadly to resonance by C16. R13 provides a dc return for D6 and D7 and establishes a load for Q2. A 9-V battery supplies operating voltage for the frequency standard. It's easy to forget to turn S4 to OFF when you are not using the standard—I've done it too many times! If the switch is left in the ON position for long periods, BT1 will be depleted. It's wise to carry a spare 9-V battery with you on field trips.

Using a new 100-kHz crystal at Y1 may be costly! I suggest that you scan the surplus equipment catalogs for moderately priced 100-kHz crystals.[3] Alternatively, you may use a 500- or 1000-kHz crystal

mitter power to J3. Adjust R6 (SENS) for a full-scale M1 reading. Now, set S2 to REF and adjust C6 for a zero reading on M1. Next, reverse the connections—connect the transmitter to J4 and the dummy load to J3, and set S2 to FWD. While applying transmitter power, adjust C5 for a zero reading on M1. Repeat this process once more to compensate for any interaction of the two trimming capacitors.

The values of R7 and R8 are different than those in the QRO bridge in the referenced article. In addition, T1 has a two-turn link rather than having the antenna line pass through the toroidal core (the equivalent of a one-turn winding). These changes ensure greater SWR meter sensitivity, necessary for QRP use. The circuit shown may be used at power levels up to 25 W without damage to the diodes.

The Meter

A 200-µA instrument is specified for M1. There are a number of low-cost, edge-reading meters of this type available in the surplus market. Most of these are FM tuning meters, but some are calibrated for use in CB transceivers. These meters are easy to take apart for substitution of a new meter scale. A 0-10 scale that will fit most of these meters was published in the article referenced in note 2. A photocopy of this meter scale can be affixed to the faceplate of your surplus meter with rubber cement.

Using a 50- or 100-µA meter at M1 will

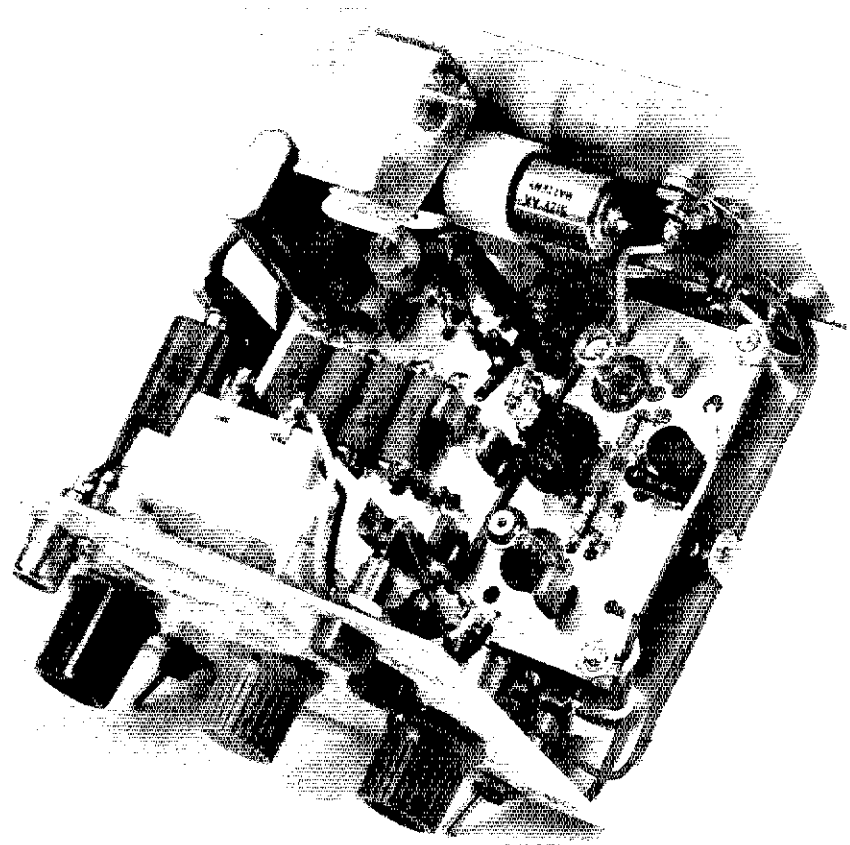


Fig 3—Interior view of the assembled Omni Box. The battery holders are affixed to the rear wall of the cabinet. The SWR bridge is at the far right of the PC board. The field-strength meter and dummy load are near the front panel at the left side of the cabinet. Y1 and the 100-kHz oscillator are located below the batteries.

with frequency dividers to obtain markers at, say, 25, 50 and 100 kHz. This approach complicates the circuit, however, and increases the current drain on BT1. Fig 2 shows an LC 100-kHz oscillator that may be substituted for Q1 of Fig 1. It will need calibration against WWV more frequently than is necessary with a crystal oscillator. It does, however, present a way to save money.

The frequency standard may be calibrated by connecting a coaxial cable between J5 and a receiver capable of receiving WWV. Tune in WWV and adjust C11 to obtain a zero beat between the output frequency of the standard and WWV. Calibration should be checked at least once a month to ensure that the standard is accurate.

Calibrate your receiver by connecting a coaxial-cable jumper between J5 and the antenna jack of your receiver. If the 100-kHz signal is too strong, you can lower the signal level by substituting a capacitor of lower value for C16 (5 to 27 pF). Tune the receiver to a convenient frequency that is an exact multiple of 100-kHz, and adjust the receiver-tuning trimmer capacitor for zero beat with the standard. Once your receiver is properly calibrated, it may be used to check the calibration of the transmitter frequency dial. A low-level signal from the transmitter, such as that obtained in the SPOT position, is sufficient for calibration, and this signal level can usually be heard without an antenna.

Continuity Tester

Continuity tests are frequently necessary when we are away from our home stations with QRP gear. Situations arise when we need to check a coaxial cable or an antenna for opens or shorts. A simple continuity tester will suffice, and it eliminates the need to carry a VOM.

I added R14 (Fig 1) and two pin jacks (J6 and J7) to the metering circuit of the Omni Box. These components, along with BT2, provide a full-scale reading at M1 when a short is placed across J6 and J7. Resistances of more than 1 ohm can be observed with this tester. No switch is needed for connecting BT2 into the circuit because the line is open until the test probes are placed across a conducting path. R14 is chosen for use with a 200-μA meter. You may need to experiment with the value of R14 if you use a meter with other than a 200-μA movement. S1 may be in any position of its three positions while making continuity tests. The diodes connected to S1 block the flow of dc from BT2 because their cathodes are connected toward the *positive* voltage source.

Construction Notes

Packaging of your Omni Box is a matter of personal choice. I used a Ten-Tec TG-TW-34 utility cabinet for this project. Its dimensions are 3 × 4-1/8 × 4-1/8 inches (HWD). The front and rear panels are eggshell white, and the cover is finished in a brown wood-grain adhesive-backed plastic. The panel labels are press-on decals that were applied after the panel holes were drilled, and before the controls were mounted. Following application of the labels, I sprayed the front and back panels with Krylon® No. 1303 clear acrylic lacquer to protect the labels and give them more contrast. This product is available in office-supply stores.

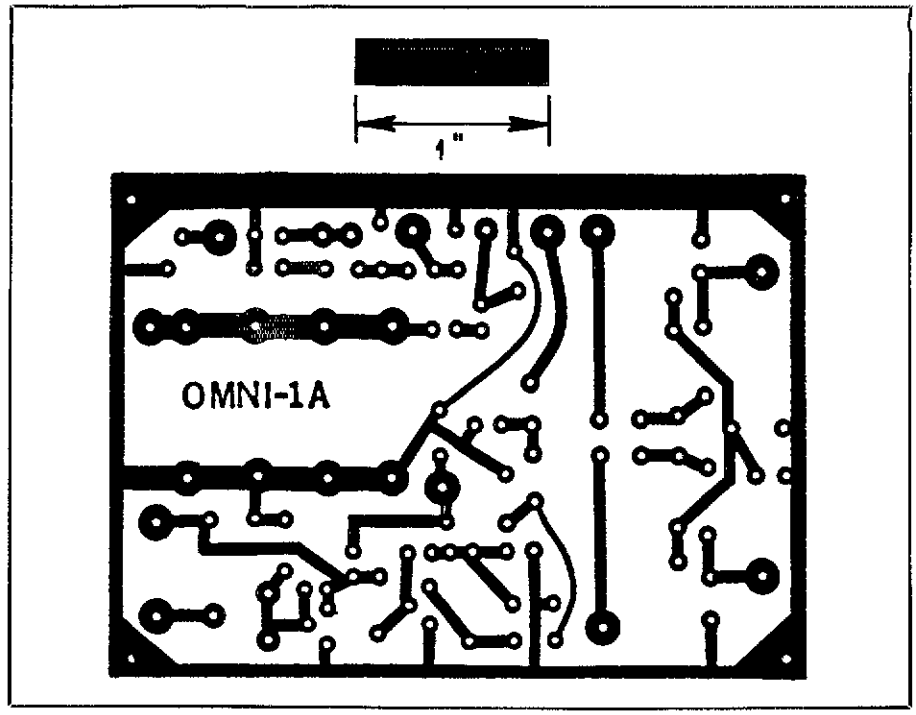


Fig 4—Circuit-board etching pattern for the Omni Box. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

An interior view of the Omni Box is shown in Fig 3. The PC board is double sided, with the copper on the component side acting as a ground plane. I suspect that single-sided board would work satisfactorily for these circuits. I used double-sided board because the input/output PC traces for the SWR bridge depend upon the ground-plane surface of the board to form 50-ohm strip lines. Elimination of the ground plane may not affect the bridge circuit significantly, because of the short distance between J3 and J4 of Fig 1. The most used controls are on the front panel of the box. S4, the ON/OFF switch for the frequency standard, is mounted on the rear panel. A U-shaped holder is used for the 9-V battery. I attached BT2 to the inner rear-panel wall with a nylon clamp. A single AA-size battery holder for BT2 would allow more convenient replacement of the 1.5-V battery: The circuit wires are soldered to the ends of BT2 in my unit.

R14 is not mounted on the circuit board. Rather, it is soldered between J6 and R6, just behind the front panel. All of the toroidal coils are mounted vertically on the PC board. I coated each of them with a homemade coil dope after they were installed. I also flowed a large drop of cement under each coil to affix them to the PC board.

I made my coil dope by dissolving small pieces of polystyrene tubing in acrylic solvent/cement. This liquid contains methylene chloride. *Warning: Do not breathe the fumes from this chemical, and avoid getting it on your skin.* A good grade of coil dope may also be made by dissolving chips of acrylic tubing or sheeting in this solvent.

A full-scale etching template for the PC board is shown in Fig 4. A parts-placement guide is shown in Fig 5. I used donut pads and PC layout tape to develop the master artwork for the PC board. I then transferred a mirror image of the pattern to a sheet of paper with a plain-paper copier. This sheet became my master artwork for Tec-200 film, from which the etch-resist pattern was ironed onto the blank PC board.[4] After drilling the holes in the board, I plated it with Kepro tin-plating solution.

Odds and Ends

The glass piston trimmers I used for C5 and C6 are set at near maximum capacitance for the desired bridge null. Had I realized this sooner, I would have substituted 6.8-pF silver-mica capacitors for the trimmers. You may want to try this, assuming that the value of C9 is close to 330 pF.

Fig 1B shows a 6.8-pF capacitor in series with the line from J1. This capacitor should

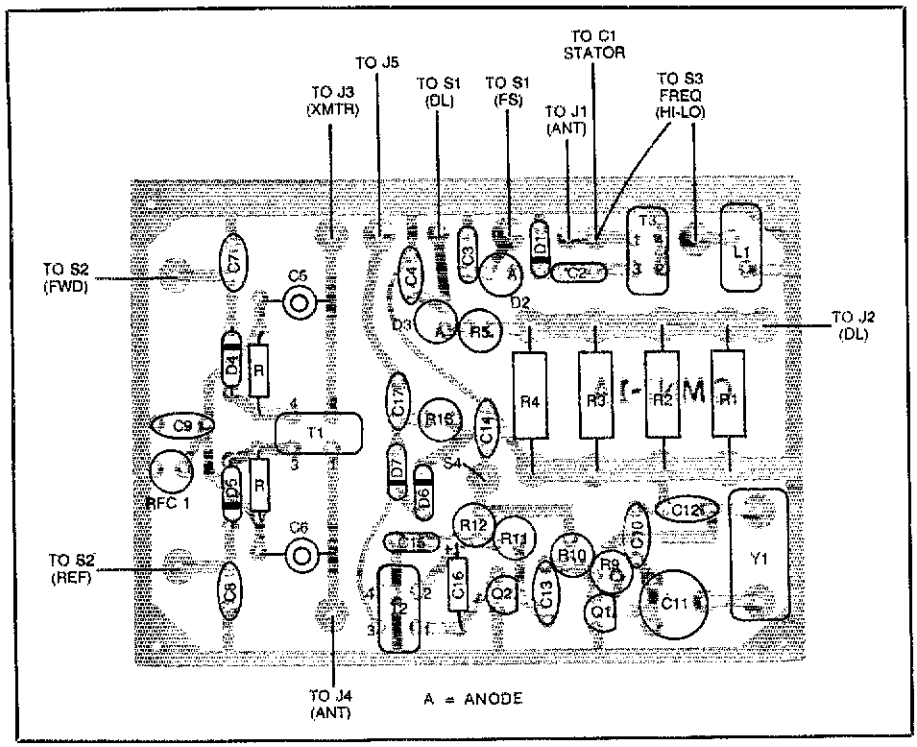


Fig 5—Parts-placement guide for the Omni Box. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

be added if you intend to use a longer pick-up antenna for the field-strength meter, or if you connect an RF-sniffer probe to the circuit. This low-value capacitor will help to isolate the tuned circuit from the added capacitance of the probe or longer antenna. Without this change, the field-strength meter's tuned circuit will have a restricted upper-frequency range and reduced Q.

Maximum SWR bridge sensitivity (SENS set fully clockwise) is 350 mW. This is more than ample for most QRP transmitters. The dummy-load metering sensitivity may be increased by changing R5 to a lower value. The meter responds adequately at 100 mW with the value for R5 given in Fig 1.

I used an RF probe and a VTVM to measure transmitter power across a 50-ohm resistive load ($P = E_{rms}^2/R_{ohms}$). I set R6 (SENS) for a full-scale reading at M1 with 5 W of RF power into the dummy load. This resulted in approximately a half-scale (12 o'clock) setting for R6. I then incrementally decreased the transmitter power and noted the readings to provide the data in Table 2. You may calibrate your meter scale for forward power by following this procedure. A scope of adequate bandwidth may be substituted for the probe and VTVM, but the resolution will not be as great as with the VTVM. You will have to convert the peak-to-peak readings of the scope to RMS values. The dummy load in the Omni Box will safely dissipate 4 W of continuous RF power. If you exceed this limit (5 to 8 W), restrict your key-down periods to 30 seconds or less, and allow a short cool-off period between tests.

You can cover the 10-m band with the field-strength meter by removing 2 turns from L1. I did not include coverage to 30 MHz because I don't operate QRP at 10 meters, likewise for 160 meters.

In the interest of miniaturization, I chose small components for most of the circuit. Surplus ceramic chip capacitors are used toward this end. Small switches are used, except for S1, which is the only suitable one I had on hand. R6 is a miniature component also.

I'm sure you will find this Omni Box as handy as I have. Maybe you'll include a QRP Transmatch in your unit to make it a complete do-everything gadget!

Notes

[1]Circuit Specialists Co, PO Box 3047, Scottsdale, AZ 85257. Part No. A1-233.
[2]D. DeMaw, "The SWR Twins—QRP and QRO," *QST*, Jul 1986, p 34.
[3]JAN Crystals, 2400 Crystal Dr, PO Box 06017, Fort Myers, FL 33906-6017, Catalog no. 30, 100-kHz crystal, 0.01% tolerance, HC-13/U case, $6.50 ea.
[4]D. DeMaw, "Homemade Circuit Boards—Don't Fear Them," *QST*, Aug 1987, pp 14-16 and 22.

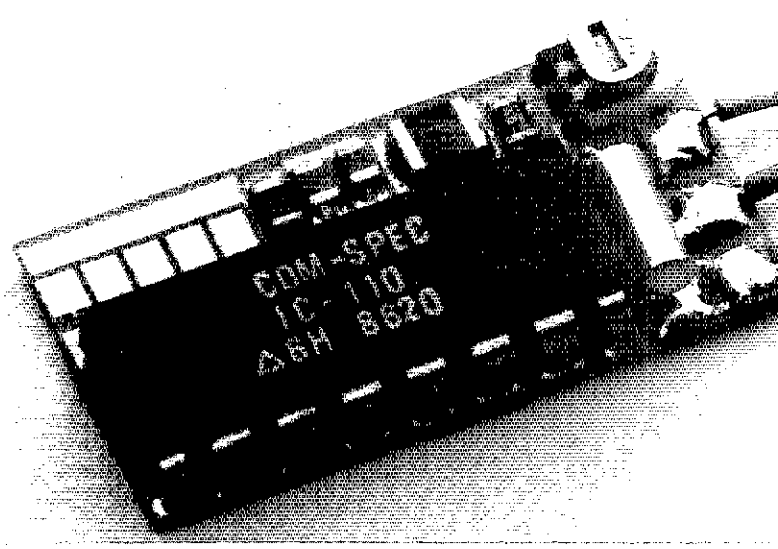
New Products

NEW SUPER-SMALL CTCSS ENCODER

☐ The super-small SS-32SMP CTCSS encoder from Communications Specialists measures only 0.53 × 1.00 × 0.16 inch and offers full tone versatility and high audio level. Any 32 tone frequencies between 0.01 and 255 Hz may be stored in a 32-bit EEPROM. These may be standard or nonstandard tone frequencies, and may be changed later if desired. The desired tone frequency is selected by soldering jumpers on the tone board.

The SS-32SMP features a low-impedance, low-distortion adjustable sine-wave output with adequate audio level to provide sufficient deviation for most hand-held radios. It operates from 6-15 V dc.

Manufacturer: Communications Specialists Inc, 426 W Taft Ave, Orange, CA 92665-4296, tel 800-854-0547. Priced at $27.95, with one-year warranty.



A Real Turn-On

Does having to turn on all your gear in sequence turn you off? Build a Turn-On!

By George Murphy, VE3ERP
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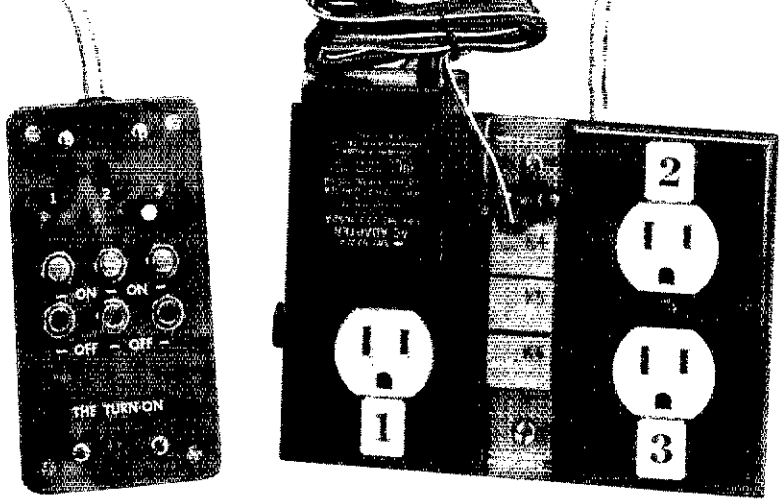


Meet the Turn-On, a gadget that can help you sort out sequential power switching. The control box (left) operates relays in the outlet box (right); the two are connected by multiconductor (antenna-rotator) cable. The plug-in ac adapter (Radio Shack 273-1652A, 117 V ac to 12 V dc, 500 mA) powers the indicator LEDs and relays in both boxes.

All electronics hobbyists worth their salt strive to impress their friends not so much by the quality of their equipment as by the sheer number of gadgets that have to be turned on before anything actually happens. Certain home computer systems offer the most impressive switching challenge: Everything in them has to be turned on in an unvarying sequence unless it's the Fourth of July, and the operator doesn't really care how much the fireworks display will cost.

Complicated power-up sequences *can* be confusing, and variation in a sequence may lead to equipment damage. My solution to this is the Turn-On, a simple switching system. I designed it with computer gear in mind, but you can expand or revamp it to suit other applications. The Turn-On sorts out sequential switching and eliminates a power bar or your present collection of extension cords.

The Turn-On's green LEDs show you which ON button to push next. If you push the wrong ON button, nothing happens. Red LEDs tell you what is already on. Push an OFF button to turn something off. Push the first OFF button and *everything* turns off. What could be simpler? If the ac line voltage disappears for any reason, everything *doesn't* start up all at once when the power comes on again—only the first green LED lights. At your option, *you* safely start up your system again—in the correct sequence.

Turn-On Hardware

The Turn-On consists of two boxes. One (the control box) contains switches, indicator lights and relays. The other (the outlet box) contains ac outlets and the relays that control them. The outlet box is plugged into the wall and hidden somewhere in the nether regions of your installation. You plug the ac power cords of your

The Origin of the Turn-On

I was in an industrial plant once when lightning struck something and the whole town went electrically dead. We didn't know it at the time, but the lightning had welded shut the contacts on the master control relay of one of the production lines. When the power came back on a few minutes later, motors totaling over 1000 hp all tried to start at once. It was very exciting.

Fail-safe control circuitry can prevent such factory fireworks, and we can use the same techniques at home. The Turn-On circuit is based on industrial motor-control practices. Fig A shows a ladder diagram of a typical sequential motor-control circuit used in industry. The "capacitors" shown schematically there *aren't* capacitors: Electricians draw relay contacts with symbols that look like capacitors to us electronics types! The contacts shown in Fig A are normally open (NO). (Normally-closed [NC] contacts are drawn with a diagonal line through them.) DS1, DS2 and DS3 are pilot lights. Switches S1-S6 are push buttons, NC for STOP, and NO for START.

The circles marked K1, K2 and K3 represent the coils of motor starters. A motor starter is just a giant relay with a low-voltage solenoid and high-current contacts (not shown in Fig A) that switch high voltage to the motor. A motor starter also has auxiliary low-voltage contacts (the things that look like capacitors in Fig A) to perform various control functions. In Fig A, the A starter contacts latch the starter solenoid so it stays energized when the START button is released, and the B contacts arm the next circuit to be started in the sequence. No motor will start unless all previous motors are running, and stopping any motor stops all subsequent motors in the ladder.

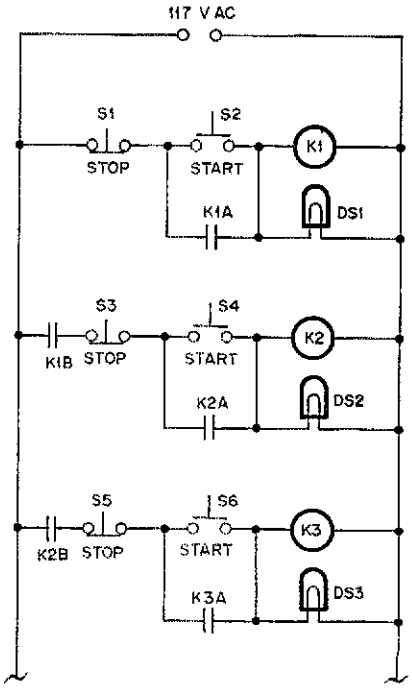


Fig A—This industrial motor-control circuit is the basis for the Turn-On circuitry. Some of these symbols are not normally used in *QST*; see the text to learn what they mean. →

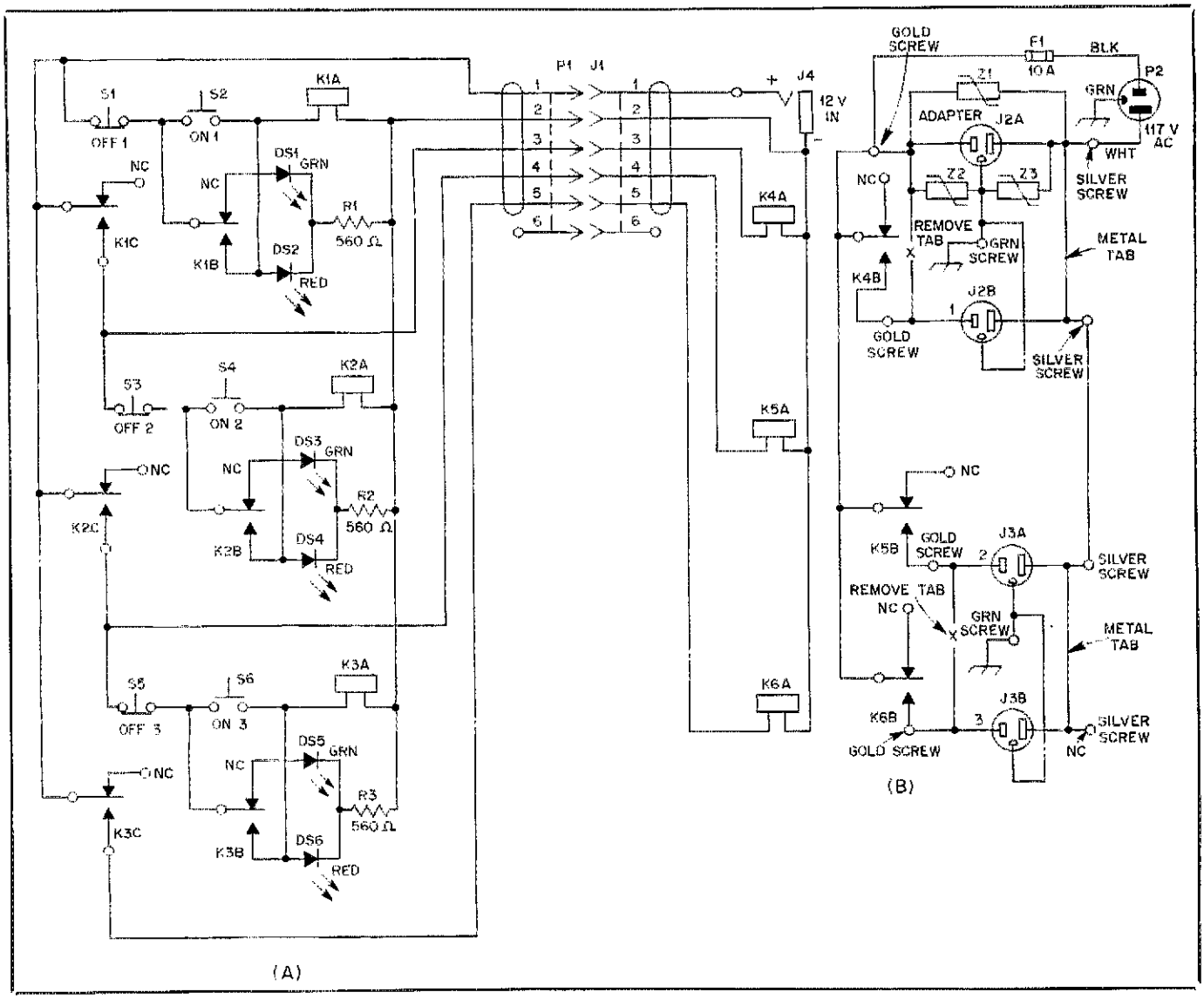


Fig 1—Schematic of the Turn-On. Inset A shows the control-box diagram; the outlet-box diagram is shown at B.

F1—10-A, 250-V fuse (RS 270-1279).
J1—6-pin socket (RS 274-236).
J2, J3—Duplex three-wire ac outlet, 15 A.
J4—Dc power jack (RS 274-1565).
K1, K2, K3—DPDT DIP relay, 1-A contacts; solenoid: 12 V dc, 43 mA (RS 275-213).
K4, K5, K6—SPDT relay, 10-A contacts; solenoid 12 V dc, 37 mA (RS 275-248).
P1—6-pin plug (RS 274-226).
P2—Three-wire plug, part of line cord assembly (RS 278-1258).
S2, S4, S6—Push button, NO contacts (RS 275-1547).
S1, S3, S5—Push button, NC contacts (RS 275-1548).
DS1, DS3, DS5—Green LED (RS 276-022).
DS2, DS4, DS6—Red LED (RS 276-041).
R1, R2, R3—560-Ω, ¼-W resistor.
Z1, Z2, Z3—MOV transient suppressor (RS 276-568).

computer, printer and monitor into the outlet box, and place the control box, with its push buttons and lights, in plain view where it can be seen and admired. The two boxes are connected by a multiwire cable. With the POWER switches of your printer, monitor and computer set to ON all the time, you control application of line voltage to these devices—in the correct sequence—with the push buttons on the control box. The cable between the two boxes carries only 12 V dc; 117-V circuitry is confined to the outlet box. Fig 1 shows the Turn-On circuit. To learn where the Turn-On circuit came from and how it works, see the sidebars, "The Origin of the Turn-On" and "Turn-On Circuit Operation."

Constructing the Turn-On

Except for the multiwire cable between the control and outlet boxes, you can get everything you need at Radio Shack® and your local hardware store. I got my multiwire cable by going to my local TV antenna installer and conning him into selling me eight feet of five-conductor antenna-rotator cable.

The Outlet Box

I built the outlet box for my Turn-On in a metal enclosure made from three sectional switch boxes. A three-gang box is also suitable; a PVC three-gang box was used in the ARRL Lab version of the Turn-On (see title photo and Fig 2). If you use sectional switch boxes, study them carefully to learn how they fit together. Remove the right-hand side of the left-hand box, the left-hand side of the right-hand box and *both* sides of the center box. Reassemble the boxes, minus these sides, into one unit. If the result looks like a three-gang box, you probably have it right! Remove one of the knockouts, install a knockout connector and cinch a three-wire, 117-V line

Turn-On Circuit Operation

Fig 1 is the home tinkerer's version of Fig A in the "Origin of the Turn-On" sidebar. This circuit also reflects my design philosophy: I rarely design anything requiring parts not available at Radio Shack and the local hardware store.

Comparing Fig 1 with Fig A, relays designated K1, K2 and K3 replace the motor starters, and relays designated K4, K5 and K6 do the work of the high-voltage contactors mentioned in the "Origin of the Turn-On," but not shown in Fig A. Relay contacts K4B, K5B and K6B perform the same functions as the "B" starter contacts. Pilot lamps in Fig A are replaced by LEDs DS2, DS4, DS6 and associated voltage-dropping resistors. Because we are using DPDT relays, and I hate to see relay contacts not doing anything, I have added more LEDs (DS1, DS3, DS5). These are the lights that tell you which button to push next.

The 117 V ac portion of the circuit is straightforward. Relay contacts K4B, K5B and K6B control the outlets powering our equipment, and there is an unswitched live outlet, J2A, into which we plug in a 117 V ac to 12 V dc adapter. The Turn-On's 117-V circuitry is equipped with three MOV transient suppressors to absorb power-line spikes. [If MOVs are new to you, see the articles cited in "More on MOVs," Technical Correspondence, *QST*, Aug 1987, p 39.—Ed.]

DS1 comes on when 117 V is applied to the Turn-On. This lets you know the system is working, and tells you which button to push first. Now that DS1 is lit, push S2, ON 1. K1A energizes, operating contacts K1B and K1C. K1B turns off DS1, turns on DS2 and latches K1A. K1C energizes K4A, turning on outlet J2B. K1C also lights up DS3 and arms the circuit to S4, ON 2. Closing S4 activates the next circuit in the sequence, clearing the way for activation of the third circuit by means of S6, ON 3. Pressing any OFF push button turns off the associated device and all circuits later in the sequence.

cord with plug (Radio Shack 278-1258 suitable) into the knockout connector, with about 9 inches of cord inside the box. (The plastic three-gang box shown in Fig 2 has built-in through holes and strain reliefs for cables; a knockout connector was not needed in this version.)

Fig 1B shows the wiring diagram for the outlet box, and Fig 2 shows the ARRL Lab implementation of the circuit. Use no. 18 (or larger) wire for all 117-V wiring. Remove all but 1 inch of the cord jacket inside the box. Cut and strip the green (ground) wire of the power cord and connect it to the box by means of a ground screw. (This does not apply if you build your outlet box into a PVC enclosure; see the important note that follows.) If you build your outlet box into a metal enclosure, the ground terminals of J2 and J3 will be connected together—and to the green (ground) wire of the ac cord—by their mounting screws as you install them in the box. *Important note:* If you use a plastic box, you *must* wire the ground terminals of J2 and J3 together *and* connect the green (ground) wire of the line cord to this common connection. A three-wire circuit with a missing or defective ground connection is more dangerous than a two-wire circuit because you'll assume later that the third wire is there! Contact with the 117 V ac line can be *deadly,* so wire and test your Turn-On carefully.

Duplex outlets J2 and J3 have two gold-colored screws (hot terminal) joined by a tab on one side, and two silver-colored screws (neutral terminal) joined by a tab on the other side. Break off the tabs joining the terminal plates for the gold-colored screws on each outlet. This allows independent wiring and control of the A and B outlets of J2 and J3. Connect the neutral terminals (silver-colored screws) of J2 and J3 together and connect the white (neutral) wire of the line cord to this bus. Wire the black (hot) conductor of the line cord to one terminal of the fuse holder.

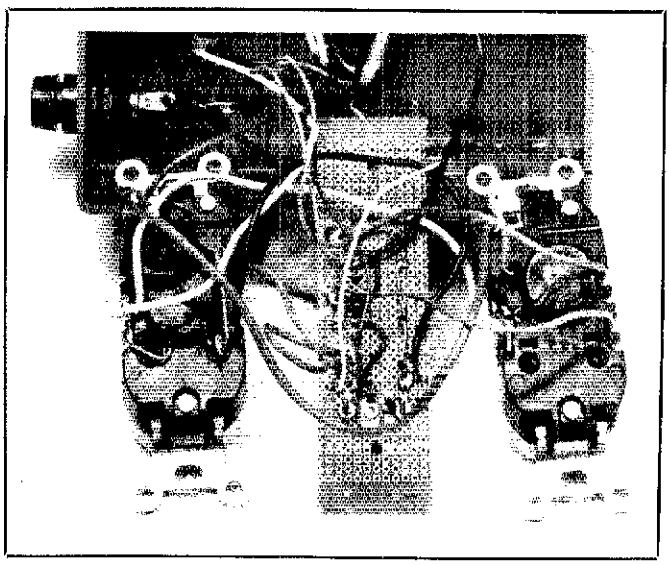


Fig 2—Outlet-box wiring. In this model, the multiwire control cable enters the enclosure through the box wall. There's room on the grid board to bring the cable in below the relays, if desired. The fuse holder is a Radio Shack 270-364.

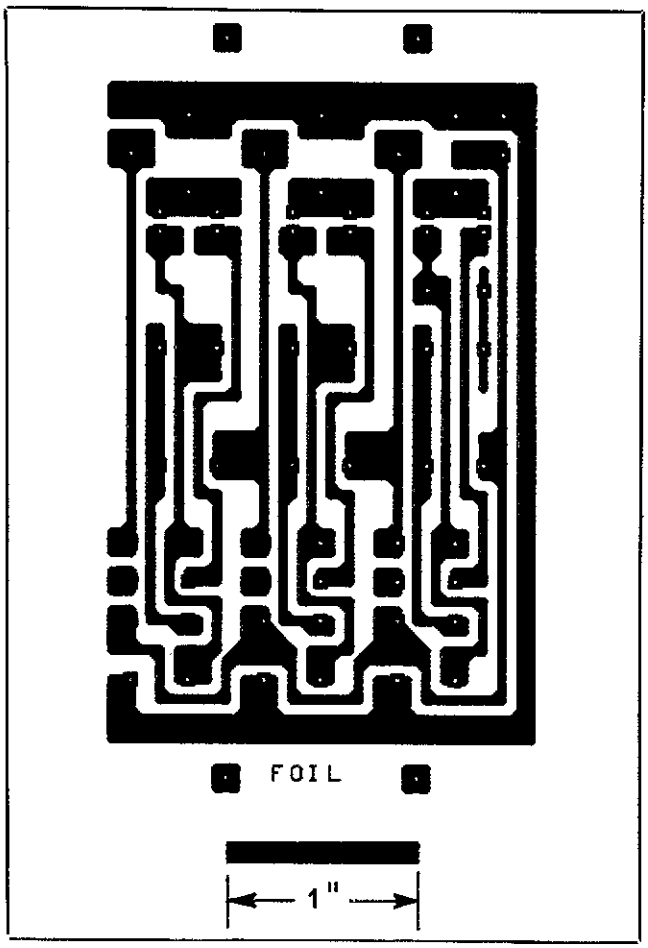


Fig 3—Circuit-board etching pattern for the Turn-On control box. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

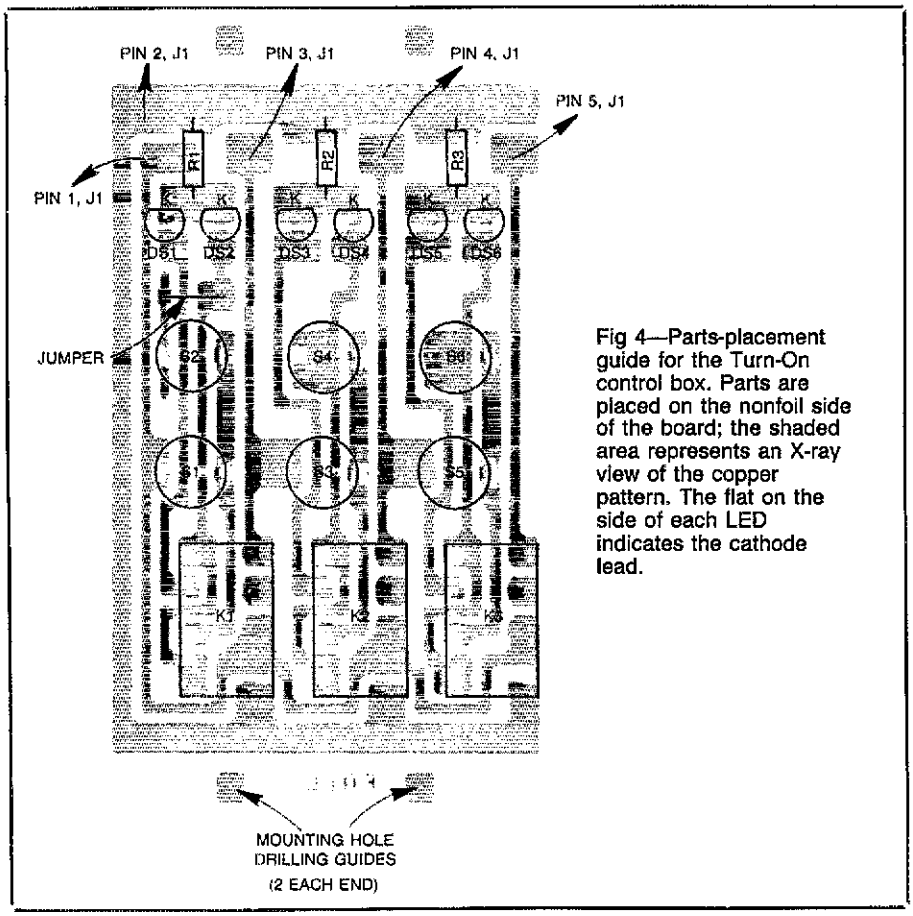


Fig 4—Parts-placement guide for the Turn-On control box. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. The flat on the side of each LED indicates the cathode lead.

the circuit board to the control-box panel by means of spacers and screws. Push the LEDs and push buttons up through their matching panel holes until their collars are flush with the underside of the panel. Solder the LED and switch leads to the circuit board, and cut off excess wire. Fig 6 shows the completed control-box PC board.

Install a grommet or strain-relief bushing for the multiwire cable in the control-box wall. Connect the five-wire cable to the PC board and install P1 on the free end of the cable, making sure P1's wiring matches that of J1. Plug the control box into the outlet box, and you're done! You can mount the control box on the side of your desk, under a shelf or anywhere else you can get at it.

Using the Turn-On

Try out the Turn-On by plugging the ac adapter into a live wall outlet. Don't plug P2 into a 117-V source yet. Plug the adapter's dc output connector into J4. The Turn-On indicator LEDs should function as described in the "Turn-On Circuit Operation" sidebar. Use an ohmmeter to confirm that no short circuits appear between the hot and neutral prongs of P2, and between either of these prongs and P2's ground prong, as you cycle the Turn-On. If all looks well, plug the ac adapter into J2A and plug P2 into the live ac outlet. Check the ac switching capability of the

Wire the other fuse-holder terminal to the gold screw on J2A.

Mount MOV transient protectors Z1, Z2 and Z3 on outlet J2A. I installed the MOVs by filing J2A's hot, neutral and ground terminal plates to remove any protective coating. Next, I tinned the plates by flowing on solder. Finally, I drilled small holes to take the leads and soldered the MOV leads to the plates.[1]

Outlet-Box Relays

Cut a 1¼- × 4½-inch piece of grid board (RS 276-147) as shown in Fig 2. Drill holes in it for the 12 V IN jack (J4), mounting screws and a grommet to pass the control cable.[2] Mount the relays on the nonfoil side of the board, securing each with a dollop of epoxy glue or household cement, if necessary. Install J4 to the board with no. 2-56 hardware.

Small hookup wire is adequate for wiring the solenoids of K4, K5 and K6; again, be sure to use no. 18 or larger wire for 117-V circuitry. Cut an 8-inch length of five-wire cable and install J1 to one of its ends. Insert the free end of the cable through the grommet in the outlet-box grid board and wire it to J4 and the appropriate relay solenoid terminals. Assemble the outlet box as shown in the title photo, with the cover plates overlapping the edges of the grid board. Place the outlet box somewhere near the equipment you intend to control—mounted on the underside of a shelf, or on the floor of your installation.

The Control Box

The control circuitry fits neatly into a Radio Shack economy box (RS 270-222). You can wire the control-box circuitry point-to-point or fabricate a PC board. Fig 3 shows the template for the control box PC board. Fig 4 shows how to mount the parts on it, and Fig 5 gives dimensions for drilling the control-box cover for the push buttons, LEDs and mounting spacers. Use 16-pin DIP sockets to mount the relays to the circuit board by cutting off unused socket pins. Install these sockets, the resistors and the jumper wire to the nonfoil side of the board.

Prepare each push button by soldering a 2-inch length of solid, bare hookup wire to each of its terminals. Run the wires up the outside of the terminals and bend the wires so they pass through the terminals toward the inside of the switch. Then, pull the wires straight back from the switches. This spaces the wires to fit the PC board. Install the push buttons (minus mounting nuts and lockwashers) and LEDs to the board without soldering them. Next, mount

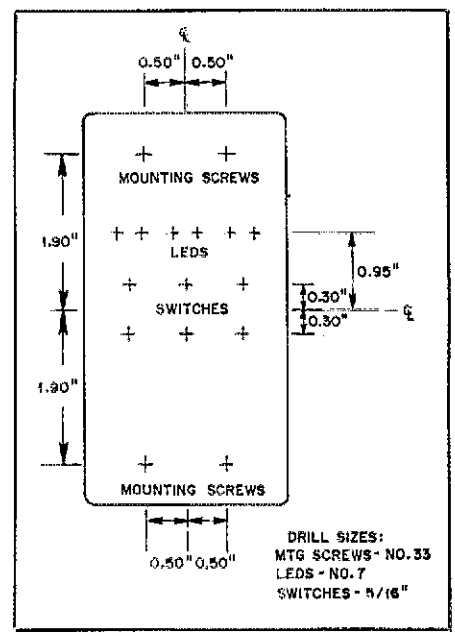


Fig 5—Drilling template for the top of the control box. The switch holes are positioned on the vertical centerline, and on vertical lines 0.7 inch to the left and right of the centerline. The LED holes are positioned 0.15 inch to the left and right of each of the three vertical switch lines. The drill sizes indicated for the LED and switch mounting holes match the parts specified in the Fig 1 parts list. Use no. 4-40 hardware to mount the PC board to the control-box top.

[1]Notes appear on page 27.

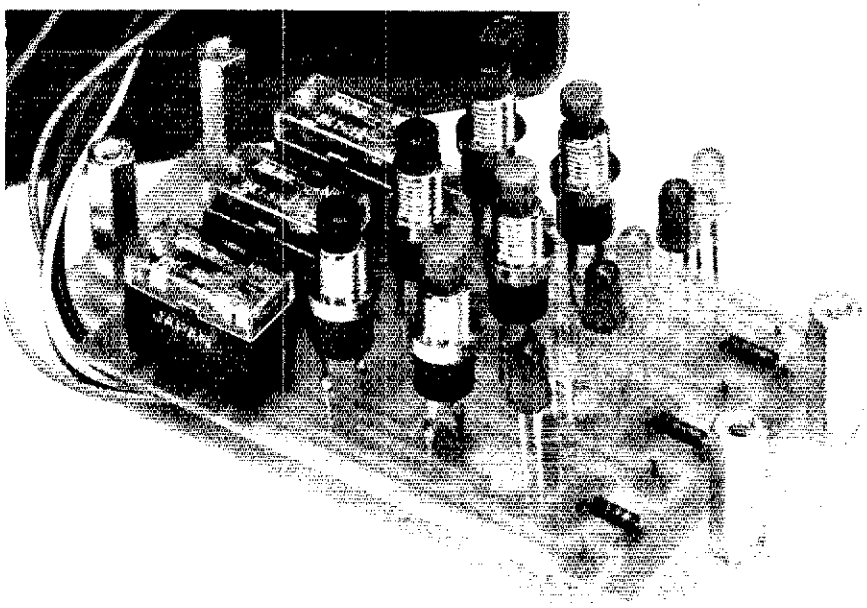


Fig 6—The completed PC board mounts to the control-box top by means of no. 4-40 screws and ¾-inch threaded spacers. The corners of the circuit board must be removed to clear the mounting posts for the control-box top.

Turn-On with three 117-V lamps. (Lamps let you *see* what's happening as you manipulate the control box, and they're much more tolerant of abuse than expensive electronic gear!) If all functions as expected, plug in your computer or other electronic devices and turn them on in style.

Load Capacity

The Turn-On uses power switching relays (K4, K5, K6) with 10-A contacts. On paper, this means that the relays are capable of switching a total of 30 A. In practice, the no. 18 wire used for the Turn-On's 117-V circuitry, and in the Radio Shack 117-V cord set mentioned earlier, limits the Turn-On's total current-handling capability to *10 A, maximum*. If you wish to increase the Turn-On's current capability, use heavier relay wiring, and a heavier cord set, appropriate to the load. F1's rating would have to be increased, also.

The Turn-On can be expanded to control more than three devices if the total current drawn by the relay solenoids does not exceed the 500-mA capability of the 12 V dc adapter. Wired as shown in Fig 1, the Turn-On draws 250 mA at 12 V with all relays actuated. Each additional circuit requires one more control wire in the cable between the control and outlet boxes.

Conclusion

If you are as fascinated as I am by push buttons and colored lights, use your imagination to dream up additional applications for the Turn-On. (How about one for your car to prevent you from turning on the headlights and the 100-W stereo before you start the engine?) In my case, I have a room full of electronic equipment, all powered from a single wall plug, because that's all there is in the room. So I am in the process of building a master Turn-On to control three other Turn-Ons—one for my computer, one for my audio equipment, and one for my ham shack. The cost of building four Turn-Ons will probably be less than what I have been spending lately on replacing popped fuses and crashed computer programs.

Notes

[1]Editor's Note: In addition to screw terminals, the duplex outlets used in the ARRL Lab version of the Turn-On (shown in the photographs) allow interconnection of hot and neutral circuits by means of spring-loaded terminals for no. 12 or 14 solid copper wire. If your outlets have these, you can use MOVs with thin leads by inserting a 3/4-inch piece of no. 12 or 14 solid copper wire into the appropriate terminal and soldering the MOV lead to it. In the ARRL Lab Turn-On, a bit of a wiring traffic jam left room to mount only Z1 and Z2 on J2. Z3—the MOV from neutral to ground—was mounted on J3.

[2]The control cable on the outlet box shown in Fig 2 doesn't pass through the grid board. Instead, we used one of the box's built-in cable holes, and the associated strain relief, to bring the control cable into the box.—Ed.

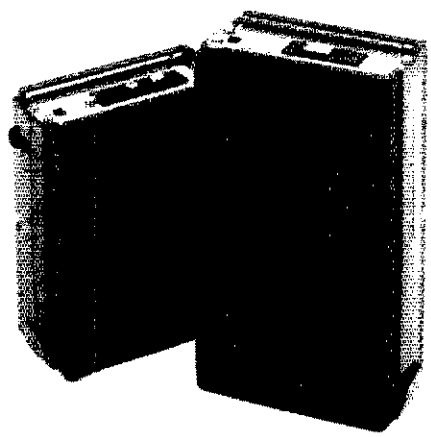
New Products

PERIPHEX HIGH-CAPACITY ICOM REPLACEMENT BATTERIES

☐ The Periphex BP-7S (right) is a direct replacement for the ICOM BP-7 (left) battery pack used on IC-02/03/04AT hand-held transceivers. Rated at 13.2 V, 900 mAh, it has double the capacity of the original equipment. The BP-8S for the IC-02/03/04AT and IC-2/3/4AT transceivers is rated at 9.6 V, 1200 mAh, 50% greater than the ICOM BP-8.

Both battery packs are chargeable only by base-station chargers—BC-35 for the BP-7S and either BC-30 or BC-35 for the BP-8S. There are no wall-plug-transformer charging connectors on these units.

Manufactured by: Periphex, Inc, 149 Palmer Rd, Southbury, CT 06488, tel 203-264-3985. Price class: BP-7S or BP-8S, with one-year guarantee, $65 plus $3 shipping and handling.



Strays

STRAY HINTS

☐ "Strays" are those interesting fillers used when space allows in *QST*. Think you have an item with Stray potential? Here are some hints to help your submission become one. (1) Be sure the information will be of interest to most *QST* readers. (2) Any photographs you send should be good-quality black-and-white glossy prints.

Items submitted are normally acknowledged, but that doesn't necessarily mean that your item will be appearing in *QST*. Strays are used on a space-available basis, and usually we receive far more material than we can find room for in each issue. Photos become the property of ARRL and can't be returned.

Follow the above hints and maybe your Stray will find a home in *QST*.—*Jeff Kilgore, N5LFW*

I would like to get in touch with...

☐ anyone with a manual for a Swan TB4HA beam. Elijah Marden, 28 Jericho Rd, Essex Junction, VT 05452.

Amateur Radio and the Blind

Part 2: Computers, speech synthesizers, software and modems—what's involved in making them work together? Let's begin the learning process.†

By Butch Bussen, WAØVJR
Box 142,
Wallace, KS 67761

(Photos by Gary Mc Duffie, AGØN)

For the blind ham interested in digital communications, there are four important items that all must work together, not counting the radio and antenna: the software, computer, speech synthesizer and modem. Because all of these items are so closely linked, it's difficult to discuss them as entirely separate entities.

If you presently don't have a computer, speech synthesizer, software or modem, there are several things you need to think about before you get any or all of them. Is your system going to be dedicated exclusively to Amateur Radio use? If not, what else do you want to use it for? When people ask me which computer to buy, I tell them to first pick the software they want to use, *then* look for systems that will run it. Dealer service, assistance through computer clubs and help from fellow amateurs are all important.

EQUIPMENT AND SOFTWARE

In preparing this series of articles, I spent many hours on the air using four modems, three computers, several pieces of software and three speech synthesizers. Advanced Electronics Applications (AEA) and Kantronics helped with this project.[6,7] A PK-232 was provided by AEA, and Kantronics loaned me a KPC-2. Both modems work well and, as you'll see in a subsequent installment, there are certain parameters that become very important when using these boxes with a speech synthesizer. I also used the Kantronics UTU and AEA AMT-1 on AMTOR.

The computers I employed included an IBM® PC compatible, (I'll use the term PC to represent the IBM PC or PC-compatible computers), an Apple® //e and the Laser 128. Chances are, the first two computer types are probably familiar to many of you, but you may not have heard of the Laser, so a quick briefing is in order.

The Laser 128

The Laser 128 is an Apple //e clone that sells for about $400, is 99% Apple //e compatible and runs all of the talking software I have tried on it. The Laser is supplied with 128 kbytes of RAM and a single, built-in disk drive. Though the Apple //e is equipped with two I/O ports, the Laser has actually three I/O ports. On the Laser, I/O port 1 can be configured as a parallel or serial port simply by moving a switch. Parallel output data is then routed to a DB-15 connector. Port 1 can be used only with a printer, as it is not software programmable for use as a serial communications port.

A little wider than the //e, the Laser is equipped with an expansion port on the left-hand side; the //e has no such expansion port. An optional two-slot expansion chassis—equipped with its own power supply—can be plugged into this expansion port.

Other Tools

Among the terminal programs I've used are Talking Transend™ and PC-Talk (a shareware program available on many computer BBSs).[8] I also ran a couple of communications programs I wrote for the Apple and PCs. COMM.BAS, a simple communications program included on the IBM DOS Supplemental Programs disk, is another that works successfully.

With the Apple and Laser computers, I used the Echo II and Echo Plus speech synthesizers; an Echo PC speech synthesizer was employed with the PC. All of these synthesizers are manufactured by Street Electronics.[9]

SPEAK TO ME...

Unless you can get the information you need *out* of the computer, it won't do you much good. We visually handicapped people are much more limited in our choice of equipment than our sighted friends. People with sight are used to looking at a video display whenever they need to gather information. Since I have never had vision, I cannot really understand what it's like to quickly scan a screen for the desired information. On the other hand, I'm sure sighted persons can't really know what it's like to have to depend *totally* on a speech synthesizer.

From the time I first learned about computers, I wanted one that would talk. Three years ago, I got one—and my life will never be the same! I'd always wanted to try my hand at RTTY, but the stumbling block I had to overcome was how to *read* what the other station was sending. I learned touch typing in the seventh grade, so using a keyboard to *transmit* was easy. I tried reading the perforated RTTY tape, but that wasn't possible for me. Also, I'm not much of a mechanic and wasn't sure I could keep one of the early "mechanical monsters" running, anyway.

I had a computer, a speech synthesizer

†Part 1 appeared in the Oct 1987 issue of *QST*.
[6]Notes appear on page 32.

and some special talking software. I figured there should be a way to put everything together and get on the air with RTTY and AMTOR. Well, that turned out the way my repeater project did: The transmitter and receiver worked fine when operated separately, but when I tried to operate them as a pair, the "fun" started! I found that putting together all the hardware and software to run RTTY was the same kind of story. With the information presented in this series, however, your road to digital communications should be much smoother.

SPEECH SYNTHESIZERS

The choice of a speech synthesizer will depend to an extent on which computer or software you decide to use. There are, however, some general points about synthesizers that need a little explanation. The first thing to realize is that speech synthesizers were, in most cases, not designed for use by the blind. We are a very small part of a manufacturer's market. Speech synthesizers are usually considered a novelty or a toy, or maybe an educational tool. The term "talking computer" doesn't necessarily imply "usable by a blind person." Only by using specialized software and hardware am I able to put synthesizers to work for me.

Internal Synthesizers

There are two basic types of synthesizers: internal and external. The internally connected synthesizer plugs into a computer's expansion slot or game port. Such synthesizers are designed for use with a particular computer type, and software that will work with the synthesizer may or may not be available.

Prices for plug-in units start at about $150 for the Echo Plus (see Fig 3). As with most things, the sky is the limit. One speech synthesizer designed by Texas Instruments for use with IBM PC systems has fabulous speech quality. It sounds almost like a real person speaking and will even answer the phone for you! The synthesizer digitally records a message someone may want to leave. It responds to standard Touch Tone® frequencies to select menu choices or answer questions. With a little clever programming, you can call and get information from your computer using a standard Touch Tone phone. This Texas Instrument synthesizer sells for around $2000.

External Synthesizers

The second type of synthesizer is external to the computer. These synthesizers have their own CPUs as well as other firmware that do text-to-speech conversion and so on. You can think of this type of speech synthesizer as a "talking printer." Instead of printing what you send it, the synthesizer speaks it. As with printers, you need to select a parallel or serial data format. (Some of these synthesizers are equipped with both parallel and serial input ports.) You send text strings to the synthesizer, and it voices them. As a rule, most synthesizers need to see a carriage-return character before they will speak the last string sent to them. Most synthesizers have a buffered input. Others have built-in sound-effects generators, clocks and filters you can shape through software. Prices for these "talkers" start at about $250 for the Echo GP (Fig 4).

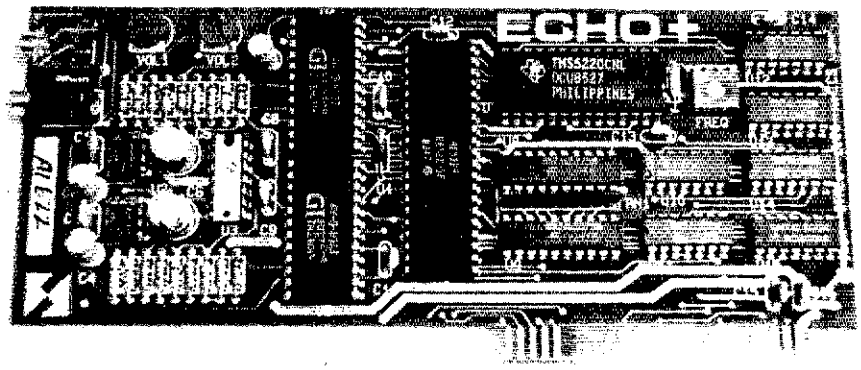


Fig 3—The Echo+ plug-in speech synthesizer for the Apple or Apple-compatible computer. This synthesizer requires text-to-speech software to be loaded into the computer's RAM prior to use.

Of the inexpensive models, the Echo GP is my favorite. I have used it on the IBM PC and PC compatibles as well as a C64. Among the better stand-alone synthesizers is the Dec-Talk, manufactured by Digital Equipment Corporation.[10] This one has many nice features and the speech is superb. The price is around $3000. No, I don't own one, but I'd love to!

The Echo synthesizer won't work when plugged directly into the Laser's expansion slot because there is no 5-V supply source at this connector. So, if you're going to use a Laser, you'll also need the optional expansion chassis. It costs $80 or less, depending on where you buy it. This box plugs into the expansion slot on the side of the computer and contains a built-in, ac-operated power supply that provides the voltage required by the Echo synthesizer. Because the expansion chassis is equipped with two slots, you can use the second one for memory expansion or some other feature.

The Apple //c has no expansion slot for the Echo card. Another synthesizer manufactured by Street Electronics (called the Cricket™) can make the Apple //c talk. The Cricket is designed to be connected to port 2 of the //c. You cannot, however, connect a Cricket to port 2 of a Laser because that port is required for serial communication with your RTTY/packet modem. A lot of existing software is not presently compatible with the Cricket, though that situation is changing.

There are some features to look for when contemplating the purchase of a synthesizer. The Echo GP is small and designed for serial input only. This unit is supplied with a serial cable equipped with a *male* connector (DB-25P); it plugs into the serial port on my Apple //e. (It can be used with a PC, too, but requires a gender changer.) The Echo PC is basically the same as the Echo GP, but is designed specifically for use with IBM PCs or compatibles. An Echo PC is supplied with a cable and *female* (DB-25S) connector wired to fit the PC's male serial port connector.

Speech Quality

The inexpensive synthesizer models all have speech characteristics of their own and take a little getting used to. The first time I heard an Echo synthesizer, I wondered how I would ever understand it! It didn't take long, however. Like most things, it just takes time and practice. I now run the Echo as fast as it will go, and that isn't fast enough for me.

If you heard an Echo GP or Echo PC talk, you'd find its speech quality is not as clear as the synthesizers you attach to, or may have in, your radios. Why? Because the synthesizers used in radios (as well as those used in talking clocks and calculators) have a very limited vocabulary; they are designed to say a *few* words and numbers very clearly. The digital equivalent for each number or word is programmed into these devices. On the other hand, general-purpose synthesizers such as the Echo GP, must pronounce *thousands* of words and phrases. If you digitally represented each word, you'd use up a lot of memory quickly.

So how does a synthesizer like the Echo GP work? It looks at each text string, including spaces and punctuation. It then uses over 400 pronunciation rules to do its best to pronounce each word. The synthesizer even changes intonation for punctuation such as periods and question marks, and it pauses for commas. The

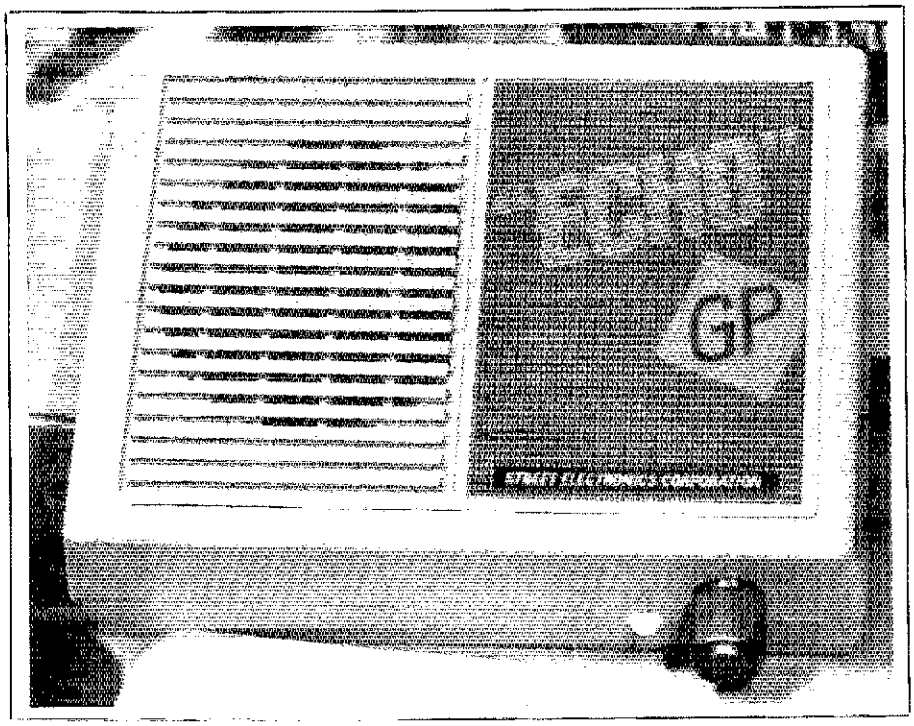


Fig 4—The Echo GP external speech synthesizer. This unit has a built-in text-to-speech converter and is driven by the computer through a serial communications port.

pronunciation isn't perfect, but it's certainly adequate. For the price, it does a good job.

I prefer the Echo GP because its voice is much like the first synthesizer I owned, and the command structure is much the same. An Echo synthesizer recognizes and voices punctuation characters. If you send it a ".", it will say "period." Some synthesizers totally ignore punctuation. If you want them to pronounce a ".", you have to spell it out for them by sending a "period."

SYNTHESIZER SOFTWARE

For the PC

Most of us who have IBM PCs or compatibles have a special program to make these machines talk. There are several such programs on the market ranging in price from $200 to $800 or so. The one I use is called Screen-Talk.Pro, produced by Computer Aids in Fort Wayne, Indiana.[11] This is a TSR (terminate, stay resident) program that hides itself in RAM and interfaces your machine to an external speech synthesizer. Screen-Talk.Pro provides you with capabilities similar to those you'd have using the Apple with the Echo Plus and Textalker software (that will be discussed in more detail later). Using Screen-Talk.Pro with ProKey® allows you to create some "hot keys" (macros) that really add power and flexibility.[12] You can also set up windows so that only characters printed within these windows are spoken by the synthesizer. This software gives you LINE REVIEW (the ability to reread a screen line), punctuation control and a SILENCE KEY.

I used Screen-Talk.Pro with the three terminal programs I ran on my PC. Screen-Talk.Pro, or a similar program, will let you use much of the commercial software available for these machines, as well as some specially written software. Some of the standard commercial software talks poorly (in some cases, not at all) because it doesn't use standard DOS I/O routines to print to the screen.

Other Alternatives

If you don't have a talking program (like Screen-Talk.Pro) for your PC, there are other alternatives, such as the COMM.BAS program supplied on the IBM DOS Supplemental Programs disk, or a shareware BASIC communications program, or one you write yourself.

Of course, you'll need an external speech synthesizer. If your synthesizer requires parallel input, you can skip steps 2 and 3 that follow; the specific commands sent to the synthesizer will probably be different as well.

First, be sure you have your synthesizer hooked up properly. I have my synthesizer plugged into the computer's COM2 port. (I use COM1 to interface the computer to the modem.) Then set the synthesizer's switches appropriately. I set my Echo PC for 9600 bauds. You'll find four DIP switches on the bottom and near the back of the Echo PC. Push all four switches down toward the back of the box for 9600-baud operation. The Echo PC requires 8 data bits and one stop bit. When you turn the synthesizer on, you should hear "ECHO READY." Now you're ready to make your computer talk. In the following steps, the command characters and keypresses you enter appear between the lesser-than (<) and greater-than (>) symbols. *Do not key in these symbols.*

1) Boot your system with your DOS disk. You'll probably be prompted for date and time, so press <Return> a couple times.

2) Type <MODE COM2:9600,N,8,1>. Then press the <Return> key. This sets up serial port COM2 to talk to the Echo PC.

3) Next type <MODE LPT1:=COM2> and press <Return>. This directs all output that would normally be routed to the printer to COM2 and on to the synthesizer.

4) To make sure everything is working so far, hold down one of the <Shift> keys and simultaneously press the <PrtSc> key. You should hear your synthesizer speak all the information that is on the screen.

5) Next, insert a disk that has BASICA and COMM.BAS on it. Now type <BASICA> followed by <Return>. Once BASICA is loaded, you can again do a screen dump by simultaneously pressing the <Shift> and <PrtSc> keys as before.

6) Press and hold down the <Ctrl> key, then press the <PrtSc> key. This sends characters as they are typed to the printer, which is usually connected to LPT1. In this case, we are using a synthesizer instead of a printer, and with the MODE command issued in step 3, we have rerouted everything to COM2 and on to the synthesizer.

7) Now we are going to send the Echo PC some specific commands. Be sure you turn <Caps Lock> on, or press the <Shift> key as the letters <C>, <D>, and <M> are typed. These letters must be *uppercase* to be recognized by the Echo PC. Type <PRINT CHR$(5);"1D"> and press <Return>. This tells the Echo PC to speak each character as it's sent. Next, type <PRINT CHR$(5);"C"> and press <Return>. This command makes the Echo speak faster. Type <PRINT CHR$(5);"M"> and press <Return>. This sets the Echo up for most punctuation—that is, most punctuation is pronounced. CHR$(5) is Control-E, which is a special command character for the Echo PC. These three commands are optional and will be different if you're using a different synthesizer. Some synthesizers don't have the ability to speak a single character without receiving a carriage return.

The <Ctrl-E"1D"> command is a bit confusing. The number can be anything from 0 through 9. Think of the <D> as a delay. This tells the speech synthesizer to speak the characters sent to it after a specified length of time even if it doesn't see a carriage return. A <0> cancels this command, and is the default. The Echo will

not say anything until it sees a carriage return. In other words, you'll not hear what you have typed until you press the <Return> key. If data is coming in a little slowly as it sometimes does on AMTOR, the synthesizer may speak parts of words because it says what is in its buffer without seeing a carriage return. In this case, you might want to lengthen the delay, or enter a <0> to turn it off altogether.

8) Now type <LOAD"COMM",R> and press <Return>. This BASIC program will be loaded and run. You'll hear it talk. Type a <6> from the menu and you'll be asked for the baud rate. Type <300> and press <Return>. To set parity, type <E> and <Return>. Set the number of bits per character by typing <7> and <Return>. To set the number of stop bits, type <1> and <Return>. Type <N> and then <Return> to omit echoing characters to the screen. If you've entered all the data correctly, type a <Y> and press <Return> when prompted. You can now talk and listen to messages from the KPC-2 or PK-232 (more on this later). Remember, you'll not have a SCREEN REVIEW as such, but you can dump the entire screen any time you want using the SHIFT and PRTSC keys. Neither do you have the use of a SILENCE key as the Control X isn't usually echoed back to the speech synthesizer.

For the Apple

My first talking computer system was an Apple //e with an Echo II synthesizer plugged into one of the internal expansion slots. (The Echo II is the predecessor of the Echo Plus mentioned earlier.) The Echo II becomes part of the operating system and requires special software (called Textalker) loaded from disk to make it talk. Textalker—a program for Apple computers only—is supplied with the Echo synthesizers. This software provides many special features for the blind. There are many general applications programs that make use of the abilities of the Echo II or Echo Plus.

With Textalker, you hear the character representation of each key as it's typed. You can select a slow or fast rate of speech. You've a choice of three levels of punctuation announcement. Your selection determines which punctuation marks the Echo will voice. If you select ALL, you hear spaces, line feeds, carriage returns; in short, everything. The MOST choice will give you the percent sign, question mark, plus sign, period and a few more. Two more commands included are the SILENCE key and LINE REVIEW. A Control X will momentarily silence the synthesizer until the next key stroke. If you are bored by hearing the same menu voiced over and over, just press CONTROL X; that tells your speech synthesizer to shut up. Not all synthesizers have this feature.

The LINE REVIEW command is one of the more useful. It allows you to enter an audio mode while running a program, or when the computer is in the immediate mode (no program running). LINE REVIEW gives you a sort of audio cursor that you can move around the screen. You can reread anything from a single line to the contents of the entire screen. You can switch from words to letters mode and use the arrow keys to check spelling of a word. A tap of the ESCAPE key will put you back at the point you were when you entered LINE REVIEW.

More Software

Other manufacturers are writing similar software to support their particular synthesizers. Some commercially written programs for the visually handicapped ask you which synthesizer you have and act accordingly. For Apple computers, I think there are more programs written for the Echo Plus or Echo II synthesizers than any other types. There are other synthesizers and more software just around the corner. Don't be afraid to ask questions and get second opinions. It is better to find out *before* you shell out your hard-earned dough what programs you can run with a particular synthesizer.

TALKING SOFTWARE PERFORMANCE

Though I find the PC's DOS powerful, I personally don't find the interaction between the computer and the synthesizer to be quite as smooth as I do the combination I use with my Apple. One big difference I notice between the two synthesizer and computer combinations is the way the screen and the synthesizer interact. Most of the external synthesizers are buffered so the computer is usually far ahead of the speech synthesizer. Some of these synthesizers have no provision to dump the buffer—no SILENCE command. If you load a BASIC program on the Apple and then LIST it and watch the screen, you see that the listing keeps pace with the synthesizer; it scrolls only as fast as the Echo is talking. This is a sort of real-time operation. If you press CONTROL X to silence the speech synthesizer, the lines will scroll at normal speed. There are advantages and disadvantages to using each method. In the real-time mode, you hear things exactly as they are occurring. This way, you get sound effects and prompts at the proper time. In this mode, the synthesizer may not talk nearly as fast as you can type. If you are using a word processor or typing a message to someone on the air, you would want to be able to type ahead of the voice, or not have the keys speak at all.

One example of why I mention all of this is the 300-baud versus 1200-baud rates used in data transfer. If you are just transferring files (without the need for speech output), 1200-baud operation is great. If, however, you are using a bulletin board and want to read all that is happening, while it's happening, there is no way the speech synthesizer can keep up with 1200-baud operation. It's like trying to have someone read to you what is on the screen with the data coming in at 1200 bauds and no way to buffer the data or temporarily stop it.

APPLICATIONS SOFTWARE PROBLEMS

Earlier I said the Echo II and Echo Plus required special software to be loaded from disk in order for them to make the Apple or Laser talk. Now, if the applications software you want to run (such as an RTTY, CW, word-processor or database program) has to be cold-booted, you blow away the speech synthesizer routines. That's exactly what happens when you use copy-protected software.

The first piece of equipment I bought to try on RTTY was the AEA CP-1 modem. The Apple software that came with it was produced by another company and was copy protected. I called the software producer in an effort to gain some insight on how to use the program with my speech synthesizer—they refused to give me any help at all. They said it wasn't possible for a blind person to operate these modes!

About this time, AEA released their own software for the Apple computer; it wasn't copy protected. AEA graciously offered any help they could give in getting the software to work with my speech synthesizer, so I thought I would give that a try. I called on some other hams for assistance, too, but we just couldn't make it talk properly.

The major problem I ran into is the use of a split-screen presentation. In such a display, the screen is divided into two, or more commonly, three sections: one section for received text, one for a transmit-text buffer and a third for display of outgoing transmitted text. That's a real neat thing for sighted people who can read the screen, but how does a speech synthesizer know what to do? Is it supposed to voice characters as you type them as well as tell you what is being printed in the received-text portion of the screen? You can see how that sort of output would get a little confusing! Actually, I never even got that far into solving the problem. Despite all my efforts, I never could find a way to make the program talk at all.

Terminal Programs

I was still working on that project when I discovered modems (such as the AEA PK-232, Kantronics KAM and others) that could be connected to any computer and used readily available terminal programs to drive them. I already had a special talking terminal program and had been active on some bulletin boards, so I was sure that was the answer. I'm happy to say—*it works!* It's not as simple to get *things working* together as you might at first think, but it

can be done, and it's a blast!

For my first such setup, I used my Apple, Talking Transend and an AEA AMT-1 modem. I operated AMTOR because of the inherent error-checking feature and because a good friend, Gary McDuffie, AGØN, was on AMTOR and was helping me along.

Gary had a C64 and a program called Chirptext,[6] which was produced by AEA. Because I was always using my Apple for things other than Amateur Radio, I thought it would be nice to have a computer totally dedicated to my radio. I already had an older Echo GP with a serial and a parallel port, so I got a C64 and printer card and switched my AMTOR operation from the Apple to the C64. I tried Chirptext, but there was no way to send everything to the speech synthesizer.

With the help of Gary and Chuck Woodman, KØKXR, I wrote a short terminal program in BASIC. It worked, but I encountered some problems. The first was that I had to send everything specifically to the printer port, to which the speech synthesizer is connected. The synthesizer did not speak with keyboard entry, so when I typed in program lines, I had no way to edit them. If I encountered an error, all files and devices were closed. So, I had a hard time figuring out where the program had crashed.

Tim Goodwin wrote a subroutine for me that dumped the entire screen to the speech synthesizer. This was a big help, but I had to listen to a whole screen of information whether I wanted to or not.

Another problem I had was related to the synthesizer's need for a carriage return before it will speak. Many RTTY stations don't send a carriage return character until 65 characters or more have been transmitted. Even though the incoming information was printing fine on the screen, I had to wait a long time before the entire line was spoken! That made the traffic flow seem uneven.

I solved this problem in a couple ways. I set program flags and looked for the +? character combination (the AMTOR "over" signal, which normally is not preceded by a carriage return). When the program saw that, it immediately sent a carriage return to the speech synthesizer. This ensured that I would hear the last line of text sent by the other station. I also had the program look for a space after the string was 30 characters long, send a return, clear the string and start counting characters again. I checked each character coming from the AMT-1 and set appropriate counters and flags. I built these into a string of the desired length and then sent the entire string to the speech synthesizer. That procedure did work, but I was never really comfortable programming on the C64 without synthesizer feedback from the keyboard, so I went back to the Apple and started developing a program there.

Before leaving the subject of the C64, I want to mention that a special speech synthesizer is available for the C64. I've never tried it, but I'm sure it would have solved many of my problems. The price of this synthesizer is around $225. Joe Giovanelli, W2PVY, is using one of these systems on a 2-meter mailbox and is doing quite well with it. He is using a commercially available terminal program, but had to rewrite quite a bit of it.

There is much more to this speech synthesizer subject than just making a computer talk. I love the screens that are bordered with asterisks ("star" to a speech synthesizer) or equals signs! Imagine your speech synthesizer saying "star, star" or "equals, equals" 40 times! Sure, there are programs that talk fine and are quite usable, but most software was written to be viewed on a screen, not listened to.

There are two distinct opinions regarding software for the visually handicapped. One is that all you have to do is somehow make your computer talk, and you can run existing software. The other opinion is that the program should be written specifically to talk. I adhere to the latter line of thought.

OPTIONAL BOARDS

Many software vendors for Apple computers copy protect their product (overall, that trend is decreasing—Ed.), so there isn't a good way to make it talk. I do have a card in my Apple called a Print-It Card, manufactured by Textprint.[13] There are other cards of this type around, but I have not tried any of them. These cards allow you to interrupt a running program by pushing a button wired to the card. You can then dump the contents of the screen to your printer, after which the program resumes. Instead of sending the screen output to a printer, I dump it to my Echo GP. (As mentioned earlier, if I have to cold-boot, the Echo card inside my Apple will not talk as there is no longer any supporting program in memory.)

I use the Print-It card dump only occasionally as it isn't really a satisfactory solution. You have to listen to the synthesizer voice the entire screen each time. There's no way of telling for sure where the cursor is, and there's no LINE REVIEW feature. Use of the card does, however, give me access to utilities and other software that otherwise would not talk at all. Graphics characters sure do drive the speech synthesizer crazy, though!

There is unprotected Apple and PC software that can be made to talk, but there are still obstacles to overcome. Sometimes the screen is addressed differently and the program in the background that works with the synthesizer never sees the characters. The screen changes, but the speech synthesizer doesn't say anything. What does all this have to do with Amateur Radio? Software for Amateur Radio is no different than other software. If you don't enter what the program wants, nothing (or the wrong thing) happens. The cursor may not move and the speech synthesizer doesn't say anything. It is easy to lose track of where you are. Whether it be a logging program, a program for designing antennas, or an RTTY program, the software may not be usable by a blind person. At a minimum, the program will probably need some modification.

Stay tuned. There's more to come.

Notes

[6]AEA, PO Box C, 2160, Lynnwood, WA 98036-0918, tel 206-775-7373.

[7]Kantronics, 1202 E 23 St, Lawrence, KS 66046, tel 913-842-7745.

[8]PC-Talk III is also available from The Headlands Press, Inc, Freeware, PO Box 682, Tiburon, CA 94920. [PC-Talk 4, the most recent version of this program, is not available as shareware —Ed.] Talking Transend is available from Computer Aids, 124 West Washington Lower Arcade, Fort Wayne, IN 46802, tel 219-422-2424.

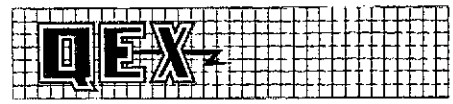
[9]Street Electronics, 1140 Mark Ave, Carpinteria, CA 93103, tel 805-684-4593. The Cricket speech synthesizer, also manufactured by this company, is designed to be connected to port 2 of the Apple //c computer.

[10]Digital Equipment Corp, 146 Main St, Maynard, MA 01754, tel 617-897-5111.

[11]124 West Washington Lower Arcade, Fort Wayne, IN 46802, tel 219-422-2424.

[12]ProKey is a keyboard-enhancement program produced by RoseSoft, PO Box 45880, Seattle, WA 98145, tel 206-282-0454. A similar product, SuperKey, is produced by Borland International, Inc, 4585 Scotts Valley Dr, Scotts Valley, CA 95066, tel 800-255-8008; in California, 800-742-1133.

[13]Textprint, 8 Blanchard Rd, Burlington, MA 01803, tel 800-255-151 or 617-273-3384.



QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

There are several ways in which to obtain a stable clock pulse for use in transmitting and receiving spread-spectrum signals. The circuit featured in October *QEX* is built from readily available parts and extracts jitter-free clock pulses by locking onto a different type of external reference signal source—an AM broadcast carrier. This circuit can also be used as a stable reference for frequency calibration purposes.

The October issue of *QEX* also includes articles on:

- "Extracting Stable Clock Signals From AM Broadcast Carriers for Amateur Spread-Spectrum Applications," by Andre Kesteloot, N4ICK
- "Midlatitude E_s at 220.1 MHz," by Michael R. Owen, W9IP/2
- "Power Dividers and Combiners," by Bill Olson, W3HQT

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.

Putting the Heath SB-200 on 160 Meters

Thinking about modifying your linear amplifier? Here are some tips to help you get started.

By Safford M. North, KG2M
1426 Riverbend Dr
Baldwinsville, NY 13027

I decided to get on 160 meters last year. Using just my transceiver and a makeshift antenna, I found 160 m to be a nice friendly band, but if I didn't want to be *the* "weak signal" in a round table, I needed a better antenna and a linear amplifier. My dilemma was whether to buy a new amplifier that would cover 160 or try to convert my SB-200. I took a hard look at the SB-200 to assess the difficulty in modifying it to work on 160 m. It looked like a fun project that would give me a feeling of personal accomplishment.

I was not particularly apprehensive about the technical aspects of the task. My only real concern was the availability of necessary parts. I didn't want to hack up a nice piece of equipment that had performed to my satisfaction on 80 through 10 meters. Before I changed anything, I took the rig out of its enclosure and examined it carefully, particularly looking for space for new tank coils I knew I would need. I had bought the amplifier, complete with instruction manual and schematic, at a local hamfest. It looked like a perfectly straightforward grounded-grid amplifier, well-designed and laid out. Someone unknown to me had done a good job in putting it together.

In talking to several people on 160 m, I learned that many had amplifiers that they considered were candidates for conversion, but few had done so. Most of them hesitated for the same reasons that bothered me. Several articles have been written describing how to convert amplifiers for 160 m, but I had not read them.[1,2] Anyway, I was not interested in what someone else had done—I wanted the fun and satisfaction of doing it myself!

I knew that if the project was successful, I would be tempted to share my adventure with others. I would probably use components from my vast supply of ugly junk in the cellar, so my particular choice of components would not be of much value to others. Therefore, please don't expect an exact description of the conversion, but rather follow me through my problems, decision points, and some of the traps I fell into.

I made the conversion successfully, for my own use in my own shack. The end result may not be the answer for you! I took some shortcuts and made some compromises that cause minor performance degradations, but these are acceptable to me. The end product is not a "stand-alone" modified amplifier that anyone can build and use in any radio station. I'll point out the areas where I took liberties and mention some alternatives. I hope that this narrative will interest you technically and that you will enjoy walking with me through my adventure.

Ground Rules and Objectives

Early in the project, I made some ground rules for myself and tried to follow them. First and foremost, I wanted the amplifier to work on 160 m, but I also wanted to retain operation on 80, 40, 20, 15 and 10 meters. I also hoped to find a way to add 12-m operation, if possible. I would perform the conversion one step at a time, so that if I encountered insurmountable problems, I could retrace my steps and put the thing back as it originally was. I preferred not to add anything to the front panel, such as another switch, knob or dial. Lastly, being lazy, I wanted to do everything inexpensively and with minimum reasonable effort.

Looking for Solutions

Some of the required changes were obvious from the start. It would be necessary to change the output coil combination to tune 160 m with a reasonable LC ratio. I also assumed that a new bifilar filament choke—one with higher inductance—would be required to permit adequate drive on 160 m. In addition, I suspected that I would run into some RF choke and capacitor changes.

My first dilemma was a band-switching problem. The band switch on the SB-200 selects coil sections for the output tank circuits and individual coils for the pi-input matching sections. The switch has only five positions—80, 40, 20, 15 and 10 m. Adding 160 and 12 m would require seven positions. My first thought was to change the entire switch and all the wafers to get the seven bands. I soon backed away from this approach because of the difficulty of removing the switch. The switch assembly extends from the front to the back of the unit and would have to be completely replaced. It would be very difficult to get a set of 7-position switches because most wafer switches have five or six terminals on each half of each wafer. To get seven positions would require one more complete wafer because both sides and both halves of the input wafer were already being used. The coils and switch wafers for the input circuitry are mounted in the crowded rear deck area and would be difficult to modify. I needed to find a compromise.

I could immediately see two alternatives: either tune two bands on each of two switch positions or tune three bands on one switch position. I felt that the lower frequencies would suffer too much degradation from such a scheme, and that left 20, 15, 12 and 10 m as candidates. I definitely wanted uncompromised performance on 20 m, but was somewhat less interested in 15, 12 and 10 m, at least until the sunspot cycle catches up with us. I explored putting 15, 12 and 10 m on one switch position, using only the SB-200's plate tuning capacitor to tune all three bands. I thought that if I was successful in putting all three on one switch position, I could optimize toward the one band I wanted most of the three—15 m.

Putting three bands on one switch position means that the output tuning circuitry can use only one coil section, and the input selection and tuning circuitry can use only one of the pi-tuned input coils. Except for a rough calculation, I had no way of knowing how well the output circuit would work except by building it and trying it. By checking resonance with a dipper, I determined that I could cover 10, 12 and 15 m with the plate tuning capacitor, but that was about as far as I could go in predicting what these changes would do to the output circuit. The less-than-optimum LC ratio would probably cause some efficiency loss; I would just have to wait and see.

I made a series of tests that gave me hope for the input circuit. The input impedance of a grounded-grid amplifier is sufficiently low (about 300 ohms) to permit a comparatively low Q in the pi-input networks. In

[1]Notes appear on page 35.

other words, the tuning is quite broad, allowing fixed tuning.

I customarily use a low-power "homebrew" matching network between my TS-830S exciter and the amplifier. This makes my exciter happy on the band edges, somewhat off resonance of the amplifier input circuit. I rationalized that with the matching network I might be able to get the single input circuit in the amplifier to accept drive on all three bands. However, I had to find out if this was possible before committing myself to the scheme. I would have to read the RF drive level at the filaments of the amplifier tubes in the amplifier. I chose to do this with an old oscilloscope, and its vertical amplifier would not respond well at 21 to 30 MHz. I fed the vertical plates directly—a hundred or so volts of RF will indeed provide a vertical deflection. I adjusted the input coil in the amplifier to maximize the signal at 21 MHz and was able to get respectable drive on 12 and 10 m. The SWR/wattmeter between the exciter and the matching network showed that the exciter was looking at a satisfactory load.

I knew these readings were only a first-order approximation. Had the amplifier tubes been fired up, the impedance seen by the input signal would be considerably lower. I figured that I had a good chance at making this scheme work, however, and at this point I felt I had an acceptable course of action.

Amplifier Changes

Input and Output Networks

Up to this point I had made no changes to the SB-200—just some simple measurements. I did, however, have a series of schemes I hoped would work. The first thing needed was a new output tank coil, or coils, that would tune 160 m, and physically fit the space that would be available after removal of the existing coil. Fig 1 shows the top view of the unmodified amplifier, and, as can be seen, considerable space can be made available. Making coils is not that tough—most of us old-timers have made lots of coils using plastic tubing or plastic strips for spacing to obtain the proper number of turns. I was lucky and found two ceramic forms of the same diameter, and only slightly smaller in diameter than the original coil. The two coils, placed end-to-end, would fit in the available space. I glued the two forms together with some "magic glue" from the drugstore. The forms already had coils wound on them, and, when the forms were put together, there was about two inches of unused coil form space left between them. I wound a bunch of turns of no. 14 enameled magnet wire to fill this unused space. Temporarily, I hung the coil in the circuit with clip leads and, with the tubes in place (to use their internal capacitance), I checked for resonance with the dipper. Luckily, I was low in frequency, so I removed turns from the center winding until it resonated at 1.8 MHz with the tuning capacitor nearly fully meshed. I had my coil (or so I thought), so I made taps for 80, 40 and 20 m using the dipper.

The SB-200 output tank uses a separate, small coil for 10 and 15 m (visible in Fig 1). My modification uses only the tapped portion of the coil for 10, 12 and 15 m.

In view of all the tests I had made, here is where I stood regarding the input circuits. The original 5-position band switch would be used to select 160, 80, 40 and 20 m, with one position for 10, 12 and 15 m. Right now, however, the input select switch did not select the same frequency ranges as the modified output band switch. In the new 160-m position, the input switch selected the 80-m coil, and so on. I left the 80, 40 and 20-m coils in their original physical location, but rewired them to the next higher band-switch position, to correspond with the output band-switch selection positions. This left two unused input coils. I rewound the 10-m coil for 160 m using lots of turns of enameled wire that was smaller than the original, and wired it over to the correct switch position. The remaining 15-m coil I peaked up as best I could to be able to drive 10, 12 and 15-m signals into the amplifier with the matching network. This whole coil-juggling operation is a lot easier than it sounds. I had originally thought that I would have to remove and rewind all the SB-200 input coils. Instead, I just cross-connected them to new switch positions, and had to make only one new coil—the 160-m one.

Ham that I am, I was anxious to find out how things would work, so far. At this point, however, I had not touched the filament choke, so I assumed that the rig could not yet work on 160 m, because sufficient drive would not be obtained on the low band. I gingerly cranked the amplifier up, and was delighted to find that it apparently worked quite well on all the original bands. I did not try operating it on 160 m.

Filament and Plate Choke Problems

Next, I tackled the bifilar filament choke problem. I found a core of ferrite or polyiron about ½ inch in diameter and about 4 inches long. I had picked it up at a hamfest, and the seller said he had used it for a filament choke. I wound as many bifilar turns of no. 14 enameled magnet wire on the core as I could and with the new choke in series with the original choke, checked them for resonance with the dipper. They resonated at a frequency lower than 1.8 MHz, so I figured I now had my filament

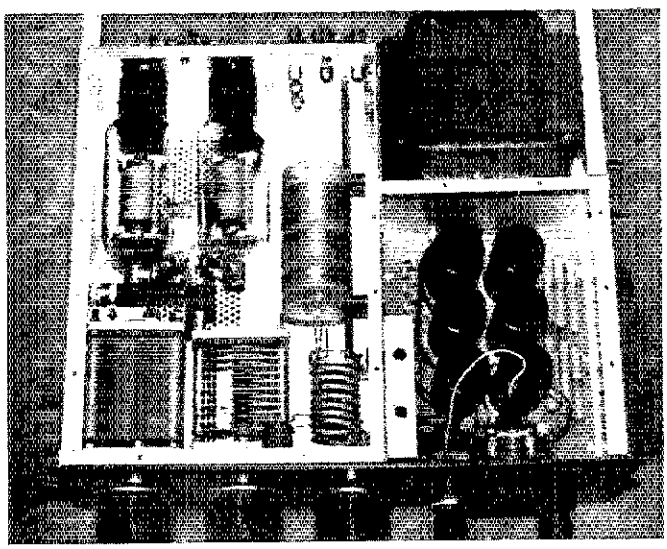


Fig 1—The original, unmodified Heath SB-200 linear amplifier. Note the relatively uncramped arrangement of components, allowing space for additional parts. At the bottom center, the output tank coil has three sections, and the smaller 10- and 15-m coil is tapped at about two turns.

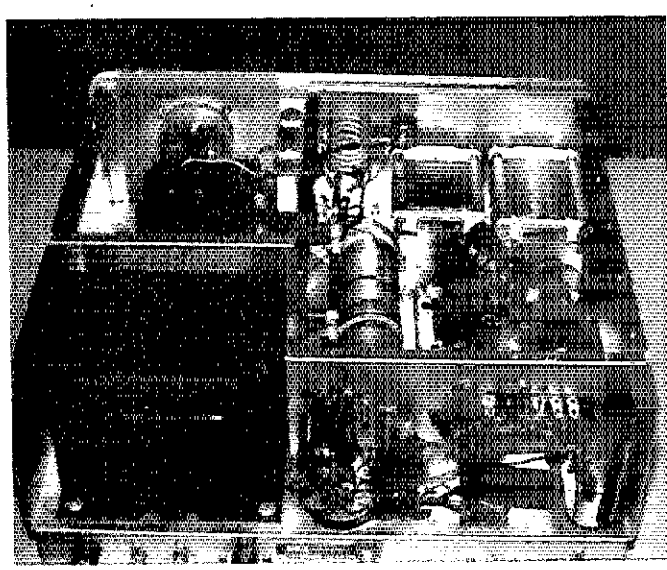


Fig 2—Rear view of the modified amplifier. The larger added tank coil can be seen in the center. The added bifilar filament choke is mounted vertically at the extreme front-right side of the photo.

choke. I wired the new choke in series with the original SB-200 filament choke, and mounted it in a vertical position off to one side (see Fig 2). Now came the moment of truth—I was ready to try it out on 160 m!

The amplifier produced reasonable output on all bands but 160 m; output was puny there. I suspected that the plate choke was the problem. I measured its resonance, and, sure enough, it resonated at a frequency higher than 2.0 MHz. I rewound the choke with many more turns of smaller wire, but still had troubles. The choke had a circular, metal clamp on the end, and I finally realized that this clamp was, in effect, a shorted turn, which raised the resonant frequency and ruined the Q of the choke. I rewound it in layers, or groups, and pared it until it showed no response near any of the bands of interest. Only then was I able to get the choke to be resonant at a frequency lower than 1.8 MHz. The thing really gave me fits!

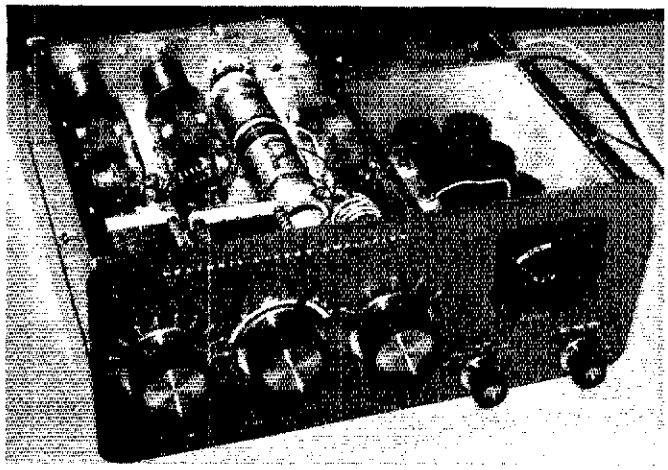


Fig 3—The completed modified SB-200 amplifier. The large, added output tank coil is suspended from two nylon straps attached to standoffs. Additional windings between the two halves of the coil form are evident by their darker color.

At about the same time, I found a plate choke from an old military transmitter. That proved to be adequate, so now I had two chokes. Doug DeMaw's excellent article on chokes also arrived in the February issue of *QST* at about this time.[3] It helped to reinstate my self-respect regarding all the trouble I had.

The Output Network, Again!

With the new plate and filament chokes installed in the amplifier, and with great expectations, I was ready to fire up the rig again. To be safe, I redipped the output tank for resonance, and got another rude awakening. The output circuit would not tune 160 m at all! Resonance of the new final amplifier coil was now much lower then 1.8 MHz. The reactance of the original plate choke and my new tank coil had been in parallel, and this had thrown me way off in checking out my carefully made new coil. I had to remove the new coil and remove some of the added turns to bring it into resonance. But, at last, I was again ready for a power test on 160 m.

I have a home-brew shielded dummy load in a one-gallon paint can that is a perfect 50-Ω load, but it is limited to a dissipation of about 100 W. To obtain a dummy load with a higher power rating, I employed the old trick of using household light bulbs. I used four 100-W incandescent bulbs in parallel. This arrangement exhibits about 25 Ω when the bulbs are lit. This load gives me an SWR of about 1.5:1—not perfect, but handy for approximating power output. I used the TS-830 in TUNE mode to feed about 40 W to the amplifier. I rejoiced when the amplifier lit up the load to full brilliance on all bands, including 160 m. I measured about 400 W out with 40 W drive. Then I switched to SSB and gingerly watched the bulbs flicker as I talked, with the mic gain turned quite low. This was great, except...on 160 m I got very little output during voice modulation. What now? I was getting good output on 160 (at reduced power) in CW, but low output on SSB. After poring over the schematic, it finally dawned on me that the grid bypass capacitors, with their associated resistors, might have the wrong time constant to bypass the grids properly under SSB conditions. I hung on some additional bypass capacitors, and that did the trick. The SSB output came right up. I now had an all-band amplifier that apparently worked fine into a rather poor dummy load. Fig 3 shows the amplifier after modification. The only obvious change in the photo is the large replacement coil assembly that is suspended in position using two nylon straps mounted to standoffs.

The Output Network—One More Time!

This just about completes the story of my misadventures, except for an output loading problem. Connected to my 160-m antenna, the amplifier would not load up completely—it seemed to need more output (loading) capacitance. I knew the antenna was not at fault. It is a 160-m dipole, center fed with coaxial cable. I have measured its SWR across the band; it is about 1:1 in the middle of the band, and somewhat higher at the edges. So, I needed more than the 850-pF output capacitance provided in the amplifier. By experimentation, I determined that I needed an additional 500 pF. There were no unused band-switch contacts in the SB-200 to add the capacitance on 160 m, and the thought of an external switch didn't appeal to me. I came up with a simple solution, peculiar to my needs and setup. This solution may not appeal to others, however.

I have four coaxial cables coming into my shack, one each for my 160, 80 and 40-m antennas, and one for my triband antenna. I connect these through a 4-position changeover switch to the amplifier output. I installed a 500-pF fixed capacitor across the 160-m position of this switch. This gives the SB-200 the added output capacitance necessary to load the antenna on 160 m, but removes the added capacitance when I switch to another band. This works fine for me, but you might prefer to mount the added capacitor in the amplifier and switch it in and out.

Summary

I have taken two side steps that make my modification depart from a universal approach. My system requires a low-power matching network to permit sufficient amplifier drive on 10, 12 and 15 m, and I use an added capacitor across the 160-m antenna feed line to avoid mounting the capacitor in the amplifier. Both departures are justified for my application, and neither is difficult for anyone else.

The dc input to the modified amplifier is between 375 and 400 mA at 2100 V (780-840 W) on all bands (about 10 or 15 mA less for 10 and 12 m). I prefer not to postulate as to what the P-P output power is. I get lots of compliments on my signal, and lots of questions on how I did it. It was a rather lengthy job, but I had a lot of fun doing it. The total cost was less than $10 (for wire), not including the stuff I used from the cellar. The entire operation required only a few days of actual work on the equipment—the planning, head scratching and teeth gnashing took longer.

I have purposely not included diagrams, specific values or coil turn data in this narrative. I intended only to point out areas of engineering interest and importance that I learned from the experience. I hope this account will bolster the confidence of the apprehensive, and forewarn the neophyte of problems. Mostly, I hope that I have provided reinforcement for those who would like to tackle this truly ham activity by offering insight into the planning and decision points they may encounter, as well as some of the mechanics of the changes.

Notes

[1]D. DeMaw, "The Low-Bander's Special," *QST*, Sep 1979, pp 17-19.

[2]M. Wilson, ed., *The 1987 ARRL Handbook* (Newington: ARRL, 1986), pp 30-39 to 30-40.

[3]D. DeMaw, "Understanding and Constructing RF Chokes," *QST*, Feb 1987, pp 16-19.

Conducted By Mark Wilson, AA2Z
Senior Assistant Technical Editor

220-MHz Adventure: *QST* Reviews

- The Yaesu FT-109RH and Kenwood TH-31BT 220-MHz Hand-Held Transceivers
- The Cushcraft ARX-220B 220-MHz Ringo Ranger Antenna

Because of Novice Enhancement, Novices can enjoy the kind of personal communication on 220 MHz that higher-class licensees have enjoyed on VHF FM for years. There have been many times when I wished that my wife Leslie and I could use 2-m FM, but Leslie has never had a great desire to upgrade from Novice. Now that we can use 220-MHz FM, we were very happy to review two 220-MHz hand-held transceivers—the Yaesu FT-109RH and the Kenwood TH-31BT.

Transceiver Features

These two hand-held radios remind me of how some people buy automobiles simply for transportation, while others buy large luxury sedans. Both automobiles will get you where you want to go, but not in quite the same way! The Kenwood TH-31BT is a "basic transportation" radio—no frills, but it certainly gets you where you want to go. The Yaesu FT-109RH is like a big luxury car—lots of features, but with a size and price tag a bit larger than the TH-31BT.

Both transceivers cover 220-225 MHz. The Kenwood has a 100-mW low-power output and 1-W output at high power. Yaesu specifies an output of 500 mW on low power, but the review unit produced closer to 350 mW. High power for the Yaesu is 5 W. Both transceivers operate simplex or with plus or minus repeater offset—the repeater offset on the Kenwood is fixed at the standard 1.6 MHz, while the Yaesu's offset can be varied.

Luxury Extras

Kenwood TH-31BT

The TH-31BT has few features. The Kenwood's operating frequency is controlled by thumbwheel switches on the top of the radio, and a small red LED indicates when the radio is transmitting. Its only frills are a dual-tone, multifrequency (DTMF) keypad for phone-patch use and a built-in subaudible tone encoder that is controlled by a DIP switch on the front of the radio and activated through the TONE button on the top panel. Many 220-MHz repeaters use subaudible tones, so this is a handy feature. Rear-panel switches control power level (HI-LO) and repeater OFFSET.

Yaesu FT-109RH

The Yaesu FT-109RH is *loaded* with extras. The transceiver has 10 memory channels that store simplex and repeater channels, including offset information (standard, nonstandard or none). The radio also has memory scanning capability. You can scan all 10 memories or choose only a few. All of these features are controlled from the front-panel keypad, which also acts as a DTMF pad for autopatch and repeater control functions. The radio emits a beep every time a key is pressed, but the beep *can* be disabled. (I was pleased to find the instructions for disabling the beep at the front of the features section in the operating manual.) You can scan memories to look for a used channel or a quiet channel. You can also scan a range of frequencies to look for a frequency in use or a quiet spot. A red LED indicates transmit mode, and a green LED indicates a busy frequency when the radio is unsquelched on receive.

When scanning, the radio steps through the selected memories (or through the preset frequency range) and stops either on a busy frequency or a clear frequency, depending on the setting of a front-panel slide switch. After approximately three seconds, scanning resumes—even if there is still activity on the receive frequency. To stop the scanning, you must press the PTT switch, the up or down arrow buttons or the D (for "Dial" mode) button. Pressing the PTT switch while scanning stops the scan, but doesn't activate the transmitter.

Memory channel 0 (zero) is the "call" channel. This is a handy feature—if you place your favorite repeater or simplex frequency in channel 0, you can call it up by simply pressing the asterisk (*) key at any time. To select another memory channel, you must press the number of the memory, followed by the MR (memory recall) button. The up and down arrow keys can also be used to step through the memory channels or to manually tune the radio through a range of frequencies.

A "priority channel" feature is also included. To enable this feature, you recall a memory channel, and then set another operating frequency with the manual dial mode. Pressing the # key then activates the priority function. Every three seconds, the radio checks the initial memory frequency while you operate on the secondary dial frequency. The radio automatically switches to the priority channel when activity is detected there.

The function of the front-panel meter is determined by the setting of the S/PO - BC switch. When this switch is set to S/PO, the meter indicates signal strength in receive and relative power output in transmit. When the switch is set to BC, the meter acts as a "fuel gauge"—a useful way to keep an eye on your battery power consumption.

The front-panel KEYLOCK switch locks the keypad, but does not disable the PTT switch. A light is provided for night use; this light stays on only as long as you press the right-side-mounted LAMP switch. Because of this, using the transceiver at night is definitely a two-handed operation—the PTT switch is mounted on the *left* side.

The VOX LOW and ON switches on the top panel are disabled except during VOX operation with the optional YH-2 headset. When the YH-2 is connected, the ON button activates VOX operation and the LOW button decreases VOX sensitivity to prevent ambient noise from keying the transmitter.

Battery Power

Both radios are supplied with NiCd battery packs and trickle chargers. The Kenwood charger puts a full charge on the supplied battery pack in just 8 hours, while the Yaesu charger requires 15 hours to recharge the battery pack.

The TH-31BT's size allows room for only six AAA-size (180 mAh) NiCd cells. The radio draws 35 mA on squelched receive; even with short transmit periods, the battery won't last much longer than about 5 hours, and a very short time on high power (the radio draws 600 mA during high-power transmit). A larger, 500-mAh pack is available that increases the overall size of the radio, but we did not have the larger battery for Product Review testing. The battery must be removed from the Kenwood for charging. Kenwood manufactures a dc-to-dc adapter that includes a cigar-lighter plug for mobile use (DC-25).

The FT-109RH is supplied with a 500-mAh battery pack that can be recharged while it is on the radio—the charger receptacle is on the bottom of the battery pack. A 12-V dc receptacle is also provided on the bottom of the battery, allowing the radio to be plugged into an external dc power supply. Plugging in the dc supply disables the battery, and as soon as the dc supply is disconnected, the radio switches back to battery power. Yaesu also makes an automobile dc adapter that simultaneously provides dc power to operate the radio and a trickle charge for the battery.

On low power, the Yaesu battery lasts quite a while. The radio includes a "battery saver" feature; the radio goes dormant for short periods and only checks the receive frequency at intervals. The checking interval is fixed at 300 ms, but you can vary the delay between

Table 1

Kenwood TH-31BT 220-MHz Transceiver, Serial No. 7100172

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 220 to 225 MHz.	As specified.
Mode of operation: FM.	As specified.
Frequency display: Thumbwheels.	As specified.
Frequency resolution: 5 kHz.	As specified.
Transmitter	*Transmitter Dynamic Testing*
Power output: High, 1 W; low, approx. 150 mW.	High, 1.4 W; low, 330 mW.
Spurious signal and harmonic suppression: Better than −60 dB	See Fig 1.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: S/N more than 28 dB at −6 dBμ (0.5 μV) input. 12-dB SINAD, less than −12 dBμ (0.25 μV)	S/N with 0.5 μV input, 29 dB. 12-dB SINAD, 0.15 μV.
Squelch sensitivity: Less than 0.2 μV.	0.05 μV, min, 0.22 μV, max.
Receiver audio output at 10% total harmonic distortion: More than 250 mW.	As specified.
Color: Black.	
Size (height, width, depth): 5 × 2½ × 1-1/8 in.	
Weight: 0.65 lb.	

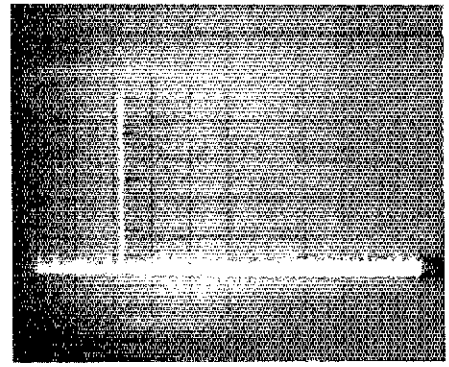


Fig 1—Spectral display of the Kenwood TH-31BT operating at 222.0 MHz with approximately 1.4 W output power. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. The fundamental has been reduced in amplitude approximately 24 dB by means of a notch filter to prevent spectrum analyzer overload. All spurious emissions are at least 66 dB below peak fundamental output. The TH-31BT complies with current FCC specifications for spectral purity.

Table 2

Yaesu FT-109RH 220-MHz Transceiver, Serial No. 6M010430

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 220 to 224.995 MHz.	As specified.
Mode of operation: FM.	As specified.
Frequency display: Four-digit LCD.	As specified.
Frequency resolution: 5 kHz.	As specified.
Transmitter	*Transmitter Dynamic Testing*
Power output: High, 5 W; low, 0.5 W.	High, 5.6 W; low, 370 mW.
Spurious signal and harmonic suppression: −55 dB or better.	See Fig 2.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: S/N more than 30 dB with 1.0 μV input. 12-dB SINAD, less than 0.25 μV	30-dB S/N with 0.92 μV input. 12-dB SINAD, 0.2 μV.
Squelch sensitivity: Not specified.	0.18 μV, min, 0.5 μV, max.
Receiver audio output at 10% total harmonic distortion: More than 450 mW.	620 mW.
Color: Silver.	
Size (height, width, depth): 6-5/8 × 2½ × 1-3/8 in.	
Weight: 1.35 lb.	

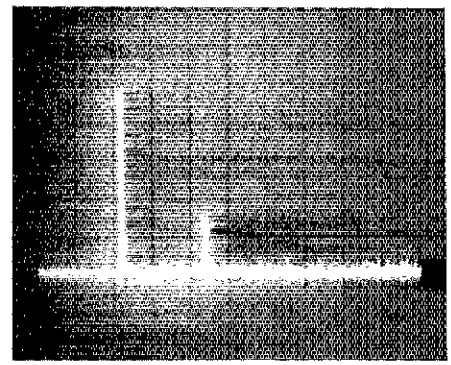


Fig 2—Spectral display of the Yaesu FT-109RH operating at 222.0 MHz with approximately 5.6 W output power. Vertical divisions are each 10 dB; horizontal divisions are each 100 kHz. The fundamental has been reduced in amplitude approximately 22 dB by means of a notch filter to prevent spectrum analyzer overload. All spurious emissions are at least 55 dB below peak fundamental output. The FT-109RH complies with current FCC specifications for spectral purity.

checks from 300 ms to 1.3 seconds. This feature really helps conserve the battery. On high power, the battery is rapidly depleted. The radio draws 1.2 A during high-power transmit.

Accessories

Plastic carrying cases are available for both radios. The optional Kenwood case has a clear plastic covering for the DTMF pad, and a metal belt clip is supplied with the case. The case must be partially removed to change the battery pack. The Yaesu case is supplied with the radio. This case has a clear plastic opening for the LCD frequency readout, but the DTMF and frequency-entry keys are accessed through an opening in the case. There is a hole in the bottom of the case for connecting the battery charger, so the battery can be charged with the radio still in the case. The case must be completely removed to replace the battery pack.

Speaker microphones are available for both radios; in addition, a headset/boom microphone combination is available for the Yaesu. The VOX circuit in the Yaesu is enabled when the headset/mic is used. Neither speaker microphones nor the YH-2 headset were supplied with the Product Review units.

We purchased an RA-9A "stubby duck" antenna for the TH-31BT. This antenna is considerably shorter than the standard antenna. The shorter antenna performed about as well as I expected—a bit worse than the standard antenna. With the standard antenna, and on low power, I can just access the W1AW 220-MHz repeater (about one mile away) from inside my office. With the stubby duck antenna, I could not raise the repeater on low power. For public-service use in a repeater's primary service area, the stubby antenna would be useful, but I think that most users will want to stick with the standard antenna.

Operation

I enjoyed both of these radios. Most of the time, Leslie used the Kenwood and I used the FT-109RH. I found the Yaesu's memory features to be handy, and I used the memory scanning quite a bit to explore the repeaters in the Hartford, Connecticut, area. I was able to monitor several repeaters, and could meet Leslie on whatever repeater was most convenient for her. The high-power output was also convenient, particularly when I had the radio connected to an outside antenna and an external power supply. I found myself wishing

for a "medium power" position for the times when 350 mW was not enough power, but 5 W used up the battery too quickly.

The Kenwood hand-held performs well. Its small size and light weight make it easy to take along anywhere. Even a new Novice will find it an easy radio to use, as there are a minimum number of controls to worry about. I might purchase a larger battery pack for my radio, but the 180-mAh battery pack is small enough so I can keep a fully charged spare in my pocket or the glove compartment. The Kenwood TH-31BT is an excellent "basic transportation" radio and a good value for someone who wants to try 220-MHz operation with a minimum investment.

Each of these radios will find enthusiastic users. The Yaesu is much larger and heavier, and, as a result, it feels a bit more rugged than the Kenwood. The TH-31BT's size and light weight are definite pluses for some applications, however, and the radio can be used unobtrusively just about anywhere.

Cushcraft ARX-220B Ringo Ranger

To complete our home 220-MHz station, we needed an outside antenna. The W1AW repeater in Newington is just a bit too far from our home to hit with a "rubber duck," but I could use the repeater reliably from inside the ARRL HQ building (a real "black hole" for RF). I put up a home-brew ground plane, but I wanted to try a different, perhaps better, antenna.

The Cushcraft Ringo Ranger is designed around three 5/8-wavelength radiating sections, with a coupling "hairpin" in the center. The antenna also has a set of ground-plane radials that are separated from the main body of the antenna by a short length of coaxial cable. The antenna must be mounted on a mast at least three feet long, as the ground-plane-radial section clamps around the mast. A matching section is provided to tune the antenna (the matching section is a ring around the base of the antenna; this is where the "Ringo" comes from)—you slide a matching bar along the ring to tune the antenna.

The Ranger is made of aluminum tubing, with all stainless-steel hardware. The directions supplied with the antenna are very brief, but clear. Most of the explanation is accomplished with a large pictorial diagram. I had no trouble putting the antenna together. For initial adjustments, I mounted the antenna on a short mast in the middle of my back yard, and tuned it using a Bird wattmeter and the Yaesu FT-109RH hand-held transceiver. Sliding the matching bar along the ring quickly produced a 1.1:1 SWR.

How does the antenna perform? I mounted it on my roof at the same height as my ¼-wave ground-plane antenna, and noticed a significant performance improvement, compared to the ¼-wave antenna. Cushcraft claims that low-angle radiation is especially enhanced, and 5/8-wavelength antennas generally perform better than ¼-wave ground planes in this regard. This is evidenced with the Ringo in much improved simplex range as well as better performance on distant repeaters. Performance with mid-range machines is about the same. The improvement in simplex range is dramatic! Leslie drove around with her hand-held, and we were able to work much farther with low power on the Ringo than we could with the ¼-wave antenna.

This is a good antenna. I noticed only a couple of disadvantages compared with the ¼-wave ground plane; the Ranger *must* be tuned for minimum SWR, and it is much larger than the ground plane. A 220-MHz ¼-wave ground-plane antenna is only 12 inches high, while the Ringo is approximately 10 feet high, fully assembled.

Manufacturers: Yaesu FT-109RH, Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90701, tel 213-404-2700. Price class, $380.

TH-31BT, Kenwood USA Corp, 2201 E Dominguez St, Long Beach, CA 90810, tel 213-639-7140. Price class, $270.

ARX-220B Ringo Ranger, Cushcraft Corp, PO Box 4680, Manchester, NH 03108. Price class, $52.—*Bruce S. Hale, KB1MW*

KANTRONICS KPC-2400 PACKET COMMUNICATOR

Kantronics has broken the 1200-baud barrier for terminal node controllers with the model KPC-2400. This packet communicator features the functions of the Kantronics KPC-2 for 300-baud HF and 1200-baud VHF work. But then the KPC-2400 goes a step beyond in providing for a new phase-shift keying (PSK) for 2400-baud work. All rates are software selectable.

If you saw the March 1987 *QST* article on packet-radio TNCs by Stan Horzepa, WA1LOU, then you know that many models are available from several different manufacturers.[1] Indeed, TNC technology has been advancing rapidly, and it appears that someone is announcing a new model every few months.

It seems not so long ago that a Kantronics KPC-1 TNC was purchased for *QST* Product Review. Before the type could be set for that review, Kantronics announced a new, improved TNC, the KPC-2, which made the KPC-1 obsolete for review purposes. Through an exchange of PROMs with Kantronics, we upgraded the KPC-1 with Version 2 software. We proceeded to review that version. I had the opportunity to use that upgraded TNC for a number of months before it, too, was returned to Kantronics under their KPC-2400 exchange program. It was a pleasure to move up to the new model when it arrived!

The Box

The front panel of the KPC-2400 has a clean look with no controls and only 5 LED indicators. These are labeled POWER, XMIT, RCV, CON and STA. The power switch is located on the rear panel, and with 12 V dc applied, the green POWER LED glows. A 12-V wall power adapter is included with the KPC-2400.

The other four LEDs are red. The XMIT (transmit) LED is illuminated when the TNC keys the PTT line to send data, and the RCV (receive) LED lights when the TNC detects a signal on the channel. The CON and STA indicators were new to me—they were not included in the KPC-1. The CON (connect) LED shows when a connection is established with another station. The STA (status) indicator glows when the TNC contains outgoing packets that have not been acknowledged. For me, this is a useful addition, giving an indication of delays on busy channels during the exchange of message files.

The rear panel has a clean look as well, with a push switch for PWR on/off and four connectors labeled +12VDC, RADIO, AUD and COMPUTER. All connections to the TNC are made at the rear panel. Power may be applied through the 12-V jack from the power adapter that Kantronics supplies, or alternatively, power may be applied through the 9-pin (DB-9) RADIO connector. The separate audio jack, AUD, is bridged to the audio pin of the RADIO connector. Thus, receiver audio tones may be routed either via the separate jack or the TNC RADIO connector. A convenient arrangement, suggested in the instruction manual, is to connect the audio pin of the RADIO connector to the external speaker jack of the transceiver. Audio is thus brought to the TNC, and leads to an external speaker can be plugged in the TNC AUD jack.

Other connections made via the RADIO connector are AFSK output tones to the transmitter, PTT and ground. Provision is also made at the RADIO jack to connect to the receiver squelch line. This line normally need not be connected; the manual suggests its use if the packet channel is shared with voice communications.

The COMPUTER connector on the rear panel is a female DB-25. A jumper plug inside the TNC enclosure provides for operating at either RS-232-C or TTL signal voltage levels through this connector. This selectable option provides for direct interface to the IBM® PC and compatibles, as well as the VIC™, C64 series or other computers.

The photo shows the KPC-2400 removed from its enclosure. The entire TNC, including power switch, connectors and LED indicators, is contained on one circuit board measuring 5-3/8 × 7-1/8 inches. Thus, there is no requirement for leads to external jacks, controls or indicators. The cabinet is a very sturdy 4-sided aluminum box with 1/8-inch-

[1] S. Horzepa, "The Shopper's Guide to Packet-Radio TNCs," *QST*, Mar 1987, pp 17-21 and 44.

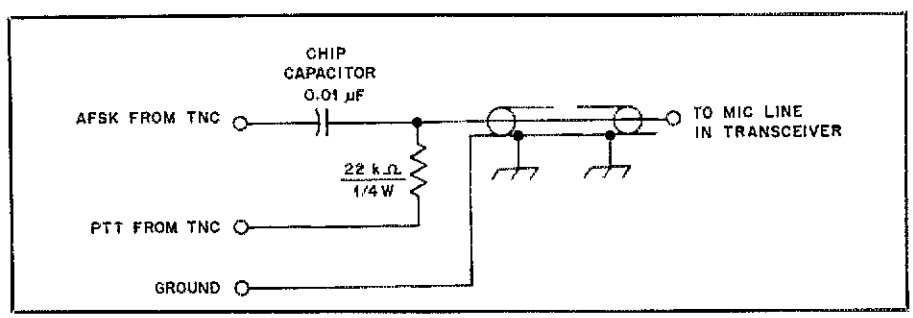
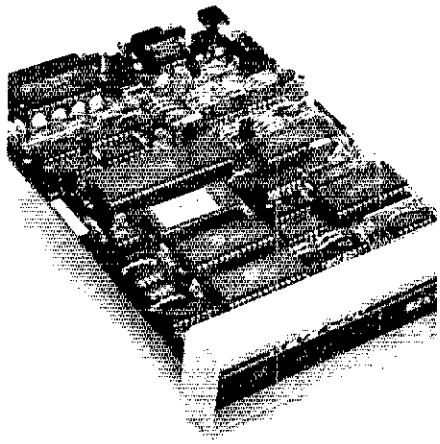


Fig 3—Hookup diagram for mating the KPC-2400 to a transceiver having no separate PTT line, such as the ICOM IC-2.



thick walls, with the side walls reinforced by additional thickness. The PC board slides into grooves formed in the side walls of the enclosure, and the front and rear panels and escutcheons are secured to the box with screws. This is undoubtedly the strongest enclosure I have ever seen for radio equipment. Although we didn't try it, I believe you could drive a truck over this TNC and it would suffer no severe damage.

The main "works" of the KPC-2400 is a 6303 microprocessor. A 27128 PROM contains the Kantronics firmware, written to comply with the ARRL AX.25 Version 2.0, level 2 protocol. (Version 1, level 2 protocol is also software selectable.) For 300- and 1200-baud communications, the unit uses AM 7910 IC modems. Operation at 2400 bauds is obtained with a differential phase-shift keyed (DPSK) modem IC developed by Kantronics. This IC is a type P423.

The TNC also contains an EEPROM that stores information such as the user's call, timing functions and operating parameters that may be selected by the user. This ROM is repeatedly reprogrammable, up to 1000 times or more. The advantage of having the EEPROM is that the data content is not lost when power is removed from the TNC.

As supplied, the KPC-2400 contains two 8-kbyte Random Access Memory (RAM) ICs, giving a total of 16 kbytes during operation. This RAM provides buffer space for packets being exchanged and other information, such as stations heard. The RAM can be expanded to 32 kbytes by replacing both ICs with a single 32-kbyte RAM IC (which need not be obtained from Kantronics). Specific instructions are given in the manual for this change. All of the larger ICs in the KPC-2400 are socket mounted. The materials and workmanship in the board assembly are of the finest quality.

Hookup and Operation

The KPC-2400 comes with an accessory bag of prewired cables. You must provide and install the connectors for your station equipment—those to fit the mic jack, external speaker jack, the PTT line and the serial port of the computer. Detailed data with pin-out connections of the 9-pin RADIO and DB-25 COMPUTER connector is included in the instruction manual. (Only 5 of the 25 connector pins are normally used in the computer interconnection.)

To test the KPC-2400 on the air, I used an Apple® //e computer with a Microtek SV-622 (RS-232-C) serial interface card, running under ASCII Express™. The original prewired DB-25 plug assembly from Kantronics had disappeared, so I was using a cable with all 25 pins interconnected. Although I used the exact hookup that had worked well with the upgraded KPC-1, the computer and the KPC-2400 just would *not* talk to each other. By fiddling with software options regarding permanent carrier versus non-permanent carrier, I was able to get the computer and the TNC to speak to one another, but as soon as I'd make a packet connection, zap! The two would stop communicating and everything would lock up!

A lengthy series of checks revealed that the polarity of the data carrier detect (DCD) line (pin 8) from the KPC-2400 was reversed from that used in my Hayes-compatible telephone modem, and also reversed from that used with the KPC-1 (if DCD information was indeed provided by the KPC-1). This is not one of the lines that is connected in the prewired connector, and simply opening that line in the interconnecting 25-conductor cable solved my problem. However, opening this line limits the use of the TNC to computer software not requiring the sensing of a "carrier," that is, a packet-radio connection. Bulletin board software, for example, does require this information. There appears to be no provision in the KPC-2400 for reversing the polarity of this line. However, in separate tests, the TNC was found to be compatible with the IBM PC while the DCD line was connected.

When the KPC-2400 is first turned on, an autobaud routine is activated to seek the baud rate that is compatible with the computer terminal. Data interchange with the computer is done with no parity, 8 bits, 1 stop bit. The TNC will talk to the computer at 300, 600, 1200, 2400, 4800 or 9600 bauds. You can select a fixed baud rate and store the information as a default in the EEPROM. Simply issuing the PERM command to the TNC reprograms the EEPROM to all the parameters that exist at the time the command is issued.

I used the TNC with an ICOM IC-2 two-meter hand-held transceiver that has no separate PTT line. Rather, with an external mic connection, the IC-2 is keyed with a dc closure of the audio line. Installing a resistor and a capacitor in the mic line to the IC-2 provides for proper operation. The hookup is shown in Fig 3. An internal jumper in the KPC-2400 provides for selecting the AFSK level, high or low. In the HIGH position, the level is 44 mV P-P, and 10 mV P-P in the LOW position (open circuit voltages). If a higher output level is required, the Kantronics manual gives instructions for changing a resistor on the TNC circuit board.

The Instruction Manual

The instruction manual contains an excellent summary of information about packet radio for a newcomer, and several pages of data and suggestions for interfacing the TNC with station equipment and various computer terminals. The manual also includes a full description of all available software commands and options.

About the only information the manual does not contain is technical data that might be helpful for troubleshooting and repairing the KPC-2400. A pictorial diagram shows the circuit-board components by part designator (U15, R77 and so forth), but no accompanying information is provided to identify these parts. No circuit diagram is included. Under normal use, however, the TNC may never need repair. There are no adjustable controls or other components needing calibration, and the use of high-quality components should assure a long life for the KPC-2400.

Table 3 provides additional data about this TNC. In summary, the KPC-2400 has broken the 1200-baud barrier for packet communications, while still providing for 300-baud HF operation and 1200-baud VHF contacts. Newer TNC models may appear, but the KPC-2400 will likely be with us for years to come.

The KPC-2400 is manufactured by Kantronics, Inc, 1202 E 23rd St, Lawrence, KS 66046. Price class: $329.—*Jerry Hall, K1TD*

NEL-TECH LABS DVK-100 DIGITAL VOICE KEYER

For as long as there have been contests, there have been lazy contesters. I'm one: My voice simply does not last for more than about 30 hours of continuous use. When the opportunity came along to review the Nel-Tech Labs DVK-100, naturally I accepted. In addition to testing the functional aspects of this new toy, I might actually be able to speak in more than incoherent rasps after a 48-hour contest!

In principle and operation, the DVK-100 is very similar to the familiar CW memory

Table 3

Kantronics KPC-2400 Packet Communicator, Serial No. 57534

Power requirements: 10 to 14 V dc, 12 V nominal, 350 mA (117 V ac power adaptor supplied).

Computer connection: DB-25 female connector (requires male plug to mate); internal jumper selection of RS-232-C or TTL signal levels.

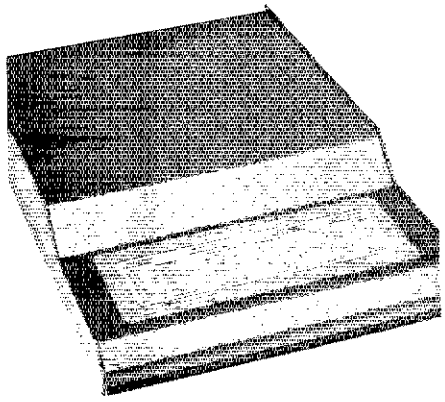
Data interchange with computer: 8 bits, no parity, 1 stop bit, at 300, 600, 1200, 2400, 4800 or 9600 bauds.

Radio connection: 9-pin connector (supplied). Separate audio jack provided for connection of external speaker.

Communication data rates (radio): 300, 1200 or 2400 baud, software selectable.

Dimensions (HWD): 1¾ x 5¾ x 8 in.

Weight: 2¼ pounds.



keyer. It is designed to eliminate all but the most basic function in an SSB contester's transmitting: answering calling stations. Other than that, there is little need to use a microphone during the contest when the DVK-100 is on line. It records CQ and exchange messages and plays them back at the press of a key.

Until recently, the only way of conveniently and inexpensively storing voice messages has been on a mechanical tape loop. Although this method does the job, it is not convenient to use in most stations. Tape loops seem to fall prey to Murphy about 10 times more often than any other station accessory. (Independent studies have shown that Murphy works most vehemently to disable the most needed equipment in the station.) The DVK-100 uses digital voice recording technology, the modern replacement for recording tape. It is housed in a low-profile cabinet with the control switches in a horizontal position close to the front of the cabinet.

Electromagnetic interference, electrostatic discharge, and radio-frequency interference protection is built in to the DVK-100, as are convenient connectors for installing the keyer in almost any station. Microphone input impedance and keying polarity are selectable, and audio output level is adjustable. Audio output is at 600 ohms, making connection to almost any transceiver possible. A separate, selectable 8-ohm audio monitor output is also available for driving a speaker. Two five-pin DIN jacks on the rear panel of the DVK-100 handle audio input and output, PTT and microphone-type selection. The mating plugs come with the voice keyer, and connection diagrams for many popular transceivers are included in the concise instruction manual.

The DVK-100 uses 128 kbytes of dynamic RAM to store messages in four hard-sectored memories; total storage time is 32 seconds. The memories are laid out for maximum flexibility: there is one 16-second memory, one 8-second memory and two four-second memories. When the unit is in the PROGRAM-RECORD mode, input audio is filtered by a fourth-order switched-capacitor filter and sampled at a 32-kHz rate. The high sampling rate is the reason for the large total memory requirement, and for the excellent audio reproduction.

These features add up to a high-quality voice recording/playback system that is handy to use. NTL paid attention to ergonomic details. For instance, recording a message DVK-100 is as easy as pushing the CONTROL keys, selecting the desired message memory and chattering away. Indicator LEDs next to each message key tell the operator at a glance the status of the recording. (Similar indications are included on the CONTROL and AUDIO functions.) There is even an interlock function that keeps the PTT line from keying the transmitter while messages are being recorded. A selectable audio compressor is also included in the package.

Message playback is even simpler than recording. After recording a message, select the PLAY mode to monitor the message through the internal monitor circuit (with an external speaker) without putting a signal on the air. When you are satisfied with the message content, simply select the OPERATE mode and push the key corresponding to the desired message. The DVK-100 keys the transmitter and lights the indicator next to the selected memory key. To stop transmitting in mid-message, simply hit the message key or briefly press the microphone PTT. If the PTT line is held closed, microphone audio is passed through the DVK-100 into the transmitter.

An end-of-transmission "beep" can be selected if desired. All but one of the several operators who used the DVK-100 during the review period disliked this beeper. It certainly does attract attention to your signal when in use, however, and leads to all sorts of unsolicited comments from others operating on the band!

The DVK-100 is solidly built, and is every bit as RFI-proof as I hoped it would be. Not once during the review period (eight contests, including a multi-multi operation in the ARRL DX contest) did the keyer even hiccup. It works well with several different popular transceivers. Only rewiring of the shielded output cable was necessary to accommodate the different microphone pin configurations of the radios used. Connection cables for many radios are available from the manufacturer.

The DVK-100 is definitely the best thing an SSB contest operator can add to an existing station to improve scores. CW is still my preferred mode, but the DVK-100 makes SSB contesting a lot more fun. Manufacturer: Nel-Tech Labs, Inc, 28 Devonshire Ln, Londonderry, NH 03053, tel 603-434-8234. Price Class: $249 (including ac adapter)—*Rus Healy, NJ2L*

Table 4

Nel-Tech DVK-100 Digital Voice Keyer, Serial No. 8607043

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency response: 300-3000 Hz, ± 3 dB relative to 1000 Hz.	−2.8 dB relative to 1000 Hz at 270 Hz; −3.2 dB at 2700 Hz.
Signal to noise ratio: Greater than 35 dB.	Greater than 55 dB.
Total harmonic distortion: Less than 4% relative to 0-dB 1000-Hz signal strength.	5.2% at 1000 Hz.
Size (height, width, depth): 1.65 × 7 × 10.6 in.	
Weight: 2 lbs.	
Color: Blue and gray.	

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

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

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

Sealed bids must be submitted by mail and be postmarked on or before November 27, 1987. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

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

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

Trio-Kenwood TR-751A 2-meter multimode transceiver, s/n 7050117, PS-30 power supply and MU-1 modem unit (sold as a package only, see Product Review, Mar 1987 *QST*). Minimum bid $489.

ICOM IC-μ2AT 2-meter FM hand-held transceiver, s/n 03372 (see Product Review, May 1987 *QST*). Minimum bid $190.

Clear Channel AR-3300 10-meter transceiver, s/n 86021304 (see Product Review, Jun 1987 *QST*). Minimum bid $233.

Ten-Tec Corsair II 160-10 meter transceiver, s/n 58001721, with Model 260 power supply (sold as a package only, see Product Review, Aug 1987 *QST*). Minimum bid $767.

Yaesu FT-767GX 160-10 meter transceiver, s/n 6J030740, with 2-meter module (sold as a package only, see Product Review, Sep 1987 *QST*). Minimum bid $1175.

Yaesu FL-7000 160-15 meter solid-state linear amplifier, s/n 6N050017 (see Product Review, Sep 1987 *QST*). Minimum bid $1063.

ICOM IC-275A 2-meter multimode transceiver, s/n 01182 (see Product Review, Oct 1987 *QST*). Minimum bid $667.

RF Concepts RFC 2-317 2-meter solid-state amplifier, s/n 1114 (see Product Review, Oct 1987 *QST*). Minimum bid $160.

Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

REPAIR VARIABLE CAPACITORS WITH PLASTIC SHEET

☐ I bought a homemade L-network Transmatch at a recent hamfest only to discover later that the ceramic insulation of its variable capacitor was badly cracked. After I overcame my disappointment, I noticed that the capacitor could be disassembled; it was held together with screws rather than rivets. I measured the thickness of the broken insulator (¼ inch), and headed to a hardware store to find replacement material.

Fifty cents' worth of scrap 1/8-inch Plexiglas™ provided the solution. Using the ceramic pieces from the capacitor as a template, I marked and drilled two identical Plexiglas pieces to bring the thickness of the replacement assembly to ¼ inch. Even though I had to make several tries at sizing the pieces because of my inexperience with tools, the rebuilt capacitor works! This hint may help others save damaged variable capacitors that cannot be replaced easily or cheaply.—*Oscar Martinson, N0DKB, Minneapolis, Minnesota*

USE A SINGLE-TRACE OSCILLOSCOPE AS A DUAL-CHANNEL LOGIC PROBE

☐ A dual-beam or dual-trace oscilloscope is nearly a necessity in serious digital troubleshooting, but what if you have only a single-trace scope on hand? For some applications, a single-trace scope can simulate dual-trace performance without using adapters or modifications.

Fig 1 shows how you can simultaneously use the X and Y inputs of a single-trace scope to monitor the input and output of a TTL inverter. First, shut off the scope's sweep. (Reduce the display intensity so that the resultant stationary dot does not damage the CRT's phosphor coating.) Connect the scope's X input to the inverter input, and the Y input to the inverter output as shown in A. Set the X and Y amplifiers for equal sensitivity. Insets B and C of Fig 1 show the scope display for a functional inverter with input high (B) and low (C). If the input to the inverter is clocked, the displayed spot shifts rapidly between these two positions, resulting in a diagonal line. Need a trigger or third channel? Use your scope's beam intensity modulation (Z-axis) input. An inexpensive, single-trace oscilloscope can be surprisingly useful in digital troubleshooting when it is applied with imagination.—*B. N. Ensanian, KI3U, Williamsport, Pennsylvania*

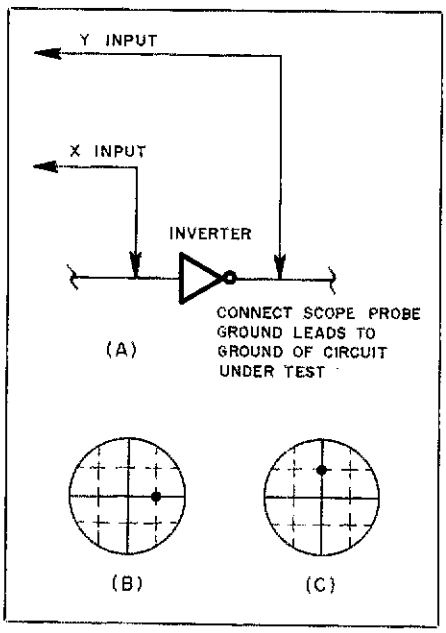


Fig 1—Using the horizontal (X-axis) and vertical (Y-axis) inputs of a single-trace oscilloscope as a dual-channel logic probe. Connect the X and Y inputs as shown at A. B shows the display when the inverter input is high, and C shows the display when the inverter input is low. Scope sensitivity is 5 V/div in these examples.

FREE NiCd CELLS

☐ Many cities and towns have an electric razor repair shop that replaces NiCd batteries in rechargeable electric razors. The razors I've seen contain two NiCd cells. Often, only one of these cells has failed, but both cells are replaced when repair time comes. I talked a razor repair person out of a box of such rejects and got 40 NiCd cells. Twenty of these charged perfectly on the first try! Brief application of heavy overcharging current to the rest of them netted another dozen usable cells. Free NiCd cells? Check your friendly electric razor repair shop.—*Bob Baird, W7CSD, Klamath Falls, Oregon*

PLATE-CURRENT METER OVERLOAD PROTECTION

☐ A short circuit or arcing in a high-power RF deck using vacuum tubes, or in its high-voltage power supply, may burn out the plate-current meter if the meter is unprotected. The usual meter-protection circuit places a pair of diodes connected as a clipper across the meter. This technique does not always provide sufficient protection, however, because appreciable current can still flow through the meter at the voltage level set by the diodes. The circuit at Fig 2 provides better protection.

M1 in Fig 2 is calibrated to read 1 A full scale, but need not indicate higher than 800 mA in my application. The meter protection circuit, D3-R2, is adjusted to protect the meter above this level. *With the high-voltage supply off and filter capacitors fully discharged,* adjust the protection circuit as follows: (1) Set R2 all the way to its M1 end. D3 does not affect the meter calibration at this setting. (2) Using an adjustable bench power supply capable of producing 10 V at 1 A, adjust R1 to calibrate M1 at 800 mA. Confirm M1's calibration at other points between zero and 800 mA, particularly at the reading corresponding to the amplifier idling current. (3) Adjust the bench supply for an indication of 800 mA on M1. (4) Adjust R2 for a barely perceptible decrease in M1's indication. This sets the protection threshold at 800 mA.

With the protection circuit adjusted in this way, only 1.5 mA flows through M1 with 6 A flowing in the amplifier plate supply. Peak currents during a short circuit may reach 300 A, but I do not have access to the equipment necessary to check the circuit at this current level. The protection circuit should limit current through M1 to only a few milliamperes when short-circuit currents reach several hundred amperes. The values shown for R1, R2 and D3 in Fig 2 apply to my particular application; they may be adapted for other voltages and currents.—*Mark Mandelkern, KN5S, Las Cruces, New Mexico*

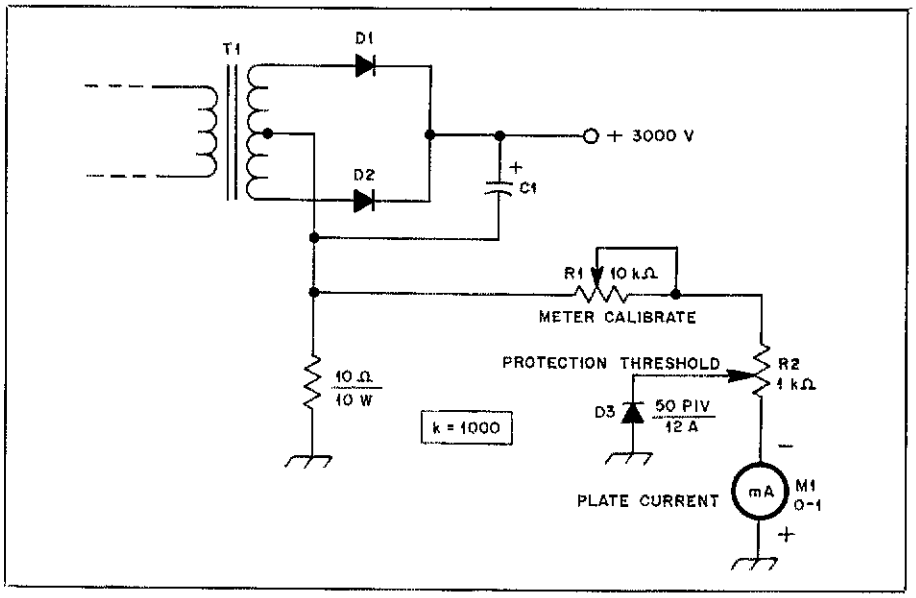


Fig 2—Plate-current meter protection at KN5S. R1 adjusts M1 calibration, and R2 sets the current level above which D3 protects M1. C1, D1, D2 and T1 are components in the amplifier plate power supply.

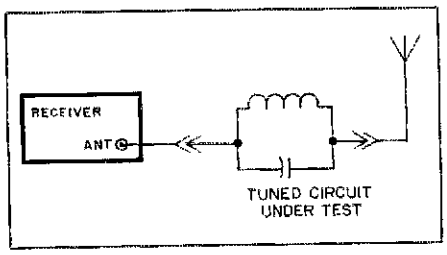


Fig 3—If the resonant frequency of an inductor/capacitor combination falls within the tuning range of your receiver, you can find resonance with this circuit.

POWERING 2.5-V HEATERS FROM A 6.3 V AC SUPPLY

☐ While restoring a radio receiver dating from the 1930s, a friend needed a type 76 tube (6.3-V, 0.3-A heater) but could only find its 2.5-V equivalent (a 56, the heater of which draws 1 A). I suggested that he use the 56 and install a 3-A silicon rectifier diode in series with one of its heater leads.

With its heater supply modified in this way, the 56 works well. The series diode conducts for half of each cycle of the 6.3-V RMS ac heater supply; this, in conjunction with the forward voltage drop of the diode, provides close to the correct heater power for the 56. A check with an ac voltmeter showed the 56's heater voltage to be 2.7 V RMS—a little high, but acceptable.—*Cal Enix, W8EN, White Pigeon, Michigan*

USING A RECEIVER TO FIND TUNED-CIRCUIT RESONANCE

☐ You can find the resonant frequency of an inductor/capacitor combination if it falls within the tuning range of your receiver. Connect the components as a parallel tuned circuit in series with the antenna lead as shown in Fig 3. With the receiver tuned for minimum signal or noise response, the receiver frequency display shows the approximate resonant frequency of this tuned circuit.

This technique can be used in situations where a dip meter is impractical, such as when the tuned circuit under test is inside a shield can or inaccessible because of its position. There is often no need to remove or otherwise isolate the tuned circuit from the associated circuitry.—*Gordon Crayford, VE6EI, Lacombe, Alberta, Canada*

A SIMPLIFIED FORMULA FOR RESONANCE

☐ The standard formula for calculating the resonant frequency of an LC circuit is

$$f = \frac{1}{2\pi\sqrt{LC}} \qquad \text{Eq 1}$$

where
f = frequency in hertz
L = inductance in henrys
C = capacitance in farads
π = 3.14

The arithmetic required for the solution of this equation is difficult for people unaccustomed to using powers of 10 in their calculations because of the mixture of very large numbers (f) and very small numbers (L and C). Rewriting the equation in terms of practical units for f, L and C gives us a formula that is easier to use:

$$f^2 = \frac{25{,}330}{LC} \qquad \text{Eq 2}$$

where
f = frequency in MHz
L = inductance in microhenrys
C = capacitance in picofarads

This is particularly useful when you know f and need to solve for L or C. If you know L and C, and wish to solve for f, rewrite the equation this way:

$$LC = \frac{25{,}330}{f^2} \qquad \text{Eq 3}$$

Equations 2 and 3 can be done on the simplest of calculators—even in your head in some cases!—*Melvin Leibowitz, W3KET (SK)*

A BALANCED 52, 70 OR 200-OHM DUMMY LOAD

☐ If you want to check SWR with a balun in your antenna system, it's handy to have a balanced resistive termination of the correct impedance. Fig 4 shows an inexpensive, easy-to-build balanced dummy load that exhibits commonly needed resistances of 52, 70 and 200 ohms. It will dissipate about 40 W for short periods; this rating is usually adequate for SWR checks.

The load consists of two resistor branches, each of which is made of 2-W, 5%-tolerance carbon-composition resistors (see Fig 5). These are soldered to no. 8-32 threaded brass rods in a V configuration and immersed in mineral oil in a one-pint plastic freezer container. The rods pass through, and are fastened to, the container lid. Connections to the resistor posts are made by means of wing nuts. The load branches are used singly for a 70- or 200-ohm load, or in parallel for a 52-ohm load.

To build the dummy load, drill three holes in a triangular pattern near the rim of the container lid. Soldering the resistors to the brass rod comes next. To avoid melting the container top during soldering, use the drilled container top as a template to locate three matching holes in a piece of scrap lumber. Drill the holes and insert the brass rods into them; if necessary, use nuts to set their height to what it will be when they're mounted in the freezer-container top. Working up from the base of the rods, wrap the resistor leads around the rods and solder. Keep the leads short, but leave ample clearance (1/8 to 1/4 inch) between the resistors to allow free oil circulation. Position the lowest resistors well above the wood to ensure that they'll be covered with oil when the assembly is inverted after completion (see Fig 6).

When the resistors and rods have cooled, brush off any excess rosin, remove the assembly from the lumber scrap and install it on the container lid. Use nuts and washers on both sides of the lid. Fill the container about ¾ full of mineral or transformer oil and put on the lid. Adjust the oil level, if necessary, but don't overfill the container—oil is messy!

To use the dummy load, place it on a cardboard box to isolate it from grounded objects. Connect the balun under test to the appropriate terminals; use a jumper (as in Fig 4) to connect the load branches in parallel if you need a 52-ohm load. Apply power (we use about 20 W—*briefly*) and check the SWR at the frequencies of interest. Don't let the load overheat. The load also works well to check unbalanced transformers (for example, 52 to 70 ohms) as well.—*Dan, N6BZA, and Marty, W6BDN, Levin, Menlo Park, California*

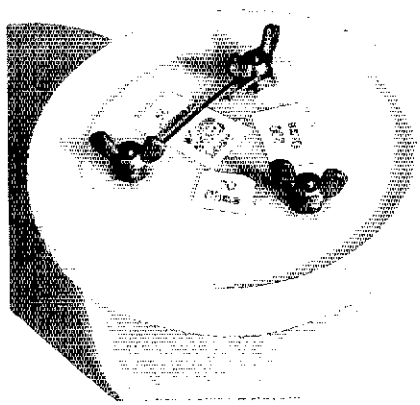


Fig 4—This dummy load can be used to provide a balanced resistive termination of 52, 70 or 200 ohms. For a 52-ohm load, connect a jumper as shown; no jumper is required for a 70- or 200-ohm termination. The unit can be used as an unbalanced load by grounding one of its terminals.

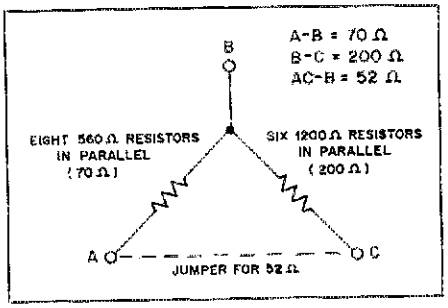


Fig 5—Schematic of the balanced dummy load. Resistors are 2-W, 5%-tolerance, carbon-composition units.

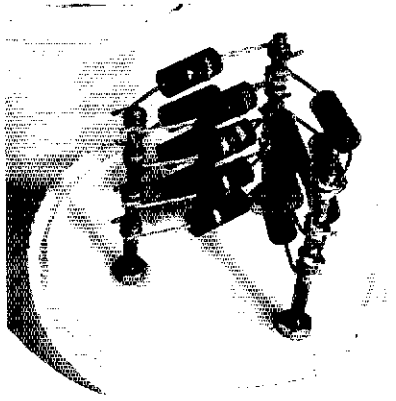


Fig 6—Construction of the balanced dummy load. The resistors, spaced to aid cooling, are immersed in mineral or transformer oil to increase their power-handling capability.

Technical Correspondence

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

MAKING PC BOARDS—ONE MORE WAY

☐ In his August article, Doug DeMaw described a few simple and easy ways to make PC boards.[1] Here's one more way: Use the direct-etch dry transfers available from Radio Shack® stores. Three different packages of these transfers are available. One package (RS 276-1577) contains four sheets bearing IC, transistor, and single-hole pads and assorted line sizes. The other two packages each contain two sheets; one has IC pads only (RS 276-1593), and the other offers single-hole pads (RS 276-1592). (The RS 276-1592 and 276-1593 packages have been dropped from Radio Shack's line for 1988. Supplies will be limited to those on hand.)

It's a good idea to make a simple pencil-and-paper sketch of your intended layout before you start moving the transfers to the PC board. If you don't, you may forget which side of the board you're working on (you're working from the foil side, remember), and come up with components in awkward places.

You can use a pencil or ball-point pen to move the transfers to a clean piece of board, but I use a piece of phenolic rod that has a smooth, narrow and blunt end. I break long lead traces at a chosen point by slicing them with a sharp knife prior to applying them to the PC board. As I work, I periodically burnish the transfers by placing the backing paper on top of the PC board and rubbing a finger across the paper. This ensures good adhesion of the transfer to the board.

I find the dry transfer method quick and relatively easy to use. The transfers adhere quite well; I've experienced no etchant leakage beneath them.

When the board has been etched and the resist removed, I buff the copper to a high sheen with steel wool, being careful to avoid placing fingerprints on the copper. Then, I spray the copper surface with a light coating of clear acrylic. That coating preserves the copper sheen and does not interfere with soldering. A similar procedure can be used with tinned boards.

More information on etching PC boards can be found in the article, "Circuit Boards From Scratch," *QST*, Feb 1981, pp 29-31. The *Handbook* also contains some information on that subject and alternative methods of prototype construction in Chapter 24. *—Paul K. Pagel, N1FB, ARRL HQ*

AND ANOTHER...

☐ Doug DeMaw's August 1987 article is interesting.[2] I have used a procedure for several years that has worked well for me when building small projects. The basic circuit board is made up of nothing but straight lines. Fig 1 shows a drawing of a typical board composed of narrow horizontal and vertical strips of copper. A resist-ink pen and ruler are the only drawing tools you need.

One variation of this scheme is to place a piece of perforated board over the copper-clad board. Using a large needle or similar tool, score the copper through the holes in the perf board to produce a pattern similar to that of Fig 1. With the resist-ink pen and ruler, connect the appropriate dots.

The drawing of Fig 1 can also be used as a layout guide and ultimately, the PC-board pattern. Draw the pattern in ink, and draw the layout in pencil so that mistakes can be erased. A sample layout is shown in Fig 2. Once the layout is completed, it shows you which lines are not needed, which lines need to be extended, location and number of holes to be drilled and so on. This process can eliminate the need for most jumper wires. When you're satisfied with the pattern, copy it onto the copper-clad board using the resist-ink pen. You can make the circuit layout as large as you need by simply spacing the lines farther apart.—*Les Johnson, KJ4TZ, 639 Robert Way N, Satellite Beach, FL 32937*

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

[2] See note 1.

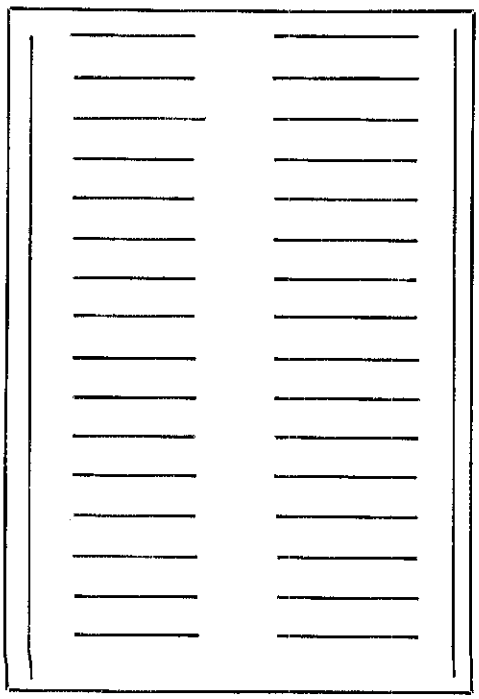


Fig 1—Drawing of a sample PC board pattern.

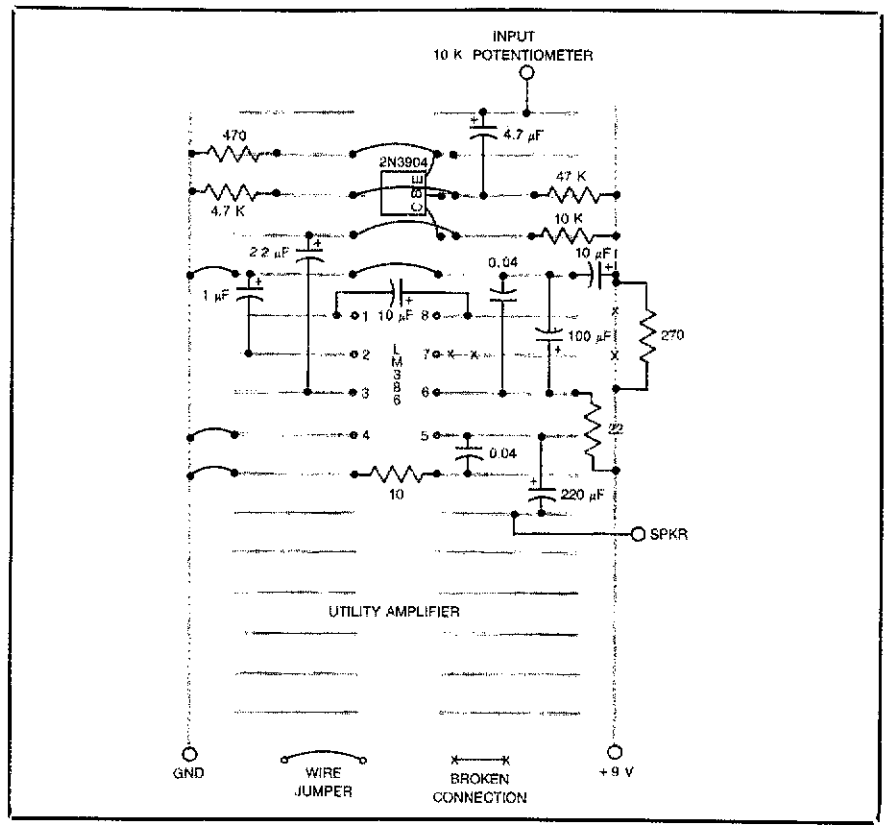


Fig 2—Example of a layout guide using the drawing of Fig 1 as a base. This layout can also be used to produce the final PC-board pattern.

TELEPHONE RFI

☐ I recently moved to a new home that had telephone jacks in six rooms. The jacks were connected to each other with six-conductor wire. Only two of the six conductors were used; nothing was attached to the other four wires.

When I got my station back on the air (operating on 20, 15 and 10 meters), the RFI introduced into the telephones was intolerable. I tried all of the usual cures: bypassing, ferrite cores and so on. None of these was effective in the least. Then I tried shorting together the four unused conductors at each telephone jack. Voila! No more RFI! I can now run a full gallon on SSB while the XYL is conducting her telephone QSOs.—*Matthew M. Bell, W8KST, 5920 Doral Dr, Sarasota, FL 34243*

[Before duplicating this procedure, make sure (as Matt did) that *nothing* is attached to the "extra" telephone wires. In some installations, these wires *are* used for other purposes, such as push-button illumination.—Ed.]

SWITCHING POWER SUPPLY QRN

☐ Several months ago, I was repairing a Yaesu FT-757GX transceiver, which has many interconnecting jumper wires. After buttoning up the rig and turning on the receiver, I noticed severe interference. The interference appeared on frequencies from the bottom of the AM broadcast band through 20 MHz or so, and was particularly strong at the broadcast band frequencies. At first, I thought I'd mixed up an interconnection or two.

Using my new FT-767GX, I discovered the same signals, so I knew it was not a trouble in the FT-757GX. By using the '767's FM discriminator meter and programmable step tuning, I determined that an interval of 41.59 kHz existed between very strong interference signals. At half that interval, there was other interference, but at a reduced level.

While pondering the problem, I luckily noticed that hum appeared on the interfering signals whenever the repeater/remote base in the shack was keyed. Shutting off the repeater's switching power supply eliminated the interference. So, if you're troubled by similar, evenly spaced signals, check for the existence of a switching power supply! —*Pres Waterman, WA2ORS, 139 Oak St, Patchogue, NY 11772-2844*

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

New Products

VHF PAK SOFTWARE

☐ VHF PAK is a collection of programs of interest to the active VHF/UHF operator. It is designed to run on the IBM® PC, PCjr, PC-XT, PC-AT, PS/2 and compatibles. A faster version, VHF87 PAK, supports the 8087 math coprocessor. With this software, you can:

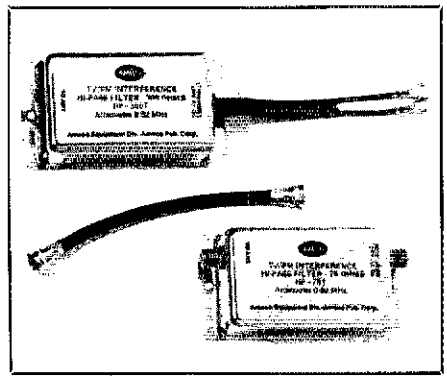
- calculate a six-digit grid square from latitude and longitude input, or vice-versa;
- calculate distance, bearing and reverse bearing to other locations based on grid square or latitude/longitude input;
- predict the best time to run a meteor-scatter schedule;
- locate and track the moon and print out azimuth and elevation pointing information, as well as data on sky noise, path degradation and mutual moon "windows" with stations in other areas of the world;
- track the moon and major celestial noise sources in real time;
- print EME log sheets showing two-minute sequences;
- calculate an EME link budget based on the specifics of your station equipment; and
- calculate vertical radiation angles for horizontal antennas.

Although separate programs exist to perform most of these tasks, VHF PAK integrates everything into one easy-to-use package. Once you customize the program for your call sign and QTH, you only have to boot VHF PAK to do all of your VHF/UHF operating calculations. VHF PAK is menu driven, and the screen prompts are easy to understand. The manual explains in great detail how to use the program.

VHF PAK requires at least 256 kbytes RAM, one disk drive and DOS version 2.0 or later. VHF87 PAK also requires an 8087 math coprocessor. Price class: VHF PAK, $35; VHF87 PAK, $45. Add $3 shipping and handling. Manufacturer: Bob Mobile, WA1OUB, RFD 2, Box 442, Hillsboro, NH 03244, tel 603-464-3187.—*Mark Wilson, AA2Z*

AMECO HIGH-PASS TVI FILTERS

☐ The AMECO HP-75T (75-ohm version) and HP-300T (300-ohm twinlead version) high-pass TVI filters are designed for easy installation between the antenna and TV set. Each filter contains 9 shielded sections and 25 elements. Stopband attenuation below 50 MHz is 70 dB. Price class: $13. Manufacturer: AMECO Equipment Co, 220 E Jericho Tpke, Mineola, NY 11501, tel 516-741-5030.—*Mark Wilson, AA2Z*



MJC TECHNOLOGIES CONTEST SOFTWARE

☐ Two software packages were recently introduced by MJC Technologies of La Crescenta, California. The software is designed to assist the contest operator in maintaining logs and producing summary information for the ARRL International DX contest and the ARRL November Sweepstakes contest. The DX contest version is called KOMPETE, and the SS version is SCORE (Sweepstakes Contest Operating Results Enhancer).

The programs use the IBM® PC (or compatible) to keep the log for the contest, prepare the summary sheet and produce a breakdown of QSO rate during each 15-minute period of the contest. The software keeps a running tally of your score, countries or sections worked and several other parameters of interest to the contest operator. All of this information can be dumped to the monitor, the printer or a disk file for future use.

Both packages are capable of automatically controlling the Kenwood TS-440S, TS-940S and Heath SS-9000 transceivers. The Pro-Search rotator controller is also automatically controllable. Two serial ports in the computer handle the interfacing. The software is designed to eliminate the need to manually change any of the transceiver settings while operating in the contests. The user may defeat these features, if desired, through the use of extensive user-definable startup parameters. The startup parameters also include the choice of the type of monitor in use, printer control codes and the transmitted contest exchange.

The programs are menu driven for ease of operation. They feature input checking of the exchange information to ensure that it is consistent with the rules of the contest. KOMPETE features a DXCC list file that is used to verify countries by prefix and to keep track of multipliers. SCORE accomplishes this with a similar feature including each ARRL section. Error messages are displayed if problems are encountered, and function keys can be pressed to display the nature of the problem. On-line help information can be activated at any time by a single function key.

System requirements include an IBM PC, XT, AT or compatible with at least 196 kbytes of available RAM, one disk drive, a monitor and DOS (version 2.1 or later). A printer is optional. MJC Technologies promises support of the software in the form of any updates made. A 30-day money back guarantee is also included.

Price class: $95.50 per copy of either program. The software and more information are directly available from MJC Technologies, 3704½ Foothill Blvd, Suite 524, La Crescenta, CA 91214.—*Rus Healy, NJ2L*

New Books

SPECTRUM MANAGEMENT AND ENGINEERING

Edited by Fredrick Matos. Published by The Institute of Electrical and Electronics Engineers, Inc, 445 Hoes La, Piscataway, NJ 08854. First edition, 1985. Hard-bound volume, 8½ × 11 inches, 493 pages. Retail price: $67.50 (nonmember), $40.50 (IEEE member). IEEE order number: PC01834.

This book is part of the IEEE PRESS Selected Reprint Series and is prepared under the sponsorship of the IEEE Electromagnetic Compatibility Society. The editor is Fred Matos, W3ICM, an Extra Class licensee and a senior member of IEEE. Fred holds a BSEE from the Illinois Institute of Technology in Chicago and an MSEE from George Washington University in Washington, DC. He has been active in spectrum management with the National Telecommunications and Information Administration (NTIA) in Washington, DC. Fred has won an IEEE Congressional Fellowship and he has served in the office of Rep Thomas Tauke (R-Iowa) as a Legislative Assistant for a year.

Demands on the radio spectrum have been increasing because of the rapid growth in telecommunications. This book was compiled to aid professionals that deal with spectrum management and engineering. In it, you will find 51 papers from a variety of sources, gathered to provide a reference resource.

The book is divided into three major parts: Legal and Regulatory (US and international), Management Tools and Methods, and Spectrum Engineering. The section on regulations covers the organizations and treaties that deal with spectrum management and engineering. The United States portion includes four papers by the National Association of Business and Educational Radio (NABER) covering frequency control and coordination. There is no coverage of Amateur Radio frequency coordination.

In the section on management tools and methods, you'll find 17 papers covering such topics as spectrum-utilization problems and efficient usage, as well as frequency-assignment topics. Other papers cover the use of microcomputers and data bases in spectrum management.

There are 15 spectrum-engineering papers dealing with such engineering problems as interference, propagation, noise and intermodulation. Some of these papers could prove quite helpful to repeater coordinators, particularly the ones that deal with propagation and coverage.

Appendices include Terms and Definitions, and Frequency Allocations from radio regulations printed by the ITU in Geneva. Two bibliographies cover space services and propagation. In the propagation bibliography, you will find references covering the spectrum from VLF to microwaves. For the person with access to an excellent technical library, the bibliographies and individual papers provide an invaluable resource.

The papers comprising this book are written by and for professionals. These papers come from many sources, some of which are difficult to find. This is neither light nor casual reading material. It is of value to those professionally involved in spectrum management, to students and to those serious amateurs who have a need for, and can understand, this advanced material.—*Charles L. Hutchinson, K8CH*

RADIO HANDBOOK

By William I. Orr, W6SAI. Published by Howard Sams & Co, Inc, a subsidiary of Macmillan, Inc, 4300 West 62nd St, Indianapolis, IN 46268. Twenty-third edition, 1987. Hard bound, 7¾ × 10 inches, 28 chapters, 638 pages plus index, $29.95.

Amateurs and electronics students should find the *Radio Handbook* important to their respective pursuits. I still think of this book as the "West Coast Handbook", its popular and unofficial title in decades past. The book has always had a special flavor that reflects the TLC given it by founder Frank Jones, W6AJF, and some amateur colleagues, when the publication was conceived some 50 years ago. As a new ham, I spent many hours reading and rereading the old Frank Jones handbooks! The relative completeness and plain-talk character of the *Radio Handbook* remains intact after many years of text additions and revisions.

It is by no means a parallel to the popular *ARRL Handbook*. Each book has something different and timely to offer. I feel that both books belong in every amateur's ham shack. Generally, if you can't find the information in one book, the other will have it.

There is strong emphasis on linear-amplifier theory and construction. This is logical, because of Orr's long career with the Eimac Corp. He has considerable input from Eimac staff engineers, and this adds to the quality of the designs found in the book. There are numerous practical circuits for HF, VHF and UHF power amplifiers in this book.

If I were to be critical of the book, I would comment on the lack of practical receiver coverage. Only one receiver (modular) is described in the book, and there is no PC-board or layout information given. The receiver that is described may be too lofty in design for a beginner. It would be nice to see several receivers in that chapter, with one or two that are designed as "starters" for inexperienced amateurs. Chapter 6 provides well-rounded coverage of receiver fundamentals, however, together with a good overview of receiver performance and how receivers operate.

The *Radio Handbook* is printed on good-quality paper, with high-contrast black print on a very white page. The quality of the photos is average—some fairly light and a few almost too dark. This is not the editor's fault, but rather the quality of the printing process.

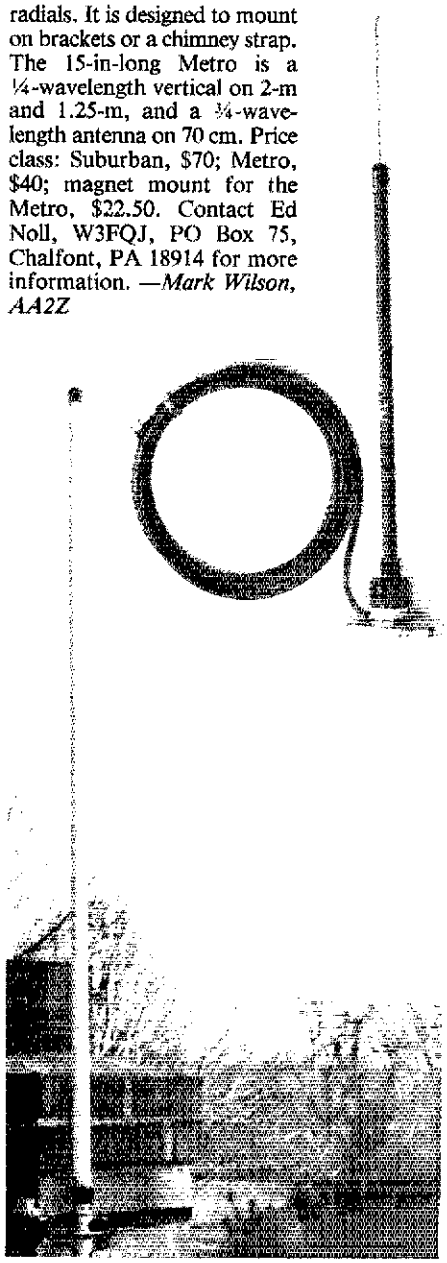
I checked four stores that handle Sams publications. None of the salespersons had ever heard of the *Radio Handbook*! Therefore, you may have some difficulty locating a copy of this volume (check the amateur-magazine ads). I had a similar experience with a Sams book I wrote some years ago.

I think the *Radio Handbook* is a fine publication. I urge any amateur, technician or engineer to obtain a copy for technical reference. It should be a helpful study guide when you prepare for license upgrading. —*Doug DeMaw, W1FB*

New Products

AUSTIN TRIBAND VHF/UHF ANTENNAS

☐ Austin Custom Antennas offers the Suburban (fixed station) and Metro (mobile) vertical antennas that cover the 2-m, 1.25-m and 70-cm repeater bands with a single feed line. The 5-ft-long Suburban functions as a half-wavelength vertical on each band and needs no radials. It is designed to mount on brackets or a chimney strap. The 15-in-long Metro is a ¼-wavelength vertical on 2-m and 1.25-m, and a ¾-wavelength antenna on 70 cm. Price class: Suburban, $70; Metro, $40; magnet mount for the Metro, $22.50. Contact Ed Noll, W3FQJ, PO Box 75, Chalfont, PA 18914 for more information. —*Mark Wilson, AA2Z*



Amateur Radio Direction Finding: A Radio Sport for All Continents

By Panayot Danev, LZ1US
Knyaz Boris 6
Sofia 1463, Bulgaria

During the past three decades, a new radio amateur sport has become very popular in Europe—Amateur Radio Direction Finding (ARDF). What kind of sport is it? Briefly, portable radio transmitters, functioning in Amateur Radio bands, are hidden in a wooded area. Participants in the competition are radio amateurs who, using special direction-finding receivers, have to locate the transmitters. They are obliged, of course, to observe some rules, but the ultimate aim is to find the transmitters as quickly as possible.

To what does ARDF owe its popularity? At least to two features. First, it is an activity that takes place in the open air. Second, it is a sport, requiring simultaneous technical and physical skills.

If we take a look back, we will get to the early '50s, when in Yugoslavia, Sweden, the USSR and after that in other European countries, radio amateurs first became interested in direction finding. In the beginning it was just a hobby, a field of radio amateur activity, a pleasant entertainment. However, very soon competition elements appeared and first rules were set.

In those days, the sport was known as "fox-hunting." The analogy is not accidental. The slyly hidden transmitter puts before the competitor problems similar to those of the hunter looking for a fox's trail.

By the end of the '50s, the first international contacts were established. It should be noted that the International Amateur Radio Union (IARU) took a positive attitude toward this new activity and encouraged its development. In 1961 the First European Championships were organized in Stockholm. G. Swenson (Sweden) and A. Akimov (USSR) were the first European champions.

Later, a special IARU Region 1 Working Group was set up. Its aim has been to promote and coordinate ARDF activities and to serve as an advisory body on ARDF matters to the Region 1 Executive Committee.

European Championships were gradually established as the most prestigious manifestation of the sport of ARDF. Hosts were subsequently Ankaran (Yugoslavia), Vilnius (USSR), Warsaw (Poland), Prague (Czechoslovakia), Duisberg (Fed Rep of Germany), Komlo (Hungary) and Skopje (Yugoslavia). At these last Championships, for the first time there were two categories other than Seniors—Juniors and Women. Since 1980, as a result of the growing interest in ARDF outside of Europe and a special decision of the IARU Region 1 EC, European Championships have been upgraded to World Championships. Two of them have already taken place—in 1980 in Cetniewo (Poland) and in 1984 in Oslo, Norway. Since 1984, one more category has been officially added—the so-called "Old-Timers" (over 40). At the Third World Championships at Sarajevo, Yugoslavia, the 25th anniversary jubilee of the First European Championships was celebrated.

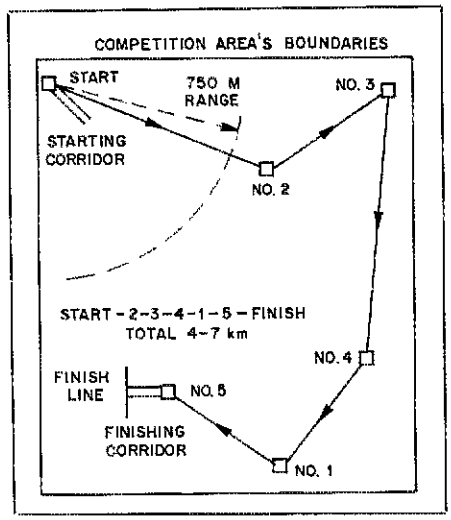


Fig 1—A typical ARDF course consists of a starting corridor, five hidden transmitters and a finishing corridor. Final score is determined by the number of transmitters found and the total elapsed time. The sport thus contains elements of cross-country racing as well as direction-finding.

A competitor in a 3.5-MHz event heads for the transmitter.

According to the existing ARDF Rules, two separate competitions are held on different days. The first is on the 3.5-MHz band (in the 3.5-3.6 MHz subband) and the other is on the 144-MHz band (144.500-144.845 MHz subband). Every participant can take part in both competitions or in only one of them.

The area for competition should be predominantly wooded, with height differences not exceeding 200 meters (650 feet), free of railway tracks, highways, high-voltage lines and large water areas. Fig 1 shows an example of how the competition area might be arranged.

Five transmitters are located at places fixed by the Jury (referees). The following requirements should be observed:

- the distances between transmitters should be not less than 400 meters.
- The transmitter nearest the start should be not less than 750 meters (about ½ mile) from the start.
- The total distance from the start to finish through all transmitters should be 4-7 km (about 2½ to 4¼ miles) in a straight line and in the shortest sequence.

The five transmitters operate on the same frequency on each band in the following sequence: *first minute*—transmitter 1, call sign (CW) MOE; *second minute*—transmitter 2, MOI; *third minute*—transmitter 3, MOS; *fourth minute*—transmitter 4, MOH; *fifth minute*—transmitter 5, MO5. The first transmitter operates again in the sixth minute (call sign MOE), the second one again in the seventh minute (call sign MOI), etc.

Just before starting the course, a competitor looks over the map showing its boundaries. *(photos by LZ1US)*

Author LZ1US stamps his ticket after finding a hidden transmitter.

A1A emission (unmodulated telegraphy) is used on the 3.5-MHz band, while on 144 MHz A2A emission (modulated telegraphy) is used. Keying speed should be 6-10 words (combinations) per minute. Output power of the transmitters should be 3 to 5 watts. Vertical polarization should be used on the 3.5-MHz band, and horizontal on the 144-MHz band. The transmitter's antennas should provide omnidirectional horizontal radiation patterns.

The transmitters should be sequentially switched and keyed fully automatically without an operator on hand. Members of the Jury (technical referees) are permitted to stay at a place sufficiently distant from the transmitter. The referees at hidden transmitters, at the start point and at the finish line should keep in touch by a radiotelephone net.

The teams taking part in ARDF competitions consist of eight competitors: 2 Seniors (aged 19-39), 2 Juniors (18 or younger), 2 Women (any age) and 2 Old-Timers (40 or older). Competitors start in groups of four—one from each category and from different teams. If there are an unequal number of competitors in each category, further groups may consist of three, two or one competitor(s). The groups start at 5-minute intervals.

Each competitor arrives with his own receiver with suitable antennas and batteries, acceptable sportswear and personal identification showing birthdate.

The organizing society supplies each competitor with a personal starting ticket, starting numbers affixed to the front and back of each person and a map covering the competition area (scale 1:25,000 or better, possibly in color). The boundary of the competition area should be clearly marked on the map by a distinct line. The Jury determines and announces the time limit (usually 100-150 minutes).

Senior competitors should find all five transmitters; Juniors, Women and Old-Timers only four. The sequence is the competitor's choice, except that transmitter 5 must be found last.

The competitor himself or herself should confirm finding each transmitter by marking or stamping the personal ticket with a tool or stamp clearly visible 3-5 meters from the transmitter.

On reaching the last transmitter, competitors run through the finishing corridor; the official time is measured at the finish line. After finishing, competitors hand over their tickets and start numbers to the referee.

Classification is provided separately for individuals and teams, and separately in each band and in each category. The place of the competitor (team) in each category depends on the number of transmitters found, and the time of the run (the shorter the time, the higher the finish). The competitors (teams) who find all transmitters are classified as "firsts," those who miss one are "seconds," etc. The organizing society is authorized to award the competitors (teams) classified in first, second and third places.

These rules are valid for IARU international competitions in ARDF and are recommended as a basis for national competitions organized by IARU member-societies.

Antennas, Receivers and Transmitters

Space does not permit a full description of all the equipment needed to compete successfully, but a brief description follows. For detailed information, see the Bibliography that follows this article.

The ARDF receiver must be used with a directive antenna. It should be emphasized that a universal antenna, one that can be used satisfactorily on both 3.5 and 144 MHz, does not exist. Thus, each competitor must use two receivers and two antennas.

On the 3.5-MHz band, a ferrite antenna

is used almost without exception. Its field pattern is shown in Fig 2. It has a figure-8 shape—two distinct minimums along the antenna axis and two maximums perpendicular to the axis. Both maximums and minimums can be used for direction-finding, but the minimums have a substantial advantage, as they are much clearer and sharper.

Using only a ferrite antenna, it is impossible to get sufficient directivity—both minimums are absolutely identical, as are

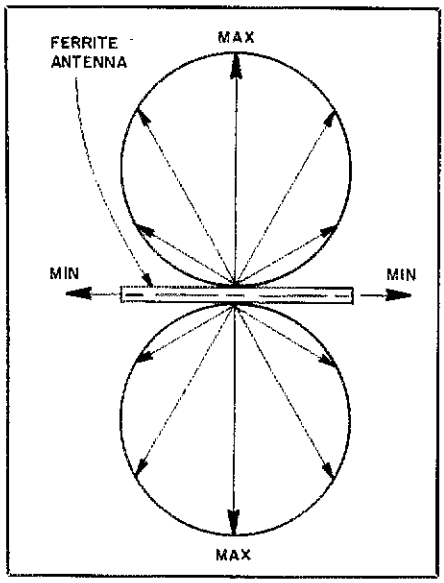


Fig 2—Field pattern of a ferrite rod antenna commonly used on the 3.5-MHz band.

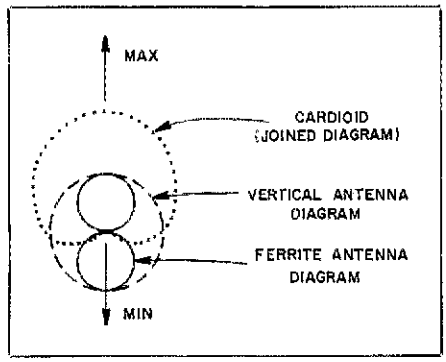


Fig 3—With the addition of a vertical, omnidirectional antenna, a cardioid pattern, displaying one maximum and one minimum, results.

the maximums. Therefore it is necessary to use an additional antenna—a short (6-8 inches), vertical, omnidirectional one. Fig 3 shows the resultant cardioid pattern.

The antenna most frequently used on 144 MHz is the three-element Yagi, slightly modified for shorter size. It has a clearly expressive maximum and the direction finding does not create problems. Elements are made of flexible material for easy crossing through bushes. [For a diagram, provided by the author, of two ARDF Yagi designs, send a self-addressed, stamped business-sized envelope to ARRL Production/ Editorial Dept, 225 Main St, Newington, CT 06111. Write or type "ARDF Antennas" on the envelope.—Ed.]

For 3.5 MHz, an ARDF receiver should have:

- relatively high sensitivity of 10-15 μV (3 dB S/N)
- a means to switch off the automatic gain control
- a BFO
- earphones for more precision and to avoid interrupting other competitors
- all unneeded elements removed to save weight and battery capacity.

For 144 MHz, an ARDF receiver should have

- relatively high sensitivity of 3-5 μV (3 dB S/N)
- its FM detector modified into an AM detector
- a means to switch off the AGC
- earphones
- all unneeded elements removed.

[Editor's Note: The author will, upon request, supply further technical details of the sport of ARDFing.]

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Panayot Danev, an electronics engineer for more than 20 years and a long-time ARDF competitor and teacher, won the 1986 annual ARDF competition of the Socialist Countries. He has been coach of the LZ national team since 1984.

Strays

TRAVELING ABROAD?

☐ ARRL HQ is equipped to assist members in obtaining operating permits for most places in the world. In addition, we can provide you with information on Amateur Radio societies and repeaters in foreign countries. Instructions and information are available from the Regulatory Information Branch. Please enclose a business-size SASE, and don't forget to indicate which country you plan on visiting.—*NICIX/JHIVRQ*

I would like to get in touch with...

☐ anyone with information on European vacuum tubes, circa 1930-1950, and a TV7-B/U tube tester. James Green, KA6CHP, Box 1173, South Gate, CA 90280.

☐ anyone with suggestions on improving CW selectivity for an HBR-16. Torfinn Horn, LA4OFA, Vestmarkv 16, N-7025 Trondheim, Norway.

☐ anyone who needs information on obtaining a replacement fan blade for a Heath SB-220. Gord Yull, VE2GE, 118 St John Rd, Pointe Claire, PQ H9S 4Z1, Canada.

☐ anyone with a manual/schematic for a Hammarlund HXL-1 linear amplifier. M. S. Reda, NØBML, 13761 N 78 Ave, Maple Grove, MN 55369.

☐ anyone with manuals/schematics for Atwater-Kent radio equipment, and with a simple method to measure vertical antenna ground losses. Richard Darwicki, N6PE, 17775 Elmhurst Cir, Yorba Linda, CA 92686.

☐ anyone with information on building a helium-neon laser. Robert Fiorentino, KB6KWO, 5544 Via Callado, La Jolla, CA 92037.

☐ anyone with service information for an Electronic Research Corp Model SL-56 outboard CW filter. R. M. Brundidge, 709 Country Pl, Burnsville, MN 55337.

☐ anyone who has modified a HAL ST-6 RTTY terminal unit. Marvin Moss, W4UXJ, PO Box 28601, Atlanta, GA 30358.

☐ anyone who has modified an SBE-33 to work CW. Rick Lasicki, WA2KEN, Rte 3, Box 342, Mocksville, NC 27028.

☐ anyone with a manual/schematic for a National Receiver Navy Model RBH-2. Ed Hart, W4EOU, 1711-A Linda La, Normal, IL 61761.

***QST* congratulates...**

☐ Dr Leonard Silvern, K6RXU, of Sedona, Arizona, on being named to the Foreign Policy Association National Honor Roll.

☐ Rabbi Ken Cohen, NI3F of Columbia, Maryland, on being appointed to the Howard County (Maryland) Ethics Commission.

☐ Dr John Townsend, Jr, W3PRB, of Clarksburg, Maryland, on being appointed director of NASA's Goddard Space Flight Center in Greenbelt, Maryland.

☐ Marv Dice, K9UBM, of Mission, Texas, on being named Outstanding Amateur of the Year for the Rio Grande Valley.

Happenings

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

ARRL Files Reply Comments in PRB-3

The ARRL has filed reply comments in PRB-3, the FCC public notice that inquires whether the private sector could establish a program to grant requests for specific amateur call signs. This notice contained the FCC criteria for the selection of a Special Call Sign Coordinator (SCSC) and established a pleading cycle for groups or organizations to file proposals to be an SCSC.

Eleven other individuals, groups and companies petitioned the FCC to be an SCSC. These are:

Radio Amateur Callbook, Inc, a for-profit Illinois Corporation that publishes amateur call-sign directories;

Buckmaster Publishing, a for-profit business operating in Virginia that provides certain database services, including amateur call-sign directories.

Frederick O Maia, W5YI, of *W5YI Report*, applied for an appointment as SCSC for the 5th call area only.

Callsign, Inc, a nonprofit corporation whose principal is Gordon Girton, a VEC in the 6th call area.

DeVry VEC/Diamond Systems, Inc, proposes to establish a nonprofit foundation to act as SCSC, would consist of a series of area coordinators, linked by computer networks.

Brown and Schwaninger, a law firm in Washington, DC, who would establish a for-profit business if appointed SCSC.

Association Headquarters, a for-profit corporation in Utah which provides management services for professional nonprofit associations. It proposes to perform SCSC duties on a nonprofit basis.

William W. Holm, N1ECM, who proposes to act as SCSC as an individual.

Acadiana Computer Systems, Inc, a for-profit corporation in Louisiana that provides computer data services.

Forest Industries Telecommunications, a membership organization that provides frequency coordination to the Forest Products Radio Services.

Central Alabama VEC, Inc, a VEC for the 4th call area, proposes to operate as a national SCSC as part of its nonprofit VEC operations.

Our comments concentrated on the extent to which each of these groups or individuals satisfied the criteria considered important by the amateur community. For example, it is obvious from the comments filed that the amateur community views the assignment of call signs as a service, and not as a business proposition, and amateurs would not be supportive of the appointment of a for-profit entity as an SCSC. "The Amateur Radio Service has always been non-commercial by its very nature, and as such it would be improper in the extreme to commercialize the assignment of call signs. Amateurs are certainly willing to pay the cost of services received, but not to the extent that a private-sector entity appointed by the Commission should profit from it."

Our comments emphasized that the amateur volunteer examiner program must not be compromised by the addition of an SCSC function by any VEC. "None of the VEC entities who have applied for appointment as SCSC have demonstrated...that degree of isolation necessary to protect the integrity of each function...By contrast, the League has demonstrated to the Commission the complete isolation between the ARRL-VEC functions and other functions of the League. Unique among the proposers, the League's books are open and thoroughly audited by a major accounting firm."

Another general principle established by the comments received by the FCC is that the amateur community is interested only in an SCSC entity that has an established record of service to amateurs on a national basis. In terms of tenure, only the ARRL and the Radio Amateur Callbook, Inc, can claim to meet that requirement. Among those proposing to be the SCSC are many organizations which are really "the elongated shadow of one person...each depends on that individual's continued health and interest. Each largely reflects the perspective of that individual. The League, on the other hand, is a broadly based, democratic organization with stability and a form of organization which permits orderly succession." Virtually without exception, the comments filed by individual amateurs in support of a particular entity functioning as SCSC supported ARRL's service in that role.

The amateur community was surprised to see a proposal by Forest Industries Telecommunications (FIT). This group had filed *supporting comments* in FCC Docket 87-14, which proposes to delete 2 MHz of amateur spectrum and reallocate it to the Land Mobile Service. In fact, FIT's comments not only supported the proposed reallocation, but suggested *that the proposal did not go far enough, and that an additional 1 MHz should be deleted from the Amateur Radio Service as well!*

Our comments asked the FCC to not even consider the FIT proposal: "...it can hardly be said that FIT is in any position to be appointed guardian of the amateur radio call sign assignment system. FIT's interests are in direct conflict with those of the Amateur Radio Service, and even the filing of its proposal is an affront to those who honestly seek to serve amateur radio in this proceeding. An entity such as FIT cannot be counted on to have in mind the best interests of the Amateur Radio Service when it is at the same time attempting to take away the frequencies on which that service operates."

In conclusion, we continue to emphasize that the assignment of call signs should be a governmental function, but if the FCC is reluctant to take on such a program, the benefits to the amateur community of a special call sign program are such that the ARRL is willing to assume this task under certain conditions. "The League alone offers the amateur community the assurance of fairness and impartiality in call sign administration, consistent with the long-term stability in its organization necessary to insure the survival of the program."

87-14 UPDATE

ARRL President Larry Price, W4RA, "completed his rounds" for General Docket 87-14 by visiting FCC Chairman Dennis Patrick on August 6; he had called on FCC Commissioners James Quello, Mimi Dawson and Patricia Dennis in June and July.

Meanwhile, the Society of Broadcast Engineers (SBE) has filed reply comments sharply critical of the FCC's proposal. SBE said: "SBE believes that the reallocation of the 220-222 MHz band to the land mobile industry is unnecessary and would result in underutilization of the band. The Commission's assumption that the land mobile industry needs this additional spectrum is unfounded."

The Society concluded its comments by saying that much of the research and development in communications electronics and engineering had been done by amateurs and that this must be permitted to continue: "Antenna and preamplifier technology from such experimental work has contributed to many forward strides in spectrum efficiency enjoyed by all services, including broadcast and land mobile.

"Therefore, the Society...feels that the reallocation of the 220-222 MHz band would be detrimental to the overall efficiency of spectrum management, as well as the communications of Amateur Radio operators. The Commission should reject the proposals outlined in the Notice."

In other news regarding the 220 band, the FCC has denied the petition for reconsideration filed by The Association of Radio Reading Services (ARRS), which had sought the reallocation of 500 kHz of spectrum in the 220-225 MHz band on a primary basis for use nationwide by radio reading services for the blind and print handicapped. The FCC had denied the original ARRS petition in February. The ARRL had filed comments opposing both the original petition and the petition for reconsideration.

In denying the petition for reconsideration the FCC said: "In the case of the ARRS petition, we are convinced that there are existing sufficient means for providing reading services both by radio and by alter-

native methods. In fact, use of FM subcarriers...and other methods are spectrum efficient ways to provide radio reading services because they take advantage of services already in place without utilizing additional spectrum. Accordingly, we decline to issue a proposal as suggested by ARRS."

CALL FOR BOARD REPRESENTATIVES IN THE DAKOTA DIVISION

In the Dakota Division, no petitions were received for the office of Dakota Division Director prior to the August 20 deadline. Also in the Dakota Division, the incumbent Vice Director has declined renomination, so new petitions for these offices are now being resolicited for the 1988-1989 term. From now until November 20 at noon, League Headquarters will accept nominating petitions signed by 10 or more full members of the Dakota Division, naming a Full member of that Division as a candidate for Director or Vice Director.

The candidate must submit information (on a form provided by Headquarters) that will allow the Executive Committee (EC) to determine the eligibility of a candidate in accordance with the Articles of Association and Bylaws, and a statement of not more than 300 words setting forth the candidate's qualifications. The candidate may also submit a recent photo of him/herself. This determination of eligibility will be made by the EC within a few days, so candidates should make sure their information form arrives at Headquarters as early as possible and in any event no later than November 20. (It is in the candidate's best interest, obviously, to get the nomination in early. If there is to be a mid-November nomination for some unavoidable reason, the candidate information, 300-word statement and photo should accompany the nominating petition.) The statement will be included with the ballot mailed to members and will be reprinted without content editing; if the statement as submitted exceeds 300 words, the first 300 words will be used. The statement must not contain any derogatory reference to any person or entity. The candidate must also submit an accompanying signed statement certifying that the information is true to the best of the candidate's knowledge and belief. Any willful violation of this statement will be grounds for disqualification by the Executive Committee.

The nominee must hold at least a Technician class amateur license, must be at least 21 years of age and must have been licensed and a Full member of the League for a continuous term of at least four years immediately prior to the election. No person is eligible whose business connections are of such nature that he or she could gain financially through the shaping of the affairs of the League by the Board or by the improper exploitation of his or her office for the furtherance of his or her own aims or those of his or her employer. The primary test of eligibility is the candidate's freedom from commercial or governmental connections of such nature that his or her influence in the affairs of the League could be used for his or her private benefit. The idea behind these rules is to ensure that candidates: (1) possess a lasting interest in Amateur Radio and the League, (2) have the legal capacity to make decisions for ARRL and (3) are free from conflicts of interest.

Balloting Will Follow

If there is more than one candidate for either office, ballots will be sent to all Full members of the League in the Dakota Division who were in good standing as of December 10. (You must be a licensed radio amateur to be a Full member.) The ballots will be mailed not later than January 1, and, to be valid, must be received at HQ by noon February 20.

Nominating Form

The following form for nomination is suggested; it may be copied onto any paper, or a form may be obtained from Headquarters upon request:

Executive Committee
The American Radio Relay League
225 Main St Newington, CT 06111

We, the undersigned, Full members of ARRL residing in the.....Division, hereby nominate.....of.....as a candidate for Director and we also nominate.....of..... as a candidate for Vice Director from this division for the 1988-1989 term.
(Signature...Call...
City...ZIP...Date...)

Nominees, or indeed any member, may obtain a copy of the Articles of Association and By-Laws, along with a pamphlet outlining the duties and responsibilities of elected League officials.

PAN AM GAMES SPECIAL EVENT STATION W87PAX

The Amateur Station at the Pan American Games, W9PAX, was granted permission by FCC to use the numerals "87" in lieu of "9" in their call sign during the games from August 1-23. W87PAX was quite active, with over 25 operators using the six station positions.

According to a press release from the station, over 23,000 QSOs with 136 countries were made during the three-week period the special "87" call sign was granted. Nearly half of the QSOs were made on 20-meter SSB.

Over 200 personal event-related messages were handled by the operators during the effort

W87PAX was a joint effort of members of the Legion of Indianapolis DXers from the station of W9SU. It was sanctioned and authorized by the 10th Pan America Games, Indianapolis Committee. All QSLs should be sent to Mike Ross, W9SU, PO Box 18495, Indianapolis, IN 46218.

AROUND HQ

Arline Bender, WA1VMC, a HQ staffer for over 27 years, has announced her retirement effective at the end of the year. For many League members, particularly those in the ARRL Field Organization, Arline's name and call should be quite familiar. She has for many years supported the needs of the volunteers in the trenches by sending out supplies, handling reimbursement and expense accounts, and conducting Section Manager elections. She's been that friendly voice on the phone, providing information and goods and services to field appointees. We wish her the best on her well-deserved retirement. Her OM, Chuck, W1WPR, Chief Operator of W1AW, recently celebrated his 35th year at HQ.

Eileen Sapko of the ARRL VEC Department is transferring to become the new Awards Manager. She will be processing WAS, WAC, VUCC and other awards. Last year, Eileen was cited for exemplary job performance. Out of some 20,000 Form 610 applications she had reviewed and submitted to the FCC, only eight were ever returned by the FCC to be corrected, with none being returned in over a year!

At the ARRL Executive Committee meeting 32 clubs were granted ARRL affiliation. This brings the total number of active affiliated clubs to 1764.

KY1T NEW DEPUTY MANAGER, FIELD SERVICES

"Luck" Hurder, KY1T, has accepted the position of Deputy Manager, Field Services Department (FSD). Luck brings to HQ a wealth of experience both in professional communications and as a long-time volunteer and leadership official in the ARRL Field Organization.

As Deputy Manager of FSD, Luck is in charge of providing HQ support to the National Traffic System and the Amateur Auxiliary to the FCC's Field Operations Bureau. Luck will also be writing the Public Service column in *QST*.

Luck has previously been employed as a Communications Technician and linguist for the US Navy, as well as with the American Red Cross National HQ communications center in Washington DC, and most recently as a radio telex operator for RCA Global Communications station WCC in Chatham, Massachusetts.

Luck has been Section Manager in both the Virginia and Eastern Massachusetts sections and is active in traffic handling, packet radio and the Amateur Auxiliary. His former call sign was WA4STO.

JAMES MILLEN, W1HRX, SK

James Millen, W1HRX, 82, was well known to the amateur community as the chief engineer and designer behind the famed AGS, HRO and National Company line of receivers beginning in the early 1930s. The AGS was the first of these high-quality receivers. It was developed for the US Department of Commerce and its initials stood for A-irport G-round S-ervice. It was introduced in the fall of 1932 and was widely advertised in *QST* as the ultimate ham receiver. Notable in the receiver were a 500-kHz IF, a tuned RF stage ahead of the first detector and a automatic volume control.

Millen was a member of the ARRL and Antique Wireless Association.

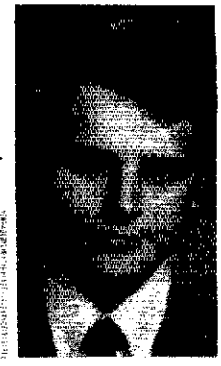
FCC CRACKS DOWN ON ILLEGAL CB EQUIPMENT

The FCC's San Diego Field Office has participated in the arrest of one man and has proposed fines totaling $14,000 for seven CB dealers in California and Arizona for allegedly selling illegal CB equipment. According to the FCC public notice, Roger


KA3FXX


KC2KK


N8FIT


KA9AKJ

Williams, proprietor of the San Diego retail CB store "Mud Shack" was arrested July 16 and charged with selling and offering to sell illegal CB linear amplifiers and modified CB radios.

Deputy US Marshals accompanied by FCC engineers also conducted a search of the store and seized an illegal CB linear amplifier and several apparently modified CB radios.

1988-89 ARRL FOUNDATION SCHOLARSHIPS AVAILABLE; 1987-88 WINNERS ANNOUNCED

The ARRL Foundation Scholarship Program plans to award six scholarships for the 1988-89 academic year to students on the basis of high academic standing, public service and financial need. Licensed amateurs pursuing studies in electronics, communications or related fields are encouraged to apply for the following scholarships:

- Goldwater Scholarship—$5000—for academic excellence and public service;
- Paul and Helen L. Grauer Scholarship —$500—preference given Midwest Division student applicants;
- L. Phil and Alice J. Wicker Scholarship —$500—preference given Roanoke Division student applicants;
- Edmond A. Metzger Scholarship—$500—preference given Central Division student applicants;
- Perry F. Hadlock Memorial Scholarship —$500—students of electrical engineering;
- You've Got A Friend In Pennsylvania —award amount varies—academic excellence.

Deadlines for applying are May 1, 1988 (all except Goldwater) and June 1, 1988 (for Goldwater). Further information and applications for the scholarships can be obtained by writing ARRL Foundation, 225 Main St, Newington, CT 06111.

The Foundation's 1987-88 academic year scholarship winners are:

The "Scholarship To Honor Senator Barry Goldwater" ($5000) has been awarded to William Sands IV, KA3FXX, 18, of Pennsburg, Pennsylvania. He holds an Advanced class license, and has been licensed since age 12. Sands graduated fourth in his high school class of 225 and is a freshman in Electrical Engineering and Computer Engineering at Carnegie-Mellon University. He is active on 160-2 meters and is the newsletter editor for his local club, the Perkiomen ARC.

Peter Jaworski, KC2KK, was awarded the "Perry Hadlock Memorial Scholarship" ($500). Peter is 17, and graduated second in his Ancram, New York, High School class of 42. He is an Extra Class licensee and active on HF CW and VHF. Jaworski is a freshman studying Electrical Engineering at the Rochester Institute of Technology.

Stephanie Dougherty, N8FIT, was awarded the "You've Got A Friend in Pennsylvania Scholarship" ($750). She graduated third from her Yale, Michigan, High School class of 150. She is studying Mechanical Engineering at Michigan State University.

"The Edmond A. Metzger Scholarship" ($500) was awarded to Robert Hulka, KA9AKJ, an Electrical Engineering major at Purdue University. He is also a member of the Kokomo (IN) ARC.

The "Paul and Helen Grauer Scholarship" ($500) was awarded to Ray Gomez Jr, NØGNA (not pictured) of Overland Park, Kansas. He is presently attending The University of Kansas studying Meteorology.

WHO SAYS FCC NO LONGER ADMINISTERS TESTS?

Amateurs do not have to suffer through an afternoon of sweaty palms under the watchful eye of an FCC examiner, but that is not to say that the FCC isn't still in the testing business. Recent victims of SPS (sweaty palm syndrome) are the manufacturers of computers and VCRs.

Fifteen Class B computing devices were tested for radiated and ac line conducted RF emissions. The results? Four of the 15 failed the conducted emission limit test, and four failed the radiated emission limit test. The bottom line? A total of six computers were tested noncompliant, since some devices failed *both* tests.

On the other hand, VCRs were put through five tests—video and audio output power levels, output conducted emissions, antenna transfer switch levels, radiated emission levels and ac power line conducted levels. Of 15 devices tested, only *one* failed to comply with regulations.

Wouldn't it be wonderful if consumer electronic devices were tested by FCC for RF susceptibility as well?

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Eastern New York, Eastern Pennsylvania, Louisiana, North Carolina, Pacific, San Diego, South Dakota and Virginia sections:

You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page eight 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 St, Newington, CT 06111

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

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

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

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

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 1, 1988. Returns will be counted February 23, 1988. SMs elected as a result of the above procedure will take office April 1, 1988.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two year term beginning April 1, 1988.

If no such petitions are received for a Section by their specified closing date, such Section will be resolicited in April 1988 *QST.* (We regret that October *QST* carried an erroneous date for *QST* resolicitations.) 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

The following Section Managers will begin a two-year term of office January 1, 1988:

Uncontested

East Bay	Robert Vallio, W6RGG
Maryland-DC	Phil Battey, W3FZV
Santa Barbara	Tom Geiger, W2KVA
Tennessee	Harry Simpson, W4MI
Western Massachusetts	William Voedisch, W1UD

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

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.

TIP-TOP OPERATING MANUAL

☐ The new *ARRL Operating Manual* is a real pleasure to read. I have nothing but praise for this wonderful work—a tremendous effort with a wonderful payoff.

Given the great detail and high quality of writing in the book, it is hard to single out chapters for special praise. From an artistic standpoint, I was particularly impressed with the use of color in Chapter 8 on operating awards. The selection was both comprehensive and beautiful. It should be an inspiration to further DXing!—*Richard H. Weil, KW0U, Bloomington, Minnesota*

POSTWAR REMINISCING

☐ I've just read the article in August *QST* entitled "Lieutenant Bigswitch Stayed for Dinner" by Rod Newkirk, W9BRD, and enjoyed it very much. The story really got me reminiscing about the days after World War II when we hams were wondering when we would be allowed to get back on the air.

I was in the Navy during World War II and was stationed on Kwajalein Atoll from October 1945 until January 1946. Sometime in late 1945, I was listening to the ham bands with an old HRO receiver and, of course, heard little activity. Suddenly, US hams were permitted back on the air, and I started to hear stateside stations out in the Pacific. I hurriedly built a copy of the old Millen Exciter and managed to get some 10-meter crystals. A modulator was built with some 6L6s and I was off and running as W2MRK/J9. I had fun with that rig until being shipped out for home.

Rod Newkirk's story stirred up many pleasant memories for me, and I thought the readers of *QST* might be interested.—*Richard A. Genaille, W4UW, Winston-Salem, North Carolina*

☐ It's nice to see Rod Newkirk, W9BRD, back in *QST*. Let's have more!—*John Schmelzer, KF5ZE, Albuquerque, New Mexico*

WHERE IS ALL THE NOVICE RTTY?

☐ As a reader of *QST* for over six years, I've enjoyed countless articles and projects. It so interested me in ham radio that I decided to get my ticket. I now hold a Technician license, and I work quite a bit in the Novice/Technician 10-meter subband. The only problem is that I can't find any RTTY or AMTOR on the band. Where is everybody?

I hope that I'm not the only person on RTTY on the whole band! So, come on Novices and Technician operators—RTTY is fun. Don't be scared of it, but get on it and have a ball!—*Roland Spoon, N5JKJ, Corpus Christi, Texas*

SPECTRUM POLLUTION

☐ The proposed loss of part of the 220-MHz band pales into insignificance beside the gradual loss of other bands, not through allocation to other services, but due to the invasion of our HF bands by numerous electronic devices.

Insufficient attention is being given to the problem by hams themselves. Perhaps most hams do not recognize interference when they hear it. The FCC enforcement efforts in the field of electromagnetic compatibility (EMC) have been reduced drastically. It is the writer's view that with adequate training most hams could perform a very valuable service to the public and to hams. Could not the ARRL spearhead a training program for amateurs to identify and locate sources of interference?

At the very hour this is being written, I am listening to some sort of electronic machine sweeping across the band and emitting a fairly strong T-6 signal. Perhaps some industrial operation is being accomplished through a high-power device that is not shielded or filtered adequately from the power lines. Since the signals are being propagated by skywave, there is no way for a single interested ham to locate such an emission. However, it is quite likely that one or more hams are within groundwave range of similar devices and could track them down with nothing more complicated than mobile rigs or small battery powered receivers. Once found, the FCC can require rule compliance. It is clear that the FCC can make more than a dent in the problem.

Spectrum pollution is getting worse. Deregulation and inadequate field response seem to be the reason. What is the answer to our bands going down the drain? It is the view of the writer that the hams themselves, with adequate training, can help solve the problem of commercial interference to the ham bands.—*William L. North, W4BX, Punta Gorda, Florida*

EVERYONE NEEDS A DUMMY LOAD

☐ This is in reference to the article in September *QST*, "Cleaning Up Your Act in the Ham Shack." I think Lee Aurick, W1SE, did a very good job with one glaring exception—the dummy load antenna was not even mentioned. We should start our new amateur operators off on the right track by encouraging them to use a "dummy load" when tuning up. Personally, I think it is required equipment for all.—*Paul Mapes, N5FGG, Longview, Texas*

IT'S NEWS TO ABC

☐ David Sumner, K1ZZ is to be commended for writing the letter ("It Seems to Us..." October 1987 *QST*) asking ABC News to correct a previous statement on the air concerning a "ham" operator accused of interfering with air-tower frequencies at New York's LaGuardia Airport. He is also to be commended for publishing the reply from ABC News.

I wonder if ABC's Mr. Siegenthaler reads what he signs. What is an "amatuer"? Does the rendition of "Mr. koppel's" last name in the third paragraph of Mr. Siegenthaler's letter indicate that Ted has now been relegated to the "lower case" section of ABC News? —*F. Paul Kosbab, NF4E, Tulsa, Oklahoma*

☐ Thanks to Dave Sumner, K1ZZ for taking on ABC News. Thanks also for publishing the exchange of letters concerning ABC's false rendering of the news story described in the October editorial.

I am firmly convinced that the news media puts great effort into trying to mold the American public into believing as they do and not enough effort into simply reporting the truth. *QST*'s October editorial prompted me to write my own letter to Mr. Arledge. —*G. E. "Jerry" Witte, K6KMF, Porterville, California*

HONOR YOUNG HAMS

☐ A group of amateurs in Santa Cruz had asked the principal of Loma Prieta High School if we could honor the 20 graduating Seniors who had earned their Novice tickets this year. We wanted to present them with an ARRL Certificate of Merit at graduation.

The principal was delighted, and he gave us a nice introduction. Each Senior stepped forward and enthusiastically detailed what ham radio had done for him or her already. From this day forth, all graduation ceremonies in Santa Cruz will honor young communicators. How about your junior and senior high school ceremonies?—*Gary Fredricks, KB6EZL, Santa Cruz, California*

THREE "FID"S

☐ Several months ago, I was walking through the Sterling/Rock Falls (IL) Hamfest when two guys with smiles grabbed me. They were Charlie, N9FID and Dallas, W9FID. We didn't know each other and had never worked on the air. We spotted each other by our call letter badges and hats quite by accident. Figure the odds of three "FID"s just running into each other!—*John E. Wiley, K9FID, Naperville, Illinois*

THANKS W1AW!

☐ I have a few words of thanks to the ARRL for their W1AW code practice. For almost 30 years, I have wanted to become a ham operator, but, for various reasons, I did not apply myself to the learning of the code. While I was studying for my Novice, there was talk of a "no code" license. I wrote the FCC and advised them that although the code was the very thing that kept me out of Amateur Radio, that I was against any form of "no-code" ham license.

I practiced for a year and then passed my Novice test. Within six months, I had passed my Technician. After many hours of listening to W1AW and to lots of code tapes, I passed my Advanced test. This is not the end of my story. Within a week of passing Advanced, I decided to go for the Extra Class license. Passing Extra was a dream come true which was beyond anything I thought I could do.

I am just starting my ham adventure at 51 years of age and I am looking forward to many years of enjoyment.—*Mac McDonald, N7ETN, Joseph, Oregon*

How's DX?

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

Mel Wardell, K4PJ: 60 Years in Ham Radio

There are operating standards set in our Amateur Radio hobby, standards of expertise and courtesy. These are the very same standards developed by our operating pioneers—those superb DX achievers and contest operators. Thanks to K4LTA, we'd like to share with you the ham radio story of another of these pioneers, Mel Wardell, K4PJ.—Ed.

Melvin Francis Wardell was born in Chester, Pennsylvania, September 26, 1912 and first licensed at the age of 15 as 3ATZ. His license lapsed during WW II, but, following the war, he became W3DGM, a member of that DX-contest-active club, the Frankford Radio Club of Philadelphia. Mel received a lot of his help from one of the most famous operating Elmers of all, W3BES (now W3GM).

K4PJ

Mel became a superb operator, and in 1956 won the ARRL DX Competition on CW, operating from the QTH of his friend Bud Green, W3DHM. (Your editor well remembers that period with the fantastic loud "sound-alike" calls emanating from FRC!) Mel then moved to Oak Ridge, Tennessee, where he was Project Manager for Catalytic Construction Company, architectural engineers for the government project located in Oak Ridge. He also became K4LPW (in 1970, he received the K4PJ call). Mel was already an avid contester and had little trouble winning most contests for Tennessee. But the one contest he truly excelled in was the ARRL November Sweepstakes. You'll find his call in the top Ten many times between 1956-76, never winning nationally (but almost always in the top five, and often finishing as high as second to those legendary operators W2IOP and W4KFC). These feats were accomplished while operating a modest station from his apartment in Oak Ridge, usually with a small amplifier and a small 3-element tribander (which he still uses today). Now, at the age of 75, Mel is still very active though not hitting the contests as hard as he did a few years ago.

"Mel, we salute you and your accomplishments in our hobby, as well as the tremendous help you have been to others in making it such a grand avocation for all."—K4LTA

Mel has been a leader in the active Oak Ridge Amateur Radio Club, pointing them to a national Field Day high in 1986 (running QRP battery power). His abilities and enthusiasm led to the development of several excellent contest operators, and his principal protegees are N4ZZ and K4LTA.

Mel's chief interest for many years has been working DX on different bands, on both CW and sideband. The totals listed in the accompanying table (worked from his apartment) should reflect a challenge to all apartment dwellers!

Band	160	80	40	30	20	15	12	10	6/2	Total	Total Band Ctries	Total Ctries
CW	103	203	289	115	332	291	19	264	4	1620	311	344
SSB	51	157	166	0	301	276	11	269	3	1234	308	329
Total	106	205	289	115	339	309	23	295	5	2854	313	348

JUNE ELECTRICAL STORM EXPOSED

It was recently learned from the National Weather Service that the electrical storm observed in Southern California on June 5, 1987, was actually caused by severe corona generated by all of the Amateur Radio operators trying to work a reported Albanian station at the same time and same 20-meter frequency. Reports received from the Los Angeles DWP indicated that power outages and brownouts will be expected if the station shows again. *(Thanks Southern California DX Club* Bulletin.)

SOUR GRAPES

[The following material is courtesy of W6BDN.]

Those of you who read "The Nones of April" in this slot in January 1986, may recall that I was finally able to work Clipperton '85, but only after a monumental effort with the aid of the IRS.

My son Dan, N6BZA, came home for a short stay during a respite in his academic activities. By prearrangement, he went directly from the airport to our rendezvous at his favorite local Chinese restaurant. In the midst of the hot and sour soup, I casually mentioned that, at the very moment, the FO0XX gang was ashore and erecting their antennas. He commented that maybe he would try to work them. I sneered silently to myself, *"Good luck,* sonny!"

The following day, I got out of jail early (I was on jury duty) and zipped home. As I pulled into the garage, the staccato bursts on the car radio could be recognized as Dan's call, and I knew that he was on the air. Once in the shack, I clucked about and checked out the station's status. There had been some changes since he was last home, but he had figured them all out and the gear was purring away.

He was after Clipperton! His fingers glided over the controls as he deftly switched between the FO0XX transmitting and listening frequencies. He found and zero beat the latest successful contender. He then waited for the QRZ, and called. "Zulu Alfa—again." He then repeated his call. "N6BZA, is that Dan?"

He had been trying only for about 20 minutes and, to top it all off, Carl (a Northern California Contest Club acquaintance) remembered his name.

Oh boy!

GB0SWR/MM

In September, this column covered in some detail the exciting DXploits of the *Sir Walter Raleigh* expedition around the world. In the intervening months, however, trouble beset the operation and, as W1LRR relates, the ship has since been decommissioned. It is particularly sad to note that three of the youngsters lost their lives during the SWR venture. Future British "Venturers" will be flown to their destinations (in some cases, carrying ham gear with them).

Anyone who worked the ship may obtain a card from GB4ORH, Operation Raleigh Support Center, 47-49 Queens Dock Ave, Hull HU1 3DT, England (or via George Taylor, G3GWT, who has been handling the QSLs).

OPERATING MANUAL

This eagerly awaited brand new 684-page compendium is a knockout. From a DXer's point of view (whether a neophyte or a seasoned country-chaser), it provides in one place a variety of DX-related material. Chapter 5, edited by that old pro W9KNI, gives a comfortable feel to DXing from the operator's point of view: how to listen, how to call, when to change bands, bands to select, etc. Reference material discusses pros/cons of split-frequency operation, transceive, nets, lists and the infamous roulette. You'll find sections on how to use the ARRL Outgoing QSL Service, the mechanics of the

Troster's Tips for Easy Listening

Nets and List Operations I

Much has been written about whether DXpeditions (or DX stations) should check into a DX operation net and work from a list of callers. Opinions are very strong on both sides.

But, what is a list operation? There are various well-known nets which meet daily (mostly on 20 sideband now)—nets that invite both DXpeditions and DX stations to check in. An MC (master of ceremonies) will then ask anyone wishing a QSO with the DX operator to give his call. A list is then compiled, and the MC then reads off the calls one-by-one. As a station on the list is called by the MC, that station will call the DX station, give a report, and stand by for a reply. The DX station will acknowledge the report and give a report of his own. The caller will acknowledge that report to complete the QSO. Simple, and, voila, some lucky operator has just worked a new country. (Various modifications of this procedure are used by most nets.) By prior agreement, stations *not* on the list, and not called out by the MC, will not be worked by the DX station.

If you are on a DXpedition, you too may wish to use this method of operation now and then.

(More next month from W6ISQ.)

incoming QSL Bureau, to be a QSL manager, etc. In one spot, you'll be able to check worldwide top-band frequencies, 80-meter phone allocations and who has what in the new bands.

Overseas DXing/DXpeditions, edited by that peripatetic traveler WB4ZNH, discusses planning/preparations/documentation, travel/arrival, a very comprehensive tabulation of characteristics of ac abroad (including types of electric plugs by country). Literally everything you've always wanted to know about operating abroad is included. The windup paragraph is significant: "DX operating and DXpeditions can be very satisfying and rewarding activities. These should not be taken lightly, since many people will look at you in the spotlight and form very distinct opinions about Amateur Radio, DXing and you personally. With just a little effort, though, all three can benefit."

Propagation-prediction information is well-represented and includes charts broken down according to path, month of year, smoothed sunspot number and time of day. A number of paths are shown: Eastern USA/Central USA/Western USA to Alaska, Hawaii, Caribbean, Eastern South America, Southern South America, Antarctica, Western Europe, Eastern Europe, Western Africa, Eastern Africa, Southern Africa, Near East, South Asia, Southeast Asia, Far East, Australia, South Pacific. To all contributing editors and most particularly to editor K1XA, well done!

HLØMOC opened by Korea's Vice Minister of Communication.

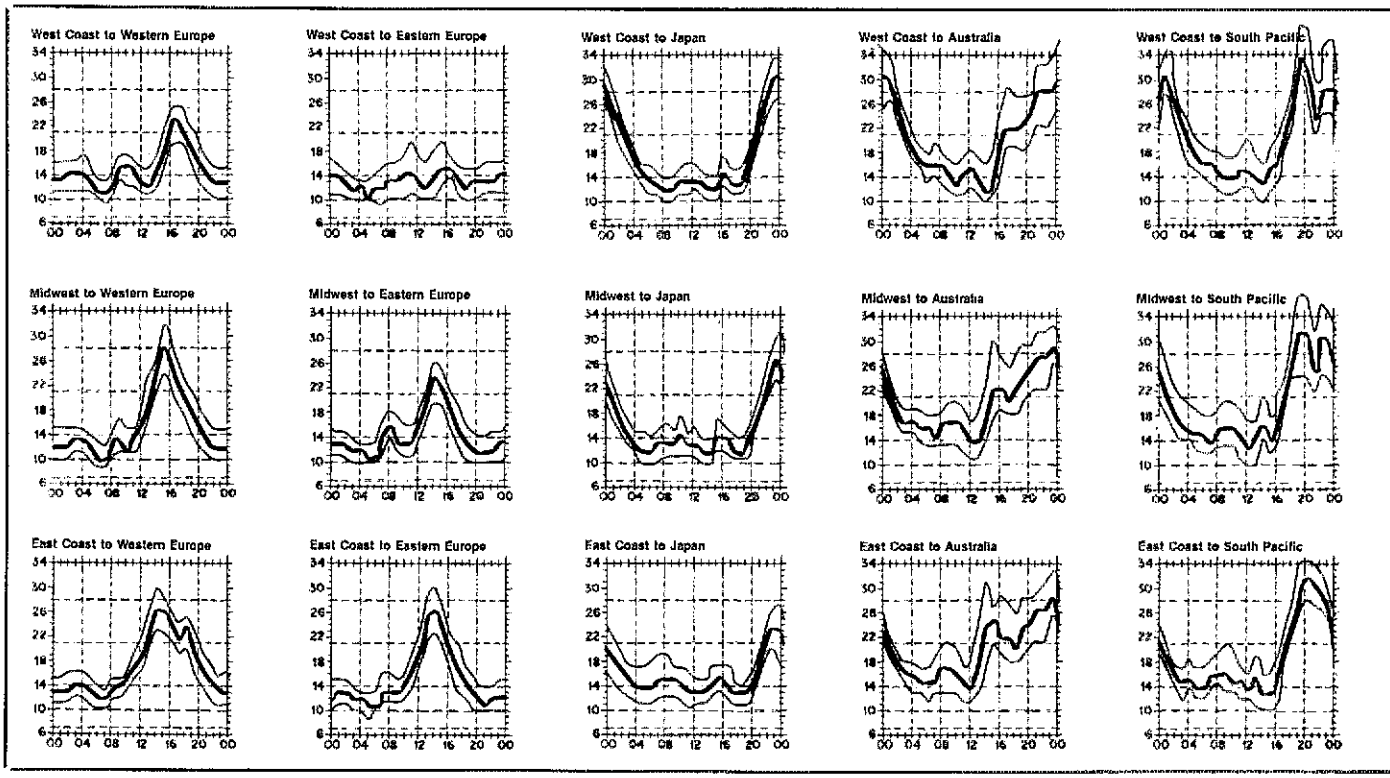
HLØMOC

The first transmission from HLØMOC, the brand new Ministry of Communication Club Station, took place early June, by the country's Vice Minister of Communication Oh Myung (see photo). Congratulations to the Korean Amateur Radio League!

THE CIRCUIT

☐ **C3ØBBE:** This Andorra operation gets confirmed via OH3TY (who also has the logs of the 1986 expedition by OH6XY): Pentti Lareva, OH3TY, Tenavankatu 34, SF 15170 Lahti, Finland.

☐ **Madeira:** WA4TLI and AA4VK operating /CT3 get confirmed via their respective *Callbook*



When are the bands open? These charts predict this month's average propagation predictions for high-frequency circuits between the US and various overseas points. One chart showing East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as the lowest curve (optimum traffic frequency, or FOT). The horizontal axis shows Coordinated

addresses (don't forget the SASE!).

☐ **ON4CLM:** A special-event station will be operating through Nov 3, honoring the Canadians who liberated Knokke, Belgium in 1944. Further info on this beautiful award via Radioshack OOstkust, ON6HC, Rijkswachtlaan 37, 8300 Knokke, Heist 1, Belgium.

☐ **UL7GW:** It took a while for the news to get out, but it is sad indeed to report the passing of another veteran DXer and *QST* author, Vit, UL7GW (thanks W1RAN).

☐ **7J1AAP:** KH6BZF active from Japan gets confirmed via CBA.

☐ **V44KAR:** W3BJI is looking for a QSL route for this early summer St Kitts operation. Assistance to Wendall Johnson, W3BJI, 802 Teakwood Dr, Severna Park, MD 21146.

☐ **4W1AA:** W8MJG needs tips on this station for a November 14, 1962 contact. R. J. Diehn, W8MJG, 3374 Blairmont Ave, Toledo, OH 43614.

☐ **ZYØ:** The mid-September Fernando de Noronha operation specialized in RTTY, AMTOR and CW by ZYØFMN (PS7AAH), ZYØFCA (PS7WB), ZYØFKL (PS7KM), ZYØFRT (PS7BY), ZYØFCM (PS7PC). Cards direct only (SASE) via Karl Mesquita Leite, Caixa Postal 385, 59001 Natal, RN, Brazil, South America.

☐ **QSLs:** OE3RE notes that European cards are considerably larger than others, not fitting standard American envelopes. Any tips for NU7V on envelopes to more closely match 4-7/32 in. × 6-5/32 in.?

☐ **South Pacific:** NA7Q is interested in knowing how many DX types might be interested in a DXpedition to the Line Islands aboard the beautiful 93-ft classic brigantine *Varua*. (The *Varua* was used for the January 1980 Kingman Reef jaunt.) Check with Ken McCann, NA7Q, Intersea Research, Inc, Box 1667, Friday Harbor, WA 98250, 206-378-5980.

☐ **8P9:** The 8P9HR October operation will be confirmed via K4BAI. John, K4BAI, will be operating late this month as 8P9HT.

☐ **J6:** The Southwest Ohio DX Association will be activating J6DX on St Lucia multi-multi. Cards for J6DX go via the Treaty City Amateur Radio Association, W8UMD, PO Box 91, Greenville, OH 45331. Others go via the operator's CBA.

QSL Corner

Administered By Joanna Hushin, KA1IFO

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

C53FC/5U7	(KA1DE)
FR5ES/J	(F6FNU)
KA2IJ	(W6CNA)
KC4AAA	PO Box 400, South Pole, c/o NSFA, FPO San Francisco 96691.
KA2HH	(W6CNA)
PAØGAM/ST	Gerben Menting, PO Box 3794, Khartoum, Sudan.
W87PAX	(W9SU)
XX9KA	Box 768, Macau.
XX9NZ	(N6TY)
XX9TDM	(W7TIR)
ZD8AE	(G3LQP)
ZP45ØA	Radio Club Paraguayo, Box 512, Asuncion, Paraguay.
ZS3HL	(W3HNK)
ZS3IL	(W3HNK)
6Y25DA	(VE4JK)

SPECIAL NOTES

Helpful hints for using the ARRL Outgoing QSL Service.

1) Addresses are not required on the QSL card; all that is necessary is the call sign.

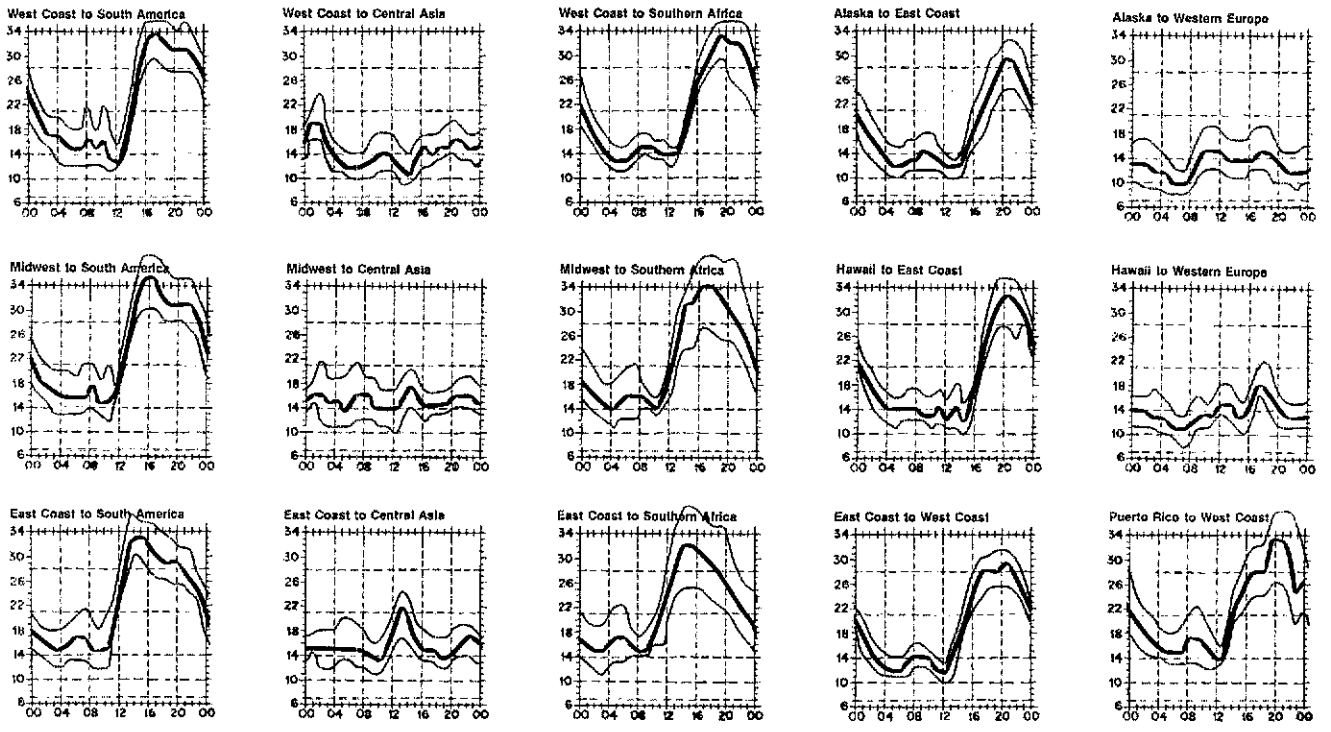
2) New prefixes (EU,RA,RF,4M,CK1,CY1 etc) should be sorted via the standard prefix.

3) QSL cards not served by the Outgoing Service, as listed on the Outgoing Service information sheet, will be forwarded to the QSL manager, when stated on the QSL card. Example: T3ØAT via G4GED, VR6HIJL via G4AAL, 5AØA via SP6BZ.

4) Do not send "green stamps" (US currency) or IRCs through the Outgoing Service.

5) Paper clips, rubber bands and paper separators hinder our sorting time. We request that you do not use these.

☐ QSL Corner, Jun 1987 *QST*, page 55, contains information and addresses for the ARRL Incoming Bureau. QSL Corner, Sep 1987 *QST*, page 63, contains information on the operations of the ARRL Outgoing Service. For additional information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.



Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more-detailed explanation. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Data provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for November 16 to December 15, 1987, assume a sunspot number of 50, which corresponds to 2800-MHz solar flux of 102.

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 August 1 through August 27, 1987. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

FM5BX/162	IK3AWP/117	JO1TMU/140	OE5HIL/150	9Y4BA/132	N2BSA/152	N3DED/104	WB4PEA/100	WZ5I/105	KB9OD/304
FM5WE/117	IK3HHL/107	JH8BOE/259	PA3DYV/106	KB1RW/104	NQ2Q/105	W3SAI/105	AI5P/TF/142	KI8GI/126	KB9OE/307
G4UJF/296	IN3XAI/295	JA0CZG/110	UO5PK/314	KC1AG/114	K3YGU/158	WB3JRU/268	K5PZ/128	NJ6P/104	KE9I/229
GM4EV/100	JI1CQA/110	JY7Z/108	TI2LTA/202	N1WR/110	KC3Z/122	AA4HX/105	N5IIT/110	WB6PFH/103	NN9G/104
GM4VAN/110	JM1SOX/107	LA9DAA/134	YI1BGD/156	W1DID/140	N3CAM/100	AB4AE/200	WD5KEM/100	WN6C/102	W9TC/311
IK2EKP/109									

Radiotelephone

CT1CDL/200	G4WDW/113	I7UNX/283	TI2MEN/105	KC1AG/114	KZ3H/121	W3IRE/271	N4DHY/104	KB8RM/190	KB9OE/301
DA2CH/104	GM4VWV/105	JO1TMU/131	VK1ZL/110	K9PEQ/139	N3CAM/105	WB3JRU/268	WA4GWD/118	N8DJX/142	W9UPC/258
DF3IU/215	HK3JJH/137	LA9DAA/123	VK2JG/130	N2BSA/129	N3DED/100	AB4AE/200	W6PGK/102	WA8LLY/104	KA9KEL/103
EA5ENG/152	IN3QCI/202	PW8ADV/124	YI1BGD/155	N2FPB/103	W3BJI/101	KE4UW/126	N7GLT/102	KB9OD/284	WB0UTS/108
FM5BX/160	IN3XAI/282	SP1MHV/130	9Y4BA/116						

CW

DL6SF/106	JI1CQA/104	SM7GCZ/127	K2PEQ/162	W3VTX/105	W5VT/250	K6LRN/108	K8IFF/281	KB9OD/225	N9BKN/102
HA6DD/110	JH8BOE/132	YU3IS/108	W2FCR/101	KD4IZ/110	AD6J/101	N6COG/103	K9VTD/100	KB9OE/245	WA9YYY/103
HA6HG/110	OZ1CMC/137								

RTTY

K2ENT/146	K2PEQ/108								

160 Meters

PY1BVY/118	T77C/106	UA6HOF/102	VS6DO/100	W2MPK/104	WB3AVN/111	K5AQ/101	AA7A/100	N9BBQ/103	

5BDXCC

SM6IQI	W5FGO	KW5K	JS6BLS	KM1E	5B4TI	NA2K	K4ZIN	HK6BER	DL3ML
W2MPK	PY1BVY	OE1TKW	HC2RG	9Y4BA	N3BNA	JR3IIR	UG1AWB		

Endorsements

Mixed

CX6CW/331	HB9AQW/327	ON5WQ/298	K1MEM/323	NA2K/274	W3LB/332	AG5X/303	N6NF/287	W7DNY/306	N9AU/310
DF8AF/280	HB9BOS/187	ON7EM/311	K1NLQ/295	W2CC/323	W3LPL/335	K5CON/301	N6VR/323	W7FPT/271	N9BKN/290
DJ1ND/293	HB9BPP/301	PA0TAU/341	K1RH/302	W2FCR/320	W3UJ/312	K5GH/329	N6WK/299	W7HR/314	NB9F/258
DJ6TK/333	HB9BYZ/253	PT2LS/245	K1ST/319	W2FG/338	WA3HUP/338	K5LP/320	N6ZU/149	W7KH/366	NF9V/209
DJ8CR/336	HB9KC/305	PT7YS/353	KB1BE/300	W2FR/325	WA3LJP/313	K5QY/312	W8AYQ/287	W7MCU/290	W9DY/355
DJ8RQ/324	HB9NL/310	PY1APS/338	KB1U/295	W2GVX/275	AA4M/315	KA5W/310	W8BA/361	W7PSC/315	W9FR/325
DK2OY/260	HB9QR/344	PY2DBU/289	KM1E/271	W2HAZ/324	AA4S/332	KB5AS/301	W8DU/320	WA7HHX/175	W9GN/281
DK2UA/309	HK3DDD/310	PY5EG/313	W1BU/318	W2JB/326	K4BBF/335	KB5DQ/303	W8EGX/201	AD8O/301	W9NGA/326
DK5AD/316	IK1HJS/228	PY7ZZ/326	W1DGJ/348	W2JVU/364	K4PVZ/322	KB5EK/272	W8FW/347	K8ED/310	W9RXJ/327
DK5WS/312	I2VDX/321	SM4DHF/327	W1FZ/361	W2PPG/336	K4XG/335	KC5M/305	W8GO/321	K8FF/348	W9SC/314
DK8NP/315	I4EAT/313	SM4EMO/315	W1HSB/312	W2TQC/356	KC4QT/261	N5DD/310	W8GR/340	K8IFF/335	W9SS/328
DK8PZ/178	I8TIC/229	SM6CST/330	W1KGH/336	W2UE/358	N4AVB/312	N5DC/307	W8HYG/354	K8KBB/162	W9TX/304
DJ9HX/270	JA1ATF/300	SM7BIP/331	K1KOB/289	WA2IZN/313	N4BSN/266	N5EPA/174	W8JRY/327	K8MNG/312	W9WAQ/296
DL1BS/330	JA1EMQ/200	SM8CMH/198	W1KSC/182	WA2JUN/313	N4CC/330	N5OK/322	W8KQ/354	K8ZR/325	W9ZR/304
DL1FBW/202	JA1NLI/297	SM8MIW/133	W1LQQ/335	WA2TMP/261	N4CID/300	N5TP/330	W8KPQ/339	KD8FO/278	WB8YXY/315
DL1LD/334	JA3BR/325	T77C/317	W1NU/357	WA2WDJ/271	N4GFI/285	ND5R/308	W8MUM/337	KR8M/150	WD9GQV/292
DL1LZI/290	JA3EMU/326	UA6JD/325	W1ODY/327	WB2CEI/311	N4JJ/322	NT5V/214	W8MUR/353	N8AQV/307	WD9IIX/311
DL1PM/343	JA3PQI/240	UQ2MU/314	W1OT/334	WB2CZB/291	N4LZL/132	W5AWT/305	W8MUS/311	W8GUQ/213	K9IFA/330
DL2FAG/210	JL3VWI/154	VE3HO/318	WA1WTP/301	WB2GAI/163	N4RR/318	W5BOS/311	W8NVN/200	W8JQ/343	K9IYF/226
DL3NBU/210	JM3ADO/137	VE3II/319	WB1CTV/175	WB2TKY/296	N4VZ/321	W5HTY/328	W8OSP/290	W8WCU/318	K9KTP/318
DL3SZ/312	JA4AOA/205	VE6XV/221	WB1EAZ/300	WB2YQH/332	NN4S/131	W5LU/333	W6PN/343	W8YAH/300	K9LD/315
DL3RK/360	JH4IFF/281	VK5WO/340	AF2O/301	K3BEQ/309	W4DMV/304	W5VT/329	W9QL/340	WA8CZS/284	K9SR/281
DL3ZI/350	JA5EYW/296	VK6HD/334	K2ENT/308	K3KG/326	W4DTO/227	W6UA/360	W6RT/360	WA8LLY/126	KA9IQR/278
DL7CW/335	JA5IU/322	VS6UA/134	K2JFE/227	K3OTY/316	W4FGX/300	W6ZPA/315	W6SIJ/304	WB8ZRL/302	KB9GJ/283
DL7JY/300	JA6RCH/310	XE1MMD/231	K2JLA/312	K3PA/202	W4IQ/308	WA5IGD/309	W6SQP/358	WD8OFB/229	N8AT/315
DL7MAE/293	JH7BDS/300	XE1OZ/228	K2MFY/321	K3SKE/156	W4JFE/335	WB5BIR/273	W6TC/329	K9BWQ/325	NA8Y/350
DL8AK/302	JA8AIP/266	YO5BQ/150	K2OVS/250	KC3X/298	W4OHZ/315	WB5MTV/177	W8TMD/311	K9JPI/154	NI0G/226
DL8MAG/305	JA9AA/343	YU1AB/323	K2PEQ/210	KE3A/310	W4PTH/324	AE8H/232	W8ZKM/337	K9MFY/314	W9BA/293
F8DZU/312	KH6CF/320	YU2OM/301	K2VV/330	KN3P/278	W4PZV/332	AJ8V/300	W8ZM/353	K9PQG/324	W9URN/252
G2DMR/334	KV4FZ/335	YU2YM/320	KA2HMJ/250	KU3G/197	W4YKH/326	K6AAW/328	WA8GFE/341	K9RA/335	W9XZV/316
G3GIG/340	LA5IU/306	YU3LF/280	KA2NRR/158	KZ3H/204	WA4VDN/280	K6LRN/177	WB6EMR/152	K9SDE/280	W9LYI/331
G3KLL/292	LA8PF/271	YU3QI/311	KB2RZ/305	N3COB/154	WB4FLB/281	K6OJ/365	WR6R/296	KB9OIO/320	WDPFG/287
G4CNY/308	LA8XM/200	YV1TO/250	KB2XL/287	N3II/326	WB4ONP/325	K6RF/351	K7EG/314	KD9CB/308	W9TRF/317
G4MZF/W4/133	LA9CE/338	ZL1AV/343	KC2YI/225	W3CVI/349	WB4UBD/307	KI6BN/150	K7ZBV/307	KE9A/306	W9UO/310
G4UIW/133	OH2BDP/321	ZL1BIL/312	KM2P/331	W3DO/300	WR4K/328	N6COG/198	N7UT/309	KR9P/305	W9VX/317
GM3BQA/337	OK1DLA/294	ZL3GQ/338	N2JV/313	W3EVI/311	WT4T/308	N6HC/234	NJ7H/134	KS9Y/264	WDWJ/208
HA9PP/187	ON4DM/359	ZL4AW/323	N2KW/316	W3FDU/163	WW4J/201	N6HL/308	NS7Z/312	KW9K/313	W9ZV/350
HB9AHL/323	ON4KR/283	K1AR/315	N2VW/290	W3IRE/288	WZ4S/231	N6JV/322	W7AGQ/209	KY9P/126	WB9NHD/313
HB9APF/164	ON4SW/303	K1BW/330							

Radiotelephone

CP5LE/125	JA1NLI/296	PT7YS/352	K1VHS/298	KM2P/329	W3DHM/357	KB5KA/226	N6LTN/159	W7DNY/303	W9RXJ/327
CX3CO/316	JI2KAR/133	PY1APS/335	K1YR/270	N2DNY/176	W3SEJ/150	KC5M/303	N6NF/298	W7KH/340	W9SS/328
DF2XC/290	JA3RBI/271	PY5EG/312	KA1PL/308	N2KW/312	WB3ABS/298	N5AJW/313	W6AXH/324	AD8O/300	W9TC/310
DF2XE/134	JA3PG/233	PY7ZZ/321	KB1BE/300	N2VW/290	AA4M/300	ND5R/306	W6BCQ/325	K8IFF/334	W9TX/288
DF4PL/292	JL3VWI/154	SM6CST/303	KB1U/251	NA2K/283	AA4S/300	NT5V/200	W6CNI/314	K8ZR/323	W9XM/316
DF7NM/304	JM3ADO/137	SM8MIW/133	KM1E/270	W2CC/323	K4BBF/335	NX5C/152	W6DU/262	N8AQV/300	W9ZR/330
DJ3CP/307	JA4AOA/205	UA6JD/321	N1API/288	W2FCR/320	K4XG/329	NY5L/306	W8FAH/249	W8JIQ/319	WB9OBX/225
DK5AD/301	JH4IFF/250	VE3HO/314	W1CU/334	W2FG/335	KI4FW/132	W5EZ/298	W8FW/345	W8JXM/333	WD9GQV/286
DK5WS/312	JA5IU/317	VE5AEC/245	W1DFO/131	W2JB/312	N4AVB/310	W5HTY/328	W8GO/319	W8MAV/320	K9EPE/336
DK6NP/303	JA6RCH/304	VK5WO/336	W1DGJ/348	W2TQC/286	N4BSN/285	W5JME/308	W8GR/339	W8WCU/305	K9IYF/158
DK9KX/320	JH8GWW/284	VK6HD/331	W1FZ/354	W2YTO/310	N4CC/326	W5UAW/338	W8HYG/350	WA8CZS/281	K9KTP/318
DJ9RG/324	JA9AA/315	VS6UA/134	W1KID/300	WA2IZN/310	N4CID/296	W5VT/317	W8LLH/304	WB8ZRL/295	K9LD/311
DL2FAG/204	KH6BB/338	XE1MMD/229	W1KSC/182	WA2JUN/308	N4CRU/308	W5YU/336	W8KON/328	K9BWQ/325	K9VRW/300
DL7MAE/294	LA5IU/304	XE1OZ/228	W1KSZ/311	WA2WDJ/271	WA8BIM/304	AE8H/172	W8KPQ/358	K9DXO/321	KB9OJ/236
DL8OS/312	LU7MAJ/303	YB5QZ/227	W1LQQ/327	WB2CEI/311	W4DMV/265	K6CCY/346	W8MUS/300	K9MFY/307	N8ABE/254
EA3AOC/316	LX1FJ/254	YU2OM/288	WA1WTP/300	WB2CVL/310	W4JFE/316	K6EID/313	W8ZKM/337	K9PQG/320	N8AT/313
F6FWW/290	OE1PCH/311	YV1TO/250	WB1EAZ/300	WB2TKY/284	W4NYN/339	K6HD/232	W8ZM/348	KA9TNZ/225	NA8Y/344
F8DZU/312	OE2EGL/335	YV5AJK/347	AF2O/301	K3BCG/322	W4PZV/329	K6RF/330	WA6SLO/289	KB9DE/259	W9BA/293
G3KLL/291	OK1DLA/283	YV6CAX/196	K2ENT/308	K3BEQ/309	WB4QNP/318	K6GI/126	WB6ANU/133	KB9LN/249	W9LYI/329
G4ZYQ/156	ON4DM/359	ZL1AV/330	K2JLA/312	K3OTY/318	WB4UBD/307	N6AMD/260	WN6R/254	KD9EB/253	W9PXM/259
GM3BQA/337	ON4SW/280	ZL1BIL/312	K2MFY/297	K3SKE/150	WT4T/303	N6ARS/178	WR6R/286	KD9QB/306	W9VX/274
HB9APF/151	ON5WQ/295	ZL3GQ/299	K2UFM/284	KD3AP/126	K5CON/301	N6COG/166	WS6F/125	KV9V/176	W9WJ/192
HB9RG/305	ON6NY/300	4Z4DX/317	KA2HMJ/200	KE3A/309	K5GH/328	N6FT/213	K7EG/279	N9BKN/282	W9YMH/322
HK3DD/310	OZ3SK/347	K1MEM/317	KB2RZ/305	KN3P/271	KA5W/299	N6HC/208	K7ICW/309	NE9I/259	WA8GUD/270
IX1BGJ/331	PA8KB/317	K1MIZ/303	KB2XU/281	N3EHD/208	KB5DQ/294	N6HL/301	K7ZBV/305	NG9L/135	WB8CIW/310
I3ADI/328	PT2LS/245	K1ST/316	KC2KU/291	N3FBN/150	KB5EK/266	N6JV/207	KC7XB/270	W9LT/322	WB9NHD/313
IV3YRN/312									

CW

DF3SV/294	DL7MAE/289	OK1DLA/268	K1RH/300	K2JLA/198	WB2GAI/154	N4RR/287	KI6T/130	W6TMD/281	K9PQG/234
DJ1ND/227	F3AT/312	ON4SW/280	K1ST/282	K2MFY/260	AA3O/127	N4VZ/306	N6HC/179	K7EG/250	KY9P/124
DK2UA/231	HB9NL/157	ON5WQ/283	K1VHS/287	KA2AOT/158	KA3NSW/126	W4JFE/270	N6IV/303	K7ZBV/266	W9TX/258
DK8NP/287	HB9NL/167	OZ2IJ/208	K1YR/177	KA2HMJ/228	WB3JRU/276	W4OHZ/140	N6NF/252	N7UT/285	W9WAC/285
DK5AD/298	HK3DDD/257	PY7ZZ/305	W1DA/316	KU2Q/207	AA4M/289	K6YY/301	N6VR/276	W7QN/150	W9ZR/312
DL1BS/274	I4EAT/253	SM4EMO/242	W1FZ/307	N2KW/309	K4XG/294	NT5G/167	W6DU/270	K8KZW/129	NI0A/176
DL1LZ/253	JA1BGS/250	SM6CST/305	W1KSZ/282	NA2K/149	KS4G/156	KA5W/293	W6GO/302	N8AQV/264	NI0G/205
DL1PM/311	JH4IFF/141	VE3HO/246	W1LQQ/281	W2GVX/239	N4AVB/184	W5ZPA/302	W6MUS/252	WB8ZRL/258	W9VX/262
DL3RK/282	JR6UDM/262	4Z4DX/293	K2ENT/271	W2HAZ/288	N4CC/240	AE6H/185	W6TC/309	K9BWQ/266	WA8GUD/200
DL7CW/269	JH7BDS/284	K1MEM/312							

RTTY

W5VT/125									

160 Meters

VK6HD/129	K2RIH/150	W2BXA/170	W2JB/153	W2TQC/175	W3GG/128	N4JJ/180	NA0Y/131	W0ZV/187	

FM/RPT

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716
CompuServe ID no. 70645,247

Repeater in the Sky

"Go ahead, the W5—you're Q5."

"Thanks. I'm in New Mexico heading to Colorado, and I'd like to know what repeater this is."

"This is the Durango, Colorado repeater."

"Hey, that can't be! I just left Albuquerque a short time ago, and it's over 150 miles to Durango. Your repeater must run super power!"

"Lots of people say that. Fact is, we get out so well because our antenna is mounted on a 5000-foot tower—but, we can't use high power because the rig is completely solar-powered."

Tall tale? Well, in a way it is. The mile-high tower is a mountain that rises 5000 feet above Durango, but the solar power part is true. As far as we have been able to determine, our repeater is the first at almost 12,000-feet elevation that is fully solar-powered (there is just no other way to power it at that site).

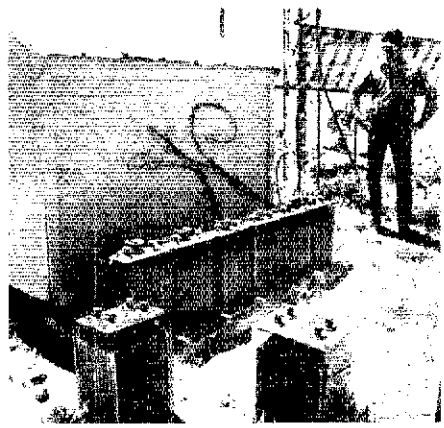
The repeater is in the La Plata Mountains, 12 miles northwest of Durango in southwestern Colorado. With a transmitter power of 30 watts and a gain antenna, the ERP is 100 watts. Coverage in most directions is about 50 miles, which is where the next high mountains intervene. However, the path is fairly clear toward the southeast and southwest, and contacts from the vicinity of Albuquerque and from northeastern Arizona are not uncommon.

The repeater is in a mountain wilderness area and is miles from the nearest commercial power, so solar power is not an altruistic matter—it is a necessity! Fortunately, southwestern Colorado is in a most favorable zone for the use of solar power. Eleven solar panels, each delivering 25 watts, provide the power, which is stored in six large, telephone-company surplus lead-acid cells. Each cell is rated at 1300-ampere-hours at 2.2 volts and weighs about 350 pounds.

Twelve years ago, members of the Durango Amateur Radio Club began toying with the idea of putting a repeater in the high mountains. The real spark plug of the project was Jerry Timm, NØAO. Jerry works for AT&T, which, among other things, operates microwave interconnect facilities around the country. These facilities include backup battery supplies, which must be very reliable and, therefore, are replaced on a regular schedule, long before they might have any problems. The old cells are sold to salvage dealers for reclamation of the lead. Jerry, of course, knew about this procedure and knew when the sales would be taking place. We put in our bid and got our batteries!

Ed Sinden, WBØVNU, who was active from his home in a nearby canyon, had a neighbor named Emzy Barker, who owned an old mining claim that included many acres at a high elevation in the San Juan National Forest. We negotiated the right to put our repeater at this choice location and Mr Barker has been a very accommodating landlord ever since.

Since then, it has mostly been hard work, softened by the magnificent mountain scenery that could be enjoyed while working. At the



elevation of almost 12,000 feet, the site is snow-covered most of the year. Access for a couple of summer months is via a jeep trail, and there is a climb of about a quarter mile from the trail to the site. The main problem was getting those 350-pound batteries up that last steep hill. That task was accomplished by slinging each cell under two two-by-fours and carrying the cells with the two-by-fours on the shoulders of as many hams as possible. As an example of the hazards involved, one member got a splash of acid in one eye, fortunately with no lasting effects. Another cell was set down on a smooth place while the team rested a moment. However, there was a pebble on the ground and, with the weight of the cell on it, it punched a neat hole in the glass case. The crew watched helplessly as the electrolyte drained slowly away.

The installation has been remarkably reliable, but, there have been failures. In the winter, taking care of those failures required heroic efforts. We have waded through waist-deep snow (before the big snows have yet fallen), gone in on snowshoes when conditions permitted, and used helicopters when that was the only way. On one of the helicopter trips, our man had to dig down through the snow to reach the shack. Some missions have provided excellent training for our members who are also members of the local mountain search-and-rescue teams.

The problems have been caused by equipment malfunction, lightning damage, mice and other creatures that like the relative warmth of the shack, theft of solar panels and high winds that broke a support and left a solar panel lying face down in the snow. Once lightning wiped out all of our equipment and shortened a half-inch diameter aluminum "lightning rod" on top of the tower by a couple of feet.

We should not dwell on the problems—the successes have far outweighed them. Some fortunate events were not anticipated. When word got out about our site, a two-way radio company approached us about putting a commercial repeater station at our site. With the concurrence of the site owner, we made the deal. Now, the commercial company shares expenses with us and has installed additional solar panels to help support the additional load. We have also gone along when they used a helicopter for access to their equipment.

The repeater includes a phone patch, which necessarily is operated through a transceiver in town, since there are no telephone lines near the repeater. Recently, we installed additional control facilities, back-up equipment and telemetry of temperature and battery voltage. Future plans call for more detailed control, more extensive telemetry and greater equipment redundancy so that problems can be diagnosed and solved by remote control. We also plan to link with other mountaintop repeaters in neighboring states to provide communications from Texas through California.

A recent addition to our system answers the often-asked question, "Just where up there is the repeater?" The mountain can be seen from Durango, but the exact location of the repeater is difficult to find. So, we installed a bright strobe light that can be turned on and off by remote control (it also turns off automatically to avoid battery drain).

That is the story of our repeater. Before closing, we should mention another ham without whom the repeater could not be the success it is. He is Kit Orlosky, KDØDI, a telecommunications technician for the State of Colorado and no stranger to communications systems and mountaintops. With assistance from others in the club, Kit does most of the equipment maintenance and also comes up with most of the interesting improvements and unusual services that the repeater provides. Incidentally, if anyone contemplating such an installation would like to take advantage of our experiences, good and bad, the club would be happy to provide information. The address is PO Box 2942, Durango, CO 81302.

If you are in southwestern Colorado or "nearby," give a call on 146.07/67 and try our repeater. It is completely open, and one of our greatest joys is helping and getting to know the hams who vacation in and around Durango. We will include you in one of our work parties if you like (and the snow is not too deep). And remember, if you are one of those who want to know where the repeater is and if it is a clear night (as most are), get in touch with a club member, and he or she will turn on the strobe light. Then, you will be able to say you saw our star—our repeater in the sky!—*Durango Amateur Radio Club*

REPEATER LOG

According to July 1987 reports received, repeaters were involved in the following public-service events: 475 vehicle emergencies, 27 weather emergencies, 19 fire emergencies, 18 alerts/drills, 8 medical emergencies, 4 public-service events, 3 criminal activities, 3 power failures.

The following repeaters were involved (followed by the number of events): NK2W 16, WA2ZWP 3, W3UER 12, WA6BJY 7, WD6DIH 22, KA6EEK 66, W6FNO 263, N6ME 103, K8DDG 8, KD8GL 9, WA8ULB 3, N9BHA 7, N9DOK 14, K9LSB 18, N9RM 6.

Conducted By Bob Atkins, KA1GT
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Breaking the North American 10-GHz DX Record

Glenn Elmore, N6GN, wrote recently with details of long-distance 10-GHz QSOs, including a new record DX contact of 413.6 miles. This month's column is devoted to Glenn's exciting story. See October's Upfront in QST *column for a map showing the QSO paths.*

In December 1986, N6GN, of Santa Rosa, California, approached the San Diego Microwave Group about an assault on the North American 10-GHz DX record of 296 miles. This marked the beginning of a coordinated effort between the Santa Rosa and San Diego groups to get stations ready for a summer 1987 attempt. By February, long-time San Bernardino Microwave Society member WA6EXV joined the attempt.

The Shakedown Cruise

In addition to local station verification at each end of the state, a "half path" shakedown was planned for June 20. The San Diego group went to Mt Pinos (8800 feet ASL) in grid square DM04. Their equipment was a modification of the KF6C station and W6OYJ's off-center-fed 30-inch dish. N6IZW modified the IF to use a 145-MHz SSB transceiver, and a two-stage receiver preamplifier was supplied by N6GN. Transmit power was about 1.5 W from a TWT. Almost 300 miles to the north, the Santa Rosa group stations positioned themselves on each side of the central valley on hilltops with views of the valley floor. W6SFH went to Pine Hill in CM98 with his 4-foot dish and 300-mW station. N6GN went to Mt Vaca in CM88 with his ¼-watt station and homemade 4-foot dish. Shortly before this test, another Santa Rosa 10-GHz enthusiast, Bruce WBØHLC, arrived on the scene with a very portable 1-watt station and a 19-inch dish. Bruce went to Mt Diablo in CM97.

The "half-path" attempt was to ascertain equipment functionality and frequency accuracy. Because of the narrow antenna beamwidths involved (less than 2 degrees), pointing accuracy—both in azimuth and elevation—was vital. A 144-MHz SSB frequency was used for liaison. The results of the shakedown were less than optimum. One of the prime problems was poor liaison. Because the path was considerably beyond the radio horizon, not to mention the visual horizon, the tropo-scatter signals on 144 MHz were marginal. Some 10-GHz signals from W6OYJ were heard at N6GN and WBØHLC, but no two-way contact resulted.

Frequency uncertainty added another dimension to the problem. Although the Santa Rosa stations were all phaselocked to 10-MHz frequency standards in proportional ovens, and as a result had at least ± 100 Hz relative accuracy, there was 10 kHz uncertainty in the frequency of the southern end. Simultaneously pointing two "flashlights" while tuning over 20 kHz for a weak signal is quite a proposition! The shakedown was worthwhile in proving the antenna pointing and station performance. The line-of-sight signals between N6GN and W6SFH at 65 miles were at least 50 dB above the noise in SSB bandwidths. The importance of good liaison in coordinating microwave DX attempts was obvious.

July 18-19: The Real Thing

In spite of not having made a two-way contact on the half-path attempt, six stations went to six different mountaintops on July 17 to try to break the standing North American 10-GHz DX record. This time, each station took 200-W-class amplifiers and large Yagis for 144-MHz liaison. In addition, 40-meter SSB and 145-MHz packet was used.

Furthest north was WB7ABP, west of Redding at 6900 feet ASL in CN80. N6GN went to Ball Rock, Tehama County, in CM89—about 45 miles to the south. WBØHLC took a central position at Mt Oso, 3300 feet ASL in CM97 (about 225 miles from each of the ends). W6OYJ was again on Mt Pinos. W6SFH went to Mt Frazier (also in DM04), about seven miles southeast of Pinos at 8000 feet ASL. WA6EXV put his station, running a 20-watt TWT and 2-foot dish, on from Piyute Peak, about 65 miles northeast of W6OYJ and W6SFH.

All stations were up and running by the afternoon of July 18. This time, all stations were able to QSO on the liaison frequency.

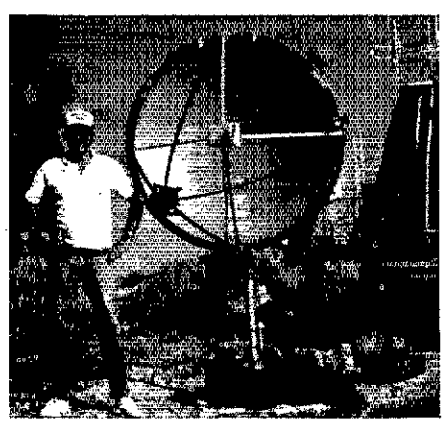
Tests proceeded to see what, if any, signals might be heard in spite of a weather front that brought rain and hail to the northern end of the path and certainly washed out any tropospheric ducts that might have been present. Texts on the subject of tropospheric scatter propagation predicted signal strengths near the noise level in CW bandwidths. As predicted, signals from W6OYJ's 1.5-watt transmitter were weakly copiable by both N6GN (414 miles) and WB7ABP (443 miles). Attempts to make a two-way contact were fruitless; none of the southern stations were receiving WB7ABP or N6GN. All stations went QRT about 2200 local time and agreed to resume at 0530 in hope of some ducting.

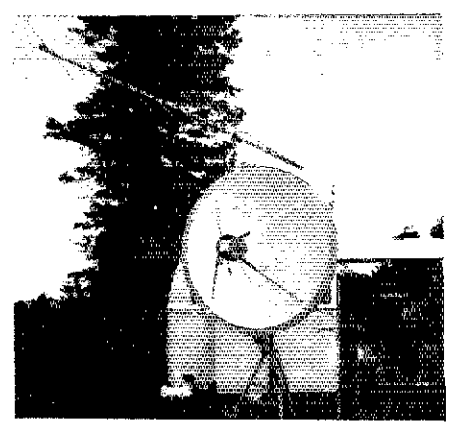
During the night, stable air returned to California. N6GN used packet radio to stimulate digipeaters along the length of the state. This gave an idea of signal strength and of any ducting that might be present at 145 MHz. At 0230, a digipeater located 100 feet from W6SFH on Mt Frazier was weakly copiable, indicating some signal enhancement. At 0520 the digipeater was no longer copiable, but the first 144-MHz SSB liaison transmissions revealed S9 signals! We had a duct! As might be expected, excitement grew from this point on. In spite the ovens for the 10-MHz frequency standards coming out of regulation from the cold and a scurry to get stations running at the early hour, W6OYJ's 10.368-GHz CW signal was copied at 0536 by both N6GN and WB7ABP, with peaks 30 dB out of the noise in an SSB bandwidth at N6GN!

In spite of such strong signals at the northern end, extremely severe multipath fading, a 7-dB differential in station ERPs and a still-unresolved apparent receiver degradation at W6OYJ caused the initial record-breaking QSO to take 13 minutes. By this time it was sunrise, at least in the upper troposphere where the ducting seemed to be taking place. Although the depth of the QSB seemed to decrease, average signal strength was declining.

N6GN next attempted to contact W6SFH, while WB7ABP attempted to work W6OYJ. These attempts resulted in call sets and acknowledgment almost immediately between N6GN and W6SFH. Because of the rapidly dissipating duct, however, the SK to confirm the new 414-mile record QSO took another 40 minutes! Meanwhile WB7ABP and W6OYJ struggled to complete a QSO for what would have been a greater distance. Although call sets were copied both ways, and W6OYJ copied Rs, WB7ABP never received Rs or QSO terminator, and no QSO resulted.

Because of the time used trying to complete contacts, WA6EXV was left to listen during the best part of the duct. By the time N6GN tried to work him, the duct was largely dissipated and WA6EXV's signals were "only" S5, with a rougher quality associated with tropo-scatter signals. N6GN's signals were extremely weak at WA6EXV and no two-way QSO resulted on this path of about 389 miles.





Both ends of the record 414-mile 10-GHz contact. The photo on the left shows W6SFH/6, Mt Frazier; on the right is N6GN/6, Ball Rock, Tehama County.

On Line

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

Packet-Radio Bits

Commodore C-64 TNC Emulation

Digicom64 is a TNC emulator program for the Commodore C-64 computer. This public-domain program, written by hams in Germany, performs all of the functions of a TNC except for multiple connections and modulation/demodulation of packets (a simple two-IC modem that can be built for approximately $15 is required). The software, documentation and modem schematic may be obtained by sending a blank disk, a self-addressed disk mailer with enough postage for at least 3 ounces and $1 for the cost of the printed documentation to Barry Kutner, W2UP, 286 Leedom Way, Newtown, PA 18940. Barry says that he has been forced to purchase a second disk drive to keep up with the demand for Digicom64 software.

Dual-Port Digipeating TNCs

Back in August, I mentioned the lack of a commercial TNC with two radio ports that allow users to digipeat from one port to another. Soon after August *QST* landed in my mailbox, I noticed an advertisement that proved me wrong. A letter from Travis Brann of Kantronics landed in my mailbox shortly thereafter.

According to Travis, "Both the Kantronics All Mode (KAM) unit and the Kantronics Dual Port KPC-4 will automatically gateway between their two radio ports. With the KAM, HF input can be output via the VHF port and vice versa. This permits VHF packet stations to connect to and converse with HF packet stations.

"The Kantronics KPC-4 works similarly with two 1200 baud radio ports, rather than an HF and VHF port. Some of these units are now in operation providing a gateway between Novice operators on 220 MHz and PBBSs on 2 meters."

New Packet-Radio Book

A new book, entitled *Your Gateway to Packet Radio,* should be available at your dealer or from ARRL soon. Written by your On Line conductor, the book attempts to cover the whole packet-radio *enchilada* with something for the packet-radio novice and expert alike. A sample of the subjects covered are packet-radio history and theory of operation; installation of packet-radio equipment; selection of TNC parameters; procedures for VHF/UHF, HF and PBBS operations; public-service, space and network communications. In addition, a series of appendices contains a wealth of useful information. The book was a labor of love for nearly a year; I hope you like it!

When Requesting Software...

Shel Shallon, W6EL, has been distributing MINIPROP, a propagation forecasting program, and remarks that "the response to the MINIPROP plug in August On Line was phenomenal! MINIPROP has been mentioned elsewhere, but with nowhere near the response. Perhaps the offer of free software is what made the difference... I don't know. In any event, I have enjoyed making MINIPROP available to your readers. A few even sent contributions, sight unseen, which is more than I expected.

"There was a negative side, however. I was shocked at how many respondents did not observe some basic courtesies. Please advise your readers that when they request software that they:

"1) Send a quality diskette that is pre-formatted and labeled, and

"2) Send an unused, self-addressed, stamped disk mailer. The mailers are usually available in stationery stores. The unsealed mailer, with diskette inside, should be sent in a large envelope or other enclosure.

"It is too late for this to help me, but perhaps someone who offers software in the future will find it easier."

HELP WANTED

I would like to get in touch with...

- anyone using an Apple IIc or Tandy 100/102 for packet radio. Ben Alabastro, WA2PXR, 108 S Frankfort St, Frankfort, NY 13340.
- anyone transmitting RTTY on 20 meters without RFI using a Radio Shack Color Computer II. Les Taylor, WAØQIT, 123 S 65th Ave, W Duluth, MN 55807.
- anyone conducting packet-radio experiments with OS-9 Level 1 or 2, BASIC09, or C running a Tandy Color Computer or other OS-9 based system. Bob Billson, KC2WZ, 837 Summit Ave, Westfield, NJ 07090.
- anyone with information about the CoCo Freeware Clearinghouse and ham-radio applications for the Tandy Color Computer. Earl Oster, Jr, KA5UJC, 3845 Eloise St, Beaumont, TX 77707.
- middle-sc[illegible] teachers interested in linking their classrooms via packet radio. Al Dilley, K1ADQ, Lyndonville Graded School, Lyndonville, VT 05851.
- anyone who has successfully interfaced a Flesher TU-170 to the RS-232-C port of a Tandy Model 100 SX computer. Charles Bisceglia, KF4PC, 5 Par Harbor, Salem, SC 29676.
- anyone with service information for a computer terminal made by Infoton of Burlington, MA (model number 1200/3 09200 G01-OM). Tim Skoning, KB9PA, 800 Water St, Dundee, IL 60118-1343.

PX: Project Mac

Instead of the usual you-send-us-an-SASE-and-we-stuff-a-program-listing-in-your-envelope-and-send-it-back-to-you, let's try something completely different. Let's call it "Project Mac" and this is how it will work:

1) You send me (*not* ARRL Headquarters) one 800k or two 400k formatted 3½-inch Macintosh diskettes with a sturdy SASE (include at least 39 cents postage for one diskette or 56 cents postage for two diskettes).

2) If you have written a ham radio program (or programs) for the Macintosh computer, include a copy on one of the diskettes you send to me (please do not send me any copies of commercial programs; we do not want to get involved with the copyright laws).

3) During the next six weeks, I will collect your diskettes and your programs.

4) After the six-week period is over, I will copy the programs I have collected onto your diskettes and return them to you.

To start the ball rolling, I will include the following Mac programs that have been submitted for PX distribution:

Logger by Dave Mascaro, WA3JUF, a contest duping and logging program written in BASIC.

MacMiniMUF by J. Scott Weaver, KA2OVS, an MUF calculator also written in BASIC.

Start those diskettes, programs and SASEs coming. Mail them to: Project Mac, c/o Stan Horzepa, WA1LOU, 75 Kreger Dr, Wolcott, CT 06716-2702. Remember, *do not* send the stuff to ARRL headquarters.

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to PO Box 117, Burtonsville, MD 20866,
or call 301-384-6736 to record late-breaking information.

A Flurry of Activity on the Microwaves

Only a couple of years ago, it was a pretty much accepted premise that we North Americans were far behind the Europeans in microwave technology and activity. While it is true that they have continued to excel in this facet of Amateur Radio, Europe no longer has the commanding lead on us that it once did. Over the last few years, microwave activity has blossomed in many parts of the US. This is in part due to the emergence of a number of regional clubs devoted to developing activity and techniques in this region of the spectrum. The Microwave Conference held for the past several years in Estes Park, Colorado is another significant contributor. In addition, there has been an increase in the number of microwave-related papers presented at the several VHF conferences held in various parts of the country. The institution in *QST* of The New Frontier column has also had a positive effect. While The World Above 50 MHz continues to report operating accomplishments on all bands above 50 MHz, The New Frontier concentrates on techniques applicable to the microwave bands.

It must be admitted that our microwave activity and level of technology has been helped by the availability of commercial European transverters and other gear. These have brought to many the advantages of narrowband techniques for bands up through 10 GHz. Just as on 5 meters in 1938 and 2 meters in the late '40s, the key to extending VHF and UHF range beyond the local area is the use of narrow-band techniques. Reducing the noise picked up by the receiver, by reducing its bandwidth to a few kHz or less, aids considerably in enabling reception of signals down to the small fractions of a microvolt. This can open up a whole new world of weak, but copiable, signals propagated by other than line-of-sight modes.

Even with the availability of commercial transverters, a significant amount of work on this side of the Atlantic is being accomplished with equipment designed and constructed entirely by the hams using it. Much of this too is stabilized, enabling the use of SSB and CW transmission and reception. One of the most outstanding examples of such narrowband microwave work done in this country to come to this conductor's attention is the product of WA3RMX and WB7UNU. These two, who reside in the Portland, Oregon area, have used SSB to cover paths as long as 115 miles on all bands from 13 cm (2.3 GHz) to 1.2 cm (24 GHz). They have even worked approximately 14 miles, also using SSB, on 47 GHz. All of this was done with equipment they constructed. Another prime example of homegrown microwave progress is the EME work accomplished on the 9- and 5-cm bands by several groups.

California has always been a hotbed of microwave activity. In part, this can be credited to the work of the San Bernardino Microwave Society, which goes back 20 or more years. Recently, they have been joined by several new groups including ones based in San Diego and Santa Rosa. See this month's The New Frontier column for the latest news on their accomplishments.

The southern Midwest, particularly Oklahoma and Texas, has become a veritable beehive of microwave activity with new groups popping up every month. Some of these take the form of organized clubs, while others can best be described as informal associations of few people who share a common interest. The Northern Oklahoma Microwave Development Society (NOMADS) appears to be one of the latter. It consists primarily of W5UGO, K5PJR and WA5ICW. The three have been traipsing all over the Midwest with portable narrowband 5-cm (5.6-GHz) gear, giving out grids and states. All use similar equipment, about 4 W to four-ft dishes, with which they have worked as far as 331 miles and amassed grid totals of up to 30. In all cases, dish height has never been more than about 10 feet above ground, and usually less. There aren't any mountains in their part of the country. Apparently, all that is needed is an unobstructed horizon. So much for line of sight!

This is just a small sample of what is happening all over the country. It should serve as an object lesson that, especially if narrowband techniques are used, these frequencies can provide contacts considerably beyond line-of-sight distances. However, whether you use wideband set-ups such as Gunnplexers or the latest in narrow-band transverters, there is a lot of enjoyment waiting on these bands. It certainly appears that the most productive method of operation is through a group effort, but two individuals can have a lot of fun, too. Keep me informed of your activities and progress, especially in a form that can be used in the Microwave Standings Box. For this, I need to know number of US states worked, number of call areas worked, number of grids worked and best terrestrial distance. This information can best be presented in the form of a tabulation of stations worked. Narratives relating experiences encountered during portable operations, while more interesting to read, often omit some of the pertinent information. It doesn't hurt to provide both.

Speaking of the Microwave Box which appeared in last month's column, I regret to report that a computer glitch was responsible for wiping out the 23-cm file. Like most computer glitches, this one was the operator's fault—mine. I tried, as best I could, in the time available after the goof was discovered, to reconstruct the missing data, but I am sure there are a few errors. Therefore, I ask that everyone who is listed, or should be, review the data presented and provide corrections or updates. Please provide information for all of the bands covered in the Box but especially for 23 cm. Have information to me by February 5. The box is to appear again in the April column.

ON THE BANDS

There isn't much space left for news this month, which is fortunate because, except for the Perseids Meteor Shower, much less in the way of long-distance propagation has been taking place than during the during June and July. A number have complained that, over the summer months, there hasn't been much in the way of tropo. That lack was made up, here on the East Coast at least, in two very good sessions. The first of these lasted some three days, apparently beginning Thursday evening August 13. This conductor first became aware of what was happening at 0140Z August 14, upon hearing a 5-by-8 2-meter signal from K2TTI FN34 in northern New York state. That's an area we don't work very often from the Washington-Baltimore area. After working that station, W1AIM Vermont, also FN34 was worked along with W9IP/2 in FN24. The opening extended well to the south as attested by hearing stations in Virginia and the Carolinas off the back of the beam working into upstate New York and New England. I was able to take advantage of the two-way propagation by turning around and working K4HJE EM96, KB4ABJ FM06 and AA4ZZ EM95 before closing down for the night at 0345Z. The following morning, at 1130Z, K1SF in FN42 was worked with ease. But the big surprise was to arrive home from work that evening at 2145Z and hear W9IP/2 still putting in a good signal. A few minutes later, WA1OUB New Hampshire FN43 was worked. Saturday morning, beginning at 1245Z contacts were made with K1GBO FN41, K1JRW FN32, KA1OTP Rhode Island FN41 and VE1UT FN63, the latter requiring me to resort to CW. That evening an FB QSO was held with WA1AYS FN42 along with his neighbor N1DIB. I know that others did much better than me in terms of number of QSOs and DX, including many contacts between the Carolinas and Georgia with northern New England. I'm not complaining, however, as the 2-meter set-up at W3XO currently consists of 80 W to 16 elements at 78 feet. Many stations heard were running moderate or low power as well, some as low as 10 W. Also, although specifics are sparse, I know that the higher bands came in for their share of extended range DX as well.

Another tropo session took place here Saturday evening September 5. This one didn't last beyond that evening and seemed to cut off at about the Richmond, Virgina-Tidewater area but, from there north, signals to New England and the Maritime Provinces of Canada were very good on bands from 2 meters up. For this conductor, the highlight of this opening was being able to hold extended QSOs with some old friends such as W2RS and K1WHS as well as to be able to complete a solid SSB contact with VE1UT. I may have discovered this opening late as K2GK, in central New York State, says that he worked Michigan and Wisconsin stations the evening before. Max reports that, in addition to working a number of 2-meter stations, many in the 10 W class, he contacted KB8JI in EN64 on 1¼ meters for grid number 53 on that band.

Next month, I will attempt to review the Perseids, including recounting a meteor-scatter contact by WB5LUA from his mobile.

50-MHz DX Standings

DXCC countries based on information received as of September 12, 1987. Space limitations dictate that continental US and lower-tier Canadian stations with fewer than 15 countries (except those who claim WAC) not be listed. Crossband totals are those not duplicated by 6-meter two-ways. Countries are those listed in the latest *ARRL Countries List,* but deleted countries worked prior to their deletion have been counted. Credit has not been granted for contacts with stations known not to have been authorized 6-meter operation at the time of the contact. Unless noted, totals are those worked by individual or club stations operating from a single location or multiple locations within a radius of 150 miles. The next update will be published in the November 1988 column. In order to be included in that update, reports must arrive at the my address, listed at the top of each World Above 50 MHz column, by September 1, 1988. Reports need not be on the special forms, but use of these forms is helpful. The forms are through for an SASE to the column address. Whether reports use the forms, they must state each country, one station worked in that country, an indication as to whether the contact was two-way on 6 meters or crossband, the date of the contact and whether the contact has been confirmed by receipt of a QSL.

	1	2	3	4
VE1YX*	82	81	14	13
JA4MBM*	81	79	0	0
KBWKZ*	76	73	13	13
K5FF*	76	73	3	3
W5VY*	76	72	10	9
KH6IAA	74	72	0	0
W5FF*	74	71	2	2
VE1BNN	73	73	6	6
W2IDZ*#	73	71	9	8
W4CKD*	73	70	12	11
ZD8TC*	71	71	14	—
W3XO*	71	60	12	5
JA1RJU*	70	70	0	0
WB2CZB*	70	64	9	9
WB4OSN*	69	67	8	6
LU3EX*	69	67	0	0
K1TOL*	69	66	0	0
W4OO*	68	67	4	—
WA5IYX*	68	60	10	8
N3AHI/4*#	67	65	0	0
W8CMS	67	64	12	9
WA1OUB	67	64	11	10
JA1VOK*	66	66	0	0
WD4IYS*	65	65	15	14
WB2MAI	65	65	9	7
W3JO	65	65	7	3
WA7JTM*	65	61	1	1
W2CAP/1*	65	58	12	11
N4EJW#	64	60	0	0
W4WHK	64	58	13	6
WA4OWC*	64	54	0	0
K4KUZ*	63	63	0	0
JA2DDN*	63	63	0	0
W5HUQ/4*#	63	59	16	8
K4CKS*	62	58	18	13
JA3EGE*	61	60	0	0
WA4UAS*	61	59	0	0
WA2BPE*	60	57	13	6
WA8LXJ*	60	55	18	18
K5SW*	59	59	10	10
K5ZMS*	59	58	2	0
JA5HTP*	59	58	0	0
W6XJ	59	—	3	—
WB7OHF*	58	58	1	0
KA1PE*	58	54	0	0
W6BJI*	57	56	2	2
LU9AEA	57	56	0	0
W1JR*	57	55	7	6
W3IWU*#	56	56	15	15
W5DZF/4*	56	54	2	2
N5DDB*	56	52	1	1
K1ZFE*	55	55	5	5
LU3DCA	55	55	0	0
KA1BRD*	55	55	0	0
WA5JRA*	55	19	3	1
W1QXX	54	54	12	11
JE1TGN*	54	54	0	0
NØLL*	54	53	8	8
WA6BYA*	54	53	0	0
N6AJ*	54	51	1	0
LU7DZ*	54	48	0	0
K5CM*	54	—	—	—
K3QMX*	53	53	12	12
W7KMA*	53	52	2	1
K8EFS*	53	51	18	15
WA5HNK*	53	51	15	15
K2YOF	53	50	9	9
JA2ODM*	53	48	0	0
W5UWB*	53	42	0	0
WB8BKC*	52	52	16	15
JAØAGA*	52	52	0	0
W2RTW	52	48	0	0
WØSF*	51	51	0	0
W1EJ*	51	50	12	10
N5KW*	51	48	—	—
WB4RUA	51	47	0	0
WA7EPU*#	50	50	1	1
WB2PMP/4*	50	49	10	9
WBØPKN*	50	49	7	7
KØGJX*	50	49	3	2
W6SMS*	50	48	1	—
PY2XB*	50	47	2	1
WB7TOV*	50	47	0	0
N6CT*	50	44	1	1
WA3DMF	49	47	13	13
WA9AHZ*	48	48	14	14
JA2TTO	48	48	0	0
K2QWD*	48	46	13	13
K8UNV*	48	46	2	2
W3WFM	48	45	0	0
W2MPK*	48	44	13	7
JA6YBR*	48	—	0	0
JF3KQA	47	47	0	0
WA1AYS	47	46	15	14
WA1UQC*	47	45	16	3
W3BWU	47	45	10	10
WA6PEV*	47	44	3	3
N4TL	47	43	3	3
KG6DX	47	42	0	0
WB8GEX*	46	44	14	12
K2QIE*	46	43	7	2
LU8BF	46	42	0	0
K1ICM*	45	45	15	8
JA9DUR*	45	45	0	0
KA1A	45	45	0	0
WB8GEW*	45	44	5	5
W4NVW/3	45	44	2	0
WD4FAB	45	43	7	5
WB8YFE*	45	43	5	5
WB2WSV*	45	42	2	2
XE1GE	45	42	1	1
WA8ONQ*	45	41	7	7
KØTLM*	45	41	5	5
K4QXX	44	43	1	1
K1MNS*	44	42	0	0
JA2GHT	44	42	0	0
AE3T*	43	43	14	14
N3CEX*	43	42	6	6
WB8KAY*	43	42	0	0
KS2T	43	41	0	0
WB4NMA	43	—	0	0
K6QXY	42	42	0	0
VK8GB	42	42	0	0
ZL1MQ	42	42	0	0
KAØAYN*	42	41	0	0
KA1DHO	42	40	10	8
KG6JDX*	42	38	0	0
KH6FLD	42	35	0	0
CX8BE*	42	29	0	0
N5BBO*	41	41	6	6
K1FWF*	41	40	18	10
W5KRH*	41	39	3	3
WB5CHW*	41	37	7	4
JG3AOD*	41	37	0	0
W5HN*	41	35	0	0
K7ICW	41	34	1	1
W3OTC	41	34	0	0
WAØCSL*	41	15	6	4
VP2VGR*	41	—	11	—
K4VPK*	40	39	7	7
N5WM*	40	39	6	5
K6KLY	40	39	0	0
KB4CRT	40	38	1	1
WB6BMB*	40	38	0	0
W1AIM*	40	36	3	0
VP2MO	40	34	0	0
WB6KBZ*	40	29	1	0
K1FJM/4*	39	39	7	6
K4GOK	39	37	12	10
K1GPJ*	39	37	0	0
K1SF	39	35	8	3
JA1NVG	38	38	0	0
WA7UJH*	38	37	0	0
W5NZS*	38	37	0	0
WA5VJB	38	35	1	1
WB5JAR*	38	34	7	6
N7AKB*	38	34	1	1
VE3ASO*	38	31	0	0
N4MM	37	37	0	0
WA1CRE	37	36	5	4
JA7QVI	37	35	0	0
W1GXT	37	34	12	4
K3ICH/4	37	32	0	0
WA6HXM	37	29	0	0
K7GGJ	37	28	0	0
KØUS*	37	23	1	1
WBØZKG*	37	20	4	3
WD2AKA	36	34	9	6
HC2FG	36	34	2	2
WAØSBZ*	36	33	3	2
W6ABN*	36	32	3	3
JH3WXB	36	32	0	0
K3HCE	36	31	6	4
VE3DSS*	35	34	14	11
WA9ETW*	35	34	2	2
WA5UFH*	35	33	0	0
KØUDZ*	35	32	3	1
KC2TX/5	35	32	1	1
N6AMG	35	26	0	0
W2VO*	35	26	0	0
N7DB	34	34	0	0
K1DAT	34	33	8	5
N4VC	34	33	1	0
WØJR*	34	33	0	0
WA6CRA/4	34	31	8	8
KAØETE*	34	31	0	0
WA1ZUB	34	30	11	7
WD2AFH	34	28	4	0
K1SC/7	34	28	2	2
VP2MJ	34	26	1	1
K6JYO*	34	22	0	0
W2LT	34	20	9	0
K6JZK	33	33	0	0
WA7GCS	33	33	0	0
W2CNS*	33	32	10	4
K8TGC	33	31	4	4
W2RLV	33	31	3	2
KA4AOK	33	30	11	6
N6RZ	33	24	1	1
AE9M*	33	23	11	1
WB8PAT*	32	32	11	9
K6GSS	32	32	0	0
K2OVS	32	31	13	12
K5VVV*	32	31	3	0
AD1C	32	31	0	0
KS4J*	32	31	0	0
N6VI	32	31	0	0
N7ARC*	32	31	—	—
WB8IGY	32	30	9	7
WS4F	32	30	—	—
K6QAX	32	29	0	0
K1ZKR	32	29	0	0
WB2QLP/4	32	26	5	4
W5NKG	32	25	2	1
K4LFF*	32	22	0	0
K6PHE	31	31	0	0
WA2EQK	31	30	6	6
VE4AS*	31	30	2	0
WB6NMT	31	26	2	1
VE1RC	31	26	0	0
W2BN	31	24	4	1
LU6DLB	31	16	0	0
VK2BA	30	30	0	0
VK4ZJB	30	30	0	0
N4CD	30	27	12	8
JG3RGG*	30	22	0	0
KC3EP	30	22	0	0
VK2DDG	29	28	2	—
K4ROM	29	27	5	5
WAØNOK	29	27	2	1
K8RZB*	29	26	8	3
KD9JQ#	29	26	0	0
VE3FDP	29	25	10	8
WB2TMD	29	25	6	4
WA8OGS*	29	25	0	0
8P6KX	29	24	8	2
WB7SLY	29	20	1	1
VE3EVW	29	17	13	7
C6AEH*	29	—	13	—
KCØJ*	28	27	0	0
N5JM	28	25	3	3
N5DDS*	28	25	2	2
W9TC	28	25	—	—
N7AQM*	28	22	1	1
WA5QCP	27	27	0	0
N9ANO*	27	27	0	0
W7FIV	27	26	2	1
KØØJ*	27	25	0	0
N6AMD	27	25	0	0
KA5CAW	27	23	0	0
K9SM*	27	21	6	4
YV4UY	27	20	0	0
N2ASC	26	26	3	3
WA9DYV*	26	26	1	1
VK2QF	26	26	0	0
VK2VC	26	26	0	0
VK2DDG	26	25	2	0
VE5LY	26	25	1	1
VK3OT	26	25	0	0
K9XY*	26	22	0	0
WA9DYT	26	22	0	0
KØSE*	26	21	2	2
NP2AE	26	21	0	0
KA1CDZ	26	13	15	3
WA2YWP	26	13	4	2
K1LPS	25	25	4	4
N7EIJ	25	25	0	0
KAØCDN	25	25	0	0
WA5OLT	25	22	5	5
JF3TDC	25	22	0	0
WØRGU*	25	21	3	3
VE5JQ	25	20	2	2
N8AXA*	25	19	5	4
XE1FE*	25	17	1	1
9Y4LL	25	13	0	0
WB4SLM	25	13	0	0
W8NE/4*	24	24	1	1
WA4TJW	24	24	0	0
KØSFH*	24	23	1	1
W7HAH	24	23	0	0
KD4HP	24	21	4	2
W8QOI	24	21	2	2
W9NAW	24	20	2	2
JM1LCW	24	17	0	0
KJ3F	23	23	0	0
HK4EB	23	23	0	0
W7ABX	23	22	0	0
VK2KAY	23	21	0	0
W7JXU	23	20	0	0
WA2QCE	23	19	0	0
HC8VHF*	23	—	4	—
OA8V	23	—	0	0
W7KNT	22	22	0	0
WB6AAG	22	22	0	0
KA6ING	22	22	0	0
VK3AWY	22	22	0	0
VK5LP	22	20	0	0
WBØRJR	22	19	4	2
WB2QLP	22	18	5	4
KA1YQ	22	17	7	1
K7NV	22	16	1	1
KB7N	22	16	0	0
PY2TTV*	22	15	0	0
KA5FLE*	22	14	0	0
KA1GIY	22	12	2	1
JE3YIA	22	12	0	0
HC1MD/HC5	22	—	2	—
WDØFOY	21	21	0	0
KD6PY	21	21	0	0
VK2BNN	21	20	0	0
KA4CRT	21	20	0	0
WB4WXE	21	20	—	—
WB6CTQ	21	19	0	0
K6ZMW	21	18	0	0
VK3AUI	21	17	0	0
VK9XT	21	17	0	0
NI6E	21	16	0	0
K1HTV/3	21	15	17	3
9Y4JW	21	12	1	1
VK4ALM	20	20	0	0
WD8OXK	20	19	2	2
JG3JLC	20	19	0	0
VK3XQ	20	19	0	0
VK7JG	20	18	0	0
K2JF	20	17	5	5
VE1BUF	20	15	4	3
KB6OK	20	—	0	0
WA8LLY/6	19	19	0	0
ZB2BL	19	18	8	4
VE5XU	19	18	0	0
WØJRP*	19	18	0	0
PY2DJC*	19	15	0	0
W9OEH	19	—	0	0
VE6CX	18	18	1	0
WØLSD	18	18	0	0
NØAJU	18	16	0	0
WA4TNV/KL7	18	15	0	0
GW3MHW	18	15	—	—
WAØOFO	18	14	1	1
KC4KK	18	14	0	0
K9LCR	17	17	3	3
VK3AMK	17	17	0	0
VK4TL	17	17	0	0
VK4ZAL	17	17	0	0
WB9OPD	17	16	1	0
KB7Q	17	16	0	0
VK3NM	17	16	0	0
N2AVR	17	15	0	0
VK4AYX	17	14	0	0
KA4CRT/5	17	14	0	0
WØPVL*	16	16	0	0
KØCJ	16	15	5	2
VK4ZSH	16	15	0	0
VK2ZRU	16	15	0	0
KL7GLL/4	16	14	0	0
W8SMD	16	11	5	5
OA8CW	16	—	0	0
KØWM	15	15	1	1
W7IDZ	15	15	0	0
VK3AQR	15	14	0	0
N5BOG	15	13	0	0
8P6CX	15	11	2	1
NA4I	15	11	0	0
VK9YT	14	12	0	0
GW3LDH	14	10	11	5
V2ADX	14	4	0	0
KL7JAI	13	13	0	0
VK2EEC	13	12	0	0
VK3ZZX	13	12	0	0
VK6HK	13	8	3	0
EI2W	13	—	—	—
WAØLHK*	12	12	2	1
VP9WB	12	11	4	1
W1QXX/KP4	12	10	0	0
G4BPY	11	11	34	30
AL7FH	11	11	0	0
AL7C	11	11	0	0
J6LOV	11	9	2	2
G3COJ	11	7	9	7
JN1DQO	11	5	0	0
GJ3YHU	11	3	4	1
VK6OX	10	10	1	1
KL7WE	10	10	0	0
KL7JJH	10	10	0	0
KL7IKV	10	10	0	0
ZD7BW	10	10	0	0
FK8EB	10	10	0	0
VK4KHZ	10	8	0	0
SZ2DH	10	—	0	0
XE2BC	10	—	0	0
VK6RO	9	9	3	3
WB4WXE/KL7	9	8	0	0
G5KW*#	9	4	35	—
K6KLY/8P6	9	3	0	0
VP2VDL	8	6	0	0
GI3ZSC	8	—	—	—
8P6MH	6	6	4	1
G4JCC	6	4	37	35
G4GLT	6	—	13	—
G3PWK	6	—	12	—
GW3LDH	6	—	—	—
WB4YLR	5	5	0	0
GU2HML	5	—	16	—
G4HUP	5	—	—	—
G4JLH	5	—	—	—
G2AOK	4	—	—	—
G4BAO	4	—	—	—
ZS6WB	3	3	0	0
GM4FZH	3	—	—	—
VK2ZDI	2	2	0	0
SM7BAE	1	1	6	3
SM6PU	0	0	23	10
DJ2RE	0	0	14	9
DK6JL	0	0	11	4
SV1DH	0	0	10	—
CT2EE	0	0	5	2
OZ9QV	0	0	5	1
G3VZJ	0	0	4	4
G3PLP	0	0	4	2
I5CTE	0	0	4	0
G4ANT	0	0	3	2
G3TAA	0	0	3	2
F6EMT	0	0	3	2
HA6NP	0	0	3	—
HB9QQ	0	0	2	2
G3RDO	0	0	2	2
OE1HGW	0	0	2	1
OZ7IS	0	0	2	—
G4IDE	—	—	18	—
GM4WOJ	—	—	9	—

1—6 Meter two-way claimed.
2—6 Meter two-way confirmed.
3—Crossband claimed.
4—Crossband confirmed.

*6 meter two-ways claimed with all continents.
#Some contacts made from locations more than 150 miles apart.
**Includes 4- to 6-meter crossbands and 4-meter two-ways.

Canadian NewsFronts

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Moved and Seconded . . .

MINUTES OF THE 1987 ANNUAL MEETING
OF THE BOARD OF DIRECTORS
THE CANADIAN RADIO RELAY LEAGUE, INC
LA LIGUE CANADIENNE DE LA RADIO
AMATEUR, INC
1987 AUGUST 29
MEETING No. 10

Agenda

1. Roll Call
2. Moment of Silence
3. Consideration of Agenda
4. Approval of Minutes of CRRL Board Meeting No. 9
5. Reports of Officers and Directors
6. Report of the Counsel
7. Report of the General Manager
8. Committee Reports
9. Other Reports
10. Items for discussion and possible action
11. Additional items as per directors' requests
12. Appointment of officers and committees for 1988
13. Approval of actions of the Executive Committee
14. Closing comments
15. Adjournment

Minutes

1) Pursuant to due notice, the Board of Directors of the Canadian Radio Relay League, Inc, met in annual session at the Airport Marriott Inn, Rexdale, Ontario, *on 1987 August 29. President Tom Atkins, VE3CDM,* called the meeting to order at 0900 EDT. The following were present: Vice President and Secretary Harry MacLean, VE3GRO; and Directors David Fancy, VE7EWI (Pacific Region), William Gillespie, VE6ABC (Midwest Region), Raymond Perrin, *VE3FN* (Ontario Region), and Claude Brunet, VE2ZZ (Quebec Region). Also present, but as observers or to present reports, were the following: Honorary Vice President Noel Eaton, VE3CJ; Treasurer William Loucks, VE3AR; Counsel Robert Benson, QC, *VE2VW*; General Manager Raymond Staines, VE3ZJ; Field Services Manager Jack Strangleman, VE3GV; Assistant Directors Al d'Eon, VE3AND, and George Spencer, VE3OZW; Canadian representative to the ARRL VHF-*UHF* Advisory Committee Dana Shtun, *VE3DSS*; and ARRL President Larry Price, W4RA.

2) President Atkins welcomed everyone to the meeting and announced that Director Ronald Hesler, VE1SH (Atlantic Region), would be unable to attend. Everyone then observed a moment of silence in memory of amateurs who had passed away.

3) It was agreed to follow the agenda that had been provided. Moved by Mr Gillespie, seconded by Mr Fancy, the Board VOTED to adopt the minutes of CRRL Board Meeting No. 9 as issued by the Secretary and printed in *QST*.

4) Mr. Atkins then presented his report. He announced that, at DOC request, CRRL would be part of a working group dealing with Restructuring of the Amateur Service. He reviewed events leading up to the *release of the 18- and 24-MHz bands. Moved by Mr* Atkins, seconded by Mr MacLean, the Board VOTED to adopt the IARU band plans for these bands and recommend them to Canadian amateurs. Mr Atkins announced that IARU Region 2 was now calculating *its dues on the basis of the number of amateurs in each* country rather than on the number of members in each country's IARU member-society. This would not result in a significant change in the dues which CRRL would be required to pay.

5) Mr Loucks, as Treasurer, reported that CRRL was in good financial health. Revenues were up considerably as a result of the successful membership-development campaign. Expenses were only slightly ahead of projections. There would likely be a small surplus at the end of the year.

6) Mr Atkins then asked each Director to comment on previously submitted written reports. Mr Perrin, as Ottawa liaison, noted that Deregulation of Mode Subbands was probably imminent. Mr Atkins advised that he would be meeting with senior DOC officials within the week. He would take the matter up with them then. Moved by Mr Perrin, seconded by Mr Fancy, the Board ADOPTED the following resolution:

> WHEREAS DOC appears committed to implementing Deregulation of Mode Subbands, *but*
>
> WHEREAS many Canadian amateurs express a continuing need for guidelines,
>
> MOVED that, should Deregulation of Mode Subbands take place, DOC be requested to *recommend the use of IARU band plans in their General Radio Regulations, Part II*, and to publish current IARU band plans in *RIC-25*.

7) Mr Brunet then spoke of the ongoing cooperation between RAQI, Radio Amateur du Quebec, and CRRL. The two organizations had jointly produced French versions of the DOC *Questions Bank* books. RAQI would be helping to market *Manual de Formation: Certificats de Radioamateur*, the French version of the Zbarsky *Licensing Manual*. Mr Atkins congratulated Mr Brunet on personally recruiting over 100 new CRRL members during Mr Brunet's first six months as Director, in recognition of which Mr Atkins presented Mr Brunet with a bottle of Canadian champagne (applause). Mr Fancy then spoke of the long and faithful service of Wally Garrett, VE7CJT, who, for *the past seven years, has been reading CRRL News* bulletins on Sunday cross-Canada and other nets. Mr MacLean spoke of the work of Jean-Serge Labelle, VE2ED, who, for the past four years, has been translating CRRL, ARRL and IARU bulletins into French *and making them available on the air. Moved by Mr* MacLean, seconded by Mr Brunet, the Board VOTED to recognize the work of Mr Garrett and Mr Labelle with CRRL Certificates of Merit, each to be presented soon, at a suitable public occasion.

8) Counsel Benson then reported on legal assistance given to amateurs experiencing EMI and antenna-tower problems. Mr Eaton related events leading to the dismissal of a request for a stop-work injunction against Ken Mangaroo, VE3NCM, of Burlington, Ontario. Mr Mangaroo would now be able to erect an antenna tower on his property. While there was still the possibility of a lawsuit, this was now unlikely. Moved by Mr MacLean, seconded by Mr Perrin, the Board VOTED that the Secretary write to Mr Mangaroo, congratulating him on securing an important victory which would benefit all Canadian amateurs. The Board was in recess from 1035 until 1050.

9) After recess, Mr Benson reviewed the Jack Ravenscroft case. He noted that CRRL Counsel had provided extensive "behind the scenes" legal assistance, *that Ontario Director Perrin had testified on behalf of* Mr Ravenscroft at the trial, and that CRRL had supported the Jack Ravenscroft Susceptibility Fund through publicity in the *CRRL News bulletins* and *QST*, and through fund-gathering activities at hamfests *and conventions. Subsequent discussion centred on the* advisability of filing an *amicus curiae* brief in the appeal. There was concern that such a brief might make CRRL party to the action and liable in the event of an adverse decision. There were other ways of assisting. *Moved by Mr Perrin, seconded by Mr Fancy, the Board* VOTED to authorize the expenditure of up to $1000 to permit CRRL Counsel to conduct additional research which could assist the law firm conducting the Jack Ravenscroft appeal.

10) Mr Staines, as General Manager, spoke about his work at CRRL Headquarters. There would soon be a need for additional space. ARRL President Price brought greetings from the ARRL Board and commented on the positive contributions CRRL had made at the IARU Region 2 General Assembly in Buenos Aires, Argentina, and the need to be ready for a General WARC which could be convened as early as 1992.

11) Mr Strangleman, as Field Services Manager, then presented his report. Many forms used by Section-level volunteers had been "Canadianized." Canadian appointment certificates were in preparation. In Canada, there did not appear to be a need for Affiliated Club Coordinator (ACC). Later in the meeting, there would be a proposal which could eliminate the need for Technical Coordinator (TC). RFI/OO coordinator (RFI/OO), Public Information Officer (PIO) and Provincial Government Liaison (PGL) might be considered optional appointments. Mr Strangleman then described the need for Vice Directors, able to act in the absence of Directors. There was some question if CRRL could have Vice Directors under Canadian corporate law. Moved by Mr MacLean, seconded by Mr Atkins, the Board VOTED to have Mr Perrin form an ad hoc committee to study changes in the CRRL By-laws, *with particular reference to the feasibility of* CRRL having Vice Directors.

12) At 1125, the Board moved into a Committee of the Whole. At 1220, the Committee rose and the Board resumed. Mr Atkins, as Chairman of the Committee, *reported that various aspects of a possible CRRL-*CARF merger had been discussed. Moved by Mr Brunet, seconded by Mr Perrin, the Board VOTED unanimously to adopt the following resolution:

> WHEREAS the CRRL Board resolved on 1985 July 13, and again on 1986 May 24, that CRRL should work for the creation of a single national Amateur Radio organization for Canada, but
>
> WHEREAS the CRRL Board still has reservations about many aspects of merger with CARF, the Canadian Amateur Radio Federation,
>
> MOVED that representatives of the CRRL Board continue discussions with their counterparts in CARF, with a view to merging the operations of CRRL and CARF into a single national Amateur Radio organization.

The Board recessed for lunch from 1230 until 1305.

13) After lunch, Dana Shtun, VE3DSS, as Canadian member of the ARRL VHF-UHF Advisory Committee, reported on his efforts to create a like committee in Canada. In addition to its other functions, this committee would assist DOC in finding frequencies, compatible with Amateur Radio, for Radiolocation, on bands which Amateur Radio shares with Radiolocation on a secondary basis. Moved by Mr Gillespie, seconded by Mr Fancy, the Board VOTED that Mr Shtun form such a committee, with himself as Chairman and with leading VHF-UHF amateurs from across Canada as members, and that the Management and Finance Committee make provisions in its 1988 budget to fund the committee's operating expenses.

14) The Board then reviewed a report from Jim DiZorzi, VE3ZK, on the use of packet radio for distributing the *CRRL News* bulletins. Several directors indicated that the system was most effective. *Others indicated they would try to expand the present* network. Moved by Mr Atkins, seconded by Mr Fancy, the Board VOTED its thanks to Mr DiZorzi for his outstanding work.

15) The Board then turned to Rules and Regulations *for the CRRL Field Organization. These were basically* the same as the old ARRL rules except that all references to ARRL, US Divisions and US Sections were replaced by references to CRRL, Canadian Regions and Canadian Sections. References to ACC were deleted. *OO/RFI, TC, PIO, PGL* and station appointments derived therefrom were made optional appointments. Moved by Mr Atkins, seconded by Mr Perrin, the Board VOTED to adopt the revised Rules and Regulations which would become effective 1988 January 01.

16) The Board then considered Rules and Regula-

tions for CRRL Conventions. These were basically the same as the old ARRL rules except that references to ARRL and ARRL organization were replaced with references to CRRL and CRRL organization, and ARRL Rules, Sections 4 and 6 were deleted, making the application and approval process less formal than in ARRL. Moved by Mr MacLean, seconded by Mr Atkins, the Board VOTED to adopt the revised Rules and Regulations which would become effective 1988 January 01. The Board recessed from 1515 until 1530.

17) The Board then turned to Rules and Regulations for CRRL Incoming QSL Bureaus. After much discussion, moved by Mr Gillespie, seconded by Mr Atkins, the Board VOTED to adopt Rules and Regulations which state, in summary, the following: (1) That it is the responsibility of the CRRL Regional Director to appoint Incoming QSL Bureau Manager(s) in his or her Region, (2) That QSL Bureau Managers may use a system of amateur-supplied prestamped envelopes, or a system of bureau-supplied envelopes and postage credits, (3) that monies received for bureau-supplied envelopes and postage credits may only be spent on the same, (4) that interest on such monies and "donations" received by a bureau should be used to help pay operating expenses of the bureau, (5) that QSL Bureau Managers, with the prior approval of their Directors, may be entitled to subsidies for travel to hamfests and conventions where they would set up a CRRL Incoming QSL Bureau displays, and (6) that once a year, each Incoming QSL Bureau Manager prepare, for his or her Director, a brief accounting of revenues and expenses, verified by the Manager and two other amateurs; a copy of this accounting would be made available to any user of the bureau upon request.

18) The Board then discussed mileage rates for CRRL auto travel. Most Directors were not charging full mileage, but only the real cost of fuel. This practice was commended. Still, it was a traveller's right to request mileage at $0.16/km. This rate, however, established several years ago, was now too low. Moved by Mr Atkins, seconded by Mr Gillespie, the Board ADOPTED a new mileage rate, effective immediately, of $0.23/km.

19) Mr Staines then spoke of the need to update certain operating aids and promotional materials, and to ensure that all such materials be of the highest quality. Moved by Mr Atkins, seconded by Mr MacLean, the Board VOTED to establish a committee chaired by Mr Atkins which would review *all materials* before they were printed or distributed in quantity, to ensure their *accuracy and quality*.

20) The Board then turned to the matter of Amateur Radio insurance. Most Canadian amateurs were finding that existing homeowner and auto insurance policies provided adequate coverage of Amateur Radio equipment. There was little call for EMI insurance at this time. There was a need for low-cost club insurance, to protect club members engaged in club activities, and to protect club radio installations from damage and theft. Moved by Mr MacLean, seconded by Mr Fancy, the Board VOTED to have Mr Loucks investigate the feasibility of offering low-cost club insurance, and to report to the Board on this as soon as possible.

21) The Board then made its appointments for 1988. Moved by Mr Perrin, seconded by Mr Fancy, the Board VOTED that Mr Eaton serve as Chairman of the Elections Committee with Mr Atkins and Mr MacLean as members. Moved by Mr Atkins, seconded by Mr Gillespie, the Board VOTED to appoint Mr Loucks as Treasurer. Moved by Mr Atkins, seconded by Mr Gillespie, the Board VOTED to appoint Mr Staines as General Manager. Moved by Mr Atkins, seconded by Mr Fancy, the Board VOTED to appoint Mr Strangleman as Field Services Manager. Moved by Mr Atkins, seconded by Mr Perrin, the Board VOTED to employ Claude Laneville, CA, as Auditor of the CRRL records and books for the fiscal period ending 1987 December 31. Mr MacLean expressed his desire to be relieved of the office of CRRL Secretary. He was prepared to carry on with all other existing duties related to the *CRRL News* bulletins, *QST* and the office of Vice President. The Board decided to defer this matter to later in the meeting. Mr d'Eon left the meeting at 1735.

22) The Board then discussed the work of General Manager Staines. Moved by Mr Perrin, seconded by Mr Gillespie, the Board VOTED to have the Management and Finance Committee provide in its 1988 budgets an increase, of at least 10%, in Mr Staines' management fee. During the course of the meeting, the need for a Long Range Planning Committee had often been discussed. Moved by Mr Atkins, seconded by Mr Brunet, the Board VOTED to establish such a committee with Mr Perrin as chairman. The Board recessed for supper at 1755.

23) The Board resumed at 1915. All those present before supper were present after, except for Mr Benson, Mr Staines and Mr Shtun, who had returned to their homes. The Board discussed a proposal for a new Technical Information Service. Under the proposal, CRRL would eliminate the TC appointment in the Field Organization and create a new appointment outside the Field Organization: Technical Information Assistant (TIA). TIAs would assist amateurs with technical questions. An amateur with a question would contact CRRL Headquarters. The question would be referred to a TIA who, for reasons of geography or technical expertise, would be in a position to answer it. Safeguards would ensure that questions were answered in a timely manner. Moved by Mr Fancy, seconded by Mr Gillespie, the Board VOTED to launch a Technical Information Service in the new year and to evaluate its effectiveness at the next CRRL Board meeting. Mr Perrin left the meeting at 1945 to return to his home.

24) Directors were then given an opportunity to seek information or make comments. Topics covered included appointment of Assistant Directors, 1987 CRRL Amateur of the Year, the need for bilingual materials, the need for additional flags and banners for conventions and hamfests, First-Class mailing of *QST* for CRRL Regional Directors, and methods of contacting new amateurs. The Board then returned to finding a CRRL Secretary. In the course of discussions, it became clear that Mr MacLean, as Secretary, had been dealing with many matters that might well have been referred to a Regional Director. If Regional Directors began dealing with such matters, it would reduce the workload of the Secretary to the point where the office of Secretary could be combined with that of Treasurer. Moved by Mr Atkins, seconded by Mr Gillespie, the Board VOTED that Mr Loucks be appointed Secretary-Treasurer, effective 1988 January 01.

25) It was agreed that CRRL was now at the point where two days were needed to conduct all the business that was now coming before the Board. The 1988 Annual Meeting of the CRRL Board of Directors would be scheduled over two days. There being no further business, moved by Mr Atkins, seconded by Mr MacLean and others, the meeting was adjourned at 2240. Total time of meeting including time as a Committee of the Whole: 11 hours, 15 minutes. Direct allocations: $1000.

Respectfully submitted,
H. J. MacLean, VE3GRO
Secretary

CRRL ELECTION RESULTS

Tom Atkins, VE3CDM, and Harry MacLean, VE3GRO, were recently re-elected, by acclamation, to the posts of CRRL President and CRRL Vice President. Tom, the first Ontario Director of CARF, and later, a founding director of CRRL has served as CRRL President since 1982. Harry is well known as Editor of the *CRRL News* bulletins and conductor of this *QST* column. Their new two-year terms of office begin on 1988 January 01.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the Maritimes-Newfoundland 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 Maritimes-Newfoundland Section. It is advisable to have more than five signatures. Photocopied signatures are not acceptable. Petition forms, FSD-129-C, are available from CRRL Headquarters in London, Ontario, but are not required. The following form is acceptable:

(place and date)
CRRL Secretary
Box 7009, Station E
London, ON N5Y 4J9

We, the undersigned Full members of the League residing in the Maritimes-Newfoundland 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 CRRL Headquarters until 1600 EST 1987 December 04. If only one valid petition is received, the person nominated will be declared elected. If more than one valid petition is received, a balloted election will take place. Ballots will be mailed from CRRL Headquarters on or just before 1988 January 01. Returns will be counted after 1988 February 19. A Section Manager elected as a result of these procedures will serve for a two-year term beginning on 1988 April 01.

If no valid petition is received, the Maritimes-Newfoundland Section will be resolicited in 1988 April and May *QST*. You are urged to take the initiative and file a nominating petition immediately.

Harry MacLean, VE3GRO
CRRL Secretary

Pacific Director Dave Fancy, VE7EWI, greets CRRL members at this year's Maple Ridge Hamfest. *(VE7EWI photo)*

NOTES FROM ALL OVER

☐ Ken Mangaroo, VE3MCM, of Burlington, Ontario, did win his court battle and the right to erect an antenna tower on his property. As reported last month, 18 of Ken's neighbours had asked for a stop-work injunction, claiming that the tower would lower their property values and cause TVI. Fortunately, Ken had obtained permission from DOC, a building permit from the municipality, and even an engineer's report testifying to the structural integrity of the tower and the ability of the ground to support it. At the hearing, Ken's lawyers argued that Ken was in total compliance with the law and that Ken's neighbours had no basis for a case. The judge agreed and refused to grant the injunction. An important victory—not just for Ken but for all of us.

☐ About 50-75 amateurs participated in the National Amateur Radio Symposium sponsored by CARF and, for the first time this year, CRRL, and held in Saskatoon on July 31-August 01. Some conclusions of the participants: (1) The Canadian Amateur Service needs more and younger amateurs; DOC must make Restructuring of the Amateur Service a top priority, (2) Deregulation of Mode Subbands should not be feared; voluntary band plans do work in Europe and elsewhere; deregulation would allow Canadian amateurs to respond more readily to changes in technology, (3) DOC should make every effort to acquire the authority to deal with the RF susceptibility of non-radio devices, and (4) if CRRL and CARF were to merge, they would be the appropriate body to take over the administration of the Amateur Radio Service in Canada; they would probably do it more cost-effectively than DOC!

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

Travels with NM7N and Fred

Editor's Note: *Each year Mary Lou Brown, NM7N, of Anacortes, Washington makes a lengthy trip across country. Amateur Radio and the many friends she has made through the hobby are an important part of that trip. She agreed to share her adventures in a two-part column.*

Those of us in ham radio enjoy a variety of activities such as chasing DX, public service, contesting, etc. About two and a half years ago, I was introduced to YL nets. Although I enjoyed the many contacts all over the country, I did not realize at the time the many friendships one could gain. I had been on the nets about four months when I mentioned I was planning to drive to Florida and Massachusetts to visit my parents and other relatives. Immediately, several of the YLs came back to inquire if I would be going near their QTH, and, if so, couldn't I come by for an eyeball visit? Because of other commitments, my schedule was a little tight, but I did manage four stops along the way. Thus, in mid-March 1985, Fred—my trusted four-legged traveling companion, sometimes referred to as K9-DOG—and I started on our adventure in a VW van.

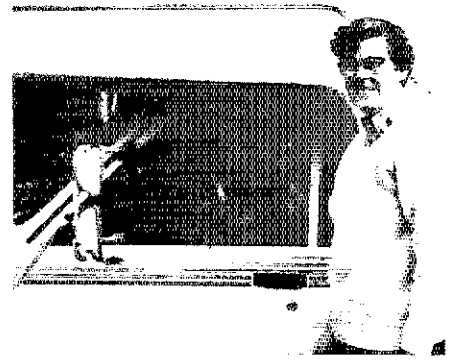
Our first stopover was Tucson, Arizona and the home of K7SEC. It was easy to pick out the right house because of the tower and beam in the backyard. However, no one was at home. Knowing that something must have come up, I took Fred for a walk. Shortly thereafter, Phyllis, K7SEC appeared and explained she unexpectedly had to take the OM to the airport. We immediately hit it off and had a great visit. That evening we had dinner at a local restaurant with a group of local YLs. The hospitality was tremendous. Fred did not agree. Phyllis was raising four one-week-old puppies, and Fred found them rather frightening. I knew for sure he was a mixed-up dog when he tried to get one of the granddaughter's dolls to play with him.

The next day, Fred and I continued our journey. After taking some time out to hike in the Chiricahua Mountains, we packed up and headed for a visit with Evelyn, KC7ET, in Douglas, Arizona. In the evening, a group from the local ham club came over for dessert at Evelyn's house. It was great to meet so many of the club members and their XYLs. After leaving Douglas, our next stop was the White Sands National Monument. I managed to get into a bunch of no-seeums and ended up with bites all over my head. Fred, being low to the ground, managed to escape. That evening, we stayed at a New Mexico state park that was located on an old lava ridge. Since it appeared to be a good spot to run radio, I fired up the rig and had a lot of fun running QRP. I even worked the OM and some DX (Tonga and the Virgin Islands). We then traveled on to the QTH of KØEPE, Marte in Kansas. Unfortunately, I didn't have a map and didn't realize until the last minute that the only address I had for her was a post office box number. When I arrived on the outskirts of Liberal, Kansas, I pulled over to the side of the road, looked up 2-meter repeater frequencies for the area, and tried to call her. An OM came back and gave me instructions to the house. He no sooner had said, "Look for a tower with a 4-element quad," when I realized I was passing the house at that very moment. Marte and I had a great visit discussing all sorts of YLRL business, Amateur Radio, etc. Fred thought all the Kansas jack rabbits were great, but my right arm came out a foot longer than my left trying to contain him on the leash. Since Liberal is the home of Dorothy from *The Wizard of Oz*, we visited her house as well as the Yellow Brick Road.

Our next stop was Hot Springs, Arkansas. Driving took a little longer than planned, and I made it just in time to meet Darleen, WD5FQX, and several local YLs area for lunch. Again, 2 meters was handy in finding the QTH. Fred was confined to the fenced-in yard while we went to lunch. From what Darleen's OM said, Fred and Murdock, the dog next door, spent the whole time running along their respective sides of the fence. It was the best exercise Fred had experienced in days.

When I arrived at my parents' place in Holmes Beach, Florida, one of the first things I did was erect my vertical in their backyard and set up my shack in the laundry room. Conditions were very poor, so all my dreams of glory weren't fulfilled. I did work Clipperton Island, the only signal on 15 meters, but heard and worked only two DX YLs in the NA YL/DX YL CW contest. My attempts to check into the YL nets had to be on CW as my new microphone decided not to work. After residing with my parents for a couple of weeks, I stayed with relatives in New Jersey and Massachusetts, then traveled to Nashua, New Hampshire to visit Karla, WA1UVJ. Since Karla and I were both officers in YLRL, we had a lot to talk about besides getting better acquainted. I even had a chance to practice a little of my rusty German, since another houseguest was visiting from Germany. It was a little embarrassing at times since my dog and the German houseguest both were named Fred. However, both Freds were good sports about it!

During the spring of 1986, I started out again on my trek across the country. This time I was driving our new Sun Rader micro-mini RV, which my OM named "Fred's Place." My itinerary was much more complicated this time. Aside from firm dates for the SAYLARC meeting and Dayton, I was able to work in most of the many invitations I received from YLs to stop for a visit. On this trip, I brought along the bird and animal slides I had taken in Kenya the preceding fall. At several of my stops, these pictures were shown to groups of YLs, the SAYLARC spring meeting and to an Amateur Radio club in Wilmington, Delaware. This trip had a slightly different aspect than the preceding one in that I had met most of the people I would stay with this time, either on the preceding trip or at the June 1985 YLRL convention in Las Vegas. Also, this trip would be more extensive as I planned to cover over 10,000 miles in my swing around the country. Fred, now being a well-seasoned traveler would, of course, again be my faithful copilot.



Fred's a bit in the dark about traveling across the continent, but Mary Lou, NM7N, found him a faithful traveling companion.

After a four-day journey over the Cascades, down through eastern Oregon and Nevada, Fred and I arrived in Arizona with great thoughts of viewing Oak Creek Canyon. However, west of Flagstaff we ran into snow. As we turned south from Flagstaff, the snow was accumulating rapidly on the pavement, and it was obvious that chains would be needed soon if I didn't descend to a lower elevation. The road through the canyon turned out to be impassable, so I had to stay on the interstate and plan to approach the canyon from the southern end (an altitude predicted to be well below snow level). We arrived at a trailer park in Sedona just in time to hook up before heavy rain beat on us. That night, while I walked Fred, the rain changed to quarter-size snowflakes, which settled on Fred's black back, giving him an interesting polka-dotted coat. By the next morning, the only passable road was to the interstate, so all we saw of the canyon was that part viewed from Sedona. In a fresh blanket of snow, it was a really spectacular sight. Because we were so close to Phoenix, I had some time to kill before I was due at the home of W2GLB/7. On an impulse, Fred and I drove to Montezuma's Castle National Monument. I was surprised to find that dogs were permitted, if leashed, to be on the walks and trails. Fred was unusually well-behaved seeing his first cliff dwelling and obediently sat and read each sign with me.

Phyllis and I goofed on which 2-meter frequency we would use, but somehow I managed to find her okay with the aid of a map. She had a spot for my RV right behind her RV in the parking lot. It is not everywhere one finds a private RV park like that! A group of YLs came over for a potluck supper one of the nights I was there. Fred really enjoys all the attention of this type of supper. After everyone left, I was thinking of heading for bed when Phyllis suggested we go sit in the spa at the end of their swimming pool. A water-logged two hours later we toddled off to bed. Fred managed to get along reasonably well with her cat, mainly because the cat was very aloof about the whole matter. Fred just couldn't understand why the cat didn't want to play. In typical fashion, he settled down to contemplate our next stop. (To be continued)

Conducted By Elizabeth Karpiej, KA1DTU
New-Ham Recruitment Coordinator

Team-Teaching with the Ocean

"Every generation, if it is to fulfill itself, must have a dream to inspire it and an adventure to ennoble it," wrote Jack Anderson, the noted political columnist. Mary Duffield, WA6KFA, believes that she and her partner are helping the next generation get properly started on the road to fulfillment.

The Redwood Youth Foundation, a nonprofit group interested in helping teenagers become communications-oriented, is sponsoring a "Sea Trek" this October. Mary is teaching the kids communications and navigation. Her team-teaching partner is the *Agua Alegre,* a sailing vessel that will help them put the lessons into practice. The ship and crew will be putting in at ports from the San Francisco Bay Area to San Diego, so that other schools and students can participate in the experience. Fifteen students and two adults will be on board. The stated goals of the trip are:

- To motivate other schools' participation in electronic friendship nets.
- To delight in *wearing the ocean* and exploring the coastal isles. This includes mastering navigation and communication skills.
- To tape record problem-solving ideas from students in schools from ports of call. These ideas will be shared, critiqued and activated by networks of kids from many countries.

Skipper WA6KFA is one of the Directors at the Redwood Youth Foundation and also the first winner of the AEA Amateur Ambassador Award for her work on behalf of the Foundation. This is the fourth such cruise the Foundation has arranged. The station aboard the *Agua Alegre* will use her call sign. The co-skipper of the *Agua Alegre* is Teresa Schneider, a teacher-counselor in the Santa Cruz school system. "Her enthusiasm and vitality will enhance the whole scene," Mary says. For the first time, junior high students are going along. "We have some kids that are just so mature and responsible, that we just had to include them," says Mary.

Not a Free Ride

The students selected for the trip were allowed to apply only if they were passing all subjects in school and could get their teachers' permission. All work and tests must be made up. Before the *Agua* leaves port, the student-crew has to make sure she's in A-1 condition. They scrape and paint, take lessons in navigation and cruise around the San Francisco Bay area to get their sea-legs. They also raise money for slip fees, food and fuel by conducting paper drives, raffles and other fund-raising activities.

Charles Kuralt and his "On the Road" production crew have tentatively arranged to film the *Agua Alegre* and her crew. The program would air in the first quarter of 1988.

The Ocean of Humanity

This is a voyage of exploration and discovery. The students will share many experiences, including radio demonstrations for students at the schools in each port of call, a possible nationwide TV audience and an international audience of young people in sister cities in Japan and the Canary Islands for their presentations. The students will rename places along the way. Mary says that although some of the kids first think about naming islands and coves after themselves, they usually end up naming them after environmental concerns or cities in Russia and China, as peace gestures.

As one of the students, 15-year-old Betsy Bailey, says, "We are stitching together the electronic nervous system of the future."

[Editor's Note: WA6KFA notified us right at press time that an oil spill in Santa Barbara Channel has delayed the planned cruise until early next spring. A mini-cruise is being planned for San Francisco Bay in early January.]

The crew of the *Agua Alegre* poses with Bill and Mary Wachter before taking a learning cruise around the San Francisco Bay. The Wachters are instructors in the Redwood Youth Foundation's sailing program.

Students at the Del Mar Middle School in Santa Cruz, California, assemble the antenna donated by KLM for their school's contacts with the *Agua Alegre* and her crew. The *Agua* will take teenage hams on an exploring cruise of the Southern California coast and ports. The crew will give Amateur Radio demonstrations along the way.

Amateur Satellite Communications

Conducted By
Vern "Rip" Riportella, WA2LQQ
PO Box 177, Warwick, NY 10990

New Russian Satellite Sparks Surge of Interest

Every once in a while, we get to share the great joy of celebrating a rare and wonderful event in Amateur Radio: The birth of a new OSCAR.[1] On June 23, our Russian colleagues in space successfully launched a new OSCAR. RS-10 and RS-11 are alive and well, some 620 miles aloft.

Unlike earlier RS satellites, which had gone up on a single launcher containing as many as six separate satellites,[2] COSMOS 1861 was a single spacecraft carrying two Amateur Radio transponders and one special navigation transponder. Here's how the story unfolded.

The Radio Moscow announcement said COSMOS 1861 had been launched earlier in the day. That was Tuesday, June 23. The announcement said COSMOS 1861 carried Amateur Radio communications relay equipment in addition to its primary scientific and communications research payload. The new RSs were aloft at last! Within hours, G3IOR had his first access and QSO, confirming that the new birds were up and running. Soon, WØCY was also reporting access and initial tracking information.

According to the best current information, RS-10 and RS-11 are identical except for operational frequencies. Each RS apparently uses *three* bands in various combinations to achieve *five* distinct modes of operation in addition to its auxiliary Robot repeaters. (A Robot is an automatic QSO machine that will engage you in a CW QSO when addressed properly.)[3]

On each RS, 15 meters is used exclusively as an uplink band, 10 meters is used exclusively as a downlink band and 2 meters can be employed as either an uplink or downlink band. The overall frequency scheme is delineated in the accompanying table.

The desired orbit was attained precisely. The nodal period is 105.0245 minutes; the orbital increment is 26.3824 degrees west per orbit. A reference orbit for Sunday, July 5, is 00:14:31 at 61.2 degrees West. Average height is close to 1000 km (621 miles).

Next month, we'll explore the fascinating RS-10 and RS-11 telemetry suite. Later, we'll return to the techno-sport theme begun last spring.

RS-10 and RS-11 Operating Frequencies

Summary for both RS-10 and RS-11:

Mode A 2 meters up and 10 meters down.
Mode K 15 meters up and 10 meters down.
Mode T 15 meters up, 2 meters down.
Mode KT 15 meters up, 10 and 2 meters down.
Mode KA 15 and 2 meters up, 10 meters down.

Beacons can carry telemetry or Robot downlink.

RS-10

(Note: All uplink and downlink frequencies are given in MHz.)

Mode A: 145.860-145.900 up yields 29.360-29.400 down.

Uplink	*Downlink*
	129.357 beacon
145.860	29.360 passband limit, lower
145.870	29.370
145.880	29.380 passband center
145.890	29.390
145.900	29.400 passband limit, upper
	29.403 beacon

Robot A:

Uplink	*Downlink*
145.820	29.357 or 29.403

Mode K: 21.160-21.200 up yields 29.360-29.400 down.

Uplink	*Downlink*
	29.357 beacon
21.160	29.360 passband limit, lower
21.170	29.370
21.180	29.380 passband center
21.190	29.390
21.200	29.400 passband limit, upper
	29.403 beacon

Robot K:

Uplink	*Downlink*
21.120	29.357 or 29.403

Mode T: 21.160-21.200 up yields 145.860-145.900 down.

Uplink	*Downlink*
	145.857 beacon
21.160	145.860 passband limit, lower
21.170	145.870
21.180	145.880 passband center
21.190	145.890
21.200	145.900 passband limit, upper
	145.903 beacon

Robot T:

Uplink	*Downlink*
21.120	145.857 or 145.903

Mode KT: 21.160-21.200 up yields 29.360-29.400 and 145.860-145.900 down.

KT Uplink	*K Downlink*	*T Downlink*
	29.357	145.857 beacon
21.160	29.360	145.860 passband limit, lower
21.170	29.370	145.870
21.180	29.380	145.880 passband center
21.190	29.390	145.890
21.200	29.400	145.900 passband limit, upper
	29.403	145.903 beacon

Mode KA: 21.160-21.200 and 145.860-145.900 up yields 29.360-29.400 down.

K Uplink	*A Uplink*	*KA Downlink*
		29.357 beacon
21.160	145.860	29.360 passband limit, lower
21.170	145.870	29.370
21.180	145.880	29.380 passband center
21.190	145.890	29.390
21.200	145.900	29.400 passband limit, upper
		29.403 beacon

RS-11

Mode A: 145.910-145.950 up yields 29.410-29.450 down.

Uplink	*Downlink*
	29.407 beacon
145.910	29.410 passband limit, lower
145.920	29.420
145.930	29.430 passband center
145.940	29.440
145.950	29.450 passband limit, upper
	29.453 beacon

Robot A:

Uplink	*Downlink*
145.830	29.407 or 29.453

Mode K: 21.210-21.250 up yields 29.410-29.450 down.

Uplink	*Downlink*
	29.403 beacon
21.210	29.410 passband limit, lower
21.220	29.420
21.230	29.430 passband center
21.240	29.440
21.250	29.450 passband limit, upper
	29.453 beacon

Robot K:

Uplink	Downlink
21.130	29.403 or 29.453

Mode T: 21.210-21.250 up yields 145.910-145.950 down.

Uplink	*Downlink*
	145.907 beacon
21.210	145.910 passband limit, lower
21.220	145.920
21.230	145.930 passband center
21.240	145.940
21.250	145.950 passband limit, upper
	145.953 beacon

Robot T:

Uplink	Downlink
21.130	145.907 or 145.953

Mode KT: 21.210-21.250 up yields 29.410-29.450 and 145.910-145.950 down.

KT Uplink	*K Downlink*	*T Downlink*
	29.407	145.907 beacon
21.210	29.410	145.910 passband limit, lower
21.220	29.420	145.920
21.230	29.430	145.930 passband center
21.240	29.440	145.940
21.250	29.450	145.950 passband limit, upper
	29.453	145.953 beacon

Mode KA: 21.210-21.250 and 145.910-145.950 up yields 29.410-29.450 down.

K Uplink	*A Uplink*	*KA Downlink*
		29.407 beacon
21.210	145.910	29.410 passband limit, lower
21.220	145.920	29.420
21.230	145.930	29.430 passband center
21.240	145.940	29.440
21.250	145.950	29.450 passband limit, upper
		29.453 beacon

Notes

[1]I use the word "OSCAR" in a generic sense here.
[2]The last RS launch was on December 2, 1981. Six satellites, RS-3, 4, 5, 6, 7 and 8, were launched by a single rocket at that time.
[3]RS-5 and RS-7 both had Robots aboard, but both are probably defunct. To address a Robot you simply send: "RS-10 de (your call) AR" on the Robot channel. RS-11 has a Robot, too, so you would substitute its call sign in your addressing transmission. For example, RS11 DE WA2LQQ AR should work fine. The Robot will reply with a signal report and the QSO serial number. In the past, special certificates were sent to Robot users by the sponsoring organization in the USSR, thought to be DOSAAF.

Coming Conventions

ILLINOIS STATE CONVENTION

November 15, Rockford

The 1987 Illinois State ARRL Convention sponsored by Rockford ARA and Experimental ARS will hold its convention at Forest Hills Lodge, 9900 Forest Hills Rd, at Rte 173, Loves Park, Illinois. Time is 8 AM-4 PM; doors open at 7 AM for exhibitors. Talk-in on 146.01/.61 and 146.52. Admission: $3 advance, $4 at the door. Activities, ARRL speaker, forums, VE, demonstrations, DX forum and much more. Equipment test table, food and beverages available. For more info: Tables & tickets SASE, Roger Sawell, KD9MQ, 6514 Swansdown Dr, Rockford, IL 61111, or tel 815-282-1283. General info: James Miller, W4JR, tel 815-397-4602.

SOUTH FLORIDA SECTION CONVENTION

November 21-22, St Petersburg

The St Petersburg Hilton and Towers will be the site of the South Florida ARRL Suncoast Convention sponsored by Florida Gulf Coast Amateur Radio Club. Huge flea market, commercial booths all indoors. Exams on Saturday, QCWA, noon luncheon, programs, technical talks and demonstrations. Meet ARRL Southeastern Division Director Frank Butler, W4RH. Tickets $4 until Nov 13, $5 at the door. Checks to FGCARC, 1556-56th Ave, N St Petersburg, FL 33703. Rooms $60, write or call Hilton & Towers, 333 1st St, S St Petersburg, FL 33701, 813-894-5000, mention convention.

COLORADO STATE CONVENTION

November 29, Golden

The Denver Radio Club Annual Hamfest and ARRL Colorado State Convention. Hours are 9 AM-2 PM at the Jefferson County Fairgrounds, 15200 West 6th Ave, Golden. Ham events include new equipment dealers, swap tables, seminars, code contests. Nonham events include craft sales, floral arrangement seminar. Fees: tables $5, admission $2. Talk-in on 147.93/33 and 146.52 MHz. Contact: Dean Haworth, ACØS, 14368 West Bayaud Ave, Golden, CO 80401, tel 303-279-4956.

October 31-November 1
Central Division, St Charles, IL

November 15
Illinois State, Rockford

November 21-22
South Florida Section, St Petersburg

November 29
Colorado State, Golden

ARRL NATIONAL CONVENTIONS

Sept 9-11, 1988—Portland, Oregon
June 2-4, 1989—Dallas/Ft Worth, Texas

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.

Attention Hamfest and Convention Sponsors

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your Division Director. For conventions, approval must be made by your Director and, additionally, by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541, ext 283.

†**Alabama (Montgomery)—Nov 14-15.** *Sponsor:* Montgomery ARC. *Time:* 9 AM-4 PM. *Place:* Ed Teague Arena at coliseum, Central Alabama State Fairgrounds, US 231 North. *Features:* Food, forums, FCC exams, overnight camper hook-ups $5/night. *Talk-in:* 146.24/84. *Admission:* Free. *Contact:* Randy Smith, N4LZU, 102 Vazis La, Montgomery, AL 36108, tel 205-832-4589 home, 205-832-5428 work.

†**Arizona (Apache Junction)—Dec 5-6.** *Sponsor:* Superstition ARC. *Time:* 7 AM Sat, 2 PM Sun. *Place:* Rodeo grounds northwest corner of Brown Rd and Meridian, 1½ miles north of US 60, six miles east of AZ 360 Phoenix and 3½ miles north. *Features:* Breakfast, food, test booth. *Talk-in:* 147.12, 233.5-MHz simplex, 146.72, 146.74, 145.41, 146.94, 223.82 and 224.94 MHz. *Admission:* $3 sellers, $1 nonsellers, for both days. *Contact:* Larry, tel 602-986-2298.

Florida (Pompano Beach)—Nov 7-8. *Sponsor:* Broward Amateur Radio Club Inc. *Time:* Sat 9 AM-6 PM, Sun 9 AM-4 PM. *Place:* Powerline and Copans. *Features:* RACES, Testing, AMSAT. *Talk-in:* 146.31/91, 444.825 (+5), 146.52 simplex. *Admission:* Advance $4, at the door $5. *Contact:* James Lorah, WB4KOB, 2407 Flamingo La, Ft Lauderdale, FL 33312.

†**Florida (Okeechobee)—Dec 5.** *Sponsor:* Okeechobee ARC. *Time:* 10 AM-6 PM. *Place:* Across from Okeechobee High School on Hwy 441 N, two miles north of town. *Features:* Arts and Crafts for women, aerobics, testing, free test bench. *Talk-in:* 147.195-MHz repeater. *Admission:* Advance $2, Door $3. *Contact:* Dot Franks, 740 Hwy 78W, Okeechobee, FL 33474, tel 813-763-2906.

Illinois (Grayslake)—Nov 1. *Sponsor:* Waukegan CAP. *Time:* 7 AM-5 PM. *Place:* Lake County Fairgrounds, Rtes 120 and 45. *Features:* Large, indoor flea market, cafeteria, free parking. *Admission:* $3. *Tables:* $5. *Contact:* SASE to CAP, 637 Emerald St, Mundelein, IL 60060.

Michigan (Hazel Park)—Dec 6. *Sponsor:* Hazel Park ARC. *Place:* Hazel Park High School, 23400 Hughes, north of 9-mile, west of Dequinder. *Talk-in:* 146.52 MHz simplex. *Admission:* $2 advance, $3 at the door. *Tables:* $1 per foot. *Contact:* HPARC, PO Box 368, Hazel Park, MI 48030.

Minnesota (Albert Lea)—Dec 5. *Sponsor:* Albert Lea Spiderweb ARA. *Time:* 9 AM. *Place:* Eagles Club, Faribault. *Features:* Exams, auction, dinner and program. *Talk-in:* 146.19/79. *Contact:* Don Franz WØFIT, 1114 Frank Ave, Albert Lea, MN 56007.

North Carolina (Greensboro)—Nov 21-22. *Sponsor:* MARK IV Radio Club. *Time:* 9 AM-5 PM. *Place:* National Guard Armory, Franklin Blvd. *Features:* Exams. *Admission:* Advance $4, Door $5. *Tables:* Tailgate Area $2. *Contact:* Fred Redmon, N4GGD, 3109 Goodall Dr, Greensboro, NC 27407. Tickets—Henry Hughes, KA4LPA, 2811 Gwaltney Rd, Greensboro, NC 27407. Exams—Hugh Brunson, AE4N, 919-852-1087.

†**Pennsylvania (Sellersville)—Nov 1.** *Sponsor:* RF Hill ARC. *Time:* Sellers, 6 AM, General public 8 AM. *Place:* Pennsylvania National Guard Armory, PA Rte 152. *Talk-in:* Repeaters 145.31, 145.19 and 146.88, and 146.52 MHz simplex. *Admission:* $4. *Contact:* Robert Buonfiglio, 361 School House Rd, Souderton, PA 18964, tel 215-723-1016.

Wisconsin (Milwaukee)—Nov 14. *Sponsor:* Milwaukee Repeater Club. *Time:* 8 AM-1 PM, sellers 7 AM. *Place:* Serb Hall, 51st and Oklahoma Ave. *Features:* Swapfest, exams. *Talk-in:* 146.91 and 146.52 MHz. *Admission:* $3 advance, $4 at door. *Tables:* $4 advance, $5 at the door. *Contact:* SASE to Milwaukee Repeater Club, PO Box 2123, Milwaukee, WI 53201.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contraction for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

†ARRL Hamfest

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

K1AAV, John E. Johnson, Pawtucket, RI
W1BXZ, Fred S. Stedman, Wakefield, RI
KA1CJJ, Carlton "Stretch" Smith, Jr, Stockton Springs, ME
W1CNO, George W. Krug, Greenwich, CT
W1COP, Harold C. Wentworth, Scarborough, ME
*W1DIS, James F. Hartley, Raymond, ME
K1DQM, Simon J. Stahl, Berlin, NH
W1EL, John F. Porter, Malden, MA
KA1ER, Russell M. Keisling, Clinton, MA
W1EXV, Thomas E. Ralph, Shirley, MA
KA1FGO, Charles K. Gleason, Chester, VT
W1GKM, David Davidson, Belmont, MA
WA1GKM, Byron H. Haining, Sr, Rockport, ME
WB1GMM, Herbert C. Weaver, Granby, CT
K1GNX, Stephen P. Dias, Noth Attleboro, MA
KA1HFN, Donald E. Harris, Sr, Dalton, MA
W1IXP, Sidney O. Crine, Groton, CT
WA1NEY, Fredrick H. Waterhouse, West Hartford, CT
W1OQP, Albert H. Graf, Wellesley Hills, MA
K1PUT, George W. Coleman, Stratford, CT
W1QZ, John M. Rutledge, Kittery Point, ME
K1RA, John B. Morgan, Payson, AZ
KT1W, William A. Broadley, Cataumet, MA
WA2AMV, Herbert A. Gibson, Oneonta, NY
N2DMT, Daniel Cetin, Valley Stream, NY
W2DWZ, Joseph Bertuca, Tonawanda, NY
WB2DYO, Milton Ruff, Pukwana, SD
WA2EAZ, Harold F. Kormann, Long Beach, NY
W2EW, Henry F. Koch, Jr, Santa Clara, CA
KA2FXT, John T. Moonan, Hopewell, NJ
K2GIN, Alexander McGlashan, East Hampton, NY
K2HUG, Burton R. Pomplun, Albany, NY
KA2IXQ, Christian E. Everson, Naples, FL
W2LEG, Michael J. Rizzo, Toms River, NJ
KD2LO, John F. Hirst, Cresskill, NJ
WA2LPX, Frank W. Lev, Farmingville, NY
W2LSV, John A. Zieger, Boonton, NJ
K2LWC, James H. Dailey, Lockport, NY
WB2MAN, Richard S. Levy, Great Neck, NY
K2MOC, Howard C. Wehner, Emerson, NJ
W2MZV, Herman A. Bohning, Parsippany, NJ
KJ2O, Americo J. Defilippo, Newark, NJ
W2OZ, John L. Oberlies, Utica, NY
*K2PA, Serge Costin, Farmingdale, NY
W2PGS, John H. Stone, Oswego, NY
WA2PIR, Russell P. Westerhoff, Ridgewood, NJ
WB2PSV, Charles J. Smutny, Valley Stream, NY
WA2RUI, Milton P. Leff, Elmont, NY
K2SE, Edin G. Solov, Wayne, NJ
W2UNI, Arthur L. Roberts, Woodstown, NJ
KA2VIA, Joseph R. McCurdy, Pennsauken, NJ
W2WRO, Warren A. Montanye, Burnt Hills, NY
WA2YHI, Elizabeth B. Allen, Centerport, NY
K2YVE, Primitivo P. Rico, Sr, Pine Plains, NY
KA3AAM, Howard D. Metzler, Rehoboth Beach, DE
AG3C, John M. Wolfe, Macungie, PA
KC3CI, Rock E. DuTeil, North Chevy Chase, MD
KA3EEK, Thomas E. Garrison, Volant, PA
W3HRW, Abraham Rubin, Annapolis, MD
W3IPR, Thomas M. Bloomer, Baltimore, MD
W3KDW, Oliver C. Emery, Clark Summit, PA
W3LVE, John G. Sommer, Silver Spring, MD
K3PND, Kenneth L. Doty, Bloomsburg, PA
W3WS, Charles F. Parcels, Wilmington, DE
W4ADG, Cecil C. Earnhardt, Jr, Charlotte, NC
WD4ADU, E. T. Johnson, Memphis, TN
N4AEV, Leopal R. Dobbins, Whitwell, TN
WA4AKF, Mary Ruth Chiles, Gatlinburg, TN
W4ASW, Harry M. Arnold, Birmingham, AL
W4AYG, W. D. Tabler, Jacksonville Beach, FL
W4CAN, A. Josh Tumlin, Cave Spring, GA
*NA4F, Joseph L. Cherry, Webster, FL
KA4GLL, Clifford Joyce, Brooksville, FL
WA4GQY, Vernon G. Frey, Jensen Beach, FL
K4HI, Russell N. Chappell, Dunedin, FL
WA4HOP, James White, Burlington, NC
K4JBH, John M. Ingold, Albemarle, NC
KC4JD, Robert T. Wettengel, Ozona, FL
W4JRW, William J. Lattin, Owensboro, KY
W4LBX, Ed Konersman, Fort Mitchell, KY
WA4LMR, Robert T. Anderson, Jr, Canton, GA
*WB4LZK, Thomas B. Ingles, III, Lynn Haven, FL
W4MKF, Charles P. Beddow, Decatur, AL
W4MNR, Alexander Toth, Sterling, VA
W4NO, Fred B. Westervelt, Charlottesville, VA
WD4OKP, Joseph D. Ford, Jr, Gloucester, VA
*W4OLL, Robert H. Strid, St Petersburg, FL
W4OZG, Emanuel Caplan, Tamarac, FL
W4PRX, Ralph J. Robinson, Longboat Key, FL
W4QS, Rex E. Bassett, Jr, Wilton Manors, FL
K4SWF, Ferris H. Marshall, Lancaster, SC
KA4UBW, Irene Vasa, Milford, DE
W4WV, Joseph P. Martineau, Virginia Beach, VA
K4XN, Raymond Leun, Bradenton, FL
WB4ZUU, Richard H. Fox, Memphis, TN
W5CCH, Robert S. Davis, Austin, TX
W5CPV, Grady L. Hardin, Camden, AR
W5DB, Walter C. Putnam, Midland, TX
W5DZF, Jeff M. Scott, Jr, Opa-Locka, FL
KA5FDR, Robert E. Payne, Waco, TX
W5FJ, Lyman M. Edwards, Houston, TX
W5HPJ, Tom K. Dixon, Jr, Brenham, TX
KB5IP, David E. Sterritt, Bell Gardens, CA
N5IYL, Richard R. Edwards, Hector, AR
WD5JES, Anton Myrtue, Mapleton, IA
WD5JUU, Sedric L. Johnston, Krotz Springs, LA
N5KAP, J. O. Floyd, Brady, TX
WB5LHK, Donald C. Veir, Boerne, TX
W5OKD, William H. Heffernan, Irving, TX
W5OY, William E. Peterson, Austin, TX
W5TCJ, Darius M. Gallagher, McAllen, TX
W5TP, Ancel L. Foster, Dallas, TX
W6AX, Thorn L. Mayes, Durango, CO
KA6BXV, Duane T. Davis, Bandon, OR
K6CMD, George H. Anderson, Tujunga, CA
AJ6E, Bennette O'Bannon, Mi-Wuk Village, CA
KK6F, Charles Busenkell, Camarillo, CA
K6HX, Lewis E. Stoner, Mercer Island, WA
K6JNL, Maxwell A. Sperry, San Diego, CA
W6KQY, Ernest Erwin, Harbor City, CA
W6MEL, Earl Warford, Bakersfield, CA
K6MKQ, John S. Nettleton, Richmond, CA
W6MWD, Ray C. Foote, Los Angeles, CA
N6NA, Marvin H. Smith, Carlsbad, CA
N6NME, Uarda I. Byer, Yermo, CA
*W6OKK, Creston Patterson, Santa Clara, CA
WA6OOC, Edward J. Murphy, Connellsville, PA
K6PHV, Norman A. Davis, Cambria, CA
W6PIC, James A. Velek, Calimesa, CA
W6PJA, Robert J. Cook, Fullerton, CA
KA6P, E. Joan Gentry, Fairfield, CA
W6PPW, Leroy E. Fresh, Sr, Felton, CA
W6PXM, Charles Cloud, Fresno, CA
W6PXY, Donald F. Stone, Pacific Palisades, CA
K6REK, James F. Van Wicklin, Sacramento, CA
WA6TTD, Thais Rose Grabenauer, Napa, CA
K6TWJ, Melvin S. Springer, San Francisco, CA
W6VCL, Roy C. Eastman, Ahwahnee, CA
K6VDS, Raymond H. Adams, Hemet, CA
W6WSL, Eugene H. Price, Aptos, CA
*K6YOR, Marty Gregor, Anaheim, CA
KA6YSV, Joseph A. King, Avenal, CA
W6ZC, Robert S. Warren, San Rafael, CA
W7ACP, Marvin E. "Rusty" Johnston, Grayland, WA
W7AHP, George P. McClanahan, Grants Pass, OR
N7AUI, Rex E. Womack, Lake Stevens, WA
W7BNK, Lowell E. Pratt, Independence, KS
W7CXK, Henry W. Goetze, Seaside, OR
W7DIN, Katie Fairbank, Fort Davis, TX
KE7DJ, Frank O. Helton, Tacoma, WA
W7FLJ, Richard E. Pasko, West Linn, OR
KB7FV, Stanton D. Bennett, Mercer Island, WA
WA7FWF, Donald A. Schultz, Baker, MT
W7GPN, Carl R. Ruthstrom, Ogden, UT
W7HLF, Dwight J. Albright, Medford, OR
K7JGM, Harold S. Reed, Seattle, WA
W7KHF, Wesley L. Stone, Pendleton, OR
W7LO, Arthur H. Bardewyck, Phoenix, AZ
K7MJC, William E. Eccles, Scottsdale, AZ
W7MWF, David D. Davis, Las Vegas, NV
KB7P, Oscar J. Dooling, Bellingham, WA
KB7TU, James W. Owens, Tucson, AZ
K7UYG, John R. Donley, Cave Creek, AZ
WB7WAW, Russell K. Bailey, Pine, AZ
WB7WBM, M. G. Zender, Tucson, AZ
WA7YMC, William A. Collyer, Port Angeles, WA
W7YM, Roy A. Mills, Idaho Falls, ID
W8AKK, Ramon W. Peterson, Battle Creek, MI
KC8AM, Dempsie L. Baker, Boomer, WV
K8AYE, William J. Neel, Georgetown, OH
K8BNI, William L. Wagner, Hudson, OH
WB8CHP, Andrew A. Petras, Copley, OH
WB8CUB, Paul E. Rice, Canton, OH
N8DIF, Millard C. Pickens, Bangor, MI
KC8DL, Ivan L. Davis, Livonia, MI
WD8DWJ, Leon V. Benn, Port Richey, FL
W8DXJ, Eben C. File, Grayling, MI
WA8FLD, Alvin E. Frick, Sebastian, FL
W8IE, Elmer F. Shaffer, Tiffin, OH
K8IUM, I. W. Graw, Dunedin, FL
W8IZF, John S. Kovac, Port Clinton, OH
K8KMQ, William H. Savage, Flint, MI
W8KVA, Leroy H. Goss, Sr, Wheeling, WV
W8TIC, Thomas C. Jensen, Muskegon, MI
W8UGT, Paul D. Hogg, Ann Arbor, MI
K9AN, Stanley M. Casey, Huntington, IN
W9BQP, John Chaplin, Kokomo, IN
K9BWF, W. R. Williams, South Bend, IN
K9CEG, Lester M. Lucas, Vincennes, IN
W9DIG, Loren Skalitzky, Waterloo, WI
KA9ERE, Simeon J. Coy, Kokomo, IN
N9FDU, Raymond D. Bugge, Waukegan, IL
KA9GSR, Walter Kevin Artz, Terre Haute, IN
W9HGA, Albert W. Lord, Montgomery, IL
W9HIW, Charles H. Cone, Bicknell, IN
K9HJ, Herbert J. Schoeder, Milwaukee, WI
W9IAG, Robert W. Pollitt, Columbus, IN
WA9IJF, Harold E. Price, Ingate, IN
WA9JAG, Eugene H. Kroon, Addison, IL
W9JGH, Richard Burdett, Lake Station, IN
WA9JOV, Raymond W. Weeks, Milwaukee, WI
K9JRM, M. P. Meisenheimer, Cherokee Village, AR
K9JYM, Ralph C. Fish, Vevay, IN
K9KFK, Edward K. Comstock, Shelbyville, IN
W9KJU, Dwight L. Barr, Sr, Lake Geneva, WI
W9LSW, Glen Hershberger, Goshen, IN
W9MHG, Richard O. Schramm, Marion, IN
W9NXZ, Kenneth R. Lung, Newport, NC
KA9OYC, Frank J. Suzda, Villa Park, IL
K9PAR, Morris W. Johnson, Evansville, IN
W9RRT, Elmer A. Heib, Milwaukee, WI
W9TEM, Thomas P. Clements, Conneaut, OH
WØABE, Lawrence G. Lundeen, Tabor, IA
WØAJA, Harold I. Kirlin, Stuart, IA
WØAKW, John C. Glaze, Oklahoma City, OK
NØAVB, W. Edward Hallbeck, Rochester, MN
KAØAYO, Edward J. Dillon, Chesterfield, MO
WØBRI, W. F. Malachowski, St Louis, MO
WØBTD, Norman Harrison, Jefferson City, MO
NØBVP, Raymond O. Overby, Minneapolis, MN
WØCUB, Jesse C. McCowen, Collins, IA
WØCXF, Robert R. French, Springfield, MO
KBØDA, James H. Little, Marshall, MO
WØDXG, Paul Binstock, St Paul, MN
WØEOE, Levi Hockett, Boone, IA
WØEXE, J. Fred Thompson, Branson, MO
WØFKL, Clarence L. Jensen, Lennox, SD
WDØFRJ, Harry K. Waymoth, Colorado Springs, CO
WØFXC, Frank V. Vosejpka, Lonsdale, MN
NØGCL, Hubert I. Stock, Pueblo, CO
WØGC, Jack H. Miller, St Joseph, MO
WØGQE, Clarence Woolworth, Hinton, IA
WDØHBN, Melvin G. Davis, University City, MO
WØIMC, George E. Noponen, St Paul, MN
WØINR, Alfred P. Wyland, Hemingford, NE
WAØIOA, Eugene J. Welp, Storm Lake, IA
WØKRU, John W. Hawes, Cedar Rapids, IA
KAØLEY, Bob Saathoff, Gering, NE
*WBØNYO, Robert J. Postel, Sr, Hiawatha, IA
KØOVA, Edward S. Roadfeldt, Badger, MN
KCØPH, Louis H. Holobaugh, St Charles, MO
WBØQKX, William E. Spencer, Independence, MO
WØRJ, Ralph L. Johnson, Denver, CO
*WBØUQI, Amy F. Hohensee, Omaha, NE
WAØVTR, John H. Volquardsen, Bettendorf, IA
WØYJY, Floyd I. Hall, Engelwood, CO
WBØYZR, Everett Dietz, Omaha, NE
VE1VI, Eric D. Redden, Chester, NS
VE2BLN, Andrien St-Martin, Iberville, PQ
VE2EVW, J. Maurice Nantel, Verdun, PQ
VE3AJZ, Vincent Fountain, Orillia, ON
*VE3BZQ, James A. Hildreth, Scarborough, ON
VE3CQS, Don Lapp, Kitchener, ON
VE3EIF, David Ferguson, Waubaushene, ON
VE3EX, Harry Collett, Toronto, ON
VE3HPR, Charles Kilgour, Cobourg, ON
VE3KS, George Meldrum, Willowdale, ON
VE3LKR, Johannes M. Holmboe, Don Mills, ON
VE3NIQ, Dick Carveth, Peterborough, ON
VE3QE, Leslie A. Whethem, Hamilton, ON
VE3TZ, Leonard Clement, Oakville, ON
VE3VB, R. A. Cline, Uxbridge, ON
VE3ZC, William R. Cartledge, Cornwall, ON
VE4JW, Bill Splett, Beausejour, MB
VE6YU, Howard Blue, Coledale, AB
VE7CEO, Ralph Hoskins, Sidney, BC
VE7FWK, Lorner Kennedy, Surrey, BC
VE7TC, Tom Chappel, Nanaimo, BC
VE7XN, Floyd Gibbon, Burnaby, BC
G2CDN, Rex J. Toby, London, Great Britain
GØESQ, Peter Buglass, Northumberland, Great Britain
JG1FJT, Mike Shiota, Tokyo, Japan
LU2DX, Jose Ahumada, Buenos Aires, Argentina
OA4GH, Elena M. Hauser, Lima, Peru

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ. Canadian reports should be sent to the CRRL HQ address on p 9.

Note: All Silent Key reports sent to HQ must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

November 1937

☐ With a record 642 individuals having participated, a report on the 1937 Field Day is the lead article this issue. Egyptian Radio Club's W9AIU/9, with five rigs available at 20 watts each, made the astounding total of 204 QSOs.

☐ Voltage-regulated power supplies are especially necessary for good speech amplifier performance, and George Grammer describes a 10-watt high-gain unit for crystal or carbon microphones.

☐ Hq. is getting ready for the Havana international radio conference (western hemisphere) where the status of our 160 and 80 meter bands, being regional in propagation effects, will be of concern to amateurs. Secretary Warner and General Counsel Segal are delegates.

☐ Using a new "infinite attenuator" coupling circuit, Hallicrafters engineers Miles and McLaughlin have come up with an i.f. amplifier system with infinite off-frequency rejection.

☐ There are now 46,850 amateurs (as of June 30), a gain of only 594 in the past year. Raising the code speed (from 10 to 13 w.p.m.) made serious inroads on the number of new amateurs.

☐ W6JTV (SCM, East Bay) shows us how to strip an automobile generator and rewind it for a 110-volt a.c. supply. A kilowatt is possible with separate excitation.

☐ To protect itself from further bootleg (and poor) translations of the *Handbook*, the League has made an arrangement with Arbo Editores of Buenos Aires to produce a quality Spanish translation each year.

☐ "End effect" in radiating antennas insures that the electrical length and the physical length of a conductor are not necessarily the same thing. W6AAR provides a table of correction factors for various types of resonant lines.

☐ W6AM describes his antenna farm, mostly beams which provide ten separate directions with energy concentrated in a width as narrow as 10° for 14 Mc.

☐ Hail to the first members of the new DX Century Club! With country totals, they are: W8CRA, 112; W1BUX, 105; W1TW/W1CMX, 104; W6CXW, 101; G6WY, 100. By comparison, 5,000 WAC certificates have been issued so far.

☐ Readers likely won't duplicate the deluxe transmitter W6DUW's Kaar Engineering Company built on order for W6CLT, but there are some interesting concepts we could put to use.

25 Years Ago

November 1962

☐ The Editor attempts to smooth the ruffled feathers of some Technicians who feel that the FCC denial of a petition for 10-meter privileges was a slap in the face. He argues that experimentation, not communication, is the primary objective of the Technician license, and Techs should be proud of the challenge they face in helping to develop new frequency territory.

☐ Spurious radiation is one source of interference which is avoidable. Technical Editor Grammer takes up the special case of the linear amplifier, showing us how to eliminate the spurious radiation that results from its mistreatment.

☐ W6PZV's filter-type 100-watt sideband rig has as features r.f. and audio limiting, VOX control, and provision for c.w. and a.m. operation.

☐ Building Fund quotas have been set for each ARRL division, based generally on membership but higher for some areas of electronics industry concentration. The Central Division is currently front runner, with 30% of its quota filled already.

☐ An inexpensive dual-voltage supply for small or medium-power transmitters by WA8AFF uses Thyratrons to attain regulation and also variable output voltages.

☐ W1CUT says his complete 432-Mc. transmitter is the "easy way" to enter amateur television activity. The r.f. end—converter with crystal controlled injection, plus a linear amplifier—has wider applications for anyone interested in working the 420-450 Mc. band.

☐ Older receivers have excellent tuning mechanisms and provide good bandspread, and thus W1ICP says are good initial investments in the second-hand market especially for a beginning amateur. Sensitivity and image rejection on the higher bands 20 through 10 are not the best, however, so he describes a simple one-tube three-band preselector to improve performance in that portion of the spectrum.

☐ The "Boolean algebra" basis for logic systems is often a mystifying discipline in science, but W4YFA thinks all amateurs should have at least a speaking acquaintance with the subject and so outlines the fundamentals.

☐ Amateurs dislike being mentioned in the same breath as Citizens Radio, but a reorganization of the Federal Communications Commission has resulted in the administration of both groups under one FCC division. An efficiency expert study concluded that the two groups were somewhat unique in being individual/personal users of radio rather than commercial users, and thus the move was logical. The good news is that two old friends and fellow amateurs head the operation—W3GD as division chief, and W4GF as a branch chief.

☐ The new T-2028 u.h.f. transistor is reasonably priced, and has a guaranteed noise figure of 4.5 db at 200 Mc. Dan Meyer of the Southwest Research Institute describes a preamplifier for 50 or 144 Mc. which gives high performance without the high B-voltage requirement for the Nuvistor.—*W1RW*

Exam Info

ARE YOU *REALLY* READY FOR THE CODE TEST?

Picture this: You're a Novice who has been working on your code speed so you can knock out the General class test that you just sat down to take. You're confident of passing because you've been on the air so much lately that you're copying well above the 13 WPM required to pass. You begin copying the code solidly, but within a few seconds your hand starts getting tired and then cramps. The code test ends before your hand relaxes enough for you to resume copying. You don't get anywhere near a passing score. What happened?

If you're like a lot of Morse code operators, you got good enough at copying that you stopped writing down what was being sent, other than the usual RST, QTH and name of the other operator. That's when you realize that it's not how well you can copy in your head, but rather how well you can copy on paper! In other words, being solid at 15 WPM in your head doesn't do you much good in the exam if your hand and wrist muscles don't keep up with your brain. Should your next shot at upgrading require passing a code element, spend some time practicing copying on paper. It's crucial that the muscles in your writing arm are toned up for the upgrade exam and coordinated with your mental decoding "machine."

Also, don't be surprised if you find initially that you can copy 15 WPM solidly in your mind, but can't write more than 4 or 5 WPM. It's a common problem, but one that is easily overcome by practicing. It's that simple. And the best way we know of to get ready for the test is to get on the air often or perhaps copy a few more W1AW code practice transmissions. Will we see *you* on the air?—*Jim Clary, WB9IHH, Manager, ARRL/VEC*

Strays

A NEW WRINKLE IN "52" PICKUP

☐ The name of the game isn't "Help Stamp Out QSL Cards!" But the photograph does illustrate what happened to a packet of cards one amateur mailed to ARRL HQ for a WAS award. Perhaps the sender thought things were tied up pretty in a super-secure packet when he or she whistled off to the post office. Instead, what you see is what we got, and little can be done to unravel the mystery of how many cards are missing. The postal personnel bundled up what they could salvage from the floor sweepings then sent us the grim remains.

What the Postal Service does prefer is (1) packing the material so it won't shift in the container, and (2) using reinforcing tape instead of string and loose paper that may snag in the automatic sorting equipment. Whether you are applying for WAS, DXCC or another award, pack those cards securely!

SPACE SYMPOSIUM WITH EDUCATION THEME

☐ The 5th Annual Space Symposium, on Saturday, November 7, at the Southfield (Michigan) Hilton, in conjunction with the Annual General Meeting of The Radio Amateur Satellite Corporation, will have a strong educational emphasis this year. Educational sessions will be featured for students and science teachers who have minimal understanding of satellite communication and Amateur Radio. Dr Tony England, WØORE, will be the featured speaker.

More details may be obtained by writing to: AMSAT, PO Box 1091, Ann Arbor, MI 48109-1091. If you are unable to attend, but would like to learn more about satellite communications and/or participate in this outreach activity to our schools, please write AMSAT, PO Box 27, Washington, DC 20044.—*tnx Jan Jellema, W8SWN*

Moved and Seconded . . .

MINUTES OF EXECUTIVE COMMITTEE
No. 427
Montreal, PQ, Canada
September 5, 1987

AGENDA

1) Approval of Minutes of May 16, 1987 Executive Committee meeting.
2) FCC Matters:
2.1) Review of status of ARRL response to FCC proposals in General Docket 87-14, Amendment of Part 2 of the Commission's Rules Regarding the Allocation of the 216-225 MHz band.
2.2) Review of status of ARRL response to the FCC inquiry in PRB-3, Privatization of Special Call Sign System.
2.3) Other FCC matters.
3) International affairs:
3.1) Review of meeting of ITU Administrative Council.
4) Local antenna/RFI matters.
5) Review of progress on Board directives:
5.1) By the vice presidents and/or chairmen for the committees.
5.2) By the Executive Vice President, on Board directives affecting Headquarters.
5.3) By the Executive Vice President, on W1AW renovations.
6) Study requested of the Executive Committee by the Board:
6.1) Regarding the ramifications of the formation of an Amateur Radio Political Action Committee, Minute 85, Second Meeting of 1987.
7) Recognition of new Life Members.
8) Affiliation of clubs.
9) Convention matters:
9.1) Approval of division, state and section conventions.
9.2) National Convention matters.
9.3) Consideration of a 7th ARRL Amateur Radio Computer Networking Conference.
10) Certification of candidates for Director and Vice Director, and review of candidates' statements.
11) Announcement of appointment of Committee of Tellers.
12) Other business.
13) Date and place of next meeting.

Pursuant to due notice, the Executive Committee of the American Radio Relay League met at 8:52 AM, Eastern Daylight Time, Saturday, September 5, 1987, at the Bonaventure Hilton International in Montreal, Province of Quebec, Canada. 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, WØFIR and George S. Wilson, III, W4OYI. Also present were Vice Presidents Leonard M. Nathanson, W8RC and William J. Stevens, W6ZM; Secretary Perry Williams, W1UED; Directors Thomas B. J. Atkins, VE3CDM, Rush Drake, W7RM, Tom Frenaye, K1KI, Edmond A. Metzger, W9PRN, Rodney J. Stafford, KB6ZV, Marshall Quiat, AGØX, and Hugh A. Turnbull, W3ABC; Vice Directors Harry MacLean, VE3GRO, and Allan L. Severson, AB8P; CRRL Director Claude Brunet, VE2ZZ; Counsel Christopher D. Imlay, N3AKD, and Canadian Counsel B. Robert Benson, QC VE2VW.

1) On motion of Mr. Wilson, the Minutes of the May 16, 1987, meeting were adopted as printed.

2) FCC Matters:

2.1) The Executive Committee reviewed the ARRL response so far to FCC proposals in General Docket 87-14, Amendment of Part 2 of the Commission's Rules Regarding the Allocation of the 216-225 MHz band, and the plans for ongoing action.

2.2) The Committee next reviewed the ARRL actions in response to the FCC inquiry in PRB-3, Privatization of Special Call Sign System (SCSC). Counsel Imlay reported that an eight-day extension of time to file reply comments in the matter, until September 8, had been granted on request of Forest Industries Telecommunications. Though the ARRL Reply Comments were ready for filing on August 31, the extension made it possible for the Committee to read the text at this meeting, prior to the new filing date.

2.3) Other FCC matters:

2.3.1) On motion of Mr. Hurlbert, the Executive Committee reaffirmed the League's interest in obtaining early access for US radio amateurs to all or part of the band 18.068-18.168 MHz, particularly in view of the increasing number of other countries including Canada that have afforded such access to their amateurs. The President and staff were instructed to continue pursuing this matter with appropriate government agencies.

2.3.2) Counsel Imlay presented a draft of a Request for Rulemaking responsive to Minute 73 of the Second 1987 Board Meeting. The draft requests adoption of a rule by the FCC which would prohibit appointment of a Volunteer Examiner in any case where the individual had been decertified by any Volunteer Examination Coordinator (VEC), without the prior express approval of the Commission. Without dissent, it was agreed that the document would be filed with the Commission after minor editorial changes.

3) International matters:

3.1) The President summarized results of the 1987 meeting of the Administrative Council, International Telecommunication Union. The council shortened the 1987 session of the World Administrative Radio Conference for Mobile Service (MOB-87), which begins on September 14 in Geneva, by one week. Dick Baldwin, W1RU, President of the International Amateur Radio Union will be present as an observer for the Amateur Service. There will be a Regional Administrative Radio Conference on Broadcasting (RARC-BC), May 23 to June 9, 1988, in Rio de Janeiro, which will plan for use of the 1605-1705 kHz broadcast band approved by WARC 79. International trade shows have been approved in connection with each of these Conferences; an IARU booth will be manned at the Geneva show, Telecom 87, and is under consideration for Rio.

3.2) The President updated his July report on the possibility of a general WARC in the 1992 time frame. Though minutes of a US Government policy meeting show a lack of unanimity on the need for WARC 92, there is no evidence that such a conference can be avoided; in view of the long lead time necessary for preparation by the Amateur community, President Price recommends prompt formulation of plans leading to the defense of Amateur Radio at such a WARC.

4) Counsel Imlay reported briefly on a new Federal preemption order in a Connecticut case, which should be of great value in local antenna matters. Copies will be sent to members of the Legal Strategy Committee.

5) Review of progress on Board directives:

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

5.1.1) Mr. Stafford, as Chairman, reported briefly for the Volunteer Resources Committee. It will meet in Hartford November 21 to perform the study of the Volunteer Examiner Coordinator process at HQ, which was mandated by Minute 80, 1987 Second meeting.

5.1.2) Mr. Metzger, as Chairman, reported on the September 4 meeting of the Administration and Finance Committee. A highlight of the meeting: The Committee authorized the purchase of an IBM System/38 computer for HQ to replace the existing computer. On motion of Mr. Hurlbert, the Treasurer was authorized to borrow not more than $419,000 to finance the purchase of the replacement computer. The A&F Committee will meet on November 21 for the 1988 budget review. The Committee was in recess from 11:02 to 11:22 AM.

5.1.3) Mr. Quiat, as Chairman, yielded to Mr. Holladay for a brief report on the Membership Services Committee. At an autumn meeting it will be working on revisions for band plans for the lower UHFs, in consultation with the VHF Repeater and VHF/UHF Advisory Committees.

5.1.4) Mr. Nathanson, as Chairman, reported that the Legal Strategy Committee plans a meeting for Scottsdale, AZ on October 10.

5.1.5) Mr. Atkins, as Chairman of the Ad Hoc Committee on the Strengthening of CRRL, reported that the CRRL Board had held its annual meeting the previous week in Toronto. The CRRL is financially stable and its membership is growing. In the latter respect, Mr. Atkins observed that the Quebec CRRL Director, Mr. Brunet, had himself recruited 100 new members. (Applause)

5.2) The Executive Vice President presented a one-page summary of 1987 Second Board Meeting directives, and answered questions from the group on items therein.

5.3) Mr. Sumner also presented the progress report on renovations to the Hiram Percy Maxim Memorial housing W1AW. The structural engineer reports that the building is basically sound. There will be a further study as to whether the cellar floor can be lowered or the building raised to make the basement area fully usable. With regard to equipment, it is intended that it be the best available.

6) Study requested of the Executive Committee by the Board:

6.1) At Minute 85 of the Second 1987 Meeting, the Executive Committee was asked to "Research, document and report the ramifications of the formation of an Amateur Radio Political Action Committee." The initial phase of the study developed three central questions: Is it a good idea for ARRL? What will it accomplish beyond present efforts? Is it legal? To the last of the three, the answer is in hand already: A not-for-profit, educational and scientific association recognized under IRS Rule 501 (c)(3)(e.g., the ARRL) is prohibited by IRS rules from working for or against the election of a public official or legislator, state or federal, and so may not have a Political Action Committee. While the study will continue, it will, therefore, be broadened beyond PACs into an examination of overall effective lobbying measures.

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

8) On motion of Mr. Grauer, the following clubs were declared affiliated:

Category I

Ames Amateur Radio Club, Moffett Field, CA
Columbia-Montour ARC, Berwick, PA
Hawksnest Repeater Association, Robinson, ND
Henry Radio of Orange County Radio Club, Woodcrest, CA
Humboldt Packet Radio Society, Eureka, CA
Inland Empire VHF Radio Amateurs, Inc., Spokane, WA
Interstate Repeater Society, Inc., Derry, NH
Lancaster Amateur Radio Club, Lancaster, NY
Las Vegas Repeater Association, Las Vegas, NV
Lubbock Amateur Radio Club, Lubbock, TX
Major Armstrong Memorial ARC, Inc., Bergenfield, NJ
Marple Newton ARC, Newton Square, PA
Mashpee Amateur Radio Association, East Falmouth, MA
Minnetonka Minnesota ARC, Minnetonka, MN
Osage County ARC, Overbrook, KS
Piscataway Amateur Radio Club, Piscataway, NJ
Radio Amateur Group, Inc., Lumberton, NC
Singer Employees ARC, Wayne, NJ
Statesboro Amateur Radio Society, Statesboro, GA
Tillamook Emergency Amateur Radio Service, Tillamook, OR
Tyler Amateur Radio Club, Inc., Tyler, TX
Upper Rio FM Society, Inc., Albuquerque, NM
Walt Disney World ARC, Lake Buena Vista, FL
Westchester FM Repeater Assn., Bronx, NY
Weston Amateur Radio Emergency Service, Weston, CT

Category II

Council for the Advancement of AR in NYC, Brooklyn, NY
Hellenic Amateur Radio Association, Fresh Meadows, NY
Radio Amateur Telecommunications Society, Bergenfield, NJ

Category III

Intermediate School 72, Staten Island, NY
K2BSA Amateur Radio Association, Euless, TX
Loyola Marymount University ARC, Los Angeles, CA
Mt. Vernon High School ARC, Fortville, IN

With the election of these clubs, the League has 1633 clubs in Category I, 17 in Category II, and 115 in Category III. The Committee was then in recess for a joint luncheon with officials of the Canadian Radio Relay League from noon to 1:20 PM, reconvening with all those previously mentioned present, except Messrs. Atkins, Benson,

(continued on page 84)

Public Service

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

Lifeline in the Wilderness

It is 1049 miles from Anchorage to Nome by way of the "Iditarod Trail." The grand prize is $50,000 and a place in Alaska history. In February 1925, a diphtheria epidemic broke out in Nome, the city of gold. Antitoxin serum would be required to halt the spread of the deadly disease. A telegraph message was sent to Fairbanks, Anchorage, Seward and Juneau asking for assistance. The serum was located at the Alaska Railroad Hospital, but the problem was getting it to Nome. It was the middle of winter.

Although airplanes were used in the territory during this period, they had been dismantled and stored for the winter, so dog teams and their drivers fell heir to the task.

The serum went by train to Nenana where the best teams from Nome and Nenana set out to meet on the trail in a relay race for life. It took 127.5 hours to cover the 674-mile trail from Nenana to Nome. A total of 20 teams participated. The serum made it in time, and the life of this isolated community on the edge of the world was saved! The Iditarod sled dog race commemorates this event.

As it was in 1925, this is a race to survive. It is a race of speed, although the winner will average less than four miles per hour. It is a race of endurance, for it will take the winner 12 days to reach Nome. It is a race of strategy, for a poorly timed stop may make it impossible to get the dogs back on the trail, or worse, land you in the middle of a raging blizzard.

Included in the 1987 slate of mushers were 56 men and 7 women ranging in age from 20 to 81 years and nearly 1000 dogs. Though most of them hailed from Alaska, there were entries from Georgia, Washington, Colorado, Minnesota, Montana, Japan, the Yukon Territory of Canada and three teams from France.

Amateur Radio's Role

Unlike the travelers of 1925, the mushers have not been alone. Amateur Radio has been the lifeline along this wilderness trail since the race began in 1973. It has connected checkpoints, some of which are more than 75 miles from the nearest telephone, with race headquarters in Anchorage. The network handles calls for veterinary and medical assistance. It assists in the staging of supplies along the trail. Dog food and sleds are "life critical" to the mushers and the dogs. Finally, the location of each team and the position in the race is relayed to anxious spectators who follow the race from their easy chairs.

Several years ago, this year's winner, Susan Butcher, used ham radio to save the lives of some of her dogs. It seems her team surprised a moose on the trail. The moose killed one and critically injured several of her dogs. Ham radio was the only communications available at the nearby wilderness checkpoint to request veterinary assistance and schedule evacuation.

Each year, in March, volunteer hams pack up their radio equipment for the trip to "the bush." Many of the checkpoints, such as Iditarod, Ophir and Rohn River to this day have no modern facilities. In addition to radios, a suitable power plant, sleeping bag, tent and other wilderness survival equipment, a two-week supply of food and fuel must also be ferried in.

Most of the operations have been conducted on 75 meters with 40 meters as a backup. As one might predict, neither band will support 24-hour communications. As a matter of fact, since all the checkpoints are above 61 degrees North Latitude, frequent disturbances render HF propagation totally useless for days at a time. Due to the distances between checkpoints, even efforts to relay by HF radio from one checkpoint to another have been futile.

Four years ago, it became obvious that the traditional HF network was inadequate to support the event. Lives, after all, were at stake.

The Network

In addition to HF radio, a network of VHF remote base stations was conceived to be located at major Alascom facilities across the state. They would be linked by satellite to a control point at race headquarters in Anchorage.

Although it was a rare conglomerate of commercial telephone equipment, Amateur Radio transceivers and a loose collection of transformers to match the nonstandard impedances of the amateur equipment to the standard 600-ohm telephone lines, it worked like a champ! For the first time, when 75 meters folded, there was still communications.

The same radios that were used in previous races were not available in 1986, but a new source offered two of the same model radio. They were guaranteed by their owner to work and by "Murphy" to fail. A single 50-watt amateur transceiver was pressed into service to provide VHF coverage of certain critical checkpoints.

Setbacks like this serve their purpose. The lives of the mushers and the support personnel could no longer be jeopardized by poor communications.

Instead of remote base stations that would only permit communications back to Anchorage headquarters, the 1987 goal was to design a network of linked repeaters capable of providing communications between any two checkpoints along the trail as well as back to race headquarters. Given the distances and terrain involved, this was a formidable task.

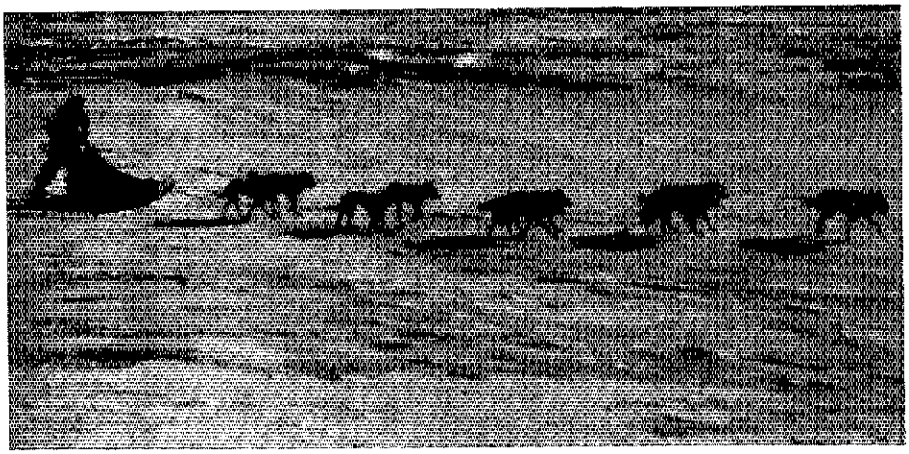
Four GE Master II® base stations and enough Wescom control equipment were required to do the job. An appropriation of funds by Alascom, Inc, purchased the items which could not be scrounged, such as commercial grade antennas and duplexers, along with identifiers and tone decoders for network administration.

With the satellite voice channels provided by Alascom, Inc, the network was in place with two weeks to spare. Repeaters were located in Anchorage, at Tatalina Air Force Station (3250 ft AMSL), Unalakleet and Nome. A fifth station will be located at Galena next year when the race follows the northern trail. With the great distances between repeaters, one frequency pair, 146.07/67 MHz, was used at all locations.

In Anchorage, an elaborate network of high-pass/low-pass filters and FSK transceivers is used to link the network. Network administration is conducted with the use of Touch Tone™ encoders and decoders. It is possible to individually activate or deactivate any receiver or transmitter by this method. Should the satellite channel fail for any reason, the FSK transceivers are wired to prevent the remote transmitters from accidentally keying on.

Most of the checkpoints were able to access

Susan Butcher, shown with her "lead dog," was the winner of the 1987 Iditarod Sled Dog Race. She is being interviewed under the trail-end mark in Nome, Alaska.



A musher drives his dogs on the shore of the Bering Sea about 10 miles east of Nome. *(photos courtesy of KL7WE)*

one or more of the repeaters. Three-fourths of the checkpoints were able to hear the repeaters, giving hope for improved performance next year. Some checkpoints were able to send messages to an adjacent checkpoint on a simplex channel for relay over the repeater network.

The Trail

The race follows the old winter trail established in 1910 from Knik, 20 miles northeast of Anchorage, to Nome on the shores of the Bering Sea. The trail was originally used by freight sleds ferrying supplies to the miners in Nome and other communities along the way. The place names visited along the trail are burned in the history of the gold rush.

Officially, the race begins in Anchorage, but the trail from there is short. It does, however, allow for all the pomp and circumstance befitting a race which covers more than twice as many miles as the Indianapolis 500. The teams line up for over half a mile along 4th Avenue awaiting their turn to start. A short way out of town they must be broken down and ferried to Knik for the real start of the race.

Once out of Knik, the trail crosses three mountain ranges, winds over 200 miles along the mighty Yukon River and after a final trek across the wind swept Bering Sea, ends up on Front Street in the golden city of Nome.

At the midpoint stands the legendary ghost town of Iditarod, for which the trail and the race is named. Little remains of this town of yesteryear. A few old buildings dot the river's edge. But, for a few brief days every other year, the old town springs to life. There are bright lights and TV cameras, news reporters and a bevy of airplanes lining the makeshift runway in the snow. And, to make it all worthwhile, a trophy and $2500 in silver ingots awaits the first musher to reach Iditarod.

The town of Iditarod existed before the Alaska Railroad gave birth to the city of Anchorage. It was a mining town of a thousand residents having such amenities as saloons, hotels, a tailor and shoemaker, restaurants and even a druggist. The town managed to rebuild after two devastating fires in 1911, only to enjoy a few brief years of mining camp prosperity before it dwindled to a ghost town.

At the end of the trail is the city of Nome. It is said that a mapmaker's error gave the town its name. He misread "? Name" as "C. Nome" or Cape Nome. However it got its name it certainly earned its reputation as "the city of gold."

In the fall of 1899, the "three lucky Swedes" as they were called, discovered gold in nearby Anvil Creek. Gold was soon after discovered on the beaches. By early spring of 1900, the beaches of Nome were crowded with over 10,000 gold seekers. By the fall of that year, there was enough rusting equipment on the beach to start a foundry. By October, the wave of excitement was gone, but a few dedicated pioneers remained to build a town. Giant storms in the Bering Sea nearly wiped out any trace of the town that first year, but it was rebuilt again and again. The most recent disaster occurred in 1974 when a giant storm sent water over the seawall wreaking millions of dollars in damages.

Communications with the villages along the trail has been primitive, at best. Some villages were fortunate enough to be connected by telegraph line. In more recent times, high-frequency radio replaced the telegraph, where it existed. For some, its coming was the first communications with neighbors and the outside world. Today, a state-of-the-art satellite network provides modern telephone communications to each village of 25 or more residents. This network covers about two-thirds of the checkpoints along the trail.

Iditarod is a major event involving an estimated 20% of the state's ham population in one way or another. It is here that ham radio provides a valuable service while acquiring skills for the future. It is, and will be, truly a "lifeline in the wilderness."—*Tim Pettis, KL7WE*

SPOTLIGHT ON SERVICE

Radio Amateurs Assist Edmonton

A once-in-a-lifetime tornado hammered the city of Edmonton, Alberta, Canada, on the afternoon of July 31, 1987. The tornado resulted in 26 deaths and hundreds of injuries. Damage was estimated at over a quarter of a billion dollars. An expert on tornadoes stated that this one was a 3.5 to 4 on a scale of 5. It was easily one of the worst to strike the North American Midwest.

Naturally, people from all across Canada and the rest of North America were very anxious to get in touch with friends and relatives in Edmonton to determine that they were safe. It was almost impossible to phone into the city because of storm-damaged and severely overloaded telephone lines. The telephone company had every available operator on duty, but even that was not enough.

Red Cross branches across Canada quickly stepped into the breach. One of the Red Cross's main functions is tracing people in disaster areas for concerned family members and others. During their busiest period, for example, the Manitoba Red Cross had 12 telephone operators taking inquiry information.

Since the telephone lines were not reliable, the Manitoba Red Cross decided to use alternate means of dispatching inquiries to Edmonton. One of the primary means was via Amateur Radio.

Gary Frankel, VE4VD, representing the Manitoba Red Cross, telephoned me late Friday evening, asking me to mobilize the Manitoba Amateur Radio Emergency Service (ARES). We were to transmit inquiries to Edmonton Red Cross and receive any replies. Early Saturday morning, August 1, Tom Mills, VE4SE, and I decided to use the Winnipeg Senior Citizens Amateur Radio Club (WSCARC) station, VE4WSC, as our base of operations.

The ARES, the Winnipeg Amateur Radio Club, Inc, and WSCARC have an informal agreement that we can use VE4WSC for any emergencies that require our services. The club station is set up for HF and VHF and is only 15 minutes away from the Red Cross building. VE4BC, representing WSCARC, quickly agreed to allow ARES the use of VE4WSC.

VE4WSC was in operation from August 1 to 3, using 20 meters exclusively. Poor band conditions and technical difficulties prevented us from using 40 meters. A link was established with the Northern Alberta ARC, VE6NC, and 450 messages were sent that first day. On the following two days, over 100 additional messages were sent and a few hundred replies were received.

I am very pleased with the Amateur Radio operators' performance. ARES had a good communications link into the disaster area with a very short time. We assisted the Manitoba Red Cross in a noble cause, and the Edmonton Red Cross learned first hand what Amateur Radio can do.—*Dick Maguire, VE4HK, District Emergency Coordinator, Winnipeg*

[See Field Organization Reports on next page.]

Strays

MOVING, UPGRADING YOUR CALL?

☐ When you change your address or call sign, be sure to notify the Circulation Department at ARRL HQ. Enclose a recent address label from a *QST* wrapper if at all possible. Address your letter to Circulation Department, ARRL, 225 Main St, Newington, CT 06111. Please allow six weeks for the change to take effect. Once we have the information, we'll make sure your records are up-to-date so you'll receive *QST* without interruption. If you're writing to HQ about something else, please use a separate piece of paper for each request.

Field Organization Reports August 1987

ARRL Section Emergency Coordinator Reports

Thirty one SEC reports were received, denoting a total ARES membership of 18,298. Sections reporting were: AR, CO, ENY, IA, KS, LAX, MDC, MI, MN, MO, NFL, NH, NNJ, NV, OH, OK, ONT, PAC, SCV, SD, SDG, SFL, STX, VA, VT, WA, WI, WNY, WPA, WTX, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	102	82.25	500	1018
TCC Central	90	96.80	420	438
TCC Pacific	112	90.32	492	998
Summary	304	89.79	1412	2454
Cycle Three				
TCC Eastern	60	96.77	54	108
Cycle Four				
TCC Eastern	117	94.35	687	1374
TCC Central	76	74.50	329	383
TCC Pacific	110	88.71	673	1317
Summary	303	85.85	1689	3074

TCC Certificates issued this month: KA1MKJ W1NJM

TCC Roster

KA1AE KB1AF N1BHH WICE K1EIC W1EFW WA1FCD KN1K KA1MKJ W1NJM KT1Q W1QYY KA1T KW1U N2AKZ W2FR W2GKZ WA2FJJ NN2H NQ2H KB2HM N2IC W2LWB KU2N W2PKY W2RQ KA2UBD N2XJ K2ZM N3COY N3DPF N3EMD KK3F WB3GZU W3OKN W3PQ KQ3T AA4AT N4EXQ N4GHI WA4JDH W4JL K4MTX WB4PNY W4UQ K4WJR K4ZK N5BB N5BT W5CTZ N5DFO W5GHP K5GM AE5I W5JOV AJ5K W5KLV KD5KQ K5MXQ WZ5N KD5RC W5QVK ND5T N5TC W5TFB K5TL W5TNT W5VMP KB5W NQ5W KV5X WB5YDD WV5Z W6EOT W6INH N6LHE K6LL WF6O K6UYK W6VZT KA7CRT NR7E W7EP W7GHT W7IGC W7LG NN7H KA7MUL K7OVK KF7R W7TGU W7VSE N8GJO WD8LDY W8PMJ W8QHB K8TPF AF8V KA8WNO N8XX WB8YDZ W8YP W9CBE W9EHS KA9FEZ W9JUJ NN9M KA9RII WB9UYU AD0A AI0A KC0D K0DJ KA0EPY K0EZ W0FRC KJ0G W0GRW N0IA NX0J KE0NI KS0U VE3FAS VE3GSQ

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	697	22.48	.578	88.7	
CAN	31	654	21.09	.482	100.0	
PAN*	59	531	9.00	.429	94.6	
Region Nets						
1RN	62	452	7.29	.419	92.6	100.0
2RN					92.0	90.3
3RN	31	192	6.19	.500	95.0	100.0
4RN	62	431	6.95	.314	82.5	96.8
RN5	62	654	10.54	.449	86.0	100.0
RN6	53	156	2.94	.302	88.3	100.0
RN7	62	402	6.48	.423	91.2	100.0
8RN	61	270	4.42	.251	90.8	96.8
9RN						100.0
ECN						48.4
TEN	62	550	8.87	.307	85.0	100.0
TWN	57	220	3.86	.346	90.0	98.3
TCC						
TCC Eastern	102	1018				
TCC Central	90	438				
TCC Pacific	112	998				
Cycle Three						
Area Net						
EAN	31	287	9.25	.508	73.7	
Region Net						
1RN						90.3
2RN	30	109	3.63	.323	89.3	90.3
3RN	20	17	85.00	.126	63.3	80.6
4RN						61.3
8RN						67.7
ECN						90.3
TCC						
TCC Eastern	60	108				
Cycle Four						
Area Nets						
EAN	31	1310	42.26	1.180	97.2	
CAN	30	709	26.63	1.050	100.0	
PAN	30	855	28.50	.832	97.2	
Region Nets						
1RN						100.0
2RN	50	209	4.18	.436	71.6	96.7
3RN	62	252	4.06	.417	94.1	96.7
4RN	62	532	8.58	.350	100.0	100.0
RN5	62	507	8.18	.590	100.0	100.0
RN6	62	545	8.79	.772	100.0	98.3
RN7	62	443	7.14	.680	88.4	98.3
8RN	59	378	6.41	.415	84.0	93.5
9RN	62	324	5.23	.389	93.1	100.0
TEN	62	371	5.98	.514	68.8	100.0
ECN						100.0
TWN	60	284	4.73	.331	79.4	95.0
ARN	31	163	5.25	.147	100.0	90.3
TCC						
TCC Eastern	117	1374				
TCC Central	76	383				
TCC Pacific	110	1317				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, AZ, BC, CT, DE, EMA, ENY, EPA, GA, IA, IL, IN, KS, MDC, ME, MN, MO, NC, NFL, NH, NLI, NTX, OK, OH, ONT, OR, ORG, RI, SC, SD, SB, SFL, STX, SV, TN, UT, VA, VT, WA, WMA, WNY, WPA, WTX, WV.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, upon sending notification of qualifying months to ARRL Public Service Branch, will be awarded a special PSHR certificate from HQ.

497
VE4WSC

176
VE7BNI

163
KA0EPY

146
VE3ORN

126
WB2ZJF

124
N4GHI

123
WB5SRX

121
VE4LB

120
AA4TE
N2EIA

119
KA9FFO

118
W7VSE

117
W1PEX
WX4H
KA3DLY

115
WA4QXT
VE4AJE

114
WF6O
K9CNP
KW1U
K5MXQ

113
KB4WT

112
W2AHV
WB2OWO

111
WA2EPI
W2MTA
WB1HIH

110
AA4MP
N3EMD
KT1Q

109
W4ANK
K2YQK

108
W9JUJ
WA2SPL
KF7BX

107
WB1GXZ
N9BDL
WA4PFK

KD7ME
KA2UBD

106
KA2F
KD0CL
N9BZZ
W3FA
KB1AF

105
NC9T
WA4JDH
WA1FCD

104
K4NLK
N2XJ
WD5GKH
AG9G
K0ERM
WA1JVV

103
WB4WII
W2RRX
W9CBE

102
N2HIF

101
KA1GWE
K0SI

100
WB6DOB

99
AA4ZV
WB4KSG

98
N1EDD
WB2VUK
WB2RBA

97
WA2VJL
N0FOO
W7LBK
VE3WV

96
WA2JBO
W4CKS
WA9VND
N6EQZ
KF7AV
NE2W

95
NQ2H
WA4RLV
WD4KBW
N3DPF
WB4ZTR

94
KI4YV
WA6ZUD
WD8KQC
NO0A
KE0NI

93
WA9VLC
KA7AID
K4MTX
WB1CBP
WA2ERT

92
KA2MYJ
W9EHS
N7GGJ

91
K0GP
W9DM
KA9RNY
WA2FJJ
ND2S

90
W3YVQ
VE7EJU
WD4COL
VE3DPO

89
WD8BZQ
K3JL
WA4LLE
KN1K

87
N1CPX
AA4HT
N3AZW
W0OYH

86
WD0GUF
N3EGF
K6UYK

85
K2ZVI
W5CTZ
N6MCY

84
K9ZBM
N7ELF
K4VWK
W5VMP

82
WA0TFC
WA3YLO
VE7EJW
KA7EEE
VE3POJ

80
WA4EIC
KD0NH
N0DPF
KA0KPY
N7APC

79
N7BGW
KA1IFC

78
WB2QMP
KA0ARP
KJ9J

77
KA4TLC
KV5X
N4EXQ
W4TZC

76
WB6QBZ
K4IWW
WA6WJZ
N0CLS
W6INH
WB7WOW
KA1EXJ

75
KK1A
WD9DZU
KC3Y
NK1Q
K4JST
K4JUM

74
WB4HRR
WA4RNP
K3NNI
KI4QH
WA1TBY

73
W9NXG
WB5EPA
N4KRA

72
W0FRC

71
KA2INE
AJ5K
W5KLV
KJ3E
WA4LTO

70
W1TN
WA4RUE
KA0SBY
AA4AT

KI4BR
WB4PNY

69
WA6QCA
NV5L
WB1HBB
KA9RII
KT9I
KC4VK
KB2BKE

68
KA4GUS
VE7ANG
W7LG
K2YAJ
WZ5N

67
K2ZM
WB5FQU
WB9PFZ
K2MT

66
WB8SYA
WA0HTN
N2GQS
KA4TWI
WG5S

65
WD8RHU
WB5YDD
N2AKZ
NB2D
W2FR

64
KA4FZI
K0PCK
KP4DJ
W4HON
NN2H
KB0Z

63
KA8CPS
VE4IX
WA3UZI
WA4ZHC
N2ABA/T
KK4FV

62
KB4BZA
WB2FTX
KB4LB

KQ3T
AI0O
VE3GSQ
VE3CYR
WD4ALY
N4KSO

61
WA8DHB
KA1LMR
WA3UNX
N2GPA
VE3GT
KC4WN

60
N2DXP
KA5UVY/T
W0UCE
WB0WNJ
W0OUD
K2TWZ
KA2ZNZ
K5UPN

57
N4MMM/T
N2HLZ/T
N2EVG/T

56
N2ETO/T

54
KA2JMA/T

53
KA1HPO/T

50
KA9CTW/T

49
N6FWG/T

46
W1YOL/T

42
KA1NOI/T

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
W3CUL	731	870	1299	79	2979
WB9YPY	0	768	84	523	1375
W3VR	370	259	301	39	969
WA4JDH	2	417	435	4	858
KT1Q	91	344	344	4	783
W7VSE	163	238	334	7	742
W1PEX	1	201	468	33	703
W9JUJ	0	345	340	2	687
N3DPF	66	286	317	11	680
N4GHI	47	314	292	23	676
WX4H	7	372	259	13	651
WF6O	1	334	292	13	640
WB0WNJ	200	104	296	1	601
W9ZRX	0	297	297	0	594
WA2SPL	68	158	279	28	533
K4DOR	19	240	255	4	518
N3AZW	—	—	—	—	515

BPL for 100 or more originations plus deliveries:

WD6BZQ	171
KA0EPY	104

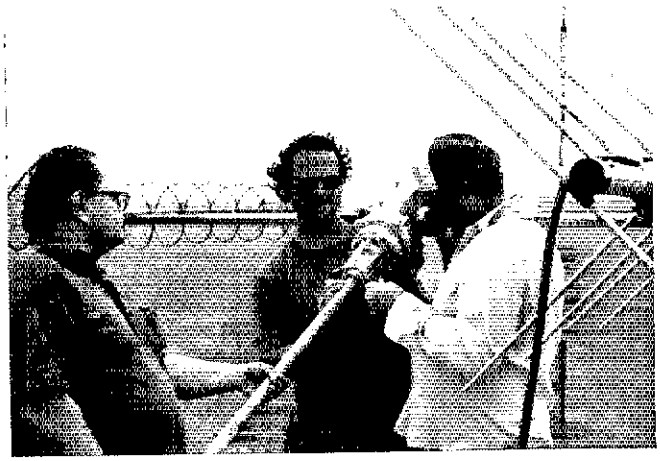
Independent Nets

Net Name	Sess	Tfc	Check-Ins
Clearing House Net	31	570	428
Early Bird Net	31	616	298
Empire Slow Speed Net	31	55	285
IMRA	26	845	1537
Mission Trail Net	31	134	934
New England Novice Net	25	41	54
NYSPTEN	31	68	491
Southwest Traffic Net	31	219	1439
West Coast Slow Speed Net	31	64	472
20 Meter ISSBN	26	770	351
75 Meter ISSBN	31	295	1254
7290 Traffic Net	47	560	2513

Field Day 1987

Fun for all and all for fun!

By Billy Lunt, KR1R and Mark Burke, KA1MIS
Contest Manager Contest Assistant



Putting the finishing touches on the OSCAR 10 antennas at WA5ZIB are (from left) N5HQM, WA5TWT and WA5WOD.

Traditionally, Field Day is marked as the fourth full weekend in the month of June. Field Day 1987 was no exception. It still remains as the most popular operating event as well as one of the most fun times of the year. What is unique about Field Day is that there is a place for everyone—contesters, traffic handlers, rag chewers, CW ops, phone ops, packeteers, picnickers, campers or those who just love get-togethers. This is what makes FD a favorite among all the hams in the US and Canada. There is fun and excitement for all. If you have never participated in FD, start making plans right now for FD 1988.

FD fever is spreading more and more each year as the number of participants and activity grows and grows. This year, 26,358 (reported) folks got together within their own clubs and groups and set up 1718 FD sites and 4020 transmitters in a variety of different locations. Some of the more popular spots were in shopping centers, churches, fields, mountaintops, parks, CD HQ and backyards. Whatever the location, the top priority for all was fun! At the stroke of 1800Z Saturday, radios buzzed from coast to coast for the next 24 hours (27 if you waited till the start to set up). Phone was the most popular mode of communications during FD. There were 771,366 phone QSOs and 446,772 CW QSOs reported for a grand total of 1.2 million contacts. When proof of bonus points were all tallied by HQ checkers, there was a total of 758k bonus points credited, making the total score earned by all entries over 4 million points. That's not bad for hams having fun!

Field Day is meant to be an emergency-preparedness exercise, where folks get experience in setting up temporary stations in a minimum of time for emergency communications. By looking at the results, emergency communications was surely met. Out of the 1718 FD stations, 1451 of them ran 100-percent emergency power (including lights, accessories, etc). Generator-powered stations numbered 1196 and battery powered 255. Many of these, also, had natural power stations (solar powered was the most popular) available when needed.

The 2A entry class is, again this year, the most favorite entry category with 544 entries. This represents about 31 percent of all entries. The second most popular class was 3A with 310 entries representing about 18 percent. For further breakdown of entries per class, check the boxes. You can use this information and the score listings as a guide for helping plan your next FD effort.

This year's W1AW Field Day bulletin announced bonus points for making cross-band contacts with MARS stations. Many entrants took advantage of these extra bonus points to add to their scores. A few MARS stations sent in their logs to HQ for checking purposes, and those are listed in the boxes. Thanks to all the MARS stations that made Field Day a great success.

Comments from several different groups are listed below. If your group's Field Day effort needs complete revamping or just some fresh thoughts on organizing, maybe the following comments will give you some ideas for next year. See you next June 25-26 during FD 1988!

Entries Per FD Class

1A—237	11A— 1	1C—31
2A—544	12A— 3	2C— 3
3A—310	14A— 2	1D—92
4A—108	15A— 2	2D— 9
5A— 61	23A— 1	3D— 3
6A— 30	24A— 1	1E—48
7A— 14	1B1—67	2E— 7
8A— 10	1B2—81	3E— 4
9A— 7	2B1— 1	4E— 1
	2B2—28	

MARS Stations

Call	*QSOs*
AGA6LA	81
AGA2LA	35
AFF4OK	21
AGA4KE	4

SOAPBOX

K2JT, 1B—1 operator Battery

Saturday morning it was raining as I started my 2-hour drive to the Catskill Mountains in New York. Fortunately, the rain ended an hour into my trip. At about 10:30, I started the 1½-mile hike up to Giant Ledge Mountain loaded down with 50 pounds of camping and radio gear. The weather was perfect for Field Day: it was wet, foggy and cool. I set up a nylon tent and strung up an inverted V fed with 300-ohm TV twin lead. After setting up, it was time for a chicken and rice dinner, cooked on my gas stove.

The only dry place to operate was inside the tent, and that got very uncomfortable with no chair or table. The rig (Argonant 515) was set at 2 watts output via a QRP wattmeter. All-band coverage was achieved with a Ten-Tec 247 antenna tuner. I used a Curtis Lil Bugger and a flyweight home-brew paddle. Power was from a pair of 6-volt gel batteries, which weighed almost 3 pounds each! Under cramped operating conditions, it's hard to operate for any length of time. The antenna worked well on 20 meters and fair on the other bands.

At 8:30 PM, the wind started blowing at gale force. Next came the rain, thunder and lightning. Operation closed. I crawled into my sleeping bag, warm and dry and I listened for three or four hours while the stormed raged. Finally, I managed some restless sleep. I woke at 4:30 AM to find it still foggy and windy, but no rain. I made a hot breakfast and set up the gear on a large rock. Then it was operating time again.

I packed up all my gear (including a very wet tent) and was on the trail by 7:30. Naturally, as soon as I started the drive home, it cleared up. At age 42, this was a tiring effort for me, but I am proud of the 2-watt QSOs that I made and I am glad to have the opportunity to participate in another Field Day contest.

N1FJ, 1B-2 operator Battery

We set up our Field Day station on Block Island, Rhode Island. All our pre-Field-Day planning sessions had only involved sitting around and talking. This meant we had to spend a wet Friday afternoon and Saturday morning slogging though tall grass cutting wire for antennas. We had a hard time getting height for the antennas on the island. The wind blows pretty steadily on the bluffs, and the big 40-year-old trees are an awesome 8 to 10 feet tall. We had enough mast to get everything up at least 20 feet. We pretended to want low antennas so we wouldn't overshoot the nearby population centers. The borrowed rig we were using didn't have a CW filter, and we are basically CW ops. It kind of makes me wonder what we did plan.

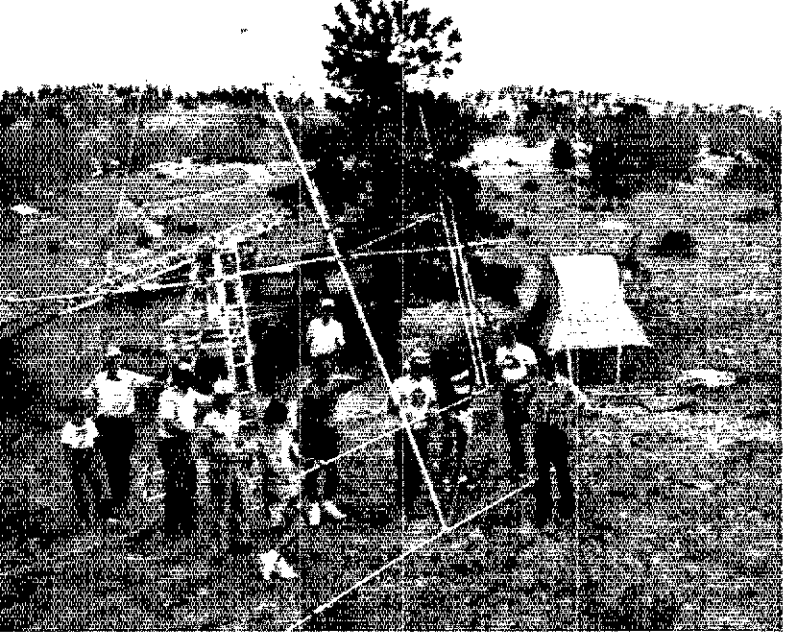
This was my (NK1I) first Field Day, and I had a great time. Being tired, wet and cold most of the weekend doesn't sound like fun—but it was! I got so tired Sunday morning I couldn't even send our call any more and had to switch to SSB.

Sunday turned out to be a beautiful, sunny day. It was perfect for topping off the batteries with the mini solar panel.

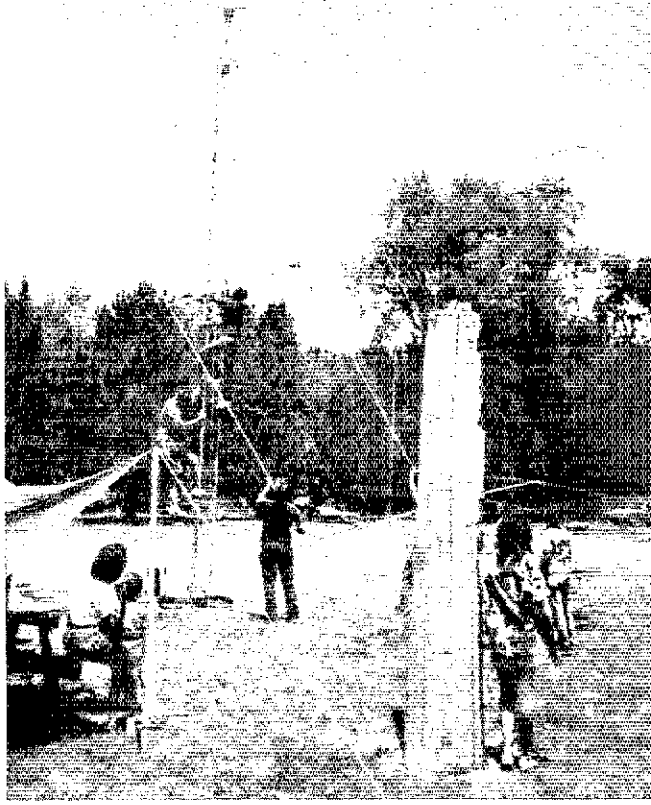
We hated to take everything down just as we were getting all the bugs out of the system. I was too tired to operate anymore anyway. Next year, I want a rig with a filter. See you again then.

KI7N, 3A

This was a spur-of-the-moment event for us. Several other groups were going to have a Field Day activity, but at the last moment, didn't. So the Oregon State University ARC and the BC ARES joined forces to see what we could do. We set up on the north side of town at the Elks Club parking lot. This was the disaster center location for floods or other emergencies that might hit our area. It was



The ops of W7NE take a photo break before the hard task of raising the tower with antenna attached.



The crew at W9UVI getting ready to raise their antenna.

the ideal site.

The tower was put up and down three times before we gave in to Murphy and decided that the beam was dead. On the fourth time up, we added a 10-meter big stick vertical to see if that would improve things.

One hour into the event, the faithful county-emergency generator quit! We had to call the county coordinator to come and perform some "magic" to get it running. That did the trick. It then ran for 23 hours straight.

Our point score wasn't a major force to contend with. However, we had fun! We're already talking about doing Field Day again next year! Maybe with some planning we can stir up enough interest to run all three transmitters for 24 hours. Importantly, we saw what was needed to make the county comm van easier to use.

W6SKQ, 4A—Battery

Once again the Zuni Loop Mountain Expeditionary Force headed for the high ground. That being a campground at the 7300-foot elevation in the mountains northeast of Los Angeles. This location, with its "user friendly" 90-ft pine trees, helped us support an array consisting of a four-element Delta-loop beam for 40 meters, a six-element Six shooter for 20 meters, a full-wave loop for 80 meters and a ZL Special for 15 meters.

In response to the challenge of some friendly rival QRP groups, we decided to try QRP, limiting our output to 1 watt. The rigs were two Argonauts, an Argosy and an HW-9. Auto batteries and solar cells provided more than enough power, since in some cases the dial lights were using more juice than the final amps!

Murphy stayed on the sidelines for the most part, only rearing his ugly head to bedevil an antenna noise bridge while the 40-meter array was being tuned. Dead reckoning and QRPer severance were called upon to negate the effects of the unwelcomed visitor.

What can be done with one watt you were asking? Lots, it appears. Our total QSOs were down from the total from last year, when we ran five watts, but not as far as we had expected. We found much more success working the edges of the fray than diving right into the middle. The open spaces of the higher bands, particularly 10 and 15 meters, seem to be tailor-made for the QRP signal. Next year, we intend to add a 10-meter antenna since this band is beginning to show much promise.

WØYC, 5A

Preparations for the WØYC Field Day expedition began in January. Unfortunately, they were never quite completed! YC is the club station at the University of Minnesota. Like any other student-run organization, it is sometimes hard to make

Looking for a clear frequency at W5FC.

things happen quickly. Perseverance, hard work, luck and a large dose of good humor made our efforts worthwhile.

We decided to mount a "DXpedition" to Abercrombie, North Dakota where an old fort is located. A couple of the guys had operated there the year before with good luck. We were right on the Minnesota-North Dakota border and had one end of our long wire in Minnesota across the river.

Never let it be said that we did anything the easy way. Where tents would have served us well, we decided to build ourselves an operating trailer. Simple wire antennas? No way! Four beams were planned on top of home-brew 40-foot towers, with loops for 80 and 40, and a long wire on 160. We had two generators, a 5 kW and 2.4 kW. We were confident that we could be serious contenders in 5A, and thought we might be able to win.

The trailer worked out very well for us. Built from the ground up as an operating station, it had through-wall coax connectors and ports for rotor cables. It was wired with two separate, but cross-connected, surge-protected power circuits so we could stay up while gassing up a generator. The operating stations were built-in tables with plenty of room for gear. We even carpeted and paneled the darn thing!

The towers looked like they would work out, too, but when we started putting the first one up on its tip-up base, Murphy reared his ugly head and lent new meaning to the word "J-pole." Imagine, if you will, a 40-foot tower with a tribander attached, inching its way skyward in YC's version of the Iwo Jima flag raising. The tower was at about a 40-degree angle when the main supports yielded. Had the mechanical engineers in the group checked the numbers for the tower sections? Nope. We eventually got three beams up on two shortened towers and a push-up mast, four hours into the contest. We actually were a bit glad that propagation was poor during most of the contest. By some convoluted reasoning, we figured that with poor propagation, our antenna problems didn't matter as much. Yours truly had debated the wisdom of bringing his trap dipole along even though we had such grand plans. Good thing I decided to bring it along as insurance. It was the first antenna up and running, and made the most contacts! After expending so much effort getting the first tower up, our plans for the loops fell by the wayside. Our final antenna farm consisted of two triband Yagis, a butterfly beam, the 80/40 trap dipole, a long wire and a 5/8-wave 2-meter mag-mount for our packet station.

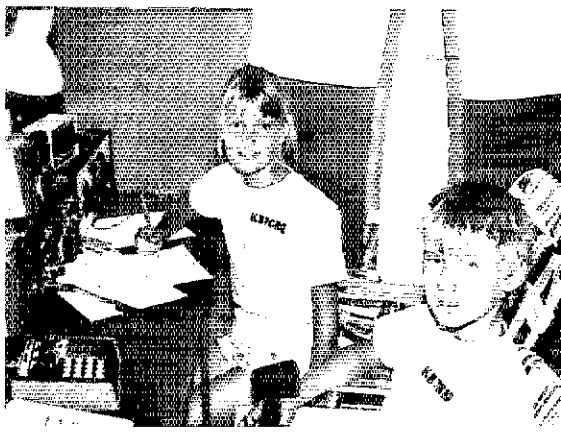
W1TKZ, 15A

As with most Field Days, planning starts early in the year. As a "gimmick" to get more participation and to get more people involved, I proposed that we operate 15A. We pondered at the thought of having 15 transmitters operating at the same time during Field Day and running on emergency power. Field Days in the past have been 2A operations that meant only a few people could operate at a time. But with 15A, there was always a station available for somebody to operate. The thing that made the 15A operation work, and get everyone involved, was the fact that everyone had to bring a rig and antenna. We assigned "station captains" to 15 people, who were responsible for supplying all our needs.

Many people in getting their antennas ready took the initiative to buy some mast and make self-supporting slopers for the higher-frequency bands. Also we took the time to get extravagant, and build a 10-meter rhombic antenna about 250 feet in length. We set up some of the most elaborate antennas seen at any Field Day site.

This had been the very first attempt at contest operation for 70% of the operators. Our group made about 500 QSOs while learning of the difficulties of stations operating in the same band on CW and phone at the same time.

The Alaskan crew of AL7IF busy at FD tasks.



Ten-year-old twins, Angie, KB7CBQ and Josh, KB7BKO operated the Novice station at N7ERG.

In the long run, the challenge that I proposed to the group of running 15A paid handsome rewards to the operating skills and to the experience of the group. We had a tremendous windfall of camaraderie. We all worked, ate and drank together in a friendly environment that the club meetings don't provide.

W9RW, 2A

Computer duping helped make this our most successful Field Day ever. Those unadorned computers duped 'em so fast, we got on with the next QSO instead of wasting time trading exchanges with a dupe. There are no chicken scratches to decipher while preparing our entry paperwork. The computer spits out clean, accurate dupe sheets. The whole gang agreed that we should make them a permanent part of our plans. They want to know why I waited until 1987 to bring my contest software to Field Day. It took five years to get enough nerve to plug the computers into a portable generator! They survived, even when we let the generator run out of gas. Computers will be with us during Field Day from now on.

N2EY/3, 1B—2 operators

This year's Field Day was somewhat different. WA3UZI and I decided to see what we could do in the 1B-2 class. UZI found an excellent site in Shrewsbury, Pennsylvania, which the local repeater group helped us obtain permission to use. We started set-up at 1800Z Friday and operated 1800Z Saturday to 1800Z Sunday. Losing only one hour to a thunderstorm and one and one half hours to rig trouble.

The rigs were my home-brew pair of 807s (CW transceiver, 80-40-20 m, 100 W output) and UZI's TS520S. The antennas were an 80-m dipole fed with open line (80-40) and a home-brew vertical (20-15-10) constructed along the lines of W1TS's ground plane. We had lots of QSOs, lots of fun, and lots of points.

Biggest thrill was working KH6WO at 0939Z on 40 CW just before the generator ran out of gas two seconds after the final! Our biggest disappointment was 10 and 15 meters. Where were the conditions?

Do we have to wait a whole year 'til the next one?

K1JNQ, 1A

Many in our club fulfilled a lifelong ambition by building a 350 × 150-foot rhombic antenna. No one had ever built one before, so we thought Field Day would be a perfect opportunity to try it. The antenna was supported on four 40-foot push-up masts. We used a homebrew 9:1 toroidal balun (we learned a lot about baluns) and a home-brew 800 ohm, 120-watt, noninductive, terminating resistor. The wire was Army-surplus field-telephone wire (700 feet of it). We fed it with 75-ohm RG-59U coax. The balun was bench-checked, and the wire was cut and soldered in advance, but the antenna wire was put into position for the first time only for a few hours before the start of the contest. After all, just where can you test a rhombic? It went up beautifully and performed well despite the poor band conditions. SWR averaged 1.5:1 from 160 though 10 meters. Some frequency segments were perfectly flat, and even the worst were still below 2.5:1 in a few harmonically related locations. Beaming due west, we had little trouble working Hawaii on 40 through 15. However, the W4 QSO total was down on the higher bands, and we didn't log any European DX this year.

W4PLB, 6A

The Orlando ARC had a real "field day" this year. In addition to our HF and VHF stations, we had lots of packet, satellite and Novice/Tech activity. Novice Enhancement sure did attract a lot of new hams to that station! Each Field Day participant received a blue and white cap which had "OARC 1987 Field Day Team Member" printed on the crown. Each station captain received a red "OARC 1987 Field Day Station Captain" cap. The caps sure boosted our team spirit!

Nothing is more grumpy than a bunch of overworked, underfed hams. So at 6 PM Saturday, so we kicked off a big barbecue. Over 100 people feasted on "dipole"-barbecued chicken, "packet" potato salad, "VHF" vegetable and "coax" cake. While the barbecue sizzled, some of "Marconi's finest" were dishing out QSOs left and right.

We noted something funny: that all of our stations with dipoles and verticals made more contacts than our Yagi stations. Goes to show you that if you have good operators and decent propagation, anything is possible.

Murphy hit us all at once this year. About two hours after operations began, what was thought to be a fatal blow hit our 10-kW generator. Fortunately, all but one station had a backup generator. That station was our flagship station, 20 CW. Our witch doctors removed the voodoo, and the generator was back on line two hours later. Murphy then took a shot at our Novice station/Welcome-booth tent. High winds had the tent supports coming apart. Imagine over 20 people trying to hold down a 20- × 40-foot tent while wiring the supports together. We never knew #14 wire had so many uses!

As we reflected on it all, our members agreed that this Field Day was the club's most successful ever. We're already planning next year's event. C U then!

W3AA, 1A—Battery

The club accepted the invitation to use the home of Bill, W3WRM, in rural Southhampton, Pennsylvania, for our Field Day site. Field Day Saturday dawned with heavy rains in the Philadelphia area, but by 11 AM, Ole Sol started to produce a sunny, but cool, nearly perfect weekend.

Our only rig, a Kenwood TS-440S, along with the computer terminal (for logging), was set up on the rear-screened porch of Bill's home. Power came from three standard automobile batteries, which powered us through the contest period.

Herb, W3CS (the local Robin Hood), made two perfect shots with his bow and arrow to get a line over the tops of the two selected trees for the installation of our wire antennas. For the first time, our antenna-raising efforts were recorded on video camera. Hopefully, the video will help us to reduce some of our fumbles and stumbles in future Field Day antenna installations.

Murphy struck immediately when strong, interfering signals from Bill's Dynabyte computer blanked out the 15 and 20-meter bands. Grounding of the terminal did not help. We tried lengthening the computer/terminal cable to allow the computer to be located much farther away. This improved things greatly.

Club members got a real kick when DL7AFV was worked on 80-meter CW Saturday evening.

K3FOU worked CW on the graveyard shift from midnight to 8 AM, without assistance. He logged 165 contacts, for an average of over 20 contacts an hour!

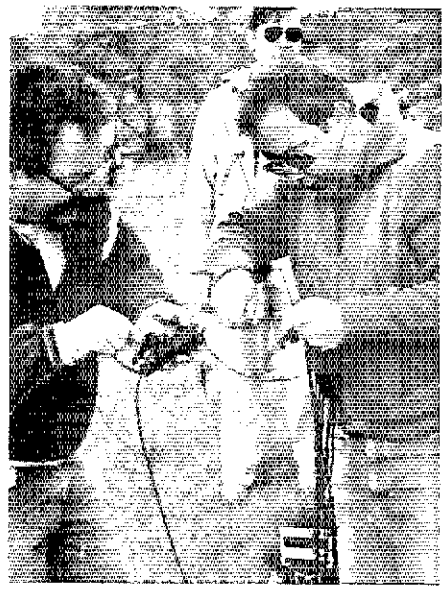
Irv and Bill catered a great gourmet breakfast on Sunday morning—a tasty break that got us off to a good day.

Phil, KD6WG at the controls of the KE6N's satellite station.

Again, our thanks to Bill, our host, for the total use of his home and facilities. We owe our fun weekend to him.

W8VM, 2A—Battery

Once again, the West Park Radiops ARC had its Field Day outing at the QTH of WA8HED, near Lagrange, Ohio.



Putting the finishing touches on the antenna at K9SO before it was hoisted into position by helium balloons.

This year, for the first time in memory, we went QRP, five watts maximum output on all transmitters for the full 24 hours, including packet, VHF, phone and CW. We were also operating off batteries. We were aiming for the "times 5" multiplier and emergency-power bonus points to boot!

The phone stations operated off a big 12-V bus battery supplied by WB8JBR. He also supplied the phone rigs and beam antennas for HF and VHF. We used a 40-foot tower that took eight people to erect. The beams were rotated with a standard rotator. The power for the rotator control, and the rotator, came from a Terado inverter running off the big bus battery.

On CW, the antenna was a 40-foot high inverted-V supported by a Tandy mast. The CW station was operated in a tent donated to the club by the late W8SDV. A "Die Hard" marine deep cycle battery lasted the entire 24 hours powering the rig and the keyer.

Our Novice station was operated in a third shelter on the other side of Wilber's pond. We used a Ten-Tec Argonaut and a wire loop antenna.

Scores

Class A stations are clubs or groups operating portable with more than two operators. Score listings are grouped according to the number of transmitters in simultaneous operation. The listings show club or group name, call(s) used, total number of QSOs, number indicating power output used (5 is less than 5 W; 2 is less than 150 W; 1 is more than 150 W), number of participants (if known) and total score including bonus points. Scores are listed from highest to lowest in each class. Non-club groups are identified by the letters "NCG."

Class B stations are portables manned by one or two operators. These may have one or two transmitters in simultaneous operation. Class 1B stations manned by one operator are listed first, followed by those with two ops, followed by Class 2B stations. When there are two operators, the other operator's call is listed in parentheses, if it is known. Numbers following the calls indicate QSOs, power and final score.

Class C stations are mobiles. They are listed by call, QSOs, power, number of operators and final score.

Class D stations are home stations using commercial power. Line scores are the same as for Class C.

Class E stations are home stations using emergency power. Line scores are the same as Class C.

Club/Non-Club Portable

1A Battery

MMB&G				
WB6ITM	728-	5-	5-	7,360
Panama City ARC				
W4RYZ	1055-	5-	35-	7,100
Colgan-Bramelea Group				
VE3XD	746-	5-	5-	6,895
Callaway ARL				
KSØM	607-	5-	9-	6,670
Meridan ARC				
W1NRG	483-	5-	12-	5,440
GE CE ARC				
N9RJ	896-	5-	12-	5,310
Sorel-Tracy ARC				
VE2CBS	508-	5-	20-	5,280
EIDXA QRPers				
NCØO	494-	5-	7-	5,240
Virgin Is ARC & BWI RL				
KP2N	474-	5-	15-	5,095
Chaffee-Lake ARA				
W9LSD	929-	5-	15-	5,065
NCG				
N5EM	405-	5-	7-	4,845
Central North Carolina DX Chasers				
N4DAZ	558-	5-	6-	4,185
Smokey Mountain QRP Group				
NU4B	380-	5-	5-	4,075
Hiawatha ARC				
KØNL/Ø	362-	5-	18-	3,585
Berry's Mt ARC				
W3TS	313-	5-	4-	3,530
Northern New Mexico ARC				
AG5S	951-	2-	24-	3,528
Resurrected River Rats				
W3NNL	318-	5-	3-	3,480
Overlookers				
NR8R	391-	5-	9-	3,415
Charlton FDG				
AA2S	364-	5-	3-	3,320
Big Al & the Pups				
K1BA	308-	5-	9-	3,300
SMURFs				
K2RS	403-	5-	3-	3,180
South Carrol ARG				
W3FCR	737-	2-	6-	3,006
Albemarle ARC				
WG4T	615-	2-	22-	2,808
Davis Co ARC				
NU7X	598-	2-	45-	2,792
Maui No Ka Oi ARC				
KH6RS	757-	2-	50-	2,756
Beacon Radio Amateurs				
W3AA	606-	2-	8-	2,578
Surely Temple Solar Society				
WB8EET	193-	5-	3-	2,430
Gaccatin Ham RC QRPers				
KE7X	186-	5-	6-	2,360
University ARC				
KS7Q	288-	5-	15-	2,310
Diamond Bar ARS				
W6HCP	323-	5-	9-	2,270
Maui Menehunes				
KH6IJS	164-	5-	6-	2,040
Twin City ARC				
K9CW	193-	5-	6-	2,030
Argonne ARC				
W9QVE	167-	5-	10-	2,015
Iowa-Illinois ARC				
WØLAC/Ø	422-	2-	18-	1,974
Gunnison Valley ARC				
WØGYV	750-	2-	10-	1,974
Lookout Mountain QRPers				
KA4LKH	276-	5-	3-	1,970
Fort Armstrong Wireless Assn				
N3DOL	264-	5-	15-	1,820
Montuose ARC				
NXØQ	126-	5-	23-	1,760
Ontario FD Assn				
VE3LPM	629-	2-	5-	1,746
Nanaimo ARA				
VE7NA	417-	2-	10-	1,742
Washington Co ARC				
W9SIZ	409-	2-	7-	1,564
Radio Free Southampton				
NR2L	229-	2-	9-	1,510
Tektronix Employees ARC				
K7AUO	218-	5-	5-	1,460
HERO				
KD8IE	211-	5-	7	1,455
D-CAT				
K5ZC/5	280-	2-	9-	1,346
University of Texas ARC				
W5EHM	248-	2-	3-	1,342
Hays ARC				
NVØY	455-	2-	4-	1,310
Worldradio Staff ARC				
N6WR	447-	2-	3-	1,310
Koolau/AF MARS				
KH6IJ	430-	2-	25-	1,260
Shafamma				
N6GKD	352-	2-	5-	1,140
Ogden ARC QRP Group				
WØKP/7	111-	5-	7-	1,110
Oak Park ARC				
W8MB	381-	2-	15-	1,034
Extra Efforts				
KG9Z	259-	2-	5-	1,006
Spink ARC				
WBØJBY	352-	2-	4-	1,004
Great River ARC				
KØYL	421-	2-	16-	942
Magic Valley Chapter IRSA				
N7GUC	249-	2-	42-	918
Kentuckiana RC				
K4CSH	236-	2-	8-	794
Blue Mountain Crew				
KA7KAJ	163-	2-	10-	736
OTHER				
WA7LEA	252-	2-	4-	730
Bare Minimum ARS				
VE4AKI/4	83-	5-	3-	675
Dugald Farm Boys				
VE4ADS	180-	2-	15-	562
Point Mugu ARC				
W6LBM	61-	2-	10-	346
Koolau Novive/Tech Station				
WH6BPK	19-	2-	5-	176
Pioneer ARC				
VE3NA	16-	2-	5-	32

1A

Voice of Volga				
K3DD	2500-	2-	8-	7,142
Rolten Radio ARC				
WK4D	2089-	2-	7-	6,472
Treaty City ARA				
W8UMD	2039-	2-	10-	8,380
NCG				
AL7H	1654-	2-	3-	5,452
SCUM				
AG9A	1164-	2-	6-	5,238
Fist & Mouth Gang				
W5EW	1308-	2-	4-	5,176
Bozo & the Lids				
W9TG	1064-	2-	5-	4,944
River Rats FDG				
KB9S	1226-	2-	5-	4,600
High Country Rebels				
K7SL	1258-	2-	10-	4,512
Lone Star RG				
KM5L	1072-	2-	8-	4,422
NCG				
W2RQ	1334-	2-	3-	4,328
Battelle RC				
W8CQK	876-	2-	3-	4,264
Whiskey Lake Bellaganas				
KI3L	1295-	2-	4-	4,210
Cowtown DX'ers				
NA5U	1098-	2-	8-	4,050
Miracle Strip ARC				
K4VFY/4	533-	5-	8-	4,045
Mad Walleye Group				
W8IQ	1224-	2-	3-	3,812
Azalea Coast ARC				
K4UWH	1089-	2-	15-	3,774
Dr Loomis Mem Jr Mechanics League				
N4YE	1067-	2-	10-	3,684
IITRI ARC				
W3MR	896-	2-	8-	3,464
Aether Tweakers				
KØDIA	1011-	2-	6-	3,382
I Hate My XXYL ARC				
NV4H	1111-	2-	3-	3,336
Collins ARC				
K5CQ	1049-	2-	14-	3,330
Cowee Bald Invaders				
KF4EZ	714-	2-	7-	3,212
SJSU ARC				
W6YL	801-	2-	13-	3,086
Sunrise RC				
W2SV/2	1142-	2-	-	3,058
Terrace & Kitimat ARC				
VE7DRW	729-	2-	6-	2,966
Thibodaux ARC				
W5YL	815-	2-	20-	2,904
Motley Crew ARC				
KK9H	923-	2-	20-	2,884
NCG				
W8DL	603-	2-	3-	2,882
Great Salt Lake RBIA				
AF7Z	1119-	2-	6-	2,860
Merry Meeting ARA				
N1MA	1057-	2-	15-	2,858
Sharon ARA				
K1JNQ	875-	2-	20-	2,846
Coverdale's Commanders				
VE3ICV	748-	2-	10-	2,738
North Austa-Belvedere RC				
K4FR	568-	2-	30-	2,698
Arrowhead RAC				
W8GKP	946-	2-	10-	2,694
Sand Hill Fleas				
WS4Y	542-	2-	15-	2,668
MR ARC				
W7MR	837-	2-	8-	2,648
Case ARC				
W8EDU	633-	2-	3-	2,632
NCG				
NG1I	922-	2-	4-	2,616
Old Friendly ART				
W6LEN	715-	2-	5-	2,596
First State ARC				
K3QBD	744-	2-	14-	2,586
Annapolis RC				
W3HVQ	776-	2-	6-	2,576
CUBS ARS of Sedro Woolley HS				
KC7UH	984-	2-	17-	2,568
Fauquier ARA				
W4NHJ	561-	2-	6-	2,530
Emerson Electric ARC				
WØPEV	832-	2-	-	2,506
Southwest Dallas Co ARC				
K5HJ	974-	2-	75-	2,498
Radio Amateur Megacycle Society				
W9DY	735-	2-	6-	2,478
ARA of Southern New England				
W1AQ	761-	2-	17-	2,430
West Carleton ARC				
VE3JQR	764-	2-	-	2,394
Tyro Trio				
NIØU	520-	2-	3-	2,380
Columbia ARA				
K3EF	772-	2-	20-	2,360
Goose River ARC				
WØKZU	986-	2-	6-	2,356
Randallstown ARC				
N3IC	651-	2-	5-	2,344
Bass Hill Repeater Group				
W1KX	561-	2-	7-	2,338
HARC #2				
KMØL	612-	2-	9-	2,326
Silicon Gluich ARC				
AE6C	1723-	1-	10-	2,322
Trailer Buddies				
K7SF	571-	2-	5-	2,280
Piggy Boys Countest Club				
KN5H	602-	2-	3-	2,278
North Bay ARA				
K6LI	527-	2-	10-	2,170
Sussex ARA				
K3JL	503-	2-	14-	2,164
Red River Valley ARC				
WB5RDD	602-	2-	9-	2,114
Metropolitan ARC				
NM5O	590-	2-	40-	2,068
Canadian Police College ARC				
VE3CPC	548-	2-	10-	2,026
St Mary ATS				
NA5G	417-	2-	26-	1,958
Independence ARC				
KØPUX	607-	2-	15-	1,938
Four-sum Group				
KF6OG	1095-	1-	4-	1,881
US Spirit ARC				
WA4ETN	612-	2-	5-	1,876
FMARC				
NWØX	557-	2-	15-	1,868
John M Blarerboonski FD Junta				
AC9C	1354-	1-	8-	1,859
North Coast Contest Club				
WB8ZYD	597-	2-	5-	1,856
Hellgate ARC				
N2ZM	721-	2-	21-	1,848
Gopher Creek				
VE5GC	712-	2-	5-	1,846
Concordia University ARC				
VE2CUA	676-	2-	9-	1,846
Kennydale Key Klicks				
W7JIE	430-	2-	3-	1,832
Chicago Art Team				
KI9H	482-	2-	5-	1,806
Fed of Amateur Radio Trans				
KA9EES	385-	2-	7-	1,796
Beer Battered Balloon Busters				
K9SO	583-	2-	5-	1,794
University of Michigan ARC				
W8UM	604-	2-	11-	1,790
NE Wyoming ARC				
KØHP	498-	2-	6-	1,752
Sam Houston ARK				
N5AF	439-	2-	19-	1,752
Anaconda ARC				
W7VNE	636-	2-	33-	1,742
Utica-Sheleby ECA				
N8FNZ	543-	2-	10-	1,726
Bell System of Indiana ARC				
W9ZW	418-	2-	8-	1,702
Marshall Co ARC				
W8GCJ	651-	2-	10-	1,702
Piscataway ARC				
KO2K	799-	2-	12-	1,698
Theodore Roosevelt ARC				
KØND	541-	2-	25-	1,688
IBM ARC				
WA2IBM/6	429-	2-	21-	1,666
NCG				
WØYHE/Ø	515-	2-	3-	1,634
Calhoun Co ARA				
WX4O	484-	2-	25-	1,608
Microtel ARC				
VE7MAC	477-	2-	6-	1,544
Just for Fun Contesters				
NI9E	577-	2-	8-	1,536
Family Field Day				
N9CHA	483-	2-	9-	1,534
Lake Co ARC				
NF5T	554-	2-	10-	1,508
Saratoga Co RACES				
KG2H	432-	2-	5-	1,494
Lockhead ERC ARC				
W6LS	321-	2-	17-	1,488
Thumb Bums				
K8JM	562-	2-	4-	1,420
Oshkosh ARC				
KD9BC	505-	2-	5-	1,410
SRO/CFMC				
W9EJ	594-	2-	64-	1,408
ITC/9M Hams				
WB9GOE	493-	2-	10-	1,402
Van Isle ARC				
VE7VCC	449-	2-	16-	1,400
Barbara'S Birthday Party				
WB8NSL	848-	1-	5-	1,373
North Saskatchewan ARC				
VE5EEE	459-	2-	10-	1,372
Nunticoke ARC				
W3XU	478-	2-	19-	1,362
Eastern Nevada ARS				
WB7WTS	561-	2-	6-	1,322
ECHO				
N4ES	251-	2-	6-	1,300
Hellertown Hams				
W3PQX	307-	2-	4-	1,282
ARA of Southeast Florida				
K4FA	288-	2-	9-	1,250
Medina Two-Meter Group				
K8TVG	274-	2-	8-	1,248
WRECS				
K8NI	568-	2-	-	1,236
Los Alamos ARC				
W5PDO	570-	2-	10-	1,232
NCG				
NK9L	318-	2-	4-	1,218
Pittsburg Co ARC				
W5CUQ	240-	2-	10-	1,196
Gaccatin Ham RC				
W7ED	397-	2-	7-	1,194
Athens State ARC				
N4CNY	432-	2-	4-	1,170
Tuscola Co ARA				
W9NNM	239-	2-	14-	1,160
Snyder ARC				
K9QHK	284-	2-	17-	1,156
Miami Co ARC				
W8FW	523-	2-	24-	1,146
Douglas Co ARA				
K4PI	405-	2-	16-	1,146
Williamson Co ARC				
W5XD	385-	2-	5-	1,138
Hillsborough ARS				
WA4GJJ	493-	2-	14-	1,128
South Huron ARC				
VE3LRD	349-	2-	8-	1,124
Butte ARC				
W7FO	712-	1-	17-	1,122

CRA SUD OUEST
VE2CEV 305-2- 14- 1,120
Jefferson Co ARC
W5SSV 276-2- 6- 1,120
Lima Area ARC
W8EQ 314-2- 9- 1,078
Lancaster Co ARC
AK4N 334-2- 14- 1,078
Crawford Co ARC
K9SYR 384-2- 8- 1,068
Pictow/Artigorish ARC
VE1UW 402-2- 19- 1,058
Clarksville ATS
KF4L 264-2- 15- 1,038
Virginia ACA
WB4YVE 337-2- 10- 1,000
Ledyard Extras
NK1N 222-2- 4- 986
Zamora Ham Radio Unit
WU4Y 340-2- 6- 980
CTV ARA
VE3CTV 287-2- 6- 978
Kaual ARC
KH6LG 474-1- 36- 978
West Alabama ARS
WD4DAT 332-2- 18- 964
Central Missouri RA
N0BEF 425-2- 8- 960
Imperial Valley ARA
WM6Z 322-2- 11- 944
Ogden ARC
KE7NS 843-1- - 943
Yellowhead ARC
VE6YAC 230-2- 3- 914
Naked Chicken FDG
KA1MIS 103-2- 4- 876
MDC Section—Military
K3VPZ 185-2- 7- 864
Last Mountain RC
VE5LM 171-2- 11- 860
West Nebraska ARC
W0AFG 422-2- 8- 844
North Island ARS
VE7ARK 319-2- 6- 838
Waxaukee ARC
KE8KU 248-2- 14- 796
3M ARC
K9MBB 184-2- 3- 768
Central Carolina ARS
WR4E 234-2- 10- 768
Treaty City ARA Novices & Techs
KA8YSF 122-2- 15- 766
Erath-Hood Co Chigger Chasers
KB5CC 305-2- 12- 710
ICARES
W8LCU 150-2- 8- 702
Humboldt ARC
W4IGW 473-1- 11- 683
Truro ARC
VE1AO 440-1- 15- 666
Lewisville Texins ARC
WY5K 192-2- - 636
Lyon ARC
KC7MP 118-2- 4- 600
Denison ARC
KD0E 126-2- 3- 582
Albert Lea ARC
WA0RAX 189-2- 2- 578
NCG
KD0AJ 125-2- 4- 504
Republic of the Rio Grand ARC
N5KEP 148-2- 7- 492
Southtowns ARS
WB2ELW 161-2- 14- 462
Washington Advertirt ARA
W3TSA 124-2- 14- 448
NCG
N9GNA 115-2- 8- 430
Tooele Co ARS
WB7V 157-2- 6- 414
IMA RC
K0GFV 150-2- 10- 400
Lake ARA
K4FC 130-2- 4- 360
NCG
W7VLG 122-2- 5- 344
Horton ARC
WD0DMV 66-2- 6- 312
Hastings Area Group
N0FKC 82-2- 8- 284
Pikes Peek VHF
N8CMW 110-2- 3- 220
Southern Counties ARA
K2RR 1-2- 10- 202

1A Commercial

Indianapolis Power & Light ARC
N9TT 590-2- 13- 1,720
NCG
NS2O 741-1- 3- 1,504
Connecticut Minutemen
KA1FEM 127-2- 18- 254
NASA Lewis ARC
AK9Y 75-2- 3- 150

2A Battery

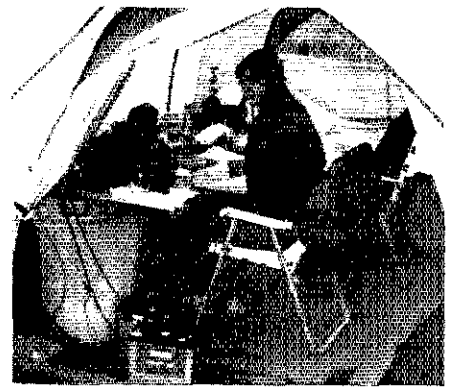
Arapahoe RC
K0NA (+KB8AOQ) 1931-5- 23- 14,765
Zygo ARC
W1ECH (+N1DXL) 1263-5- 7- 9,690
SDXA Country Western Boys
K8FU (+KA8YMR) 1138-5- 14- 9,260
Southern Humboldt ARC
W6JTI (+KB6LAC) 875-5- 8- 7,750
Chehaw ARS
NA4J 1029-5- 11- 7,610
East Alabama & Auburn Univ ARC
KE4T 732-5- 20- 6,260
Massillon ARC
W8NP (+KA8ZQC) 688-5- 20- 6,165
Anne Arundel RC
W3VPR (+KA3RSN) 769-5- 27- 6,105
Bloominton ARC
W9NX (+KA9IPQ) 677-5- 11- 5,855
Wallan RA
W2LZ 523-5- 8- 5,840
Eastern Michigan ARC
K8EPV (+N8GKY) 576-5- 24- 5,555
Harper Air Hawks
K9NG 540-5- 8- 5,410
LARA QRPers
K2ECQ 595-5- 10- 5,365
Shelby Co ARC
N4NR (+KB4UJG) 621-5- 33- 5,285
West Park Radiops
W8VM (+KA8YQL) 618-5- 14- 5,245
Thumb ARC
W8AX 658-5- 8- 4,955
Muscatine HF Group
WB8X (+KA8YUZ) 546-5- - 4,945
Tamaqua Area ARA
W3VA 1303-2- 15- 4,794
Knox Co ARC
W9GFD (+KA9AEW) 1279-2- 23- 4,400
OTPARG
K7RO 1337-2- 6- 4,380
Capital ARS
K4BWC 1810-2- 8- 4,144
NBS BRASS
K3AA (+KA3QDJ) 979-2- 23- 3,894
Columbiana Co ARC
NN8B (+N8GOB) 423-5- 16- 3,865
Old Bridge RA
NA2J (+KA2ZID) 1279-2- 14- 3,820
SWVWA & RARES
KC4DY (+N4MII) 1050-2- 25- 3,548
San Andreas Fault Line Services
NZ6N 1055-2- 36- 3,536
Morton ARC
W9EEB (+KA9FGJ) 1149-2- 10- 3,468
Red Neck ARS of Alabama
NR4A 940-2- 9- 2,972
Carrol Co ARC
K3PZN (+KA3PRG) 877-2- 15- 2,880
St Charles ARC
N8GL (+N8HDL) 918-2- 28- 2,832
Athens RC
AA4GA 658-2- 10- 2,556
Lake of the Ozarks ARC
NI8V 484-2- 14- 2,514
Ham Hawks
NT5R 200-5- 5- 2,425
Kerr Lake Campers
N4SW 741-2- 8- 2,284
Pine State ARC
K1CZ (+WA1ERJ) 532-2- 10- 2,280
Mammouth Cave ARC
KD4SS 588-2- 18- 2,100
ARC of Savannah
W4HBB (+WD8OBD) 499-2- 40- 2,048
YF-22A Group
W6FP 693-2- 3- 2,032
Rideau ARC
VE3BPC 436-2- 10- 1,976
Kern River Valley ARC
W6TN (+KB6TBK) 618-2- 18- 1,934
Sandy River ARC
KI1B 648-2- 25- 1,784
E Ohio AWA & N Panhandle ARC
W8ZQ 579-2- 30- 1,782
Western Quebec UHF/VHF Assn
VE2RM 504-2- 8- 1,762
Mogollon Monsters
KE7GR 451-2- 18- 1,542
Rappahannock ARA
AA4OH (+N4KBP) 362-2- 20- 1,522
Pecos Valley ARC
WS5A (+N5ECE) 191-2- 8- 1,434
Triangle ARC
W4LEN 370-2- 26- 1,426
Friends of EAX HF Hikers
WB2EKK/4 342-2- 3- 1,374
Wilson QRP Group
WB4THL 126-5- 5- 1,235
North Penn ARC
W3BTN/3 153-5- 3- 1,210
Fort Pierce RC
N4MIY 429-2- 15- 1,196
Semo ARC
K9CEA 301-2- 35- 1,076
Northwoods ARC
AA9Y (+KA9WDE) 311-2- 42- 1,038
Central Georgia ARC
AA4WS 285-2- 14- 842
Delaware Co ARA
W3UER (+KA3PME) 167-2- 20- 802
Tuolumne ARS
W6QYO 121-2- 4- 442
Bemidji ARC
KA0FME 68-2- 8- 332

2A

Silicon Jct RC
K1VT (+N1EUQ) 3424-2- 14- 9,932
444 DX Group
K2SG (+KB2CAT) 2598-2- 9- 8,452
Ohio Valley ARA
W4FU/8 (+N8IKD/8) 2888-2- 12- 8,292
MARC
W5EJK (+N5HFY) 3491-2- 35- 8,274
Owensboro ARC
K4HY (+N4PHW) 2570-2- 30- 8,160
Salt City DX Assn
W2FR (+KB2AYA) 2351-2- 18- 8,054
Radio Amateur Tech Soc
W9RW 2708-2- 9- 7,900
Norwood ARC
K1JMR (+KA1PGI) 2028-2- 25- 7,380
McDonnell Douglas AARC & SCAN
W6VLD (+N6KOA) 2514-2- 12- 7,304
Desert DX Corps
AA7A/7 2131-2- 4- 7,146
Western Massachusetts YCCC
KY1H (+KA1OKF) 2058-2- 15- 7,142
ARC of Greater Milwaukee
N9AW (+KA9TEP) 1980-2- 12- 6,764
Lake Co RACES
K9SA (+KA9JAZ) 2033-2- 25- 6,722
Ham Assn of Mesquite
WC5M (+N5AIB) 1888-2- 24- 6,306
Mountaineer ARA
W8SP (+KA8RHJ) 1819-2- 36- 6,298
Rochester (NY) DX Assn
W2TZ (+KB2CHC) 1834-2- 11- 6,288
Pike & Lincoln Co ARES
N8MU (+KB8AMC) 1843-2- 19- 6,218
145.41 Repeater Group
W0AA 1539-2- 18- 6,208
Deleware ARA
W8QLS (+KB8BSM) 1541-2- 31- 6,180
Muncie ACS
W9MA (+WD9CSI) 1563-2- 35- 6,132
Motor City RC
W8MRM (+KB8BJN) 1796-2- 43- 6,096
St Louis ARC
K9LIR (+KA9MLA) 1892-2- 20- 5,974
Midland ARC
K9CFA (+KB5CQZ) 1690-2- 34- 5,968
Kingsport ARC
W4TRC 1743-2- 30- 5,828
Harris ARC
W4KS (+KB4WEH) 1755-2- 75- 5,822
Farout ARC
WB8SMC (+N8IGS) 1601-2- 35- 5,756
Overlook Mountain ARC
K5NA (+WB2RUW) 1628-2- 40- 5,722
Escondido ARS
N6WB 1726-2- - 5,442
Big Bend ARC
K5FD (+KB5DSD) 1816-2- 18- 5,372
Northern Ohio DX Assn
N8ATR (+N8DMM) 1628-2- 20- 5,360
Oak Ridge ARC
K4PJ (+N4PWO) 1510-2- 25- 5,218
Anoka Co RC
W6CF (+N6BPE) 1649-2- 30- 5,138
Cape Fear ARS
K4MN (+N4EWG) 1471-2- 27- 5,134
Central Michigan ARC
W8MAA (+WB8LZG) 1397-2- 26- 5,126
Enfield RAG
N1SR (+KA1GIC) 1535-2- 15- 5,120
Metro Alt Tele Pioneer ARC
W4QO (+KB4SLV) 1399-2- 35- 5,104
Garland ARC
K5QHD (+KB5DOF) 1650-2- 27- 5,048
Campbell Co ARC
W7HNI (+KB7AWM) 1531-2- 15- 5,020
Halifax ARC
VE1FO 1462-2- 20- 5,014
Brazosport ARC
N5FN (+KA5COA) 1381-2- 43- 4,932
Humboldt ARK
K8GP (+N8GME) 1583-2- 30- 4,928
Rankin Co ARC
KV5R (+N5III) 1822-2- 14- 4,900
Anderson RC
W4FX (+WD4BUH) 1191-2- 25- 4,888
Arlington ARC
K5SLD (+KB5CQE) 1563-2- - 4,856
Arkansas River Valley ARS
K5PXP (+KA5UQM) 1195-2- 15- 4,808
Lakeland Community College ARC
WA8SBC 1452-2- 7- 4,808
Kanawha ARC
W8GK (+KB8BHD) 1339-2- 21- 4,790
Elgin ARS
W9IKN (+KA9RVN) 1197-2- 20- 4,734
Mid Missouri ARC
N8SS (+KA8DLD) 1309-2- 20- 4,724
Tri Co ARA
K59O (+KA9TIM) 1490-2- 10- 4,718
Austin ARC
W5KA (+WD5CDY) 1233-2- 50- 4,718
Gower Gulch Gang
NN8L (+KB8QYV) 1494-2- 18- 4,702
Suncoast ARC
WA4T 1212-2- 10- 4,678
Granite State Hilltoppers
AF1T 1632-2- 5- 4,674
Putnam ARA
N8RR (+KB8CRL) 1324-2- 26- 4,610
Anniston Area ERC
WW4O (+K4GUO) 1836-2- 40- 4,572
St Paul RC
K8AGF 1375-2- 25- 4,570
Southwest Missouri ARC
W8EBE (+N8HTE) 1416-2- 30- 4,526
Fairfield ARA
K1BR (+KA1PKA) 1160-2- 40- 4,512
Bartlesville ARC
W5NS (+KA5OXA) 1292-2- 35- 4,512
Broken Arrow ARC
N5WX (+N5EZK) 1245-2- 15- 4,482
Reidsville ARG
N4IV 1151-2- 9- 4,444
Utica ARC
K2IO 1463-2- 20- 4,442
Acadiana DX Assn
WO5G (+KB5CXH) 1345-2- 22- 4,416
Schaumburg ARC
K9NO (+KA9WDV) 1267-2- 42- 4,394
Hoosier Lakes RC
K9RD 1897-2- 8- 4,372
Union Co ARC
WK4S (+N4QIN) 1226-2- 26- 4,356
Calumet ARES
KN9P (+KA9USW) 1039-2- 11- 4,352
Rockwell Autonetics RC
WB6YPX 1128-2- 21- 4,340
Western Kentucky DXA
WD4MDY (+N4HID) 1311-2- 7- 4,214
Cedar Valley ARC
W8QQ (+KB8ATA) 1194-2- 25- 4,206
Tupelo ARC
K5JG 1218-2- 30- 4,118
Sheboygan City ARC
NI9Z (+KA9YQU) 1223-2- 15- 4,076
Free State ARC
K3IVO (+N2GTE/3) 1124-2- 20- 4,076
Batesville ARC
NG5M (+WD5CJM) 1251-2- 12- 4,068
Suburban ARC
W0DCW (+N0IAT) 1193-2- 12- 4,066
Rocky Mount ARS
KF4R 1193-2- 20- 4,052
West Texas ARC
N5ETX (+N5KOA) 1449-2- 20- 4,046
Lewis & Clark RC
KS9R (+WD9GMO) 1563-2- 25- 4,044
South Lyon Area ARC
N8AR 1440-2- 6- 4,040
New Providence ARC
NA2R (+KB2BBP) 1048-2- 20- 4,030
Wake Tech College ARC
WB4TOP (+N4PSJ) 918-2- 25- 4,020
Twin City FM Club
K8AD (+KA8VYB) 1159-2- 15- 3,952
Atlanta RC
W4DOC 1122-2- 13- 3,900
Spartanburg ARC
K4II (+N4OEG) 988-2- 24- 3,872
Champlain Valley ARC
W2UXC/2 1110-2- 11- 3,852
San Angelo RC
W5QX (+KA5BCR) 1112-2- 35- 3,850
NCG
NJ4F 1215-2- 8- 3,840
Mountain ARC
W8JAW (+KA8WUC) 1078-2- 25- 3,826
Hattiesburg ARC
AG5Z (+N5JYK) 1151-2- 18- 3,780
Broome Co All-Stares
N2HR 1202-2- 27- 3,758
Loveland RA
W9DZ 1210-2- 25- 3,734
Tuscaloosa ARC
W4XI 978-2- 20- 3,724
Tri-City ARC
N1RW (+KA1QMP) 1088-2- 20- 3,724
Chamyland ARC
NC8P (+KB8ALS) 1065-2- 23- 3,710
Farmington ARC
W8RC (+KA8ZME) 1419-2- 35- 3,684
Ozarks ARS
KY6B (+N6GNH) 1190-2- 32- 3,664
Lynchburg ARC
K4HEX (+KB4OLC) 975-2- 21- 3,642
Beaches ARS
W4DU (+KB4YKC) 971-2- 37- 3,642
Waterton ARS
W8NT (+KA8TXK) 1040-2- 15- 3,818
Rolm Organization for Am Radio
K6XS/8 (+N6PHW) 970-2- 20- 3,608
Paducah ARA
NU4N (+KB4YBJ) 1209-2- 10- 3,602
Greater Lawrence ARF
W1FW (+KA1OSS) 892-2- 20- 3,600
Fall River ARC
W1ACT (+KA1CZQ) 1103-2- 15- 3,568
Sussex Co ARC
N2WM 969-2- 13- 3,562
Reading RC
W3BN (+KA3JHZ) 922-2- 30- 3,562
Northern Chautauqua ARC
W2SB 1081-2- 10- 3,552
Fremont Co ARC
K7MM 790-2- 9- 3,530
Blueridge ARS
WK4O (+KB4LYE) 917-2- 50- 3,528
Hannibal ARC
W8KEM 859-2- 14- 3,496
NCG
K1BL (+N1ELF) 1463-2- 25- 3,494
Daytona Beach ARA
K4SV (+N4PZT) 1029-2- 30- 3,480
IBM Boca Raton ARC
KC4V (+N4PYB) 908-2- 12- 3,422
Northwest Arkansas ARC
KM5G (+KA5ZVV) 1044-2- 38- 3,418
Johnson City RA
W4ABR (+KB4ZIO) 928-2- 30- 3,388
Tampa ARC
W4DUG (+WD4REX) 874-2- 25- 3,372
Findlay RC
W8FT 953-2- - 3,342
Lake Co ARC
W9LJ (+KA9UOK) 870-2- 40- 3,338
Forx ARC
KE8A 873-2- 27- 3,328
Mecklenburg ARS
W4BFB (+KA4WYC) 929-2- 25- 3,314
New Ulm ARC
K8YST (+KA8QKT) 970-2- 12- 3,306
Tandem RAC
KE6N (+N7GSD) 789-2- 18- 3,302
Ski Country ARC
ND8E (+N8IBF) 1092-2- 38- 3,280
Mission Heights Mesa
NX4H (+KA8QMK) 1087-2- 6- 3,268
Susquehanna Valley FDG
NB3I 1052-2- 8- 3,262
Pottstown ART
KI3S (+KA3RMM) 1020-2- 17- 3,258
Green Mtn WS
N1VT 2041-1- 30- 3,245
Charleston ARS
N4LS (+N4LYB) 864-2- 22- 3,240
Irvington Roseland ARC
K2GQ (+WA2JSB) 1233-2- 50- 3,208
Tennessee City ARC
NY4N 1158-2- 5- 3,204
Puerto Rico ARC
KP4ID 936-2- 20- 3,196
Watertown ARC
N9HR 809-2- 14- 3,186
Blossomland ARA
W8MAI (+WD8MWT) 849-2- 40- 3,180
Faulkner Co ARC
W5LL 829-2- 30- 3,156
Parkersburg ARK
K8UC 806-2- 20- 3,150
Tucson IBM ARC
N7ERG (+KB7BKO) 951-2- 12- 3,142
Shy-Wy ARC
W7NE (+N7JJY) 955-2- 20- 3,138
ARINC ARC
W3ZH (+WB2TNL) 1000-2- 12- 3,124
Middle Tennessee ARS
W4UOT/4 918-2- 15- 3,114
AT&T CRES ARC
W8ZPF 938-2- 20- 3,094
Sarasota FDG
K8CS (+KB4WUB) 802-2- 10- 3,090
Ole Virginia Hams ARC
N4FS (+KB4BWM) 943-2- 20- 3,082
Valley ARA
WX4C (+N4ORR) 1104-2- 45- 3,046
Wilderness Trail ARC
KI4B (+KA4OKG) 700-2- 30- 3,044
Cowichan Valley ARA
VE7CVA 861-2- 37- 3,044
Louisville ARTS
W4CN (+KB4YST) 788-2- 45- 3,034
CRA Vallee du Richelieu
VE2CVR 914-2- 5- 3,016
Friday Afternoon RTS
K1XR (+N1ELO) 931-2- 15- 2,990
Southern Maryland ARC
W3PT 899-2- 30- 2,988
Gonzaga Prep Ham Rc
KC7FJ (+KA7UNG) 1034-2- 10- 2,984
Canton ARC
W8AL (+KA8YMQ) 804-2- 95- 2,970
Centerville ARS
K8GN (+WB8UUH) 980-2- 12- 2,962
Club RA de Quebec
VE2CQ 615-2- 50- 2,960
Independent ARC
NB8H 764-2- 11- 2,920
Pikes Peak RAA
WA8UTU (+KA8ZHP) 828-2- 40- 2,896
Gadsden ARC
K4JMC (+KC4ANB) 746-2- 25- 2,894
Joliet ARS
W9OFR 680-2- 20- 2,888
Sedrock ARES
KB8VT (+WN8IDF) 689-2- 10- 2,888
Northern Ohio ARS
K8KRG (+KA8VTS) 894-2- 50- 2,880
Kaptain & Crew
K1DI 1190-2- 22- 2,872
West Haven ARA
K1RH (+N1EDX) 732-2- 18- 2,870
TOC
N7ZZ 928-2- - 2,842
Blackstone Valley ARC
W1DDD 845-2- 18- 2,832
San Fernando Valley ARC
W6SD (+N6MQD) 781-2- 50- 2,832
Central Washington ARC
W7GBI/7 727-2- 5- 2,820
Edison RAA
K8VA 917-2- 15- 2,818
Saline Co ARC
K5NE (+N5JVB) 753-2- 28- 2,796
Bullit ARS
N4NCN (+KB4FPI) 953-2- 68- 2,794
NOBARC
K1FFK 558-2- 15- 2,788
Penticton ARC
VE7PRC 886-2- 15- 2,782
ARC of Central Wisconsin
N9BBN 985-2- 12- 2,770
Falls ARC
K9RHH 811-2- 10- 2,748
Northeast Missouri ARC
W0CBL 695-2- 8- 2,730
Pioneer ARC
AA4HF 740-2- 19- 2,692
PHD ARA
K9OO (+KB9AQA) 948-2- 38- 2,686
Tri-State ARC
AK3M 811-2- 35- 2,686
Tompkins Co ARC
N2BU 899-2- 15- 2,676
Aroostook ARA
KA1B (+KA1OOX) 835-2- 31- 2,674
Middlesex ARC
W1HEB 1020-2- 19- 2,668
Valley Forge Mountain FDG
K3AU 863-2- 8- 2,666
Citrus Belt ARC
K6IG (+KB6OKS) 704-2- 22- 2,656
Clinton Co ARC
W9PC (+KA9WDJ) 824-2- 14- 2,664
Northern Kentucky ARC
K4CO 847-2- 25- 2,650
Bristol ARC
N4KTB 810-2- 50- 2,640

AD6E operating CW at W6YL.

The CW station at W4DUG, Tampa ARC.



Barb, NK1I, at the operating position of N1FJ, 1B—2 operator Battery.

Hockley Co ARC				
WB5EMR	747	2	11	2,624
ARES of Edison Township				
W2VY (+N2HFG)	723	2	15	2,624
Viking ARS				
KØRVN	679	2	5	2,614
AR Caravan Club				
NO5F (+KB5ARL)	606	2	35	2,612
Tyler ARC				
AA5AA (+KB5CRR)	796	2	40	2,610
Nashoba ARC				
WC5V (+N5KNZ)	863	2	23	2,592
3M ARC				
WØMR	783	2	10	2,574
Old Natchez ARC				
K5OCM (+N5KDV)	1030	2	15	2,566
Orrville ARS				
KD8EU	1043	2	40	2,566
Three Missileers				
WU6D	687	2	8	2,552
Twin City Hams				
W5EA (+KA5UZZ)	689	2	50	2,548
ARIG				
K3TS	564	2	12	2,546
Teays ARC				
KO8D	693	2	25	2,544
NCG				
WM5K	925	2	14	2,502
Terracom ARC				
N7CW	933	2	6	2,500
Decatur ARC				
W4ATD	740	2	17	2,492
Dolphin ARS				
AA4RO	522	2	5	2,488
Clackamas ARC				
KX7T (+KA7KIL)	698	2	20	2,470
Hazel Park ARC				
W8JXU (+N8IBU)	937	2	15	2,458
Upper Valley ARC				
W8LH	989	2	8	2,454
Tallahassee ARS				
KN4Y	587	2	40	2,448
Trident ARC				
N4EE (+N4EUI)	764	2	40	2,442
Greater Norwalk ARC				
KE1F	540	2	-	2,426
Ausable Valley ARC				
KB8TS (+N8EPJ)	638	2	16	2,424
Orange Co ARC				
W6ZE (+N6JSV)	930	2	30	2,416
Shenandoah Valley ARC				
W4RKC (+KB4UKN)	683	2	25	2,416
Mt Baker ARC				
K7SKW/7 (+WB7POV)	774	2	28	2,366
Algoma ARC				
VE3SOO	671	2	10	2,378
Lowndes Co ARC,				
K5BX	593	2	12	2,376
Spa ARA				
NW5A (+N5KMS)	893	2	18	2,366
Regina ARA				
VE6NN	756	2	25	2,364
Twin State RC				
K1DL (+N1EMF)	608	2	15	2,362
Falmouth ARA				
K1GN (+W1VAK)	663	2	28	2,362
Falconers				
NØGII	2051	1	6	2,362
Sweetwater ARC				
N7ERH (+KA7ZXU)	667	2	12	2,354
Turkey Island DXC				
KØJGH	691	2	4	2,338
Valley RC of Eugene				
W7PXL (+KB7CIY)	929	2	20	2,330
Kaw Valley ARC				
WØCET (+KAØYST)	913	2	50	2,328
Nittany ARC				
W3YA	581	2	12	2,308
Ephrata Area Repeater Society				
W3RJ	698	2	7	2,304
Stilling Farm Expedition				
NØRVP (+KAØKBU)	599	2	4	2,298
Metrocrest ARS				
KB5A (+N5FHW)	629	2	37	2,294
Southern Illinois ARS				
N9CLB (+KA9SUU)	652	2	15	2,290
Jupiter RG				
W4KOG (+W4KOG)	992	2	15	2,288
Hastings ARC				
WØWWV	603	2	11	2,284
Gwinnett ARS				
NG4I	661	2	15	2,268
Geauga ARA				
K8LP	602	2	10	2,268
Goddard ARC				
WA3NAN (+KA3NMS)	507	2	20	2,262
McNairy ARS				
WA4TPA (+N4PJI)	890	2	42	2,252
Des Moines RAA				
WØAK (+KAØZRT)	655	2	20	2,248
Teen's ARC				
W15K (+KB5AUL)	742	2	8	2,234
Butler Co VHF Assn				
W6CCI (+KA8SSB)	975	2	15	2,222
Fresno ARC				
W6TO (+KB6NCE)	537	2	100	2,216
Columbia ARC				
AD4W	696	2	25	2,198
University of New Mexico ARC				
WB5AXC	944	2	5	2,194
RAC of Knoxville				
W4BBB	824	2	15	2,172
West Seattle ARC				
W7AW	643	2	14	2,172
Estero ARC				
W6JU	568	2	17	2,170
Dauphin ARC				
VE4NUF	563	2	15	2,152
Central Wisconsin RA				
W9NN/9 (+KA9VMF)	568	2	21	2,146
CARS/CCC				
KZ8B (+KB8BTY)	675	2	17	2,124
Tri-Counties Ham RC				
W8YP (+KB8BFM)	671	2	25	2,118
Wantaeh ARC				
W2VA (+KB2BIT)	743	2	15	2,118
Beaumont ARC				
W5RIN (+WB5YVM)	572	2	30	2,114
Southern Nevada Group				
K7SN	554	2	100	2,104
Onslow ARC				
WD4FVO (+KA4SFF)	570	2	30	2,100
Flathead Valley ARC				
K7LYY	473	2	20	2,068
Mad Scientists				
KF6VB	700	2	12	2,068
Juneau ARC				
KL7GPG (+KL7RH)	612	2	20	2,058
Lakeshore ARC				
WA2DCC (+KA2IKE)	666	2	10	2,050
Lower Yellowstone ARS				
N7AQQ	598	2	7	2,042
North Ridgeville RA				
K8JK	474	2	14	2,040
Freeport ARTS				
NR9W	603	2	15	2,006
Mobridge Area ARC				
KØERM (+KAØUDE)	355	2	9	2,000
Big Island ARC				
AH6P	608	2	16	1,992
Oggdensburg ARC				
NR2B (+KA2CCU)	526	2	15	1,990
St Clair ARC				
K9GXU	425	2	10	1,974
Honolulu ARC				
KH6WO	813	1	25	1,973
Fulton ARC				
NQ2I	553	2	32	1,970
Victoria ARC				
W5DSC	514	2	15	1,968
Minneapolis RC				
WØCKF (+NØHRP)	686	2	15	1,968
Platinum Coast ARS				
AA4FC (+KA4ZPM)	827	2	15	1,948
Parsons Area ARC				
NB8V	564	2	12	1,920
West Georgia ARS				
W4FWD (+KB4TCD)	513	2	15	1,918
Three Rivers ARC				
W8BRN	745	2	12	1,914
Hartford AREMT				
W3LDD	550	2	10	1,900
Great Falls Area ARC				
K7ABV	1210	1	50	1,894
Yolo ARS				
NZ8A (+KB6KCQ)	769	2	28	1,894
Hampton Roads RA				
N4SD	566	2	10	1,872
Cabarrus ARS				
W4DSU (+KC4AIM)	610	2	16	1,870
Hewlett-Packard Lake Stevens ARC				
N7NN	547	2	12	1,846
New Bern ARC				
WD4JMS (+N4PPD)	591	2	15	1,838
Auburn ARA				
KC2UB	482	2	17	1,832
West Island ARC				
VE2CWI	467	2	15	1,832
Wichita ARS				
N5JEZ (+N5JWU)	573	2	20	1,830
Hot Springs ARC				
WA5BRF (+KB5CDN)	545	2	60	1,826
Harvard Repeater				
K1BOX	661	2	9	1,822
Sarasota ARA				
W4IE (+KB4OGM)	499	2	20	1,820
Santa Clarita ARC				
W6JW (+KA6VJF)	606	2	25	1,818
East Pasco ARS				
AA4RU	486	2	10	1,806
Gulf Coast ARC				
WC4D	489	2	15	1,802
North Providence ARC				
KY1G (+KA1JFT)	443	2	10	1,800
NCG				
K6PD	402	2	5	1,800
Iowa River Valley ARC				
KDØGH (+NØGIV)	642	2	9	1,800
Ascension ARC				
WB5KKM	580	2	25	1,800
River City ARCS				
KG6XX (+WB6YLK)	486	2	10	1,784
Yucaipa Valley ARC				
W6CV	436	2	20	1,758
River Cities ARA				
KZ4G	483	2	42	1,754
Lakes Area ARC				
WB9PZH (+KA9TVC)	475	2	12	1,752
Navy Memphis ARC				
W4QDR (+KB4YLN)	536	2	9	1,748
Lakeview ARC				
NG9U	623	2	10	1,748
Delta Co ARS				
K8ZAS (+KA8WOF)	452	2	16	1,744
American Red Cross EC				
N2MH	528	2	17	1,740
Missouri Valley ARC				
WØNH/Ø (+KBBAEC/Ø)	543	2	31	1,728
Staten Island ARA				
W2CWW (+WA2KWH)	401	2	26	1,726
West Morris WS				
KS2M (+KA2UHT)	533	2	15	1,718
Pioneer ARC				
WØRCH (+KBØASB)	485	2	25	1,714
Naperville ESDP				
N9RF	452	2	13	1,712
Port Lavaca & Golden Cresent ARCs				
W5DUQ (+KB5CJS)	442	2	25	1,710
Texins ARS				
WX4S	601	2	7	1,706
Rockport ARG				
W6NI	392	2	10	1,700
Lorain Co ARA				
N8AM	500	2	23	1,692
Boonville ARC				
WD2ADX (+KA2SJG)	386	2	4	1,688
Kendall ARS				
KF5BT (+KA5OSM)	512	2	13	1,674
Shiawassee ARA				
W8QQQ	484	2	11	1,672
LaPorte & Michigan City ARCs				
K9JSI (+KA9YNX)	352	2	50	1,672
Yellowstone RC				
K7EFA	401	2	20	1,666
Bluff ARC				
WD9AXV	393	2	10	1,658
Issaquah ARC				
W7BI	470	2	18	1,654
LARC of Liverpool				
KD2A	411	2	8	1,646
Owatonna Steele Co ARC				
NV8C (+NØGJJ)	537	2	55	1,644
Old Pueblo RC				
W7GV (+KA7ZPT)	490	2	57	1,644
Florence ARC				
W4ULH	518	2	21	1,642
Upper Crab Creek Ham Club				
WC7C	388	2	3	1,630
Shawano Schools RC				
NO9K	479	2	14	1,618
Sun City ARC				
K5WPH	486	2	30	1,618
Burnaby ARC				
VE7BAR	448	2	-	1,614
Grand Island ARS				
WØCUO	578	2	18	1,608
Harlan Co ARC				
KB4EES	550	2	5	1,600
Central Dakota ARC				
WØZRT (+KBØALR)	610	2	25	1,600
ODXA				
WB7VTY (+N7GRY)	480	2	6	1,598
Quinte ARC				
VE3RL	322	2	23	1,594
Tippecanoe ARA				
W9REG (+N9DKI)	551	2	21	1,584
Sleepy Hollow Badgers				
W8URM (+N8IFX)	333	2	5	1,580
Kentucky Colonels ARC				
K4ORC	306	2	15	1,580
Bankhead ARC				
N4IDX (+KC4AMB)	628	2	12	1,556
Royal Gorge ARC				
NCØA (+KAØZUQ)	723	1	12	1,554
Cal Poly ARC				
W6BHZ	435	2	8	1,534
Oswegatchie Valley ARC				
NR2S (+KA2AUH)	446	2	11	1,526
Shuswap ARC				
VE7WI	489	2	10	1,524
Franklin ARC				
AB4H	288	2	15	1,506
Denton Co ARC				
W5NGU	370	2	30	1,506
Centralina ARC				
N4QR	542	2	19	1,504
Miami Co ARC				
K9ZEV	271	2	10	1,502
Charter Oak WS				
KZ1A	326	2	3	1,496
Borealis ARC & Arctic ARC				
WL7X (+NL7KP)	687	1	19	1,494
Lake Co ARS				
KA6IWO (+KB6QWJ)	383	2	36	1,490
Fairfield ARA				
KD8M	413	2	17	1,488
Old Post ARS				
KD9TV	641	2	18	1,482
Tri-County ARC				
W9MQB (+KA9ODI)	351	2	10	1,474
Indianapolis Red Cross ARC				
WA9LGQ	370	2	30	1,470
Otsego Co ARA				
NC2C (+KB2CRL)	418	2	7	1,462
Ottawa Valley MRC				
VE3JW	456	2	36	1,452
Columbus ARC				
K9RXK	556	2	33	1,450
Cameron Co ARC				
KA3MMM (+WA3WPS)	285	2	8	1,450
North Fulton ARL				
KI4MQ	464	2	-	1,428
Kentucky ARS				
WE4K	430	2	15	1,418
Carbon ARC				
WB3EFI	312	2	7	1,412
Plano ARC				
WG5E (+N5DBI)	283	2	-	1,392
NovAtel ARC				
VE6NOV	340	2	10	1,386
Sky High ARC				
KB2AR	475	2	8	1,378
Athens ARC				
W5CR (+KB5AEV)	335	2	15	1,366
SBARA				
N6BFO	436	2	24	1,364
Explorer Post 73				
NM5U (+N5KLH)	532	2	18	1,364
Huber Heights ARC				
N8TD	366	2	8	1,362
Post Elgin Repeater Team				
VE3PER	414	2	9	1,360
Glynn ARA				
K4TVE (+KA4OTR)	205	2	8	1,340
Broward ARC				
W4AB (+N4ORN)	496	2	18	1,338
Missouri ARA				
WB3KPJ (+KA3RNY)	402	2	8	1,334
ARA of Bremerton				
W7VE	256	2	14	1,332
Rip Van Winkle ARS				
W2FSL (+KA2QYG)	323	2	23	1,316
Katy ARS				
KM5S (+WD5ICM)	464	1	9	1,315
Monterey Marauders				
N6ALS	278	2	3	1,296
Comm Club of New Rochelle NY				
K2DN (+KB2BQY)	225	2	8	1,296
Spring Hill ARC				
N4US	260	2	42	1,292
Petaluma DX & Experimenters Soc				
WB6EGE (+KA6OPN)	322	2	9	1,290
VAMPIRES				
KA1OU (+WB2FSK)	453	2	11	1,280
Raritan Bay RA				
K2GE (+KA2FNZ)	261	2	12	1,256
McCounty ARC				
W3VV (+KA3RGT)	615	1	15	1,252
NCG				
NV8U	355	2	4	1,238
Neptune ARC				
N2GT (+WB2TZJ)	299	2	15	1,224
Three Rivers ARC				
KNØA	457	2	11	1,220
Douglas Co ARC				
WØXI	403	2	-	1,218
Tahoe-Truckee ARA				
KI8IV	387	2	3	1,212
Land of Grant ARC				
NS8I	533	1	14	1,209
Arrowsmith ARC				
VE7EMO	342	2	12	1,208
Connaaut ARES				
W8SD	303	2	10	1,206
Sierra ARA				
NM5Y	431	2	10	1,204
Clover Leaf ARC				
WD4IIO	199	2	10	1,198
Backwoods BDBBARTSS				
WD4EIQ	298	2	5	1,184
LAMARS				
W9HOQ (+KA9WLK)	318	2	16	1,180
Snowline ARC				
KI6DJ (+N6PAE)	210	2	7	1,156
NCG				
VE4GM/4	347	2	4	1,156
Matanuska ARA				
KL7ILA	311	2	10	1,146
Chippewa ARC				
KBVEV	204	2	15	1,142
Wallaceburg ARC				
VE3WAA	346	2	10	1,140
NCG				
W5ES (+N5ISH)	362	2	-	1,138
REDCOMSEVEN				
W4NUS	165	2	3	1,136
Flint Hills ARC				
WØHT	405	2	10	1,110
HTTY-AMSAT Houston				
WA5ZIB (+KB5DFY)	321	2	17	1,110
Gratiot Co ARA				
NT8W	380	2	7	1,110
Hermiston ARC				
WA7ZWD	403	2	27	1,106
Cowair ARC				
W6UUS (+KB6PLI)	498	2	-	1,104
Longmont ARC				
N4EQ	250	2	29	1,092

Fort Myers ARC
W4LX 340-2- 30- 1,060
Fire Lands ARA
WA8HUR 266-2- 45- 1,038
NCG
WB8SIW 299-2- 4- 1,034
Sand Hills ARC
KX8L 265-2- 12- 1,032
Pioneer ARC
WB8TMP 263-2- 3- 1,032
Coon Valley ARC
W8RJX 361-2- 40- 1,022
Principia College ARC
K9BO 465-1- 15- 1,020
Muscle Shoals ARC
W4JNB (+KA4IYO) 295-2- 16- 990
McDonnell Douglas ARC
WADCGV 226-2- 12- 976
Masab WA
K8MK 187-2- 13- 966
Pike Co ARC
W9CZH 166-2- 8- 958
Mighty ARS
WA6SLA (+KB6GBF) 377-2- 5- 954
Kings Co RC
W2RAK 218-2- 28- 936
Monterey Park ARC
K8GIP 262-2- 16- 924
Coastline ARA
NC1D 234-2- 21- 920
Parkland RC
VE5PRC 603-1- 7- 903
Piqua ARC
W8SWS 147-2- - 880
Manasota RA
K4WV (+KC4AJN) 255-2- 20- 878
Westcum ARC
VE1WRC 116-2- 12- 874
Greater Bridgeport ARC
W1WV (+KA1QMW) 532-1- 30- 871
Cascade RG
N7CFO (+N7EYO) 210-2- 7- 870
Milwaukee ARC
W9RH (+KA9YHY) 379-2- 26- 864
Catskill Mountain ARA
KC2H (+KB2DYB) 254-2- 12- 850
Hilline ARC
N7EOL 105-2- 5- 848
NCG
VE5RI/6 246-2- 5- 844
South East ARC
K8EMY (+KA8UFK) 225-2- 15- 828
Allegany Highlands ARC
W2SAM 229-2- 8- 828
Wildcat ARS
NI9J (+KA9TNH) 161-2- 4- 826
Cape Ann ARA
W1RK (+KA1EDY) 131-2- 25- 826
Casper ARC
W7VNJ 212-2- 35- 824
Northwest Ohio ARC
WB8ULC (+KB8BMQ) 258-2- 20- 816
Valley of the Moon ARC
WB8DWY 255-2- 6- 810
Chehalis Valley ARS
WA7UHD 189-2- 27- 804
RASON
KA1IFG 173-2- 16- 796
Confederate Signal Corps
W4VTA 293-2- 6- 786
Hualapai ARC
WA7LAZ 181-2- 6- 762
Pinewood Mountain ARG
WB8LTV (+N8GYW) 228-2- 5- 756
Country Cousins
K3KW (+KA3NWM) 156-2- 6- 750
Irving ARC
WA5CKF (+N5BFG) 98-2- 15- 704
NCG
AL7HW 587-1- 6- 702
Enterprise ARS
WD4ROJ 176-2- 20- 700
Newport Co RC
W1SYE 152-2- 10- 678
White River Valley ARS
N8DCT (+KA8WNS) 176-2- 11- 664
Lake Huron ARS
W8JC 172-2- 5- 644
Pittsburg St Univ ARC
N8EYE 326-1- 5- 630
Plateau ARC
K4VMQ/4 260-2- 7- 620
Nuts of Nottingham
KB8OS 209-2- 5- 618
Coronado ARS
W6MLI 55-2- 20- 610
Cranford ARS
WB2CLW 193-2- 3- 588
Bay Area RA
KM3I 118-2- 7- 576
Indian Foothills ARC
WB8WMM 151-2- 8- 544
Heart of Texas Ham Operators Group
WW5M (+KA5YGR) 106-2- 13- 518
Glades ARC
WD4KPG 60-2- 10- 514
Explorer Post 599
W9HXL (+KA7VEG) 383-1- - 513
Capilla Peak FDG
K5FSB 304-1- 6- 506
K-BAR-A
W7VW 221-2- 10- 442
Wilson ARC
WA4MFJ 115-2- 9- 432
Eastern Illinois HC
W9GWF 58-1- 10- 386
DR9NK Radio Network
NN6E 15-2- - 230

CHARRO
W5KR 1-2- 11- 204

2A Commercial

Porter Co ARC
N9RD/9 (+N9FKD) 2973-1- 39- 4,207
Order of Boiled Owls
K2KM 2484-1- 15- 3,868
Serious Hams ARC
AA4W (+KB4RMX) 1007-2- 12- 3,646
Ottumwa ARC
N8SM (+KB8AKB) 1160-2- - 3,248
Indiana Lakeshore Amateurs
KQ9Q (+N9GCY) 2648-1- 35- 3,133
Marshal Co ARA
N4KKW (+N4ONL) 658-2- 12- 2,500
Sumter ARA
WA4UMU 672-2- 20- 1,932
Pearl River Co ARC
W5UO 473-2- 14- 1,892
Cape May Co ARC
AE2Y 495-2- 15- 1,836
North Shore RC
KX9O 570-2- 45- 1,696
Scotland Co ARC
WB4ERO 646-2- 16- 1,668
Carolina ARL
KS4S (+KA4LLC) 470-2- 12- 1,634
Rowan ARS
W4EXU (+KB4HJR) 555-2- 12- 1,574
Mohawk ARC
NA1F (+N1EKE) 469-2- 16- 1,484
Southern Appalachian WS
NV8O 692-2- 8- 1,390
Southwest Louisiana ARC
W5BII 497-2- 25- 1,352
Logan Co ARC
NU8K 426-2- - 1,232
Green Fox ARC
KC8EY 539-2- 10- 1,212
Ozone ARC
K5OZ (+KB5ARE) 444-2- 30- 1,000
Ellis Co ARC
N5KFC (+KA5RDC) 354-2- 13- 886
Iron Range ARC
W8YNY 163-2- 8- 798
Synton ARC
W9YH 168-2- 10- 680
NCG
WB8WZT 315-2- 3- 656
Pretty Wasted FDG
K9JU/8 163-2- 4- 596
Tri County ARC
KA8ILO 274-2- 8- 560
Cullman ARC
AK4B 255-2- 7- 510
TARS
W9OG 159-1- 30- 457
Aero ARC
W3PGA 164-2- 5- 398
Appalachain RA
KD8MZ 181-2- 18- 362
Radio Amateur Mobile Society
W8HIR 179-2- 20- 358

3A Battery

Sumit ARA
KS3L (+N3ECR) 1994-5- 25- 12,740
University of Maryland ARA
W3EAX (+N3FHW) 1263-5- 12- 10,160
North Ottawa ARC
KC8P (+KB8SLX) 1171-5- 25- 7,500
Suffolk Co RC
W2DQ (+KA2ZPW) 675-5- 30- 6,630
Ampex Employees ARC
K6QEZ 638-5- 10- 6,320
Williamsburg Area ARC
K4RC (+WD4JYQ) 1653-2- 35- 6,230
A-Team
W4RRW 401-5- 9- 4,510
Oregon Tualatin Valley ARC
K7JF (+KB7AHX) 1412-2- 36- 4,502
Hendricks Co Ham Club
N9SF 1185-2- 18- 4,096
QRP Wind Farmers
W1XH 412-5- 10- 4,025
Madison ARC
W9EFU 1200-2- 14- 3,888
Twin Cities RC
W8BU (+KA8NXS) 1018-2- 25- 3,860
Montachusett ARA
W1GZ (+KA1PNP) 1168-2- 20- 3,816
Ruminski-Sowinski RG
WB8HKK (+KB8AHQ) 441-5- 8- 3,395
Eagle Rock ARC
NO7B (+N7JAM) 384-5- 15- 3,205
Michigan QRP Club
KB3RO 250-5- 10- 2,900
East Bay ARC
W6CUS (+KB6JZM) 753-2- 32- 2,886
Elkhart Red Cross ARC
AE9U 1008-2- 10- 2,718
Santa Clara ARA
W6UW (+KB6HRN) 619-2- 35- 2,410
Pilot Knob ARC
N8SF 420-2- 20- 1,924
Wisconsin Rapids ARC
W9DQA 330-2- 14- 1,716
NCG
WA7B (+KA9RDG) 473-2- 8- 1,548
BRATS
KC3DO 211-5- 25- 1,395
Sierra Contest Club
WW6O 106-2- 9- 512

3A

Dallas ARC
W5FC (+N5IQP) 3638-2- 45- 10,844
Ashtabula Co ARC
W8CY (+KA8LTE) 2945-2- 18- 10,814
Hughes Fullerton Emp Assn ARC
K6QEH (+N6ORK) 3078-2- 50- 10,330
Poughkeepsie ARC
N2YL (+KA2SRC) 3157-2- 35- 10,172
Sutton ARS
K8HA 3469-2- 10- 10,018
Albuquerque DX Assn
N5RR (+N5GFR) 3132-2- - 9,276
Hebron AWG
K1DW (+KA1PMW) 2489-2- 13- 8,766
Red Ryder Contest Club
W8VS (+KA8BFF) 3024-2- 14- 8,648
Acton Boxboro ARC
W1UC (+KA2DJH) 2332-2- 30- 8,090
Selden Repeater
NO2D (+N2FXD) 2309-2- 25- 7,624
Fort Wayne RC
W9TE (+KA9OSE) 2394-2- 40- 7,578
Satellite ARC
W8AB (+KB8KZL) 2760-2- 23- 7,476
Shreveport ARA
W5AU (+KB5AAQ) 2386-2- 60- 7,020
Paso Robles ARC
W6LKF 1890-2- 24- 6,754
Columbus ARA
W8TO (+KB8CDI) 1877-2- 20- 6,680
Northwest ARC
W9LM 2072-2- 25- 6,494
OH-KY-IN ARS
K8SCH (+KB4TEE) 2054-2- 35- 6,440
Radio Central ARC
K2VL (+KA2MUM) 2008-2- 55- 6,408
Saginaw Valley ARA
KBDAC (+N8GAN) 1912-2- - 6,374
Boulder ARC
W6DK (+N6HAU) 2085-2- - 6,300
South Florida DX Assn
W4WJ 1906-2- 18- 6,242
Capeway RC
K1BU (+KA1BBU) 1817-2- 15- 6,142
CAREN
KE9I (+KA9YLV) 1955-2- - 6,076
Springhill ARC
N5II 2081-2- 12- 5,890
Santa Barbara ARC
K6TZ (+KB6MEP) 2015-2- 35- 5,844
Jet Propulsion Laboratory ARC
W6VIO (+KA6DAN) 1697-2- 45- 5,796
Delaware Lehigh ARC
W3OK 1966-2- 30- 5,788
Mississippi Coast ARA
K5OS 1638-2- 31- 5,766
FARS/EMARC
K6YA (+N6PCS) 1519-2- 30- 5,598
Ramapo Mountain ARC
NN2T (+WA2GYK) 1573-2- 22- 5,590
Riverland ARC
NS9E 1608-2- 20- 5,546
Waterbury ARC
K1EB (+KA1NTB) 1951-2- 35- 5,416
Dauberville DX Assn
KI3N (+KA3PLC) 1868-2- 20- 5,312
Virginia Beach ARC
K4IX (+KB4VUG) 1569-2- 50- 5,218
Suburban Cincinnati ARS
K8BZ 1769-2- 25- 5,160
Surrey ARC
VE7SAR 1382-2- - 5,086
Dupage ARC
W9DUP (+KA9WPS) 1638-2- 23- 5,062
RA of Erie
W3GV 1275-2- 15- 4,804
Providence RA
W1OP (+KA1OSZ) 1622-2- 15- 4,774
Goz's Gang
K2SA (+KB2CHE) 1278-2- 16- 4,744
Southern Penninsula ARC
W4PRO (+N4IIC) 1466-2- 60- 4,710
Maryland Apple Dumpling RAS
W3PH (+KA3QCV) 1495-2- 19- 4,692
Northfield EAT
N1CC (+K1RKT) 1301-2- 14- 4,686
Calgary ARA
VE6NQ 1204-2- 16- 4,620
PEN-MAR RC
W3MUM (+KA3NRA) 1308-2- 19- 4,560
Davenport RAC
W6BXR (+KA6ZBB) 1486-2-150- 4,514
San Mateo RC
W6LMN (+KB6NYZ) 1209-2- 31- 4,508
Green Co ARC
N5FER 1135-2- 15- 4,396
Great South Bay ARC
NT2U (+N2FIM) 1218-2- 50- 4,370
Billerica ARS
KB1GP (+KA1QCL) 1215-2- 15- 4,298
San Lorenzo Valley RC
N6RZ (+N6NLT) 2969-1- 21- 4,217
GDRA RC
W5SJZ (+KA5VRT) 1360-2- 41- 4,210
North Shore RA
W1ND (+N1BZF) 1115-2- 35- 4,156
North Florida ARS
W4IZ (+KB4ZZZ) 1357-2- 55- 4,138
Poway ARS
K6CD (+KB6QMV) 1175-2- 24- 4,102
Great Bay RA
WB1CAG (+KA1LLP) 1124-2- 33- 4,074
Band Dit-Dahs
K2MP 1201-2- 14- 4,068
Huntington Co ARS
W9EI 1542-2- 28- 4,068
Allen Co ARTS
W9INX (+N9FSJ) 1495-2- 26- 3,986
Naval Research Laboratory ARC
W3EW (+KA3HNH) 1058-2- 19- 3,898
Florida Westcoast DX Ring
KO4J (+N4OGL) 1365-2- 16- 3,858
Night Owls of Rhode Island
KO1X (+KA1OTN) 922-2- 14- 3,842
Palo Alto ARA
W6OTX (+KA6JLT) 1451-2- 29- 3,830
Yuba-Sutter ARC
NR6A (+WA6ISR) 1102-2- 45- 3,784
North Central ARES
NG9Y (+KA9SVS) 1284-2- 20- 3,774
Codex Corp ARC
KR1B 1159-2- 10- 3,734
Jones Co ARC
W9GN 975-2- 7- 3,726
SOBARS & ARES
K9QHQ (+KB6ROH) 957-2- 25- 3,722
Midstate ARC
N9DLN (+KA9VWR) 1106-2- 23- 3,682
Milford ARC
W8SDL 1021-2- 25- 3,644
North Kitsap ARC
KI7T (+KA7RCE) 976-2- 40- 3,602
Chattanooga ARC
W4AM 1192-2- 40- 3,580
Clark Co ARC
W9WWI (+KA9VLY) 957-2- 62- 3,542
Port City ARC
W1WQM 1066-2- 15- 3,540
Club de Radio Sherham
VE2FC 1014-2- 30- 3,476
South Georgia ARC
W4FGH 1096-2- 12- 3,474
Coastline ARC
WA6TOW 1193-2- 9- 3,462
Edmond ARS
KV5X (+N5IZZ) 788-2- 80- 3,448
Montgomery ARC
N3SE (+N3ESR) 1108-2- - 3,444
ECHO RA
K9BTB (+KA9TNU) 872-2- 30- 3,428
Colonial Wireless
W1EEL 998-2- - 3,424
CMARC FDG
KY3W 948-2- 12- 3,370
Putnam Emergency AR
NW2F (+N2EGS) 868-2- 26- 3,364
Skywide ARC
VE3ATD 1026-2- 18- 3,360
Salem ARC
W7SAA (+N7IBV) 1098-2- 23- 3,350
ITT ARC
NO2T (+N2HDG) 778-2- 10- 3,294
MRC/MOEM/RVEN
K2SE 998-2- 23- 3,288
Rappahannock Valley RC
K4TS (+KB4ZRV) 901-2- 14- 3,252
Lockheed-Sunnyvale ARC
WA6GFY 1187-2- 7- 3,250
Splitrock ARA
K2RF (+N2GZE) 1095-2- 40- 3,246
Metuchen ARC
K2YNT 983-2- 20- 3,242
Wichita ARC
W9SOE (+KA9ZUM) 970-2- 40- 3,230
CLARA
WM6J 1073-2- 13- 3,222
Better Luck Next Year ARG
KB7KY 995-2- 25- 3,214
NCG
KB8QA 986-2- 9- 3,202
Black River ARC
KG8K (+N8GUM) 1045-2- 20- 3,182
NCG
W9EBY (+WD9JKS) 998-2- - 3,178
GLERC ARC
N4NL 924-2- 20- 3,176
Sunset Empire ARC
W7BU (+N7IJA) 863-2- 25- 3,172
Tioga Co ARC
K2QR 777-2- 15- 3,120
Lower Columbia ARA
W7DG (+N7IQM) 874-2- 45- 3,088
AT&T ARC
KU9C 748-2- 15- 3,074
Alliance ARC
KD8MQ (+N8GIE) 974-2- 24- 3,070
Ocean/Monmouth ARC
KC2Q 821-2- 15- 3,062
Griffith
WA2ZXS (+KB2DGR) 1023-2- 32- 3,040
Holland ARC
K8DAA 919-2- 35- 3,028
Pocono ARC
KB3TS (+KA3RBJ) 813-2- 24- 2,996
Albany ARA
K2CT 1077-2- 46- 2,984
Lee DeForest RC
W6WJ (+KB6LTR) 809-2- 32- 2,932
Queen City Emergency Net
W8VVL (+N8HRD) 751-2- 25- 2,892
Downey ARC
W8TOI (+N8MYY) 788-2- 29- 2,860
Aurora RA
W8SM (+KA8VOY) 701-2- 52- 2,854
Mound ARA
W8DYY 731-2- 57- 2,846
Denver RC
W8TX (+KA8ZEK) 799-2- 17- 2,842
Montgomery ARC
N4AU (+KB4YGA) 745-2- 27- 2,828
Tri-Town RAC
W9VT (+KA9VMX) 663-2- 25- 2,808
Twin City ARC
W7LA 860-2- 24- 2,800
Fond Du Lac ARC
K9NC 875-2- 9- 2,740
PART of Westford
AB1A 692-2- 8- 2,736
Niagara Falls Red Cross DCS
W2DRN 772-2- 19- 2,730
Whitman ARC
WA1NPO (+KA1MUW) 730-2- 15- 2,722
Blue Valley ARC
WA8HOU (+KA8ZXQ) 1034-2- 30- 2,722
Ocean State ARG
KZ1C (+N1EAJ) 849-2- 20- 2,718
AK-SAR-BEN ARC
W0ECU (+KB0ARA) 905-2- 38- 2,696
Japanese American ARS
K6DLG (+KA6WXZ) 781-2- 40- 2,694
Inland Empire ARC
WA6ZEF (+KA6ENG) 832-2- 30- 2,686
Lake Area RC
KD8YL 806-2- - 2,678
NARC/RATS/WATTS
W4AY/4 879-2- 24- 2,672
Lincoln Trail ARC
AA4OR 882-2- 24- 2,670
Hendersonville ARC
K4DZR (+WB4ENC) 835-2- 16- 2,668
McHenry Co WA
KB9K (+KA9VNV) 970-2- 20- 2,654
Mahaska ARC
NR0C (+KA0VWV) 933-2- 12- 2,580
Laurel ARC
W5NA 831-2- 20- 2,574
York RC
W9PCS/9 (+KA9WPP) 988-2- 20- 2,572
Coastal Area RS
AB4B (+KB4ZGF) 646-2- 25- 2,544
Central Kansas ARC
NW0W (+KA0QNB) 619-2- 12- 2,532
Larkfield ARC
WA2PNU 738-2- 40- 2,530
Comsat ARC
WA3LOS 964-2- 14- 2,514
Moreno Valley ARA
WR6G 801-2- 25- 2,510
Peninsula ROS
KC3TA 810-2- 14- 2,506
Detroit Metropolitan RC
W8LXE 837-2- 6- 2,506
ZOT ARS
WB6RDO (+N6PRG) 801-2- 5- 2,488
Brazos Valley ARC
WZ5T (+KA5SGM) 818-2- 20- 2,482
Moose Lake Madmen
N9GEE 1041-2- 5- 2,482
Brightleaf ARC
W4AMC (+N4GVK) 773-2- 15- 2,436
NCARC/WARS
W8UPS (+KA8ZOS) 851-2- 40- 2,382
Anchorage ARC
KL7AA (+WL7AFN) 564-2- 27- 2,366
Fossil Creek WS
K9MK 762-2- 10- 2,362
AT
N3LR 738-2- 5- 2,350
North Hills ARC
W3XX (+KA3LFY) 656-2- 36- 2,344
Marshall RC
W8BMJ 771-2- 15- 2,342
Mt State Transmitters
K8VNQ 589-2- 8- 2,320
Smoky Mountain ARC
W4OLB (+KC4ALO) 704-2- 36- 2,312
Apple Valley ARC
KN8S (+KA8UZG) 895-2- 22- 2,308
Perkiomen Valley ARC
W3GOS 632-2- 10- 2,306
Platt Co AC
K9IYP (+KA9VHQ) 741-2- 10- 2,292
Lubbock ARC
K5LIB 831-2- 53- 2,282
Pasadena RC
W6KA (+KB6ORT) 814-2- 40- 2,256
Simi Settlers ARC
W6TOQ (+KB6IXA) 818-2- - 2,232
York ARC
W3EDU (+KA3QXE) 607-2- 24- 2,186
Tri-County ARC
K4SSV 474-2- 18- 2,112
BGMRC
K4SEX (+N4NKT) 837-2- 41- 2,104
Highland AHA
NF8G (+WD8DJJ) 602-2- 14- 2,102
Everglades ARC
W4SVI (+KB4QLH) 486-2- 23- 2,090
Northeastern Indiana ARC
K9ZBM (+KA9RVH) 658-2- 21- 2,076
Westark ARC
WE5L 680-2- 14- 2,060
Jayhawk ARS
W8LB (+N8HAF) 393-2- 20- 2,056
Natchaug ARA
KA1HR (+N1EDE) 692-2- 19- 2,038
Hamilton Co ARA
K8KWO 784-2- 10- 2,028
Hebbronville Star LPA
WG5U 458-2- 15- 2,010
Stockton-Delta ARC
W6SF 641-2- 12- 2,006
Algonquin ARC
KB1WW (+KA1NLX) 433-2- 10- 2,000
Maryland Mobileers
K3WD 546-2- 14- 1,998
West Valley ARA
W6PIY (+N6JTU) 1080-1- 26- 1,993
Barnstable RC
K1PBO 448-2- 14- 1,992
Jefferson Co RAC
NW2O 480-2- 40- 1,986
Thomasville ARC
W4UCJ (+KB4HPM) 650-2- 14- 1,982

Whitewater Hills ARC
N9FKF 502-2- 22- 1,968
Rank ARS
N8EPX 717-2- 7- 1,934
Fullerton RC
W6UJ (+K6PHE) 749-2- 15- 1,922
North Penninula Electronics Club
W6PMK 449-2- 19- 1,922
Western Piedmont ARC
K4VLY 486-2- 16- 1,898
Mancorad Club
W9DK 576-2- 17- 1,892
Lee's Summit CES
W8IE (+KA8FMS) 671-2- 15- 1,872
Keowee/Toxaway ARC
K4PYM 440-2- 18- 1,868
EARA/CCARES
W2ZJ 374-2- 22- 1,862
Michacon
N8LT 448-2- 8- 1,860
Kodak Park ARC & KAD ARC
N2AX (+N2BNE) 487-2- 14- 1,812
Grand Strand ARC
WD4JMT 684-2- 10- 1,804
Tri-County RA
W2LI 595-2- 10- 1,796
Tri-County ARC
KA3T 498-2- 20- 1,782
NCG
WB8GXT (+KB8BVR) 471-2- 18- 1,778
Nutley ARS
W2GLQ 415-2- 20- 1,768
Granite State ARA
K1RD 713-2- 26- 1,766
Wythe ARC
N4KZL 605-2- 8- 1,750
Beloit ARC
K9EP 497-2- 5- 1,744
Sabine Parish ARC
K5ABA (+KA5LUF) 604-2- 14- 1,716
NCG
WD9HIB (+N8CUF) 685-2- 15- 1,684
Warren ARA
W8VTD 542-2- 26- 1,680
Independent RA
W8VZE 494-2- 8- 1,656
Raritan Valley RC
W2QW 466-2- 9- 1,638
Lehigh Valley ARC
W3OI 402-2- 10- 1,630
Virginia ARA
W4FEG 354-2- 15- 1,610
North Hills RC
K6IS 571-2- 15- 1,598
Olympia ARS
NV7J 520-2- 60- 1,584
Muskegon Area ARC
WB2HO (+KB8BCO) 539-2- 25- 1,566
Lakehead ARC
VE3FW 864-1- 12- 1,559
Sub Club ARA
KF6RP (+KA6NOO) 429-2- 20- 1,556
Club Radio Amateur Owtaouais
VE2CRO 524-2- 10- 1,548
Lebanon Valley SRA
KM3D 505-2- 21- 1,548
E-Systems ARC & Sabine Valley ARA
WF5C (+KA5YFI) 368-2- 20- 1,530
Jamestown ARC
W9FX 348-2- 15- 1,524
Blue Ridge ARC
W8NBX 406-2- 15- 1,518
Rensselaer Co RACES
KA2AXN 506-2- 15- 1,516
Boeing Employees' ARS
AE8A 306-2- 25- 1,512
Hewlett-Packard Spokane Div ARC
NO7Q 402-2- 11- 1,506
Cumberland ARC
K3IEC 442-2- 15- 1,468
San Francisco RC
W6PW 499-2- 20- 1,464
Benicia ARC
K6KAP 222-2- 12- 1,448
Intercity ARC
W8WE 318-2- 16- 1,424
High Plains ARC
W8LHA (+WD8ESY) 344-2- 8- 1,408
ARC
VE2CRG 292-2- 12- 1,394
Macon ARC
W4BKM (+KB4KZO) 527-2- 20- 1,392
Golden Empire ARS
W6RHC 394-2- 26- 1,388
Sudbury ARC
VE3BLZ 313-2- 19- 1,374
Chesco ARA
K3BKG 458-2- 14- 1,354
Southern Alberta ARC
VE6CAM 243-2- 10- 1,348
Skyline ARC
NW2X 463-2- 53- 1,336
Grand Rapids ARA
W8DC (+WD8RET) 334-2- 19- 1,334
Geraldton ARC
VE3KRX 458-2- 8- 1,316
Pawnee ARC
AF0N 371-2- 25- 1,304
St Cloud ARC
W0SV 377-2- 8- 1,292
Prospect Harbor Group
NC4Y 370-2- 12- 1,278
Quad City ARC
W9YCR (+N9DNY) 327-2- 10- 1,272
Emergency ARC
KH6BI (+KH6KL) 210-2- - 1,272
Marrion ARC
W8GVB 312-2- 30- 1,262
RAGE
N2DM 217-2- 5- 1,258
Hartford Co ARA
W1NEM 427-2- 12- 1,254
LKM ARS
W6ISQ/6 276-2- 3- 1,232
Yellow Thunder ARC
WB9FDZ 293-2- 12- 1,232
ARA Portneuf
VE2CSP 305-2- 10- 1,224
Bay Area ARC
N6BBR 347-2- 10- 1,202
NCG
N2EVZ 351-2- 3- 1,174
Mankato Area RC
W0WCL (+KA0EEK) 616-1- 40- 1,136
Lakeland RA
W4JM 225-2- - 1,132
Rantoul ARA
W9ZK 258-2- 8- 1,128
Kings Co RA
W2XY 342-2- 10- 1,110
Tioga Co ARC
WA3RRS (+KA3FEW) 352-2- 21- 1,104
Refugio Co ARC
NV5X (+KA5WBT) 298-2- 25- 1,090
NCG
W3HZW 316-2- 26- 1,082
DVOECA
W3STW (+N3DVY) 298-2- 8- 1,068
Benton Co ARES & OSU ARC
KI7N 312-2- 9- 1,046
Cricket WA/Glastonbury CP
KA1ST (+KA1NYV) 270-2- 12- 1,046
Plainview ARC
W5WV 219-2- 6- 1,038
Cascade RC
W7EK 350-2- 10- 1,000
PARK
KE7TB 229-2- 12- 984
Northrop Advanced Systems Div ARC
AA6CR (+KB6OYD) 297-2- 10- 948
Rogue Valley ARC
W7OEK 192-2- 15- 932
Beaver Valley ARA
W3SGJ 243-2- 10- 902
Greenwood ARC
VE1WN 244-2- 10- 888
RA of the Gorge
NB7M 282-2- 26- 866
Tri City RAC
W0VQN 279-2- 18- 864
Harrison ARC
KM9E 245-2- 12- 826
Humboldt ARC
N6AFT 136-2- 8- 816
Germantown ARA
KJ4KR (+KA4ATI) 256-2- 9- 814
National Trail ARC
K9UXZ 349-2- 5- 698
ESL Irregulars
KA6ASV 67-2- 4- 664
Central Solano Co ARES
WO6Y (+KB6JZE) 234-2- 13- 630
Dunnville ARC
VE3HOP 40-2- 10- 605
Quad Co ARC
NA3Y 146-2- 29- 592
Crete ARC
K8JOQ 64-2- 9- 582
Wheat Straw ARC
K5GBN/5 66-2- 5- 432
Mt Prospect ARC
N9DZN (+WD9GVJ) 53-2- - 406
Wood Co ARC
K8TIH (+K8YTN) 152-2- 19- 342

3A Commercial

West Side RC of Toronto
VE3JJ/3 790-2- 9- 2,642
Seitler's Boys
KG7B 608-2- 5- 2,354
RA of Western New York
W2PE 682-2- 7- 2,246
Brothers of Cape Cod
KI1M 458-2- 3- 1,682
Lawtonfort Sill ARC
W5KS/5 574-2- 19- 1,474
Prairie Dog ARC
W0OJY 432-2- 15- 1,218
Zero-Beaters ARC
WA8FYA 232-2- 10- 1,060
Somerset Co ARC
AK3J 266-2- 8- 846
Central Iowa ARS
K9KQJ8 338-2- 5- 776
TARCOM
W2FWG 263-2- 15- 654
Hub City ARC
NY0W 188-2- 14- 376
Sabana SEAA ARC
KP4USN 73-2- 10- 360

4A Battery

Mason Dixon ARC
K8HS (+KB8ACY) 1072-5- 32- 6,315
Zuni Loop Mountain Expeditionary
W6SKQ 648-5- 8- 5,755
Northeast Iowa RAA
W8MG 1147-2- 25- 3,114
Three Generations
W8SGJ (+KB6MWU) 703-3- 7- 2,470
Ada Co ARES
KA7T 607-2- 25- 2,330
Los Angeles Co DCS
N6ZH (+KB6RVL) 573-2- 25- 2,236

4A

Texas DX Society
K5DX (+KA5YXX) 5394-2- 27- 16,248
Cherryville RA
K2NJ (+KB2BCF) 4587-2- 40- 14,872
Kettle Moraine RA
N9KS (+WD9DNM) 3254-2- 58- 10,916
Scottsdale ARC
K7TR (+KA7AKJ) 3096-2- - 9,846
Cary ARC
N4NC 2755-2- 24- 8,818
Eastern Connecticut ARA
K1MUJ (+KA1MCY) 2485-2- 22- 8,748
Hamtesters RC
W9AA (+KA9STV) 2806-2- 35- 8,232
Ozaukee RC
K9CAN (+KA9UBW) 2309-2- 26- 8,132
Redwood Empire DX Assn
KK6X 2475-2- 14- 8,104
Fox River RL
NA9A (+KA9WVO) 2246-2- 54- 7,588
Sturdy Mem Hosp ARC/Foxboro Co ARC
K1ZZJ (+N1DZJ) 1949-2- 33- 6,896
Westchester ECA
K2ZM (+KA2UFN) 1800-2- 25- 6,760
Pentagon ARC
K4AF (+KBUOK) 2169-2- 14- 6,690
Palomar ARC
W6NWG (+KB6RRV) 2423-2- 85- 6,254
Wayne Co ARTS
KA8D (+KB8CMK) 1692-2- 10- 5,938
Riverside Co ARA
W6TJ (+KB6KXV) 2067-2- 29- 5,818
Reservoir ARA
K8QYL 1968-2- 13- 5,784
West Allis RAC
W9FK 1801-2- 21- 5,754
Alamance ARC
K4EG 1814-2- 30- 5,486
Greater Memphis AFD
W4EM (+KB4QFU) 1561-2- 75- 5,482
Fredericton ARC
VE1ND 1516-2- 16- 5,326
Niagara Peninsula ARC
VE3VM/3 1526-2- 9- 5,088
Double Cheese No Onion
W8MRE 1493-2- 16- 5,078
Tuscarora ARA
KI3D 1588-2- 17- 4,606
Lake Monroe ARS
W4MH 1448-2- 30- 4,594
Rochester ARC
W6MXW (+KA6RTZ) 2410-1- 35- 4,555
Sonoma Co RA
W6LFJ 1112-2- 12- 4,504
CFB Gagetown ARC
VE1JO 1216-2- 10- 4,416
Kalamazoo ARC
W8VY (+N8IIO) 1262-2- 35- 4,388
Huntington ARC
W3VI (+N3ELE) 1171-2- 22- 4,388
Livingston ARC
KW8G 1260-2- 15- 4,172
Carver ARES/HTCARS
NI0X (+N0GNO) 1350-2- 25- 4,156
Palisades ARC & Clinton ARC
NR9G 1391-2- 20- 4,010
Arizona ARC
W7IO/7 (+KB7ABI) 1398-2- 29- 3,962
OCARS
W8TNO (+KB8CGQ) 1104-2- 35- 3,882
Ararat Shrine ARC
K8DM (+N8ECS) 876-2- 16- 3,816
Hazleton ARC
W3SJI 963-2- 40- 3,794
Van Wert ARC
W8FY 1248-2- 25- 3,732
Orange Park ARC
NU4Y (+N4OOF) 979-2- 32- 3,724
Genesee RA
W2RCX (+KB2AWF) 1222-2- 36- 3,670
Harrisburg RAC
W3UU (+N3EYQ) 1059-2- 30- 3,652
Discrete Components of 955
K3WJV 966-2- 21- 3,608
Kelly AFB MARS
WK5O 968-2- - 3,488
Silvercreek ARA
WD8PNF (+N8IHF) 988-2- 24- 3,476
Catalina RC
NW7N (+KA7BXA) 1043-2- 15- 3,340
Ottawa ARC
VE3RC 950-2- 25- 3,298
Ripley Co RC
N9DOK 1347-2- 23- 3,204
Stamford ARA
K1GF (+KA1NGG) 904-2- 32- 3,178
ARC of Augusta
W4DV (+KB4SSR) 1062-2- 4- 3,168
Sterling Park ARC
W4RW 998-2- 20- 3,108
Tahoe ARA
WA6SIM 846-2-100- 3,078
Parker Co RC
W5J 781-2- 20- 3,048
Antietam RA
W3CWC 913-2- 23- 3,046
Shore Points ARC
NR2Q 742-2- 35- 3,004
Durango ARC
KD8DI 747-2- 10- 2,808
Prince Edward Island ARA
VE1PEI 1934-1- 51- 2,793
Southington ARA
W1ECV (+KA1QDC) 663-2- 39- 2,746
San Gabriel Valley RC
W6QFK 646-2- 48- 2,684
Greater Toledo ARA
K8ALB 680-2- 16- 2,650
Key City ARC
WX5T (+KB5BDP) 672-2- 30- 2,582
Transylvania Co ARC
N4GBY (+KB4TXZ) 835-2- 14- 2,570
Sylvania ARA
WB8LRV 651-2- 5- 2,556
Mid-Atlantic ARC
W3SA 719-2- 26- 2,502
Kokomo ARC
W9XX 898-2- 25- 2,406
Alamogordo ARC/AF MARS/NMC MARS
KD5HP 585-2- 25- 2,338
Lincoln ARC
K0KKV 1571-1- - 2,246
Sun Country ARS
K4UBR (+N4PER) 542-2- 18- 2,212
Southern Sierra ARS
K6RL 443-2- 8- 2,198
Delaware ARC
W3SU/3 597-2- 8- 2,196
Rome RC
W2OFQ (+KB2DVI) 401-2- 35- 2,180
NCG
N8ARY 889-2- 9- 2,178
North Shores ARC
K6HAI 572-2- 30- 2,176
Enid ARC
W5HTK 515-2- 32- 2,140
Chippewahills ARC
KA8T 617-2- 10- 2,128
Iroquois Ford ARC
WB9TAH (+KA9MNY) 682-2- 18- 2,100
Chehalem Valley ARC
K7FM 694-2- 9- 2,078
Poinsettia ARC
N6SR (+N6OPB) 745-2- 23- 2,022
Siouxland ARA
K8AAR 690-2- 23- 2,010
Pueblo Ham Club
KR0K 624-2- 11- 2,004
Okaw Valley ARC
W9KXQ 546-2- 25- 1,882
Midland ARC
W8KEA (+KB8BWK) 512-2- 18- 1,746
Island Co ARC
W7PN 318-2- 10- 1,710
Evergreen ARS
W7GT (+KA7ZNY) 372-2- 9- 1,674
Indian Hills RC
W8ICS 473-2- 21- 1,662
Clallam Co ARC
W7FEL (+KA7ZOC) 356-2- 25- 1,606
Omik Electronic ARC
W8CEV (+KB8BKI) 349-2- 21- 1,462
Dalton ARC
KK4LL (+KB4MJW) 304-2- 37- 1,428
Muscatine ARC
KE0Y 452-2- 20- 1,416
Genesee Co RC
W8ACW 568-2- 12- 1,362
York North ARC
VE3YRA 874-1- - 1,356
Mid Michigan ARC
N8ARI 377-2- 10- 1,254
Kingston ARC
VE3UEL 274-2- 7- 1,224
Marin ARC
W6SG 354-2- 11- 1,208
Fayette ARA
KE6FQ (+KA6YPA) 247-2- 20- 1,168
Tri-Lakes ARC/Kimberling City ARC
N0GW 167-2- 12- 1,094
Sierra ARC
N6KEP 433-1- 6- 933
DeForest ARC
KA8FJM 193-2- 16- 836
Zephyrhills ARC
W8ELO 127-2- 11- 754
Palestine/Anderson Co ARC
W5ORW 47-1- 15- 547
Hangtown ARC
KA6EBR 216-2- 11- 432

4A Commercial

Lake Region ARC
K0QIK (+N0DVO) 791-2- 19- 1,942
Valley ARA
K1EIC 740-2- 4- 1,894

5A Battery

Lincoln Co ARC
K7PQ (+N7IYL) 1188-2- 17- 3,936
Brantford ARC
VE3BA 1000-2- 38- 3,378
Intermountain ARC
W6LKV (+KB6SBS) 899-2- 21- 3,168

5A

Huntsville ARC
K4BFT (+WA4SCS) 3842-2- 42- 12,130
Western ARA
N6ME (+N6MKL) 3489-2- 50- 11,390
L'Anse Creuse ARC
K8RO (+N8IFA) 3148-2- 40- 9,626
Hampden Co RA
W1NY (+KA1QAH) 3738-2- 37- 9,538
United RAC
K6AA (+KA6AAA) 2677-2- 40- 8,998
Garden State ARA
W2GSA (+KA2HSU) 2715-2- 40- 8,698
Wheaton Community RA
W9CCU 2080-2- - 7,196
Hughes Aircraft Co HESEA ARC
K6ZT/6 (+KB6KSD/6) 2210-2- 25- 6,842
Schenectady ARA
K2AE (+KA2DJD) 2021-2- 40- 6,736
Grumman ARC
WA2LQO (+N2GCW) 1546-2- 45- 5,736
RCA Astro Electronics ARC
W2DU (+KA2JUO) 1858-2- 25- 5,678
Old Barney ARC
N2OO (+KA2AJU) 1714-2- 30- 5,654
Long Island Mobile ARC
W2VL (+KA2EVJ) 1507-2- 65- 5,492
Hamilton ARC
VE3DC 1919-2- 30- 5,292
West Branch ARA
W3AVK (+KA3PTH) 1420-2- 31- 4,862
Sioux Empire ARC
W0ZWY (+N0HRV) 1285-2- 30- 4,646
Quannapowitt RA
W1EKT (+KA1PQH) 1145-2- 41- 4,404
University of Minnesota ARC
W0YC 1469-2- 10- 4,390
Triple States RAC
K8AN (+KA8VAU) 1017-2- 40- 4,280
Mount Diablo ARC
W6CX 1364-2- 20- 4,108
West Coast ARC
WI6C 1109-2- 75- 4,004
Alexandria & Arlington RCs
W4HFH (+N4HCP) 1040-2- 38- 3,976
Armadillo Gang
KF5PX 1349-2- 35- 3,924
Monongalia WA
K8WV 1136-2- 25- 3,920
Panhandle ARC
W5WX 1366-2- 25- 3,884
Cuyahoga Falls ARC
W8VPV (+KB8BKJ) 1293-2- 30- 3,862
Burlington Co RC
K2KED (+N2CIP) 939-2- 43- 3,840
Amateur Radio Fellowship
N8MC (+N8ICE) 1160-2- 40- 3,816
Portage ARC
NN8F (+KB8CBG) 932-2- 14- 3,532
Tulsa ARC
W5OK (+KB5CWP) 1199-2- 23- 3,498
Manhattan ARS
NO0D (+KA0SKJ) 895-2- 10- 3,482
West Palm Beach ARC
W4HAW (+N3CNK) 1053-2- 25- 3,460
Southern California ATS
WB6LRU (+KB6SMY) 1046-2- 20- 3,158
Rock Creek ARA
W3RCN 752-2- 25- 2,756
Stonewall Jackson ARA
W8HB 789-2- - 2,706
Gainesville ARS
K4DPZ (+KB4KGM) 759-2- 25- 2,688
Mount Vernon ARC
KX4W 851-2- 35- 2,688
Warren Co RACES
NV8X (+KB8AVX) 832-2- 20- 2,512
Grant Co ARC
W9EBN 760-2- 50- 2,304
Silverton ARC
KD7X 640-2- 25- 2,298
Southern Berkshire ARC
W1BAA (+KB2AGS) 571-2- 12- 2,278
20/9 ARC
W8BOO 743-2- 35- 2,186
Champaign/Logan ARC
W8EBG 519-2- 30- 2,150
Keuka Lake ARA
AI2W 444-2- 12- 2,076
Chicago ARC
W9CAF 573-2- 40- 1,994
Susquehanna Co ARC
KM3E (+KA3PTG) 410-2- 11- 1,922
Sierra Foothills ARC
WW8Q 621-2- 18- 1,892
Paroramaland ARC
W7JTR/7 444-2- 10- 1,728
Willmar Area Emergency ARC
W0SW 302-2- 35- 1,652
Markham CD & AREA
WA9MRA 411-2- 27- 1,646
Cenois ARC
K9HGX (+KA9PBH) 328-2- 20- 1,612
Parma RC
WB8UBS 359-2- 7- 1,568
Dixie ARC
KA7FDP (+KA6EMS) 250-2- 15- 1,516
Gladwin ARC
K8JDI (+K8AYR) 402-2- 22- 1,404
West High School ARC
KB9NG 246-2- 12- 1,302
Capital City ARC
KE7DK 252-2- 41- 1,272
Jefferson Barracks ARC
K8ZFK (+KA8WHP) 538-1- 23- 1,173

5A Commercial

Greene Co RC
W5BJR (+KA5YUT) 290-2- 15- 684

6A Battery

Central Oregon RAC
K7OMT 699-5- 10- 4,725
Tanana River Raiders
AL7IF 135-5- 8- 2,295

6A

Northrop RC & Palos Verdes ARC
W6CN (+KB6JIV) 3402-2- 56- 9,870
Lake Co ARA
K8BL 2777-2- 21- 8,172
Hoodview ARC
WB7QIW (+KA7ZEF) 2400-2- 35- 7,768
South Pickering ARC
VE3SPC 2226-2- - 7,764
Orlando ARC
W4PLB (+N4LMS) 2200-2-102- 7,686
Bolingbrook ARS
AF9M (+N9FRT) 2271-2- 42- 7,156
Two Rivers ARC
W3UST (+N3EOP) 1513-2- 30- 5,554
Chicago Suburban RA
N9TM (+WD9FXP) 1583-2- 50- 4,694

Peoria Area ARC
W9UVI/9 1463-2- 50- 4,422
NCG
VE3YXU 1111-2- - 3,828
Middlesex ARS
W1EDH (+KA1OQW) 1084-2- 25- 3,744
Southern Michigan ARS
W8DF (+KB8BSO) 971-2- 75- 3,522
Indiana Co ARC
W3BMD (+KA3RUX) 766-2- 45- 3,304
Toledo Mobile RA
W8HHF 1015-2- 6- 2,676
Umpqua Valley ARC
W6OFF/7 (+KA7VZB) 569-2- 25- 2,642
Bellevue ARC
W8WYV 560-2- 10- 2,598
Gabilan ARC
KB6GV (+KB6LOZ) 1512-1- 25- 2,440
Michiana ARC
W8AB 650-2- 20- 2,390
South Waterloo ARC
VE3SWR 819-2- 13- 2,334
Pymatuning ARC
NI3B (+KA3RPE) 702-2- 9- 2,304
Metropolitan ARC
NA8S (+KA8DQX) 691-2- 13- 2,258
Adrian ARC
W8TQE 696-2- 60- 2,254
Mountain ARC
W3YMW 576-2- 15- 2,180
Washington ACOM
KA3MZS 539-2- 21- 2,178
Pinellas Co ARC
KK4DG (+KB4UDM) 500-2- 50- 2,026
Fulton Co ARC
K8BXQ 400-2- 10- 1,996
Mobile Sixers RC
W3AWA 399-2- 20- 1,912
Beach Cities WS
K6MJ (+KB6FYG) 308-2- 21- 1,622

7A

Penn WA
W3SK (+KA3QHS) 3399-2- 40- 11,782
Mike & Key ARC
K7LED (+KB7BTN) 3174-2-105- 10,164
RF Hill ARC
W3AI/3 2966-2- 30- 9,362
TRW ARC
W6TRW (+KB6LSE) 2668-2- 14- 7,926
RC of Tacoma
W7DK 1863-2- 19- 6,780
Bergen ARA
K2ZO (+KB2BWP) 1882-2- 25- 6,756
Scarborough ARC
VE3WE 1845-2- 55- 5,736
Murgas
K3YTL 1723-2- 40- 4,518
Empire RC
K6ZL 722-2- 14- 3,168
North Coast ARC
KB8A (+KA8ZVW) 832-2- 32- 3,114
SELECT III
W5CFX 379-2- 35- 2,362
Chathan-Kent ARC
VE3CRC 602-2- 35- 2,136
Amateur Radio & Youth
N8GQC (+KB8BON) 523-2- 16- 2,052
Baldwin Hills ARC
NY6L 521-2- 30- 2,050

8A Battery

Alameda Co RC
N6WG (+KA6OSM) 1031-5- 25- 8,050
Field Day's Finest
N9DD 762-2- 10- 2,986

8A

Crystal RC
W2DMC (+KB2BOU) 3083-2- 31- 9,642
Mahoning Valley ARA
W8QLY (+KA8TZX) 2281-2- 43- 8,702
Warminster ARC
K3KT (+KA3ROF) 2301-2- 50- 7,808
Windsor ARC
VE3OW 1687-2- 76- 5,564
San Antonio RC
W5SC (+N5IGB) 1335-2- 69- 4,962
Rockford AEA
W8AXD (+KA9IMW) 1321-2- 50- 4,528
Vienna WS
K4HTA (+KC4AQJ) 840-2- 80- 2,976
Clark Co ARC
W7AIA 333-2- 44- 1,718

9A Battery

Roanoke Valley ARC
W4CA (+KA4YUY) 1200-2- 60- 4,730

9A

South Jersey RA
K2AA (+KA2YKN) 3991-2- 56- 11,930
Gloucester Co ARC
W2MMD 2655-2- 53- 8,599
Four Lakes ARC
W8JZ (+KA9KTY) 2501-2- 35- 8,158
Eastern Ontario ARC
VE3SAU 862-2- 25- 3,520
Houston Echo Society
WQ5Y (+N5JEV) 516-2- 28- 2,662
El Dorado Co ARC
W6AJJ 504-2- 13- 2,388

11A

Kern Co Central Valley ARC
W6LIE 504-2- 15- 3,534

12A Battery

Conejo Valley ARC
K6CAB (+N6OPK) 1272-5- 26- 15,285

12A

Woodbridge Wireless
W4IY (+KC4AFT) 2876-2- 73- 11,930
Rio Hondo ARC
W6GNS 106-2- 18- 3,174

14A

Nortown ARC
VE3NAR 1302-2- 23- 8,764
Triple A ARA
AC3J 1372-2- 80- 6,464

15A

Nashua ARC
N1NH (+KA1LDS) 2154-2- 90- 12,608
Wellesley ARS
W1TKZ 260-2- 36- 3,276

23A Commercial

Englewood ARA
K2ND/2 130-2- 10- 708

24A

Silver Springs RC
K4GSO 1868-2- 48- 10,442

One or Two Person Portable

1B-1 op Battery

K3ONW 463-5- 4,730
N8XX 410-5- 4,600
NU7B 301-5- 3,310
WB2MBM/3 279-5- 2,535
NM7N 218-5- 2,390
W4XD 228-5- 2,380
KM8X 224-5- 2,335
K5ER 431-2- 1,814
KW4M 160-5- 1,800
KT7G 452-2- 1,788
WA2DFI/7 128-5- 1,580
K4RDU 137-5- 1,470
K8LMN 222-5- 1,315
K7BFL 143-5- 1,115
K7RK 135-5- 1,030
AA1O 283-2- 1,010
KA2KMU 48-5- 880
NA9O 184-2- 834
K2JT 71-5- 810
W9FN/1 67-5- 770
W7LNG 40-5- 685
W5TB 55-5- 650
WB5BYK/6 69-5- 645
WA1TWW/6 209-2- 642
WD4DJJ/9 199-2- 642
W5BLC 133-2- 614
WR6I 95-5- 575
NE3I 59-2- 538
N8AFP 62-5- 520
N6KFS 197-2- 502
K8CVF 184-2- 368
WR6X 131-2- 362
KA5B 59-2- 336
W6BR 32-5- 260
KA9N 26-5- 250
KA8UET 4-5- 240
N9DET/7 64-2- 234
KA7BCD 13-5- 230
KA7VUG 44-2- 188
W7BYK/7 22-2- 144
K8LHE 59-2- 118

1B-1 op

W4NW/8 803-2- 3,312
K2TB 426-2- 1,804
W3GN/3 357-2- 1,520
K2ITT 382-2- 1,462
NJ7M 133-5- 1,430
KA9EWN 220-2- 1,138
KE7UM 430-2- 960
K7DQ 171-2- 784
N7ETC 159-2- 736
WA3UXZ 141-2- 664
W6CBA 121-2- 664
N9JR 274-2- 618
K8CWW 203-2- 608
N4PCQ 103-2- 600
WA3KEY 217-2- 534
N1BVY 93-2- 472
KB5BGV 185-2- 470
K5XI 206-2- 418
K6GPD 73-2- 346
KA8LXS 110-2- 328
WA7SKG/8 72-2- 244
W4KP 8-2- 130
WD9EME 25-1- 29

1B-1 op Commercial

W1NJM 301-2- 1,204
N8CTB 129-2- 258
KA9NCC 46-2- 92

1B-2 ops Battery

WA6PZL (+N6ENU) 688-5- 5,775
KR2Q (+WB2BHC) 558-5- 5,385
K7CA (+KG7D) 482-5- 4,580
N6EK/1 (+N1BLQ) 394-5- 4,140
NX9I (+WD8AVV) 334-5- 3,455
W8UY (+K8WRY) 435-5- 3,130
W7EL (+K7PJT) 276-5- 3,060
ND7A (+NC7B) 274-5- 3,030
AA4YZ (+KJ4LL) 380-5- 3,020
NI1L (+WB2AMU) 323-5- 2,870
N6KR (+N6AKF) 314-5- 2,835
K7QYY (+K6AIA) 481-5- 2,505
WA6FSF/7 (+WB6JJE) 593-2- 2,488
WB8RXF (+WA8ZPT) 237-5- 2,450
AH6V (+KH6AH) 222-5- 2,420
WB7Y (+KK7A) 862-2- 2,322
KF8J (+KF8K) 452-2- 2,218
NG5Q (+K5WK) 177-5- 2,070
N1FJ (+NK1I) 439-2- 1,952
VE3HIE/3 (+VE3ORB) 170-5- 1,900
K8IXC (+KA8WQQ) 159-5- 1,890
AA4OO (+KB4UZB) 185-5- 1,870
NK1P (+WB9IHH) 219-5- 1,860
WB7BIV (+KK7C) 188-5- 1,815
NT8I 145-5- 1,550
NR5A (+WB8WQS) 143-5- 1,530
AG7U (+KA7FRZ) 158-5- 1,255
KB4PLH (+WB8LGH) 511-2- 1,236
WA8TCG (+KA8TRL) 218-5- 1,190
K8YUM (+KE8AZ) 116-5- 1,160
N4KEZ (+N4KEQ) 103-5- 1,085
AA4MP (+N4MQU) 129-2- 876
KU7K (+KA7ARC) 211-2- 750
K5TMS (+WB5FID) 226-2- 708
N9EX (+KA9NZI) 40-5- 700
K1TW (+K1ILR) 203-2- 620
WB3DNA (+KB3OQ) 85-5- 605
W3LPQ (+WB3JZZ) 250-2- 600
N5AE (+KF5QE) 74-5- 595
N8BDK (+WD8HXN) 59-2- 518
KA6NEJ (+KA7CMP) 92-2- 512
NH6GC (+AH6CD) 201-2- 504
WW5N (+N5KCI) 141-2- 490
VO2WL (VO2AG + VO2CZ) 117-2- 334
VE6ZS (+VE6CSE) 117-2- 334
VE2XLJ7 (+VE2XS) 44-2- 188
N7HQE (+N7GXT) 32-5- 180

1B-2 ops

W8TK (+WD8AUB) 1224-2- 4,968
K9RS (+K9SH) 1289-2- 4,052
K9LJN (+KA9LTR) 744-2- 3,076
W8FN (+KU8E) 871-2- 2,668
W8MHK 582-2- 2,566
W1WP (+AD1C) 552-2- 2,334
W9LNQ (+N9ALC) 692-2- 2,154
WB6HGJ (+KB6PJU) 528-2- 2,136
NW2I (+NI2S) 210-5- 2,100
N2EY/3 (+WA3OZI) 575-2- 2,044
NT9B (+KZ8F) 381-2- 1,592
W1HBP (+WB1FAW) 572-2- 1,564
KA1MWD (+KA1NSV) 496-2- 1,488
AD7L (+KA7WDM) 337-2- 1,478
VE2QST (VE2BP + VE2WH) 235-2- 1,376
N5CI (+K3GFV) 433-2- 1,362
N8GNG (+KA0EMM) 481-2- 1,286
WA2CWX (+N4MVA) 410-2- 1,106
WA2LWT (+WA2QIC) 207-2- 984
AK3A (+KB3LB) 254-2- 954
NA2T (+KC3AX) 308-2- 928
N3DXJ (+KN3S) 175-2- 872
VE6AMY (+VE6BGN) 373-2- 846
W3IW (+KD9HL) 153-2- 800
WA8YRS (+WA8ONN) 263-2- 630
KE6MX (+NI6G) 195-2- 610
WD5GBX (+KB5KW) 139-2- 588
AA4YE (+N4QBR) 220-2- 540
KE4EL (+KB4MRH) 169-2- 438
W7DHS (+N7EDK) 87-2- 342
N7HMB (+KB7ASO) 35-2- 170
N8FAU 12-5- 160
KB5BD (+N5BNI) 50-2- 120

1B-2 ops Commercial

N4OHW (+KB4QNR) 253-2- 506

2B-2 ops Battery

N3AE (+WA2SOC) 575-5- 4,380
NO6B (+WB6VRN) 429-5- 2,545
N6MBY (+WB6UER) 171-5- 1,760
N6IPE (+WA6MJM) 238-2- 980
N5HGN (+WD5HLD) 47-5- 870
N9ACA (+K9IOH) 188-2- 576
KA3COZ (+WB5TTG) 72-2- 562

2B-1 op

WA6RND 127-2- 1,000

2B-2 ops

AC4Q (+N4IQ) 713-2- 3,204
VE3EWK (+VE3AAT) 380-2- 1,726
NX6M (+N6PEQ) 453-2- 1,382
N4LUT (+KK4ME) 426-2- 1,322
W1EJI/7 (+K6BXI) 381-2- 1,316
VE4RFI (VE4AEX + VE4AKN) 329-2- 1,242
NQ8T (+N4FKF) 311-2- 970
WA2TMC (+KD2QO) 405-2- 910
KD7GE 192-2- 824
N4DOR (+N4CNT) 194-2- 778
K7THW/7 (+KA7QAH) 110-2- 704
N9GFS (+WB9TZC) 201-2- 602
WA2VJL 26-2- 602
NV8I (+N8GKG) 136-2- 572
KB6NLO (+KB6PVN) 165-2- 530
W5BLB 147-2- 500
KA8YZB (+KA8ZFH) 122-2- 498
K2REE (+KB2MO) 89-2- 378

2B-2 ops Commercial

WA8GNO (+WB8GKH) 1016-2-2,500
W5VUX (+N4DVW) 360-2-1,278
KK4LU 86-2- 182

Mobile Stations

1C

NN5O 355-5- 4- 3,200
N6BK 310-5- 2- 3,100
W6JI 776-2- 4- 2,684
K3MD 443-2- 1- 1,772
KA1CV 174-5- 1- 1,645
W8CEM 642-2- 1- 1,284
NB3O 309-2- 1- 1,236
WA6UYB 269-2- 1- 1,076
W3CDE 438-2- 1- 876
N6IGI 283-2- 1- 566
KI8J 129-2- 1- 514
NN7A 42-5- 1- 420
KA8ZFX 194-2- 1- 388
WB5CTS 58-5- 1- 316
W7IEU 68-2- 1- 272
W7KQZ 100-2- 1- 200
WB6QZK 97-2- 1- 194
N2EDX 93-2- 2- 186
KA9FUG 91-2- 1- 182
NA8R 81-2- 1- 162
WB6YIR 68-2- 1- 136
KD8UV 46-2- 2- 92
K3SA/VE1 24-2- 1- 90
K2KGJ 9-5- 1- 90
WA4YRN 33-2- 1- 66
WA4UAF 22-2- 1- 44
N6NVF 15-2- 1- 30
KB4RMX 15-2- 1- 30
KB7AIL 10-2- 1- 28
N1EE/6 5-2- 1- 10
KA8ZDF 2-2- 1- 4

2C

WT6G 243-2- - 520
W6EEN 138-2- 4- 276
NK0B 130-2- 6- 272

Home Station Commercial Power

1D

KR0B 1614-2- 3- 5,112
N5TR 3516-1- 5- 3,600
K5NW 1211-2- 1- 3,482
K9ZO 1031-2- 1- 2,950
WG5J 1309-2- 1- 2,822
KT3W 559-2- 2- 1,974
W1QK 212-5- 1- 1,815
KD7ZZ 794-2- 1- 1,588
KS7T 998-1- 1- 1,466
KA1VH 591-2- 2- 1,182
WB6OVV 333-2- 1- 1,138
KA4NOO 554-2- 4- 1,108
ND7M 543-2- 1- 1,086
KA5AGD 501-2- 1- 1,002
K5SS 210-2- 1- 838
VE3NDI 82-5- 4- 820
NY8R 294-2- 10- 750
K4ZM 183-2- 1- 732
NJ1Q 262-2- 3- 732
KA8NIE 353-2- 10- 708
KB2AOE 172-2- 3- 676
WX5D 215-2- 2- 658
WA3RTY 155-2- 1- 620
K8DI/2 307-1- 1- 614
W6JL 158-2- 1- 576
WX6M 505-1- 1- 505
WB1CCF 110-2- 1- 440
WD9EPI 207-2- 2- 414
VE3SMH 204-2- 1- 408
WB3BRF 202-2- 1- 404
W8HV 189-2- 20- 404
WA3VPL 92-2- 1- 368
KA3OOD 171-2- 1- 342
WB2KQP 126-2- 1- 342
WB8ULZ/9 84-2- 1- 336
WA5IYX 162-2- 1- 324
KC3LM 150-2- 1- 312
KB6RCI 145-2- 5- 304
KA1NXT 78-2- 1- 274
KB4BKV 129-2- 2- 272
KD8JB 114-2- 8- 270
KA2PZD 125-2- 1- 266
WB3CDX 131-2- 1- 262
N1EEB 130-2- 3- 260
W3HGM 64-2- 1- 258
KJ4UF 111-2- 2- 222
KB9PA 108-2- 3- 212
W5NR 105-1- 1- 210
K3TEZ 93-2- 1- 186
KA2EMZ 90-2- 2- 180
KD9WZ 61-2- 1- 150
K8EVC 75-2- 1- 150
KA1DSQ 135-1- 1- 135
KA5VZG 33-2- 1- 132
WA8GFR 66-2- 1- 132
W2CVW 40-2- 1- 130
W0NKO 104-1- 1- 104
WB9UYR/2 52-2- 1- 104
WA3VIL 51-2- 1- 102
N8HVP 69-1- 1- 99
N2GNJ 49-2- 1- 98
KC5BH 47-2- 1- 94
N4PAU 24-2- 5- 90
WA4YNP/3 45-2- 1- 90
W6SX 54-1- 1- 90
WA8HRK 87-1- 1- 87
AB4AH 42-2- 1- 84
KA3GXP 21-2- 1- 84
W3HII 41-2- 1- 82
WA7MBL 37-2- 1- 76
W9REC 38-2- 1- 76
VE3NTK 37-2- 1- 74
AA6EE 18-2- 1- 72
KB5ADE 32-1- 1- 64
WA1PLK 29-2- 1- 64
KE2AN 32-2- 1- 64
KA0P 17-2- 1- 62
W3UIU 15-2- 1- 60
KG6ZV 57-1- 1- 57
W4HVU 50-1- 1- 50
W3GPR 40-1- 1- 40
KA9WYF 18-2- 1- 36
K6ICS 18-2- 1- 36
KI2Y 7-2- 1- 28
KA5PBA 7-2- 1- 28
KC4SI 9-2- 1- 20
W1YO 12-1- 1- 12
WA3LGG 3-2- 1- 6
NF1R 4-1- 1- 5
KA6USY 5-1- 1- 6
K5HIM 4-1- 1- 4
KB2BCJ 2-2- 2- 4

2D

KW8N 495-2- 20- 1,184
KA2VXM 562-1- 6- 656
K5FOG 65-5- 5- 560
WA5CBF 252-2- 2- 506
NP4AV 244-2- 3- 488
WD4U 147-2- 3- 342
KZ1V 55-2- 5- 184
WA6TST 43-2- 2- 96
KI6TI 5-5- 1- 25

3D

W1TR 474-2- 3- 1,538
KB6N 434-2- 3- 1,258
W9MJL 295-2- 22- 748

Home Station Emergency Power

1E

WB8JBM 768-5- 4- 6,930
AA4S 1358-2- 3- 5,258
W8XK 2670-1- 4- 3,817
NG3K 353-5- 2- 2,966
W5ORM 224-5- 1- 2,240
K8HVT 671-2- 1- 2,194
WB8ERJ 224-5- 1- 2,160
K3DML 184-5- 1- 1,840
K8LL/7 1540-1- 35- 1,785
N4NWA 1704-1- 4- 1,704
K7FC 135-5- 1- 1,350
NC5W 131-5- 1- 1,310
K1BTD 129-5- 2- 1,290
VE7RCN 635-2- 9- 1,270
NN7D 138-5- 3- 1,250
WA6YGA 438-2- 7- 1,124
K8CV 110-5- 1- 1,075
KD7E 405-2- 1- 1,050
W9EG 256-2- 1- 1,024
WB8EEE 502-2- 3- 1,004
W6YVR 147-5- 1- 980
WB9HPR 186-5- 1- 940
WS7JT 420-2- 1- 840
WA7L 145-5- 1- 805
KT1Y 153-5- 2- 790
N4BP 286-2- 4- 780
VE8AZZ 289-2- 2- 598
WA7WOC 152-2- 1- 562
NW8O 84-5- 1- 530
W1XN 90-5- 1- 510
W7TU 49-5- 1- 490
W8PRI 125-2- 1- 452
WB2UEY 303-2- 1- 406
W7ON 140-2- 1- 402
WD5IOM 100-2- 1- 400
N4MUH 35-5- 2- 350
W9AVE 63-5- 1- 315
N9ESH 132-2- 1- 308
VE7FB 130-2- 2- 260
WB2DLA 26-5- 1- 260
WD8CKP 49-5- 1- 250
KS8Q 45-5- 1- 225
WB8YYZ 52-2- 1- 176
WD9AGR 62-2- 1- 174
KT1H 21-5- 1- 115
KA1ITX 18-5- 1- 105
K9BAD 18-5- 1- 95
WA1TDA 2-2- 1- 4

2E

K5TYP 510-2- 12- 1,050
W2ODV 318-2- 6- 858
K9YHB 275-2- 5- 552
KB7RS 217-2- 6- 432
W4ZBB 112-2- 6- 432
WD4EOG 168-2- 3- 348
KA7SOL 155-2- 6- 318

3E

WE5P 1593-2- 12- 4,570
VE7FG 1068-2- 12- 3,038
W8LF 680-2- 16- 2,106
W3KWH 763-1- 30- 895

4E

W1FM 1074-2- 9- 3,420

Checklogs

KZ1O, N1AA, W3EXP, WA4A, K5RR, K7BZ, W7LQU, KD8FR, N8BJV, W8VUV, KA8QEK, LU4EBC

Rules, ARRL 10-Meter Contest

This year's contest has some changes that will affect not only activity, but also your scoring. One change is a new rule that will affect both single-operator mixed-mode and multi-operator entrants [see Rule 5(B)]. Multipliers can now be counted separately on phone and CW. That is, "double" multipliers are in effect. For example, you get one multiplier for working Texas on phone and another multiplier if you work it on CW.

Another noteworthy change is, that with Novice Enhancement, Novices and Technicians can now work SSB from 28.3 to 28.5 MHz and CW from 28.1 to 28.3 MHz. Those band segments should be hotbeds of 10-meter activity this time around. QSOs with Novice/Technician operators count 2 points each on SSB and 8 points each on CW. Certificates will be awarded to the top scoring Novice/Technician operator in each ARRL section.

Official entry forms are available from ARRL HQ for an SASE. If you need log sheets for more than 200 QSOs, please include one extra unit of first-class postage for each five sheets ordered along with a note specifying how many sheets you need. (Each log sheet has room for 100 contacts.)

Sample 10-Meter Contest Exchanges

Phone

CQ Contest CQ Contest
From Kilo-Alfa-Five-Whiskey-Mike-Juliet
KA5WMJ Contest

→ November-Seven-India-Papa-Golf

N7IPG Thank you
You're 59 Texas

→ Roger, you're 59 Utah N7IPG

QSL, QRZed
KA5-Whiskey-Mike-Juliet

CW

CQ Test CQ Test
DE KA5WMJ/N KA5WMJ/N K

→ DE N7IPG/T

N7IPG/T 599 TX

→ R 599 UT N7IPG/T

R TU KA5WMJ/N QRZ

Rules

1) **Object:** For amateurs worldwide to exchange QSO information with as many stations as possible on 28 MHz.

2) **Contest Period:** Second full weekend of December (December 12-13, 1987). Starts 0000 UTC Saturday; ends 2400 UTC Sunday. All stations operate no more than 36 hours out of the 48-hour period. Listening time counts as operating time.

3) **Categories**

(A) *Single operator:* One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance though DX-alerting nets, etc) is not permitted.

(1) Mixed mode (phone and CW)
(2) Phone only
(3) CW only

(B) *Multioperator:* Single transmitter, mixed mode only. Those obtaining any form of assistance, such as relief operators, loggers or use of spotting nets.

4) **Contest Exchange**

(A) W/VE stations (including KH6/KL7) send signal report and state or province (District of Columbia is a separate multiplier). Novice and Technician stations sign /N or /T.

(B) DX stations (including KH2/KP4, etc) transmit signal report and serial number starting with 001.

(C) Maritime or aeronautical mobile stations send signal report and ITU Region (1, 2 or 3).

5) **Scoring**

(A) *QSO points:* Count two points for each complete two-way phone QSO. Count four points for each two-way CW QSO. Count eight points for CW QSOs with US Novice or Technician stations signing /N or /T (28.1 to 28.3 MHz only).

(B) *Multipliers:* Fifty US states (plus District of Columbia), Canadian call areas (VE1-8, VY1, VO1-2), DXCC countries (except the US and Canada), ITU regions (maritime and aeronautical mobiles only) *per mode* (phone and CW).

(C) *Final Score:* Multiply QSO points by total multipliers (the sum of states/VE call areas/DXCC countries/ITU regions per mode). Example: W1XX works 2245 stations including 1305 phone QSOs, 930 non-Novice CW QSOs, 10 Novices CW QSOs, for a total of 6410 QSO points. He works 49 states, 10 Canadian call areas, 23 DXCC countries and a maritime mobile station in Region 2 on phone and 30 states, 8 Canadian call areas, and 19 DXCC countries on CW for a total multiplier of 140. Final score = 6410 (QSO points) × 140 (multiplier) = 897,400 points.

6) **Miscellaneous**

(A) Call signs and exchange information must be received by each station for a complete QSO.

(B) No crossmode contacts; CW QSOs must be made below 28.3 MHz.

(C) Single-operator mixed-mode and multioperator stations may work stations once on CW and once on SSB

(D) Your call sign must indicate your DXCC country (K6LL in Arizona need not send K6LL/7, but K1JD in Hawaii must send K1JD/KH6).

(E) One operator may not use more than one call sign from any given location during the contest period.

(F) All entrants may transmit only one signal on the air at any given time.

(G) The use of non-Amateur Radio means of communication (eg, telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

7) **Reporting**

(A) Official forms are recommended (available from ARRL HQ for an SASE or 2 IRCs).

(B) Logs must indicate time in UTC, mode, call and exchange for each QSO. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs must include cross-checking sheets (dupe sheets).

(C) Postmark your entry by January 13, 1988.

8) **Awards:** A certificate will be awarded to the highest-scoring single-operator station (in each category) from each ARRL Section and DXCC country. The top scoring Novice/Technician station (in each category) in each ARRL Section will be awarded certificates. Top multioperator entries in each ARRL Division and each continent will receive certificates. Additional certificates will be awarded as participation warrants.

9) **Condition of Entry**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: Excess duplicates and call sign/exchange errors. See January 1987 *QST* for complete details.

Rules, ARRL 160-Meter Contest

This year's "Top Band" contest rules are the same as last year's. This is the chance to brush up on your CW and get your 160 country total up or work on your WAS. Multipliers are ARRL Sections plus VE8/VY1 (max 75) and DXCC countries (W/VE only). Don't forget to work WTX; it is a multiplier. Also, remember that 1.830-1.850 MHz is for intercontinental QSOs only.

Official entry forms are available from ARRL HQ for an SASE. If you need log sheets for more than 200 QSOs, please include one extra unit for each five sheets ordered and include a note specifying how many you need.

Rules

1) **Object:** For amateurs worldwide to exchange information with W/VE amateurs on 1.8-MHz CW only. DX-to-DX QSOs are not permitted for contest credit.

2) **Contest Period:** 2200 UTC December 4 until 1600 UTC December 6. Forty-two-hour period with no time limitation.

3) **Categories**

(A) *Single operator:* One person performs all transmitting, receiving, spotting and logging functions.

(B) *Multioperator:* Single transmitter only. Those obtaining any form of assistance, such as relief operators, loggers or use of spotting nets.

4) **Contest Exchange**

(A) W/VE: Signal report and ARRL Section.

(B) DX: Signal report. Country name is obvious from the prefix. Send ITU Region if maritime or aeronautical mobile.

5) **Scoring**

(A) *QSO Points:* Two points for QSOs with amateurs in an ARRL Section. W/VE stations count five points for DX QSOs.

(B) *Multipliers:* ARRL Sections plus VE8/VY1 (maximum of 75) and DXCC countries (W/VE participants only).

(C) *Final Score:* Multiply QSO points by multiplier. Example: K1MM works 357 stations, including 13 DX stations, and has a multiplier of 67. His score would be 753 QSO points [(344 × 2) + (13 × 5)] multiplied by 67 for 50,451 points.

6) **Miscellaneous**

(A) Participants are reminded that the segment 1.830 to 1.850 should be used for intercontinental QSOs only, in conformance with ARRL band plan.

(B) The use of non-Amateur Radio means of communication (eg, telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

7) **Reporting**

(A) Official forms are recommended (available for ARRL HQ for an SASE or two IRCs).

(B) Logs must indicate time in UTC, call and exchange. Multipliers should be clearly marked in the log the first time worked. Entries with more than 200 QSOs must include cross-check sheets (dupe sheets).

(C) Postmark your entry by January 6, 1988.

8) **Awards** A certificate will be awarded to the top-scoring single-operator station in each ARRL Section and DXCC country, and to the top-scoring multioperator stations in each ARRL Division and continent.

9) **Condition of Entry**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: Excess duplicates and call sign/exchange errors. See January 1987 *QST* for complete details.

Moved and Seconded ...

(continued from page 70)

Brunet and MacLean, who were attending a CRRL meeting.

9) Convention matters:

9.1) On motion of Mr. Wilson, the following conventions for 1987, 1988 and 1989 were approved:

Colorado State Convention, November 29, 1987, Golden, CO
South Florida Section Convention, February 6-7, 1988, Miami, FL
Missouri State Convention, April 8-10, 1988, Kansas City, MO
North Carolina State Convention, April 10, 1988, Raleigh, NC
Midwest Division Convention, May 20-22, 1988, S. Sioux City, NE
Atlantic/New York State Convention, May 20-22, 1988, Rochester, NY
West Gulf Division Convention, June 3-5, 1988, Arlington, TX
Missouri State Convention, April 7-9, 1989, Kansas City, MO
Southeastern Division Convention, August 19-20, 1989, Huntsville, AL

9.2) Mr. Drake reported briefly regarding the preliminary program for the ARRL National Convention in Portland, Oregon, September 9-11, 1988; without objection, the interim plans were approved.

9.3) On motion of Mr. Butler, the holding of the 7th ARRL Amateur Radio Computer Networking Conference was approved for the Greater Washington (DC) area, in August or September 1988.

10) On motion of Mr. Holladay, the Executive Committee ratified its mail votes on the eligibility of candidates for director and vice director for the 1988-1989 term.

10.1) The eligible candidates listed immediately below were the only candidates for the office shown, and were, accordingly, declared elected pursuant to the By-Laws, for a two-year term beginning January 1, 1988 (Applause):

Atlantic
Director: Hugh A. Turnbull, W3ABC
Vice Director: James M. Mozley, W2BCH

Great Lakes
Vice-Director: Allan L. Severson, AB8P

Midwest
Director: Paul Grauer, WØFIR

Pacific
Director: Rodney J. Stafford, KB6ZV
Vice Director: James D. Knochenhauer, K6ITL

Southeastern
Director: Frank M. Butler, Jr., W4RH
Vice Director: Evelyn D. Gauzens, W4WYR

10.2) More than one candidate was found eligible for each office listed below; their names were ordered placed on ballots to be sent to Full Members of the respective Divisions, accompanied by the candidates' statements of no more than 300 words.

Delta
Director: Joel M. Harrison, WB5IGF
Arthur P. Kay, Jr., W5APX
Lionel A. "Al" Oubre, K5DPG
John M. "Wondy" Wondergem, K5KR
Vice Director: Joe A. Butler, K5OS
Jimmy D. Roller, N4IR

Great Lakes
Director: Leonard M. Nathanson, W8RC
George S. Wilson, III, W4OY1

Midwest
Vice Director: C. Richard "Dick" Dyas, WØJCP
L. C. "Chuck" Miller, WAØKUH

10.3) No petition was found nominating a candidate for Director from the Dakota Division. A petition was found naming Richard C. Whiting, WØTN, as a candidate for Vice Director from the Dakota Division, but Mr. Whiting withdrew his name. In accordance with By-Law 21, the Secretary was ordered to resolicit nominations for Director and Vice Director in the October and November issues of *QST*.

11) Without dissent, the following were appointed as a Committee of Tellers for the current elections:
Mr. Metzger, Chairman
Mr. Atkins
Mr. Stevens
Mr. Severson, Alternate
Mr. Turnbull, Alternate

12) Other business:

12.1) It was moved by Mr. Hurlbert that there is created a special committee, to be called "The Elections Committee," charged to study all facets of ARRL elections, including qualifications of candidates, campaign practices, conduct of elections, and tenure of office, for the offices of Director, Vice Director and Section Manager. This committee shall consist of not less than three, nor more than five ARRL Directors and Vice Directors, to be appointed by the President. The Committee shall elect its own officers, proceed with its task with orderly dispatch, and report its findings and recommendations to the full Board at its earliest convenience. The question being called, the vote was two in favor to two opposed; there being no majority in favor, the motion was lost.

12.2) It was moved by Mr. Wilson that Minute 69 of the July Board meeting referring to the Diamond Jubilee Award be amended to require that Extra, Advanced and General Class licensees must work all states on 12 meters and one other band. Technician and Novice Class licensees must work all states on any two bands that their operating privileges allow. On motion of Mr. Butler, the motion was amended so as to refer the matter to the Membership Services Committee. The question then being on the main motion as amended, the same was adopted. The Committee was in recess from 2:10 to 2:40 PM.

12.3) On motion of Mr. Butler, a member of the prevailing side, the Committee voted to reconsider its previous action which defeated Mr. Hurlbert's motion for creation of a special committee, The Elections Committee. On further motion of Mr. Butler, the motion was amended to take out the specificity regarding appointments by the President. The question then being on the motion as amended, the same was adopted.

12.4.) The Executive Committee informally reviewed advertising policies for *QST* magazine, and found no cause to change them.

13) The next meeting of the Executive Committee will be held at the call of the President in accordance with Article 6; members are asked to keep the weekend of November 20-22, 1987 free as the most likely date of any such meeting.

There being no further business, on motion of Mr. Hurlbert the meeting adjourned at 3:21 PM.

Respectfully submitted,
Perry Williams, W1UED
Secretary

Life Members Elected

September 5, 1987

Robert L Archie, NCØT; Natalie Baustert, N4QGL; Robert E Belk, N2HEO; Andre DeJong, PA3DBX; David J Doiron, WA1MKE; Frederick W Dorst, KU4Y; Linda J DuBrul, KAØELY; Reginald C Durham, N4KZL; Mike Fatchett, NIØE; John S Fogle, WD7H; Larry Jawitz, N1AUE; Eugene D Jellison, N6OSF; Susan Langley Jones, WA4AKB; Richard F Kane, W8VUV; Jimmie Joe Key, W5CDO; Alice King, N4DDK; Laura A Magiera, WA9VND; Sue E Milner, N7EKI; Coleen M Morris, KI6EN; C Kay Neary, KB4BBB; Scott E Neary, KB4AQR; Teresa Kay Northcutt, WD5DYJ; Al Ogrizovich, KX5U; Allan R Orton, KA7LEG; Karl Pagel, N6BVU; Mary A Pagel, KA6IGG; Mark E Pecan, KC9X; Paula M Place, N1DNB; John D Pointer, WA7WDJ; Roy C Pollitt, KD4HC; Alfred N Raines, II, N4NL; James Irvin Reynolds, KA4BMZ; Thomas F Sherwood, AL7HW; James B Sellers, K9ZBM; Thornton L Stokes, KN1M; Emil Walder, HB9CXE; Stephan Walder, HB9DDO; Geoffrey Way, KA1IOR; Eric R Wolfe, WB3IHQ.

Contest Corral

Conducted By Billy Lunt, KR1R
Contest Manager

NOVEMBER

4

West Coast Qualifying Run, 10-35 WPM, at 0500Z Nov 5 (9 PM PST Nov 4). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3590 kHz. 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.

7-9

ARRL November Sweepstakes, CW, Oct *QST*, p 72.

International Police Association Contest, Oct *QST*, p 87.

QST QSO Award Party, phone, sponsored by the Canadian Radio Relay League, Nov 7-8, 1500Z-2200Z each day (CW—Nov 14-15). The award is available to any amateur who makes phone, CW or mixed contacts with 8 of the 11 QST stations in Canada. To receive the award send SASE or IRC to Garry Hammond, VE3XN, 3 McLaren Ave, Listowel, ON N4W 3K1, Canada.

Ten-Ten International Net Fall CW QSO Party, sponsored by the Ten-Ten International Net, from 0000Z Nov 7 until 2400Z Nov 8. Open to all amateurs, but only paid-up 10-10 members are eligible for awards. Single operator only. CW and RTTY. Work stations once on 10 meters only. Contacts must be in the CW sub band. Exchange call, name, state and 10-10 number (if member). Count 2 points for each QSO with a member, count 1 point for each QSO with nonmember. Final score is total QSO points. Awards. Send logs along with cover sheet and dupe sheet before Dec 1 to Sky Blue Waters Chapter, c/o Dale Saukerson, NØAOZ, 3024 30th Ave S, Minneapolis, MN 55406.

13

W1AW Qualifying Run, 10-35 WPM, at 0300Z Nov 14 (10 PM EST, Nov 13). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Nov 4 listing for more details.

14-15

ARRL International EME Competition, part 2, Sep *QST*, p 85.

European DX Contest, RTTY, Oct *QST*, p 87.

QST QSO Award Party, see Nov 7-8 listing for more details.

15

SOWP High Speed Certificate Test, Oct *QST*, p 87.

21-23

ARRL November Sweepstakes, phone, Oct *QST*, p 72.

AOEC 160-Meter DX Contest, Oct *QST*, p 87.

MARAC Maritime Activity Contest, Oct *QST*, p 87.

23

W1AW Qualifying Run, 10-35 WPM, at 2100Z (4 PM EST). See Nov 13 listing for more details.

28-29

***CQ* World Wide DX Contest,** CW, Oct *QST*, p 86.

DECEMBER

1

West Coast Qualifying Run, 10-35 WPM, at 0500Z Dec 2 (9 PM PST Dec 1). See Nov 4 listing for details.

4-6

ARRL 160 Meter Contest, this issue, p 84.

TOPS Activity Contest, sponsored by TOPS International, from 1800Z Dec 5 until 1800Z Dec 6. CW only, 80 meters. Single op stations must take one seven-hour break, multi op stations may operate the entire 24 hours. Classes are single operator, multi operator, and single op-QRP (5 W or less input). Frequencies are 3.500-3.585 MHz. The lowest 12 kHz are reserved for DX contacts. Exchange RST and three-digit serial number. TOPS members also give their membership number. Count 1 point for QSOs with own country (each call area in W, VE, VK, PY, U and JA counts as a separate country). Count 2 points for QSO with own continent. Count 6 points for each QSO with another continent and count 2 bonus points for QSOs with TOPS member (TOPS members get 3 bonus points for QSOs with other members). For final score, multiply total points by the number of prefixes worked. Participation certificates for North American entries. Send logs before Jan 31 to Bertil Arting, SM3VE, Bergesvegen 26, S-823 00 Kilafors, Sweden.

12

W1AW Qualifying Run, 10-35 WPM, at 0300Z Dec 13 (10 PM EST, Dec 12). See Nov 13 listing for details.

12-13

ARRL 10 Meter Contest, this issue, p 83.

13

ARCI QRP Homebrew CW Sprint, sponsored by QRP ARC International, from 2000Z Dec 13 until 2400Z Dec 13. Home-brew receiver, transmitter or transceiver must be used on each band worked. Commercial-gear-only entries will be checklog. CW only. Single band or all band. Work stations once per band. Exchange signal report, HB (homebrew) or C (commercial), state/province/country and QRP number if member. Nonmembers send power output. Suggested frequencies: 1.810 3.710 3.560 7.110 7.040 14.060 21.110 21.060 28.110 28.060 50.060. Count 5 points for QSO with ARCI member. Others count 2 points for same continent and 4 points for different continent. If station worked is using home-brew, add 5 points per QSO. Bonus points for using home-brew equipment (HB): Add 200 points for each band an HB transmitter is used; add 300 points for each band an HB receiver is used; add 500 points for each band an HB transceiver is used. Multiply QSO points by states/provinces/countries worked per band by power multiplier (4-5 W output ×2; 3-4 W output ×4; 2-3 W output ×6; 1-2 W output ×8; 0-1 W output ×10). More than 5 W output counts as checklog. If 100% natural power, multiply final score by 2; if 100% battery, by 1.5. Include description of home-brew equipment, commercial equipment and antennas used and indicate which equipment was used on which bands. Awards. Mail entry (SASE for results) before 30 days after the contest to QRP ARCI Contest Chairman, Eugene Smith, KA5NLY, PO Box 55010, Little Rock, AR 72225-0010.

27

Canada Winter Contest

29

W1AW Qualifying Run

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 **Dec 1** to make the **February** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Standard Contest Guidelines

1) Make sure your log details the date, time, band, call sign and complete exchange sent and received, for each QSO claimed for contest credit.

2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.

3) Crossband, crossmode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.

4) Your log should be checked carefully for duplicate QSOs; and if more than 200 QSOs are made, dupe sheets should be included with your entry.

5) Your log may be considered a checklog or disqualified if it is incomplete or if too many errors are detected by the contest committee.

6) Avoid standard net frequencies.

7) International contests generally offer awards to top scorers from each US call area and each country, state QSO parties to each state/province.

8) Your summary sheet should include the following statement: "I have observed all competition rules as well as all regulations established for Amateur Radio in my country." The declaration should be signed and dated.

Mini Directory

As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in *QST*.

Advisory Committee Members	Jun 1987, p 51	Major ARRL Operating Events and Conventions—1987	Jan 1987, p 57
ARRL International EME Competition	Sep 1987, p 85	Novice Enhancement Report and Order	Apr 1987, p 64
Club Contest Rules	Jan 1987, p 81	Packet-Radio Frequency Recommendations	Sep 1987, p 54
Constitution Bicentennial WAS	Sep 1987, p 14	QSL Bureaus Incoming	Jun 1987, p 54
DX Contest Awards Program	Feb 1987, p 82	Outgoing	Sep 1987, p 63
Element 2 Question Pool, New and Revised Questions, Answers	Apr 1987, p 23	Reciprocal-Operating Agreements	Jul 1987, p 51
Frequency/Mode Allocations	Apr 1987, p 70	Tech and General Written Exams	Apr 1987, p 29
Golden Jubilee of DXCC Award	Sep 1986, p 60	Third-Party-Traffic Agreements	Jul 1987, p 51
Hamfest Calendar Rules	Sep 1986, p 84	220-MHz Band NPRM	Apr 1987, p 16
Landline BBSs	Oct 1987, p 56		
License-Renewal Information	Apr 1987, p 70		

Special Events

Conducted By Billy Lunt, KR1R
Contest Manager

Middlesex County, Virginia: The Rappahannock ARA will operate AA4HQ **Nov 7**, 1300Z-2200Z, to commemorate the 30th annual Urbanna Oyster Festival. Operation will be in the lower 25 kHz of the 40 and 80 General phone bands. For a certificate, send QSL and large SASE to Fay E. Smith, KB4NGO, PO Box 88, Hardyville, VA 23070.

Lafayette, Indiana: The Tippecanoe ARA will operate a special-event station from 1300Z **Nov 7** until 0300Z **Nov 8** in celebration of the Battle of Tippecanoe. Suggested frequencies: 3.870 14.235 21.375 28.400. For certificate, send QSL and large SASE to W9REG, 111 S 7th St, Lafayette, IN 47901.

Logan County, West Virginia: The Logan Co ARC will operate NU8K from 1600Z **Nov 7** until 0200Z **Nov 8** from a mountaintop in the heart of WV's billion-dollar coalfields during their "Mountain State Award" Expedition. Operation will be 25 kHz from low end of the General phone bands. For certificate, send QSL and legal-size SASE to Roy Elkins, NU8K, PO Box 202, Monaville, WV 25636.

El Cajon, California: The El Cajon ARC will operate WA6BGS from 1400Z **Nov 7** until 0100Z **Nov 8** during their "All States Picnic." Suggested frequencies: phone, CW, RTTY and packet on the 40, 20, 15 and 10-meter bands. For a QSL, send QSL and SASE to QSL Request, City of El Cajon, 200 E Main St, El Cajon, CA 92020.

Newport, Rhode Island: The Newport Co RC will operate W1SYE **Nov 7-8** to celebrate the bicentennial of the US Constitution. Operation will be on all bands and all modes. For a special QSL, send SASE to Fred Evans, W1JFF, 74 Bedlow St, Newport, RI 02840.

Davidsonville, Maryland: Special-event station W3VPR/200 will operate **Nov 7-8**, starting at 1300Z both days, to commemorate the US Constitution. For QSL, send QSL and no. 10 SASE to W3VPR, PO Box 308, Davidsonville, MD 21035.

Newington, Connecticut: The Armored Forces AR Net will operate from 0600Z **Nov 7** until 2400Z **Nov 11** to commemorate Veterans Day. Suggested frequencies: phone—3.920 7.283 14.325 21.375; CW—7.065. For certificate, contact any net member and send 9- × 12-inch SASE to Peter Kohanski, WB1DWR, 16 Berkley Cir, Newington, CT 06111.

Hines, Illinois: The Hamfesters RC will operate K9WFN from 1500Z **Nov 8** until 0300Z **Nov 9** in observance of Veterans Week from Hines VA Hospital's "Robert K. 'Pappy' Wade Memorial Ham Shack." Suggested frequencies: 7.260 14.260 144.210 USB 146.430 FM. For certificate, send QSL, QSO number and 9- × 12-inch SASE (39 cents) to Hamfesters RC, c/o Robert K. "Pappy" Wade Memorial Ham Shack, Bldg 8, Hines VA Hospital, Hines, IL 60141.

Ieper, Belgium: Special-event station ON7FF will operate **Nov 9-11** to commemorate the cessation of World War I. Operation will be 14.250. For certificate, send QSL and SASE to *Callbook* address of KA2YDZ.

Kimberling City, Missouri: The Kimberling ARC will operate NQØG **Nov 14-15**, 2000Z-2200Z, in celebration of the inauguration of the new W5BDL memorial club station. Suggested frequencies: SSB—7.235-7.250, 28.350-28.400; CW—7.025-7.050, 7.100-7.150. For commemorative certificate, send business-size SASE to K-ARC, 27 Trail Ridge Dr, Kimberling City, MO 65686.

Jackson, New Jersey: The Sunrise RC will operate W2SV from 1500Z **Nov 16** until 0200Z **Nov 17** to celebrate their 55th anniversary as an ARRL Affiliated Club. Operation will be 40 kHz above the CW band edges and in the lower portion of the General phone bands. For commemorative QSL, send SASE to Box 164, Howell, NJ 08527.

Ormond Beach, Florida: The Daytona Beach ARA will operate K4BV **Nov 21-22**, 1300Z-2000Z, in celebration of the Birthplace of Speed Commemoration and Gaslight Parade. Operation will be in the Novice bands, 25 kHz from the lower edge of the General phone bands, 147.150 and packet with digi 904DAB. For certificate, send SASE to DBARA, PO Box 9852, Daytona Beach, FL 32015.

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 **Dec 1** to make the **February** issue. Please include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

W1AW Schedule

October 25, 1987—April 1, 1988 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0300, 1400; TThS: 0000; TThSSn: 2100; Sn: 0300
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300; Sn: 0000
	CW Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 AM, 7 PM; TThSSn: 4 PM, 10 PM
	Fast Code Practice	MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM
	CW Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Teleprinter Bulletins	Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM
	Voice Bulletins	Dy: 9:30 PM, 12:30 AM
CST	Slow Code Practice	MWF: 8 AM, 6 PM; TThSSn: 3 PM, 9 PM
	Fast Code Practice	MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM
	CW Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Teleprinter Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Voice Bulletins	Dy: 8:30 PM, 11:30 PM
MST	Slow Code Practice	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM
	Fast Code Practice	MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM
	CW Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Teleprinter Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Voice Bulletins	Dy: 7:30 PM, 10:30 PM
PST	Slow Code Practice	MWF: 6 AM, 4 PM; TThSSn: 1 PM, 7 PM
	Fast Code Practice	MWF: 1 PM, 7 PM; TTh: 6 AM; TThSSn: 4 PM
	CW Bulletins	Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM
	Teleprinter Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Voice Bulletins	Dy: 6:30 PM, 9:30 PM

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.
Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

On Monday, Wednesday and Friday, 1400 through 2200 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from July 1987 *QST*, pages 9 and 77," indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 77.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Tuesdays and Saturdays at 2330 UTC, Keplerian Elements for active amateur satellites will be sent on the regular teleprinter frequencies.

W1AW CW and voice bulletins are sent on OSCAR 10, Mode B, subject to reactivation of the transponder. Look for CW on 145.840 MHz and SSB on 145.962 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1600 UTC transmissions, and 2300 UTC on WThFSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8 AM to 1 AM EST and on Saturday and Sunday from 3:30 PM to 1 AM EST. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 PM Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on November 26 and 27, December 25, January 1, February 15 and April 1.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, Bill Gillespie, VE6ABC—A/SM: VE6AMM. SEC/TC: VE6AFO. OO: VE6TY. STM/DEC/SM: VE6ABC.On July 31, 1987 Edmonton was struck with a tornado which killed about 30 persons and caused millions of dollars in damage. Alberta amateurs, and especially Edmonton amateurs, rallied to provide communications outside of Edmonton for worried relatives in other parts of Canada. Hopefully a full report will be made available as various agencies meet to determine the effectiveness of communications. Traffic: APSN QNI 643, QTC 13, Informal 69 (poor condx during month), ATN QNI 171, QTC 74. Personal totals: VE6GUS 33, VE6CHK 14, VE6EO 8, VE6ABC 5, VE6AKY 4.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—British Columbia Emergency Net, 3650 at 0300 UTC Net Manager, Ferdi, VE7EJU-BCEN is running smoothly but number of QNIs were down. We were lucky to get over twenty each night. Hopefully things will improve in the fall. Could certainly use more check-ins from the Vancouver area and always looking for more traffic. Thanks to all NCS liaison station to RN-7 for their extra work. British Columbia Public Service Net, 3729 KHz nightly at 0030 UTC. Net Manager Jim, VE7BLO. Sorry we received no monthly report. Tacoma Ham-Fair was well represented by the VE7s again, and I feel sure we all enjoyed ourselves. But this time none of the VE7s were lucky in the draws. Now we are heading into the fall and clubs will be holding their elections for the new term, we would appreciate hearing who the President, Vice and Secretary are, thanks. Traffic: VE7BNI 469, VE7EJU 186, VE7EJW 136, VE7ANG 98, VE7XA 48, VE7FME 46, VE7DJ 37, VE7EGM 27, VE7FB 19, VE7BZI 8.

MANITOBA: SM, Jack Adams, VE4AJE— A big thank you to Dick Maguire, VE4HK- District Emergency Coordinator on the very informative report on the activities of the Manitoba ARES during the recent Edmonton Tornado, July 31, 1987. On behalf of the CRRL/ARRL my sincere compliments to the following amateurs who dedicated their time to get welfare messages to and from Winnipeg & Edmonton. Also many thanks to VE4WSC (Winnipeg Seniors Club) for the use of their well equipped station. Operators involved are as follows: VE4SE Tom Mills, VE4ACF Bill Darg, VE4AJO Al Seddon, VE4BC Keith McConnell, VE4PN Dave Place, VE4ADS John Gowron, VE4ATM Rod Kischook, VE1AWS Walter Rawle, VE4VD Garry Frankel, VE4HK Dick Maguire. August net reports will be added to September's report.

ONTARIO: SM, Larry Thivierge, VE3GT—A/BM: VE3GT. SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. OBS: VE3AR VE3BBS VE3CDS VE3DZH VE3EFX VE3GRO VE3LSU VE3MGQ VE3MNI VE3MOL VE3WM. Congratulations to CRRL President VE3CDM and CRRL Vice-President VE3GRO on their re-election, by acclamation, for a further two year term commencing in January 1988. Together, with their stable and effective leadership over the past five years, the CRRL is now better equipped, in every way, to meet the many and varied challenges that lie ahead in the future of Amateur Radio. Let's all get together and work with them for the betterment of our hobby. The Toronto Star recently carried an excellent article about VE3AYL, complete with photograph, and Amateur Radio. As everyone knows, Gwen's favourite mode of communications is RTTY. VE3ECD and VE3AJW are new members of the QCWA, Chapter 73. VE3PPE of the Ottawa ARC has been chosen the winner of the 1987 Joe Norton Award. This award, funded by the legacy of Silent Key, Joe Norton, VE3PN, is given annually to the newly certified amateur in the National Capital Region who has done the most to advance Amateur Radio. National awards manager, VE3XN, who has just received his DXCC Golden Jubilee certificate with 208 countries so far this year, advises that his new edition of the Awards Directory of the World is ready for distribution. Contact Garry for details. Incidentally, Garry is trying to get one award from each of 100 DXCC countries. So far he's up to 91 with others in the works. Your NTS nets operating within the Section are:

NET	FREQ	TIME/DAY	MGR
OQN(S)*	3.667	1830/DLY	VE3GSQ
OQND*	3.667	2100/DLY	VE3GSQ
OLN	7.66/.06	2330/DLY	VE3DQK
OPN*	3.742	0000/DLY	VE3BUO
OQN*	3.667	0000/DLY	VE3CYR
KTN	7.96/.36	0200/TUE/THUR/SAT	VE3AJN
OQN*	3.667	0300/DLY	VE3GSQ

*denotes Section Net, all times shown are UTC. Traffic: VE3FAS 428, VE3GSQ 418, VE3ORN 217, VE3CYR 153, VE3WV 147, VE3GNW 145, VE3OCF 131, VE3GT 91, VE3DPO 72, VE3HGJ 64, VE3EAM 47, VE3WG 47, VE3BUO 43, VE3POJ 28, VE3KXB 26, VE3AJN 18, VE3BAJ 16, VE3NVJ 16, VE3BCZ 15, VE3BDM 15, VE3FGU 10, VE3ILN 7. Late Reports (July 1987) VE3KXB 34, VE3ILN 7.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2ADO. BM: VE2ALE. CT: VE2ED. OO: VE2DNH. Congratulations to Assistant Directors, VE2AKD (Saguenay-Lac St-Jean) et VE2FVB (Quebec City area). The VE2ED PBBS is on the air on 3.607.3 MHz. Jean is the Section Node (NTSPQ) packet radio National Traffic System with Gateway on 145.010 MHz. Felicitations à Alain, VE2CAE, qui est tres actif en plus d'etre le secrétaire de VE2MO. Pierre, VE2GKX, est son compagnon tres compétant. Avec regret j'ai a vous annoncer le décès de VE2ALR, apres une longue maladie. Traffic: VE2BP 57, VE2WH 42, VE2JN 34, VE2EC 24.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—SEC: KC3TI. DEC: K3PFW & N3FDL. EC: KC3JM KA3LNK WA3PHT WA3VDJ. STM: KA3GRQ. PIO: WB3DPJ. SGL: AF3R. PSHR: K3JL. An election for Section Manager will be held, and you will receive your ballot through the mail. Please use it and vote. The SM is your voice in Delaware. Both repeaters in Seaford were hit by lightning; damages were extensive. Kent ARC will run a special events station Dec. 5,6,7 at the Kent Co. Courthouse. You are invited to participate. Also FSARC is planning to run a station to celebrate the entrance of Delaware into the Union. AWARE Xmas Party Dec. 10. DTN stations 292 traffic 39 in 21 sessions. DEPN stations 53 traffic 14 in 5 sessions. SEN stations 63 traffic 2 in 4 sessions. Traffic: W3QQ 73, WB3DUG 37, WA3WIY 36, K3YBW 28, KA3GRQ 23, K3JL 19, W3PVO 19, W3FEG 10, KC3JM 7. (July) K3YBW 20.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KA3A, KO3B, K3ZFD. ACC: KC3QB. SGL: WA3IAO. STM, BM: KB3UD. PIO: W3AMQ. TC: W3FAF. In Thanksgiving's month, here's a kilowatt of "thank you" to each ARRL member, Field Organization volunteer, and Affiliated Club. Thanks also for the hospitality and friendliness shown to your Section Manager so many times in 1987. EPA salutes our 2 Foundation for Amateur Radio scholarship winners: Doug Benish, N3CXB, and Paul Hoffman, KA3PVC. In addition to those outstanding student Amateurs, EPA Section also congratulates (dramatic drum roll) ARRL Foundation's 1987-88 Goldwater Scholarship winner: Tom Sands, KA3FXX, former president of Perkiomen Valley ARC. Guys, we're proud of you! Our Assistant TCs haven't been collecting cobwebs lately. W3CPR has responded to "help!" messages relayed via Newington, and W3FM has assisted local hams with antenna dilemmas. An article written by WA3IAC appeared in the July-August issue of Modern Electronics, and he started a Novice class at his work QTH. These and other ATCs are ready to help when you need them. In ARES news, N3ECL has been appointed EC for Adams County. Dist. 3 took part in this fall's NDMS drills, along with Dists. 1 and 4. DEC9 KB3YS reports good local media coverage of Skywarn organizational meetings. Official Observers W3IS and KC3SM received thanks from hams to whom they'd sent advisory notices pinpointing technical haywires. You can never be too rich, too thin, or have too many PL-259s, but harmfest season closes in EPA with RF Hill ARC's November 1 event. KC3LM will visit Warminster ARC's meeting this month. They originated over 200 messages in this year's Grange Fair activity. Suburban ARC began a CW activity night Wednesdays at 8 PM on 28.150. Not a formal net, this is a chance to learn to QSO and to grow comfortable using CW. By the way, owing to deregulation and budget cuts, ELI the ICE man has been laid off indefinitely, capacitance has been abolished, and inductance was last seen in East Stroudsburg wearing a wig and false nose. KC3QB has been doing a super job as Affiliated Club Coordinator. Please call on him when your club has a question about its relationship with ARRL. In recognition of his work in forwarding W1AW and EPA bulletins through the packet system, KB3UD has been named Bulletin Manager. Traffic (July): N3AZW 515, N3DRM 224, N3CD 103, W3IPX 72, KA3DLY 66, W3JKX 58, W4UQ 57, KY3M 58, KB3FW 51, W3KAG 50, KB3UD 43, W3DP 39, KU3R 31, K3TX 30, WA3CKA 37, N3EFW 24, W3TWV 22, KA3RGF 18, W3CL 16, KO3M 13, W3AQN 11, W3VA 10, W3ADE 6, N3COY 2. Nets (July, QNI/QTC): D6ARES 100/14, MARCTN 149/31, MARCARES 47/6, EPAEPTN 403/93, PTTN 231/87, EPA 405/127, D3ARES 55/9. Packet BBS AG3F 64, KB3UD 138.

MARYLAND-DC: SM, John A. Barolet, KJ3E— W3FZV, Phil Battey of Chevy Chase, will be the next Section Manager. He was nominated and elected without balloting; his term will commence January 1. Please give him your full support; I certainly shall. My meetings with Phil have been on the section CW traffic net and at the MEPN picnics; they have been pleasant. We shall have several meetings during October, November and December as I transfer to him the records and other paperwork associated with the SM position. Don't forget the Maryland-DC Section QSO party, 2200Z October 30 until 2200Z November 1, 80-10 meters (no WARC bands), single operator category only. A plaque will be awarded to the highest scoring Maryland club (the club score equals the sum of the club-member scores). ATC NF3X in Hagerstown is recruiting technical assistants and speakers in the four western counties of Maryland. ATC W3VVN designed modifications for a 12-volt power supply to support a DC-bus at KJ3E and to charge NiCd batteries at various constant currents. N3CDR and W3HII are other busy ATCs in Montgomery County. So the Assistant Technical Coordinator corps in MDC is increasingly active. Former SEC K3RXK is an editor and publisher. One of his magazines, SPACE TODAY, is a monthly update on what is happening from the earth's surface outward, including ham radio activities. Traffic handlers! Experience at KJ3E shows CW traffic moves at 25-30 ARRL-format messages per hour on a good circuit, 8-10 per hour on a poor circuit; 20-25 per hour on a good phone circuit, 6-8 on a poor phone circuit; 60 per hour on a good packet circuit BUT NONE PER HOUR on a poor packet circuit. DON'T NEGLECT YOUR CW! Of course, traffic handling is ultimately limited by the receiving operator's ability to copy it LEGIBLY on paper! Power line interference? K1ZAT wrote an excellent article on solutions in the Southern Maryland ARC Newsletter. An SASE might get you a copy! And the Baltimore ARC has published a multi-part series of articles on RFI, CAUSES AND CURES, by WB5IIR. Information and instructions in these articles are helpful to all of us. Saint Mary's County ARA completed its first Novice Class in some years; results . . . 15 starters, 11 finishers, 8 new licensees after the first exam. NC3V, WB3BJM, KA3POK and KB4TEH are welcome new regulars on MDD. WITH THE NETS: Net/Mgr QND/QTC/QNI: MSN/KC3Y 31/32/3279, MEPN/N3EGF 31/141/744, WRPON/WB3BFK 22/11/156, BCN/N3EGF 4/2/27, MDD/W3FA 62/288/590 (TOP BRASS W3FA/92, KJ3E/75, WA3YLO/74, KC3Y/69. PSHR:W3FA 106, W3YVQ 90, N3EGF 86, WA3YLO 82, KC3Y 75, K3NNI 74, KJ3E 71, WA3UZI 63 Traffic: KK3F 618, W3FA 183, KJ3E 175, N3EGF 111, W3YVQ 94, KC3Y 91, WA3YLO 77, W3LDD 76, K3ORW 65, NC3Z 60, WA3UZI 56, N3DE 48, K3NNI 44, WB3BJM 36, WB3BFK 29, KT3T 27, W3FZV 26, WB3LQT 14, W3DQI 12, NB3P 10, NF3X 9, K2EB 6, WA3GYW 6, KC3DW 5, WA2WDT 5, KC3ZJ 2.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—ASM: N2CER. SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: N2BQT. PIO: VACANT. SGL: VACANT. BM: WB2UVB. OOC: WA2HEB. ATCs K2JF, KA2RJA and WB2MNF. Our SGL, KA2KMU has resigned. I'd like to thank Ken on behalf of the SNJ staff and our membership for the work he has done. You'll be missed, Ken! Since the SGL's position is now vacant, I'd like to appeal to any of you out there who might have ties to the state, or have a good rapport with your local representatives. Please consider helping out our section by accepting this very important position. Every now and then something is introduced into the state legislature that directly, or indirectly affects Amateurs. For further information, please contact me at the address listed on page 8 of QST. It's that time of year again. The holiday season is upon us again. Why not send season's greetings to your family and friends via our National Traffic System? To find the local traffic net in your area, please contact our STM at 15 E. Camden Ave., Moorestown 08057. For those of you into packet, don't forget you can send traffic via your local PBBS. Until next month, very 73. Traffic: WB2ZJF 303, N2CER 33, WA2HEB 4.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—Appointment: K2BWK (EC) Ontario County. Club Officers: ARATS NO2E W2VEX WA2BYN; KPARC WB2HDM N2GWN KA2GPJ; OCARA WB2OTC KA2QBQ WB2PRV;RAGS K2SDD KD2OQ NV2V WA2URK WA2PUU; RAWNY KA2NYS WA2FKV KA2EXI KD2V; Rome K2GVI WA2HNQ KA2JXA W4BNY. Nineteen (19) clubs, including 5 SSC's, have not filed Annual Reports. Twenty-nine (29) clubs, including 4 SSCs, have filed reports—THANKS! Is YOUR Club affiliated with the League? Ask your club officers at the next Club meeting. The future of amateur radio depends upon the strength of clubs and their affiliation with the League . . . and don't you forget it!

NET	MODE	FREQ	TIME	DAY	MGR	QNI	QSP	QND
NYSEMO	SSB	3993	0900	SUN	N2AGO	088	008	05
NYSR	CW	3530	0930	SUN	W2MTA	014	004	05
NYS/M*	CW	3677	1000	DY	N2EIA	310	175	31
WDN/M*	FM	04/64	1100	DY	WB2OWO	294	087	31
NYPON*	SSB	3913	1700	DY	KA2UBD	557	252	31
EMPIRE SS	CW	3590	1800	DY	W2WSS	285	055	31
LEWIS CO.	FM	/015	1800	SUN	WA2OEP	044	000	05
NYSPTEN	SSB	3925	1800	DY	WB2HKU	491	068	31
OCTEN/E*	FM	34/94	1830	DY	WB2HLY	515	108	31
QNET	FM	31/91	1830	DY	N2AGK	393	007	30
STAR*	FM	13/73	1830	DY	NE3B	321	057	31
WDN/E*	FM	57/17	1830	DY	WB2OWO	454	161	31
NYS/E*	CW	3677	1900	DY	KU2N	390	243	31
BRVSN	FM	/655	2000	DY	WB2OFU	351	004	31
BLUE LINE	FM	93/33	2000	DY	WA2SEF	150	015	21
JCRACN	FM	10/70	2000	DY	KA2OTS	303	013	29
MOHAWK	CW	21150	2000	T-T	KA2OQB	009	045	09
VHF THIN	FM	04/64	2000	WED	WB2OWO	041	000	05
CNYTN*	FM	90/30	2115	DY	WA2PUU	316	058	31
OCTEN/L*	FM	28/88	2130	DY	WB2HLY	210	027	31
WDN/L*	FM	04/64	2130	DY	WB2OWO	417	100	31
NYS/L*	CW	3677	2200	DY	KU2N	427	243	31

*NTS nets. Public Service Honor Roll: N2ABA N3DPF N2EIA N2EVG WA2FJJ W2FR NN2H W2MTA WB2OWO WB2RBA ND2S KA2UBD NE2W K2YAI KA2ZNZ. August BPL: N3DPF. New Callsigns: N3DPF now NJ3V, W2ZOJ now NY2V. Packet Radio Mode: seems to be a lotta spirited interest in traffic handling on this mode these days. Remember, don't knock it if you ain't tried it . . . and keep in mind that it took ten years for the first National Traffic System plan (called NTP) to take hold! Once procedures become standardized (along with technique) for message traffic handling, this mode will greatly augment the existing NTS. NTS management supports use of the mode as demonstrated now by both the Eastern and Central Areas of the National Traffic System. Net Managers must get behind "it" too . . . more liaison assignments need to be made, to and from the Section Packet Node Stations. Happy Thanksgiving! August Traffic: N3DPF 680, KA2UBD 456, W2MTA 325, N2EIA 309, WB2OWO 271, NE2W 194, WA2FJJ 179, W2FR 161, N2ABA 152, KU2N 124, ND2S 120, NN2H 112, KA2QOO 109, WB2QIX 76, WB2RBA 72, WB2LJK 66, KA2ZNZ 61, N2FKB 58, N2EVG 56, NS2X 56, AF2K 42, NE3B 41, K2YAI 36, W2ZOJ 23, W2PPS 18, KA2DBD 13, KA2TWY 13, WB3CUF 12, K2IUT 12, K2QR 11, KA2TVX 11, WA2OEP 8. July Traffic: WB3CUF 21, N2DYT 10.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. STM: (temp. K3SMB). BM: KC3ET. TC: N3EFM. OOC: KX3V. ACC: AK3J. SGL: W3DTW. PIO: N3DOK.

NET	QNI	QTC	SESS	KHz	T/D
WPACW	201	100	31	3985	7:00P/D
WPAPTN	336	89	31	3983	6:00P/D
KFN	128	50	21	3983	1:30P/MtoFR
PFN	145	130	31	3958	5:00P/D
WPA2MTN	282	54	31	146.28/88	8:00P/D
NWPA2MTN	588	48	30	44.53/45.13	9:00P/D
WPARTTY	9	1	5	3640	9:00P/SUN

WN3VAW has resigned as Section Traffic Manager. I want to thank him for a job well done. He is too busy with his job at Allegheny County Community College and acting as a private consultant. Good luck, Ron, in your new endeavors. I will be acting STM until we can fill the vacancy. If you would like to fill this appointment you must be active on CW and Phone nets. I need an assistant SM. Any one willing to take a crack at either or both, let me know. On August 22-23 a major emergency occurred in McKeesport, PA. A train derailment consisting of several cars loaded with dangerous chemicals were among those derailed. The most volatile was one loaded with Butane Gas in liquid form, which could have wiped out a whole neighborhood. People in the area were evacuated by the officials, and the Am. Red Cross was put in charge of the shelters. Twenty-four amateurs provided communications. Some were on duty for almost 24 hours. The response was terrific and many others were standing by if needed. The ARES and RACES members in WPA Section are very readdy to help at all times. Aug. Traffic: KQ3T 351, W3OKN 311, N3EMD 276, N3AES 93, N3CZW 74, KA3NVP 65, W3NGO 62, K3SMB 61, KC3ET 57, N3FM 32, WA3UNX 43, W3KUN 32, KC3GO 28, W3RUL 28, KD3AC 24, WA3QNT 22, W3DBW 20, KA3EGE 11, K3LTV 9, W3SN 5, N2BSS 3.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH. STM: K9CNP. OOC: W9TT. BM: K9EUI. SGL: W9KPT. PIO: N9EWA. ACC: WB9SFT. TC: N9RF. ASM: AA9D. SECTION NETS (NET/FREQ/TIMES,LOCAL): ISN/3905/1880, DAILY. ILN/3690/1830 + 2200, DAILY. ITN/3705/1900, DAILY. CTN/147.69/09/2100, DAILY. ILARES/3905/1630,1st + 3rd SUNDAYS. INDEPENDENT NETS (NET/FREQ/TIMES,LOCAL): IEN/3940/0900,SUNDAYS. ILPN/3915/1630, M-F. 1430 SUNDAY. NCPN/3915/0700, MON-SAT. NCPN/7270/1215, MON-SAT. For the ARES members in the greater Chicago area, August 1987 was the kind of month that we train for. On Friday,

(continued on page 92)

August 14th, a record nine inches of rain fell on the west suburbs causing flooding which closed road and interrupted power and telecommunications services. As may be expected, local government radio communications resources were unable to meet the increased demands for communications and many ARES units were activated. The list of amateurs who participated in assisting throughout the flood recovery is truly too lengthy to print here, which is a credit to the volunteer spirit of all those involved. As of this writing, I have heard nothing but superlatives used by those commenting on the Amater Radio reponse and the job done. Ray, N9CIB, EC for DuPage County and Dennis, WB9URA, EC for NW Cook County deserve special recognition no only for the work that they did in organizing the specific response to this event, but to the many hours of planning and training done in the past to have an organizational structure within their ARES units which is PREPARED to respond to such a need. When the rain starts to back up in the basements is not the time for the Amateur community to be telling local government officials what we can do. It is also not the time for service minded amateurs to be learning net procedures or seeing a radiogram form for the first time. These concepts are not new to Ray and Dennis, and it's because of their untiring past efforts and those of the amateurs who work with them that the response worked so well. Congratulations to all involved!! Over the years, I have seen a cyclic trend in terms of participation in the various activities of the field organization. Some areas are up right now such as the OO program and the ATC program, some are status quo such as the emergency area. At the present however, there seems to be a distrubing downturn in interest in TNS. Month after month the same reliable stations (Bless you!) are manning the ILN, ISN CTN, ITN and liaison slots. I have heard it said that the reson for declining interest is that folks say that NTS can all be done with PACKET. While I firmly believe that PACKET has an important future with NTS, I am sure that no single mode can ever do it all. I am also sure that the best PACKET NTS ops will be those whose training began with CW and phone nets, as is evidenced by the fine job that many of our NTS ops are doing with formal traffic via PACKET now. WA7MAD may have put the problem into the best perspective when he bemoaned the following formula: NO TRAFFIC + NO VOLUNTEERS + NO NEW BLOOD = NO NTS. The Amateur Radio community cannot afford to let this "formula" become reality. NTS has been and will continue to be the backbone of the field organization and of Amateur Radio's ability to serve the public in time of special need. The methods may change, but the needs are the same. Try volunteering for NTS; we won't bite and we're sure that you will enjoy the time spent, as well as gaining valuable traffic handling skills. Talk up NTS participation at club meetings. Let's get after some of the old hands that have become inactive and some of the new blood that is coming into Amatuer Radio as a result of Novice enhancement. Remember, ITN is on 3705. . .a frequency ALL licensed amateurs can operate. Above all, use the system, SEND TRAFFIC. You will gain experience in message formulation, and find out who the liaison stations in your area are, important information in an emergency. If you don't feel like sending a radiogram to uncle Floyd and Aunt Zelda, then send one to me telling me that you are participating in NTS! My address is listed on page 8 of QST, but you don't even really need it! If you check in to ILN, ISN or CTN with traffic for WD9EBQ, it will get here. Give it a try! Traffic: KA9FEZ 398, NC9T 324, W9EHS 145, W9HLX 144, K9CNP 133, NN9M 132, W9HOT 91, WA7MAD 80, W9NXG 77, W9LWH 74, WA9VLC 73, N7DOY 58, KA9EWN 55, K9EUI 38, W9LNO 21, WB9TVD 20, WB9JTK 19, KA9CTW/T 16, WD9DZU 15, K9EHP 14, W9KR 11, W9VEY/M 9, WA9RUM 7, KD9TX 5, WD9HOW 4.

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UMH. SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. PIO: KA9LQM. TC: K9PS. SGL: WA9VOO. BM: KC9TA. OOC: KJ9G. SRC: N9WB. Net Manger: ITN KD9DU, QIN KJ9J, ICN KD9ER, VHF W9PMT, IWN KA9ERC.

NET	FREQ	TIME/Daily/UTC	QNI	QTC	QTR	Ses
ITN	3910	1330/2130/2300	2883	421	3754	84
QIN	3656	1430/0000/0300	613	268	1653	93
ICN	3705	2315	113	22	584	27
IWN	3910	1310	1701	358	31	
IWN	VHF	Bloom./Kokomo				
Hoosier VHF Nets:			4158	127	3511	191

Silent Key: N9EGO, Columbus. BPL: W9JUJ Orig 0; Rcvd 345; sent 340; Dlvd 2. W9ZRX Orig 0; Rcvd 297; Sent 297; Dlvd 0. OO reports rcvd from KA9DZM and KA9FFO. Now that this year's SET is history, make sure that you submit your reports and critique your activity. It is important for you to evaluate what went right and what didn't. This is, after all, a learning experience. I am planning to update pages of the Indiana Section Emergency Response Plan in January. If you received one and know of updates or corrections, let me know before the end of November. Thanks for all the good comments sent to me about the Plan. All ECs should keep their copy handy and ready for use. If your group has set the dates for your 1988 hamfest or VEC test sessions, let me know. I'd like to include your info in next year's listing. Congratulations to the Indiana Digital Experimenters Assn on becoming an organized packet network in the state. Indiana has an outstanding packet community and efforts will soon be completed to make NTS message handling by packet a routine part of the statewide NTS system. KD9ER is point man for that effort. One of these days, I'll have to break down and admit that computers and computer-dependent technology are here to stay! How is your Golden Jubilee DXCC coming? Year's end is fast approaching. Don't forget the Fort Wayne Hamfest on the 8th, one of Indiana's biggest and best! Join me on 3910 for the Saturday evening session of ITN at 2300Z. Traffic for August: W9JUJ 687, W9ZRX 594, KJ9J 278, KA9FFO 110, K9TKE 87, NJ9S 82, N9BZZ 71, WA9QCF 66, W9UEM 55, WD9HII 54, KD9ER 51, K9WWJ 46, KB9HH 46, WB9MDS 45, K9SBW 36, WB9IHR 36, KA9EIV 29, W9ZGC 26, WD9DWD 24, KA9LQM 21, W9BTZ 20, KA9QMI 11, K9ZBM 10, WB9PFZ 10.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. Sorry to report Silent Key Sid Pokorny, W5UAU (formerly W9NRP) who helped form Wisconsin QCWA Chapter 55 in 1971 and Wisconsin traffic nets. Sid was a Wisconsin SCM and was known for his devoted volunteer work to promote Amateur Radio. W9YCV worked YL BY1CKJ on 14.052 MHz CW and then YB0DPO for good measure. Les was also busy during a short two-meter opening, quickly working 12 stations in 10 different grid squares. Don't delay your antenna work any longer, winter is coming. November 14th, the Milwaukee Repeater Club will hold the 6.91 Friendly Fest open at 8 AM, 7AM for sellers, inside the greatly enlarged Serb Hall on one ground floor, 51st and Oklahoma in Milwaukee with free parking. K9IZV for more information. See you at the Friendly ARRL table. The Friendly Fest will have on-site exams given by the Milwaukee RAC VEC starting at 9 AM. November 16th the West Allis RAC will hold its Awards Dinner. Badger Examiners exam November 21st, 1 PM, reservation with KB9G. Remember to indicate your Club participation when submitting an entry in the November phone or CW ARRL Sweepstakes, mark your log accordingly. Happy Thanksgiving to all. Traffic: WB9YPY 1375, W9YCV 300, KA9RIF 280, W9CBE 235, K9GDF 190, N9BGE 117, WA9WYS 98, N9BCX

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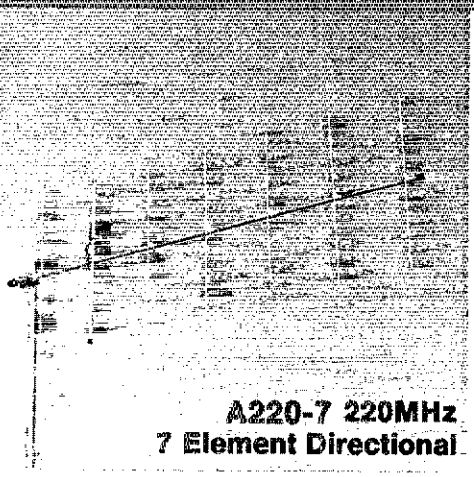

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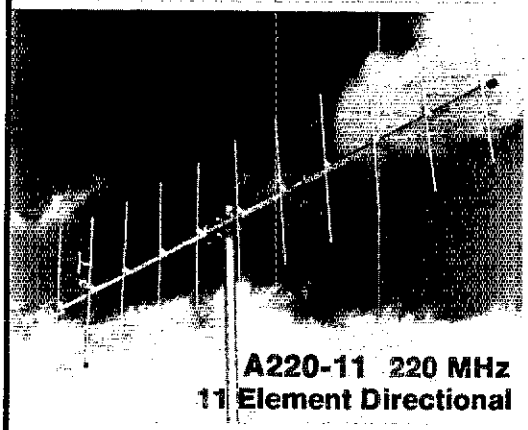
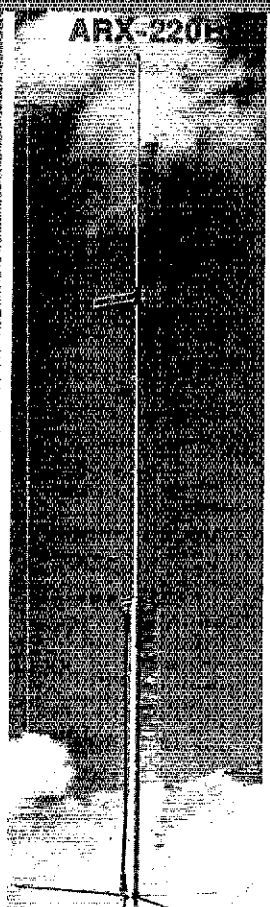


A220-11 220 MHz
11 Element Directional



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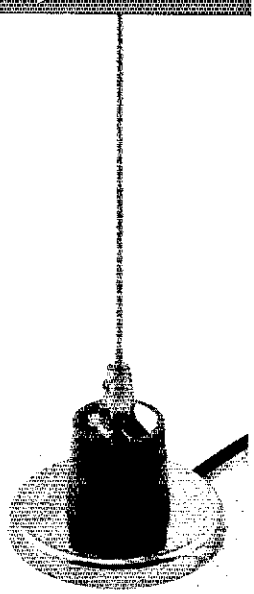
220MHz
Omni-Base



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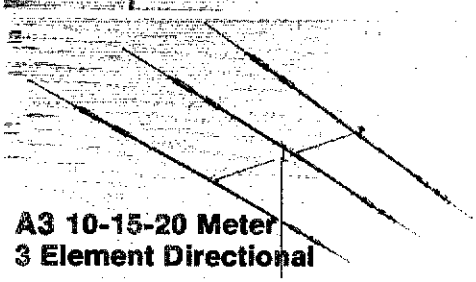
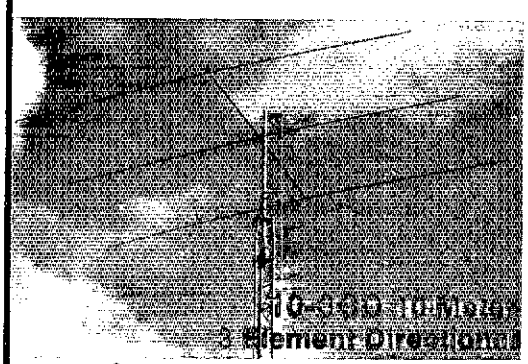
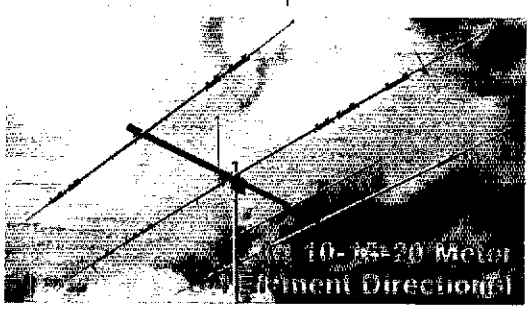
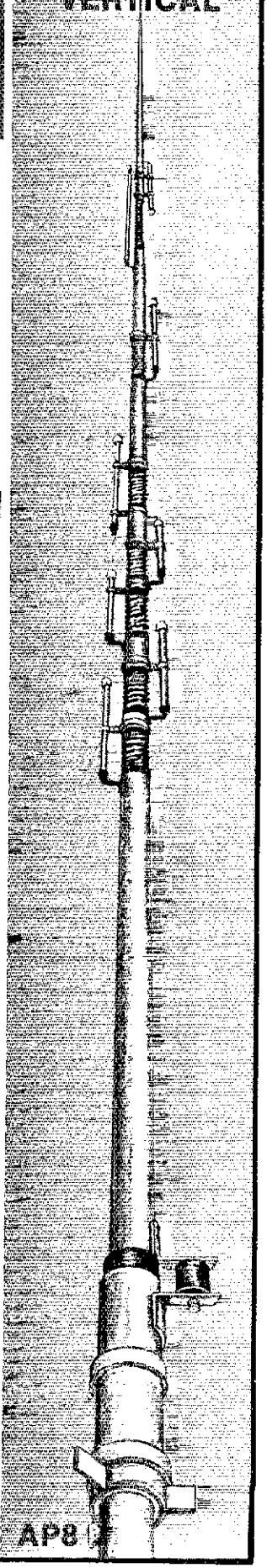


A3 10-15-20 Meter
3 Element Directional





ALL BAND VERTICAL



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DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr. KCØT—A time of change: Kenny, KDØCI, after 4½ years as STM decided to step down. A Big Thanks for a super job, Kenny. The new STM effective Sep. 1 is Jim Swisher, KAØEPY. Other changes include Jack Ritter, WØUCE Net Manager for MSN/1 replacing KAØEPY. Also, Len Carlson, NØGNN, is Ass't. Net Manger for MSN/2, and Curt Weinstein, KAØNBS is the Ass't Net Manger for MSN/1. Congratulations to Wid Johnson, W9DM, as the Minnesota Amateur of the Month for August. Wid has been amateur of the month for probably 50 years or so, but this time it's official. By the time this is published, both MSN/RTTY and MNAMWXNT will be back in operation. It's hard to believe we're at the shank end of what has been ahot and somewhat bumpy summer. SKYWARN was activated a number of times and the HF Net had their share of QRN-to say nothing of some rigs that got ripped by ligtning. Looking ahead: The Annual Courage Center Handi Hams winter *Hamfest and Silent Auction will be held Saturday December* 5th at the Eagle's Club in Faribault, MN. The event starts at 9:00 AM with a dinner at noon followed by a program and VE Testing. Talk-in on 19/79. For further information, contact Don Franz, WØFIT, 1114 Frank Ave., Albert Lea, MN 56007. 73, Jim Swisher, KAØEPY, STM.

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/RTTY	3620	6:30P	Starts Sep.	WAØLUT
MSN/1	3685	6:30P	377/158/31	WØUCE
MSN/2	3685	10:00P	268/48/31	KDØNH
MSSN	3710	8:00P	271/35/31	KAØSBY
MSPN/N	3860	12:05P	450/198/31	WBØWNJ
MSPN/E	3860	5:30P	802/204/31	KCØT/KDØCI
MNAMWXNT	3860	6:15P	Starts Sep.	KØOGI
PICO Net	3925	9:00A	3141/298/121	WDØBAC

MN EMERGENCY FREQ 3860 BULLETINS 3860 Traffic: WBØWNJ 601, WAØTFC 416, KAØEPY, KAØARP 378, NØCLS 186, NØFOO 154, W9DM 141, KDØCL 135, WØGRW 95, KT9I 91, KAØSBY 91, WØUCE 76, KDØNH 73, NØJP 67, KCØT 45, KDØCI 42, WDØGUF 42, KØOGI 27, KAØAJF 12, *NTØS 11, KEØBQ 6, KAØBFP 5. Total: 3095.*

NORTH DAKOTA: SM, Bill Kurtti, NØAFP—Hello to all from a happy SM. We just finished our harvest this morning at 3:30 AM. No more combine mobile from me for another year. Dickinson reports that the new repeater on Sentinal Butte is in operation on 146.73/13 with 100 watts and a voice ID, WAØRWI. ASM NØGUU has a new callsign: KEØPW. Congratulations, Karin. We are sorry to report that WØHJK and WØAUH are now Silent Keys. Fargo has been having problems with their 146.76/16 repeater but hope to have a new machine on the air soon. We in the Devils Lake area will sure miss NAØO who moved to Wausau, Wis. this month. 30 below antenna construction season is coming up soon. Traffic: KAØFSM 25.

NET	FREQ	TIME	SESS/QNI/QTC	MGR
GOOSE RIVER	1.9	9 AM SUN	5/96/5	WØCDO
DATA	3985	6:30PM Daily	28/367/45	KAØFSM
WX Nets	*3985*	*9 AM, 12:30, to 5:30 PM*	*to resume Oct 20*	WØGFE
North 40	146.64	0200Z, Sun.	5/40/0	NSØH

SOUTH DAKOTA: SM, R.L. Cory, WØYMB—SEC: KAØKPY. STM: KDØYL. ASST SM: NØABE, WAØFPR. A line was dropped from the September issue so will repeat that WBØVBW has received a W.A.S. on both CW and SSB on the 160 meter band. In test sessions held at Brookings ten out *of 12 applicants upgraded.* LARK *of Watertown reports* contacting 49 states and Canadian provinces during Field Day with North Dakota being the elusive state. WBØMWJ finished eighth in the nation in last Dec ARRL 10 meter contest-Rapid City Club has received a certificate-plaque from ARRL commemorating having been an ARRL affiliated club for 50 years. Also celebrating 50 years in Ham Radio is WØZWL, Martha Shirley. In memory of the 15th anniversary of the terrible flood that hit Rapid City, their ARES held a Simulated Emergency Test-Total traffic reported was 646 with 9 stations reporting-also reports were received from 9 nets. Traffic: NØOPF 251, KØZBJ 122, KØERM 112, WØMZI 37, WBØOMF 34, WAØVRE 30, KDØYL 29, KAØKPY 21, WØYMB 10.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF—ASM: K5UR. SEC: N5BPU. STM: W9OK. ACC: NI5D. SGL: W5LCI. TC: W5FD. OOC: NR5Q. BM: W5LL. PIO: K5TML. Repeater Frequency Coor. WB5FDP. In the summer, 1974, the Section Communications Manager's office in Arkansas became vacant. A special election was held and Sid Pokorny, W5UAU, took over and began to rebuild the ARRL activity in the state. Sid served until March, 1981, as SCM but continued his support afterward with assistance whenever it was needed in the areas of net management, OBS, and traffic handling. *Sid continued active almost up to the very minute he became* a Silent Key. It is with sorrow that I report the passing of our friend and dedicated Amateur Radio operator and ARRL volunteer. On behalf of the Amateur community in Arkansas and the ARRL, I extend our sympathy to the family of Sid Pokorny, W5UAU.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. SEC: N5ADF. ACC: K5DPQ. SGL: KD5SL. TC: W5RWF. OOC: KE5QK. *Packet: NE5S. Ed Crump, KB5CX,* chairman of the Louisiana Council ARC Linking Committee presented a statewide linking plan approved by the Council at the Shreveport meeting. The plan consists of a 440 MHz trunkline system connecting major areas throughout the state and accessible on 144 MHz to any other location on the *system. A local group would furnish tower space and* "buy-in" to the statewide system maintained by the Louisiana Council at a cost of $1500. In turn the local group would receive from the Council two 440 MHz transceivers with PL access, 2 antennas, feedline, and a microprocessor controller to connect the statewide system to their local repeater. The Central Louisiana ARC at Alexandria was the first group to send the Council the $1500 to begin purchasing the necessary equipment and get the system started. Hopefully, many more groups will join shortly and a statewide emergency and public-service network will become a reality. Welcome aboard to Bill Yorty, W5RWF, recently appointed ARRL Technical Coordinator for Louisiana.

MISSISSIPPI: SM, Jim Davis, KK5Z— ASM: W5TRD. SEC: WD5IKD. SGL: NC5Y. ACC: K5VXV. PIO: WN5M. BM: W5EPW. TC: KF5DE. OOC: KK5K. STM: KB5W. VHF/UHF COORD: N5DWU. Great meeting at Tupelo ARC and presentation of "Thank You" to XE1MMJ. Congrats to Jackson ARC on new repeater on 146.22/88 MHz; to Delta ARA on new repeater, 1000 feet at Invemess on 147.78/18 MHz. Congrats to FOLG upgrades: KB5DTR to Tech; N5JGK to Gen. K5KR announces his candidacy for Delta Div. Dir. DRN5 (WB5YDD) represented 98% by N5AMK. Sessions 62, QTC 654. Miss. represented by K1SZ, W5HKW, KB5W, WB7COQ, KE5EC. Miss/Lou/Emerg/Net (WD5O) sessions 5, QNI 128, QTC 1.

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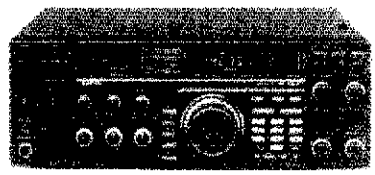

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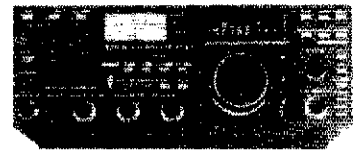

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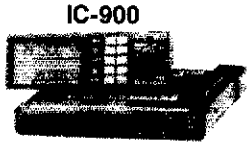

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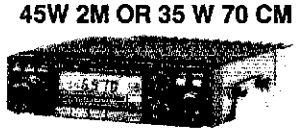

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Lauderdale County ARES (WD5HLD) sessions 4, QNI 81, QTC 1. 30 ARES members. Mag/Sec/Net (NS5M) sessions 31, QNI 465, QTC 9. NE Miss FM Net (NS5M) sessions 31, QNI 217, QTC 5. ARRL Info Net (KK5Z) sessions 4, QNI 59. Miss/Slo/Net (W5YRX) sessions 18, QNI 53, QTC 15. MSBN (KF5DE) sessions 31, QNI 59, QTC 1547. GCSNB (W5JHS) sessions 31, QNI 16, QTC 1186. Traffic: KT5Z 94, WQ5H 208, N5AMK 320, WB7CQQ 18, KB5W 343,. PSHR (N5AMK) 1-30, 2-30, 3-12, 4-12, 5-12, 6-1, Total of 97 points.

TENNESSEE: SM, John C. Brown, NO4Q—ASM: WA4GLS. ACC: WA4GLS. OO/AA: W9FZW. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. STC: W4HHK. This report is being prepared by WA4GLS because NO4Q is ill, hope and trust that he will be fully recovered long before you read this. Sure glad to report that Packet Radio is getting off the ground in middle Tennessee. I would like to remind all clubs to make your annual report in order to remain affiliated and also your club must update its plans and activities in order to maintain Special Service Club status. Now that all the Hamfests have been successfully completed, get your rigs tuned up and enjoy a season of on-the-air rag chewing and DX. The traffic activity for the section was as follows: LP sessions-72, QNI 4001, QTC 56; VHF sessions-68, QNI 2878, QTC 601; CW sessions-38, QNI 196, QTC 63. CW Net Honor Roll for period: N4OZB, W4LVP, NN4D and NG4J. Individual station activity for the period was as follows: W9FZW 144, WA4FMR 123, K4WWQ 60, KA5KDB 48, W4DDK 37, NN4S 25, W4PFP 19, W4TYV 15, W4PSN 8, KB4UQ 7.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thames, WM4T—AUGUST REPORT: SEC: WB4NHO. STM: KA4MTX. PIO: WA4SWF, WD4CPQ is a new Technical Coordinator, Joe Rice, W4RHZ, has obtained 5 Band WAS after several years of effort. If you would like a net roster for MKPN, contact WD4RWV. Many people have given me and the SEC their suggestions for a Kentucky Emergency Response Plan. Your comments are appreciated, and many will be incorporated in the plan. Contest season and cold weather is approaching, so get those antenna projects finished now!

NET	QNI	QTC	SESS	MGR
MKPN	1216	129	31	WD4RWU
KTN	617	44	31	WB4LBO
KNTN	214	53	41	KB4OZ
KYN	300	119	62	K4AVX/KZ8Q
KYPON	69	14	5	WA4AVV

Station Activity Reports (August): K4VHF 140, WD4RWU 105, KI4OH 54, KC4WN 51, K4AVX 44, WA4SWF 41, WB4LBG 35, N4PEK 26, WA4AVV 16, KA4MTX 8, WD4CQF 8. PSHR: KI4QH 74 and KC4WN 61.

MICHIGAN: SM, James R. Seeley, WB8MTD—The ARRL Division/State Convention in Saginaw has to be counted a success. It was my "first time out" in many months and was very worthwhile and enjoyable trip. Thanks to the committee and the whole 5-county gang for a job well done. I have taken a step in what I sincerely feel is good direction to begin making order out of the somewhat chaotic packet situation in MI by appointing Ed Galipeau, WA1LRL, as ASM for packet technical coordination. Ed has been at the front of the packet wave since the beginning and has a wealth of expertise to contribute. He will continue as DEC for SE MI. SEC (and former ASM-thanks again, George) WB8BGY announces seven new EC appointments, listed here by county: Benzie, WB8ITI; Huron, KA8PZP; Kalkaska, NX8S; Manistee, WB8DRM; Oceana, WB8CCS; Ottawa, WD8BXP; and Wexford, WB8WIV. Retiring Ottawa EC, WD8BZF, deserves special mention for his 14 years of continuous and excellent service in that appointment. The end of an era. Well done, Ed! Have you gotten involved with the new MI ARPSC net? Its forerunner, the MI ARES net, was for its many years of operation one of the most effective and useful of HF public service nets anywhere. The new net follows the same general format, expanded to include ALL aspects of public service and emergency operating and to provide a weekly gathering place where section leadership people are available. Featured are on-the-air mini-forums on topics such as emergency power, emergency antennas, message form, net procedures, etc. All amateurs with an interest in any aspect of public service/emergency radio are welcome and encouraged to participate. 5:00 PM local time every Sunday, 3932 kHz, which is still designated as the MI HF emergency frequency. The day and frequency are the same as the old ARES net, with the starting time 1/2 hour earlier. EC/DEC reports (AUG.): N8AKZ, N8ASB, N8AYQ, N8BBY, W8CUP, N8DKM, WB8DRM, W8ECK, WA8EFK, WA1ELA, N8EQD, WA1LRL, WD8JCN, WD8JJM, W8LCU, KA8PZP, WD8QPG, KA8SFQ, KZ8V, WB8WJV, NK8X, KD8YX. Traffic: KA8CP5 318, WB8YDZ 127, WD8RHU 82, WD8KQC 72, K8GXV 68, W8QHB 68, NJ8S 64, WA8DHB 47, W7LVB 43, WD8MJB 42, WB8MTD 38, AF8V 36, W8YIQ 31, K8OCP 28, N8CNY 27, W8IHX 25, K8UPE 24, KI8Q 21, K8ZJU 19, W8EOI 18, WB8BGY 17, N8HWL 17, WB8SYA 17, NJ8X 14, W8VIZ 10, WA8MVH 9, WB8ITT 8, W8YZ 8, K8HAP 5, W8URM 5, N8AYQ 2.

OHIO: SM, Jeffrey A. Maass, K8ND— ASM: N8AUH. SEC: WD8MPV. STM: KF8J. BM: W8ZM. ACC: KJ3O. TC: KB8MU. OOC: AD8I. SGL: N8CVK.

NET	QNI	QTC	SESS	TIME	FREQ	MGR
BN(E)				1845	3.577	N8EVC
BN(L)	188	117	31	2200	3.577	K8TVG
BNR	221	72	31	1800	3.605	W8EK
BSSN	300	191	61	0945,1900	3.873	KD8FW
ONN	129	30	31	1825	3.708	WD8KBW
OSN	292	103	31	1810	3.577	N8AEH
OSSBN	2140	917	93	1030,1815 & 1830	3.9725	WB8JGW
				0645M-F	3.577	KA8GJV
OSSN	162	94	31	0900S-SN	3.577	KA8GJV
OHIO SECTION ARES NET				1500SUN	3.875	WD8MPV.

Ohio hamfests in November: Massillon Auctionfest, 11/22. VE exam sessions for November and December (plan ahead!): Columbus 11/14; Maumee 11/14; Elyria 11/14; Canton 11/28; Columbus 12/5; Dayton 12/5; Portsmouth 12/5; Maumee 12/12; Mentor 12/12; North Olmstead 12/12; Zanesville 12/12; Elyria 12/13; Ravenna 12/26. Contact me for details. I am now assembling my 1988 Hamfest schedule, which I distribute at hamfests and club meetings throughout the year. If I am to avoid making errors, those of you who are hosting hamfests in the coming year must pass along accurate information to me ASAP. This will also help to avoid the unfortunate scheduling of two events on the same date (as with the Goodyear and Cleveland hamfests this year.) Pick your date early! During the Ohio State Fair in Columbus, Amateur Radio was represented by station W8TO, which demonstrated our hobby and originated radiogram greetings for the Fair's visitors. Sponsored by the Columbus ARA, supported with loans of equipment by Universal Amateur Radio, and coordinated by N8FFK (with heavy assist by W8BKO), the exibit originated 983 radiograms, all but 12 sent on packet! Are you doing your part at your local County Fair? On the evening of August 12, the Central Ohio ARES was alerted to an overturned tanker truck carrying liquid hydrogen (!). The truck, located at the intersection of I-70 and I-71, was leaking vapor. A large area was evacuated to shelters, although most of the area was comprised of downtown neighborhoods (businesses). Although the truck did not ignite, COARES deployed to its

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That's right! Now all Kantronics packet units* include the Personal Packet Mailbox™, come with 32K RAM, and are TCP/IP Networking compatible — ALL AT NO EXTRA CHARGE. And there's more . . .

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At Kantronics we're committed to keeping you current. Check below and see — we offer more features and the best customer support around.

KPC-2™ This low cost/high performance Kantronics TNC features a built-in HF/VHF modem, the Personal Packet Mailbox, full duplex operation, and multiple connect capability. The serial RS-232/TTL port allows easy interfacing with all computers, even Commodores. KPC-2 is TCP/IP Networking compatible, includes 32K RAM, and uses only five front panel indicators for easy operation. Like all Kantronics units, KPC-2 is fully compatible with existing TNCs.

KAM™ KAM is the fully programmable All Mode unit that lets you operate VHF Packet, HF Packet, CW/RTTY/ASCII/ and AMTOR. But that's not all . . .

Only KAM's dual VHF/HF radio ports work together for simultaneous Connects, Digipeating, and VHF/HF GATEWAY operations. And now KAM is TCP/IP Networking compatible, comes with 32K RAM, and has the Personal Packet Mailbox ALL STANDARD.

KAM includes watchdog timers on each port, an RS-232/TTL serial port, and a bargraph tuning indicator for HF operation. KAM even comes with an external modem connection point for optional 2400 b/s packet operation. For the greatest degree of sensitivity and flexibility, turn to KAM, Kantronics All Mode.

KPC-4™ Only KPC-4 features simultaneous Connects, Digipeating, and Gateway functions on two fully functional VHF radio ports — each of which includes a watchdog timer. What's more — you can add 2400 b/s operation to port 2 with Kantronics optional 2400 Modem™.

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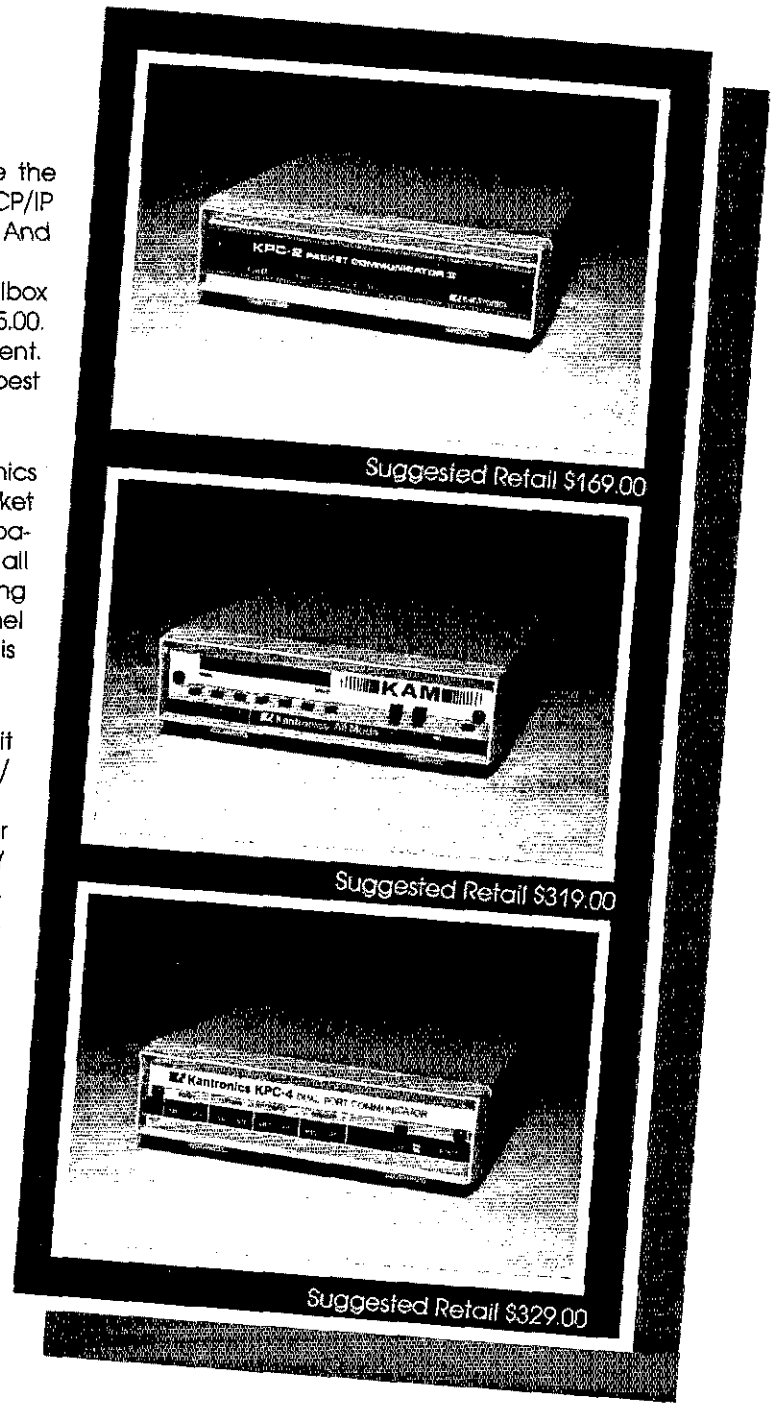

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* KAM, KPC-2, KPC-4, and KPC-2400 units shipped 7-31-87 or later.
** KPC-1 (Packet Communicator), KPC-2, KPC-4, KPC-2400

served agencies smoothly and professionally, and was ready to do the job if the worst happened. Good job! Belated recognition to N8XX and his crew of operators for their traffic-handling efforts during the 1987 Tour of the Scioto River Valley (TOSRV) in May. They originated Mothers' Day radiograms for 133 bicyclists from rest stops along the 210-mile ride. With SNAFU-like delays by me, their BPL certificates have finally been sent! K8LMN reports that the Reservoir ARA (Mercer and Auglaize Counties), an ARRL Special Service Club, has been providing communications for an incredible number of events! The Portage County ARES provided communications at a chemical fire on August 2 in Kent. The Mad River Radio Club Christmas Bash for contesters will be held January 2 at the new QTH of K8MR. DARA's newsletter has begun listing area Amateurs who offer their services (repairing radios, helping with antenna or tower projects, etc.): an excellent idea! The 1986-87 Ohio Single Sideband Net (OSSBN) Merit Award was presented to Jack, KA8CGF, at the Findlay Hamfest. The presentation honors were done by last year's winner, W8QZK. *Congratulations!* The *Amateur Radio stations* listed below have reported handling radiogram traffic during the month of August 1987: W8TO 983, KV8Q 601, WB8JGW 516, N8IBS 459, WA8EYQ 331, WD8KFN 277, K8TVG 249, W8PMJ 247, W8SKP 211, W8BO 206, KD8HB 194, K8DHD 193, KD8KU 184, W8ZOL 183, N8AKS 160, K8JDI 155, W8QZK 141, WD8QXT 138, K8OZ 129, KF8J 122, N8GEC 117, K8ND 116, K8IOW 102, KA8GJV 100, WD8IKC 100, KD8FW 98, W8EK 90, K8CMR 87, WB8KWC 87, N8EFB 78, W8FPA 71, WD8RIB 68, KD9KR 66, KA8CGF 64, NF8B 62, KE8CV 53, WB8BWY 52, WD8KBW 48, WD8MPV 48, N8FWA 46, N8CJS 45, N8AEH 44, N8GTU 44, WA8SSI 43, WA8HGH 39, KD8XL 39, WA8HED 38, K8ES 34, K8EF 33, KC8YV 32, K8CKY 30, KA8SOM 24, KC8UZ 24, K8LQM 22, WA8DYS 21, WB3LHI 20, KA8TNT 20, N8HRW 19, KJ3Q 19, KA8RIX 19, KA8DRR 18, KC8WH 18, WB8HHZ 17, WD8JYE 17, N8GOB 15, W8JLW 15, NW8E 14, KC8JV 14, W8UQV 14, KA8OQF 13, KD8WI 13, K8VDY 12, WB8KWD 10, WD8ATN 9, N8IIP 9, KA8YIT 9, KA8ZOW 9, K8ALV 8, WB8AWM 8, K8DXZ 8, WB8YFD 8, W8BHL 7, KA8CBO 7, W8GDQ 7, WD8JAW 7, W9SWM 7, N8CDN 6, WD8CSP 6, NC8Q 6, W8ZM 6, N8CW 5, N8GIO 5, N8HBF 5, W8IQ 5, KZ8P 5, WD8PWG 5, WD8DKQ 3, N8FBE 3, N8HJL 3, WB8OFR 3, N8CB 2, KE8CL 2, WB8GDM 2, NU8I 2, K8EEN 1, K1LT 1, KA8VYT 1, K2RJ 0. (Aug.) W8PMJ 186.

HUDSON DIVISION

EASTERN NEW YORK: *SM, Paul S. Vydareny, WB2VUK—*ASM & STM: K2ZM. SEC: WA2ZYM. BM: WB2IXR. PIO: KB2TM. TC & OO/RFI: KC2ZO. ATC: WA2VGM. SGL: KB2HQ. NWSNL ED: WB2NHC. NET REPORTS(QNI/QSP): AESN 45/5 CDN 488/69 ESS 285/55 HVN 432/84 NYPON *557/252 NYS/E 390/243 NYS/L 427/243 NYS/M 310/175 SDN* 207/56. CLUB NEWS: WA2DHF, Hudson Division Director talked on the latest happenings in Amateur Radio at the Albany ARA. They report K2HUG as Silent Key. Communications Club of New Rochelle enjoyed a successful Field Day. The *Overlook Mtn ARC reports that due to the efforts of Ulster RACES* and SKYWARN Ulster County recently received an achievement award for Outstanding Public Service. W2KN presented a program on Ham Radio operation on the Isle of Man to the Westchester ARA. WECA discussed bylaws revisions. Please *send any information on what your club is doing or your* newsletter to me by the 8th of the month. Any information not received by that date will not appear in the column due to deadlines which must be met by HQ. I would like to take this opportunity to thank all the members of the staff of ENY for their untiring efforts. Their help is greatly appreciated. Also, I would like to thank all those who contribute in any way, traffic nets, public service activities, other club activities, volunteer examiners, those who teach courses, etc. It is through your efforts that amateur radio will grow. A Very BIG thank You! Don't forget to volunteer your services to your club for public service activities. Also, net managers can always use more help to handle upcoming holiday traffic! AUG PSHR N2HIF WB2VUK WA2JBO NQ2H KA2MYJ K2ZVI K2ZM AUG. Traffic: N2HIF 191, WB2VUK 178, WA2JBO 115, NQ2H 93, K2ZM 88, K2LYE 87, K2ZVI 58, KA2MYJ 43, KA2TQW 29, N2FTR 26, WA2YBM 24, W2CJO 8.

NEW YORK CITY-LONG ISLAND: SM, Walter Wenzel, *KA2RGI—ASM: K2IZ. ASM VE: W2NL. ACC: KA2WIJ. SEC:* KA2LAD. QOC: NB2T. TC/RFI: WA2YNM. STM: K2MT. PIO: N2GQR. The following are traffic nets in and around the section:

NCVHF	146.745/R	1930 M-F	K2MPG, mgr
SCVHF	*145.37D/R*	*2000 M-F, Sun*	KA2JMA
BAVHF	145.350/R	2000 DAILY	K2YQK
NYPON	3913 kHz	1700 DAILY	KA2IBD
NYS/M	3677 kHz	1000 DAILY	N2EIA
NYS/E	3677 kHz	1900 DAILY	KU2N
NYS/L	*3677 kHz*	*2200 DAILY*	KU2N
ESS*	3590 kHz	1800 DAILY	W2WSS
NLT	28450 kHz	2100 Wed	KB2BKE
BBS	145.010 Packet Node Station AI2Q		

*Independent Net, recognized by NTS, all times are local, *please note that AI2Q is the Packet Node Station and that all* incoming NTS traffic should be routed through him. Please note the new "NLT" net, short for "NYCLI Ten Meter Net," it meets every Wed. at 2100 local and STM K2MT invites everyone to try checking in. Novices please note you are now eligible to operate in this portion of the band, so why not give it a try. On behalf of our SM, Walter, his wife and family and my wife and family, we wish everyone a very happy Thanksgiving. Hudson Div. Director WA2DHF was a guest speaker at the Aug meeting of Metroplex. It is with deep regret that we list Ron Miller, N2DO, as a Silent Key. Radio Central will hold their "Ham Expo 87" on Sunday Nov. 8 at the Suffolk Community College in Selden, for further info please contact Andy Feldman, WB2FXN. LIMARC will continue to conduct exam sessions on the second Saturday of the month at the NY Inst. of Technology, Rt. 25A, Old Westbury, in Salten Hall, Rm 2, applicants are reminded to bring 2 forms of ID, original and copy of their FCC license, check for $4.50 made payable to ARRL/VEC, pens/pencils, and a calculator for the math questions. For further info please contact Joe Kolb, W2NL. Grumman ARC will be conducting exams on the first Wed. of the month. For further info, please contact Howard W2QUV at 516-354-6861. Suffolk County ARC is also conducting exams at Suffolk Community College, the 2nd Saturday of the month. For further info, call George, WA2VNV at 516-751-0894. Traffic (Aug): N2AKZ 152, W2LWB 144, N2AMV 132, K2YQK 118, K2MT 95, WB2EUF 77, NB2D 65, N2GPA 49, KB2BKE 45, W2GKZ 42, K2MPG 40, N2GQS 37, N2HLZ 31, KA2RGI 30, N2ETO 25, KA2JMA 22, K2TWZ 21, KA2UIU 21, N1GNQ 6, KB2AKY 2.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM (VE Liaison): N2XJ. ASM (FO Info): NW2L. SEC: N2BMN. STM: KA2F. OO/AAC: KA2BZS. AAC: KY2S. SGL: W2KB. TC: K2BLA. *BM: N2CXX and PIO: WB2NQV (PH* 735-8550). Appointment endorsements for the next two-year term starting 11/87 follows: ATC W2JCI and WA2CWA. EC KB2QO OBS WA2CWA. One new appointment effective 9/87 is OES NW2L. OBS W2FMN a 100 wpm RTTY MSO at Wyckoff operating on 144.99 MHz has reported experiencing interference from packet stations. This is a similiar problem to the now familiar situation of 1 MHz split FM repeaters vs

FM simplex channels. Although other parts of the country have more recently designated certain band segments for specific uses, we here in the NY metropolitan area have made these decisions a long time ago. In the case of RTTY, to solve a long standing FM voice channel interference problem TSARC the recognized frequency coordinating body for our area, moved the RTTY MSO operating frequency from 147.51 MHz to 144.99 MHz. This is in the segment of the band for "digital" communications including both RTTY and Packet. At this time Packet starts at 145.01 MHz thru 145.09 MHz. Please, let's not start another war! Congratulations to the following who were newly licensed or upgraded during August sessions conducted by: NNJ VE Board, and Old Bridge ARA. Technician: KB2DDM, KB2DKU, KB2EEJ, KB2EER, A. Nordgren and G. Martinock. General: KB2DKW, N2HIB and N2HFZ. Extra: N2HIC, DJ6OV and R. Volk. From our STM, KA2F, "August 1987 Traffic Net statistics have been omitted this month and will appear in this column next month. Henceforth, the additional month delay will alleviate pressures of end-of-the-month deadlines." With the start of this procedure, the publication delay changes from 2 to 3 months. This is not a desirable situation. It seems to me that in this age of the modern communications technique ORSs and NMs should be able to forward their reports in a timely manner that is acceptable to the STM without creating unacceptable deadline pressures. Give this problem some thought, then if appropriate let the STM know how it can be resolved to allow him to return to the 2-month delay schedule. Traffic Nets: /P indicates VHF Packet Liaison.

NET	MGR	FREQ	TIME	SESS	SES QSP QNI
NJM	WB2ZJF	3695	1000	DY	AUGUST 1987
NJPN	W2CC	3950	1800	DY	TRAFFIC NET
NJN/E	KA2F	3695	1900	DY/P	STATISTICS
NJN/L	WA2EPI	3695	2500	DY/P	WILL APPEAR
OBTTN	K2SC	147.12	2000	DY	HERE IN THE
TCETN	WD2AHD	146.685	2030	DY	DECEMBER 1987
NJVN/E	WB2FTX	146.895	1930	DY/P	ISSUE.
NJVN/L	WB2ANK	146.49	2230	DY/P	PLEASE SEE
NJTTTN	WA2EPI	223.88	2100	DY	EXPLANATION
NJSN	WB2PKG	3735	1830	DY	ABOVE.
NNJ/PL	W2QNL	145.01	24HR	VIA	WA2SNA-1.

SAR/PSHR for August will be included next month.

MIDWEST DIVISION

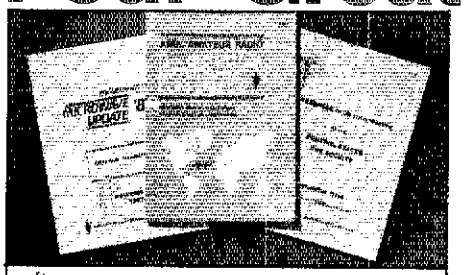
IOWA: SM, Wade Walstrom, WØEJ; ASM, WBØAVW; SEC, KDØBG; STM, KCØXL; ACC, NUØP; OOC, WAØQMU; BM, KØIIR; TC, KØDAS; PIO, NØBDF; Congratulations to those who upgraded to Technician class at the recent exams at Humboldt: KAØZOZ, KA5TQE, KBØBAC, KAØYVV. Exams for all classes of amateur licenses will be given in Ames at 9:30 AM on December 12. Walk-ins are welcome. Contact KCØRX. New calls in the section include NYØU and NYØV. NXØW is sporting a new tower and tribander. The State of Iowa has replaced about 150 terminals used by law enforcement agencies in the state and has given the replaced equipment to the amateur community for ARES use. These units are well suited for packet radio applications. KDØBG has been coordinating the transfer of this equipment to the local ECs. Linn County ARES recently completed a local disaster preparedness exercise with other Civil Defense agencies. WAØRJT-1 Packet BBS had a traffic count of 24 in August. NØGIK is a welcome new Packet BBS on in the Quad Cities. See you all in the November Sweepstakes! IA 75 M Noon Net: QNI 1255, QTC 51, 27 sessions; IA 75 M Eve. Net: QNI 874, QTC 54, 27 sessions; TLCN: QNI 249, QTC 145 in 62 sessions; West Central IA ARES Net: QNI 286, QTC 0, 20 sessions Traffic: WØSS 264, KØGP 119, W4JL 117, KAØADF 98, WØYLS 93, KØIPT 64, WBØAVW 57, KAØGSA 26, WBØMCX 12, WØBW 10, KØBRE 8, KAØVBA 6, KCØKZ 6. (July) KCØKZ 28.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: WØCHJ. STM: WØOYH. ACC: KØBXF. TC: WBØNQM. BM: KØJDD. SGL: NØBLD. Net Mgrs: CW- WBØZEN. Voice-WØFRC. RTTY-KAØCUF. Slow Speed CW-WØMYM. WX Net- WAØHOZ. DECs WØOAG, WØEB and WBØYJT. Hopefully by next month's report, all clubs will have communicated with your SM and the addition of new DECs will be made official. Net results for July follow: KSBN 764/593. CSTN 1828/52. QKS 229/72 and QKS-SS QNI 22 QTC 7. Lack of activity on RTTY resulted in no report this month. Sorry to hear of WAØTJU and WBØSEE having to do a short stay in the hospital the last of July and first part of August. I am happy to report that most roads leading into KCKs are under construction as they are in your area, no doubt. Looking forward to winter hours and less work here. WØOYH is publishing a short bulletin each month for those who are active in the CW net. I am sure he would send you a copy for a few cents postage, if you are interested. KØEOH, WBØQYA and KAØRID suffered wind damage to antenna systems recently. Last but not least, another Silent Key from Wichita—WØGML—licensed for 65 years. First call was 9CCZ. Traffic (July): WØFRC 206, KSØU 161, WØFIR 150, NØGZT 120, WØOYH 74, KØBXF 68, WAØHOZ 68, WØFDJ 64, WØQMT 61, NBØZ 46, WBØZEN 44, NØDJT 35, WØCHJ 27, WØMYM 20, KXØI 11, WØRBO 9, NØBDG 7, WØPB 6.

MISSOURI: SM, Ben Smith, KØPCK—STM: KØSI, SEC: K9OCU. BM: WBØTEG. ACC/PIO: KT5Y. SGL: KDØUD, OO Coordinator: WBØRHK and RFI/Tech Coordinator K4CHS. Since Fall and Winter seasons are now here, perhaps this would be a good time to go to the shack and fire up the rig or put to use, if they will work, some of the things you bought at hamfests this past summer. There must be a lot of HF rigs that could use some work, because quite often I hear someone on VHF say, "I don't remember when I made a contact on HF." The Missouri Section has several Section Nets that need representation from more parts of the state. The Section Nets are a good place to meet amateurs around the state, handle some traffic, get your CW speed up if you check in on the CW nets. Just about every community has some type of local VHF Net and also many Ten Meter Nets. The more participation the more enjoyable it is for everyone. Those that have RTTY capabilities will find a net every Saturday morning at 8:00 AM on 3.63 MHz. Don't forget your local club meetings; they need the support of every amateur in the community. If it had not been for the Novice classes given by the local clubs, a lot of people would never have a ham ticket. So take part in club activities to show your appreciation for being on the air. There is a lack of club news in this column this month because I did not receive any. Send me reports on what projects your club is doing, and it will soon be officer-election time. Let me know who has been elected. Nets reporting:

NET	SES	QNI	QTC	DAY	TIME PM	FREQ MHz	MGR
MOSSB	31	673	182	Dly	6:00	3.963	KØCRB
MON	82	262	114	Dly	7:00/9:45	3.585	KØSI
MEOW	31	541	84	Dly	5:30	3.963	K9DSQ
HBN	21	228	18	M-F	12:05	3.880	KØDSQ
PHD	5	151	11	Mon	9:00	146.43	WAØKUH
RRABN	29	393	10	Dly	8:00	146.19/79	KAØLLN
ZAEN	4	54	8	Tue	8:00	147.84/24	NØBE
SLAN	5	339	7	Mon	8:00	146.31/91	KØWEX
MOFON	4	18	3	Wed	8:15	222.42/4.02	AIØO
OMEN	5	60	3	Wed	9:00	146.16/76	KØPCK
ARESN	4	46	1	Thu	9:00	147.855/255	NØFQW

Four Great Conferences



Mid-Atlantic VHF Conference

Packet Radio Enthusiasts meet in California. VHF/UHF and Microwave Enthusiasts gather in Texas, Colorado and Pennsylvania

Anyone who says that experimentation and building equipment by radio amateurs is a lost art should take a long hard look at these proceedings books! They are available from many dealers or directly from ARRL for $10 each. Please include $2.50 ($3.50 for UPS) to cover shipping and handling of each order. Papers submitted are in camera-ready form, are unedited and are solely the responsibility of the authors.

The VHF Society Proceedings and Proceedings of Microwave Update '87 complement each other quite well. While still offering a wealth of construction material, the former book contains a great deal of material on propagation and EME. The latter is devoted to interesting construction projects for 902, 1296, 2304, 3456 and 5760 MHz.

Even though you can buy a computer at the local discount store and a TNC from your ham radio dealer, packet radio is just in its infancy. There are still many things to be resolved and even more technological advances to be made. Where is digital communication headed? The ARRL Amateur Radio 6th Computer Networking Conference helps to answer these questions.

6th Computer Networking Conference

This conference was held in Redondo Beach, California on August 29, 1987 and the following papers appear in the proceedings book: Estelle: Formal Description Technique for Communication Protocols, VE2BPM; OSI: A Plan Comes Together, W2VY and N2DSY; A High Performance Packet Switch, WB6HHV, N6NKF and KA6IQA; The KISS TNC: A Simple Host-to-TNC Communications Protocol, K3MC and KA9Q; Digital Signaling Processing and Amateur Radio, W3IWI and N4HY; A Duplex Packet Radio Repeater Approach to Layer One Efficiency, N6CXB and N6BGW; Packet Radio Developments over the Last Year, WB4JFI; Thoughts on the Issues of Address Resolution and Routing in Amateur Packet Radio TCP/IP Networks, N3EUA; The Design of a Mail System for the KA9Q Internet Protocol, N3EUA and PAØGRI; A Bit Error Rate Tester for Testing Digital Links, K9NG; A 56 Kilobaud RF Modem, WA4DSY; Reusable IP Addresses in a Dynamic Network, N3CVL; Software Design Issues for the PS-186 Advanced Packet Network Controller, WB6CYT; Another Look at Authentication, KA9Q; A High Performance, Collision-Free Packet Radio Network, KA9Q; The KA9Q Internet (TCP/IP) Package: A Progress Report, KA9Q; Approach for Digital Transmission of Pictures, DL2MDE; RUDAK - The Packet Radio Experiment On-Board OSCAR P3C, DK1YQ; Improving Shared Channel Access Techniques for Amateur Packet Radio, WB6RQN; The Noise Performance of Several Data Demodulators, LU4DXT; Overview of the TEXNET datagram protocol, N5EG; CSMA Multihop Networks: Throughput Analysis, N4HY; DSP Modems: It's Only Software, N4HY; HF Packet: Where do we go from here?, VE3JF; FINDER—The Family Information Database for Emergency Responses, WN6I and N6MWD and N6KL; Dial "O" for Operator: Message Routing in the Amateur Packet Network, W2VY; Packet Radio and IP for the Unix Operating System, NIDMM; Pacgram Messaging Protocol for Packet Networks, WB8TKL; Performance Monitoring or I Wanna Fix it, Is it Broke?, WB6YMH and NK6K; ASC X12.A-1985: Draft Proposed American National Standard for Electronic Business Data Interchange Amateur Radio Message Transaction Set, NC4E; Design Abstractions for Protocol Software, VK3BLY.

Proceedings of the 21st Conference of the Central States VHF Society

On July 23 through 26 VHF/UHF and Micro-wave enthusiasts from across the country met in Arlington, Texas. Covered in the proceedings book are the following: Report of the 20th Central States VHF Conference, W3XO; A Brief History of the Central States VHF Society, W3XO; 2 GHz to 6 GHz Power Amplifiers, WØPW; Insulated Element Length Disturbances and Possible Correction factors for Yagi VHF/UHF Antennas, KF4JU; The Thanksgiving Tropo Opening of 1986, NOØY; How to Get Started in VHF (VHF: A New Beginning), K5YY; A No-Tuning Crystal Controlled Microwave Local Oscillator, KK7B; Inexpensive Microwave Frequency and Power Measurements, K5BYS; Meteor Scatter Propagation, W9IP/2; Amateur Radio Satellite Operation for the VHF/UHF Amateur, W5IU; Use of Small TVRO Dishes for EME, VE4MA; Building Epuipment for 3456 and 5760 MHz, KØRZ; AA5C 432 MHz Transverter, AA5C; VHF Amplifier Design and Construction, KXØO; Microwave DXing: An Introduction to Long-DistaNce UHF and Microwave Propagation, W3EP; Orbital Mechanics of the Moon, W9IP/2; Lifeline in the Wilderness, KL7WE; Smith Chart, Part 2: The Scalar Approxmiation, N6TX; GaAsFET Mixers for 5.7 GHz W7CNK; 3456 MHz IMFET Amplifier, WB5LUA and WA5TNY; Microwave Antenna Ranges, WA5VJB; Gunnplexer Tips, WA5VJB; Mounting MMICs, WA5VJB; Horn Gain: A Computer Program, WA5VJB and K5SXK; Construction of the DJ9HO Stacked Twin-Eight Array for the 23 cm Band, WA6KOU; More on Stacking, or Why 50 MHz is different. N7BSN. A Solid State Power Amplifier for 5.7 GHz, WA5TNY; Microwave EME Experiments, Spring 1987, KD5RO.

Microwave Update '87

Estes Park, Colorado was the location of this popular conference which was held on September 10-13, 1987. These papers are published in these conference proceedings: What's New in MMICs?, WB5LUA; 9 and 13 cm Transverters, KK7B; A 3.3 GHz Signal Source with +10 dBm Output, WØPW; Modifying the UPX-6 Cavities for 902 MHz, VE3CRU; Microstrip Bandpass Filters, WA8NLC; G Lines for 1296, 2304 and Above, W4OJK; 10 GHz Noise Source, WA5VJB; Building Equipment for 3456 and 5760 MHz, KØRZ; Another 3456 MHz Transverter, KØKE; 2 GHz to 6 GHz Power Amplifiers, WØPW; Phase Lock Source Update, KØKE; A 2160 MHz Local Oscillator, WB5LUA; Tuning of Microwave Stripline Amplifiers, KØKE; 2304 MHz Amplifier Using 7289 or Similar Tube, VE4MA; Antenna Ideas for 3.5, 5.8 and 10.4 GHz, WØPW; A 6 cm Waveguide to N Connector Transition, WØPW; The "First" 3456 MHz Long Yagi?, KØKE.

Mid-Atlantic VHF Conference

Sponsored by the Pack Rats ARC, this conference was held in Warrington, PA on Oct. 10 and 11. Papers include: VHF Mountain Topping, W1XX; SHF Receivers, WA2GFP; Transceivers for the 3400 and 5600 MHz Bands, WA3JUF and WA3AXV; Two 7289s on 903 MHz, W1RIL; VHF/UHF GaAs FET Preamplifier Update, W1JR; A 404-MHz Local Oscillator, WB3JYO; The Diplexer Filter: A method for Enhancing Double Balanced Mixer Performance, WB3JYO; RF Man's 903 MHz Transverter, and 903 MHz UT-141 Filter, WA3AXV; Microwave Building Blocks, WA3JUF.

LOZBC	26	426	0	Mon-Sat	8:00 AM	146.13/73	N8HVO
SWARC	4	195	0	Tue	7:00	146.31/91	KD0UD
LOZFM	4	83	0	Fri	9:00	146.13/73	N8HVO
KARES	5	57	0	Sat	9:00 AM	146.37/97	K0UAA
JCCCN	5	57	0	Wed	8:00	146.40/7.00	W0ORI
SARN	4	52	0	Tue	9:00	146.43/7.03	W0ENW
TCN	4	44	0	Thu	9:00	147.09/69	NZ0F
PHDTEN	4	41	0	Mon	8:00	28.43	AJ0Z
MCARES	4	29	0	Thu	8:30	146.205/805	WB0ELJ
CMOYL	5	24	0	Mon	8:00	147.285/855	N8HVO
CARL	3	13	0	Wed	8:30	146.46	WB0WLU

Traffic: K0SI 225, AI0O 109, NQ0G 101, KC0AS 82, K0PCK 81, K0ORB 78, WA0VJX 75, WA0HTN 60, W0OUD 45, K9OCU 49, WD0ELL 31, ND0N 26, K2ONP 22, KT5Y 21, KD0AJ 9, K0UUA 3.

NEBRASKA: SM, Vern Wirka, WB0GQM—STM: Jerry Kohn, WD0EGK. SEC: Michael Ruhrdanz, N0FER. The Midway Amateur Radio Club of Kearney reports the formation of a new packet radio group in Nebraska. The new packet group is call "Mid-America Packet Association." SEC Michael Ruhrdanz, N0FER, reports packet radio was used for the first time in connection with recent disaster planning exercises at the two nuclear power plants in Nebraska. Packet radio was used to transmit messages between the Nebraska State Civil Defense office emergency operations center and the nuclear power plants located at Fort Calhoun and Brownville. Amateur Radio operators assisted Offutt Air Force Base Military Police with communications, once again this year, during the annual open house August 22 and 23. The first day of the open house drew an estimated crowd of 85,000 because of cool, wet weather but the second day was clear with the temperature in the mid 70s and a new single day attendance record was set with an estimated 300,000 persons passing through the gates of Offutt Military Police expressed appreciation for the additional communication capabilities to handle their duties. The Blue Valley Club reports very good attendance at a joint club picnic with the Buzzard's Roost Club. Plans have already been made for a another joint picnic for the two clubs at Genoa, Nebraska, August 14, 1988. Traffic: K0DKM 424, KA0BCB 47, KA0KPT 44, WD0EGK 26, W0KBS 17, WA0BOK 17, WB0GMQ 8, WB0GQM 8, KA0TDR 5, KL7XW 4, NO0A 3, W0NIK 2, WD0CRD 1.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KZ1Z—ASM: KB1H. STM: K1EIC. SEC: N1DCS. OOC: NA1I. ACC: NK1J. PIO: WA1CMF. TC: W1HAD. SGL: K1AH.

NET	NM	SESS	QTC	QNI
CN	K1EIR	54	150	201
CPN	NK1J	31	90	280
WCN	WB1GXZ	31	140	367
CSN	WB1GXZ	21	32	128
RTN	KA1JAN	31	48	200
10M RC		5	150	201

Greetings and a Happy Thanksgiving to all. Congratulations to all those who participated in the recent SET. A new rptr is up and running from West Peak in Meriden 224.80 out/223.20 in, sponsored by Southington ARA. Packeteers please note that CT Section News is available from many area BBSs. If your BBS doesn't carry it, have the sysop contact ASM KB1H for details. The current stations carrying Section News Activities include: NE1U-4, W1AW-4, K1CE, W1OPS-4, K1TKP-3, KA1LMN-1, N1CUI-4 with additional BBSs to be added soon. With the holiday season approaching, why not become involved in NTS? You can generate a variety of messages from not only yourself and friends, but also by contacting area nursing homes, public and private educational institutions, fraternal of social organizations. Congrats to ASM KB1H and his YL on the birth of their new harmonic. KA1ECL and KA1KP are both sporting new towers. KA1BB ops on the air with over 300 QSOs from Flat Hammock Rock Special Events station. KA4NME put on fine packet demo for the public at Ledyard Park. A hearty welcome to KY1T, who has recently moved into the section. He is an active and knowledgable ham whose presence in the section will be valued. Attention Club Program Chairpersons: Looking for program ideas? The Section Leadership officials, listed at the top of this column, are available for club speaking assignments. Contact them directly or NK1J for details. Members of GNARC are truly HAMs (Hot Air Mobiles) having provided communications for a hot air balloon race. 73, KZ1Z. Traffic: W1EFW 239, WB1GXZ 172, N1EDD 167, KA1GWE 153, N1DMV 109, NK1J 78, KY1F 58, W1YOL 49, NM1K 26, WA1NLD 20, W1BDN 16, KA1OCZ 11, KB1LO 8, K1AQE 5, WB2SGI 5, W1QV 4.

EASTERN MASSACHUSETTS: SM, Barry Porter, KB1PA—ASM: K9HI. STM: KW1U. ACC: KA1KCU. PIO: K1HLZ. BM: KB1AF. OO/AA: AG1F. SGL: K3HI. TC: KA1IU. EMass Hotline—437-0111. Westlink—449-2226.

NET	MGR	FREQ	TIME	DAY
EMRI	N1AJJ	3658	1900/2200	DY
EMRIPN	WA1FCD	3880	1730	DY
EM2MN	NK1Q	63/23	2000	DY
NEEPN	K1BZD	3945	0830	SUN
HHTN	NG1A	04/64	2230	DY
EMRISS	N1CVE	3715	1600/2030	DY
CITN	KB1AF	745/045	1930	DY

I would like to take this opportunity to thank Luck Hurder, KY1T, for all he has done for our section. His shoes are going to be a challenge to fill, but our loss is the ARRL's gain. His new job in Newington will be as Deputy Field Services Manager, where he will be responsible for the ARRL Public Service Activities and the OO Program among other jobs. I would also like to thank Bill Hanrahan for all the time he has devoted to getting OO/AA program on its feet. Increased work responsibilities forced Bill to give up the OO/AA coordinator's job. He will remain an OO and help out where he can. Al Hamilton, AG1F, a long time OO, will take his place. Welcome to Bill, KA1NOI as an Official Bulletin Station. He will be reading any important bulletins on the HHTN when he gets a break from his studies at the University of Lowell. I would like to thank all the members of the EMASS Field Organization, especially the staff, for the superb job they are all doing. I am looking forward to working with them. If there was an evacuation in your town and you were the only ham operator present, would you know what frequency to get on, and could you handle message traffic in the proper format? For training, check in to one of the traffic nets listed above or contact KW1U or KB1PA for info. Do you know what CD sector your town is in, and what frequency the local RACES net is on? Contact DECs W1REP or KW1P for RACES info. We need more local ECs and RACES operators so we can provide as wide an area of coverage as possible in a communications emergency. The slots for DEC of Norfolk County and Public Service DEC are open. If anyone is interested let me know. The plans for the Eastern Massachusetts SET are coming along. I hope to have a large group participate to show off our capabilities to the State CD, State Police and Red Cross. As you read this the Museum of Science weekend will be history. Bob Salow, WA1IDA, and his crew do a great job showing all the various aspects of our hobby to the science oriented public. KA1IU reports a quiet month. Now that summer is ending, we can give some of our attention to various radio projects. Mort and his group of technical wizards stand ready to give advice and

will try to answer any technical questions that come up. KB1AF reports that 433 Bulletins were transmitted during August, the majority (343) by local packet BBSs. The packet network keeps expanding. NetRom digis are springing up all over the place and TCP/IP nodes (on 144.91) are being developed. Is there a club planning to apply to the ARRL for the right to use the special 200 callsign during the Bicentennial of the week Massachusetts ratified the U.S. Constitution (February 6-12 1988)? If you are interested, let me know. Have you expressed your opinion to your Division Director or Section Manager lately? Traffic: KB1AF 471, KN1K 426, KW1U 419, WA1FCD 331, *WA1TBY 172, W1ZHC 172, KA1MDM 132, NK1Q 98,* KA1NOI 92, WA1FNM 82, KA1EID 74, *N1CVE 73,* K1ABO 69, W1CE 42, KA1LIH 37, K1SEC 29, KA1BBU 28, K1BZD 18, WA1KLG 13, K1LCQ 9, N1BHH 6, N1EGN 6, KA1AMR 5, WA1SNH 5, KA1EDY 4.

MAINE: SM, Cliff Laverty, W1RWG—ASM: Bill Mann, W1KX. SEC: KA8UVO. STM: WA2ERT. BM: W1JTH. ACC: KA1FKS. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: KQ1L. ASM/P: N1AAH. I regret to annnounce Minot, AK1W, has resigned as section traffic manager. He has served faithfully since Dec 1, 1981. I have accepted the application by Ted, WA2ERT, who has a long and active traffic handler record. Congrats *to Link Clifford upgrading from KA1ORD to N1FAX. Pen Bay* ARC provided comms for the first annual New Hope Bike Trek Aug 29-30. 15 bikers completed the 100 miles and raised $4500 for New Hope for Women local project. They rode through Port Clyde, St. George, Rockland, Camden, Lincolnville, Searsmont, Belmont, and Liberty. Edna Bennett, *K1VEB, directed comms with 17 other members. W1JTJH,* BM, reports transmission of 5 ARRL 2 Maine and 4 propagation bulletins for August by N1BUG, W1KX, W1VEH (packet) N1BCF, W1JTH. Pen Bay is sponsoring a radio class Camden/Rockport HS. The following hams responded to phone emergency due to a lightning strike causing a power failure in Farmington: W1RUZ, W1WXI, WB1DHU, KA1GZR, WA1JZP, K1YXO, KA1CYE, W1HTG covered the hospital nursing home ambulance svc and fire department with back-up comms. New officers for Yankee ARC include Rhea K1ERT, pres; Don W1ITU, vp; Bernie W1EZR, scy; Margaret KA1FTQ, treas. Traffic: AK1W 115, ND1A 67, WB1CBP 62, W1JTH 48, KA1JOJ 40, W1RWG 40, WA2ERT 35, KA1ODT 29, W1BMX 20, W1KX 20, WA1YNZ 16, NI1Y 12, NB2K 8, N1BJW 3.

NET	SESS	CHECNINS	TRAFFIC	MANAGER
SEA GULL	26	888	112	K1GUP
PINE TREE	31	296	82	ND1A
AROOSTOOK EMERG	4	67	6	WA1YNZ

PSHR: WA2ERT 93, WB1CBP 93.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—SEC: K1ACL. BM: K1OSM. Wow, what a busy summer! Dot and I worked portable in Vermont much of the summer, and I got a lot of time on RS10/11 and OSCAR 10. Lots of other folks around the section were also very busy helping ham radio grow. *KARS,* one of the outstanding public-service clubs in the section, supported Hospital Day in N London and demo'd packet, HF and handled radiograms. Assisting in the demo and supporting the parade were N1CIR and N1DRE, W1GUX, KB1DL, WB5DLV, KY1U, KA1CEJ, W1IXA and the family team of W1GUA (Rudy), WA1THF (Doris) and daughter Jenny *(KA1PVX). Butch WB1GXM sent me a copy of a neat ham* radio bookmark he and W1FYR developed for distribution to libraries, schools, etc around the state. Contact them for more details. What's YOUR idea for promoting the hobby with young people? Butch also reports that he and several other stations in Chesire Sullivan Ctys have generators for emergency power-a serious commitment to emergency comm! NARC had a walking fox hunt in a local park in Nashua with KA1CRN locating the insidious fox in record time. A cookout with about 40 club members and families followed the hunt. Packet takes another giant step-W1TN reports that NTSZIP has come to NH! Msgs put on a PBBS with the zip as the first three digits of zipcode are now being autoforwarded anywhere in NE. John also announced that Dana, N1ALM, is the new net manager of GSFM. Bud, W1HMT, IRS pres reports that plans for an emergency repeater on Pack Manadnock are progressing well. Congrats to Ray, KY1N, for his excellent talk on the VE program at the Aug IRS meeting. CNHARC participated in the Belmont and Guilford Old Home Days promoting the hobby. I attended a hearing in Hampton in which K1ZLA attempted unsuccessfully to gain an exception to allow a 55-ft tower on *his property. Even with PRB-1 as ammunition,* we again saw that if local boards and governments are not aware of Ham Radio's contributions and public service support, there is little sympathy for our position in these matters. Think about your club's status in the community and how well you promote your various activities. Also consider club support of community *activities other than those related to Ham Radio. Local projects* of various types can help identify your group as a public spiritied organization. There is an excellent article promoting the hobby in current issue of "The Mountain Ear," published by the Mt Washington Society. W1PRN, W1LCQ and KA1PCJ were portrayed in words and picture and the fun and service aspects of the hobby were well presented. As we moved into fall and winter, look around at the opportunities to "go public" with Ham Radio. PROGRAM CHAIRPERSONS-Look within the section for some excellent speakers - K1ACL on statewide emergency comm, KY1N on the VE program, KX1L on ideas for youth activities, and KI1M on strengthening club activities. NET/TIME (PM) /FREQ/MGR: GSPN/6/3942/WA1YZN. NHN/7/3547/N1NH. NHNTN/7 M-F/28330/KB1XI. GSFMS/8:30/146.94/N1ALM. GSFMN/8:30/146.475/N1ALM. Traffic: GSPN 191, NHN 118, GSPN 107, W1PEX 703 BPL, N1CPX 248, W1FYR 182, K1TQY, N1NH 141, WA1FHB 124, K6UXO 104, KK1E 102, W1ALE 77, W1TN 67, WB1HBB58, WA1YZN 50, N1AKS 40, KA1NXT 40, KA1LMR 36, KI1M 30, KA1OU 29, WB1GXM 21, N1ALM 21, KA1LBW 16, KV1S 14, KA1KFX 11, K1OIQ 10, KA1JOU 9, KA1HPO 9, KA1PFS 5, *N1DQA 4, K1ACL 2.*

RHODE ISLAND: SM, Charles H. DiLuglio, K1DA—During the spring and summer, Rhode Island amateurs assisted in a number of public service events. Among them the New England White Water Canoe Race, the Gaspee Day Parade, and the Save The Bay Swim. We earn goodwill by doing these public service events and that translates into help when we need to oppose the "band grabbers" after our spectrum. It has been reported that KB1TC has left Rhode Island along with his wife, N1DRT to live and work in Maryland. He asks that KA1LA be given use of his hard earned nickname "Gulich" as he lives in one and TC will be living at last on *a hill. Anyone wishing an ARRL appointment please feel free* to contact me at 34 Nun Avenue, Jamestown. I am assuming that existing appointees wish to retain their positions unless they indicate otherwise. The Rhode Island Red Cross has contacted OSARG with a proposal that OSARG assist in getting operational a communications van last used by the *Navy for use during times when a disaster requires communi*cations assistance. The van is about 20 years old but has low mileage. The Red Cross can help with storage and insurance but does not have a large budget for repair. Anyone wishing to help get the van in shape should contact me, WA1RBT, or WA1ZGG. The van will be available for public service events, and will be good PR for amateur radio. I would like

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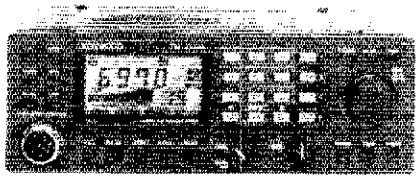

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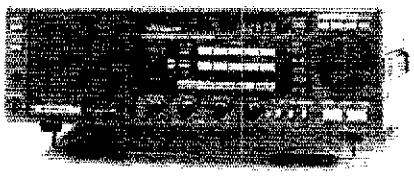

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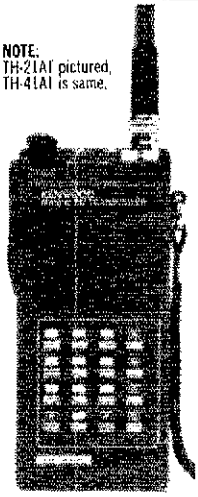

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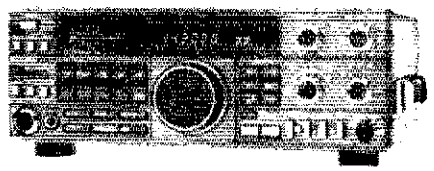

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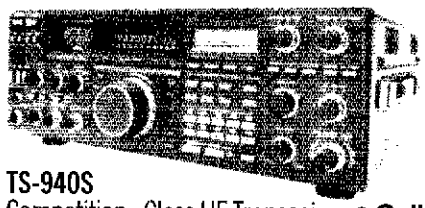

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to have the name of every radio club helping out with it painted on the side of the van. Finally, thanks to all who supported me in the election.

VERMONT: SM, Frank I. Suitor, W1CTM—ASM: KD1R. STM: AE1T. SEC: W1KRV. PIO: WA1YOY. As fall comes to our Green Mtns, radio club activities have sure started to increase. Club meetings provide many of us the opportunity to both learn about different facets of our hobby and to socialize with old and new friends. Like most club activities, it takes a lot of planning to make meetings interesting. Club officers are requested to provide me with meeting dates/subjects so I can put them in this column. Example, CVARC Sept. meeting featured K1BKK (Warren) who presented an overview of the State Telecommunications System and how we as amateurs fit in. Club operating activities such as Silicon Jct ARC's part in the VHF QSO Pty on Mt. Equinox as well as their award-winning performance in this year's Field Day provide a way to sharpen operating skills while having fun. Another example is with the Simulated Emergency Test (SET) which had outstanding participation this year by ARES members. SEC W1KRV is still looking for a few good members (Hi!). Still another way clubs can provide service is by conducting demos of our HF/VHF/UHF capabilities. CVARC's demo to the Capitol Fire Mutual Aid System, Boarder ARC's installation of packet on Jay Peak, Twin State ARC's demo at Montshire Museum, and BAR's service to Red Cross/NWS are excellent examples. A way for clubs to ensure a constant flow of new members is to conduct Novice/upgrade classes. BARC/CVARC have done great job in turning out new hams by providing classes and exams. The next BARC VE session is scheduled for Dec 12 at Red Cross in Burlington. ARRL has been rock of support for 220 MHz frequency allocation fight and also by correcting ABC News when they maligned hams in their 8/17 newscast. Good luck to all participants in the Nov SS. Congrats to N1EQP (Steve) and his new XYL, Jane. ATV activity highlights included test xmission from Camel's Hump which could be seen from many locations around the state. This mini DXpedition was conducted by KU1H, KB1PF & N1EPO. New ATV station on tube include KB1PF, WA1DKW. On the ARES front, W1KRV now has 176 members and still growning. Contact him for membership applications. Chittendon Co DEC NB1A announced appointment of WA1UVW (Jim) as So Burlington EC and N1DTQ (Doug) as EC for Richmond. K1AUE (Ben), after deserting the BARC hamfest organizing committee, now says he will definitely attend the Xmas Party on Dec 11 at the Sheraton. All hams welcome—contact N1DLE for reservations/tickets. STM AE1T encourages continued participation in section traffic nets. Contact Pete if you wish a free VT Net Directory. Nets: BSCN 4/64/1, CVFMN 5/80/5, TSEN 4/54/1, VTN 31/154/182, VPHN 5/72/10, GMN 25/369/33, CAP 26/582/59. Traffic: KT1O 783, WA2SPL 533, WA1JVV 141, AE1T 110, W3QQ/1 73, KD1R-1 44, W1KRV 24, NB1A 22, WA1VXW 14. Happy Thanksgiving to all!

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/RFI: N1CM. PIO/ACC: K1BEL. SEC/SGL: WB1HIH. TC: KA1JJM. STM: KA1EXJ. I had the opportunity to take a ride to Dalton and visit the NOBARC flea market. The boys at NOBARC did a great job of organizing again. KJ1K did an admirable job of demonstrating a working packet station. Most of the equipment was home brew and you couldn't tell it from commercial gear. He knows packet and his tutorial session was very enlightening. Talk about hams helping hams, he had public domain software for the asking. MARC will be handling the communications for a five hour parade to celebrate the Constitution. With sixty-five floats and sixteen divisions participating they will have their hands full on September 20. Mt. Tom ARA furnished communication for the annual Coolidge Forest Sportscar Rally. This rally is through the town of Plymouth Union, Vermont, with speeds in excess of 50 mph on narrow back roads and many checkpoints. Fran-KA1PET, Ray-WB1GLX, Pat-N1CET, Larry-N1BDH, Bruce-N1AYS and Larry-WB1DBY sure had their hands full. Traffic: KA1IFC 405, W1UD 138, KA1T 103, W1KK 102, KA1EXJ 65, WB1HIH 47, KA1EKQ 45, W1SJV 27, KA1QFV 15, W1ZPB 5.

NORTHWESTERN DIVISION

IDAHO: SM: Don Clower, KA7T—SEC: W7REX. STM: W7GHT. OOC: WB7CYO. ACC: N7BI. PIO: WB7PFQ. The WIMU Hamfest was a huge success this year. I had the pleasure of meeting several SMs from the Rocky Mtn. Division. The N. W. Division Director and Vice-Director, and the Rocky Mtn. Division Director and Vice-Director were also present. It was a real learning experience being able to exchange ideas with more experienced SMs. It has been suggested that we have an Idaho Trophy Cup to be awarded to the group with the highest FD score each year. What do you think? Let me know. 73s, Don.

MONTANA: SM, Ken Kopp, K0PP—W7LR is new OO Coordinator and needs OOs. KE7TB new Lincoln Cnty EC. SEC KC7HP has more positions available. Clubs starting classes—make upgrading your goal this winter. Get VE exam info on MSN. Large turnouts for Big Arm and White Earth picnics. W7BQE honored as oldes ham at Saskatoon's Hamfest '87. ARRL has new Affiliated Club letterhead available. Also "Elmer" awards. It's easy to honor yours with one. KB7CPD (11), KB7CPF (17), new YLs in Bozeman. Traffic: KF7R 88 (PSHR), N7AIK 32, N7HKW 2.

NET	SESS	QNI	QTC	MGR
IMN	31	315	115	WA4GQO
MSN	5	56	0	K0PP
MTN	31	1572	117	KF7R

OREGON: SM, Randy Stimson, KZ7T— ASM: KM7R. STM: W7VSE. SEC: W7FBP. PIO: KC7YN. SGL: KA7KSK. ACC: KB7CC. RFI: AK7T. OO: N7SG. STC: N7ENI. Tom, N7CPA, has resigned as Section Emergency Coordinator. I would like to thank Tom for all the work that he has done for the ARES program. I have asked Dale, W7FBP, to take over as SEC and he has accepted. Dale is no stranger to the ARES program as he was Emergency Coordinator in Clackamas County for years. I am sure that Dale will do a good job. If you need to get in touch with Dale his address is good in the call book. We have a new Novice in the Portland area his name is Justin Ashworth KB7CRB. His first contact on CW-10M was to NH6FL and his Dad's call is K7FL. The reason that I mention this is that Justin is nine years old. Welcome to the Ham community Justin. The hams had a booth at the Douglas County Fair and I heard that they handled some 700 pieces of traffic from there and during the same time Dave KA7VZD was becoming a Father, congratulations. We need Emergency Coordinators in Clackamas, Yamhill and Washington Counties. Emerson K7SGU, is the new Emergency Coordinator for the Portland area. Traffic (P = Packet): W7VSE 742, N7BGW 211, N7ELF 149, KA7EEE 142, N7APC 135, KF7BX 89, W7ODG 58, W7FBP 45, KA7AID 31, WB7SZM 23P, W7LNE 14. (June) N7BGW 212.

WASHINGTON: SM, Brad Wells, KR7L—STM: KD7ME. ASM/ACC: KC7PH. BM: N7CAK. SEC: KA7INX. ASM: KA7CSP. SGL: KD7AC. TC: W7BUN. ASM: KD7G. The big contests this month are the Phone and CW Sweepstakes. Both are fun with lots of participation. Neither require a "killer" station to win, since this is a stateside contest. Here's your chance to get 5BWAS within two weekends. Super power is not required either . . . there are categories for high power, low

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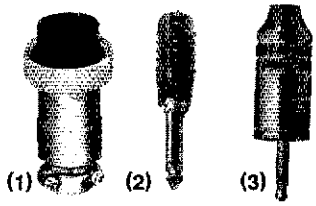


(1) Eight-Pin Mike Plug. Fits many popular Ham transceivers. #274-025 . . . . 2.19
(2) Headphone Adapter. Accepts ¼" stereo plug. Plugs into ¼" monaural jack of home com. gear. #274-360 . . . . . 1.89
(3) Mini to Submini Monaural Adapter. Great for HTs! Accepts ⅛" plug. Plugs into 3/32" jack. #274-327 . . . . . 1.29

Our Improved RG8A/U Coax Cable

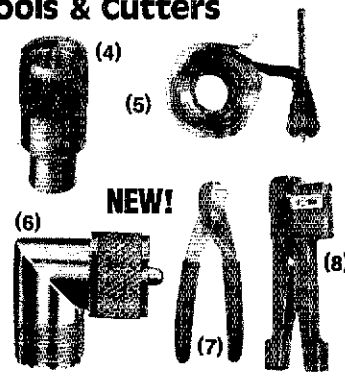
Per Foot

NEW! 36¢

- 95% Shielding
- Low-Loss Polyethelene Dielectric
- All-Copper Conductors

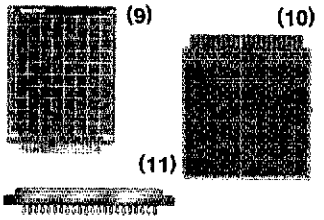
New high-grade coax with extra-heavy shielding delivers more signal and less chance of RFI. Velocity factor: 66%. Loss per 100 ft. at 100 MHz only 2.5 dB! Give it a try! #278-1323

Coax RF Connectors, Adapters, Crimping Tools & Cutters



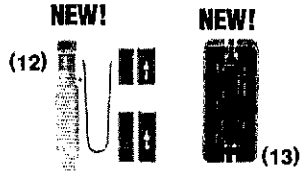
(4) PL-259 Plug. Standard UHF-type connector with screw-on lock. #278-205 . . . . . **Pkg. of 2/1.99**
(5) Outdoor RF Connector Sealant. Designed for TV antenna, satellite dish and other connections. Waterproof and non-corrosive. Stays flexible. #278-1645 . . . . . 2.49
(6) M-359 Right Angle Adapter. SO-239 socket to PL-259 plug. For tight spots. #278-199 . . . . . 2.19
(7) NEW! Coax Cable Cutter. Blades do not flatten cable, preserve correct impedance. #278-244 . . . . . 4.95
(8) Coax Cable Stripper. Adjustable blades give perfect strips with RG6, RG59, RG58, RG8M and RG62 cables. For cables from 1/16" to 5/16" diameter. #278-240 . . . . . 11.95

Boards for Building



(9) Plug-In Board With Ground Plane. 4½ x 5 11/16" #276-188 . . . . . 4.99
(10) Multipurpose Plug-In Board. Three buses, 4½ x 4", 1/16" grids. #276-154 . . . . . 2.99
(11) 44-Position Card-Edge Socket. #276-1551 . . . . . 2.99

IC Handlers



(12) IC Inserter/Extractor Set. Helps you install/remove ICs from sockets without bending pins. For 6-pin to 40-pin DIPs. Extractor works with LSI, MSI and DIP devices. Both tools are groundable. #276-1581 . . . . . 6.95
(13) IC Pin Aligner. With just a squeeze, bent pins become factory-straight. For 6-pin to 40-pin DIPs. Conductive plastic. #276-1594 . . . . . 2.99

Hookups for Computers & Peripherals

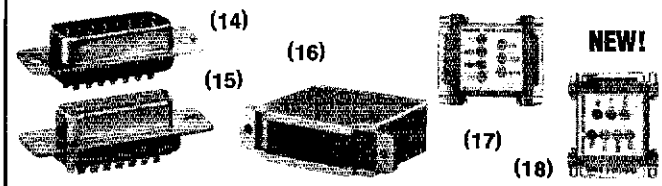
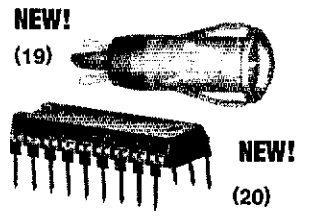


Fig.	Type	Positions	Cat. No.	Ea.
14	Male	9	276-1537	1.49
15	Female	9	276-1538	2.49
16	Hood	9	276-1539	1.99

Type	Positions	Cat. No.	Ea.
Male	25	276-1547	1.99
Female	25	276-1548	2.99
Hood	25	276-1536	1.99

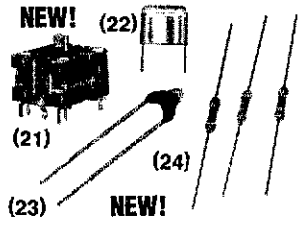
(17) RS-232 Inline Tester. Diagnose interface problems in micros and peripherals. Instantly detect communication "glitches"! #276-1401 . . . . . 14.95
(18) RS-232 Surge Absorber. AC line protection is not enough. Guard each PIA port with a surge absorber to stop spikes. Shielded. #276-1402 . . . . . 16.95

Hobby Widgets



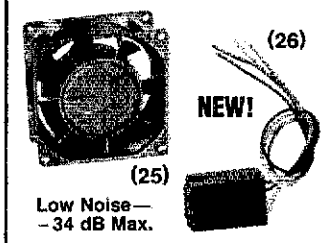
(19) Brilliant Red LED With Holder. Incredible 500 mcd, 20 mA. #276-088 . . . . . 1.79
(20) TDA7000 FM Receiver on a Chip. Combines RF mixer, IF and demodulator stages in one IC. With application notes. #276-1304 . . . . . 5.95

Parts-Pourri



(21) Variable Tuning Capacitor, 335 pF. Two section, PC mount. #272-1337 . . . . . 4.95
(22) 6-50 pF Trimmers. #272-1340 . . . . . 2/1.59
(23) Thermistor. 271-110 . . . . . 1.99
(24) ¼ Watt Carbon Film Resistors. Assortment of 500. #271-312 . . . . . 7.95

Fan & Transformer



Low Noise— –34 dB Max.

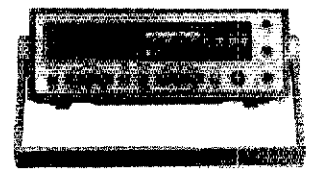
(25) Brushless 3" DC Fan. Airflow: 27 cubic feet per minute. Requires 7 to 13.8 VDC. #273-243 . . . . . 14.95
(26) 1:1 Audio Transformer. For telephone interconnects, interstage coupling, more. #273-1374 . . . . . 3.49

'88 Semiconductor Guide

NEW! 3.99

Semiconductor Reference Guide. Cross-reference/substitution section lists over 80,000 types and low-cost Radio Shack replacements. Data on linear and digital ICs, modules, SCRs, LEDs, diodes and opto devices. Illustrated, 288 pages. 276-4011

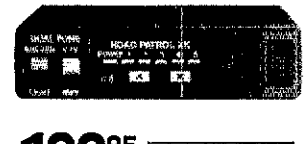
Bench Multimeter



99.95 Low As $15 Per Month* Manual or Autoranging

The 31-segment analog bar graph display makes input peaks and trends easier to follow. Transistor checker measures h_{FE} (gain). Tests diode junctions. Memory function and buzzer continuity checker. Measures to 1000 VDC, 750 VAC, 10 AC/DC amps, 30 megohms. Input impedance: 10 megohms on DCV/ACV. #22-195

Radar Detector



199.95 Low As $15 Per Month*

The Micronta Road Patrol XK® is a palm-sized performance giant! GaAs Schottky diode front-end and dual-superhet provide astonishing sensitivity. Exclusive *FAST*™ processor reduces false alarms. Separate LEDs and tones for X/K bands.* #22-1617

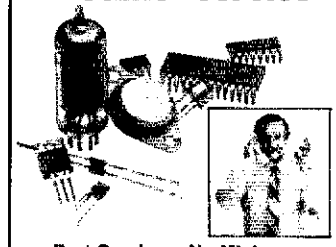
8-Channel Pager

99.95

Super for Public Service Events

Digitally encoded for private paging! Push a button on transmitter and receiver "beeps" to alert user to check in. With one receiver. Transmitter is AC powered. Receiver operates on 3 "AAA" batteries (extra). #49-710 . . . . . 99.95
Extra Receiver. 49-711 . . . . . 29.95

"Hotline" Service



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- No Minimum
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Over 1000 items in stock: Binding posts, Books, Breadboards, Buzzers, Capacitors, Chokes, Clips, Coax, Connectors, Fuses, Hardware, ICs, Jacks, Knobs, Lamps, Multitesters, PC Boards, Plugs, Rectifiers, Resistors, Switches, Tools, Transformers, Transistors, Wire, Zeners and more!

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*Radar detectors not sold where prohibited. Use may be regulated by state or local law.

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power and QRP. New attendance records were set this year for the Tacoma Hamfest. The success of this event is due to much hard work by members of the Radio Club of Tacoma. I enjoyed meeting all of you and hope those who attended my seminars found the information useful. Many thanks to all of you who took the time to let me know how things are going (or not going) in this section. The Section Staff and I cannot provide the services you want without this feedback. One of the many good ideas heard at the hamfair was from Danny, K7SS: "One way to attract young people to ham radio is to emphasize the sporting aspect of our hobby. Radio contesting offers them the opportunity to become true international sportsmen. Where else, but in ham radio, do people of high school and jr. high school age have the opportunity to compete annually in a number of international sporting events?" With League and manufacturer support, it sounds like a good way to attract new blood into our hobby. Many thanks to all the ARES groups that participated in the Simulated Emergency Test during October 17-18. This annual event strengthens our ability to respond to local area communication needs during times of crisis. If your group was unable to participate, you can still schedule your own SET at any time. If you are not active in your local ARES group, become a member and help provide much-needed public service activity. Stu Farmer, K7WF, has put together a neat video on the workings of the 7th area QSL bureau. Contact him for additional info. These Washington hams have been appointed Asst. Directors by W7RM: WA7EVH, K7ZR, W7TJ, K7SUQ, K7WF, W7JIE, KK7M, K7LAY, N7RO, NB7G, KC7PH, KA7QSP, W7JPH, W7BUN, KD7G, W7LG, N7ABE. They are your contact people for Division Affairs, while the Section Staff are the people responsible for the daily management of section activities. Interested in knowing the various operating awards put out by the ARRL? Look in the new OPERATING MANUAL or contact me for an awards brochure. ARRL bulletins are now being posted on a regular basis on most Washington BBS's, but are only accessible to those with digital capability. We need people who would be willing to rebroadcast these bulletins on a weekly basis on local FM repeaters. If you are interested in performing this service, please contact Pat Morgan, N7CAK. The very best of Thanksgiving wishes to all of you from the entire Washington Section Staff. ARES PUBLIC SERVICE HOURS: Thurston 29; Kitsap 132; King 412; Franklin 25. Traffic: W7IGC 278, W7LG 263, K7GXZ 240, N6EQZ 221, WB7WOW 187, N7GGJ 143, W7GB 87, WA7CBN 68, KR7F 67, K7AJT 63, W7LBK 58, W7APS 44, WA7YEN 32, K7SUX 18, WA7PIN 13, N7DIP 10, W7IEU 10, KA7PMD 7, N7IIJ 5, N7FXM 2; Category 2: KD7ME & KR7L.

PACIFIC DIVISION

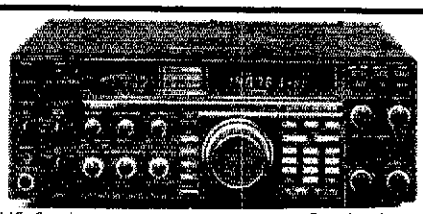
EAST BAY: SM, Bob Vallio, W6RGG— ASMs: W6ZF, N6DHN. EC: W6LKE. OOC: NY6Z. TC: N6AMG. Hayward Radio Club Novice classes are set for this Fall with KI6VS and KB6RKR as instructors. Meetings on 3rd Fridays, 1930, Hayward Fire Station 6. Livermore Amateur Radio Klub member, KI6OY, wrote to all his congressmen about 220 MHz and received a reply only from Pete Stark. Meetings on 3rd Saturdays, 0930, St. Bartholomew's Church. East Bay ARC's "THE BLOWN FUSE," featured many FB pix of their FD effort, which was headed by K6MBV. Meetings on 2nd Friday, 2000, Salvation Army, 1110-36th St, Richmond. Mt. Diablo ARC's "THE CARRIER," has a new editor, WU6P. In addition to utilizing desktop publishing software, Stan can also receive members' inputs via packet. Meetings on 3rd Fridays, 2000, Grace Presbyterian Church, 2100 Tice Bl., Walnut Creek. North Bay ARA's "QRZ NBARA" is looking for a new editor, as business commitments have taken too much of "OLD ED's" time. Meetings 4th Wednesday, Homestead S&L, 440 Santa Clara, Vallejo. Benicia ARC recently held "The Lyndon Baines Johnson Memorial T-Hunt," a team competition. Meetings 3rd Wednesday, 1900, West End Hose Company, Solano & Hastings, Benicia. TFC Nets: NCN1, 3630 at 1900; NCN2 (low speed), 3630 at 2030; NCN VHF, 145.41 at 1930. Traffic: WB6DOB 132, WB6UZX 30.

NEVADA: SM, Joe Lambert, W8IXD—ASM/SEC: K7HRW. ACC: N7FFP. BM: WB5PTO. TC: K7ICW. ECs: KE7LC, W6JBB, KA7RBM, KA7AJQ, NK7N, KE7FV. ATCs: KD7YZ, NW7O, N7GQR, NF7V. PIAs: N7EAG, KA7AJQ. DECs: K7HRW, WB6BPU, N7CXD. ORS: K7QOP. OBSs: AF7I, AD7K, N7OK. STM/NM: W7BS. Northern Nevada hams using SNARS repeater are to be congratulated for their work with health and welfare traffic during the recent Woodfords fire. Special recognition was given to Lou, WB6BPU and Jay, K7WYC by the Alpine Co. Sheriff's Dept. SNARS is planning a Hamfest/Swap Meet. Watch for announcements in this column. Las Vegas Repeater Association had a picnic at Mt. Charleston which was enjoyed by all. Welcome to new appointees in Northern Nevada: KE7FV, EC and NF7V, ATC.

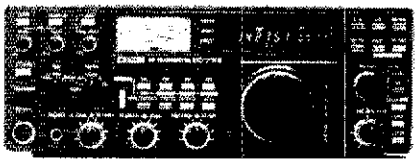
PACIFIC: SM, Army Curtis, AH6P— ASM: KH6BZF. STM: KH6HIJ. SEC: KH6B. PIO: KH6IJ. ECs: Hawaii - WH6BDH. Kauai - KH6S. Maui - KH6H. Oahu - KH6NP. Aloha and hata adai to all of the Pacific. Vacation time and many are traveling and having a great time. The last meeting at Lihue wound up being mostly a travel log. Good fun! And W6ORS says he had a ball in KL7 land. Brought back a lot of fish! Where's mine, Corky? Congrats to KH6AJ on upgrade to Extra. Mariners here in the Pacific are reminded they cannot use 7100-7300, or 3900-4000 KHz south of 10 degrees north latitude. Check it out. EARC net reports QNI 313, QTC 30 in 28 sessions in August. Very good! Traffic: KH6S 41, AH6P 2.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—When this is being written, the big activity as Wm. "Add" Addison, N6GLL, EC for Trinity County put it, is "Lightning struck, fires started, and the hams were called for help." I have only partial reports at this time with the most detailed for Add. From Monday to the following Friday, 34 hams put in 1200 man-hours in Trinity County at fire camps, evac centers, working with the sheriff and at the Office of Emergency Services. Les Kratz, KX6Q, Shasta County EC, provided 8 of his people to help Trinity County. Ron Monet, N6AUB, Mother Lode Counties District EC, and a helper WB4YTJ, got a 1/4 page spread on the front page of the Auburn paper on their, and other ham's activities in Nevada County fires. Walt Cross, KE6EP, the new District EC for the Northern Counties reported that things there had quieted down after several days as the Forest Service and other agencies got their own communications in operation. Next day the Yuba/Sutter people were called to fire camps. With 20 counties in the Section, and several hundred fires in those counties the reports here are only a hint of the ham activities. DON'T FORGET the SECTION NET: First Sunday each month, 8 PM, 146.085. Traffic: N6LUY 373, WD6BZQ 366, WA6WJZ 130, K6SRF 99, WA6ZUD 26, W6RFF 21, WB6SRQ 6, N6PNK 8, N6PNL 2.

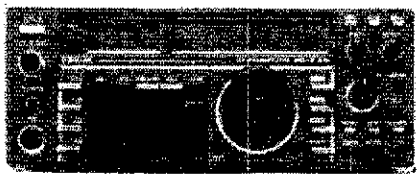
SAN FRANCISCO: SM, Bob Smith, NA6T— The fire season has been big news in the SF Section. Quite a few hams turned out to help in Mendocino and Lake counties with the VIP program. There should be some real activity from CDF in Mendocino County. They THOUGHT they had a VIP program, but someone forgot to organize it!! But CDF is actively organizing now!! Hope to see you all at PAC-CON in San Jose this year - At all the ARES Forums, come and learn how to help yourself!! Lindy, WA6ZDO, is sporting a new Quad and Tower, right behind K6HY's house! The FD saga is now round three, SCRA-1 and REXDA-1, who will do it to who next year?



HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	2149
HM-36 Scanning hand microphone	44.50	
SP-20 Ext. speaker w/audio filter	149.00	139.95
FL-101 250 Hz 1st IF CW filter	69.95	
FL-53A 250 Hz 2nd IF CW filter	108.00	99.95
FL-102 6 kHz AM filter	56.00	
EX-310 Voice synthesizer	46.00	



IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	1399
PS-35 Internal power supply	199.00	179.95
FL-32A 500 Hz CW filter (1st IF)	66.50	
FL-63A 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	
IC-745 9-band xcvr **CLOSEOUT**	1049.00	899.95



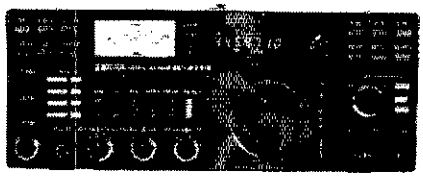
IC-735 HF transceiver/SW rcvr/mic	999.00	829.95
PS-55 External power supply	199.00	179.95
AT-150 Automatic antenna tuner	445.00	349.95
FL-32A 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	

Other Accessories	Regular	SALE
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
MB Mobile mount, 735/751A/761A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal for 751A	63.00	
PP-1 Speaker/patch	179.00	164.95
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
GC-5 World clock	91.95	89.95

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	1049
IC-275H 100W 2m FM/SSB/CW	1389.00	1229
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1249

ICOM

IC-475H 75W 440 FM/SSB/CW	1599.00	1429
IC-575A 25W 6/10m xcvr w/ps	1399.00	1249



IC-471A* 25W 430-450 **CLOSEOUT**	979.00	749.95
PS-25 Internal power supply	115.00	104.95
AG-1* Mast mounted preamplifier	99.50	
IC-471H* 75W 430-450 **CLOSEOUT**	1399.00	989.95
PS-35 Internal power supply	199.00	179.95
AG-35* Mast mounted preamplifier	95.00	

***Preamp $9.95 with 471A or 471H Purchase**

Accessories common to 271A/H and 471A/H		
SM-6 Desk microphone	44.95	
EX-310 Voice synthesizer	46.00	
TS-32 CommSpec encode/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	Regular	SALE
IC-290H 25W 2m SSB/FM **CLOSEOUT**	639.00	549.95
IC-490A 10W 430-440 **CLOSEOUT**	699.00	399.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	379.95
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399.95
IC-37A Compact 25W 220 FM, TTP mic	499.00	439.95
IC-47A Compact 25W 440 FM, TTP mic	549.00	489.95
PS-45 Compact 8A power supply	139.00	129.95
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 Extra 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-900 Transceiver controller	589.00	529.95
UX-29A 2m 25W unit	295.00	269.95
UX-29H 2m 45W unit	339.00	309.95
UX-39A 220MHz 25W unit	349.00	319.95
UX-49A 440MHz 25W unit	339.00	309.95
UX-59A 6m 10W unit	339.00	309.95
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	22.00	
Larsen PO-MM Magnetic mount	22.00	
RP-3010 440MHz 10W FM repeater	1229.00	1089
IC-1200 10W 1.2GHz FM Mobile	699.00	629.95
IC-1271A 10W 1.2GHz SSB/CW Base	1229.00	1089
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	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1479.00	1299
RP-2210 220MHz 25W repeater	1499.00	1329

MasterCard VISA

Hand-helds	Regular	SALE
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
IC-02AT 2-meters	365.00	299.95
IC-02AT/High Power	399.00	339.95
IC-03AT for 220 MHz	449.00	389.95
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
IC-u4AT 440 MHz, TTP	369.00	329.95

Accessories for micros - CALL $

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	399.95
A-2 5W PEP synth. aircraft HT	499.00	449.95
A-20 Synth. aircraft HT w/VOR	599.00	529.95

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
MB-16D Mobile mtg. bkt for all HTs	24.50
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier **SALE**	99.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	$949.00	799.95
RC-11 Infrared remote controller	67.25	
FL-32A 500 Hz CW filter	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	42.50	
EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25MHz to 2GHz scan rcvr	1099.00	949.95
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
TV-R7000 ATV unit	131.95	119.95
AH-7000 Radiating antenna	89.95	(5)

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Sorry to hear that Len, K6ANP, is moving back east, but he' WILL be heard from back there, he's always got a big signal! Packet is going great in the section, now Oregon to SF is no sweat via Net-Rom with three new digi's in Humbolt county courtesy of the Humbolt Packet Society. HARC and FWRA will be helping with the Ave. of The Giants Marathon this year again, get out and help with the PR and communications. The GS Ladd Pioneers supplied communications for the "Cycle for Sight" (litehouse for the Blind) event this year and had over 2000 riders to control via amateur radio. Glad to see Bob, W6RNL and Karl, KK1A, back handling traffic in the Section after both taking a short rest during the summer. Traffic: W6RNL 144, N6FWG 48, KK1A 60.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U, STM: N6AWH, TC: WA6EXV, ACC: W6DPD, ASST SMs: W6TRP and K6YK. Emergency Coordinators are still needed in Madera, Mariposa and Mono Counties. Amateurs of the SJV spent many hours and days providing communications support during the recent forest fires. They did a great job. Congratulations. KA6USP and W6PSV are SILENT KEYS. KE6DK and others operated a special events station that operated in conjunction with the 75th Anniversary of Clovis, CA. If you, your club or your group wants news of an upcoming event reported in this column, I need the details at least 3 months in advance of the event. KB6TBK is Tech. KB6PKH is N6OZG. KB6MAD is KI6SK. KB6FBW is KI6VK. Congratulations to WB4AYE/6 and WB6YIY for their 1st and 2nd place finish in the June VHF QSO Party. HAPPY THANKSGIVING to all. Traffic: N6MCY 82, WA6YAB 18, W6DPD 1. Total: 104. Late report for July: N6AWH 51.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W. SEC: WA6OCV. TC: WA6PWW. STM:N6JLJ. PIO: WB6OML. ASM: N6JQJ & NS6N. ACC: W6MKM. BM: (vacant) OOC: (vacant) It is with great regrets that I announce the resignation of Bert Sacks, WB6NLA, as PIO. Our new PIO will be Bill Robinson WB6OML. Many of you know Bill as the former DEC for Santa Clara County. Also, we are welcoming new PIAs Randy N6HMO and Sally KB6STX. Bill says that there will be more new PIAs in the near future. At this time we are still looking for an OO Coordinator and a Bulletin Manager. Please contact me if you are interested . . .Doc W6ZRJ finally has his TS440 on the air. Doc is NCS on PAN (Pacific Area Net) every Friday at 2030L on 7075 kHz . . .As this is written, many of you are involved with the support effort for the fire fighters in the eastern part of the state. Thanks to you. Also special thanks to KA6TGE, N6MWD, N6GAL, KB6ICQ. KB6CEY, and WB6QFG for their service as net control on the resource net. Also thanks to KB6STX/KT, WB6OML, and N6HMO for their assistance with publicity. We were on TV channels 5, 7, and 36 (at least!) More details next month . . . the Gablilan ARC continues as a Special Service Club, keep up the good work!

The "Banana Classic" bicycle tour was supported by 19 Amateurs from SPECS, SVECS and the Lockheed Club. This was a dual (100 km AND 100 mile) course which generated 76 total messages. The traffic was handled via the WA6GFY (LARC), W6ASH (SPEC6), and WB6JKV repeaters. A hearty well done to all concerned . . .W6CF reports "QRL with work" . . . the SLAC ARC is continuing with their disaster communications project . . . the Gabilan ARC has a new newsletter editor, Vince Henley KB6GV, I gather that this isn't the first time Vince has done this, judging from the quality of his "first" effort . . . That's it for now, keep those newsletters coming! 73 de WB6W, OO reports: K6AYB, WA3SAD Traffic: (Aug) NR7E 207, W6YBV 187, W6KZJ 116, W6ZRJ 16, N6JLJ 7. (Jul) W6YBV 229.

ROANOKE DIVISON

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. TC: K4ITL. SGL: KE4ML. Concord Hamfest Nov. 1. Greensboro Hamfest Nov. 21-22. WA4MMS reports that Onslow ARC promoted Amateur Radio by participating in Hurricane Awareness Week recently. W4EXU celebrating 50 years as a club. Can anyone top this club for longevity? AB4W reports that 50 amateurs provided communications assistance in the recent US Olympic Festival. W4LYV has a new piece of wallpaper—Golden DXCC. With sunspot cycle on rebound get in on the fun of Amateur Radio now. Fall Novice classes now in full swing. Clubs make your final plans now for Christmas Mall Traffic displays. Good to see all at rainy Shelby Hamfest. Excellent group at the NTS/ARES luncheon. Congrats to AA4ZV K4IWW K4SWN N4MMM KI4YV WA4MNR who were presented their PSHR certificates. KB4YYC now N4QZH advises that a group of amateurs at NCSU are putting W4ATC back on air. KB4ZUT now N4QNJ. PETN is now Piedmont Emergency Training Net and meets daily on 145.350 which is K4ITL's new repeaterlink into Charlotte and South Carolina. SILENT KEYS: W4GRS, W4NFZ. AB4S has been appointed the Section representative in the formation of the NTS packet traffic net scheme. KA4JAH and K4AZA are reestablishing the SKYWARN program for Greensboro NOAA office and meets Wednesdays at 8 PM on 146.790. Someone asked recently what the numbers after an amateur's call at end of column was for. This is the pieces of traffic that the individual amateur reported as passing during the month. In this case, the month of August. If you would like to have your call listed, then send this SM a report the first of each month. It is greatly appreciated. Would like to wish everyone in Section a HAPPY THANKSGIVING from the Section staff. Traffic: K4NLK 376. AA4TE 271, KA4EYF 192. AA4MP 166, AA4ZV 147, K4IWW 124, WD4HTE 122, WB4HRR 73, KA4TLC 61, KB4FWL 58, WB4WII 58, K4GI 55, K4SWN 55, N4MMM 49, WD4MRD 35, W4EHF 33, KI4YV 32, WA4MNR 31, WA4GEH 30, WD4EOK 29. WD4EOK 29, WB4CYN 26. N4TN 24, WD4B 20, N4CJJ 16, KB4NWX 13, AK1E 8, NT4K 6, N4JEO 4. (July) NE4J 30. Totals: 31 SARs and 2204 pieces of traffic. Thanks to everyone for your dedication to PUBLIC SERVICE.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ— Several months ago I asked the Bulletin Manager to write a bulletin asking all traffic handlers to add five words to their traffic information sent me each month on their SAR. Those five words are, "OF TOTAL (X) WERE PACKET." What I need to know is the degree to which packet radio is used in section traffic activities. The best way to find out is to ask those who do the work! Please continue these five words until further notice. With November and December being the two largest traffic months of the year, everyone is requested to make a real effort to assist the section traffic activities. Contact the STM in Charleston, W4ANK, and find out how you can help this season. We have two section voice nets and are part of two section CW nets. We also have a responsibility to meet two sessions of 4RN which meet in the afternoon. The CN rep meets the two sessions of 4RN in the evening; extra receive ops are frequently needed. Did you see the show featuring Amateur Radio activities in SC on ETV? CONGRATS to the Sumter Amateurs for a GREAT JOB! My very best wishes to all for a Happy Thanksgiving! Traffic: W4ANK 224, K4ZN 162, KB4BZA 115, KA4LRM 51, WB4UDK 51, W4DRF 33, KA4YEA 22.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC:

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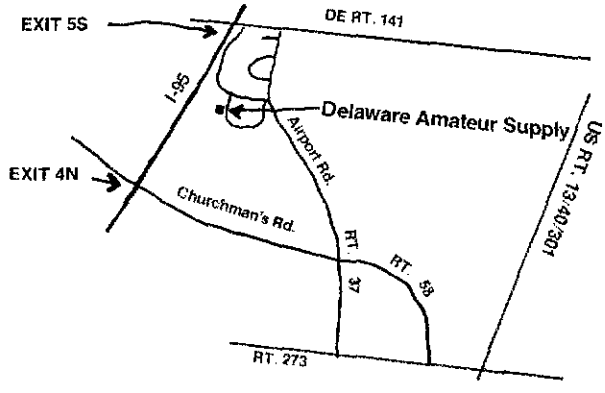

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N4EXQ. ACC: NT4S. OOC: W4HU. BM: AB4U. TC: WB4MAE. SGL: W4UMC. PIO: AA4VP.

VTN	1 PM	3907	KB4NGO
VSBN	6 PM	3947	KI4BR
VSN	6:30 PM	3680	N4KSO
VN (EARLY)	7 PM	3680	N4GHI
VN (LATE)	10 PM	3680	WB4KSG
VLN	10:15 PM	3947	KJ4MF
SVEN	7:15 PM	146.82	NT4S
STARES	9 PM	146.97	KJ4VT

Recent field appointments: N4KET and N4JED as PIA (Public Information Assistant) and N4AOP as ATC (Assistant Technical Coordinator). All NOVICES please take note that you are now eligible for many ARRL field appointments. If interested, contact the SM, W3ATQ. There have been reports of equipment damage from lightning this summer. If you are an ARRL member, you may still have time to enroll in the special enrollment period for "All Risk" Ham Insurance. The period closes Nov. 1 and covers almost all type of equipment losses. See page 59, Sept QST or contact the SM for details. To all DXers, you may still have time to qualify for the DXCC Golden Jubilee award. You need to contact 100 countries; QSLs are not required. I have received reports that VE exams listed as WALK-IN ONLY have been cancelled without notice. VE exams teams have the added responsibility of ensuring that when an exam is announced in this manner, the exam will be available to any WALK-IN. N3RC sez he will be signing /VP2V from a 42-ft sailboat, so look for him in November. Follows some VE exam scheduled in the section: Nov 7, Shenandoah Valley ARC, contact NC4B. Nov 14, Portsmouth ARC, contact AA4AT. Nov 21, Ole Virginia Hams, contact W4PVA. Dec 12, Woodbridge ARC, contact Don Ross. Dec 12, Va. Beach ARC, contact KA4UNC. KA4IUM and K4JST back from a vacation trip to western Canada. Gil reports that he was able to keep nightly skeds back to Williamsburg area using the 10 MHz band. It looks like the Fall and Winter traffic season is underway. Traffic count for August was 4534 with 49 stns reporting. N4GHI and K4DOR made BPL. I want to apologize to those stns that have qualified for BPL card certificates since June and have not received them. The reason for the delay is that the cards are out of stock at headquarters and availability is unknown. It was a pleasure meeting many of you at Va. Beach and discussing the operation of the Section. Your comments and suggestions are always welcome. Traffic: N4GHI 676, K4DOR 518, K4MTX 431, W3ATQ 314, N4EXQ 286, WB4PNY 266, KB4WT 199, KB4NGO 143, K4JST 138, KI4BR 130, KA4TWI 110, WD4ALY 109, AA4AT 96, AA4GL 84, WB4KSG 81, W4TZC 75, W4JLS 74, WB4EDB 73, WB4ZNB 67, WB4ZTR 67, K4BGZ 63, WD4OCW 62, K4JUM 60, K4JM 49, WA4LTO 41, WB4UHC 33, NJ3H 29, N6ANQ 38, N4KBS 28, KK4FV 25, WD4MIS 25, N4KSO 22, NG2H 20, KB4PW 13, K4GR 12, WA4TVS 12, NN4I 11, K4MLC 11, K4VWK 8, KB4OPR 7, WB3ANC 6, N4FNT 6, WB4KIT 6, KI4W 6, W4YE 5, N3RC 2, WA1VRL 2, NW4O 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. ACC: WA8CTO. SGL: K8BS. Rept. Coord.: WD8OZT. Nice WX greeted hams at the Tri-county ARC's September 13th swap meet at St. Albans roadside park. Chas area hams are invited to "come to Breakfast" each Sat. morn at Rose City Cafeterias in So. Chas. More activity needed on Section Nets, see schedules below.

NET	FREQ	TIME	QNI	QTC	SESS	NM
WVFN	3865	6:00	923	148	31	W8YP
WVMD	7235	11:45	690	26	31	W8FZP
HILLBILLY	14290	NOONSU	138	18	5	W8YP
WVRN	3640	6:30	200	21	31	K8LG
WVNN	3730	5:15	146	21	31	WD8LDY
WVN	3567	7:00	257	92	31	KZ8Q

Traffic: W8YP 305, K8TPF 251, KA8TIK 194, K8QEW 174, WD8LDY 150, KA8WNO 142, KZ8Q 131, W8FZP 122, K8UQY 120, KE8FI 85, K8KT 27, N8FXH 20, KA8OGF 11, NJ8J 9, NC8G 9, WD8DHC 3.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—ASM: KA0MQA. SEC: WB0TUB. STM: KB0Z. ACC: WB0DUV. OOC: KC0UD. PIO: N0FOE. BM: KA0CZW. TC: NC0F. SGL: WB0FQB. Recently, I was notified by headquarters that I had been re-elected Section Manager. I would like to take this opportunity to thank the ARRL members of the Section for your vote of confidence, and look forward to working with you during the next two years. Colorado now has its own Awards Manager for VUCC & HF WAS awards. This activity is being sponsored by one of our Special Service Clubs, Pikes Peak Radio Assn, and the Awards Manager is NK0P. Congratulations go to PPRAA for the excellent job of communications on the annual Pikes Peak Hill Climb, and to K0WOP & WB0DUV for the coordination of the communications of the International Golf Tournament, and also to ECHO for the coordination of communications for the annual Jerry Ford Tournament. Nov 29th is the date for the DRC Swapfest to be held in Jefferson County Fairgrounds. . . Indoor facility should make this an excellent fall event. 73, KQ0J. NETS: Col; QNI 965, QTC 47-inf 101, QNF 911, 31 sess. CWN; QNI 59, QTC 83, QNF 314, 24 sess. HNN; QNI 1709, QTC 108-inf 328, QNF 1227, 31 sess. NCTN; QNI 160, QTC 105, QNF 175, 25 sess. SCTN; QNI 283, QTC 62, QNF 334, 26 sess. Traffic: KE0NI 286, WB0FFV 149, N0HMR 109, KB0Z 88, K0HOA 86, WB0BLV 52, KA0WIE 34, W0NFW 20, N0HFZ 9.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO K6LL W5QNR. TC: W8GY. ACC: KA5BEM. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 202 msgs with 223 checkins. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 62 msgs with 1252 checkins. New Mexico Breakfast Club meets daily on 3939 and handled 173 msgs with 1041 checkins. Yucca 2-mtr Net 78/18 handled 23 msgs with 285 checkins. Caravan Club 2-mtr Net 66/06 handled 0 msgs with 184 checkins. SCAT Net 66/06 handled 6 msgs with 615 checkins. Info Net 13/73 with 125 checkins. Vy sorry to report the passing of W5MYQ. He will certainly be missed. Alamogordo's Third Annual Hamfest was an outstanding success. WA5UNO and his wonderful crew did an excellent job as always, and we are all looking forward to next year. Traffic: W5DAD 92.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. Davis Co. ARC now has repeater up on 147.64/04, and has backup power available. The Davis Co. ARC sponsored the repeater. It signs NU7X. Let's get more Novices and Techs on the Utah Code Net! Its purpose is to give the less experienced (and the more experienced, but rusty) operators a chance to improve code speed, and improve traffic handling skills. The UCN is called at about 10 wpm, and the net control station will slow down from there if the station checking in does so as a slower speed. The UCN meets daily on 3710 kHz at 7:30 PM local time. 73 de NA7G. Traffic: WA7KHE 96, WA7MEL 80, N7ASY 35, N7JLC 26, NA7G 23, NS7K 22, W7OCX 12.

WYOMING: SM, Jim Raisler, N7GVV—ASM: Steve Cochrane, WA7H. SEC: Jim Anderson, W7TVK. Carbon County Amateur

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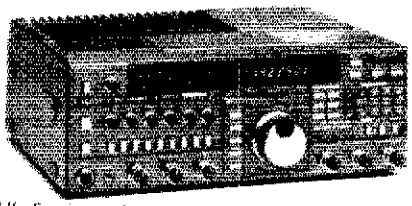

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KY-ONE Keyer unit	50.00
DC-ONE DC cable	15.00

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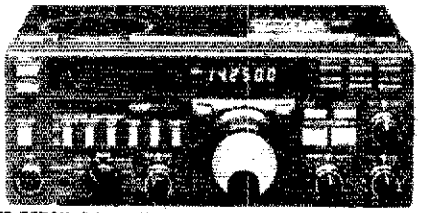

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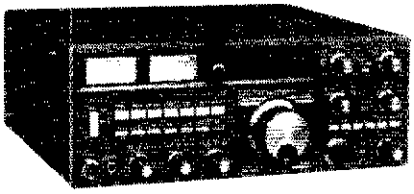

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440/726 440-450 MHz unit (FM band)	329.95
SU-726 Satellite duplex module	129.95
XF-455MC 600 Hz CW filter	69.95
DC-726 DC cable for FT-726R	15.00
FTE-36 Tone board for FT-726R	58.00
AD-2 50w 2m/440 duplexer	34.95
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FT-311RM 25w 220MHz FM w/autodialer mic	439.95
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FTS-8 Encoder/decoder	49.95
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AD-2 50w 2m/440 duplexer	34.95
FT-770RH 25w 440 FM xcvr w/1TP mic	479.95

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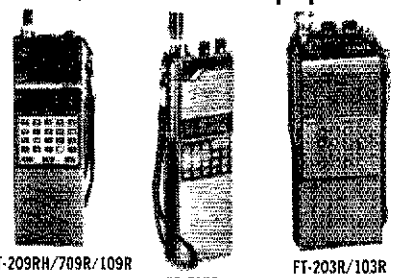

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Society members W7KF, N7JNI, and KA7ZKH provided communications, timing and four-wheel-drive services for the Overland Trail 150 mile horseback endurance ride on August 13-15. They also assisted in search for two lost riders. Thanks Bill, W7KF, for the report. Traffic: NN7H 571. Net reports: Cowboy—44 sessions, 1201 QNI, 21 QTC; Sheridan RACES—3 sessions, 46 QNI; Wyoming RACES/ARES—5 sessions; Casper ARES—5 sessions, 172 QNI. Data above for July and August. A new digi KE7NT-2 "PUMP" is located on Pumpkin Buttes, a joint Casper/Gillette project. If you would like to get packet messages to the SM, leave with KE7NT in Gillette. 73 till next month.

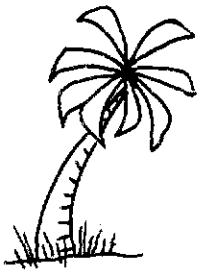
SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, Jr., WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/A AUX: AA4BL. TC: N4AU. ATC: WB4BYQ. ACC: WA4RNP. "3cr" SEC: WA4RNP. Here are the new officers of the Tuscaloosa Amateur Radio Club: President WB4LLQ, Hubert Worthy; Vice President KB4QDB, Billy Mackey; Secretary/Treasurer AA4QV, L. Warren Brandt. I was glad to see such a good turn out for the Simulated Emergency Test last month. I think that says we have what it takes to get the job done. I have a Silent Key report this month: W4WJF, Clarke Cordle of Birmingham. He will be missed by many as he was a friend of Amateur Radio. Traffic: CAND reports 594 messages in 31 sessions with DRN5 rep 100% by WA4JDH, W4CKS, and NW4X. DRN5 reports 654 messages in 62 sessions with Alabama rep 90% by WA4JDH, W4CKS, NW4X, W4PIM and W4WJF. RN5 reports 509 messages passed in 62 sessions with Alabama rep 94% by WX4I, W4CKS,W4QAT, WA4ZPZ, WA4LLQ, NW4X, and W4PIM. AEND reports 40 messages passed in 31 sessions with other nets rep by WA4JDH, W4CKS, WD4NYL, NW4X and N4DCS. AENB reports 43 messages passed in 31 sessions with RN5 rep by WA4JDH, W4CKS, NW4X, WB4LLQ, WA4ZPZ, W4PIM and W4QAT. AENM reports 68 messages passed in 34 sessions. Brass Pounders League: WA4JDH. PSHR: WA4JDH, W4CKS and WA4RNP. Traffic: WA4JDH 858, W4CKS 109, W4PIM 78, NW4X 41, WA4RNP 29, W4AOZ 28, WA4TVY, W4DGH 8, K4HJX 6.

GEORGIA: SM, Eddie Kosobucki, K4JNL—ASM & ACC: WA4ABY. SEC: NC4E. STM: WB4WQL. STM (Packet): W4QO. BM: WB4ZOJ. OOC: NA4I. PIO: WB4DEB. SGL: W4BTZ. TC: WD4PAH. At the annual GA SSB Associates meeting, N4LGF was presented with the GA 1987 AMATEUR OF THE YEAR AWARD. KF4FG was elected Pres, N4DQM VP, W4HON Sec/Treas, WB4ZMH & WA4EPK Directors. GA had three Silent Keys during August: W4NWB, W4GHA & WA4IUD. Our sympathy goes to their families. Once again, I am asking u to send me the obituary of a SK or send it directly to ARRL HQ. Columbus ARC 1987-88 officers are: Pres: WB4TOM, VP: K4DOW, Sec: W4TMK & Treas: KD4NZ. BGMRC in Newnan elected WD4PAG Pres, N4ODI as VP, Sec/Treas: KB4BBC, Act Mgr: KC4AVT Finance: WS4N. N4IBW has been re-elected Pres of the Atlanta ARC & W4BTZ as VP. WA4ABY as Sec, WA4PZD Treas & Act Mgr: K4VTJ. MALARC is five years old this mo & elected as follows: Pres: N4MAQ, VP: N4HJE, Sec: WO4U, Treas: K4JGK, News Ed: N4OCJ, Act Mgr: N4DTC. Memb: KB4QKX, Hist: K4DDQ, Pub: KL7JAN & tape: WO4U. Remember HAMFEST & COMPUTER EXPO in Lawrenceville on Oct 31 & Nov 1. GPEARS (GA Power) have K4GKV as Pres, WS4N as VP, N4IQR as Sec/Treas & WA4VEX as Rpt Mgr & Trustee. MATPARC has elected KJ4JK as Pres, VP: KJ4YM, Sec: WA4PZN, Treas: N4MXN, Packet: W4QO & K4PQC & Trustees: W4BJT & W4ZTL. It's absolutely wonderful to be SM of the GA section with over 60 active clubs. To the outgoing club officers TNX fer a job well done & to the incoming GUD LUK & help to keep our FB GA section active & healthy in this hobby we're all in. Now that I'm fully retired, I will be more available to visit ur club. If u desire my presence, write me a letter so I can put it in my sked book. Both WB4DVZ & KI4IG made PSHR in July. Mail was late getting to me. Aug PSHR honorees are WB4DVZ, WD4COL, WA4LLE, W4HON & WA4ZHC. When any of u qualify for a PSHR certificate, write K1CE at ARRL HQ. Don't forget to send in ur SET reports & PSE check into one of the FB GA nets. Traffic: WB4DVZ 122, WA4LLE 71, WB4WQL 63, WD4COL 56, KF4FG 55, N4DOM 50, WA4ZHC 38, W4HON 20,K4JNL 14, N4MWR 11, KA4HHE 10, N4UZ 10, K4BAI 7, K4NM 6.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—STM: Rip, AA4HT. OO/RFI: Jim, K4JJE. ACC: Giff, WD4RIO. SGL: John, KC4N. PIO: Petey, WA4PUO. SEC: Rudy, WA4PUP. TC: Ed, WØRAO. ASM/BM: Wimpy, KB4LB. The Amateur Radio Community will miss Phil, WF4X, our past SM and SEC. Our sincere condolences to LOU and the family. He had suffered thru slow recovery following heart attacks for almost two years. We wish COTTON, KB9LT a speedy recovery. He was our STM earlier this year. For those of you who wonder how you can receive an appointment to the various LO positions in the Section, HQ has designed a form for you to apply for several of the positions we fill, to help the activities of the Section move ahead. I have a supply, so send me a note and an SASE for one. We'll keep them on file and use them as needs arise. I'm starting to receive more club newsletters, so thanks to FFARA for THE UGLY CHICKEN and FLAG FLACK. They do not identify their editor so I cannot single him/her out. Also WDWARC has their WISE QUACKS letter with Randy, KJ4BG as editor. A new editor for THE LISTENING POST of the OARC is Doug, N1AIM. Congratulations to all these editors who struggle every month to get their paper out. It's the only way to reach all the club members, since about 1/3 come out to the meetings, so the editor's job is a very important one. CONGRATULATIONS to all of them!!! If your club has not put the SM on their mailing list, I encourage you to do so. It helps to hear from you every month. If there are any questions about the Section, please drop a line. See page 8. QST. Traffic: WX4H 651, WA4QXT 266, W7YWF 230, N4PL 228, AA4HT 171, WD4IIO 131. WA4EYU 111, N4JAQ 93, WC4D 81, N4GMU 73, KB4LB 70, KC4VK 66, N4ADI 66, W4MGO 58, WD4IUI 58, KI4CQ 58, K4CY 56, AA4QC 49, KB4FIY 41, KA4YLH 39, W4KIX 35, WB4TZR 33, N4JHI 30, N2AOX 24, NQ4P 22, WA4SXW 20, NF4O 19, W4DTV 18, KI4NN 18, WA4PUP 18, NS4C 16, KA4KAH 16, N4DY 15, W4UEA 15, WD4HBP 13, KF4GY 13, W4GUJ 11, KJ4RD 8, WB4AWG 7.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OOC: W4TAH. ACC: K4EUK. WD4KBW reports 52 bulletins received and 140 sent by AA4BN 17, W4DL 35, WA4EIC 67, WT4F 13, KA4GUS 4, WD4KBW 19, K4IEK 15, and WA4RLV 22. I was very sorry to hear that Phil O'Dwyer, WF4X, became a Silent Key during August. Phil was especilly active on the Florida Midday Traffic net and Gator Net. He was SM for Northern Florida up until illness caused him to retire. He was a true gentleman and will be missed. W4BCZ is also a Silent Key. Brown Colored Zebra was a real oldtimer, and very active with the Knights of the Kilocycle, Tropical Phone Traffic Net and the Florida Phone Traffic Net. The Modulator, published by the Fort Myers ARC, reported that KYØT had a pot of hot coffee fall and scald his back while he was near Spain. KYØT is a member of QFN when he is home in Lee County, but he is now on another sailing trip. Down Under Land is also scheduled for his trip. Congrats to N4IWO who has taken over as manger of the Florida Medium Speed



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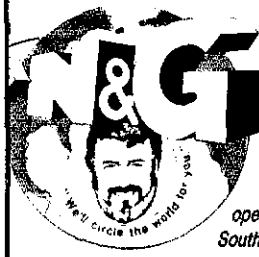

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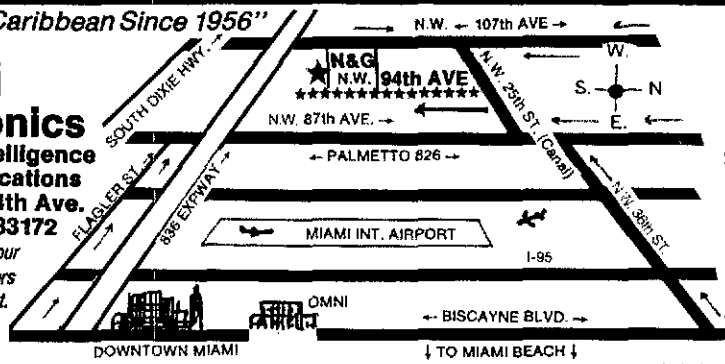

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Net—and thanks to WD4KBW for his workas manager during the past year. KA4FZI had a great first day back at school—she is a computer instructor and had been reconfiguring the hardware system on an IBM computer, but couldn't get the printer to work with it. She called her county consultant and was told that no one could get the terminal program to work that she was using, and that they had someone working on it—about five minutes later she called him back to say she had debugged the program and was using it—hi. WD4KBW reports that the Hardee County ARES provided communications for the 15th annual Hardee County Canoe race establishing a net on the Wauchula repeater (WD4KBW/R 146.625) with net control at the finish line at Pioneer Park in Zolfo Springs and 5 checkpoints along the 13-mile course. The checkpoints observed the canoes as they passed to ensure no one was left up the creek without a paddle. Incidentally, the repeater was donated by WD4KBW and is located in the Hardee County Courthouse in the Emergency Operations Center. Its range is about 30 miles in virtually all directions. The typical comment has been "it fills the gap" and "the heartland is now fully covered by repeaters." The new repeater was built by WD4KBW from a Hamtronics kit, and is house d in a rack donated by Fairchild, Inc. of Sarasota as a result of efforts by W4TAH in Sarasota. The primary purpose of the repeater will be for emergency communications. It is the official voice of the Peace River Valley Amateur Net which now meets at 7:30 PM on Mondays and Thursdays. The Melbourne Hamfest was a great success as usual. There were many excellent meetings—the Traffic Handlers Breakfast again spilled over into two rooms and must have had at least 60 or more in attendance. 73 de WA4PFK. Traffic: W3CUL 2979, W3VR 989, WA4PFK 355, K4EUK 217, K4IA 197, K4SCL 192, WA4RUE 185, KA4FZI 168, W4NFK 167, KA4NXF 138, WA4EIC 138, AA4BN 133, KB4WYG 132, WD4KBW 126, WA4VND 123, W4DL 92, WA4RLV 87, KA4YHS 83, KA4GUS 79, KB4KXV 79, N4MML 76, KA4SIH 64, KB4MON 60, W3TLV 59, K4ZK 54, N4ET 52, W4TAH 49, KB4LPL 46, WB4GCK 36, K5IHH 36, KJ4WJ 35, N4KB 31, KB4FO 30, N4ORZ 29, KI4ZW 28, WA4HDH 27, N4HAS 27, KF4RL 24, WA4VWJ 24, 24, N4QER 22, K4FQU 21, WV5Z 14, KA9AKY 13, AA4CH 13, WT4F 12, WA1BWV 11, W4MPV 11, W3IJR 9, KA6RUL 9, NX5Q 8, W4NSY 8, KC4BCV 8, KB4YBS 7, WD4NXK 7, K9ALX 7, KB4YJF 7, KA0GYF 7, AB4BC 6, WK4F 4, KY6V 4, KA4GDU 3, N4PSV 3, W4TKQ 3, KB4EWO 3, KD4GR 3, K4OVC 2, W4DWN 1, W4MFD 1, KF4JA 1.

WEST INDIES: SM, Jose A. Purcell, Jr. KP4IG—ASM: NP4WI. STM: KP4JW. PIO: NP4XM. BM: KP4EW. TC: KP4ARY. SGL: WP4CSG. ASM: WP4ETG. NM-WINC: KP4JW. NM-WINS: KP4DJ. NM-WINE: VP2VI. A special agreement between ARES group and the PR Civil Defense will be completed by October. Due to personal reasons, WP4FKJ will move to the US. Thanks and good luck to Tito. Please sponsor our Traffic nets, they were organized to serve the amateur radio community. West Indies Nets: WINS 2300 UTC, 3710 kHz-sessions 31, QND 210, QTC 22. QNI 109. WINE: 0001 UTC, 1984 kHz, sessions 28, QNI 51, QTC 2. WINC: 2230 UTC 147.09 MHz, sessions 25, QNI 250, QTC 12.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NMs: K6LL, K7POF, WB7CAG. NTS Traffic Nets:

DAY	TIME	NET	FREQ	QNI	QTC
DAILY	1800 MST	CACTUS NET	3.915 MHz	639	71
DAILY	1830 MST	SWN	3.583MHz	223	202
DAILY	1930 MST	ATEN	3.992MHz	892	101
DAILY		ACN(VHF)		258	64.

More and more communities are considering enactment of highly restrictive zoning ordinances with respect to antenna structures. Latest problem is the Sedona area, with members of the Verde Valley ARC working diligently with county officials to see that amateur radio gets a reasonable deal. Art, KC2EN, doing a great job heading up the committee. Final results later. Congrats to Margaret, KV7D, and Dan, KV7B, of TAPR fame, on bringing in a new harmonic on schedule. (Tks, Solid Copy.) KA7SUF advises that the Superstition ARC will have their annual winter hamfest in Apache Junction Dec. 5-6. Got rained out last year. History cannot repeat! Congrats to Bill, K7CO, on his induction into the Niagara Frontier Aviation Hall of Fame. (Tks, Solid Copy.) Activity reports for August were down. Guess vacations pushed amateur radio to the back burner. As the winter season begins, let's get our operating activities going again in full swing. The sunspots are coming back, so DX should pick up. Bill, K7KI, our Section Technical Coordinator (TC), is looking for a few good people to volunteer for ATC appointments. If interested, contact him for application. By the time you read this your SM will be ensconced back in Tucson at the home QTH. It was a great summer in the White Mtns, and we hope to do it again next year. Hope all you ECs and DECs out there are planning your SET scenarios for November. If you need additional reporting forms, contact the SM, and be sure and send in SET reports before January 29, 1988. See you on same street corner next month. Keep those cards and letters coming in. 73, Jim. Traffic: KA7MUL 471, W7EP 151, K6LL 146, WE7G 105, WB7CAG 77, W7KCM 71, K7JKM 50, W7AMM 44, N7ETP 28, K7POF 27, W7KXE 17.

LOS ANGELES: SM, Bob Poole, AJ6F— ASM:K6IYK. SEC:AK6Y. STM:W6INH. SGL:K6KSY. TC:WA2KDL. ACC:KB6AXK. Preparations are underway at press time for the second Angeles Crest 100 foot race which will again be supported by radio amateurs from all over the south land; W6ORG, Tom, indicates that the support given by hams last year was widely acclaimed. I'm sure that the hams will live up to their usual good reputa tion again this year. On August 29th, the digital "gurus" made their way to TRW for the sixth ARRL Networking Conference; TRW, the SCDCC and several local packet groups were well represented as the various papers were presented and the proceedings became a matter of record. My personal thanks to WA2KDL and the TRW club for making this activity a success in spite of the nearly simultaneous swap meet which seemed to proceed as normal. Watch for news on the first annual SGVRC swapmeet on October 6th. The SCDXC and TRW clubs were both treated to a show and tell on the subject of the Downey ARC's communications van in July; plans include taking the van to the TRW swapmeet to show to passers-by there. Many of the local clubs will be staffing an amateur radio booth at the LA County Fair; over a million folks are expected to pass by the booth during the fair this year - congrats to the LAACARC for their persistence in making this a reality this year. Speaking of persistence, Tex, N6AHV and others in the SCDXC managed to regain the DWP cafeteria as a regular meeting place. Nice going, Tex. Contact Bill, W1WEX for details on the San Fernando Valley ARC auction coming soon (via PO Box 3151, Van Nuys 91407). Hughes club members and the rest of the section congratulate these two active hams upon their retirement: K6JGV and WD6BAI; now Orson and John can get to some REAL work! Les, KB6LTL, has provided the following activity for inclusion here and (hopefully) for recognition as PSHR candidates: (CALL/TRAFFIC) N6AHT 50, KB6DDV 3, K6IDU 7, WD6L 1, KB6LTL 6, N6MGC 1, WB6MKA 3, N6NYK (unbelieveable!) 165, KA6RQT 2, KB6SPF 57, KA6UIT 1, WA6UVV 5, KR6Y 2, KA6ZDL 15. Worthy of special note in the above W6FNO/R emergency

traffic activity is the one incident handled by Bill, KA6ZDL, whereby he handled a distress call from a vessel sinking in Region 2. The annual report from the FNO group includes several PSHR current and potential PSHR candidates. Travelers to the LA area should be aware that FNO operates on 146.82(–) and is a dedicated emergency and calling *frequency. Other cities should adopt this unique concept and* publicize the frequencies for the travelling hams to turn toward in case of trouble. The traffic count for AJ6F-1, K6IYK-4 and -14, WB6YMH-2, NK6K-2 and -3 and N6CUS-1 is on the rise; packet and NTS are finally getting together with the help of veteran traffickers and computer nuts together. With the STA *and SkipNet developments progressing, watch for more traffic* to be handled this modern way along difficult routes with the conven tional personalized delivery technique at the end of the path. Thanks to all the Brass-Pounders who are now equipped to do traffic either way. STM News: Things picking up on the national traffic system. New active stations now W6TH and soon VE3AWE. Terry, who is going to be with us for a few years. Located in Santa Barbara and former RN-1 manager. It's great to get some new help on the nets. Vito is located in Rosamond and additional hobby is catching rattlersnakes. Traffic: K6UYK 470, W6INH 268, W6TH 222, N6LHE 197, WB6VPY 114, N7CZF 105, K6YBV 74.

ORANGE: SM, Joe H. Brown, W6UBQ—ASM: Riv Co. BOB W6LKN (714-686-3823). ASM: Org Co. RALPH WB6JBI (714-776-9272). ASM: SB Co. TONY WB6OHB (714-981-1836). ARES/RACES activities. EQ Response 87 Exercise Workshop Section meeting was well attended and productive. 42 were there. Fm Org Co Gary WB6HUG (RACES/COMM), Chris Boyd (Co FD EMD Manager). Riv Co, Mike N6KZB (Asst Div Chief ESD FD), Greg Scott (Chief ESD RCFD/CDF. Don KB6JQS (Municipal Water Dist of SC) and that list is from the Government side. ARRL Field Organization was well represented, Ron AK6Y (SEC LA), Ken WA6ZEF (SEC, ORG) too many EC, AEC, ASM, ATC to list in this limited space, but must list DEC Mike KA6HII, DEC Lee N8HGT, DEC Corky N6HQI and of course SW Div Dir Fried WA6WZO and *Sandy WA6WZN, ACC. Gov officials discussed level of play* and the amateur community will offer supplemental radio communications. A section control point to assess Amateur manpower requirements will be established. Packet will play a major role. Ernie, WA6QCA, STM will test our HW traffic-handling ability. Good luck!! 9 Sept 87 1910L, Cleveland *National Forest Fire. OES requested Packet Station (Org Co)* RACES activation for mutual aid from Silverado fire camp to QSO with Parris ICC and Riv Co MEOC. Dave, WA6PMX, and Mark, KD6KO, did the honors for Org Co side and WB7QKP Dennis, WA6QMW John and N6FRW Jeff on the Riv County Side. Later that eve, a request for a link to San Diego (Forest HQ), with a big assist from Don WB6UCK (State OES) the path was established. Unfortunately, I do not have the names or calls of the San Diego Co Amateurs. In the middle of all was ASM Digital Mike N6KZB. Good show. ACC activity. INLAND EMPIRE ARC special event station is active at most events, fairs, wine festivals, turtle races and what have you. Listen for WA6WZF and get a fantastic certificate. Check QST for info. Riverside ARA reports the newspaper and can project is going project is going well. This is an ongoing project for ARC to think about. The loot keeps the Repeater and other projects going. Norco Corona ARC has mini DXpedition to mountain tops, what with Murphy, wind, cold, heat, bugs and different views. Sounds like fun? Citrus Belt ARC celebrated its 40th anniversary. What a BASH. STM info PSHR, WF6O WB6QBZ and WB6QCA. BPL WF6O with 640 traffic total.

Net	Freq	Sec	QNI	TFC	Time	NM
SCN/1	3598	31	285	360	1830	WF6O
SCN/2	3598	30	180	99	2015	WF6O
SCN/V	146.645	31	352	243	2100	WA6QCA

Traffic: WF6O 640, AD6A 100, KA6HJK 98, WA6QCA 83, K6DD 74, WB6QBZ 72, K6ZCE 65, N6GOT 62, W6CPB 24, *KA6GND 21, KA6TND 18, W5TZR 14, W6TNT 10, W6SX 2.*

SAN DIEGO: SM, Arthur R. Smith, W6INI—TC: N6JZE. STM: N6GW. ASST STM: N4KRA. SEC: W6INI. PIO: KG6LF. ECs: WD6CSS. K7DCG, W6INI, WF6K, WK6M, N6NKJ. Forest fires in northern California created a wildland fire hazard in SD County by siphoning off a high percentage of CDF equipment *and firefighters. ARES Red Flag patrols helped till the gap* for several days by providing extra eyes in critical areas. North Shores ARC uses 145.660 as Club frequency. Upgrades: to Advanced, KB6KWO, KB6NTW. N6JZE is RFI chmn for SD Amateur Radio Council. KF6BB is starting a 10-10 chapter for SD. KB6RYE claims to be most southwesterly station in *continental US. Escondido ARS meeting night has been* changed to fourth Thursday at SDG&E facility. Mission Rd & Citracado Pkwy. The National Disaster Medical System drill on Sept. 9 involved over 50 ARES operators at 20 hospitals and NAS Miramar. Poway ARS under the direction of EC K7DCG is drawing up an emergency plan for Rancho Bernardo. The Club meets for breakfast on Saturdays at 0800 at Gus's Family Restaurant, 13224 Silver Lake Dr, Poway. NCTN met 30 times, handled 59 msgs. Traffic: N4KRA 57.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—We are very fortunate that Paul Gagnon, N6MA, and Bill Hoover, KB5AH, accepted appointments as Asst Sect Mgr for Ventura Co. and Affiliated Club Coordinator, *respectively. We are* planning to establish a Section wide organization to help support all our clubs. (There are 15 affiliated clubs and repeater groups, and several unaffiliated clubs, in the Section. Unaffiliated clubs please contact me. . . We'd like to include you in our council.) *Congrats to the Santa Barbara ARC on another fine BBQ, and thanks for the podium time. Also congrats and thanks to the Santa Ynez hams for their hospitality. Looks like you've started a fine tradition. *Know anyone who's willing to translate licensing material into Spanish? (A good grasp of the technical material, as well as fluency in Spanish, are a must.) Please contact me if you do. * Do you like on-the-air activities? Do you enjoy working with other hams? Like to contact and work with the news media? Do you want to help ham radio, your club and/or your Section? *Consider accepting a Section appointment. Your help is* welcome at all levels. * 73 for now. Traffic: W6NOR 136, N6FOU 39, KB6IEC 36, KB6HGB 22.

WEST GULF DIVISION

NORTH TEXAS: SM, Phil Clements, K5PC—ASM: K5MXQ. *STM: W5VMP. SEC: W5GPO. PIO: K5HGL. OOC: WB5JBP.* ACC: W5URI. BM: W5QXK. TC: W5LNL. Welcome to AJ5K, who is very active in the NTS, and has moved into our section. South Texas' loss is our gain, Sid! Good luck to Pat, KM5L, who is relocating to Kansas City. Look for him on CAN. The 7290 Tfc Net for Aug. QNI: 2,513. QTC: 560 in 47 sessions. NM of 7290 is K5QEW. *Sorry to report that Barry Fromm,* KB5R, has become a Silent Key. We have a new ARES Emergency Coordinator for Limestone Co. He is Altus Carter. WA5CLX, in Mexia. Hope to see you at the annual Texoma Hamarama Oct 23, 24 & 25. A good turnout and a great time at the WARS Hamfest in Wichita Falls Sept. 18 and 19. PSHR for August: K5MXQ W5VMP WZ5N WG5S K5UPN. Our Bulletin Mgr. W5QXK suffered a devastating lightning strike which damaged most of his radio gear and RTTY equipment beyond repair. As soon as the equipment is replaced, Don plans to return to his nightly W1AW bulletin sked on the 146.10/70 repeater in Dallas. Traffic: W5TNT 263, N5BT 219, KD5RC 190, WZ5N 187, WG5S 184, K5MXQ 183, W5YQZ 166, W5VMP 133, KA5AZK 100, K5UPN 82, KC5NG 67, W5QU 54, WX5O 33, WA5EZT 25.

OKLAHOMA: SM, Bill Goswick, K5WG—The South Canadian Amateur Radio Society started a Novice/upgrade class on 12 October, and has scheduled a VE examination for 2 December. *For more information, contact Monte Bateman,* WB5RZX or Davis Egle, KD5IT in Norman. There presently is an opening on the section-level staff for the Affiliated Club Coordinator position. The only requirements for appointment are current League membership, an interest in Amateur Radio Clubs and their activities, and a willingness to work with clubs and assist them with achieving affiliation and/or Special Service Club status. If you are interested in this position, please give me a call. For those of you holding ARRL Field Organization appointments please be advised-DO NOT LET YOUR LEAGUE MEMBERSHIP EXPIRE. I have been forced to cancel several appointments over the past year because of expired ARRL memberships. Don't let it happen to you. Life membership is a good way to eliminate membership renewal hassles. Traffic: WB5SRX 285, W5AS 258, WA5OUV 89, W5RB 80, KF5RD 79, KV5X 72, W5IKN 63, WD5IFB 47, K5GBN 39, N5FEM 39, WA5ZOO 30, WA5OGC 29, W5VLW 27, W5VOR 25, K5WG 18. Brass Pounders League: W5AS. Public Service Honor Roll: WB5SRX, KV5X. July Traffic: *KA5WGS 91, NQ5Y 4.*

SOUTH TEXAS: SM, Art Ross, W5KR—ASM: N5TC. SEC: K5DG. STM: K5QEW. TC: NZ5U. ACC: WB5YDD. PIO: WA5UZB. OOC: WA2VJL. BM: K5CVD. SGL: K5KJN. HAMBONES, El Campo, reports KB5DWF upgraded to Technician. PIO WA5UZB and BM K5CVD doing great work *visiting clubs in and around the Houston area. Beaumont ARC* reports good PR with high-visibility ARES booth at local shopping mall. PIA N5FIX, Northwest ARS, Houston, reports KE5IC is new OBS; KB5AEJ is new community activity coordinator. PIA N5IKW, San Houston ARK, reports Novice classes ready to go, DRN5 Mgr WB5YDD reports 654 messages passed in 62 August sessions; STX represented *by 100% by W5CTZ, N5DFO, W5KLV, K5WOB, KD5KO,* K5QEW, N5BHQ, WB5EPA, WB5FQU, WB5EZQ, KE5ZV, WA5ZJY, W5SHN, WB5YDD, PIA NZ5J, Seguin, reports W5FFG awarded ARRL Certificate of Merit for 53 years. Amateur Radio service plus establishing the Seguin 146.16/76 repeater; WR5X heard a Mississippi mobile station request help for a family locked out of their car on a little-traveled road, phoned long-DX to Mississippi Hiway Patrol and reports mission accomplished; N5IVU is now an Ensign stationed at Corpus Christi NAS; 12-year old KB5AGM going for Advanced at next VE session. HOT HOG News, Brady, reports completion of McCulloch County ARES communications van. OBS W5KLV reports 6 ARRL bulletins, 31 satellite bulletins, 4 propagation forecasts, 4 DX bulletins, 2 CRRL bulletins given 162 readings on 9 nets. Bay Area ARC's Picayune Intelligencer La Porte, reports club busy installing ARES antenna systems at La Porte City Hall; much RG8U donated by KA5ULZ and N5JQS; training in message handling given to club members. Kendall ARS, Boerne, reports Amateur Radio served *well in Comfort disaster; WB5HHF, KB5ST, KA5WJY,* WB5KPQ, W5RCW and others served where needed. CAND Mgr W5KLV reports 654 messages passed in 31 August session: DRN5 represented 100%; STX stations helping were WB5FQU, NX5V, KD5KQ, N5DFO, WB5EPA, WB5YDD, W5SHN, W5KLV. ORS AC5K reports operating mobile CW *in County Hunters CW contest; worked several Europeans;* will soon have 100% solar- powered station; received a QSL card from USSR which had a cartoon character SNOOPY on it. Texas Southmost ARC's most recent VE test session had 5 applicants, all for Novice to Technician. All upgraded: KA5OQG, KB5ADQ, KA5JBB, KB5CHW and one with no call sign but with proof of passing Novice exam earlier. BM K5CVD is seeking more OBS volunteers; send word to W5KR or WA5UZB, if you wish appointment; KV5VD is till torn up from moving. Traffic: W5KLV 485, WB5YDD 331, W5SHN 297, W5CTZ 244, WD5GKH, AJ5K 112, WB5EPA 109, WB5FQU 94, W5BGE 40, NV5L 33, WB5J 31, W5KR 23, WA2VJL 18, K5DG 7, KA5UVY/T 2, NZ5J 2. (Jul.) AJ5K 193.

WEST TEXAS: SM, A. Milly Wise, W5OVH—ASM: KA5PTG. ASM: WF5D. ASM: N5DO. SEC: W5MVJ. PIO: KE5ZW. ACC: K5IS. OOC: KD5FI. BM: K5VRF. TC: K5CU. STM: AE5I. DEC Herb, N5FHR, reports El Paso, Brewster and Presidio Counties now all have ARES operations in place. Snyder ARC had a booth at the Scurry County Fair. Key City ARC of Abilene had their Communications Van at the Rodeo and Fair in Abilene. Panhandle ARC of Amarillo hold their ARES/RACES Training Net Mondays on 146.67. Lou Davis, K5CU, Tech Coord for WTX has been busy appointing ATCs and is looking for other qualified hams. Lubbock has two nets operating. VHF 146.34/94 every Tues at 8 PM CST and HF net 28.454 MHz at 9 PM CST weeknights. Section Traffic Manger Gene, AE5I, is looking for traffic handlers in West Tx. Since the West Tx Section has been divided into five districts by me, still lack one Assist. Section Manager so need an ASM to cover the area from Taylor County to Andrews County. Section Officials listed above are looking for willing, able and qualified hams to appoint to positions. If you are willing to help, contact the appointee in charge. Activity reports: N5FHR, KE5ZW, *W5MVJ K5CU and AE5I rec 32, sent 41, del 1, total 74;* WA5ROE Rec 3, sent 3, del 2, total 18.

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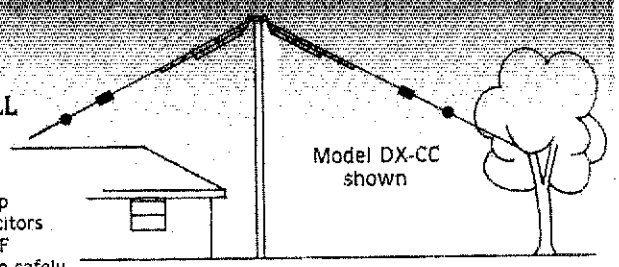

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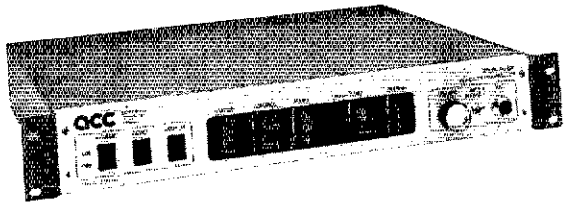

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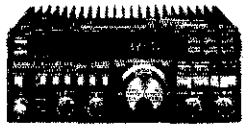

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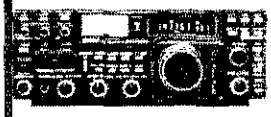

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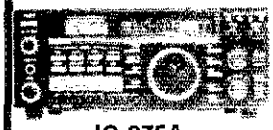

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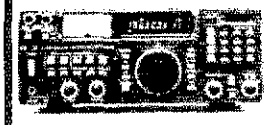

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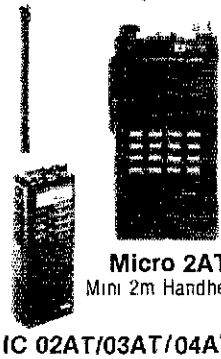

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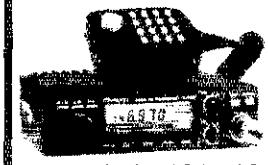

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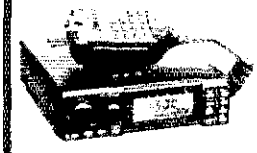

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ICOM

ICOM: Rock Stable and Designed to Stay that Way!

Modern communications techniques are indeed unlimited in their capabilities and quite exacting in their related transceiver's performance. High frequency stability and accurate dial calibration are important to SSB operations while newer printed modes such as RTTY mailboxing and HF packeting are even more frequency sensitive in nature. Even a miniscule loss of information on those modes can disqualify a full transmission's contents.

Recognizing those criteria, ICOM transceivers incorporate full microprocessor controlled dual PLL tuning systems for ultimate frequency stability and superb calibration accuracy. The resultant products are transceivers you can tune to a specific frequency, then rely on their no-compromise operation at that precise point ten hours, ten days, or even ten years thereafter. This pacesetting performance reflects ICOM's dedication to manufacturing the best equipment consistent with modern technology.

Older style tranceivers used analog VFO's with variable capacitors or permability-tuned coils for frequency selection. Low operating ranges plus use of carefully selected temperature compensating capacitors were their main means of limited drift. Naturally, those units were also susceptible to image reception.

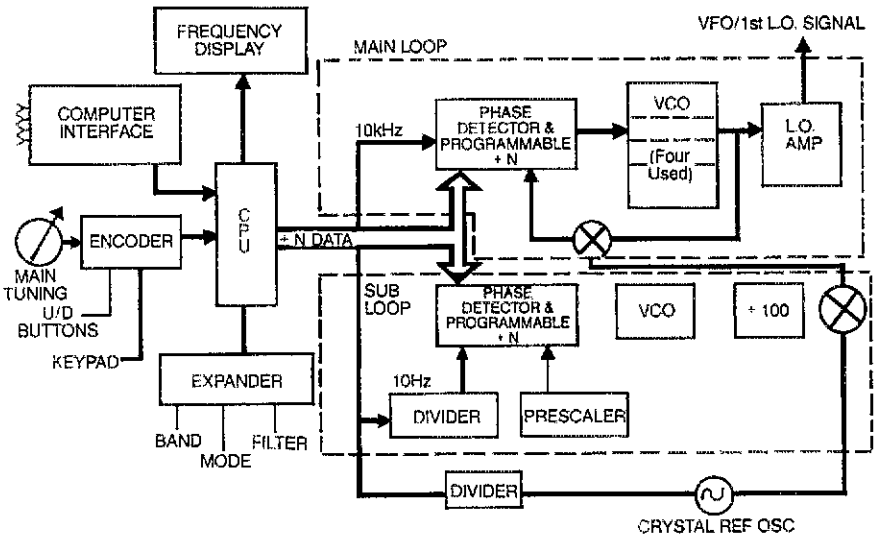
ICOM's technically advanced transceivers utilize a sophisticated double Phase Lock Loop system for generating their ultra-stable VFO signal while integrating IF up-conversion to virtually eliminate images. This PLL system is driven or programmed via the transceiver's microprocessor which, in turn, is controlled by the unit's main tuning knob, up/down buttons, computer interface, etc. Its condensed block diagram is shown in the included figure.

The main PLL is comprised of several stages, including an externally programmable divide-by-any-number section, phase comparator, four tuning range-controlling VCO's and an in-loop mixer that accepts injection frequencies from the sub loop. This down-mixing concept allows the PLL's VCO's to operate at frequencies significantly higher than the speed of the programmable divider, creating a reversal of loop dynamics and stabilizing it within extremely close tolerances. The sub loop is similar in design except different division ratios are utilized inside and outside the loop to achieve smooth multirate tuning. An independently operating master crystal oscillator generates reference signals for the loops.

Transceiver frequency selection is determined by the VFO signal, which is determined from the combined operation of the main and sub loops and the crystal reference oscillator. When the main tuning knob is rotated, its slotted flywheel behind the front panel interrupts two LED beams that are phototransistor-sensed, pulse-encoded and directed to the Central Processing Unit. That unit sends "divide-by-N" data to the loops plus developing information for band/mode/filter sections and the frequency display. The main loop is referenced to, and increases/decreases in 10kHz steps. Likewise, the sub loop is 10Hz referenced and increases/decreases in 10Hz steps.

The concept of using a high stability crystal oscillator, mixing its signal with a comparably referenced and precisely stepped pair of PLL's, and including four local oscillator-determining VCO's in the main PLL yields long term stability comparable to, or better than, a crystal. Likewise, exact frequency calibration is maintained through divide-by-N data from the CPU. A thermistor-controlled crystal oven is included in ICOM's IC-761, and available as an option for the IC-751/A. Coreless coils are used in the VCO's to assure maximum stability and immunity to external sources. The crystal reference oscillator and Voltage Controlled Oscillators are also double voltage regulated for additional stability!

When rock stable performance and superb dial calibration accuracy are important to your activities, think ICOM. Industry-leading designs are combined with proven reliability, and the full package is backed with an incomparable customer support/warranty program. ICOM: rock stable and designed to stay that way!



ICOM'S PLL TUNING SYSTEM
(CONDENSED FOR SIMPLICITY)

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline (206) 454-7619**
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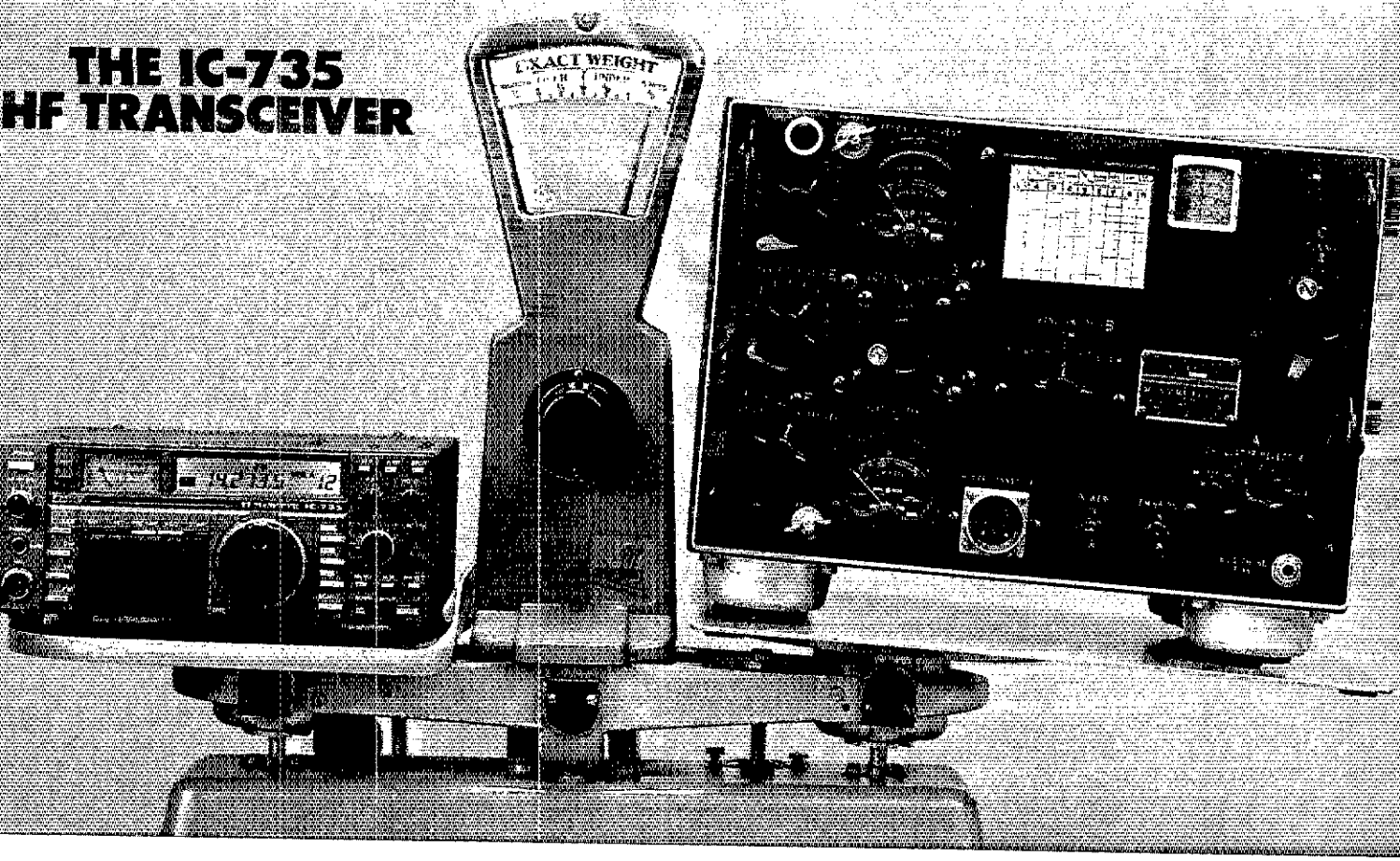
THE IC-735 HF TRANSCEIVER



BUY YOUR HF FOR PERFORMANCE, NOT BY THE POUND

- **All HF Band Transceiver/ General Coverage Receiver**
- **HM-12 Scanning Mic Included**
- **12 Memories/Frequency and Mode**
- **105dB Dynamic Range**
- **All Modes Built-In USB, LSB, AM, FM, CW**

The IC-735 is a heavyweight when ou compare features and performance. Other transceivers may weigh more than he advanced IC-735 compact HF transeiver, but inch-for-inch and pound-foround, the IC-735 outweighs them all.

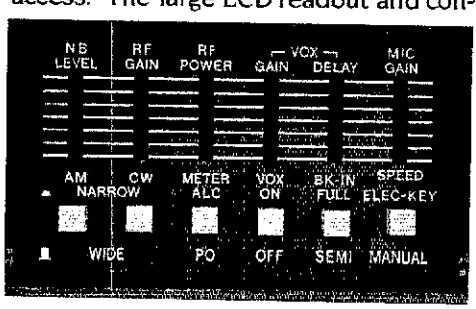
Ultra Compact. Measures only 3.7 ches high by 9.5 inches wide by 9 ches deep and weighs only 11.1 pounds. Without question, the IC-735 is the best F transceiver for mobile, marine or ase station amateur operation.

All Amateur Band Coverage. It's a gh performer on all the ham bands, us it includes general coverage recepon from 100kHz to 30MHz. May be asily modified for MARS operation.

12 Memories. Frequency and MODE may be easily stored and retrieved in the 12 tunable memories.

Exceptional Receiver. To enhance receiver performance, the IC-735 has a built-in receiver attenuator, preamp, and noise blanker. PLUS it has a 105dB dynamic range and a technologically advanced low-noise phase locked loop for extremely quiet rock-solid reception.

Simplified Front Panel. Controls which require infrequent adjustment are placed behind a unique hatch cover on the front panel of the radio. The hatch cover is designed to protect seldom used controls from being accidentally knocked off line, but also provides easy access. The large LCD readout and conveniently located controls enable easy operation, especially important for the mobile environment.



More Features. FM built-in, HM-12 scanning mic, program scan, mode scan and memory scan. Switchable AGC, automatic SSB selection by band and RF speech processor. Continuously adjustable output power up to 100 watts, 12V operation, 100% duty cycle and deep tunable notch filter.

Options. A new line of accessories are available, including the AH-2 mobile antenna system, AT-150 whisper quiet automatic bandswitching antenna tuner for base station operation and the PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

See the IC-735 performance heavyweight at your local authorized ICOM dealer.

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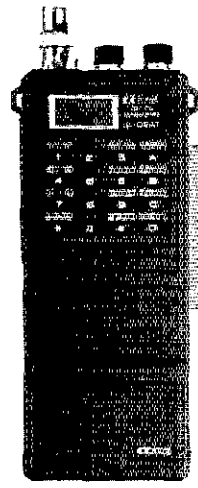
SATURDAY
NOVEMBER 7, 1987
9:00am till 3:00pm

ICOM



WIN!!

* **Prize drawings each hour! Come and register to win!**

Grand Prize

IC-02AT 2-Meter
Digital Readout
Handheld
(No purchase necessary to win.)

* **Special pricing**
* ***ICOM personnel to demonstrate new equipment***
* **See the new line of ICOM equipment**

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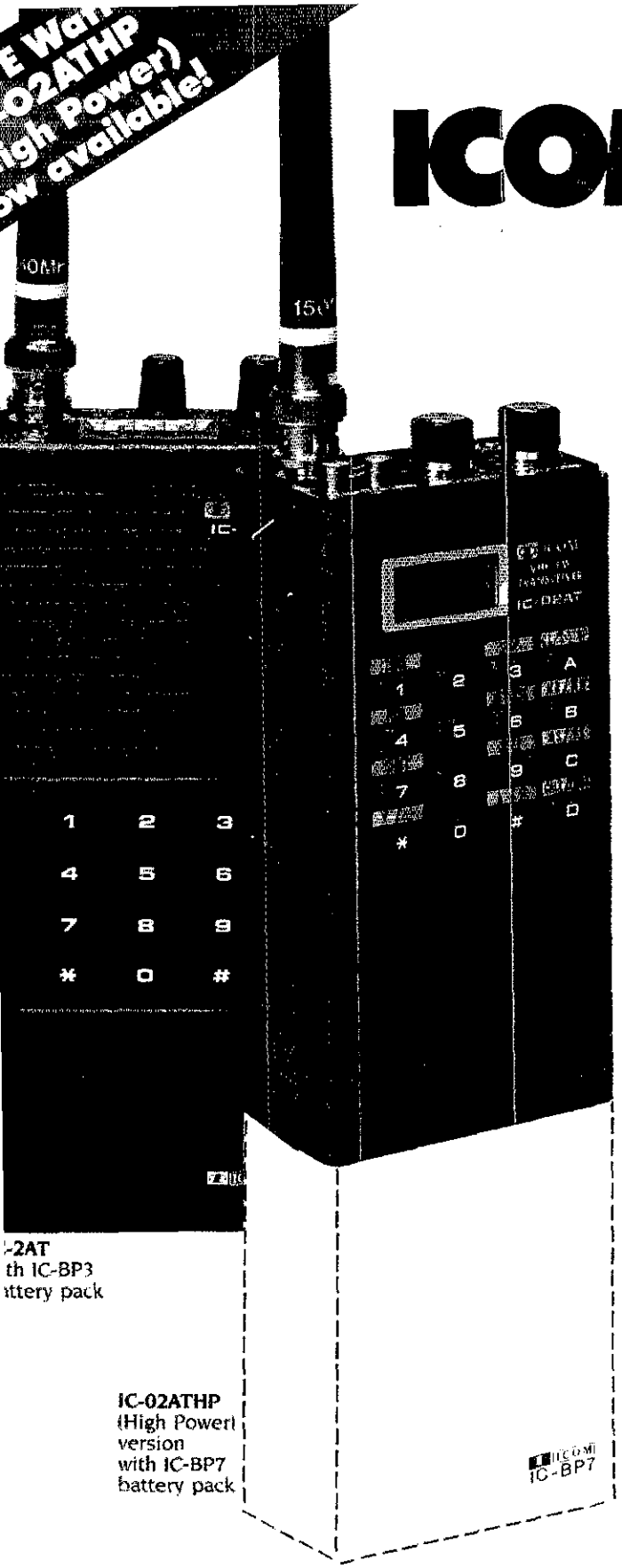
Spectro Comm™

It's like nothing you've seen before!

ICOM IC-02AT



-2AT
th IC-BP3
ttery pack

IC-02ATHP
(High Power)
version
with IC-BP7
battery pack

Full Size, High Power

If you want a 2-meter handheld with exceptional features, quality built to last, and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

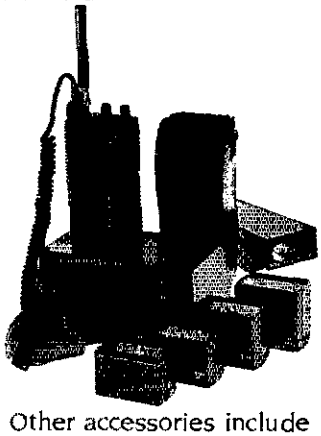
Frequency Coverage. The IC-02AT covers 140.000 through 151.995MHz and the IC-2AT, 141.500 through 149.995MHz...both include frequencies for MARS operation.

IC-02AT Features. ICOM's versatile IC-02AT handheld has the following outstanding features:

- DTMF/direct keyboard entry
  LCD readout
- 3 watts (IC-BP3 battery pack) standard, or 5 watts (IC-BP7 battery pack)
- 10 memories which store duplex offset and PL tone (odd offset can be stored in last 4 memories)
- Frequency dial lock
- Three scanning systems: priority, memory and programmable band scan (selectable increments of 5, 10, 15, 20, or 25kHz)

IC-2AT Features. The IC-2AT is ICOM's most popular handheld on the market. The IC-2AT features a DTMF pad, 1.5 watts output, and thumbwheel frequency selection. The IC-2A is also available and has the same features as the IC-2AT except DTMF.

Accessories. A variety of slide-on battery packs are available for the IC-02AT and IC-2AT, including the new long-life 800mah IC-BP8 which can be used with both handhelds.



Other accessories include the HS-10 boom headset, HS-10SB PTT switchbox, HS-10SA VOX unit (for IC-02AT), and an assortment of battery pack chargers.

The IC-02AT and IC-2AT come standard with an IC-BP3 NiCd battery pack (IC-02ATHP comes with IC-BP7 battery pack), flexible antenna, AC wall charger, belt clip, wrist strap, and ear plug. See the IC-02AT and IC-2AT 2-meter handhelds at your local ICOM dealer.

Often imitated, never duplicated.

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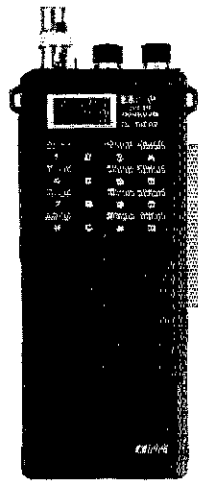
SATURDAY
November 14, 1987
9:00am til 5:00pm

ICOM



WIN!!

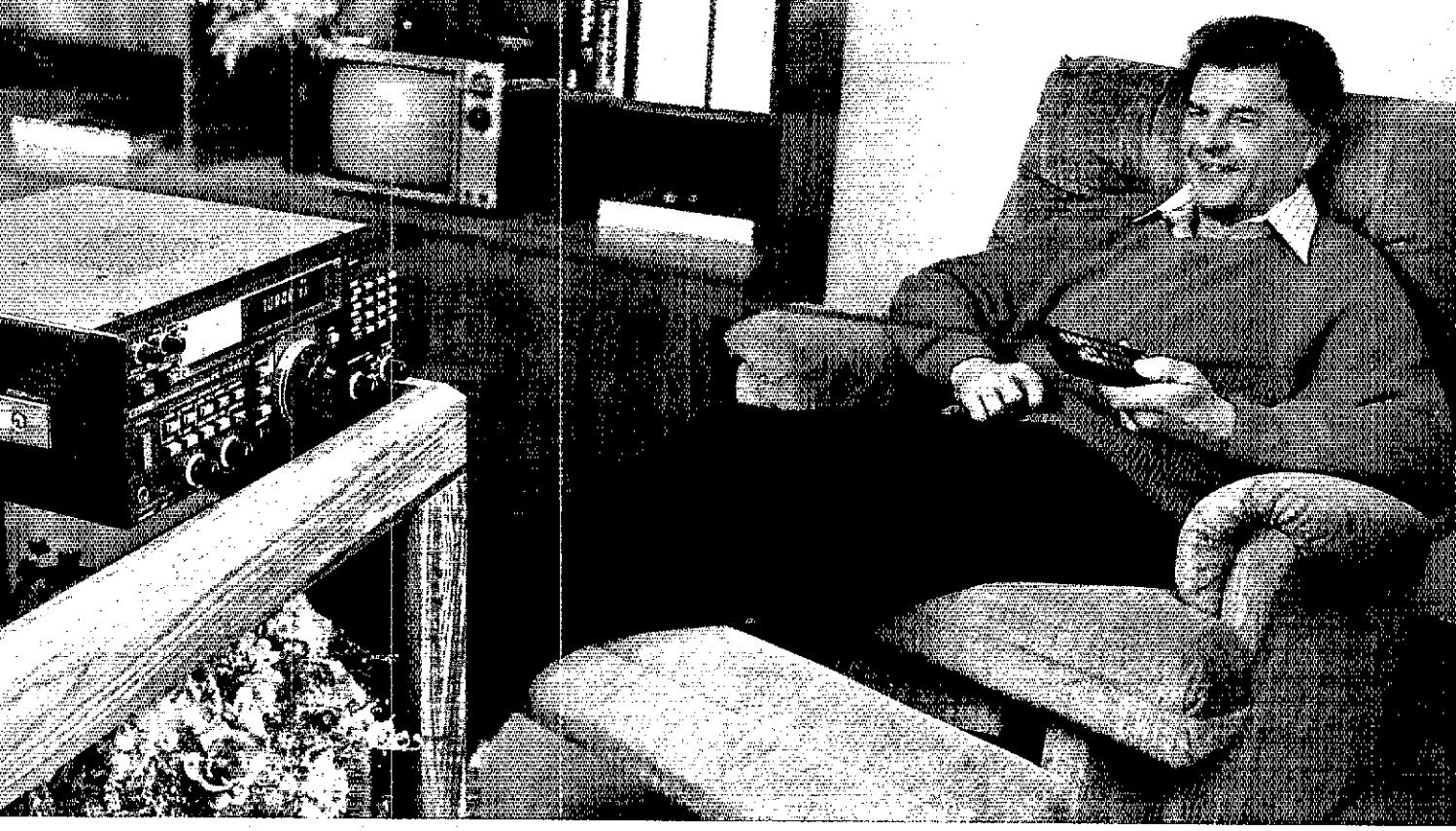
★ **Prize drawings each hour! Come and register to win!**

Grand Prize

IC-02AT 2-Meter
Digital Readout
Handheld
(No purchase necessary to win.)

★ **Special pricing**
★ **ICOM personnel to demonstrate new equipment**
★ **See the new line of ICOM equipment**

What is an ICOM Spectro Comm™?



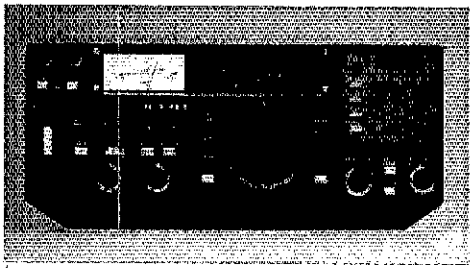
ICOM RECEIVERS

The World at Your Fingertips

Only ICOM brings the world into ur living room...HF, VHF, UHF, and v band receptions. ICOM is the pro-ssional's choice to receive interna-nal broadcasts, aircraft, marine, siness, emergency services, televi-n, and government bands. Tune in th ICOM's IC-R7000 25-2000MHz* d IC-R71A 0.1-30MHz commercial ality scanning receivers for full spec-m coverage.

Incomparable Frequency Control. th the IC-R71A and IC-R7000 feature **ect frequency access** via their front ypad, main tuning dial, optional infra-d remote control and/or computer in-face adapter. **Flexibility of this na-e can only be accomplished with an OM!**

Full Coverage, Maximum Perform-ce. The superb **IC-R71A** is your front v seat to worldwide SSB, CW, RTTY, l, and FM (optional) communications d foreign broadcasts in the 100kHz to MHz range. It features passband, IF tch, low noise mixer circuits, and dB dynamic range. The pacesetting **R7000** receives today's hot areas of interest, including aircraft, marine, public services, amateur, and satellite transmissions in the 25MHz to 2000MHz* range. It includes **all mode operation** low noise circuits plus outstanding sensitivity and selectivity. The combined IC-R71A/IC-R7000 pair creates a full radio window to the world!



The IC-R71A is a shortwave listener's delight. Its **32 tunable memories** store frequency and mode information, and they are single-button reprogrammable **independent of VFO A or VFO B's operations!** This HF reception is further enhanced by a dual width and level adjustable noise blanker, panel selectable RF preamp, selectable AGC, **four scan modes**, and all-mode squelch.

The IC-R7000 is a high band monitor's masterpiece. Its **99 tunable memories** are complemented by **six scanning modes**. It even scans a band and loads memories 80 to 99 with active frequencies without operator assistance! Additional features include selectable scan speed and pause delays, wide/narrow FM reception, and high frequency stability. Many professional services use IC-R7000's as calibration references.

Options. IC-R7000: RC-12 remote control, EX-310 voice synthesizer, CK-70 DC adapter, MB-12 mobile bracket. IC-R71A: RC-11 remote control, EX-310 voice synthesizer, FM module, CK-70 DC adapter, MB-12 mobile bracket, FL-32A 500Hz, FL-63A 250Hz, and FL-44A filters.

See the IC-R7000 and IC-R71A at your local authorized ICOM dealer.

* Specifications of IC-R7000 guaranteed from 25-1000MHz and 1260-1300MHz. No coverage from 1000-1025MHz

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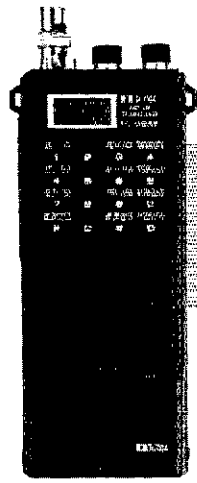
SATURDAY
NOVEMBER 21, 1987
10:00am till 4:30pm

ICOM



WIN!!

* **Prize drawings each hour! Come and register to win!**

Grand Prize

IC-02AT 2-Meter
Digital Readout
Handheld
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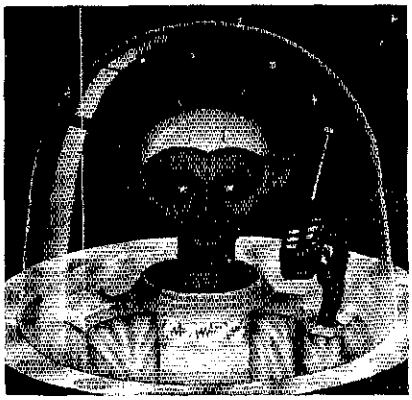
* **Special pricing**
* **ICOM personnel to demonstrate new equipment**
* **See the new line of ICOM equipment**

See the ICOM Spectro Comm™ in December's QST!

Yaesu's FT-736R. Because you never know who's listening.



Why just dream of talking beyond earth?

With Yaesu's new FT-736R VHF/UHF base station, you can discover some of the best DX happening in ham radio. Via moonbounce. Tropo. Aurora. Meteor scatter. Or satellites.

You see, the FT-736R is the most complete, feature-packed rig ever designed for the serious VHF/UHF operator. But you'd expect this of the successor to our legendary FT-726R.

For starters, the FT-736R comes factory-equipped for SSB, CW and FM operation on 2 meters and 70 cm (430-450 MHz!), with two additional slots for optional 50-MHz, 220-MHz, or 1.2-GHz modules.

Crossband full duplex capability is built into every FT-736R for satellite work. And the satellite tracking function (normal *and* reverse modes) keeps you on target through a transponder.

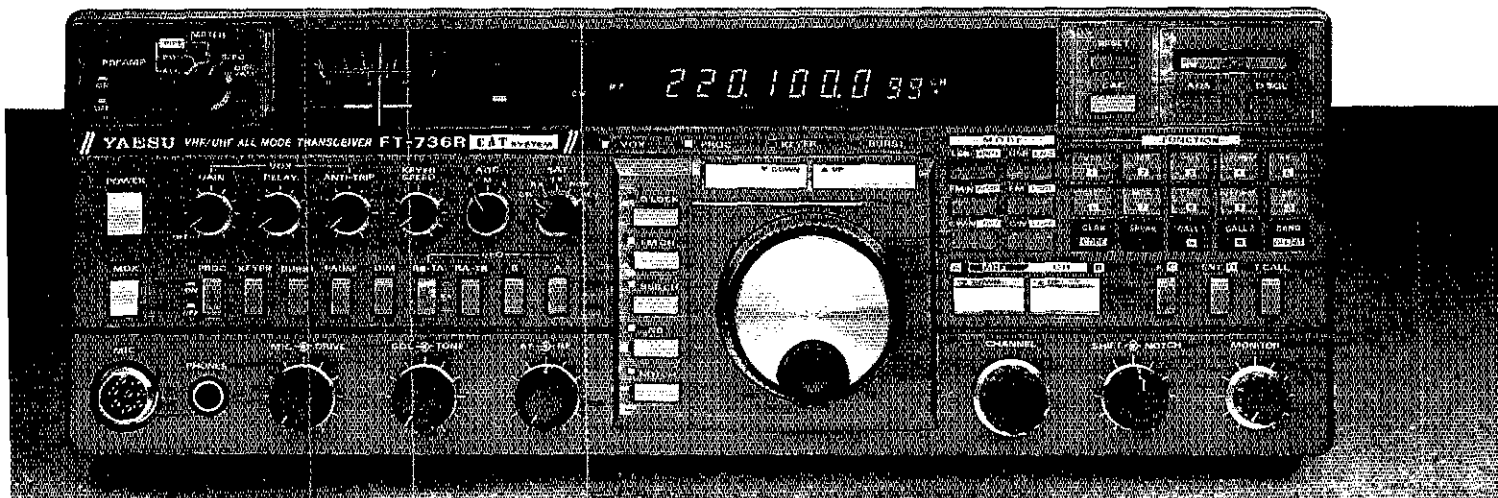
The FT-736R delivers 25 watts RF output on 2 meters, 220 MHz, and 70 cm. And 10 watts on 6 meters and 1.2 GHz. Store frequency, mode, PL frequency, and repeater shift in each of the 100 memories.

For serious VHF/UHF work, use the RF speech processor. IF shift. IF notch filter. CW and FM wide/narrow IF filters. VOX. Noise blanker. Three-position AGC selection. Preamp switch for activating your tower-mount preamplifier. Even an offset display for measuring observed Doppler shift on DX links.

And to custom design your FT-736R station, choose from these popular optional accessories: Iambic keyer module. FTS-8 CTCSS encode/decode unit. FVS-1 voice synthesizer. FMP-1 AQS digital message display unit. 1.2-GHz ATV module. MD-1B8 desk microphone. E-736 DC cable. And CAT (Computer Aided Transceiver) system software.

Discover the FT-736R at your Yaesu dealer today. But first make plenty of room for exotic QSL cards. Because you *never* know who's listening.

YAESU



Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Repair Service: (213) 404-4884. Parts: (213) 404-4847.
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011 (513) 874-3100.

Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc. FT-736R shown with 220-MHz option installed.

The New 688-page ARRL Operating Manual is HOT...

On July 8, 1986, a railroad tanker carrying toxic phosporous derailed and caught fire near Miamisburg, Ohio. The success of the Monsanto Amateur Radio Association's emergency plan in helping local authorities deal with this potential disaster is documented in November 1986 *QST*. The photograph above which was taken over the scene by Mike Carter, WD8BSI, shows what could happen in your backyard! Would you be ready for such a situation? The Emergency Communications chapter by Richard Regent, K9GDF, in the new *ARRL Operating Manual* tells how to prepare for such an eventuality. Emergency Communications and efficient message handling go hand-in-hand. Maria Evans, KT5Y, tells all about this subject and how you can become a part of the National Traffic System in the expanded Traffic Handling chapter.

Over forty percent of the radio amateurs licensed today were at one time or still are shortwave listeners. With modern transceivers, it's possible to hear what is going on outside our ham-bands. David Newkirk, AR7M, adds his enthusiasm for this closely related hobby in the SWL chapter. On a related subject, Paul Rinaldo, W4RI, tells us about the characteristics of the Amateur Radio Spectrum and how our bands are assigned.

Most hams are interested in just getting on the air and talking to someone. Even so, ham radio is a lot more than talking into a microphone or pounding a telegraph key. Carol Smith, AJ2I, and Bill Jennings, K1WJ, have prepared a chapter on Basic Operating. It is just what the newcomer needs in order to get started, and it's good review for some of us who have been away from ham radio for a while. Almost everyone can qualify for the Rag Chewer's Club Certificate, but do you realize that there are hundreds of Amateur Radio awards from throughout the world? Well you can see dozens of these awards in *full color* along with their requirements in the Awards chapter by Bob Halprin, K1XA.

Clarke Greene, K1JX, tells all about competitive operating. Clarke has won almost every major contest, HF, VHF/UHF, from home and away, using full power and QRP. Now he tells how it's done!

Almost everyone seems to be interested in digital communications these days. Stan Horzepa, WA1LOU, covers Packet Radio in detail; while Larry Wolfgang, WA3VIL, covers RTTY and other digital modes in a separate chapter. If you find SSTV or ATV of interest, Bruce Brown, WA9GVK, has put together a fantastic chapter on Image Communications.

If you still need to work the countries represented by the QSLs below, you're not alone; but you can pickup some good tips on working DX from well-known DXer and author Bob Locher, W9KNI. DX-peditioner Carl Henson, WB4ZNH, gives advice on how to operate from the "rare ones" without catching malaria or worse! You can find out when to work DX at anytime during the sunspot cycle by referring to the propagation tables which were newly incorporated in this edition. You'll also find sunrise-sunset tables for working DXCC countries around the world, and there is a great chapter on Antenna Orientation by *ARRL Antenna Book* editor Jerry Hall, K1TD.

Besides "packet," WA1LOU tells what is new in the area of FM and Repeater operation. This chapter is "must" reading for Novices who want to use repeaters for the first time or for those who want to upgrade their existing repeater operations. There is a lot doing these days on weak signal VHF/UHF work and Mike Owen, W9IP, shows how it's done from moonbounce to meteor scatter. Will you be ready for the OSCAR launch that may take place later this year? Dick Jansson, WD4FAB, captures us with his satellite operating techniques.

You'll also find numerous handy tables and charts in the third edition of *The ARRL Operating Manual*. It is edited by Robert J. Halprin, K1XA, Deputy Manager of Membership Communications at ARRL HQ. The new edition is available at your dealer or from ARRL for $15. (Please add $2.50, $3.50 for UPS for shipping and handling.)

but it's also FUN!

KENWOOD

...pacesetter in Amateur Radio

New 220 MHz

220: FM for All!

Kenwood brings you a wide range of 220 MHz gear designed for every need. Choose from two types of mobile and two types of HT. The TH-315A is a full-featured HT covering 220–225 MHz. Ten memory channels and 2.5 watts of power. (5 W with PB-1 or 12 V DC.) Uses the same accessories as the TH-215A for 2 meters or TH-415A 440 MHz. For truly "pocket portability," choose the TH-31BT, a thumb-wheel programmable, 1 watt unit. For mobile use, select the TM-321A or TM-3530A.

The TM-321A is the 25 W, 220 MHz, 14-channel version of the super popular, super compact TM-221A. The 25-watt TM-3530A has 23 channels, a 15 telephone number memory and auto dialer. Direct keyboard frequency entry and front panel DTMF pad enhances operating convenience. Novice to Amateur Extra, these transceivers will put everyone on the air "Kenwood Style"!

TH-315A
Full-featured HT

TM-321A
Compact mobile transceiver

TH-31BT/31A
Pocket-held HT

New

New

TM-3530A
Full-featured mobile transceiver

KENWOOD

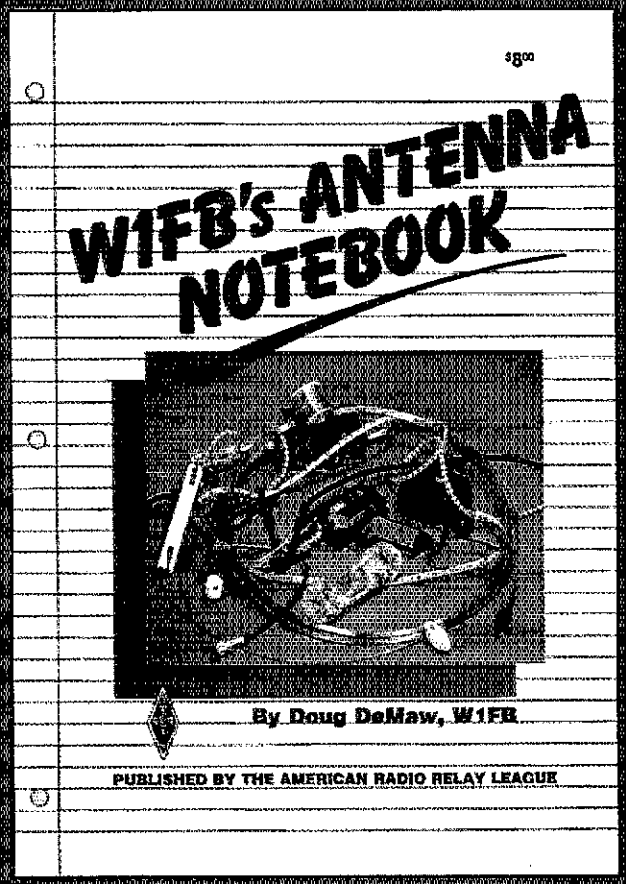
KENWOOD U.S.A. CORPORATION
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

A complete line of accessories is available for all models.
Complete service manuals are available for all Kenwood transceivers and most accessories
Specifications and prices are subject to change without notice or obligation.

W1FB's Antenna Notebook

Here's a brand-new ARRL publication written by Doug DeMaw packed with wire-and-vertical antenna designs you can use. It's based on Doug's experiences and interests and it's a novel!

This is one of the most readable books about antennas ever published. It's not really a novel about antennas, but *W1FB's Antenna Notebook* is far from being a dry lecture on the properties of wire and vertical antennas. Instead, we can imagine ourselves being invited over to Doug DeMaw's hamshack to chew the rag about antennas. Have a seat in the easy chair in front of the fireplace while Doug grabs his *Antenna Notebook* off the shelf. Listen intently as we discuss what this new ARRL publication is about.



While the adage, "the bigger and higher the better" might be true for those with unlimited pocketbooks, lots of real estate, and plenty of technical and mechanical knowledge; most of us are constrained in some way from putting up vast arrays of heavy metal! Wire antennas are inexpensive, can be unobtrusive, and give good performance if designed properly. Verticals don't have to be "equally weak in all directions," and we learn how to overcome this so-called "curse." That bargain coax that you picked up at the local flea market may look good, but is it? The first chapter describes a simple test to find out for sure, as well as telling us about the hidden traps of traps, what conditions cause baluns to do some very nasty things, and a brief discussion on SWR (or VSWR if you prefer.)

The second chapter is devoted to the dipole and its variations: the inverted-V, G5RV, trap dipoles, folded dipoles, multi-band dipoles, and dipole look-alikes. Chapter three covers the care and feeding of end-fed wires. Doug tells how to treat them properly so they won't bite! He will also make your day by telling you how to terminate true longwires—painlessly (so that most of the radiation will be in just one direction.)

During the time that W1FB was *QST* Technical Editor, he lived on a typical suburban lot in Newington, Connecticut. He had a tri-bander for 10, 15 and 20 meters on a 55-foot tower. Since Doug lacked the space to "go out" he decided to "go up" by optimizing his tower and beam for use on the lower amateur bands—especially 160-meters. You'll learn from his experience in one of the most informative chapters on vertical antennas ever written.

Since Doug used to live only 2 blocks from League HQ, he had to cope with over 1 volt of RF at the receiver antenna terminals when WIAW was on the air. With code practice and bulletins being sent on 7 bands, the result was the generation of all sorts of mixing products in many receivers. (This was before the time "bullet-proof" solid-state devices had been developed for receiver front ends.) All of this noise made reception difficult at best! The chapter on Special Receiving Antennas is the result of the author's experience using receiving loops and other types of antennas to overcome this problem. Of course, the antennas described offer a solution to other forms of man-made noise as well.

Wire antennas come in two models: the basic street model, like the dipole, and high performance "off road" configurations. The latter actually provide gain over a dipole in certain directions and are described at length: loops (in almost all geometric configurations,) collinear arrays, and cloud-warmers (for effective short-range communication.)

We know of a local amateur who worked 200 countries from his apartment using a 33-foot end-fed invisible antenna running from the window to a nearby tree. He used a black plastic comb as an insulator on the far end. Chapter 6 is devoted to limited-space and invisible antennas including flag poles, TV antennas (the guy lines are the antenna) and the half sloper.

Need a match? The chapter on matching techniques has circuits ranging from simple L-networks to complete Transmatches.

The final chapter is devoted to measurements. It tells how to build and use such useful devices as field strength meters, SWR bridges, noise bridges, dip meters and a current sampling meter for verticals.

That is *W1FB's Antenna Notebook* in a nutshell. This 122 page publication is available for $8.00 at your dealer or directly from ARRL. Please add $2.50 ($3.50 for UPS) for shipping and handling.

KENWOOD

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#1 Rated HF

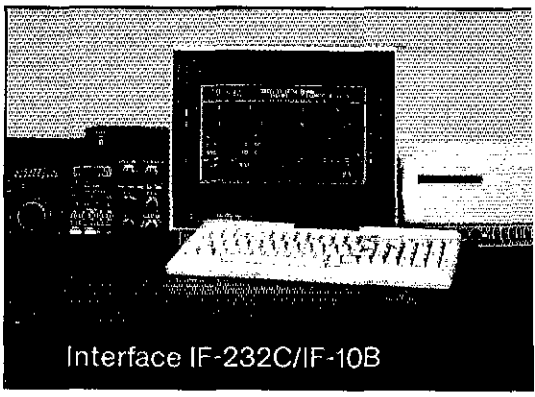
"DX-cellence!"

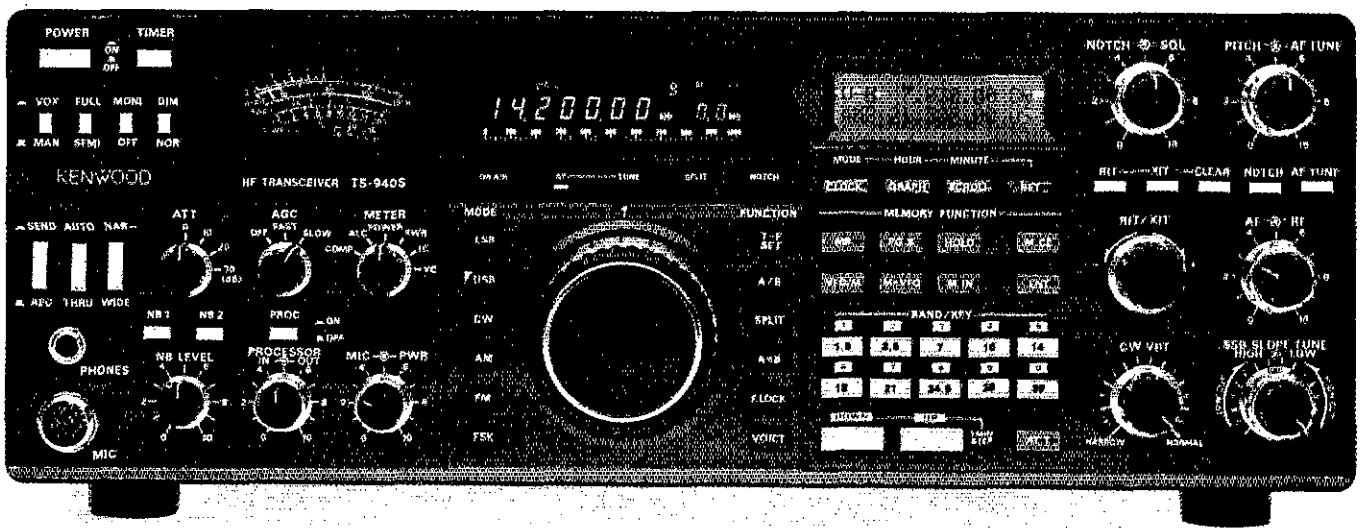
TS-940S

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

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**
- **Semi or full break-in (QSK) CW.**
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **Programmable scanning.**
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First!

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.


Interface IF-232C/IF-10B



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

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

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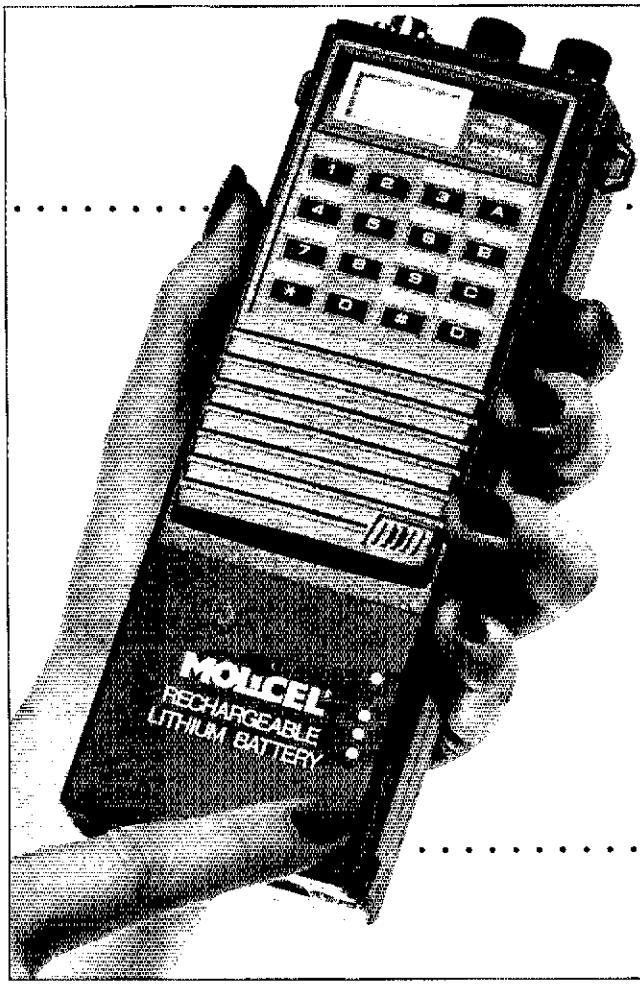

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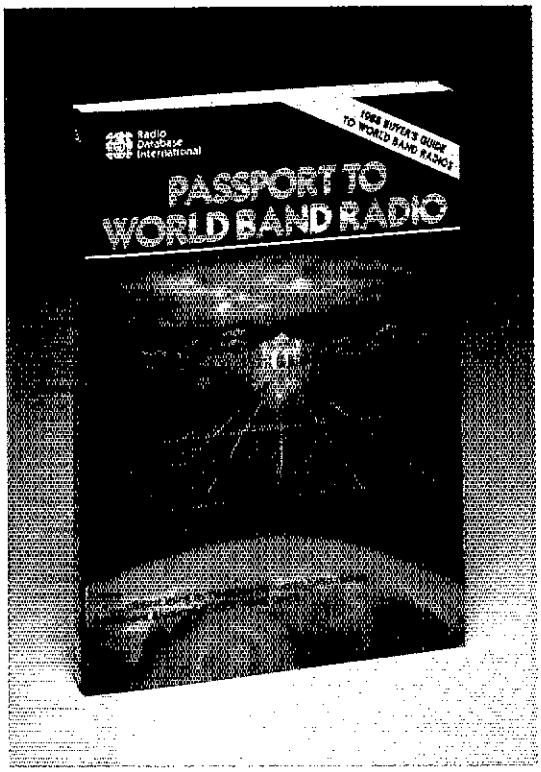

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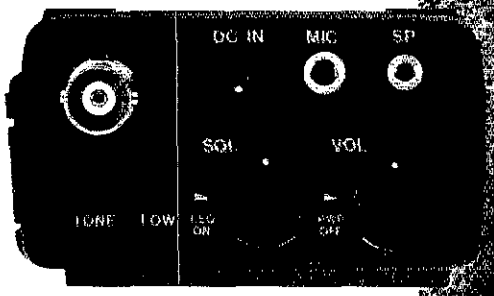
220 MHz TH-315A Here Now!

This HT Has it All!

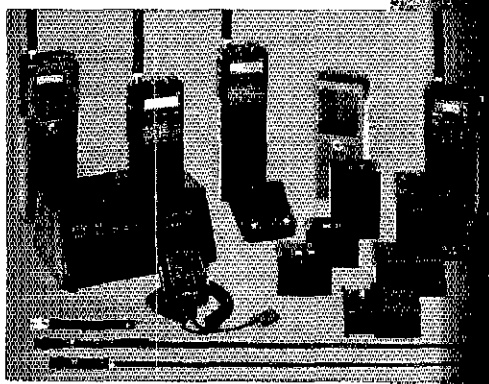
TH-215A/315A/415A

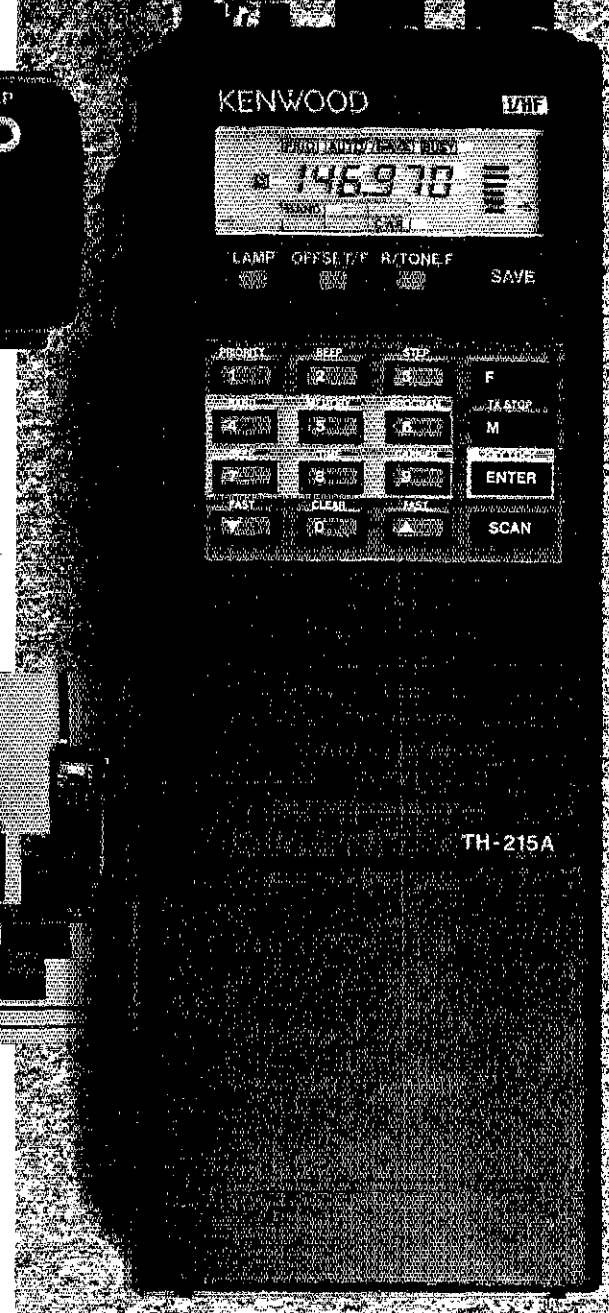
Full-featured Hand-held Transceivers

Kenwood brings you the greatest hand-held transceiver ever! More than just "big rig performance," the new TH-215A for 2 m, TH-315A for 220 MHz, 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-315A covers 220-225 MHz, 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.**
- **Odd split, any frequency TX or RX, in memory channel "0."**
- **Nine types of scanning!** Including new **"seek scan" and priority alert.** Also memory channel lock-out.
- **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 applied, RF output is 5 W! (Cable supplied!)
- **New Twist-Lok Positive-Connect™ locking battery case.**
- **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, DC cable, dust caps.





Optional Accessories:

• PB-1: 12 V, 800 mAH NiCd pack for 5 W output • PB-2: 8.4 V, 500 mAH NiCd pack (2.5 W output) • PB-3: 7.2 V, 800 mAH NiCd pack (1.5 W output) • PB-4: 7.2 V, 1600 mAH 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-88 StubbyDuk antenna • TSU-4 CTCSS decode unit • VB-2530: 2m, 25 W amplifier (1-4 W input) • LH-4, 5 leather cases • MB-4 mobile bracket • BH-5 swivel mount • PG-2V extra DC cable • PG-3D cigarette lighter cord with filter

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

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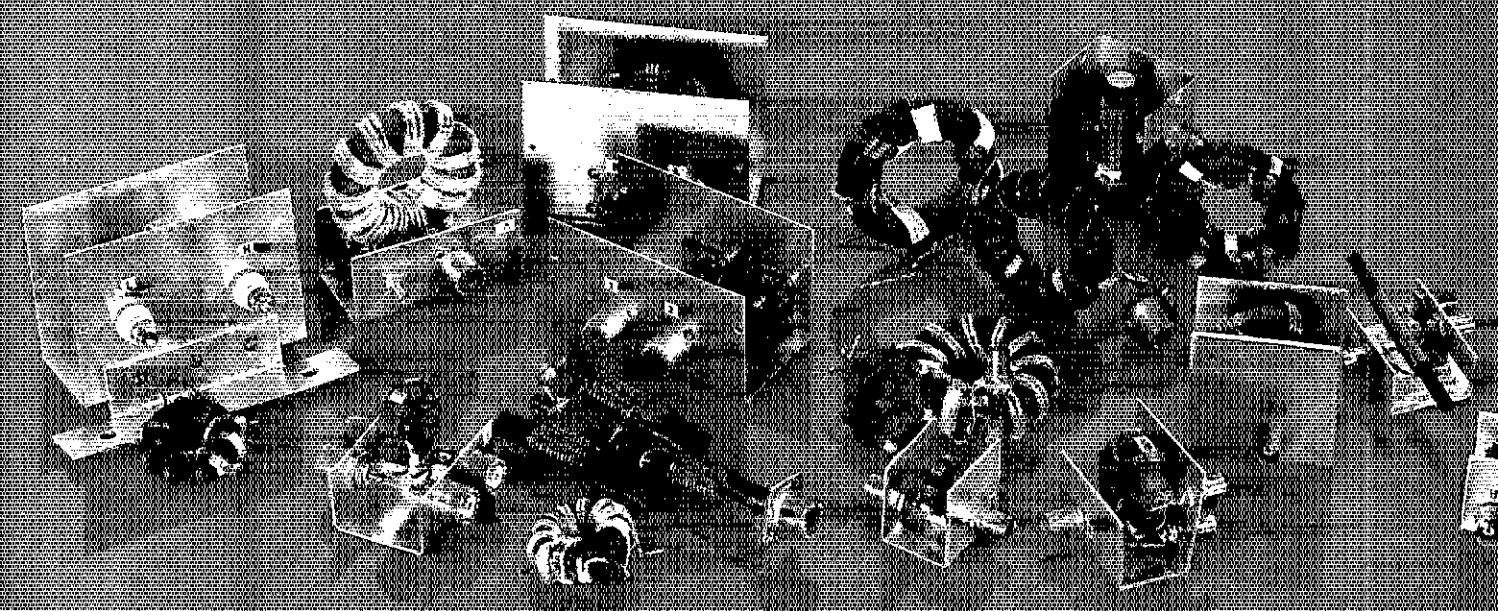
TRANSMISSION LINE TRANSFORMERS



A new ARRL Publication by Dr. Jerry Sevick, W2FMI

Despite the popularity of transmission line transformers in both commercial and amateur applications, little practical design information has been published concerning these devices. The lack of data was made abundantly clear to Jerry Sevick, W2FMI when he began designing matching transformers for the short vertical antennas that are the subject of his classic series of articles that appeared in *QST*. In order to fill in the gaps of available knowledge, Jerry decided to study the subject of transmission line transformers in depth and the results of his findings are contained in this new ARRL publication!

Transmission Line Transformers covers types of windings, core materials, fractional-ratio windings, efficiencies, multiwinding and series transformers, baluns, and limitations at high impedance levels. There is also a chapter on practical test equipment. This book is must reading for everyone interested in antenna and transmission line theory. Copyright 1987, 128 pages $10 hardcover only.

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220 MHz TM-321A Coming Soon!

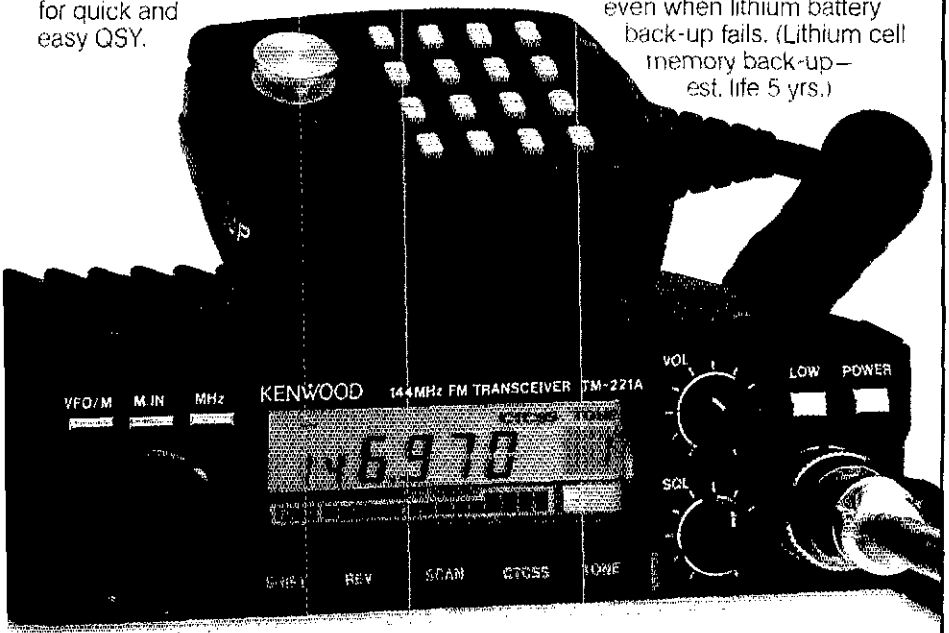
Here's One for You!

TM-221A/321A/421A

2 m and 70 cm FM compact mobile transceivers

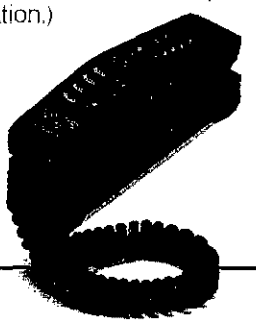
The all-new TM-221A, TM-321A and TM-421A FM transceivers represent the "New Generation" in Amateur radio equipment. The superior Kenwood GaAs FET front end receiver; reliable and clean RF amplifier circuits, and new features all add up to an outstanding value for mobile FM stations! The optional RC-10 handset/control unit is an exciting new accessory that will increase your mobile operating enjoyment!

- **TM-221A provides 45 W, TM-321A, 25 W. The TM-421A is the first 35 W 70 cm mobile!** All three models have adjustable 5 W low power.
- **Selectable frequency steps** for quick and easy QSY.
- **TM-221A receives from 138-173.995 MHz. This includes the weather channels!** Transmit range is 144-148 MHz. Modifiable for MARS and CAP operation. (MARS or CAP permit required.) *(Specifications guaranteed for Amateur band use only.)*
- **TM-321A covers 220-224.995 MHz. The TM-421A covers 438-449.995 MHz.**
- **Built-in front panel selection of 38 CTCSS tones.** TSU-5 programmable decoder optional.
- **Simplified front panel controls**—makes operating a snap!
- **16 key DTMF hand mic., mic. hook, mounting bracket, and DC power cable included.**
- **Kenwood non-volatile operating system.** All functions remain intact even when lithium battery back-up fails. (Lithium cell memory back-up—est. life 5 yrs.)
- **Packet radio compatible!**
- **14 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2 m is automatically selected.** There are **two channels** for "odd split" operation.
- **Programmable band scanning.**
- **Memory scan with memory channel lock-out.**
- **Super compact:** approx. 1-1/2"Hx5-1/2"Wx7"D.
- **New amber LCD display.**
- **Microphone test function on low power.**
- **High quality, top-mounted speaker.**
- **Rugged die-cast chassis and heat sink.**



RC-10 Remote Controller

For TM-221A/321A/421A. Optional telephone-style handset remote controller RC-10 is specially designed for mobile convenience and safety. All front panel controls (except DC power and RF output selection) are controllable from the RC-10. One RC-10 can be attached to two transceivers with the optional PG-4G cable. When both transceivers are connected to the RC-10, **cross band, full duplex repeater** operation is possible. (A control operator is needed for repeater operation.)



Optional Accessories:

- **RC-10** Multi-function handset remote controller
- **PG-4G** Extra control cable, allows TM-221A/TM-421A full duplex operation
- **PS-50/PS-430** DC power supplies
- **TSU-5** Programmable CTCSS decoder
- **SW-100A** Compact SWR/power/volt meter (1.8-150 MHz)
- **SW-100B** Compact SWR/power/volt meter (140-450 MHz)
- **SW-200A** SWR/power meter (1.8-150 MHz)
- **SW-200B** SWR/power meter (140-450 MHz)
- **SWT-1** Compact 2 m antenna tuner (200 W PEP)
- **SWT-2** Compact 70 cm antenna tuner (200 W PEP)
- **SP-40** Compact mobile speaker
- **SP-50B** Mobile speaker
- **PG-2N** Extra DC cable
- **PG-3B** DC line noise filter
- **MC-60A, MC-80, MC-85** Base station mics.
- **MC-55** (8-pin) Mobile mic with gooseneck and time-out timer
- **MA-4000** Dual band antenna with duplexer (mount not supplied)
- **MB-201** Extra mobile mount

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Complete service manuals are available for all Kenwood transceivers and most accessories.

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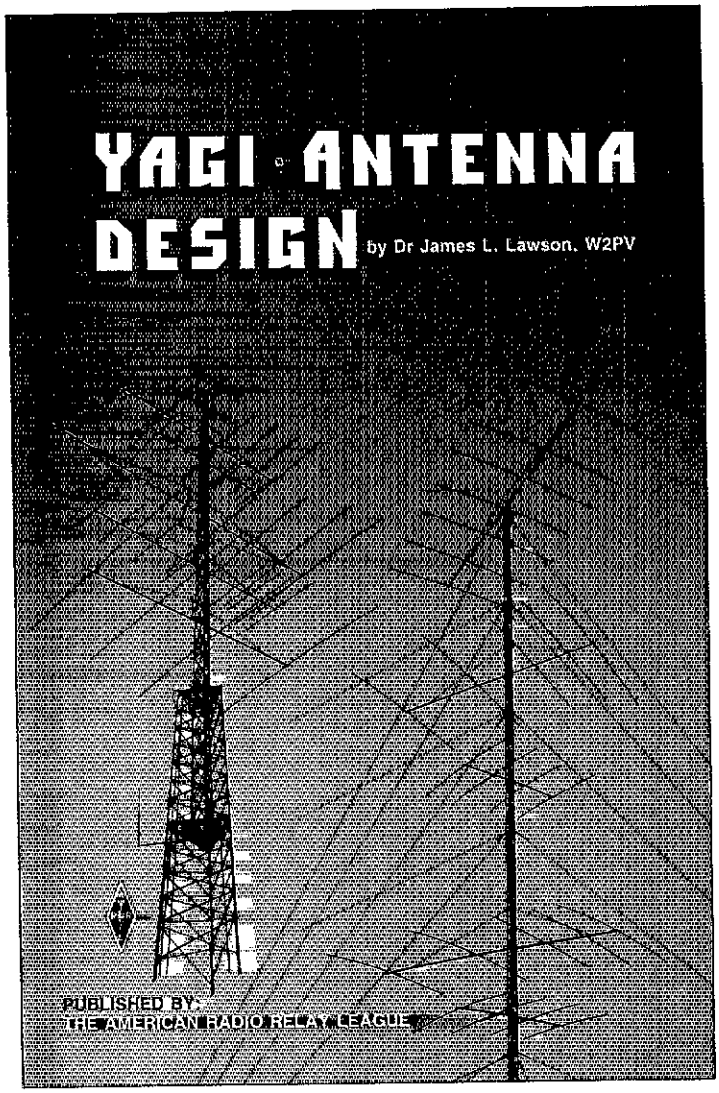

Yagi Antenna Design is based on the series in **Ham Radio Magazine** by the late Dr. James L. Lawson, W2PV. Jim was a highly competitive person and this carried through to his Amateur Radio hobby and work with antennas. Although this book is primarily the work of the author, credit should be given to 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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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.

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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.

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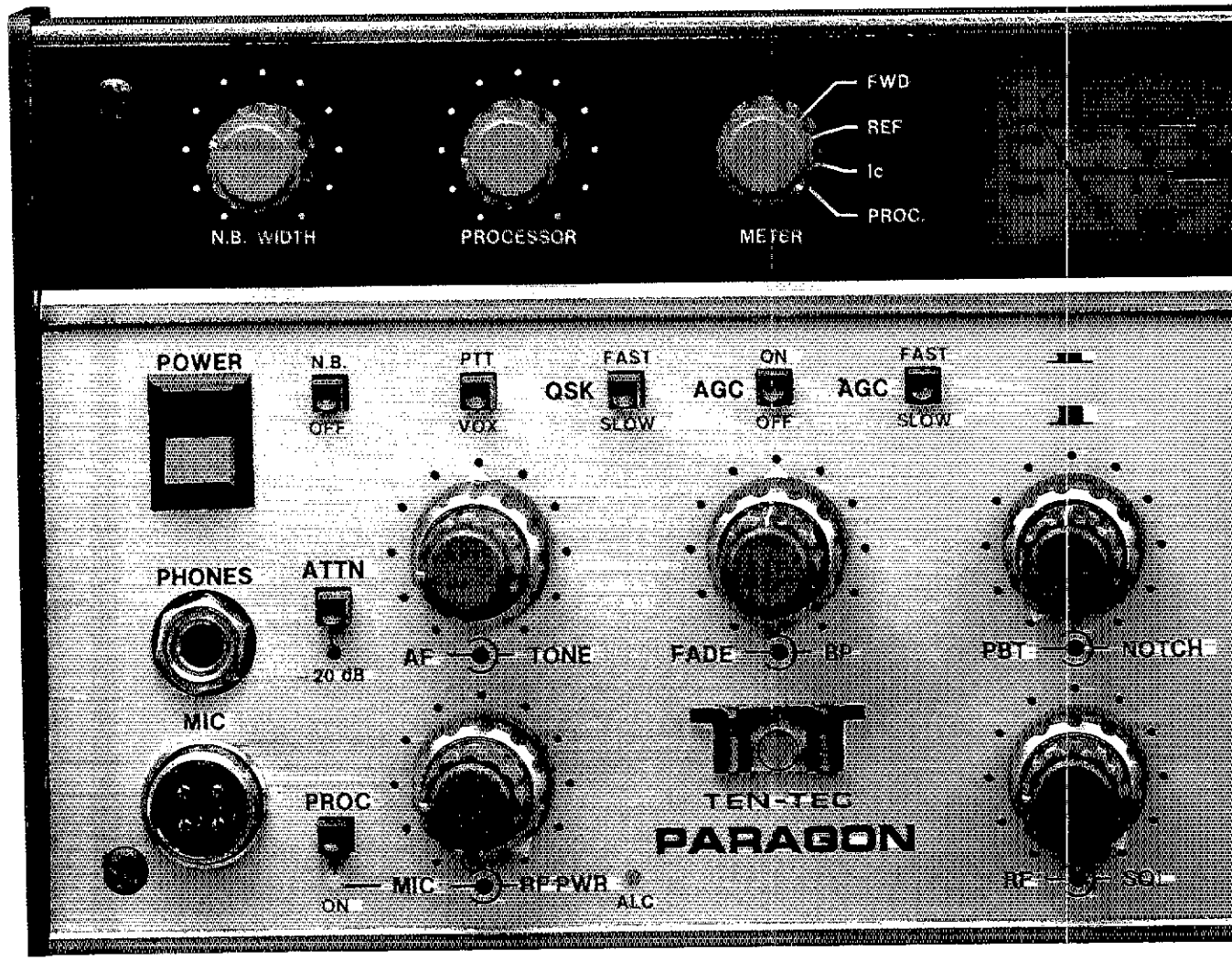


You're face to face

Meet America's Newest, the Ten-Tec Paragon, Model 585

PARAGON HF TRANSCEIVER, Model 585 . . . $1995

The Paragon Model 585 is a full featured, synthesized transceiver. General coverage all mode receiver tunes from 100 kHz to 29.999.99 MHz. Transmit at 100 watts output on all authorized frequencies from 1.8 to 29.999.99 MHz. SSB, CW, FSK and optional FM. Noise blanker and speech processor are standard equipment. Dual VFOs, RX offset, TX offset, QSK with a changeover time of less than 30 ms, five i-f filters (standard 6 kHz AM and 2.4 kHz SSB, optional 1.8 kHz, 500 Hz and 250 Hz) that are front panel selectable independent of mode, selectable tuning rates with automatic speed-up at rapid tuning knob rotation, passband tuning, audio bandpass filtering, tone control, squelch, notch filtering and more!

Sixty-two programmable memories that include frequency, mode, filter selected, channel number and a 7 character alpha-numeric tag for entering a net name, call sign or I.D. of your choice. As the memory channels are scanned, all of the information is displayed (what a light show!) and the receiver automatically sets up mode, filters, tag and frequency as stored in each channel. Channels scanned are totally controllable with global lock-out, global reset and individual lock-out and reset.

The construction is impressive too. All circuit boards are glass epoxy (G-10) and all of them can be removed without desoldering. The front panel is hinged to provide access to all sections of the chassis. All aluminum construction keeps the weight of the rig reasonable too. And of course, the front panel is a spacious arrangement which makes the critical controls easy to use.

Frequency selection can be made using the main tuning knob, keypad direct entry or up/down buttons that can shift one MHz or to the next ham band. Frequency readout is selectable to display to 100 Hz or 10 Hz. Front panel clock is in 24 hour format. Rear panel input and output provisions keep the all-mode operator in mind too. Fixed level audio out and FSK keying (170 Hz shift), auxiliary dc jack, amplifier control circuits plus all the other connections that you could possibly need, including RS-232 computer interface option.

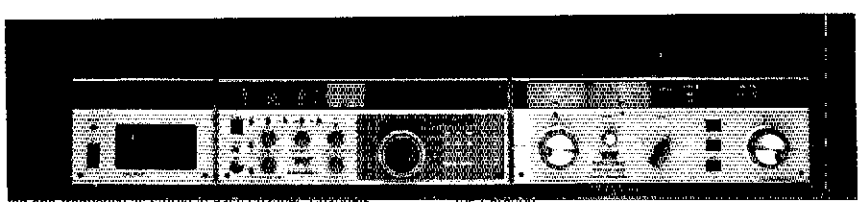
The Paragon is the end result of a three year engineering effort. Much of that effort was invested in improving the receiver performance and controlling the phase noise inherent in a PLL oscillator. We are proud of the performance of the Paragon and we think it has set new standards of excellence in synthesized rigs. All we ask is that you take the time to check it out. We think that you will share our pride in the Paragon.

GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.8 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer, 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C. at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Tuning Rate:

	Normal	Normal Shifted
CW/USB/LSB/FSK	10 Hz 4.8 kHz per turn	20 Hz 9.6 kHz per turn
AM/FM	50 Hz 24 kHz per turn	100 Hz 48 kHz per turn
	Fast	**Fast Shifted**
CW/USB/LSB/FSK	20 Hz 9.6 kHz per turn	40 Hz 24 kHz per turn
AM/FM	100 Hz 49 kHz per turn	500 Hz 240 kHz per turn

Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062" glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¼" x 14¾" x 14¼". 13 x 37 x 36 cm.
Net Weight: 16 lbs. 7.25 kg.



Paragon Station with Model 960 Matching Power Supply ($229), and the Mighty Titan Amplifier ($2685).

Shown actual size.

with the Paragon.

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Typical 200 watts.
RF Power Output: ALC stabilized, adjustable, 10 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ± 99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1 - 1.6 MHz	1.6 - 29.999 MHz	
SSB/CW/RTTY	5 uV	.15 uV	10 db S/N @ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

	-6 dB BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.25 kHz	1.875:1
Standard SSB	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz SSB (Model 288)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 285)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 282)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: + 16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: + 18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ± 99.9 kHz.
Pass Band Tuning I-F Shift: ± 1.2 kHz
Audio Output: 1.5 watts @ 8 ohms, 5% distortion max.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

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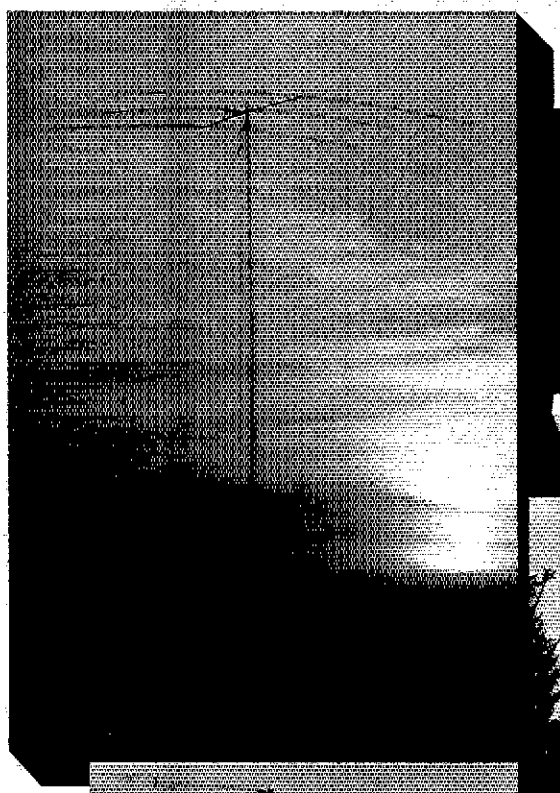
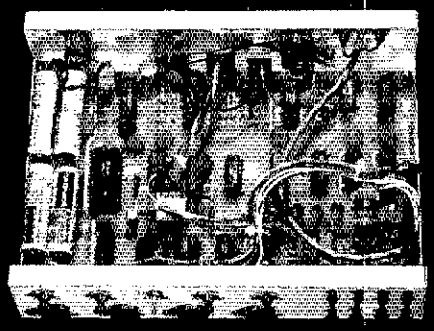
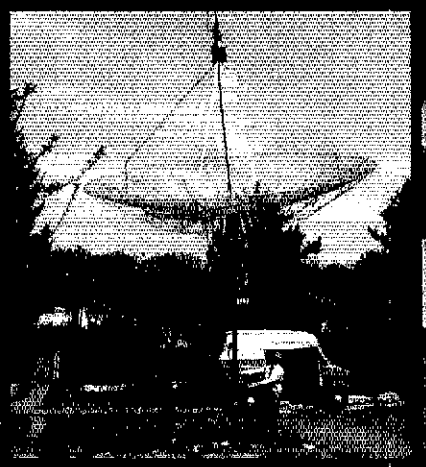
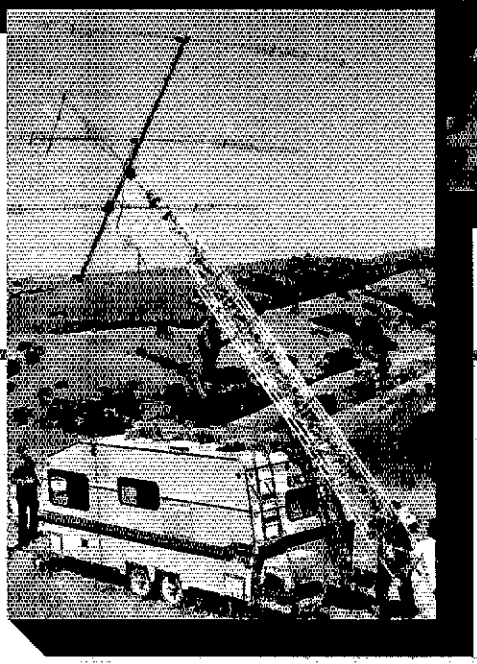
THE 1988 ARRL HANDBOOK

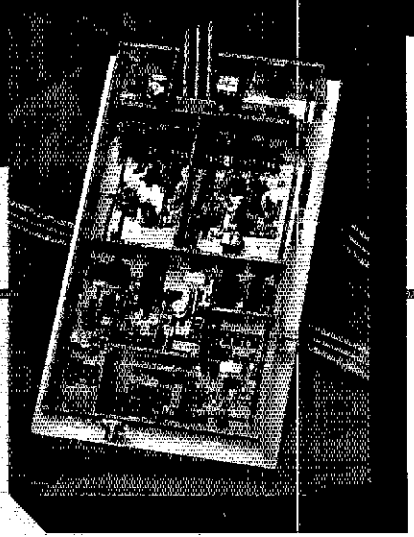
FOR THE RADIO AMATEUR



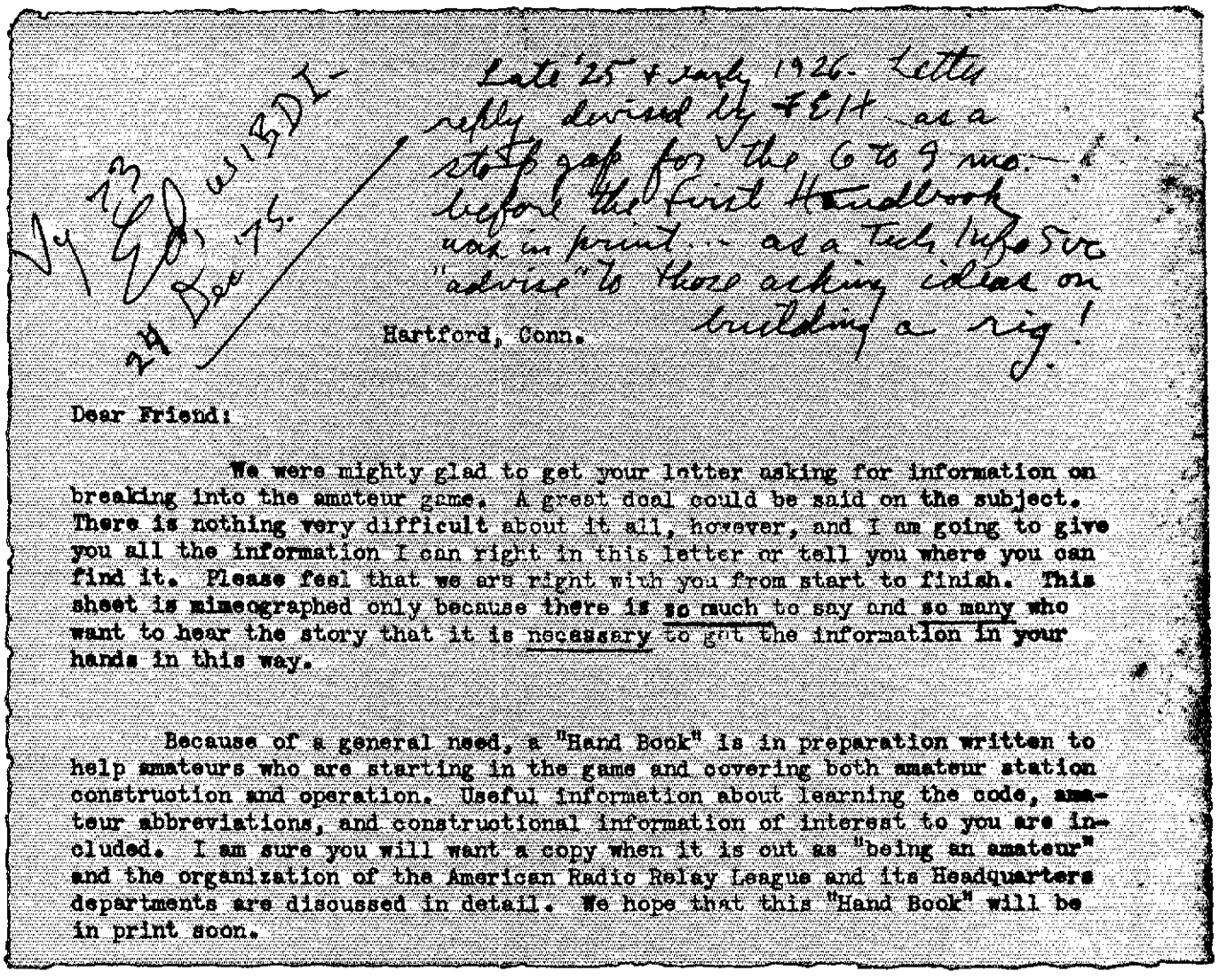








PUBLISHED BY:
THE AMERICAN RADIO RELAY LEAGUE



Late '25 + early 1926. Letter reply devised by ED H as a stop gap for the 6 to 9 mo. before the first Handbook was in print -- as a Tech info & "advice" to those asking ideas on building a rig!

Hartford, Conn.

Dear Friend:

We were mighty glad to get your letter asking for information on breaking into the amateur game. A great deal could be said on the subject. There is nothing very difficult about it all, however, and I am going to give you all the information I can right in this letter or tell you where you can find it. Please feel that we are right with you from start to finish. This sheet is mimeographed only because there is so much to say and so many who want to hear the story that it is necessary to get the information in your hands in this way.

Because of a general need, a "Hand Book" is in preparation written to help amateurs who are starting in the game and covering both amateur station construction and operation. Useful information about learning the code, amateur abbreviations, and constructional information of interest to you are included. I am sure you will want a copy when it is out as "being an amateur" and the organization of the American Radio Relay League and its Headquarters departments are discussed in detail. We hope that this "Hand Book" will be in print soon.

FROM 12 PAGES TO OVER 1200!

Sixty-five editions and 5.8 million copies later, we wonder if Ed Handy had any idea what began as twelve mimeographed information sheets would lead to one of the most highly respected publications in the RF design field! But more importantly, the 1988 ARRL Handbook for the Radio Amateur is a *basic resource* for *all* radio amateurs as well as technicians and engineers.

What is new in this edition? As usual, "hot topics" that are changing on a day-to-day basis were given top priority on the revision list. Next, we took a close look at those subject areas of interest to the "enhanced Novice" and updated these as necessary. New construction projects range in complexity from a passive CW audio filter to a synthesized computer-controlled receiving converter for 100 kHz to 20 MHz. Other fun projects added to the new edition include a new deluxe memory keyer, balanced QRP transmatch, DTMF (Touchtone®) decoder and QSK 3-watt 160-meter transverter.

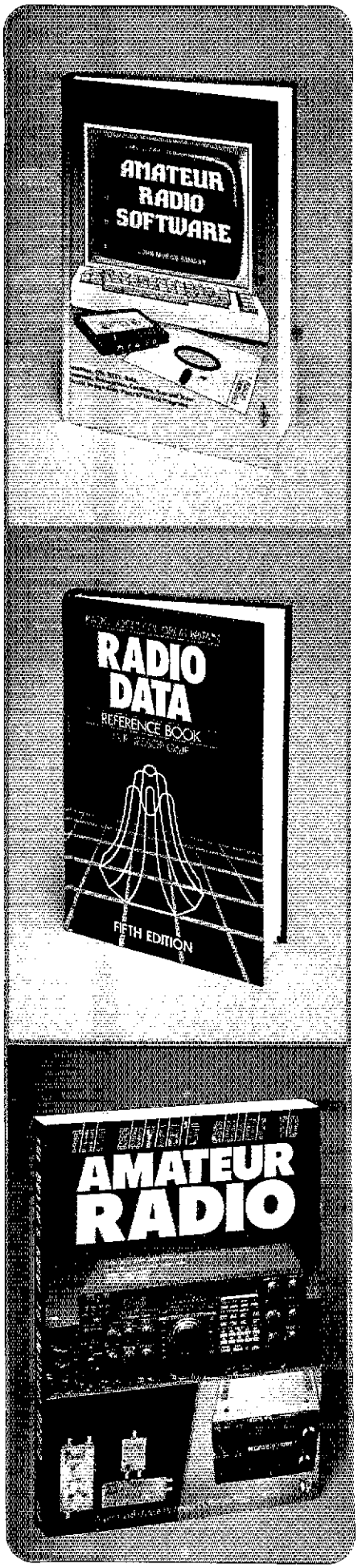
The sixty-fifth edition not only will stand on its own as to content but physically as well. Older editions felt and acted like floppy city telephone directories. Now, all 1988 Handbooks will use the popular and economical hard cover design of the type used to bind *Yagi Antenna Design*.

Unless we become victims of Murphy's Law, we expect the 1988 Handbook to be available at your U.S. or Canadian dealer by mid-to-late October or order directly from ARRL. The price is $21.00 in the U.S. or $23.00 in Canada and Elsewhere.

Here is a description of what is covered in the Handbook:

The first 5 chapters serve as an introduction and cover: basics of Amateur Radio, electrical fundamentals, radio design technique and language, and solid state fundamentals. Vacuum tube principles as they pertain primarily to high power amplifier design are also presented in these introductory chapters. There are 12 chapters devoted primarily to these radio principles: power supplies, audio and video, digital basics, modulation and demodulation RF transmitters, receivers, transceivers, repeaters, power amplifiers, transmission lines and antenna fundamentals. Another 4 chapters cover voice, digital, image and special modulation techniques. The RF spectrum, propagation and space communications are covered in 2 chapters. The construction and maintenance section has 12 chapters of useful projects ranging from power supplies and antennas through digital equipment. You'll find up-to-date component data that the Handbook is famous for. The final 5 chapters cover how to obtain your license, station design and operation, interference, monitoring and direction finding. An abbreviations list, huge index and etching patterns make up the balance of the book.

The American Radio Relay League, Inc., 225 Main St., Newington, CT 06111 USA



RSGB BOOKS

AMATEUR RADIO SOFTWARE by John Morris, GM4ANB. Designed to be a sourcebook for the radio amateur program. Contains 86 programs written in BASIC and 6 in assembly language. The introductory chapter describes the differences between various versions of BASIC so that the programs presented can be modified slightly in order to be used on as many types of computers as possible. The remaining 8 chapters cover: CW, sending and receiving; RTTY and Data including Amtor and packet; Antennas and Propagation, predicting path loss, propagation predictions; Distances, Bearings and Locators; Satellites, predicting elliptical and geostationary orbits; Sun and Moon; Circuit Design Aids, filters and matching networks; Miscellany, a simple data base system and network analysis package. Copyright 1985, 328 pages, $15.00 hardbound. First Edition.

RADIO DATA REFERENCE BOOK by G. R. Jessop, G6JP. This handy publication is divided into 9 chapters: Units and symbols. Basic calculations, Resonant circuits and filters, Circuit design, Antennas and transmission lines, Radio and TV services, Geographical and meterological data, Materials and engineering data, and Mathematical tables. You'll find hundreds of useful tables, charts, and formulas. Fifth Edition, Copyright 1985, 244 pages, $15.00 hardbound.

NEW!

THE BUYER'S GUIDE TO AMATEUR RADIO by Angus McKenzie, G3OSS. Have you ever seen a used equipment ad and wondered what the specifications were for the piece of gear advertised? Is the rig that your friend is selling all he claims it to be? *The Buyer's Guide to Amateur Radio* may have the answers! This book contains over 100 full reviews of equipment and close to that number of product descriptions. Modern gear is covered as well as some venerable "boat anchors." Some of the descriptions apply only to the British versions of equipment designed for operation under European band plans. The opinions expressed in this book are those of the author and not necessarily those of ARRL. Copyright 1986, 480 pages, $12.00 softbound.

THE AMERICAN RADIO RELAY LEAGUE, INC.
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Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

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The League reserves the right to decline or discontinue advertising for any reason.

CLUBS/HAMFESTS

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers—W7GAQ/6 Box 530, Santa Rosa, CA 95402.

IMRA-International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1:00-3:00 PM Eastern Time. Rev. Thomas Sable, S.J., University of Scranton, Scranton, PA 18510

THE Veteran Wireless Operators Association, a nonprofit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: *F.A. Dunlap* (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

FCC EXAMS. Novice-Extra. Sunnyvale VEC ARC. *408-255-9000, 24/hr. Gordon, W6NLG, Pres. Flea* Market, Los Altos, CA March-September.

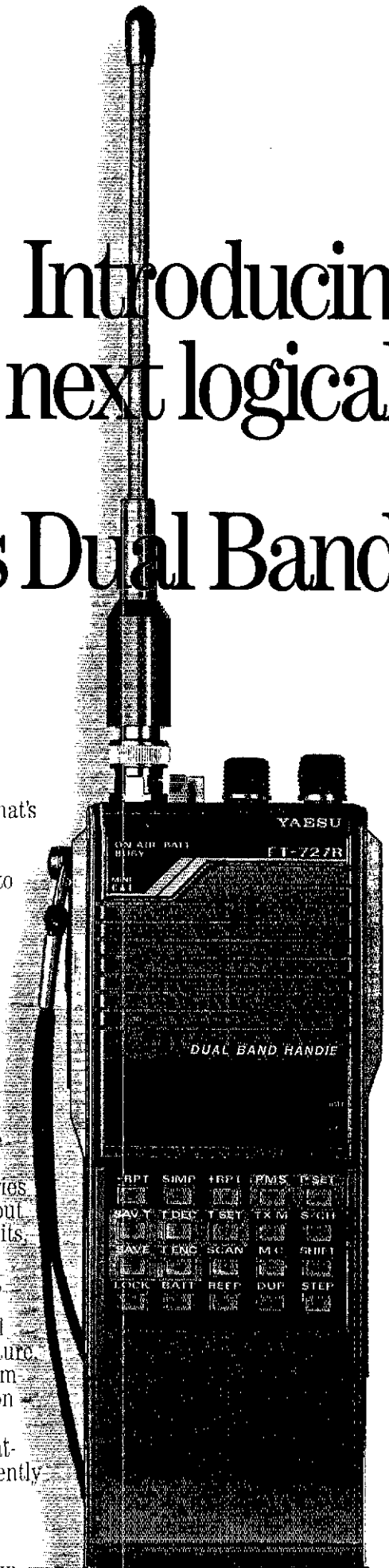
JOIN the Old Old Timers Club, an international nonprofit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C., 20933 Brant Avenue, Long Beach, CA 90810.

RV OPERATORS are invited to check in Sun 2PMC, 14.240 + 5 Tues, Thurs 8 PMC 3,880 + 5- Good Sam RV net-info SASE KJ4RO.

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610

Introducing the next logical step.

Yaesu's Dual Band Handie.



Two affordable radios in one—that's exciting.

Yaesu's dual-band FT-727R packs our best HT know-how into one compact design. At a price that's in step with your ham budget.

Hit hard-to-reach repeaters with a powerful 5 watts on both 2 meters and 440 MHz.

Work the bands quickly and easily with a wealth of microprocessor-controlled commands:

Jump between the separate VHF and UHF VFO registers. Program each of the ten memories for instant recall of repeater input and output frequencies, odd splits, and tone encode/decode.

Scan the memory channels, the entire band, or a band segment. And return to any special frequency with the priority feature.

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Conserve power with the battery saver. It lets you monitor silently while drawing negligible current. And measure your battery level with the digital battery voltmeter. There's even a "Low Battery" LED.

Finally, your operation is rounded out with features like VOX capability. A one-touch repeater reverse switch. An LCD readout with illumination lamp. A high/low power switch. Remote computer control capability. An optional CTCSS module. And Yaesu's full line of optional accessories.

So step up your operating capability now with the logical choice in HT operation.

Yaesu's dual-band FT-727R.

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Parts: (213) 404-4847

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

ATTENTION!!! Any Amateur Radio Operators interested in forming a new type of Amateur Radio Club. For information please send $2 to cover postage to KA3RET, P.O. Box 96, Uniontown, PA 15401.

MASONIC AND Associated Organizations. We have a Michigan Amateur Radio Square and Compass Club that publishes a newsletter, Michigan Masonic Amateur Radio News, and a net on 3910 KC at 2 PM on Sundays. We are planning an issue of the newsletter devoted to all types of Masonic Ham Radio activity in the USA and World. Please send any information you have and you will receive a copy of the special edition newsletter. Please send to Wells Chapin, W8GI, Masonic Home, 1200 Wright Avenue, Alma, MI 48801.

QSL CARDS/RUBBER STAMPS/ENGRAVING

CANADIANS QSL samples $1 (refundable) M. Smith, VE7FI, Box 1376, Delta, BC V4M 3T3.

DON'T buy QSL cards until you see my free samples-or-draw your own design. I specialize in custom cards. Send black and white sketch; will give quote. I would also like to introduce you to our personalized QSL Business Cards. Same size as standard business cards (3-1/2 × 2). Write or call for free samples. Little Print Shop, Box 1160, Pfluegerville, TX 78660, 512-990-1192.

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QSLs SAMPLES 40 cents (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

BE SURPRISED-get a variety of cards - 100 for $8 or 200 for $13. Samples $1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

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PICTURE QSL CARDS of your shack, etc. from your photo or black ink art work. 500 $24; 1000 $36.50. Also non-picture cards. Customized cards, send specifications for estimate. Send two stamps for illustrated literature. Generous sample kit $2; half pound of samples $3. Raum's, R.D. 2, Orchard Road, Coopersburg, PA 18036. Phone 1-215-679-7238

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MAGNETIC CALLSIGN . . 2' × 8' . . Instant transfer car to car! Your call in lettering Black, Blue, Green or Red (white background). Each sign only $8.50 ppd. Sign-On, Dept. T, 1923 Edward Lane, Merrick, NY 11566

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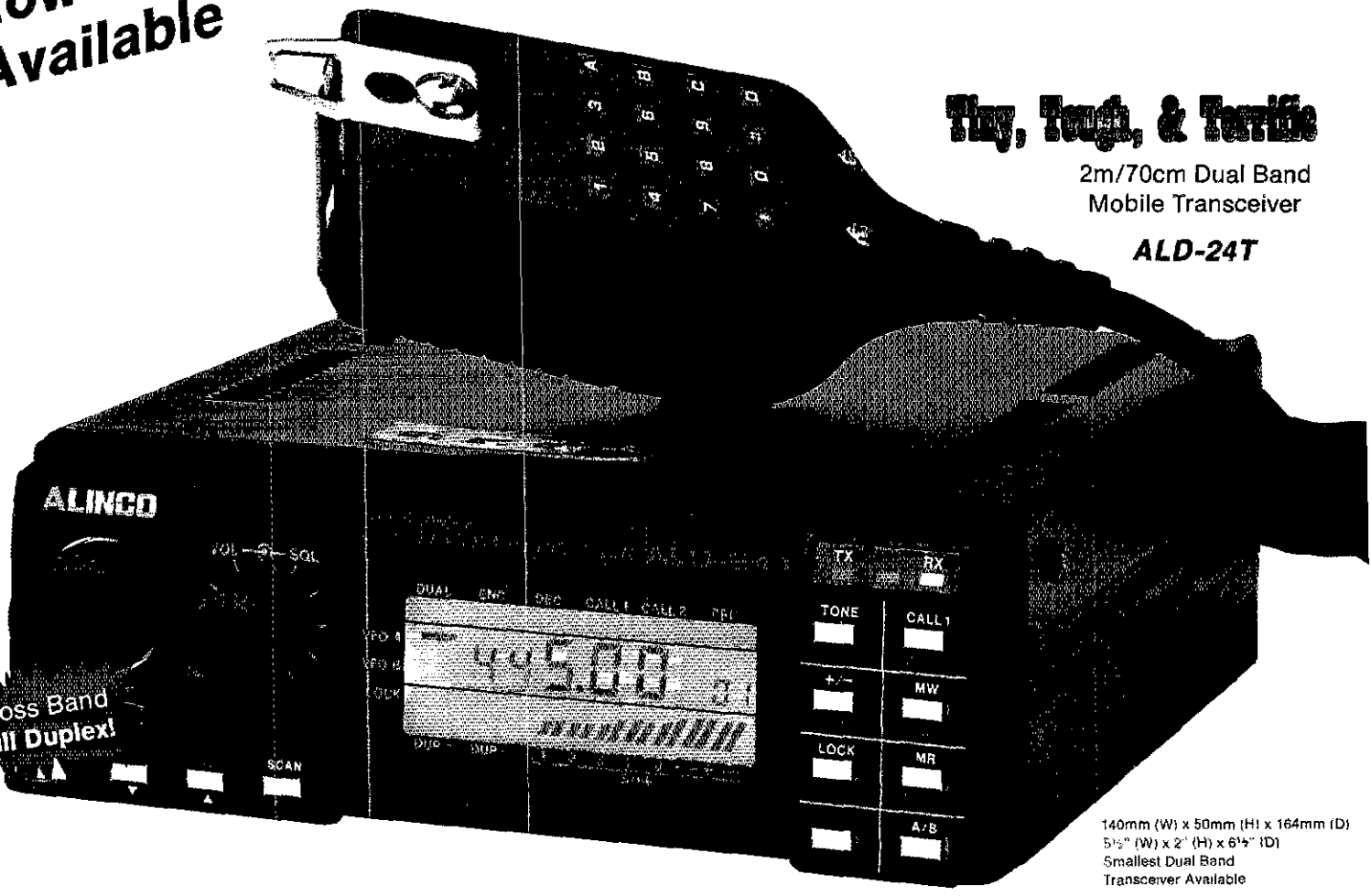

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Mobile Transceiver

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Smallest Dual Band
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With ALINCO's advanced engineering and technology, the ALD-24T 2m/70cm Dual Band Mobile Transceiver is designed to be the ultimate in compact size with an impressive array of features, allowing maximum flexibility in installation and ease of operation.

- 140-147.999 Mhz/440-450 Mhz
- CAP and MARS compatible
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- 21 Memory Channels
- Dual VFOs
- Large LCD
- **CTCSS Encoder/Decoder: Standard**
- 16-Key Autopatch Microphone with Up/Down Buttons
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- Memory Scan and Memory Lockout
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*Many features, see your Dealer!
Also now available:
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AES - Orlando, FL.
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AES - Las Vegas, NV.
Austin Amateur Radio Supply - Austin, TX.
Barry Electronics - New York, NY.
Burghardt Amateur Center - Watertown, SD.
Delaware Amateur Supply - Delaware, DE.
Doc's Communications - Rossville, GA
Earth Star Communications - Minneapolis, MN.
El Original Electronics - Brownsville, TX.
EEB - Vienna, VA
EGE, INC. - Woodbridge, VA.
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Erickson Communications - Chicago, IL.
Floyd Electronics - Collinsville, IL.
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The Ham Hut - Amarillo, TX.
Hatry Radio - Hartford, CT.
Henry Radio - Los Angeles, CA.
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HRO - Phoenix, AZ.
HRO - San Diego, CA.
HRO - Van Nuys, CA.
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Jun's Electronics - Culver City, CA.
Kennedy Associates - San Antonio, TX.
KJI Electronics - Cedar Grove, NJ.
Madison Electronics - Houston, TX.
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Memphis Amateur Electronics - Memphis, TN.
Michigan Radio - Mt. Clemens, MI.
Mission Consulting - Houston, TX.
Missouri Radio Center - Kansas City, MO.
N & G Electronics - Miami, FL.
Omni Electronics - Laredo, TX.
Quement Electronics - San Jose, CA.
Reno Radio - Reno, NV.
Rivendell Associates - Derry, NH.
Rogus Electronics - Southington, CT.
Rosen's Electronics - Williamson, WV.
Ross Distributing Co. - Preston, ID.
TNT Radio Sales Inc. - 4124 Robbinsdale, MN.
Tel-Com Electronic Comm. - Littleton, MA.
Texas Comm. Center - Houston, TX.
Texas Towers - Plano, TX.
VHF Communications - Jamestown, NY.

CANADA:
Atlantic Ham Radio Ltd. - Downsview, Ontario
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Com-West Radio Systems - Vancouver, B.C.
Hobby Tronique Inc. - Ville St. Laurent, Quebec
R&S Electronics Ltd. - Dartmouth, Nova Scotia
Texpro Sales Inc. - Burlington, Canada

QSLs, QSLs, Rusprint QSLs quantities of 100, 200, 300 or more. Full color of Old Glory and cartoons. Also parchment, golden eagle and others. SASE appreciated. Rusprint, Rt. 1, Box 363-*QST*, Spring Hill, KS 66083.

QUALITY QSL Cards and Rubber Stamps. Send 39 cents postage or SASE for samples. New stock designs or custom cards from your black ink artwork. Sandollar Press, P.O. Box 30726, Santa Barbara, CA 93130.

SAVE ON QSL and Business Cards. Original masters for your copy shop. Send SASE for samples and order form. Holliday Graphics (N6MZY), 602 Euclid Street, Santa Monica, CA 90402.

QSL CARDS. 100 for $8. Fast service. High quality. Free samples. Shell Printing, KD9KW, P.O. Box 50, Rockton, IL 61072.

GAIL's QSL's, Stamp for sample, first 100 for $10, $5 thereafter, fast service, postpaid. KAØYZT, 1150A Muenz, Wright City, MO 63390.

QSL samples - 25 cents. Samcards, 48 Monte Carlo Drive, Pittsburgh, PA 15239

ANTIQUE-VINTAGE-CLASSIC

NATIONAL NC-57 or NC-33, clean, unmodified, wanted. Also National AGS. Harry MacLean, VE3GRO, 500 Riverside Drive, London, ON N6H 2R7, 519-473-1668.

WANTED: Old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204

MANUALS FOR MOST Hamgear made 1937/1972 plus Kenwood. No quotes. Our current catalog "F" at $1 required to order. Over 2,000 models listed. HI-MANUALS, P.O. Box G802, Council Bluffs, IA 51502-0802

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201, 818-242-8961.

MICROPHONES AND related memorabilia used in radio/TV broadcasting prior to 1960 wanted. Cash paid: trade terms available. Write: James Steele, 160 West 77th Street, New York, NY 10024-6942.

WANTED: *QST* VOLUME 1. W6ISQ, 82 Belbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brandname, Model No., SASE Scaramella, Box 1, Woonsocket, RI 02895-0001.

TELEGRAPH BUGS, paddles, old keys wanted. Collector seeks all models and variations to date. Keys by Martin-United Electric-Vibroples wanted working or not. Donations of parts, partial or damaged keys appreciated. Write: John Hensley, WJ5J, 5054 Holloway Avenue, Baton Rouge, LA 70808.

WE MAY HAVE the tubes you need. (Thousands in stock). Send S.A.S.E for our list. Fala Electronics, P.O. Box 1376-1, Milwaukee, WI 53201.

WANTED, BOOKS: Pre-1900 Electricity and Telegraphy, Pre-1925 Radio, Pre-1940 Television. Books, Magazines or any other related literature. Jim Kreuzer, N2GHD, 6270 Clinton St., Elma, NY 14059, 716-681-3186

BUY, sell, collect and restore early tube equipment? Early receivers, tubes and telegraph gear? Join the Antique Wireless Association which sponsors old-time "meets," flea markets, museum and journal with technical articles and free want ads. Membership and annual dues only $10. Write for information and Museum hours: Bruce Kelley, W2ICE, Route 3, Holcomb, NY 14469.

WANTED: McINTOSH Tube-type Audio Equipment, Accessories, and literature for personal collection. All inquiries answered; information and appraisals gladly given. Marcus Frisch, WA9IXP, Box 385, Elm Grove, WI 53122-0385, 414-545-5237.

R-390A RECEIVER: $115, electronically complete, reparable (Government-removed meters, operation unaffected). R-390 Parts: Info SASE. Mint military-spec pull-out 12AT7, 6AG5, 6BA6: $15/dozen. CPRC-26 six meter FM transceiver with crystal, handset: $22.50, $42.50/pair. Add $4.50/item shipping except R-390A, shipped collect. Baytronics, Box 591, Sandusky, OH 44870.

CODE/CIPHER MACHINES Wanted! Historian buys code/cipher devices, manuals, books, etc.! All periods! Melton, Box 5755, Bossier City, LA 71171, 318-798-7319.

QST's 1943 to present, complete. Make offer, cash or trade. W6NJW, 818-767-3499.

WANTED *QST* pre-1930. NV2C, Richard Titus, 231-9 Lucas Lane, Voorhees, NJ 08043, 609-772-0316.

WANTED: Antique Radios wanted for my collection. Battery sets of early '20s, tubes, and 2 volt farm radios of '30s. Especially RADIOLA RS and Clapp-Eastham & sets made in Northwest. Charlie Rhodes, Journey's End Road, South Salem, NY 10590, 914-533-2503.

WANTED: Hallicrafter silver panel Skyriders and other very old or unusual Hallicrafter equipment, parts, etc. Chuck Dachis, "The Hallicrafter Collector," 4500 Russell Drive, Austin, TX 78745.

QST from 1938 to 1982 - $100. Traps from damaged THDX6 - as is $25. W6BIH.

FOR SALE: HRO, late production of original model, 6V tubes, fourteen coil sets, power supply, no speaker. I pay shipping. $225. Yardley Beers, WØJF, 740 Willowbrook, Boulder, CO 80302, 303-443-1252.

QST, 1950 to date, nearly intact. Station equipment, tower, beam, rotator. SASE for list. WØBIG, 6636 KY 56, Owensboro, KY 42301.

WANTED: Anxiously seeking Hallicrafters S-35 Panoramic Receiver with or w/o SX-28A. Also want National TV-7 and coils for HRO-50. Sam Thompson, W6HDU, 1031 San Antonio Avenue, Alameda, CA 94501, 415-521-1429.

"GREAT DAYS Of The Heliograph," by W9CNY, story of "sun telegraph." 70p., 8-½ × 11, illus., $5.95 ppd., Lewis Coe, 115 E. 113th Avenue, Crown Point, IN 46307.

WANTED: Collection of *QST*s from 1915-1930, QSL cards from the 1920s. W3HWT, 329 Evergreen, North Wales, PA 19454.

QST: 1950-1985 Complete. Make offer. W9KLG, 4206 N. Manchester, Muncie, IN 47304.

QST's 1925 to 1980 $275. 1932 Hammarlund Comet "Pro" in a floor cabinet, all coils, $250. 1931 military tranceiver, model BC148, $90. Pierson KE93 Receiver, with AC power supply, $90. Other ARRL Publications. SASE for information and shipping conditions. Bruce Mueller, K6KQT, 730 E. Harmony Lane, Fullerton, CA 92631.

HALLICRAFTERS S-85, good working condition. Make offer over $50. WV5S, 7006 East 100th Street, Tulsa, OK 74133, 918-299-3105.

SBE 34 with custom travel case $150. Drake 2B $100. Elmac PMR8, AF68A, complete $150. Viking II with VFO $125. Wanted Grebe CR18 - SW3-4-5 FB7 receiver. Stancor 10P, Utah, Ten-Tec QRP Transmitter. K4UJZ, Russ Olmsted, 608 W. Thompson Lane, Murfreesboro, TN 37130, 615-893-5344.

HALLICRAFTERS S-107 rcvr. .55-54 mcs. With bandspread. Works and looks great. $100. I ship. N1AHR, 603-539-2762.

NEW 3-1000 sealed carton, used guaranteed 4-1000, *QST* and 73 Magazine 1960 through 1980. W2CQB, 201-741-1596.

GENERAL

DO-IT URSELF DXpedition. Stay at ZF8SB, 2BR cottage, beach, Quad. Fish or dive if band folds. Write airmail: ZF8SB, Little Cayman, CAYMAN ISLANDS.

WANTED: Heathkit SBA-104-1 Noise Blanker in mint condition. VE7HN, 1973 McTavish Road, Sidney, B.C. CANADA V8L 1E1.

WANTED: Linear Alpha 78 or Alpha PA-77SX. Offers to HB9AHL, Willy Rusch, Haldenstrasse 3, 5742 Kolliken, SWITZERLAND.

TELETYPEWRITER parts, supplies, gears. Toroids, S.A.S.E. list. Typetronics, Box 8873, Ft. Lauderdale, FL 33310. Buy unused parts, cash or trade.

HAM TRADER YELLOW SHEETS. In our 26th year. Buy, Swap, Sell ham radio gear. Published twice a month. Ads quickly circulate—no long wait for results. Send #10 SASE for sample copy. $12 for one year (24 issues). P.O.B. 2057, Glen Ellyn, IL 60138-2057.

TEFLON, s.a.s.e. W9TFY, Alpha IL 61413.

COLLINS Repair and Alignment, former Collins engineer. Research and Consulting, Glenn A. Baxter, P.E., Registered Professional Engineer. K1MAN 207-495-2215.

WE BUY Electron tubes, diodes, transistors, integrated circuits, semiconductors. Astral Electronics, P.O. Box 707, Linden, NJ 07036. Call toll-free 800-526-4052.

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- Five-function instant metering—four separate LED bargraphs.
- Quick, easy tune-up.

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- 3 year limited warranty —exclusive with ETO.
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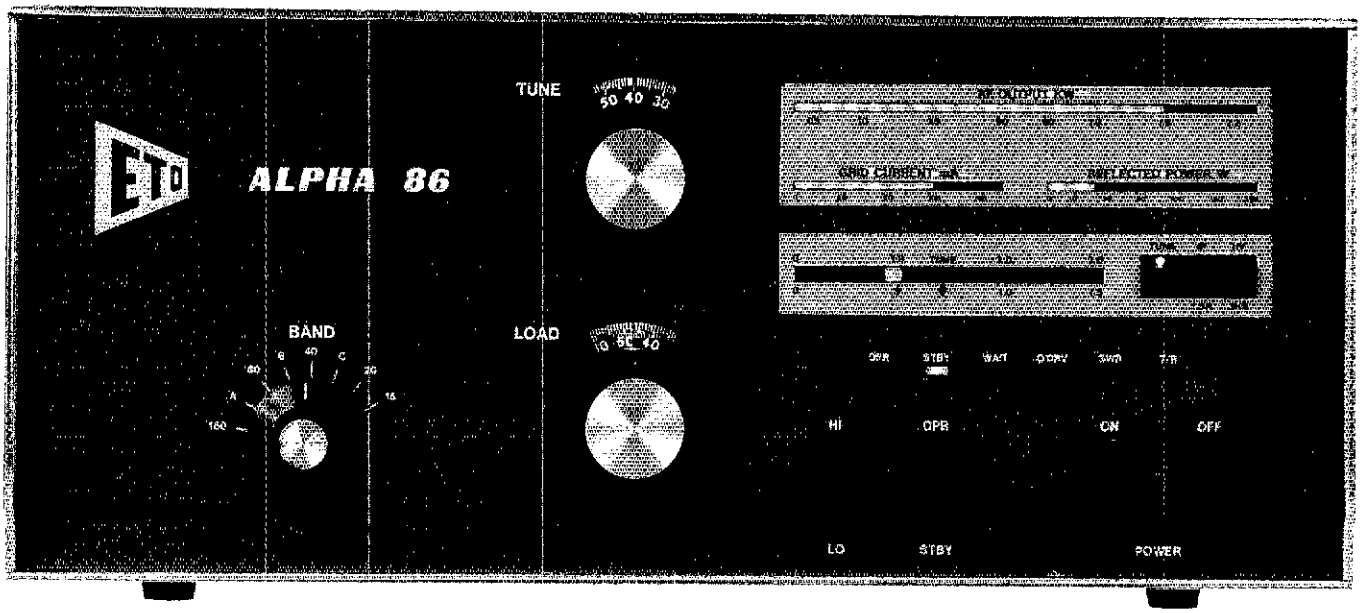

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KEYERS... CONTEST, MEMORIES, Iambic. Outstanding performance. Guaranteed. $15 up. MSC, 1304 Toney Drive, Huntsville, AL 35802.

TUBES WANTED..I pay cash or trade for all types of transmitting or special purpose tubes - Mike Forman, 1472 McArthur Blvd., Oakland, CA 94602 415-530-8840.

CHASSIS & CABINET Kits. 5120 Harmony Grove Rd., Dover, PA 17315 SASE K3IWK.

INTERNATIONAL Amateur Radio Network programs, 14.275 MHz and 3.975 MHz. Mon-Fri at 1300Z, 1700Z, 2100Z, 2400Z. Weekends at unscheduled times. Glenn Baxter, K1MAN, Network Manager.

TOWER CLIMBING Safety Belts and Accessories. Free info. Avatar Mag (W9JVF) 1147 N. Emerson Indianapolis, IN 46219-2929

COMPREHENSIVE APPLE SOFTWARE Transmit/receive CW/RTTY with/without TU. Variable speed code practice. Calculate/display/beam headings on world map. More. $49.95 and callsign brings disk and good instructions for II/II+/e. Send now for free brochure. W1EO 39 Longridge Road, Carlisle, MA 01741.

SAVE $1.50 SHIPPING on any ARRL book. Send book price plus $1 to Marshall Hill Enterprises, Bradford NH 03221.

'N-TENNA QUAD KITS, $64.50. Box 5332, Hickory, NC 28603.

MICROLOG AIR-1 with AMTOR, Close-Out Sale. List price $279. VIC-20 AIR-1's $125. Add $5 for shipping in US. $10 elsewhere. Md. res add 5% sales tax. G and G Electronics, 8524 Dakota Drive, Gaithersburg, MD 20877. 301-258-7373.

MADISON-BELDEN: 9913 low loss solid center conductor foil & braid shield - excellent product 45 cents/ft.; 8214 RG8 foam 43 cents/ft.; 8237 RG8 40 cents/ft.; 8267 RG213 52 cents/ft.; 8262 RG58C/U milspec 16 cents/ft.; 8000 14ga. stranded copper ant. wire 13 cents/ft.; 8448 8-conductor rotor cable 31 cents/ft.; 9405 HD rotor cable 2-16ga., 6-18ga. 52 cents/ft.; 8403 mic cable, 3 condctr & shield 80 cents/ft.; 100 ft. 8214 w/ends installed $45; 9258 RG8X 19 cents/ft.; Mastercard/VISA/COD. Madison Electronics Supply Inc., 3621 Fannin Street, Houston, TX 77004, Phone 713-520-7300 or 800-231-3057.

TRYLON FREE - STANDING Towers, up to 96 feet, for info write BJX Supply, Box 388, Corfu, NY 14036

23 CM "READY-TO-GO" 100+ watt linears and 2C39 amplifier cavities. Hi-Spec, Box 387, Jupiter, FL 33468

MORSE CODE Practice program for IBM-PC and Compatibles. Send $10.00 check to SP MicroComputing Co., 1008 Swallow Drive, Cherry Hill, NJ 08003. Developed by NU2H.

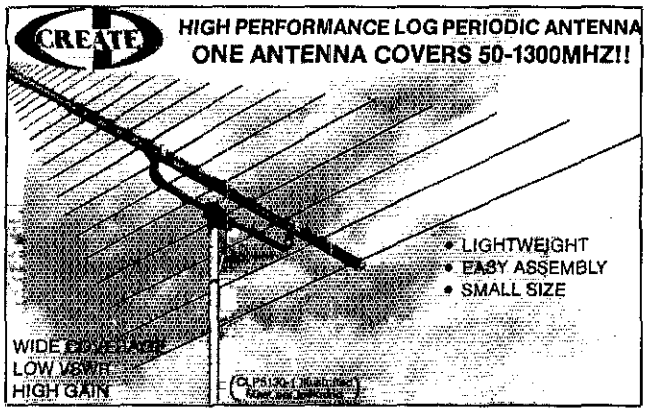
RTTY JOURNAL, published 10 times per year for those interested in digital communications. Read about RTTY, AMTOR, MSO, Packet Radio, RTTY DX and Contests, and Technical Articles concerning the digital modes. $10 per year (foreign higher). RTTY Journal, 9085 La Casita Avenue, Fountain Valley, CA 92708.

THE DX BULLETIN provides you with comprehensive, up-to-date DX information and much more. SASE or call for samples. Box 4233, Santa Rosa, CA 95402, 707-523-1001.

YAESU OWNERS - Hundreds of modifications and improvements to rig. Select the best from fourteen years of genuine top-rated Fox Tango Newsletters by using our new 32-page Cumulative Index. Only $5 postpaid (cash or check) with $4 Rebate Certificate creditable toward Newsletter purchases. Includes famous Fox Tango filter and Accessories List. Milt Lowens, N4ML (Editor), Box 15944-A, W. Palm Beach, FL 33416, Telephone 305-683-9587.

RADIO SHACK Color Computers: Hardware and Software for ham use. Dynamic Electronics, Box 896, Hartselle, AL 35640, 205-773-2758.

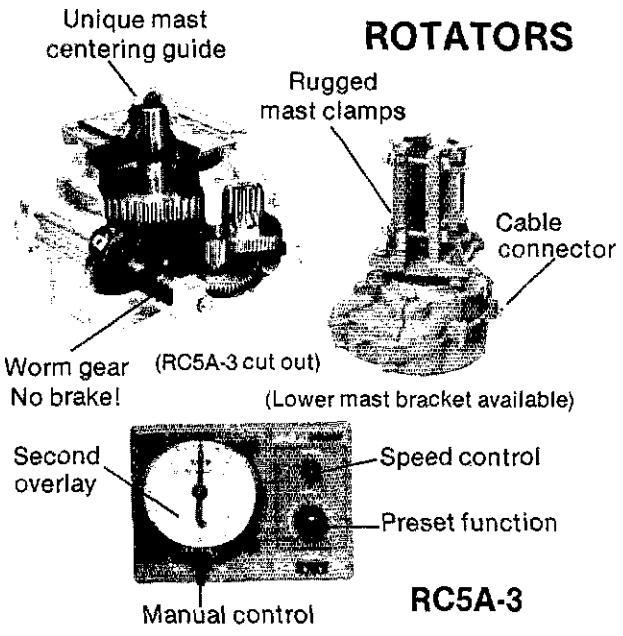
SPY RADIOS WANTED! Buying all types of espionage radios and code machines! Especially wanted are military-type radios in civilian suitcases! Museum, Box 8146, Bossier City, LA 71113, 318-798-7319.



CLP5130-1 50-1300 MHz 25 el. 500W 6′ Boom $199 UPS
CLP5130-2 105-1300 MHz 20 el. 500W 4′6″ Boom $119 UPS

Operate on 6m, 2m, 1¼m, 70cm, 900 MHz and 1.2 GHz using only one antenna and one feedline. No tuning is required and the VSWR is 2:1 or less across the entire frequency range with excellent forward gain. The boom is made of high quality aluminum and the elements are precut for easy assembly. Each model can be mounted for either vertical or horizontal polarization. Create VHF/UHF log periodics are great for the amateur bands, scanners and numerous other applications.

ROTATORS



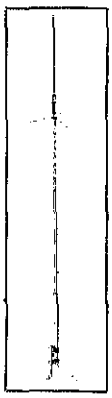
RC5-1	10 sq. ft.	$229
RC5-3	10 sq. ft. preset	$299
RC5A-2	25 sq. ft.	$373
RC5A-3	25 sq. ft. preset	$436
RC5B-3	35 sq. ft. preset	$736

(All rotators are UPS shippable)

See Lew McCoy's Review In August 1987 Issue Of CQ.

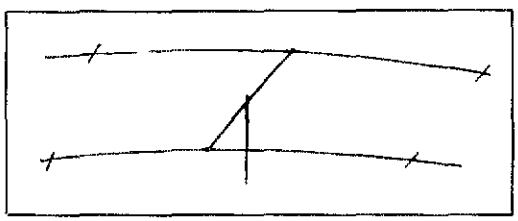
CREATE

Creative Design Co., LTD.®



CV-48 is a ruggedly built 40 and 75 meter vertical. Overall length of 40′8″ means full size performance on 40m. Antenna comes with radial system. An optional adaptor for 80m is available. Handles 2KW PEP.

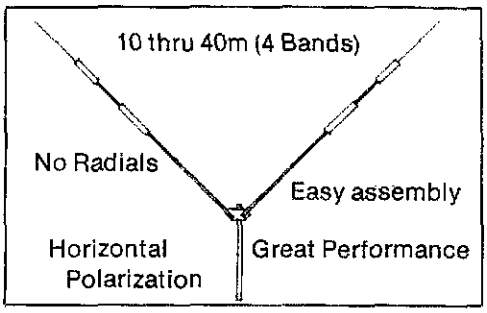
CV-48 $251 UPS AD-385 (adaptor) $63



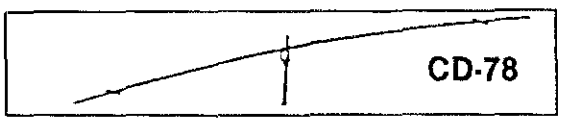
Unique 2 element phased arrays offer excellent gain and front to back ratio compared to standard parasitic antennas.

AFA75-1	75 meters 29′6″ boom	$1842
AFA40	40 meters 16′8″ boom	$ 344

730V-1



The 730V-1 is a V-dipole consisting of two 19 ft. heavy duty, self-supporting elements and bracket with an efficient balun that is ready for mounting on a standard TV mast. The V-dipole is superior to standard vertical antennas in gain, noise and efficiency. **$148 UPS**



Rotatable dipole for 3.5 MHz and 3.8 MHz is 58 feet long. Tuning unit allows operation on 3.5 MHz.

$418 UPS

Prices do not include shipping.

ALSO AVAILABLE: ROOF TOWERS • MONOBANDERS • TRIBANDERS • TOWERS • DUALBANDERS • COMMERCIAL

All Create Antennas Are Manufactured With High Quality, Heavy Duty, Precision Aluminum Tubing For Easy Assembly And Long Life.

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(Specifications and prices subject to change without notice or obligation)

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ORION HI-TECH
P.O. Box 8771
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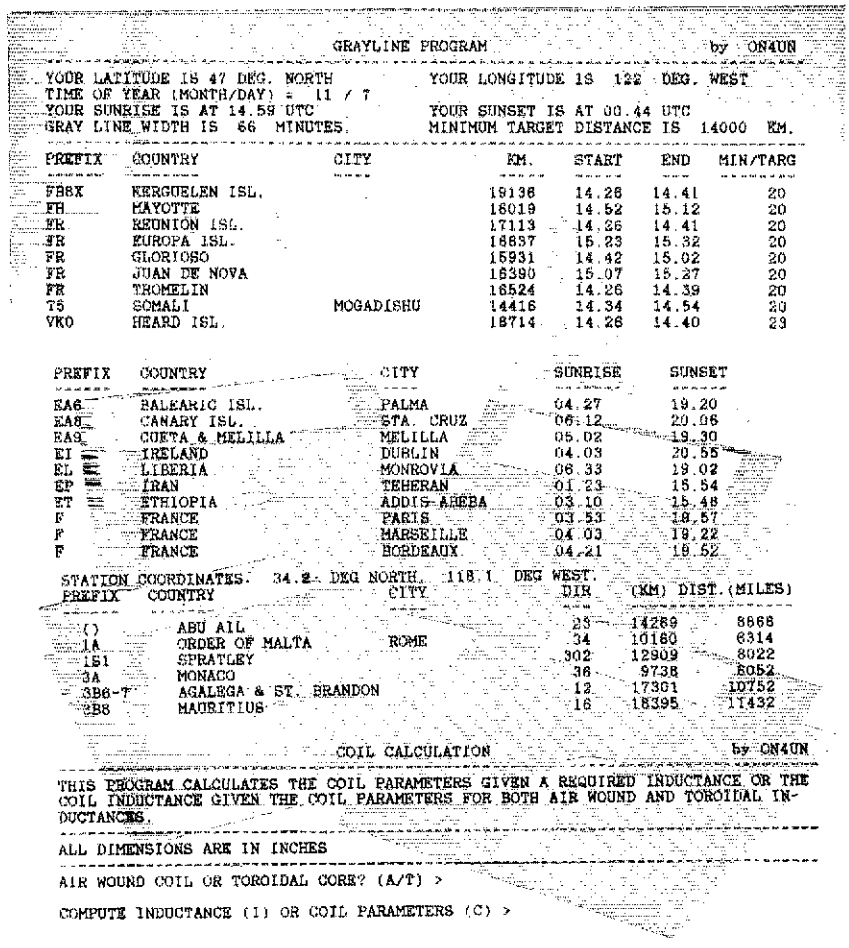

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                        GRAYLINE PROGRAM                        by  ON4UN

 YOUR LATITUDE IS 47 DEG. NORTH          YOUR LONGITUDE IS  122  DEG. WEST
 TIME OF YEAR (MONTH/DAY) =  11 / 7
 YOUR SUNRISE IS AT 14.58 UTC            YOUR SUNSET IS AT 00.44 UTC
 GRAY LINE WIDTH IS  66  MINUTES.        MINIMUM TARGET DISTANCE IS  14000  KM.

 PREFIX   COUNTRY                 CITY              KM.    START    END    MIN/TARG
 ------   -------                 ----              ---    -----    ---    --------
 FH8X     KERGUELEN ISL.                          19136    14.28   14.41       20
 FH       MAYOTTE                                 18019    14.52   15.12       20
 FR       REUNION ISL.                            17113    14.26   14.41       20
 FR       EUROPA ISL.                             16837    15.23   15.32       20
 FR       GLORIOSO                                15931    14.42   15.02       20
 FR       JUAN DE NOVA                            16390    15.07   15.27       20
 FR       TROMELIN                                16524    14.26   14.39       20
 T5       SOMALI                  MOGADISHU       14416    14.34   14.54       20
 VK0      HEARD ISL.                              18714    14.28   14.40       23


 PREFIX   COUNTRY                 CITY              SUNRISE    SUNSET
 ------   -------                 ----              -------    ------
 EA6      BALEARIC ISL.           PALMA               04.27     19.20
 EA8      CANARY ISL.             STA. CRUZ           06.12     20.06
 EA9      CUETA & MELILLA         MELILLA             05.02     19.30
 EI       IRELAND                 DUBLIN              04.03     20.55
 EL       LIBERIA                 MONROVIA            06.33     19.02
 EP       IRAN                    TEHERAN             01.23     15.54
 ET       ETHIOPIA                ADDIS ABEBA         03.10     15.48
 F        FRANCE                  PARIS               03.53     18.57
 F        FRANCE                  MARSEILLE           04.03     19.22
 F        FRANCE                  BORDEAUX            04.21     19.52

 STATION COORDINATES:  34.2 DEG NORTH,  118.1  DEG WEST.
 PREFIX   COUNTRY                 CITY              DIR    (KM) DIST.(MILES)
 ------   -------                 ----              ---    ---------------
 ()       ABU AIL                                    28      14269       8868
 1A       ORDER OF MALTA          ROME               34      10160       6314
 1S1      SPRATLEY                                  302      12909       8022
 3A       MONACO                                     36       9738       6052
 3B6-7    AGALEGA & ST. BRANDON                      12      17301      10752
 3B8      MAURITIUS                                  16      18395      11432


                        COIL CALCULATION                        by  ON4UN

 THIS PROGRAM CALCULATES THE COIL PARAMETERS GIVEN A REQUIRED INDUCTANCE OR THE
 COIL INDUCTANCE GIVEN THE COIL PARAMETERS FOR BOTH AIR WOUND AND TOROIDAL IN-
 DUCTANCES.

 ALL DIMENSIONS ARE IN INCHES

 AIR WOUND COIL OR TOROIDAL CORE? (A/T) >

 COMPUTE INDUCTANCE (I) OR COIL PARAMETERS (C) >


 REQD. INDUCTANCE (uH)> ? 3 4
 COIL DIAMETER IN INCHES > ? 3
 COIL LENGTH IN INCHES  > 4

                REQUIRED NUMBER OF TURNS =  9
```

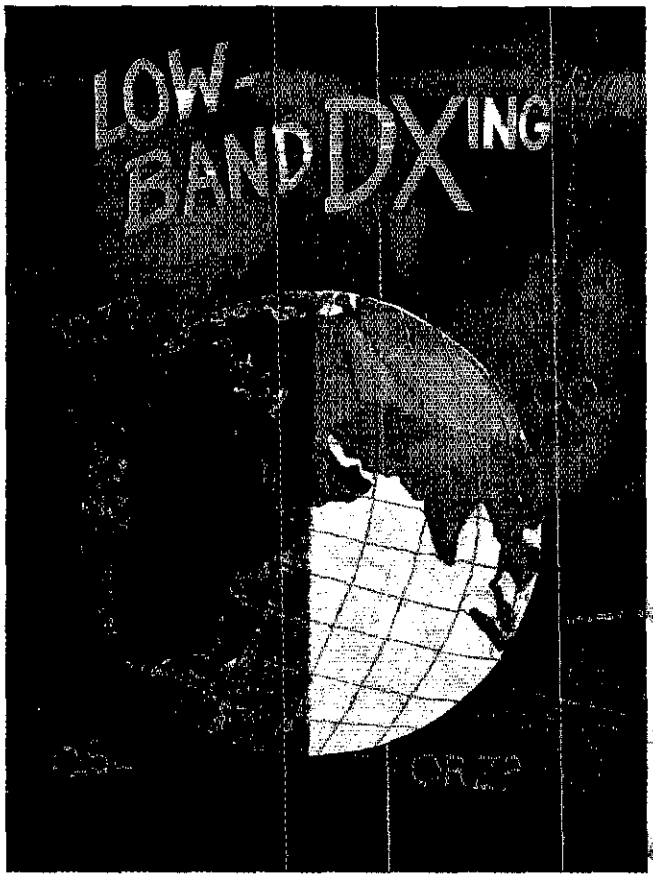
Low Band DXing Software

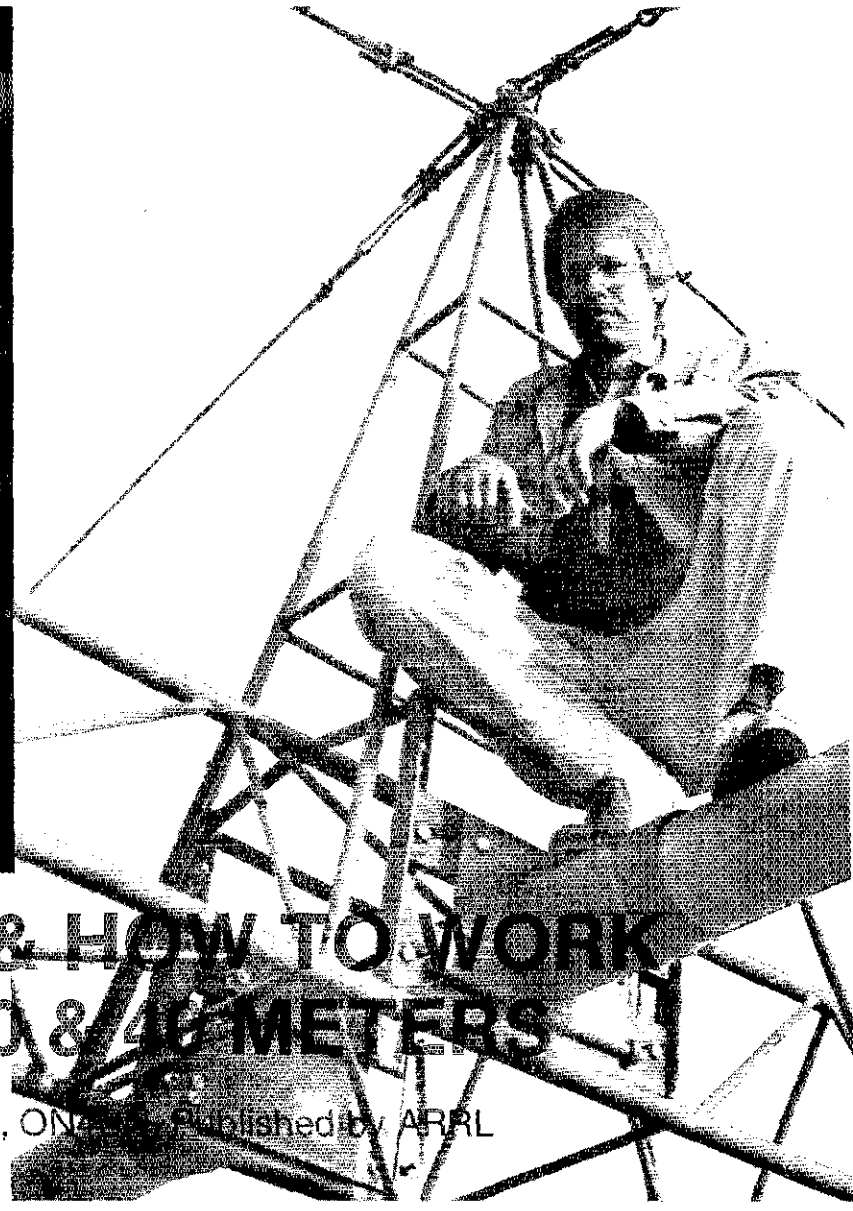
by John Devoldere, ON4UN

This inexpensive software will save you plenty of time. DXers will find these programs useful: grayline, great circle, and sunrise/sunset time listings. Of particular interest are the types of problems you can solve that have to do with antennas and transmission lines: mutual impedance, element driving impedance, voltage or impedance along with feedlines, feedline transformer, shunt or series input L network iteration and design, shunt or series impedance network, Pi or T line stretcher, feedline T junction/parallel impedances, SWR iteration and calculation, stub matching, horizontal antenna wave angle, vertical antenna design program, top loaded vertical design program, vertical array pattern calculation, element taper, coil calculation, RC/RL circuit transformation and obtaining precise resistance and capacitance values.

When ordering specify format; these versions are available for $20: **MS-DOS** for IBM and IBM compatibles, **DOS 3.3** for Apple 2C, 2E, or 2+, **CP/M** for Kaypro or Xerox, **CB-128 CP/M** for the Commodore C-128. The **MacIntosh** version is $25. Please add $2.50, ($3.50 for UPS) shipping and handling.

THE AMERICAN RADIO RELAY LEAGUE
225 MAIN STREET
NEWINGTON, CT 06111





WHEN, WHERE & HOW TO WORK DX ON 160, 80 & 40 METERS

Written by John Devoldere, ON4UN. Published by ARRL

It's the first really brisk day of autumn, and the trees have begun to shed their leaves. It's been crisp and clear for the past couple of days and there is not hint of rain in the forecast, so there should be no QRN. Propagation bulletins are predicting low absorption. It's going to be a great night for Low Band DXing!

This is an over-simplification. Radio amateurs know practically by instinct that 160, 80 and 40 meters "open up at night." But anyone in the Eastern U.S. who has worked Western Australia on 40-meters in the middle of the afternoon or West Coast amateurs who work into the Middle East on 80 meters just after daybreak know that, depending on the time of year, these bands have many secret hiding places for their DX-treasurers! Now, John Devoldere, ON4UN, has put together a treasure map in the form of a 210-page book published by ARRL where he completely explores the 160, 80, and 40-meter bands.

John draws on his vast knowledge and years of experience, as well as that contained in over 500 references which are listed in their own chapter. A large portion of the book is devoted to the design and building of efficient antennas for these frequencies. Receiver, transmitter and transceiver characteristics are also covered. The propagation chapter is the key to understanding when to work DX. The operating chapter tells where to find DX and gives tips on maximizing the effectiveness of your station for low band work. There is also a chapter of interesting and useful BASIC programs. But you don't have to keyboard these programs; there is inexpensive software that can be purchased separately which is available for use on many popular personal computers. (See next page.)

This new ARRL publication is copyright 1987. It is available in softcover only for $10 plus $2.50 ($3.50 for UPS) shipping and handling from ARRL.

OLDTIMERS! - N6AW is compiling information for a series of articles and a book about W6AM. If you have *a story to tell about Don Wallace, jot it down. If you* have pictures of Don or his station from past years, please make a copy. (Costs reimbursed.) Send to: Jan D. Perkins, N6AW, 6200 E. Ocean Bl. #7, Long Beach, CA 90803.

FULL TRANSMIT Screen Editing in the DIGIPAC series of telecommunications programs for your packet or mulitmode controller and PC or compatible/clone. With full NTS traffic forms and other features. All under $50. Write for information and pricing. Kalt and Associates, 2440 East Tudor Road, Suite #138, Anchorage, AK 99507, 907-248-0133. Charge Cards accepted.

FLORIDA QTH. 1983 Custom 2250 sq. ft. home. Master bedroom suite with hamshack. Fifteen miles from Gainesville in center of hunting and fishing. Tower, satellite, many extras. $84,500. AA4FL, 904-481-2677.

QRP KITS and parts. SASE brings brochures. W1FB, Box 250, Luther, MI 49656.

FOR SALE: Collins radio transmitter; crank-down tower and antenna. Call evenings 914-969-1223. Mrs. A.E. Kokinchak.

WANTED: 8874 tubes two - Roy Jones, 205 Industrial Avenue, Williston, VT 05495.

PERSONALIZED Shirts/Hats Call Signs Decals etc. Send SASE for details and sample lists. Faddy Daddy Productions, 5515 Jackson Dr. Ste. 819, La Mesa, CA 92041, 619-697-2145.

DXER'S Locator Blue Book, instant prefix ID, DX Bearings, Locator Grid Map, DX Time, Zones, QSL, QTH info. SASE sample, satisfaction guaranteed $4.50 W4UYZ - J/C Enterprises, 4920 Mayflower Street, Cocoa, FL 32927.

ATLAS RADIO Repair Service — Factory trained technicians. Fast service and reasonably priced. Parts available. RF Parts, 1320 Grand, San Marcos, CA 92069, 619-744-0720.

CODE PROGRAMS. Apple/C-64. 37 Modes, Graphics, Lessons, etc. Laresco, POB 2018, 1200 Ring Road, Calumet City, IL 60409, 1-312-891-3279.

LIMITED SPACE Dipoles for 160/80, 160/40, 80/40, co-ax fed, no tuning, $59.50 postpaid. G5RV multibander $35. G5RV Junior $32. SASE. Tom Evans, *W1JC, 113 Stratton Brook, Simsbury, CT 06070.*

SELL: ICOM IC-751, excellent condition, one owner. $675. KQ4O, 803-871-3190.

COMPLETE 1KW SSB/CW Station. Must Sell. Heath SB200, SB301, SB401, SB610 (scope) & HD19 (phonepatch). Rohn tower and rotator. Cubex 2 element triband quad antenna. Spares, manuals, and much more, in mint condition. Pick-up only. Write or call for list. Bill, W2NF, 621 Belgrove Drive, Kearny, NJ 07032, 201-991-8077.

HAM LAB Project. Want several pieces HP G-382A variable attenuator. Will consider any repairable condition. K6GOX, P.O. Box 10, O'Neals, CA 93645, 209-868-3548 collect.

COLLINS 75S3 receiver. Mint. K6TGE, 619-728-7777.

WANTED: Low priced broken ham radio gear to be repaired and given to needy Evangelical Christian Missionaries. Donations would be appreciated and receipts given for income tax deductions. Provide price and description to: Joel, WB6PDP, Missionary Amateur Radio Outreach, 4575 Badger Road, Santa Rosa, CA 95405.

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BEAM Headings your QTH. $5. W8JBU, 253 River Road, Hinckley, OH 44233.

WANTED: Collins. Looking for round emblem 75S-3C, 32S-3A, 516F-2. Must be excellent condition, unmodified, with manuals. Will pick up if practical. Mike Zak, AI1N, Box 1877, Brookline, MA 02146, phone 617-734-0627.

ORDER NOW in time for Christmas. Solid brass belt buckles. Name or call - one line $12. Name and call - two lines $14. Add $1 postage. S. Slonim, Dept. S, 320 Rose Street, Massapequa Park, NY 11762.

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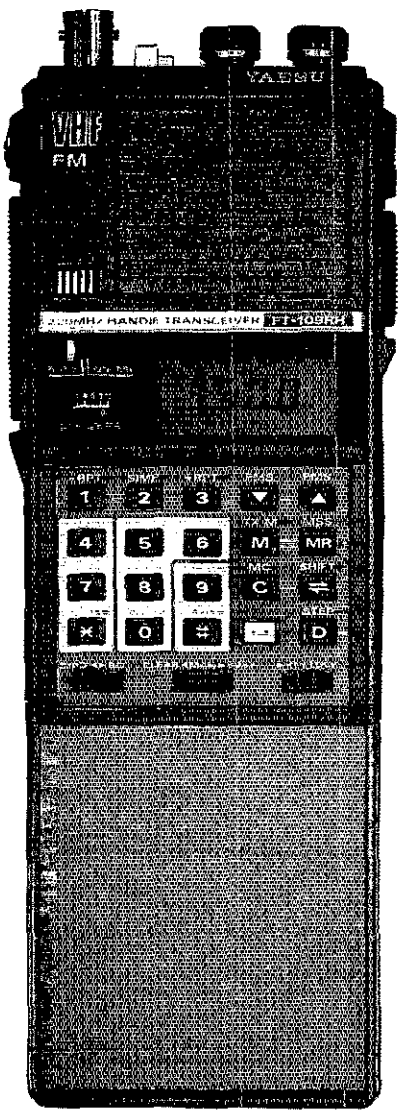
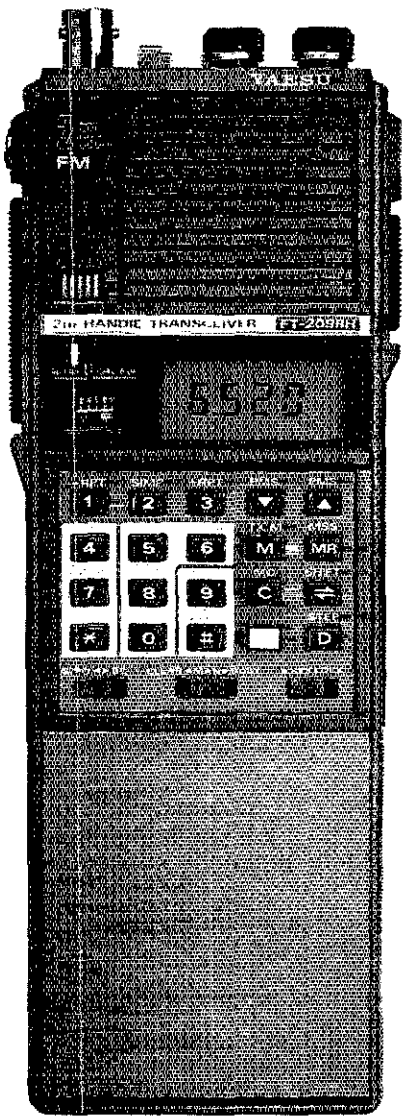
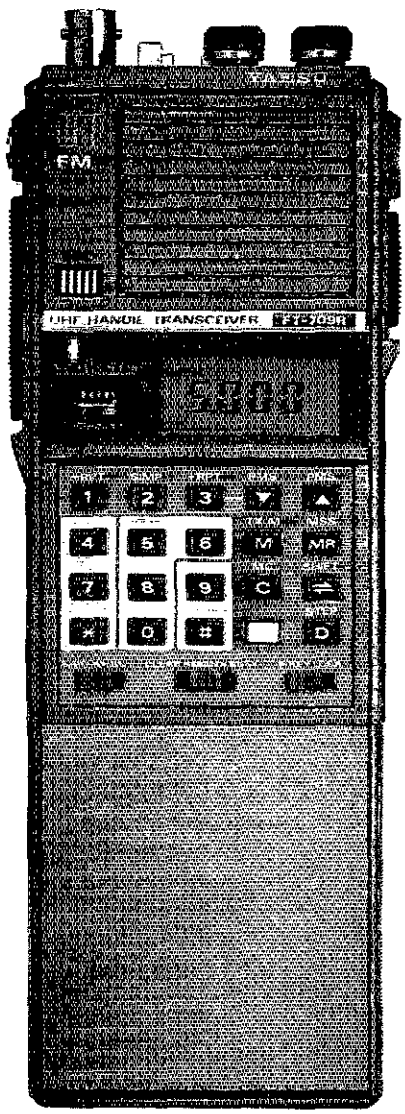
220 MHz



2 Meters



440 MHz



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SMART Battery Charger for gell-cells or lead acid batteries, by Warren Dion, W1BBH. See June 87 *QST* Magazine for circuit details. Complete kit, nothing else to buy, only $49.95 plus $3.50 S/H. Order #150-kit. A & A Engineering, 2521 W. La Palma, Unit K, Anaheim, CA 92801.

WANTED: Millen counter dial or equivalent, 250 pf per section split - stator variable air capacitor, .171 plate spacing. KA1BWO, 32 Kimball Road, RFD 3, Lisbon, CT 06351.

WANTED: Western Electric type TS34/AP hand portable oscilloscope manufactured 1950/1960. Call 203-753-5840.

RTTY SETUP: C-64, HD, color monitor, Hamtext, AEA CP-1, manuals and other software; $500. Rohn 48' tower, TET 5 element yagi, HAM-4 rotor; $600. No shipping; W5VFO, 214-680-9204.

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FREE: Sell-Want List. WA6GER, 3241 Eastwood Road, Sacramento, CA 95821.

WANTED: Kelsey 3 × 5. Give best price, phone no. best time to call. Smith, 121 Maple, Oak Ridge, TN 37830.

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COLLINS 30L-1 linear, excellent, manual, extra tubes, $425. Drake MN2000 KW antenna tuner, factory serviced, $125. Will ship UPS or Purolater. Mel, W8LLX, 727 Floral Avenue, Terrace Park, OH 45174 (near Cincinnati), 513-831-2252.

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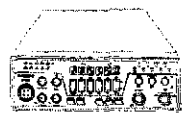

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Same as above except, 35 amp constant, 37 amp surge, adjustable from 10 to 15 volts

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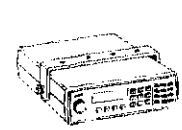

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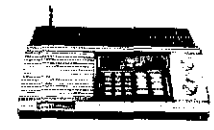
100 Channel mobile scanner with service search, programmable, 11 band with aircraft, weather, priority, channel lockout, scan delay, auto search, illuminated controls, track tuning, direct channel access



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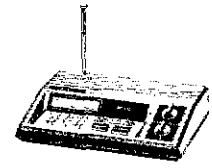
40 Channel split into 2-20 Ch banks, 11 band, weather & aircraft, weather search, priority, channel lockout, scan delay, auto search, programmable, auto squelch, track tuning, direct channel access, AC/DC



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16 channel 10 band, programmable, 2 digit LED display, priority, memory backup, channel lockout, weather search, AC/DC

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10 ch 10 band, hand held, 2 digit LCD, keyboard lock, Ch lockout, battery-low light, memory backup, built in delay, direct Ch access, track tuning.

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Mini size, audible & visual alert, omni-polarity guard, dash/visor.

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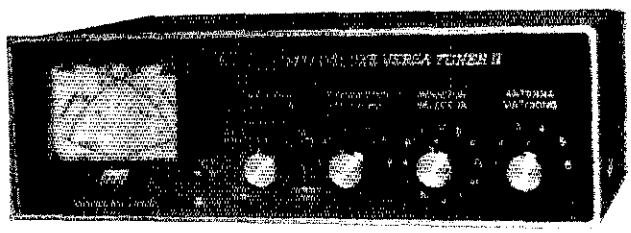

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MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A cross-needle SWR/Wattmeter gives you SWR, forward and reflected power -- all at a single glance. SWR is automatically computed with no controls to set. 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

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A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor -- 3 inches in diameter -- gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches give you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

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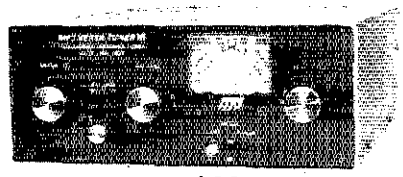
MFJ-108 $19.95 **MFJ-107 $9.95**

Huge 5/8 inch bold black LCD numerals make these 24 hour LCD clocks a must for your ham shack. Choose from a dual clock that displays UTC and local time or the single unit that displays 24 hour time.

Mounted in a brushed aluminum frame, these clocks feature 5/8 inch LCD numerals and a sloped face for easy across the room reading. Both also feature easy set month, day, hour, minute and second functions that can be operated in an alternating time-date display mode. MFJ-108, 4½x1x2 inches; MFJ-107, 2¼x1x2 inches. Battery included.

MFJ-962B VERSA TUNER III



MFJ-962B $229.95

Run up to 1.5KW PEP and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire.

Lighted Cross-needle Meter reads SWR, forward and reflected power in one glance. Has 200 and 2000 watt ranges. 6 position antenna switch handles 2 coax lines, random wire and balanced lines. 4:1 balun. 250 pf, 6 kv variable capacitors. 12 position ceramic inductor switch. Smaller size matches new rigs: 10¾ x 4½ x 14 7/8 inches. Flip stand for easy viewing. Requires 12V for light.

MFJ RANDOM WIRE TUNER

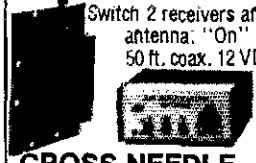
MFJ-16010
$39.95

MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping. Tunes 1.8-30 MHz. 2x3x4 inches.

REMOTE ACTIVE ANTENNA

54 inch remote active antenna mounts outdoor away from electrical noise for maximum signal and minimum noise pickup. Often outperforms long-wire hundreds of feet long. Mount anywhere-atop houses, buildings, balconies, apartments, ships.

Use with any radio to receive strong clear signals from all over the world. 50 KHz to 30 MHz. High dynamic range eliminates intermodulation. Inside control unit has 20 dB attenuator, gain control. Switch 2 receivers and auxiliary or active antenna. "On" LED. 6 x 2 x 5 in. 50 ft. coax. 12 VDC or 110 VAC with MFJ-1312, $9.95.



MFJ-1024
$129.95

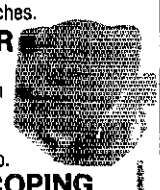
CROSS-NEEDLE SWR/WATTMETER

MFJ-815
$59.95

MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power -- all at a single glance! SWR is automatically computed -- no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter needs 12 V. ±10% full scale accuracy. 6½x3¼x4½ inches.

COMPACT SPEAKER

MFJ-280 $18.95



Mobile speaker. Tilt bracket on magnetic base. 3½ mm phone plug. Use with 8 and 4 ohm impedances. Handles 3 watts audio.

HANDHELD TELESCOPING ANTENNAS WITH BNC

MFJ-1710, $9.95, 3/8 wave 2 meter. Pocket clip. 5¾" - 24½".
MFJ-1712, $14.95, ¼ wave 2 meter; 5/8 wave 440 MHz, 7¼" - 19".
MFJ-1714, $16.95, ½ wave 2 meter. End-fed halfwave dipole. Shorter, lighter, more gain, less stress than 5/8 wave mounted on handheld. When collapsed it performs like rubber duck.

MFJ "DRY" DUMMY LOADS

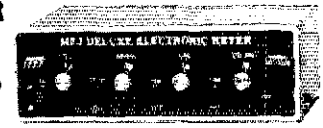
MFJ-262
$64.95

MFJ-260
$26.95

MFJ's "Dry" dummy loads are air cooled -- no messy oil. Just right for tests and fast tune up. Non-inductive 50 ohm resistor with SO-239. Full load to 30 seconds, de-rating curve to 5 minutes. **MFJ-260 (300 watt),** SWR 1.1:1,1-30 MHz, 1.5:1, 30-160 MHz, 2½x2½x7 inches. **MFJ-262 (1 KW),** SWR 1.5:1.30-160 MHz. 3x3x13 in. Alum. housing.

MFJ DELUXE ELECTRONIC KEYER

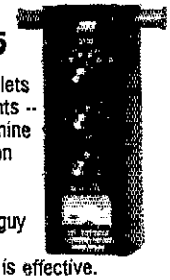
MFJ-407B
$69.95



MFJ-407B Deluxe Electronic Keyer sends iambic, automatic, semi-auto. or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8-50 WPM. Speed, weight, tone, volume controls. On/Off. Tune. Semi-auto switches. Speaker. RF proof. 7x2x6 inches. Uses 9 V battery. 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

ANTENNA CURRENT PROBE

MFJ-205 $79.95



MFJ Antenna Current Probe lets you monitor RF antenna currents -- no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **Determine if ground** system is effective.
- **Pinpoint RF leakage** in shielded enclosures.
- **Locate best place** for mobile antenna.
- **Use** as tuned field strength meter.
- **Indicate transmission line radiation** due to high SWR, poor shielding, antenna unbalance.
- **Detect re-radiation** from gutters, guy wires that can distort antenna field patterns.

Monitors RF current. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strength meter. 4x2x2 inches.

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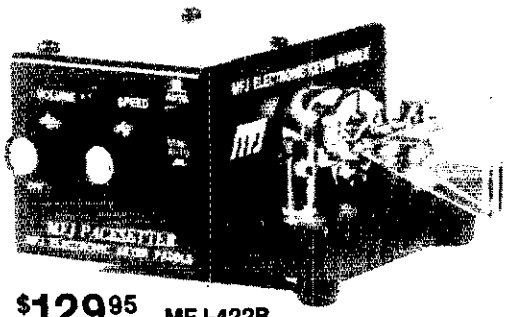
BEST OF MFJ

MFJ, Bencher and Curtis team up to give you America's most popular keyer in a compact package for smooth easy CW



$129.95 MFJ-422B

The best of all CW worlds - a deluxe MFJ Keyer using a Curtis 8044ABM chip in a compact configuration that fits right on the Bencher iambic paddle!

This MFJ Keyer is small in size but big in features. It features iambic keying, adjustable weight and tone and has front panel volume and speed controls (8-50 WPM), dot-dash memories, speaker, sidetone and push button selection of semi-automatic/tune or automatic modes. It's also totally RF proof and has ultra-reliable solid state outputs that key both tube and solid state rigs. Uses 9 V battery or 110 VAC with MFJ-1305, $9.95.

The keyer mounts on a Bencher paddle to form a small (4 1/8 x 2 5/8 x 5½ inches) attractive combination that is a pleasure to look at and use.

America's favorite paddle, the Bencher, has adjustable gold-plated silver contacts, lucite paddles, chrome plated brass, and a heavy steel base with non-skid feet.

You can buy just the keyer assembly, MFJ-422BX, for only $79.95 to mount on **your** Bencher paddle.

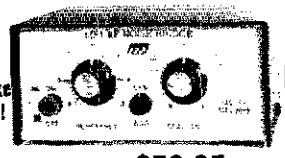
MFJ's best selling TUNER

MFJ-941D $99.95

The MFJ-941D is MFJ's best selling (and probably the world's best selling) 300 W PEP antenna tuner! Why? Because it has more features than tuners costing much more and matches everything from 1.8 to 30 MHz for your solid state or tube rig: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

New dual-range SWR wattmeter reads forward and reflected power in both 30 and 300 watt ranges. Convenient **front-panel mounted** 6-position antenna switch lets you select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load. New, larger, more efficient airwound inductor gives lower losses and more watts out. **Plus** . . . built-in 4:1 balun for balanced lines. 1000 V capacitor spacing, brushed aluminum front panel on all-metal cabinet. 11x3x7 inches.

RX NOISE BRIDGE



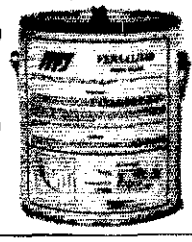
Make your antenna perform like you know it should! MFJ-202B tells whether to shorten or lengthen antenna for minimum SWR. Also measure resonant frequency, radiation resistance and reactance.

MFJ-202B $59.95

Exclusive features: individually calibrated resistance scale, expanded reactance range, built-in range extender for measurements beyond scale readings. 1-100 MHz. Uses 9 V battery. 2x4x4 in.

1 KW DUMMY LOAD

MFJ-250 $44.95



Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP. VSWR under 1.2 to 30 MHz. 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

INDOOR ACTIVE ANTENNA

"World Grabber" rivals or exceeds reception of outside long wires! Unique **tuned** Active Antenna minimizes intermode, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Telescoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 inches. 9V battery, 9-18 VDC or 110 VAC with MFJ-1312, $9.95.

MFJ-1020A $79.95

Grandmaster MEMORY KEYER

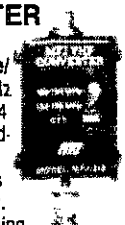
MFJ-484C $139.95

The MFJ-484C "GRANDMASTER" memory keyer is **THE** choice of CW contesters. Why? Because it's so easy to use, it's second nature . . . you don't have to learn complex commands . . . **and** it has all the features you'll ever need for easy CW.

Features like these . . . store up to twelve 25 character messages **plus** a message of up to 100 characters. Or use a switch to combine 25 character messages for up to three 50 character messages. Repeat any message continuously or pause between repeats and change or insert into a playing message by simply sending. And you don't lose your settings when you lose power.

The MFJ-484C is RF proof, sends 8-50 WPM and measures just 8x2x6 inches. It uses 12 to 15 VDC or 110 VAC with MFJ-1312, $9.95.

POLICE/FIRE/WEATHER 2 M HANDHELD CONVERTER



Turn your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner! 144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA maritime coastal plus more on 160-164 MHz. Mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Crystal controlled. Bypass/Off switch allows transmitting (to 5 watts). Use AAA battery. 2¼x1½x1½ in. BNC connectors

MFJ-313 $39.95

MFJ's smallest VERSA TUNER

$59.95 MFJ-901B

The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP Versa tuner -- when both your space and **your budget is limited.** Matches dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines from 1.8 -30 MHz. Excellent for matching solid state rigs to linears. Efficient airwound inductor. 4:1 balun.

RTTY/ASCII/CW COMPUTER INTERFACE

MFJ-1224 $99.95

Free MFJ RTTY/ASCII/CW software on disk and cable for VIC-20 or C-64. Send and receive computerized RTTY/ASCII/CW with nearly any personal computer (VIC-20, Apple, TRS-80, Atari, TI-99, Commodore 64, 128 etc.) Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 170, 425, 850 Hz) and any speed (5-100 WPM RTTY/CW, 300 baud ASCII). Sharp 8 pole active filter for CW and 170 Hz shift. Sends 170, 850 Hz shift. Normal/reverse switch eliminates retuning. Automatic noise limiter. Kantronics compatible socket plus exclusive general purpose socket. 8 x 1¼ x 6 inches. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

RECEIVER ANTENNA TUNER/PREAMPLIFIER

MFJ-959B $89.95

Impedance match your antenna to your receiver to increase your signal strength with this MFJ-959B and you may hear signals that you didn't even know were there. A 20 dB preamplifier with gain control boosts weak stations and a 20 dB attenuator prevents overload. It has switches for selecting between two receivers and two antennas. Covers 1.8 to 30 MHz. 9x2x6 inches. Uses 12 VDC or 110 VAC with MFJ-1312, $9.95.

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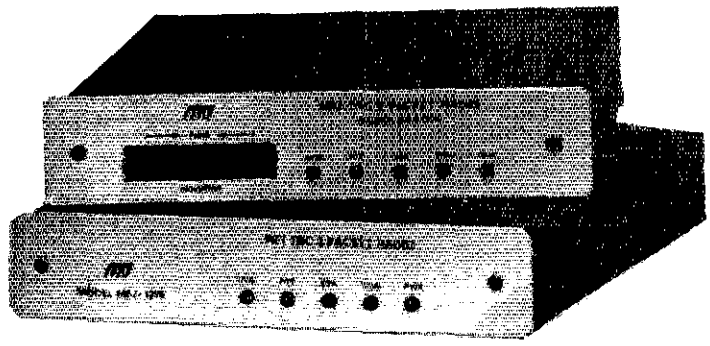
New MFJ-1274 lets you work VHF and HF packet with built-in tuning indicator for $169.95 . . .

. . . you get MFJ's latest clone of TAPR's TNC-2, TAPR's VHF/HF modem and built-in tuning indicator that features 20 LEDs for easy precise tuning

MFJ-1274
$169.95

MFJ-1270
$139.95



Now you can join the exciting world of packet radio on both VHF and HF bands with a precision tuning indicator . . . for an incredible $169.95!

You get MFJ's top quality clone of the highly acclaimed industry standard TAPR TNC-2. We've made TAPR's modem selectable for both VHF and HF operation, added their precision 20 segment LED tuning indicator, a TTL serial port, an easily replaceable lithium battery for memory back-up and *put it all in a new cabinet.*

If you don't need the tuning indicator or the convenience of a switchable VHF/HF modem, choose the affordable MFJ-1270 for $139.95.

All you need to operate packet radio is a MFJ-1274 or MFJ-1270, your rig, and any home computer with a RS-232 serial port and terminal program.

If you have a Commodore 64, 128, or VIC 20 you can use MFJ's optional Starter Pack to get on the air immediately. The Starter Pack includes interfacing cable, terminal software on disk or tape and complete instructions . . .everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), $19.95.

Unlike machine specific TNCs you never have to worry about your MFJ-1274 or MFJ-1270 becoming obsolete because you change computers or because packet radio standards change. You can use any computer with an RS-232 serial port with an apropriate terminal program. If packet radio standards change, software updates will be made *available as TAPR releases them.*

Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a machine specific TNC or one without hardware HDLC as higher speeds come into widespread use.

You can also use the MFJ-1274 or MFJ-1270 as an excellent but inexpensive digipeater to link other packet stations.

Both feature AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, multiple connects, 256K EPROM, 16K RAM (expandable to 32K with optional EPROM), simple operation, socketed ICs plus much more.

You get an easy-to-read manual, a cable to connect your transceiver (you have to add a connector for your particular radio), a connector for the TTL serial port and a power supply for 110 VAC operation (you can use 12 VDC for portable, remote or mobile operation).

Help make history! Join the packet radio revolution *now and help spread this exciting network* throughout the world. Order the top quality and affordable MFJ-1274 or MFJ-1270 today.

MFJ-1273, $49.95

Now you can tune in HF, OSCAR and other non-FM packet stations fast! This MFJ clone of the TAPR tuning indicator makes tuning natural and easy - - it shows you which direction to tune. All you have to do is to center a single LED and you're precisely tuned in to within 10 Hz. 20 LEDs give high resolution and wide frequency coverage.

The MFJ-1273 tuning indicator plugs into the MFJ-1270 and all TNC-1s, TNC-2s and clones that have the TAPR tuning indicator connector.

Order any product from MFJ and try it -- no obligation. If not satisfied return within 30 days for prompt refund (less shipping). • One year unconditional guarantee • Add $5.00 each shipping/handling • Call or write for free catalog, over 100 products.

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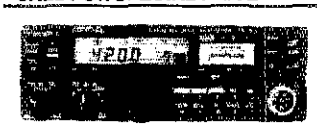

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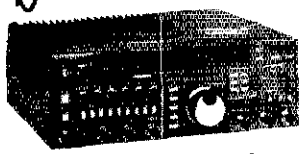

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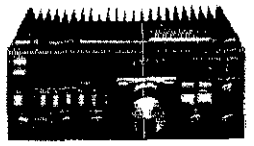

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RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	195
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MIRAGE

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$289
B23A	2M	Yes	2W	30W	$129
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$259
B3016	2M	Yes	30W	160W	$229
D1010N	440	No	10W	100W	$319

rfconcepts

rfc 2-317 2M
30W in = 170W out
LIST $299.00

Model	Band	In-Out	List Price
2-23	2M	2-30W	$112.00
2-217	2M	2-170W	$299.00
2-117	2M	10-170W	$299.00
3-22	220	2-20W	$112.00
3-211	220	2-110W	$299.00
3-312	220	30-120W	$264.00

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LK 800 A	$2695	LK 800 NT	$2995
AT 1200	$ 229	AT 3000	$ 499

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ELH-230D	89.95	ALR-72T	
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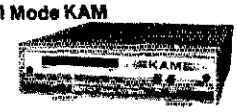
NEW All Mode KAM
$289.95



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KPC 4 Node Controller.....$299.95
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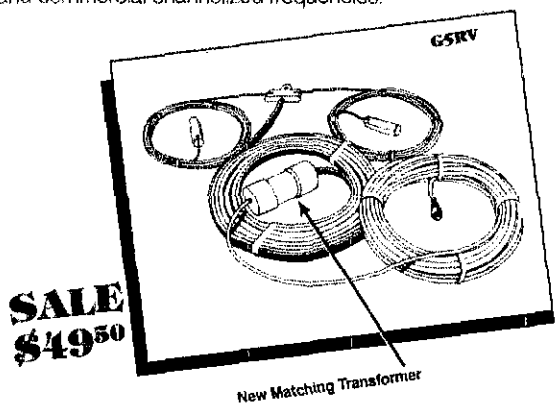

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SWAN 400, 420 VFO, 406 Mobile VFO, 117-B and 14-117 power supplies, bracket for remote mobile operation, complete operation and maintenance manuals. Extra set tubes, $150. W8JMH, 513-385-6532.

OPERATE under rugged field conditions, own the Yaesu FT-70G Portable Manpack Transceiver. Tranceiver complete with battery pack, RSL70 antenna, antenna tuner, speed charger/power supply, telephone mike, speaker-mike, *LSB filter*, canvas case. Transmit 2.0000 to 29.9999 MHz. Like-new $998 - Ervin Jackson Jr., 1835 Pinewood Circle, Charlotte, NC 28211, 704-366-9230.

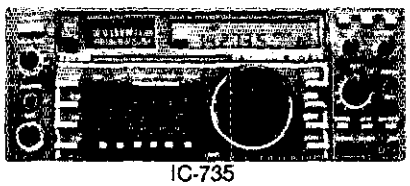
DIGITAL Automatic Display for FT-101's, TS-520's (DG-5 clone), Collins, Drake, Swan, Heath and all others. Six ½" digits, 5" wide by 1¼" metal cabinet. Reads receive and transmit frequencies. Send $2 for information. Receive a $30 discount. Includes comparison of the simple "BCD" readouts found in new radios and our very accurate "Calculating Frequency Counter" readouts. Please be specific. Grand Systems, POB 3377, Blaine, WA 98230.

FOR SALE: Arcos 2 meter KW RF Deck using 8930 tubes unit was built by Arcos then tested and not used since. RF deck, manual and blower all new. $650. Call NS9M at 317-832-2229, and leave message.

ROSS'$$$$ Used November Specials: Kenwood TS-430SW FM-430 $669.90, TS-130S $439.90 *R-599A $159.90, VFO-180 $95.* Yaesu FTV- *250* $169.90, SP-101PB $46.90, FV-200 $99.90, FP-757GX $119.90, AEA PK-64 $109.90, Robot 400 $299.90. Phone or send SASE for used items list. Over 8,772 new ham items in stock. Mention ad. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830, P.O. Box 234.

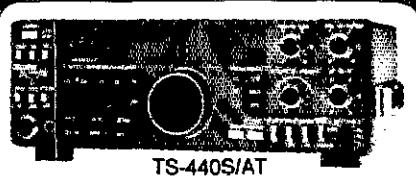
WANTED: Information on Pride Electronics, model 100, linear amplifier. Will gladly pay copy cost. Thanks. NV2P, Box 350385, Sheepshead Bay, NY 11235.

ICOM KENWOOD YAESU



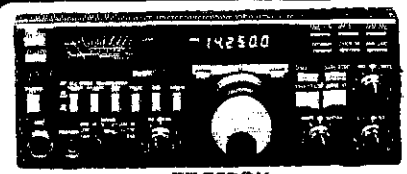
IC-735

HF Equipment	List	Juns
IC-761 New Top Of Line	$2499	Call $
IC-735 Gen. Cvg Xcvr	999.00	Call $
IC-745 Gen. Cvg Xcvr	1049.00	Call $
IC-751A Gen. Cvg. Xcvr	1649.00	Call $
IC-575A 10m/6m Xcvr	TBA	Call $
Receivers		
IC-R7000 25-1300 + MHz Rcvr	1099.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	949.00	Call $
VHF		
IC-275A All Mode Base w/PS	1199.00	Call $
IC-275H All Mode Base 100w	1389.00	Call $
IC-27A FM Mobile 25w	429.00	Call $
IC-27H FM Mobile 45w	459.00	Call $
IC-28A FM Mobile 25w	429.00	Call $
IC-28H FM Mobile 45w	459.00	Call $
IC-2AT FM HT	299.00	Call $
IC-02AT FM HT	399.00	Call $
IC-μ2AT Micro HT	329.00	Call $
IC-900 Six Band Mobile	TBA	Call $
UHF		
IC-475A All Mode 25w	1399.00	Call $
IC-47A FM Mobile 25w	549.00	Call $
IC-48A FM Mobile 25w	459.00	Call $
IC-4AT FM HT	339.00	Call $
IC-04AT FM HT	449.00	Call $
IC-μ4AT 440 FM HT	369.00	Call $
IC-3200A FM 2m/70cm 25w	599.00	Call $
220 MHZ		
IC-375A All-Mode, 25w, Base Sta.	TBA	Call $
IC-38A 25w FM Xcvr	459.00	Call $
IC-37A FM Mobile 25w	499.00	Call $
IC-3AT FM HT	339.00	Call $
IC-03AT Deluxe HT	449.00	Call $
1.2 GHz		
IC-1271A All Mode 10w	1229.00	Call $
IC-120 1w, FM, Xcvr	579.00	Call $
IC-12AT Deluxe 1w HT	459.00	Call $



TS-440S/AT

HF Equipment	List	Juns
TS-940S/AT Gen. Cvg Xcvr	$2,349.95	Call $
TS-940S Gen. Cvg Xcvr	2,119.95	Call $
TS-930S/AT Gen. Cvg Xcvr	1999.95	Call $
TS-830S Xcvr	1199.95	Call $
TS-430S Gen. Cvg Xcvr	899.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1,299.95	Call $
TS-440S Gen. Cvg Xcvr	1,099.95	Call $
TL-922A HF Amp	1,599.95	Call $
Receivers		
R-5000 100 kHz-30 MHz	949.95	Call $
R-2000 150 kHz-30 MHz	699.95	Call $
VHF		
TS-711A All Mode Base 25w	999.95	Call $
TR-751A All Mode Mobile 25w	629.95	Call $
TM-221A Compact FM 45w	419.95	Call $
TM-2530A FM Mobile 25w	459.95	Call $
TM-2550A FM Mobile 45w	489.95	Call $
TM-2570A FM Mobile 70w	589.95	Call $
TH21-BT FM, HT	279.95	Call $
TH-205 AT, NEW 2m HT	279.95	Call $
TH-215A, 2m HT Has It All	359.95	Call $
UHF		
TS-811A All Mode Base 25w	1,199.95	Call $
TR-851A 25w SSB/FM	729.95	Call $
TM-421A Compact FM 35w	439.95	Call $
TH-415A 2.5w 440 HT	379.95	Call $
TH-41BT FM, HT	299.95	Call $
TW-4100A, 2m/70cm FM	669.95	Call $
TR-50 1w 1.2GHz FM	599.95	Call $
220 MHZ		
TM-3530A FM 220 MHz 25w	479.95	Call $
TH-31BT FM, 220 MHz HT	299.95	Call $
TM-321A Compact 25w Mobile	439.95	Call $
TH-315A Full Featured 2.5w HT	379.95	Call $



FT 757GX

HF Equipment	List	Juns
FT-ONE Gen. Cvg Xcvr	$2859.00	Call $
FT-980 9 Band Xcvr	1795.00	Call $
FT-757 GX II Gen. Cvg. Xcvr	1079.95	Call $
FT-767 4 Band New	1895.00	Call $
FL-7000 15m-160m Solid State Amp	1895.00	Call $
Receivers		
FRG-8800 150 kHz - 30 MHz	699.95	Call $
FRG-9600 60-905 MHz	579.95	Call $
VHF		
FT-211RH FM Mobile 45w	459.95	Call $
FT-290R All Mode Portable	579.95	Call $
FT-23 R/TT Mini HT	299.95	Call $
FT-209RH FM Handheld 5w	359.95	Call $
UHF		
FT-711RH FM Mobile 35w	479.00	Call $
FT-770RH FM Mobile 25w	479.95	Call $
FT-73 R/TT Mini HT	314.95	Call $
FT-709RH FM HT 4w	359.95	Call $
VHF/UHF Full Duplex		
FT-726R All Mode Xcvr	1095.95	Call $
HF/726 Module for 10,12,15M	289.95	Call $
430/726 430-440 MHz	329.95	Call $
440/726 440-450 MHz	329.95	Call $
SU-726 Sate Duplex	129.95	Call $
FT-690R MKII, 6m, All Mode, port.	569.95	Call $
Dual Bander		
FT-2700RH FM 2m/70 cm 25w	599.95	Call $
FT-727R 2m/70 cm HT	479.95	Call $
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FT-109 RH New HT	379.95	Call $
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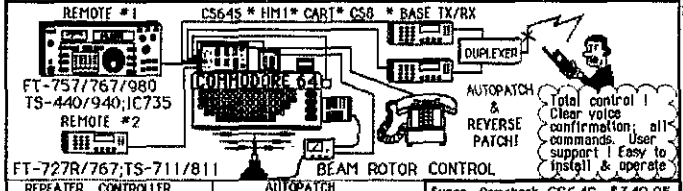

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*Directed/general & reverse page
*Full or Half duplex (level cont.)
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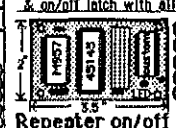

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WANTED: TS130V, excellent condition. Dale Hall, KBØWZ, Box 9609, Kansas City, MO 64134.

TH-215A 2M Handheld. Mint. Extras. $275. Bud, N7BFN, 206-939-6899.

FT-101E, $350, Digital Display YC-601, $125, Shure Desk Mike, $25. All excellent condition. AI5C, 713-479-2721.

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32S3, 516F2, Winged. $225. 75S3B, 500 Hz Filter, Round. $325. W1QFJ. No Shipping.

FOR SALE - 80 foot Rohn 4M self supporting tower with hardware and beacon. U-ship $500. Call Jeff, NB3H, 717-374-1815 after 4 PM.

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WANTED: Ham Software for portable Tandy 600 computer. Charles J. Hudson, 44 Nelson, Cooperstown, NY 13326.

HANDHELD Wilson T-1405SM 5 Watt, 6 Channel, Leather Case, Extra, Xtals, Manual Condx Excellent. 315-363-5582, W2GXE.

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EL PASO, TX, 3 bedroom, 1-¾ bath, 1300+ sq. ft. home. Ham shack, 65' tower w/ TH 7 DXX, many extras. Mid 60's. N5RK, 915-581-7944.

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RX-1 PROP-Pitch Rotator by W0MLY, never used. Ready to mount on tower, motor fitted with Selsyn and housed in steel cannister, has direction indicator with great circle map in Collins-type cabinet. Paid $1150 April 1987, sell for $1050. Call Gary, NS5R, 915-676-2800.

KANTRONICS "The Interface", *P/S* and VIC-20 with Ham software, $70. Palomar RX-100 Bridge $27. W1MG, 617-987-5075.

WANTED: Collins 75S-3C or 3A, 32S-3A, 516F-2, 312B-4, excellent condition. Chuck, KA8PLJ, 9965 Fox, Allen Park, MI 48101, home 1-313-383-7205, work 1-313-845-2691.

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WEST COAST Swap Sheets: Special offer, free ad for a full year, SASE. WD6AFC, Bill, 4076 No. Hammel, Fresno, CA 93727.

AZDEN Service by former factory technician. Fast turnaround. PCS-300 NiCads $34.95. Southern Technologies Amateur Radio Inc., 10715 SW 190 St. #9, Miami, FL 33157, 305-238-3327.

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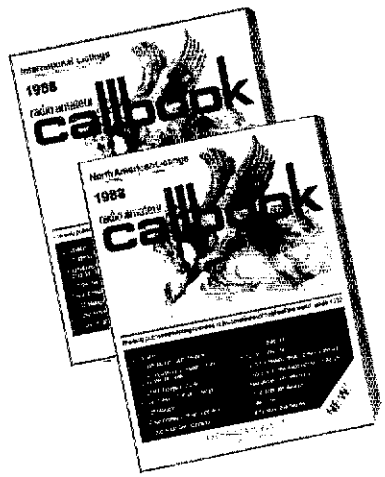

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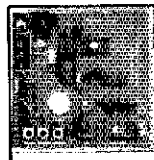

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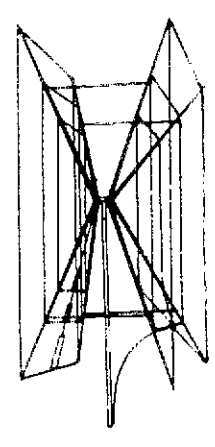

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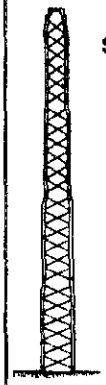

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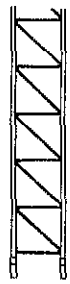

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90'	1069	1999	2249
100'	1149	2179	2439
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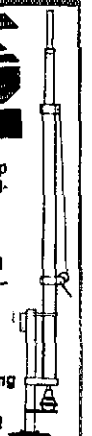

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TX456	22'	56'	18 sq ft	1249
TX472	23'	72'	16 sq ft	2068
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Note - US Towers Shipped Freight Collect From Visalia, CA Factory

*Note-towers rated at 50 mph to EIA specifications

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RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
¼" Heliax	50	.1	.2	.5	.9

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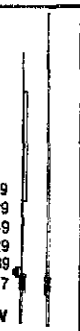

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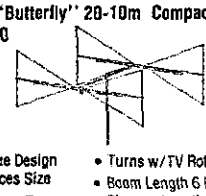

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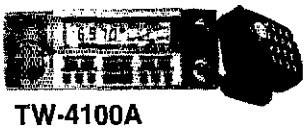

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- Frequencies: 142-149 MHz 440-449.995 MHz
- Selectable Full Duplex Cross Band Operation

KENWOOD

TM-221A

- 2m FM Mobile Transceiver
- 45W Output w/HiLo Switch
- 14 Multi-Function Memories
- TM-421A Available For 440 MHz

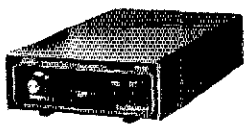
KENWOOD

TH-215A

"FULL FEATURED 2m HT"

- 141-163 MHz Receive
- 144-148 MHz Transmit
- 2.5w Output (5w Optional)
- 10 Memories
- Built-in CTCSS Encoder
- Nine Types of Scanning

AEA



PK-64/HFM

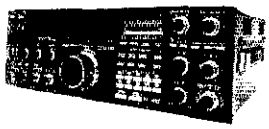
- Morse, Baudot, ASCII, AMTOR and Packet
- Operates VHF and HF
- You Need Only Your Transceiver and a Commodore 64 or 128

SPECIAL! SAVE $100.00

$184.95

Limited Supply

KENWOOD



TS940S "DX-cellence"

- 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

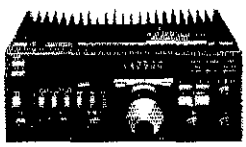
On Sale Now, Call for Price!

KENWOOD

TS430S

- Compact SSB, CW & AM Transceiver
- 160-10m w/General Coverage Receiver
- Solid-State Lightweight
- Dual VFO's

YAESU

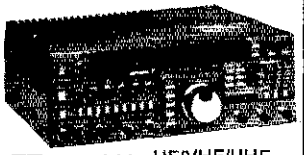


FT-757GX/II

"CAT SYSTEM"

- All Mode HF Transceiver
- Dual VFO's
- Full Break-in CW
- 100% Duty Cycle

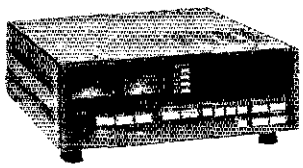
YAESU



FT-767GX HF/VHF/UHF BASE STATION

- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-In
- Lots More Features

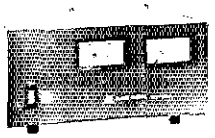
YAESU



FL-7000

- Solid State Amp for 160-15M
- Built-In Power Supply
- Automatic Tuner
- 1200W PEP Input

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

YAESU

FT-109RH

- 220 MHz Handheld
- 5W Output
- Ten Memories
- Battery Saver
- Memory And Priority Scanning
- FT-209RH-2m
- FT-709RH-440 MHz

YAESU

FT23/73R

- Super "Mini" HT's
- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-164 MHz, 440-450 MHz
- 2W Battery Pack or Optional 5W Pack

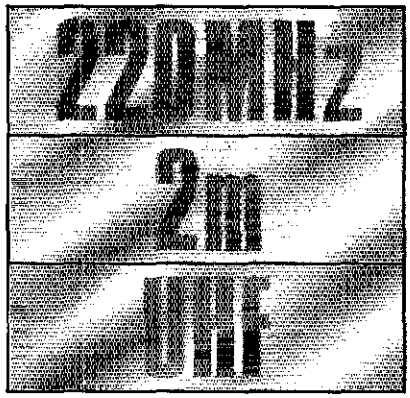
YAESU

FT-727R

- Two Affordable Radios in One
- 2m/440 MHz Handheld
- 5W on Both Bands
- Ten Memories
- Multi-Scan Systems
- Battery Saver

MOST ORDERS SHIPPED SAME DAY

Yaesu's mini HTs. The smallest, smartest, toughest radios. Anywhere.



Whether you're a Novice or Extra class operator, you're sure to appreciate the high power, durability and size of Yaesu's FT-23R Series mini-HTs.

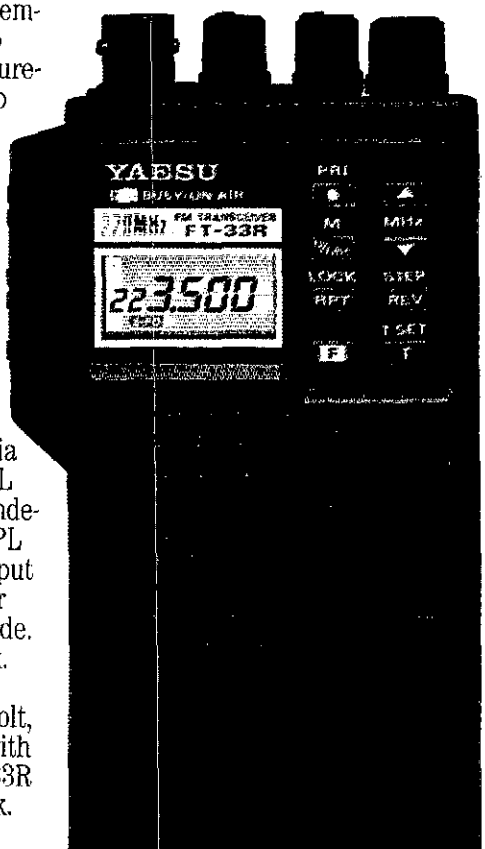
To begin with, you'll find a model that's right on your wavelength. The 2-meter FT-23R. The 220-MHz FT-33R. Or the 440-MHz FT-73R.

Whichever you choose, you benefit from incredibly small packaging. (Take a look at the actual size photo.) Aluminum-alloy cases that prove themselves reliable in a one-meter drop test onto solid concrete. And moisture-resistant seals that really help keep the rain out.

But perhaps best of all, each radio blends sophisticated, microprocessor-controlled performance with surprisingly simple operation. In fact, it takes only minutes to master all these features:

Ten memories that store frequency, offset and PL tone. Memory scan at 2 frequencies per second. Tx offset storage. Priority channel scan. Channel selection via tuning knob or up/down buttons. PL tone board (optional). PL display. Independent PL memory per channel. PL encode and decode. LCD power output and "S"-meter display. Battery-saver circuit. Push-button squelch override. Eight-key control pad. Keypad lock. High/low power switch.

The FT-23R comes with a 7.2-volt, 2.5-watt battery pack. The FT-73R with a 7.2-volt, 2-watt pack. And the FT-33R with a powerful 12-volt, 5-watt pack.



You can choose the miniature 7.2-volt, 2-watt pack shown in the photo below. And all battery packs are interchangeable, too.

And consider these options: 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 more.

Check out the FT-23R Series at your Yaesu dealer today. Because although we can tell you about their incredible performance, toughness and small size, seeing is really believing.

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. PL is a registered trademark of Motorola, Inc. FT-33R shown with optional FNB-9 battery pack.

KENWOOD

...pacesetter in Amateur Radio

NEW.

Affordable DX-ing!

TS-140S

HF transceiver with general coverage receiver.

Compact, easy-to-use, full of operating enhancements, and feature packed. These words describe the new TS-140S HF transceiver. Setting the pace once again, Kenwood introduces new innovations in the world of "look-alike" transceivers!

- **Covers all HF Amateur bands with 100 W output.** General coverage receiver tunes from 50 kHz to 35 MHz. *(Receiver & specifications guaranteed from 500 kHz to 30 MHz.)* Modifiable for HF MARS operation. *(Permit required).*
- **All modes built-in.** LSB, USB, CW, FM and AM.
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.

- **New Feature! Programmable band marker.** Useful for staying within the limits of your ham license. For contesters, program in the suggested frequencies to prevent QRM to non-participants.
- **Famous Kenwood interference reducing circuits.** IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.

- **M. CH/VFO CH sub-dial.** 10 kHz step tuning for quick QSY at VFO mode, and UP/DOWN memory channel for easy operation.
- **Selectable full (QSK) or semi break-in CW.**
- **31 memory channels.** Store frequency, mode and CW wide/narrow selection. Split frequencies may be stored in 10 channels for repeater operation.
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- ***MC-43S UP/DOWN* mic. included.**

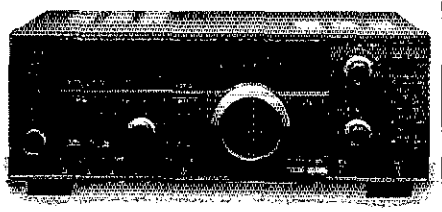
Optional Accessories:

• **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface • **MA-5/VP-1** HF mobile antenna (5 bands) • **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85** disk mics. • **PG-2S** extra DC cable • **PS-430** power supply • **SP-40/SP-50B** mobile speakers • **SP-430** external speaker • **SW-100A/SW-200A/SW-2000** SWR/power meters • **TL-922A** 2 kW PEP linear amplifier (not for CW QSK) • **TU-8** CTCSS tone unit • **YG-455C-1** 500 Hz deluxe CW filter, **YK-455C-1** New 500 Hz CW filter.

TS-680S

All-mode multi-bander

- 6m (50-54 MHz) 10 W output plus all HF Amateur bands (100 W output).
- Extended 6m receiver frequency range 45 MHz to 60 MHz. Specs. guaranteed from 50 to 54 MHz.
- Same functions of the TS-140S except optional VOX (VOX-4 required for VOX operation).
- Preamplifier for 6 and 10 meter band.



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

KENWOOD

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